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A systematic review of waiting times and outcomes for sight restoration

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Purpose: This study was undertaken to determine what evidence exists for acceptable sight restoration waiting times, adverse health events in relation to sight restoration waiting times, the role of effect modifiers on the relation between waiting times and clinical outcomes, and sight restoration benchmarks.

Methods: A systematic review of published and unpublished reports assessing wait times for sight restoration was undertaken. Any study on wait times conducted in Canada or comparable jurisdictions with standard diagnostic criteria for vision impairment after 1990 was included. Databases (i.e., MEDLINE, HealthSTAR, EMBASE, and Cochrane Library) and conference proceedings were searched using a strategy designed by an assembled technical expert panel. Abstracts identified using this search were consolidated and screened for relevance. All articles deemed potentially relevant were reviewed in full text by 2 reviewers. Following a calibration exercise, data from relevant articles was abstracted independently by one reviewer and subsequently confirmed by a second reviewer.

Results: The search strategy identified 827 articles of potential relevance for this systematic review. After abstract review, 21 articles were found to address the relation between wait times and outcome or adverse events. Nine of the 21 articles dealt specifically with cataract surgery wait times. A large randomized clinical trial found that waits for sight restoration greater than 6 months are clearly detrimental when compared with waits less than 2 months. Wait times can be divided into passive (the result of intrinsic factors in the health system) or active (the result of a deliberate attempt to control wait times). Passive wait times for sight restoration are heterogeneous between countries and within countries. Active wait times have been implemented in several jurisdictions ranging from 3 to 4 months. Implemented benchmarks for sight restoration wait times have been based on level 4 evidence (expert opinion, focus groups) rather than empiric testing of the benchmark.

Conclusion: Waiting time for sight restoration of less than 2 months has superior outcome and less adverse events than waiting time of greater than 6 months. Currently employed benchmarks for sight restoration wait time are based on low levels of evidence and further study will need to be undertaken to determine optimal wait time for sight restoration.

Diagnosis and management of slipped or lost extraocular muscles

M. Flanders, S. Al-Ghamdi

Purpose: Marked limitation of ocular rotation following a traumatic orbital event or a surgical intervention involving the extraocular muscles is strongly suggestive of a slipped or lost rectus muscle. This can occur after trauma, strabismus surgery, paranasal sinus surgery, orbital surgery, or retinal detachment surgery. This report describes the clinical characteristics and surgical management of a series of patients with slipped or lost rectus muscles.

Methods: This is a retrospective, noncomparative, interventional case study. Eleven patients (11 eyes) with slipped or lost rectus muscles are reported. We retrospectively reviewed the charts of all participating patients. Details of the trauma or surgical history were noted. Pre- and postoperative measurements of ocular alignment, ductions, versions, saccades, forced duction, and muscle force generation tests were recorded. Reports of surgical interventions and postoperative results were analyzed. Orbital images were studied and findings were documented photographically when possible.

Results: There were 9 medial recti, 1 inferior rectus, and 1 lateral rectus muscle involved. Three of the medial recti slipped from the globe intraoperatively at strabismus surgery and were retrieved during the same surgical intervention. Two medial recti were ruptured during sinus surgery. Traditional strengthening procedures (resections) of the retrieved muscles and weakening procedures (recession) of the ipsilateral antagonist with or without botulinum toxin resulted in significantly improved alignment in 7 of the 10 patients operated.

Conclusion: The extraocular muscle most frequently slipped or lost is the medial rectus. Careful clinical examination will identify the injured muscle, and orbital imaging will define the nature of the injury and the location of the slipped muscle. Retrieval of the muscle combined with traditional strabismic surgical techniques can effective in alleviating this unfortunate problem.

Presumed ocular tuberculosis in Canada's indigenous population: a case report

A.R. Al-Ghoul, R.J. Schneider

Case report: To present a case of presumed ocular tuberculosis in an indigenous patient.

Comments: A 42-year-old aboriginal man presented with 1-month history of pain and redness in the right eye. His past medical history was remarkable for a hospitalization 10 years prior for possible tuberculosis infection that the patient denied having. Family history was positive for tuberculosis. Visual acuity on presentation was 20/40 and 20/20 in the right and left eyes, respectively. Ocular examination revealed panuveitis causing moderate anterior chamber reaction, granulomatous keratic precipitates, vitreous cells, candle-wax drippings, and several areas of choroidal swellings. The left eye had a similar choroidal lesion temporal to the fovea with no inflammation in the eye. Skin testing for tuberculosis was positive. The rest of the ancillary testing results were negative. After consultation with a respirologist, we started the patient on isoniazid and rifampin. The panuveitis resolved over several months and visual acuity recovered to 20/20 bilaterally. Tuberculosis is prevalent in our indigenous population. Ocular inflammation secondary to tuberculosis should be suspected in a patient with high risk for tuberculosis.

Emerging trends in the microbiology of bacterial endophthalmitis

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Purpose: To examine the spectrum and sensitivity patterns of all bacterial isolates derived from culture-positive aqueous and vitreous samples submitted for culture and sensitivity analysis at our institution over the past 5 years.

Methods: Over a 5-year period from January 2000 through December 2004, a total of 256 aqueous and vitreous samples with positive cultures were identified. Isolated pathogens and their in vitro antibiotic sensitivities were then analyzed for emerging trends.

Results: Over 5 years, 88.5% of patients cultured either *Staphylococci* (*S. aureus* and coagulase-negative *Staphylococcus* (CNS)) or *Streptococci*. Gram-negative bacteria were isolated in only 9.3% of patients. Over the study period, an increase in the incidence of streptococcal isolates was found in association with a slight decline in CNS positivity. From 2000 through 2002, 19.2% of patients isolated *Streptococci* compared with 27.4% from 2003 to 2004. Similarly, 64.2% of patients isolated CNS as compared with 53.2% in the latter 2 years. From 2000 through 2002, 85% and 61.7% of CNS isolates were sensitive to ciprofloxacin and cefazolin, respectively, compared with 73% and 43% of isolates in the past 2 years. Over the entire study period, ceftazidime retained 100% efficacy against the gram negative isolates tested. Vancomycin was 99.4% effective against the gram positive isolates tested, with only one documented case of vancomycin-resistant *Enterococcus*.

Conclusion: The microbiology of pathogens isolated from the aqueous and vitreous mediums is evolving, with an increase in streptococcal isolates and a decrease in CNS. A significant increase in the incidence of CNS resistance to both ciprofloxacin and cefazolin emerged over 5 years. These trends may have significant implications on the management of bacterial endophthalmitis.

Accuracy of Goldmann applanation tonometers at a Canadian university health centre

K.M. Baig, N.E. Saheb

Purpose: Intraocular pressure (IOP) is an important risk factor for the progression of glaucoma. The Early Manifest Glaucoma Trial showed that reducing IOP by as little as 1 mm Hg could translate into a 10% reduction in the risk of nerve damage progression. The gold standard for clinical measurement of IOP is Goldmann applanation tonometry. Manufacturers specify that Goldmann tonometers should be calibrated to within ±0.5 mm Hg. Tonometers with errors greater than this are considered faulty and should be recalibrated. Given the importance of IOP measurement in managing glaucoma patients, the purpose of this study was to determine the accuracy of applanation tonometers used daily at a Canadian academic centre.

Methods: A prospective check of the calibration error was performed on all Goldmann applanation tonometers in the departments of ophthalmology and emergency medicine at the 4 teaching hospitals of McGill University. The tonometers were checked twice by a single investigator according to the manufacturer's method using a standard calibration weight bar. Calibration errors were checked at pressure levels of 0 mm Hg, 20 mm Hg (clinically, the most important level), and 60 mm Hg. Tonometers were then grouped according to their deviation from these true pressure levels.

Results: A total of 52 tonometers were checked for calibration errors: 50 tonometers in the Department of Ophthalmology and 2 tonometers in the Department of Emergency Medicine. Seven (14%) of 52 tonometers were within the acceptable calibration range at every one of the 3 test levels. When testing at the 20 mm Hg level in the Department of Ophthalmology, 14 of 50 tonometers (28%) fell within the recommended calibration range of ±0.5 mm Hg; 38% had an error of ±1.0 mm Hg, 8% of ±1.5 mm Hg, 16% of ±2.0 mm Hg, 8% of ±2.5 mm Hg, and 2% of ±3.5 mm Hg. In the Department of Emergency Medicine, the calibration errors of the 2 tonometers at the 20 mm Hg mark were ±2.0 mm Hg and ±3.0 mm Hg.

Conclusion: At the clinically important test level of 20 mm Hg, only 28% of the 50 tonometers in the Department of Ophthalmology fell within the manufacturer's recommended calibration range. Neither of the 2 tonometers in the Department of Emergency Medicine was in the recommended range. Moreover, only 14% of the 52 tonometers fell within the acceptable range at each of the 3 test points. Thus, the majority of Goldmann applanation tonometers used daily at the teaching hospitals of McGill University are not accurate and should be recalibrated.

Prevalence and outcomes of uveitis in juvenile idiopathic arthritis

K.M. Baig, R. Polomeno, C.M. Duffy, K.N.W. Duffy

Purpose: Earlier studies indicated that the prevalence of chronic uveitis in juvenile idiopathic arthritis (JIA) was 6%–24% and that significant ocular complications were common. More recent studies suggest uveitis is now less common, complications are less severe, and close follow-up is associated with a better outcome. Our study aimed to determine the prevalence of uveitis in JIA, the factors associated with its development, and its outcome in a model that maintains a close working relationship between the pediatric patient, the pediatric ophthalmologist, and the pediatric rheumatologist.

Methods: We have been prospectively maintaining a database of all JIA patients since January 1992. All patients are now classified in accordance with the JIA classification criteria (Edmonton revision 2001). Data on measures of joint disease activity and uveitis were entered every 3–6 months. Specific data include the presence and extent of uveitis and its complications, as well as measures of joint disease activity and function. All uveitis data were provided primarily by one pediatric ophthalmologist. We analyzed the data entered to the end of 2005 at the Montreal Children's Hospital of the McGill University Health Centre.

Results: Of the 520 JIA patients with new-onset disease enrolled into the database, 52 (10%) developed uveitis (11 males, 41 females). Of these, 35 (67%) had oligoarthritis, 7 (13%) had polyarthritis with negative rheumatoid factor (RF), 4 (8%) had psoriatic arthritis, 5 (10%) had enthesitis-related arthritis, and 1 (2%) had undifferentiated arthritis. Of the 35 oligoarthritis patients, 28 (80%) were females and 22 (63%) were positive for antinuclear antibody (ANA). All 7 RF-negative polyarthritis patients with uveitis were female. No patients with uveitis had systemic arthritis or RF-positive polyarthritis. The mean age at diagnosis of JIA was 56 months (range of 45–157 months) and 20 (38%) patients had a concurrent diagnosis of uveitis. Visual outcome was excellent as only 6 patients (12% of uveitis patients, 1.2% of JIA patients) developed complications (cataract in 3 eyes, band keratopathy in 3 eyes, glaucoma in 3 eyes) resulting in minimal visual loss (≤20/40).

Conclusion: The prevalence of uveitis in our JIA cohort was 10%. The majority of uveitis occurred in antinuclear antibody (ANA)-positive females with oligoarthritis. Although 6 patients developed complications, there were no cases of significant visual loss. One of the factors contributing to the excellent outcome in this cohort may be the close collaborative relationship between the ophthalmologist and rheumatologists.

Precision and reproducibility of central corneal thickness (CCT) measurements with Pentacam vs. ultrasonic pachymetry

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Purpose: To compare precision and reproducibility of central corneal thickness (CCT) measurements using the Pentacam (Oculus) pachymetry 25 and 50 Scheimpflug imaging system vs. ultrasonic pachymetry (DGH 500 Pachette).

Methods: 12 consecutive patients from the University of Ottawa Eye Institute were enrolled as part of a larger study. Patients either had no evidence of ocular disease or had been diagnosed with open-angle glaucoma or as glaucoma suspects. Data for right and left eyes were analyzed separately, and only right eye data are presented. CCT measurements, taken at the pupil center, were measured 10 times with ultrasonic pachymetry and the lowest reading was recorded. Pentacam pachymetry at 25 and 50 imaging was done in random order by the same examiner. Reproducibility was determined using 4 consecutive measurements for 3 pairs of healthy eyes.

Results: The mean CCTs with the Pentacam 25, Pentacam 50, and ultrasonic pachymetry were 535 ± 38 μm, 538 ± 38 μm, and 527 ± 43 μm, respectively. The mean differences between the Pentacam 25 and 50, Pentacam 25 and ultrasonic, and Pentacam 50 and ultrasonic pachymetry were –3.45 ± 6.98 μm, 7.29 ± 24.20 μm, and 10.71 ± 22.18 μm, respectively. There were no statistically significant differences between the 3 groups using the Student's *t* test. Analysis of left eye measurements gave similar results. A Cronbach's alpha of 0.9930 was derived for average Pentacam pachymetry 50 imaging system measurements.

Conclusion: CCT at the pupil center with the 25 and 50 imaging systems of the Pentacam instrument were comparable to the ultrasonic pachymeter measurements. Pentacam CCT showed slightly higher readings than the ultrasonic CCT, but this did not reach statistical significance. Measurements of CCT were also comparable between the 25 and the 50 Pentacam imaging system. The Pentacam pachymetry system was found to be highly reproducible.

Can a diet rich in blueberries improve vision?

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Purpose: Among the numerous health-promoting properties attributed to blueberries (which are rich in anthocyanins), the most widely recognized are benefits to vision and eye health. Despite these claims, supportive scientific evidence is still lacking. We undertook a prospective, randomized, double-crossover study including blueberry juice, dry blueberry powder, and placebo, using dark adaptometry (DA), visual acuity, contrast sensitivity, reading abilities in low illumination conditions, and macular stress test. Here we report preliminary results on dark adaptometry.

Methods: 23 normal subjects, ages 33–61 (median 48), completed the nonblinded pilot study. Each subject underwent 2 baseline DA evaluations, 2 more during daily ingestion of blueberry juice corresponding to 240 mg anthocyanins for 4 weeks, and 2 final evaluations after 10 weeks of washout. Following an initial bleaching period of one minute at 100 cd/m^2, dark-adapted threshold was regularly measured for 30 minutes or until the minimum intensity was reached using the SST-1 whole-field scotopic sensitivity tester (LKC Technologies).

Results: The final dark-adapted threshold (pretest, 3.2 ± 0.5 dB; test, 2.5 ± 0.5 dB; post-test, 3.7 ± 0.6 dB) was significantly improved following blueberry juice consumption and returned to initial values after the washout period (ANOVA repeated measures, $p < 0.005$; post hoc Bonferroni correction). Age and gender were nonsignificant factors. The time to reach this threshold, as well as the time of the cone–rod break and the DA curve integral, was not significantly affected.

Conclusion: A diet enriched in blueberries improves the ability to see in the dark. The improvement observed in this pilot study, though statistically significant, is modest and may not be subjectively noticed in everyday life conditions, particularly in an urban living style. We are currently investigating other psychophysical aspects of vision in a placebo-controlled, double-blind, crossover study to better document the beneficial aspects of a diet rich in blueberry anthocyanins in individuals with healthy vision.

Initial experience with the Visiogen Synchrony accommodating IOL

G. Beiko

Purpose: The Visiogen Synchrony accommodating intraocular lens (IOL) is currently undergoing Phase 1 Food and Drug Administration trials. The purpose of this study is to present the findings in 20 patients who were selected to participate in this study and who were implanted at one Canadian study site.

Methods: Patients presenting for cataract surgery were selected to participate in the study following full disclosure of the study. The patients had 2 healthy eyes and had to be able to give informed consent. Visual acuity, distance-corrected near visual acuity, intermediate vision, defocus curves, and complications were recorded.

Results: These will be presented.

Conclusion: These will be presented.

A comparison of registered nurse vs. anaesthetist provision of sedation for cataract surgery

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Purpose: To determine whether nurse-provision of conscious sedation for cataract surgery at the Vancouver General Hospital Eye Care Centre (ECC) maintains the usual standard of care.

Methods: During a 4-month period, we prospectively studied 106 patients having outpatient cataract surgery on a day when conscious sedation was provided by an anaesthetist, and 105 patients on a day when an ECC registered nurse provided conscious sedation. This represents 10% of the population of interest. We looked at patient perception of well-being, pain, and anxiety before surgery, before discharge, at 48 hours, and at six weeks post-op. Using routinely collected data, we looked for evidence of complications and we recorded data on visual acuity pre-op and at 6 weeks.

Results: There were no anaesthetic complications in either group and there were no significant differences in surgical complications. Patient reports of well-being, pain, and anxiety pre- and postoperatively were similar.

Conclusion: The results suggest that conscious sedation of cataract surgery patients can be safely and effectively provided by a trained nurse for selected patients.

Comparison of antibiotic-only and antibiotic–steroid combination treatment in patients with corneal ulcer: interim analysis of a double-blinded, randomized clinical trial

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Purpose: To evaluate the benefits and risks of using early topical steroids in addition to antibiotics in the treatment of corneal ulcers.

Methods: Eyes with bacterial corneal ulcers, diagnosed by cornea specialists at the University of Ottawa, were randomly assigned either to receive a topical steroid at day 3 in addition to a broad-spectrum antibiotic or to receive a broad-spectrum antibiotic only. The residual ulcer size (difference from ulcer size at beginning of treatment) and other treatment outcomes between groups were compared. Standardized photographic assessments were used.

Results: Interim analysis of this randomized clinical trial is being conducted quarterly, overseen by the data safety and monitoring board. The interim analysis is guided by the Lan–DeMets alpha spending function. The second quarterly analysis will be available for presentation to the COS annual meeting in June 2006.

Conclusion: The results of this study will likely change how cornea ulcers are managed. This interim analysis may give clinicians an early indication of the final results.

Monovision for improving intermediate vision with bilateral implantation of the ReSTOR IOL

J. Blaylock, Z. Si, C. Vickers, S. Aitchison

Purpose: To evaluate the visual outcome, adverse effects, and subjective outcome after bilateral implantation of the AcrySof SA 60D3 ReSTOR multifocal intraocular lens (IOL).

Methods: A prospective study was done on 20 eyes of 10 patients implanted bilaterally with the ReSTOR IOL. For patients who need good vision at intermediate range, the nondominant eye was designed to be overcorrected with –1.00 D of myopia to improve the intermediate vision after surgery. This design was based on our results; mean +1.20 D added to distance correction of eye with ReSTOR IOL can achieve best corrected intermediate vision. Visual acuity (VA) was determined at a series of distances (20, 33, 40, 50, 60, 70, and 300 cm) 3 months after surgery. Vision consistency over distance was statistically analyzed. Contrast sensitivity, stereoacuity, and subjective outcomes were assessed.

Results: Postoperatively, 95% of eyes were within ±0.50 D and 100% of eyes were within ±1.00 D of intended residual refraction. There were no statistically significant differences for binocular uncorrected VA between each focus distance ($p > 0.05$). The mean binocular uncorrected near, intermediate, and distance VA were 20/23, 20/20, and 20/20, respectively. No significant differences were found between preoperative near-point stereoacuity with near correction and postoperative uncorrected near-point stereoacuity, nor between preoperative and postoperative contrast sensitivity ($p > 0.05$). Ninety percent of patients did not note the blur at intermediate range on questioning. Only 10% of patients had some minor difficulty seeing, being bothered only occasionally by the blur at intermediate range.

Conclusion: Monovision for improving intermediate vision by bilateral implantation of the ReSTOR IOL offered consistently good vision at all ranges and is a safe and valuable option for patients who require good vision at intermediate range.

Consistency of vision over distance after implantation of the ReSTOR multifocal intraocular lens

J. Blaylock, Z. Si, C. Vickers

Purpose: To evaluate the consistency of visual acuity (VA) and determine the refraction of emmetropic pseudophakic eyes at various distances after implantation of the AcrySof SA 60D3 ReSTOR multifocal intraocular lens (IOL).

Methods: Thirty-seven eyes of 20 patients had implantation of the ReSTOR IOL. VAs were measured at 20, 33, 40, 50, 60, 70 and 300 cm. Best distance-corrected, best intermediate-corrected (60 cm), and best near-corrected (33 cm) VAs were determined 3 months after surgery. Subjective outcomes were assessed by questionnaire in 17 patients with bilateral implantation (BI).

Results: Mean monocular postoperative VAs were 20/20 for best distance-corrected, 20/46 for best distance-corrected intermediate, and 20/23 for best distance-corrected near. The best distance-corrected VAs at 40, 50, 60, and 70 cm were statistically significantly worse than best distance-corrected and best distance-corrected near VAs ($p < 0.05$). All BI patients noted the blur on questioning, but 76.5% had little or no difficulty seeing and 70.6% were bothered only occasionally or never by the blur. The mean additional add to best distance correction for best intermediate-corrected VA was +1.20 ± 0.27 or –1.68 ± 0.24 D, and for best near-corrected VA was –0.26 ± 0.24 D.

Conclusion: Implantation of the ReSTOR IOL offered good VA at distance and near distance, but not as good VA at intermediate range. Few patients were affected by the decrease in intermediate vision. For patients who need good vision at intermediate range, leaving one eye with distance myopia or hyperopia to compensate for intermediate vision could provide consistent good binocular vision over the full range in BI.

Screening for diabetic retinopathy in urban and semi-urban areas in Canada through telemedicine

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Purpose: We present the results of screening patients with diabetes throughout Canada for diabetic retinopathy (DR) using telemedicine.

Methods: Through a validated telemedicine project, fundus imaging of persons with diabetes was performed through screening health days held in pharmacies in Quebec, Ontario, Saskatchewan, Manitoba, Alberta, and British Columbia. Clinical data and visual acuity were obtained and DR education provided by a nurse. The clinical data and images were encrypted and transmitted to a data centre through a safe and secure protocol. Using secure digital imaging software, retina specialists assessed the images and clinical data and provided their recommendations. A report was sent to all physicians involved in the patients' care, and all patients were notified of their results. Positive screening led to the organization of a timely appointment with their own ophthalmologist, whom they had often neglected to see, or with an ophthalmologist in their area if they were not already being followed.

Results: Significant health results were measured through the large number (48%) of patients with diabetes who were noncompliant to screening guidelines (i.e., over 2 years since last examination) and who were recuperated through this approach. The presence of some level of DR was detected in 26% of the screened patients of whom 23% needed to be followed up and (or) treated urgently. The savings of examinations for DR (85%) to ophthalmologists who can better use their time and expertise for the benefit of more urgent cases are important.

Conclusion: This model for mass screening for DR with telemedicine in patients with diabetes efficiently reaches under-serviced diabetic populations in urban and semi-urban areas. It provides medical-quality DR screening and timely ophthalmologic follow-up and (or) treatment. It also favors the development of multidisciplinary collaborations between ophthalmologists and other physicians involved in the care of patients with diabetes.

Abnormal retinal vascular development in fetal and neonatal alloimmune thrombocytopenia?

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Purpose: Severe neonatal haemorrhage or mortality can be associated with abnormal platelet function or abnormal blood vessel development. In the past 2 decades, it has become evident that pregnant women can develop antibodies against the platelet antigens inherited by the fetus from the father. Platelets cross from fetus to mother and, reciprocally, antibodies cross from mother to fetus leading to intracerebral haemorrhage, spontaneous abortion, or neonatal death. Because platelets express the b3 integrin (aIIb3) and retinal blood vessels also express b3 (avb3), we asked whether a severe form of fetal and neonatal alloimmune thrombocytopenia (FNAITP) might directly damage the retinal vasculature and whether this could be detected by evaluation of the developing retina in a murine model. We also asked whether treatment of the pregnant mothers with intravenous IgG (IVIG) during pregnancy could reduce this damage.

Methods: Female b3 –/– mice were twice immunized with b3+ platelets and mated with wildtype males. Miscarriage, neonatal haemorrhage, and maternal–fetal titres of anti-b3 antibodies were evaluated. In addition, b3 –/– mothers with a history of FNAITP received IVIG once weekly during subsequent pregnancies. On postnatal day 2, dissected wholemount retina were stained with fluorescently-conjugated Lectin SB4 and anti-collagen IV antibodies and underwent immunohistochemical analysis. Vessel growth from the optic nerve head was quantified using a prebuilt radial grid overlay (Image J). Up to 8 measurements were obtained per eye.

Results: Sensitized pregnant females with demonstrable anti-b3 antibodies had high rates of miscarriage and gave birth to stillborn or small pups often with notable haemorrhage. Preliminary data suggest that new vessel growth in the retina was reduced in pups born to b3 –/– mothers. It also appears that IVIG was able to lessen the inhibition of new vessel growth.

Conclusion: We have demonstrated that the retinal vasculature can be damaged in a mouse model of FNAITP. It is currently not known whether a clinical correlation exists, in large part because ophthalmologists are not involved in patient evaluation; further, postmortem studies of aborted fetuses and neonatal deaths do not include retinal evaluation. We suggest that in cases of suspected FNAITP or in cases of fetal and (or) neonatal loss in a previous pregnancy that consideration be given to a dilated retinal examination. Because immune modulation of pregnant mothers is now a clinical option, it is possible that appropriate ophthalmic evaluation could enhance the likelihood of successful subsequent pregnancies. Although preliminary, we suggest that ophthalmic screening of retinal vascular development should be considered for newborns with unexplained haemorrhage or a suspicion of FNAITP.

Phase IIIb, multicenter, randomized, double-masked, sham injection-controlled study of the efficacy and safety of ranibizumab in patients with choroidal neovascularization (CNV) secondary to age-related macular degeneration (AMD): first-year results of the PIER study

D.M. Brown, T. Ianchulev, H. Yue, N. Shams, for the PIER Study Group

Purpose: The PIER study is 2-year trial assessing the efficacy and safety of two doses of intravitreal ranibizumab in patients with AMD-related primary or recurrent subfoveal CNV with or without a classic component.

Methods: Patients were enrolled and randomly assigned in a 1:1:1 ratio to 0.3 mg ranibizumab, 0.5 mg ranibizumab, or sham injections. Injections were given monthly for 3 months followed by injections once every 3 months. The study will conclude after a total of 24 months. The primary efficacy outcome is mean change from baseline in the best corrected ETDRS visual acuity score at 12 months. Safety assessments include the incidence and severity of ocular and nonocular adverse events at 12 months and 24 months.

Results: The study was completely enrolled (184 patients) in March 2005. Data for the first 12 months have not yet been analyzed, but will be available before the June 2006 COS annual meeting.

Conclusion: Twelve-month efficacy and safety data from the Phase IIIb PIER trial will be presented.

Administration technique and compliance in topical drug therapy of glaucoma

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Purpose: Whereas up to 80% of glaucoma patients do not use glaucoma medications as directed, published levels of noncompliance vary greatly. This raises the possibility of regional and practice-specific determinants. Our purpose was to estimate the prevalence of noncompliance and ineffective medication administration in the treatment of glaucoma and to investigate possible risk factors for noncompliance.

Methods: In the first stage of this planned multicentered pan-Canadian clinical investigation, data were obtained from 2 tertiary glaucoma practices. Data concerning use of medications were obtained using a validated questionnaire. Noncompliance was defined as missing at least 1 drop/week or using incorrect medications or dosage. Medication instillation technique was assessed in all subjects by direct observation. A series of predictor variables were assessed for their impact on compliance and effective medication administration.

Results: 80 subjects on chronic glaucoma therapy without recent surgery were enrolled in the study. 2.5% (95% CI, 0.3%–9%) of subjects failed to deliver medication to the eye. However, 49% (37%–60%) contaminated the bottle tip while administering medication. Only 24% (15%–35%) of subjects had been shown how to administer drops by their pharmacist. Overall, 33% (21%–46%) of subjects reported noncompliance. Univariate analysis showed that men were more likely to report noncompliance (OR = 3.0; 95% CI, 1.1–8.0). This relationship remained significant in multivariate logistic regression. Of note, age, severity of visual field loss, disease stability, and number of medications were not associated with noncompliance.

Conclusion: Almost half the study patients contaminated their medication bottles during drop administration. This may be of special concern in eyes predisposed to serious infection such as those with filtering blebs. Only a minority of patients were shown how to use ophthalmic medications by their pharmacist, suggesting that physicians should not rely on this service. Finally, noncompliance was common in the study population and is a valid concern for physicians treating patients with glaucoma.

The role of *ATRX* gene in retinal development

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Purpose: Defects in the ATRX (transcriptional regulator) have been associated with several X-linked mental retardation syndromes. Individuals with the ATR-X syndrome display features suggestive of abnormal neuronal development, including moderate to severe cognitive delay, microcephaly, and severe neonatal hypotonia. As well, there have been clinical reports of ocular pathology in these patients. The aim of this study was to use the ATRX mental retardation syndrome as a model to study how a systemic disorder of neuronal maldevelopment may affect neuronal development in the eye. Since the retina consists of six classes of neurons, we examined this tissue in particular. More specifically, the purpose of this study was to elucidate the role of the ATRX protein in progenitor cell proliferation and cell death during retinal development in the murine model.

Methods: Mice conditionally deficient for ATRX were generated by crossing ATRX(*lox*P) females to heterozygous *Foxg1Cre* knock-in male mice. BrdU labeling was performed on time-mated homozygous ATRX(*lox*P) mice by injecting intraperitoneally with 5-bromo-2-deoxyuridine (BrdU). Animals were sacrificed after 1 h. Embryonic ocular tissue was fixed and frozen, and 10 μm horizontal sections were mounted on slides. Yolk sac DNA from embryos was genotyped by PCR. Immunofluorescence staining was performed to identify proliferating cells (in the S phase of the cell cycle) with an anti-BrdU antibody (BU-20) to study cells in S phase. Cell death was assessed by the TUNEL assay.

Results: Loss of ATRX in the retina causes increased programmed cell death of progenitor cells. As well, loss of ATRX alters progenitor cell proliferation and differentiation during the embryonic period. These findings could account for the abnormal neuronal cell fate in the retina of these knock-out mice.

Conclusion: Our results identify the ATRX protein as a critical player in normal retinogenesis. Loss of this protein leads to profound defects in retinal progenitor cell development. We have also identified strong parallels between the role of the ATRX protein in the retina and in cortical development. This has implications for other mental retardation disorders whereby the same pathological neuronal development in the cortical system may contribute to pathology in retinal neuronal development and ultimately limit the maximal visual potential possible.

The effect of pupil dilation on driving vision in Canada

H.F. Chew, S.N. Markowitz, J. Flanagan, Y.M. Buys

Purpose: To determine whether there is a clinically significant reduction in visual acuity or contrast sensitivity, with and without the presence of glare, following an ocular examination with pupil dilation in patients currently driving.

Methods: From November 1, 2004, to February 28, 2005, 105 patients who presented consecutively to the Toronto Western Hospital Eye Clinic were assessed in this prospective nonrandomized comparative trial. For each patient, the better eye was assessed both pre- and postdilation with and without the addition of glare administered through the brightness acuity tester (BAT). Visual acuity was assessed using the Early Treatment in Diabetic Retinopathy Study (ETDRS) and Snellen charts. Contrast sensitivity was measured using the Vistech VCTS 6500 chart.

Results: In the absence of added glare, there was a mean reduction of 4.8 letters read from the ETDRS chart following dilation ($p < 0.001$). In the presence of glare, there was a mean reduction of 7.1 letters ($p < 0.001$). Without glare, 8 patients (7.6%) had visual acuities worse than 20/50 postdilation. With glare, 15 patients (14.3%) had visual acuities worse than 20/50 postdilation. Compared with patients who were initially 20/20, patients presenting with a Snellen visual acuity of 20/25 to 20/40 had a 5.25 relative risk of having a postdilation visual acuity worse than 20/50. With the addition of glare, the relative risk doubles to 10.5. Without glare, there was a significant reduction in contrast sensitivity postdilation at spatial frequencies of 2.0, 4.0, and 6.0 cycles/degree ($p = 0.014$, $p < 0.001$, and $p < 0.001$, respectively). With the addition of glare, there was a greater reduction in contrast sensitivity at the same 3 spatial frequencies ($p < 0.001$ for all).

Conclusion: There is a significant reduction in visual acuity and contrast sensitivity postdilation that is further confounded by the effect of glare. This reduction may limit some patients from driving postdilation.

Evolving endoillumination options

D.R. Chow

Purpose: New xenon endoilluminators have dramatically altered the way vitreoretinal surgery can be performed. Our previous studies have confirmed the increased brightness of both the Alcon and Synergetics xenon light sources along with the superior safety of the Synergetics xenon light.

Comments: Monochromatic endoillumination, in particular yellow light, on the Synergetics xenon allows for unparalleled safety and power capabilities to drive chandeliers, 25 g light sources, and illuminated instruments. The latest advances in endoillumination options will be presented in a video format.

Clinical study of anterior segment tumors using ultrasound: comparing the UBM and 20 MHz probe

C. Corriveau, M. Mansour

Purpose: To compare 2 techniques of ocular ultrasonography in regard to the determination of the exact lesion location, tissue involvement, diagnosis, and facility of manipulating the ultrasound probe.

Methods: We performed ocular ultrasonography using the immersion technique for the UBM (ultrasound biomicroscopy) and the direct contact using a membrane filled with BSS for the 20 MHz probe. We used our anterior segment classification of tissue location from the anterior to posterior, i.e., from iris to the peripheral choroid. We evaluated 54 eyes (42 patients) having anterior segment tumors clinically.

Results: Mean age was 52.2 years and 67% of our patients were female. Approximately 67% of eyes were OS and 33% OD. Diagnoses (by percentage of patients) were 56% iris nevus, 23% iris–ciliary body epithelium cysts, 13% suspicious iris–ciliary body lesions that were followed to detect any growth, 6% iris freckles, 2% iris–ciliary body adenoma, and 2% defective scleral tissue that appeared as conjunctival cyst clinically. The locations of these tumors were 37% inferotemporal, 16% inferior, 12% inferonasal, 9% nasal, 9% temporal, 9% superotemporal, 5% all quadrants, and 2% superonasal. The mean measurements of all lesions in longitudinal, transverse, and height were 2.6 mm × 3.0 mm × 1.4 mm, respectively. We were able to detect 28 ciliary body tissue involvements with the use of UBM vs. 16 with the 20 MHz probe. The UBM could locate 28 lesions in the anterior corona, 11 lesions in the posterior corona, and 9 lesions in the orbicularis of the ciliary body. The 20 MHz could not differentiate these locations within the ciliary body. We detected 51 iris lesions with the UBM vs. 48 with the 20 MHz probe. The UBM could locate 43 peripheral iris involvements vs. 39 with the 20 MHz and 10 pupillary lesions vs. 9 with the 20 MHz probe.

Conclusion: Both techniques can differentiate between solid or cystic lesions or when both components are present in vivo. The 20 MHz technique is a useful tool to screen for anterior segment tumor, but it cannot detect all the lesions affecting the ciliary body. However, all the cystic lesions were detected by the 20 MHz ultrasound and it appears to be a good instrument to make the appropriate diagnosis for ciliary body and iris cyst. The UBM instrument requires a greater expertise since the manipulation of the probe is more difficult to control if we compare with the 20 MHz probe. The UBM detects the exact location and tissues involved by the tumors and is useful for the follow-up detection of any changes that could occur consequently, for planning intervention.

Screening for primary open-angle glaucoma in a high-risk population using intraocular pressure corrected for central corneal thickness

A. de Saint Sardos, A.K. Fansi, M. Chagnon, P.J. Harasymowycz

Purpose: To compare different central corneal thickness (CCT)-based algorithms for the correction of intraocular pressure (IOP) when screening for primary open-angle glaucoma (POAG) in various at-risk groups.

Methods: Study data were gathered during a community-based, high-risk, glaucoma screening clinic conducted in Montreal, Quebec, between October 2003 and February 2004. Two hundred and seventy-four patients underwent a complete ophthalmic examination including visual acuity, ultrasonographic corneal pachymetry (the average of 3 separate measurements), IOP measurement by Goldmann applanation tonometry, gonioscopy, slit-lamp and dilated funduscopic examination, as well as imaging of the optic nerve with confocal scanning laser ophthalmoscopy (HRT II). Outcome measures included IOP, CCT, and the presence of glaucomatous optic nerve damage as confirmed by a consensus of 3 glaucoma specialists. Five different published algorithms were used to correct IOP for CCT for each eye. The corrected IOPs of patients with glaucoma were compared with those of glaucoma suspects as well as with those of participants without glaucoma and not suspect. Statistical analyses, including ANOVA, Student's *t* test, multivariate analysis, and area under the receiver operating characteristic (AROC), were conducted using GraphPad Prism and SPSS software.

Results: A total of 516 eyes with an average IOP of 16.4 mm Hg and an average CCT of 550.4 μm were included in the study. There were 31 eyes diagnosed with POAG (prevalence 6.0%) and 68 eyes that were suspect for glaucoma. Before correcting for CCT, an IOP greater than 21 mm Hg was determined to be highly specific (99%) as a screening test for POAG, with a sensitivity of 12%, a positive predictive value of 43%, and a negative predictive value of 95%. The AROC, using 21 mm Hg as a cutoff for the right and left eyes, were 0.57 and 0.51, respectively. Depending on the correction factor used, the AROC varied significantly from 0.51–0.70 postadjustment of IOP for CCT. When using 21 mm Hg as a screening test cut-off point, postadjustment of IOPs for CCT was not significantly more sensitive and no less specific than unadjusted IOPs.

Conclusion: Whereas certain algorithms that correct IOP for CCT provide a more sensitive and specific threshold for detecting glaucoma in a high-risk population, correcting IOP for CCT does not substantially improve its validity as a screening tool.

Practice patterns among members of the Canadian Cornea, External Disease & Refractive Surgery Society in management of patients with cataract and Fuchs' endothelial dystrophy

M. Dollin, S. Srinivasan, A.R. Slomovic

Purpose: To assess practice patterns among the members of the Canadian Cornea, External Disease & Refractive Surgery Society (CCEDRSS) in the management of patients with coexisting cataract and Fuchs' endothelial dystrophy (FED).

Methods: A questionnaire was sent to each of the 42 members of the CCEDRSS. The questionnaire assessed their decision for combined versus sequential procedures, the type of combined versus sequential procedure, and the measures taken to protect the corneal endothelium intraoperatively in patients with coexisting cataract and FED.

Results: The response rate was 67%. The 3 most important factors for deciding to do a combined versus sequential procedure were (*i*) clarity of the cornea (64%), (*ii*) degree of cataract (64%), and (*iii*) age of the patient (58%). Surgeons more often relied upon pachymetry (64%) than specular microscopy (32%) in assessing the corneal status in patients with FED. In managing patients with FED, corneal edema, and cataract, 46% of respondents preferred doing a combined transplant, phaco, and intraocular lens (IOL) implant, 29% preferred doing a transplant followed by a phaco at a later time, and 7% preferred doing a phaco followed by a transplant at a later time. During cataract operation in patients with FED, the 3 most important factors for protecting the endothelium were (*i*) use of dispersive viscoelastic (40%) and soft shell technique (18%), (*ii*) reduced phaco time and power (64%), and (*iii*) alteration of phaco technique (bevel down, endocapsular phaco, and irrigation away from the endothelium) (57%).

Conclusion: Although factors for deciding to do a combined or sequential procedure in a patient with coexisting FED and cataracts are consistent among Canadian cornea surgeons, there is wide variation among the initial procedure selected.

Cost-effectiveness of Macugen in the treatment of subfoveal wet age-related macular degeneration (AMD) in Canada

S. Earnshaw, Y. Moride, A. Moshyk

Purpose: To examine the cost-utility and cost-effectiveness of treatment with pegaptanib sodium injection (Macugen) compared with 2 treatment strategies using photodynamic therapy with verteporfin (PDT) for subfoveal wet age-related macular degeneration (AMD) in the Canadian elderly population: (*i*) treatment with PDT in predominantly classic AMD only (standard care); and (*ii*) treatment with PDT for all angiographic lesion subtypes.

Methods: A Markov framework was used to model the lifetime movement of an AMD cohort through 5 health states based on visual acuity (VA): >20/40, 20/40 to >20/80, 20/80 to >20/200, 20/200 to >20/400, and ≤20/400. The model incorporated patients across all lesion subtypes: predominately classic, minimally classic, and occult. All drug costs, procedure costs, and costs associated with declining VA (costs associated with depression, injuries, and nursing home admission) were derived from several Canadian sources including databases of the Régie de l'assurance maladie du Québec and the Ontario Ministry of Health and Long-Term Care. Expert interviews were conducted to determine adverse event (AE) treatment patterns and vision rehabilitation resource use. Transition probabilities for Macugen, standard care, and treatment of all lesion subtypes with PDT were derived from published clinical efficacy among patients in the Macugen VISION study and the Treatment of AMD with Photodynamic Therapy (TAP) and Verteporfin in Photodynamic Therapy (VIP) trials. Utilities were obtained from similar published sources as used in previous AMD models.

Results: The incremental cost per quality adjusted life year (QALY) gained for Macugen compared with standard care and PDT for all lesion subtypes is $59 039 CAD and $49 052 CAD, respectively. The incremental cost per vision year gained for Macugen compared with standard care and PDT for all subtypes is $21 559 CAD and $20 401 CAD, respectively. Variations in model horizon have the greatest impact on results.

Conclusion: Macugen is a cost-effective treatment for subfoveal wet AMD regardless of lesion subtype when compared with PDT with verteporfin.

The effect of optic disc area, axial length, and refractive error on RNFL thickness as measured by OCT III

A.K. Fansi, P. Harasymowycz

Purpose: To study the influence of anatomic variations in optic disc area, axial length, and refractive error on thickness of retinal nerve fibre layer (RNFL) as measured by Zeiss optical coherence tomography (OCT) III.

Methods: 221 nondilated eyes were scanned as part of a glaucoma screening study. IOL Master was used to measure axial length and refractive error. OCT III scans were used to measure optic disc area and average RNFL thickness under preset concentric circles of 9.425 mm and 10.87 mm perimeter around the disc. Scans with signal strength below 6 (out of 10) were deemed of insufficient quality and excluded. Statistical correlation and Student *t* tests were used to analyze data.

Results: Poor but significant correlations were found between RNFL thickness and optic disc area ($R = 0.25$, $p < 0.01$, $n = 124$) in the larger diameter circle scan and between both RNFL thickness and axial length ($R = –0.31$, $p < 0.01$, $n = 154$) and RNFL thickness and refractive error ($R = 0.25$, $p < 0.01$, $n = 154$) in the smaller diameter circle scan. A statistically significant difference (2-tailed Student *t* test, $p = 0.003$) was also found between mean RNFL thickness measured at 10.87 mm ($n = 65$, mean 97.0 ± 12.8) and that at 9.425 mm ($n = 80$, mean 107.3 ± 16.0).

Conclusion: Few studies have evaluated the influence of anatomic variations on RNFL thickness as measured by OCT III. This study demonstrated that RNFL thickness increases the closer the measurements are performed to the disc margin. This may be due to a thicker anatomic distribution of fibers closer to the disc margin combined with the fact that larger discs have a larger number of nerve fibers. These differences should be considered when interpreting OCT RNFL results in individual patients.

Effect of dalteparin in the prevention of neovascularization of iris in recent-onset central retinal vein occlusion

M.S. Farahvash, S. Mohammadzadeh, M. Moradimogadam, S. Moghimi

Purpose: To compare the effect of dalteparin in the prevention of neovascularization of iris (NVI) in recent-onset central retinal vein occlusion (CRVO) with that of aspirin.

Methods: A randomized controlled clinical trial was conducted on patients with CRVO of less than 21-days duration. The patients in the dalteparin group received subcutaneous dalteparin, whereas the patients in the aspirin group were given aspirin.

Results: 93 patients were enrolled (47 in the dalteparin group and 46 in the aspirin group) and were followed up for at least 6 months. One of 47 (2.1%) in the dalteparin group and 14 of 46 (30.4%) in the aspirin group developed iris neovascularization; the difference was significant ($p = 0.0001$). The visual outcomes of the 2 groups were compared and a significant difference ($p = 0.016$) was found.

Conclusion: Patients treated with dalteparin within 21 days of the onset of CRVO were less likely to develop NVI. There was also a significant difference in visual acuity between the 2 groups. The result of this study strongly suggests the use of dalteparin in patients with recent-onset CRVO.

Does strabismus lead to morphological change in the feline lateral geniculate nucleus (LGN)?

H.M. Fennell

Purpose: To determine whether strabismus, surgically implemented at various ages, leads to morphological change in layers of the feline lateral geniculate nucleus (LGN) associated with the deviated eye. If so, how do these changes compare to those seen with monocular deprivation?

Methods: At various times during the critical period, strabismus was surgically induced in 12 cats (including 2 adult cats). After being reared with strabismus, the LGNs of each cat were examined to see if the strabismus resulted in any cellular change. Tissues were examined using a stain for Nissl substance and using SMI-32.

Results: Strabismus leads to morphological change in the feline LGN, but to a lesser extent than with monocular deprivation.

Conclusion: These findings suggest that strabismus, if implemented early enough during the critical period, is sufficient to cause morphological changes in the feline LGN.

Forecasting the vision loss epidemic in Canada: estimates and projections of age-related eye disease

M. Fielden, R. Buhrmann, W.G. Hodge

Purpose: Demographic modelling paints a grim picture of a rising epidemic of vision loss in Canada. The purpose of this study was to generate best estimates and projections of the number of Canadians 40 years and older with age-related macular degeneration (AMD), diabetic retinopathy (DR), open-angle glaucoma (OAG), and cataract/pseudophakia. These estimates will enable advocacy efforts, health policy development, and health care planning to more effectively address the vision loss epidemic.

Methods: We conducted a systematic literature review to obtain prevalence estimates for AMD, DR, OAG, and cataract/pseudophakia applicable to the Canadian population and determined that the best available estimates were from a published meta-analysis of the major eye examination surveys over the past 15 years. For demographic modelling we used 2001 postcensal estimates of the Canadian population, and for 5-year age intervals from 2001 to 2026 we used median plausible population estimates from the Statistics Canada population growth model based on the 1996 census. Prevalence estimates were direct-standardized to the Canadian population at each time point. Estimates were produced for intermediate AMD (drusen ≥125 μm), advanced AMD (geographic atrophy and (or) neovascularization), DR, vision-threatening DR (severe retinopathy and (or) macular edema), OAG, cataract, and pseudophakia/aphakia.

Results: The increase in the estimated number of Canadians (in thousands) with age-related eye diseases from 2001 to 2026 was substantial: advanced AMD, 193 (88%); intermediate AMD, 651 (77%); OAG, 143 (70%); DR, 266 (64%); vision-threatening DR, 58 (61%); cataract, 1964 (83%); and pseudophakia/aphakia, 573 (84%). The 2026 Canadian estimates in thousands (95% confidence limits) were 1502 (1415–1590) for intermediate AMD; 412 (388–436), advanced AMD; 349 (329–368), OAG; 681 (636–727), DR; 154 (135–173), vision-threatening DR; 4343 (4234–4451), cataract; and 1255 (1190–1320), pseudophakia/aphakia. Over the same period, the relative increase in prevalence was 24.5% for intermediate AMD; 32.8%, advanced AMD; 19.6%, OAG; 15.8%, DR; 13.2%, vision-threatening DR; 28.8%, cataract; and 29.9%, pseudophakia/aphakia. The projected increase in age-related eye disease varied widely between provinces owing to demographic differences.

Conclusion: Demographic modelling predicts a dramatic increase in the number of Canadians affected by age-related eye disease over the next 2 decades. Innovation, vigorous advocacy, policy development, and health care planning are urgently required to prevent the eye care services from being overwhelmed.

Relationship between a new paradigm for recording pattern electroretinogram (PERGLA) and frequency doubling technology in glaucoma

M.J. Fredette, D.R. Anderson, D.L. Budenz, V. Porciatti

Purpose: To determine the relation between a new paradigm for recording pattern electroretinogram in glaucoma (PERGLA) and the second-generation perimetry with frequency doubling technology (FDT2, Humphrey Matrix) in patients with a range of severity of glaucoma.

Methods: 49 stable glaucoma patients with a broad range of disease severity had both repeated PERGLA recordings of amplitude and phase and repeated FDT2 24-2 threshold strategy on 5 different days within an 8-week period. Mean values of amplitudes on PERGLA and thresholds on FDT2 were compared using correlation coefficients.

Results: The coefficient of correlation between the mean amplitude on PERGLA and the mean threshold on FDT2 was $r = 0.341$ ($p = 0.0164$). The coefficient of correlation between **t**he mean amplitude deviation on PERGLA and the mean deviation on FDT2 was $r = 0.475$ ($p = 0.0006$).

Conclusion: Although statistically significant, the correlations between PERGLA and FDT2 measurements in glaucoma were not strong. Further investigations are needed to better understand the underlying mechanisms that could explain this limited correlation between the 2 instruments.

Endogenous *Aspergillus* endophthalmitis in an immunocompetent patient

J. French, D. Haase, A. Samad

Case report: To present the case of a healthy immunocompetent 65-year-old man who presented with acute *Aspergillus* endophthalmitis.

Comments: Case presentation with clinical–pathological correlation including biomicroscopy, ultrasonography, radiologic imaging, microbiologic investigations, and tissue pathology. Endogenous *Aspergillus* endophthalmitis may develop in susceptible immunocompetent individuals.

The eyelid cleansers "EYECL08" and "EYECL12" are bactericidal for 40 endophthalmitis organisms

J.P. Gilbard, B. Paton

Purpose: Endophthalmitis is a devastating complication of eye surgery, and the eyelids are frequently the source of the offending organisms. The antibacterial action of eyelid cleansers EYECL08 and EYECL12 was tested.

Methods: Using stock cultures of *Pseudomonas aeruginosa* (PA), *Moraxella catarrhalis* (MC), *Escherichia coli* (EC), *Serratia marcescens* (SM), and *Staphylococcus aureus* (SA), zone diffusion assays were performed. We then collected 40 organisms isolated from cases of endophthalmitis that had presented to the Massachusetts Eye and Ear Infirmary for broth testing. The organisms comprised 19 strains of *Staphylococcus epidermidis*, 8 strains of SA, 4 strains of PA, 3 strains of methicillin-resistant SA, 3 strains of *Staphylococcus warneri*, and 3 strains of SM. Inoculums were prepared from overnight cultures grown on noninhibitory media. Four- or 5-well isolated colonies of each isolate were emulsified in 5 mL of sterile distilled water. The solutions were adjusted to approximate a 0.5 McFarland turbidity standard and then 10 μL aliquots were inoculated into (*i*) a control tube containing 1 mL of tryptic soy broth, (*ii*) 1 mL of EYECL08, and (*iii*) 1 mL of EYECL12. Tubes were incubated overnight in a non-CO_2 incubator.

Results: Zone diffusion assays showed inhibition zones against PA, MC, EC, SM, and SA. In broth testing, all control tubes showed growth. EYECL08 and EYECL12 tubes showed no growth.

Conclusion: EYECL08 and EYECL12, eyelid cleansers designed for convenient and comfortable patient use, are bactericidal, may help reduce the incidence of endophthalmitis, and may be helpful in the treatment of blepharitis, dry eye, and the in situ disinfection of punctal plugs.

Screening for retinopathy in the pediatric sickle cell patient population

H.S. Gill, M. Kirby-Allen, W.C. Lam

Purpose: Individuals with sickle cell disease (SCD) are at risk for developing proliferative retinopathy (PR) and vision-threatening complications. This study aims to determine the prevalence and age of onset of clinically significant retinopathy and to suggest an appropriate time frame for referral to ophthalmology.

Methods: We reviewed consecutive records from 1987 to 2005 retrospectively for children with SCD referred to the ophthalmology service at the Hospital for Sick Children, Toronto. Data obtained included age, sex, sickle cell genotype, and presence of systemic manifestations of SCD. The genotypes hemoglobin SS, SC, and SB-thalassemia were considered separately for univariate and survival analyses.

Results: The hemoglobin SS group consisted of 163 patients. Over follow-up, 1 patient (0.06%) had PR (age at first eye findings, 16 y), 23 patients (14.1%) had nonproliferative retinopathy (NPR), and 139 patients (85.3%) had no retinopathy. The hemoglobin SC group consisted of 73 patients. Over follow-up, 6 patients (8.2%) had PR (mean age at first eye findings, 13.7 y; median, 13 y; range, 9–18 y), 18 patients (24.7%) had NPR, and 49 patients (67.1%) had no retinopathy. The hemoglobin SB-thalassemia group consisted of 27 patients. Over follow-up, no patients had PR, 3 patients (11.1%) had NPR, and 24 patients (88.9%) had no retinopathy. In all genotypes, differences in the survival rates for time to retinopathy based on age, sex, and presence of systemic manifestations were not statistically significant. Both sex and presence of systemic manifestations had no statistically significant association with presence of retinopathy in any group (SS, $p = 0.2564$ and $p = 0.1293$; SC, $p = 0.5617$ and $p = 0.7856$; SB-Thalassemia, $p = 0.5350$ and $p = 1.000$, respectively).

Conclusion: Proliferative retinopathy is a rare event in the pediatric sickle cell population that is more common in the hemoglobin SC genotype. In this group, patients can demonstrate clinically significant retinopathy as young as 9 years of age and more commonly at approximately 13 years. We recommend SC patients be referred for full ocular examination at age 9 and be followed annually. For the hemoglobin SS and SB-thalassemia genotypes, PR is more rare, and so patients can be referred for ocular examination at a later age (13–16 y) and followed biennially. Sex and presence of systemic manifestations do not seem to be associated with presence of retinopathy.

An unequal playing field: the met and unmet needs of people living in Canada who are blind or visually impaired

D. Gold, W.G. Hodge

Purpose: The primary objective of the study was to describe the needs of Canadians who are living with vision loss.

Methods: A questionnaire was issued to 352 adult consumers, 54 parents, 55 ophthalmologists and optometrists, and 136 rehabilitation service providers and teachers of students with visual impairments. Data were analyzed using SPSS software.

Results: It was found that people who are blind generally have good levels of education, high unemployment, and low incomes. They also have extensive unmet needs for support in areas of daily living including transportation and access technology. Most are using some type of technical aid to access information, whether a magnifier, closed-circuit television, or computer.

Conclusion: Recommendations were generated during 12 cross-country community consultations in which findings were presented for input and suggestions.

Endophthalmitis admissions treated in Manitoba between 1993 and 2004

P. Gooi, L. Bellan, M. Mathen

Purpose: To investigate endophthalmitis cases treated at the Misericordia Health Centre (MHC), Winnipeg, Manitoba, from 1993 to 2004 in comparison with other centres in North America.

Methods: All endophthalmitis cases requiring admission in Manitoba are treated at MHC. We conducted a retrospective chart review of all patients admitted for suspected endophthalmitis at MHC from 1993 to 2004 looking at prior surgeries, culture results, and their management.

Results: A total of 69 patients were admitted for suspected endophthalmitis. Of these, 52 patients were postoperative from 173 314 eye surgeries performed during this period, giving a postoperative endophthalmitis incidence of 0.03%. Forty of the 69 patients underwent a vitrectomy or tap of the anterior chamber, and 67.5% of the cultures were positive in this subgroup.

Conclusion: The incidence of suspected postoperative endophthalmitis in Manitoba was less than rates reported in the literature (0.17%–0.24%). Most of the vitrectomies or taps conducted yielded positive cultures, suggesting that the index of suspicion for performing these more invasive interventions was at the appropriate level. The findings were used to create templates for documenting endophthalmitis cases that cover patient and surgical characteristics in greater detail for future work.

Cat-scratch disease masquerade

C. Gottlieb, Z. Xu, A. Samad

Purpose: To present the case of a young woman who developed symptoms typical for cat-scratch disease including visible dermal abrasions, regional lymphadenopathy, fevers, myalgia, and malaise. The development of photopsias and unusual choroidal lesions led to investigations revealing the rare entity of non-small cell lung carcinoma with widespread systemic metastasis.

Methods: Case presentation with clinical-pathological correlation including fundus photographs, thoracic and abdominal radiologic imaging, lymph node pathology, and autopsy results.

Results: This case demonstrates that ocular manifestations in systemic disease can give clues to the origin of the causative entity, particularly when symptoms and laboratory evidence produce a clinically confusing picture.

Conclusion: The primary diagnosis to be considered in a patient with bilateral choroidal lesions is metastatic disease. Despite a typical clinical presentation of symptoms of a known systemic disease, serologic or laboratory evidence should be sought to confirm the diagnosis of a presumed infectious etiology.

A simple corneal substitute from cross-linked collagen

M. Griffith, W.G. Hodge, M. Hassanlou, R. Munger

Purpose: To develop a simple corneal substitute from cross-linked collagen.

Methods: 10% medical grade porcine type I collagen, pH 5, was mixed with 1-ethyl-3-(3-dimethylaminopropyl) carbodiimide (EDC) and N-hydroxysuccinimide (NHS). The final homogenous solution was moulded to corneal dimensions, cured, and then implanted into mini-pigs by deep lamellar keratoplasty. The implants were followed for up to 12 months postoperative. Clinical examinations of the cornea included detailed slit-lamp biomicroscopy, in vivo confocal microscopy, topography, and aesthesiometry for nerve function. Histopathologic examinations were also performed.

Results: Cross-linked collagen (refractive index 1.35) had optical clarity superior to human corneas. When implanted into pig corneas, the corneas showed a slight haze within the first few weeks. However at 6 and 12 months postoperative, all implants remained optically clear. Topography showed a smooth surface and a similar profile to the contralateral unoperated eye. The implanted matrices promoted regeneration of corneal cells, tear film, and nerves. Touch sensitivity was restored, indicating some restoration of function. The operated corneas with implants showed no significant loss of thickness and demonstrated stable host–graft integration. More recent implants tested recombinant human collagen, also without any adverse effects.

Conclusion: Collagen, porcine or recombinant human, can be adequately stabilized using water soluble carbodiimides as protein cross-linking reagents in the fabrication of corneal matrix substitutes for implantation. The simple cross-linking methodology would allow for easy fabrication of matrices for transplantation in centres where there is a shortage of corneas or where there is need for temporary patches to repair perforations in emergency situations.

Retinal horizontal cells accumulate abnormal tau protein in human glaucoma

N. Gupta, L.C. Ang, E. Girard, Y. Yücel

Purpose: To determine whether abnormal tau protein accumulation contributes to the pathological process in glaucoma.

Methods: Following institutional research ethics board approval, postmortem human eyes without glaucoma were collected from the Eye Bank of Canada, Ontario Division, and eyes with glaucoma were collected from the Ophthalmic Pathology Laboratory, University of Toronto. Fifteen glaucoma eyes with optic nerve cupping (open-angle and secondary glaucoma) and 5 control eyes without glaucoma were studied, with mean ages of 72 ± 13 y and 79 ± 9 y, respectively. Formalin-fixed, paraffin-embedded sections (7 μm) from each eye were stained simultaneously with antibody to PHF-Tau that recognizes abnormally phosphorylated Ser202 residue. Positive controls were performed on neuropathologic material. Negative controls were obtained by omitting the primary antibody for each control and glaucoma eye studied. Hematoxylin counterstaining was used to identify nuclei.

Results: Abnormal tau protein immunoreactivity was observed for PHF-Tau in all glaucoma eyes. PHF-Tau signal was strong and consistently observed in the horizontal cells of the retina in human glaucoma eyes. No immunoreactivity for PHF-Tau was seen in control eyes.

Conclusion: Abnormal tau protein accumulation in the horizontal cells of the retina is part of the pathology in human glaucoma.

Endothelial keratoplasty: is a microkeratome necessary to obtain a smooth donor interface?

K. Hoar, M.A. Terry, J.M. Wall

Purpose: To histologically evaluate the donor stromal interface in endothelial keratoplasty, with comparison of microkeratome and manual dissections. In addition, to determine whether interface quality varies with the experience of the surgeon using both methods.

Methods: Ten pairs of donor corneas were randomized between 2 surgeons with differing experience in lamellar surgery. Right and left eyes from the same donor were randomized to manual or microkeratome dissection. The stromal interface of the donor button was then histologically evaluated using scanning electron microscopy. The interface smoothness of each donor cornea was graded in a masked fashion on a scale of 0–4 using standardized photographs as reference (0 = extremely rough, 4 = extremely smooth).

Results: Results are completed in 4 eyes. The interface smoothness of the microkeratome dissections ranged from 1 to 3 regardless of the surgeon involved. The manual dissections varied between 2 and 3 with minimal difference between the novice and experienced surgeon.

Conclusion: Compared with manual donor dissection, the microkeratome did not provide a greater consistency of interface smoothness. A microkeratome is not required in endothelial keratoplasty to create a smooth donor interface. The quality of the microkeratome interface was not related to surgeon experience.

Laser treatment for retinopathy of prematurity: evolution in treatment technique over 15 years

B. Hurley, J.A. McNamara

Purpose: Laser photocoagulation treatment of retinopathy of prematurity (ROP) involves applying laser burns to the avascular retina commencing just anterior to the ridge and extending the treatment to the ora serrata. The number and density of laser burns required for a complete treatment has remained controversial. Recent work suggests more complete destruction of the avascular retina with continuous laser photocoagulation yields improved results. We undertook a review of all patients treated on the Retina Service of the Wills Eye Hospital from 2002 to 2004 to determine whether there has indeed been an increase in the number of laser burns used (and hence the density of treatment) compared with earlier treatment patterns that would confirm the trend toward more confluent treatment.

Methods: A retrospective chart review was performed using the records from the Wills Eye Hospital Retina Service. All patients from 2002 to 2004 who underwent laser photocoagulation treatment for ROP were identified. A total of 183 eyes from 93 patients treated by 7 physicians from this practice who treat ROP were identified in the 2-year period over which the analysis was performed.

Results: Initial reports of diode laser photocoagulation conducted by the same Wills Eye Hospital-based vitreoretinal practice in 1991 revealed that an average number of 816 spots (range 470–1379) were required to treat eyes that had achieved threshold ROP. In that study, the standard of practice was to place laser burns 0.5 to 1.0 burn widths apart. Approximately 15 years later, the average number of spots applied increased by 265% to 2163 applications per eye (range 461–3969) with a goal of nearly confluent laser treatment.

Conclusion: This increase in number of spots required to treat reflects a changing philosophy towards increased laser burn density in the avascular retina as the accepted burn pattern approaches near confluence. This trend likely reflects published and presented reports on increased effectiveness of continuous versus noncontinuous laser photocoagulation for the treatment of retinopathy of prematurity.

Regulation of retinal pigment epithelial cell death induced by oxidative stress

C.M.L. Hutnik, H. Liu, A. Mao, T. Peng

Purpose: To investigate the regulation of retinal pigment epithelial (RPE) cell death induced by oxidative stress. Specifically, the role of p38 mitogen-activated protein kinase (MAPK) in oxidative stress-induced RPE cell death was examined.

Methods: Oxidative stress was induced by the chemical oxidant tert-butylhydroperoxide (t-BOOH) in the human RPE cell line ARPE-19. Cell viability was assessed by both the MTT assay and the trypan blue assay. The phosphorylation of p38 MAPK was measured by Western blot using a specific antibody against phospho-p38 MAPK. Knockdown and activation of p38 MAPK were carried out by siRNA and overexpression of MAPK kinase-6E (MKK6E), respectively.

Results: t-BOOH induced RPE cell death in a dose- and time-dependent manner. t-BOOH increased phosphorylation of p38 MAPK. The inhibition of p38 MAPK with a selective inhibitor (SB203580) and the knockdown of p38 MAPK with siRNA both enhanced t-BOOH-induced RPE cell death. Overexpression of a dominant active mutant of MKK6 (MKK6E), a kinase upstream of p38 MAPK, increased phosphorylation of p38 MAPK and attenuated t-BOOH-induced RPE cell death. Additionally, preconditioning with a low dose of t-BOOH, which increased p38 MAPK activation but did not induce appreciable cell death, decreased the RPE cell death induced by a higher dose of t-BOOH. This protective effect was absent when the RPE cells were pretreated with SB203580 for 30 minutes prior to preconditioning.

Conclusion: Activation of p38 MAPK protects human RPE cells against oxidative-induced injury. Since RPE cells play a key role in the homeostasis of the retina, this finding may have significant implications of retinal ganglion cell and photoreceptor health.

Tissue-engineered corneal substitutes for refractive correction

W.B. Jackson, W.G. Hodge, F. Li, P. Fagerholm, M. Griffith

Purpose: To test the feasibility of using tissue-engineered extracellular matrix (ECM) substitutes as implantable lenticules or onlays for refractive correction.

Methods: A range of ECM substitutes including crosslinked collagen, hybrid collagen-synthetic, and biomimetic materials were fabricated into onlays (7.5 mm diameter, 70 μm thickness at the centre). A new delaminating device (Gebauer) to create epithelial pockets was tested in mini-pigs and humans. Onlays were inserted and clinical examination was performed pre- and postoperatively.

Results: Crosslinked porcine and human recombinant collagen showed optical clarity by slit lamp with neither inflammation nor neovascularization. At 6 month post-op in mini-pigs, nerve regrowth and touch sensitivity was regained and implants remained optically clear. The epithelium adhered well to all lenticules and expressed appropriate epithelial markers. The results of the first human implanted onlays are presented.

Conclusion: ECM substitutes can be fabricated as onlays that can integrate functionally within host corneas. Epithelial pockets can be created and there is potential for such lenticules to be useful future supplements for, or alternatives to, laser-based refractive corrections.

Long-term results from the international multifocal presbyopia clinical trial

W.B. Jackson, G. Mintsioulis, M.D. Lafontaine

Purpose: To discuss safety and efficacy results of the Canadian multicenter trial of multifocal LASIK treatments for the correction of hyperopic presbyopia.

Methods: Long-term clinical trial follow-up study of 75 hyperopic presbyopic eyes treated, with 12 months postoperative results in 34 eyes. Subjects preoperatively presented with a mean sphere of 1.70 D (range 0.5 to 3.50 D) and mean cylinder of 0.43 D (range 0.00 to 1.5 D). Iris registration is a key element of the treatment process. Postoperative subjective questionnaire was administered.

Results: Twelve months postoperatively, 94% of eyes (n = 34) saw 20/25 or better at distance and 85% saw J3 or better at near. At 6 months, 96% of the subjects achieved 20/25 distance and J3 near or better. Overall patient satisfaction was good and spectacle independence was achieved in 50% of patients. There was no significant loss of contrast acuity and the spherical aberration changed from positive to negative spherical aberration.

Conclusion: Long-term results of multifocal presbyopic correction for hyperopic presbyopes demonstrate stability and safety with high overall patient satisfaction.

Ophthalmic artery occlusion associated with migraine: a case study of a 22-year-old woman

P. Jelfimow, K. Colleaux

Purpose: Transient ocular symptoms are a common consequence of migraine. We present a case of permanent monocular vision loss as a result of ophthalmic artery occlusion in a 22-year-old woman with a history of migraine.

Methods: Case report.

Results: Extensive investigations including laboratory and imaging modalities failed to reveal an etiology for the ophthalmic artery occlusion.

Conclusion: Migraine is a common neurologic syndrome of young adults. Various visual phenomena including scintillating scotomas, visual field defects, and transient visual loss have been reported. Permanent visual or neurologic sequelae have been rarely reported. We present a case of a young woman who developed monocular no light perception vision in conjunction with migraine headache.

Impact of a structured assessment protocol on the reliability of optic nerve evaluation

D. Jinapriya, R. Campbell

Purpose: With recent developments in optic nerve imaging, the limitations of clinical examination have been highlighted. Thus, we evaluated the potential of a teaching intervention combined with use of a structured protocol for optic nerve assessment to improve reliability. Second, we evaluated the impact of level of ophthalmology training on the effectiveness of these interventions.

Methods: Attending ophthalmologists (AO; $n = 7$), residents in ophthalmology (RO; $n = 7$) and nonophthalmology physicians (NOP; $n = 5$) viewed 24 stereoscopic disc photos on 2 separate occasions, with a standardized optic nerve assessment protocol taught between viewings. A subset of 6 discs was presented twice during each session. Evaluators assigned vertical cup-to-disc ratio (VCDR) and thinnest rim width (TRW) estimations for each disc photo. Intraclass correlation coefficients (ICC) and percentage of discs with VCDR range > 0.2 (% > 0.2) were used as measures of variability.

Results: (*i*) Interobserver reliability–VCDR: the NOP group demonstrated significant improvement with the intervention (preICC = 0.23 vs. postICC = 0.78 ($p < 0.001$), pre-% > 0.2 = 65%; post-% > 0.2 = 17% ($p < 0.001$)). Both the AO and RO groups demonstrated high preintervention agreement with ICCs of 0.89 and 0.89 and % > 0.2 of 13% and 17%, respectively. These values were not significantly improved with the intervention. (*ii*) Intraobserver reliability–VCDR: the NOP group showed significant improvement with the intervention. (preICC = 0.55 vs. postICC = 0.83 ($p < 0.001$)). Both the AO and RO groups demonstrated high preintervention agreement with ICCs of 0.85 and 0.91, respectively. These values were not significantly improved with the intervention. (*iii*) Interobserver reliability–TRW: the NOP group demonstrated significant improvement with intervention (preICC = 0.169 vs. postICC = 0.787 ($p < 0.001$)). Both the AO and RO groups demonstrated moderate to substantial agreement preintervention with no statistically significant improvement postintervention (AO: preICC = 0.58 vs. postICC = 0.77; RO: preICC = 0.74 vs. postICC = 0.76). The ICCs for TRW were smaller than those for VCDR ($p < 0.01$ for all comparisons).

Conclusion: A standardized optic nerve assessment protocol can be rapidly taught and results in significant improvements in reliability among nonophthalmology physicians. Our study demonstrates a high degree of reliability among evaluators with ophthalmology training. However, despite the use of a standardized nerve assessment protocol, improvements in the reliability of disc parameter evaluation among those with such training were not found. There are a number of potential explanations for this result, including the possibility that the structured assessment tool employed was not optimal. Second, those with training may have been unable to alter their ingrained approaches. Finally, our results may simply reflect a limit to human performance. Overall, the reliability of clinical examination among those with ophthalmology training is excellent and clinical examination will continue to be of vital importance. However, the use of stereo photographs or automated nerve evaluation technologies also appears important, especially in practices in which patients are managed by numerous practitioners.

Is strabismus surgery really on the decline? A 10-year review of surgical rates for strabismus in the province of Alberta

M. Johnson, I.M. MacDonald

Purpose: Recent reports have highlighted the dramatic decline in the frequency of strabismus surgery in the United Kingdom and Ontario. The purpose of this study was to determine whether there has been a similar decline in the annual rate of strabismus surgery over the past decade in the province of Alberta. Efforts were also made to determine which factors might influence this rate.

Methods: A retrospective review of billing information from Alberta Health and Wellness (AHW) was performed to determine the annual number of patients who had strabismus surgery from 1995 to 2004 for 2 age groups, 0 to 16 years and those 17 years and older. Further data were also collected from AHW for various factors that may influence the frequency of surgery, namely: the number of surgeons performing strabismus surgery, the benefit schedule, the number of patients who had the diagnosis of strabismus recorded as part of billing practices, and changes in the population base. Correlation between the various factors and the surgical rates was attempted.

Results: From 1995 to 2004, the number of strabismus procedures performed annually for ages 0 to 16 increased by 3.7% (656 to 680), and for those 17 years and older the rate increased by 43.9% (255 to 367). The population only grew by 1.4% and 22.6% for the age groups respectively, whereas the number of patients with the diagnosis of strabismus from billing codes decreased by 9.1% and 13.2% respectively. The number of surgeons performing strabismus surgery also decreased by 29.4%, whereas the reimbursement rate increased by 31.4% over the 10-year period. The surgical rate in Alberta for children ages 0 to 16 with strabismus was significantly higher than the rate cited for Ontario ($p < 0.0001$).

Conclusion: Although the rate of strabismus surgery may be declining significantly in various health care systems, this trend is not universal. Whereas we cannot conclusively state the factors that play a significant role in determining the rate of surgery, we suggest that the resources available for strabismus surgery, reimbursement rates, and current attitudes toward surgical correction of strabismus may be important.

Periocular swelling as a manifestation of Melkersson–Rosenthal syndrome: a review of the literature and a case report

S. Jouhargy, A. Al Hammadi, K. Watters, D. Sasseville, F. Codere

Background: Melkersson–Rosenthal (also known as Miescher–Melkersson–Rosenthal) syndrome (MRS) is a rare noncaseating granulomatous disease of unknown etiology characterized by a triad of symptoms comprising recurrent facial paralysis, chronic edema of the face and lips, and hypertrophy and fissuring of the tongue (lingua plicata), although the complete triad is actually seen in only 25% of patients. It usually presents in childhood or youth as recurrent, nonpitting, idiopathic facial edema. The edema usually involves the lips, gingiva, palate, cheeks, tongue, and buccal mucosa. Involvement of the scalp, forehead, and eyelid has also been reported. Granulomatous cheilitis is the most common cutaneous manifestation of MRS.

Case report: As the syndrome is rare, misdiagnosis or delayed diagnosis is common; however, the syndrome should be considered in a rare periocular form. Biopsy is advised in cases of persistent eyelid edema of unknown etiology. We present a case of a 35-year-old male with unilateral periocular swelling diagnosed with Melkersson–Rosenthal syndrome. The etiology, clinical presentation, pathology, and management of this disorder are discussed.

The vision rehabilitation evidence-based review (VREBR): findings for selected applications of low vision rehabilitation

J. Jutai, P. Hooper, G. Strong, E. Russell-Minda

Purpose: To present findings and formulate conclusions on the basis of a comprehensive search for the best research evidence related to the effectiveness of low vision rehabilitation (LVR).

Methods: A research synthesis was conducted that entailed a systematic effort to identify, assess, and interpret the global pool of knowledge available to answer focused questions about the effectiveness of low vision rehabilitation. Findings are reported for 2 selected applications to present a range of important issues for research syntheses on LVR: (*i*) age-related macular degeneration (AMD), and (*ii*) driving with low vision.

Results: There is relatively strong evidence for the effectiveness (or ineffectiveness) of (*i*) LVR and medical interventions for improving quality of life, and low vision aids, with application to AMD, and (*ii*) driving education programs, predictive validity of vision performance assessments, useful field of view (UFOV) training, and low vision aids, with application to driving.

Conclusion: Evidence is strong for both the effectiveness and ineffectiveness of various applications of LVR. However, evidence is lacking in many important areas of intervention. In addition, reconciling the results from many international reports is difficult because of complications with the definition of low vision.

Multiple sclerosis presenting with Millard-Gubler syndrome and concurrent optic neuritis

K. Kassiri, M. Melanson

Case report: A 26-year-old man came to our hospital with left-sided lower-limb weakness and right-sided sixth and seventh nerve palsy while recovering from an episode of right retrobulbar neuritis.

Comments: The patient was admitted to our hospital for investigations. Ongoing laboratory data have been normal. Brain magnetic resonance imaging (MRI) has revealed multiple lesions consistent with multiple sclerosis.

Changing trends in the microbial profile of bacterial corneal ulcers through the past 52 years in Punjab, India

G. Kaur, A. Verma, B.S. Dhillon, A. Aggarwal, S.S. Shergill

Purpose: To isolate and identify causative organisms in bacterial corneal ulcers and determine the current trend.

Methods: Medical records of 515 patients clinically diagnosed with bacterial corneal ulcers who visited the hospital for treatment were reviewed retrospectively. These patients were included from 6 different studies conducted in this hospital at various intervals from April 1953 to April 2005. Demographic data and detailed history were recorded, and thorough ocular examination by an ophthalmologist, fluorescein staining, and grading of size were done. Conjunctival swabs were taken, inoculated on various media and subcultures were made wherever necessary. Antibiogram was by modified Stokes' disc diffusion method.

Results: 308/515 (59.8%) positive bacterial cultures were obtained. Rate of positive isolates decreased during the study period (81% in 1953 to 56% in 2005). A gradual decrease in gram-positive isolates was seen from 85% in 1953 to 46.67% in 1981, and thereafter a gradual increase to 67.85% in 2005. A drastic decrease was documented in *Staphylococcus aureus* (31% in 1953 to 4% in 2005) whereas a more gradual decrease was noted in alpha haemolytic *Streptococcus* (8% to 4%) and *Pseudomonas aeruginosa* (14% to 10%) over the same period. A gradual increase was documented in coagulase-negative *Staphylococcus* (22% in 1953 to 30% in 2005). A 6-fold increase was noted in *Escherichia coli,* and *Acinetobacter lwoffii* appeared as an emerging pathogen. All isolates were sensitive to amikacin, whereas fourth generation fluoroquinolones were effective in all gram-positive isolates. Gentamicin and ciprofloxacin were effective in all gram-positives except coagulase-negative *Staphylococcus* (93.33% and 50%, respectively). Sensitivity of gentamicin and ciprofloxacin varied between 20% and 100% in gram-negative isolates. *Acinetobacter lwoffii* was sensitive to all antibiotics tested.

Conclusion: The increased recovery of coagulase-negative *Staphylococcus*, *Pseudomonas aeruginosa*, and *Escherichia coli* poses a therapeutic challenge. Moreover, decreased sensitivity to gentamicin, piperacillin, erythromycin, and fluoroquinolones except the new generation drugs is indeed a matter of concern for ophthalmologists.

Indoor soccer-related eye injuries

J.S. Kent, R. Eidsness, K.G. Romanchuk

Purpose: To present the spectrum of eye injuries caused by indoor soccer as seen at our institution. To initiate discussion of whether eye protection should be mandatory for this indoor sport.

Methods: Chart review of patients presenting to our institution with eye injuries from indoor soccer.

Results: Five cases were identified from 2001 to 2005. All injuries occurred during the winter or late fall, and all were due to contact with the soccer ball itself. Initially, all 5 patients showed commotio retinae, 2 showed hyphema and traumatic mydriasis, 1 showed prominent retinal hemorrhage and vitreous hemorrhage, and 1 showed subconjunctival hemorrhage. Three resolved uneventfully with 20/20 or better vision; however, 2 developed findings of choroidal rupture with chorioretinal scarring, 1 of these with 20/20 vision but the other with 20/40 vision. One patient also showed a peculiar iris scar.

Conclusion: Soccer-related eye injuries have been recognized as an important ophthalmologic problem in Europe and now increasingly so in North America. With increasing popularity of indoor soccer in Canada (owing to climate), serious eye injuries have become more prevalent. We believe there may be a need to make eye protection mandatory for indoor soccer, following guidelines for suitable sport protective eyewear developed by the American Society for Testing and Materials.

Ophthalmic findings in Setleis syndrome: two new cases in a mother and son

J.S. Kent, K.G. Romanchuk, E.G. Lemire

Purpose: To describe the unique ophthalmic manifestations in a mother and son with Setleis syndrome, a rare genetic disorder previously unreported in Canada.

Methods: A report describing the ophthalmic findings in 2 individuals with Setleis syndrome.

Results: A mother and son were diagnosed clinically with Setleis syndrome on the basis of appearance and the presence of temporal skin defects. The son (8 months old) displayed bilateral markings on his superior temporal skin and had a dysmorphic appearance. He also displayed 3 rows of eyelashes on the upper lids, areas with sparse eyelashes on the lower lids, and an epiblepharon bilaterally. He presented with a partial coloboma on his left lower eyelash, puckered skin around the eyes, periorbital puffiness, and a bulbous nasal tip. The mother (32 years old) presented with left superior unitemporal cutaneous markings and a leonine appearance. She had 3 rows of eyelashes on her upper lids, whereas her lower lids were relatively deficient of eyelashes. Autosomal dominant inheritance is postulated on the basis of the relationship of these 2 cases.

Conclusion: Setleis syndrome is an inherited disorder that is included in the group of diseases known as ectodermal dysplasias. Both autosomal recessive and autosomal dominant modes of inheritance have been reported in the literature. It is a rare disorder that was first described by Setleis et al in 1963 in 5 children from Puerto Rico. There have been approximately 20 cases reported in medical literature in individuals of European, Japanese, and Arabic descent. To our knowledge, these are the first reported cases of Setleis syndrome in 2 Canadian individuals of Métis descent. The presence of characteristic findings allowed us to advance this diagnosis. Clinical findings of Setleis syndrome include unitemporal or, more commonly, bitemporal forceps-like cutaneous markings, periorbital puffiness, wrinkled skin around the eyes, abnormalities of the eyelashes, eyebrows, and eyelids, and flattened nasal bridge with a bulbous nasal tip. Although most ophthalmic findings are benign, it is important to recognize the clinical significance of this rare disorder for management and to provide genetic counselling.

Restrictive strabismus following Jones tube insertion: a case series of eight patients

K. Keyhani, V. Hill, M. Ashenhurst

Purpose: Restrictive strabismus and diplopia is an uncommon complication of conjunctivodacryocystorhinostomy (CDCR) with insertion of the Lester Jones tube. A literature review revealed only 4 published reports of this complication with a total of four patients affected.

Methods: We report a series of 8 patients who presented with restrictive strabismus and diplopia following Jones tube insertion.

Results: Time to presentation was variable and was found to occur from several months to as long as 6 years following insertion. Treatment included topical steroid therapy initially. Surgery was done to release adhesions and scarring if topical treatment failed. Mitomycin C was used in 2 patients. Only 3 of the 8 patients had successful resolution of their diplopia with either therapy.

Conclusion: Diplopia following Jones tube insertion is an infrequent complication of surgery. Medical or surgical therapy can be utilized to help resolve symptoms, but is often unsuccessful.

Identification of novel mutations in the *SOX2* gene in patients with anophthalmia and microphthalmia

F. Kherani, T. Young, T. Bardakjian, J. Katowitz, N. Hughes, L. Schimmenti, A. Schneider

Purpose: The *SOX2* gene, located at chromosome 3q27-q28, encodes an *Sry*-related transcription factor containing an HMG (high mobility group) DNA-binding domain and plays a key role in cell fate determination. Mutations in the *SOX2* gene have been reported in 13 sporadic cases of patients with anophthalmia or microphthalmia.

Methods: In this study, a set of 35 anophthalmic and (or) microphthalmic patient DNA samples were screened for sequence changes by gel shifts in the *SOX2* gene initially by conformation-sensitive gene electrophoresis. Abnormal amplicon patterns were subsequently screened by direct sequencing.

Results: Two novel heterozygous mutations were identified in 2 patient samples. Mutation 737G→T was in the HMG DNA-binding domain and resulted in a change from glutamic acid to a stop codon. The predicted product would produce a truncated protein and disable the DNA-binding function. The second mutation was a single nucleotide deletion 976delC in the activation domain, resulting in a frameshift and premature termination of the coding sequence. The predicted shortened protein product would interfere with transcription activation. Both mutations resulted in loss of function. In addition, a nucleotide substitution (1938G→A) was identified in the 3′ untranslated region in one unrelated patient. Another patient was observed to have a 2050C→A SNP (rs11915160), which has been reported in normal individuals.

Conclusion: The relation between the mutation at 3′-UTR and anophthalmia and (or) microphthalmia is indeterminate. These results support the role of *SOX2* in ocular development. Loss of *SOX2* function results in severe eye malformation.

Management of clinical anophthalmia

F. Kherani, J. Katowitz

Purpose: Clinical anophthalmia is a rare disorder of eye development characterized by smaller than normal axial lengths with maldevelopment of the ocular adnexa. Traditional management of clinical anophthalmia involves serial expanding conformers. Management of clinical anophthalmia has evolved since the introduction of hydrogel orbital expanders.

Methods: We report our experience with 17 children.

Results: Progressive enlargement of eyelids and socket was achieved in all patients.

Conclusion: Surgical technique and complications are reviewed.

Combined surgery of the anterior and posterior segments: an improvement in the outcome of severe eye traumas

A.F. Laplante, B. Cinq-Mars, R.N.V. Dinh

Purpose: Few studies have described the outcome of severe eye traumas. We reviewed the evolution of patients referred to our institution with severe ocular trauma involving both the anterior and posterior segments of the globe. These patients underwent a combined surgery by a team of 2 subspecialized surgeons.

Methods: We conducted a retrospective analysis of cases occurring from 2001 to 2004, studying the visual acuity of the patients at 3 months and their post-trauma complications.

Results: We reviewed 31 combined surgeries. Among the numerous complications, retinal detachment was the most frequent. The majority of patients had visual acuity between 20/100 and light perception, which represented an improvement compared with their preoperative status.

Conclusion: Compared with the literature, we report an improvement in the outcome of these severe ocular traumas as almost all the operated eyes were salvaged and some patients ended with a functional vision.

Anterior segment optical coherence tomography (AS-OCT) in the evaluation of angle anatomy before and after laser peripheral iridotomy (LPI): a prospective study

R. Lee, I.I. Ahmed, C.J. Pavlin, K. Hasanee

Purpose: To assess the usefulness of the newly developed anterior segment optical coherence tomography (AS-OCT) in evaluating angle anatomy before and after laser peripheral iridotomy (LPI).

Methods: Patients identified to have closed or occludable angles on gonioscopy were prospectively evaluated with the AS-OCT at baseline and 2 weeks post-LPI. A vertically and horizontally oriented cross-sectional scan of the entire anterior chamber (16 mm × 6 mm) was taken as well as high-resolution scans of the superior, inferior, temporal, and nasal angles (10 mm × 3 mm). AS-OCT scans were acquired under uniformly dark conditions. Detailed ophthalmologic examination including applanation tonometry and gonioscopy were also conducted at baseline and 2 weeks post-LPI. Gonioscopy was documented using the Shaffer grading scale (0–IV). Anterior chamber depth (ACD), angle opening distance at 500 μm and 750 μm from the scleral spur (AOD 500, AOD 750), trabecular–iris space area at 500 μm^2 and 750 μm^2 from the scleral spur (TISA 500, TISA 750), trabecular–iris contact length (TICL), and mean angle width were measured on each scan using ImageJ software (National Institutes of Health). Statistical significance was determined using the paired *t* test in Microsoft Excel.

Results: This preliminary study consisted of 15 eyes from 15 patients. Mean age of patients was 67.2 ± 10.2 years (60% females), with 65% of eyes having closed angles and 35% occludable angles. There was no statistically significant increase in mean ACD (11μm) and TISA 500 (5 μm^2) postoperatively in the inferior angle. There was, however, a statistically significant ($p < 0.05$) increase in mean AOD 500 (52 μm), AOD 750 (134 μm), TISA 750 (16 μm^2), angle width (5º), and decrease in mean TICL (185 μm) postoperatively in the inferior angle. These findings were correlated with mean Shaffer grade increases of 1.20 in the inferior angle postoperatively.

Conclusion: AS-OCT is a useful noncontact tool in assessing the effects of LPI on angle anatomy. LPI has significant effects on increasing AOD 500, AOD 750, TISA 750, angle width, and on reducing TICL in eyes with closed or occludable angles.

Endophthalmitis following sphincterotomies in an aphakic child

J. Little, S. Al-Zuhaibi

Purpose: To report the management of early endophthalmitis following sphincterotomies in a 2-year-old aphakic girl.

Methods: A 2-year-old girl with a previous history of cataract removal, anterior vitrectomy, and posterior capsular opening had sphincterotomies performed for a poorly dilating right pupil. The procedure took approximately 15 minutes and no complications were experienced. On the first postoperative day, the child had severe conjunctival congestion, a hazy cornea, and an anterior chamber (AC) filled with dense fibrin and a hypopyon, indicating endophthalmitis was present. The patient underwent anterior chamber washout as well as anterior vitrectomy on the same day. After samples from AC were sent to microbiology, intraocular vancomycin and ceftazidime were injected. Postoperatively, fortified vancomycin and cefazolin eye drops were instilled hourly. Two days postoperatively, the cultures grew *Staphylococcus aureus* and the infectious disease service recommended intravenous cefazolin. The patient's eye showed slow improvement, but a persistent hypopyon suggested that a repeat procedure was in order. This was done 4 days later and samples from the AC again grew *Staphylococcus aureus* organisms on subculture.

Results: The eye showed dramatic improvement after the second procedure. Shortly thereafter, this eye could fixate fairly well (similar to preoperatively); refraction and retinal examination could now be performed.

Conclusion: To our knowledge, this is the first case of endophthalmitis after sphincterotomies in an aphakic child. We believe that early interventions and careful follow-up resulted in the successful treatment and good visual outcome in this patient.

Familial cold-induced transient diplopia

K. Luneau, M. Brodsky, C. Blais, D. Boghen

Case report: A 40-year-old woman presented with the chief complaint of transient vertical diplopia following exposure for 15 minutes or longer to sub-0°C temperatures. Her symptoms had been present for 10 years. Her mother, aged 67, had had a similar complaint since the age of 50. Examination of the daughter revealed the presence of a left hyperphoria that converted to a left hypertropia after exposure to the outdoors on a cold winter day. After a few minutes indoors, the tropia regressed and the results of the eye examination returned to baseline. Results of an extensive work-up that included complete blood chemistry studies and electromyography were negative. Prolonged cover of the left eye produced a left hypertropia.

Comments: To our knowledge, a similar case has not been previously reported.

Corneal flap dimension predictability with the Zyoptix XP microkeratome in a multicenter study

S. MacRae

Purpose: To determine the predictability of the Zyoptix XP microkeratome in LASIK surgery.

Methods: We conducted a prospective multicenter study in 6 U.S. and 2 Asian sites to determine the predictability of flap thickness and diameter using the Zyoptix XP microkeratome for flap creation in LASIK surgery. Three sizes of microkeratome heads (120, 140, and 160 μm) and 2 sizes of rings (19 and 20 mm) were evaluated. The nominal flap diameters were 8.5 mm and 9.5 mm. Intraoperative ultrasonic pachymetry was measured and flap thickness was calculated by the subtraction technique.

Results: A total of 695 patients with a mean spherical equivalent of –3.20 ± 2.10 D, mean preoperative pachymetry of 558.6 ± 35.10 μm, and mean K of 43.5 ± 1.40 D underwent LASIK. The mean ± SD (range) flap thickness was 115.1 ± 18.5 (57–170) μm for the 120 μm head, 135.8 ± 23.2 (72–293.3) μm for the 140 μm head, and 148.7 ± 21.3 (90–215) μm for the 160 μm head. The mean ± SD (range) flap diameter was 9.00 ± 0.4 (8.4–11.0) mm for the 8.5/19 mm ring configuration, 9.1 ± 0.5 (8.5–10.2) mm for the 8.5/20 ring, 9.7 ± 0.3 (8.8–10.5) mm for the 9.5/19 ring, and 9.9 ± 0.3 (9.0–10.6) mm for the 9.5/20 ring. Even greater predictability of flap thickness with 115 ± 13 μm (SD) was obtained by using a “dry” ultrasonic pachymetry measuring method.

Conclusion: In this large multicenter study, the Zyoptix XP microkeratome produced predictable corneal flap diameter and thickness.

Surgical macular decompression for macular edema in retinal vein occlusion

M. Mandelcorn, E. Mandelcorn, F.A. Adatia

Purpose: Recently, a number of surgical and laser approaches have been utilized to improve the visual outcome in cases of central retinal vein occlusion (CRVO) and branch retinal vein occlusion (BRVO). Intravitreal steroid injection alone appears to offer only temporary improvement at best. Radial optic neurotomy for CRVO and arteriovenous adventitial sheathotomy for BRVO are currently the most frequently utilized surgical procedures for these conditions, but evidence regarding efficacy is still lacking. We have suggested that macular decompression by internal limiting membrane (ILM) peeling may be an effective method of reducing macular edema and hemorrhage and improving visual acuity by relieving elevated intraretinal tissue pressure and facilitating the egress of blood and extracellular fluid out of the inner retinal layers into the vitrectomized vitreous cavity. Further experience in 50 consecutive cases suggests that this surgical approach may be efficacious.

Methods: 50 consecutive cases of severe visual loss owing to macular edema caused by CRVO or BRVO that were not eligible for laser photocoagulation underwent pars plana vitrectomy with removal of preretinal hyaloid, peeling of the ILM stained with indocyanine green dye, air–fluid exchange, and postoperative prone positioning.

Results: In all cases, intraretinal blood and retinal thickening diminished within 6 weeks of surgery. Visual acuity improved in 83% of CRVO cases and 65% of BRVO cases. Vision improved and became stable at 39 days following surgery. The average improvement was 2.6 lines with a 6-line improvement in 1 case. There was no difference in outcome between cases exhibiting ischemic or nonischemic features on fluorescein angiography.

Conclusion: Further experience with macular decompression using vitrectomy and ILM peeling confirms the effectiveness of this technique in the treatment of severe visual loss owing to macular edema in CRVO and in those BRVO cases that do not qualify for laser photocoagulation.

Choroidal folds in age-related macular degeneration: a report of 6 cases

M. Mandelcorn, E. Mandelcorn

Purpose: To standardize findings in eyes that may respond best to photodynamic and (or) intravitreal injection therapy, recent studies of age-related macular degeneration (AMD) have classified subfoveal choroidal neovascularization into classic, predominantly classic, minimally classic, or occult types. Other features thought to be important in the prognosis of treated or untreated AMD involve changes in the retinal pigment epithelium. Choroidal folds have been infrequently observed in cases of AMD, but their pathogenesis and prognostic importance are poorly understood. This report concerns the findings in 6 cases of AMD in which choroidal folds were a prominent feature. Our findings suggest a new hypothesis concerning the mechanism of damage caused by choroidal neovascularization in AMD.

Methods: Six women were referred for treatment of AMD. Ages ranged from 61 to 85 (average 79) years. There were 3 of 6 right eyes (50%). Patients underwent a complete ophthalmologic examination with fluorescein angiography and optical coherence tomography (OCT). Rapid sequence early indocyanine green video angiography to detect feeder vessels was performed in 2 cases. Follow-up ranged from 5 to 17 (average 10) months.

Results: Visual acuity in the affected eye ranged from 20/50 to 20/800 (mean 20/200). Choroidal neovascularization was occult in all 6 cases ranging in diameter from 4 to 7 (average 5.5) mm. OCT demonstrated choroidal folds with choroidal thickening. Three cases showed subretinal pigment epithelial fluid; 1 case had subretinal fluid; 2 cases had no evidence of fluid leakage. The fellow eye in each case had drusen in 5 cases and geographic atrophy of the retinal pigment epithelium sparing the fovea in 1 case. One eye was treated with photodynamic therapy with verteporfin (Visudyne), with vision remaining at the pretreatment level of 20/260 throughout the 8-month follow-up period.

Conclusion: Choroidal folds were a feature of occult choroidal neovascularization in a small number of cases of AMD. Visual acuity tended to remain stable with or without treatment with photodynamic therapy throughout the duration of follow-up in this study. OCT studies demonstrated folding of inner choroid and overlying retinal pigment epithelium probably owing to the expansion of choroidal neovascularization within the confined choroidal space. Histopathologic studies have previously demonstrated that choroidal neovascularization can cause thickening of the choroid without invasion of the subretinal pigment epithelial or subretinal space. Consequently, these neovascular channels may not always grow toward Bruch's membrane and the retinal pigment epithelium but may also grow laterally in the choroid or even centrifugally away from Bruch's membrane. Choroidal folds occurring in AMD may be a useful sign of occult choroidal neovascularization even before leakage occurs into the subretinal or subretinal pigment epithelial space. Our findings suggest that the presence of choroidal folds in AMD may indicate a previously undescribed pattern of growth of choroidal neovascular channels within the choroid.

Erythropoietin (Epo) and its receptors in rat models of type I and II diabetic retinopathy

N. Mathalone, F. Altomare, M. Sit, A. Berger, L. Giavedoni, D. Wong, S. Boyd

Purpose: Originally described as a haematopoietic hormone, erythropoietin (Epo) is now known to be neuroprotective and pro-angiogenic. Diabetes mellitus induces vascular and neural sequelae and we hypothesize that diabetic retinopathy (DR) is both a vasculopathy and neuroretinopathy. Molecules such as Epo may influence both compartments. Epo has been shown to be neuroprotective in 5 experimental models of retinal degeneration and in a model of diabetic peripheral neuropathy. Case reports of patients receiving Epo for diabetic renal anemia suggest visual improvement. By contrast, new studies correlating Epo expression with proliferative DR in human vitreous samples, and animal studies of nondiabetic proliferative retinopathy, suggest that Epo can worsen retinal neovascularization. The purpose of this study was to investigate the distribution of Epo and its receptors (EpoR) in the retina of diabetic animals. We wished to observe their correlation with markers of the neuronal and vascular compartments. We also wanted to correlate Epo/EpoR expression with markers of reactive gliopathy and Epo-regulated components of the cell death pathway.

Methods: We investigated the streptozotocin (STZ, 65 mg/kg i.p.)-induced model of Type I diabetes and the genetically obese Zucker diabetic fatty (ZDF) (leptin receptor –/–) rat. Controls included non-STZ and Zucker lean (lepR +/–). Epo, EpoR, glial fibrillary acidic protein (GFAP), and vimentin were analyzed by epifluorescent immunohistochemistry and confirmed by polymerase chain reaction.

Results: As expected, Epo and EpoR were observed at low levels in the normal, nondiabetic retinas. Expression was significantly increased in the retinas of both diabetic models, most notably in the inner retina. Diabetic retinas also showed changes in GFAP, which included ectopic staining in vimentin+ Muller cells. Staining of both Epo and EpoR was clearly outside of the vascular tree in the neuroglial parenchyma.

Conclusion: The presence of Epo and its receptors in early preproliferative diabetic retina is consistent with the notion that Epo could function as an endogenous neuroprotective molecule. It is possible that ongoing and inappropriate Epo expression can accelerate retinal vasculopathy. We further characterize the time-course of Epo and EpoR in DR and ask whether increased early neuroglial expression gives way to vascular expression later in disease.

Complement C5b-9, microglia, and APP immunoreactivity in the human retina

J.A. Matsubara, A. Seth, J.Z. Cui

Purpose: Drusen contain mediators of inflammation, including amyloid beta, and components of the complement cascade (including the membrane attack complex, C5b-9). The purpose of this study was to determine the spatial relation of activated microglia, amyloid precursor protein (APP), and C5b-9 in normal-aged human retina.

Methods: Immunohistochemical methods were used to identify APP, C5b-9, and activated microglia in cryostat sections of retina from normal donor eyes less than 55 years (n = 15) or greater than 70 years of age (n = 15).

Results: Immunohistochemical staining patterns were distinct for each antibody. APP immunoreactivity was present in retinal pigment epithelium (RPE) and retinal ganglion cells. C5b-9 immunoreactivity was present in drusen and underneath the RPE layer in the matrix surrounding the choriocapillaris. Ricinus communis agglutinin (RCA) lectin-binding was present in activated microglia. None of the 15 eyes less than 55 years of age exhibited strong C5b-9 staining, whereas 2 of 15 (13%) exhibited mild to moderate C5b-9 immunostaining. In the group of eyes greater than 70 years of age, 3 of 15 eyes exhibited strong, whereas 4 of 15 eyes exhibited mild to moderate, immunostaining for C5b-9 (total 7/15 or 46%).

Conclusion: Preliminary data suggest that C5b-9 immunoreactivity in the choriocapillaris zone increases with age in normal donor eyes. The relation between C5b-9, APP, and activated microglia in human donor eyes is discussed.

An information and training session for glaucoma patients: I. Who is interested in attending?

É. Mazerolle, P. Blondeau

Purpose: Compliance with respect to glaucoma treatment is frequently unsatisfactory. A 2-hour information session was developed and offered to patients who were using antiglaucoma eye drops to improve their understanding of glaucoma and its treatment. In this first report, data are presented on participants involved in the information session.

Methods: Participation in the project was offered to 100 patients who were using eye drops for glaucoma. Data regarding the age, sex, race, travelling distance, type of glaucoma, number of medications, duration of glaucoma, laser trabeculoplasty, trabeculectomy, medical conditions, visual acuity, visual field mean deviation (MD), and pattern standard deviation (PSD) were documented. Reasons given for declining the offer to attend the sessions were also compiled.

Results: 60% of all subjects approached, but 93.4% of those with glaucoma therapy for less than one year, wanted to participate. In a univariate model, factors identified for nonattendance were advanced age, extended duration of glaucoma, patients who had a trabeculectomy, coronary heart disease, worse PSD the better and the worst eye. A multivariate analysis removed only the worst PSD in the worst eye. The main reasons for nonattendance were difficulty involving transportation arrangements, travel distances involved, trust in the treatment prescribed by their physicians, and an unwillingness to be made aware of the information presented.

Conclusion: 60% of all subjects approached, but 93.4% of those with glaucoma therapy for less than one year, wanted to participate. Greater age, extended duration of glaucoma, patients that had a trabeculectomy, coronary heart disease, worse PSD the better and the worst eye were factors for not coming to the session. These information sessions have the potential to improve compliance in newly diagnosed glaucoma patients.

An information session for glaucoma patients: II. patient satisfaction

É. Mazerolle, P. Blondeau

Purpose: Glaucoma is an asymptomatic disease that leads to blindness if not treated. It is usually well controlled medically, but noncompliance to treatment is a concern. Studies in 1999 found that compliance to glaucoma treatment was only 56% in Quebec.

Methods: We recently started an information session on glaucoma for all our patients in the Eastern Townships region of Quebec who are on glaucoma medical treatment, with the objective of increasing their understanding of glaucoma and the need for treatment and follow-up. Our first report has already described the type of patients interested in attending the information session, and in this second report we evaluate patient satisfaction with the session. Upcoming reports will evaluate short-term and long-term patient comprehension and retention of information and will verify the effect patient education has had on compliance with glaucoma treatment by comparing before and after data from la Régie de l'assurance maladie du Québec (RAMQ).

Results: One hundred and fifty-eight patients have now received a 2-hour session on glaucoma, glaucoma treatment, and drop practice, as well as a 24-page document with all the information covered during the session for further reference. Each patient completed an evaluation form after the session. Approximately 65.3% reported that their expectations were completely met and their questions completely answered. Additionally, 99.3% found this session useful (77.5% very useful) and 77.7% found it very good, whereas 42.7% would like to receive reassistance for further explanations on particular subjects. Finally, 99.2% would suggest this session to a friend with glaucoma.

Conclusion: These results suggest the need to heighten public awareness of glaucoma and offer support for the type of high-quality sessions we had hoped to provide for our patients. We feel that a bias can be interpreted when analyzing data from patients willing to come to the session. Thus, these results can only be extrapolated to patients regularly coming to their follow-up visits. We may not get the same results if we were to give this session only to new patients, but we believe that we have an improved chance of reaching newly diagnosed patients and thus achieving better follow-up and compliance. As we know from other studies on patient education, compliance to treatment is dependant on patients' understanding of their disease. We wish to accomplish this task in glaucoma by giving patient education in small-group sessions. Evaluation of patient satisfaction has demonstrated appreciation of the quality, usefulness, and efficacy of the sessions in responding to patient expectations and concerns. The high number of patients willing to suggest this session to a friend is an indirect indication of their satisfaction. We feel that patient education can help increase compliance to glaucoma treatment and thus prevent blindness in the long term.

Deep anterior lamellar keratoplasty for post-LASIK ectasia

P. McAllum, F. Segev, S. Herzig, D. Rootman

Purpose: To report the clinical management of 2 cases of laser-assisted in situ keratomileusis (LASIK) ectasia with deep anterior lamellar keratoplasty (DALK).

Methods: Clinical findings, surgical interventions, and outcomes are reported. The surgical technique of DALK is described.

Results: Two patients developed progressive loss of vision following LASIK surgery with enhancement procedures. Corneal ectasia was diagnosed on the basis of clinical findings, progressive central corneal thinning on pachymetry, and topographical changes with irregular astigmatism and inferior corneal steepening. Both patients underwent uneventful DALK surgery in which the anterior 80% of the central corneal stroma was replaced by a donor button and sutured in place. The postoperative recovery was uneventful, except for mild interface haze in 1 case, which resolved within 2 weeks of surgery. However, one patient required additional surgery, including clear lens extraction with intraocular lens implantation, astigmatic keratotomies, and photorefractive keratectomy (PRK) to achieve good unaided visual acuity. At last follow-up 2 years after DALK, both patients were very satisfied with their vision. Their uncorrected visual acuity (UCVA) was 20/60+ and 20/40+ in the operated eyes, improving to 20/40+ in the first case with a low refractive correction. The grafts and lamellar interfaces were clear.

Conclusion: DALK should be considered as an alternative to penetrating keratoplasty for the surgical management of iatrogenic corneal ectasia secondary to LASIK and can improve the UCVA and best spectacle-corrected visual acuity in these patients.

Binocular multivision after bilateral implantation of SofPort AO IOLs

J.E. McDonald II

Purpose: To evaluate quality of vision and accommodative visual function in patients implanted with a new aspheric intraocular lens (IOL).

Methods: A retrospective chart review of 13 patients was conducted to evaluate postoperative binocular multivision after bilateral implantation of the SofPort AO IOL. Near eyes were implanted first with a target refraction of plano in one eye and –1.0 D to 1.5 D in near eyes. Average postoperative follow-up was 4 months. Data collected included uncorrected (UC) and best corrected (BC) near and far visual acuity (VA) and patient responses to a postoperative questionnaire.

Results: At 4 months postoperative follow-up, 100% of patients achieved 20/30 or better monocular distance BCVA, 20/30 or better binocular distance UCVA, and J2 or better binocular near UCVA. Spectacle use was reported by 18% of patients for near and far all of the time, and 9% of patients for near and far some of the time; 100% of patients reported that they did not wear spectacles for intermediate, and 82% of patients reported spectacle independence. There were no complaints of higher order aberrations. Initial results of a prospective evaluation are reported.

Conclusion: The results of this retrospective chart review indicate that the aspheric design of the SofPort AO provides patients with multivision and excellent postoperative distance and near, BCVA, and UCVA at all contrast levels. Results of the prospective study will confirm these findings.

Stress and distress in ophthalmology

C. Menard, L. Lachance, S. Vivier, M.F. Maranda

Purpose: To describe the stress and distress among ophthalmologists in the province of Quebec.

Methods: A team of PhD psychologists and ophthalmologists were involved in the study. We sent a questionnaire specifically designed for ophthalmology and analyzed the replies.

Results: 50% of the ophthalmologists answered the questionnaire. We found a higher level of stress and distress among ophthalmologists compared with the general population. We discuss the different results and the solutions to face the problems.

Conclusion: A higher stress and distress level among ophthalmologists in the province of Quebec is an alarm signal. We need to address this issue to maintain the quality of care for patients and the quality of life for ophthalmologists.

Macular hole repair with limited nonsupine positioning

A.B. Merkur, R. Tuli

Purpose: To assess the surgical success rates of modern macular hole repair with elimination of face-down positioning.

Methods: Retrospective case series. A review was performed of 72 eyes from 102 consecutive cases between 1998 and 2004 with idiopathic macular holes treated surgically with limited 24-hour nonsupine positioning. Exclusion criteria consisted of duration of macular hole greater than 1 year or of unknown duration and macular holes from secondary causes. All patients were evaluated and surgically managed by one surgeon (R.T.).

Results: Average preoperative best spectacle-corrected visual acuity (BSCVA) was 20/170 (6/51) and average postoperative BSCVA was 20/47.4 (6/14.2). Six patients had a grade II hole, 60 patients had a grade III hole, and 6 patients had a grade IV hole. Anatomic success was achieved in 92% with one operation and an average postoperative BSCVA of 20/46 (6/14). Six patients required additional surgical management to achieve anatomic success and an average postoperative BSCVA of 20/55 (6/16.5). The postoperative BSCVA improved an average of 5.7 lines from baseline.

Conclusion: Favorable anatomic and BSCVA outcomes were achieved with the elimination of face-down positioning in the postoperative period. Additional benefits are an increase in patient acceptance, compliance, and the number of patients eligible for the procedure.

Changes of VEP in MS disease in a study of 49 cases in a period of 3 years, 2002–2005

M. Movassat

Purpose: To show the accuracy and importance of tests of visual evoked potentials (VEP) in the diagnosis of possible, probable, and definite multiple sclerosis (MS).

Methods: 49 cases were studied in a retrospective case series over a period of 3 years from 2002 to 2005. Twenty-seven of the cases had definite MS proven with magnetic resonance imaging (MRI), 6 cases had probable MS, and 16 cases had possible MS. The VEP test was performed for all cases with the Metrovision system.

Results: In definite MS, abnormality of VEP was very severe in both implicit time and amplitude of the P100 wave. In probable and possible MS, abnormality was more significant in implicit time than amplitude.

Conclusion: The VEP test is a useful test with high accuracy in the diagnosis of MS. In primary stages of the disease, abnormality is in implicit time of waves, but with progression of the disease, changes of amplitude will also appear.

Teleophthalmology: meeting remote First Nations community needs

N. Muller

Purpose: To assess the success of the Keewaytinook Okimakanak Tribal Council teleophthalmology program.

Methods: Keewaytinook Okimakanak Tribal Council, in partnership with the University of Alberta's ophthalmology department, has begun a program to ease the burden of diabetes complication surveillance for their communities. A diabetes educator – teleophthalmology nurse works with community health staff to offer unique services for community members living with diabetes. A comprehensive eye assessment as well as prevention education and support are important features of this service. An encrypted, password-protected Web site enables the ophthalmologist to read retinal images and create a report quickly and efficiently from the data the teleophthalmology nurse transmits. Only clients in need of treatment or further testing are referred out to the ophthalmologist's office.

Results: Three communities (Keewaywin, North Spirit Lake, Poplar Hill) participated in this pilot study. Eighty-six people with diabetes were assessed (51 females, 34 males). Seventy clients (81.4%) had no diabetic retinopathy, 6 clients (7.0%) had mild nonproliferative diabetic retinopathy (NPDR), 1 client (1.1%) had moderate NPDR, and 1 client (1.1%) had proliferative diabetic retinopathy; 8 clients (9.3%) could not be assessed owing to ungradeable photos or incomplete photo sets. This service has greatly increased the number of patients with diabetes meeting the Canadian Diabetes Association's Clinical Practice Guidelines (CDA CPG) for retinopathy screening. Other eye diseases including glaucoma, cataract, pterygium, myelinated nerve fibre layer, and corneal scarring were also identified.

Conclusion: Teleophthalmology is a feasible way to detect and monitor diabetic retinopathy, thus meeting the CDA CPG. Teleophthalmology offers clients a quality alternative to traveling for clinical examination at the office of an ophthalmologist.

Phenotypic characterization of La Plaine retinal dystrophy

R.H. Muni, P.J. Kertes, L. MacKeen, H. Shillingford-Ricketts, E. Héon

Purpose: Retinal degeneration is a the leading cause of blindness in the La Plaine district on the southeast coast of Dominica, an island in the eastern Caribbean. The purpose of this study was to describe the somewhat unique phenotype of what we have called La Plaine retinal degeneration.

Methods: A team consisting of ophthalmologists and an eye photographer from the University of Toronto travelled to Dominica to study the affected population. Areas with high numbers of affected patients were informed of the study several weeks prior to the team's arrival. Five health districts were visited and patients with visual complaints were examined. All patients underwent a detailed history and ocular examination. Patients also underwent fundus photography with the Retcam fundus camera and the handheld Kowa camera. Fluorescein angiograms were performed on selected patients. Patients were also asked to provide a blood sample for genetic testing. Detailed family trees were constructed.

Results: La Plaine retinal degeneration is characterized by extensive midperipheral and macular drusen, chorioretinal atrophy, retinal pigment epithelium (RPE) hyper-pigmentation, hemorrhagic retinal pigment epithelial detachments (RPEDs), choroidal neovascularization, and massive subretinal fibrosis. Three stages have been identified. Stage 1 consists of a few drusen in the macula and midperiphery (often a temporal patch of drusen) with variable amounts of RPE hyperpigmentation often found in the midperiphery. Stage 2 consists of more extensive drusen and RPE changes. Early stage 3 consists of choroidal neovascularization and hemorrhagic RPEDs, and late stage 3 consists of massive subretinal fibrosis. A total of 128 patients underwent medical history, ocular examination, and blood work. The average age of the sample was 53 years, with 34 men and 94 women. 105 patients underwent fundus photography and fluorescein angiography if indicated. The sample consisted of 11 patients with stage 1 disease (8%), 18 patients with stage 2 disease (14%), and 21 definitely affected patients with end-stage disease (16%). There were 78 patients that were unknown or unaffected (62%). The average age of affected stage 3 patients was 73 years, with 18 women and 3 men. Initial genetic testing has ruled out Doyne's honeycomb dystrophy, Sorby's macular dystrophy, and factor H mutation.

Conclusion: This is the first report of La Plaine retinal degeneration, a disease that has many similarities to age-related macular degeneration (AMD). This disease is characterized by extensive midperipheral and macular drusen, chorioretinal atrophy, RPE hyper-pigmentation, hemorrhagic RPEDs, choroidal neovascularization, and massive subretinal fibrosis. La Plaine retinal degeneration may provide a genetic link to AMD.

The role of the EYESI virtual reality surgical simulator in resident and fellow surgical teaching

R.H. Muni, F.A. Adatia, D. Assaad, D. Chow

Purpose: The EYESI virtual reality (VR) simulator is a new surgical teaching tool that has the potential to revolutionize surgical teaching for ophthalmology residents and retina fellows. The purpose of this study was to determine the utility of the VR simulator in surgical training of ophthalmology residents and fellows.

Methods: Participants in the study included 5 ophthalmology residents, 2 retina fellows, and 2 experienced retinal surgeons. Participants were asked to complete specific tasks testing manual dexterity, degree of tremor, and ability to peel the internal limiting membrane (ILM). The study was performed using the EYESI ophthalmosurgical simulator (VRmagic, Germany), a virtual reality system that includes a computer model of microsurgical instruments, intraocular anatomy, intraocular surgery, and the specific tasks used in this study to test tremor and manual dexterity. Manual dexterity was tested by asking trainees to move a needle tip into bubbles of various sizes dispersed within the vitreous cavity. Degree of tremor was tested by asking participants to follow a ball with a needle tip along a given trajectory as closely as possible. The program contained an odometer that determined the degree of deviation of the needle tip from the given trajectory. Finally, participants were asked to peel the ILM with end-gripping forceps and then remove the peeled membrane with a vitrector. Participants used a light pipe in their nondominant hand during all tasks. Participants received a score for each task, and the time required to complete each task was recorded.

Results: All participants indicated that the EYESI VR simulator was a beneficial tool to aid them in their surgical training. Current studies are underway to determine the effect of caffeine, alcohol, sleep deprivation, and use of the nondominant hand on manual dexterity, tremor, and ability to peel the ILM.

Conclusion: The EYESI VR simulator allowed ophthalmology trainees to perform tasks to improve manual dexterity, degree of tremor, and ability to peel ILM in virtual reality. Current studies are underway to determine the effects of caffeine, alcohol, sleep deprivation, and use of the nondominant hand on virtual reality surgical performance.

Agreement among Canadian retina specialists in the determination of treatment eligibility for photodynamic therapy in age-related macular degeneration

R.H. Muni, M. Altaweel, M.T.S. Tennant, B. Weaver, P.J. Kertes

Purpose: As treatment choices for choroidal neovascular membranes (CNV) in age-related macular degeneration (AMD) are dependant on the interpretation of the fluorescein angiogram (FA), it is important to consider how well retina specialists agree in their angiographic classification of CNV. The purpose of this study was to determine the interobserver agreement among Canadian retina specialists in the determination of treatment eligibility for photodynamic therapy and the angiographic classification of CNV. Agreement was also determined between retina specialists and the University of Wisconsin Fundus Photograph Reading Center (Reading Center).

Methods: All retina specialists in Canada were asked to participate in a Web-based survey, which consisted of 24 cases of exudative AMD provided by the Reading Center. Participants were provided with a digital colour and (or) red-free photo, in addition to the digital FA for each case. Participants were asked to indicate whether they would treat with PDT and to categorize the CNV. Agreement was determined for decision to treat and for interpretation of the FA by calculating intraclass correlation (ICC) and pairwise κ. Furthermore, the angiographic interpretation by participants was compared with that of the Reading Center (the "gold standard") for each case.

Results: 40 Canadian retina specialists participated in the survey. The 24 cases selected by the Reading Center consisted of 9 predominantly classic lesions (PC), 5 minimally classic (MC), 6 occult with no classic (ONC), and 4 others (O). The ICC among participants for treatment decision and lesion categorization were 0.293 (95% CI, 0.184–0.419) and 0.430 (95% CI, 0.364–0.518), respectively. The ICC among participants for lesion categorization was 0.615 for PC, 0.184 for MC, 0.507 for ONC, and 0.278 for O. The mean raw agreement with the Reading Center for lesion categorization was 65.42% (83.77% for PC, 41.60% for MC, 69.83% for ONC, and 47.24% for O). The pooled estimate of κ between observers and the Reading Center for lesion categorization was 0.561 (95% CI, 0.503–0.620).

Conclusion: There is poor interobserver agreement among Canadian retina specialists for decision to treat with PDT and moderate agreement for angiographic CNV categorization. There is moderate agreement between observers and the Reading Center for angiographic CNV categorization. Agreement with the Reading Center was worst for minimally classic lesions and best for predominantly classic lesions. These results have significant implications for patient care and utilization of health care resources.

Treatment of amblyopia in older children using macular stimulation with telescopic magnification

F. Nazemi, S.P. Kraft, S.N. Markowitz

Purpose: To assess the effectiveness of macular stimulation with telescopic magnification (MSTM) for treatment of anisometropic amblyopia in older children.

Methods: We recruited children aged 7 to 18 years with a diagnosis of anisometropic amblyopia who had undergone a trial of patching therapy in the past. Best corrected visual acuity (BCVA) was tested with a regular Snellen chart before and after a 6-month therapy with MSTM. Macular stimulation with a Galilean telescope with ×2.2 magnification was used to produce magnified images during 30-minute training sessions. Our results were compared with those of a recently published multicenter study on amblyopia sponsored by the National Eye Institute in the United States in amblyopic patients of a similar age, in which traditional methods were used (penalization and patching).

Results: We have treated 14 patients, aged 7 to 16 years, with mean BCVA of 20/50 (range 20/30–20/200) most of whom had hyperopic anisometropia. MSTM resulted in significantly better BCVA levels ($t_{14} = -4.91$, $p < 0.00001$). All eyes achieved BCVA of at least 20/40 and most (71%) achieved BCVA of 20/25, compared with 25% in the published NEI study. No patient suffered diplopia as a result of the improvement in vision in the amblyopic eye.

Conclusion: MSTM is an effective method for treating anisometropic amblyopia in older children and may be superior to the traditional methods in this age group.

An investigator-masked, randomized, parallel comparison of the efficacy and tolerability of brimonidine tartrate – timolol maleate ophthalmic solution (Combigan) and dorzolamide hydrochloride – timolol maleate ophthalmic solution (Cosopt) in patients with open-angle glaucoma or ocular hypertension

D.R. Nixon

Purpose: Evaluate the efficacy and tolerability of brimonidine tartrate – timolol maleate ophthalmic solution (Combigan) vs. dorzolamide hydrochloride – timolol maleate ophthalmic solution (Cosopt).

Methods: Subjects who were either newly diagnosed or by the investigator's clinical judgment had intraocular pressure (IOP) that was uncontrolled on a regimen of not more than 2 ocular hypotensive agents were enrolled in this single-centre, investigator-masked, parallel-comparison study. After a 4-week washout period of current glaucoma medications, subjects were randomized to receive either brimonidine–timolol or dorzolamide–timolol twice daily for 3 months. Efficacy was measured by IOP reduction from baseline at 1 month and 3 months. Tolerability was measured by subjects rating comfort, stinging, burning, and unusual taste on a scale of 1 to 5 (1 = none and 5 = severe).

Results: Interim results of 35 patients in this on-going study showed that brimonidine–timolol was reported to be significantly more comfortable than dorzolamide–timolol ($p = 0.004$). In addition, patients who were treated with brimonidine–timolol reported significantly less burning ($p < 0.001$), stinging ($p < 0.001$), and unusual taste ($p < 0.001$) than did patients treated with dorzolamide–timolol. IOP measurements at baseline were similar for both treatment arms (21.5 ± 4.7 mm Hg in brimonidine–timolol-treated patients and 21.3 ± 4.5 mm Hg in dorzolamide–timolol-treated patients ($p = 0.897$)). The fixed combination of brimonidine–timolol provided statistically significant reductions in IOP at each follow-up visit ($p < 0.001$); dorzolamide–timolol provided significant IOP-lowering at 1 month ($p < 0.001$) but not at 3 months ($p = 0.067$). There were no serious adverse events reported.

Conclusion: Subjects reported that brimonidine–timolol was significantly more comfortable and produced less burning, stinging, and unusual taste than dorzolamide–timolol. Mean IOP-reduction was slightly greater with brimonidine–timolol than with dorzolamide–timolol.

Outcome of trabeculectomy with intraoperative mitomycin C for uveitic glaucoma

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Purpose: The purpose of this study was to compare the outcome of mitomycin C (MMC)-augmented trabeculectomy in glaucoma patients with uveitis to those without uveitis but with other high-risk characteristics.

Methods: Fifty-one eyes of 51 patients (21 uveitic patients and 30 nonuveitic patients) were included in the study. Two outcome classifications were analyzed: absolute success (IOP ≤ 30% baseline without glaucoma medications or 5-fluorouracil (5-FU) injections), and qualified success (IOP ≤ 30% baseline with glaucoma medications or 5-FU injections). Kaplan-Meier survival curves were constructed for both models.

Results: After a mean follow-up of 52 months, uveitis emerged as a negative predictor of success. In the qualified success model, uveitic patients demonstrated survival rates of 90% and 79% at 1 and 2 years compared with 100% for all time points in the control group (Wilcoxon test, $p = 0.005$). Uveitic patients were more likely to require postoperative 5-FU injections than the control group (33% vs. 10%, respectively, $p = 0.039$) and were more likely to require glaucoma medications postoperatively for IOP control (38% vs. 3%, respectively, $p = 0.001$).

Conclusion: Uveitic glaucoma patients are more likely to require postoperative therapeutic interventions to maintain adequate pressure control in the short-term and are at higher risk of surgical failure in the long-term.

Utility of the National Eye Institute VFQ-25 questionnaire in a heterogeneous group of patients with multiple sclerosis

J. Noble, F. Forooghian, M. Sproule, C. Westall, P. O'Connor

Purpose: To investigate the utility of the 25-item National Eye Institute Visual Function Questionnaire (VFQ-25) in assessing visual dysfunction in a heterogeneous group of patients with multiple sclerosis (MS) and to identify correlations of VFQ-25 scores with a variety of relevant clinical parameters.

Methods: The VFQ-25 was distributed to patients with MS at an inner-city teaching centre. Patients underwent a comprehensive ophthalmic examination, including Early Treatment Diabetic Retinopathy Study (ETDRS) visual acuity (VA), contrast sensitivity measurement (CS), Humphrey visual field testing (HVF), and 100 Hue colour vision testing (100-Hue). Scores on the Expanded Disability Status Scale (EDSS) were recorded for each patient. Comparative analyses using χ tests and *t* tests were performed. Spearman's rank correlation coefficients were computed to identify relations between VFQ-25 composite scores and various measured clinical parameters.

Results: In comparison with published reference data of individuals without ocular disease, patients with MS had significantly worse VFQ-25 composite scores as well as worse subscale scores. VFQ-25 composite score were found to be modestly and significantly correlated with several clinical parameters, including: VA ($r = –0.63$, $p < 0.001$), CS ($r = 0.60$, $p < 0.001$), HVF ($r = 0.53$, $p = 0.003$), and 100-Hue ($–0.48$, $p = 0.01$). EDSS scores, the use of disease-modifying agents, and a history of optic neuritis did not significantly correlate to VFQ-25 composite scores.

Conclusion: VFQ-25 scores correlate modestly and significantly with clinically relevant parameters in MS patients, suggesting that the VFQ-25 questionnaire is a sensitive and useful tool in assessing visual dysfunction in such patients.

Incision size change and postoperative astigmatism following coaxial phacoemulsification and aspiration, via small incision within 2.5 mm

K. Ogino, S. Miura, R. Kiyotake, M. Suzuki, Y. Tanaka

Purpose: To determine incision size change and postoperative astigmatism following phacoemulsification and aspiration (PEA) procedure with Ultra Sleeve.

Methods: Retrospective review comprised of 180 eyes of 116 patients who had undergone PEA and intraocular lens (IOL) implantation. We performed coaxial PEA procedure through sclerocorneal tunnel (incised with steel knife of 2.0, 2.2, or 2.5 mm) and implanted foldable acrylic IOL using the Monarch II/ cartridge C, without enlargement of incision. We measured incision size (*i*) before PEA, (*ii*) before IOL implantation, and (*iii*) after IOL implantation. In addition, we evaluated surgically induced corneal astigmatism.

Results: Incision size was enlarged as the operation proceeded (i.e., before PEA < before IOL< after IOL, $p < 0.05$) in all groups. The enlargement rate differed significantly, i.e., 2.5 mm < 2.2 mm < 2.0 mm, respectively ($p < 0.05$). Surgically induced astigmatism in the 2.5 mm group was significantly ($p < 0.05$) smaller than that in the other 2 groups.

Conclusion: Small incision for coaxial PEA was enlarged during operative procedure. It is possible that postoperative astigmatism was due to enlargement of a “too small” incision under 2.2 mm.

Clinical comparison of contrast sensitivity and ocular wavefront aberrations with an aspheric (LI61AO) and conventional (SA60AT) IOL

J.S. Pepose, M.A. Qazi, K. Edwards

Purpose: Experimental models predict that the aspheric design of the SofPort Advanced Optics (AO; LI61AO, Bausch & Lomb) intraocular lens (IOL) will improve the ocular wavefront compared with conventional, spherical IOLs, as the SofPort AO does not add spherical aberration to the eye and is immune to visual deterioration that can occur when other IOLs are decentered or tilted. This study was conducted to evaluate the clinical performance of SofPort AO against that of a conventional, spherical IOL.

Methods: Patients underwent uneventful phacoemulsification with implantation of either an aspheric silicone lens, the SofPort AO (n = 19), or a biconvex acrylic lens, the AcrySof SA60AT (Alcon, n = 21). Postoperatively, study eyes were pharmacologically dilated. A 5 mm artificial pupil was positioned in trial frames with the manifest refraction in place during uniocular contrast sensitivity function (CSF) and low contrast visual acuity testing with the Optec 6500 (Vision Sciences Research). Ocular wavefront error was measured with Hartmann-Shack aberrometry (Zywave, Bausch & Lomb; COAS, Wavefront Sciences). Mean levels were calculated for the individual Zernike coefficients at 5 mm wavefront diameters and statistically analyzed.

Results: Mean postoperative spherical equivalent and best corrected visual acuity was statistically similar between the AO and SA60AT groups ($p > 0.2$). Mean CSF scores were better in all frequencies tested for the AO group and achieved statistical significance at 6 cycles/degree (3.9 ± 1.9 AO, 2.5 ± 1.7 SA60AT, $p = 0.02$). Total letters read on a LCVA chart with a glare stimulus were 30.9 ± 5.0 for AO eyes and 25.2 ± 6.8 for SA60AT eyes ($p = 0.005$). AO eyes had lower magnitudes of spherical aberration ($Z_{(4,0)}$= –0.35 ± 0.18) than did the nonaspheric IOL eyes ($Z_{(4,0)}$ = –0.50 ± 0.13), with $p = 0.03$.

Conclusion: Eyes with the SofPort AO IOL demonstrated less spherical aberration and better low-contrast acuity as compared with eyes with a spherical IOL (SA60AT). The aspheric IOL technology shows superior optical performance in objective and subjective testing, in agreement with laboratory testing.

Laboratory and clinical studies of aspheric IOLs

J.S. Pepose, G.E. Altmann

Purpose: To compare the theoretical optical performance of an aspheric intraocular lens (IOL) that has no spherical aberration (SofPort L161 AO, Bausch & Lomb), with an aspheric IOL with negative spherical aberration (Tecnis Z9000, Advanced Medical Optics) and a conventional IOL with positive spherical aberration (L161U, Bausch & Lomb) simulating typical variations in the pseudophakic ocular system.

Methods: Ray-tracing software and an anatomically, biometrically, and optically correct computer model of the human eye were used to model the optical performance of the 3 aforementioned silicone IOLs in uniform, polychromatic lighting. Using random values for optical parameters that normally vary in vivo (all within 2 SD of mean values in the literature), 800 random Monte Carlo simulations were performed with each IOL for the following 4 sets of parameters: IOL decentration and tilt (with regard to the papillary axis); higher order aberrations of the anterior corneal surface; decentration and tilt of the visual axis with regard to the pupil; and surface irregularity of the IOL. The averaged results for each IOL then were analyzed for 3 mm and 4.5 mm pupil sizes and 2 object distances. The resulting scenarios were plotted on log contrast sensitivity graphs and compared with the known mean contrast sensitivity produced at different spatial frequencies by conventional IOLs.

Results: Over a wide range of spatial frequencies, the SofPort AO aberration-free lens produced up to 20% better contrast sensitivity than the other 2 IOLs. The aberration-free lens always exceeded the performance of the conventional IOL and it outperformed the Tecnis under more than 68% of the conditions modeled with a 3 mm pupil viewing an object at infinity and 89% of simulations viewing an object at 2 m. In a small number of cases, particularly with a small pupil, the optical performance with Tecnis exceeded that of the aberration-free lens. Clinical wavefront studies confirmed a reduction in specific higher-order aberrations in eyes implanted with the SofPort IOL in comparison with a conventional spherical IOL.

Conclusion: Based on robust computer simulations, the aberration-free SofPort AO produces better contrast sensitivity overall than either a conventional IOL or the modified prolate Tecnis. Corneal aberrations dominate retinal image quality. Unlike the conventional IOL, the SofPort AO does not add to the cornea's positive spherical aberration. In the average eye, which is subject to IOL positioning errors including decentration of the IOL with regard to the visual axis, its aberration-neutral design protects the SofPort AO’s performance from the degradation in optical quality demonstrated in the Tecnis under equivalent conditions.

Determining corneal power for intraocular lens calculation after myopic excimer keratorefractive surgery

J.S. Pepose, M.A. Qazi

Purpose: To assess the accuracy of Orbscan slit-scanning videokeratography (Bausch & Lomb) for intraocular lens calculation in eyes that have previously undergone myopic photorefractive keratectomy (PRK) or laser-assisted in situ keratomileusis (LASIK).

Methods: Corneal power (*K*) was determined using manual keratometry, placido-disk topography (Humphrey Atlas; Carl Zeiss Meditec), slit-scanning videokeratography (Orbscan; Bausch & Lomb), and rigid contact lens over-refraction (CLO) in eyes whose status was postkeratorefractive excimer laser surgery scheduled to have phacoemulsification with intraocular lens implantation. Implant lens power was determined in 21 eyes of 16 patients utilizing customized software with the Holladay 2 (H2), Hoffer Q (HQ), and SRK/T (SRKT) lens calculation formulas. Manifest refraction was determined at least 4 weeks following cataract surgery and used to back-calculate corneal power (BCK). The BCK for each eye was compared with Orbscan power map measurements, including total mean power, anterior axial power, total axial power, total tangential power, and total optical power. Statistical analysis was performed using paired Student *t* test and the Pearson correlation coefficient.

Results: Twenty-one eyes, with a prerefractive surgery spherical equivalent of –5.88 ± 2.55 D and mean axial length 26.15 ± 1.1 mm, underwent phacoemulsification 52.2 ± 16.2 months following their initial LASIK or PRK procedure. Mean refractive error following cataract surgery was –0.95 ± 0.79 D (range –2.38 to +0.75 D). The mean postrefractive surgery corneal power, based on BCKs using 3 intraocular lens (IOL) calculation formulas in this cohort was 39.35 ± 2.58 D (BCK H2), 39.08 ± 2.46 D (BCK HQ), and 38.46 ± 2.95 D (BCK SRKT). Mean manual keratometry readings (40.52 ± 1.95 D) and all anterior axial measurements, including Atlas-based values, were statistically higher than BCK H2 ($p < 0.001$). Mean corneal power calculated from prekeratorefractive surgery data (historical method) was 39.33 ± 2.70 D ($p = 0.83$ to BCK H2, $n = 19$) and CLO was 41.38 ± 3.11 D ($p = 0.19$, $n = 5$). Orbscan parameters ($n = 21$) of total mean power (3 mm central cornea: 39.10 ± 2.63 D, $p > 0.11$), total tangential power (3 mm: 39.11 ± 2.60 D, $p > 0.14$), and total optical power (3 mm: 39.08 ± 2.78 D, $p > 0.12$; 4 mm: 39.39 ± 2.76 D, $p > 0.76$) were statistically similar to both historical-based calculations of central corneal power and BCK H2. The H2 formula offered IOL selection that would minimize postoperative hyperopic outcomes when compared with calculations using the HQ or SRKT formulas.

Conclusion: In patients with surgically altered corneas, Orbscan power readings offer an alternative to refractive history-based calculation of IOL power and become particularly useful when pre-LASIK data are unavailable.

Glaucoma in Canada: results from population-based surveys, 1994–2003

A.V. Perruccio, E.M. Badley, G.E. Trope

Purpose: To review the self-reported prevalence of glaucoma in Canada, derived from the National Population Health Surveys (NPHS) and Canadian Community Health Surveys (CCHS), examining current estimates and trends over the past decade and the sociodemographic profile, vision problems, number of contacts with eye specialists, and other chronic medical conditions of those affected.

Methods: Analyses were based on the cross-sectional, self-reported data from the 1994–1995, 1996–1997, and 1998–1999 (minimum n = 33 153) NPHS and the 2000–2001 and 2002–2003 (minimum n = 113 212) CCHS for patients aged 20+ years. The minimum household and person response rates were 82.6% and 91.9%, respectively. Descriptive analyses examined the prevalence of glaucoma overall and by age and sex (1994–2003). Prevalence was also examined by level of education, vision problems, and number of visits to eye specialists. Logistic regression analyses examined the association of sociodemographic characteristics and a number of chronic conditions with the reporting of glaucoma.

Results: 409 000 Canadians (aged 20+ years) reported they had glaucoma in 2002–2003. From 1994 to 2002, the overall prevalence of glaucoma increased significantly from 1.2% to 1.8%. In 2002–2003, the prevalence among 40+ and 50+ age groups were 2.7% and 3.9%, respectively. The prevalence was 11% among the 80+ age group. Significant increases in prevalence over time were observed among individuals aged 40–49 and 60+ years. Fourteen percent of people reporting glaucoma reported no recent contact with an eye specialist. Arthritis and (or) rheumatism, high blood pressure, migraines, and diabetes were significantly associated with reporting glaucoma.

Conclusion: Our review suggests glaucoma is at least as prevalent in Canada as in other Western nations. It is very common in the 80+ age group (11%) and appears to be associated with other chronic medical conditions. In addition to considerations for the aging of the population, one must also consider the increasing age- and sex-specific prevalence when estimating the future burden of glaucoma.

Comparison of satisfaction and visual outcomes in patients implanted with both aspheric and foldable nonaspheric PCIOLs

C. Peters

Purpose: To compare visual outcomes and overall satisfaction in patients with both aspheric and foldable nonaspheric posterior chamber intraocular lenses (PCIOLs) implanted in either eye.

Methods: ETDRS and Snellen acuities measured in both photopic and scotopic conditions were compared. Patients were surveyed with regard to quality of vision between the two eyes.

Results: Higher measurable acuities and greater satisfaction were reported in eyes with aspheric implants under scotopic conditions, with no significant patient concerns under binocular conditions.

Conclusion: Aspheric PCIOLs provide a better visual outcome as well as higher patient satisfaction when compared with the nonaspheric lens in the opposite eye. Having mixed PCIOLs (i.e., aspheric and nonaspheric) did not impair patient's visual perception under binocular conditions.

Core vitrectomy versus near-total vitrectomy with induction of posterior vitreous detachment (PVD) and retinal surface cleaning in the management of postoperative endophthalmitis

G. Pillai, S. Edakhlon

Purpose: To compare core vitrectomy and near-total vitrectomy with PVD induction and retinal surface cleaning in the visual outcome of postoperative endophthalmitis.

Methods: 24 consecutive cases of postoperative endophthalmitis were randomly allocated to core vitrectomy or near-total vitrectomy with PVD induction. Media clarity, need for resurgery, visual outcome, and surgical complications were studied.

Results: Near-total vitrectomy was statistically superior to core vitrectomy in postoperative media clarity and visual outcome ($p < 0.05$). Patients who underwent core vitrectomy required resurgery to remove vitreous opacities in 50% of cases. There were no surgical complications in any of the cases.

Conclusion: Near total vitrectomy with PVD induction and retinal surface cleaning is more effective and equally safe when compared with core vitrectomy.

Cataract surgery rates in Ontario from 1992 to 2005: are we supplying enough?

R. Rachmiel, G.E. Trope, M.L. Chipman, Y.M. Buys

Purpose: To evaluate trends of cataract surgeries in Ontario between 1992 and 2004.

Methods: A retrospective analysis of the number of cataract surgeries, Ontario population, and number of ophthalmologists from April 1992 to March 2005.

Results: The number of cataract surgeries per 1000 patients at risk to develop cataract increased from 64.6 in 1992 to 115.65 in 2004 (79%, or a 4.97% increase per year). This rate was strongly positively correlated with time and with the increase in Ontario population ($r = 0.920$ and $r = 0.922$, respectively).The number of ophthalmologists increased by 2.2% from 1992 to 2004. This change was not correlated with the cataract rates ($r = 0.475$). However, the number of ophthalmologists per million population had a highly negative correlation with cataract surgery rates ($r = –0.757$).

Conclusion: There has been a significant increase in cataract surgeries in Ontario relative to the affected population despite a decrease in the number of ophthalmologists per million population.

Laser trabeculoplasty trends before and after the introduction of selective laser trabeculoplasty

R. Rachmiel, G.E. Trope, M.L. Chipman, Y.M. Buys

Purpose: To correlate trends of laser trabeculoplasties (LTP) with the introduction of medical therapies for glaucoma and to assess whether these trends changed following the introduction of selective laser trabeculoplasty (SLT) in 2001.

Methods: A retrospective analysis of LTP numbers, filtration surgeries, glaucoma medications dispensed, and population distribution by age in Ontario, Canada, between April 1992 and March 2005.

Results: The number of LTP per 1000 persons at risk for primary open-angle glaucoma (POAG) increased from 138.05 in 1992 to a maximum of 149.23 in 1996 (8.1% increase) and then steadily decreased to 70.65 in 2001 (47.34% decrease). From 2002 to 2004, the LTP rate increased to 162.54 (230% increase). The number of filtration surgeries steadily decreased from 1997 to 2004 by 27.27%. The number of glaucoma medications dispensed in Ontario increased from 1992 to 2004 by 91.5%. There were no significant correlations between the LTP rates and the new glaucoma medications rates ($r = –0.35$ to 0.09; $p = 0.34$ to 0.82) or filtration surgeries rates ($r = 0.007$; $p = 0.98$).

Conclusion: There was a substantial reduction in the number of LTP between 1997 and 2001 coinciding but not correlated with the introduction of medications for the treatment of glaucoma. Between 2002 and 2004, the LTP rates increased, coinciding with the introduction of SLT.

Identification of choroidal neovascularization: comparison of digital imaging, 35 mm film, and clinical examination

R. Raut, S. Olivier, P. Labelle, G. Cordahi, M.C. Boucher

Purpose: To compare digital images of the macula with 35 mm color transparencies and clinical examination for sensitivity in detecting choroidal neovascularization (CNV) requiring fluorescein angiography (FA). To evaluate the roles of stereopsis and knowledge of symptoms in detecting CNV in these macular images.

Methods: Both eyes of 60 consecutive patients referred in our retina service for age-related macular degeneration (AMD) with possible CNV were assessed clinically by 4 retina specialists with classification of the AMD characteristics. Maculas were then photographed with 35 mm stereoscopic pictures and with a digital 1280 × 960 resolution camera. FA was performed thereafter. Three experienced blinded graders later classified signs of AMD in each picture and digital image and determined whether the possibility of CNV warranted FA for each eye. All 35 mm color transparencies and digital images were interpreted in 2-D with reassessment of the interpretation after knowledge of visual loss, metamorphopsis, and duration. A third interpretation was performed in stereopsis for the 35 mm color transparencies. Changes in classification and CNV assessment were noted between interpretations after each addition, and 35 mm and digital images as well as grouped right and left eyes were evaluated 4 weeks apart.

Results: On the basis of the FA results, sensitivity for CNV detection was compared among clinical examinations, 35 mm color transparencies and digital images, using the paired *t* test. The added knowledge of symptoms and stereopsis were evaluated by comparing sensitivities to those of the previous step (paired *t* test). Intra- and intergrader agreement were evaluated as well using the weighted κ statistic.

Conclusion: Considering the practical advantages of digital imaging, this technique may be useful in screening patients with AMD and improving their access to timely FA evaluation and treatment of CNV.

Duration of binocular image decorrelation predicts the severity of latent fixation nystagmus in strabismic macaque monkeys

M. Richards, L. Tychsen, P. Foeller, D. Bradley, A. Wong

Purpose: To determine how the duration of early-onset strabismus affects the severity of latent fixation nystagmus (LN).

Methods: Binocular image decorrelation (i.e., optical strabismus) was created in infant macaques by fitting them with prism goggles on day 1 of life. The goggles were removed after 3 weeks ($n = 2$), 3 months ($n = 2$) or 6 months ($n = 3$), emulating surgical repair of strabismus in humans age 3, 12, and 24 months, respectively. Two monkeys wore plano lenses and served as controls. Eye movements during fixation tasks were recorded several months later.

Results: Animals with short-duration (3 week) decorrelation exhibited stable fixation, whereas those with longer-duration decorrelation developed LN. Slow-phase eye velocity and intensity (amplitude × frequency) of LN increased with greater duration of optical strabismus.

Conclusion: Early correction of strabismus reduces LN in primates and may be beneficial for normal ocular motor development.

Keratoconjunctivitis sicca (KCS) in graft-versus-host disease (GVHD): our experience with pulsed steroid in critical phases of the disease

L. Riveros, E.R. Simpson, J. Lipton

Objective: To evaluate the therapeutic options in the management of keratoconjunctivitis sicca (KCS) secondary to graft-versus-host disease (GVHD).

Methods: A retrospective case analysis was conducted. Eight patients with GVHD with severe ocular involvement were evaluated in the Ocular Oncology Service at Princess Margaret Hospital, University Health Network. Severe KCS with corneal involvement including ulceration and (or) perforation occurred in all cases. Initial management included profuse ocular lubrication, occlusion, and cycloplegia. Administration of high-dose systemic steroid was initiated during the course of the disease and the results evaluated.

Results: 8 patients (16 eyes) were diagnosed with severe KCS secondary to GVHD. Four eyes (25%) presented with corneal perforation and 12 eyes (75%) keratoconjunctivitis, epithelial defect, and (or) corneal ulceration. The central cornea was involved in 100% of cases. Treatment with high-dose steroid employing intravenous methylprednisolone (Solu-Medrol) was administered in all 8 patients. Three patients received more than 1 intravenous bolus over 6 months. Eleven eyes (68.75%) showed clinical improvement between 4 and 7 days after receiving the steroid bolus. Thirteen eyes (82.25%) showed improvement, whereas 3 eyes (18.75%) remained unchanged. Systemic complications of systemic steroid treatment included epigastralgia, muscles weakness, asthenia, and adynamia.

Conclusion: Keratoconjunctivitis sicca is a significant ocular complication following allogeneic bone marrow transplantation. Most disease can be controlled with topical lubrication and antiinflammatory regimens. However, more refractory disease may benefit from high-dose systemic steroid therapy with stabilization of corneal integrity and preservation of vision.

EUA and nasolacrimal probing in children: does IV access affect length of procedure and length of hospital stay?

R. Riyaz, P. Shuckett, A. Chiu, H. Wong

Purpose: To assess whether the presence or absence of an intravenous catheter in children during examinations under anesthesia (EUA) and surgical probings of the nasolacrimal duct affects the length of the procedure, time spent in phase 2 recovery, time spent on the day surgery ward, total time spent in hospital, and postoperative complications.

Methods: Retrospective review of the cases of 253 pediatric patients undergoing EUA or surgical probing under general anesthesia between January 2001 and May 2005. In 57 of these cases, an intravenous catheter was not inserted, and in the remaining 196 cases an IV catheter was inserted. Age, length of procedure, time in phase 2 recovery, time on the day surgery ward, total time in hospital, time until first void, and postoperative complications were analyzed and the results compared between the 2 study groups.

Results: Children who did not have intravenous access spent less time in the operating room after anesthesia began (16.2 ± 4.5 vs. 21.8 ± 9.0 min; $p < 0.0001$), less time in phase 2 recovery (30.5 ± 13.6 vs. 36.0 ± 12.0 min; $p = 0.004$), less time on the day surgery ward (65.1 ± 12.4 vs. 71.1 ± 22.2 min; $p = 0.0098$), and less time in the hospital altogether (111.3 ± 18.6 vs. 129.0 ± 28.1 min; $p = 0.0001$) than children with intravenous access. Also, children without IV access took less time to void after the procedure than children with IV access (91.5 ± 22.3 vs. 105.2 ± 32.1 min; $p = 0.0006$). There was no significant difference between the 2 groups in Tylenol administration or in postoperative pain and vomiting.

Conclusion: Children undergoing EUA or nasolacrimal probing under general anesthesia without IV access spent less time in the operating room, less time in phase 2 recovery, less time on the day surgery ward, and less time in the hospital altogether. Also, the absence of intravenous access in children undergoing EUA or surgical probing under general anesthesia was not associated with any added morbidity.

Intralase Intacs for keratoconus and post-LASIK corneal ectasia

G. Rocha

Purpose: To report on the use of intracorneal ring segments (Intacs) for the correction of keratoconus and post-LASIK corneal ectasia.

Methods: Six eyes (keratoconus $n = 4$; ectasia $n = 2$) of 4 patients were included in this study. A femtosecond laser (Intralase Corporation) was used to create the intrastromal corneal channels. Settings used were depth 400 μm, inner diameter 6.6 mm, outer diameter 7.6 mm, and entry cut length 1.2 mm. Single or double Intacs segments ranging in thickness from 0.30 to 0.45 mm were inserted and oriented according to the steep meridian. Inclusion criteria comprised (*i*) central corneal thickness >400 μm, (*ii*) central keratometry readings <55 diopters (D), (*iii*) no central or apical scarring, and (*iv*) intolerance to contact lenses.

Results: All eyes showed improvement in the following: (*i*) uncorrected (UCVA) and best corrected (BCVA) visual acuity increased an average of 5.6 lines and 1 line, respectively, (*ii*) manifest spherical equivalent (MSE) changed from –3.79 to –1.41 D, (*iii*) cylinder was reduced from 3.60 to 1.00 D, and (*iv*) flattening of central videokeratography measurements (from 47.09 D to 43.24 D) and centralization of the posterior elevation on Pentacam analysis was evident in all eyes.

Conclusion: Insertion of Intacs segments using the femtosecond laser appears to improve the corneal shape in patients with keratoconus and post-LASIK ectasia. Visual acuity and quality of vision are improved. Furthermore, this technique does not involve tissue removal, is reversible, and allows for subsequent spectacle or contact lens fitting.

From "zero" to 100 harvested corneas per year: are we there yet?

G. Rocha, S. Simkins

Purpose: To report on the strategies employed in the western Manitoba region to increase eye donation and reduce corneal transplant lists.

Methods: Three components have been essential in the development of this eye donation project: (*i*) Eye Bank facilities in Winnipeg, (*ii*) a local harvesting initiative in the western Manitoba region, coordinated in Brandon, and (*iii*) implementation of the legislation on the Human Tissue Gift Act that requires mandatory reporting of in-hospital deaths.

Results: (*i*) There has been an increase in the number of eye donations from 5 donors in 2004 to 24 donors in 2005. (*ii*) The percent of in-hospital deaths reported to the eye bank technician has increased to 86% (124/143). (*iii*) The percent of potential donors that were suitable for donation was 19%. (*iv*) A reduction in the corneal transplant list by 50% was observed. (*v*) Doubling in the number of corneal transplant surgeries from 2003 to 2005 resulted from these initiatives.

Conclusion: With the implementation of these strategies, a significant increase in the number of eye donations has been observed. In addition, there has been a substantial reduction in the corneal transplant waiting list for Manitoba. Mandatory reporting of in-hospital deaths with a system to appropriately procure donated organs should be available in all provinces.

Upper eyelid fistula caused by frontal sinusitis

D. Rossman, D. Verity, G. Rose

Purpose: To present a series of cases of chronic upper eyelid fistula caused by frontal sinus infection.

Methods: Patients were selected retrospectively from the orbital database at Moorfields Eye Hospital in London, England. Patients were investigated with orbital computed tomography scan and required sinus surgery for definitive treatment.

Results: The typical location of the fistula ostium was on the medial part of the upper eyelid and the history was that of chronic, purulent discharge. There was contraction of the surrounding skin and minimal inflammation of the adjacent tissues.

Conclusion: It is important for the ophthalmologist to be aware of frontal sinus disease when dealing with an atypical eyelid abscess.

The benefits of stereopsis when identifying clinically significant macular edema via teleophthalmology

C.J. Rudnisky, M.T.S. Tennant, A.R. de Leon, B.J. Hinz, M.D.J. Greve

Purpose: The need to incorporate stereopsis into a teleophthalmology system is controversial. Because some groups feel that the monoscopic detection of hard exudate in the macula is adequate, this study was designed to determine whether this is indeed an accurate surrogate for the stereoscopic detection of clinically significant macular edema (CSME).

Methods: 120 patients with diabetes underwent clinical retinal examination with contact lens biomicroscopy by a retinal specialist. On the same day as clinical grading, 30° stereoscopic digital photographs of the macula were captured. The digital images were viewed at least 2 months after clinical examination by masked graders for the presence or absence of hard exudate and CSME.

Results: 207 eyes of 105 patients had complete data sets for both diagnostic modalities. Although the sensitivity of hard exudates (93.9%) in predicting the presence of CSME was similar to stereopsis (90.9%), the difference was not statistically significant ($p = 0.5$). Stereopsis was significantly more specific (92.9%) than hard exudates alone (81.6%) in predicting the presence of CSME ($p = 0.00003$). This difference was maintained even when controlling for image quality. Logistic regression analysis using monoscopic detection of hard exudate (as a surrogate for the presence of CSME) in a predictive model produced a sensitivity of 93.9% and 81.6% specificity, indicating that improvements in specificity for the detection of CSME can only be achieved via stereopsis.

Conclusion: Although the presence of hard exudate within the macula is a sensitive surrogate marker for CSME, it is less specific than stereoscopic evaluation. Any (ATA Category 3) teleophthalmology system that utilizes hard exudate as a surrogate marker for CSME may refer patients unnecessarily for clinical evaluation.

Nerve fiber layer changes in highly myopic eyes by optical coherence tomography

K. Schweitzer, R. García-Salinas

Purpose: To determine the thickness of the retinal nerve fiber layer (NFL) in normal and highly myopic patients and to look at the effect of this thickness on computer models used in current ophthalmic equipment.

Methods: The NFL thickness of 10 highly myopic patients was determined with the use of the Zeiss Stratus Optical Coherence Tomography. An equal number of controls matched for age and sex were included in this study. All patients had axial length measured using the IOL Master, and no patients displayed evidence of glaucomatous changes.

Results: Patients with high myopia had a lower NFL thickness than normal patients. There was also a gradual trend of decreasing thickness with increasing axial length.

Conclusion: The NFL thickness was found to be significantly thinner in highly myopic patients when compared with the control group. In some computer programs, patient results are automatically compared with a set of normal values. The thinner NFL of highly myopic patients would have an effect on these normal values and should be considered when interpreting patient information from computer programs using these models.

Near vision test as a predictor of visual acuity in patients with nuclear cataracts

K. Schweitzer, R. García-Salinas

Purpose: To determine the value of near vision in predicting the postoperative visual acuity in patients with nuclear cataracts.

Methods: A total of 53 patients undergoing cataract surgery had presurgical near vision scores recorded. Patients were given the near vision eye chart and asked to read the lowest line visible under good illumination. The patients underwent cataract surgery and had visual acuity testing 2 months later. Kendall's tau-b, a measure of the agreement between 2 rankings, was used to account for the nonparametric and non-normally distributed nature of the data and for the fact that there were a large number of tied ranks.

Results: The mean difference in visual acuity between presurgical near vision scores and postsurgery test scores was 9.6 ± 16.8 points. The median difference was 5.0 points. In 84.9% of the patients, the predicted visual acuity was within ±20 points. For example, a near vision of J2 that is predictive of 20/30 vision was in 84.9% of cases followed by a postsurgery visual acuity score within ±2 lines. Overprediction of the visual acuity occurred in the majority of the remaining patients (15.1% of total). A highly significant relation was observed between presurgery near vision scores and postsurgery visual acuity test scores (Kendall's tau-b coefficient = 0.283, $p = 0.006$).

Conclusion: The near vision eye chart is a rapid and inexpensive test that can be used to help predict visual acuity outcomes in patients with nuclear cataracts. It aids in weighing the risks and benefits of proceeding with surgery and patient satisfaction. It can also help a physician understand any disease process that may be occurring behind the opacified lens. Ophthalmologists should make use of the test to help in decisions concerning the benefit of cataract surgery and in ensuring the patient understands the degree of improvement that can be expected after their surgery.

Peripapillary atrophy changes in a longitudinal follow-up of glaucoma patients

J. See, M. Nicolela, P. Artes, R.P. LeBlanc, B. Chauhan

Purpose: Many studies have shown an association between peripapillary atrophy (PPA) and glaucoma. However, less is known about the relation between PPA change and the rate and extent of optic disc change measured over time. We therefore studied this relation in a group of patients who were followed in a longitudinal prospective study.

Methods: Our sample contained 1 eye each of 86 patients (baseline age 61.7 ± 12.0 years) with early to moderate baseline glaucomatous visual field damage. Patients were followed prospectively for 8.6 ± 3.0 years with images of the optic nerve and peripapillary retina recorded with the Heidelberg Retina Tomograph (HRT) at 6-month intervals. The data were processed using customized software (v.3.0.2) that measured several parameters of PPA. Optic disc change was quantified by the largest cluster of red superpixels within the disc margin in 3 consecutive examinations using the topographic change analysis (extent of disc change) and global and sectoral rim area regression analysis (rate of disc change).

Results: The median (and 90% range) change in PPA area was 0.090 (–0.081, 2.80) mm^2 or 20.8 (–15.1, 246.7)%, indicating an overall increase in PPA. The corresponding figure for global rim area slope was –5.87 (–47.5, 15.0) × 10^{-3} mm^2/y. There was, however, a poor association between the absolute (r = –0.099, p = 0.399) or percent (r = 0.069, p = 0.562) PPA change and the extent of disc change. Similarly, there was no association between these parameters of PPA and rate of disc change (r = –0.010, p = 0.933 and r = 0.093, p = 0.416, respectively). The analysis of sectoral disc changes also yielded poor relationships with PPA changes.

Conclusion: In this cohort of glaucoma patients, changes in PPA occurred frequently. However, they are not associated with the extent and rate of disc change. These results suggest that the mechanisms of PPA and disc change may be independent.

Utilization of a community-based teleophthalmology screening program in Ontario for AMD: impact on patient wait times and access to treatment

T. Sheidow

Purpose: To determine the ability of a community-based teleophthalmology network to enhance the access of patients with wet age-related macular degeneration (AMD) to treatment, and to evaluate the cost savings associated with this form of referral network.

Methods: A network of 12 community optometrists and general ophthalmologists surrounding the Ivey Eye Institute in London, Ontario, were offered the opportunity to refer all patients with suspected wet AMD for stereoscopic, digital teleophthalmic screening. Referrals were facilitated through the SDI system (Alberta Retina Consultants) and images were graded by one surgeon. An historical control group was utilized to compare access times and delays to treatment in a standard referral process.

Results: Patients requiring evaluation were assessed and treatment was initiated. Comparison to a historic control group was made to determine time savings. Cost calculations were performed to determine the relative cost savings to the OHIP system and to the community in general, based on patients not requiring treatment.

Conclusion: Teleophthalmology offers the opportunity to facilitate access for those patients who will benefit the most from vitreoretinal referral. This shortens the wait time for patients requiring treatment and offers cost savings through decreased referrals and travel costs.

Rehabilitation of potential visual acuity in age-related macular degeneration

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Purpose: To determine the suitability of image relocation (IR) with prisms for availing potential visual acuity (PVA) for permanent use in patients with age-related macular degeneration (AMD).

Methods: The study consisted of the best-performing eyes of 33 patients. PVA was measured with the flooding E tumbling test. Best corrected visual acuity (BCVA) was tested with the Early Treatment Diabetic Retinopathy Study (ETDRS) charts before and after IR with prisms. IR with prisms was used to redirect images to preferred retinal loci, which are the presumed sites for PVA.

Results: IR with prisms in patients with AMD resulted in significantly better BCVA levels ($t_{33} = 8.57$, $p < 0.0001$). The better BCVA levels achieved were almost identical to PVA levels ($t_{33} = 0.415$, $p < 0.681$; y= –0.136 + 1.195x, $r = 0.8333$).

Conclusion: IR with prisms enables immediate and permanent utilization of PVA in patients with AMD.

Factors in one-year regression after laser in situ keratomileusis for hyperopia

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Purpose: To evaluate 1-year outcomes and identify preoperative risk factors for regression after hyperopic laser in situ keratomileusis (H-LASIK).

Methods: We retrospectively reviewed 152 consecutive H-LASIK treated eyes of 81 patients. The range of preoperative manifest refraction spherical equivalent (MRSE) was between +0.13 and +5.75 diopters (D). H-LASIK based on cycloplegic refraction (CR) was performed by the same surgeon (J.F.B.) using the Visx Star S2 excimer laser with personal nomogram adjustment (NA). Predisposing preoperative factors and the 1-month and 12-month postoperative MRSE were analyzed by linear and (or) binary logistic regression models.

Results: At 1 year, 98.7% of eyes were within ±1.00 D of the intended correction. From 1 to 12 months, there was a hyperopic shift of +0.28 D (range, –0.75 to +2.25 D). Overall, 50.0% of eyes had regression of +0.25 D or more. Overcorrection had significant linear correlation with regression ($p < 0.001$, $R = 0.68$). We observed that theoretical removed corneal thickness (TRCT), percentage of TRCT, and preoperative CR spherical equivalent (CRSE) had statistically significant association with regression and that this statistically significant association was maintained after adjusting for the effect of latent hyperopia and age (OR 1.03, 95% CI 1.00–1.06; 1.18, 1.02–1.37; and 1.34, 1.01–1.78, respectively).

Conclusion: H-LASIK based on CR offered predictable outcome 1 year after surgery. Deeper laser-ablation, however, is associated with increased odds of postoperative regression. For eyes with moderate and high CRSE, adding to CR in NA for ablation could further promote regression and may induce unstable refraction postoperatively.

Duration of binocular decorrelation predicts the angle of infantile strabismus in macaque monkeys

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Purpose: To determine whether duration of image decorrelation is related systematically to the magnitude of infantile strabismus.

Methods: Binocular image decorrelation (i.e., optical strabismus) was created in infant macaques by fitting them with prism goggles on day 1 of life. The goggles were removed after 3 weeks ($n = 2$), 3 months ($n = 2$), or 6 months ($n = 3$), emulating surgical repair of strabismus in humans at ages 3, 12, and 24 months, respectively. Two monkeys wore plano lenses. Alignment in each cardinal position was measured using binocular search coils during automated single and alternate-cover testing.

Results: The longer the duration of image decorrelation, the greater the magnitude of resultant concomitant esotropia.

Conclusion: Longer durations of binocular decorrelation in infancy cause greater maldevelopment of the (tonic) vergence system manifested as larger-angle esotropia. These results reinforce the importance of restoring normal eye alignment in infancy within a short period of time.

Stereotactic radiotherapy in the treatment of juxtapapillary choroidal melanoma: the Toronto experience

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Purpose: To evaluate the efficacy of stereotactic radiotherapy in the management of patients with juxtapapillary choroidal melanoma.

Methods: A retrospective, consecutive case series of patients with choroidal melanoma located within 2 mm of the optic nerve who were treated with stereotactic radiotherapy at Princess Margaret Hospital, Toronto, were evaluated from October 1998 to the present.

Results: This evaluation was intended to provide information regarding survival rates and ocular complications including radiation-induced neovascular glaucoma, cataract, retinopathy, and optic neuropathy. Furthermore, results of local tumor control and metastatic intervals are discussed with a median follow-up of 3 years.

Conclusion: Stereotactic radiotherapy offers a noninvasive alternative to enucleation and brachytherapy in the management of juxtapapillary choroidal melanoma.

The safety of triamcinolone-assisted pars plana vitrectomy

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Purpose: To determine the incidence of complications following triamcinolone-assisted pars plana vitrectomy (PPV).

Methods: A retrospective review of 222 cases of triamcinolone-assisted PPV performed between January 2000 and February 2003. The primary outcome was incidence of postoperative endophthalmitis. Secondary outcomes included intraocular pressure, rate of cataract extraction, and reoperation rate.

Results: No postoperative endophthalmitis was identified in the 222 triamcinolone-assisted vitrectomies reviewed. Intraocular pressure was found to be elevated above 22 mm Hg in 57 (26%) cases. All cases of elevated intraocular pressure were treated with topical or oral agents alone. Average duration of treatment was 23 days. The incidence of cataract extraction was 26%, whereas the rate of reoperation was 14%.

Conclusion: The use of triamcinolone during vitrectomy is not associated with an increased risk of endophthalmitis. Whereas use of triamcinolone may be associated with an increase in postoperative intraocular pressure, this effect is temporary and is controlled by short-term medical therapy.

Intraoperative iris prolapse during cataract surgery in men using alpha-blockers for benign prostatic hypertrophy

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Purpose: Recent literature has suggested a relation between the use of alpha-blockers, namely tamsulosin (Flomax), for benign prostatic hypertrophy (BPH) and intraoperative iris prolapse (floppy iris syndrome) during cataract surgery. The aim of this study was to assess the occurrence of iris prolapse during cataract surgery in all men on all systemic alpha-blockers at our institution.

Methods: We performed a retrospective chart review of 1612 eyes of 1298 patients who underwent cataract surgery under 2 surgeons between January 2000 to July 2005. All hospital and office charts were examined for every patient. Patients and (or) their family physicians were contacted if additional information was required. Patients undergoing additional procedures at the time of their cataract surgery were excluded.

Results: The mean age of the cohort was 75.9 years. Sixty-five of 1298 patients (5%) were on alpha-blockers. Of these, 49% (n = 32) were on terazosin, 27.3% (n = 18) were on tamsulosin, 25.8% (n = 17) were on doxazosin, and 1 (1.5%) patient was on alfuzosin. Ninety-five cataract surgeries were performed on 65 patients who were on systemic alpha-blockers. Iris prolapse occurred in 14 of 95 eyes (14.7%) (13 patients). At the time of surgery, 10 patients were on tamsulosin, 2 were on doxazosin, and 1 was on terazosin. Six patients had unilateral surgery and each had iris prolapse, whereas 6 had bilateral surgeries while on alpha-blockers for both surgeries. Five of the 6 patients had unilateral iris prolapse. One of the 6 patients had bilateral iris prolapse. One patient had bilateral cataract surgery; however, he was on tamsulosin for only 1 eye that had iris prolapse.

Conclusion: Intraoperative iris prolapse occurred in 14.7% of a cataract surgery population. Although it appears to occur more commonly in men on tamsulosin, other alpha-blockers may also be related to this complication at cataract surgery. All alpha-blockers should be used with caution in those undergoing cataract surgeries until further information is available.

Application of fibrin glue (Tisseel) for conjunctival autograft during primary pterygium surgery

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Purpose: To evaluate the clinical efficacy, safety, and the complications rate following the use of fibrin glue (Tisseel) for attaching the conjunctival autograft during primary pterygium excision.

Methods: Single centre, retrospective chart review. We reviewed the medical records of 62 patients with primary pterygium who underwent pterygium excision and conjunctival autograft with the use of fibrin glue at a single institution between April 1 and September 30, 2005.

Results: 65 eyes of 62 patients were included in this study. Thirty patients (46%) were women. The median age was 53 years (range, 31–81 years). The mean follow-up time was 9.5 months (range, 9–14 mo) to February 2006. There were no intraoperative complications. Postoperatively, conjunctival graft displacement was noted in 2 of 65 eyes (3.1%). Graft displacement was successfully managed by re-glue with anchoring sutures.

Conclusion: Application of fibrin glue to conjunctival autograft is a safe and effective technique. The recurrence rates of conjunctival autograft with fibrin glue were comparable to standard technique of suturing the conjunctival autograft for primary pterygium surgery.

Analysis of vitreous and serum leptin levels in diabetic retinopathy

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Purpose: Leptin is a 167 amino acid protein encoded by the *Ob* gene and secreted from adipocytes. Recent research has demonstrated that leptin is also a potent stimulus for angiogenesis and that it may be involved in the neovascularization associated with proliferative diabetic retinopathy. The purpose of this study is to measure the serum and vitreous levels of leptin in patients with diabetes and in control patients without diabetes to ascertain any difference between the 2 groups.

Methods: Patients with diabetes requiring vitrectomy were matched by body mass index (BMI) and sex with patients without diabetes requiring vitrectomy for epiretinal membranes, macular holes, and recent rhegmatogenous retinal detachments. Vitreous and serum samples were collected from patients and were analyzed by radioimmunoassay to determine leptin concentrations. Additionally, vitreous specimens will be assayed for leptin mRNA to determine whether leptin is produced locally within the eye.

Results: 25 control patients and 30 patients with diabetes were enrolled in the study. There was a statistically significant difference ($p < 0.05$) in the mean serum leptin concentrations between control patients (14.1 ± 2.4 ng/mL) and patients with diabetes (24.0 ± 4.7 ng/mL). Mean vitreous leptin levels were also significantly higher in the vitreous of patients with diabetes (2.1 ± 0.5 ng/mL) than in the vitreous of control patients (0.20 ± 0.05 ng/mL).

Conclusion: Mean leptin levels in the serum as well as the vitreous of patients with diabetic retinopathy were elevated compared with control patients. The elevated vitreous leptin levels suggest that leptin may be involved in the neovascular process and be produced in the eye. A systemic contribution to intraocular leptin levels cannot be ruled out, however. Pending mRNA analyses of vitreous samples will help determine whether leptin is produced intraocularly.

Consultation services via teleophthalmology: the benefit to patients

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Purpose: To evaluate the results of a teleophthalmology program linking optometrists with retinal specialists in the province of Alberta.

Methods: Optometrists with on-site digital retinal imaging were invited to participate in a pilot project to access, store, and forward ophthalmology consultation services via secure internet connection.

Results: Four different optometry groups participated in this pilot study. Three of the groups were located in small cities without ophthalmology services, whereas the fourth was located within the greater Edmonton area. One hundred and sixteen optometry patients were assessed by teleophthalmology between December 2004 and December 2005. A variety of eye pathologies were identified including: macular degeneration (51 people), diabetic retinopathy (14 people), branch retinal vein occlusion (11 people), and other eye diseases (21 people). For those people identified with macular degeneration, 24 people (47.1%) had changes consistent with choroidal neovascularization, whereas 27 people (52.9%) had dry macular degeneration only. All 24 patients identified with wet macular degeneration underwent fluorescein angiography followed by clinical examination and treatment when appropriate by a retinal specialist within 1 week of tele-examination. In total, 68 people (58.6%) were referred for further testing, examination, or treatment.

Conclusion: Teleophthalmology is an effective tool for consultation services between optometrists and ophthalmologists.

Glutamate NMDA receptor 1 is overexpressed in the lateral geniculate nucleus of experimental glaucoma

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Purpose: To determine whether the *N*-methyl-D-aspartate (NMDA) receptor implicated in glutamate excitotoxicity is overexpressed in the lateral geniculate nucleus (LGN) of experimental glaucoma.

Methods: Eight adult cynomolgus monkeys with unilateral experimental glaucoma for up to 11 months duration and 3 normal monkeys were studied. LGN layers were examined following immunocytochemical staining with antibody to NMDA receptor 1 subunit (NMDA R1).

Results: In the normal LGN, NMDA R1 immunoreactivity was present and evenly distributed across layers 1 to 6. In glaucomatous LGN, NMDA R1 was also present in all 6 layers, but NMDA R1 expression was increased in layers connected to the glaucomatous eye compared with those connected to the nonglaucomatous eye.

Conclusion: Glutamate NMDA R1 is increased in LGN layers connected to glaucomatous eyes in monkeys. This finding suggests that glutamate is involved in glaucomatous central nervous system (CNS) degeneration and may be relevant to treatment strategies in glaucoma.

Erythropoietin receptors (EpoR) are upregulated by hypoxia in rodent retinal stem cells

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Purpose: Originally described as a haematopoietic hormone, erythropoietin (Epo) is now known to be both angiogenic and neuroprotective. Epo is upregulated by hypoxia, and its concentration is elevated in human vitreous from patients with proliferative diabetic retinopathy. Recent studies confirm that Epo is protective of neuronal stem cells, and we hypothesize that this endogenous dual "neurovascular" molecule could enhance retinal stem cell (RSC) survival. To this end, we asked if Epo receptor (EpoR) was present on quiescent murine and rat RSCs, and whether its expression could be upregulated by moderate hypoxia. We then asked if this upregulation promotes survival or differentiation of RSCs.

Methods: RSCs were dissected from the ciliary body of the CD1 mouse or Sprague-Dawley rat. Dissociated cells were grown into spheres in DMEM/F12 serum-free media and plated 1 week later on laminin-coated plasticware. Cells were incubated at 1% O_2 (5% CO_2, balance N_2) for 6, 12, 18, 24, and 48 hours, and then prepared either for fluorescent immunohistochemistry (IHC) staining or for quantitative polymerase chain reaction (qPCR) detection. In addition, RSCs were treated with recombinant human Epo (rhEpo) to test its ability to rescue RSCs in a severe low oxygen environment. The glial and neuronal lineage of RSCs were evaluated by glial fibrillary acidic protein (GFAP) and neurofilament heavy chain (NFH), respectively. Apoptosis was evaluated by TUNEL staining and expressed as percentage of apoptotic RSC cells in total RSC cells.

Results: EpoR was found at low levels on quiescent retinal stem cells. On exposure to 12 hours of low oxygen, EpoR protein was upregulated; mRNA expression was increased before this time. GFAP and NFH were detectable in differentiating RSCs and their changes in expression with hypoxia or rhEpo treatment are being calculated. Similarly, TUNEL staining was increased with hypoxia and preliminary data suggest that treatment with rhEpo reduces RSC cell death.

Conclusion: We have demonstrated for the first time that rodent RSCs express EpoR and suggest that signaling through the endogenous Epo system could enhance RSC survival or differentiation. These data imply improved RSC survival in ocular conditions characterized by hypoxia.

Twenty years' experience with uveitis secondary to ocular sarcoidosis in the Pacific Northwest

W.W. Li, N.K. Wade

Purpose: To identify clinical findings and demographic variables that could influence the presentation and predict the course or outcome of uveitis secondary to ocular sarcoidosis.

Methods: 562 consecutive uveitis patients with possible ocular sarcoidosis seen by a single uveitis subspecialty ophthalmologist (N.K.W.) were identified from a retrospective chart review. Of these, 276 patients with either biopsy-proven or clinically presumed ocular sarcoidosis were included in the study. 198 patients with suspected ocular sarcoidosis were excluded because they did not meet the rigid predetermined criteria requiring 5 of 10 clinical signs plus support for the diagnosis from both imaging and laboratory findings. 88 patients ultimately had a confirmed alternative diagnosis and were excluded as well. Demographics, clinical findings, disease course, complications, treatment, and outcomes were recorded, analyzed, and compared.

Results: Mean age was 43 (range, 5–89) years, with the majority of patients being Caucasian (72%) and female (62%). Mean follow-up was 4.5 years. A prior diagnosis of systemic sarcoidosis, before onset of ocular disease, was seen in 17% of patients. The most common presentations were bilateral (91%), insidious onset (86%), and diffuse (78%) uveitis. The most frequent clinical signs were granulomatous keratic precipitates (57%), choroidal granulomas or choroiditis (51%), and snowballs (49%). The most frequent complications were cataract (67%) and glaucoma (46%). Diffuse uveitis generally had the longest time to quiescence (45 months), worst signs, and worst prognosis compared with all other types of uveitis. Patients with diffuse uveitis also had the most complications, with the exception of glaucoma, which was more prevalent in anterior uveitis. Patients of Asian descent were more likely to develop cataract (88%) and glaucoma (67%) complications compared with all other patients (65% and 44%, respectively [$p < 0.05$ for both]). In contrast, patients of South Asian descent had the longest mean time to quiescence (64 months) and were more likely to take on a chronically active disease course (92%) compared with all others (31 months and 79%, respectively [$p < 0.05$ for both]). Caucasians were more likely to present with multifocal choroidal "punched out" lesions (50%) compared with all others (11%) ($p < 0.01$). Males were more likely to develop glaucoma (65%) and hypertensive uveitis (35%) compared with females (35% and 19%, respectively [$p < 0.01$ for both]).

Conclusion: This is the largest sarcoidosis uveitis series of which we are aware, and it is the only study to address variations based on Asian and South Asian ethnicities. This study identifies factors which influence presentation, course, and outcome of uveitis secondary to ocular sarcoidosis.