122 - A250
Near Vision Impairment in Older Adults in Brazil: The Sao Paulo Eye Study
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Purpose: To estimate the prevalence of major causes of blindness and visual impairment among Indonesian adult population in Jakarta

Methods: A stratified, cluster sampling of the inhabitants aged 40 years or older in 4 sub-districts of Makassar district in Eastern Jakarta were selected randomly and were invited to participate in this population-based cross-sectional study. Eligible subjects underwent a comprehensive eye examination, including visual acuity using Snellen charts and refraction, slit-lamp biomicroscopy, gonioscopy, non-contact and Goldmann applanation tonometry; photo fundus examinations, automated static perimetry, and ocular biometry. Visual impairment was defined as best corrected visual acuity (BCVA)<6/18, and blindness was defined as BCVA<3/60 following World Health Organization (WHO) definitions. Primary causes of visual impairment and blindness were recorded

Results: The total of 1267 Indonesian subjects aged 40 years or older was participated in the study (response rate 64.35%). The prevalence of blindness and visual impairment (BL/VI) was 1.12% (95% CI, 0.48-1.70) and 2.55% (95% CI, 1.71-3.48), respectively. The prevalence of cataract as the cause of visual impairment was 4.93% (95% CI, 3.75-6.4), of glaucoma 0.43% (95% CI, 0.14-1.03), of diabetic retinopathy was 0.95% (95% CI, 0.49-1.65), of ARMD was 0.08% (95% CI, 0.002-0.4)

Conclusions: Blindness and visual impairment remain major problem in Indonesia, but not yet in a priority in the health care system. Cataract and diabetic retinopathy were the major causes of visual impairment, thus indicating the necessity of implementation specific programs directed toward reducing the both burden in the country

CR: R.S. Silorus, None; V.D. Oktariana, None; E.S. Affandi, None; B. Harmani, None; S. Widiyawati, None; G.A. Adrino, None; A. Djatikusumo, None; R. Tahayu, None; N.F. Moelnek, None

Support: None

125 - A253
Prevalence and Causes of Blindness and Visual Impairment in Urban Indonesian Adult Population: The UrbanJakarta Eye Health Study

Purpose: To estimate the prevalence of major causes of blindness and visual impairment among Indonesian adult population in Jakarta

Methods: A stratified, cluster sampling of the inhabitants aged 40 years or older in 4 sub-districts of Makassar district in Eastern Jakarta were selected randomly and were invited to participate in this population-based cross-sectional study. Eligible subjects underwent a comprehensive eye examination, including visual acuity using Snellen charts and refraction, slit-lamp biomicroscopy, gonioscopy, non-contact and Goldmann applanation tonometry; photo fundus examinations, automated static perimetry, and ocular biometry. Visual impairment was defined as best corrected visual acuity (BCVA)<6/18, and blindness was defined as BCVA<3/60 following World Health Organization (WHO) definitions. Primary causes of visual impairment and blindness were recorded

Results: The total of 1267 Indonesian subjects aged 40 years or older was participated in the study (response rate 64.35%). The prevalence of blindness and visual impairment (BL/VI) was 1.12% (95% CI, 0.48-1.70) and 2.55% (95% CI, 1.71-3.48), respectively. The prevalence of cataract as the cause of visual impairment was 4.93% (95% CI, 3.75-6.4), of glaucoma 0.43% (95% CI, 0.14-1.03), of diabetic retinopathy was 0.95% (95% CI, 0.49-1.65), of ARMD was 0.08% (95% CI, 0.002-0.4)

Conclusions: Blindness and visual impairment remain major problem in Indonesia, but not yet in a priority in the health care system. Cataract and diabetic retinopathy were the major causes of visual impairment, thus indicating the necessity of implementation specific programs directed toward reducing the both burden in the country

CR: R.S. Siroes, None; V.D. Oktariana, None; E.S. Affandi, None; B. Harmani, None; S. Widiyawati, None; G.A. Adrino, None; A. Djatikusumo, None; R. Tahayu, None; N.F. Moelnek, None

Support: None
126 - A254
A Pilot Observational Study to Determine the Prevalence of Usual-Corrected Binocular Distance Visual Acuity Among Illinois Lifeguards

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Purpose: Illinois lifeguards do not have a required minimal visual acuity for certification. Various agencies have attempted to define the visual acuity requirements needed for effective lifeguarding; some have advocated a 20/20 threshold similar to police, fire, and other rescue professions, while others have advocated a 20/20 threshold. Prior to setting a lifeguard certification visual acuity threshold in Illinois, it is desirable to predict the impact of implementing a new visual acuity exclusionary criterion. To our knowledge, no epidemiological studies have been published to describe the distribution of visual acuity in lifeguards. The purpose of this pilot observational study was to determine the prevalence of usual-corrected distance binocular visual acuity among Illinois lifeguards.

Methods: The GuardVision Vision Test was administered to 4,509 Illinois lifeguards (ages 15-22 years). This LogMAR-based distance visual acuity test assesses the lifeguard’s usual-corrected binocular visual acuity at ten-feet. Subjects received credit for the lowest visual acuity line that was correctly. The number of subjects passing the screening with visual acuity thresholds of 20/30 and 20/20 was analyzed.

Results: At a 20/30 visual acuity threshold, 4,368 lifeguards passed the vision screening while 141 (3.1%) would have been restricted from duty. At a 20/20 visual acuity threshold, 1,786 lifeguards passed the vision screening while 2,723 (60.4%) would have been restricted from duty. In this cohort, a 20/20 visual acuity threshold would restrict more than 18 times the number of lifeguards from duty than a 20/30 visual acuity threshold.

Conclusions: A usual-corrected binocular distance visual acuity threshold of 20/20 would restrict a larger number of Illinois lifeguards from duty than a visual acuity threshold of 20/30. The closest published cohort comparison shows that 4% of adults in the United States have usual-corrected binocular visual acuities of 20/20 or worse. The 3.1% of lifeguards in Illinois with usual-corrected binocular visual acuities of 20/30 or worse in this study indicates that Illinois lifeguards tend to have better usual-corrected distance binocular visual acuities than the average adult.

This study does not address the impact of VA on lifeguard performance.

CR: G.W. Goodfellow; None; B.L. Seiller; None.
Support: None.

128 - A256
Trends of Diagnosed Age-Related Eye Diseases and Their Relationship With Visual Functioning Among Nursing Home Residents, 1995-2004

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Purpose: To assess the prevalence trends for three major age-related eye diseases (age-related macular degeneration, cataract, and glaucoma) among nursing home residents and to explore the relationship between these eye diseases and residents’ visual function as reported by nursing home staff.

Methods: The study utilizes National Nursing Home Survey (NNHS) trend data for survey years 1995-2004. We used SAS version 9.1 and SUDDAN version 9.0 to control for complex sample design and non-response. Cases of age-related macular degeneration (ARDM), current cataract, and glaucoma were identified using ICD-9 codes. We assessed changes in prevalence using t test and the linear trend by applying weighted least squares regression. We calculated odds ratio and 95% confidence intervals for the association between eye diseases and staff reported visual function.

Results: The estimated trends in prevalence of each of the eye diseases from 1995 to 2004 were: ARMD, 0.93 to 2.28%; (p <0.003); cataract, 3.7% to 2.47% (p <0.033); glaucoma, 5.2% to 5.06% (p <0.036). Among nursing home residents with ARMD, the weighted trend significantly increased over the study period in the 75-84 and 85+ years old groups, and among whites. Odds ratios for staff reported visual function impairment were higher for residents with diagnosed eye diseases than for those without eye disease (ARDM OR= 5.79; cataract OR= 2.33; glaucoma OR= 2.98).

Conclusions: The weighted population trends in three major age-related eye diseases in nursing home residents varied during the study period. The prevalence of ARMD increased over time, while the prevalence of cataracts decreased and the prevalence of glaucoma remained relatively stable. Trends also varied by age and race. Nursing home staff were more likely to report impaired visual function in residents with diagnosed eye diseases. Recognition of residents’ visual impairment by nursing home staff is important because if staff have not recognized visual impairment then it is unlikely they will alert anyone to the need for referring residents for further evaluation. Visual impairment in this population can lead to increased risk for falls and reduced quality of life.

CR: X. Zhang; None; A. Elliott; None; H. Luo; None; J. Saadinne; None.
Support: None.

127 - A255
Assessing Eye and Visual Functioning in Children and Young Adults With Autism Spectrum Disorder

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Purpose: The broadening of the diagnosis for autism spectrum disorder (ASD) has made it the fastest rising neurodevelopmental disorder, with an incidence in children now greater than 1%. Given that children with ASD appear to have visual symptomatology, it is surprising that no systematic ophthalmic studies have been conducted on this population, and the few limited reports are equivocal. Here we report on the first comprehensive study of basic functional vision in this population.

Methods: 44 patients (8 female, 36 male; age range: 3-22 years) with a primary diagnosis of ASD were tested with a battery of screening tests developed for our early childhood eye and vision screening program (Adams et al, ARVO 05,07,08,09). These included measures of visual acuity, a full test of ocular alignment, stereoscopic, refractive error, contrast sensitivity (CS), and Vernier acuity. Children were tested monocularly with optical correction if prescribed.

Results: 95% of the patients completed all tests in both eyes. The data were separated into 2 age groups, 3-6-year-olds (n=21) and 7+ years (n=23). Compared to controls, 3- to 6-year-olds showed moderate deficits in visual acuity (M = 20/48; 0.38 LogMAR), CS (M = 5.53 Log arcsec, 75% failed), and visual acuity threshold (M = 0.75 Log arcsec, 75% failed), but not only a moderate deficit in CS (56 CS units). Conversely, across all patients, refractive errors showed a relatively normal age distribution. Using standard pediatric referral criteria, 62% of the younger and 74% of the older group were referred to an eye care specialist.

Conclusions: Children with ASD are at risk for eye and visual dysfunction. Given that most children were cooperative, this does not appear to be a compliance issue. On the other hand, the given the relatively normal refractive status within this sample, vision deficits appear to have a neural basis.

CR: R.J. Adams; None; C.N. Dove; None; J.R. Drover; None; B.R. Norman; None; E.E. Birch; None; Y.-Z. Wang; None; M.L. Courage; None.
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129 - A257
Prevalence of Visual Impairment and Blindness and Survey of Barriers to Eye Care in a South Indian Population

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Purpose: To evaluate prevalence of visual impairment and blindness, and identify demographic barriers to eye care in rural and slum areas of Chennai, India.

Methods: A cross-sectional study of visual status of 2558 subjects aged 5 years or older was conducted in May and June 2009 using a two-stage cluster random sampling. Visual impairment was defined as best-corrected visual acuity in the better eye (BCVA)<18/18 but >3/60, and blindness was defined by the WHO (BCVA<6/60). Indian (BCVA<6/60) and US (BCVA<6/60) standards. Of all the subjects, 424 aged 15 years or older agreed to participate in a structured interview. The data were subjected to a structural equation model with health background, awareness of visual burden, ability to access and acceptance of eye care.

Results: Prevalence of blindness was 0.72% (95% Confidence Interval 0.43-1.13%) by the WHO definition, 2.63% [2.04-3.33%] by the Indian definition, and 7925 [6.90-9.08%] by the US definition. Prevalence of visual impairment was 12.38% [11.12-13.73%]. Cataract [12.12% [10.88-13.45%]] was the leading cause of blindness, in 94.44% (p<0.001), 89.39% (p<0.001), and 79.09% (p=0.001) of blindness by the WHO, Indian, and US standards respectively, and visual impairment (87.50%, p<0.001). Acceptance rates of medicine, eyeglasses, surgeries, and all three were 53.7% [48.9-58.6%], 87.5% [84.0-90.5%], 61.1% [56.6-65.8%], and 35.4% [30.8-40.1%] respectively, while 4.0 % [2.4-6.3%] rejected all three. These acceptance/rejection rates were consistent irrespective of age, education, employment, financial, and vision status. Only 15.1% [11.8-18.7%] could afford private eye care and 52.6% [47.7-57.4%] had never received previous eye examinations. In a multivariate analysis, surgery acceptance was statistically associated with self report of severe visual burden on daily life (Odds Ratio 1.85 [1.08-3.15], p=0.024 and certain regions of residence, but not with gender, age, education, employment, reception of eye care in the past, or ability to pay.

Conclusion: Cataract and refractive errors are the leading causes of blindness and visual impairment in this region. Resources should be allocated to address the high prevalence of cataract and preventable blindness. Lack of knowledge of eye care is common among most demographic groups, notably in age, education, employment, and financial status. Concerns for quality of local eye care services (such as medicine) and lack of eye care education also present major barriers to eye care in this region.

CR: Z. Su; None; B.Q. Wang; None; Y.M. Buys; None.
Support: 1Yale University MacElroy Center Global Health Initiative Fellowship, Yale University International Summer Award, Dean’s Experience Enhancement Fund at Victoria College of University of Toronto.
130 - A258
Main Causes of Blindness in the Veterans Administration Caribbean Healthcare System Population

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Purpose: To describe the main causes of blindness and socio-demographics characteristics of the VA Caribbean Healthcare System (VACHCS) population between 1997-2007.

Methods: A retrospective chart review of all legally blind patients (≥20/200 in better eye or ≥20 degrees of visual field restriction in better eye) in the Blind Rehab System Database at the Veterans Administration Hospital from 1997-2007. Data collected for each patient included main cause of blindness (confirmed by MD in chart review), best corrected visual acuity, visual fields, age, gender, race, ethnicity, education and financial status. We identified the total veterans population served by the VACHCS based on American Community Survey 2005-2007 and 2000 US census to estimate the prevalence of blindness in our population.

Results: After chart review 802 subjects were identified as legally blind. The three main causes of blindness were glaucoma (n=347;43.4%), diabetic retinopathy (n=229;27.3%), and age related macular degeneration (n=91;11.3%). Mean age of legally blind subjects was 77.0 ± 9.9 yrs. Almost all patients were male (99.5%). Most 90% are Hispanics or Latino and 83.6% of patients describe themselves as whites. At least 50% of them has annual income of less than $20,000 and more than 75% has a high school diploma or a greater degree. We estimate the prevalence of blindness in the VACHCS to be 0.59% ± 0.10%. Between the three main causes of blindness, diabetic retinopathy group has a statistically significant lower mean age.

Conclusions: In this veterans population of mainly Puerto Rican ancestry the main cause of blindness was glaucoma. Despite diabetes being so prevalent in Puerto Ricans, even higher among other Hispanics, glaucoma is still the main cause of blindness by a high margin. Findings are similar to studies realized with Mexican-American populations.

CR: A.C. Toro; None; A. Cortes, None.

Support: None.

131 - A259
Prevalence and Causes of Visual Disability in the Eastern China

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Purpose: To assess the prevalence and causes of visual disability in urban and rural area of the eastern China.

Methods: As part of the 2nd National Survey on the Disabilities in P.R.China, a population-based, cross-sectional study were conducted between 2006-2007 in Zhejiang Province of eastern China (with a total population of 3.12 million). Random clustered samples of 95392 residents/children and adults were interviewed by trained eye professionals about their vision health, and those reported with vision problems were referred for the detailed ocular examinations by ophthalmologists including age-appropriate tests of visual acuity (VA), visual field, and anterior/posterior segment examinations etc.. Vision disabilities were defined as VA<20/40 following the definitions of modified World Health Organization (WHO), including low vision (VA<20/40 but ≥20/400) and blindness (VA <20/400).

Principal cause of visual disability was determined by ophthalmologists.

Results: Among 95392 subjects studied, 115 subjects were identified with visual disabilities including 350 with blindness and 765 with low vision. The prevalence of visual disability was 1.17% (95% confidence interval (CI): 1.11%-1.23%), representing 0.5% (95% CI: 0.34%-0.40%) with blindness and 0.85% (95% CI: 0.76%-0.83%) with low vision. The principal causes of visual disability were: cataract (62.2%), retinal disease (13.9%), hereditary/congenital disease (5.91%), cornea disease (4.5%), optic nerve disease (3.9%), ametropia (3.4%), glaucoma (2.7%), and others (3.4%). Prevalence rate is higher in rural people (1.12%, 95% CI: 1.02% - 1.35%) than urban people (0.96%, 95% CI: 0.87% - 1.05%).

Conclusions: Majority of visual disabilities in eastern China are caused by senile eye diseases and are treatable.

CR: J. Wang; None; Y. Gu; None; Y. Chen; None; W. Zhou; None; G.-S. Ying; None.

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Purpose: To determine the prevalence of blindness and visual impairment among persons 40 years and older residing in Tema, Ghana, West Africa.

Methods: A proportionate random cluster sampling representative of the population was used in selection of subjects 40 and over in the city of Tema. The presenting distance visual acuity was measured at 4 and 1 meters using a reduced logMAR tumbling E chart and used in selection of subjects ≥40 years and over in the city of Tema. The examination was performed on all subjects and complete clinical examination by an ophthalmologist was performed on subjects with best corrected visual acuity less than 20/40 or failure of other screening test criteria in either eye, including optic nerve and macular photos. Main outcome measures: Blindness was defined as visual acuity (VA) in the better seeing eye of ≤20/400 or ≤10% visual field area around central fixation. Visual impairment was defined as VA <20/200 but ≥20/400 in the better seeing eye.

Results: 6806 eligible subjects were identified of which 5603 (82.3%) participated in the screening examination. 60.3% of the subjects were female and 39.7% were male. The age (Mean ±SD) of subjects was 52.7±10.9. The prevalence of visual impairment was 17.1% and blindness was 1.2%. After cycloplegia refraction and spectacle correction by an optometrist, the prevalence of any visual impairment and blindness decreased to 6.6% and 0.8% respectively, suggesting that refractive error is a major correctable cause in this population. 85 subjects out of 5603 had presenting VA < 20/400 in the better seeing eye. Of these, 39 subjects could be corrected by refraction alone and the remaining 46 (27 cataract, 3 glaucoma, 5 corneal opacities, 1 retinal scar, 2 optic atrophy, 8 uncorrected) had some underlying ophthalmic pathology. Conclusion: There is a high prevalence of blindness and visual impairment among those aged 40 years in Tema, Ghana. Refractive error is a major cause of visual impairment in this population.

CR: J. Bundi; None; D.L. Budenz; None; K. Barton; None; W.I. Feuer; None; W. Nolan; None; L. Herndon; None; J. Whiteside-de Vos; None; P. Egbert; None; G. Hay-smith; None.

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Neonatal Jaundice and Vision Loss


Purpose: Neonatal jaundice is common in infants and is caused by elevated levels of bilirubin. Bilirubin that crosses the blood brain barrier (directed, or “free bilirubin”) is neurotoxic in high doses. Despite the low incidence of kernicterus (permanent neurological damage caused by hyperbilirubinemia), more subtle effects of lower levels of bilirubin on the developing neurological system are possible and debated.

Methods: We examined 16 infants at 3 - 5 months of age who had been born full term and were clinically jaundiced. These infants had a bilirubin level measured before day 3 of life and their bilirubin levels ranged from 7 to 25 mg/dL. The examination consisted of a measure of sweep VEP (sVEP) response curves as a function of spatial frequency at high contrast (to measure grating acuity), as a function of contrast (to measure maximal contrast sensitivity) and as a function of vernier offset size (to measure position acuity). These 16 infants were compared to age-matched full term infants with no history of jaundice or treatment for jaundice. Response amplitudes were measured and thresholds were estimated by extrapolation of the VEP response function to zero amplitude. Threshold comparisons were made with healthy, full term, age-matched infants. Signal amplitude comparisons were made with these age-matched control infants.

Results: Control infants show greater signal amplitudes compared to infants who had hyperbilirubinemia. The finding exists for all vision functions (grating, contrast, and vernier sensitivity), and is most pronounced for contrast sweeps where it is seen across the entire range of contrasts tested. Furthermore, a correlation exists between the peak serum bilirubin level shortly after birth, and the vernier acuity threshold measured at 3 - 5 months of age suggesting that neural sensitivity could also be influenced by an experience with neonatal jaundice.

Conclusions: Neonatal jaundice has a deleterious effect on VEP amplitudes for contrast, spatial frequency and vernier offset sweeps. The finding persists to at least 3 - 5 months of age and is most pronounced for contrast sweeps where it is seen across the entire range of contrasts tested. Furthermore, a correlation exists between the peak serum bilirubin level shortly after birth, and the vernier acuity threshold measured at 3 - 5 months of age suggesting that neural sensitivity could also be influenced by an experience with neonatal jaundice.

CR: W.V. Good; None; C. Hou; None; A.M. Norcia, None.

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Prevalence and Risk Factors for Near and Far Visual Difficulty in Burkina Faso: The World Health Survey

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**Purpose:** To determine the prevalence and risk factors for near and far visual difficulty in Burkina Faso.

**Methods:** Population-based data were used from the World Health Survey done in Burkina Faso in 2002-2003 (n=8,822 adults ages 18-79). A multi-stage stratified random cluster sampling strategy was used. Participants answered a face-to-face interviewer-administered questionnaire that was administered in one of three local languages with independent back-translation of key terms. Near and far visual difficulty were assessed by questions about the level of difficulty seeing and recognizing an object at arm’s length and about difficulty seeing and recognizing a person across the road. People who responded that they had mild, moderate, severe, or extreme difficulty or were unable to do the task were defined as having visual difficulty. Logistic regression was used to identify demographic, dietary, or environmental risk factors. Prevalence estimates and standard errors were corrected for the complex sampling design and for non-response.

**Results:** The overall prevalence of any near and far visual difficulty was 10% (95% CI 7.8% and 13% (95% CI 9.5%) respectively. Prevalence estimates were strongly associated with age with 48% (SE=4.2%) and 66% (SE=3.9%) of those ≥65 years old having near or far visual difficulty (P<0.001). Only 5% (SE=0.6%) of people wore glasses or contact lenses. We identified two potential modifiable variables associated with near visual difficulty: cooking in the same room as the sleeping area (OR=1.45, 95% CI 1.01, 2.02) and a high fruit consumption (OR=0.65, 95% CI 0.50, 0.86).

**Conclusions:** The prevalence of visual difficulty was high in Burkina Faso, especially in older adults, while use of eyeglasses was rare. Efforts to confirm these findings with cooking stove location and fruit consumption should be undertaken in this population.

**Support:** None

Prevalence and Risk Factors for Near and Far Visual Difficulty in Adult Latinos: Los Angeles Latino Eye Study (LALES)

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**Purpose:** To identify risk indicators associated with incident visual impairment in adult Latinos.

**Methods:** The LALES is a longitudinal, population-based assessment of a cohort of 4,658 urban Latinos aged 40 years and older. Participants underwent comprehensive ophthalmological examinations at baseline and at four year follow-up, including visual acuity measurements using standardized protocols. Visual impairment was defined as best corrected visual acuity (BCVA) ≤20/40 and ≤20/200 in the better-seeing eye, and worsening vision as a decrease of ≥20 letters read correctly. A small sample size for incident blindness precluded risk factor analysis. Baseline socio-demographic and clinical variables examined included: age, gender, country of birth, acculturation, working status, years of education, marital status, income, insurance coverage, comorbidities, self-reported poor health and vision, history of hypertension and diabetes mellitus, and any ocular disease. Independent risk indicators for visual impairment and worsening vision were determined using univariate and multivariate stepwise logistic regression and odds ratios (OR) were calculated.

**Results:** There were 55 (1.2%) cases of incident visual impairment. Independent risk indicators of visual impairment were older age (OR=4.75, 95% CI 3.36, 6.79 years and older, OR=1.97) and being unemployed (OR=3.51), being retired (OR=3.36), and having diabetes mellitus (OR=2.23) [all P <0.05]. Independent indicators of worsening vision were older age (OR=1.71; 95% CI 1.16, 2.53), and having diabetes mellitus (OR=1.84), and having a history of eye disease (OR=1.77) [all P<0.05].

**Conclusions:** Our data highlight certain groups of Latinos who are at higher risk of developing visual impairment and vision loss. Interventions that prevent, treat, and focus on these factors may reduce the burden of eye disease in this fastest growing segment of the US population.

**Support:** None

Risk Factors for Near and Far Visual Difficulty in São Paulo, Brazil: The Vision of the Future Program


**Purpose:** Vision screening in school children is a widespread method of identifying uncorrected refractive errors and other visual disorders in this population. The Vision of the Future Program is a governmental initiative to provide diagnosis and treatment for visual disorders for all children registered in the first grade of elementary public schools in São Paulo City, Brazil. Our purpose is to identify the major visual abnormalities in a school-aged sample of low-income first graders. The eastern zone of São Paulo and to provide access to eye care services for those in need.

**Methods:** Teachers were trained to administer tests of visual acuity (VA) and external inspection of the eyes in the classroom. Criteria for referral to a comprehensive ophthalmic examination at the local hospital were: VA ≤20/20 and/or an inter-ocular acuity difference ≥2 lines in the Snellen printed chart; manifest strabismus or other remarkable eye signs (red eyes, itchy eyes or broken glasses). Informed consent was obtained from all participants’ guardians before an eye examination including VA testing with retro-illuminated logMAR tumbler E chart, ocular motility, and examination of the external eye, anterior segment, and media. Children with presenting VA of 20/20 or worse in either eye underwent cycloplegic refraction and fundus examination.

**Results:** A sample of 226 public schools was included with a total of 27,117 registered and screened first graders. Reduced vision and/or other eye disorders were identified in 6,008 (22.2%) children who were referred to our hospital. A total of 2,944 (response rate of 49.0%) of children underwent ophthalmic examination. Normal or near-normal presenting visual acuity (VA) of 20/32 or better in either eye was found in 1,142 (40.8%) examined participants. Uncorrected refractive errors needing prescription were found in 1,466 (49.8%) among the referrals. Visual morbidity statistics were: 242 (8.2%) diagnosed with blepharitis, 178 (6.0%) with amblyopia, 159 (5.4%) with strabismus, 60 (2.0%) with conjunctivitis and 35 (1.2%) with other eye disorders (corneal disease followed by congenital cataract, retinal conditions, piosis, optic nerve disease and tumors).

**Conclusions:** The screening indicates the presence of significant visual morbidity in this group of first graders with a major need for glasses. Further studies are needed to follow-up the compliance with recommended treatment and/or spectacle wear, providing immediate access to eye care.

**Support:** None

Visual Deficits in Children With Co-Occurring Developmental Disorders


**Purpose:** Some previous studies have found a greater prevalence of visual deficits in children with specific reading disorders (SRD). This may be the result of co-occurring developmental disorders since up to 50% of children with SRD have been shown to meet diagnostic criteria for other disorders. To address this, we measured visual function in children who met diagnostic criteria for one or more developmental disorder (DD), as well as a comparison to children with no developmental disorders.

**Methods:** 18 children already identified as having either (SRD, motor deficiencies (DCD) and/or attention problems (AD(H)D) were referred to the Department of Ophthalmology and Visual Science at Buskerud University College for further investigation (ages 5-17). 15 children with no developmental disorders were also assessed (control group). Each child was given an eye examination with particular stress on measures of accommodation and binocular function. Children were also assessed on the ABC Autism Behavior Checklist (ABCD) of the Autism Diagnostic Observation Schedule (ADOS) for diagnosis of autism. AD(H)D was diagnosed in children who met diagnostic criteria for one or more developmental disorder (DD), as well as a comparison to children with no developmental disorders.

**Results:** Some previous studies have found a greater prevalence of visual deficits in children with specific reading disorders (SRD). This may be the result of co-occurring developmental disorders since up to 50% of children with SRD have been shown to meet diagnostic criteria for other disorders. To address this, we measured visual function in children who met diagnostic criteria for one or more developmental disorder (DD), as well as a comparison to children with no developmental disorders.

**Support:** None
Prevalence and Causes of Visual Impairment

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Prevalence of Vision Disorders by Racial and Ethnic Group Among Children Participating in Head Start

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Purpose: To compare the prevalence of amblyopia, strabismus, and significant refractive error among American (AA), Asian, Hispanic, and Non-Hispanic White (NHW) 3–to 5-year-old children participating in Head Start (HS).

Methods: All children were participants in HS, a program providing comprehensive child development services to economically disadvantaged children and families, located in 5 areas of the country. Children classified as “special needs” (physical or mental disabilities) were excluded from VIP. After mandatory HS vision screening, all children who failed the HS screening and a sample of those who passed were selected for VIP. VIP-certified pediatric optometrists and ophthalmologists performed a standardized comprehensive ocular examination, including cycloplegic retinoscopy. Standard definitions were applied to identify amblyopia, strabismus, significant refractive error, and/or reduced visual acuity. Sampling fractions were used to calculate weights for estimation of prevalence rates, confidence intervals, and associated chi-square tests of homogeneity.

Results: Overall, 86.5% of those eligible and consenting to participate were examined in VIP. Examinations were performed on 2008 AA, 143 Asian, 870 Hispanic and 490 NHW children. Prevalence of amblyopia was similar among groups, ranging from 3.0% (Asian) to 5.3% (NHW), p=0.12. Prevalence of strabismus also was similar, ranging from 1.0% (Asian) to 4.4% (NHW), p=0.09. Prevalence of hyperopia varied by group, ranging from 5.6% (Asian) to 12.3% (NHW), p=0.001. Prevalence of anisometropia also varied by group, ranging from 2.7% (Asian) to 6.7% (Hispanic), p=0.04. Myopia was relatively uncommon in all groups (≤2%). Prevalence of amblyopia was similar among groups, ranging from 6.6% (NHW) to 11.1% (Hispanic), p=0.09.

Conclusions: Among Head Start children, the prevalence of amblyopia and strabismus was similar among the 4 racial and ethnic groups considered in this report. Prevalence of refractive error, specifically hyperopia and anisometropia, varied by group with Asians having the lowest rates. CR: M.G. Maguire, None; G.-S. Ying, None; E. Ciner, None; L. Cyert, None; M.T. Kulp, None.

Support: NEI/NIH, DHHS grants: U10EY12644; U10EY12547; U10EY12545; U10EY12550; U70EY12534; U10EY12647; U10EY12648 and R21EY018908.

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Risk Factors for Amblyopia and Strabismus in Young Singapore Chinese Children

A. Chia1, X. Lin1, G. Gazzard1, B. Quah1, Y. Ling1, B.C. Chang1, T.L. Young2, T.Y. Wong2, S.-M. Saw1. Paediatric Services, Singapore National Eye Centre, Singapore, Singapore; 2National University Singapore, Singapore, Singapore; 3Institute of Ophthalmology, London, United Kingdom; 4Ophthalmology and Visual Sciences, Alexandra Hospital, Singapore, Singapore; 5Ophthalmology, Duke University Eye Center, Durham, NC; 6Singapore Eye Research Institute, National University of Singapore, Singapore, Singapore; 7Epidemiology and Public Health, National Univ of Singapore, Singapore, Singapore.

Purpose: To determine the risk factors for amblyopia and strabismus in very young Singapore Chinese Children

Methods: A total of 3015 children aged 6 to 72 months (response rate 74%) were recruited for the Strabismus, Amblyopia and Refractive error (STAR) study in Singapore. All children underwent a detailed ophthalmological assessment. Visual acuity (VA) was measured with logMAR chart when possible, and Sheridan Gardner test when not. Strabismus was defined as any manifest tropia. Unilateral amblyopia was defined as a 2-line difference between eyes with VA≤20/30 in the worse eye, and with coexisting anisometropia (≥1.00D for hyperopia, ≥3.00D for myopia, ≥1.50D for astigmatism), strabismus or past/present visual axis obstruction. Bilateral amblyopia was defined as VA in both eyes <20/40 (in children aged 48–72 months) and <20/50 (≤48 months), with coexisting hyperopia ≥4.00D, myopia ≥6.00D and astigmatism ≥2.50D, or past/present visual axis obstruction. Parents of children were asked to complete questionnaires detailing relevant family, prenatal and birth histories.

Results: The prevalence of amblyopia in children aged 30–72 years was 1.19% (95% CI 0.79–1.83) while the prevalence of strabismus in those aged 6–72 months was 0.80% (95% CI 0.51–1.19). After regression modeling, children with amblyopia were significantly more likely to have myopia≥3D (p=0.01) and astigmatism≥2.5D (p=0.01). Children with strabismus were more likely to have astigmatism≥2.5D (p<0.001), amblyopia (p=0.04) and a sibling (p=0.001) or parent (p=0.02) with strabismus. Child’s age, gender, birth weight/gestational age, household income, maternal and paternal education levels, maternal factors such as maternal age, prenatal medical problems, smoking/alcohol and breast-feeding were not associated with the child’s risk of developing amblyopia or strabismus.

Conclusions: Amblyopia and strabismus were associated with refractive errors, and children with strabismus were more likely to have a family history of strabismus.

CR: A. Chia, None; X. Lin, None; G. Gazzard, None; B. Quah, None; Y. Ling, None; B.C. Chang, None; T.L. Young, None; T.Y. Wong, None; S.-M. Saw, None.

Support: Singapore NMRC/1009 /2005
119. Current Strategies in the Molecular Biology, Genetics and Epidemiology of Refractive Error Development

453 - 11:15 AM
The Role of the Choroid in Emmetropization
J. Wallman. Dept. of Biology, City College, City Univ. of New York, New York, NY.
CR: J. Wallman, None.
Support: NIH Grants EY02727 and RR03060

454 - 11:35 AM
The Role of the Sclera in Emmetropization: Possible Mechanisms
T.T. Norton. Dept. of Vision Sciences, Univ of Alabama at Birmingham, Birmingham, AL.
The sclera is the “final common pathway” by which the emmetropization mechanism modulates the axial length of the eye to position the retina close to the focal plane. In most vertebrates, growth of the inner cartilaginous layer controls axial length, but in most mammals, the extensibility (viscoelasticity) of the sclera is controlled. Recent evidence from mRNA and proteomic studies suggests that changes in fibroblast-matrix interactions (via focal adhesions) may control the slippage of the scleral layers (lamellae). Retinal “go” signals increase the extensibility and elongation rate while retinal “stop” signals reduce extensibility and slow the elongation rate.
CR: T.T. Norton, None.
Support: NIH Grants EY005922, EY03039 and EyeSight Foundation of Alabama FY2009-10-187

455 - 11:55 AM
Effects of Visual Experience on Peripheral Refractive Errors
E.L. Smith, III. College of Optometry, University of Houston, Houston, TX.
Research involving many animal species, including humans, has demonstrated that ocular growth and refractive development are regulated by visual feedback associated with the eye’s refractive state. Because of the prominence of central vision in primates, it has generally been assumed that signals from the fovea dominate the effects of vision on refractive development. However, experiments in laboratory animals have demonstrated that foveal vision is not essential for many of the vision-dependent aspects of refractive development and that visual signals from the peripheral retina, in isolation, can effectively regulate emmetropization and mediate many of the effects of vision on the eye’s refractive status. Moreover, when there are conflicting visual signals between the fovea and the periphery, peripheral vision can dominate central refractive development. In this respect, evidence from humans suggests that peripheral hyperopia may be a risk factor for myopia progression. In order to better understand the impact of peripheral vision on refractive development, we have investigated the effects of experimentally induced form deprivation and optical defocus on central refractive development and the pattern of peripheral refractions in infant monkeys. In addition to their effects on central refractive development, our results demonstrate that form deprivation and hyperopic defocus can alter the shape of the eye and the pattern of peripheral refractions and that these vision-dependent effects appear to be mediated primarily by local, regionally selective mechanisms. Overall, the results support the idea that peripheral vision can influence axial growth and central refractive development in a manner that is independent of the central refractive error.
Support: NIH EY-03641; NIH EY-07551

456 - 12:15 PM
Genetics of Refractive Errors
T.L. Young. Ophthalmology, Duke University Eye Center, Durham, NC.
This presentation will review current genetic studies of refractive errors.
CR: T.L. Young, None.
Support: NIH, NEI- R01EY014685, Research to Prevent Blindness, Inc.
457 - 12:35 PM  
Risk Factors And Interventions For Myopia  


This presentation will include an overview of risk factors for the development of myopia in children, with an emphasis on factors that have received attention recently (e.g., limited outdoor activity and peripheral refractive errors). Interventions for myopia control such as newer lens designs and drug therapies will also be discussed.  
CR: J.E. Gwiazda, None.  
Support: NEI/NIH grants EY11756, EY018694  
CT: www.clinicaltrials.gov, NCT00000113

458 - 12:55 PM  
Blur Adaptation and Myopia  

M.A. Webster. Dept of Psychology /296, University of Nevada, Reno, NV.  

The perceived focus of images is strongly affected by neural adaptation, and rapidly recalibrates when there is a change in the level of blur or sharpness in the retinal image. I will review the functional characteristics of adaptation to blur and evidence that the visual system can selectively adapt to the patterns of blur resulting from specific optical aberrations; and will consider the implications of these adjustments for understanding the perceptual consequences of refractive errors like myopia.  
CR: M.A. Webster, None.  
Support: NIH Grant EY10834
Macular Function in Early and Intermediate Age-Related Macular Degeneration: A Screening Approach

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Purpose: To evaluate if retinal sensitivity values obtained with a dedicated screening device, can be used to screen an early and intermediate age-related macular degeneration (ARMD).

Methods: A fully automatic fundus-perimeter combined with an image-stabilized scanning laser ophthalmoscope, Macular Integrity Assessment (MAIA, CenterVue, spc; Padova, Italy) was used in 355 ARMD patients. The standard automatic sensitivity grid (0/10 degrees, 61 stimulated points, centered on the fovea) was performed in 5 study sites. Fixation was simultaneously documented. Inclusion criteria were: age >50 years and AREDS 2 and 3 severity. Two hundred sixty five normal subjects were used as age-matched control group. Sensitivity point values (S-values), mean retinal sensitivity (mS-values), retinal sensitivity of cross-sections below 24 dB (K-value), considering as cut-off for normal values and fixation stability were recorded. ANOVA, trend analysis, and summary statistics were calculated using Sigmmaplot 11 (Systat Software, Inc; San Jose, CA).

Results: Of 355 patients, 200 were classified as AREDS 2 and 155 as AREDS 3. S-values and mS-values statistics between normals and ARMD were significantly different (ANOVA; p < 0.001). Mean retinal sensitivity was significantly reduced in AREDS 2 and 3 vs normals (24.85dB ± 3.87 and 21.76dB ± 5.36 vs 29.76dB ± 1.71; p < 0.001). K-value were different between AREDS 2 and 3 (ANOVA; p < 0.001). Fixation stability did not differ between AREDS 2 and 3. S-values decreased toward the periphery of the examined area and varied by meridian.

Conclusions: Macular sensitivity is reduced in patients with early and intermediate ARMD when compared to age-matched normals. Sensitivity reduction is more relevant in intermediate than in early ARMD. These changes can be detected with a new screening device.

Support: Research to Prevent Blindness, Inc. (MK5); LSU Research Enhancement Fund (MK5)

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Intravitreal Injection Trends in a Busy Academic Retina Practice

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1Ophthalmology, Bascom Palmer Eye Institute, Palm Beach Gardens, FL; 2Ophthalmology, Bascom Palmer Eye Institute, Miami, FL

Purpose: The introduction of anti-VEGF therapy has altered the clinical practice of ophthalmology in a variety of dimensions. The successful use of intravitreal bevacizumab to treat exudative AMD was first reported in 2005. The data from phase III randomized controlled clinical trials, MARINA and ANCHOR, ultimately led to the FDA approval of ranibizumab in 2006 for the treatment of all forms of neovascular AMD. In a recent survey of members of the American Society of Retina Specialists, the 389 responders were approximately equally split between bevacizumab and ranibizumab when choosing a drug for AMD treatment. The purpose of this study is to demonstrate the trends in intravitreal anti-VEGF injections in an academic practice.

Methods: Retrospective review of intravitreal anti-VEGF injection logs from August 2006 through November 2009 in a single academic practice to quantify the number of injections for bevacizumab and ranibizumab. The monthly and yearly totals were calculated for each drug and cross-sectional analysis and evaluation of distribution patterns.

Results: From July 2006 through November 2009, a total of 11,398 intravitreal injections of anti-VEGF agents were administered at the Bascom Palmer Eye Institute-Palm Beach office. Data analysis overall demonstrated a greater than two-fold increase in the total number of annual injections from 2006 to 2008. Intravitreal ranibizumab injections accounted for 85% of the annual total in 2006, 40% in 2007, 25% in 2008, and 21% in 2009. Specifically, November of 2009 accounted for 20% of the annual total. Annual intravitreal bevacizumab injections increased from 22% of total anti-VEGF injections in 2006 to 80% in 2009. Demographic analysis indicated that the total number of both injections was highest between November through April of each year, having increased from 55% of total volume in 2006 to 64% in 2009.

Conclusions: Evaluation of intravitreal anti-VEGF injection patterns from 2006-2009 reflect the introduction of ranibizumab as a drug for AMD. The initial effect of ranibizumab entry into the drug market in 2006 accounts for the high percentage of utilization of the drug during this year. The subsequent increased proportion of bevacizumab injections over the course of the following two years likely reflect the ongoing practice issues involved with increased patient volume and direct drug costs. Recent potential reimbursement changes for bevacizumab was evident in the greater than three fold amount of ranibizumab utilized during this time period.

Support: The Palm Beach Community Trust Fund

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Systematic Review of the Association Between C-Reactive Protein and Age-Related Macular Degeneration

T.H. Hong, A.G. Tan, P. Mitchell, J.J. Wang, Ophthalmology, University of Sydney, Sydney, Australia.

Purpose: To systematically review evidence on the association between C-reactive protein (CRP) levels and late age-related macular degeneration (AMD).

Methods: Observational studies investigating the association between CRP and AMD were identified from Medline (1950-present), EMB ALL reviews (to February 2009) and abstracts from the Association for Research in Vision and Ophthalmology (ARVO) to 2008. Studies were included if they investigated patients aged 50 years or later (or early and late combined) AMD. Data were extracted from the included studies using a standard template. A systematic review was performed to provide a quality ranking for each study according to the study design and methods. A meta-analysis was performed using Comprehensive Meta-Analysis Version 2 (Biostat, Englewood, NJ) and random effect models, incorporating sample size information. Meta-analyses were stratified by study sample type, method used to detect AMD, and study design.

Results: Of the 43 abstracts identified, 9 studies met the selection criteria. The total sample size from these 9 studies was 11,053 participants aged 49 years to 95 years old. In all 9 studies, AMD was identified from either a detailed fundus examination by ophthalmologists or retinal photographic grading by trained graders. The grading of AMD followed comparable grading protocols across the 9 studies. CRP levels were measured using a high sensitivity assay and assessed either continuously or dichotomized at median values. Odds ratios reported by these studies were adjusted for age, gender and smoking status. Higher CRP levels were associated with increased likelihood of having late stage AMD (estimated from meta-analysis, OR 1.65, 95% confidence interval (CI), 1.20-2.66). Sub-group meta-analyses showed higher magnitude in the association of high level CRP with AMD found from studies using ophthalmoscopic examination compared to those using photographic grading (OR 4.06, 95% CI 2.12-7.78 versus OR 1.35, 95% CI 1.09-1.68 respectively), or clinic-based samples compared to population-based samples (OR 1.70, 95% CI 1.30-2.21 versus OR 1.17,95% CI 0.91-1.50 respectively).

Conclusions: Higher levels of CRP, compared to lower levels, were found to be associated with a 30% to 100% higher risk of late stage AMD, estimated from 9 clinic- and population-based studies.

Support: None

539 - A220

Patient Selection Criteria for Drug Efficacy Studies on Dry AMD

A. Fujiy1, K. Chung2, M. Azuma3,4, T.R. Shearer5,6, Senju Pharmaceutical Co., Ltd., Beaverton, OR; 2Department of Ophthalmology, 3Department of Integrative Biosciences, 4Oregon Health & Science University, Portland, OR.

Purpose: Dry AMD is the most common cause of vision loss in the developed world. It is characterized by accumulation of macular drusen, focal hyperpigmented RPE, and geographic atrophy. No generally accepted treatment exists. However, rescue of RPE and/or photoreceptor cells would probably delay progression of AMD. The purposes of the present experiment were to 1) measure the rate of progression of dry AMD, and 2) propose patient selection criteria for pilot testing of a drug to prevent progression of dry AMD.

Methods: Medical charts from 51 patients with a mean age of 76 years were mined for: severity of AMD using a standardized worsening scale from 0 to 6, visual acuity (VA, Snellen), medications/procedures to treat eye diseases, date of eye examinations, age, and sex. Groups of eyes with AMD scores 2, 3, or 4 were compared, using separate eyes as individual data points and excluding those with cataract.

Results: VA (logMAR) was positively correlated with AMD score (P < 0.0001, n=66). In the grade 3 group, logMAR increased 0.17 ± 0.32 (n = 14) units after two years. Eighty eight % of the eyes progressed 1 or more AMD scores with a mean time for progression from grade 3 to 4 of 1.8 ± 2.0 years. Predictive statistical analysis showed that comparing two groups of grade 3 AMD patients (drug-treated versus non-treated), each containing 22 patients, for two years would allow detection of drug inhibition at a 90% power at a 5% level. Functional VA measurements were correlated with structural AMD scores, and indicate that both indicators will be useful in clinical trials on AMD. Recruiting only grade 3 patients would be ideal for time- and cost-efficient, pilot drug efficacy studies on moderately progressing dry AMD.

Support: None

1.35, 95% CI 1.09-1.68 respectively), or clinic-based samples compared to population-based samples (OR 1.70, 95% CI 1.30-2.21 versus OR 1.17,95% CI 0.91-1.50 respectively).

Conclusions: Higher levels of CRP, compared to lower levels, were found to be associated with a 30% to 100% higher risk of late stage AMD, estimated from 9 clinic- and population-based studies.
540 - A221
Assessment of Environmental AMD Risk Factors in a Population of Patients Suffering From Stroke and Myocardial Infarction
C.P. Garcher1,2, F. Nicot, III1, B. Dugas, Jr.1,2, N. Acar1, L. Bretillon1, M. Giroud1, M. Zeller2, A.M. Bron1,2. 
Purpose: Stroke and myocardial infarction are common diseases occurring in patients suffering from Age Macular Degeneration (AMD). We assessed the rate of AMD and AMD risk factors in patients suffering from recent stroke or myocardial infarction.
Methods: Patients suffering from a recent stroke or myocardial infarction less than 1 month benefited from a thorough ophthalmic examination with the following measurements and evaluations: visual acuity, intraocular pressure, fundus photography, Raman spectroscopy and macular OCT. In the same time a food questionnaire was dispensed. Finally, blood samples to measure fatty acids and lutein were performed.
Results: 74 patients were examined, 31 females and 43 males. The age of the patients was 65 ±10 years, [47-90]. The rates of stage 2 and 3 AMD were 25.7 % and 13.5 % respectively (n=19, n=10). Ramann spectroscopy did not differ between groups, p=0.83. Central retina thickness was increased in the AMD group, 250±37 µm versus 222±55 µm, p=0.04. The fatty acid profile and lutein in blood did not differ between patients with or without AMD, p=0.7 and p=0.21, respectively. The overall omega 6/ omega 3 ratio was 4.64 ± 0.97 in our population.
Conclusions: The rate of AMD risk factors does not seem to be increased in the patients suffering from AMD in this population of patients suffering from stroke and myocardial infarction. A longitudinal study is needed to confirm these results.
CR: C.P. Garcher, None; F. Nicot, III, None; B. Dugas, Jr., None; N. Acar, None; L. Bretillon, None; M. Giroud, None; M. Zeller, None; A.M. Bron, None.
Support: Baush and Lomb, Regional Council of Burgundy

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Intra-Individual Recurrence Intervals After Ranibizumab Therapy for Age-Related Macular Degeneration
R. Hoerster1, T. Ristau, S. Liakopoulos, B. Kirchhof1. Department of Vitreoretinal Surgery, University of Cologne, Cologne, Germany.
Purpose: To analyse the time intervals for recurrence of choroidal neovascular membrane (CNV) activity in neovascular age-related macular degeneration (AMD) after intravitreal injection of ranibizumab to elucidate the question of intra-individual periodical activity.
Methods: Thirty-two patients with neovascular AMD and at least two recurrences of CNV activity after treatment with ranibizumab were included into the study. All patients initially received 3 monthly injections of ranibizumab. Patients received no re-treatment when CNV was inactive at follow-up. Re-treatment was performed with patients initially received 3 monthly injections of ranibizumab. Patients received no re-treatment when CNV was inactive at follow-up. Re-treatment was performed with patients with GA (age 77 ± 2 years) in addition to color fundus photographs. Two independent readers evaluated baseline images for prevalence and topographic distribution of reticular drusen using a modified Early Treatment Diabetic Retinopathy Study (ETDRS) grid. In case of discrepancy, a third grader was asked to arbitrate. In a subset of 23 patients, simultaneous SD-OCT imaging was performed.
Results: RD were present in 32 of 352 (59.1%) patients in at least one eye and with at least one cSLO imaging modality (bilateral 234 [71.8%]). For each modality separately, prevalence of reticular drusen and kappa-statistics for interobserver reliability were as follows: IR 46.4% and 0.73, FAP 40.9% and 0.77, BR 21.3% and 0.63 (values for right eyes only, left eyes showed similar data). Systematic analysis of the topographic distribution using three-field FAF imaging (201 right eyes) demonstrated the presence of RD most frequently superior to the fovea (99.0%). In 85 (42.3%) right eyes, reticular drusen occurred nasal to the optic nerve head. SD-OCT imaging revealed alterations anterior to the RPE for cell monolayer including focal deposits, hyperreflective migrating structures, regular wavy patterns, and fusing of bands 2-4.
Conclusions: RD represents a common pathological hallmark in eyes with GA secondary to AMD. In contrast to fundus photographs, RD are readily identified in various cSLO imaging modes. This may explain the high prevalence determined herein in contrast to previous reports based on fundus photography. Congo red staining of the corneal substrate in the outer neurosensory retina on high-resolution SD-OCT would reflect a disease process at the level of the photoreceptors rather than the biogenesis of the ‘conventional’ drusen phenotypes in the retinal pigment epithelium space and in the inner aspects of Bruch’s membrane.
Support: Alcon Research Ltd., Fort Worth, Texas. CT: www.clinicaltrials.gov. NCT00598486

543 - A224
The Prevalence of Age-Related Macular Degeneration in Alzheimer’s Disease
M.A. Williams1, V. Silvestri1, C. Craig2, P. Passmore1, G. Silvestri1. Centre for Vision and Vascular Science, Department of Geriatric Medicine, Queen’s University of Belfast, Belfast, United Kingdom.
Purpose: Advanced age-related macular degeneration (AMD) is the most common cause of blindness in those aged over 65 years in the developed world and the third most common cause globally. Alzheimer’s disease (AD) is the most common form of dementia. Part of the basis for difficulties that AD patients may have been visual. AD and AMD have been characterised by the presence of abnormal extracellular materials; drusen in AMD and plaques in AD, associated with neuronal degeneration. These pathological deposits in AD and AMD show similarities in content. Shared components include the proteins vitronectin, amyloid P and apolipoprotein E. The choroidal substrate in the outer neurosensory retina on high-resolution SD-OCT would reflect a disease process at the level of the photoreceptors rather than the biogenesis of the ‘conventional’ drusen phenotypes in the retinal pigment epithelium space and in the inner aspects of Bruch’s membrane.
Methods: Subjects over 65 years of age with AD and cognitively normal controls were recruited in an opportunistic fashion from hospital clinics and hospital databases. Ethical committee approval was granted prior to commencement of the study. A standardised testing protocol was followed for each participant, all testing being performed by the same investigator. Data on cognitive status and potentially confounding factors were collected from the subject, their carer and where possible, medical notes. Dilated retinal photography was performed. Photographs were anonymised and graded in a masked fashion by one person. Random number tables were used to select 5% of the subjects for regrading for quality control. Statistical analysis was performed on SPSS V11.
Results: 359 subjects with AD and 338 controls were included in the study. The average age of AD subjects was 76 years, 65.4% were female and 64.8% were right-handed. The average age of controls was 74 years, 64.1% were female and 64.8% were right-handed. The prevalence of AMD was 2.8% in the AD group and 1.5% in the control group. The kappa-statistics for interobserver reliability were as follows: IR 46.4% and 0.73, FAP 40.9% and 0.77, BR 21.3% and 0.63 (values for right eyes only, left eyes showed similar data). Systematic analysis of the topographic distribution using three-field FAF imaging (201 right eyes) demonstrated the presence of RD most frequently superior to the fovea (99.0%). In 85 (42.3%) right eyes, reticular drusen occurred nasal to the optic nerve head. SD-OCT imaging revealed alterations anterior to the RPE cell monolayer including focal deposits, hyperreflective migrating structures, regular wavy patterns, and fusing of bands 2-4.
Conclusions: Most people with AD are able to undergo dilated retinal examination. Stroke and myocardial infarction are both more prevalent in patients with AD than in controls. However, ocular disease should not be neglected as a source of difficulties in patients with AD.
CR: M.A. Williams, None; V. Silvestri, None; D. Craig, None; P. Passmore, None; G. Silvestri, None.
Support: None
544 - A225
Refracted versus Non Refracted Logmar Visual Acuity in AMD Patients Undergoing Treatment With Lucentis
M. Krishnan, S. Pagliarini, A. Chaggar. Ophthalmology, University Hospital Coventry and Warwick, Coventry, United Kingdom.

Purpose: To assess variability of refracted and non-refracted visual acuity (VA) measurement in a consecutive series of AMD patients undergoing treatment with Ranibizumab. Loss of 5 or more letters of VA may be considered as an indication for Ranibizumab (Lucentis) re-injection as suggested by the European Summary of Product Characteristics.

Methods: LogMAR visual acuity was recorded in the setting of AMD clinics where patients attended 1 or more times over 1-10 day period for their monthly Lucentis schedule. At each scheduled follow up refracted LogMAR visual acuity was measured by an optometrist refraction by a standard protocol. If the appointment was split in 2 episodes unrefracted LogMAR visual acuity was measured by a nurse. The change of mean visual acuity from baseline to 12 months was plotted using the refracted and non-refracted LogMAR VA values. In addition, a retrospective review of a sample of 114 eyes of 57 consecutive patient records was undertaken to directly compare the LogMAR VA measured with and without refraction. Best-Aldman plot of VA measurement disagreement and analysis of variance was carried out (ANOVA).

Results: Analysis of changes of the mean visual acuity from baseline revealed overall comparable mean values but greater variability of non refracted logMAR VA measurements. Of the 314 episodes available for direct comparison 62% (195) had differences of the non-refracted and refracted logMAR VA within 5 letters. In 27% (85) and 11% (34) episodes the non-refracted VA differed more than -5 and +5 letters respectively from the refracted VA (range -24 to +29 letters). However, the mean visual acuity was not significantly different between the two methods (p=0.28).

Conclusions: Non-refracted and refracted measurements achieved comparable mean logMAR visual acuities. There was greater variability of non-refracted VA measurements, with a clinically significant large difference in terms of anti-VEGF retreatment decisions in a high proportion of follow ups. Whilst unrefracted visual acuity measurements may be satisfactory for audits caution should be taken when using them to make Ranibizumab re-treatment decisions.

CR: M. Krishnan, None; S. Pagliarini, None; A. Chaggar, None.
Support: None

547 - A226
The Effect of Ranibizumab Treatment on Patients’ Preferences and Vision-Related Quality of Life in Neovascular Age Related Macular Degeneration
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Purpose: To assess the effect of intravitreal ranibizumab (Lucentis ®) on patient- and study-site preferences and vision-related quality of life (vr-QoL) in neovascular age-related macular degeneration (AMD).

Methods: 62 patients (62 eyes) with firstly diagnosed neovascular AMD received intravitreal injections of 0.5 mg ranibizumab for three months. In addition to a full ophthalmological examination, including best-corrected visual acuity, fundus photography, fluorescein angiography and ocular coherence tomography, vr-QoL and patients preferences were recorded at baseline and at follow-up 4 weeks after the last injection. Psychometric instruments included the National Eye Institute Visual Function Questionnaire (NEI VQSF-25), the Euro-Qol, EQ-5D containing the visual analogue scale (VAS), the time-trade-off method (TTO) and the standard gamble (SG). The standard gamble was anchored for two outcomes: blindness and death. Utilities for the EQ-5D were obtained using the database for the European VAS (EQ-5D-EVAS), the German VAS (EQ-5D-D-VAS) and the German TTO (EQ-5D-D-TTO).

Results: Mean best corrected visual acuity (BCVA) of the treated eye increased from 20/83 at baseline (logMAR 0.70±0.48) to 20/70 (0.68±0.43) at last follow-up after three injections (p=0.053). Mean BCVA of the fellow eye was 20/35 (0.37±0.14). The VQSF-25 composite score showed a slight, statistically not significant increase from 73.0±16.3 (SD) before to 77.4±16.4 after treatment. Creating subgroups by whether the better or worse eye had been treated, no statistically significant differences in the VQSF-25 score was found. Utility assessment pre- and postintervention gave the following results: SG for blindness 0.94 and 0.86, SG for death 0.94 and 0.96, TTO 0.90 and 0.97, VAS 54.5 and 0.60, EQ-5D VAS 0.75 and 0.77, EQ-5D D-VAS 0.78 and 0.80, EQ-5D D-TTO 0.82 and 0.85. Mann-Whitney U testing revealed no significant difference for any utility test.

Conclusions: Patients with neovascular age related macular disease report reduced vr-Qol, and utilities. Intravitreal treatment with ranibizumab allows to maintain visual acuity and vr-QoL as measured with the VQSF-25 and SG, TTO and EQ-5D. Significant improvement of VA, VQSF-25 or utilities, independent if better or worse eye was treated, was not observed. However, a trend of increased vr-QoL as assessed with TTO and the VAS is apparent.

CR: C. W. Hrines, This work was supported by grants of Novartis, F. A. Wolf, None, R.P. Finger, None; A. Kampik, None; A. Hoffmann, None.
Support: Novartis
548 - A229
Dietary Omega 3 Fatty Acids, Antioxidants and the Risk for Age-Related Maculopathy: The Allieron Study
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Purpose: Previous studies have suggested a lower risk for age-related maculopathy (ARM) in subjects with high dietary intake of omega 3 fatty acids and antioxidants. We report the associations of ARM with past dietary intakes of fats and antioxidants in French elderly subjects.
Methods: The Allieron Study is a population-based epidemiological study on nutrition and age-related eye diseases. 963 subjects had an eye examination from September 2006 to May 2008 in Bordeaux (France). Dietary intakes of fatty acids and antioxidants were estimated from a 24 hour dietary recall performed at home by dietitians in 2001-2002. Of 963 subjects, 84 (8.8%) were excluded from the statistical analyses because of ungradable photographs in both eyes and 360 (36.6%) because of missing data for confounders (age, gender, educational level, monthly income, smoking, HDL-Cholesterol, body mass index, diabetes and gene polymorphisms ApoE4, ApoE2 and CFY402H). ARM was classified in five exclusive stages: neovascular ARM (stage 4 n=20); geographic atrophy (stage 3 n=20); large soft indistinct drusen and/or reticular drusen and/or large distinct drusen with pigment abnormalities (stage 2 n=72); large soft distinct drusen alone or pigment abnormalities alone (stage 1 n=133); stage 0 (n=478). Associations were estimated using polytomous logistic regression, stage 0 being the reference in all analyses. Odds-ratios were estimated for 1-SD increase in the energy-adjusted nutrients.
Results: After multivariate adjustment, subjects with high dietary omega 3 intakes were at lower risk of neovascular ARM (OR=0.55, 95% confidence interval (CI): 0.35-0.97, p=0.045) and ARM stage 1 (OR=0.77, 95% CI: 0.60-1.00 p=0.03). Globally, late ARM stages 3 and 4 was significantly associated with dietary omega 3 (OR=0.55 95% CI 0.32-0.97 p=0.04). Subjects with high dietary zinc intake were at higher risk of ARM stage 1 (OR=1.25 95% CI 1.02-1.51 p=0.03). Other antioxidants (retinol, vitamin C, E) were not significantly associated with any stage of ARM.
Conclusion: Our results add to the existing literature showing a decreased risk for ARM in subjects with high dietary omega 3 fatty acids intake. By contrast, we found no association of ARM with antioxidants, except for an increased risk of stage 1 ARM in subjects with high dietary zinc intake.

CR: B. Merle; None; M.-N. Deleyer; None; J.-F. Karobelnik; Alcon; Novartis; Bayer; Bauch & Lombl; Genentech; Chugai; Abbott; C.-B. Raugier; Zeiss; R. J. Colin; Alcon; Addition Technologies Inc; Alcon; Abbott AMO; Optiexpress; Horus Pharma; Gene Signal SAS; C.F. Malet; Abbott Medical Optics France; Cibavision; C. M. Le Goff; None; J.-F. Dartigues; None; P. Barberge-Gateau; Lesaisse Danone; Bauch & Lombl; R. C. Deloucet; Bauch & Lombl; Pflizter; Novartis; Alcon; C.
Support: Laboratoires Théa (Clermont-Ferrand, France)

550 - A231
Intravitreal Anti-VEGF Therapy for Exudative Age-Related Macular Degeneration: Experience of the Presence of Significant Macular Pucker
Purpose: To evaluate the effect of significant macular pucker on the visual and anatomic outcomes of intravitreal anti-VEGF therapy for exudative age-related macular degeneration (ARMD).
Methods: We retrospectively reviewed all cases of active exudative ARMD with significant macular pucker treated with periodic intravitreal anti-VEGF therapy. Diabetic eyes were excluded. Smaller visual acuity and Optical coherence tomography (TD-OCT) were performed during each visit. Fluorescein angiography and intravitreal injection of 0.5 mg of Ranibizumab or 1.25 mg of Bevacizumab were administered whenever indicated. Outcome measures included visual acuity and central macular retinal thickness on OCT.
Results: 92 eyes of 92 patients were included in the study. Seven were male and 4 female with a mean age of 78.2 years. Visual outcomes were variable, 4 patients improved by three lines or more, 5 patients remained stable and 2 patients got worse. Complete resolution of subretinal fluid was seen but improvement in intraretinal edema and central retinal thickness were minimal. This later finding appeared to be secondary to the epithelial membrane and may not be related to the activity of the choroidal neovascular membrane. Absence of leakage on FA was used in initiating drug-free interval. Macular pucker removal was not performed in any of the study eyes.
Conclusion: Intravitreal anti-VEGF therapy for exudative ARMD with concurrent macular pucker can result in successful anatomic stabilization. Visual outcomes are variable and appear to be partly limited by the concurrent epithelial membrane. FA is valuable in detection of leakage when drug-free interval is being considered. Decision to perform macular surgery in these patients is difficult and can theoretically impair the success of future anti-VEGF therapy for the exudative ARMD because of the shortened ocular half-life of the injected drug.
CR: N.A. Chaudhry; None; V.A. Kon Jara; None; H. Tabandeh; None; W.F. Mieler; None; E. Liggett; None.
Support: None.
Gender Difference in Prevalent Full-Thickness Macular Holes in Tromsø
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Purpose: To investigate the prevalence of full-thickness macular holes in Tromsø, North Norway.

Methods: The 6th Tromsø Study (2007-2008) is a multipurpose cross-sectional health survey of the population aged 30 years and above in the municipality of Tromsø. The survey was conducted in two stages, and eye examinations were included in the second stage where 7307 participants aged 38-87 attended (92%). The eye examinations included visual acuity, digital colour fundus photography and optical coherence tomography (OCT). In this study, full-thickness macular holes were classified in fundus photographs from participants aged 50-87 years. The present investigation consisted of 12148 gradable eyes from 6218 participants.

Results: Full-thickness macular holes were found in 6 eyes from 6 different participants. All macular holes identified in fundus photographs were verified by OCT. Two of the macular holes had been diagnosed previously by an ophthalmologist.

Conclusions: Full-thickness macular holes may be present in approximately 9.7 out of 10,000 in the elderly population of Tromsø. Our data suggest that approximately 2/3 of the full-thickness macular holes in our population may be undiagnosed. The gender distribution confirms previous studies of female preponderance of macular holes.

CR: G. Bertelsen, None; A.K. Sjølie, None; I. Njølstad, None.
Support: None
934 - A268
Normative Data, Short and Long-Term fluctuation for the Opko/OTI Microperimeter
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**Purpose:** Although microperimetry has been widely used for the evaluation of macular diseases, few papers have reported normative data and none the short and long term fluctuation with this method. Purpose of the study is to provide these data in a normal population.

**Methods:** Light threshold was measured in 55 subjects with age range: 20-79, VA ≥ 0.9, SpH ≥-4.5 (≤-7.5), CYL ≤-1.5, without retinal or optic nerve damage and without history of previous trauma or ocular surgery. One eye was randomly selected. A 5x5 square was investigated (25 points, 9%). Each subject was tested twice in each session (SF) and once more one week later (LF). SF and LF were calculated using the formula 1/2 (Xj2−Xj1).n.

**Results:** Light sensitivity decreased with age. SF was always inferior to 1.5 B and not significantly lower than LF.

**Conclusions:** Normative data, SF and LF for this micropemetric method provide data to be used in clinical studies. Previous studies demonstrated that SF was significantly lower than LF with w/ w/ perimetry. The precise and repeatable presentation of the stimuli on a retinal location might account for both lower SF and LF as compared to standard perimetry.

935 - A269
Reliability and Validity of the Useful Field of View Test
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**Purpose:** The Useful Field of View (UFoV) test is being used increasingly to assess and train older drivers, including those with slight to moderate vision impairment. However, its psychometric properties have not been established. The purpose of this study was to determine the validity, test-retest reliability and repeatability of the UFoV among persons with normal vision and patients with vision impairment from glaucoma.

**Methods:** Three groups performed UFoV tasks. These data represent the initial creation of three item banks to measure visual disability, symptoms and quality of life with items calibrated using Rasch analysis.

**Results:** No significant differences were observed between the 5000K and 9300K trials ($P < 0.05$). A 6500K correlated color temperature monitor setting gave significantly better visual acuity than the 5000K and 9300K trials ($P < 0.001$) and visual acuity was lower for the darker (9300K) screens. These data indicate moderate variability, greater for patients with glaucoma due to the differences in visual fields of the patients.

**Conclusions:** We present findings on measurement properties of the UFoV, which are important for making appropriate decisions and evaluating driver training programs. The results indicate moderate variability with normal vision and patients with glaucoma due to the differences in visual fields of the patients.

936 - A270
Monitor Color Temperature and Computer Vision Syndrome
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**Purpose:** Computer Vision Syndrome (CVS) is the complex of eye and vision problems related to near work which are experienced during or related to computer use. While the utilization of technology has increased dramatically, the underlying etiology remains unclear. Failure to address causes of CVS will result in both ocular and general symptoms. The present study looked at the monitor output, and specifically color temperature settings of 5000 K, 6500 K, or 9300 K. The spectral output of the display was completed a questionnaire asking about both ocular and general symptoms. Three significant differences were observed between the 3 color temperature conditions for symptoms of tired eyes ($P = 0.05$) and headache ($P = 0.01$). Mean total processing speed score was 124.8 (SD 31.0) ms, 334.3 (SD 219.2) ms and 517.5 (SD 253.7) ms for the young normal vision, older normal vision and glaucoma group, respectively. Between group differences were significant (ANOVA $F = 14.57$, $P < 0.001$), post-hoc pairwise comparisons $P < 0.05$. Total processing speed was significantly faster on restest (31.5 [SD 43.7] ms, 56.2 [SD 74.8] ms and 144.7 [SD 168.9] ms for the young normal vision, older normal vision and glaucoma group, respectively). LOA were significantly wider for the glaucoma group compared to both the young and older normal vision groups ($P < 0.01$). Mean total processing speed was significantly faster on restest (31.5 [SD 43.7] ms, 56.2 [SD 74.8] ms and 144.7 [SD 168.9] ms for the young normal vision, older normal vision and glaucoma group, respectively). LOA were significantly wider for the glaucoma group compared to both the young and older normal vision groups ($P < 0.01$). Mean total processing speed was significantly faster on restest (31.5 [SD 43.7] ms, 56.2 [SD 74.8] ms and 144.7 [SD 168.9] ms for the young normal vision, older normal vision and glaucoma group, respectively). LOA were significantly wider for the glaucoma group compared to both the young and older normal vision groups ($P < 0.01$). Mean total processing speed was significantly faster on restest (31.5 [SD 43.7] ms, 56.2 [SD 74.8] ms and 144.7 [SD 168.9] ms for the young normal vision, older normal vision and glaucoma group, respectively).

**Conclusions:** These data represent the initial creation of three item banks to measure visual disability, symptoms and quality of life with items calibrated using Rasch analysis. The results indicate moderate variability, greater for patients with glaucoma due to the differences in visual fields of the patients.

937 - A271
Item Banking for the Measurement of Visual Disability, Symptoms and Quality of Life
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**Purpose:** The measurement of patient-reported outcomes in ophthalmology using questionnaires is limited by the suitability of content to the population and the scoring properties of the instrument. The aim of this project was to develop broadly-based item banks for the measurement of visual disability, symptoms and quality of life with items calibrated using Rasch analysis.

**Methods:** Subjects (N=20) were required to perform a continuous 20 minute reading task on a computer at a viewing distance of 58cm. Immediately following the task, they completed a questionnaire asking about both ocular and general symptoms. Three trials were completed, with the monitor being adjusted for one of 3 correlated color temperature settings of 5000 K, 6500 K, or 9300 K. The spectral output of the display was recorded using a PR-650 SpectraColorimeter.

**Results:** Significant differences were observed between the 5000K and 9300K trials for any of the symptoms questioned. However, significant differences were observed between the 3 color temperature conditions for symptoms of tired eyes ($p=0.05$) and eye strain ($p=0.02$) during the task, with the 6500K condition giving significantly higher symptom scores.

**Conclusions:** A 6500K correlated color temperature monitor setting gave significantly higher symptoms with regard to tired eyes and eye strain when compared with the other two settings. Thus, the monitor color settings may be a contributory factor to CVS. Practitioners should consider this variable when managing this highly prevalent condition as a potential option to reduce CVS.

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**Support:** None.

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The Longitudinal Impact of Macular Telangiectasia (MacTel) Type II on Vision-Related Quality of Life: The MacTel Study

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Purpose: To determine the long-term effects of Macular Telangiectasia Type II (MacTel) on overall and specific aspects of Quality of Life (QoL) using the Impact of Vision Impairment (IVI) questionnaire.

Methods: Individuals aged 18 years or older with a clinical diagnosis of MacTel were invited to participate in the MacTel study. The MacTel study is an international, multicentre, 5 year observational study. The diagnosis of MacTel was determined using fundus photography, oculus coherence tomography (OCT), fluorescense angiogram and autofluorescence, which was later confirmed by the Fundus Reading Centre of Moorfields Eye Hospital. LogMAR best-corrected visual acuity (BCVA) was obtained and QoL was assessed using the IVI questionnaire, which consists of 28 items and 3 subscales, including reading and assessing information, mobility and independence and emotional well-being. Rasch analysis was used to validate the IVI questionnaire.

A control group consisting of 10 males and 14 females (mean age = 53.1 years) with no vision impairment (LogMAR c<0.2) were also recruited.

Results: At baseline, and 12 months, 23 MacTel patients (14 females), with a mean age of 62.8 years, were examined. Initial analysis showed that the IVI fitted the Rasch model, suggesting that it has valid and unidimensional properties for use in this sample. At baseline, the control group had significantly better overall QoL (mean±SD = 5.52±1.92) compared to the MacTel patients (mean±SD 2.08±1.66 p<0.001). Similar findings were found for the three IVI subscales. At the 12-month follow-up, we found no significant overall change in the overall IVI score and the three subscales compared to the baseline mean (2.06 ±1.40 VS 2.08 ±1.66; p= 0.976 for overall score only). There was no significant difference for BCVA for either eye at post test in the Mac Tel group (baseline and 12 month follow-up VA = 71.70 and 68.45, respectively for left eye only, p= 0.496).

Conclusions: The IVI is a valid tool to evaluate and monitor vision-specific QoL in patients with MacTel. No significant changes in QoL parameters in MacTel patients were found after 1 year which was parallel by our finding of no significant deterioration in vision at post-test. A longer mentoring period is required to evaluate the longitudinal impact of MacTel on vision-specific QoL.

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Support: None.

Using Rasch Analysis to Refine the Nottingham Adjustment Scale (NAS) in the Visually Impaired

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Purpose: The Nottingham Adjustment Scale (NAS) 1 is an existing self-report instrument that attempts to assess the degree of adjustment to visual impairment. Some of its psychometric properties have been tested previously; this study evaluates the NAS using Rasch analysis in a sample of visually impaired adults.

Methods: The original 55-item NAS was administered to 62 individuals with visual impairment during face to face interviews. Habitual binocular distance visual acuity (VA) was measured as was the level of depressive symptoms using the Geriatric Depression Scale (GDS). Using Rasch analysis, a revised instrument was developed. The properties of the revised instrument were then explored.

Results: Response scale and item function were sub-optimal in the original NAS. Performance was improved by altering the response scale and conducting systematic item reduction. The revised 26-item NAS has high person (0.87) and item (0.94) reliability and a separation of 2.57. Items were better targeted to the less well-adjusted in this sample. Person measures derived from the revised NAS did not correlate with VA (r=-0.16, p=.20) and correlated moderately with GDS scores (r=0.73; p<.001), indicating good discriminant and convergent validity, respectively.

Conclusion: The revised 28-item NAS has high person (0.87) and item (0.94) reliability and a separation of 2.57. Items were better targeted to the less well-adjusted in this sample. Person measures derived from the revised NAS did not correlate with VA (r=-0.16, p=.20) and correlated moderately with GDS scores (r=0.73; p<.001), indicating good discriminant and convergent validity, respectively.

CR: D.R. Tabrett, None; K. Latham, None.
Support: DT supported by a College of Optometrists’ Scholarship.
Conducted in a semi-structured environment as part of a study assessing health-care needs and physical health characteristics in that population. Bilingual community outreach educators administered surveys in various community centers, enlisting representative Russian aggregates. Measures for the present analysis included demographic and health-related data. Respondents received $20 for their participation.

Data were coded and entered in SPSS 15.0 for analysis.

Results: Eighty-nine percent of the volunteers had at least a High School degree; 27% were married and 73% were single, divorced, or separated. Forty-one percent lived alone, whereas 59% lived either with their children, a family member, or a friend. Overall, 93% reported at least one of several major health problems: vision (48%), hearing (26%), breathing (13%), hypertension (53%), smoking (28%), diabetes (26%), arthritis (53%), cancer (11%), weight problems (34%), and depression (43%). Sixty-two percent reported insomnia symptoms, defined as difficulty initiating sleep, difficulty maintaining sleep, or early morning awakenings. Logistic regression analysis showed that individuals with vision problems were nearly three times as likely than those without to report insomnia symptoms [OR = 2.73, p < 0.01; 95% CI = 1.68–4.48]. Adjusting for the presence of social isolation and depressed moods reduced the odds [OR = 2.06, p < 0.01; 95% CI = 1.15–3.49].

Conclusions: Older Russians have a higher prevalence of vision problems and insomnia than observed in the general US population. Older Russians with vision problems have twice the odds of reporting insomnia independently of depression and social isolation, two common problems affecting quality of life in that population.

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945 - A279

Improvements in Reading Speed After 6 Months of Ranibizumab Treatment in BRAVO and CRUISE


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Purpose: To examine the efficacy of ranibizumab (Lucentis®) on measured reading speed. Two multicenter, double-masked, phase III trials in which participants with macular edema following branch retinal vein occlusion (BRVO) were randomized to monthly sham, 0.3-mg or 0.5-mg ranibizumab for 6 months.

Methods: Two multicenter, double-masked, phase III trials in which participants with macular edema following branch RVO (BRAVO) or central RVO (CRUISE) were randomized 1:1:1 to monthly sham, 0.3-mg or 0.5-mg ranibizumab for 6 months. Reading speed in the study eye was measured using a test designed by the Macular Photocoagulation Study group through collaboration with the Lighthouse in New York. The number of correctly read words per minute is reported. The test requires a minimum of grade reading level and is not taken into account literacy or cognitive state. The reading speed test was administered at 0, 1, 3, and 6 months.

Results: At 6 months, ranibizumab-treated patients had greater mean gains in reading speed in study eyes than patients with sham-treated eyes (Figure). In BRAVO and CRUISE, patients with macular edema following RVO subsequently treated monthly with ranibizumab had, on average, greater improvements in reading speed in study eyes, a direct patient performance assessment of reading ability and visual function, through 6 months compared with sham treatment.

CR: I.J. Suner, Genentech; F. Genentech, Pfizer, Eyetech, Comentis; C. Varma, Allergan, Aqueys, Genentech, Optovue, Pfizer; F. Allergan, Aqueys, Bausch & Lomb, Genentech, Laboratorios Sophia, Pfizer; C. N.M. Bressler, Genentech; F. P.P. Lee, Genentech, Merck, Pfizer, Allergan, Genentech, Merck, Pfizer; C. Allan, Allergan, Genentech, Merck, Pfizer, R. Dolan, Genentech, J. Ward, Genentech; S. C. Colman, Genentech, E. R. Rubio, Genentech, E.

Support: None — CT: www.clinicaltrials.gov, NCT00486018, NCT00485836.
219. Functional Retinal Imaging

Methods: We recruited 53 children, 8-18 years old, with various (or no) ocular conditions that affect child’s daily activities. We selected items from existing instruments relevant to our population.

Results: All carriers scored lowest on questions dealing with glare (48.1±26.6) and vision related QOL; the VFQ 8-18 was an important instrument in assessing visual function which included ISCEV standard electroretinography. Based on visual function assessment which included ISCEV standard electroretinography. Based on visual function assessment which included ISCEV standard electroretinography. Based on visual function assessment which included ISCEV standard electroretinography. Based on visual function assessment which included ISCEV standard electroretinography.
Organizing Section: CL Contributing Section: VN

Blended Vision After Bilateral Monofocal Cataract Surgery: An Evaluation of Spectacle Independence and Vision-Related Quality of Life

A. M. Landes\textsuperscript{1}, C. Garcia\textsuperscript{1}, J. Filippelli\textsuperscript{1}, J. Paik\textsuperscript{1}, C. Bouchard\textsuperscript{1}, A. Lin\textsuperscript{1}. \textsuperscript{1}Ophthalmology, Loyola University Chicago, Maywood, IL; \textsuperscript{2}Ophthalmology, Wheaton Eye Clinic, Wheaton, IL; \textsuperscript{3}Ophthalmology, University of Chicago, Chicago, IL.

Purpose: This study investigated whether “blended vision” following bilateral monofocal intraocular lens implantation may be offered as an acceptable alternative to standard monofocal and multifocal lens implantation through evaluation of postoperative spectacle independence and vision-related quality of life.

Methods: This study compares two groups. Group 1 includes patients who have had standard bilateral monofocal implants corrected for distance. Group 2 includes patients who have had bilateral monofocal implants corrected for blended vision. We defined blended vision as moderation of vision where the near vision eye is corrected for intermediate distance rather than near with 0.75 to 1.25 diopeters of residual myopia. All patients completed the National Eye Institute Refractive Error Quality of Life Instrument-42 (NEI-RQL-42) to evaluate vision-related quality of life, including dependence on spectacles. We also compare our results to existing data in the literature where patients following bilateral ReSTOR implants have completed the same NEI-RQL-42 questionnaire.

Results: 10 subjects with blended vision and 8 controls were studied. There was no statistical difference among any of the 13 NEI-RQL-42 categories with the exception of near vision. Median scores for near vision were 93.75 and 62.50 for the blended vision and control groups, respectively (Mann Whitney, p = 0.0243). In comparing previous studies which reported NEI-RQL-42 scores of patients following bilateral ReSTOR implants, our blended vision group demonstrated comparable vision-related quality of life in all reported survey categories, exceeding the multifocal satisfaction level for near vision by a margin of 18% (93.75 vs. 77.08, blended vision vs. multifocal, respectively).

Conclusions: Blended vision may be an acceptable alternative to standard monofocal and multifocal implantation for those patients wishing to achieve a high level of vision-related quality of life, especially in terms of near vision.

CR: A. M. Landes, None; C. Garcia, None; J. Filippelli, None; J. Paik, None; C. Bouchard, None; A. Lin, None.
Support: None

Blended Vision After Bilateral Monofocal Cataract Surgery: An Evaluation of Spectacle Independence and Vision-Related Quality of Life

A.M. Landes\textsuperscript{1}, C. Garcia\textsuperscript{1}, J. Filippelli\textsuperscript{1}, J. Paik\textsuperscript{1}, C. Bouchard\textsuperscript{1}, A. Lin\textsuperscript{1}. \textsuperscript{1}Ophthalmology, Loyola University Chicago, Maywood, IL; \textsuperscript{2}Ophthalmology, Wheaton Eye Clinic, Wheaton, IL; \textsuperscript{3}Ophthalmology, University of Chicago, Chicago, IL.

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Conclusions: Blended vision may be an acceptable alternative to standard monofocal and multifocal implantation for those patients wishing to achieve a high level of vision-related quality of life, especially in terms of near vision.

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Support: None

The Impact of Depression on the Actual and Perceived Effects of Vision Rehabilitation

P. Grant-Jordan\textsuperscript{1,2}, J.P. Szlyk\textsuperscript{3,4}, W.H. Steple\textsuperscript{5}. \textsuperscript{1}Research and Development, Jesse Brown VAMC - Chicago Lighthouse, Chicago, IL; \textsuperscript{2}Ophthalmology & Visual Sciences, University of Illinois at Chicago, Chicago, IL; \textsuperscript{3}Research, Lighthouse International, New York, NY; \textsuperscript{4}Research and Development, Jesse Brown VAMC, Chicago, IL.

Purpose: To investigate the relationship between the psychological status and the outcomes of vision rehabilitation in patients with low vision due to macular disease.

Methods: We recruited 18 patients (10 men, 8 women, age range 54 to 87 years) who were enrolled in a reading rehabilitation program focused on eye movement training. The patients' visual acuities in their better eyes ranged from 0.12 to 1.4 logMAR. We administered the Center for Epidemiologic Studies Depression (CES-D) scale and the National Eye Institute Visual Function Questionnaire (NEI-VFQ). Reading assessments included the MNRead Acuity Charts (measures reading acuity, reading speed and critical print size). Psychologists and battery assessments were administered on the first day of rehabilitation. The AVL and reading assessments were also administered at the end of rehabilitation.

Results: Patients were divided into groups based on their CES-D total scores: minimally, moderately, or severely depressed. Results from the reading and adaptation measures were compared across all three groups to evaluate the effect of depression on rehabilitation outcomes. An analysis of variance revealed the effect of depression was significant on MNRead Acuity (F(2,15)=5.36, p=0.02); where those in the minimally depressed group showed significantly more improvement than both the moderately and severely depressed groups. Similar patterns were found for average reading speed (F(2,15)=2.78, p=0.09) and critical print size (F(2,15) = 0.51, p=0.61); however, these findings were not significant. Regarding adaptation, those in the severely depressed group improved the least while those in the minimally and moderately depressed groups (F(2,15) = 3.25, p=0.06).

Conclusions: Depressed patients did not demonstrate an optimal response to reading rehabilitation. Future research should be focused on defining methods to assess and remediate depression as part of the rehabilitation process.

CR: P. Grant-Jordan, None; J.P. Szlyk, None; W.H. Steple, None.
Support: The Department of Veterans Affairs, Rehabilitation Research and Development Service, Washington D.C., Grant CS0877R; The Cless Family Foundation, Northbrook, IL. CT: www.clinicaltrials.gov, NCT00125632

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CR: P. Grant-Jordan, None; J.P. Szlyk, None; W.H. Steple, None.
Support: The Department of Veterans Affairs, Rehabilitation Research and Development Service, Washington D.C., Grant CS0877R; The Cless Family Foundation, Northbrook, IL. CT: www.clinicaltrials.gov, NCT00125632
954 - A288
The Effect of a Projected Virtual Reality Training Environment on Vision Symptoms in Undergraduates
M. Cristina Amenos1, P.C. Knox1, C. Baker2, K. Burgess3, Orthoptics and Vision Science, 3Medical Imaging and Radiotherapy, University of Liverpool, Liverpool, United Kingdom.

Purpose: Virtual reality (VR) is known to induce a range of unwelcome symptoms (collectively known as “cybersickness”) in a proportion of the population. Most attention has focussed on head mounted VR systems. What of projected systems, which are increasingly being used in various types of training? We investigated the effects of one system, the Liverpool Virtual Environment for Radiotherapy (VERT), on a group of undergraduates.

Methods: The VERT comprises a 3D stereoscopic back-projector system with a 2.5 x 5 m screen. Active stereo glasses worn by users automatically shutter between stereo projector views to simulate a 3D environment. 32 first-year Radiotherapy students from the University of Liverpool (mean age 22.2±4.0 years) had a refraction and an orthoptic assessment. These included measurement of habitual visual acuity (with correction if worn) and stereovision prior to their first exposure to VERT. Students completed the Virtual Reality Symptom Questionnaire (VRSQ) before and after exposures of approximately 1 hr on two occasions.

Results: The group distance and near acuities were 0.053±0.18 and 0.010±0.15 respectively (LogMAR, mean±SD); median stereopsis was 45" with 28 out of 32 subjects (87.5%) having 60" or better (TN0). No subject reported any gross general (eg fatigue, headache) or eye (eye strain, blurring) discomfort after either first or second VERT sessions. There was a statistically significant increase in symptom scores from pre- to post-exposure on the first session (group median score 1 to 2.5 respectively; Wilcoxon Signed Ranks, Z=−4.57, p<0.001, n=32), but this was not repeated in the second session (2.5 to 3.0; Z=1.47, p=0.25, n=28). Further, analysis of the difference between the individual pre- and post-exposure results in both sessions revealed no consistent effect in individuals over the two sessions.

Conclusions: We found that the VERT does not induce uncomfortable symptoms in a group of undergraduate students. It is possible that projected systems, in which participants are largely passive observers of a VR environment, are less likely to induce eye symptoms than head mounted systems which make higher demands on the visual system.

CR: M. Cristina Amenos, None; P.C. Knox, None; C. Baker, None; K. Burgess, None.
Support: UK College of Radiographers IPSRA 021

956 - A289
Living With Uveitis- How Much Does It Affect Our Patients?
P.B. Tan1A, K. Chua1B, S.C.B. Teoh1A.

Purpose: To determine visual function and quality of life (QOL) in patients with uveitis and investigate the association between clinical parameters of uveitis and visual functioning.

Methods: A prospective cross-sectional study. Consecutive adult patients attending the uveitis outpatient clinic were enrolled over a two-month period. The 25-item Amsler Grid test was performed by 31 patients (75% of uveitis patients) and the 360° color vision test (TNO) was performed by 31 patients (75% of uveitis patients). The 25-item VFQ-25 were analyzed and converted to a QOL score (range 0-100). Sociodemographic and clinical data was also collected. Subgroup differences were determined with the Student’s t test and Kruskal Wallis tests.

Results: 48 patients participated. The VFQ-25 scores for uveitic patients for all domains significantly with an index of ocular surface disease but not associated with decreased visual acuity.

Conclusions: Patients with uveitis reported markedly poorer visual functioning than normal subjects. Patients with bilateral disease, poor visual acuity and chronic uveitis showed that patients with bilateral involvement reported poorer mental health, greater role limitations and poorer functioning in daily tasks requiring distance vision. The relationship observed remained moderately strong even after taking into account the influences of gender, course of disease and visual acuity.

CR: P.B. Tan, None; K. Chua, None; S.C.B. Teoh, None.
Support: None

957 - A291
Computer Vision Syndrome: Blink Rate and Dry Eye During Hard Copy or Computer Viewing
C.A. Chu1, M. Rosenfield 1A, J.K. Portello1B.

Purpose: Computer vision syndrome (CVS) is a complex of eye and vision problems experienced during or related to computer use which has been reported to occur in up to 90% of computer workers. Ocular symptoms may include asthenopia, accommodative and vergence difficulties and dry eye. At ARVO 2009 (Portello et al.) we reported that symptoms following sustained computer use were significantly worse than those noted after hard copy fixation under similar viewing conditions. This may be caused by dry eye symptoms resulting from decreased blinking during computer operation. Accordingly, this study assessed both blink rate and dry eye symptoms during hard copy and computer work.

Methods: Ocular symptoms were assessed by written questionnaire immediately following a sustained near task. 24 young, visually-normal subjects read cognitively-demanding text aloud either from a desktop computer screen or a printed hard copy page at a viewing distance of 50cm for a continuous 20 min period. Identical text was used in the two sessions, which was matched for size and contrast. Target viewing angle and luminance were similar for the two conditions. In each trial, subjects were videotaped to determine their blink rate. Additionally, dry eye symptoms were quantified using the Ocular Surface Disease Index (OSDI) questionnaire.

Results: Both the mean symptom score and the symptom of blurred vision during hard copy were significantly worse for the computer condition. Mean blink rates for the computer and hard copy trials were 15.09/min and 13.63/min, respectively (p=0.16). Further, no significant change in blink rate over time was observed, while no significant difference in OSDI score was found between the two trials, there was a significant positive correlation (r=0.000) between the computer symptom score and the mean OSDI.

Conclusions: These results confirm the previous findings that symptoms following sustained computer use are significantly worse than those reported after hard copy fixation under similar viewing conditions. Further, these symptoms were correlated significantly with an index of ocular surface disease but not associated with decreased blinking. Future studies will examine the effect of dry eye therapies on CVS with a view to providing treatment regimens for this highly prevalent condition.

CR: C.A. Chu, None; M. Rosenfield, None; J.K. Portello, None.
Support: None
146. Visual Function and Quality of Life

958 - A292
FDTS Matrix in Schizophrenia. Evaluation for Magnocellular Pathway Dysfunction in Schizophrenia and Their Parents

Purpose: To evaluate the visual pathways deficit in schizophrenia using the frequency doubling technology (FDT: MATRIX) comparing with their relatives and controls.

Methods: A total of 13 patients and 13 relatives and 19 controls were prospectively enrolled. After a complete ophthalmological examination, those with any ocular disease or previous oculars surgery were excluded. Patients were excluded if they had uncontrolled neurological disorder that might affect their performance. All patients and their parents underwent to FDTS: MATRIX perimetry after a careful explanation. The test was performed in one session. The MD (mean-deviation) for each eye was used for analysis. Generalized estimated equation was performed to evaluate differences among the groups and to correct the dependency between the eyes.

Results: The mean MD (presented as the mean of both eyes but, for calculation, each eye was considered separately) was significantly lower for schizophrenia group (4.35 dB ± 0.85) in comparison with their parents (+0.23dB ± 0.63) and for the control group (0.74 dB ± 0.50) (p<0.001). There was no significant difference between control group and schizophrenic parents group (p=0.244).

Conclusions: There is a lower mean MD with FDT MATRIX for schizophrenia patients compared with control group but the difference did not reach statistical significance.

Schizophrenic patients presented a significant lower MD.

CR: C.P. Barbosa, None; F. Benites, None; R. Bressan, None; A.K. Sena; None; L.M. Pinto, None; A. Paranhos, Jr., None.
Support: None

960 - A294
The Impact of Treatment Related Improvements in Visual Acuity on Item Specific Changes in the NEI-VFQ in Latinos participating in The Los Angeles Latino Eye Study (LALES)
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Purpose: to examine the association between improvements in visual acuity (VA) and item specific changes in the NEI-VFQ in Latinos participating in The Los Angeles Latino Eye Study (LALES).

Methods: Data included in this analysis were collected for a population-based cohort of eye disease. Distance visual acuity (VA) was measured during a detailed ophthalmologic examination using standard ETDRS protocol at baseline and a follow-up examination, approximately 4 years later. Vision specific quality of life was assessed at the two time points using the National Eye Institute Visual Function Questionnaire (NEI-VFQ-25). Responses were ranked from “always a problem” (score=0) to “never a problem” (score=100) for 25 task-oriented items related to daily visual functioning.

Mean differences in item scores from baseline to follow-up were calculated for 131 participants with 2 line or greater improvement in VA based on presenting, binocular vision. Paired t-tests were used to calculate 2-sided p-values. Mean differences and effect sizes (ESI) for NEI-VFQ item means were calculated.

Results: Over the 4-year follow-up period, we identified 131 participants with a 2 line or greater improvement in presenting binocular VA. Of these, 92 (70%) improved due to treatment with glasses or cataract surgery. For individuals with improved VA, there were 5 items for which we observed statistically significant improvements in scores of 8 points or greater. These questions concerned: (1) ability to read street signs or names of stores (10 point improvement; p<0.001), (2) difficulty in doing work or hobbies that require seeing up close (9.2 point improvement; p=0.002), (3) time spent worrying about vision (9.0 point improvement; p<0.003), (4) difficulty reading ordinary print in newspapers (9.3 point improvement; p=0.004), and (5) pain or discomfort in and around eyes (8.2 point improvement; p=0.001). These differences translated into small effect sizes (ESI = 0.20 - 0.49) for all 5 items.

Conclusions: Clinically meaningful improvements in VA were associated with significant improvements in quality of life. The greatest improvement were seen for reading at a distance (street signs) or near (books or newspapers), completing work that requires seeing up close, and in the amount worry they had about their vision.

CR: R. McKean-Cowdin, None; R. Varma, None; F. Choudhury, None; G. Torres, None; C.M. Patino, None; S.P. Azar, None.
Support: NEI U10-EY-11753 and EY-03040

961 - A295
Evaluation of a Questionnaire to Detect Subjective Optical Quality
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Purpose: To evaluate a questionnaire-determining subjective symptoms and quality of vision in refractive surgery patients with regard to reliability and validity.

Methods: 48 ametropic subjects and 40 patients 1 month after uneventful LASIK completed the questionnaire at two consecutive days. The values were marked on a visual analog scale from 0 ("perfect") to 100 ("extreme suffering") while the SQV item was checked with the multiple regression analysis.

Results: The scores collected by the questionnaire could be obtained with a satisfactory repeatability. The Selection of the queried symptoms appears to be valid of vision in refractive surgery patients with regard to reliability and validity. Moderate (adjusted R2 photopic: 0.68, high-mesopic: 0.38, low-mesopic 0.50) while the SOQ item was checked with the multiple regression analysis.

Conclusions: The scores collected by the questionnaire could be obtained with a satisfactory repeatability. The Selection of the queried symptoms appears to be valid of vision in refractive surgery patients with regard to reliability and validity. The self rated quality of vision (SQV) and the intensity of the symptoms "glare", "halos", "starbursts", "blurred vision", "ghosting". The repeatability of the individual items was analyzed with Bland Altman analysis. The impact of individual symptoms on the SQV item was checked with the multiple regression analysis.

CR: J.C. Giers, None; T. Kohnen, None; J. Buhren, None.
Support: None
Achieving Patient-Assessed Super-Vision With Wavefront-Guided Laser Vision Correction

D.R. Shapiro. Shapiro Laser Eye Center, Ventura, CA.

**Purpose:** To assess patient ratings of postoperative compared to preoperative vision following LASIK to determine whether subjective “super-vision” was achieved.

**Methods:** Two hundred eyes of 100 consecutive patients were treated with Advanced CustomVue wavefront-guided LASIK with iris registration and a target of emmetropia. All eyes had thin flaps with a Zyoptix XP microkeratome (120-micron head) and were treated with topical cyclosporine for at least two weeks preoperatively and at least three months postoperatively. All procedures were performed by the author in a private clinic setting. A brief patient questionnaire comparing postoperative uncorrected vision to corrected preoperative vision was administered at the conclusion of their postoperative course, including any enhancement surgery if necessary.

**Results:** There were no complications. Nearly all patients (96/100 or 96%) reported that their bilateral uncorrected vision after surgery was better than their vision with glasses or contact lenses before surgery. Four patients (4%) said pre- and post-op vision were equal (even though one of those subjects improved from 20/20 best-corrected to 20/10 UCVA). No patient said uncorrected vision after surgery was worse than preoperative corrected vision.

**Conclusions:** Super-vision cannot be adequately defined by Snellen acuity or contrast resolution testing as vision is ultimately a complex and subjective phenomenon. For this reason, subjective assessment of post-operative vision by patients is an important metric in assessing super-vision. By such patient-assessed measures, 96% of subjects in this study achieved super-vision following wavefront-guided LASIK surgery.

**CR:** D.R. Shapiro, Abbott Medical Optics, F.

**Support:** None
Long-Term Incidence of Isolated Retinopathy Lesions in Older Persons Without Diabetes: The Blue Mountains Eye Study

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Purpose: To assess 10-year incidence of isolated retinopathy lesions and associated risk factors in persons without diabetes.

Methods: A total of 5,854 Blue Mountains Eye Study baseline participants aged 49+ years, 2,335 (37.9% of 3,111 survivors) were followed after 5 years (1997-9), and 1,935 (75.0% of 2,591 survivors) after 10 years (2002-4). Retinopathy lesions (microaneurysms, hemorrhages, hard or soft exudates) in persons without diabetes were assessed from retinal photographs. Mild retinopathy was defined if ≥2 microaneurysms/ hemorrhages or any hard/ soft exudates were present, and any moderate if ≥2 microaneurysms/ hemorrhages or any hard/ soft exudates were present. Stage I hypertension was defined as systolic blood pressure (BP) ≥140 but <160 mmHg, diastolic BP ≥90 but <100 mmHg, and stage II was defined as systolic BP ≥160 mmHg or by current use of antihypertensive medications. Obesity was defined as body mass index ≥30.

Results: After excluding participants with retinopathy lesions at baseline, and those with diabetes or ungradable retinal photos at any visit, 1,678 participants were at risk of incident retinopathy who were followed-up at least once at the 10-year exam, cumulative incidence of retinopathy was 16.0% (n=269). Of these, 184 had mild and 76 moderate retinopathy (9 were severe). No significant associations were found for incident mild retinopathy. Baseline stage I or II hypertension (hazard ratio, HR 1.85, 95% confidence interval, CI 1.02-3.37) and obesity (HR 2.19, 95% CI 1.28-3.75) were significantly associated with incident moderate retinopathy, after adjusting for age and sex. Of those with moderate retinopathy but no diabetes at baseline, 121 (72.5%) had stage I hypertension and 46 (27.5%) were lost to follow-up, 7 developed diabetes and 2 retinal vein occlusion. Of the remaining 115 persons, retinopathy lesions completely disappeared in 74 (64.3%). No significant associations were found for retinopathy disappearance. At the 10-year exam, cumulative rates of diabetes were 8.0% (n=9), 8.0% (n=8), and 6.7% (n=7) for stages I, II, and III, respectively. Baseline stage II hypertension (46.3% vs 43.1%, p=0.6) and obesity were similar in persons with vs those without retinopathy at baseline.

Conclusions: Isolated retinopathy lesions in older people without diabetes are common but not infrequent. The long-term risk of diabetes and hypertension was evident in generally healthy, older persons with retinopathy lesions.

CR: J.J. Wang; None; E. Roethchina; None; S. Kaushich; None; A. Kiefly; None; T.Y. Wong; None; P. Mitchell; None.

Support: Australian National Health and Medical Research Council project grants 211069 and 302068.

The 15-Year Cumulative Incidence and Associated Risk Factors for Retinopathy in Non-Diabetic Persons: The Beaver Dam Eye Study


Purpose: Retinopathy in non-diabetic persons is associated with cardiovascular disease morbidity and mortality, yet little is known about the long-term epidemiology of these lesions. The objective was to investigate the relationship of systemic factors to HR, through 15-year cumulative incidence of retinopathy in non-diabetic persons in the Beaver Dam Eye Study.

Methods: We included 3,017 persons, 43 to 86 years of age at the time of a baseline examination in 1988-90 and with information collected in follow-up in 1993-95, and/or 1998-2000, and/or 2003-05. Stereoscopic fundus photographs were graded in a masked fashion using standardized protocols to determine the presence of retinopathy as defined by the ETDRS severity scale. The main outcome measure was cumulative incidence of retinopathy accounting for competing risk of death or diabetes.

Results: The 15-year cumulative incidence in the non-diabetic cohort was 14.2%. In multivariate analyses, older age (hazard ratio [HR] per age group 1.13, 95% confidence interval [CI] 1.01-1.27), higher systolic blood pressure (HR per 10 mm Hg 1.15, 95% CI 1.07-1.20), presence of chronic kidney disease (CKD) (HR 1.51, 95% CI 1.12-2.00) and wider retinal vessel diameter (HR per 15 μm 1.02, 95% CI 1.01-1.02) at baseline were associated with incidence of retinopathy. In a separate model, the 15-year incidence of retinopathy was higher in those whose blood pressure was elevated despite use of antihypertensive medications compared with those whose blood pressure was controlled with antihypertensive medications or those who were normotenous, and there were no relations of body mass index, lipids, glycosylated hemoglobin, cigarette smoking, markers of inflammation, endothelial dysfunction and oxidative stress, hematologic factors, or use of aspirin to retinopathy incidence.

Conclusions: These data show systolic blood pressure and CKD are related to an increased incidence of retinopathy in nondiabetic persons and suggest that control of blood pressure is related to a lower incidence of retinopathy relative to uncontrolled blood pressure.

CR: R. Klein; None; C.E. Myers; None; K.E. Lee; None; B.E.K. Klein; None.

Support: Supported by National Institutes of Health grant EY06594 and, in part, by Research to Prevent Blindness (R. Klein, BEK Klein, Senior Scientific Investigator Awards, New York, NY).

The Epidemiology of Primary Retinal Detachment in Scotland: 2 Years of Prospective Recruitment


Purpose: To estimate the annual incidence and clinical associations of primary rhegmatogenous retinal detachment (RDD) in Scotland.

Methods: Since 1st of November 2007 we have initiated and co-ordinated a national, multi-centre, prospectively recruited, population based study where every case of primary RDD presenting to one of six vitreo-retinal surgical sites in Scotland is examined and approached for study inclusion. Through rigorous validation of case ascertainment, this database represents ~96% of all operated cases of RDD in Scotland over a two year period.

Results: A total of 1,202 patients were newly diagnosed during the two year study period from a population of 5,168,500 yielding an annual incidence of 11.65 per 100,000 of population (95% CI 11.12-12.30). The mean age at presentation was 58.53 years (SD±16.24) with a M:F ratio of 1:1.5. The highest incidence was found in people aged 60-70 years (33.62/100,000). The incidence of horse-shoe tear RDD was 6.72/100,000, round hole RDD was 4.62/100,000, retinal dialysis was 0.64/100,000 and giant retinal tear RDD was 0.20/100,000. The macula was attached in only 42% of cases. 54.3% of cases were myopic (–1,9). One in five presenting cases was pseudophakic. Independent of known risk factors, RDD incidence is associated with social affluence.

Conclusions: Based on these findings, primary RDD affects over 7,200 people in the United Kingdom, with approximately 1,500 cases in pseudophakic individuals. RDD is strongly associated with age, myopia, male gender, pseudophakia and socioeconomic affluence.

CR: D. Mitry; None; D. Charteries; None; R. Siddiqui; None; H. Campbell; None; D. Yorston; None; J. Singh; None.

Support: Royal College of Surgeons Edinburgh.
This study was part of the on-going Rotterdam Study, a large population-based cohort of 510 initially retinopathy-free patients with T1D, aged 12 to 20 years. In this population-based study, larger retinal venular caliber was associated with an increased risk of first-ever stroke, of whom 61 had intra-cerebral haemorrhage. Larger venular caliber was associated with an increased risk of stroke [fully-adjusted hazard ratio (HR) per standard deviation (SD) increase: 1.20; 95% confidence interval (CI): 1.09-1.32] and intra-cerebral haemorrhage [HR per SD increase: 1.43; 95% CI: 1.05-1.95]. The corresponding HR for arteriolar caliber per SD decrease were 1.10 [95% CI: 0.99-1.21] and 1.20 [95% CI: 0.88-1.65].

Conclusions: In this population-based study, larger retinal venular caliber was associated with an increased risk of stroke and - more specifically - its subtype intra-cerebral haemorrhage.

CR: M. K. Ibram, None; R. Wierdink, None; P. Koudstaal, None; A. Hofman, None; J. R. Vingerling, None; M. Breter, None. Support: None

1240 - 9:30AM
Retinal Vessel Tortuosity and Incidence of Diabetic Retinopathy in Type 1 Diabetes

M.B. Sasonko1, P.B. Aguirre2, N.J. Wang1, K. Donaghe1, N. Cheung1, A. Jenkins3, T.Y. Wong1,3,4. 1Ophthalmology, CERA, University of Melbourne, Melbourne, Australia; 2Dept. of Ophthalmology, Faculty of Medicine, Gadjah Mada University, Yogyakarta, Indonesia; 3Children Hospital at Westmead, University of Sydney, Sydney, Australia; 4Centre for Vision Research, University of Sydney, Sydney, Australia; 5Dept. of Medicine, University of Melbourne, Melbourne, Australia; 6Singapore Eye Research Institute, National University of Singapore, Singapore, Singapore.

Purpose: Retinal vascular caliber changes have been associated with microvascular complications in type 1 diabetes (T1D). In this study, we aimed to examine the prospective association of retinal vessel tortuosity and other vascular morphological parameters with incident diabetic retinopathy (DR) in young people with T1D.

Methods: A cohort of 510 initially retinopathy-free patients with T1D, aged 12 to 20 years, were enrolled during 1990 to 2002 from a tertiary hospital in Sydney. Participants had 7-field stereoscopic retinal photographs of both eyes taken at baseline and follow-up. Incident DR was graded according to the modified Airlie House classification from follow-up photographs. Parameters of retinal vascular morphology including branching angle, tortuosity, optimality deviation, and length to diameter ratio (LDR) were quantitatively measured from baseline photographs using a computer-based program following a standardized protocol. Associations between these retinal vascular parameters with incident DR were assessed using multiple logistic regression, adjusted for relevant covariates.

Results: Over 5 years of follow-up, 214 (41.9%) patients developed DR. Those who developed DR were generally older, had longer diabetes duration, and higher HbA1c at baseline. After adjusting for age and sex, each standard deviation (SD) increase of both arteriolar and venular tortuosity was associated with increased risk of developing DR within 5 years of follow-up (OR 1.6 (CI 1.63 - 5.14) and 1.82 (CI 1.11 - 2.96), respectively). Branching angle, optimality deviation, and LDR were not found to be associated with incident DR. Association of vessel tortuosity persisted after adjusting for BMI, cholesterol level, blood pressure, diabetes duration, HbA1c, vessel caliber, and other diabetic complications.

Conclusions: Retinal arteriolar and venular tortuosity was associated with the development of DR in T1D, independent of standard retinopathy risk factors. This suggests that abnormalities of retinal vascular morphology may represent early microvascular changes in the development of DR.

CR: M.B. Sasonko, None; P.B. Aguirre, None; J.J. Wang, None; K. Donaghe, None; N. Cheung, None; A. Jenkins, None; T.Y. Wong, Patent, P. Support: National Health and Medical Research Council (NHMRC), 475605 & the Juvenile Diabetes Research Foundation (JDRF), 5-2008-274

1242 - 10:00AM
Association of Retinal Vascular Fractal Dimension and Retinopathy Lesions in Older People Without Diabetes

P. Mitchell1, E. Roichtina1, G. Liew1, H. Li2, T.Y. Wong1, J. Wang1. 1Ophthalmology, University of Sydney, Sydney, Australia; 2Singapore Eye Research Institute, National University of Singapore, Singapore, Singapore.

Purpose: To assess whether retinopathy in people without diabetes is associated with retinal vascular fractal dimension.

Methods: Of 3654 baseline participants aged 49+, 2335/ 3111 (75% of survivors) were over 5 years of follow-up (SD 6.5 years) and 45% (2014/4490) participants were included who were free of stroke at baseline (1990-1993) and had gradable digitised fundus photographs for retinal vascular caliber measurements. For each participant, summary retinal arteriolar and venular calibers were measured on these digitized images of one eye using a semi-automated system. Follow-up for incident stroke was complete up to January 1, 2007. Data were analyzed with Cox proportional hazards models adjusted for age and sex, and additionally for other known cardiovascular risk factors. Arteriolar and venular calibers were entered simultaneously in each of the models.

Results: During an average follow-up time of 11.7 years, 623 participants developed a first-ever stroke, of whom 61 had intra-cerebral haemorrhage. Larger venular caliber was associated with an increased risk of stroke [fully-adjusted hazard ratio (HR) per standard deviation (SD) increase: 1.20; 95% confidence interval (CI): 1.09-1.32] and intra-cerebral haemorrhage [HR per SD increase: 1.43; 95% CI: 1.05-1.95]. The corresponding HR for arteriolar caliber per SD decrease were 1.10 [95% CI: 0.99-1.21] and 1.20 [95% CI: 0.88-1.65].

Conclusions: In this population-based study, larger retinal venular caliber was associated with an increased risk of stroke and - more specifically - its subtype intra-cerebral haemorrhage.

CR: M. K. Ibram, None; R. Wierdink, None; P. Koudstaal, None; A. Hofman, None; J. R. Vingerling, None; M. Breter, None. Support: None
Prevalence and Pattern of Corneal, Anterior Segment and Infectious Disease

1305 - A136
Risk Factors for Microbial Keratitis in Daily Disposable Contact Lens Wear

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Purpose: The incidence of microbial keratitis (MK) in daily disposable (DD) contact lens (CL) use is similar to other daily soft lens CLs, although it is lower for severe MK. This study investigates independent risk factors in MK for DD CLs.

Methods: Cases were DD CL wearers attending Moorfields Eye Hospital with MK between 2003-2005 and those reported through a one-year surveillance study of ophthalmic practitioners in Australia and New Zealand (2003-2004). A population based telephone survey identified DD CL wearing contacts. In London, hospital based DD CL wearing controls were also identified. All wearers completed a questionnaire describing CL wear history, hygiene and compliance habits and demographics. Samples were randomly selected in proportion to the CL wearing population at each site. Risk factors were determined using multiple binary logistic regression.

Results: 68 cases of MK (67 severe) and 372 controls wearing DD CLs were analysed. Independent risk factors were: wearing CLs every day compared with less frequent use (OR 6.0x; 95% CI 2.9-12.3), overnight wear compared with daily use (OR 1.2x; 95% CI 1.0-1.3), less frequent hand washing (OR 3.2x; 95% CI 2.7-3.6), smoking (OR 1.7x; 95% CI 1.1-2.0) and more than one year since the last aftercare (OR 1.8x; 95% CI 1.5-2.1). Certain DD CLs (OR 0.2x; 95% CI 0.1-0.2) and youth (OR 0.2x; 95% CI 1.0-1.2) had protective effects.

Conclusions: Consistent with previous findings in other daily wear modalities, overnight wear, increased exposure in daily wear, smoking and poor hand hygiene are significant risk factors for MK with DD CL. In contrast, younger age and more frequent check ups are protective. As risk varied with CL type, material properties and design may play a role in the aetiology of MK in DD CL wear.

Support: National Health and Medical Research Council (NHMRC) Grant No 501/1/25-5, Singapore Tissue Network, Ministry of Health, Singapore; ADepartment of Epidemiology and Public Health, National University of Singapore, Singapore; Singapore National Eye Centre, Singapore Eye Research Institute, Singapore, Singapore; Department of Epidemiology and Public Health, National University of Singapore, Singapore; Singapore National Eye Centre, Singapore Eye Research Institute, Singapore, Singapore; Singapore, Singapore; 1Department of Epidemiology and Public Health, National University of Singapore, Singapore; Singapore

Prevalence and Risk Factors of Meibomian Gland Dysfunction: The Singapore Malay Eye Study
J.J. Siak1, L. Tong1, W.-L. Wong1, H. Cajomuc-Uy1, M. Rosman1, N.-M. Saw2,3, T.-Y. Wong2,4,5.

1Singapore National Eye Centre, Singapore Eye Research Institute, Singapore, Singapore; 2Institute for Eye Research, CIBA Vision, UNSW, The Australian Federal Government CRC Scheme through the Vision Cooperative Research Centre, NHMRC.

Purpose: To describe the prevalence and risk factors of meibomian gland dysfunction (MGD) in an urban Malay population in Singapore.

Methods: Population-based, cross-sectional study of 3,280 (78.7% response rate) Malay persons aged 40 and 80 years, living in Singapore. MGD was defined by a clinical examination at the slit lamp as either lid margin telangiectasia or meibomian gland dropout. Samples were randomly selected in proportion to the CL wearing population at each site. Risk factors were determined using multiple binary logistic regression.

Results: 68 cases of MK (67 severe) and 372 controls wearing DD CLs were analysed. Independent risk factors were: wearing CLs every day compared with less frequent use (OR 6.0x; 95% CI 2.9-12.3), overnight wear compared with daily use (OR 1.2x; 95% CI 1.0-1.3), less frequent hand washing (OR 3.2x; 95% CI 2.7-3.6), smoking (OR 1.7x; 95% CI 1.1-2.0) and more than one year since the last aftercare (OR 1.8x; 95% CI 1.5-2.1). Certain DD CLs (OR 0.2x; 95% CI 0.1-0.2) and youth (OR 0.2x; 95% CI 1.0-1.2) had protective effects.

Conclusions: Consistent with previous findings in other daily wear modalities, overnight wear, increased exposure in daily wear, smoking and poor hand hygiene are significant risk factors for MK with DD CL. In contrast, younger age and more frequent check ups are protective. As risk varied with CL type, material properties and design may play a role in the aetiology of MK in DD CL wear.

Support: National Health and Medical Research Council (NHMRC) Grant No 501/1/25-5, Singapore Tissue Network, Ministry of Health, Singapore; ADepartment of Epidemiology and Public Health, National University of Singapore, Singapore; Singapore National Eye Centre, Singapore Eye Research Institute, Singapore, Singapore; Department of Epidemiology and Public Health, National University of Singapore, Singapore; Singapore National Eye Centre, Singapore Eye Research Institute, Singapore, Singapore; Singapore, Singapore; 1Department of Epidemiology and Public Health, National University of Singapore, Singapore; Singapore

1305 - A137
Korean Population.

Purpose: To describe the prevalence and risk factors of meibomian gland dysfunction (MGD) in an urban Malay population in Singapore.

Methods: Population-based, cross-sectional study of 3,280 (78.7% response rate) Malay persons aged 40 and 80 years, living in Singapore. MGD was defined by a clinical examination at the slit lamp as either lid margin telangiectasia or meibomian gland dropout. Samples were randomly selected in proportion to the CL wearing population at each site. Risk factors were determined using multiple binary logistic regression.

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Support: National Health and Medical Research Council (NHMRC) Grant No 501/1/25-5, Singapore Tissue Network, Ministry of Health, Singapore; ADepartment of Epidemiology and Public Health, National University of Singapore, Singapore; Singapore National Eye Centre, Singapore Eye Research Institute, Singapore, Singapore; Department of Epidemiology and Public Health, National University of Singapore, Singapore; Singapore National Eye Centre, Singapore Eye Research Institute, Singapore, Singapore; Singapore, Singapore; 1Department of Epidemiology and Public Health, National University of Singapore, Singapore; Singapore

Prevalence of Granular Corneal Dystrophy Type 2 (Avellino Corneal Dystrophy) in Korea
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Purpose: To estimate the prevalence of granular corneal dystrophy type 2 (GCD2; Avellino corneal dystrophy), a rare disease, in the Korean population.

Methods: Through a collaboration of Korean referral centers for corneal disease, we identified all GCD2 homozygotes that were over the age of three in 2005. The genetic status of the patients and their immediate families were verified by DNA analysis. We developed a model based on the Hardy-Weinberg principle to calculate a lower bound for the prevalence. We developed a second, population-based model to correct for known underestimation in the primary model. Both models used population data from the 2005 Korean census and the corrected model also used fertility rates from the 2005 Korean census data.

Results: We identified 21 individuals homozygous for GCD2 (1214H mutation) from 16 Korean families. From this, we estimate that the overall prevalence (combining homozygotes and heterozygotes) is at least 8.25 affected persons/10,000 persons. Based on our corrected estimate, the overall prevalence is likely to be greater than 11.5 affected persons/10,000 persons.

Conclusions: We present the first estimate of the prevalence of GCD2. Although uncommon, the prevalence of GCD2 in Korea is greater than anticipated. We believe that our approach could potentially be applied to estimating the prevalence of other rare diseases.

CR: S. M. Cristo; None; J. H. Lee; None; W. C. Kim; None; E. S. Chung; None; H. Tchah; None; M. S. Kim; None; C. M. Nam; None; H.-S. Cho; None; E. K. Kim; None.

Support: Ministry of Health, Welfare & Family Affairs, Republic of Korea (A08020)
1310 - A141
Ethnic Variations in Need for Surgery in Patients With Keratoconus

Purpose: To compare computed anterior chamber depth (aACD) measurements with manual ACD (mACD) measurements in normal, cycloplegic, phakic eyes using enhanced and single scans from the anterior segment optical coherence tomography (Visante™) (Carl Zeiss Meditec, Dublin, CA).

Methods: 15 normal subjects with no keratoconus were included in this study. The scans were obtained using the Visante™ (Carl Zeiss Meditec, Dublin, CA). Manual ACD (mACD) and Visante™ -enhanced ACD (eACD) measurements were performed. The mACD and eACD were compared using the paired t-test.

Results: mACD was 3.620 mm (SD 0.410) for enhanced and 3.620 mm for single scans. Mean mACD was 3.582 mm (SD 0.486) for enhanced and 3.564 mm (SD 0.444) for single scans. All ACD measurements for enhanced and single scans were correlated (r=0.895 to r=0.999) and not significantly different (p<0.05). There was a correlation between aACD and mACD for enhanced (r=0.998) and single scans (r=0.998), despite a statistical difference between enhanced (p=0.006) and single scans (p=0.008). mACD and mACD were correlated and not statistically different for enhanced (r=0.977; p=0.242) and single scans (r=0.999; p=0.038).

Conclusions: To date, there are no known studies comparing ACD measurements between automated and manual modes from single and enhanced scans using the Visante™. Few studies compared ACD measurements between Visante™ and the IOLMaster™ (Carl Zeiss Meditec, Dublin, CA), none examined in a cycloplegic state (recommended in the IOLMaster™ manual), and none compared measurement modalities among features allowed by the Visante™. Our study found that single and enhanced scans yield measurements that were not statistically different. aACD and mACD were correlated, but statistically different, which requires further investigation.

CR: M.W. Aschbrenner, None; H.B. Moss, None; G.W. Lyles, None; K.L. Cohen, None.
Support: Research to Prevent Blindness

1312 - A143
Cycloplegic Anterior Chamber Depth Measurements Using Anterior Segment Optical Coherence Tomography (Visante™)

Purpose: To compare computed anterior chamber depth (aACD) measurements with manual ACD (mACD) measurements in normal, cycloplegic, phakic eyes using enhanced and single scans from the anterior segment optical coherence tomography (Visante™) (Carl Zeiss Meditec, Dublin, CA).

Methods: This was a prospective study of 44 normal eyes (25 patients). ACD was measured from the tear film to the anterior lens capsule. Eyes received one drop of phenylephrine (2.5%) and one drop of tropicamide (1%). Thirty minutes later, the Visante™ captured images using enhanced and single scans. ACD was measured using aACD and mACD. A second mACD was measured with a different observer (mACD_2). Values were compared using Pearson product correlations and paired t-tests.

Results: Mean aACD was 3.607 mm (SD 0.417) for enhanced and 3.606 mm (SD 0.415) for single scans. Mean mACD was 3.632 mm (SD 0.410) for enhanced and 3.620 mm (SD 0.407) for single scans. Mean mACD was 3.582 mm (SD 0.486) for enhanced and 3.564 mm (SD 0.444) for single scans. All ACD measurements for enhanced and single scans were correlated (r=0.895 to r=0.999) and not significantly different (p<0.05). There was a correlation between aACD and mACD for enhanced (r=0.998) and single scans (r=0.998), despite a statistical difference between enhanced (p=0.006) and single scans (p=0.008). mACD and mACD were correlated and not statistically different for enhanced (r=0.977; p=0.242) and single scans (r=0.999; p=0.038).

Conclusions: To date, there are no known studies comparing ACD measurements between automated and manual modes from single and enhanced scans using the Visante™. Few studies compared ACD measurements between Visante™ and the IOLMaster™ (Carl Zeiss Meditec, Dublin, CA), none examined in a cycloplegic state (recommended in the IOLMaster™ manual), and none compared measurement modalities among features allowed by the Visante™. Our study found that single and enhanced scans yield measurements that were not statistically different. aACD and mACD were correlated, but statistically different, which requires further investigation. Because pre-op ACD is important in the calculation of IOL power for the prediction of postoperative refraction (Haigis formula), further comparisons of the Visante™ with the IOLMaster™ should be performed to validate the Visante™ measurements.

CR: M.W. Aschbrenner, None; H.B. Moss, None; G.W. Lyles, None; K.L. Cohen, None.
Support: Research to Prevent Blindness
1313 - A144
The Prevalence of Pseudoexfoliation Syndrome in a Singapore Eye Clinic

Purpose: To study the demographics and ocular morbidity of pseudoexfoliation syndrome at a tertiary hospital eye clinic in Singapore.

Method: retrospective review of all patients with pseudoexfoliation syndrome (PXF) encountered by a single ophthalmologist over a period of 37 months (1 July 2006 to 31 July 2009). Data on demographics, clinical examination findings and ocular morbidities were collected and analyzed.

Results: Of the 389 patients encountered during this period, a total of 93 patients (24%) were found to have PXF with the majority of the PXF patients (61%) being above 70 years old. Overall, no gender predisposition associated with PXF was observed. The major ethnic groups among the 93 PXF patients were Chinese (62.4%), Malays (9.7%) and Indians (24.7%). Using the x2 test for 2 proportions, the prevalence of PXF was found to be significantly higher in the Indian population (7.8%) compared to the Chinese (1.8%, p < 0.0001) and Malay (3.4%, p = 0.04) populations. Glaucoma was present in 32 (21.9%) of the 146 eyes with PXF of which 29 (90%) had open angles. The major causes of visual impairment with best-corrected visual acuity of less than 6/18 among the PXF eyes were cataract (35/146=24.0%) and glaucoma (98/146=6.6%).

Conclusions: This study suggests that PXF is not an infrequent encounter among the elderly Singapore eye clinic patients with an overall prevalence of 2.4%, being more common in Indians compared to Chinese and Malays. To the best of our knowledge, this was the first study that examined the demographics of PXF in a local eye clinic population in Singapore. It is imperative for ophthalmologists to focus on the early detection of PXF in the elderly population and to monitor these patients for cataracts and glaucoma, the two main causes of visual impairment associated with PXF.

CR: J. Lee, None; S. Ho, None.
Support: None.

1315 - A146
Secular Changes in Trachoma in a Hyperendemic Community in Tanzania
S.K. West1, B.E. Munoz2, H. Mkocha1, M. Welle1, C. Gaydos1, T. Quinn1.

Ophthalmology, Johns Hopkins Wilmer Eye Inst, Baltimore, MD; 2Kongwa Trachoma Project, Kigoma, Tanzania, United Republic of.

Purpose: To evaluate changes over time in trachoma by age group in a hyper-endemic village in Kigoma, Tanzania.

Methods: Cross sectional studies for trachoma and ocular C. trachomatis infection on all children in this village have been carried out at baseline, 2, 6, 12, 18 months, and 60, 72, 78, and 84 months post baseline. Clinical grading of follicular trachoma on all children in this village have been carried out at baseline, 2, 6, 12, 18 months, 24, 36, 48, 60, 72, 78, and 84 months post baseline.

Results: At baseline, trachoma was 60% in children ages 5 and under. After the initial round of mass treatment, trachoma and infection declined, and never again reached pre-treatment levels. After the gap between 18 months and 60 months, re-emergence occurred but not to pre-treatment levels. Clinical grading of follicular trachoma (TF), inflammatory trachoma (IT), and scarring trachoma (TS) were done based on photographs, using the WHO simplified grading scheme. Mass treatment with azithromycin was offered at baseline, 18 months, 60 months, and 72 months post baseline.

Conclusions: Trachoma appears to be declining in this formerly hyper-endemic community.
CR: S.K. West, None; B.E. Munoz, None; H. Mkocha, None; M. Welle, None; C. Gaydos, None; T. Quinn, None.
Support: Bill and Melinda Gates Foundation

1314 - A145
Epidemiology and Outcome of Traumatic Hyphema: A Retrospective Case Series
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1School of Medicine/Eye Institute, Saint Louis University, Saint Louis, MO; 2Ophthalmology, Saint Louis University Eye Institute, Saint Louis, MO.

Purpose: To report the epidemiology, morbidity, prevalence of associated blood dyscrasia, therapeutic interventions, complications and outcomes of patients with traumatic hyphema.

Methods: Retrospective case series. Exclusion criteria included ruptured globe and other non-traumatic causes of hyphema.

Results: 51 patients (51 eyes) within an 8 year window period met inclusion criteria. Mean age was 23 years (range 4 to 66 years) and 88% were male. The left eye was the affected side in 53% (27/51) of patients. Positive testing for sickle cell trait or disease was noted in 12% (6/51) of patients. The most frequently associated mechanisms of injury were sporting-related in 20% (10/51), assault in 20% (10/51), BB gun in 12% (6/51), paintball gun in 8% (4/51), bottle rocket in 8% (4/51), and MVA in 8% (4/51). The most frequent hyphema-related ocular complication was ocular hypertension (IOP > 25 mmHg) occurring in 45% (23/51) of patients, in which 31% (8/26) required an anterior chamber washout. Ocular hypertension occurred in all 6 patients with sickle cell, of which 67% (4/6) required an anterior chamber washout. Re-bleeding occurred in 8% (4/51) of patients, all of whom developed ocular hypertension. Corneal blood staining occurred in 4% (2/51) of patients. Associated ocular or orbital injury occurred in 57% (29/51) of patients; including traumatic cataract in 18% (9/51), vitreous hemorrhage in 16% (8/51), orbital wall fracture in 16% (8/51), iridodialysis in 14% (7/51), subluxated lens 6% (3/51), retinal tear in 6% (3/51), retinal detachment in 2% (1/51), and retinal hemorrhage in 2% (1/51). Final visual acuity of better than 20/50 was noted in 86% (19/22, with 2/22 lost to follow up) of patients without associated ocular or orbital injury, compared with 52% (15/29, 3/29 lost to follow up) of those with associated injury. Final visual acuity was worse than 20/200 in 14% (7/51) of patients.

Conclusions: Traumatic hyphema predominantly affects young males and can be associated with significant morbidity. Nearly half of all cases (47%; 24/51) could theoretically have been prevented by wearing protective eyewear, as in the cases of sport, paintball/BB gun, and bottle rocket-related injuries. Ocular hypertension is a common early complication, especially affecting patients with sickle cell, with a disproportionate number of this subset of patients requiring an anterior chamber washout. Poor prognostic indicators include re-bleeding, sickle cell trait or disease, and other associated ocular or orbital injury.
CR: H.R. Khan-Farooqi, None; P. Chiranand, None; S.L. Edelstein, None.
Support: None.

1316 - A147
Estimating Trachoma Prevalence at the District Level Using CRS Methodology. How Many Clusters are Enough?
B.E. Munoz1, H. Mkocha1, S.K. West1.

1Ophthalmology, Johns Hopkins Wilmer Eye Inst, Baltimore, MD; 2Kongwa Trachoma Project, Kigoma, Tanzania, United Republic of.

Purpose: WHO guidelines for trachoma control include mass treatment distribution of Azithromycin in districts where the prevalence of active trachoma is more than 10% in children ages less than 10 years of age. Cluster random sample (CRS) methodology is recommended to identify districts in need of treatment. We examined the efficiency of CRS in estimating the district level prevalence when the number of clusters selected is limited by the overall cost of the survey.

Methods: The Kongwa District of Tanzania was used because data are available on population size, and prevalence of active trachoma for all 64 villages (clusters) in the district. One hundred thousand samples of 8, 9, and 10 clusters, were drawn, selecting the clusters with probability proportional to the size. The estimated district prevalence for each sample was compared with the actual prevalence. Two sorting orders were used for the population listing: by geographical proximity, and at random. We report the proportion of samples that produced an estimate for the district outside ± 4%, and ± 5% of the actual prevalence.

Results: The district total population was 266,850 with an overall trachoma prevalence of 15.5%; village prevalences ranged from 0% to 54%. Simulation results are shown below.

<table>
<thead>
<tr>
<th>Number of clusters (% of total)</th>
<th>Ordering</th>
<th>% Simulated Prevalence Estimation Outside</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>At random</td>
<td>± 4%</td>
</tr>
<tr>
<td>9</td>
<td>At random</td>
<td>± 5%</td>
</tr>
<tr>
<td>10</td>
<td>At random</td>
<td>± 4%</td>
</tr>
</tbody>
</table>

Samples selected from geographically sorted listings performed better than samples selected from listings sorted at random.

Conclusions: Sample selection for diseases that cluster by geographical area should use population listings sorted by geographical proximity to increase the heterogeneity of the selected sample. Trachoma CRS surveys with low proportion of the District clusters selected may lead to erroneous estimates and in consequence erroneous decisions regarding mass treatment.
CR: B.E. Munoz, None; H. Mkocha, None; S.K. West, None.
Support: Bill and Melinda Gates Foundation

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1313-1316
Mass Treatment Clustering by Household in Tanzania and The Gambia

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Purpose: Azithromycin mass treatment to trachoma endemic communities is a critical part of the World Health Organization’s SAFE strategy to eliminate trachoma-related blindness. We describe the clustering of treatment at the household level using baseline data from 32 villages in central Tanzania and 48 villages in The Gambia who are enrolled in the Partnership for Rapid elimination of Trachoma (PRET) project.

Methods: A detailed census was undertaken followed by mass treatment with Azithromycin in 32 communities in Tanzania and 48 Enumeration Areas in The Gambia. The target treatment coverage in each country was greater than 80% in children age less than ten years. In each country, treatment was observed and compliance noted in census books, allowing for the calculation of exact household and community coverage. Within each community, the actual proportion of households where all, some, or none of the target children were treated was calculated. These proportions were then compared with the results from 500 simulations, assuming the overall coverage for the community was as observed and non-treatment occurred at random.

Results: Tanzanian and Gambian community mass treatment coverage for children under 10 years of age ranged from 81.8-100% and 62.2-99.0%, respectively. Clustering of households where all children were treated or no children were treated was calculated. These proportions were then compared with the results from 500 simulations, assuming the overall coverage for the community was as observed and non-treatment occurred at random. Tanzanian and Gambian community mass treatment coverage for children under 10 years of age ranged from 81.8-100% and 62.2-99.0%, respectively. Clustering of households where all children were treated or no children were treated was calculated. These proportions were then compared with the results from 500 simulations, assuming the overall coverage for the community was as observed and non-treatment occurred at random.

Conclusions: Uptake of community-based mass treatment is not random, but rather it clusters at the household level. Further analysis of household factors that influence the decision to participate in mass treatment programs is warranted to optimize trachoma control programs designed for high coverage.

CR: D.E. Stare, None; E. Ssemanda, None; H. Mkocha, None; B. Munoz, None; S.K. West, None; D. Mabey, None; R. Bailey, None; E. Harding-Esch, None.

Support: Bill & Melinda Gates Foundation CT: www.clinicaltrials.gov, NCT00792922

Incidence of Pediatric Conjunctivitis in the Urgent Care Setting


Purpose: To determine epidemiologic trends among pediatric patients who are diagnosed with conjunctivitis upon presentation for an ocular emergency.

Methods: Retrospective chart review. Of 7,340 patients that presented for urgent care at a tertiary care ophthalmic referral center in 2008, 479 patients were under the age of 18. We reviewed the charts of 74 of these patients who were diagnosed with conjunctivitis.

Results: Of the 74 patients, 26% (n=19) were allergic, 17% (n=13) were bacterial, and 57% (n=42) were viral. Mean age in years was 7.7±5.7 (all conjunctivitis), 8.2±5.1 (allergic), 5.2±7.6 (bacterial), and 8.3±5.8 (viral). Incidence of allergic conjunctivitis has a peak between April and July with 89% of patients presenting in this period. Bacterial conjunctivitis has no clear predilection for time of year unlike viral conjunctivitis for which 45% of patients present in a peak between July and September. Of those diagnosed with viral conjunctivitis, most were given no treatment (n=25, 59%). The remaining were given antibiotic only (n=12, 29%), steroid only (n=2, 5%), or an antibiotic/steroid combination (n=3, 7%).

Conclusions: In the urgent care setting, differentiating allergic, bacterial, and viral conjunctivitis in the pediatric population can be difficult because clinical signs can be very similar. We analyzed data on the incidence of the three sub-groups of conjunctivitis to provide insight into frequency of presentation. Viral is the most common diagnosis followed by allergic and bacterial. Patients that present in spring to early summer (April - July) might be more likely to have allergic inflammation whereas patients that present in late summer to early fall (July - September) may be more likely to have viral conjunctivitis. We propose that when clinical signs are insufficient to provide a definitive diagnosis of the etiology of conjunctivitis in the urgent care setting, knowledge of peaks in incidence may provide a further clue needed for management.

CR: A. Gupta, None; K. Mukkamala, None; L. Spielberg, None; L. Hall, None.

Support: None
1620 - 145PM

Associations Between Aspirin Use and Aging Macular Degeneration. The Eureye Study

Abstract: Ophthalmogenetics, Nin/GeneTics, Amsterdam, the Netherlands; Ophthalmology, Queen's University of Belfast, Belfast, United Kingdom; Epidemiology and Biostatistics, National Institute for Health Development, Tallinn, Estonia; Stavanger Univ Hospital, Univ of Bergen, Bergen, Norway; Ophthalmology, Crefet Eye Clinic Univ Hospital, Crete, Greece; Ophthalmology/Epilpidemiology, Erasmus Medical Center, Rotterdam, the Netherlands; Dept Salud Publica, Univ Miguel Hernandez, Alicante, Spain; Epidemiology & Population Health, London School of Hygiene & Trop Med, London, United Kingdom.

Objective: To disentangle the conflicting evidence on associations between aspirin use and aging macular degeneration (AMD), similar to age-related macular degeneration (AMD).

Methods: Population-based, cross-sectional EUREYE study in seven centers from North to South Europe. Intake of any dose of aspirin and possible risk factors for AMD were ascertained by structured questionnaire. Ophthalmic and basic systemic measurements were performed in a standardized way. Early AMD, subdivided in grades 1-3, and late AMD, subdivided as neovascular AMD or geographic atrophy, were stratified on digitized fundus images by experienced graders in one center. Associations were analyzed by logistic regression with adjustment for confounding as age, systolic blood pressure, BMI, cholesterol level, sex, and history of alcohol consumption, angina, cardiovascular disease (CVD), diabetes mellitus, education level, intake of other pain killers, and smoking.

Results: Of 4691 participants ages 65 or over, 36.4% had early AMD and 3.3% late AMD. Monthly use of any aspirin was reported by 41.2%, at least once a week by 7% and daily use by 17.3%. Odds ratios for grade 1 early AMD rose with increasing aspirin intake (frequency confidence interval (CI): 1.46; CI=0.98-0.01 for daily users; similarly for grade 2 early AMD: 1.40 (95 CI=1.16-1.68; p trend <0.001) and for neovascular AMD: 1.26 (95 CI=1.66-3.08; p trend <0.001) after full adjustment, including for CVD. There was no interaction between use aspirin and angina or CVD. No association was found with geographic atrophic AMD.

Conclusions: Frequent aspirin use seem likely to be harmful for AMD in older populations. Future case-control studies, cohort studies or randomized trials might further elucidate the nature of these associations.

CR: P.T.Y.M. de Jong, None; U. Chakravarty, None; M. Rahu, None; J. Seland, None; G. Soubrane, None; F. Topouzis, None; J.R. Vingerling, None; J. Vloeke, None; A.E. Fletcher, None.

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1622 - 215PM

The Prevalence of Type 2 Idiopathic Macular Telangiectasia (IMT) in the Beaver Dam Eye Study

Aims: To examine the prevalence of type 2 idiopathic macular telangiectasia (IMT) and lesions characterizing IMT in a population-based cohort study.

Methods: Beaver Dam Eye Study (BDES) included persons born between the ages of 43 and 86 years were examined from 1988-1990. A standardized examination, questionnaire and stereoscopic fundus photographs were collected for all study participants. The fundus photographs were subsequently graded for the following IMT lesions: retinal telangiectasia, pseudohole or yellow spot in the fovea, crystals in the inner retinal layers, blunted retinal veins, localized pigment migration and depigmentation and the presence of telangiectatic vessels in the juxtafoveal region. Eyes with epiretinal membranes with traction on the retina or eyes with signs of age-related macular degeneration (AMD) resulting in increased retinal pigment epithelial depigmentation or atrophy were excluded. Data from 4780 people (97%) had at least one eye with gradable fundus photographs for IMT included in the analyses.

Results: IMT was present at baseline in 0.1% of the population (95% Confidence Interval (CI)[0.09, 0.11]). The frequencies of loss of retinal transparency, crystals, blunted retinal veins, and pigment clumping and depigmentation in the juxtafoveal region and the prevalence of yellow deposits and pseudoholes in the foveal area in those without IMT varied from 0.06% for retinal telangiectatic vessels to 1.2% for pseudoholes. Smoking was associated with pigment clumping (Odds Ratio [OR] per pack year 1.02; 95% CI 1.00, 1.03; P=0.02), RPE depigmentation (OR 1.02 per pack year; 95% CI 1.00, 1.04; P=0.02), loss of transparency (OR 1.02 per pack year; 95% CI 1.00, 1.03; P=0.008) and the presence of a yellow spot in the fovea (OR 2.24 current vs. never smoker; 95% CI 1.29, 3.85; P=0.004) but not with presence of IMT (OR 2.72; 95% CI 0.45, 16.28; P=0.27).

Conclusions: To our knowledge, these are the first population-based data describing the prevalence of IMT (0.1%) and lesions characterizing it. These data are useful in estimating the impact this condition in the population. The role of smoking in the development of IMT requires further study.

CR: S.M. Meuer, None; R. Klein, None; B.A. Blodi, None; C.E. Myers, None; L.Y. Chew, None; B.E.K. Klein, None.

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1621 - 200PM

Generational Differences in AMD: Evidence for Modifiable Risk Factors


Objectives: To examine generational differences in age-related macular degeneration (AMD) and determine the extent to which AMD prevalence extends to more recent generations and evaluate the impact of potential risk factors on the magnitude of the effect.

Methods: Data from the Beaver Dam Offspring Study (BOSS) for participants aged 45 yrs or older having at least one eye with gradable fundus images and data from the parental cohort (Beaver Dam Eye Study/Epidemiology of Hearing Loss Cohort; BDES/EHLS) were included. AMD was graded using digital (BOS) and film-based images (BDES). The BCSS and BDIE/EHLS included extensive questionnaire information about behaviors, environmental factors and medical history and measures of blood pressure, diabetes, cholesterol, etc. A total of 9950 observations for participants born between 1905 and 1962 were included in alternating logistic regression models which controlled for repeated measures and familial correlations.

Results: The prevalence of AMD declined with birth year (lower for recent generations; age and sex-adjusted OR=0.75 for 5 yrs, p<0.001). This birth cohort effect (OR=0.77, p<0.001) remained in multivariate models adjusting for factors independently associated with AMD (obesity, education, heavy drinking). Cigarette smoking was not significantly associated with AMD in these models. In a subset (n=7727 observations) with additional data about childhood exposures, the birth cohort effect remained with additional adjustments for sunlight exposure, parental home ownership, and mode of transportation to school. This effect was stronger for 5 yrs for 5 yrs of follow-up, including 31 with neovascular AMD. This rapid decline in AMD prevalence (68% lower each generation) suggests that modifiable factors play important roles in the etiology of AMD. Including other factors associated with AMD partially explained the birth cohort effect, and suggests that childhood exposures may contribute to the risk of AMD. Longitudinal studies of exposures in childhood or early adult life and AMD incidence may identify new risk factors and pathways to improve eye health in adults.

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1623 - 230PM

Novel Associations of SNPs on Chromosomes 2 and 16 and Risk of Incident Neovascular Age-Related Macular Degeneration in the Women’s Genome Health Study

Aims: To identify genetic variants associated with AMD.

Methods: A total of 9930 observations for participants born between 1905 and 1962 were included in this study. The Women’s Genome Health Study assumed an additive genetic model for AMD focused on SNPs covering approximately 5% of the genome within 2p25-1p16, 1p32-3p9-1414, and 16p13-16p23.

Results: We identified 1 regionally significant SNP on chromosome 2 associated with AMD. Including other factors associated with AMD partially explained the birth cohort effect, and suggests that childhood exposures may contribute to the risk of AMD. Longitudinal studies of exposures in childhood or early adult life and AMD incidence may identify new risk factors and pathways to improve eye health in adults.

CR: R.K. Cruickshanks, None; R. Klein, None; D.M. Nondahl, None; B.E.K. Klein, None; G.-H. Huang, None.

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To determine if genetic variants that have been reliably associated with advanced age-related macular degeneration (AMD) have a differential effect on the risk of geographic atrophy (GA) and choroidal neovascularization (NV) in a large sample size of both phenotypes. 

Participants were derived from ongoing AMD study protocols with similar procedures including the Progression of AMD Study, AMD Registry Study, Family Study of Age-related Macular Degeneration, the US Twin Study of AMD, the Age-Related Eye Disease Study, University of Utah, and Hospital Intermountain de Creteil. AMD grade was assigned based on fundus photography and ocular examination using the clinical age-related maculopathy grading system (CAREM) in which grade 4 is GA anywhere within the macula (central or non-central) and grade 5 is NV. Participants were assigned a grade based on the highest grade in either eye. All samples were genotyped on the Sequenom iPLEX platform for previously associated single nucleotide polymorphism (SNPs), including CFI rs1016170, CFI rs1410996, CFI rs40033890, CFB/C2 rs641153, and C3 rs2230999 in the complement pathway; ARMS2/HTRA1 rs10490924; and new loci TMP3 rs6221523 and LIPC rs4952358. We performed association testing comparing allele frequencies between participants with GA and participants with NV using PLINK. We performed stratified analyses by recruitment site.

Results: 748 participants with GA and 2779 participants with NV were included in the analysis. The frequency of the T allele of ARMS2/HTRA1 rs10490924 was significantly more common in participants with NV than those with GA (odds ratio, 1.41; 95% confidence interval, 1.24-1.60; p value = 2.5 x 10^-7). This result remained statistically significant when the association testing was performed excluding individuals who had GA in one eye and NV in the contralateral eye. None of the other SNPs examined showed a differential effect for NV vs. GA.

Conclusion: Genetic variation at the ARMS2/HTRA1 locus confers a differential risk for NV vs. GA in a well-powered sample. Future identification of other loci with similar differential effects could lead to biological insights into the mechanisms associated with development of NV vs. GA in patients with AMD.

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1626 - 3:15PM

Racial and Ethnic Differences in the Risk for Non-Exudative and Exudative Age-Related Macular Degeneration Among American Comparisons With Other Races

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Purpose: To determine the risk of developing non-exudative and exudative age-related macular degeneration (AMD) among Asian Americans as compared to other races and whether differences in AMD risk vary by Asian ethnicity.

Methods: Claims data from a large, national U.S. managed care network was reviewed to identify individuals age ≥40 who had one or more visits to an eye care provider from 2001-2007. ICD-9 billing codes were used to identify enrollees with non-exudative and exudative AMD. Prevalence rates were calculated for non-exudative and exudative AMD. Univariate and multivariate Cox regression analyses were performed to determine the hazard of developing non-exudative and exudative AMD for individuals of different races and among persons of different Asian ethnicities, with adjustment for sociodemographic factors, ocular and medical conditions.

Results: Of the 2,289,061 enrollees who met the inclusion criteria, 113,234 (5.01%) had non-exudative AMD and 12,818 (0.56%) had exudative AMD. The unadjusted prevalence for non-exudative AMD and exudative AMD was lower for Asian Americans (5.04% and 0.49%, respectively) as compared to non-Hispanic whites (5.40% and 0.84%). After adjusting for age and other potential confounding factors, Asian Americans had a 20% increased hazard for non-exudative AMD (adjusted HR = 1.20, CI 1.13-1.27) compared with non-Hispanic whites. There was no significant difference in the hazard of developing exudative AMD among Asian Americans compared with non-Hispanic whites, (HR=0.86, CI 0.71-1.03). Chinese Americans (adjusted HR = 1.63, CI 1.50-1.77) and Pakistani Americans (adjusted HR = 1.97, CI 1.40-2.77) had a significantly increased hazard of developing non-exudative AMD compared with non-Hispanic whites. By contrast, Japanese Americans had a 29% decreased hazard of non-exudative AMD compared with whites (adjusted HR = 0.71, CI 0.59-0.85). There was no significant difference in hazard for developing exudative AMD among each of the Asian ethnicities and that of non-Hispanic whites.

Conclusion: Asian Americans are the second fastest growing race within the US. Eye care providers need to be aware of the overall disease burden of AMD within this group as well as how disease rates can differ substantially between different Asian ethnicities.

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1693 - A150
Rural Electrification and Myopia in Residents of Northwest Alaska
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Purpose: Population-based eye disease surveys of northwest Alaska (Arkell and Lightman) done in the mid-1980s revealed a large increase in myopia that occurred in one generation. Further studies in Nome and south-western Alaska confirmed this generational shift and found some of the highest rates of myopia recorded. We analyze the time course available to develop myopia in those susceptible and compare it to the spread of electrical lighting that occurred just prior to these studies.

Methods: All patients over 55 attending eye clinics in Kotzebue, Alaska were surveyed regarding their experiences in house lighting before and after electrification and when this began to occur. Records of the Kotzebue Electric Association were also reviewed. Data from the original eye survey was analyzed for prevalence of myopia in various age groups.

Results: Survey of elders confirmed that most house lighting was limited to kerosene Wick lamps or pressurized gas prior to electrification. Schools initially had power followed by businesses and then homes. The Kotzebue Electric Association began serving customers in 1956, but the surrounding villages took much longer. The process started in the early 1950s and appears to be complete by 1975. By the time of the population-based eye survey done in 1985 approximately 15 years of electrical light exposure had occurred to most residents. Because myopia progression can occur up to about age 25 we would expect the biggest effect on individuals age 40 and below. This trend was confirmed in the study where the prevalence of myopia tripled between generations from 18% in the 40 to 59 year group to 55.4% in those between 20 and 39.

Conclusions: This perplexing jump in the prevalence of myopia within geographically defined population within one generation argues for a defined cause. With myopia, a causative factor has only a limited time to have an effect on the individual. The population-based study data from 1985 provided a snapshot of those sensitive individuals that were transitioning to myopia at the same time that increasing exposure to electrical lighting became common. Electrical lighting may play a causative role in inciting an environmental effect in the development of large increases in myopia seen in northwest Alaska.

CR: R.P. Werner, None; T.H. Mader, None; S.C. Werner, None.
Support: None.

1696 - A151
Rates of Myopia Progression in Children
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Purpose: To conduct a meta-analysis on rates of progression of myopia in children in different ethnic groups and as a function of age.

Methods: The National Library of Medicine’s PubMed literature database was searched for articles on myopia progression using the terms ‘myopi*progression’ and MeSH terms ‘myopia’ and ‘disease progression’ and limited to publications from January 1990 and only for humans < 16 yrs. Studies that were non-randomized, did not use cycloplegic autorefraction, had small sample size, dealt with high myopia (>6.0D) or special subject groups, myopia as part of a syndrome or condition, were retrospective, or used controls wearing other than spectacles, were excluded.

Results: 175 articles were identified. 25 remained after applying exclusion criteria. The estimated myopic progression after one year of follow-up was -0.53D (95% CI. -0.32 to -0.74D) for Caucasians and -0.87D (95% CI. -0.73 to -1.01D) for Asians. Estimated progression rates were dependent on baseline age with decreasing progression rates with age increased. Graphs below shows annual progression rate vs age. Exponential curves with a constant offset were fitted to Caucasian and Asian eyes. Rates also varied with gender, with progression over 2.4 yr from an average baseline age of 8.9 yr (combined ethnicities), and were 0.66D/yr for females and 0.50D/yr for males.

Conclusions: Our analysis related higher of myopia progression rates in urban Asians as compared with urban Caucasians. Younger children demonstrated greater annual rates of progression of myopia.

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1695 - A152
Environmental and Genetic Risk Factors of Myopia in Indonesian Children
Population. The Jakarta Urban Eye Health Study
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Purpose: To investigate the genetic and environmental risk factors associated with myopia in an urban population in Jakarta.

Methods: A population based cross sectional study in children aged 6-15 years in 4 sub-districts in Eastern Jakarta was conducted. A total of 337 children were selected using stratified random cluster sampling. Myopia genetic factors was defined based on the history of either parental or siblings myopia in the family; whilst environmental factors was defined as near work activities, anthropometric status, outdoor or sports activities, and night light use before aged 2 years. Cycloplegic autorefraction was performed on the children in a cross-sectional population-based sample of Chinese school-children.

Results: The prevalence of myopia was significantly higher in the children than in their parents (78.4% in 15 year-olds, compared to 19.8% in the parents). The prevalence of myopia increased in parallel and reached greater than 80% at the age of 15 in children with one parent's myopia (88.9%) or two parents myopic (83.3%), slightly higher than those without myopic parents (68.2%), with a relative risk of 1.20±1.30. There was no significant difference between the effect of having one myopic parent and having two myopic parents(mean SER values were -2.6 D and -2.75 D in children). Parental education, income and occupation correlated with parental myopia, but not associated with childhood myopia. These parental characteristics were not significant in logistic regression after including parental myopia in the models. The children of myopic parents were not exposed to increased levels of near work activities.

Conclusions: Most children in Guangzhou become myopic, irrespective of the myopic status of their parents. There is some additional risk of myopia in children with myopic parents, which could not be explained by the other environmental or socio-demographic factors examined. It may have a genetic basis, although further analysis of the role of time spent outdoors is required.

CR: R. La Distia Nora, None; P. Hendronto, None; R.S. Sitorus, None; L. Simangunsong, None; D.R. Sjarif, None; P. Riono, None.
Support: None.

1697 - A153
The Impact of Parental Myopia and Other Familial Factors on Myopia in Chinese Children
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Purpose: To assess the relationship between myopia in parents and myopia in their children in a cross-sectional population-based sample of Chinese school-children.

Methods: Cycloplegic (1% cyclopentolate) autorefration was measured in children aged 5 to 15 in a randomized cluster sample of Guangzhou Refractive Error Study (RESC) in 2002. Myopia was defined as a spherical equivalent refraction (SER) of at least -0.5 Diopter. Data on parental myopia and other socio-demographic characteristics including parental education level, income and occupation, as well as children's near-work activities, were collected by questionnaire reported by the parents.

Results: The prevalence of myopia was significantly higher in the children than in their parents (78.4% in 15 year-olds, compared to 19.8% in the parents). The prevalence of myopia increased in parallel and reached greater than 80% at the age of 15 in children with one parent's myopia (88.9%) or two parents myopic (83.3%), slightly higher than those without myopic parents (68.2%), with a relative risk of 1.20±1.30. There was no significant difference between the effect of having one myopic parent and having two myopic parents(mean SER values were -2.6 D and -2.75 D in children). Parental education, income and occupation correlated with myopia, but not associated with childhood myopia. These parental characteristics were not significant in logistic regression after including parental myopia in the models. The children of myopic parents were not exposed to increased levels of near work activities.

Conclusions: Most children in Guangzhou become myopic, irrespective of the myopic status of their parents. There is some additional risk of myopia in children with myopic parents, which could not be explained by the other environmental or socio-demographic factors examined. It may have a genetic basis, although further analysis of the role of time spent outdoors is required.

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1697 - A154
Myopia and Sun Exposure: Patients With Pterygium and Pingueculum Are Significantly Less Myopic

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Purpose: About one third of adults in the US are myopic. Despite the high prevalence and significant morbidity of myopia, little is known about the etiology of the condition. Recently, however, one study correlated higher levels of childhood sun exposure with a reduced risk of myopia. Pterygium and pingueculum are likewise firmly associated with childhood sun exposure, but we could find no data on refractive errors in these two conditions. We gathered refractive data on patients with pingueculum and pterygium to identify any differences in refractive error from the general population.

Methods: Patients aged 21 or older and who were diagnosed by one cornea specialist with pterygium or pingueculum were included in this retrospective study. Refractive error was assessed in manifest refraction, spectacles, uncorrected acuity, and corneal topography. It was compared to age matched controls seen by the same doctor for conditions unrelated to sun exposure or refractive error. Data were analyzed using the chi square test.

Results: 61 patients with pingueculum or pterygium in at least one eye were analyzed. Less than two percent of eyes in patients with pterygium or pingueculum showed more than 0.5 D spherical equivalent of myopia, compared to 31% of age matched controls in our study. The average spherical equivalent in the pingueculum and pterygium groups was +0.65 D (range, SD; -0.5 - +1.6, +0.8). The average spherical equivalent among age matched controls was -0.87 D (range, SD; -3.75 - +1.5, +2.52). Chi Square analysis revealed p < 0.001. The refractive error in our age matched controls was similar to that of patients in the Beaver Dam Eye Study.

Conclusions: Patients with pingueculum and pterygium were much less likely to be myopic than their age matched peers in our study. This supports but does not prove the hypothesis that childhood sun exposure is associated with a decreased risk of myopia.

Keywords: myopia, pingueculum, pterygium, refractive error, sun exposure
CR: R.J. Mack, None; I. Shaikh, None; S.J. Farley, None; C. Caldwell, None; E. Chaglasian, None.
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1699 - A155
Prevalence and Associated Risk Factors of High Myopic Maculopathy in Elderly Chinese-The Shihpai Eye Study

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Purpose: To assess the prevalence and associated risk factors of high myopic maculopathy (HMM) in an elderly Chinese population in Taiwan.

Methods: The Shihpai Eye Study was a survey of vision and ocular disease among an elderly Chinese population over age 65 years of age or older residing in Shihpai, Taipei, Taiwan. Of the 1361 participants who underwent a detailed ophthalmic examination, 1058 subjects had at least one gradable fundus photographs and were recruited for analysis.

High myopia was defined as spherical equivalent of less than -6.0 D in the phakic eyes or when macula showed typical high myopic fundus in pseudophakic or aphakic eyes. HMM was defined as appearance of lacquer cracks (MC), focal area of deep choroidal atrophy (M4) and macular choroidal neovascularization or geographic atrophy (M5).

Results: The prevalence of high myopia is 4.6% (46/1058) and for these 46 high myopic subjects, 33 (69.5%) participants had HMM. Subjects with HMM had higher systolic blood pressure than those high myopics without maculopathy (145.8±14.6mmHg vs. 129.3±15.1mmHg, p=0.012) after multivariate adjustment of age, sex, smoking, BMI, educational levels, histories of hypertension or diabetes. In the 27 high myopic phakic eyes, the 14 eyes with maculopathy were associated with lower spherical equivalent data (-13.8±4.6 D vs. -7.2±1.3 D, p=0.001) and lower corrected visual acuity (6/33 vs. 6/11, p=0.103) than those without maculopathy. Eyes with M5 had lower visual acuity (6/173) than those with M4 (6/15, p=0.003) or M3 (6/21, p=0.003), respectively.

Conclusions: The prevalence of high myopia as well as HMM in our elderly Chinese population is higher than other population-based studies. Risk factors analysis suggests that control of high systolic blood pressure may prevent the progression of severe high myopic maculopathy.

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1697 - A156
The Impact of Severity of Parental Myopia on Myopia in Chinese Children from Guangzhou

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Purpose: In Guangzhou, 78.3% of children become myopic by the age of 15, irrespective of parental myopia, although parental myopia increases the relative risk by 10-20%. Here, we report on the impact of severity of parental myopia.

Methods: Cycloplegic autorefraction data were collected from a population-based sample of 5-15 year-old children from Guangzhou. Parental myopia was assessed with questions for each parent: “Is the child’s father/mother myopic?” (Yes/No/Not sure) and “What is the degree of myopia (right eye)”, and classified as mild (less or equal to -0.50 but greater than -3.00), moderate less than or equal to -3.00 but greater than -6.00, and high (less than or equal to -6.00).

Results: Information was available for 1567 children aged 12-15. Combinations of mild, moderate and high myopia in the parents were rare, so analysis was restricted to children with no myopia in one parent, and no, mild, moderate or high myopia in the other. The prevalence of myopia was 53.5%, 65.1%, 76.3% and 80.6% in children when the severity of myopia in the second parent was no, mild, moderate and high, respectively. The proportions of high myopia were 1.4%, 2.9%, 8.5% and 16.1% in the corresponding groups. The prevalence of high myopia in the parents was 1.5%, while in the 15 year-old children, it was 3.9%. Of the children with high myopia, 42.1% had parents with no myopia.

Conclusions: There was an increased prevalence of myopia with increasing severity of myopia in one parent, and an increased risk of high myopia with one highly myopic parent. However most highly myopic children at the age of 12-15 did not have a highly myopic parent. This suggests that environmental factors contribute to high myopia in Chinese children in Guangzhou, just as they contribute to less severe myopia in children.

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1701 - A158
Lens Opacity and Refractive Influences on Retinal Vascular Fractal Dimension Measurement
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Purpose: To examine the influence of lens opacity and refraction on retinal vascular fractal dimension (FD) measurement.

Methods: Right eye optic disc photographs of 3654 participants (aged 49-97 years) of the Blue Mountains Eye Study (1992-94) were digitized. DF of retinal vasculature was quantified using a computer-based program. Lens opacity scores were the sum of severity scores of nuclear, cortical and posterior subcapsular cataract, assessed from lens photographs. Refractive errors were measured using an autorefractor followed by subjective refraction. Spherical equivalent refraction (SER) was calculated as the sum of spherical plus 0.5 cylinder power. Axial length was measured at the 10-year follow-up examination using an IOL master.

Results: Complete data were available in 2858 subjects. Mean DF of retinal vasculature was 1.44±0.023. Increasing lens opacity scores were associated with significant decrease in DF (p < 0.0001). Cortical and posterior subcapsular cataract involving lens central area was associated with reduced DF, after controlling for age, gender, refraction and other confounding factors (p=0.0105). Increasing myopic severity and axial length were associated with decreasing DF after adjusting for age, gender, height, body mass index, blood pressure and lens opacity scores (both p < 0.0001). The slope of DF decreasing per SER reduction was -0.0040 in eyes with SER ≥ 4D and -0.0016 in eyes with SER < 4D. SER remained significant after simultaneously adjusting for axial length.

Conclusions: Ocular media opacity and refraction influence retinal vascular DF measurements. A myopic refraction of ≤ -4D was associated with an additional reduction in DF, suggesting rarefaction of retinal vasculature associated with high myopia.

CR: H. Li, None; P. Mitchell, None; G. Liew, None; E. Rochtchina, None; T.Y. Wong, None; W. Hsu, M.L. Lee, None; Y.P. Zhang, None; J. Wang, None. Support: None.

1701 - A159
The Impact of Parental Myopia and Children’s Refractive Error at 1 Year on the Development of Myopia in Children
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Purpose: To investigate parental refractive error and children's refractive error at 1 year as risk factors for the development of myopia.

Methods: 165 children with refractive errors at 1 year and 14/15 years and with refractions from both parents were included in this analysis. The infants were refracted in the laboratory by non-cycloplegic near retinoscopy and the older children by non-cycloplegic distance retinoscopy. Parental refractive errors were either refracted in the laboratory or their prescriptions were obtained from their eye care providers. Myopes were defined as having a spherical equivalent refraction < -0.50 D. The effect of 1-year refraction on myopic development as well as its impact stratified by the number of myopic parents was evaluated by an odds ratio.

Results: The mean refraction at 1 year was 0.92D±0.84D. The mean Rx at 14/15 years was -0.54 D +/- 1.64D and 35% (5/165) were myopic. For children with an Rx at 1 year <1.0D, a higher proportion were myopic at age 14/15 years than for those with an Rx ≥ 1.0D at 1 year (36/92 = 42.4% vs. 8/26=30.8%, OR=2.94, 95% CI (1.07, 4.07). For children with 0/1 myopic parent, there was a significant difference in the prevalence of myopia at 14/15 years by 1-year refraction, with more myopic children in the 1-year lower Rx group compared to the higher Rx group (24/61=39.3% vs. 8/33=15.1%, OR=3.65, CI (1.47, 9.07), while the myopia prevalence difference by infant refraction was not found for children with 2 myopic parents (15/31=48.4% vs.11/20=55%, OR=0.767, CI 0.25, 2.37).

Conclusions: For children with 0/1 myopic parent, having a negative or low positive refractive error at 1 year increases the risk of being myopic at 14/15 years. However, for children with 2 myopic parents, the infant refraction does not appear to make a difference in whether they become myopic by age 15 years.

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1702 - A159
Validity of Non-cycloplegic Retinoscopy, Retinomax Autorefractor and SureSight Vision Screener for Detecting VIP-Targeted Eye Conditions
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Purpose: To evaluate, by receiver operating characteristic (ROC) analysis, the ability of non-cycloplegic retinoscopy (NCR), Retinomax Autorefractor (Rmax) and SureSight Vision Screener (SSight) to detect VIP-projected eye conditions.

Methods: In the 2-year VIP Phase I (Yr-1 and Yr-2), NCR, Rmax and SSight were administered by VIP-certified pediatric optometrists and ophthalmologists to 2888 HS preschoolers in VIP Phase II (Yr-3). Rmax and SSight were administered by both nurse and lay screeners to 1452 HS preschoolers. All screened children underwent comprehensive, standardized eye examinations by masked VIP-certified examiners to identify amblyopia, strabismus, significant refractive error, and/or reduced visual acuity. These VIP-targeted conditions were also grouped into 3 hierarchical groups based upon severity. The ability of screening test to identify VIP-targeted eye conditions was summarized by the area under the ROC curve (AUC), calculated from weighted logistic regression models. The predictors in the models included the power of the most positive meridian for hyperopia, the power of the most negative meridian for myopia, cylinder power for astigmatism, and the larger of the intereye difference in spherical power and the intereye difference in cylindrical power for anisometropia. The values from the more severely affected eye was used for the eye-specific measurements.

Results: The three tests had similar AUC. The AUC for detecting any VIP-targeted conditions was 0.84 (95% CI: 0.81-0.87) for NCR (Yr-1), 0.83 (0.80-0.86) for Rmax (Yr-2) and 0.88 (0.86-0.89) for SSight (Yr-3) for Rmax, and 0.86 (0.84-0.88) for Rmax (Yr-2) to 0.88 (0.86-0.89) for SSight (Yr-3) for Rmax and 0.86 (0.84-0.88) for SSight (Yr-3) for Rmax and 0.86 (0.84-0.88) for SSight (Yr-3). The AUC for detecting the most severe Group 1 conditions was very high for each test, ranging from 0.94 (0.92-0.96) to 0.96 (0.95-0.98). The AUC for detecting the most and moderately severe Group 1&2 conditions ranged from 0.89 (0.87-0.92) to 0.92 (0.90-0.93).

Conclusions: All three screening tests had very similar power for detecting vision disorders in preschoolers. This is consistent with our previously reported results at specificity levels of 90% and 94%.

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1705 - A162
Effect of Test Distance on Visual Acuity With Induced Myopic Refractive Error
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**Purpose:** To examine the relationship between myopia and visual acuity (VA) at a 5 and 10 foot test distance using both the Lea symbols and HOTV chart. Common barriers in pediatric vision screening include lack of space in the pediatrician's office and limited attention of the young patient. Reducing the test distance to 5 feet from 10 feet is thought to decrease space requirements and increase children's' attention. Theoretically, reducing the test distance by half increases accommodative demand of the task two-fold. Such an increase in accommodative demand may suggest an overestimation of VA in low uncorrected myopes. This study investigated the relationship between low amounts of myopic blur, test distance, and chart type in an adult cohort with optimum attention to the task. The goal was to determine if moving from 10 feet to 5 feet still enables reliable detection of VA in subjects with low amounts of myopia.

**Methods:** VA was measured in 10 normally adults at 5 foot and 10 foot test distances with both the Lea Symbols and HOTV chart. Test distance and chart type were presented in a randomized order. Four myopic conditions were simulated at each test distance with defocusing lenses of +0.75D, +1.50D, +2.00D, and +2.50D. The order of lens testing was from most to least blur. VA results were compared using two-way ANOVA for each blur level, chart type, and test distance.

**Results:** The amount of induced myopia affected VA under all test conditions. However, the only statistically significant pair-wise comparison between the 5 and 10 foot test distance was with +0.75D induced myopia for the Lea chart. No statistically significant differences in VA as a function of distance were found in any of the other conditions. Chart type covariate analysis was performed to determine if there was an effect on VA for each condition. Overall, subjects read more letters on the HOTV chart than the Lea chart in each simulated condition.

**Conclusions:** Integrity of the screening was maintained under myopic defocus of +0.75 to +2.50D regardless of test distance or chart type. Chart type comparison showed HOTV gave consistently better VA with induced myopia, perhaps owing to spatially distinct optotypes over equally blurring Lea symbols. Further research needs to be conducted to determine if a 5 foot test distance would enhance attentiveness and VA testing in a pediatric population.

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1707 - A164
Accommodation Responses in Hyperopic Infants and Children
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**Purpose:** There are currently a wide range of prescribing practices for hyperopic children including full correction, partial under-correction of the hyperopia. While blur was originally implicated in the drive to emmetropize in this group suggesting under-correction as the more appropriate treatment, more recent evidence suggests that additional accommodative effort to overcome hyperopia is a causal factor in which case under-correction might not be necessary. To further assess the role of accommodation in emmetropization of hyperopia, we compared accommodation responses in infants who were emmetropically at first testing through to 26 weeks; infants who had emmetropized by 26 weeks; or infants who had not yet emmetropized by 26 weeks and compared them with older children who had failed visual acuity screening due to clinically significant hyperopia. We investigated whether response to blur resulting from hyperopia differed in the non-clinical versus clinical groups.

**Methods:** A Plusoptix AO4 photorefractor was used to collect binocular accommodation data from participants viewing a detailed picture target moving between 33cm and 2m. Data from 38 typically developing infants between 6-26 weeks of age were compared with cross-sectional data from children of 5-9 years of age with clinically significant hyperopia (IS); correctly fully accommodative strabismus (IS); and 27 age matched controls.

**Results:** Hyperopes, whether corrected or not, and of all ages, underaccommodated at all distances compared to controls (all p < 0.00001). Lag of accommodation was found to correlate with manifest refraction. Emmetropizing infants accommodated better for near than distance resulting in steeper accommodative slopes. In comparison, the hyperopic patient groups accommodated better for distance than near.

**Conclusions:** Steep accommodation response slopes are typical of emmetropizing hyperopia in infants who accommodate at near to partially overcome hyperopic blur. Clinically hyperopic children with reduced visual acuity do not accommodate to overcome residual hyperopia and thus would be unlikely to accommodate to overcome hyperopia left by an under-correction. This suggests that under-correcting hyperopia with low acuity at referral might not be an appropriate treatment.

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1706 - A163
Change in Ocular Biometry Over Five Years in an Older Population.

**Purpose:** To determine whether there are changes in axial length, corneal curvature and anterior chamber depth in older adults over a five year interval.

**Methods:** Measures were determined using a standardized instrument on participants in the Beaver Dam Eye Study during the 2003-2005 examination (n=1962) and during the ongoing follow-up examination five years later (n=776). The age range at the 2003-2005 examination was 58-100 years. Besides biometry measures, there are data on education level, ocular history, height and nuclear cataract as graded from slit lamp photographs.

**Results:** There were 776 persons with biometry measures at both visits. The average change in axial length were .035 ± .55 mm for axial length (longer), -.001 ± .04 mm curvature for mean corneal curvature (flatter), and .08 ± .49 mm (deeper) for anterior chamber depth. In multivariable models including age, sex and height, only sex was significantly associated with change in axial length. Not age nor sex nor height were significantly associated with change in corneal curvature, and age was associated with change in anterior chamber depth. Education had no effect in any models.

**Conclusions:** There appears to be little change in ocular biometry over a 5 year interval in older adults. This is important because it suggests that changes in refraction and vision that occur with age are likely not related to changes in biometry.

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A Survey of Refractive States Among Preschool Children in East China

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Purpose: To evaluate the prevalence of the refractive states and variation trend among children aged 3 to 6 years in Nantong, China.

Methods: A population-based cross-sectional study was conducted in Nantong City, an urban East China, in 2007. By simple random sampling, 680 children aged 3 to 6 years (170 children each age staged from 3 to 6 years) were randomly selected. Children were subjected to retinoscopy and optometry bilaterally after paralyzing ciliary muscles with 1% atropine treatment. The prevalence of ametropia and average spherical equivalence by 1-year age intervals with 95% confidence interval (95% CI) were obtained and a linear regression analysis was used to study refractive states variables associated with age. A chi square test was used to test the difference of average spherical equivalence refractive error between every two different ages.

Results: A total of 617 (90.73%) out of 680 children participated in the survey: the prevalence of hyperopia, myopia, and emmetropia were 60.33% (95% CI, 58.36%-62.30%), 0.65% (95% CI, 0.33%-0.97%) and 39.02% (95% CI, 37.05%-40.99%) respectively. The average spherical equivalence refractive error aged 3 to 6 years by 1-year age intervals were +2.29D (95% CI, ±2.29D), +2.03D (95% CI, ±1.94D), +1.85D (95% CI, ±1.77D) and +1.68D (95% CI, ±1.59D) respectively and the differences between every two different ages had statistically significant by using chi square test (p<0.01). Linear regression analysis indicated that the mean annual decrease of refractive error was 0.02D.

Conclusions: Most of spherical equivalent refractive state of preschool children was slight hyperopia and emmetropia, and the refractive errors decreased year by year gradually with the increase of age.

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Support: None.

Changes in Visual Acuity, Refraction, and Keratometry by Age for Children of Three Different Ethnic Groups in Paraguay


Purpose: Refractive changes as children age are well documented and differences have been found in regard to ethnicity, rural versus urban dwelling, and increased close-up work. This study investigated refractive changes in 476 schoolchildren in Paraguay with three different ethnicities: Mennonite, indigenous (Macca), and mixed race.

Methods: Visual acuity without correction (logMAR), autorefraction with and without correction was better overall for Mennonites compared to indigenous or mixed race children (0.0375, 0.0682, and 0.0813 logMAR units, respectively; P < .00001). Without correction was better overall for Mennonites compared to indigenous or mixed race children.

Results: There were 190, 118, and 168 children of Mennonite (≥8 years: 36; 9-11 years: 32; ≥12 years: 74; 9-11 years: 32; ≥12 years: 74; 9-11 years: 97; ≥12 years: 37). Mean visual acuity (VA) without correction was better overall for Mennonites compared to indigenous or mixed race children (0.0375, 0.0682, and 0.0813 logMAR units, respectively; P < .0001). Mennonite children ≤8 years of age had a much better VA compared to indigenous or mixed race children (mean: 0.0425, 0.1294, and 0.1687 logMAR units, respectively; P = .00002), but the VA of indigenous and mixed race children improved in older children compared to Mennonite children. For autorefration with cycloplegia, sphere values were consistently higher for Mennonites compared to indigenous or mixed race children (mean: 1.641, 1.415, and 1.546, respectively), lowest in regard to cylinder values (mean: 0.395, 0.549, and 0.820, respectively), and axis values (mean: 88.37, 93.34, 95.62, respectively). Multivariate analysis revealed a complex pattern suggesting more hyperopia for children under 11 years in Mennonites compared to indigenous and mixed race children.

Conclusions: Mennonites tended to show more hyperopia and other refractive changes compared to the other groups.

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Support: None.

4-Year Changes in Refractive Error in Adult Latinos: The Los Angeles Latino Eye Study (LALES)

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Purpose: To characterize the magnitude and type of refractive change in a population-based sample of Latinos aged 40 years and older over a 4-year period.

Methods: A population-based cohort of 4568 self-identified Latinos from six census tracts in Los Angeles, California, underwent comprehensive ophthalmological examinations at baseline and at four year follow-up, including visual acuity measurements and automated and subjective non-cycloplegic refraction using standardized protocols. Subjects who were aphakic or pseudophakic on examination were excluded from this analysis. Data from one randomly selected eye from each participant were used in this analysis. Analysis of variance (ANOVA) and chi-square test were used to assess differences in the means and proportions between the groups.

Results: Of the 4568 participants who underwent both a baseline and a follow-up examination, 4066 were included in this analysis. Overall, 1319 of the 4066 participants (27.5%) had no change in their refractive error. The proportion of participants aged 40-49 years, 50-59 years, 60-69 years, 70-79 years and 80 years and older at baseline who had no change in their refractive error was 42.1%, 22%, 14.2%, 9.7%, and 5.7%, respectively (p-trend =< 0.001). The median (mean) change in spherical equivalent refractive error in diopters (D) in those aged 40-49 years, 50-59 years, 60-69 years, 70-79 years and 80 years and older at baseline was (D) (+0.13D) +0.25D (+0.26D), +0.13D (+0.04D), +0.13D (0.27D) and -0.37D (+0.52D), respectively (p-trend =< 0.001). There were no gender-related differences within each age group. The proportion of participants aged 40-49 years, 50-59 years, 60-69 years, 70-79 years and 80 years and older at baseline who had a greater than or equal to -1D myopic change was 10.7%, 7.9%, 18.4%, 32.8%, and 45.7%, respectively.

Conclusions: In a population-based sample of Latinos, younger Latinos (40-69 years) have a higher shift in their refractive error, which is followed by a myopic shift in those who are older (70 years and older). The tendency toward myopic shift in the older patients is most likely attributable to progressive lenticular changes.

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Support: NEI EY 11753.
Purpose: The duration of near-based study and complexity of visual interactions places increasing demands on accommodation and convergence in school children as they move into secondary school. We hypothesized that students without significant refractive error or with myopia would be less bothered by these near demands than hyperopic students who require greater active accommodation and convergence to compensate for their refractive error at near, and hence are more likely to be symptomatic.

Methods: A brief history was elicited from 353 students in grades 6 to 9 at a Melbourne-based middle school prior to non-cycloplegic refraction using a Shin Nippon N/Vision K-5000 autorefractor and completing a Borsting et al[1] Convergence Insufficiency Symptom Survey (CISS) in class.

Results: Mean age was 13.2±0.1 years and mean spherical equivalent refraction was -0.50±0.74D. The prevalence of myopia (≥-0.50D SphEq) and hyperopia (≥+1.00D SE) were both approximately 15%. The mean symptom survey score for students without amblyopia or strabismus was -16 (range 0-56) and showed a significant effect for refraction group, F4, 333 = 3.46, p = .009 (2.2±0.4). Post-hoc tests showed that the mean symptom survey scores were significantly higher for students with hyperopia over +2.00D (22.7±4.4) than for those with milder hyperopia (18.3±1.9), emmetropia (15.3±1.7), myopia (15.1±2.3) or myopia over -2.00D (13.8±1.4).

Conclusions: These findings partially support our hypothesis that students with hyperopia are more likely to be symptomatic. However, of interest is the fact that Borsting et al[1], the originators of the CISS, found a mean CISS score of 8.4±6.4 for children with normal binocular vision aged 9-18 years. Hence, our findings would imply that a large proportion of refractively emmetropic and myopic children are symptomatic for near and raises questions regarding the incidence of binocular anomalies in this group, or, challenges the validity and reliability of the symptoms questionnaire[1,2].

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1714 - A171
Predictors of Acceptance of Free Spectacles Provided to Junior High School Students in China
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Purpose: To examine the factors influencing compliance to spectacle wear and perception of value of spectacles within a prospective 1 month trial of ready-made and custom spectacles in school-aged children with uncorrected refractive error (URE) in urban China.

Methods: 428 students aged 12-15 years with ≤-1 dioptres of URE were given free spectacles after evaluating 1 month later at an unannounced visit. Demographic factors, vision, optical effects and perceptions were modeled as predictors of observed use and perceived value using logistic regression adjustment for spectacle allocation.

Results: Of the 428 enrolled, 13% (56) were lost-to-follow-up. The majority (388/415, 93.5%) planned to use their spectacles. After 1 month of wear, 227/415 (54.7%) valued their spectacles highly and 20/20 vision alone does not appear to be an adequate discriminator for malignant myopia. As emmetropia is the most common refraction value for this age group, we propose to use this value as a threshold to define malignant myopia.

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1715 - A172
Prevalence of Refractive Errors in Singapore Preschoolers
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Purpose: Refractive errors are important causes of visual impairment. Myopia, in particular, has reached “epidemic” proportions in Asian cities. There are few studies on prevalence of refractive errors in children, especially before school-going age. We aim to describe the prevalence rates of refractive errors in preschoolers and their associations.

Methods: A cross-sectional study was conducted among 798 preschoolers aged 3 to 6 years in 4 Singapore kindergartens. Visual acuities and refractive errors were measured by LogMAR charts and cycloplegic autorefractometry respectively. Parents completed a questionnaire providing social demographic data and family history of myopia. Spherical equivalent (SE) was defined as sphere power + 0.5 cylinders. Myopia was defined as SE ≤-0.5D, hypermetropia as SE ≥+1.00D, anisometropia as SE ≥-0.50D (p<0.001). The prevalence of myopia was 13.0%, 95%CI=11.6-14.5, and hypermetropia 12.4%, 95%CI=11.0-13.9. Neither sex nor age was associated with myopia. Anisometropia was associated with positive family history. Myopia was more common in non-Chinese (p=0.037) for SE ≤0.50D. Myopia rates increased with family history of myopia. Prevalence of myopia had significantly higher rates in non-Chinese (p=0.025), in contrast to anisometropia.

Conclusions: The most common refractive error in Singapore preschoolers is astigmatism, followed by hypermetropia, myopia and lastly anisometropia. Astigmatism was associated with lower income and myopia. Myopia was associated with positive family history. Anisometropia was associated with Chinese race. The high prevalence of refractive errors in Singapore preschoolers constitutes a major public health problem, which left uncorrected, can cause significant visual impairment.

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1713 - 1716
Epidemiology of Refractive Errors
Lens Power in an Adult Population: The Los Angeles Latino Eye Study

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Purpose: To study the crystalline lens power in older adults without cataract in relation to refractive error.

Methods: A subset of participants from a population-based study, the Los Angeles Latino Eye Study, consisting of only those aged 60-70 years with nuclear opacity grading 0 and I (i.e.: without clinical cataract) was studied. This selection was performed to concentrate on persons after age-related hyperopic shifts had occurred, but before there were myopic shifts associated with nuclear cataract. The ocular components were measured by A-scan and the lens power was calculated with Bennett’s formula.

Results: There were 452 participants in the 60-70 age range with nuclear opacity grading 0 and I. Men comprised 39.8%. Refractive groups differed in axial length (p = 0.048). There were negative correlations between calculated lens power and axial length (r = -0.531, p < 0.001), and between lens power and refractive error (r = -0.531, p < 0.001). This produces a paradox, because less powerful lenses were associated simultaneously with longer eyes and with more hyperopic refractions. The mean lens power was lower in hyperopes when compared to emmetropes (3.10 ± / 0.39 mm vs. 4.50 ± / 0.49 mm, p = 0.048). There were negative correlations between calculated lens power and axial length (r = -0.531, p < 0.001), and between lens power and refractive error (r = -0.531, p < 0.001). This is explained because hyperopic eyes have lower lens power than emmetropes.

Conclusions: These results confirm the existence of a paradox first noted by Olsen et al. (Acta Ophth Scan 2007;85:360-6) of negative correlations of lens power with axial length and refractive error. This is explained because hyperopic eyes have lower lens power than emmetropes.

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Canadian Uncorrected Refractive Error Study - A Pilot Study

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Purpose: Uncorrected refractive error is the leading cause of reversible visual impairment in the world. The prevalence of this problem has not been previously studied in Canada. A pilot study was conducted in Brantford, Ontario. The primary purpose of this cross-sectional study was to measure the prevalence of uncorrected refractive error in a representative sample of the population.

Methods: The target population included all people 40 years of age and older in the City of Brantford. Study participants were selected using a cluster sampling strategy based on postal codes. Presenting distance and near visual acuities were measured with the participant’s habitual spectacle correction, if any, in place. Best-corrected visual acuities were determined for all participants who had a presenting distance visual acuity of less than 6/7.5 in either eye. Near visual acuity was assessed binocularly. The study population included 768 residents, 38.6% of the target population of 2500 people over age 40. The study population was 78.8% female. One hundred and twenty-six participants or 16.5% (95%CI, 13.7% to 19.5%) were found to have presenting distance visual acuity less than 6/7.5 in their better seeing eye (75 female, 51 male). Nearly 3% of the sample had a presenting distance vision acuity in the better eye that was less than 6/12 (95%CI, 1.7% to 4.4%). Best corrected visual acuities improved by 1 to 5 lines for 89 of these 126 study participants (70.6%).

Results: In addition, 203 study participants, 26.43% (95%CI, 23.12% to 29.9%), were found to have presenting near visual acuity less than 6/7.5 in their better seeing eye (75 female, 51 male). Nearly 3% of the sample had a presenting distance visual acuity in the better eye that was less than 6/12 (95%CI, 1.7% to 4.4%). Best corrected visual acuities improved by 1 to 5 lines for 89 of these 126 study participants (70.6%).

Conclusions: There is a high prevalence of uncorrected refractive error in the City of Brantford. This finding is similar to what has been found in studies in the United States, the United Kingdom and Australia. The majority of people with decreased distance and near visual acuities can be corrected with new spectacles. Decreased near visual acuity occurred 61% more frequently than decreased distance visual acuity in this population.

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Organizing Section: CL

2077 - A117
Comparative Study of Laboratory Findings of Patients Without Diabetic Retinopathy and Proliferative Diabetic Retinopathy

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Purpose: To describe the laboratory findings of diabetic patients without diabetic retinopathy and with proliferative diabetic retinopathy and compare the results between each other.

Methods: A retrospective observational, transversal, and comparative study. We worked on the results of the preoperative tests of 200 patients, 124 of whom were diagnosed with cataract and had no diabetic retinopathy (NDR), and who underwent cataract surgery; the other 76 had proliferative diabetic retinopathy (PDR) and underwent vitrectomy.

Results: A statistical significant difference was determined for the following variables: age of diagnosis, years of diagnosis, protrombin time, hemoglobin, hematocrit, platelets, urea, creatinine, cholesterol, urinary proteins and potassium. The most significant variables for predicting PDR were years of diagnosis, creatinine and urinary proteins. Using all significant variables PDR can be predicted in 85.4% of cases.

Conclusions: Mexican diabetic patients show a poor glycemic control done in primary care institutions. Patients with proliferative diabetic retinopathy are an economically active population and probably have some degree of renal failure. Primary care physicians will be able to refer the patients for an earlier detection of they can determine the probability of the disease.

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Support: None.

2078 - A118
Determining the Risk Factors Associated With the Development and Severity of Retinopathy in a Cohort of Poorly Controlled and Underserved Diabetic Patients


Purpose: To determine what factors influence the development and severity of diabetic retinopathy in a cohort of underserved and poorly controlled diabetic patients.

Methods: A total of 94 poorly controlled type II diabetic patients (defined by HbA1c >7%) were categorized by level of diabetic retinopathy (none, mild, moderate, severe, and proliferative). Data was collected on HbA1c, the number of years since diagnosis, presence of hypertension or nephropathy, and the use of ace inhibitors. Student t-test and stepwise linear regression were performed for statistical analysis.

Results: Mean HbA1c amongst our cohort was 8.71. Among our diabetic patients, HbA1c did not differ between those with (7.58) and without retinopathy (8.83) (p=0.47). The level of HbA1c also did not correlate with the severity of retinopathy (p=0.82). However, those with retinopathy did have a significantly longer average disease duration (12.8 yrs vs. 8.59 yrs). Similarly, those with severe nonproliferative and proliferative retinopathy also showed a longer duration of diabetes when compared to those with mild and moderate retinopathy (p=0.01). Chi square analysis revealed that the presence of hypertension and nephropathy were more prevalent in those with retinopathy, with the highest percentage of patients having both comorbidities in the severe nonproliferative and proliferative groups (p=0.009, 0.015). There was no statistical difference in age, sex, or use of ace-inhibitors, between those with and without retinopathy.

Conclusions: In patients with poorly controlled diabetes, disease duration and the presence of comorbidities, such as hypertension and nephropathy, appears to play a more important role than the actual level of hyperglycemia in the development and severity of retinopathy.

CR: P. Patel, None; S. Reddy, None.
Support: None.

2079 - A119
Ocular Manifestations in Patients With Diabetes-Related End Stage Renal Disease in Various Ethnic Groups (DRIVE UK Study)

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Introduction: Diabetic Retinopathy in various ethnic groups in UK (DRIVE UK) is an epidemiological study looking at prevalence of diabetic retinopathy in different ethnic groups (mainly Caucasians, Afro-Caribbeans, and South Asians) in UK. This data was collected as part of this study.

Aim of the study: To study the differences in severity of diabetic retinopathy and other ocular co-morbidities in patients with diabetic end stage renal disease (ESRD) in various ethnic groups.

Materials and Methods: This cross-sectional population-based study identified the patients with diabetes from the diabetic eye complication screening services (DECS) and hospital renal services in South East London. Data collected included baseline demographics, date of diagnosis of diabetes and ESRD, type of diabetes and associated systemic risk factors. Longitudinal regression analysis was done to adjust for age, gender, HbA1c at the time of diagnosis of ESRD, lipid profile, hypertension, smoking, peripheral vascular disease, neuropathy, macular complications and renal function tests. Comparison of disease severity between ethnic groups was done using ANOVA analysis.

Results: Out of the total of 167 patients with ESRD, there were Afro Caribbean (n=59), Caucasian (N=76), South Asians (n= 19), and others (n=13). The mean duration of diabetes to onset of ESRD was longer in Caucasian (26.19 years) followed by Afro Caribbean (20.81 years) and Asians (19.21 years) respectively. The rate of PDR was maximum in Caucasian in 58.97% and least in Asian (36.24%). This was statistically significant. (p<0.05). However, the highest rates of maculopathy (52.54%) were in Afro Caribbean’s with least in Asians (46.94%). This was statistically significant. (p<0.05). Cataract rate was highest in Afro Caribbean (22.84%) with least in Caucasian (12.84%).

Conclusions: Ocular manifestations in patients with diabetes related ESRD vary significantly between ethnic groups. It is important to consider ethnicity of an individual in the management of eye diseases in diabetics.


CR: B. Gupta, None; I. MacDougall, None; C. Sherpe, None; S. Jayawardene, None; T.A. Bailey, None; S. Sivaprasad, None.

2080 - A120
Diabetes and Ophthalmic Outcomes Following Integration of a Culturally Oriented Program for Diabetic Latino Patients and an Ocular Telemedicine Program

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Purpose: To describe effects of the Latino Diabetes Initiative (LDI), a culturally oriented clinical program, on ophthalmic and diabetes (DM) outcomes in diabetic patients and to determine if the Joslin Vision Network (JVN) telemedicine eye care program further benefits diabetic Latino patients.

Methods: Retrospective structured electronic medical record query of all BEI patients between 1/2006 and 10/2008 as well as LDI participants with 2 years followup with or without JVN imaging between 7/2002 and 11/2007. Ocular and systemic outcomes were compared between LDI participants and Latino non-participants, and between those who did and did not have JVN imaging.

Results: Of 13,815 patients at the BEI, 522 (4%) were identified as Latino. There were 257 (49%) subjects who participated in LDI and 265 (51%) who did not. LDI subjects were more likely to be DM (86% vs 57%; p<0.001), higher systolic blood pressure (126 vs 120 mmHg; p=0.006), hyperlipidemia (81% vs 57%; p=0.023), or microalbuminuria (57% vs 23%; p=0.014). There was no significant difference in HbA1c, DR severity, or presence of vision threatening DR, DM, or PDR between LDI and non-LDI subjects. However, LDI subjects had better VA (mean VA 20/17 vs 20/19; p=0.04) and were more likely to undergo focal laser (11% vs 6%; p=0.04) or any treatment for DME including intravitreal injection (22% vs 17%; p=0.05). Of 145 LDI patients with 2 years followup, 46 (31.7%) had JVN imaging. Baseline characteristics of JVN and non-JVN subjects, including HbA1c were not statistically different. Over 2 years, all baseline cardiovascular risk factors were not statistically different between LDI and non-LDI subjects, including HbA1c. However, those with retinopathy did have a significantly longer average disease duration (12.8 yrs vs. 8.59 yrs). Similarly, those with severe nonproliferative and proliferative retinopathy also showed a longer duration of diabetes when compared to those with mild and moderate retinopathy (p=0.01). Chi square analysis revealed that the presence of hypertension and nephropathy were more prevalent in those with retinopathy, with the highest percentage of patients having both comorbidities in the severe nonproliferative and proliferative groups (p=0.009, 0.015). There was no statistical difference in age, sex, or use of ace-inhibitors, between those with and without retinopathy.

Conclusions: In patients with poorly controlled diabetes, disease duration and the presence of comorbidities, such as hypertension and nephropathy, appears to play a more important role than the actual level of hyperglycemia in the development and severity of retinopathy.

CR: C.R. Sanchez, Allergan Horizons Grant, F. K.M. Agarwal, None; A. Millan-Ferro, None; J.K. Sun, None; P.S. Silva, None; J.D. Crullerferno, None; L.M. Aiedo, None; L.P. Aiello, None; A.E. Caballero, None.
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CR: C.R. Sanchez, Allergan Horizons Grant, F. K.M. Agarwal, None; A. Millan-Ferro, None; J.K. Sun, None; P.S. Silva, None; J.D. Crullerferno, None; L.M. Aiedo, None; L.P. Aiello, None; A.E. Caballero, None.
Support: None.

Monday, May 3, 3:45 PM - 5:30 PM Hall B/C Poster Session Program Number/Board # Range: 2077 - 2095 / A117 - A135

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2081 - A121
Systemic Co-Morbidity in Patients Undergoing Diabetic Vitrectomy
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Purpose: To study the systemic co-morbidity factors in patients undergoing diabetic vitrectomy & its co-relation with severity of diabetic eye disease (DED).

Methods: In this retrospective study records of 100 patients with diabetes mellitus (DM) who underwent parsplanar vitrectomy (PPV) were reviewed. All the patients underwent thorough systemic clinical examination. The following systemic co-morbidity factors were evaluated: hypertension (HTN), ischemic heart disease (IHD), cerebrovascular accidents (CVA), hyperlipidemia (HLY), diabetic nephropathy (DNP), diabetic neuropathy (DNU) & diabetic foot (DF). The DF was laboratory investigations (blood & urine) were also reviewed. The data was analyzed with respect to the incidence of systemic co-morbidity in these patients & the possible correlation with respect to disease severity.

Results: There were 62 males & 38 females with mean age of 56.3 years. The mean duration of DM was 13.2years & there were 89 patients with insulin-dependent DM (IDDM) & 11 with non-IDDM. 95 patients had proliferative diabetic retinopathy. The indications for PPV were vitreous haemorrhage-54, diabetic tractional detachment-30, vitreomacular traction-9, combined retinal detachment-4 & neovascular glaucoma-3. The following was the incidence of co-morbidities HTN-71%, IHD-67, HLY-45, IHD-33, DNU-27, CVA-19, DF-19 & foot amputation8. Amongst the co-morbidity factors, the severity of DED in the non-operated eye (in terms of visual acuity and macular edema) correlated well with poor hypertension control and worse DNP.

Conclusions: Ophthalmologist should exert proper attention to systemic profile in diabetic population. The need of team work is stressed in appropriate management of diabetes mellitus. Adequate renal status and hypertension control could prevent worsening of DED.

CR: N. Vashishth, None; P. Venkatesh, None; P. Naithani, None; S. Khanduja, None; S. SInha, None; S. Garg, None.
Support: None

2082 - A122
Prevalence and Risk Factors for Cataract in Population With Type II Diabetes Mellitus
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Purpose: To study the prevalence of cataract, including sub-types, in a population-based study in Type II diabetes mellitus and elucidate the risk factors associated with it.

Methods: Of the 5,999 subjects enumerated, 1,414 individuals with diabetes were identified, of these 1,414, 131 were excluded due to bilateral cataract surgeries (n=125), and six, ungradable images (n=6). Severity of lens opacities was graded according to photographic standards, using LOC5-I standard photographs.

Results: Age- and gender adjusted prevalence of cataract was 65.7% (95%CI: 65.6-65.8). The most common sub-type was the mixed cataract: combination of nuclear sclerosis (NC), cortical cataract (CC), and posterior subcapsular cataract (PSC) (Figure 1). For presence of cataract in type II diabetes mellitus, on multivariate analysis, increasing age (OR 1.14, 95%CI 1.12-1.17), macroalbuminuria (OR 4.66, 95% CI 3.65-44.45) and increasing glycosylated hemoglobin (OR 1.79, 95%CI (1.15-2.79) were identified as risk factors, and higher hemoglobin (OR 0.39, 95%CI 0.23-0.66), as the protective factor.

Conclusions: Around two-thirds of the population with diabetes mellitus showed evidence of cataract, the commonest being the mixed variety.

CR: R. Raman, None; J. S Adam, None; S. Saumya Pal, None; K. Vaiheetswaran, None; T. Sharma, None.
Support: None

2083 - A123
Retidiab®: Assessment of a Continuing Medical Education Website for the Improvement of Diabetic Retinopathy Management
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Aim: The aim of this study was to evaluate the ability of a continuing medical education (CME) website to improve the knowledge of ophthalmologists for the management of diabetic retinopathy (DR).

Methods: A World Wide Web site called Retidiab® was created. At their first connexion, users had to answer a first test in order to evaluate their baseline level. Then they could have free access to the entire website, any time they wanted, with no obligation of duration. The website was composed of a course and different kind of interpretations of diabetics’ fundus photographs, and case reports. After surfing on each pages of RETIDIAB®, they had to perform a second assessment. Finally they were asked to fill a questionnaire to evaluate this software.

Results: Seventy-seven participants were recorded. Among these users, 52 made only the first evaluation, and 19 tested the web site completely. They were residents for 73.7% and physicians in practice for 26.3%. There were 11 men and 8 women. There age was 25 to 41 years (27.6±3 years). We found a statistically significant progression between the first and the second evaluation (54% of good answers versus 54%; p<0.001). The average time which separated the first and the second evaluation was 40 days ±20. In addition, the users globally expressed a high level of satisfaction with respect to the site.

Conclusions: This study demonstrated the interest and the effectiveness of RETIDIAB®, a new CME website which is exclusively devoted to DR management.

CR: J. Beynat, None; A. Ben Mehidi, None; J.P. Aubert, None; A.M. Bron, None; P.G. Massin, None; C.P. Creuzot-Garcher, None.
Support: None

2084 - A124
High Serum Bilirubin Levels Preserve Diabetic Retinopathy in Patients With Diabetes and Impaired Glucose Metabolism: The Hisayama Study

Purpose: We examined the association between serum bilirubin levels and diabetic retinopathy in patients with diabetes and impaired glucose metabolism.

Methods: A total of 1,672 Japanese subjects, aged 40 years or older and with diabetes or impaired glucose metabolism (according to 2003 American Diabetes Association criteria), were stratified into four groups according to serum bilirubin quartiles, and diabetic retinopathy was assessed by ophthalmic examination.

Results: Of the subjects, 70 had diabetic retinopathy. The age, sex, and 2-h plasma glucose-adjusted prevalence of diabetic retinopathy decreased significantly as the quartiles of bilirubin levels increased. In multivariate analyses, the risk of diabetic retinopathy was significantly lower in the highest bilirubin quartile than in the lowest after adjustment for a number of confounding factors (odds ratio, 0.22; 95% confidence interval: 0.08-0.62).

Conclusions: Our findings suggest that elevated serum bilirubin levels significantly prevent the development of diabetic retinopathy, independent of plasma glucose and hemoglobin A1c.

CR: M. Yasaeda, None; Y. Kiyohara, None; S. Arakawa, None; M. Iida, None; T. Ishibashi, None.
Support: None
A Retrospective Analysis for Progression to Proliferative Diabetic Retinopathy (PDR) in Type 2 Diabetes


Purpose: The United Kingdom Prospective Diabetes Study (UKPDS) established intensive control of blood glucose and blood pressure slowed progression of retinopathy and reduced microvascular complications in Type 2 Diabetes. We hypothesize specific characteristics could be established that risk stratify patients with Type 2 Diabetes as to the progression of retinopathy.

Methods: We compared duration of illness, HbA1c, and insulin dependence between 52 consecutive patients with Type 2 Diabetes with Proliferative Diabetic Retinopathy (PDR) who received Pan Retinal Photocoagulation (PRP) to a control of 52 patients with Type 2 Diabetes in a general medical practice.

Results: Patients with Type 2 Diabetes and PDR had a 76.9% likelihood of insulin dependence versus 17.3% (p<0.01 by chi square test), a median HbA1c of 9.5% versus 76% (p<0.005 by the Mann-Whitney test), and had diabetes for a median of 10 years versus 4 years (p<0.001 by the Mann-Whitney test).

Conclusions: Results indicate that in our population, Proliferative Diabetic Retinopathy (PDR) is significantly associated with longer duration of illness, insulin dependence and an elevated HbA1c. Insulin dependence in clinical practice may indicate poor diabetic control or progression of disease as opposed to intensive blood glucose control and patients should be examined closely for signs of high risk Proliferative Retinopathy at regular intervals.

CR: R. Bhandari, None; I. Reich, None; J. Frisbee, None; A. Kartvelishvili, None; R. Coe, None; M.E. Hajee, None; E.M. Shrier, None; D.R. Lazzaro, None.

Support: None

Knowledge of Diabetes and Diabetic Eye Disease Among Individuals of Eastern European Russian Descent With and Without Diabetes

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Knowledge of Diabetes and Diabetic Eye Disease Among Individuals of Eastern European Russian Descent in San Francisco With and Without Diabetes.

Objective: To evaluate the knowledge gap and barriers to care for diabetes and diabetic eye disease in individuals of Eastern European and Russian descent living in San Francisco to aid the development of educational measures.

Methods: The California Pacific Medical Center IRB granted review and consent exemptions for this study. A Russian language questionnaire was generated to assess knowledge of diabetes, diabetic retinopathy and preventive strategies, and distributed at locations including pharmacies, the Jewish home, optometry and physicians’ offices from June of 2009 to August of 2009. Subjects were asked to complete the questionnaire; reading and writing assistance were provided for visually impaired patients. Questionnaires were collected and data transferred into an Excel (Microsoft Corp, Redmond WA) spreadsheet. Normative data were calculated with Excel.

Results: 239 Russian language individuals returned completed questionnaires. Respondents reported their highest levels of education as 57% University or higher, 13% high school only, and 28% additional vocational education. Language skills included 16% reporting the ability to read in English or Russian, 83% reading only Russian, and 2% preferring reading in English. Health care was surprisingly available; 94% have PCP did not speak Russian did not find language a barrier to care. 90% of diabetic patients reported their highest levels of education as 57% University or higher, 13% high school only, and 28% additional vocational education. Language skills included 16% reporting the ability to read in English or Russian, 83% reading only Russian, and 2% preferring reading in English. Health care was surprisingly available; 94% have PCP did not speak Russian did not find language a barrier to care. 90% of diabetic patients.

Support: None

The Impact of a Diabetes Teleretinal Imaging Program in a Predominantly Hispanic, Urban Patient Population

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Purpose: To assess the impact and accuracy of digital fundus photography screening of diabetic patients for diabetic retinopathy (DR) in an urban primary care clinic with a high-risk, predominantly Hispanic patient population through analysis of outcomes in referred patients.

Methods: Digital fundus photos of type-2 diabetics were taken with a Topcon TRC NW-65 non-myrdicam camera in an urban primary care clinic located in Chelsea, MA. Trained readers documented the severity of DR and made referrals on the basis of these photos. The results in-office clinical exam of patients referred by this screening method were compared to their fundus photo evaluation.

Results: Among imaged patients (n=233), 57% were female and 42.9% were male with a median age of 52 years (range 22-80). The majority of patients were of Hispanic ethnicity (67.4%), while the remainder of patients reported themselves as either Caucasian (19.3%), African-American (8.6%), Middle Eastern (3.4%) or Asian (1.3%). Mean HbA1c was 7.6%. The majority of photos (89.7%) were of sufficient quality to assess for DR. Forty patients (17.2%) had mild non-proliferative DR (NPDR), three patients (1.3%) had moderate NPDR, two patients (0.9%) had severe NPDR, and one patient (0.4%) had proliferative DR (PDR). Twelve patients (5.1%) had macular edema (ME). Overall, seventy-three patients (31.3%) were referred to ophthalmology. Among referred patients, the indications for referral included DR (88.4%), ungradable images (14.7%), non-diabetic retinal disease (23.3%), and enlarged optic nerve cup-disc ratio (12.3%). Thirty-three (45%) of the referred patients were seen at MEE for clinical evaluation. Average time from image acquisition to clinical exam was 4.2 months (range 17 days - 10 months). There was 75.9% concordance between the image evaluator and clinical examiner regarding the presence of DR. On clinical exam, only one of nine patients (1%) referred for possible ME had clinically significant ME (CSME), which was treated with grid laser. Two patients referred for DR had CSME treated with anti-VEGF injection, one of whom also had PDR and underwent vitrectomy. Four referred patients underwent cataract surgery and/or pterygium excision.

Conclusion: Evaluation of digital fundus photographs taken in a predominantly Hispanic, urban primary care setting provides a clinically useful screening method to identify high-risk patients with DR as well as non-diabetic eye disease that would benefit from ophthalmologic referral and treatment.

CR: Y. Liu, None; R. Haziri, None; K. Chen, None; C. Kloek, None; D. Varevo, None; J. Miller, None; D. Xerxes, None; L. Pasquale, None.

Support: None

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2088 - A125

2088 - A126

Support: None
Screening, Risk Factors and Progression of Diabetic Eye Diseases

Monday, May 3, 3:45 PM - 5:30 PM Hall B/C Poster Session Program Number/Board # Range: 2077 - 2095 / A117 - A135

280. Screening, Risk Factors and Progression of Diabetic Eye Diseases

M. Dirani1A, E. Fenwick1A, A.K. McAuley1, M. Larizza1, G. Rees1, T.Y. Wong1, E.L. Lamoureux1, 2, A. Harper2, T.Y. Wong3, S. Tatipata4, T. Dunbar5, O. K’Dor6, J. Cunningham6. 1Centre for Eye Research Australia, University of Melbourne, Melbourne, Australia; 2Centre for Eye Research Australia, Reservoir, Australia; 3Centre for Eye Research Australia, Singapore, Singapore; 4Menzies School of Health Research, Charles Darwin University, Australia; 5National University of Singapore, Singapore; 6Singapore Eye Research Institute, Singapore, Singapore.

Purpose: To describe the testing and recruitment modalities of the first Australian Diabetes Management Project (DMP), investigating the barriers to optimal diabetes care in adults with type I and II diabetes mellitus (DM), with and without diabetic retinopathy (DR).

Methods: Individuals with type I and II diabetes, with and without DR, aged 18 years or older, English-speaking and with no significant cognitive impairment were invited to participate in the DMP. Most study participants were recruited through ophthalmology clinics at the Royal Victorian Eye and Ear Hospital (Melbourne).

Results: Of the 4468 patients screened, 690 (15.4%) were eligible, with 423 (61.3%) accepting the invitation into the DMP. Assessments sessions, ranging between 3-4 hours, occur between 8 to noon to accommodate our fasting patients. To date, 200 participants [136 males (68.0%)] aged between 27 and 90 years (mean age = 64.2 years) have been examined. The mean HbA1c for all participants was 7.68% (range = 5.0% to 12.8%), with mean arterial BP (MAP) being 97.9mmHg. Almost half (n = 87, 46.6%) of our patients had poor diabetes control, with no age or gender effects (p=0.05).

Conclusions: One-fifth of the expected DMP cohort has been examined, with a high positive response rate. The DMP has demonstrated the successful implementation of a comprehensive protocol to investigate the barriers associated with sub-optimal diabetes care in individuals with and without DR. Almost half of our recruited patients had poor diabetes care, which further substantiates the rationale for undertaking the DMP.

Support: Australian Research Council (ARC) Linkage

2091 - A131 Smoking and Retinopathy in Long-Term Surviving Type I Diabetic Patients


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Purpose: To evaluate the association between smoking and retinopathy in a population-based cohort of 201 long-term surviving Danish type I diabetic patients.

Methods: A population-based cohort of 201 Danish type I diabetic patients was examined in 2007-2008. A Topcon TRC-NW65 camera was used to capture 9 field ophthalmoscopic digital color fundus photographs of both eyes. Retinopathy was graded according to the modified Airlie House classification scheme as used in the Early Treatment Diabetic Retinopathy Study. The level of retinopathy was determined according to the worse eye. Patients were asked about their current and past smoking habits and pack-years of smoking were calculated. One pack-year of smoking was defined as 20 daily cigarettes in one year.

Results: Median age and duration of diabetes was 58.8 and 43 years, respectively, and 59.7 (120 of 201) were male. The prevalence of current smokers, ex-smokers and never-smokers were 22.9%, 36.8% and 40.3%, respectively. Only 6 patients of a comprehensive protocol to investigate the barriers associated with sub-optimal diabetes care in individuals with and without DR. Almost half of our recruited patients had poor diabetes care, which further substantiates the rationale for undertaking the DMP.

CR: M. Dirani, None; E. Fenwick, None; A.K. McAuley, None; M. Larizza, G. Rees, T.Y. Wong, E.L. Lamoureux, None.

Support: Australian Research Council (ARC) Linkage

2092 - A132 Information Technology to Control Screening for Diabetic Retinopathy

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Purpose: To test and refine risk assessment algorithms for diabetic retinopathy, which were based on published epidemiological studies.

Methods: A diabetic eye screening programs in Reykjavik, Iceland and Århus, Denmark have accumulated data on diabetic eye disease for up to 30 years. These databases were used to test and refine risk assessment algorithms for diabetic retinopathy, which were based on published epidemiological studies.

Results: When tested against the diabetes data base in Århus, Denmark (5210 patients) the algorithm suggested an average screening interval of 27 months at risk margin 4% and 95 patients progressed to sight threatening retinopathy within the recommended risk and economic screening programs.

Conclusions: In indigenous Australian diabetic patients, eyes with severe stage DR have smaller Df compared to eyes without DR Although the study was based on small numbers, the data suggests altered retinal vascular architecture in eyes with advanced DR, and fractal imaging analysis may be useful in understanding vascular patterns and progression of DR.

CR: M. Yanagi, None; R. Kawasaki, None; L. Maple-Brown, None; E.L. Lamoureux, None; A. Harper, None; T.Y. Wong, None; S. Tatipata, None; T. Dunbar, None; K. O’dea, None; J. Cunningham, None.

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2093 - A133
Proportion of Progression of Diabetic Eye Disease in Patients Monitored With a Non-Mydriatic Retinal Camera
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Purpose: To determine the severity and progression of diabetic retinopathy (DR) using telemedicine and non-mydriatic cameras in an underserved, ethnically diverse diabetes clinic population.

Methods: We included data from 226 eyes of 115 patients with at least 1 follow-up imaging visit. We determined the severity of DR using a modified International Classification Scale for DR (Wilkinson, Ophthal 2003), which ranges from Stage 0 (no DR) to Stage 5 (Proliferative Diabetic Retinopathy, or PDR). We defined progression of DR as at least one stage increase from the enrollment date to last imaging date. We also determined the risk factors for DR progression.

Results: The stage of diabetic retinopathy at last follow-up was none (n=184, 81.4%), mild nonproliferative diabetic retinopathy (NPDR) (n=21), 10.2%), moderate NPDR (n=5, 2.2%), severe NPDR (n=3, 1.3%), and PDR (n=1, 0.4%). Over an average follow-up time of 537 days, a total of 28 eyes (12.4%) had progression of DR. Ten (4.4%) eyes had a decrease in the stage of DR; 188 (83.1%) eyes did not have a change; 20 eyes (8.8%) progressed by one stage; and 8 (4.0%) progressed by 2 or more stages. The average time to progression was 300 days. In comparison to those who did not have DR progression, those with progression were older (58.0 (8.4) vs. 53.3 (11.6), p=0.017; and were more likely to have non-white ethnicity (64% vs. 46%, p<0.05). Female gender were more likely to progress (71% vs. 52%; p=0.05), but was not statistically different.

Conclusions: Most patients in this study did not have levels of DR requiring an intervention by an eye care provider. DR progression was more common in older and non-white participants. Telemedicine using non-mydriatic cameras can be used to follow diabetic eye disease.

CR: T.M. McClure, None; K.A. Wooten, None; T.M. Becker, None; S.L. Mansberger, None.
Support: IU43 DP00002401 (SLM), SK23EY015501-01 (SLM), American Glaucoma Society (SLM)

2094 - A134
Risk Indicators Associated With 4-Year Incidence of Diabetic Retinopathy. The Los Angeles Latino Eye Study (LALES)
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Purpose: To determine the association between independent risk indicators and four-year incidence of any diabetic retinopathy (DR) in a population-based sample of adult Latinos.

Methods: The LALES is a longitudinal population-based cohort that examined the 4-year incidence of eye disease in Latinos age 40 and older. All participants underwent a standardized comprehensive ophthalmic examination, including a series of stereoscopic fundus photographs (7 standard Early Treatment Diabetic Retinopathy Study fields). Photographs were graded in a masked manner using a Modified Arlie House classification system to assess presence and severity of DR. Participants were considered at risk for developing any DR if diabetes mellitus was present and persons were free of DR at baseline. Risk Indicators (gender, age, use of insulin, HbA1c, random blood glucose, systolic and diastolic blood pressure, and duration of diabetes) were assessed to determine their relationship with incidence of any DR. Logistic regression procedures were used to calculate Odds ratios (OR) for the independent risk associated with development and progression of DR.

Results: Of the 404 diabetic persons without DR at baseline, 114 (28.2%) developed incident of DR at the 4-year follow-up. Independent risk indicators associated with incident DR included, longer duration of diabetes mellitus (OR: 2.2), elevated levels of HbA1c (OR: 1.5), and an increase in the level of HbA1c from baseline to 4-year follow-up (OR 2.2).

Conclusions: Our data suggest that poor glycemic control and longer duration of diabetes mellitus are independently associated with higher incidence of DR in our Latino population. Maintaining good glycemic control continues to play an important role in the management of DR in Latinos.

CR: M. Torres, None; J. Chung, None; S. Azen, None; R. Klein, None; R. Varma, None.
Support: NEI EY 11753

2095 - A135
The Prevalence of Diabetic Retinopathy in a Rural Guatemala Eye Clinic
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Purpose: To describe the age- and gender-specific prevalence, characteristics, and severity of diabetic retinopathy (DR) in a rural population in Escuintla, Guatemala.

Methods: Patients presenting to the Fundazucre Eye Clinic for initial ocular evaluation were invited to participate in the study once they reported having a diagnosis of diabetes. Those who chose to participate were given a comprehensive ocular examination. The presence of diabetic retinopathy was considered a significant outcome. All findings were identified and classified for the severity of diabetes by the modified Early Treatment Diabetic Retinopathy Study classification system. The collected data were analyzed using standard statistical computations.

Results: Of the 693 patients without DR at baseline, 114 (28.2%) developed incident of DR at the 4-year follow-up. Of the 693 patients receiving their initial evaluation, 73 were determined to have diabetes. Of those identified as having diabetes, 426 (60%) had retinopathy. The ratio of male to female was 3:4. The age of patients ranged from 1 to 94. Average age was 53 years, with duration of disease average as 6.1 years. Undiagnosed diabetic retinopathy was present in 26.19% (11/42); untreated diabetic retinopathy was present in 26.19% (11/42); vision threatening retinopathy -untreated -was present in 26.19% (11/42) while vision threatening retinopathy -previously treated was present in 4.76% (2/42). Macular edema was present in 21.43% (9/42). Of the 9 patients with macular edema 88.89% (8/9) was clinically significant and untreated. Clinically significant macular edema when present was either bilateral (4/8) and/or accompanied by further retinal complications which consisted of the following: macroneurom (1 patient); BRVO (1 patient), severe non-proliferative diabetic retinopathy (1 patient).

Conclusions: This study demonstrates the need for effective screening and access to necessary care in remote areas of Guatemala.

CR: E. Gable, None; L. Novak, None.
Support: None.

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We did not demonstrate a statistically significant increased risk of PSC associated with granulocyte donation in healthy apheresis donors. However, although this risk was associated with granulocyte donation in healthy apheresis donors, the odds ratio (OR) did not reach statistical significance (OR = 2.53; p = 0.21) for ≥ 20 donations, 13.0% (OR = 3.60; p = 0.11) (p = 0.06 for trend). Excluding eyes with a history of cataract extraction for PSC, 2.0% of platelet donors had PSC and the risk of PSC increased with number of granulocyte donations: 4-9 donations, 5.9% (OR = 4.43, p = 0.15); 10-19 donations, 4.8% (OR = 4.43, p = 0.37); and ≥ 20 donations, 13.0% (OR = 11.77, p<0.001), respectively (p=0.04 for trend).

Conclusions: Despite our small sample size, we demonstrated a statistically significant increased risk of PSC associated with granulocyte donation in healthy apheresis donors. However, although this makes a large risk unlikely, we can not rule out a small to moderate risk and there is biologic plausibility that the stronger cataract associations reported with granulocyte donation could be associated with PSC formation. A larger study is necessary to precisely define the extent of the increased risk. Frequent granulocyte donors should consider regular eye examinations.

Support: National Eye Institute and the Department of Transfusion Medicine, National Institutes of Health.

Results: The follow-up intervals for Ast were: 5 yr 171; 4 yr 189; 3 yr 199; 2 yr 202, 1 yr 225. The median follow-up time was 1 yr. Partial uveitis was excluded for C. There was a statistically significant adverse effect (p=0.033) of exposure (yes/no) on C progression. Also for C using a skew-normal cross-sectional model on log10 area opaque for C collapsed to median for each subject, variance was higher in AstEx for nonparametric cross-sectional analyses on collapsed (to medians) maximum opacity (over years) for C only. An ovoid mask and an adaptive test mask with a maximum size of 300 pixels was used. A control group of 1,750 individuals was matched for age and sex. The exclusion of cases with cataract treatment at 84%, and MRSA accounted for 15% of organisms versus 5% in the younger populations had culture results available, and 268 (60%) of this subset were culture positive. 92% cultured gram-positive organisms, and 16% cultured gram-negative organisms. Multivariable models included pairs of cataract surgeons differed by age group. Among the 85+ age group, MRSA accounted for 15% of organisms versus 5% in the younger populations (p = 0.04). MRSA was more common among non-whites, accounting for 14% of all culture positive organisms compared to 5% within the white population (p=0.08).

Presenting visual acuity was 20/200 or worse for 92% of culture positive cases and 79% of culture negative cases (p=0.0002). Culture positive compared to culture negative cases were more likely to undergo vitrectomy (64% vs. 44%, respectively; p=0.0003). 49% of both culture positive and culture negative cases received intravitreal vancomycin, usually in combination with ceftazidime (70%), amikacin (22%) or another antibiotic. 25% also received a systemic antibiotic. Final visual acuity was 20/200 or worse for 40% of culture positive cases compared to 29% of culture negative cases (p=0.003). Among those treated with intravitreal vancomycin and amikacin were less likely to have poor visual acuity (20/200 or worse) at follow-up compared to other regimens (p=0.06). Final visual acuity was 20/200 or worse for 92% of culture positive cases and for 79% of culture negative cases (p=0.0002). Culture positive compared to culture negative cases were more likely to undergo vitrectomy (64% vs. 44%, respectively; p=0.0003). 49% of both culture positive and culture negative cases received intravitreal vancomycin, usually in combination with ceftazidime (70%), amikacin (22%) or another antibiotic. 25% also received a systemic antibiotic. Final visual acuity was 20/200 or worse for 40% of culture positive cases compared to 29% of culture negative cases (p=0.003). Among those treated with intravitreal vancomycin and amikacin were less likely to have poor visual acuity (20/200 or worse) at follow-up compared to other regimens (p=0.06).
Surgical Factors Play a Significant Role in Rates of Trichiasis Recurrence


**Purpose:** Trachoma is the leading infectious cause of blindness worldwide. Rates of trichiasis recurrence following surgery are high in many settings. Early studies of recurrence suggested that surgical factors may play a role. However, what factors in particular are important have not been well elucidated. The goal of this analysis was to examine surgical factors collected in a standardized fashion in the context of a clinical trial in order to examine what factors may play a role.

**Methods:** This analysis is based on data from the STAR trial, a randomized clinical trial to evaluate the use of antibiotics at the time of surgery in preventing trichiasis recurrence. Eligible individuals were evaluated for baseline trichiasis severity. Eyes with previously unoperated trichiasis were operated using the binamellar tarsal rotation procedure. During surgery, data were collected on the duration of surgery, length of incision, operated eye (right or left) and name of surgeon. Patients were followed for two years to evaluate trichiasis recurrence. Length of incision was measured by cutting a piece of suture material that extended from one end of the incision to the other following the eyelid contour. Cox proportional hazard models were used to examine risk factor associations.

**Results:** 1452 individuals enrolled in the STAR trial. Operated eyes were distributed equally between left and right eyelids. By two years post-surgery, 136 eyelids (9.4%) had developed recurrence. 8% of right eyes and 11% of left eyes developed recurrence. 58% of the recurrences were in left eyes. 38 (2.6%) eyelids had short incisions; 18% of eyelids with short incisions developed trichiasis recurrence compared to 9% of eyelids with long incisions (p=0.05). Rates of recurrence by surgeon varied from 8-12%. In multivariate analyses adjusting for antibiotic treatment at time of surgery, age, gender and baseline trichiasis severity, left eyes were 45% more likely to develop recurrence than right eyes (HR 1.45; 95% CI: 1.00-2.05). In addition, a borderline statistically significant association was seen by surgeon. Surgeon 3 was 50% more likely to have patients with trichiasis recurrence than surgeon 1 (95% CI: 0.95-2.39).

**Conclusions:** Surgical factors play an integral role in long-term trichiasis recurrence. Methods to help standardize procedures may prove useful in improving trichiasis recurrence rates.

**CR:** E.W. Gower, None; B.E. Munoz, None; W. Alemayehu, None; S.K. West, None.

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**Purpose:** To evaluate differences in clinical trial participants with newly-diagnosed primary (POAG), pseudoexfoliative (PEx), and pigmentary (PGM) forms of open-angle glaucoma (OAG).

**Methods:** 607 subjects with newly-diagnosed OAG were enrolled in the Collaborative Initial Glaucoma Treatment Study (CIGTS) between October, 1993 and April, 1997. Three types of open-angle glaucoma were included: POAG, PEx, and PGM. A thorough baseline examination was performed. Clinical measures included the mean deviation (MD) from Humphrey 24-2 full threshold visual field testing, refraction and best-corrected visual acuity measured using the ETDRS protocol, and IOP determination by Goldmann application tonometry. Comparisons were performed using analysis of variance, chi-square tests, extended Fisher's exact tests, and multinomial logistic regression.

**Results:** Of 607 enrollees, 550 (91%) were diagnosed with POAG, 29 (5%) with PEx, and 28 (5%) with PGM. Age at diagnosis differed significantly (p<0.0001); enrollees with PEx were older (65 yrs) than those with POAG (58 yrs) or PGM (49 yrs). IOP at enrollment was significantly higher (p<0.0001) in those with PEx (32 mmHg) than POAG or PGM (27 & 28 mmHg, respectively). Enrollees with PEx were more likely to have high myopia (p=4D sphExp), 28% PGM vs. 5% POAG and 4% PEx. In terms of race/ethnicity, 76% of POAG, 78% of PGM, and 46% of PEx were Caucasian (p<0.0001).

**Conclusions:** Newly-diagnosed enrollees into a clinical trial of OAG treatment differed relative to the type of OAG. Enrollees with PEx were older and had higher IOP. Those with POAG were more likely to be blacks, have a family history of glaucoma, and be diabetic. PGM enrollees were younger and more likely to have high myopia. Some of these differences relate to the underlying pathogenesis of the specific type of OAG; others are noteworthy for confirmation and further investigation.

**CR:** D.C. Musch, None; T. Shimizu, None; L. M. Niziol, None.

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**2756 - A542**

**Differences in Characteristics of CIGTS Enrollees Based on Their Type of Open-Angle Glaucoma**

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**Purpose:** To examine differences in retrobulbar blood flow in African Americans and Caucasians with primary open-angle glaucoma (OAG).

**Methods:** 607 subjects with newly-diagnosed OAG were enrolled in the Collaborative Initial Glaucoma Treatment Study (CIGTS) between October, 1993 and April, 1997. Three types of open-angle glaucoma were included: POAG, PEx, and PGM. A thorough baseline examination was performed. Clinical measures included the mean deviation (MD) from Humphrey 24-2 full threshold visual field testing, refraction and best-corrected visual acuity measured using the ETDRS protocol, and IOP determination by Goldmann application tonometry. Comparisons were performed using analysis of variance, chi-square tests, extended Fisher's exact tests, and multinomial logistic regression.

**Results:** Of 607 enrollees, 550 (91%) were diagnosed with POAG, 29 (5%) with PEx, and 28 (5%) with PGM. Age at diagnosis differed significantly (p<0.0001); enrollees with PEx were older (65 yrs) than those with POAG (58 yrs) or PGM (49 yrs). IOP at enrollment was significantly higher (p<0.0001) in those with PEx (32 mmHg) than POAG or PGM (27 & 28 mmHg, respectively). Enrollees with PEx were more likely to have high myopia (p=4D sphExp), 28% PGM vs. 5% POAG and 4% PEx. In terms of race/ethnicity, 76% of POAG, 78% of PGM, and 46% of PEx were Caucasian (p<0.0001).

**Conclusions:** Newly-diagnosed enrollees into a clinical trial of OAG treatment differed relative to the type of OAG. Enrollees with PEx were older and had higher IOP. Those with POAG were more likely to be blacks, have a family history of glaucoma, and be diabetic. PGM enrollees were younger and more likely to have high myopia. Some of these differences relate to the underlying pathogenesis of the specific type of OAG; others are noteworthy for confirmation and further investigation.

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**2757 - A543**

**Evaluation of Compliance to Topical Ocular Hypotensive Medical Therapy in Glaucoma**


**Ophthalmology, AIIMS, Delhi, India.**

**Purpose:** To study compliance to topical anti-glaucoma medications in patients of primary open angle glaucoma and primary angle closure glaucoma in the Indian population and to assess barriers affecting compliance

**Methods:** A cross sectional study of 165 patients of primary open angle and primary angle closure glaucoma recruited from out patient services of a tertiary care eye facility using semi-structured questionnaire was performed. Compliance being defined as missing of 1 or more doses in the past one month. Factors leading to non-compliance were classified into three categories-situational, provider and regimen related. Health literacy was assessed using a questionnaire.

**Results:** The mean age of patients was 60.2 ± 11.6 years (105 males and 60 females). One hundred and twenty patients (72.72%) were found to be non-compliant. A health literacy score of more than 50% was found in sixty patients (36.36%). Out of the patients who were non-compliant with their medications, 75% were literate (literacy being defined as able to read and write), 80 patients (48.48%) missed 1 day of dosing while 10 patients (6.06%) missed more than 3 days. 6 patients (0.36%) had not taken the medications for more than one month in the past one year. The factors leading to non-compliance were situational (50 patients, 90.95%), regimen related (10 patients, 0.06%). Provider related (3 patients, 0.06%). The most common cause of non-compliance due to regimen was poor tolerability to medications. Non-compliance due to provider factors was attributed to the non-communication of the need to take anti-glaucoma medications life long.

**Conclusions:** High rates of non-compliance were seen in the Indian population. The most common causes leading to non-compliance were situational factors.

**Support:** None

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**2758 - A544**

**Long-Term Outcome After Acute Primary Angle Closure**

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**Purpose:** To identify the long-term visual outcome of eyes who suffered an acute attack of primary angle closure, and to determine the causes of poor vision.

**Methods:** Retrospective case-series of 134 consecutive eyes who presented with acute primary angle closure (APAC) to a supra-regional tertiary referral unit in the United Kingdom over a period of 60 months. We looked at the best-corrected visual acuity (BCVA) in the affected eye at presentation, 6 months after the acute event and at the final follow up. Causes of poor vision were recorded as well as socio-demographic variables and surgical interventions.

**Results:** All 133 subjects were assessed, 97 (72.4%) were females and 37 (27.6%) males. The majority were Caucasians (77.6%), followed by Asians (14.2%), African-Carribbean (2.2%) and other ethnicities (6%). The mean age was 67.3 ± 11.9 years. 52 eyes (38.6%) had cataract surgery, 21 (15.7%) required filtration surgery, and 5 (3.7%) had a laser iridotomy. BCVA of 6/18 was recorded in 301 (75.4%) eyes at presentation, in 33 (24.6%) eyes at the six months appointment and in 34 (25.4%) eyes at the final follow up. At presentation only 18 (13.4%) eyes had a good BCVA of ≥6/12 compared to 85 (63.4%) eyes at the six month follow up and 90 (67.2%) eyes at the final follow up. The mean final follow up period was 2.6 ± 1.5 years. Reasons for poor vision at the final follow up were cataract in 10 (29.4%) eyes, glaucomatous optic neuropathy in 8 (23.5%), age-related macular degeneration in 3 (8.8%), amblyopia in 3 (8.8%) and other pathologies in the remaining 10 (29.4%) eyes.

**Conclusions:** More than two third of the eyes treated for APAC regained good central vision. Poor long-term visual acuity was mainly due to non-operated cataract and glaucomatous optic neuropathy. Individuals who suffered an APAC attack would benefit from cataract surgery and regular follow ups to monitor glaucoma progression.

**CR:** W. Andreatta, None; M. Nessim, None; P. Shah, None.

**Support:** Applied for an ARVO Travel Grant
2760 - A546
High Prevalence of Narrow Angles Among Filipino-American Patients
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Purpose: To determine the prevalence of gonioscopically narrow anterior chamber angles in a Filipino-American clinic population.

Methods: The records of 122 consecutive, new, self-declared Filipino-American patients examined in a comprehensive ophthalmology clinic in Vallejo, California were reviewed retrospectively. After exclusion, 222 eyes from 112 patients remained for analysis. Data were collected for anterior chamber angle grade as determined by gonioscopy (Shaffer system), age, gender, manifest refraction (spherical equivalent), intraocular pressure (IOP) and cup-to-disk ratio (CDR). Data from both eyes of patients were included and modeled using a standard linear mixed-effects regression. As a comparison, data were also collected from a group of 30 consecutive Caucasian patients from the same clinic. After exclusion, 30 eyes from 25 Caucasian patients remained for comparison.

Results: At least one eye of 24% of Filipino-American patients had a narrow anterior chamber angle (Shaffer grade 2), whereas all 30 Caucasian patients had open angles (Shaffer grade 3-4) in both eyes (p=0.004). Filipino-American angle grade significantly decreased with increasing IOP and larger CDR (p=0.038). Filipino-American women had significantly decreased angle grades compared to men (p=0.028) but angle grade did not vary by IOP or age (all, p≥0.059).

Conclusions: Narrow anterior chamber angles are highly prevalent in Filipino-American patients in our clinic population.

CR: M.I. Seider; None; C.S. Sales; None; R.Y. Lee; None; A.K. Agadzi; None; T.C. Porco; None; R.N. Weinreb; None; S.C. Lin; None.

Support: Research to Prevent Blindness, NIH-NEI EY002162 – Core Grant for Vision Research, and That Man May See, Inc.

2761 - A547
Optic Disk Size in Mexican Mestizo Population: Microdisk and Macrodisk Prevalence

Purpose: To determine optic disk surface area in mexican mestizo population without known ocular pathology and in patients with glaucoma suspected optic disk and glaucoma diagnosis. To define microdisk and macrodisk diagnostic criteria and determine its prevalence in this population.

Methods: 200 eyes of mexican mestizo subjects without known ocular pathology or glaucoma related family conformed group 1. Group 2 was constituted by 1677 eyes of patients with glaucoma suspected optic disk and glaucoma diagnosis. For both groups, Heidelberg Retina Tomograph 3 (HRT3) tomography was evaluated. Mean optic disk area and standard deviation (SD) were determined. Microdisk was defined as the optic disk area equal or smaller than the mean minus two SD and macrodisk as the optic disk area equal or greater than the mean plus two SD. The prevalence for both instances was determined. Studies with thopographic standard deviation (SD) equal or more than 30 µm were excluded.

Results: 12 studies from group 1 were excluded. Mean optic disk area was 1.974mm² (4.34±1.0 mm² SD ±0.529 mm²). Microdisk was defined as the optic disk surface area equal or smaller than 0.915 mm² and macrodisk as those who showed surfaces area equal or greater than 3.033 mm². Macrodisk prevalence was 2.65%. No microdisk cases were demonstrated for this group. In group 2, 486 studies were excluded. Mean optic disk area was 2.451 mm² (0.08-0.46mm² SD ±0.623mm²). Microdisk and macrodisk prevalence was 0.068% and 15.909% respectively.

Conclusions: Mexican mestizo population without known ocular pathology shows optic disk surface areas smaller than those for other ethnic groups and, for the other hand, mexican mestizo population with glaucoma suspected optic disk and glaucoma diagnosis have optic disk surface areas and macrodisk prevalence greater than those with known ocular pathology.

CR: T.N. Adabache Guel; None; C. Muñoz Barocio; None; A. Morales González; None.

Support: None

2762 - A548
Incidence of Dry Eye or Ocular Infection in Open-Angle Glaucoma (OAG) and Ocular Hypertension (OH) Patients Treated With Latanoprost (LAT) With BAK or Travoprost-Z (TRAV-Z) With SoFloZ™
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Purpose: To compare the 1-year incidence rates of dry eye or ocular infections in OAG and OH patients newly treated with LAT or TRAV-Z.

Methods: Retrospective study of 3 US-based patient-centric medical/pharmacy claims databases (MedStat, Pharmetrics, 3-Inegis) of patients with any OAG or OH diagnosis within 3 months of the first (index) prescription for LAT or TRAV-Z monotherapy. Excluded were those with a LAT or TRAV-Z prescription within 6 months pre-index or with a diagnosis of dry eye or ocular infection (ICD-9-CM codes 372.30, 372.39, 372.20, 372.00, 372.03, 372.53, 370.0, 370.00, 370.2, 370.20, 370.21, 370.3, 370.33, 370.4, 370.8, 375.15, 710.2; CPT: 68760, 68761) within 6 months pre-index. Time to incidence in the first year post-index was estimated with a composite endpoint: dry eye-related diagnosis or ocular infection by ICD-9-CM code OR prescription for Restasis™ or other anticytobiotic.

Results: 1208 patients were identified in MedStat (LAT, 980; TRAV-Z, 228). Over 1 year, 36.3% (356/980) of LAT and 36.6% (88/228) of TRAV-Z patients were identified with composite endpoint (P=0.439; log-rank test). Similarly, 2786 patients were identified in Pharmetrics (LAT, 2177; TRAV-Z, 589). Over 1 year, 21.8% (474/2177) of LAT and 20.9% (123/589) of TRAV-Z patients were identified with composite endpoint (P=0.761; log-rank test). Lastly, 1670 patients were identified in 3-Inegis (LAT, 1164; TRAV-Z, 408). Over 1 year, 34.6% (403/1164) of LAT and 32.6% (131/408) of TRAV-Z patients were identified with composite endpoint (P=0.8794; log-rank test).

Conclusions: The retrospective analysis of 3 large prescription databases revealed that OAG and OH patients newly treated with BAK-containing LAT or SoFloZ-containing TRAV-Z did not differ statistically in rates of dry eye or ocular infections, as defined in the study, during the first year post-index. Limitations of claims-based analyses: nonrandomization; cannot account for over-the-counter use or samples.

CR: S. Kotak, Pfizer, E; G.F. Schwartz, Pfizer, C; J. Mardekian, Pfizer, E; J. Fain, Pfizer, E.
Support: Pfizer Inc

2763 - A549
Longitudinal Associations With 4-Year Changes in Intraocular Pressure: The Los Angeles Latino Eye Study
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Purpose: To examine risk factors related to increase in intraocular pressure (IOP) over a 4 year period.

Methods: Data were collected from the LALES - a population-based sample of self-identified Latinos predominantly of Mexican ancestry, ages 40 years or older, in Los Angeles County. Participants underwent an interview and an ocular examination at baseline and 4 years later. General and ocular measures that were assessed included age, gender, body mass index, pulse rate, systolic and diastolic blood pressure, glycosylated hemoglobin, refraction, iris color, and degree of nuclear sclerosis, IOP (Goldmann applanation tonometry), central corneal thickness, and axial length. IOP increase was defined as an increase > 4 mm Hg at the year 4 follow-up compared to baseline. All persons with a history of ocular hypotensive treatment were excluded. Univariate and stepwise regression analysis were used calculate odds ratios (OR) for those independent risk factors associated with increased IOP.

Results: Of the 3990 subjects examined at baseline and 4 years later, 361 participants (9.0%) had ≥ 4 mm Hg increase from their baseline IOP and 3336 participants (83.6%) had a < 4 mm Hg change in IOP (reference group). Independent risk factors for ≥ 4 mm Hg increase in IOP at 4-year follow up when compared to the reference group were lower baseline IOP (OR 0.83 per mm Hg), older age (OR 1.02 per decade), shorter axial length (OR 0.84 per mm), and presence of diabetes mellitus (OR 1.49).

Conclusions: This study identifies biological factors that can help define groups at risk for developing elevated IOP. Persons with these risk factors should be examined periodically to detect the early development of glaucomatous optic nerve damage.

CR: Y. Pan; None; C. Vigen; None; S.P. Azen; None; R. Varma; None.
Support: grants NEI U10-EY11753 and EV-00340
Influence of Family History on Primary Angle-Closure and Primary Open Angle Glaucoma in China

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Purpose: To investigate the influence of family history on the presence and severity of primary angle-closure (PAC) and primary open angle glaucoma (POAG) in China.

Methods: A total of 332 PAC patients, 228 POAG patients and 193 cataract patients excluding glaucoma as control were enrolled in this study. All participants underwent a comprehensive eye examination and asked to finish a formed questionnaire. Past history of hypertension, diabetes mellitus, hyperopia, high myopia, and family history of glaucoma was noted. If family history was positive, the details of the affected relatives should be specified. Prevalence and odds ratios of family history and first-degree relatives including parents, siblings and offspring were calculated and analyzed. PAC and POAG were defined according to the Preferred Practice Pattern developed by American Academy of Ophthalmology. Severity of glaucoma was graded according to visual field examination.

Results: Of the 332 PAC patients, 83 (25.00%) had glaucoma family history. Characteristic-adjusted odds ratio (OR) of family history for PAC was 4.82 [95% confidence interval (CI): 2.08-11.19] and for severity of PAC was 1.61 (95% CI: 1.05-2.49). Presence and number of first-degree relatives both contribute to PAC with OR 5.09 (95% CI: 2.04-12.67) and OR 4.71 (95% CI: 1.91-11.60) respectively. Among first-relatives only parents contribute to PAC [OR 8.76 (95% CI: 2.00-38.32)]. Of the 228 POAG patients, 49 (21.49%) had glaucoma family history. Odds ratio for POAG was 8.38 (95% CI: 3.33-21.07) and for severity of POAG was 1.81 (95% CI: 1.05-3.14). Presence and number of first-degree relatives both contribute to POAG with OR 7.28 (95% CI: 2.79-19.64) and OR 6.61 (95% CI: 2.48-17.58) respectively. Different from PAC, only siblings and offspring contribute to POAG [OR 6.99 (95% CI: 2.38-20.39) and OR 19.23 (95% CI: 1.53-241.24) respectively].

Conclusions: Our study showed that glaucoma family history plays an important role not only for the presence but also for the severity of PAC and POAG. Only first-degree relatives have significant influence on PAC and POAG. Furthermore, parents related to PAC while siblings and offspring related to POAG. It will be an effective way to carry out screening of glaucoma mainly on the first-degree relatives of patients.

Support: National Natural Science Foundation of China (No. 30903647)

Gender Differences in Numbers of Primary Open Angle Glaucoma Cases in the United States

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Purpose: To determine the estimated number of primary open-angle glaucoma (POAG) cases in the United States by age, gender and race/ethnicity.

Methods: The prevalence rates of POAG reported in population-based studies were used to calculate the number of projected persons with POAG in the U.S. The Eye Diseases Prevalence Research Group, The Los Angeles Latino Eye Study (LALES), and a population-based study in Guangzhou of China, were selected as representative of the US White/Black, Hispanic and Asian populations, respectively. For the distribution of POAG cases, the gender-, age, race/ethnicity- specific prevalence rates were then applied to the 2010 US population estimates.

Results: For the US populations aged 40 and older, approximately 1.44 million men and 1.84 million women are projected to be affected by POAG in 2010. The estimates in men are comprised of 51% in White, 16% in Black, 25% in Hispanics and 7% in Asians. In addition, the estimates in women are comprised of 62% in White, 36% in Black, 19% in Hispanics and 3% in Asians. By race/ethnicity, the overall estimate is 56% and 26% higher in White and Black women, respectively. In contrast, the overall estimate is lower in Hispanic and Asian women (4% and 52%, respectively). For all race/ethnicity combined, the estimate in men peaks at 86th decade and then it starts descending slightly. For women, the estimate in women continues to escalate from the 4th decade steadily to the 7th decade. After the 7th decade, the estimate in women increases exponentially. In addition, the highest overall estimate is within the 8th decade and older (85% higher in White women). For POAG individuals who are eligible for Medicare (aged 65 or older), the projected number is 1.98 million in 2010 (37% higher in women; 1.14 million women vs 835,215 men).

Conclusions: Women outnumber men for POAG cases in the US. Based on our projected estimates, the proportion appears highest in elderly women, especially in the 8th decade and older. This likely reflects longevity in women compared to their men counterpart. Understanding the gender differences in the numbers and distribution of POAG cases will lead to better allocation and use of resources. It will also further stimulate the investigations of gender differences in glaucoma.

Support: T.S. Vajaranant, None; S. Wu, None; M. Torres, None; R. Varma, None; NEI EY 11753, K12HD055892 (NICHD and ORWH).

Glucoma Disease Significantly Related to Severity at Time of Diagnosis and Associated Risk Factors

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Purpose: It has previously been shown that the cost for treating glaucoma increases with disease severity. This study was designed to describe the severity of glaucoma at time of diagnosis in Canadian patients and to compare glaucoma risk factors by disease severity.

Methods: This was a cross-sectional, non-interventional study. Eligible subjects with POAG were recruited and previously diagnosed. Inclusion criteria were age ≥ 50 years, primary open-angle glaucoma, optic neuropathy (without visual field loss) at baseline and the duration of follow-up.

Results: During follow-up, 108 participants (2.8%) developed glaucomatous visual field loss. Participants using ophthalmic steroids and steroid ointments had a 2.2-fold (95% CI 1.3-3.6; p=0.004) and 2.2-fold (1.2-3.9; p=0.007) higher risk of developing glaucomatous visual field loss. The attributable risks and population attributable risks were 52% (95% CI 29-81%) and 14% (8-22%) for ophthalmic steroids and 56% (25-78%) and 26% (12-36%) for steroid ointments.

Conclusions: Ophthalmic steroids and steroid ointments appear to increase the risk of developing glaucoma. Prolonged use of these steroids should be discouraged, and if its use is deemed necessary some kind of glaucoma monitoring seems to be advisable.

Support: None

Glucoma Disease Significantly Related to Severity at Time of Diagnosis and Associated Risk Factors

P.J. Harasymowycz1, Y. Buys2, R. Gaspo3, K. Kiar4, D. Zhou5, T. Nguyen6, 1Ophthalmology, Maisonneuve-Rosemont Hospital, Montreal, QC, Canada; 2Montreal Glaucoma Institute, Montreal, QC, Canada; 3Ophthalmology, University of Toronto, Toronto, ON, Canada; 4Pfizer Canada, Montreal, QC, Canada; 5Ophthalmology, Pfizer, New York, NY.

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Support: None

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Methods: This was a cross-sectional, non-interventional study. Eligible subjects with POAG were recruited and previously diagnosed. Inclusion criteria were age ≥ 50 years, primary open-angle glaucoma, optic neuropathy (without visual field loss) at baseline and the duration of follow-up.

Results: During follow-up, 108 participants (2.8%) developed glaucomatous visual field loss. Participants using ophthalmic steroids and steroid ointments had a 2.2-fold (95% CI 1.3-3.6; p=0.004) and 2.2-fold (1.2-3.9; p=0.007) higher risk of developing glaucomatous visual field loss. The attributable risks and population attributable risks were 52% (95% CI 29-81%) and 14% (8-22%) for ophthalmic steroids and 56% (25-78%) and 26% (12-36%) for steroid ointments.

Conclusions: Ophthalmic steroids and steroid ointments appear to increase the risk of developing glaucoma. Prolonged use of these steroids should be discouraged, and if its use is deemed necessary some kind of glaucoma monitoring seems to be advisable.

Support: None
This study describes the association between the high risk LOXL1 SNPs and vitamin D levels. Recently, vitamin D has been associated with various diseases, including glaucoma. Although the mechanisms are not fully understood, there is an ongoing interest in vitamin D's potential role in glaucoma prevention and management. In this study, we aimed to determine the relationship between vitamin D levels and the prevalence of high-risk LOXL1 SNPs.

**Methods:**
We conducted a case-control study involving 200 Indian patients with glaucoma and 200 age- and gender-matched controls. The case group was diagnosed with primary open-angle glaucoma based on ophthalmic examinations. The control group consisted of healthy individuals without a history of glaucoma.

**Results:**
- **Vitamin D Levels:** The mean vitamin D level was significantly lower in the case group compared to the control group (p < 0.05).
- **LOXL1 SNPs:** The prevalence of the high-risk alleles rs2165241 (CT/TT), rs1048661 (R141L), and rs3825942 (G153D) was higher in the case group compared to the control group (p < 0.05).

**Conclusions:**
Our findings suggest a potential association between low vitamin D levels and the prevalence of high-risk LOXL1 SNPs. Further studies with a larger sample size are needed to confirm these results and explore the underlying mechanisms.
Prevalence Rates and Risk Factors for Refractive Errors in Urban Singapore Indians: The Singapore Indian Eye (SINDI) Study

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Purpose: To determine the prevalence and risk factors for refractive errors in urban Singapore Indians.

Methods: A population-based, prevalence survey of Indians ≥40 years was conducted in the South-Western part of Singapore based on the Singapore Malay Eye Study protocol. An age-stratified random sampling procedure was used for 6,350 Indian names. Subjective refraction was determined, and autorefraction using the Canon RK-F1 table-mounted autorefractor. Myopia was defined as spherical equivalent (SE) < -0.50 diopeters (D) and high myopia as SE < -5.00 D. Astigmatism was defined as cylinder (C) ≤ 0.50 D, hyperopia as SE ≥ +0.50 D and anisometropia as a SE difference ≥ 1.00 D. Prevalence rates were adjusted to the 2000 Singapore census.

Results: Of the 6,350 names, 4,555 were eligible to participate, and of these, 3,379 (72.4%) were examined and right eye data were available for 2,824 audits with no history of cataract surgery. The age-adjusted rate of myopia was 27.9% (95% confidence interval [CI] 25.9, 30.1), with 28.3% in females and 26.5% in males. The high myopia rate was 4.4% (95% CI 3.6, 5.3). There was a U-shaped relationship between prevalence of myopia and increasing age (33.6%, 23.9%, 20.2%, 25.5% for age clusters below 50, 50-59, 60-69, 70 years and above respectively). The age-adjusted rates were 55.5% for astigmatism, 25.6% for hyperopia, 4.4% for myopia progression and 24.4% for anisometropia. In a multiple logistic regression model, adults who were female, younger, taller, used the computer regularly, and read regularly were more likely to be myopic. Adults with myopia, cataract, who were heavier and older had higher risks of astigmatism. Both hyperopia and anisometropia were associated with regular computer usage and older age.

Conclusions: The rate of myopia of 27.9% is fairly high in Singapore Indian adults, similar to Singapore Malays adults (26.2%). Gender, height, reading, writing, and computer use are associated with myopia, while cataract, weight, age, and myopia are associated with astigmatism.

CR: S.-M. Saw; W.-L. Wong; R. Lavanya; R. Wu; Y. Zheng; T. Aung; T.L. Young; P.J. Foster; P. Mitchell; T.Y. Wong.

Support: Biomedical Research Council (BRC), 08/1/35/19/550, Singapore

Time Outdoors, Near Work, and the Progression of Myopia in Children


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Purpose: Several studies have shown that myopic children spend less time outdoors than non-myopic children. We have also shown that more time spent outdoors by non-myopic children is associated with a reduction in the risk of myopia onset (Jones et al., IOVS, 2007). We investigated whether time spent outdoors or performing near work is related to the rate of myopia progression in children.

Methods: Subjects were 840 myopic participants in the Collaborative Longitudinal Evaluation of Myopia Progression (CLEERE) Study who returned for at least one subsequent annual visit and had a parent-completed survey of near work and time spent outdoors. Refractive error was measured by autorefractometry (Reichert RM-5000) under cycloplegia ( tropicamide or tropicamide plus cyclopentolate). Multilevel, repeated-measures linear regression models were fitted to determine the effect of time outdoors and near work on the annual refractive error change. Covariates in all models included age, gender, ethnicity, study site, and refraction type.

Results: There were no significant main effect model associations between myopia progression and either time outdoors or near work (p = 0.23 and p = 0.65, respectively; the 95% CI for each estimated slope was less than ±0.005). A more detailed analysis showed a significant gender-by-activity interaction for both time outdoors and near work (p = 0.039 and p = 0.0005, respectively, for the interactions). These interactions were comprised of statistically significant but clinically meaningless associations between myopia progression and time outdoors for girls (0.005 D per year less progression per hour spent outdoors each week) and near work for boys (-0.0015 D per year more progression per hour spent in near work each week).

Conclusions: Activities such as being outdoors or performing near work appear to have no meaningful influence on the rate of myopia progression. The protective effects of time outdoors or activity may be mediated by a reduction in the risk of myopia onset or may only apply to non-myopic eyes before onset. Alternatively, this protective effect may influence some factor related to the risk of myopia onset that is not directly related to the rate of ocular axial elongation and, therefore, not directly related to the rate of myopia progression.

CR: D.O. Mutti; T.I. Sinnert; L.A. Jones-Jordan; S.A. Cotter; R.N. Kleinstein; R.E. Mann; J.D. Twelker; K. Zadnik.

Support: NIH/NEI grants U10-EY08893 and R24-EY014792, the Ohio Lions Eye Research Foundation, and the EF Wildermuth Foundation.
This study aims to describe peripheral refraction measurements and their relationship to central refractive error in Singaporean Chinese children.

**Methods:** 450 children aged 40 months or older from the Strabismus, Amblyopia and Refractive error in Singaporean Children (STARS) study were recruited. Peripheral refraction was measured after pupil dilation using an infrared autorefractor (Grand Seiko Autorefractor) and Keratometer WAM-5500, Grand Seiko Co. Ltd., Hiroshima, Japan. A total of 5 measurements were captured: central visual axis, and 15 degrees eccentricities in the nasal and temporal visual fields.

**Results:** The mean age of the participants recruited was 83.1 ± 36.2 months. There were 118 children with myopia (47.2%), 84 with emmetropia (33.6%) and 47 with hyperopia (18.8%). The mean SE was -0.57 D at the center, -0.80 D at temporal 30 degrees, -1.09 D at temporal 15 degrees, -0.52 D at nasal 30 degrees and -1.11 D at nasal 15 degrees. Children with myopia had relative hyperopia at the temporal (mean = -2.22D) and nasal 30 degrees (mean = -1.7D) compared to the central meridian (mean = -2.64D) (p < 0.001), but not at the nasal and temporal 15 degrees. Children with emmetropia and hyperopia had peripheral relative myopia at all eccentricities (p < 0.001).

**Conclusions:** Young myopic Singaporean Chinese children with myopia tend towards relative hyperopia in the periphery. These data substantiate previous studies in older people, and provide insights into possible early changes in the eye in myopia development.

**Support:** Support from Essilor SA

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**2970 - 2:45PM**

**Genome-Wide Association Study Identifies Genetic Variants on Chromosome 15 Associated With Refractive Error**

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**Purpose:** Genome Wide Association Studies (GWAS) have enabled identification of genetic associations for many complex traits. Myopia and refractive error are highly heritable. We conducted a GWAS of refractive error in an unselected volunteer cohort of British Caucasian adult twins.

**Methods:** Non-cycloplegic autorefractometry was obtained for volunteers from the TwinsUK Adult Twin Registry attending our institution. Mean spherical equivalent for both eyes was used calculated from the standard formula: spherical-equivalent = (cyl/2) in twins. All individuals included subsequently underwent genotyping with Human Hap300k Duo for part of the cohort, and Human Hap60 Quad array for the rest (platforms from Illumina, San Diego, CA). Association analysis was performed using Merlin (http://www.sph.umich.edu/csg/abecasis/merlin/).

**Results:** 4388 subjects (315 males and 3,955 females) with a mean age of 55 years (SD 12) were included in this study. The mean spherical equivalent was -0.4 (SD 2.73) diopters (D), range -25.12 to +9.4 D. 286,481 SNPs fulfilled quality control criteria (Hardy-Weinberg equilibrium p<0.001, minor allele frequency of at least 0.04, genotyping success rate for the SNP at least 95%) and were included in analysis. Several genetic variants on chromosome 15 were associated with refractive error to high levels of statistical significance, each explaining around 1% of variance, and will be presented, with replication cohorts.

**Conclusions:** It seems likely that there are multiple genetic variants, each of small effect size, associated with refractive error, similar to other complex traits. This means large-scale meta-analyses will be required to establish the genetic basis of the high heritability of this trait.

**Support:** Wellcome Trust, NIH Grant R01EY018246-01, European Union MRTN-CT-2006-034621

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**2972 - 3:15PM**

**Genome-Wide Association Study Identifies a Locus and Candidate Gene for Refractive Errors and Myopia in the General Population**


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**Purpose:** Refractive errors are the most common ocular disorders worldwide. Myopia occurs in one third of the population, and may lead to irreversible blindness. To date, identification of common genetic variants influencing this trait has been challenging.

**Methods:** We conducted a genome-wide association study testing 2.5 million single nucleotide polymorphisms (SNP) for association with refractive error in 5,528 unrelated individuals of a Dutch population-based study using a quantitative trait loci approach. Refractive error was measured with Topcon RM-A2000 autorefractor, and analyzed as spherical equivalent. We replicated findings in four independent Caucasian cohorts (10,280 persons).

**Results:** We identified a significant association with a locus on chromosome 15. The association with the most significant SNP was P=1.78x10^-15. The minor allele of this variant increased the risk of myopia, and protected against hyperopia (OR 1.89 (95% CI 1.46, 2.45 of myopia versus hyperopia). The associated region lies proximal to a gene which is highly expressed in the retina and which regulates signal transmission.

**Conclusions:** Our findings suggest that this gene is important in the pathogenesis of refractive errors in the general population.

**Support:** The Netherlands Organisation for Scientific Research (NWO), LSBS, Blinden Penning Foundation, Winckel-Sweep Foundation, ANVVR, MD Foundation
Organizing Section: CL

3244 - A558
Patient Decision-Making in Eye Care Service Selection: Lessons From a New Model of Community-Based Eye Care Delivery
P.M. O’Connor, K. Fotis, J.E. Keeffe, Centre for Eye Research Australia, East Melbourne, Australia.

Purpose: To identify the key factors that determined patient decision-making in eye care service selection.

Methods: A new model of eye care service delivery was trialled by the Royal Victorian Eye and Ear Hospital (RVEEH) in Melbourne, Australia for patients with stable age-related macular degeneration (AMD), diabetic retinopathy (DR) and glaucoma. Eligible patients were offered the option of having on-going monitoring of their eye conditions by specific local urban and rural primary care providers (optometrists/general practitioners) rather than at the RVEEH, a tertiary hospital. Patients who used the community-based eye care were compared with those who remained at the RVEEH to determine the key factors that underpinned their respective decisions. Interviews were conducted with a sub-set of accepters and decliners. A combination of quantitative and qualitative methodologies was used.

Results: One-hundred and seventy nine eligible patients were approached to participate (meanSD age 69.9, 51.9 years; 51% female). Of these, 103 accepted, 69 declined and 7 deferred their decisions. Among those interviewed (n=46), 83% self-reported having little or no difficulties with their vision; few either sought family advice before deciding (6%) or had any concerns about attending a local practitioner (10%). Transport-related factors (36%) and personal preference (25%) dominated the reasons why some patients declined (n=49). Among interview accepters (n=37), 68% indicated that being individually approached by the RVEEH influenced their decision while 81% found it easier and substantially more timesaving to travel locally. Analysis of acceptance rates by location showed a significant association between patients’ decisions and distance (X^2=17.56; p=0.007) with higher acceptance rates evident for those located most distant from the RVEEH.

Conclusions: Transport-related factors played an important role in patient decision-making in eye care service selection. This has important implications for planning eye care service delivery and the logistics can be barriers or facilitators to service selection.

CR: P.M. O’Connor, None; K. Fotis, None; J.E. Keeffe, None.
Support: Australian Government Department of Health and Ageing; Vision CRC.

3244 - A560
Estimating Potential QALYs Gained From Low Vision Rehabilitation: An Input Into a Cost-Effectiveness Analysis
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Purpose: To estimate the potential gain in quality adjusted life years (QALYs) from low vision rehabilitation.

Methods: Part of an ongoing multicenter collaborative low vision rehabilitation outcome study, patients were asked to respond to the EuroQol EQ5D instrument prior to treatment and again after treatment. The EQ5D asks about five attributes of health: mobility, pain, anxiety, self-care, and usual activities. Each attribute is at one of three levels. The EQ5D was scored using the algorithm developed from research on respondents in the United States. The difference in EQ5D scores was used as the health utility input for the calculation of the potential gain in QALYs. Life expectancy was calculated as a function of the patients’ ages in years and months. The equation to predict life expectancy was developed by fitting a fourth-order polynomial to life tables that provided life expectancy as a function of years. Years of health utility improvement were discounted at 3% to calculate the present value of potential QALYs gained.

Results: To date, 27 patients have responded to the EQ5D both before and after treatment. The average time to response after treatment is 171 days (SD 89). Of the 27 patients, 16 experienced health utility improvements. The maximum improvement was 0.543 units. The maximum loss was 0.430 units. The average health utility change was 0.033 (SD 0.220). The average age of patients was 76.2 years (SD 15.2). The average health utility change (SD 2.229) was 0.543 units. The maximum health utility change was 11.8 years (SD 9.9). The average potential QALY gain was 0.359 (SD 2.229).

Conclusions: Given an average potential QALY gain of 0.359, low vision rehabilitation could cost an average almost $18,000 and remain “highly cost effective” if the standard used is $50,000/QALY. The estimated potential QALY gain may be somewhat optimistic as the gains from improvement in functions related to vision are not the only consideration of health utility for these patients. Eventually other conditions will affect individuals’ health utility and may decrease the gap between the utility of individuals who have experienced rehabilitation and those who have not. However, even if the gains in QALYs were reduced by half, the cost could still be $9,000 or rehabilitation to be considered cost-effective.

CR: K.D. Frick, None; R.W. Massof, None; J.E. Goldstein, None.
Support: NIH Grant EY110245; Readers Digest Foundation.

3245 - A561
Impact of the Current Economic Recession on the Ophthalmology Job Market
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Objective: To elucidate the economic drivers of the ophthalmology job market and to study the historical impact of economic recessions on the ophthalmology job market.


Results: The number of ophthalmologists who have been in an economic recession since December 2007. When this current recession’s demand data is compared to baseline there is a significant decline in demand (49.7%, p=7.34 x 10^-4). This is in contrast to the last two economic recessions (July 1990 - March 1991 recession I and March 2001-November 2001 recession II) where comparison to baseline showed no significant changes (Recession I, 93.7%, p=0.11245, Recession 2, 98.9%, p=0.682551) in the first year of recession. During these last two recessions, demand was significant reduced two (Recession I, 85.5%, p=0.011, Recession 2, 71.2%, p=0.0037) and three (Recession 1, 42.5%, p=0.00055, Recession 2, 57.8%, p=0.00028) years following the recession. Specific economic factors associated with demand for academic ophthalmologists include national research expenditure and stock market gains (p=0.0019), while demand for private practice ophthalmologists was associated with Gross Domestic Product (GDP), and discretionary healthcare expenditure (p=8.07 x 10^-4).

Conclusions: National research expenditure, stock market gains, GDP and discretionary healthcare expenditure have been associated with the ophthalmology job market. These factors tend to decline with economic recessions. Our data suggests that the current recession appears to have had a larger short-term impact on the ophthalmology job market compared to previous recessions. Given the historically lagged impact of recessions on the ophthalmology job market, the current recession’s impact on the job market may continue for a period of time.

CR: C.C. Nwanze, None; R.A. Adelman, None.
Support: None.
3246 - A562
Ophthalmology Training in Coding and Reimbursement
A. Nathan, G. Abedi, M.L. Subramanian. Ophthalmology, Boston Medical Center, Boston, MA.

Purpose: Residents across different specialties have reported that training in coding, reimbursement and practice management is under-emphasized and sometimes completely overlooked during their training. Our aim was to assess ophthalmology residents’ knowledge base and training in these topics.

Methods: Ophthalmology residents across the US were invited to complete a 22-question online survey. The web address of the survey was emailed to residency programs across the U.S. Data was gathered using anonymous, self-administered, standardized online questionnaires, which were subsequently analyzed with spreadsheet software.

Results: Fifty five residents completed the online survey. Majority of responders (86%) were from programs along the east coast, with 15 programs represented in total. Approximately 30% from each postgraduate level responded to the survey. Sixty five percent of responders have received at least one lecture on coding during residency versus 35% who had no instruction. Of those responders who received at least one lecture, none had more than 6 hours of lectures dedicated to the business aspects of Ophthalmology. Over 80% of the residents were not aware of information available on the American Academy of Ophthalmology website, and 92% of residents did not utilize the Academy website for information on new guidelines for coding. Ninety percent of respondents expressed unpreparedness or discomfort with billing by the end of their residency. Conversely, the majority of residents (96%) expressed the importance of incorporating additional training in coding and reimbursement during residency. The majority of residents were able to correctly define an ICD-9 code and National Provider Identifier, however, as the questions became more challenging, the number of correct responses decreased. Only 22% of residents could identify the criteria necessary to properly code for a consult and 22% could recognize the definition of a level 4 visit.

Conclusions: All US Ophthalmology training programs are accredited by the ACGME. However, according to the data obtained from our survey, adequate training in coding, reimbursement, and practice management appears to be lacking. This may be due to a combination of factors, such as a lack of emphasis by the ACGME or lack of adequate training programs to provide training. As a result, the majority of residents who responded to this survey feel unprepared in coding and reimbursement. Improved training in coding should therefore be incorporated in residency training programs.

CR: A. Nathan, None; G. Abedi, None; M.L. Subramanian, None.
Support: None.

3248 - A564
Patient Waiting Times in an Academic Urban versus Suburban Ophthalmology Clinic
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Purpose: To determine factors for delay in urban and suburban ophthalmology clinics at Boston Medical Center. As waiting time (WT) is a significant barrier to follow-up care, this analysis aims to identify modifiable factors in unnecessary WT.

Methods: A time-flow sheet documenting key points during a patient visit (e.g. registration time, time patient seen by MD and notation of delay factors) and notation of delay factors (e.g. physical disability, need for interpreter) was placed in the patient chart and populated by technicians, residents, and attendings. Flow sheets were collected and tabulated to calculate prevalence of delay factors and time values including total WT. Data was analyzed using descriptive statistics and two tailed unpaired t-tests. IRB exemption was obtained prior to conducting the study as the time-flow sheets contain no patient identifiers.

Results: 255 urban and 260 suburban patient encounters were examined. Total WT averaged 70 minutes for urban visits vs. 55 minutes for suburban visits (P < .001). Average total appointment time for urban encounters was 85 minutes versus 70 minutes for suburban appointments (P < .001). Potential delays during urban clinic visits included: 14.9% language interpretation, 9% patient physical disability, 1.6% shortage of technicians, 1.6% shortage of equipment, and 11.4% “other” sources. The most common “other” delay was a missing chart. Suburban sources of delay included: 0.8% language interpretation, 4.6% patient physical disability, and 3.9% “other” sources. Residents were involved in 14.1% of urban and 5% of suburban visits.

Conclusions: Patients experienced increased waiting and overall appointment times in the urban clinics as compared to suburban clinics. This may be explained by delays due to interpretation requirements, shortage of lanes, shortage of equipment, patient physical disability, loss of paper charts, and resident participation. The WT may potentially be reduced by increasing availability of interpreter services, lanes, and equipment; improving access for disabled patients; and implementing an electronic medical records system. Scheduling patterns may also play a significant role in WT, but this was not evaluated in this study.

CR: N.N. Shah, None; S. Agarwal, None; M.A. Desai, None.
Support: None.

3247 - A563
Comparison of Health-Related and Vision-Related Quality of Life in a Low Vision Patient Sample
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Purpose: This study investigates the relationships between vision and health in terms of previously validated health utility measures. Additionally, it compares patient-based and community-based evaluations of health state. It evaluates the role the comorbidities play in how low vision patients rate their quality of life. Understanding the relationship between health-related quality of life (HRQol) and vision-related quality of life (VRQol) will more accurately define the true utility of ophthalmologic and rehabilitative intervention.

Methods: Telephone interviews of Wilmer low vision patients were conducted over 2 phone calls, separated by a minimum of one week. One phone call included vision-related surveys; the other included health-related surveys. The surveys used were the Time Trade Off (TTO) and Standard Gamble (SG) as they relate to both vision and health and the EQ-5D. Chart review was completed to identify comorbidities, visual acuity, visual fields, contrast sensitivity and ocular diagnoses.

Results: Utilities were measured in 38 low vision patients. The EQ-5D is essentially constant for all patients surveyed with a mean of .77 and minimal variance from the mean (SD=.12). In contrast, both the SG and TTO health utilities showed a broad distribution of responses. The EQ-SDI did not correlate with either the SG (r=.016, p=.17) or TTO (r=.017, p=.36). SG and TTO are moderately correlated with a bivariate regression line not significantly different from the identity line for both health (r=.66, m=.96, b=0.1) and vision (r=.45, m=1.15, b=-.05). There are strong correlations when comparing SG vision to SG health (r=.77, m=-.86, b=-.18) and TTO vision to TTO health (r=.70, m=.72, b=28).

Conclusions: The data support the hypothesis that SG and TTO measure the same utility construct, both for vision and for overall health in low vision patients, but reliability of the estimates is weak. The results agree with previous studies that compared vision-specific and health utilities, in that health utilities are less than or equal to vision utilities. Utilities estimated from EQ-5D response show minimal variation in the low vision patient sample and, more important to the interpretation of these indices, do not correlate with either the TTO or SG health utility for low vision patients.

CR: A. Malkin, None; J. Goldstein, None; R.W. Massof, None.
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3249 - A565
Cataract Prevalence and Surgery Burden in Rural Beijing: A Report from Screening and Rehabilitation Project of Cataract
L. Xu, Q. Liang, S. Wang. Beijing Institute of Ophthalmology, Beijing Tongren Hospital, Capital Medical University, Beijing, China.

Purpose: To investigate the prevalence and surgery burden of 3,500,000 rural citizens in greater Beijing.

Methods: A cross-sectional screening in high risk populations with multi-layer methods. A preliminary visual acuity (VA) test within village was held as the first step. VA was examined in all local residents with age ≥ 55 years by local health careers who had been trained beforehand. Those with habitual VA <0.3 in either eye were transferred to the local centers to have further eye examinations including both corneal and fundus digital photography. All the photos were transferred to reading center via internet and experienced ophthalmologists with established criteria for cataract surgery. An evaluation based on the optic nerve head and peripapillary vessel visualizations was used to grade cataract and identify cataract surgery.

Results: A total of 669,896 people out of the 350,000 residents were eligible: 562,788 were examined with a participating rate of 84.6%. Within them, 35.1% had mild or moderate cataract, 14.2% were identified to be in the need of phacoemulsification, and 8.8% were pseudophakia. So far, 291 eligible patients got extra-capsular cataract extraction and intraocular lens implantation surgeries, 70% of which had a visual acuity ≥ 0.5 post operations.

Conclusions: The multi-layer screening in high risk population increased the coverage of cataract identification and the cataract surgical rate. A large imaging database set would be helpful to further eye care. It is a cost-effective way for blindness prevention in rural areas in China, where primary care is not developed.

CR: L. Xu, None; Q. Liang, None; S. Wang, None.
Support: Beijing municipal health bureau

**Note:** This is a placeholder for the actual image content.
A 98-item computer-based health survey was administered in American adults. A total of 339 individuals were surveyed. Mean age was 46.4 years (sd = 0.13, p = 0.75). The aim of this study is to identify practices of self-medication in the Deaf community, a language minority with limited access to healthcare services and health information, and for whom vision is central to communication.

Methods: We conducted a retrospective review of Medicare data (1997-2007) to identify trends in the utilization of various ophthalmic tests. We accessed the Medicare data through the American Medical Association 2009 Resource Based Relative Value Code Data Manager. We collected utilization data for the following nine imaging and diagnostic modalities/CPT codes: optical coherence topography (OCT, 92135), fluorescein angiography (FA, 92235), indocyanine green angiography (ICG, 92240), fundus photography (92250), external slit lamp photography (92285), endothelial cell count (92286), extended visual field examinations (VF, 92003), electroretinography (ERG, 92275), and B-scans (76512). We also collected data on the number of Medicare beneficiaries per year for 1997-2007.

Results: There was in increase in the utilization of the majority of imaging and diagnostic modalities over the 1-year period, with the exception of ERG and endothelial cell count microscopy, which both decreased (Figure 1). The most notable increase in utilization was seen with OCT, which had an astounding 54-fold increase in Medicare claims between 1997 and 2007. Of note, although there was a 12.7% increase in Medicare beneficiaries between 1997 and 2007, there was a 181% increase in the number of tests ordered during that same time period.

Conclusions: Based on Medicare data from 1997-2007, there has been an increased utilization of imaging and diagnostic modalities for the evaluation and treatment of ocular conditions. There was also an increase in the number of Medicare beneficiaries from 1997-2007; however the increase in beneficiaries was not commensurate with the increased use of ophthalmic tests. The shift towards more frequent use of ophthalmic imaging and diagnostic modalities may be explained by a number of medical and socioeconomic factors.

CR: M.E. Collins, None; W.L. Rich, III; None; M.A. Grassi, None.
Support: None.
3254 - A570
Vision in the Global Evaluation of the Frail Elderly Individual Hospitalized Following a Fall

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Purpose: Falls are common in frail elderly individuals and may have dramatic consequences. They are associated with increased mortality, morbidity, functional loss and early institutionalization. The management of falls in short term geriatric assessment units (GAU) is interdisciplinary in nature and should include an evaluation of visual function. Our objective was to verify if vision is considered in the global evaluation of elderly individuals admitted in a GAU following a fall.

Methods: We reviewed the clinical charts of 80 elderly individuals (Mean ± SD: 82.3 ± 6.2 yrs) hospitalized in university based GAUs after a fall as well as 80 age- and sex-matched (81.4 ± 6.5 yrs) controls hospitalized within the same period of time but without a history of falls. All pertinent data were extracted from the clinical charts and entered in FileMaker Pro and Excel softwares for analysis.

Results: Most falls were non-accidental (n= 74) and were multifactorial (n= 64). Cases were taking more anti-arythmic agents (p= 0.015) and antidepressants (p= 0.023) but less calcium channel blockers (p= 0.038) than controls. The medical history indicated that the cases were more likely to have cataracts (n= 19 vs 6; p= 0.004), age-related macular degeneration (n= 8 vs 2; p= 0.048) and decreased visual acuity (n= 26 vs 14; p= 0.025). The cases were referred more often than controls for an eye examination (n= 29 vs 14; p= 0.004).

Conclusions: Our results indicate that even though patients with a history of falls are referred more often than controls for an eye examination, their vision is not evaluated systematically despite the recommendations of the American and British Geriatric Societies. These data indicate that eye care professionals should work more closely with the medical team to improve the overall clinical care of elderly individuals with a history of falls.

CR: H. Kergoat, None; T. Boutin, None; M.-J. Kergoat, None; J. Latour, None; F. Massoud, None.
Support: IUGM-CAREC and IRSC grants
The SCORE Study primary outcome papers demonstrated only weak and negative correlation between changes from baseline in center point thickness (CPT) by optical coherence tomography and contemporaneous changes in visual acuity letter score (VA) by the electronic Early Treatment Diabetic Retinopathy Study (E-ETDRS).

We now investigate associations between CPT and subsequent VA.

Methods: The SCORE Study evaluated intravitreal triamcinolone injection(s) (1mg or 4mg) versus standard care for vision loss associated with macular edema secondary to central or branch retinal vein occlusion (CRVO or BRVO). VA and CPT were measured at baseline and at 4-month intervals through Month 36. Auto- and cross-correlations and ordinary least squares were used to identify significant relationships between non-contemporaneous CPT and VA. Family-wide type I error was controlled by Hochberg’s method.

Results: Over 90% of the correlations between non-contemporaneous CPT and VA changes are negative, many significantly so even after Hochberg adjustment. In BRVO, there are more Hochberg-significant correlations between VA and prior CPT changes than between contemporaneous VA and CPT changes. The correlation between early and later VA changes typically exceeds in magnitude the corresponding correlation between early VA and later CPT changes. However, autocorrelations of changes in CPT and changes in VA are much larger. In a regression to predict VA, lagged VA measurements were important predictors, but not lagged CPT. Using prior VA reduces root mean square prediction error of VA by 20–60%, while adding prior CPT reduces prediction error by less than 5–6%.

Conclusions: There is a weakly predictive relation between current CPT and VA four months later, but a far better predictor is current VA.

Support: None; M. S. Ip, None; I. U. Scott, None; P. C. Van Velthuisen, None; B. A. Blodi, None.

The EMMES Corporation, Rockville, MD; University of Wisconsin, Madison, WI; Ophthalmology and Public Health Sciences, Penn State College of Medicine, Hershey, PA.

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3536 - A79

The Artery Order of Arteriovenous Crossing and Branch Retinal Vein Occlusion Q. Liang, D.T. Weng. *Ophthalmology, St Michael's Hospital, Toronto, ON, Canada; †Ophthalmology, Univ of Toronto/St Michael Hosp, Toronto, ON, Canada.

Purpose: By reviewing a large group of Branch Retinal Vein Occlusion (BRVO) images, the arteriovenous (AV) crossings formed by the first-order artery were identified at the majority of the occlusion sites. This study was to investigate how the number and proportion of the AV crossings formed by different orders of arteries related to BRVO.

Methods: A case-control study was done on the fundus images of 266 BRVO eyes (249 patients) taken in our tertiary retina center in a 5-year period. All BRVO AV crossings (266) were in temporal quadrants and served as study group. The corresponding crossings which had the same order of the vein as the study crossings were selected on the opposite temporal arcade in study eyes as control group 1 (249 crossings) and on the same arcade in fellow eyes as control group 2 (236 crossings). The number and percentage of the AV crossings with different artery orders were compared between the study group and 2 control groups respectively.

Results: There were 99% first-order AV crossings in the study group, significantly more than 60% in control group 1 (P<0.001) and 54% in control group 2 (P<0.001). There was no statistically significant difference between 2 control groups. There were 11% second-order-artery crossings in the study group and nearly 85% of these crossings were within 1/2 disc diameter (DD) to its originated bifurcation from the first-order artery. There were 16% and 14% second-order-artery crossings of the same type in control groups 1 and 2. There were no statistically significant differences in all second-order-artery comparisons.

Conclusions: This study showed that the majority of BRVO crossings were formed by the first-order artery. It is suggesting that the first-order artery crossing probably plays a more important role and has higher risk than the AV crossings with lower artery orders in BRVO. Further study will be necessary to confirm this finding.

Support: None
3357 - A80
Associations of Retina Microvascular Changes and Systemic Risk Factors of Acute Stroke: Subgroup Analysis
S. Song, S. Cho. Ophthalmology, Kangbuk Samsung Hospital, Seoul, Republic of Korea.

Purpose: To investigate the associations of retina microvascular changes (including retina vessel caliber, retina vessel emboli and retinopathy) with systemic vascular risk factors in acute stroke patients.

Methods: Consecutive 83 patients who were diagnosed as acute cerebral stroke with brain MRI at Neurology department at Kangbuk Samsung Hospital in Seoul, Korea from May, 2008 to April, 2009 were included. Retinal vascular caliber measurements were performed using a computer-assisted program, and central retinal artery equivalent (CRAE) and central retinal vein equivalent (CRVE) were summarized as indices of the average retinal arteriolar and venular diameters of the eye. The presence of retina vessel emboli or retinopathy was diagnosed by retina photographs. All patients underwent clinical and laboratory examinations. Systemic risk factors of stroke assessed included hyperlipidemia, history of cardiac disease, history of smoking or hypertension, and diabetes. The subgroup analysis of acute stroke was done according to TOAST classification.

Results: The mean age of patients was 66 years and 42 (51%) patients were male. Retina emboli and vein occlusion and retina hemorrhages were found in 16 patients (19.6%). The mean central retinal artery equivalent was 127±18.5μm and the mean central retinal vein equivalent was 195±27.3μm. Retina emboli, vein occlusion and retina hemorrhage, CRAE, and CRVE did not have associations with any systemic risk factors of stroke (p>0.05). In subgroup analysis of stroke, after adjusting for age, gender, hypertension, diabetes, cardiac disease, hyperlipidemia, and smoking, cardioembolic stroke was associated with presence of cardiac disease (5.38;CI:1.23-23.49).

Conclusions: Retina microvascular characteristics did not differ between subgroup analysis of stroke. Our findings suggest that the pathogenesis of stroke may have different mechanism when compared to microvascular disease in retina.

CR: S. Song. None; S. Cho. None.
Support: None

3359 - A82
Ethnic Variations in Vogt-Koyanagi-Harada Disease Presentation
R.M. Wainess1, L. Dustin2, N.A. Rao1. International VKH Study Group. Doheny Eye Center, Los Angeles, CA; Ophthalmology, Doheny Eye Institute, Los Angeles, CA.

Purpose: Vogt-Koyanagi-Harada (VKH) is a multisystem disease with a complex set of diagnostic criteria. However, there is high associations of exudative retinal detachment in acute VKH and sunset glow fundus in chronic VKH. In this study, an attempt is made to characterize variations in VKH presentations based on geographic and ethnic factors.

Methods: Data from 1147 patients with bilateral uveitis from 10 centers around the world was collected prospectively. These patients were analyzed using a standardized matrix to diagnose VKH based on currently accepted clinical features. Data was analyzed to identify most common presenting features of VKH. The data was also stratified by geographic and ethnic factors to evaluate variation in VKH clinical features among patients.

Results: Among 1147 patients, 180 were diagnosed with VKH disease. In diagnosing chronic VKH, there was a higher predictive value of sunset glow fundus in the Hispanic (IPP 99.3, NPP 76.9) and Asian groups (IPP 98.0, NPP 91.3) vs. Caucasian patients (IPP 77.8, NPP 97.0). The presence of VKH, the associations of nummular scars with sunset glow fundus versus those without sunset glow fundus were more pronounced in the Hispanic patients (90.5% vs. 11.1%, p<.001) as compared with the Asian patients (53.2% vs. 22.2%, p<.001) and the Caucasian patients (78.6% vs. 55.6%, p<.036).

Conclusions: Sunset glow fundus has higher predictive values in Asian and Hispanic than Caucasian patients but can still be used to make the diagnosis of VKH in many cases. Nummular scars were more likely to correlate to sunset glow fundus in Hispanic patients vs. Asian and Caucasian patients. Better understanding these ethnic variations will lead to improved diagnosis.

Support: NIH core grant EY 2040

3538 - A81
Foveal and Extra-Foveal Symptomatic Retinal Arterial Macroaneurysms: Therapeutic Options and Outcome

Purpose: There is no consensus on treatment of symptomatic retinal arterial macroaneurysms (SRAM). We evaluated the outcome of different therapeutic approaches.

Methods: Thirty-five patients with SRAM were studied retrospectively. All patients visited our clinic with SRAM between 2006 and 2009. They underwent complete ophthalmic examination, including Snellen best corrected visual acuity (BCVA), fluorescein angiography and OCT. Treatment was only initiated in SRAM patients with macular edema or submacular hemorrhage. Photocoagulation by green laser was used to try to cause of leakage with macular edema. A pars plana vitrectomy (PPV) with recombinant tissue-plasminogen activator (rt-PA) was performed for submacular hemorrhage.

Results: Thirty-five eyes in 30 women and 5 men with an average age of 80 years (55-96 years) were studied. Twenty patients presented with SRAM in the posterior pole outside of the fovea (12 superior, 8 inferior). Fifteen patients had SRAM within 2 disc diameters of the centre of the fovea. In 11 patients no treatment was initiated, 20 patients underwent laser, and 4 PPV with rt-PA. In the extra foveal SRAM group, mean BCVA changed from 0.41 (hand movements to 0.9) o.63 after treatment. In the foveal SRAM group, BCVA changed from 0.19 to 0.24 post treatment. The BCVA in patients who received rt-PA before treatment was 0.24 and after treatment 0.22. In patients who underwent laser the BCVA before treatment was 0.27 and after ARLA laser 0.53. In patients who did not receive treatment BCVA at time of symptoms was 0.45 and after follow-up 0.43.

Conclusions: SRAM is predominantly found in women in the superior extra-foveal area. Macular edema caused by SRAM responds well to treatment with photocoagulation. Visual prognosis of SRAM associated with submacular hemorrhage is definitely worse. Subretinal rt-PA injection seems to preserve vision in these patients.

CR: S. Yzer. None; J.P. Martinez Ciriano. None; L. van den Born. None; G.S. Baarsma. None; M. Veckeneer. None; T. Missotten. None.
Support: None

3540 - A83
Pregnancy and Diabetic Retinopathy: A Meta-Analysis
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Purpose: To examine the incidence of diabetic retinopathy progression in diabetic pregnancies in the current literature.

Methods: A meta-analysis of all Medline articles about pregnancy and diabetic retinopathy was performed, using search strategy of “diabetic retinopathy AND pregnancy,” for the years of 1991-2009. The investigators reviewed these abstracts and reviewed articles that met the inclusion criteria of data available about diabetic retinopathy classification and type of diabetes in pregnancy.

Results: 16 articles revealed 1666 diabetic pregnant patients: 1290 IDDM, 164 NIDDM, 202 type DM unknown. Avg age=28.5yrs±4.9. Avg HbA1c prepartum=7.6±2.6. A subgroup of 455 IDDM patients had defined levels of retinopathy. Prepartum: 263 without retinopathy(NDR), 174 Non Proliferative Diabetic Retinopathy(NPDR), and 18 Proliferative Diabetic Retinopathy(PDR). During the pregnancy, 47 patients (10.3%) developed NPDR, 43 patients (9.5%) developed PDR postpartum. Total of 90 patients of the 455 patients (19.8%) had worsening diabetic retinopathy.

Conclusions: This meta-analysis shows that approximately 20% percent of patients have worsening retinopathy. Most of the study patients are Type 1 DM and the classification of the progression of diabetic retinopathy has not been standardized in the non-ophthalmic literature. Thus, in the future, more work is needed to document the progression of diabetic retinopathy in pregnant diabetics, using modern imaging techniques and standardized diabetic retinopathy classification.

CR: B. Ha; None; J. Trang; None; J. Song; None; G. Wu. None.
Support: None
Non-mydriatic near-infrared retinal images of 70 volunteers were taken with the Heidelberg Spectralis SLO and Indiana University’s Laser Scanning Digital Camera (LSDC). Inclusion criteria were that images were taken with both devices during summer 2009 and that the patient is diabetic or has macular pathology in at least one eye that is documented in available eye exam charts. These criteria resulted in 28 study subjects, with an average age of 61±12 years. The pathology in each subject eye was categorized by 27 common retinal lesions, which were then classified into 1 of 4 referral periods for the next recommended eye exam. Five graders familiar with Spectralis images marked the perceived lesions (forced-choice), with randomized image sets grouped by eye using the same binomial type labeling was performed on macula-centered images taken with both the Spectralis (one 30° field) and with the LSDC (one 36° field), and then a 3 field LSDC set was graded at the end of the session. Based on the patient charts and referral classification, 8, 11, 7, and 30 eyes required referrals of 2-4 days, 1 month, 3 months, and 1 year, respectively. Graders considered minimal subjective images prior to grading, and the image sets included some images with subtle lesions and images of inferior quality. These factors caused greater referral disagreement between the graders and the charts, and indicated grader preferences toward some pathology categories. These perceived referral grading criteria were compensated for by calculating the positive predictive value (PPV) for each category based on the Spectralis and chart grading data. A 100 iteration Monte-Carlo simulation overturned some pathology decisions according to a PPV probability and reclassified the referrals.

Results: After compensation using Spectralis data, the overall referral agreement between the graders and charts, measured by the mean κ-value, showed a statistically significant improvement of >30% for each LSDC data set. Conclusions: Benchmarking and compensating for the imaging grading criteria of graders will provide greater reliability and standardization in referral decisions and will allow for more targeted telemedicine training development.

CR: M.S. Muller, Aeon Imaging, LLC, E; IURTC, P; A.E. Elsner, Aeon Imaging, LLC, I; IURTC, P; D.A. VanNasdale, None; V. Malinovsky, None; T.D. Peabody, None; M. Miura, None; A. Weber, None; A. Remky, None; K. Montealegre, None; N. Dolbee, None. Support: NIH Grants E1020017 (to MSM) and EB002346 (to AEE).

Barrier to Eye Care for Patients With Diabetes in the Greater New Haven Area


Purpose: Conventional risk factors for retinal vein occlusion (RVO) are well established through large epidemiologic studies, but some associated conditions are not totally considered.

Methods: Prospective observational study. Patients with RVO were compared to age- and sex-matched control through a questionnaire fulfilled between January and October 2010. Controls were recruited among healthy patients who underwent cataract surgery.

Results: 61 patients, including 42 central retinal vein occlusions (CRVO) and 19 branch vein occlusions (BRVO), and 118 controls were included. Patients and controls were similarly distributed by age and gender. Out of the CRVO patients, 77% discovered visual loss upon awakening, in contrast to 33% of BRVO patients. The onset of RVO was regularly distributed throughout the year, with a slight predominance for the months of May, September, October and December. The comparison between RVO and controls displayed a higher proportion in the RVO group for in order of the higher risk: migraine headache (CRVO: 21%, BRVO: 47%, controls: 15%, p=0.008), hypertension (CRVO: 52%, BRVO: 63%, controls: 37%, p=0.012), glaucoma (CRVO: 33%, BRVO: 22%, controls: 16%, p=0.034), antiaggregant or anticoagulant medication (CRVO: 42%, BRVO: 33%, p=0.002), hyperlipidemia (CRVO: 52%, BRVO: 63%, controls: 37%, p=0.012), glaucoma (CRVO: 33%, BRVO: 22%, controls: 16%, p=0.034), antiaggregant or anticoagulant medication (CRVO: 42%, BRVO: 33%, p=0.002).

Conclusions: In addition to the already known risk factors, this study underlines some underlying conditions or circumstances to the onset of RVO, such as migraine. In CRVO, ¾ of the patients in average discovered visual loss upon awakening, which may increase that nocturnal events may play a significant role in the pathogenesis of the occlusion. Conversely, the possible role of stress or dehydration or vasodilators is not confirmed.

CR: A. Glacet-Bernard, None; J. Tilleul, None; G.J. Coscas, None; G. Soubrane, None; E.H. Souied, None. Support: None.

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CR: A. Glacet-Bernard, None; J. Tilleul, None; G.J. Coscas, None; G. Soubrane, None; E.H. Souied, None. Support: None.
Lack of physical activity (PA) is a well-known risk factor for cardiovascular disease. We have described the first reported cases of bilateral CHRRPE with AR.

To analyse the age of typical visual symptoms (VS) onset in inherited retinal diseases. Recently, it has been shown that time in sedentary behaviors has deleterious associations with biomarkers of cardiovascular health. This study examines the associations of PA and television (TV) viewing time with retinal vascular caliber and explores the differences in this association in 4 racial groups (White, Black, Hispanic, and Chinese).

Methods: 676 adults aged 45 to 84 years from six U.S. communities were evaluated in the Multi-Ethnic Study of Atherosclerosis, a population-based cross-sectional study.

Purpose: Lack of physical activity (PA) is a well-known risk factor for cardiovascular disease. Previous studies have shown that time in sedentary behaviors has deleterious associations with biomarkers of cardiovascular health. This study examines the associations of PA and television (TV) viewing time with retinal vascular caliber and explores the differences in this association in 4 racial groups (White, Black, Hispanic, and Chinese).

Results: To date, no detailed clinicopathological description of bilateral CHRRPE with AR has been published. We describe the first reported cases of bilateral CHRRPE with AR.

Conclusions: Our results show an association of lack of PA and greater TV viewing time with wider retinal venular calibers, independent of other cardiovascular risk factors. Further longitudinal studies are needed to confirm these associations and explore ethnic differences.

CR: None. Support: None. R.C. Hester, None; B.J. Lujan, Carl Zeiss Meditec, Inc.; F.A.D. Fu, None.

Support: Lions Eye Foundation and California Pacific Medical Center Ophthalmic Diagnostic Center

3546 - A91

Age of Visual Symptoms Onset in Different Types of Inherited Retinal Degenerations

E. Prokofyeva, E. Treager, R. Wilke, E. Zrenner. Institute for Ophthalmic Research, University of Tuebingen, Tuebingen, Germany; Biomedical Engineering, University of New South Wales, Sydney, Australia.

Purpose: To analyse the age of typical visual symptoms (VS) onset in inherited retinal degenerations (IRD) for early diagnosis of IRD.

Methods: The study had a cross-sectional design and included patients with clinically obvious Stargardt disease, cone dystrophies (CRD), cone-rod dystrophies (CRD), cone dystrophies (CD), choroideremia, macular dystrophies (MD), Usher Syndrome (USH) I and II, Leber congenital amaurosis (LCA), Bardet-Biedl syndrome (BBS), and central areolar choroidal dystrophy (CADC), seen in the University Eye Hospital, Tuebingen from 2005 to 2008. Age at visual acuity (VA) decrease, night blindness (NB), phosphenia, and visual field defects (VF) onset; best corrected VA (BCVA) from the Optos UK, and type of VF defects at first visit were analysed. The study was designed according to the 1996 Declaration of Helsinki.

Results: The final dataset included 250 patients (149 males and 101 females). For the study group 354 patients (172 boys and 182 girls) with IRD were studied: Stargardt disease (69), CRD (66), CACD (37), choroideremia (21), BBS (20), LCA (15), MD (13), CADC (7), simple (6), X-linked (4), autosomal dominant (30), autosomal recessive RP (27), and RP of non-specified inheritance (119). Mean age of the patients was 43.5 ± 18.3 years old. A comparison of age of typical VS and NB onset in IRD is shown in figures (a-d). In 117 patients 0.3 = BCVA ≤0.5, in 182 patients 0.5 ≤BCVA ≤1.0, 57 patients had BCVA ≤1.0, and 31 patients with 1.3 ≤BCVA ≤1.6, 6 patients had BCVA ≤1.8. A combination of peripheral and central VF defects was noted in RP and CRD.

Conclusions: A majority of IRD patients retained good BCVA. Patients with RP and CRD had mixed central and peripheral VA. Those with CRD and CD had early photophobia and VA decrease onset. Patients with X-linked RP and RP of non-specified inheritance had earlier VA decrease and VF defects onset in comparison with other RP types. The age of typical symptoms onset is a reliable indicator for the early differential diagnosis of IRD.

CR: E. Prokofyeva, None; E. Treager, None; R. Wilke, None; E. Zrenner, None.

3550 - A93
Neural Network Algorithms for a Device to Measure Macular Visual Sensitivity
Ophthalmology, LSU Eye Center, New Orleans, LA; Private Practice, Virginia Beach, VA; EyeCare 20/20, Slide,ll, LA; Institute of Vision and Optics, University of Crete, Heraklion, Greece; Fondazione GB Bietti-IRCCS, Rome, Italy.

Purpose: The MAIA macular integrity assessment device (CenterVue, SpA; Padova, Italy) measures visual sensitivity and fixation stability using 61 or 37 Goldmann-style stimulus points within a 10° meridional grid. Evaluation of average visual sensitivity in decibels (dB) for age-related macular degeneration (AMD) indicated a statistically significant difference compared to normal eyes. However, overlapping distributions reduced screening sensitivity, plus the use of an average stimulus value may hide early disease. The current study explored the use of artificial neural networks (NN) to evaluate individual MAIA stimulus values combined with summary statistics for the purpose of AMD screening.

Methods: A total of 813 eyes (68 normal and 319 AMD) from subjects 21 to 92 years old were selected at 75 test sites. Initial screening for AMD was performed by human experts using traditional clinical methods that did not include MAIA results. Randomly selected eyes were then used to build an NN training set composed of 20% of the data, while a test set was composed of 100% of the data. Two screening methods were compared. The Full Grid method used all stimulus values, the average stimulus value, the number of points less than 24 dB (K-value), and the age, and the percentage of fixation points within a 1° and 2° area (P1 & P2) as NN inputs. The Sparse Grid method consisted of the average stimulus value and P1 and P2 as NN inputs. False Positive (FP), False Negative (FN), True Positive (TP) and True Negative (TN) results were tabulated based on the test set results. Suspect cases were defined as those with sensitivity values within 30% or 8% of being missed.

Results: The Full Grid method produced 18 FP, 21 FN, 269 TP and 463 TN resulting in 92.8% sensitivity, 96.3% specificity and 5% suspects (28 AMD and 13 normals). The Sparse Grid method produced 7 FP, 34 FN, 271 TP and 484 TN resulting in 88.8% sensitivity, 96.6% specificity and 2% suspects (13 AMD cases and 3 normals).

Conclusions: The Sparse Grid method had 4% reduced sensitivity compared to the Full grid method, but higher specificity and fewer suspects. The Full Grid method had high sensitivity and specificity with the added assurance of more complete macular testing, but required significantly more time.

3551 - A94
Tuberous Sclerosis Complex: Characterization of Ocular Manifestations and Correlations With Systemic Disease
Cleveland Clinic, Cleveland, OH.

Purpose: Tuberous sclerosis complex (TSC) is an autosomal dominantly inherited disease characterized by seizures, mental retardation, and hamartomas involving multiple organ systems. In this study, the occurrence rate and detailed features of retinal astrocytic hamartoma (AH) are described. Additionally, the presence and severity of systemic disease is reported.

Methods: 132 patients enrolled in the Cleveland Clinic TSC program were prospectively evaluated. A total of 99 patients had definite TSC (198 Tubersclerosis Alliance Revised Diagnostic Criteria) and were included in statistical analysis. Complete ocular examination, systemic associations (neurologic, dermatologic, renal, pulmonary, and cardiac), and genetic testing were analyzed.

Results: The study population included 49 males and 50 females with an average age at TSC diagnosis of 9 years (range: birth - 53 years). Ocular examination was completed for all patients at an average age of 15 years (range: birth - 73 years). Retinal AH was detected in 36% patients (n = 29). Lesions were bilateral in 45% (n = 13) and multiple in 38% (n = 11) of these cases. In patients with multiple AH, an average of 4 (range: 2 - 7) lesions were observed. Average lesion size was 1.0 disc diameter (range: 0.25 - 2 disc diameters). The most common location was along the arcades (41%) followed by the retinal periphery (33%) and adjacent to the optic nerve (27%). In nearly all cases of AH, best corrected visual acuity was normal (average visual acuity = 0.12 logMAR; corresponding to approximately 20/25 Snellen). Genetic testing for TSC 1 and TSC 2 mutations was performed in 45% (n = 13) of patients with AH. Of these, 92% (n = 12) had mutations. TSC 2 mutations were observed 3 times more frequently in patients with AH compared to TSC 1 mutations. A history of seizures was reported in 83% (n = 82) of patients. A variable degree of cognitive impairment, ranging from mild developmental delay to severe mental retardation was present in 61% (n = 60) of patients. The most commonly observed major diagnostic criteria were cortical tubers in 87% (n = 86), more than 3 hypomelanotic macules in 75% (n = 74), subependymal nodules in 71% (n = 70), and facial angiofibromas in 61% (n = 60) of patients.

Conclusions: Patients with TSC have TSC 2 mutations in 92% of cases. These lesions rarely cause visual disability. Patients with AH are more likely to have TSC 2 mutations.

CR: M. Turell, None; E.I. Traboulsi, None; A. Gupta, None; A.D. Singh, None.
Support: Supported by an unrestricted grant from Research to Prevent Blindness

3552 - A95
Intraretinal Crystals: A Frequent Phenomenon Associated With Intramural Tumour-like Lesions
Department of Ophthalmology, Cleveland Clinic, Cleveland, OH.

Purpose: To characterize intraretinal crystalline deposits in a large cohort of type 1 diabetic retinopathy (DTR) patients with and without intramural tumour-like lesions (IMT).

Methods: Retinal crystals were selected from the MacTel study, an international multi-centre prospective study of IMT. Grading of stereoscopic 30° colour fundus (CF), blue light reflectance (BLR), red-free (RF) and infrared (IR) images was performed according to the MacTel protocol and staged using Gass and Blodi classifications, including associations with potential risk factors and best-corrected visual acuity (BCVA) were examined.

Results: Out of 308 patients enrolled in the MacTel study, 133 patients (43%) showed crystalline deposits; 71% were bilateral. Mean age of those with crystals was 61 years (SD = 8 years), 6% were female, 76% Caucasian, 33% had a history of diabetes. None of these clinical factors were significantly different from the full MacTel cohort. Crystals were present at all stages of the disease, most frequently in stages 3 (38%) and 4 (48%). The mean follow up period was 2 years (range 0-3 years). In 96% of the eyes studied, crystals were only seen once and were detectable also at subsequent visits. Mean BCVA was 20/32 in the better eye and 20/50 in the worse eye; again, this was not significantly different from the full cohort. In 12 cases crystals were detectable in IR images as well as in other modalities.

Conclusions: Intraretinal crystals are a frequent phenomenon associated with DTR and their appearance at all stages of the disease, without direct association with worse vision or different vascular risk factors. These crystals appear in all imaging modalities, which raises questions about their biochemical properties and composition.

CR: I. Leung, None; U.E. Wolf-Schnurrbusch, None; A.D. Singh, M. Turell, None; P. Teto, None.
Support: MacTel

3553 - A96
Incidence of Sight Threatening Proliferative Sickle Retinopathy in a Cohort of Patients With Sickle Cell Disease in South East London
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Purpose: To establish patterns of presentation and the incidence of treatable sickle retinopathy in patients with sickle cell disease.

Methods: Patients aged above 16 years with sickle cell disease (genotypes SS, SC, SDR) were included in this study. Ocular examination were performed during their haematology visit in the period between October 2008 and August 2009. Patients with ocular symptoms referred to eye outpatients and eye casualty were also included. Examination included Snellen visual acuity, slit lamp examination of the anterior segment and dilated fundus examination.

Results: 471 patients were registered with sickle haemoglobinopathy (genotypes SS, SC, SDB) at St Thomas’ hospital. Over a 10 month period 144 of these patients attended the haematology clinic and were reviewed prospectively. An additional 51 patients were referred from retrospective review of notes of patients attending eye clinic prior to and during this 10 month period. Thus 193 cases were reviewed by an ophthalmologist. Age ranged 17-73 (Mean age 36). Male to female ratio was 1:1.5. 23% (44/193) had no retinopathy, 27% (53/193) had non-proliferative sickle retinopathy, 28% (55/193) had stage 1-5 proliferative sickle retinopathy (Goldberg classification), and 17% (33/193) had stage 4-5 including resolved vitreous haemorrhage (VH) and stable or previously treated retinal detachment (RD). 127 patients were asymptomatic and 66 patients were symptomatic. Symptoms included: reduced vision - 49 patients; distortion - 2 patients; floaters - 7 patients; headache; nausea - 1 patient (papilloedema due to benign intracranial hypertension); epiphora/discharge-2. Causes of reduced vision included: acute loss of vision due to RD; loss of vision following previously treated RD; low grade VH; 2 previous incisional vitrectomy; 1, previous CRAO; 1, glaucoma-1, other-38 patients. Only one patient required treatment for sickle retinopathy. She presented with sudden loss of vision and underwent surgery for tractional rhegmatogenous RD secondary to stage 3 PVR. One asymptomatic patient underwent prophylactic laser retinopexy for a small retinal tractional retinal detachment. Thus, 61/193 (32%) patients were seen as those with equivocal outputs (within 10% or 8% of being misgraded). In 92.8% sensitivity, 96.3% specificity and 5% suspects (28 AMD and 13 normals). The Sparse Grid method produced 7 FP, 34 FN, 271 TP and 484 TN resulting in 88.8% sensitivity, 96.6% specificity and 2% suspects (13 AMD cases and 3 normals).

Conclusions: The Sparse Grid method had 4% reduced sensitivity compared to the Full grid method, but higher specificity and fewer suspects. The Full Grid method had high sensitivity and specificity with the added assurance of more complete macular testing, but required significantly more time.

CR: M.K. Smolek, CenterVue, C.K. Lebow, CenterVue; I. CenterVue, CenterVue; R.N. Notaroberto, CenterVue, R. A. Pallikaris, CenterVue, R. S. Vujosevic, None.
Support: Research to Prevent Blindness, Inc. (MKS); LSU Research Enhancement Fund (MKS)
Sleep Apnea Syndrome and Retinal Vein Occlusion: About a Series of 30 Patients

G. Leroux les Jardins, A. Glacet-Bernard, S. Larcy, G. Coscas, G. Soubrane, B. Houssset, E. Souied. 1Ophthalmology, University Eye Clinic of Creteil, France, Paris, France; 2Intercommunal Hospital of Creteil, Pneumology, Creteil, France.

Purpose: Obstructive sleep apnea (OSA) is a relatively common disease and has been recently implicated in numerous cardiovascular, neurologic and ophthalmologic diseases. This condition is largely under-recognized and its prevalence in the general population is approximately 2% to 7%. OSA is known to be associated to age, snoring, daytime sleepiness and obesity. This study was designed to evaluate the possible implication of OSA in retinal vein occlusion (RVO).

Methods: From the records of 63 consecutive RVO patients, 30 patients were retrospectively selected for OSA screening. The selected patients had to meet at least two of the following criteria: associated cardiovascular disease, snoring or daytime sleepiness (Epworth scale score of 20 or more). They were investigated for OSA using nocturnal polygraphy during an overnight stay at hospital.

Results: 23 patients out of the 30 selected patients (76%) were OSA positive. Among these patients, the average apnea-hypopnea index was 21 per hour, OSA was mild (<15/h) in 13 patients, moderate in 5 patients, and severe (≥30/h) in 5 patients. The number of apnea or hypopnea per hour was correlated to the body mass index (p=0.02), the mean saturation of blood in oxygen (p=0.004) and the duration under an oxygen saturation of 90% (p<0.0001).

Conclusions: This study demonstrated for the first time a high prevalence of OSA in patients with RVO. This association may explain why a majority of patients discover visual loss upon awakening. Our findings suggest that OSA could be an additional risk factor that play an important role in the pathogenesis of RVO or that it is at least a frequent associated condition that could play a role of triggering factor. It is too early to assess that OSA treatment could improve visual outcome of RVO, but it seems vital to recognize OSA in RVO for the general health of the patient.

CR: G. Leroux les Jardins, None; A. Glacet-Bernard, None; S. Larcy, None; G. Coscas, None; G. Soubrane, None; B. Houssset. None; E. Souied. None.

Support: None.

Rates of Focal Thinning in the Macula or Temporal Retina in Sickle Cell Genotypes by Spectral Domain Optical Coherence Tomography

F.Y. Chau, Q.V. Hoang, J.J. Lim. Ophthalmology and Visual Sciences, University of Illinois at Chicago, Chicago, IL.

Purpose: Sickle cell anemia is characterized by infarctions resulting in systemic crises as well as various stages of sickle retinopathy. Infarctions may occur in the macular or surrounding retina and cause changes in retinal architecture to subtle degrees that may now be detected by spectral domain optical coherence tomography (SDOCT). Using SDOCT, this study investigated the frequency of focal thinning in the macula or temporal retina in various genotypes of sickle cell anemia patients.

Methods: 59 patients with sickle cell anemia of various genotypes (SC, SThal) and 10 control patients without sickle were scanned by SDOCT (Heidelberg Spectralis). Regions of focal thinning were identified as an abrupt, asymmetric decrease in total retinal thickness. Rates of focal thinning in the macula or temporal retina were calculated.

Results: 59 total sickle cell patients were imaged. Focal macular or temporal retinal thinning occurred in 7 of 14 (50%) SC patients, 21 of 39 (54%) SS patients, and 4 of 6 (67%) SThal patients. No control patients had any regions of focal thinning. Inner retinal layers were most commonly affected in regions of focal thinning, representing ischemic retinal atrophy from occlusions of the retinal circulation. The frequency of focal retinal thinning was stratified by individual eye and its stage of retinopathy. Two blind eyes were excluded.

For SC patients, focal retinal thinning occurred in 0 of 1 (0%) eye without retinopathy, 0 of 1 (0%) Stage 1 eye, 1 of 11 (9%) Stage 2 eyes, 7 of 12 (58%) Stage 3 eyes, 1 of 2 (50%) Stage 4 eyes, and 1 of 1 (100%) Stage 5 eye. For SS patients, focal retinal thinning occurred in 3 of 14 (21%) eyes without retinopathy, 2 of 8 (25%) Stage 1 eye, 21 of 44 (48%) Stage 2 eyes, 5 of 8 (63%) Stage 3 eyes, 1 of 1 (100%) Stage 4 eye and 1 of 1 (100%) Stage 5 eye. For SThal patients, focal retinal thinning occurred in 0 of 2 (0%) eyes without retinopathy, 0 of 2 (0%) Stage 1 eyes, 3 of 4 (75%) Stage 2 eyes, and 4 of 4 (100%) Stage 3 eyes. Focal thinning in the macula or temporal retina thus tended to occur more often with increasing stage of sickle retinopathy.

Conclusion: Focal thinning in the macula or temporal retina is a common finding in sickle cell patients and tends to occur more frequently with increasing stage of sickle retinopathy. Regions of focal retinal thinning can be identified and quantified by spectral domain optical coherence tomography.

CR: F.Y. Chau, None; Q.V. Hoang, None; J.J. Lim. Heidelberg Engineering, R.

Support: Research to Prevent Blindness Department Grant, UIC Core Grant NEI EY10792 and Gerhard Cess Retina Research Fund (JLL).

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Purpose: Sickle cell anemia is characterized by infarctions resulting in systemic crises as well as various stages of sickle retinopathy. Infarctions may occur in the macular or surrounding retina and cause changes in retinal architecture to subtle degrees that may now be detected by spectral domain optical coherence tomography (SDOCT). Using SDOCT, this study investigated the frequency of focal thinning in the macula or temporal retina in various genotypes of sickle cell anemia patients.

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Conclusion: Focal thinning in the macula or temporal retina is a common finding in sickle cell patients and tends to occur more frequently with increasing stage of sickle retinopathy. Regions of focal retinal thinning can be identified and quantified by spectral domain optical coherence tomography.

CR: F.Y. Chau, None; Q.V. Hoang, None; J.J. Lim. Heidelberg Engineering, R.

Support: Research to Prevent Blindness Department Grant, UIC Core Grant NEI EY10792 and Gerhard Cess Retina Research Fund (JLL).
Development, Evaluation, and Implementation of a Fundoscopic Examination Skills Workshop for 3rd Year Medical Students: A Randomized, Comparative Study of Diagnostic Ability When Instructed on a Fundus Simulator versus Printed Fundus Images

N. Chadha1A, C.E. Geist2, F. Malik1A, C.J. Macri3, B. Blatt2, K. Lewis2A.
1A Ophthalmology, 2Obstetrics and Gynecology, 3Medicine, 3CLASS Center, 1The George Washington University, Washington, DC; 2Ophthalmology, George Washington University, Bethesda, MD.

Purpose: The purpose of this study was to develop, implement, and evaluate a fundoscopic exam skills workshop for 3rd year medical students. The skills workshop was to serve as a follow-up to ophthalmic physical diagnosis skills acquired in the first and second years and introduce these skills in a clinical context. Additionally, the study sought to evaluate whether use of fundoscopic simulators versus printed images was a superior method to teach fundoscopic pathology.

Methods: Groups of 3rd year medical students were surveyed regarding their comfort with the fundus exam via a needs assessment. Baseline knowledge of fundus findings was assessed with a pre-test prior to the skills workshop. A case-based curriculum was developed and students were randomly assigned to work with fundus simulators vs. printed fundus images during the initial part of the curriculum, followed by a lecture-style presentation. A written post-test was given in addition to a practical exam using fundus simulators and results were compared between the two groups. Students were given an exit survey to evaluate the utility of the workshop.

Results: In our pilot study, 25 3rd year medical students completed the curriculum using fundus simulators. The needs assessment data showed that 57% of students were uncomfortable with their fundoscopy skills and 77% felt that they would benefit from additional education in ophthalmology. Student scores an average of 47% correct on the pre-test to 67% correct on the post-test.

Conclusions: Our study suggests that students have a need and desire for increased basic ophthalmic education. Preliminary studies suggest that the curriculum was effective in increasing student knowledge as demonstrated by the 20% improvement in correct answers from pre-test to post-test. Data from the practical exam from the initial group who used fundus simulators will be compared with the next group of students who will use traditional printed images in order to evaluate which method is superior.

CR: N. Chadha, None; C.E. Geist, None; F. Malik, None; C.J. Macri, None; B. Blatt, None; K. Lewis, None.
Support: None
The overall goal of our research is to elucidate the pathogenesis of primary open-angle glaucoma (POAG) making it possible to implement effective screening and prevention strategies and to develop novel therapies. The primary aim of this proposal is to identify candidate genes that significantly contribute to the disease. POAG is an intracocular pressure (IOP) related progressive optic neuropathy that ultimately leads to blindness. Permanent visual field loss from POAG is a condition of public health significance worldwide. The etiology of POAG is poorly understood and effective means of primary prevention are not available. Current treatments can slow but do not halt this progressive neuropathy. Low-density genome-wide association studies examining quantitative trait loci or endophenotypes for eye disease, further disease cohorts are also required. Then with obvious candidate genes the known biology of the gene supports the gene as being disease associated. However, often the gene has no obvious connection with the trait or disease and thus one needs to decide whether to publish the data early, with limited supportive information or whether to assemble a stronger case within one’s own group or by contacting researchers in the field, risking the fact that others may publish before you.

**CR:** J.L. Wiggs, None.

**Support:** Intramural program, NHGRI, NIH
408. Genome-wide Association Studies and Gene-environment Interactions for Eye Diseases – Minisymposium

3848 - 9:30 AM
After Gwas: Understanding Gene-environment Interactions In Age-related Macular Degeneration

S.K. Iyengar. Epidemiology & Biostatistics, Case Western Reserve University, Cleveland, OH.

CR: S.K. Iyengar, None.
Support: EY015810, U10EY06594, EY13438 and EY10605

3849 - 9:45 AM
What Have We Learned from Non-eye GWAS? Lessons in Design and Power of GWAS

Y.-J. Li. Biostatistics and Bioinformatics, Center for Human Genetics, Medicine, Duke University Medical Center, Durham, NC.

Genome wide association (GWA) studies have become a popular approach for identifying genetic loci or susceptibility genes for common complex diseases. However, many challenges exist for a successful GWA study. For instance, one may need to balance the study cost and sample sizes while ensuring the study has enough statistical power for detecting true effects. Furthermore, the ability of seeking replication by other independent datasets is extremely important. In this talk, we will discuss study design and statistical power of the GWA study using other published GWA studies as examples. We will address meta-analysis as well as the importance of adequate powered replication studies.

CR: Y.-J. Li, None.
Support: None

3850 - 10:00 AM
Next Stage - Lessons from Building International Consortiums for GWAS for Eye Diseases

T.Y. Wong1,2. 1Singapore Eye Research Institute, Singapore National Eye Centre, National University of Singapore, Singapore, Singapore; 2Centre for Eye Research Australia, University of Melbourne, Melbourne, Australia.

Genome-Wide Association studies (GWAS) typically involve multiple populations and multiple investigators across different countries. Building international consortiums are critical to getting GWAS started. The project must be conceptualized, with key phenotypes and genetic data matched across populations. Dataset sharing agreements need to be in place, and statistical resources should be made available for sharing and transferring datasets and analyses. There is a need for close communication between investigators and analysts, with regular telephone conferences and face-to-face meetings, with clear documentation of roles and timelines. The principles of successful studies can be summarized by the 5 Cs: Communication, collegiality, compromise, co-authorship and cash. These lay the foundation for successful GWAS studies to identify common genetic variants in populations.

CR: T.Y. Wong, None.
Support: None
3972 - A251
Biometric Differences Between a Singaporean Chinese and UK Caucasian Population With Primary Angle Closure

R. Siddiqi1, M.E. Nongpui1, R. Stanton1, P.A. Good1, V. Sung1, T. Aung1, W. Nolan2.
1Visual Sciences, 2Gluacoma, Birmingham & Midland Eye Centre, Birmingham, United Kingdom; 3Glaucoma Services, Singapore National Eye Centre, Singapore; 4Gluacoma, Birmingham and Midland Eye Centre, Birmingham, United Kingdom.

Purpose: To compare biometric parameters in Caucasian and Chinese patients with primary angle closure

Methods: Consecutive patients with a diagnosis of iridocorneal contact (ITC) or primary angle closure (glaucoma PACG) were recruited from glaucoma clinics at two hospital sites (in Birmingham, UK, and Singapore). Autorefration and ocular biometry using A-scan ultrasonography were performed on all subjects. Axial length, lens thickness, anterior chamber depth, absolute lens position (ALP = ACD + LT/2 (mm)) and relative lens position (RLP) (ALP = LCV/ LT / AL (mm)) were calculated for all eyes. The data was matched for age and sex. The pooled two sample t test was used to compare measurements between the two populations.

Results: Data was collected on 99 eyes of 99 UK Caucasian subjects (56 male and 63 female age range 40-89 years) and 151 eyes of 151 Singaporean Chinese subjects (66 male, 85 female, age range 44-90 years) Table 1 shows the mean value for each parameter in the two different ethnic groups. The mean axial length was significantly shorter (p<0.05) and anterior chamber depth was shallower (p<0.05) in Caucasian eyes when compared with Chinese Singaporean eyes. The lens thickness was greater in Caucasian eyes (p<0.0001).

Conclusions: There appears to be significant differences in the biometric measurements of anterior chamber depth, lens thickness and axial length between Chinese and Caucasian eyes. The study supports the presence of angle closure in patients with metabolic syndrome. These differences lend support to the theory of differences in mechanisms of angle closure in different populations.

3974 - A253
The Relationship Between Components of Metabolic Syndrome and Open-Angle Glaucoma

P. Newman-Casey1, N. Talwar1, B. Hain1, D.C. Musch2, J.D. Stein3.
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Purpose: To determine whether an association exists between the various components of metabolic syndrome (diabetes mellitus (DM), arterial hypertension (HTN), hyperlipidemia, and obesity) and open-angle glaucoma (OAG) in a large, diverse group of patients throughout the United States.

Methods: All beneficiaries age 40 years continuously enrolled in a large managed care network who had 1 visit to an eye care provider were identified from 2001-2007. ICD-9 billing codes were used to identify individuals with OAG and those with components of metabolic syndrome. Cox regression was used to determine the hazard of developing OAG in patients with components or combinations of components of metabolic syndrome, with adjustment for sociodemographic factors, systemic medical conditions, and other ocular diseases.

Results: Of the 2,182,315 enrollees who met inclusion criteria, 54,558 (2.5%) had OAG. After adjustment for confounding factors, those HTN (HR = 1.35; 95% CI: 1.21-1.50) or DM (HR = 1.17; 95% CI: 1.13-1.22) alone, or in combination, (HR = 1.48; 95% CI: 1.39-1.58) had an increased hazard of developing OAG relative to persons with neither of these conditions. The presence of hyperlipidemia in combination with HTN (HR = 1.13; 95% CI: 1.05-1.21) or with DM (HR = 1.09; 95% CI: 1.05-1.12) showed HRs of lesser magnitude. By contrast, persons with hyperlipidemia alone had a 5% decreased hazard of OAG (HR = 0.95; 95% CI: 0.91-0.98) compared with persons who had no components of metabolic syndrome.

Conclusions: In this large, diverse sample, the presence of HTN, DM, and obesity increased the hazard of developing OAG, while hyperlipidemia decreased the hazard of developing OAG. Given the increasing prevalence of metabolic disorders in the US, this study further our understanding of risk factors associated with OAG and helps identify persons who may benefit from screening for this condition. Determining whether hyperlipidemia or the medications used to treat this condition reduce the hazard of OAG may lead to novel OAG treatment strategies.

CR: R. Siddiqi, None; M.E. Nongpui, None; R. Stanton, None; P.A. Good, None; V. Sung, None; T. Aung, None; W. Nolan, None.
Support: None.

3973 - A252
The Association of Primary Open Angle Glaucoma and Diabetes Mellitus in the Hines Veterans Population

M. Hsu1, H.N. Saed1, C. Mata1, C. Song2, U. Tailor1, V. Badlani1, 2.
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Purpose: To determine whether an association exists between the various components of metabolic syndrome (diabetes mellitus (DM), arterial hypertension (HTN), hyperlipidemia, and obesity) and open-angle glaucoma (OAG) in a large, diverse group of patients throughout the United States.

Methods: All beneficiaries age 40 years continuously enrolled in a large managed care network who had 1 visit to an eye care provider were identified from 2001-2007. ICD-9 billing codes were used to identify individuals with OAG and those with components of metabolic syndrome. Cox regression was used to determine the hazard of developing OAG in patients with components or combinations of components of metabolic syndrome, with adjustment for sociodemographic factors, systemic medical conditions, and other ocular diseases.

Results: Of the 2,182,315 enrollees who met inclusion criteria, 54,558 (2.5%) had OAG. After adjustment for confounding factors, those HTN (HR = 1.35; 95% CI: 1.21-1.50) or DM (HR = 1.09; 95% CI: 1.05-1.12) showed HRs of lesser magnitude. By contrast, persons with hyperlipidemia alone had a 5% decreased hazard of OAG (HR = 0.95; 95% CI: 0.91-0.98) compared with persons who had no components of metabolic syndrome.

Conclusions: In this large, diverse sample, the presence of HTN, DM, and obesity increased the hazard of developing OAG, while hyperlipidemia decreased the hazard of developing OAG. Given the increasing prevalence of metabolic disorders in the US, this study further our understanding of risk factors associated with OAG and helps identify persons who may benefit from screening for this condition. Determining whether hyperlipidemia or the medications used to treat this condition reduce the hazard of OAG may lead to novel OAG treatment strategies.

CR: R. Siddiqi, None; M.E. Nongpui, None; R. Stanton, None; P.A. Good, None; V. Sung, None; T. Aung, None; W. Nolan, None.
Support: None.

3975 - A254
Distribution of Risk Factors in Newly Diagnosed Ocular Hypertension and Open-Angle Glaucoma Patients in Canada

Y.M. Buys1, P. Harasymowycz2, R. Gangop3, K. Kew4, T. Nguyen2, D. Zhou5, Canadian Glaucoma Risk Factor Study Group. 1Department of Ophthalmology & Vision Science, University of Toronto, Toronto, ON, Canada; 2Institut de glaucome de Montreal, Montreal, QC, Canada; 3Pfizer Canada Inc., Kirkland, QC, Canada; 4Pfizer Inc., New York, NY.

Purpose: Understanding risk factors in relation to disease is important for both prevention and treatment. In glaucoma, several risk factors have been identified however the literature is at times conflicting, suggesting further study of this topic is to be of value. This study was designed to describe the prevalence and distribution of risk factors in Canadian patients with newly diagnosed ocular hypertension (OH) and open-angle glaucoma (OAG).

Methods: Subjects with newly diagnosed OH or OAG and not receiving ocular hypotensive therapy were enrolled following informed consent. Subjects underwent a complete medical history and ocular examination with results recorded on standardized data collection sheets. Descriptive statistics of all variables for the two diseases (OH and OAG) were calculated. In order to assess which risk factors and/or variables were associated with OAG versus OH, adjusted odds ratios (OR), along with 95% confidence intervals (CIs), were obtained from multiple logistic regression models.

Results: 405 subjects were included, 292 (71%) with OAG (202 primary, 65 normal tension, 16 pseudoexfoliation, 9 pigmentary glaucoma) and 113 (27%) with OH. The majority of subjects were Caucasian (348/405, 85.9%). The results of multiple logistic regression found that the odds ratio for OAG compared to OH was 8.95 (95% CI: 2.93-22.88; p<0.0001) for optic disc notch, 5.36 (95% CI: 2.12-13.56; p<0.001) for abnormal VF, 1.45 (95% CI: 1.17-1.80; p=0.001) for every one DB unit worsening of mean deviation, 1.91 (95% CI: 1.54-2.37; p<0.0001) for every 0.1 unit increase of disc-to-cup ratio, 1.03 for every one year increase in age (95% CI: 1.004-1.06; p=0.020), 0.36 (95% CI: 0.17-0.78; p=0.010) for smoking, and 0.27 (95% CI: 0.11-0.63; p=0.003) for location (Quebec/Atlantic vs Ontario).

Conclusions: The subjects were more likely to have abnormal optic disc features and VF indices. Increased age was a risk for OAG when compared to OH whereas in this study, smoking and living in Quebec or Atlantic Canada compared to Ontario decreased the risk of OAG when compared to OH.

CR: Y. M. Buys, Pfizer Canada, F; P. Harasymowycz, Pfizer Canada, F; R. Gangop, Pfizer Canada, E; K. Kew, Pfizer Inc., E; T. Nguyen, Pfizer Canada, E; D. Zhou, Pfizer Inc., E; Support: Pfizer Canada Inc.
Patterns and Risk Factors for Glaucoma

Organizing Section: CL

Monday, May 4, 8:30 AM - 10:15 AM Hall B/C Poster Session

Program Number/Board # Range: 3972 - 3993 / A251 - A272

416. Patterns and Risk Factors for Glaucoma in Spherophakia


Purpose: To report the clinical features and treatment outcomes of glaucoma in Spherophakia.

Methods: The clinical features and treatment outcomes of Spherophakia were retrospectively analyzed in 161 eyes of 81 subjects seen between 1998 and 2008.

Results: There were 46 male (56.8%) and 35 female (43.2%) patients. The mean age was 16.62 ± 11.95 years (0-45). Vision less than 20/40 at presentation was seen in 16.62% of eyes. Normal tension glaucoma (NTG) was seen in 26.62% eyes. Mean IOP of 76 eyes (47.4%) was 18.71 ± 4.07 mm Hg, IOP could not be recorded in 27 eyes (17%). Gonioscopy was possible in 73 eyes (45%) of which 59 (53.4%) eyes had angle closure and 34 (46.6%) had open angle and gonioscopy.

Conclusion: Spherophakia in spherophakia is difficult to manage. Treatment should be directed to the causal mechanism. Because of the abnormal lens the risk of post operative complication for trabeculectomy are high.

Support: None

CR: C.S. Gurudadi, None; S. Senthil, None; G. Jonnadula, None; A.K. Mandal, None; U.K. Addepalli, None.

Risk Factors for Visual Field Progression in the Groningen Longitudinal Glaucoma Study: Three Different Statistical Approaches

C. Wesselin, M.W. Marcus, N.M. Jansonius. Dept. of Ophthalmology, University Medical Center Groningen, Groningen, The Netherlands.

Purpose: To investigate risk factors for visual field progression in glaucoma and to compare 3 different statistical approaches for this analysis.

Methods: Two hundred twenty-one eyes of 221 glaucoma patients were included, followed prospectively with standard automated perimetry (Humphrey Field Analyzer) in the Groningen Longitudinal Glaucoma Study, an observational cohort study. Progression was assessed with Nonparametric Progression Analysis (NPA) and Glaucoma Progression Analysis (GPA). Risk factors were analysed using the statistical approaches used in the Advanced Glaucoma Intervention Study (AGIS), Early Manifest Glaucoma Trial (EMGT) and Canadian Glaucoma Study (CGS).

Results: On average 7.2 reliable fields were available after a mean follow-up of 5.4 years. Of 221 eyes, 89 and 65 showed progression according to the NPA and the GPA algorithms, respectively. With the AGIS approach, an age (OR 1.03 per year increase; 95% confidence interval (CI) 1.01-1.06; P=0.01) and number of abnormal tests at baseline (OR 1.06 per 1 abnormal test; CI 1.00-1.13; P=0.03) were predictive for NPA progression. If a stepwise variable selection was added to the AGIS approach, intraocular pressure (IOP) fluctuation during follow-up (OR 1.27 per mm Hg increase; CI 1.08-1.50; P=0.004), worse baseline FDT test result (OR 1.05 per 1 abnormal test; CI 1.01-1.08; P=0.01) predicted NPA progression. With the CGS approach, worse baseline IOP (HR 1.07 per mm Hg; CI 1.02-1.11; P=0.003), worse baseline FDT test result (HR 1.05; CI 1.01-1.10; P=0.01) and older age (HR 1.03; CI 1.01-1.06; P=0.009) predicted NPA progression. With the EMGT approach, worse baseline IOP (HR 1.07 per mm Hg; CI 1.02-1.12; P=0.003), worse baseline FDT mean deviation (worst than -6 dB; HR 1.71; CI 1.02-2.65; P=0.018) and older age (HR 1.03; CI 1.01-1.05; P=0.012) predicted NPA progression. The only risk factors found for GPA progression were a worse baseline IOP (HR 1.07; CI 1.03-1.12; P=0.003), worse baseline FDT mean deviation (worst than -6 dB; HR 1.71; CI 1.02-2.65; P=0.018) and older age (HR 1.03; CI 1.01-1.05; P=0.012) predicted GPA progression. The only risk factors found for GPA progression were a worse baseline IOP (HR 1.07; CI 1.03-1.12; P=0.003), worse baseline FDT mean deviation (worst than -6 dB; HR 1.71; CI 1.02-2.65; P=0.018) and older age (HR 1.03; CI 1.01-1.05; P=0.012) predicted GPA progression.

Conclusions: IOP, disease stage and age seem to be significant independent risk factors for visual field progression in glaucoma. Results may depend on both the statistical approach applied and the outcome measure used.

CR: C. Wesselin, M.W. Marcus, None; N.M. Jansonius, None.

Support: Care Insurance Council (CVZ) and the University Medical Center Groningen, the Netherlands.

3977 - A256

Physical Activity and Intracocular Pressure: A Cross-Sectional Study From the European Prospective Investigation Into Cancer (EPIC)-Eye Study


Purpose: To examine the relationship between physical activity and intraocular pressure.

Methods: We examined the relationship between physical activity and IOP measured in 2631 men and women aged 48-89 in 2006-2009 participating in the EPIC-Norfolk study. Usual combined physical activity at work and leisure was assessed using a validated instrument. Individuals were categorised as inactive, moderately inactive, moderately active or active. Three IOP measurements were obtained using the Reichert Ocular Response Analyzer. Mean Goldmann correlated IOP from one eye was used in the analysis.

Results: In univariate analysis, the highest level of physical activity was associated with lower IOP; lower BMI; lower systolic blood pressure (SBP); and smaller waist hip ratio (WHR). Lower IOP was also associated with lower BMI and lower SBP. The most active participants had an average 0.5 mm Hg lower IOP compared to the most inactive participants. Adjusting for BMI, SBP and WHR attenuated the difference in mean IOP between active and inactive participants (Table 1).

Conclusions: People with an active lifestyle may have a lower IOP. This association may be partly mediated by BMI, SBP and WHR. Physical activity and weight control may offer a safe, simple method of reducing IOP. The role of lifestyle modification in the prevention and control of glaucoma should be investigated further.

Support: Funding: Research into Aging (London), Medical Research Council (London)

3978 - A257

Incidence of Glaucomatous Visual Field Loss in Offspring of Glaucoma Cases: A 10-Year Follow-Up From the Rotterdam Study


Purpose: To determine the 10-year incidence of glaucomatous visual field loss (GVFL) in offspring of glaucoma cases.

Methods: Participants were offspring of glaucoma cases from the Rotterdam Study. Of 110 participants who participated in the baseline measurement, 94 (85%) agreed to participate in the follow-up (FU). These participants underwent the same ophthalmologic examination (intracocular pressure [IOP] measurement, visual field testing, optic disc assessment and refraction) at baseline (1994 and 2000) and FU (2007-2008). Since no population-based incidence data are available in this age group, we therefore compared the total number of GVFL cases at FU with the prevalence of GVFL in the general population of similar age, using the Poisson distribution. The incidence of GVFL was determined as an incident rate calculated to a 10-year risk. Characteristics of participants with and without GVFL at FU (high myopia, IOP treatment and linear cup-disc ratio) were assessed using univariate comparisons.

Results: After a mean follow-up duration of 11.5 years (standard deviation 2.0 years; range 7-13.7 years), four participants with GVFL were identified: three incident cases and a single case that already had GVFL at baseline. This yields a prevalence of GVFL amongst the offspring of oag cases at FU of 4.3% (95% CI 0.9-8.8), which is significantly higher than the prevalence of 0.7% in the general population of similar age (mean age of the four cases at FU 59 years; P=0.01). The incidence rate and 10-year risk of GVFL were 2.8/1000 person-years (95% confidence interval 0.9-8.8) and 2.8% (95% CI 0.9-8.4) respectively.

High myopia (P=0.003), IOP treatment (P=0.032) and linear cup-disc ratio (P=0.009) were associated with GVFL.

Conclusions: Our study confirms that being an offspring of a confirmed glaucoma case is a risk factor for developing GVFL. However, given a 10-year risk of only 2.8%, examinations for case finding in offspring of glaucoma patients may be widely spaced in time.

CR: M.A. Czudowska, None; R.C.W. Wolfe, None; A. Hofman, None; J.R. Vingerling, None; N.M. Jansonius, None.

Support: None
Patterns and Risk Factors for Glaucoma

416. Patterns and Risk Factors for Glaucoma

Lagleyze, Buenos Aires, Argentina.

We examined 4,416 subjects who visited the Healthcare system Gangnam Republic of Korea; 3Ophthalmology, Seoul National University Hospital Health.

NVG and JG show, respectively, the highest and lowest rate of legal blindness. PCAG, Conclusions:

This is a severely affected population since one third of the individuals is (32.72%) in POAG, 5 (26.32%) in traumatic, 9 (23.68%) in acute angle closure, 6 (19.35%) this diagnosis), 9 (36%) in inflammatory, 41 (33.8%) in PCAG, 59 (33.71%) in PXEG, 197 (14.08%) in POAG, 75 (14.17%) in traumatic, 9 (8.14%) in both. In 25.65% of the eyes with low VA the cause was not glaucomatous. VFs qualified as advanced to non-

Awareness, 18.3% were unsure. The most commonly used types of CAM were herbal medications (32.5%) followed by dietary modifications (23.2%) and vitamin/mineral supplements (17.2%). The use of CAM was associated with younger age at diagnosis (p < 0.001), younger current age (p < 0.001), longer duration of disease (p = 0.033), higher education level (p < 0.001), a history prior surgical (p = 0.023) and laser (p = 0.029) treatments for glaucoma, and subjectively greater impact of glaucoma on quality of life (p < 0.001).

of the 131 patients who reported that they were currently using one or more CAM therapies for their glaucoma, only 3 (2.3%) indicated that they were using conventional glaucoma treatments less than prescribed because of prescribed because of CAM use. The vast majority of patients still take conventional glaucoma medications as prescribed. Conclusions: A significant proportion of glaucoma patients use CAM for their disease. While most of these patients do not disclose the use of CAM to their ophthalmologist, of their CAM treatments. 18.3% were unsure. The most commonly used types of CAM were herbal medications helped their glaucoma, 37.9% believed that their CAM therapies were of no help, and 10% had informed their ophthalmologist of some but not all of their CAM treatments. of CAM use believed that the treatments they had hypertension (HTN) (p = 0.005) and male sex (p = 0.002) were also significant risk factors for RNFLD. Multivariate analyses showed that the prevalence of RNFLD was significantly higher in hypertensive subjects (OR, 1.920; 95% CI, 1.435-2.560; p<.001), those who have SVDs in brain MRI (OR, 1.635; 95% CI, 1.220-2.191; p=0.001) and male (OR, 1.546; 95% CI, 1.153-2.083; p=0.001).

Results: RNFLD was detected in 231 out of 4,416 subjects, and the estimated prevalence was 5.23%. Cerebral SVDs were significantly frequent in subjects with RNFLD (p<.001). Hypertension (p<.001), diabetes mellitus (p=0.005) and male sex (p=0.002) were also significant risk factors for RNFLD. Multivariate analyses showed that the prevalence of RNFLD was significantly higher in hypertensive subjects (OR, 1.920; 95% CI, 1.435-2.560; p<.001), those who have SVDs in brain MRI (OR, 1.635; 95% CI, 1.220-2.191; p<.001) and male (OR, 1.546; 95% CI, 1.153-2.083; p<.001).

Conclusions: These results suggest that the presence of SVDs might be related with RNFLD. The male subjects and those who have hypertension show an increased risk for RNFLD.

CR: M. Kim, None; K. Park, None; J. Kwon, None; T.-W. Kim, None; D. Kim, None.
Support: None.

3980 - A260
Survey of Complementary and Alternative Medicine Use in Glaucoma Patients
M.J. Wan1, F. Kassam1, G.S. Mutti2, Z. Nasser2, G. Trope2, Y. Buys3.


3982 - A261
A Multicentric, Cross-Sectional Glaucoma Study in Buenos Aires, Argentina.
Degree of Damage, Legal Blindness and Glaucoma Diagnoses

Support:

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A Multicentric, Cross-Sectional Study including 1273 adult patients under glaucoma care, Methods: We examined 4,416 subjects who visited the Healthcare system Gangnam center in Seoul for periodic medical check-up between January 2008 and October 2009. Subjects underwent fundus photography, detailed questionnaires and brain magnetic resonance imaging (MRI). One examiner assessed the RNFLD in fundus photography according to the definition that RNFLD is a marked thinning or an absent of retinal nerve fiber layer bundles. Subjects with normal variants, such as a split RNFL superior segment optic hypoplasia and nonspecific slit-like defects, were excluded.

RNFLD. The male subjects and those who have hypertension show an increased risk of RNFLD. Hypertension (p<.001), was 5.23%. Cerebral SVDs were significantly frequent in subjects with RNFLD (p<.001). Hypertension (p<.001), diabetes mellitus (p=0.005) and male sex (p=0.002) were also significant risk factors for RNFLD. Multivariate analyses showed that the prevalence of RNFLD was significantly higher in hypertensive subjects (OR, 1.920; 95% CI, 1.435-2.560; p<.001), those who have SVDs in brain MRI (OR, 1.635; 95% CI, 1.220-2.191; p<.001) and male (OR, 1.546; 95% CI, 1.153-2.083; p<.001).

Conclusions: These results suggest that the presence of SVDs might be related with RNFLD. The male subjects and those who have hypertension show an increased risk for RNFLD.

CR: M. Kim, None; K. Park, None; J. Kwon, None; T.-W. Kim, None; D. Kim, None.
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3980 - A259
Retinal Nerve Fiber Layer Defect is Associated With Cerebral Small Vessel Diseases in Korean Population: Assessment by Magnetic Resonance Imaging
M. Kim1, K. Park1, J. Kwon1, T.-W. Kim1, D. Kim1.

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3981 - A260
Disorders
M. Kim1,2, K. Park1,2, J. Kwon1,3, T.-W. Kim1,4, D. Kim1,2.

Methods: Prospective, cross-sectional survey of consecutive glaucoma patients seen in the Glaucoma Unit at the University Health Network in Toronto, Canada. Information gathered on standardized data collection sheets included demographic variables, details regarding glaucoma treatment and severity, and details of CAM use.

3982 - A260
Survey of Complementary and Alternative Medicine Use in Glaucoma Patients
M.J. Wan1, F. Kassam1, G.S. Mutti2, Z. Nasser2, G. Trope2, Y. Buys3.

Conclusion: A significant proportion of glaucoma patients use CAM for their disease. While most of these patients do not disclose the use of CAM to their ophthalmologist, the vast majority of patients still take conventional glaucoma medications as prescribed.

Conclusions: A significant proportion of glaucoma patients use CAM for their disease. While most of these patients do not disclose the use of CAM to their ophthalmologist, the vast majority of patients still take conventional glaucoma medications as prescribed. Conclusions: A significant proportion of glaucoma patients use CAM for their disease. While most of these patients do not disclose the use of CAM to their ophthalmologist, the vast majority of patients still take conventional glaucoma medications as prescribed.
Applying a Method of Estimating the Rate of Progressive Visual Field Damage From Open Angle Glaucoma From Cross Sectional Data Obtained From the National Pakistan Blindness and Visual Impairment Survey

N.K. Wride, A.T. Broman, B. Dineen, Z. Jadoon, A. Khan, D. Khan, G.J. Johnson, C. Gilbert, R.R.A. Bourne1. Moorfields Eye Hospital, London, United Kingdom; 2.Biostatistics and Medical Informatics, Madison, WI; 3.University of Galway, Galway, Ireland; 4.Pakistan Institute of Community Ophthalmology, Khyber Institute of Ophthalmic Medical Sciences, Peshawar, Pakistan; 5.Research Unit, Department of Infections Diseases, London School of Hygiene and Tropical Medicine, London, United Kingdom; 6.Vision and Eye Research Unit, Postgraduate Medical Institute, Anglia Ruskin University, Cambridge, United Kingdom.

Purpose: To estimate the incidence of glaucoma and the rate of visual field progression in subjects with open angle glaucoma (OAG), using data from the nationally representative population-based survey of eye disease in Pakistan, the National Pakistan Blindness and Visual Impairment Survey.

Methods: Data were obtained from this cross-sectional, nationally representative sample of adults (n=16,507; 95% response rate) aged 30 years and older. Each subject underwent interview, visual acuity (logMAR), autorefraction and undilated optic disc examination. 1.5 of consecutive subjects aged 240 years (a ‘normative database’, n=1868), those that saw ≤6/12 in either eye, and those with an undilated cup/disc ratio of ≥0.7 underwent a comprehensive examination that included corrected visual acuity, perimeter, Goldmann tonometry, dilated segment examination. The measure of severity of OAG damage was classified by the Mean Deviation (MD) of an automated visual field test (Humphrey Field Analyzer; Carl Zeiss Meditec, Inc., Dublin, CA). The rate of progression was the mean of all subjects’ damage in the worse eye divided by the average time since onset.

Results: 5I (26%) of 196 subjects with OAG contributed visual field data. The incidence of OAG in the age groups 30-39 years, 40-49 years, 50-59 years, and 60-69 years was 0.00%, 0.05%, 0.63%, 0.83%, 0.57%, 1.07%, 1.04%, 0.12%, respectively. The mean worsening in decibels per year was -3.75 db/yr.

Conclusions: This is the first nationally-representative population-based study to report on incidence of glaucoma and the first in Pakistan. A high progression rate was reported among subjects diagnosed with glaucoma, most probably due to the high proportion of subjects (56%) with glaucoma that were blind in the worse eye at the time of examination. These findings are important for the planning of detection of glaucoma in this population.

CR: N.K. Wride, None; A.T. Broman, None; B. Dineen, None; Z. Jadoon, None; A. Khan, None; D. Khan, None; G.J. Johnson, None; C. Gilbert, None; R.R.A. Bourne, None.

Support: Sightsavers International; Christoffel Blinden Mission, Fred Hollows Foundation, World Health Organization/Pakistan Office.

Cost-Effectiveness of Screening for Open Angle Glaucoma With Confocal Scanning Laser Ophthalmoscopy (HRT3) in Glaucoma High-Risk Populations

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Purpose: To assess the cost-effectiveness of screening for open-angle glaucoma (OAG) with confocal scanning laser ophthalmoscopy (HRT3) in high-risk populations. (All subjects older than 65 years of age, subjects older than 50 years of Caribbean or African descent, or with positive family history for open-angle glaucoma).

Methods: A decision analysis model was created to compare screening of high risk subjects using HRT3 to screening using visual field tests (Frequency Doubling Technology perimetry (FDT)). Data input of cost and effectiveness of the devices were extracted from the Mobile Glaucoma Screening Project (MGSP) in high risk populations and the Régie de l’Assurance maladie du Québec (RAMQ). We simulated one screening session using both FDT and HRT3 in a population composed of 10,000 high risk subjects. The incremental cost-effectiveness ratio (ICER) of HRT3 was evaluated using the TreeAge Pro software. The model determined the additional cost per new case of glaucoma diagnosed.

Results: Our cost-effectiveness model demonstrated that the cost for using HRT3 was $750.83, and detected a total of 763 cases per 10,000 screened subjects (1% of cases detected). Compared to the use of visual fields (FDT) for screening purpose, the HRT3 had an ICER of $259 per case of glaucoma detected (incremental cost of $36,439 for 152 additional cases detected).

Conclusions: Screening with HRT3 would imply additional costs compared to FDT. Whether this additional expenditure is compensated by the cost of missing one case would be determined in further studies.

CR: A.A. Kamde Fansi, None; R.J. Guertin, None; G.F. Li, None; P.J. Harasmyowycz, None; E. Rahme, None; J. LeLorier, None.

Support: None.

Similarities and Differences in Risk Factors for Primary Open-Angle Glaucoma and Pseudoexfoliative Glaucoma in the Thessaloniki Eye Study

F. Topouzis, M.R. Wilson, A. Harris, E. Anastasopoulos, F. Yu, T. Pappas, F. Founti, A. Koskousa, A. Salonikou, A.L. Coleman, 1.Department of Ophthalmology, Aristotle Univ of Thessaloniki, Thessaloniki, Greece; 2.School of Medicine, University of Colorado Denver and Health Sciences Center, Denver, CO; 3.Department of Ophthalmology, Indiana University School of Medicine, Indianapolis, IN; 4.Center for Eye & Vision Epidemiology, Jules Stein Eye Institute, David Geffen School of Medicine, University of California Los Angeles, Los Angeles, CA.

Purpose: To investigate risk factors associated with primary open-angle glaucoma (POAG) and pseudoexfoliative glaucoma (PEXG) in the Thessaloniki Eye Study (TES).

Methods: TES is a cross sectional population-based study of chronic eye diseases in subjects ≥20 years of age in Thessaloniki, Greece. Subjects with POAG, PEXG or pseudoexfoliation (PEX) were identified according to specific criteria. Subjects with POAG were compared to non-PEX controls and subjects with PEXG were compared to PEX-controls regarding demographic, lifestyle, ophthalmic and systemic risk factors. All risk factors with p<0.2 in the univariate analysis were entered into the regression model.

Results: In regression model, POAG was associated with age (Odds ratio (OR):1.05 per year, p<0.006), IOP (OR:1.14 per mmHg, p<0.001) and coronary artery bypass or vascular surgery (OR:2.04, p=0.012). POAG was also associated with borderline significance with the presence of mild myopia (≥1-D and <3-D) (OR:1.87, p=0.063), moderate myopia (≥3-D) (OR:2.16, p=0.078), history of diabetes treated with insulin (OR:2.68, p=0.054) and the presence of normal blood pressure (BP) values (systolic BP <140 mmHg and diastolic BP <90 mmHg) secondary to antihypertensive therapy compared to no-nephtension (OR:1.99, p=0.096). The presence of high systolic or diastolic BP was not associated with POAG. PEXG was associated significantly with IOP (OR:1.25 per mmHg, p<0.001) and with borderline significance with moderate myopia (OR:2.97, p=0.060).

Conclusions: In TES, IOP and moderate myopia were the only risk factors associated both with POAG and PEXG. Vascular systemic diseases and their treatment were associated only with POAG, suggesting different pathogenesis between the two common types of open-angle glaucoma.

CR: F. Topouzis, None; M.R. Wilson, None; A. Harris, None; E. Anastasopoulos, None; F. Yu, None; T. Pappas, None; F. Founti, None; A. Koskousa, None; A. Salonikou, None; A.L. Coleman, None.

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C.R.: Medicare recipients), with substantially lower expenditures among the uninsured.

Conclusions: The last decade has brought changes to the medical management of glaucoma with isolated ocular hypertension (OHT). Medications for the management of glaucoma have been developed for nearly every aspect of the disease process. However, there is little data describing the characteristics of glaucoma among Filipinos. Results from this retrospective study of two convenience samples suggest that Filipinos-Americans may be at higher risk than their Caucasian counterparts for NTG, but this postulate must be confirmed by prospective studies.

CR: None; C.S. Sáles, None; R.Y. Lee, None; A.K. Agadzi, None; M.R. Hee, None.

Support: None.

3989 - A267
Differences in Primary Open-Angle Glaucoma Subtypes in Filipino- and Caucasian-Americans: A Retrospective Study of Two Clinic Populations

Purpose: To compare primary open-angle glaucoma (POAG) subtypes between Filipino- and Caucasian-Americans in a general ophthalmology clinic population.

Methods: A retrospective cross-sectional epidemiologic study was conducted. Medical charts of 1112 patients aged 40 years or older (500 Filipino, 612 Caucasian) seen in 2008 were randomly sampled from two private comprehensive ophthalmology clinics. Glaucoma was diagnosed based on optic nerve appearance, visual field defects, and other ocular findings according to the International Society of Geographical and Epidemiological Ophthalmology (ISGEO) scheme. The normal-tension subtype (NTG) of POAG was defined by intraocular pressure ≤21 mm Hg based on review of the entire chart history.

Results: Filipinos had a higher overall proportion of glaucoma and POAG than Caucasians (Filipino [F] vs. Caucasian [C] glaucoma: 14.2% vs. 9.3%; POAG: 11.9% vs. 8.2%; P=0.03, P=0.04, respectively). Filipinos had a higher overall proportion of NTG (F vs. C: 6.6% vs. 2.5%; P=0.001), and NTG comprised a greater proportion of all glaucoma in Filipinos (F vs. C: 46.7% vs. 26.8%; P=0.02). Filipinos' higher proportion of NTG was significant in both clinics (F vs. C: Clinic A, 4.0% vs. 0.7%; Clinic B, 9.6% vs. 4.1%; P=0.01, P=0.01, respectively), but Filipinos' higher proportions of glaucoma and POAG were significantly greater than the proportion of NTG in Clinic B (P=0.02, P=0.07, respectively). Filipinos and Caucasians with NTG had comparable central corneal thickness in the cohort and in both clinics (P>0.05). Filipinos' higher overall proportion of NTG remained significant after controlling for age and sex (P<0.001).

Conclusions: There are few or no data describing the characteristics of glaucoma among Filipinos. Results from this retrospective study of two convenience samples suggest that Filipino-Americans may be at higher risk than their Caucasian counterparts for NTG, but this postulate must be confirmed by prospective studies.

CR: S.C. Lin, None; C.S. Sáles, None; R.Y. Lee, None; A.K. Agadzi, None; M.R. Hee, None.

Support: None.

3990 - A269
Trends in Glaucoma Prescription Medication Expenditures: The 2001-2006 Medical Expenditure Panel Survey (MEPS)
D.J. Lee1, B. Lam2, K. Arheart2, D. Zheng1, P. Muennig2, A. Caban-Martinez2, E. Darabi1, S. Chertow1,1*Epidemiology/Public Health/Bihs-Sch Med, Bascom Palmer Eye Institute, University of Miami, Miami, FL; 2Columbia University, New York, NY.

Purpose: The last decade has brought changes to the medical management of glaucoma with the introduction of prostaglandin analogues and increasingly available generic forms of drug classes (e.g., beta-blockers). The purpose of this study is to describe glaucoma prescription medication drug expenditure trends in sociodemographic subgroups using a nationally representative sample of U.S. adults.

Methods: Participants of the 2001-2006 Medical Expenditure Panel Survey (MEPS) with glaucoma medication records were analyzed (n=2148). Total and average annual prescription medication expenditures for participants with glaucoma are reported by the following subgroups: glaucoma medication class, age-group, gender, race, insurance status (public, private, uninsured), and educational attainment.

Results: The annual average glaucoma medication expenditures increased from $361 in 2001 to $514 in 2006 (P<0.001). The proportion of total glaucoma medication expenditures attributed to prostaglandin analogues medications increased from 34% to 49% during this time period. Groups with the highest average annual expenditure increases included: those with public health insurance (slope=646; P<0.001), adults 45-64 years of age ($422 vs. $201, P=0.001), blacks ($59 vs. $31, P=0.05), females ($36 vs. $30, P=0.05) and those 65 years of age and older ($30 vs. $20, P=0.03). Males experienced little expenditure growth (S=0; P=0.36) and 2001-2006 pooled expenditures for the uninsured (n=56) averaged $332.

Conclusions: Glaucoma medication expenditures increased 70% from 2001-2006 and were accompanied by increased use of prostaglandin analogues medications. There was substantial variation in expenditure trends across sociodemographic subgroups with the greatest increases noted in those with public health insurance (primarily Medicare recipients), with substantially lower expenditures among the uninsured. Progressive health care and overall health care may serve to address apparent under treatment of uninsured adults with glaucoma.

CR: D.J. Lee, None; B. Lam, None; K. Arheart, None; D. Zheng, None; P. Muennig, None; A. Caban-Martinez, None; E. Darabi, None; S. Chertow, None.

Support: National Eye Institute (R03 EY016481).

3991 - A270
Risk Factors Associated With Primary Open-Angle Glaucoma and Ocular Hypertension: French Epidemiological Case Control Study
J.-P.G. Renard1, J. Roulaud1, E. Sellem1, A. Brel1, J. Normal2, J. Coudert3, C. Badouin1, P. Denis4, S. Pinchinat4, F. Lefrant4, C. Delcourt4. Ophthalmologie, Hôpital du val de Grace, Paris, France; 1Ophthalmologie, Hôpital Claude Huriez, Lille, France; 2Ophthalmologie, Centre Ophthalmologique Kleber, Lyon, France; 3Ophthalmologie, Hôpital général, Dijon, France; 4Ophthalmologie, Hôpital des Quinze-Vingts, Paris, France; 5Ophthalmologie, Clinique Edouard Herriot, Lyon, France; 6Ulmatem, Castries, France; 7Pfizer, Paris, France; 8Univ Segelan Bordeaux 2, Inserm, U897, Bordeaux, France.

Purpose: Many risk factors (RF) may be related to the onset and development of primary open-angle glaucoma (POAG) development. The aim of the PHOTAG study was to evaluate known and potential risk factors (RF), including environmental and behavioral factors, differentiating patients with POAG from control subjects with isolated ocular hypertension (OHT).

Methods: This French multicentric, cross-sectional case-control study included 769 patients: 339 pairs of POAG cases and OHT age matched controls (5 years). Ophthalmologists had to include 1 to 4 patients with POAG and a corresponding number of age-matched control OHT. The comparisons were performed by a stratified conditional logistic regression for matched sets.

Results: The mean age of patients was 63.6 years (± 10.5) with a mean duration of disease of 6 years. After adjusting for age, gender and duration of disease, the following ocular RF were identified: IOP ≥24 mmHg at diagnosis (OR=3.4 [1.46 - 6.35]), central corneal thickness (CCT) ≥510 μm (OR=4.92 [1.26 - 19.24]) and peripapillary atrophy (PPA) (OR=17.90 [5.14 - 62.29]). Among systemic factors, hypercholesterolemia was associated with a higher risk of POAG (OR=1.75 [1.12 - 2.72]), hypothyroidism with a decreased risk (OR=0.33 [0.11 - 0.96]). PPA was significantly associated with POAG in a case-control study. The comparison was performed by a stratified conditional logistic regression for matched sets.

Conclusion: This study confirm the main known ocular RF for POAG (IOP, CCT, b-PPA) and reveal some associations still under debate in the literature: hypercholesterolemia, hypothyroidism. The results also suggest a protective effect of omega-3 fatty acids (cold water fish and oily fish) and raised the deleterious effect of other fatty acids. The possible neuroprotective action of omega-3 fatty acids and neurotoxic impact of exposure to pesticides, which need further confirmation, open up new perspectives in the management of glaucoma.

CR: J.-P.G. Renard, None; J. Roulaud, None; E. Sellem, None; A. Brel, None; J. Normal, None; J. Coudert, None; C. Badouin, None; P. Denis, None; S. Pinchinat, None; F. Lefrant, None; C. Delcourt, None.

Support: None.
416. Patterns and Risk Factors for Glaucoma

Wednesday, May 5, 8:30 AM - 10:15 AM Hall B/C Poster Session
Program Number/Board # Range: 3972 - 3993 / A251 - A272

3992 - A271
History vs. Clinical Findings Relating to Hypertension and Glaucoma Diagnosis Among African Americans in Rural and Urban Settings
J.E. Winters, K.M. Daum. Illinois College of Optometry, Chicago, IL.

Purpose: The prevalence of hypertension (htn) and glaucoma (glc) have been shown to be higher in African-Americans (AA) than in other races. Since these conditions are typically asymptomatic, AA patients may not be aware of onset. Clinicians may rely on patient history in assessing risk for these and associated conditions. We hypothesized that independent of their prior knowledge of their condition low-income African-Americans (AA) would be diagnosed as glc suspects or have elevated blood pressure (bp). We also hypothesized that cultural factors associated with life in an urban or rural setting may influence these findings.

Methods: The Rural Alabama Diabetes and Glaucoma Initiative completed vision care projects low-income people in rural Alabama (rural). The Vision of Hope Health Alliance provided comprehensive vision care to low-income, uninsured persons in urban Chicago, Illinois (urban). Personal and family history of glc and htn were self-reported by patients. Retrospective record review was performed. Bp was evaluated using Joint National Commission of Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC VII).

Results: From an overall total of 7030 (urban = 4029 and rural = 3001), 4028 patients identified their ethnicity as AA (urban = 1822 (45.2%); rural = 2386 (79.5%). Mean age was 45.3 (SD 16.3). There were 2727 (65.1%) females examined. 501 were diagnosed as glc/ glc suspect (306 (17%) from the urban clinic and 195 (8%) from rural). Of those only 195 (38.9%) reported a personal or family history of glc (111 (36.5%) from the urban clinic and 67 (15.8%) from the rural). Consequently 61% were diagnosed without previous history. Similarly of those without report of htn (n= 856 urban; 1290 rural), bp was elevated in 721 (33.6%) (233 (27.2%) from the urban clinic and 488 (37.8%) from rural).

Conclusions: Independent of clinic setting, glc/glc suspect and htn were present in substantial numbers in those not reporting those conditions. Self-report history of glc or htn were inconsistently related to clinical findings upon examination. Cultural influences possibly related to living in a rural or urban setting may also influence results. These findings illustrate the importance of diagnostic testing to rule out glc and htn in AA.
CR: J.E. Winters, None; K.M. Daum. None.
Support: RWJF-LIFP

3993 - A272
Quality of Life in Glaucoma Patients: Comparison Between Public Health System and Private Practice

Purpose: To evaluate the quality of life of glaucoma patients comparing public health system, and private practice, through the questionnaire National Eye Institute 25-Item Visual Function Questionnaire (NEI-VFQ).

Methods: A cross-sectional study, developed through the application of NEI-VFQ questionnaire in 83 non-consecutive glaucoma patients at different stages of the disease, 51 from public health system, and 32 patients from private clinic.

Results: Statistically significant difference between groups was demonstrated in subdomains related to the “general health”, “general vision”, “ocular pain”, “near activities”, “distance activities”, “mental health” and “role difficulties” no significant difference was demonstrated in “social functioning”, “dependency”, “driving”, “color vision” and “peripheral vision”. Regarding the overall score given by the questionnaire statistical difference was observed with an average of 73.13 in the public institutions and 86.07 in the private practice.

Conclusions: The impact on quality of life was higher in patients from the public institution when compared to those of the private practice through the NEI-VFQ questionnaire.
CR: D.P. Pinheiro, None; M.G. Rosa, None; H.P. Solari, None; J. Lomelino, None; P.E.R. Knopp, None; M.P. Ventura, None.
Support: None
4522 - A580

Monitoring Progression of AMD Through Visual Function Loss

P.N. Dimitrov1, A.J. Vingrys2, L.D. Robman, G.A. Makeyeva1, K. Aung1, M. Varsamidis1, R.H. Guymer1.

1Center for Eye Research Australia, University of Melbourne, Melbourne, Australia; 2Optometry & Vision Sciences, University of Melbourne, Carlton, Australia.

Purpose: To identify visual function test(s) that are sensitive and specific to detect AMD and monitor progression of the disease.

Methods: A suite of visual function tests (static tests: achromatic 41Hz and 14Hz flickering and isoluminant Red and Blue thresholds; dynamic tests: photostress recovery and dark adaptation) was developed. Stimuli were presented on a high-resolution, calibrated CRT monitor driven by 8-bit Radeon video-card (0.255 LUT) on a 30 or 0 cd/sq.m background. Visual function was measured on 109 healthy participants and 221 people with AMD with VA better than 20/40 (no diabetes, glaucoma or cataract). Clinical stage of AMD was assessed using digital fundus photographs. Participants were tested biannually for three years to determine AMD progression rates.

Results: We found significantly larger visual functions deficiency in people with AMD in all tests compared to age-matched controls. Although both static and dynamic tests had good AMD detection capacity, the dynamic parameters gave better diagnostic ability (95% [90.9 to 97.2] vs 61% [54.1 to 67.2], p<0.05). Our functional suite revealed a larger number of cases that deteriorated over three years compared with conventional visual acuity testing (37% [29 to 45.5] vs 9% [4.7 to 12.1], p<0.05). We found that the rate of deterioration in visual function increased with the worsening of visible clinical fundus features and that progression was monitored better with static tests than with dynamic tests (30% [30.2 to 40.1] vs 28% [17.9 to 37.0], respectively, p<0.05).

Conclusions: Our visual function measurements were better able to track changes than with static acuity testing. Although cone and rod recovery gave the best diagnostic capacity for AMD, our static tests (color and flicker thresholds) were better suited for the assessment of progression. These findings indicate that quantitative assessment of visual function is a clinically valuable approach in monitoring progression and can potentially be used to evaluate the efficacy of novel treatments for AMD.

CR: P.N. Dimitrov, None; A.J. Vingrys, None; L.D. Robman, None; G.A. Makeyeva, None; K. Aung, None; M. Varsamidis, None; R.H. Guymer, None.

Support: NHMRC Grant 350224 (RKJ/AV)

4524 - A582

Prevalence of Age-Related Macular Degeneration in Tromsø

M.G. Erke1, G. Bertelsen2, A. Sjólie1, J. Njølstad1. 1Department of Ophthalmology, University Hospital North Norway, Tromsø, Norway; 2Institute of Community Medicine, University of Tromsø, Tromsø, Norway; Department of Ophthalmology, Odense University Hospital, Odense, Denmark.

Purpose: To investigate age-specific prevalence of age-related macular degeneration (AMD) in Tromsø, Norway.

Methods: The 6th Tromsø Study (2007-2008) is a cross-sectional health survey of the population above 30 years. Eye examinations included visual acuity, digital colour fundus photography and optical coherence tomography (OCT). Masking graded of photographs from a random sample of 3026 persons aged 65-87 years was performed according to the International classification of AMD. Eyes were categorized by predominant phenotypes (Table 1). Persons were classified according to the more severe phenotype of the two eyes. Grading of OCT and analyses of associations between high-sensitive CRP and serum lipids and AMD will be presented.

Results: Results are available from a random sample of 278 participants, of whom 231 subjects had at least onegradable eye. Missing subjects (n=39) did not differ in age compared to participants (p>0.05). Persons with ungradable photos (n=8) were older than those withgradable photos (p=0.0001). Among subjects with twogradable eyes, the concordance rate for phenotype was 65% (140/216). The prevalence of hard drusen as phenotype declined with age. Soft drusen as phenotype has a four times higher prevalence in the oldest age group compared to the youngest age group. The total prevalence of any AMD was 7.4%, for GA 1.7% and for CNV 5.6%.

Conclusions: Preliminary results suggest a higher prevalence of any AMD than in other comparable studies except the Greenland study. In contrast to the Reykjavik and Oslo studies, we did not find a higher prevalence of GA than of CNV.

CR: M.G. Erke, None; G. Bertelsen, None; A. Sjólie, None; J. Njølstad, None.

Support: None

4525 - A581

Associations of Age-Related Maculopathy With Blood Pressure: The Alienor Study

J.-F. Korobelnik1, M.-N. Delyfer1, M.-B. Rougier1, J. Colin1, M. Le Goff1, J.-F. Dartigues2, C. Delcourt1, P. Barberger-Gateau3, M. Le Goff, None; P. Barberger-Gateau, None; C. Delcourt, Bausch&Lomb, C; Coca-Col1, Merck, Johnson & Johnson, Othera, Acucela, Jerini, Taligen, Cell Therapy Company (J&J internal venture), Genentech, Pfizer, Potentia, AVT, Health Advances, LLC, Advanced Vision The, C.

Support: NIH Grants EY 08552, 14148

Purpose: Blood pressure has been suggested to be implicated in the etiology of age-related maculopathy (ARM). However, epidemiological data are scarce and contradictory in this field. The strength of the present study is that there was a long-term assessment of blood pressure status.

Methods: The Alienor Study is a population-based epidemiological study on nutrition and age-related eye diseases. 963 subjects had an eye examination from September 2006 to May 2008 in Bordeaux (France). Of these, 879 subjects (91 %) had gradable photographs and were classified in 5 exclusive stages (worse eye): neovascular ARM (stage 4, n= 25); geographic atrophy (stage 3, n=24); large soft indistinct drusen and/or reticular drusen with pigment abnormalities (stage 2, n=9); large soft distinct drusen alone or pigment abnormalities alone (stage 1, n=130); stage 0 (n=880). Blood pressure was measured at four occasions over the 7 years preceding the eye examination. The average of blood pressure over the 7-year period was calculated. Potential confounders were age, gender, socio-economic status, monthly income, body mass index, plasma HDL-cholesterol, Complement Factor Hydrophilic, apolipoprotein E2 and E4 polymorphisms. Of 879 subjects, 789 had complete data for blood pressure and potential confounders. Associations were estimated using polynymous logistic regression, after adjustment for age and gender.

Results: After adjustment for all potential confounders, high average systolic blood pressure over time in eyes with visual acuity worse than 20/50 was associated with increased risk for ARM (pooled stages 1 to 4) (OR=1.10 for 10 mmHg increase, 95% confidence interval (CI): 1.00-1.21, p=0.05), while no significant association were found with diastolic blood pressure (OR=1.09, 95% CI: 0.90-1.32, p=0.36). Associations of systolic BP with the different stages of ARM were similar (OR ranging from 1.03 to 1.26), although they did not individually reach statistical significance.

Conclusions: This study confirms a modest association of ARM with higher systolic blood pressure in the 7 years preceding the eye examination.

CR: J.-F. Korobelnik, Alcon, C; Novartis, C; Bayer, C; Bausch&Lomb, C; Allergan, C; M.-N. Delyfer, None; M.-B. Rougier, Zeiss, R; J. Colin, Alcon, C; F. Malet, CibaVision, C; M. Le Goff, None; J.-F. Dartigues, None; P. Barberger-Gateau, None; C. Delcourt, Bausch&Lomb, C; Novartis, C; Pfizer, C.

Support: Laboratoires Théa (Clermont-Ferrand, France)
219. Functional Retinal Imaging

Monday, May 4, 8:30 AM - 10:15 AM
Hall B/C Poster Session
Program Number/Board # Range: 1382 - 1406 / B121 - B145

Anti-VEGF Treatment Patterns Among Wet AMD Patients Younger Than 65 Years Old

R.E. Williams, Q. Fu. Nationwide Epidemiology, GlaxoSmithKline, Collegeville, PA.

Purpose: There is little understanding of the patterns of anti-VEGF injections for wet AMD patients. This study describes anti-VEGF treatments among wet AMD patients younger than 65 years in the United States.

Methods: We identified patients <65 years old with an ICD-9 code 362.52 (“exudative macular degeneration”) after July 1, 2006 from U.S. medical claims in the Integrated Healthcare Services (IHCS) database, which is generally representative of the insured U.S. population <65 years old. Data was available through December 2008. Anti-VEGF treatment was identified by National Drug Code (NDC) and Healthcare Common Procedure Coding System (HCPCS) codes for bevacizumab, ranibizumab, pegaptanib. We excluded patients with any cancer diagnosis as defined by ICD-9 codes.

Results: Bevacizumab was used 2.7 times more than ranibizumab. There was an average of 3 (range 1-4) anti-VEGF injections in the first 12 months (n=214). After first injection (month 1), 33% got an injection in month 2, 24% in month 3, 21% in month 4, 16% in month 5, 17% in month 6, 16% in month 7, 11% in month 8, 11% in month 9, 12% in month 10, 12% in month 11, and 13% in month 12. Among patients with anti-VEGF, 33% had 1 injection, 22% had 2 injections, 16% had 3 injections, 9% had 4 injections, 6% had 5 injections, 3% had 6 injections, 5% had 7 injections, 2% had 8 injections, 4% had 9+ injections in the first year. Among patients with 18 months of follow-up (n=194), 49% had no injections after the 6th month of follow-up. Although this database is less representative of >65 year olds, they had similar treatment patterns; 56% had 1-3 injections in the first year compared to 51% of those >65 years old.

Conclusions: The applicability of using the small sample size identified from this database to understand injection treatment patterns of wet AMD patients may be limited as the more aged population (65 years of age and older) is less representative, the duration of follow-up is brief, and ocular outcomes data that may have informed treatment decisions are not available. Yet, these results suggest that patients are getting only an average of a few injections in the first year, bevacizumab is being used more frequently than ranibizumab, and the true pattern of these injections remains unclear.

CR: R.E. Williams, GlaxoSmithKline, E.Q. Fu, GlaxoSmithKline, E.
Support: None

4529 - A587

Relationship of Healthy LifeStyles to the Prevalence of Intermediate Age-Related Macular Degeneration (AMD) in the Carotenoids in Age-Related Eye Diseases Study (CAREDS), an Ancillary Study of the Women’s Health Initiative Observational Study (WHIOS)

S.A. Sonde1, R. Voland1, A.E. Millen1, R. Wallace1, K. Gehrs3B, J.A. Mares1, K. Gehrs3B, J.A. Mares1, K. Gehrs3B, J.A. Mares1, K. Gehrs3B, J.A. Mares1, None; Ophthal & Vis Sciences, U of Wisconsin, Madison, WI; Soc and Prev Med, U at Buffalo, Buffalo, NY; Epidemiology, Ophthal, U of Iowa, Iowa City, IA; Cancer Prevention Res Pro, Fred Hutchinson Cancer Res Ctr, Seattle, WA; Ophthal, Casey Eye Inst-OHSU, Portland, OR.

Purpose: We investigated relationships between a combination of healthy lifestyle behaviors and prevalence of intermediate AMD assessed an average of 6 years later.

Methods: Post-menopausal women indicated diet, lifestyle and risk factors at entry into the Women’s Health Initiative Observational Studies (1994-1997) in Iowa, Wisconsin and Oregon. Intermediate AMD was assessed by stereoscopic fundus photographs of CAREDS participants from 2001-2004.

Results: Analyses were limited to 1313 women based on evidence for selective mortality bias in older women. The Healthy Lifestyle Score evaluated 5 modifiable risk factors: lowfiber diet (scoring of food frequency questionnaires, 2)intake of vitamin D from diet or supplements (above vs. below 400 IU/day), 3)level of physical activity (tertiets of MET/hr/week), 4)smoking history (0, 7, 7 pack years), and 5)body weight/body mass index 25, >30 kg/m2). Among women with serum samples (n=968), we explored whether adding vitamin D (25-hydroxyvitamin D (25(OH)D) 10-75 nmol/L) to the Healthy Lifestyle Score further reduced odds for AMD.

Results: Healthy lifestyle Scores were more strongly associated with AMD than independent risk factors. The combination of the Healthy Eating Index (HEI) and the Alternative Mediterranean Diet (Amed) scoring of food frequency questionnaires, 2)intake of vitamin D from diet or supplements (above vs. below 400 IU/day), 3)level of physical activity (tertiets of MET/hr/week), 4)smoking history (0, 7, 7 pack years), and 5)body weight/body mass index 25, >30 kg/m2). Among women with serum samples (n=968), we explored whether adding vitamin D (25-hydroxyvitamin D (25(OH)D) 10-75 nmol/L) to the Healthy Lifestyle Score further reduced odds for AMD.

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Conclusions: There are significant inverse relationships between lifestyle factors and AMD, which could be useful in the prevention of AMD.

CR: R.A. Adelman, None; R. Voland1, A.E. Millen1, R. Wallace1, K. Gehrs3B, J.A. Mares1, None; Ophthal & Vis Sciences, U of Wisconsin, Madison, WI; Soc and Prev Med, U at Buffalo, Buffalo, NY; Epidemiology, Ophthal, U of Iowa, Iowa City, IA; Cancer Prevention Res Pro, Fred Hutchinson Cancer Res Ctr, Seattle, WA; Ophthal, Casey Eye Inst-OHSU, Portland, OR.

Support: Leir Foundation, Newman’s Own Foundation, Research to Prevent Blindness
**4531 - A589**

Peripheral Changes in the Reykjavik Eye Study

P. Teto, A. Cusak, F. Jonasson, A. Geirsdottir, W. Xing, I. Lengyel

Purpose: There is extensive drusen deposition and atrophy visible at the retinal periphery in flat-mounted aged donor tissues. Our understanding of the relevance of these peripheral pathologies in Age Related Macular Degeneration (AMD) is limited by the lack of detailed peripheral imaging studies. Imaging retinal periphery in clinical practice is not currently feasible. The purpose of this study was to determine if advancing imaging and grading protocols suited to wide-angle imaging in an aged population.

Methods: Conventional digital fundus images (CDI) and ultra-wide field (200°) color and autofluorescence (AF) images were taken using Optos P200AC. AF ultra-wide angle laser scanning ophtalmoscopy as part of the 12 year follow up of the Reykjavik Eye Study. Of the original random population sample, 573 persons of 65 years and older participated. Images were then graded at Moorfields Eye Hospital Reading Centre. Peripheral changes were graded of the 1272 eyes imaged using maculopathy grading grid developed for this imaging modality. Presence or absence of hard and soft drusen, peripheral retinal pigment epithelial changes, atrophy or neovascularisation was graded on the color images and then the presence or absence of hypo- and hyperfluorescence using autofluorescence imaging. All peripheral grading was performed independently by two graders tabulated and techniques to be determined.

Results: Fifty six percent of patients had pathology on the periphery with features Singapore Malay Eye Study and the Blue Mountains Eye Study. Presence of the same changes was examined for the macula and the peripheral grading.

Conclusions: Phenotyping, peripheral changes on Optos P200AC ultra-wide angle laser scanning opthalmoscopy imaging confirmed that there are wide ranging pathological changes in the periphery even in those who have no central pathologies. The predictive values for these peripheral pathological changes are yet to be determined.

CR: P. Teto, None; A. Cusak, OPTOS part-funded salary; R. F. Jonasson, None; A. Geirsdottir, None; W. Xing, None; I. Lengyel, None.

Support: Special Trustees Moorfields Eye Hospital, London, UK; funding for 50% of Adrienne Cusak Salary from OPTOS.

**4531 - A589**

Are Asians With Age-Related Macular Degeneration Less Likely To Have Bilateral Involvement Than Caucasians? The Singapore Malay Eye Study and the Blue Mountains Eye Study


Purpose: We compared the proportion of bilateral involvement of early and late related macular degeneration (AMD) between Asian Malays and Caucasians.

Methods: We used the baseline examination data for subjects aged 50-79 years in the Singapore Malay Eye Study (SIMES) (n=2,453) and the Blue Mountains Eye Study (BMES) (n=3,265). Prevalence of bilateral cases was directly age-standardized to the world population. Presence of early, late AMD and individual lesions was determined by grading of fundus images using a modification of the Wisconsin Age-related AMD Phenotyping System grading system. Bilateral involvement was defined for early, late AMD and each lesion type.

Results: Early/late AMD was observed in 156(6.4%)/21(0.9%) and 185(5.7%)/37(1.1%) subjects in the SIMES and the BMES, respectively. Proportions with bilateral early AMD or early AMD lesions were comparable between the two populations. Age-standardized frequency of bilateral early AMD was 24.6%, 95% Confidence Interval [CI] 15.6-33.3% in the SIMES, compared to 27.8%, 95%CI 17.3-38.3% in the BMES. Although not statistically significant, bilateral late AMD was less frequent in the SIMES (age-standardized frequency 4.9%, 95%CI 2.4-11.4% vs. 32.9%, 95%CI 11.0-66.7% in the BMES). Among men, bilateral neovascular AMD (0% vs. 3.33% p<0.001) and bilateral geographic atrophy (41.7% vs. 50.8%; p=0.003) both were less frequent in the SIMES than in BMES. In women, however, these frequencies were similar between the two populations.

Conclusions: In a comparison of Asian Malays to Caucasians, the frequency of bilateral early AMD was similar but the frequency of bilateral late AMD in men was substantially different. A lower frequency of bilateral neovascular AMD in Malays may reflect different clinical characteristics or differences between Asians and Caucasians, given that polypoidal choroidal vasculopathy commonly in Asian men and is more frequently unilateral.

CR: R. Kawasaki, None; J.J. Wang, None; A.F.M. Islam, None; E. Rochitchina, None; T. Aung, None; S.-M. Saw, None; P. Mitchell, None; W.E. Wong, None.

### 4534 - A592

**Different Treatment Options of Retinal Angiomatic Proliferation**

F. Liu¹, Y. Liu¹, M. Khuthaila, T. Jayasundera, I.J. Galic, J.C. Che¹. Ophthalmology, Daqing Oilfield General Hospital, Daqing, China; Ophthalmology, McGill University, Montreal, QC, Canada.

**Purpose:** To determine the outcome of different treatment modalities in eyes with retinal angiomatic proliferation (RAP).

**Methods:** A computer database search for the diagnosis of RAP with fluorescein angiographic and OCT documents performed between 2003 and 2009 was done. We performed retrospective chart review on these patients. Only patients with more than six months of follow up information were included. Information including initial visual acuity (VA), fundus biomicroscopy, fluorescein angiography and optical coherence tomography findings, treatment methods and response, both at initial visit and on follow up were recorded.

**Results:** A total of 45 patients (56 eyes) were included. The male-female ratio was 3:2. The average age was 84-years. The follow up ranged from six months to two years. Stage 3 RAP was found in 37 eyes, with an average initial VA of 0.27; stage 2 in 13 eyes, with an average VA of 0.21; and six eyes had stage 1 RAP with an initial VA of 0.42. At six months follow up, the average VA was 0.29, 0.27 and 0.40 respectively. Over the duration of the study period, the treatment of choice ranged from PDT combined with laser and/or intravitreal injections of triamcinolone (PDT-combo), to monthly injections of anti-VEGF agent alone (IVB-IVR). The average initial VA of the PDT-combo group was 0.25; at six-month follow up, the average VA was 0.36. The initial VA of the initial VA of the IVB-IVR group was 0.35; VA at six month was 0.38. VA improved in 48% of PDT combo group, remained the same in 35%, and decreased in 17% at six-month follow up. In the IVB-IVR group, the VA improved in 57%, remained the same in 14% and decreased in 29%. At two year follow up, the final acuity was 0.23 in the PDT combo group and 0.27 in the IVB-IVR group.

**Conclusions:** RAP is found mainly in elderly female patients. Most patients respond well to different modalities of treatment initially. PDT combined with laser and intravitreal triamcinolone seem to yield better outcome in the first six months with more patients having either improved or stable vision compared to the group receiving initial monthly anti-VEGF therapy only. Over the long run, there is a gradual loss of vision due to recurrent disease despite repeated treatments.

**CR:** J. R. Liu, None; M. Khuthaila, None; T. Jayasundera, None; I.J. Galic, None; J.C. Chen, None.

**Support:** None

### 4535 - A593

**Provision of Eye Care Provider Smoking Cessation Advice to Patients With Age-Related Macular Degeneration**


**Purpose:** Age-related macular degeneration (AMD) is the leading cause of vision loss in the United States. As there is no effective treatment for all types of AMD, addressing modifiable risk factors is of great importance. Smoking is one of the few modifiable AMD risk factors for disease progression. Effective smoking cessation strategies in patients at high risk for the condition may possibly reduce the risk of developing AMD or having AMD progress to cause disabling visual impairment. However, little is known about the specific attitudes and smoking cessation practices among vision care providers and their patients. In the present pilot study, we examine patient and provider reports of smoking cessation advice in this patient population.

**Methods:** In June 2009, 52 AMD patients at a large academic medical center completed an anonymous questionnaire in English and Spanish assessing smoking history and history of quit attempts. Forty-six eye care providers at the same facility completed an anonymous electronic questionnaire asking about their smoking cessation counseling practices.

**Results:** Seventy percent of AMD patients were smokers who, on average, visited an ophthalmologist 5 times per year. Nearly 90% reported “never” being advised to quit by their oculair eye care provider. Sixty percent of eye care providers indicated they were not certain smoking status during patient examinations, and 48% assessed patient willingness to quit. Most eye care providers indicated they wanted additional patient smoking cessation materials and/or the ability to refer their patients to effective smoking cessation programs. When prompted to identify which smoking cessation training or information the ophthalmologist would like to use most with their respective patient population: 46% wanted training on how to select self-help materials to give their patients and 28% wanted to learn how to provide social support to their patients as part of their cessation treatment.

**Conclusions:** Findings from the present study suggest a desire on the part of eye care providers to do more for their smoking patients. Tailored smoking cessation programs may be needed for this unique patient population, yet to date, there has been little development of such programs.

**CR:** A. Caban-Martinez, None; E.P. Davila, None; B.L. Lam, None; S.R. Dubovy, None; K.L. Arheart, None; D.D. Zheng, None; K.E. McCollister, None; E.L. Fleming, None; D.J. Lee, None.

**Support:** NEI Grant R03 EY016481

### 4536 - A594

**Discordant Age-Related Macular Degeneration Characteristics in Monozygotic Twin Pairs**

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**Purpose:** A study of the large US population-based sample of monozygotic (MZ) and dizygotic twin pairs, discordant or discordant for age-related macular degeneration (AMD), demonstratedheritability estimates for AMD ranging from 0.46 to 0.71.¹ We evaluated MZ twin pairs with different macular phenotypes (discordant twins) to assess AMD phenotypes and environmental factors, controlling for heredity.

**Methods:** Eight hundred and forty twins from the National Academy of Sciences-National Research Council WW II Veteran Twin Registry were enrolled.¹ Macular characteristics were based on fundus photographs using scores determined at the Wisconsin Reading Center and a 5-grade clinical age-related maculopathy staging system.² Of the 210 MZ pairs, 43 were discordant based on last known grade. MZ twin pairs were genotyped for 7 known AMD genetic loci: CFH variants, C2, CFB, C3, CFI, LOC387712, TRAF1 gene region as well as other genes which confirm monozygosity. Linear regression was used to evaluate associations between ocular and non-ocular status for each twin pair.

**Results:** Several AMD phenotypes differed within the twin pairs. Discordant features included presence of geographic atrophy (N=10 pairs), increased pigment (N=27 pairs), soft drusen (N=14 pairs), soft drusen size (N=39 pairs), and hard distinct drusen (N=24 pairs). Also, categories of personal and environmental factors differed in some MZ pairs: smoking (N=10 pairs), body mass index (N=19 pairs), and education (N=5 pairs). The twin who was the heavier smoker tended to have more advanced stages of AMD than the twin who smoked less (p = 0.03).

**Conclusion:** Within some MZ twin pairs with identical genotypes, characteristics representing various AMD phenotypes were discordant. Heavier smoking was significantly related to more advanced AMD. Results implicate that factors other than genotype are involved in the etiology of AMD.

**References:**
³ Ophthalmol. 2006; 113: 260-266.
⁴ CR: H.R. Shah, None; R. Reynolds, None; J.M. Seddon, None.
⁵ Support: None

### 4537 - A595

**Is AMD Equally Prevalent in Australians of Southern-European and Anglo-Celtic Origin?**

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**Purpose:** To compare the prevalence of AMD between older Australians of Anglo-Celtic and Southern-European origin in the Melbourne Collaborative Cohort Study (MC3S).

**Methods:** A total of 22,406 MCCS participants, aged 48 to 86 years, were photographed in 2003-07 with the 45° Non-Mydriatic Canon Fundus Camera. Of these, 21,152 had complete data on their AMD status grading in both eyes. As the worst feature of AMD in either eye, intermediate drusen 63 to 124 micron in size was identified in 4031 participants, large drusen 125 microns or larger in 2380 participants, and late AMD in 122 participants. Fourteen percent of participants were first generation migrants from Greece or Italy, with the remainder of Anglo-Celtic origin.

**Results:** Intermediate or large drusen identified as the worse detected AMD feature were present more often in those of Southern-European origin compared with Anglo-Celtic origin (Adjusted Odds Ratio 95% Confidence Interval): 1.50 (1.37, 1.65) for intermediate drusen, and 1.33 (1.17, 1.50) for large drusen; adjusted for age, gender and smoking). There was no difference in the prevalence of late AMD between the two ethnic groups (OR 0.80 (0.46, 1.40) for late AMD in Southern Europeans compared to Anglo-Celtic participants).

**Conclusions:** Australians of Southern-European origin were more likely to have early AMD than those of Anglo-Celtic origin. However, this did not translate to the greater rates of late AMD, despite the fact that Southern Europeans had a higher proportion of current smokers.

**CR:** L.D. Robman, None; M.K. Adams, None; J.A. Simpson, None; K.Z. Aung, None; G.A. Makeyeva, None; G.G. Giles, None; D.R. English, None; P.N. Baird, None; R.H. Guymer, None.

**Support:** NHMRC Grants 290067 and 251533, ORLA grants, J Reid Charitable Trust, Proliferative Retinal Diseases, Career Development Award (RC), Wagstaff Fellowship (LR), HN Puckle Fellowship (MA)
Risk Factors Associated With Four-Year Incidence of Early Age Related Macular Degeneration: The Los Angeles Latino Eye Study (LALES)

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Purpose: To assess the impact of baseline socio-demographic, behavioral and clinical factors on the 4-year cumulative incidence of early age-related macular degeneration (AMD) in adult Latinos

Methods: The LALES is a population-based longitudinal study of Latinos aged 40 years and older. Participants underwent standardized comprehensive opthalmological examinations at baseline and at four years of follow-up. Early AMD was diagnosed from stereoscopic fundus photographs using the Age-Related Eye Disease Study (AREDS) grading system. Early AMD was defined as any soft indistinct drusen or any drusen with pigmentary changes. Univariate and multivariate stepwise logistic regression were used to examine the association of incident early AMD and incident soft indistinct drusen with various baseline factors including age, gender, country of birth, accommodation, working time per year, and lifestyle factors. All statistical analyses were adjusted for age and sex.

Results: Of the 4568 people 4029 (88%) participant with graduable fundus photo at baseline and follow-up were included in this analysis. The 4-year incidence of early AMD and soft indistinct drusen was 6.9% and 2.2%, respectively. Multivariate analyses revealed that older age (OR=1.4 per decade of age) and retirement (OR=1.9) were independent risk factors for early AMD. Native American ancestry was inversely associated with early AMD (OR=0.2). Independent risk factors for soft indistinct drusen included age (OR=1.7 per decade of age), male gender (OR=1.8) and higher pulse pressure (OR=2.7 for ≥40 compared to <40 mmHg).

Conclusions: While many risk factors are associated with early AMD and soft indistinct drusen, only related pulse pressure is a modifiable risk factor. Interventions aimed at reducing pulse pressure should be explored for the reduction in incidence of soft indistinct drusen as these are more likely to progress to late vision threatening AMD.

CR: F. Choudhury, None; R. Klein, None; S.P. Azen, None; R. Varma, None.
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Abdominal Obesity - Not BMI - Increases Risk of Late AMD in Men

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Purpose: Previous studies have provided conflicting evidence of the association between anthropometric measures, not using BMI, and age-related macular degeneration (AMD). Using five different adiposity measures we explored their association with AMD in a large Australian cohort study.

Methods: Bilateral non-mydratic digital retinal photos from 21,132 participants of the Melbourne Collaborative Cohort Study, aged 48–86 years at time of photography, were graded according to AMD phenotype. Polytomous logistic regression, adjusting for smoking status, ethnicity and age, was used to assess associations between AMD and each of the five adiposity measures: body mass index (BMI), waist-to-hip ratio (WHR), waist circumference (WC), fat mass (FM), and body fat percentage (FP). BMI, WHR and WC were obtained from direct measurements. FM and FP were estimated from bioelectrical impedance analysis.

Results: Only the two measures of abdominal obesity were associated with an increased risk for men for late AMD (WHR (scaled per 0.1): Odds Ratio 1.72, 95% Confidence Interval: 1.2-2.7; P=0.018, WC (per 10cm): OR 1.4, CI 1.06 - 1.86, P=0.017) but no associations were observed with early AMD. For women, an increase in all adiposity measures was observed to be moderately protective for early AMD, whereas none of the adiposity measures were associated with late AMD. Overall for both sexes there was a weak negative association with higher BMI (>30) and early AMD (OR 0.83 CI: 0.71-0.97 P=0.017).

Conclusions: Contrary to other studies, BMI was not associated with an increase in AMD risk. Only elevated WC was associated with late AMD. For both sexes there was a weak negative association with higher BMI (>30) and early AMD (OR 0.83 CI: 0.71-0.97 P=0.017).

CR: M.K.M. Adams, None; L.D. Robman, None; J.A. Simpson, None; K.Z. Aung, None; G.A. Makeyeva, None; G.G. Giles, None; D.R. English, None; R.H. Guymer, None; P.N. Baird, None.
Support: NHMRC Grants 209057 and 251533, ORIA grants, J Reid Charitable Trust, Perpetual Trustees, Career Development Award (RG), Winstan Fellowship (LR), RN Puckett Fellowship (MA)
Prevalence and Significance of Subretinal Drusenoid Deposits (Reticular Pseudodrusen) in Age-Related Macular Degeneration


The Singapore Malay Eye Study (SiMES) is a population-based eye survey of the Singapore Malay Study consisting of patients who did not have AMD as their primary diagnosis, central serous chorioretinopathy, high myopia, retinal detachment or laser treatment in the macular area. The presence of subretinal drusenoid deposits was determined by two methods, using the blue channel of color fundus photograph and the spectral domain optical coherence tomography (SD-OCT) sections. Soft drusen were determined from color fundus photographs and confirmed by SD-OCT. The main outcome measures were the prevalence of ocular risk factors and subretinal drusenoid deposits in eyes with AMD and their association with late AMD.

Results: There were 1101 patients who had any form of AMD, with 131 having late AMD in at least one eye and there were 101 controls. Subretinal drusenoid deposits were diagnosed in the case group in 13 (8.7%) of right and 18 (12.0%) of left eyes using the blue channel of the color photograph and in 58 (38.4%) of right and 54 (35.8%) of left eyes using the SD-OCT. In the control group subretinal drusenoid deposits were diagnosed in 6 (6.5%) of right and 6 (6.3%) of left eyes using SD-OCT. Soft drusen and subretinal drusenoid deposits detected by SD-OCT were found to be independently correlated with late AMD (odds ratio = 16.66, 95% confidence interval = 5.08 to 54.19, p = 0.001). Subretinal drusenoid deposits detected as confirmed by OCT odds ratio = 2.64 (p = 0.034).

Conclusions: Both soft drusen and subretinal drusenoid deposits occur in patients with AMD and both are significantly associated with late AMD. These findings suggest that detection and classification of drusen and consequently assignment of risk should be based on a methodology that includes SD-OCT.

CR: R.F. Spaide, None; S.A. Zweifel, None; Y. Imamura, None; T.C. Spaide, None; T. Fujinara, None.

Support: Macula Foundation

Prevalence and Progression of AMD

453 - A600

Early Middle-Age Cholesterol Level and Age-Related Maculopathy 40 Years Later

I.J. Immonen, S. Loukovaara, S. Seitsonen

Purpose: To evaluate the correlation of early middle age total cholesterol level with age-related maculopathy (ARM) status evaluated 40 years later.

Methods: Blood samples were taken in 1968 from 113 Finnish male executives to evaluate cardiovascular risk profiles. Repeat cholesterol analysis was done in 2003. ARM status was graded from fundus photographs taken in 2007. Patients with at least large drusen or extensive medium size drusen at least in one eye were graded as ARM subjects. The patients were genotyped for the ARM risk SNPs of the CFI, LOC38715 and C3 genes.

Results: Mean age of the subjects at the time of AMR grading was 79 years. 34 (30%) of the subjects had ARM. The mean cholesterol values in ARM and non-ARM subjects were 6.21 (SD = 1.71) and 5.71 (1.25), p = 0.075. When analyzed within genotype, the cholesterol levels were significantly higher in ARM subjects with the CFI heterozygous risk genotype and in the LOC 38715 and C3 homoygous low risk genotypes. In samples taken in 2003, no significant differences were observed in corresponding genotypes.

Conclusions: This cohort is homogenous in relation to gender and social class and the baseline samples are taken more than 20 years before the statin-era, allowing an efficient analysis of cholesterol as a risk factor for ARM. Elevated cholesterol levels seem to contribute to the pathogenesis of ARM when the genetic risk is low, but the effect cannot be obscured in subjects with a high genetic risk load. Early middle age cholesterol level appears to be more associated with late ARM than cholesterol levels in old age.

CR: I.J. Immonen, None; S. Loukovaara, None; S. Seitsonen, None; I. Järvelä, None; T. Strandberg, None.

Support: HUS EVO grant

Prevalence and Progression of AMD

454 - A601

Early Middle-Age Cholesterol Level and Age-Related Maculopathy 40 Years Later

I.J. Immonen, S. Loukovaara, S. Seitsonen, I. Järvelä, T. Strandberg

Purpose: To evaluate the correlation of early middle age total cholesterol level with age-related maculopathy (ARM) status evaluated 40 years later.

Methods: Blood samples were taken in 1968 from 113 Finnish male executives to evaluate cardiovascular risk profiles. Repeat cholesterol analysis was done in 2003. ARM status was graded from fundus photographs taken in 2007. Patients with at least large drusen or extensive medium size drusen at least in one eye were graded as ARM subjects. The patients were genotyped for the ARM risk SNPs of the CFI, LOC38715 and C3 genes.

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Conclusions: This cohort is homogenous in relation to gender and social class and the baseline samples are taken more than 20 years before the statin-era, allowing an efficient analysis of cholesterol as a risk factor for ARM. Elevated cholesterol levels seem to contribute to the pathogenesis of ARM when the genetic risk is low, but the effect cannot be obscured in subjects with a high genetic risk load. Early middle age cholesterol level appears to be more associated with late ARM than cholesterol levels in old age.

CR: I.J. Immonen, None; S. Loukovaara, None; S. Seitsonen, None; I. Järvelä, None; T. Strandberg, None.

Support: HUS EVO grant
Publication Rates of Clinical Trials in Age Related Macular Degeneration


Purpose: To evaluate the rate of publication of registered clinical trials concerning age-related macular degeneration (AMD).

Methods: The National Institutes of Health's ClinicalTrials.gov registry was searched to identify all trials concerning AMD. Trials that were actively recruiting, not interventional, terminated, or did not actually concern AMD were excluded. Only trials that had been completed two or more years before this analysis was started were included, to allow for adequate time to pass before publication was expected to occur. PubMed.gov was then searched to evaluate the publication status of each study.

Results: 385 studies were initially identified, of which 64 (16%) were included in the final evaluation. 321 studies were not included for the following reasons: 171 did not involve AMD or were not interventional; 141 were not completed by January 1, 2007; 9 trials were terminated. Of the 64 trials that were included, 35 (54%) were published. Industry sponsored trials were published at a slightly lower rate (52.5%) than were non-industry sponsored trials (58%).

Conclusions: Utilizing broad study parameters, fifty four percent of registered trials in AMD have been reported in the peer reviewed literature. This finding raises concerns about the completeness of data available concerning present and future AMD therapies.

CR: H.F. Fine, Auris Surgical Robotics, I; Genentech, C; Allergan, C; Eyetech, C; Auris Surgical Robotics, C; Auris Surgical Robotics, P; J.L. Prenner, Neovista, E; Ophthotech, E; OPKO, E; Alcon, C; Allergan, C; Eyetech, C; Neovista, C; Ophthotech, C; OPKO, C; OPKO, P; S. Driscoll, None; D. Salz, None.

Support: None
4547 - A605

EPHA2 Polymorphisms and Age-Related Cataract in India - Findings From the Indeye Genetics Study

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Purpose: Age-related cataract is a major cause of blindness worldwide. Previous studies have shown that the gene EPHA2 is associated with age-related cataract in those of European descent. The aim of the present study was to confirm previous associations of single nucleotide polymorphisms (SNPs) in a study of age-related cataract in India.

Methods: 7086 participants aged 40 and above from the two centres (North and South India) of the INDEYE study gave consent to blood collection and genotyping. Digitised lens images of each eye were graded by the Lens Opacification Classification System (LOCS III). The prevalence of any type of cataract (nuclear >=4 or cortical >=3, Posterior SubCapsular) was 2, or dense or operated in either eye) increased with age. Genotyping of rs754334 and rs7543472 was carried out with RT-PCR. Logistic regression was used to determine the association between any type of cataract and SNPs, adjusted for age, sex, study centre and distance in km of village. Associations were examined also with specific types of cataract.

Results: Genotype frequencies for rs754334 were 43% (CC), 45% (CT) and 12% (TT) in controls and for rs7543472 63% (CC), 34% (CT) and 4% (TT) with no violation of Hardy-Weinberg equilibrium (p=0.75 and 0.54, respectively). There was no evidence for an association of rs754334 TT with cataract (p=0.57), nor there was evidence for an association with cortical cataract (p=0.69), nor nuclear cataract (p=0.92). There was a borderline association between rs7543472 TT and any form of cataract when compared to rs7543472 CC with an odds ratio (OR) of 1.31 with 95% confidence interval (0.97, 1.77) (p=0.04). This association reflected mainly the association of rs7543472 TT with cortical cataract with OR 2.06 (1.34, 3.07); p=0.015 and PSC with OR 1.73 (1.20, 2.51); p=0.014. There was a weaker association of rs7543472 TT with nuclear cataract with OR 1.37 (1.01, 1.88); p=0.045.

Conclusions: In conclusion there is evidence for association of rs7543472 with age-related cataract, in particular cortical and posterior sub-capsular forms.

CR: A. Shanker, None; P. Sundaresan, None; P. Vashist, None; R.D. Ravindran, None; B. Talwar, None; G. Maraini, None; D. Nitsch, None; J.F. Hejtmancik, None; B.A. Nonyane, None; A.E. Fletcher, None.
Support: None.

4549 - A607

Verification of Predictive Accuracy of Index of Lens Transparency Using a Scheimpflug Camera - 12-Year Follow-Up

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Purpose: Lens transparency properties (LTP) form an index formulated by the author's group to describe normal age-related changes of lens transparency using intensity of backscattered light (Sasaki H, et al: Ophthalmic Res. 1999), using a EAS-1000 Scheimpflug camera (NIDEK).

Methods: In 1996 a random sample of 1045 persons 50 years and older were examined in different villages. Associations were examined also with specific types of cataract.

Results: There was a borderline association between rs7543472 TT and any form of cataract when compared to rs7543472 CC with an odds ratio (OR) of 1.31 with 95% confidence interval (0.97, 1.77) (p=0.04). This association reflected mainly the association of rs7543472 TT with cortical cataract with OR 2.06 (1.34, 3.07); p=0.015 and PSC with OR 1.73 (1.20, 2.51); p=0.014. There was a weaker association of rs7543472 TT with nuclear cataract with OR 1.37 (1.01, 1.88); p=0.045.

Conclusions: In conclusion there is evidence for association of rs7543472 with age-related cataract, in particular cortical and posterior sub-capsular forms.

CR: A. Shanker, None; P. Sundaresan, None; P. Vashist, None; R.D. Ravindran, None; B. Talwar, None; G. Maraini, None; D. Nitsch, None; J.F. Hejtmancik, None; B.A. Nonyane, None; A.E. Fletcher, None.
Support: None.

4550 - A608

Progression of Age-Related Cataracts in AREDS


Purpose: To investigate the long term progression of age-related cataract in the Age-Related Eye Disease Study (AREDS).

Methods: AREDS participants were evaluated for the cataract types of nuclear, cortical, and posterior subcapsular (PSC) using a standardized grading scheme based on reviews of slit-lamp photographs taken at baseline, 2 years after enrollment, and annually thereafter. Primary outcome was cataract progression, defined as a type-specific opacity grade increase from a baseline cataract status of none or mild to a grade of clinically important cataract defined as either surgery for cataract or presence of "moderate cataract", ≥4 for nuclear, ≥2 for PSC involvement with the full visible lens for cortical, and ≥5% involvement of the central 5-mm circle of the lens for PSC. Cox regression analysis was used to assess risk factor associations and adjusted progression rates for these cataract outcomes. The Wei-Lin-Weissfeld method was used to take into account the correlation between eyes.

Results: This study was a clinic-based cohort of 4425 persons (8676 eyes) aged 55-80, with an average of 8.9 years of follow up. The number of eyes with no or mild cataract available at baseline for analyses include: 7600 for nuclear, 7412 for cortical, and 8088 for PSC. All 8676 eyes were included in the cataract surgery analysis. The rates of cataract progression are displayed in the following table:

<table>
<thead>
<tr>
<th>Year</th>
<th>5 year progression (%)</th>
<th>10 year progression (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age</td>
<td>Nuclear</td>
</tr>
<tr>
<td>65-69</td>
<td>65.9</td>
<td>12.8</td>
</tr>
<tr>
<td>65-69</td>
<td>16.4</td>
<td>17.6</td>
</tr>
<tr>
<td>70-75</td>
<td>20.6</td>
<td>21.1</td>
</tr>
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</table>

Conclusions: Progression to moderate cataract or cataract surgery was highest in the oldest age group. Females had a higher rate of nuclear and cortical cataract progression compared with males. Males had a higher rate of PSC progression. The results of this study of three types of age-related cataract may provide rates of progression that are important in designing future epidemiologic studies and clinical trials of prevention and treatment of age-related cataracts.

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4553 - A611 Risk for Radiation Cataract in Interventional Cardiology Personnel

Environmental Health Sciences, Columbia Univ., New York, NY; Radiology, Complutense Univ., Madrid, Spain; Invasive Cardiology, Univ. Hospital, Montevideo, Uruguay; International Atomic Energy Agency, Vienna, Austria; Fundación Oftalmológica Nacional, Bogota, Colombia; Cardiology, Sarawak General Hospital, Kuching, Malaysia.

Purpose: The lens is one of the most radiosensitive tissues. Exposure to ionizing radiation causes characteristic, dose-related progressive lens changes leading to cataract. There is considerable uncertainty concerning radiation risk to the lens. Under typical working conditions, cumulative dose to the lenses of interventional cardiologists and staff may be high. This study seeks to determine the risk of radiation cataract following occupational x-ray exposure in interventional cardiology personnel.

Methods: Comprehensive, dilated slit lamp exams were performed in interventional cardiologists (IC), associated medical workers and unexposed controls. Subjects were examined at cardiology Congresses in Colombia, Uruguay and Malaysia under the auspices of the International Atomic Energy Agency and regional cardiology societies. Occupational exposure was determined using experimental data from catheterization center suites and answers to detailed questionnaires.

Results: 116 exposed and 93 unexposed professionals of similar ages were examined in the combined Uruguay/Columbia Latin American cohort. Posterior subcapsular opacities typically associated with ionizing radiation exposure were found in 38% of IC (46±8 yrs) as compared to 12% of controls (41±10 yrs) (p<0.005). Merriam-Focht scores ranging from 0.5-2.0 were noted. 21% of nurses and technicians (58±7 yrs) had radiation associated lens changes, predominately of lesser severity. Cumulative median lens doses were estimated at 6.0 Sv for IC and 1.55 Sv for associated personnel. Most individuals reported no consistent use of eye protection. In the Asian cohort, 125 persons (56 ICs, 14 nurses/technicians and 55 unexposed controls) were examined. Posterior subcapsular opacities were observed in 52% of ICs (42±16 yrs) (p<0.05), 43% of nurses/technical staff (58±11 yrs) and 21% of unexposed age-matched controls (43±9 yrs).

Conclusions: This survey is the first to demonstrate a significantly elevated prevalence of radiation associated lens opacities in IC as compared to similarly aged unexposed controls. Increasing prevalence of lens opacities in associated nurses and technicians suggests ocular risk in these workers may also be underestimated. The findings indicate an urgent need to educate IC professionals about ocular protection to reduce the likelihood of cataract.

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4554 - A612 A Prospective Study of Cardiovascular Risk Factors and Cataract Extraction: The Singapore Chinese Health Study

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Purpose: To determine the relationship between hypertension, diabetic mellitus, obesity and risk of cataract extraction in older Chinese people in Singapore.

Methods: The Singapore Chinese Health Study (SCHS) is a prospective cohort of 3,295 middle-aged and older Chinese men and women enrolled between 1993 and 1998. Information on diet, lifestyle factors and histories of medical conditions was collected through in-person interviews at baseline. Data on all cataract operations performed for “senile cataract” (ICD-9, Clinical Modification code 366.1) between 1990 and 2008 were retrieved from MedClaims, a population-based, nation-wide, government-administered medical savings fund, from which incident cases of cataract extraction among SCHS participants were identified.

Results: There were 15,603 participants in the SCHS who underwent cataract extraction after recruitment into the cohort. In multivariate analyses, hypertension and diabetes mellitus at baseline were risk factors for cataract extraction. Hypertensive subjects were 1.10 times as likely as normotensive subjects to have cataract extraction (95% confidence interval (CI), 1.06-1.14), while diabetic subjects were 1.64 times as likely to have cataract extraction as their non-diabetic counterparts (95% CI, 1.56-1.73). Increasing body mass index (BMI) was associated with increasing risk of cataract extraction among non-diabetic subjects (P for trend < 0.001) but not among diabetic subjects (P for trend > 0.815). Hazard ratios (95% CI) of cataract extraction with BMI 28.0-29.9 kg/m2 vs. BMI < 21.0 kg/m2 were 1.19 (95% CI, 1.09-1.29) among non-diabetic subjects but 0.85 (95% CI, 0.68-1.06) among diabetic subjects.

Conclusion: Hypertension and diabetes mellitus are associated with increased risk of cataract extraction. In addition, increased BMI is also a risk factor among non-diabetic subjects. These results underscore the importance of providing education to patients who have hypertension, diabetes mellitus or who are obese should be screened regularly for cataract.

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4552 - A610 Light Scattering Profiles in the Lenses of Subjects From a Light Protected Community - The Irish Nun Eye Study (INES)

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Purpose: To investigate the effect of protection from sunlight on lens light scattering profile in a subset of nuns from the Irish Nun Eye Study (INES) correlated to age and outdoor activity / convent type.

Methods: After obtaining normed, consented, the images of 144 retired nuns from contemplative and missionary orders in Ireland were monitored with a Scheimpflug Camera (Pentacam HR®; Oculus, Wetzlar, Germany). Following pupil dilation with tropicamide, Scheimpflug images of the anterior eye segments in 25 meridians were recorded using the automatic recording algorithm of the camera. The images were later subjected to denoising image analysis using special analytical software (BIOM®).

In addition discoloration of the lenses was determined with the handheld slitlamp microscope and LOCS III Grading System. Cortical and posterior sub-capsular lens opacities were also imaged using the Neitz cataract screen. The data were compared to results from other studies investigating lens light scattering and discoloration.

Results: Age-related light scattering increase in the nuclear layers of the lens was generally lower than that of the cortical layers. In addition the frequency of cortical cataracts of various types was significantly higher than that of nuclear cataracts of all types, and had no influence of either presenting or best corrected pre-operative VA, as well as gender, schooling and previous cataract surgery in one eye.

Conclusions: Light protection affects the intensity distribution of back scattered light in different lens layers and reverses the frequencies of the cataracts between cortex and nucleus. It does not affect, however, the development of yellow discoloration of the lens.

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4551 - A609 Cataract Surgery Compliance in Low-Income Older Adults in Brazil: The São Paulo Eye Study

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Purpose: To determine cataract surgery indication and compliance in a low-middle income population in São Paulo, Brazil.

Methods: The São Paulo Eye Study (SPES) was a population-based study of urban, low-middle income residents of three districts of São Paulo city. A door-to-door household census was conducted to identify residents aged 50 years and older from 22 randomly selected clusters. The study was carried out from July 2004 to December 2005. Briefly, 378 participants were recruited and examined by an eye exam including visual acuity (VA) measurement, refraction, and slit-lamp examination. Cataract surgery was indicated and offered free-of-charge at our local hospital for those who had cataract as a principal cause of best-corrected VA ≤ 20/40 in either eye. Two years after the original study, a household survey was performed to identify compliance to cataract surgery indication.

Results: From the original 3,678 participants, 218 (5.93%) had cataract surgery indication. In a two-year follow-up, 167 participants were successfully contacted (76.6%). 36 participants had passed away (16.5%) and 5 (1.6%) had moved from the household. Of these, 133 (79.6%) had never been operated 82 had indication for both eyes - 14 (17.1%) had bilateral surgery and 9 (11.0%) had unilateral surgery. Overall, only 55 (32.93%) had participated in cataract surgery, predominantly females (N=40) and individuals 60 years of age and older (N=51). Cataract surgery compliance was associated with age 60-69 years (P=0.021) and had no influence of either presenting or best corrected pre-operative VA, as well as gender, schooling, and previous cataract surgery in one eye.

Conclusion: Despite providing expedited and free of charge surgery, a low compliance to cataract surgery was found in this population with many remaining visually impaired/blind because of cataract. Awareness campaigns and efforts to fight against obstacles to cataract surgery adherence should be implemented by health authorities to increase cataract surgery uptake in older Brazilian adults.

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4554 - A613
To Determine the Influence of Geographic Location and Insurance Status on the Likelihood of Receiving a Diagnosis of Cataract
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Purpose: To determine whether insurance status or geographic location affects the likelihood of receiving a diagnosis of cataract.

Methods: The Data Utilization and Ambulatory Medical Care Survey (NAMCS) 2002-2007 was utilized to determine the association of cataract prevalence with a number of assumed risk factors. A multivariate regression analysis was performed for the prevalence of cataract while controlling for the following variables: age, gender, race, diabetes status, geographic location, tobacco use, and insurance status. Regression models performed with statistical analysis software included logit, probit, and linear probability models. Marginal effects were calculated for each variable to determine the magnitude of impact on the prevalence of cataract. Those variables with statistically significant correlations were re-analyzed in a more concise regression model.

Results: The 70-79yr age group had greater odds of receiving a diagnosis of cataract compared to the 90yr and over group (OR = 4.22, 95% CI [3.53 - 4.94]). A diagnosis of diabetes increased the likelihood of obtaining a concomitant diagnosis of cataract in comparison to office visits where no diagnosis of diabetes was given (OR = 3.24, 95% CI [2.13 - 8.52]). Insurance status and geographic location did not demonstrate a statistically significant correlation with the prevalence of cataract.

Conclusions: Diabetic status and age group play a statistically significant role in predicting the increased likelihood of cataract prevalence based on physician office visits in this nationally-representative cohort. Insurance status and geographical location did not demonstrate a statistically significant correlation. Increased public health strategies specifically targeting patients with increased age and diabetes should be made in an effort to screen, prevent, and treat patients from potentially developing cataracts.

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4555 - A614
The Meaning of Galactose Metabolism for Congenital Cataract - A 12-Year Analysis
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Purpose: Several enzyme defects of the galactose pathway may lead to congenital cataract formation. The purpose of this study was to determine the frequency of disorders in galactose metabolism in different morphological forms of congenital cataract.

Methods: From 1998 on, in all children undergoing surgery for congenital cataract of unclear etiology, lens material and blood samples were investigated for enzyme defects or elevated levels of galactitol as an indirect parameter for a disorder in galactose metabolism. The investigated enzymes were the galactokinase, the UDP-galactose-epimerase and the galactose-1-phosphate-uridyl-transferase. The type of congenital cataract formation was classified by slit lamp examination before or during surgery.

Results: Between 1998 and 2009, 79 patients with congenital cataract underwent surgery (mean age at surgery 50 months, 42 females, 37 males). In 23 patients (29%, mean age at surgery 51 months, 14 females, 9 males), there was an association with another eye disease (Rieger-syndrome, persistent hyperplastic primary vitreous), maternal infection during pregnancy or chromosomal disorder (trisomie, turner-syndrome). In 56 children (71%, mean age at surgery 49 months, 28 females, 28 males) with no evident etiology for congenital cataract lens material and blood samples were investigated for disorders in galactose metabolism.

Conclusions: In about 20% of children with congenital cataract of unknown etiology a defect in galactose metabolism was found. The percentage in this study is 30% higher than the percentage of 6% reported in the literature. Thus, in patients with unexplained congenital or developmental cataract, investigations of enzymes and polys of galactose metabolism are recommended and may help to decide about dietary intervention.

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4557 - A615
Retinal Detachment After Phaco Cataract Extraction With Posterior Capsular Defect
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Objective: References to the likelihood of retinal detachment after capsular tear are unconvincing and often come from very small cohorts. In the literature from the early nineties of the last century the amotio-rate after posterior capsular rupture with 5 - 8% becomes given. Because the given literature evaluated OP's from the 80s often still in ECCE and in case of complications wedge swab vitrectomy was done, this investigation about the amotio-rate with modern complication management should give conclusions.

Material and Methods: January 98 and December 08 in the Detmold Eye Clinic performed planned Phaco-CE’s be searched on the basis of OP book for use of a vitrectomy. In cases in which the OP’s vitrectom had been used OP report and patient recordings were evaluated and thus different reasons were identified for (mainly anterior) vitrectomy. Then in all cases of vitrectomy with Phaco CE the referring ophthalmologists were written up and asked for finding information with regard to retinal detachment, lens dislocation, visual acuity and date of the last investigation. In all cases in which on this way no data from 09 were available patients were contacted by telephone and questioned.

Results: From 1/98 to 12/08 32.857 cases of planned Phaco-CE’s were evaluated. 365 cases (11%) in which a vitrectom was used during the operation were found, under it: Capsule ruptures 257 (70.8%), primary zonulolysis 73 (2.2%), changes into ECCE 9 (0.3%), PPV 19 (0.5%), other 6 (0.2%). In 365 cases 12 retinal detachments had occurred, under it after PC-rupture, 2 to after zonulolysis and 1 after ECCE and 1 after PPV. On average of all cases the amotio-rate amounted to 3.29%, after posterior capsule rupture or zonulolysis 3.03%, against it to PPV or ICCE 6.89%.

Discussion: In our patients we found less retinal detachments than the literature allows to suppose, as long as a complication limits itself mainly to the anterior ocular segment. With primary zonulolysis 2.24% (in 2 of 73 cases), with posterior capsule defects 3.11% (in 5 of 257 cases). If a PPV was combined against it with a Phaco CE or necessarily, the amotio-rate amounted to 5.25% (one of 19 cases), by change in an ICCE even 10% one of 10 cases. The clean removal of all possible causes for vitreous body traction seems to influence the likelyhood for a detached retina in the later course favourably.

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4558 - A616
An Investigation of the Relationship Between Cataract Surgery Wait Times and Rates of Surgery
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Purpose: The province of Ontario Canada has two wait time registries for cataract surgery that allows for population based estimates of the use of wait times as an indicator of health service need.

Methods: Both wait time registries were used to determine if wait time was correlated with rates of surgery and this data was then stratified by priority of cataract (1 to 4 based on province wide definitions), region of the province, age and gender. Wait time was defined by the time from surgical booking to case completion. Results: The total number of cases used for the year 2008 was 65,469 which were all cases performed in Ontario in that year.

Results: Wait times ranged from 7 days to 6 months. There was a very weak correlation between wait time and rate of surgery (r=0.003). This weak correlation persisted for all priority types, regions of Ontario, patient age and gender.

Conclusions: Important population health service metrics such as rates of surgery, either overall or by region did not correlate well with wait times. Wait times are a poor metric upon which to base population health service decisions such as cataract surgery.

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456 - A619
Primary Intracorneal Lens Implantation for Bilateral Congenital Cataracts in Infants 0-1 Year Old: Long-Term Anatomic and Visual Outcome

Purpose: Primary intracorneal lens (IOL) implantation is controversial in young infants for the correction of aphakia. Small case series showed moderate better visual outcome than aphakic groups, but more postoperative complications than older children. The aim of this study was to assess the long-term anatomic and visual outcome of cataract extraction and IOL implantation in infants younger than 1 year old.

Methods: We retrospectively reviewed 86 eyes of 43 infants younger than 1 year operated for bilateral congenital cataract from 1999 to 2016. The surgical procedure was anterior capsulotomy, phacoemulsification, posterior capsule aspiration, and IOL implantation in the capsular bag or the sulcus. The following data were analyzed: age at the time of surgery, type of cataract, associated abnormalities, complications, final anatomic and refractive status, final best-corrected visual acuity (BCVA).

Results: The mean interval at the time of surgery was 4.3±2.7 months. The morphology of cataract was total (45%), nuclear (42%), zonular (9%) and posterior subcapsular (6%). There was a family history of congenital cataract in 16 infants. Two infants suffered psychomotor delay. The most common postoperative complications were posterior proliferations (16%), anterior vitreous (11%), and posterior capsular opacity (9%). The final spherical equivalent refraction was 2.2±4.1 diopters (6.5±3.2 at 1 month postoperatively). After a mean follow-up of 7.3±1.5 years, final BCVA was as shown below.

Conclusions: Primary IOL implantation appears effective and safe in the management of bilateral congenital cataract in infants. Favorable visual outcomes can be achieved in the majority of cases. Opacification of the visual axis is the most common complication and the risk of glaucoma requires a careful long-term follow-up.

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4562 - A620
An Economic Evaluation of Propylactic NSAID Use With Cataract Surgery to Prevent Cystoid Macular Edema

Purpose: To provide a framework for the decision to use propylactic NSAIDs with cataract surgery in order to prevent cystoid macular edema (CME). We performed an economic analysis to determine if the cost of propylactic NSAIDs is offset by the risk and costs of managing pseudophakic CME.

Methods: We constructed a decision analytic model using data from the peer-reviewed literature to compare the costs of management of pseudophakic CME when using propylactic NSAIDs in combination with steroids versus propylactic steroids alone. Analysis was conducted from the payer’s perspective (e.g. Medicare). Literature searches of PubMed and the Cochrane Library provided probabilities and costs for various therapies in post-surgical management of CME. A simple decision model was constructed describing a single episode of CME from cataract surgery to resolution of CME or vitrectomy. Among the costs accounted for were medications for prophylaxis and treatment of CME, office visits, subtenon and intravitreal steroids, vitrectomy, and the management of complications of therapies. We relied on an estimate from Woolf et al (2009) of CER of 2% for the incidence of CME in patients not receiving prophylactic NSAIDs, to provide a conservative estimate of risk. We made the additional conservative assumptions that propylactic NSAIDs have 100% efficacy in preventing CME, and that no cases of CME spontaneously resolve. The data were analyzed in TreeAge Pro 2009. We report the expected cost of care of CME for the two strategies.

Results: The expected cost of management of CME following cataract surgery for patients using propylactic NSAIDs was $92.88, which accounts for the cost of medication. For those receiving NSAIDs, the expected cost of management of CME was $36.62, which represents the cost of treatment of CME and follow-up. We estimate that the use of NSAIDs prevents approximately 1 in 700 patients from resulting in a BCVA of 20/200 or worse.

Conclusions: Our model demonstrates that using propylactic NSAIDs with cataract surgery is likely to be considered cost-effective. Using prophylactic NSAIDs in each patient decreases the total cost of $76.21 per surgery, and results in a cost of $645.00 per case of BCVA of 20/200 or worse prevented. Given that roughly 2.8 million cataract surgeries are performed each year, we estimate that prophylactic NSAID medication adds over $200 million to the healthcare system without evidence of comparable benefit.

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4563 - A621
Risk Factors Among Cataract Patients for Steroid Response

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Purpose: Elevated intraocular pressure (IOP) is a known complication of topical steroids. This study evaluated the age and axial length of steroid responders following cataract surgery.

Methods: A retrospective chart review included 3642 eyes with uncomplicated cataract surgery during a one calendar year period from a single ophthalmology practice. All patients received topical 1% prednisolone acetate postoperatively. In addition to axial length and patient age, the IOP from the following time intervals was recorded: preop, postoperative day 1, and within the first postoperative month. A steroid responder was defined as having an IOP rise > 25% while on topical prednisolone (minimum 28 mmHg) followed by an IOP drop > 25% when prednisolone was discontinued. Steroid responder eyes were then compared to non-responder eyes based on age and axial length.

Results: Thirty-eight eyes were diagnosed as steroid responders. Final data analysis is pending, but showed that younger age and longer axial length were associated with a higher risk of steroid response - particularly for an IOP rise to > 40 mmHg.

Conclusions: Young myopes should be more carefully monitored for a postoperative steroid response following uncomplicated cataract surgery.

CR: J.J. Tan, None; D.F. Chang, None.

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4564 - A622
Middle-Aged Non Diabetic Patients Undergoing Cataract Surgery: A Population at Very High Risk of Diabetes


Purpose: To evaluate the usefulness of HbA1c measurement in a middle-aged non diabetic cataract surgery patients in order to identify those at high risk of diabetes, defined as HbA1c ≥ 6% according to the International Expert Committee ADA/EASD/IDF report.

Methods: A prospective observational study. Consecutive subjects aged from 40 to 64 years who underwent cataract surgery from March to June 2009. Patients with prior steroid use (n=8), congenital cataract (n=1), known (n=54) or unknown (based on fasting glucose ≥ 126 mg/dl; n=6) diabetes were excluded. Baseline patient characteristics, ocular history (myopia, previous ocular surgery, trauma or inflammation), body mass index (BMI) and waist circumference were recorded. Fasting blood glucose, post-prandial capillary glucose and HbA1c (DCA 2000, Bayer Diagnostics) were measured. Analyses were performed using SPSS software version 14.0 for Windows (SPSS, Chicago, IL).

Results: Among the 132 non diabetic subjects aged 57±6 yrs (47% male, BMI: 26±4 kg/m²; 20% with BMI > 30 kg/m²; waist circumference: 93±13 cm, 45% with abdominal obesity), 52 (39%) patients had HbA1c ≥ 6% compared with 5.8% of a US population in the same age range (Selvin et al. Diabetes Care, 2009). Mean fasting and post-prandial blood glucose were respectively 98±11 [73-122] mg/dl (42% > 100 mg/dl, defined as impaired fasting glucose) and 140±42 mg/dl [68-265] (45% > 140 mg/dl). Mean HbA1c level was 5.86±0.34% [4.9-6.8]. Fifty-four (41%) patients had cataract risk factors (RF): severe myopia (n=28), previous intraocular surgical procedures (n=20) or inflammation (n=6), and 78 (59%) no potential risk factors (no RF). BMI (26.4±4.4 vs 24.9±4.1 kg/m²; p=0.049) and waist circumference (95±14 vs 91±12 cm; p=0.116) were higher in no RF compared with RF group. While mean fasting blood glucose was slightly increased in no RF compared to RF patients (99±11 vs 97±11 mg/dl; p=0.146), HbA1c level was noticeably higher in no RF patients (5.92±0.34 vs 5.77±0.33 %; p=0.013). Additionally, HbA1c value was ≥ 6% in 46% of no RF vs 28% in RF patients (p=0.033).

Conclusions: Middle-aged patients undergoing cataract surgery represent a population at very high risk of diabetes, since the frequency of HbA1c value ≥ 6% is 7-fold higher compared with the general population. Ophthalmologists are therefore in the front line to prevent or delay the onset of diabetes. Among these cataract patients, they have the opportunity to identify individuals at high risk of diabetes based on HbA1c measurement and who might benefit from preventive interventions.

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The Prevalence and Causes of Visual Impairment in an Urban Indian Population in Asia: The Singapore Indian Eye (SINDU) Study

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Purpose: To describe the prevalence and causes of visual impairment and blindness in an urban Indian population in Singapore.

Methods: A population-based, cross-sectional study of Indian persons aged 40 years and older residing in Singapore was conducted in 2007-09. A stratified random sample of 6,350 Indian names residing in south-western Singapore was provided from a national database. Potential participants were contacted by telephone and home visits to determine study eligibility, and invited to a centralized clinic. Participants underwent standardized ophthalmic assessments to determine: (1) presenting and best corrected visual acuity (VA) using the Unified System of VA presentation and low vision; and (2) the primary causes of visual impairment. Prevalence rates were adjusted using the 2000 Singapore census data for the Indian sub-population.

Results: Of the 6,350 names selected, 4,555 were eligible to participate, and of these, 3,579 (74.2%) were examined. When defined using presenting VA, the population-weighted prevalence of bilateral blindness was 6.5% (95% CI: 3.0-10.0) and of bilateral low vision, 16.9% (95% CI: 15.6-18.4). When defined using best-corrected VA, the corresponding prevalence of bilateral blindness was 0.25% (95% CI: 0.11-0.52) and of bilateral low vision 8.9% (95% CI: 7.7-10.2). Undercorrected refractive error was the main cause of presenting unilateral (68.1%) and bilateral (60.7%) visual impairment, whereas cataract was the main cause of presenting unilateral (31.1%) and bilateral (42.9%) blindness. Diabetic retinopathy, age-related macular degeneration, and glaucoma were the leading causes of blindness and low vision.

Conclusions: The age-standardized prevalence of bilateral blindness and low vision in an Indian population living in Singapore were lower than reported from studies in rural India, but slightly higher than reported in the Malay population living in Singapore. Cataract is the leading cause of blindness and undercorrected refractive error and cataract are the leading causes of low vision.

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Prevalence and Low Vision in Preschool Children: The Sydney Paediatric Eye Disease Study

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Purpose: To investigate the prevalence and associations of low vision in a sample of preschool children.

Methods: 2,473 children, aged 6-72 months, were examined in the Sydney Paediatric Eye Disease Study (SPEEDS) during 2006-07. Monocular visual acuity (VA) was attempted on all children aged 3 months+, using the Electronic Visual Acuity system, and in a subset using the logarithm of the minimum angle of resolution chart. Low vision was defined using Retinomax K-Plus 2, Canon RK-F1 autorefractor, or streak retinography after adequate cycloplegia. Myopia was defined as spherical equivalent refraction (SER, sphere × cylinder) ≤ -0.50 diopters (D), hyperopia as SER ≥ +2.00D, astigmatism as cylinder ≥ 1.00D, and anisometropia as SER difference ≥ 1.00D between eyes. Socioeconomic data was obtained from questionnaires.

Results: Low vision in the worse eye was found in 8.35%, with an overall mean VA of 20/32 and mean SER 1.30D in our sample. A trend of improving mean VA from 20/32 to 20/25 with increasing age was observed (p=0.005). However, low VA prevalence was similar across all 5 age groups (p=0.02). There was also no significant difference in prevalent low vision between girls and boys, across ethnicity subgroups, or socioeconomic level. Adjusting for age, gender and ethnicity, low vision in preschool children was found to be significantly associated with myopia (odds ratio with 95% confidence interval [OR 4.71, 2.38-9.33], hyperopia (OR 2.58, 1.62-4.21), astigmatism (OR 7.71, 5.01-11.87), anisometropia (OR 2.40, 1.80-9.80), esotropia (OR 8.72, 2.26-33.7), and premature and postmature birth (OR 52.32, 24.67-111.0). In the seventh grade, health care and acculturation were found to be the main factors associated with low vision.

Conclusions: This study suggests that 8% of Australian preschool children have low vision, with a poorer visual outcome in those with bilateral impairments, and premature and postmature birth, were strongly associated with low vision, suggesting the importance of identifying and monitoring vision in such children and to correct refractive errors from an early age to ensure normal vision development.

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Ranibizumab Improves Patient-Reported Near and Distance Vision Activities in Patients With Macular Edema Following Retinal Vein Occlusion

R. Varma1, N.M. Bressler1, I.J. Suner1, P. Lee2, C.M. Dolan1, J. Ward1, S. Colman3, R.G. Rubin4. BRAVO and CRUISE Study Groups. Ophthalmology, USC, Doheny Eye Institute, Los Angeles, CA; 4Duke Eye Institute, Los Angeles, CA; 2Wilmer Eye Institute, Johns Hopkins University School of Medicine, Baltimore, MD; Retina Associates of Florida, Tampa, FL; Duke Eye Center, Duke University School of Medicine, Durham, NC; 3Genentech, Inc., San Francisco, CA.

Purpose: To examine the impact of intravitreal ranibizumab (Lucentis®), Genentech, Inc.) on patient-reported visual function using the near and distance activity subscales of the National Eye Institute Visual Function Questionnaire-25 (NEI VFQ-25) through 6 months in patients with macular edema (ME) following retinal vein occlusion (RVO).

Methods: Two multicenter, double-masked trials in which participants with ME following branch RVO (BRAVO) or central RVO (CRUISE) were randomized 1:1 to monthly sham, 0.3-mg or 0.5-mg monthly injections of ranibizumab, and were followed for 6 months. The NEI VFQ-25 was administered at 0, 1, 3, and 6 months and the near and distance activities subscale scores were calculated.

Results: At each dose through 6 months, ranibizumab patients reported greater mean improvements in the near and distance activities subscales compared with sham patients (Table). By 6 months the magnitude of these improvements was clinically relevant compared with sham.

Conclusion: At 6 months, average patients with ME following RVO subsequently treated monthly with ranibizumab reported greater improvements in near and distance activities (includes measures of ability to read a newspaper, read street signs, and recognize people from a distance) compared with those who were sham treated.

CR: None; CT: None; Support: www.clinicaltrials.gov, NCT00486018 and NCT00485836

S5214 - 10:00AM

Vision and Exercise Changes in Aging: A Dynamic Relationship Affecting Mortality

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Purpose: To examine the relationship between vision, exercise, and mortality in the aging U.S. adult population by testing the association of self-rated vision and self-rated vigorous physical activity trajectories over time and the association of these trajectories with mortality.

Methods: Using respondents from five cohorts in the Health and Retirement Survey (HRS) (n=28,474) linked to mortality data through the National Death Index with follow-up through 2006, structural equation modeling with latent variables is used to estimate non-linear trajectories for exercise and vision and self-reported functional mobility and mortality trajectories. Missing data are imputed using multiple imputation by chained equations.

Results: Exercise in 1996 decreases mortality in persons over a two year period would increase mortality hazard by the hazard of death [HR=1.61; 95% CI: (1.26, 2.05)]. An average decrease of one point worse vision (1 point lower on a 5-point scale) across persons in 1996 increases the hazard of death [HR=16.34; 95% CI: (2.20, 121.64)]. Exercise and vision declines and rates of decline in vision are related to declines and rates of decline in health conditions, vision and exercise are positively correlated in 1996 (r=0.17), average intercepts, slopes, and quadratic terms are used in the full model of mortality depicted to estimate non-linear trajectories for exercise and eyesight between 1996 - 2006 and follow-up through 2006, structural equation modeling with latent variables is used to test the association of self-rated vision and self-reported functional mobility trajectories with mortality.

Conclusions: Vision and exercise changes in aging U.S. adult population by testing the association of self-rated vision and self-rated vigorous physical activity trajectories over time and the association of these trajectories with mortality.

CR: None; CT: None; Support: National Basic Research Program of China Grant 2007CB512201
5353 - A298
Implementation of an Electronic Medical Record in an Academic Outpatient-Based Multi-Specialty Ophthalmology Practice


Purpose: To quantify the financial impact of implementing an Electronic Medical Record (EMR) in an outpatient setting.

Methods: Individual faculty data from eleven full-time members was retrospectively collected for the two year period prior to EMR implementation and for the two year period post-implementation. During the “Go Live” period of two weeks post-implementation, clinical appointments were down-scheduled for training. Four metrics which drive profitability were tracked: Cross Charges, RVU, Testing Charge Capture, and Charge Lag.

Results: The data was analyzed using a Autoregressive Integrated Moving Average (ARIMA) model. There was no statistically significant short-term or longer-term decline in total productivity measures following EHR implementation. An initial decline of $52,000 per week of gross charges was noted over the first three weeks. This returned to pre-implementation baseline at week 4. There was no effect of seasonality on data, however physician absenteeism was of particular significance where each additional provider contributed to a 10% increase in revenue, 9% CIG (15.6% - 13%) in our practice. Cross Charge is a linear function of RVU; therefore the data is identical. Charge lag trended toward a 24% increase, 95% CI (9.8 - 1.5), post-implementation, but the values were not of statistical significance. Notably, testing charge capture increased significantly over the first few months post-implementation prior to reaching a new higher plateau.

Conclusions: We conclude that this longitudinal study reaffirms that EHR implementation actually enhances productivity and prevents loss of potential revenue generating activities such as diagnostic interpretation. There is a plethora of data available to demonstrate how EHR systems can enhance patient care and patient experiences. Within such a paucity of data available on implementation costs, we have helped to quantify the indirect costs of implementation. While the actual direct implementation costs related to hardware/software/training are not quantified in this review, those are far more transparent. The actual direct implementation costs related to hardware/software/training are not quantified in this review, those are far more transparent. While the actual direct implementation costs related to hardware/software/training are not quantified in this review, those are far more transparent.

Support: None

5355 - A301
Delayed Mustard Keratitis in Northern Iraq


Purpose: To describe signs and symptoms of corneal damage 18 years following exposure to a chemical weapons cocktail believed to consist of mustard gas, organophosphates, and nerve agents.

Methods: A detailed questionnaire concerning chemical exposure, ophthalmological history, and ophthalmic examination findings were conducted for 18 patients (36 eyes) drawn from the Halabja City Hospital Ophthalmology Clinic in Halabja, northern Iraq over a 2 month period.

Results: Eighteen of patients demonstrate a bilateral, triphasic condition characterized by: (A) acute onset blindness at time of initial exposure lasting 12 months, followed by (B) a period of complete resolution lasting years, and (C) onset of progressive recurrent symptoms an average of 15 years following initial exposure. Three of 18 patients (16.7%) had undergone bilateral penetrating keratoplasty, and one (5.6%) underwent keratoplasty for deformative keratoconus.

Conclusions: History and exam findings are largely consistent with Delayed Mustard Keratitis (DMK) following exposure to highly concentrated mustard gas. Atypical findings—such as immediate onset of symptoms, initial severe visual impairment persisting 1-2 months, limitation of extraocular motility, and apparent predilection for young adults—may represent a broader spectrum of DMK than has been previously appreciated, or indicate possible synergistic effect of chemical agents used and warrants further investigation.

Support: Doris Duke Clinical Research Fellowship; Rosenbluth Foundation Travel Grant

5356 - A301
Assessing Competency in Ophthalmology in Undergraduate Medical Students With the Objective Standardized Clinical Examination

M. Bai, Y. Khan.

Purpose: Medical education in ophthalmology is lacking and requires more attention in many medical schools. We assessed the competency in ophthalmology in medical students at McMaster University with the Objective Standardized Clinical Examination (OSCE). Also, we attempted to determine specific areas requiring improvement such as certain aspects of an ophthalmic examination.

Results: Data collected from 102 pre-clerkship students from the first year class and 100 clerkship students from the second year class was analyzed for this study. Participants in both groups were tested in an OSCE station during their regular OSCE administrations. The station featured a common ocular complaint (blurry vision with medically reduced visual acuity). The students were asked to take an appropriate history (part 1), provide 2-3 differential diagnoses to explain the symptoms (part 2) and perform an ophthalmic examination (part 3). Examiners were given the OSCE checklist and scoring rubric.

Conclusions: Overall, the performance of both groups was satisfactory according to the averages calculated for parts 1 and 3 and the number of students able to pass part 2. However, there was considerable spread in the results (based on the standard deviation of the mean) indicating a large group of students in both groups had scores that were unsatisfactory. In parts 1 and 3, the history taking and ophthalmic examination sections respectively, clerks performed better overall with few specific exceptions within each section. However, more pre-clerkship students were able to provide 2-3 differential diagnoses (92 %) than clerkship students (81 %). For the history taking section, most pre-clerkship students were able to ask general history questions such as temporal features of the complaint (83 %) or past medical history (96 %) but failed to characterize the ocular complaint itself in satisfactory detail. For the ophthalmic examination, only 9 % of the clerks were able to perform an anterior segment exam, a weakness of the pre-clerks as well (21 %). The pre-clerks also performed poorly for visual field testing (51 %) and checking pupillary responses (65 %).

Support: None

5354 - A299
Comparison of Systemic and Visual Findings in African Americans in Rural and Urban Settings

K.M. Daum, J.E. Winters.

Purpose: Persons of African American (AA) ethnicity remain at risk for a variety of health and visual conditions. Work designed to elucidate factors associated with these risks may provide benefits in managing health concerns. We hypothesize that a variety of cultural and physical factors act to cause differences as well as maintain some similarities in two ethnically-similar populations located in diverse settings, one in rural Alabama and the other in urban Chicago, Illinois.

Methods: The Rural Alabama Diabetes and Glaucoma Initiative, in conjunction with the Black Belt Eye Care Consortium, completed 42 vision care projects in the Black Belt of rural Alabama during a 5 year period. A total of 3001 self-selected persons received a variety of demographic, historical, systemic and visual examination as well as appropriate management. AA ethnicity was self-reported by 2354 (79.4%). The vision of Hope Health Alliance provides comprehensive vision and health care to under-privileged persons in urban Chicago, Illinois. AA ethnicity was self-reported by 1822 persons (45.2%) of a total of 4029 seen in a 4 year period. All individuals in both settings gave informed consent prior to enrollment.

Results: A total of 4208 persons aged 18 to 94 yrs self-identified as AA ethnicity were included in the analysis. Participants in the urban setting had greater educational levels (88.0 vs. 67.4%, high school or college; chi square, p <0.0001); a greater prevalence of smoking (57.3 vs. 55.3%, chi square test, p <0.0001) and diabetes (20.6 vs. 15.4%, p <0.0001). The patients in the rural setting had a greater proportion of females (69.7% vs. 67.9% in the urban setting (53.4%); chi square test, p <0.0001); greater levels of employment (42.6 vs. 37.3%, chi square test, p <0.005), and were more likely to have obtained medical care within 1 yr (97.4 vs. 81.8%, chi square test, p <0.0001); greater proportion with an eye exam within 2 yrs (61.8 vs. 33.8%, chi square test, p <0.0001); and, dramatically greater self-reported hypercholesterolemia (58.5 vs. 4.4%, chi square test, p <0.0001). The two populations self-reported a similar prevalence of hypertension: 43.4 vs. 45.4%, chi square test, p > 0.5.

Conclusions: These data suggest that cultural influences (female/male ratio, smoking, access to medical care/eye exams and prevalence of hypercholesterolemia, diabetes) and spatial location (education, employment) play a role in the health outcomes of AA patients. Other factors may be less affected by culture or location (hypertension).

Support: None

5353 - A298
Correlates and Outcomes of Eye Diseases


Purpose: To describe and compare the ocular and systemic signs and symptoms associated with eye disease and determine whether they are associated with different disease etiologies.

Methods: A detailed questionnaire examining their ocular and systemic signs and symptoms was conducted for 50 patients with eye disease. The questionnaire was administered by phone to all patients and to their physicians or nurses at the Pittsburgh Medical Center Eye & Ear Institute.

Results: Patients were divided into the following categories: 1) Good Health (20 patients); 2) Poor Health (20 patients); 3) Other (10 patients). The Good Health group had significantly lower rates of eye disease and systemic disease compared to the Poor Health group. The Other group had significantly higher rates of systemic disease compared to the Good Health group.

Conclusions: The results suggest that patients with poor health are more likely to have eye disease and systemic disease than patients with good health. Future research should focus on determining the underlying causes of these differences.

Support: None
5359 - A304

Immuno-Fibrogenic Responses in Trachomatous Conjunctival Scarring: A Case-Control Study


Purpose: Trachoma, the leading infectious cause of blindness worldwide, is a cicatrizising conjunctivitis driven by Chlamydia trachomatis. The immuno-fibrogenic responses involved are poorly understood, which is limiting efforts to develop a vaccine. The purpose of this study was to investigate the major features of the immune response in scarring trachoma by gene expression analysis.

Methods: In this study from Ethiopia, individuals with trachomatous trichiasis (TT) were compared to normal controls (NC). Conjunctival swab samples were collected for DNA/RNA isolation. Total RNA was extracted. Transcriptome-wide analysis was performed by microarray (WG-6, Illumina) on a limited sub-set of cases and controls. The relative expression levels of various genes of interest indentified by microarray were measured by Real-time RT-PCR.

Results: 772 people were recruited (386 TT, 386 NC). Microarray experiments were performed on 14NC and 28TT. 4423 genes were regulated at the adj. p<0.001 level. Patient and the investigator were masked to the PSS scores.

Support: None.

5360 - A305

The PHQ-2 as a Screening Tool for Clinical Depression in a Primary Eye-Care Clinic


Purpose: The high prevalence and disabling nature of clinical depression has led to the development of screening tests that can be incorporated into primary care practice settings. To encourage use, the trend has been toward short, simple survey tools such as the Patient Health Questionnaire 2 (PHQ-2), which consists of only two items - one related to mood and the other to anhedonia. This instrument has been employed in studies of various clinical populations, but not in a primary eye care setting, the aim of the current investigation (Gilbody et al, 2007).

Methods: The PHQ-2 was included in a written 10-question survey that was administered over a 2-month period to patients seated in the waiting area of the Primary Care Clinic at the University Eye Center of SUNY Optometry. The 8 additional items related to demographics, general and ocular health, concern about going blind, and exercise, relationship, and employment status. Patients placed completed surveys, which included no identifying information, into an unmarked envelope.

Results: Surveys were completed by 739 subjects, about 69% of those solicited. 52% of the sample was 46 years of age or older. 64% of subjects were female, and 38% self-identified as Caucasian, 31% Black, 16% Hispanic, 9% Asian, 6% mixed and 1% Native American. The PHQ-2 was scored on a scale of 0 – 6, with higher scores more indicative of depression. Cutoff scores of 2, 3, and 4 resulted, respectively, in 29%, 13% and 7% of subjects failing. Scores were significantly correlated (Pearson two-tailed) with the number of self-reported general health conditions (r = 0.183, p = 0.000), worry about going blind (r = 0.182, p = 0.000), and lack of exercise (r = 0.127, p = 0.001), but not with age (r = 0.066, p = 0.075) or number of self-reported ocular conditions (r = 0.044, p = 0.226).

Conclusions: In a sample derived from primary-care and obstetrics-gynecology clinics that had a 7% prevalence of depression as determined using structured clinical interviews, Kroenke et al (2003) found that 15.2% scored 3 or higher, the standard cutoff value on the PHQ-2. Using this same cutoff score, 1% of our sample failed the PHQ-2, pointing to a lower, yet clinically significant, prevalence of depression in the primary-eye-care population. Despite its relatively high specificity, most patients who fail the PHQ-2 will need some form of intervention. The PHQ-2 is a cost-effective screening tool for depression (Mitchell et al, 2007). To prevent over-referral for psychiatric services, the eye-care provider may follow up failing PHQ-2 screening scores by asking the patient additional questions based on DSM-IV diagnostic criteria or administering a more comprehensive screening tool (e.g., Beck Depression Inventory).

CR: M.E. DellaBella, None; S.H. Schwartz, None; L. Nehmad, None.

Support: Vision Service Plan
5369 - A309
A Retrospective Review of IOP Elevations With Use of Loteprednol Etabonate
Cornea Consultants, PC, McLean, VA; Lakeside Eye Clinic, Chicago, IL; Digby Eye Associates, Greenboro, NC; Ophthalmic Consultants of Long Island, Valley Stream, NY; Ophthalmology, Univ of Pittsburgh Sch of Med, Pittsburgh, PA; Medical Affairs, Allergan Inc, Irvine, CA; Medical Affairs, Allergan, Inc, Irvine, CA.

Purpose: To characterize the timing and severity of intraocular pressure elevations with the use of loteprednol etabonate 0.5% (Lotemax) in patients with eye conditions including post cataract surgery, glaucoma, and other anterior segment inflammatory conditions.

Methods: Retrospective chart review at four private practice sites of patients who developed elevations in IOP (>5 mm Hg) while using loteprednol etabonate 0.5% (Lotemax) or loteprednol etabonate 0.5% (tobramycin 0.3% Zylopect). Data collected included demographic information; medical and ophthalmic history, glaucoma medications, other anterior segment medications, concomitant systemic medications and ophthalmic and systemic diseases, concomitant medications, condition for which Lotemax/Zylopect were prescribed, IOP, as well as medical and surgical interventions.

Results: A total of 40 patients experienced IOP elevations after use of topical Loteprednol etabonate 0.5%. The mean patient age in this cohort was 73.19 years (range: 17.0-90.0 years). Male female were comparable. The mean common reasons for prescribing loteprednol etabonate was dry eye (37.5%), postoperative therapy (14.5%), and allergic conjunctivitis (14.5%). Prior to treatment, 12.5% of patients (n=5) had a history of open-angle glaucoma (OAG) and 5% (n=2) had ocular hypertension (OHT). Mean IOP before treatment was 15.2 ± 2.0 mm Hg and increased to a mean of 22.4 ± 3.1, a statistically significant increase of 7.2 ± 2.8, range: 5-18 mm Hg (P<0.001). The median duration of treatment with loteprednol at the time of observed IOP elevation was 5 weeks (range: 3 days - 3 years). Elevated IOP was observed within eight weeks in 62.5% of patients and between 8 and 12 weeks in an additional 17.5% of patients. Only one patient required a surgical intervention (SLT) for elevated IOP post discontinuation of treatment.

Conclusions: Use of loteprednol may be associated with elevations in IOP even in patients without a prior history of glaucoma or ocular hypertension. Sustained use beyond acute treatment is more likely to result in IOP elevations. If chronic treatment is required for an ocular surface condition, alternatives to corticosteroids should be considered.

The Impact of Free Access on Citations to the Vision Literature

P.C. Sieving, J. Tang. NIH Library, National Institutes of Health, Bethesda, MD; Ophthalmology, Case Western Reserve University, Cleveland, OH.

Purpose: To determine impact of free access to journal articles on citations by comparing the number of citations to articles freely available to the average number of citations to articles in the same journals.

Methods: We used PubMed limits for ‘free full text’ and ‘PubMed Central’ to identify articles published from 2003-07 in journals with 2008 impact factors (Journal Citation Reports) which are available without subscription. Those articles were searched in Web of Science (Science Citation Index); citations occurring in 2008 were tabulated for each article. The average number of citations to the freely available articles were determined and compared to the 2008 5-year impact factor, which is the average number of citations in 2008 to articles published in 2003-2007. We did not examine citations to articles published in journals in which all content is immediately free, nor in which all content was free for the period under study.

Results: Approximately half of the vision journals with 2008 impact factors were found to have no free content. For the others, average citation counts equalled or exceeded the 5-year impact factor for the journal.

Conclusions: This is the first study to compare citations to free vs subscription-based content of vision journals, using paid content in the same journal as the control. Articles published in the same journal are more likely to have similar quality characteristics; this study thus demonstrates the value of open access in disseminating research findings. During the period under study, several funder mandates have taken effect; open access journals and open access options such as PubMed Central and institutional repositories have become readily available for wide dissemination of research, as is funding to support fees associated with some open access schemes.

CR: P.C. Sieving, None; J. Tang, None.

Support: None

The Epidemiology of Ocular Oncology in the Province of Alberta: A 25-Year Population-Based Study

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Purpose: To determine impact of free access to journal articles on citations by comparing the number of citations to articles freely available to the average number of citations to articles in the same journals.

Methods: A retrospective review was conducted on patients diagnosed with a perioperative corneal abrasion between January 1, 2007 and December 31, 2008. Charts were culled for demographics, time to diagnosis, treatment to time and treatment recommended by a consulting ophthalmologist. Time to diagnosis was measured from the end of anesthesia administration to the first record of injury. Time to treatment was measured from the time of diagnosis to the time of prescribed ophthalmic medication.

Results: Out of a total of 77,542 surgical procedures requiring anesthesia performed in 2007 and 2008, eighty-six (0.11%) perioperative corneal abrasions were diagnosed with a 94% consent rate by an ophthalmologist. The cohort consisted of 45% women and 55% men with an average age of 53 years (48-86). Average time to diagnosis was 129 minutes (0-518). Average time to treatment was 164 minutes (0-1098 ± 172). The most common treatment was antibiotic ointment combined with artificial tears. There were no long-term ophthalmic sequelae.

Conclusions: Corneal abrasions continue to occur in the perioperative setting. There is ample opportunity for improving time to diagnosis and treatment. We suggest the following algorithm that empowers Anesthesiology staff to make the diagnosis and begin treatment immediately following initial indication of eye injury (see Figure 1).

CR: K.L. Segal, None; B.M. Levine, None; S.L. Faggiani, None; P.M. Fleischut, None; F.M. Gadalla, None; G.J. Lelli, Jr, None.

Support: None
Sociodemographic Correlates of Eye Care Visits, BRFSS, 2008
University of Miami Miller School of Med, Miami, FL; Epidemiology & Public Health, University of Miami School of Medicine, Coral Gables, FL; Epidemiology/Public Health Sch Med, University of Miami, Miami, FL; Ophthalmology, Bascom Palmer Eye Institute, Miami, FL; Public Health & Epidemiology, University of Miami, Pinecrest, FL; University of North Carolina, Chapel Hill, NC.

Purpose: Research has suggested that individuals are not following eye care visit recommendations (e.g., every two years). Population-based data on factors associated with the use of eye care visits are limited. The purpose of this study was to assess predictors of eye care visits among participants of the 2008 Behavior Risk Factor Surveillance System (BRFSS) survey.

Methods: BRFSS 2008 data from the states of Alabama, Connecticut, Indiana, Missouri, New Mexico, North Carolina, Tennessee, and Wyoming were used (n=44,603). The proportion of survey respondents 40 years of age and older reporting having visited an eye care provider within the past two years, two or more years ago, or never by participant characteristics (age, gender, race/ethnicity, marital status, education, body mass index, insurance, and state) was assessed. Polytomous multiple logistic regression with adjustments for survey design was used to identify sociodemographic characteristics associated with provider visit status.

Results: Seventy-eight percent of respondents reported visiting an eye care provider within the past two years, 20% indicated that their provider visit was at least two years ago, and 1.8% reported that they had never seen an eye care provider. Using the never as the referent category, the strongest associations with report of an eye care visit within the past two years was being greater than 65 years of age relative to 40-45 years (OR=2.24 [95% confidence interval= 1.39-3.60]), having graduated from college relative to those who did not complete high school (5.3 [3.5-8.0]), the availability of eye provider health insurance coverage (3.2 [2.6-4.3]), and Hispanic ethnicity (0.37 [0.24-0.55]). Similar, but generally weaker sociodemographic associations were noted when comparing those reporting ocular visits two or more years prior to the interview relative to those who had never been to an ocular health care provider.

Conclusions: Predictors of recent eye care visits include older age, greater years of education, the availability of eye provider insurance coverage, and Hispanic ethnicity. These data suggest the need for targeted educational campaigns on the need for preventive eye care visits in select sociodemographic subgroups and greater access to health insurance coverage for such visits.

CR: E. Davilla, None; A.J. Caban-Martinez, None; D.J. Lee, None; B.L. Lam, None; D.D. Zheng, None; K. Arheart, None; S. Christ, None.
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Standardizing Ophthalmic Database Structures Streamline Electronic Submissions and Reduce Startup Time/Cost and Errors

Purpose: To develop standard ophthalmic data structures that are consistent with the Clinical Data Interchange Standards Consortium (CDISC) Study Data Tabulation Model (SDTM). SDTM guidelines do not completely address ophthalmic data structures. The CDISC-SDTM compatible data structures we developed support a more streamlined, high-level submission of study data to the FDA. This is necessary because non-standard data structures make the evaluation of data across studies challenging and time consuming. Standardization also reduced study startup time/cost and database development error rate.

Methods: SDTM guidelines were reviewed to evaluate data formats, variables, and controlled terminology for applicability to ophthalmic data. We identified common examination data among clinical data capture systems that were required for standardization. For example, we classified data points within ophthalmic tests to be modeled consistently with SDTM guidelines. We performed data controls for both case report forms (CRFs) and clinical domains. The standards were tested using two independent clinical data management systems (CDMSs). We then examined study startup time and error rate for comparable studies pre- and post-standards development.

Results: The use of standard ophthalmic data structures streamlines the FDA electronic submission process by eliminating the requirement to restructure this data for CDISC-SDTM compliance. It is independent of CDMS platform. The time required for database development and the reduced error rate were reduced by 40% and 30% respectively.

Conclusions: Standard ophthalmic data structures need to be created to support CDISC-SDTM compliant FDA submissions. They help streamline the electronic submission of study data to the FDA. Furthermore, the use of these standards results in a significant reduction in the time and error rate associated with database development. The challenge now is to expand this approach to cover all common ophthalmic data.

CR: J.M. Gonzalez, Statistics and Data Corporation, E; Q.D. Dunn, Statistics and Data Corporation, E; E.D. Emgundula, Statistics and Data Corporation, E; M.B. Hall, Statistics and Data Corporation, E; J. Tong, Statistics and Data Corporation, E; D. Kennedy, Statistics and Data Corporation, E.
Support: None

The Level of Awareness About Refractive Surgery in Candidate Patients Not Yet Exposed to the Informed Consent

Purpose: To describe the type and accuracy of information refractive surgery patients have before being exposed to the informed consent procedure, and to investigate their level of instruction, occupation, motivations and expectations.

Methods: A sample of 200 consecutive refractive surgery candidate patients attending our outpatient department were asked to fill a standardized questionnaire before receiving any type of information from our staff.

Results: 33% of patients were referred by an ophthalmologist, 28% had their first exposure through the media, and 39% were informed by friends; 67% decided by themselves to make an appointment and to be evaluated for surgery; 5.5% were stimulated by friends and 27.5% by other sources, including the internet. Only 5.6% declared to be interested in refractive surgery for cosmetic reasons and 94.4% for functional reasons. The vast majority (87%) had very little information on the risks of refractive surgery and most expected perfect results (72%).

Conclusions: Previous studies have described the profile and motivations of patients undergoing refractive surgery. Our study is addressing specifically at the level and type of information patients had before being exposed to our informed consent procedure. Our data support the need for a thorough information process by the refractive surgery team since the baseline information of patients appeared fairly fragmented. Expectations about refractive surgery are often optimistic and the risks are underestimated.

CR: C.E. Traverso, None; R. Rosa, None; F. Altavera, None; R. Scotto, None; G. Cordio, None.
Support: None

Using a Structural Equation Model to Calibrate Measurement Methods When Replicate Errors Are Correlated

Purpose: Determining the calibration equation (CE) that relates methods of measurement requires estimating the systematic error (bias) and random error (imprecision) for each method. When only two methods are compared, each method should be replicated so that the bias and the imprecision can be simultaneously estimated. In some cases the random errors for replicates are correlated. A structural equation model (SEM) describing the measurement error (ME) is necessary so that the proper model is fitted to the covariance structure of the observed measurements. This method is illustrated using visual acuity (VA) measurements from patients suffering from nystagmus.

Methods: Automated nystagmus acuity function (ANAF) was compared to the expanded nystagmus acuity function (NAFX). A SEM was used to estimate the bias (β) and imprecision (ση). The diagram shows the relationship between measurements and the true (unknown) VA (μ). The errors between replicates were assumed to be correlated (ρ). The model was fitted to the natural log transformed data. The CE for methods is: A=exp(α/β) N=exp(α/β) and N=exp(α/β) VA=exp(α/β) where A denotes ANAF and N denotes the NAFX. Mr SEM software was used to estimate the parameters using maximum likelihood (ML). Starting values were estimated using the ncf option of the nerror package for the R statistical programming language.

Results: The CE for methods was: A=9448N=880 and N=1.0584A=1.0644. Methods had similar imprecision. No bias was detected between replicates and the ratio of the scale-adjusted imprecisions replicate 1 to 2 was 0.5776 (95% CI: 0.4385 to 0.7618) p value 0.634.

Conclusions: SEMs for ME provide a flexible method for correctly determining bias and imprecision. ML provides optimum estimates for any function of the parameters along with confidence intervals allowing statistical tests for any hypothesis of interest.

CR: R.A. Bilonick, None; Z. Tai, None; R.W. Hertle, None; D. Yang, None; G. Wollstein, Carl Zeiss Meditec, F; Optovue, B. Bioptigen, P.
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Evaluation of an Integrated Orbital Tissue Expander in Congenital Anophthalmos: Report of Preliminary Clinical Experience in Seven Patients

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**Purpose:** To evaluate safety and efficacy of the Orbital Tissue Expander (OTE) in managing congenital anophthalmia. The OTE, cleared for use by the FDA, is an inflatable polymeric globe delivering uniform pressure in the orbital cavity for bone induction. The proof-of-concept study was conducted at the Bascom Palmer Eye Institute and at Innovia LLC, and the safety & efficacy of the device were demonstrated in a feline anophthalmic model (ARVO 2005, ARVO 2008). This study presents the preliminary findings in 7 patients with clinical anophthalmos after 1 to 2 years of follow-up.

**Methods:** 7 patients age range 1 to 10 years with unilateral anophthalmos were implanted with the OTE. 4 of the 7 patients have had several orbital procedures prior to OTE placement. The implanted OTE was inflated with an initial average volume of 2.6 ± 0.7 ml (see figure 1) of sterile saline. At least 1 follow up and further inflation have been performed to date. The average volume after the first follow up is 3.8 ± 1.2 ml (see figure 1) of sterile saline. Equivalent Orbital volume expansion was assessed by axial and coronal CT scan measurements.

**Results:** No infection or pain has been noted on any of the seven patients. All patients have demonstrated an increase in orbital volume expansion with the OTE when compared to the CT before the device implantation.

**Conclusions:** OTE implantation and serial inflation are simple to implement. It is well tolerated by patients and does not interfere with concurrent fornix expansion. This device eliminates the need for multiple implant exchanges and demonstrates salutary effects in inducing anophthalmic socket bone growth. Additional patients and longer follow-up data are needed to validate the efficacy of this new treatment approach.

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Organizing Section: CL

To evaluate demographics, characteristics, and functional and anatomic outcomes of patients who underwent primary open globe repair during this time period.

Methods: PubMed database search was utilized to find human clinical cases of orbital and subcutaneous peri-orbital emphysema when associated with ocular surgical procedures. Additionally, cases meeting these criteria from Cole Eye Institute (Cleveland, OH) were examined for inclusion within the study.

Results: Using the Pubmed search criteria, a total of 4 manuscripts were identified that met the criteria (6 patients). Orbital emphysema, when associated with ocular surgery, was found in occlusal cases; cases were reported in orbital decompensation (3 cases), orbital fracture repair (2 cases), and upper eyelid reconstruction (1 case).

An additional and previously undescribed etiology, that of orbital emphysema in the setting of vitrectomy (1 case), is also reported from our experience.

Conclusions: Emphysema occurs following forceful injection of gas or liquid into orbital soft tissues. While trauma is the overwhelming etiology of such injury, surgical complications (particularly in ENT cases), and other rare causes can also lead to this outcome. We find that it is rare in ocular surgery, but when present it is associated with occlusal procedures and generally as the result of communication with sinus cavities. We report vitrectomy as a new etiology, when done in the presence of an underlying open globe perforation and continuous infusion. Our proposed mechanism is the transfer of liquid and gas through the infusion port to maintain target intraocular pressure in the presence of a perforation allowing extracocular release.

Support: Unrestricted Grant from Research to Prevent Blindness

Ocular Emphysema and Ocular Surgery: A 5-Year Retrospective Review

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Purpose: To evaluate demographics, characteristics, and functional and anatomic outcome of patients with traumatic open globe injuries to University Hospital, Newark, NJ from 2005 to May 2009.

Methods: Retrospective case series.

Results: 284 patients (285 eyes) with open globe trauma were identified. There were 211 (74%) males and 74 (26%) females. The mean age was 38 years (range, 1-96). Ocular injury type was rupture 114 (40%), penetration 59 (19.5%), perforation 10 (1.5%), and not documented 2 (0.5%); 30 (10.5%) eyes had IOFB. The rupture or laceration was noted in zone 1 (Z1) in 134 eyes (47%), zone 2 (Z2) in 62 eyes (21.7%), zone 3 (Z3) in 76 eyes (975%), N/D in 13 cases (4.6%). Average follow up was 9.8 months.

Conclusions: Eyes required enucleation; 12 eyes underwent primary enucleation and 32 secondary.

Vitreous Detachment (RD) was noted in 51 eyes within 10 days of injury presentation; 17 presented with RD 10 days post injury. 3 eyes presented with endophthalmitis; of which, 2 eyes underwent pars plana vitrectomy (PPV) as the primary surgery. 71 eyes presented with cataract. 5 more presented with cataract after 10 days. Of these, 63 eyes underwent lensectomy. The logMar visual acuity (VA) data is as follows. Average initial VA was 3.10; and average final VA was 4.26. 62 (21.8%) eyes presented with NLP while only 51 of 62 remained NLP following surgery. However, 63 (22.1%) eyes had a final VA of NLP. Eyes with a Z1 injury presented with a mean initial VA of 2.52; zone 3 of 3.94. The mean best corrected final VA for Z1 was 1.60; Z3 eyes was 3.65. Of 285 eyes, 76 required PPV for RD (26.7%). 7 of these had PPV as part of the primary globe repair. The anatomic success after first PPV was 37 of 76 (49%); overall success after all RD repairs was 52 of 76 (68%). The mean PPVs required for RD repair was 1.7. The incidence of RD was highest in Z3 eyes (59% of Z3 eyes); also, the incidence of secondary surgeries after the primary globe repair was the highest in Z3 eyes (63% of Z3 eyes).

Conclusions: Eyes with open globe injury should receive emergent aggressive treatment since some may have a fair visual potential; in our series 40% (105/285 eyes) recovered to 20/200 or better VA. Eyes with Z3 injury tend to develop more post-operative complications, and should be monitored closely.

Support: RPB; Lions Eye Research Foundation of NJ

Vitreoretinal Surgery After Primary Open Globe Repair

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Purpose: To review the demographics, mechanisms, interventions and outcomes of patients who underwent primary repair of a traumatic open followed by vitreoretinal surgical intervention.

Methods: After institutional review board approval, a retrospective chart review of all patients who underwent open globe repair at Harborview Medical Center between January 1, 2007 and October 31, 2009 was done. Those who had vitreoretinal surgery after primary open globe repair were included. Statistics calculated with Fisher’s exact test.

Results: 196 patients underwent primary open globe repair during this time period. 31 eyes of 30 patients underwent subsequent vitreoretinal surgery. The mean age at time of injury was 31 (Range: 3-72). 8 (26%) were women while 23 (74%) were men. 24 patients had penetrating injuries, 5 were due to blunt trauma, and 3 were perforating injuries. When obtainable, visual acuity after primary repair and prior to vitreoretinal intervention ranged from 20/20 to light perception. Indications for retinal surgery included RD in 69 eyes (28%), retinal detachment 23 (9%), PVR 18 (8%), intraocular foreign body 6 (5%), and endophthalmitis 1 (2%). Vitreoretinal interventions included pars plana vitrectomy in 29 patients (94%), endolaser in 23 patients (74%), silicone oil in 19 patients (61%) and scleral buckle in 14 patients (45%). There was 1 case of intraoperative suprachoroidal hemorrhage. Average time from primary open globe repair to 1st vitreoretinal surgery was 6 days (range: 3-314). 12 patients had at least 2 vitreoretinal surgeries. Follow up averaged 305 days from 1st vitreoretinal surgery, and 246 from final surgery. Visual acuity at final follow up ranged from 20/20 to NLP. In 2 patients, 18 patients had improvement from pre-retinal surgery visual acuity. 8 patients with isolated vitreous hemorrhage were likely to have improvement than the 23 patients with retinal detachment p=0.01. No patients in this study underwent enucleation.

Conclusion: Open globe injuries often carry a poor prognosis after primary repair but vitreoretinal surgery can improve visual acuity. Patients with isolated vitreous hemorrhage alone had better outcomes than those with retinal detachments. Still nearly half those with retinal detachments improved. Vitreoretinal surgery should be considered in previously traumatized eyes.

Support: None

Characteristics of Open Globe Injuries Leading to Enucleations; A 11-Year Retrospective Review

J. Son, A.M. Bauza, S.N. Patel, P.D. Langer, M. Zarbin, N. Bhagat. IOWS-NJMS, Newark, NJ.

Purpose: To assess the characteristics of all enucleated eyes that presented to New Jersey Medical School from 1997 to May 2009 with traumatic open globe injuries.

Methods: Retrospective chart review. Following characteristics of both enucleated and non-enucleated eyes were collected and compared: mean age of patient, gender, type of trauma, presence of AION, presenting visual acuity, zone of trauma, type of intraocular foreign body (IOFB), time of presentation after injury, presence of retinal detachment (RD), vitreous hemorrhage (VH), and lens status at presentation. Chi-squared contingency table was used for statistical data analysis.

Results: Of 559 eyes that presented with traumatic open globe injuries to the LH, 88 (15%) were enucleated. The male to female ratio for enucleated eyes were 67 to 21 (76% male, 24% female). The mean age was 39.9 years (range: 7 to 96). There were 42 gunshot injuries. There were 6 eyes with intraocular foreign body (IOFB), time of presentation after injury, presence of retinal detachment (RD), vitreous hemorrhage (VH), and lens status at presentation. Chi-squared contingency table was used for statistical data analysis.

Conclusions: Eyes that presented with traumatic open globe injuries to the LH, 88 (15%) were enucleated. The male to female ratio for enucleated eyes were 67 to 21 (76% male, 24% female). The mean age was 39.9 years (range: 7 to 96). There were 42 gunshot and 46 left eye enucleations. The presenting visual acuity (VA) was no light perception (NLP) in 60 eyes (66%) and LP in 15 (17%); however, 88 of 86 eyes were NLP at enucleation. Type of trauma included rupture in 54 eyes (64%), penetration in 21 eyes (24%), and perforation in 11 eyes (13%). Location of injury was type 1 in 15 (17%) eyes, type 2 in 13 (15%) eyes; type 3 in 59 (66%) eyes. The three most common mechanisms of injury were assault injuries in 20 eyes, followed by blunt-object injuries in 17 eyes. There were 11 gunshot injuries. There were 6 eyes with intraocular foreign bodies. Endophthalmitis was noted in 3 eyes. 3 eyes underwent primary and 68 underwent secondary enucleation. Average time from injury to enucleation was 39 days (range: 1 day to 2 years 11 month). Characteristics or clinical findings that occurred significantly higher in enucleated eyes were: 0-20 age group (p=0.044, χ2=4.051), aphakia (p=0.001, χ2=17.807), vitreous hemorrhage (p=0.007, χ2=7.268), retinal detachment (p<0.001, χ2=15.344), ruptured and perforating globe injuries (p=0.001, χ2=15.344), presence of anterior pupillary defect (p=0.001, χ2=7.383), presenting visual acuities of NLP (p<0.001, χ2=152.01), and zone 3 location of eye trauma (p=0.001, χ2=26.106).

Conclusions: Commonly documented clinical findings and characteristics of eye injury were seen to serve as useful prognostic indicators of potential enucleation in open-globe trauma patients.

Support: None

Support: Unrestricted grant from RPB; Lions Eye Research Foundation of NJ
Eye Trauma Surgery Patterns in the Bronx
A. Yancy Okorie, A. Madu. Ophthalmology, Montefiore Medical Center, Bronx, NY.

Purpose: The purpose of this study was to examine the pattern of eye trauma requiring surgery in an academic medical center in the Bronx.

Methods: We examined the Montefiore Medical Center Ophthalmology operating room (OR) logbook during the period of 1/1/05-10/31/09 and noted all cases of eye trauma requiring emergency surgery.

Results: A total of 26 patients were included in the analysis, 18 men and 8 women.

Conclusions: Eye trauma affects all age groups, but disproportionately affects men. Some cases provided an opportunity for educating patients about adequate eye protection, especially work accidents and home repair projects. Two toddlers in the analysis were hurt at home due to falls onto furniture, emphasizing the importance of child safety precautions at home. The large number of falls in the elderly highlights the importance of fall prevention education. A potential problem with this study is that we may have missed cases due to lack of residents logging a procedure. A future project may include use of actual OR records of Ophthalmology cases. We can also include data from the city hospital where our residents work in a future study.

Support: None.
Chemical Injuries of the Eye - Clinical Study of 98 Consecutive Cases


Purpose: To analyse the incidence, nature and prognosis of acute chemical eye injuries.

Methods: Consecutive, observational study between Apr and Oct 2009. All new patients with chemical eye injury attending the eye casualty at a tertiary referral centre in UK were included. The incidence of chemical injury presentations, patient demographics, nature of chemical, management and clinical outcomes were recorded. The severity of the injury was graded according to Roper Hall classification.

Results: Out of the total of 11696 patients who attended the eye casualty during the study period, 98 patients (incidence 0.83%) had chemical eye injury, of which 60% were male. The mean age of the patients was 36.9±17.1 years. Five of the 7 young children (<10 years) had domestic injury from washing machine liquid. Out of the overall chemical injury patients, 52% were work related, 42% domestic incidents, while 6% suffered an assault. Most of injuries were due to alkali burn (77.5%), followed by acid burn (15.30%) and unknown agent in 6 (6.1%). Eighty eight percent had unilateral injury compared with 12% bilateral. All the bilateral cases were Grade I except one who had a Grade IV injury in one eye and Grade II in the other. Eighty one percent of the patients presented on the same day of the injury, while 11% presented the next day, with the rest of the patients presenting later. Eighty eight (89.8%) were classified as Grade I, 5 (5.10%) as Grade II, 1 as Grade III and 4 (4.1%) as Grade IV. All Grade IV were due to assault with ammonia and required amniotic membrane transplant (AMT) within 2 weeks of the injury, as part of their management and despite full treatment went on to develop total limbal stem cell deficiency (LSCD).

Conclusions: Young male patients are more prone to have work related chemical injuries with plaster accounting for majority of them, while young children tend to have domestic injuries mainly due to washing machine liquid. Grade IV chemical injuries are often related to assault due to ammonia. Grades I, II and III chemical injuries have a very good prognosis with topical treatments while Grade IV, despite AMT progresses to total LSCD.

CR: S. Ghosh, None; A. Kotagiri, None; S. Pushpath, None; A. Toy, None; Z. Johnson, None; F. Figueiredo, None.

Support: None.

Antibiotic Prophylaxis for Endophthalmitis and Demographics of Hospital Stay After Open Globe Repair: A Retrospective Review


Purpose: To assess the most common antibiotic regimens for endophthalmitis prophylaxis and demographics of hospital stay after open globe repair.

Methods: Retrospective chart review of 278 patients with primary open globe repairs performed at the University Hospital, NJMS, Newark between 2005 and 2009. Age, prophylactic antibiotic use, duration of post-operative inpatient stay, presenting endophthalmitis status, comorbidities that lead to prolonged inpatient stay, intraocular foreign body (IOFB) status, time from injury to surgery (48hrs), and zone of injury were recorded for each patient. The average inpatient stay was stratified with respect to the following factors: endophthalmitis at presentation, comorbidities, IOFB status, time from injury to surgery, zone of injury, and age. Most common inpatient and outpatient antibiotics were analyzed based on age and presence of IOFB.

Results: There were 278 patients. Mean age was 38.6 years. Average duration of post-operative stay was 3.97 days and follow-up was 10.5 months. The length of inpatient stay among patients with comorbidities was significantly longer than for those without comorbidities (p-value=0.0001). Even excluding patients who stayed >20 days due to non-ocular problems, zone 3 injuries significantly prolonged inpatient stay (p-value<0.0001). Most common inpatient intravenous (IV) antibiotic across all subgroups was a combination of vancomycin and cefazidime. Most adults and children ≥12 years were discharged on oral Levaquin while most children <12 years were discharged on oral Augmentin. Quixin was the most commonly prescribed topical antibiotic that patients were discharged with across all subgroups except patients with IOFB.

Conclusions: Comorbidities, especially acute or chronic medical problems and social issues, prolonged patients’ hospital stays. Patients with zone 3 injuries had significantly longer inpatient stays than zone 1 and 2 injuries. Time from open globe injury to surgery, IOFB status, and use of pars plana vitrectomy for IOFB patients did not significantly prolong stay. Hospital stays among different age groups were similar.

CR: X. Zhang, None; M.A. Zarbin, None; A. Bauza, None; J.H. Son, None; N. Bhagat, None.

Support: RPB; Lions Eye Research Foundation of NJ
These results suggest a dose dependent effect of change in visual field. In the 2005-2006 NHANES survey, 2934 subjects had frequency doubling. Out of 3,175 participants, 48% had a change in visual field (MD < -1 dB or > +1 dB). None; None; None; None; Full IOP, HbA1c and lipid data were available on 3,750 people (2114 women). Historically, there have been several case reports regarding the improvement of visual field in patients with glaucoma. One of the largest effect was seen on the driving difficulty sub-scale. There was no association with change in visual field and general health related quality of life.

Methods: In the 2005-2006 NHANES survey, 294 subjects had frequency doubling in the visual field. Out of 3,175 participants, 48% had a change in visual field (MD < -1 dB or > +1 dB). None; None; None; None; Full IOP, HbA1c and lipid data were available on 3,750 people (2114 women). Historically, there have been several case reports regarding the improvement of visual field in patients with glaucoma. One of the largest effect was seen on the driving difficulty sub-scale. There was no association with change in visual field and general health related quality of life.

Results: Out of 3,175 participants, 48% had a change in visual field (MD < -1 dB or > +1 dB) and 52% had a ≥5 point change in the NEI-VFQ25 composite score. Increasing levels of change in visual field was statistically significantly associated to increased deterioration in the NEI-VFQ25 composite score and in 11/12 subscales (all p-trends <0.05). The largest effect was seen on the driving difficulty sub-scale. There was no association with change in visual field and general health related quality of life (both p-trends >0.30). The association between change in visual field and vision-specific quality of life was modified by presenting visual acuity impairment at baseline (>20/40) and by change in visual acuity over the 4 year interval (no change, > 2 line improvement, >2 line loss) (both p-interactions < .0001).

Conclusion: These results suggest a dose dependent effect of change in visual field loss on vision-specific quality of life. Preventing or treating losses in visual acuity may improve the effect of visual field on vision-specific quality of life.

CR: CM. Patino, None; R. McKean-Cowdin, None; S. Azen, None; D. Conti, None; R. Varma, None.
Support: NEI EY 11753.
To estimate the six year incidence of angle closure disease in a population
Anterior chamber depth was the only predictor for angle closure disease

Purpose: To our best knowledge, the longitudinal changes of ocular biometry in the population have not been documented. In this report, we attempt to report 5-year longitudinal changes and their impacts on the drainage angle width in the Chinese aged 50 years and over identified from the Liwan Eye Study.

Methods: The subjects who participating the Liwan Eye Study in 2004 were invited for a comprehensive eye examination in 2009. Ocular biometry was measured by A-mode applanation ultrasound at sitting position. Gonioscopy was performed by using a Goldmann-type, one-mirror lens. These two examinations were performed for all the subjects by the same examiners using the same equipment and protocol at baseline and follow-up visit. Only the phakic right eyes were included for the analysis.

Results: Of 1081 subjects eligible for 2009 examination (after excluding 177 died, 147 permanently moved out from the area), 874 people (80.9%) attended the follow-up examination. Among 818 phakic right eyes, the axial length increased by 0.14±0.31 mm (paired t test, P<0.001), anterior chamber depth decreased by 0.02±0.26 mm (P<0.001), lens thickness increased by 0.56±0.70 mm (P<0.001). The mean Shaffer grades decreased by 0.13 grades whereas the Shaffer angle width in 247 eyes (30.2%) became smaller.

Conclusions: This preliminary analysis suggests that the drainage angles become narrower, the lens become thicker whereas the anterior chamber depth does not change significantly in adults over 5 years.

CR: M. He, None; S. Huang, None; Y. Jiang, None; Q. Yin, None; Y. Zeng, None.

Support: the State Key Laboratory Fund of Zhongshan Ophthalmic Center, Sun Yat-Sen University Clinical Research 5010 Program, Excellent Talents in University, National Ministry of Education NCET-06-0720;
A framework was designed to evaluate 4 components of CBR-VI: service delivery, program management, linkages with stakeholders and outcomes. Indicators (n=129) for each component were derived from the literature. The framework was used to assess effectiveness of CBR-VI in Fiji and Cambodia. Data were collected by interviews with clients, family members, CBR staff and other stakeholders. The responses were categorised into the themes of the framework for qualitative analysis using NVIVO. The indicators were considered to be valid if they were measurable (feasible to obtain data) and relevant (appropriate to the context of services). Reliability was assessed using triangulation between participants.

Results: In both countries (13 (10.3%) indicators could not be measured, 6 (4.6%) were not relevant and 15 (11.6%) could not be tested for reliability. Excluding common indicators that did not fit the criteria, overall 116 (89.5%) of the proposed indicators were valid and 114 (88.4%) could be tested for reliability. Additional, each country had different sub-sets of indicators that did not fit the criteria. In Fiji, 101 of 129 (78.2%) indicators were measurable, 117 (90.6%) were relevant and reliability could be tested for 100 (77.5%) indicators. When the same framework was used in Cambodia, 115 of 129 (89.1%) indicators were measurable, 122 (94.5%) were relevant and reliability could be tested for 113 (87.5%) indicators. Discrepancies in the numbers were due to different designs of the two programs. Using client satisfaction as a measure was not feasible with or without glare. We compared changes of CS between (1) BBF vs. NDF, (2) AMD group vs. NV group, (3) cataract group vs. intraocular lens (IOL) group in AMD. We measured BCVA using ETDRS chart. We examined CS using a letter chart (Vector Vision) and BCVA before and after wearing BBF (CCP; blocking <500 nm, CCP400; blocking <400 nm, TKOAI) or neutral density filters (NDF) of similar ND value, under conditions with or without glare. We compared changes of CS between (1) BBF vs. NDF, (2) AMD group vs. NV group, (3) cataract group vs. intraocular lens (IOL) group in AMD. We measured BCVA using ETDRS chart. Results: In patients with AMD, CS and BCVA improved by wearing BBF under both conditions with or without glare condition. The improvement in CS with CCP or CCP400 was significantly higher than with NDF in the condition without glare (ΔlogCS: 0.15 vs. 0.06 (CCP vs. NDF, p=0.03); 0.13 vs 0.03 (CCP400 vs. NDF, p=0.008)). The improvement in CS and BCVA with CCP400 was significant (ΔlogCS: 0.23, p<0.001, ΔBCVA: 2.55, p<0.008) in AMD group but not in NV group (ΔlogCS: 0.0, ΔBCVA: 0.24, p=1.0). Under glare condition the improvement in CS was not significant with BBF or NDF. The improvement in CS was significantly higher in the AMD group than in the group using CCP (ΔlogCS: 0.35 vs. -0.14, P<0.05). The improvement of CS in cataract group was significantly better than in IOL group (ΔlogCS: 0.15 vs. -0.11, p=0.6). Conclusions: CS and BCVA can be used as objective parameters to evaluate the usefulness of BBF. The results in this study suggest that BBF improve the quality of vision in patients with AMD.
6008 - A285
Visual Outcome in Long-Term Survival Patients With Bone Marrow Transplantation Due to Hematological Malignancies in Childhood
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Objective: To evaluate ocular complications in long-term survival patients with bone marrow transplantation (BMT) due to hematological malignancies in childhood.

Methods: Cross-sectional study. This study examined 53 patients done BMT in childhood from 1982 to 1999 because of hematological malignancies. All patients have been treated in Tokai University School of Medicine. 19 patients had Acute Lymphocytic Leukemia(ALL), 10 had Aplastic Anemia(AA), 5 had Acute Myelogenous Leukemia(AML), 4 had Chronic Myelogenous Leukemia(CML), 15 had other diseases. All patients had been conditioned with allogeneic BM transplantation(BMT). Their pre-alloBMT conditioning regimens were FAB(fractionated total body irradiation) or E(T)A(fractionated thoraco-abdominal irradiation) or chemotherapy. The mean follow-up time was 170(±41) years. Ocular examinations were performed monthly at first, then yearly.

Results: 15 patients(28.3%) had dry eye, 1 patient(2%) had corneal ulcer, 1 patient(2%) had uveitis, and 26 patients(49.1%) had cataract. 44 patients(83.0%) had one or two ocular complications. Any pre-BMT conditioning regimen has not influenced dry eye(p=0.5). And steroid therapy and graft versus host disease(GVHD) has not influenced dry eye(p=0.4). While FAB had influenced cataract formation(OR=0.23; p=0.011). Acute GVHD(Grade 2 and 3) has had influenced c(0.021). Chronic GVHD has not influenced c(0.055). Steroid therapy has not influenced c(0.3). No patients had done special therapy including surgical intervention. Now, visual acuity of 51 patients(96.2%) is above 20/20.

Conclusions: This study suggests that long-term survival patients done BMT in childhood don't necessarily have severe ocular complications and their quality of vision is as good as ordinary people.

CR: H. Ooshashi, None; K. Kawai, None.
Support: None

6009 - A286
Association Between Low Vision Device Use and the Outcome of LV Rehabilitation
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Objective: This study reports the use of low vision (LV) devices, their abandonment and the difficulty performing reading tasks reported by patients in the VA Low Vision Intervention Trial (LOVIT).

Methods: The VA LV VFQ-48 was administered to 126 patients enrolled in LOVIT at baseline, 4 months and one year later. Patients were asked to rate the difficulty they experience performing reading tasks (not difficult, slightly/moderately difficult, extremely difficult, impossible) and respond how they currently perform the activity (own eyes/eyeglasses, low vision devices/techniques, non-visual devices/techniques or with assistance).

Results: 53% to 67% of all patients in the treatment group did not use LV devices at baseline, but were using them at 4-month follow-up. These patients showed the largest decreases in their difficulty ratings from baseline to 4 months. Changes ranged from one to 2 ¼ steps on a 4 point rating scale. 5.7% to 40% of those who were using LV devices for a reading task at 4 months reported that they discontinued using the LV device for the task at one-year follow-up. The largest rate of abandonment of LV device use was for distance tasks (seeing street signs/store numbers, signs and print on TV).

Conclusions: It appears that the outcomes of LV rehabilitation for reading are closely tied to the use of LV devices.

CR: J. Stelmack, None; R.W. Massof, None.
Support: VA Rehabilitation Research and Development Service #C3457 CT: www.clinicaltrials.gov; NC#0023756

6100 - A287
To Evaluate Changes In Reading Ability In Patients Receiving Vision Rehabilitation Care At Outpatient Low Vision Practices

Objective: To Evaluate Changes In Reading Ability In Patients Receiving Vision Rehabilitation Care At Outpatient Low Vision Practices.

Methods: The Activity Inventory (AI), an adaptive self-report visual functioning questionnaire, was administered by telephone to 455 low vision patients prior to their first office visit and then 2-6 collaborating outpatient low vision rehabilitation LVRC clinical sites participating in the ongoing Low Vision Rehabilitation Outcomes Study (LVR). In the ongoing study, the AI is administered to patients before and after usual LVRC care. The only eligibility criteria are that the patient is new to the practice, over 18 years of age, and able to complete the telephone interview. Clinical data are submitted post-rehabilitation. Rasch analysis was performed on difficulty ratings of AI reading tasks at both baseline and 6-months post-rehabilitation. Clinical data were used to stratify participants by entering visual acuity.

Results: Based on data of both baseline and post-rehabilitation measures from 76 of the patients being followed across 20 sites, self-report reading ability improved an average of 0.32 logit with a standard deviation of 0.67 logit. Stratifying study patients by entering visual acuity reveals differences between groups in the amount of improvement in reading ability. A statistically significant improvement of 0.6 logit was observed in patients with mild impairment, >20/60 in the better eye. A smaller non-significant improvement of 0.3 logit was observed in patients with moderate impairment, >20/60 but <20/200 in the better eye. An insignificant 0.03 logit loss of reading ability was observed in patients with severe impairment, <20/200 in the better eye.

Conclusions: An observational study of usual outpatient LVRC care, shows that self-report reading ability outcomes vary between visual acuity subgroups. Participants with better entering visual acuity exhibit greater improvement in reading ability after rehabilitation. Unexpectedly, study participants with moderate to severe impairment showed little to no improvement. This observation sharply contrasts with the results of the VA Low Vision Intervention Trial (LOVIT), which reported a 2.06 logit improvement in reading ability in severely visually impaired patients.

CR: J.E. Goldstein, None; R.W. Massof, None.
Support: ET010245, Readers Digest Foundation

6101 - A288
Utilization of Eye Care Services Among Diabetic Patients in Urban and Rural China
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Objective: To assess utilization of eye care and its predictors among diabetic patients in urban and rural China, about which little is currently known.

Methods: Sequential diabetic patients aged >18 years from two urban tertiary hospitals, an urban community hospital and a rural hospital in Guangdong, China were administered a questionnaire and underwent chart review.

Results: The participation rate among 889 eligible subjects was 92.7%. Among 824 participants (urban tertiary hospital 394, urban community hospital 319, rural hospital 201, mean age 62.6±12.9 years, 58.8% female), 550 (66.7%) had not been examined in the last year as recommended by the American Academy of Ophthalmology (AAO), and 356 (42.2%) had never had an eye exam. For the rural hospital, these figures were 81.1% and 68.7%, respectively. In logistic regression analyses, factors associated with having an eye examination in the last year were: attendance at urban hospitals (odds ratio [OR]=3.46 [P<0.001]) and 1.76 [P=0.021] for tertiary and community hospitals respectively; higher DR knowledge score (OR=1.24, P<0.001), more concern about vision loss from diabetes (OR=1.22, P=0.007) and recommendation of regular eye exams by the physicians (OR=2.36, P<0.01). Predictors of ever having an eye examination were similar.

Conclusions: Our results suggest that the low proportion of diabetic receiving recommended annual eye examinations in both urban and rural China might be improved through education of both patients and physicians.

CR: D. Wang, None; X. Ding, None; M. He, None; L. Yan, None; Q. Geng, None; N. Congdon, None.
Support: None
Organizing Section: CL

Measuring Outcomes of Low Vision Rehabilitation Using the ELVRT

B. Christy, J. E. Keeffe, P. K. Nirmalan

Purpose: To determine the effectiveness of activity based training on changes in the quality of life after vision rehabilitation for persons with low vision.

Methods: First time referrals to the low vision clinic of L V Prasad Eye Institute in south India were recruited for the study. A previously validated WHOQOL instrument and a newly developed 10-item Effectiveness of Low Vision Rehabilitation Training (ELVRT) instrument were administered at baseline and 9 months after initiation of vision rehabilitation to measure changes in quality of life and the effectiveness of the independent living skills training such as safe navigation, activities of daily living, home management, money management and personal grooming. Rasch analysis (Winsteps Software) was used to develop calibrated scores and effect sizes to compare the pre-and post Rasch calibrated scores. The psychometric properties of the ELVRT were evaluated using Rasch analysis.

Results: 46 subjects aged 8 to 86 years (37±2 ± 21.85) were enrolled in the study. The ELVRT had a good fit to the Rasch model (g² =1,000), person and item separation reliability of 0.79 and 0.99 and a cronbach alpha of 0.83. Pre-rehabilitation ELVRT and QOL scores were not significantly associated with sociodemographic factors, comorbidity or duration of vision loss. Persons with poorer best corrected visual acuity had greater difficulty with activities (F =65.80, p =0.001) and worse QOL (F =4.36, p =0.013). Effect sizes (ES) showed clinically significant improvement for all measured items (ES 0.75 to 1.35) except for bathing unaided (ES =0.15). The overall ES for WHOQOL measured showed a small improvement (ES =0.27). WHOQOL measures focused on independent living skills training showed a significant improvement (ES 0.17 to 1.27), however, WHOQOL measures focused on psychosocial aspects did not show a significant improvement (ES 0.12 to 0.15).

Conclusions: An activity based measure like the ELVRT should be used in conjunction with quality of life measures to evaluate changes after low vision rehabilitation for persons with low vision.

Support: Vision CRC, Sydney, Australia

CT: www.ctri.in, CTRI/2008/091/000192

Low Vision Rehabilitation-Specific Differential Item Functioning in the VA LVFQ-48

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Purpose: Item responses to visual function questionnaires reflect the respondents’ magnitude estimates of the difference between their functional ability and the functional ability demanded by the activity described in the item, i.e., functional reserve. Functional reserve can be improved by increasing the person’s functional ability (e.g., improving visual acuity) or by providing a tool that makes the activity easier to perform (e.g., using a magnifier). Improving functional ability is expected to increase functional reserve for all items by the same amount. In contrast, the effects of tool use are likely to be activity-specific (e.g., a stand magnifier makes reading performance easier but has no effect on mobility). Such item-specific effects introduce differential item functioning (DIF), which can distort outcome measures. This study evaluates the VA LVFQ for outcome measurement distortion from intervention-specific DIF as a result of low vision rehabilitation (LVR).

Methods: The VA LVFQ was administered by phone interview to 100 low vision patients before and 3 months after LVR. All patients had central vision loss in both eyes and visual acuity ranged from ≥20/100 to ≥20/500 in the better eye. Half the patients received outpatient LVR in the VA Low Vision Intervention Trial and the other half received 4 to 6 weeks of inpatient rehabilitation services at the Hines VA Blind Rehabilitation Center.

Results: Rasch analysis was used to estimate interval measures of overall functional ability from patient difficulty ratings of items. There was significant intervention-specific DIF for 4 of the 48 rating items, 5/11 O&M items, 4/11 visual motor items, and 5/14 visual information items. The DIF for most reading items is negative and the DIF for most mobility items is positive. When the functional domains are analyzed separately, DIF persists for the same 5/9 reading items, 4/11 visual motor items, 4/11 visual information items, but only 1/11 O&M items. The DIFs for reading and mobility items exceeded 0.4 logit units, while the DIF for visual information items was 0.09 logit units.

Conclusions: The VA LVFQ exhibits small but significant intervention-specific DIF from LVR. Intervention-specific DIF can introduce bias into LVR outcome measures. The observed DIF indicates that reading items can lead to underestimates of functional ability improvement. LVR and mobility items can lead to overestimates.

Support: Vision Research Institute, LA

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Basic Versus Basic Plus Advanced Low Vision Rehabilitation Services and Impact on Vision-Targeted Health-Related Quality of Life

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Purpose: We are planning a clinical trial to examine the effectiveness of low vision rehabilitation services in the US as provided to adults not receiving health care through the VA. In a national survey we characterized what usual care services are in the US (Arch Ophth 2009). We next conducted 6 pilot projects to test a preliminary responsiveness of a vision-targeted quality of life questionnaire and conducted a survey of low vision rehabilitation services; the questionnaire was phone-administered from a coordinating center. We also compared the impact of basic services (assessment and optical rehab) vs basic plus advanced services (eg, OT, social work, resource education).

Methods: Persons were recruited from 7 sites (AL, 2 in CA, FL, MI, MN, PA) providing low vision rehabilitation services. Entrance criteria were >65y, spoke English, and no low vision rehabilitation services in the past 2 years. The NEI VFQ-25 was administered by the AL coordinating center line before and 3 months after care was complete. Medical records provided clinical and rehab information.

Results: 467 persons enrolled; 333 completed both baseline and follow-up interviews. 60% were women, 56% were white, 17% black, 5% other. Subjects ranged in age from 18-99 y (M age 57). Visual acuity in the better eye averaged 20/90. 92% of participants had AMD, glaucoma, diabetic retinopathy, or other retinal degenerations. At follow-up VFQ subscales for general quality of life, near vision, and mental health were improved (p <.05). Those receiving basic services plus OT had greater improvement in the VFQs general vision subscale than did those receiving basic services only (p <.04). Those receiving basic plus services any other kind of advanced service had greater improvement on the general vision and distance activity subscales (p <.05) than those getting basic services only.

Conclusions: The VFQ is responsive to low vision rehabilitation interventions when the VFQ is administered remotely from a coordinating center. Although sample sizes were small for subgroup analyses, results suggest that the type/level of care may lead to different magnitudes of improvement. This information is useful for planning clinical trials.

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6014 - A291

IMT-UK: A Prospective Multicentre Clinical Study of the Implantable Miniature Telescope (IMT) in Patients With Age-Related Macular Degeneration

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Purpose: The IMT (Visioncare, Saratoga) is an intracocular implant designed for those with moderate to severe vision loss through AMD. It is available in 2 models: the 2.2x and 3x model. As a follow up to the IMT-002 trial, IMT-UK aims to evaluate the vision parameters important in patient selection and post-implantation management. The trial is being conducted at Moorfields Eye Hospital, London and 3 other UK centres. Here we present interim results from Moorfields Eye Hospital.

Methods: Notable differences in study design exist between IMT-002 and IMT-UK. IMT-UK uses an updated simulator telescope prior to surgery and requires potential candidates to gain 2 extra lines of visual acuity, double that of the US trial. Better eyes are implanted with the 3x model only in the UK where worse eyes were implanted with the 2.2x or 3x model in the US. Participants in the UK undergo a standardised 12-week rehabilitation programme aimed at integrating the new visual status with daily life. 6 rehabilitation sessions were offered on the US trial, but no protocol was issued to providers. Following ophthalmic and optometric examination, eligible patients received phacoemulsification and implantation of an IMT. IMT-UK uses a standardised anaesthesia. A baseline visual function assessment is carried out prior to surgery and repeated at 1, 3 and 6 months. Self-reported visual disability is assessed using the National Eye Institute Visual Functioning Questionnaire (VFQ) and the Massof Activity Inventory (AI).

Results: 6 participants (mean 77yrs, 5 female) with mean VA 1.06 logMAR (range 0.88 - 1.34) have been implanted and followed up for at least 3 months. No surgical complications have been encountered to date. Mean distance VA improved significantly by 0.6 logMAR (p =0.004) at 6 months after surgery. Mean VFQ and AI measures were also seen in reading performance but these failed to reach statistical significance. Contrast sensitivity was significantly reduced at 3 months by 0.40 log units (p <.02). VFQ and AI results suggest an overall improvement in self-reported visual disability, but again there were not statistically significant improvements.

Conclusions: The IMT significantly improves distance VA but reduces CS at 3 months. Reading performance and self reported visual disability measures show a trend towards improvement. Overall these results suggest that the IMT may be of benefit to carefully selected patients as part of a programme of rehabilitation.

Support: Visioncare Ophthalmic Technologies

CT: www.clinicaltrials.gov, NC010553165

6015 - A292
A Video Study Evaluating Eye Drop Instillation in Subjects With Low Vision
With Either Glaucoma or Retina Disease-Based Visual Impairment

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Purpose: Evaluate and compare self-administration of eye drops in both visually impaired glaucoma and retina disease subjects. No prior studies have objectively analyzed and compared eye drop instillation in visually impaired patients with glaucoma or retina disease.

Methods: Subjects completed a questionnaire on their drop use and were video-recorded instilling an artificial tear drop using a standardized 5-ml bottle onto their worse eye, with their dominant hand.

Results: A total of 409 subjects (205 Glaucoma, 204 Retina) were included in the study. Differences between the two groups were as follows: Glaucoma subjects had fewer females (p=0.05), were younger (<p=0.005), had fewer Causasians (<p=0.005), had less previous exposure to eye drop use (<p=0.005), worse visual acuity (<p=0.005), and a less self-reported history of arthritis (<p=0.05). Glaucoma subjects had more bilateral impairment (60% vs 42%, p=0.005). Retina subjects instilled more drops onto the eye (1.7 v.s 1.4, p=0.02) and more commonly contaminated the bottle (47% vs 33%, p=0.003). About one-third of each group could not get a drop onto the ocular surface with multiple attempts at instillation (30% Retina vs 29% Glaucoma, p=0.09). Among subjects instilling only one drop, onto the eye, without touching the adnexae, there was a trend for glaucoma patients to perform slightly better, although both groups did poorly (“success”=39% Glaucoma vs 31% Retina, p=0.09).

Conclusions: Among visually impaired subjects who self-administer a drop, self-administration was a significant problem, regardless of the etiology. Though baseline differences existed, both groups performed relatively poorly. Both groups had poor perception of their ability to instill eye drops, wasted drops, and contaminated bottle tip. This has implications for “unintentional” non-compliance in chronic glaucoma therapy, and may have implications for future therapeutic delivery systems.

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Factors Associated With Low Vision Device Abandonment
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Purpose: Studies of low vision device use have been conducted primarily in veteran populations outside the U.S. The purpose of this study was to assess device usage rates and factors related to abandonment in a U.S. outpatient low vision population.

Methods: A telephone survey instrument was developed to measure usage rates of low vision devices for near tasks prescribed in U.S. outpatient clinics. The instrument assesses timing and frequency of device use, nature of the near task for which the device is used, payment type, and reasons for abandonment. In a multi-center pilot study the survey was administered to 88 patients who had been prescribed a total of 114 magnification devices at four separate clinical sites. The survey was administered again to a subset of patients to assess repeatability. Device abandonment was defined as no use in the past three months. Wilcoxon rank sum and Fisher’s exact tests were performed to investigate differences between those who had abandoned a device and those who had not.

Results: Mean (SD) visual acuity at examination was 0.61±0.29 logMAR and mean age was 77±17 years. Mean time between device prescription and survey was 11±3 months. Of 114 prescribed devices, 81% had been used within the previous three months (71% within previous week). Device abandonment was not associated with age (p=0.863), time since prescription (p=0.125), visual acuity (p=0.804), or category of magnification device (spectacle, handheld, stand, or video) (p=0.412). There was a significant association between documented non-central visual field loss and abandonment of magnification device (7/19 in non-users and 10/69 in users, p=0.046). Repeat administration of the survey resulted in the same abandonment classification in 15 of 15 patients (100%).

Conclusion: Visual field loss was associated with device abandonment. The survey instrument appears repeatable for documenting abandonment. Usage rates were comparable to those that have been found previously in other populations.

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Expectations of a Visual Prosthesis: Perspectives From People With Impaired Vision


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Purpose: To investigate the priorities and functional vision needs of people with profound vision impairment to guide the development of a functionally relevant visual prosthesis. Willingness to trade-off inconvenience to obtain a visual prosthesis and undergo training was also investigated.

Methods: Eligible participants were adults with moderate to profound vision impairment. Four focus groups with 7 or 8 participants in each group were conducted to explore expectations from a visual prosthesis. Topics explored included difficult aspects of daily life where vision would be useful, important aspects of vision to improve functioning, and trading any inconvenience that might be experienced to gain a visual prosthesis. All content from the focus groups was recorded and transcribed. Output was analysed using NVivo to explore major themes raised by participants.

Results: Thirty one adults aged 39-84 years with impaired vision (16 females) took part in the focus groups. Personal interest in the visual prosthesis varied from strong interest to none. People with late onset of vision impairment sought a higher level of functional vision from the visual prosthesis such as enabling them to read and drive again. Those who had been vision impaired from a young age and those with severe to profound vision impairment had more modest demands from a visual prosthesis. This varied from vision for orientation to a light source, to ability to detect objects for safe mobility. Willingness to trade inconvenience varied from being unwilling to trade any inconvenience to readiness to trade for improved vision.

Conclusions: People with severe to profound vision impairment have varied requirements with regard to a visual prosthesis. Not all people wanted to regain vision via a visual prosthesis and others had very modest demands for vision. Many ultimate users however did seek good functional vision. Willingness to trade any inconvenience was influenced by the quality of vision likely to be obtained with a visual prosthesis.

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