

Abstracts

Edited by Dr. Tahir Mahmood

Glaucoma progression is associated with decreased blood flow velocities in the short posterior ciliary artery

Zeit O, Galambos P, Wagenfeld L, Wiermann A, Wlodarsch P, Praga R, Matthiessen E T, Richard G, Klemm M

Br J Ophthalmol 2006;90:1245-8.

Besides increased intraocular pressure (IOP), a disturbed microcirculation at the level of the optic nerve head as well as a primary neurodegenerative component are thought to contribute to glaucomatous optic neuropathy. To gain insight into the pathophysiological relevance of haemodynamic disturbances on the course of disease progression, in this study it was hypothesised that there are inferences in haemodynamics of patients having glaucoma with progressive versus stable disease, which are independent of IOP and systemic blood pressure.

An altered perfusion of the optic nerve head has been proposed as a pathogenic factor in glaucoma.

Peak systolic velocity (PSV), end diastolic velocity (EDV) and resistivity index in the short posterior ciliary artery (SPCA), central retinal artery (CRA) and ophthalmic artery were recorded in 114 consecutive patients having glaucoma with an intraocular pressure (IOP) < 21 mm Hg, as well as in 40 healthy volunteers, by colour Doppler imaging (CDI).

Of the 114 patients with glaucoma, 12 showed glaucoma progression (follow-up period: mean 295 (standard deviation (SD) (18) days). CDI measurements in these patients showed decreased PSV and EDV in the SPCA ($p < 0.001$ and $p < 0.05$, respectively) and decreased PSV in the CRA compared with patients with stable glaucoma and healthy controls ($p < 0.05$). No differences in flow velocities were found for the ophthalmic artery. IOP and systemic blood pressure was similar in all the three groups.

Authors concluded that progressive glaucoma is associated with decreased blood flow velocities in the small retrobulbar vessels supplying the optic nerve

head. The detected difference could represent a risk factor for progression of glaucomatous optic neuropathy.

Surgical embolus removal in retinal artery occlusion

Garcia-Arumf JG, Martinez-Castilio V, Boixadera A, Fonoliosa A, Corcostegui B

Br J Ophthalmol 2006; 90: 1252-5.

Retinal artery occlusion (RAO) is a potentially devastating visual disorder, usually caused by blockage of a vessel by emboli or atheroma. The emboli, which are visible in 20-40% of eyes, mainly originate in the carotid arteries (74.5%) and are comprised of cholesterol. Fibrin-platelet emboli (15.5%) and calcific emboli from the cardiac valves (10.5%) are also relatively frequent, whereas emboli caused by corticosteroid use, cardiac myxoma and intravenous drug misuse are uncommon. The site of the pathological process determines whether the central retinal artery (lamina cribrosa), a branch retinal artery or the cilioretinal artery will be affected. Experimental studies have shown that irreversible retinal damage occurs by 24 hrs after central RAO. Numerous treatment approaches have been attempted to improve vision in eyes with RAO, but none has proved particularly effective.

In 1990, Peyman and Gremillion surgically removed one embolus in a patient with branch RAO of 60 h duration, with a visual acuity improvement to 2/200. The purpose of this study was to assess the anatomical outcome, safety and functional effectiveness of surgical embolus removal in seven consecutive patients with RAO.

Prospective study of seven patients with RAO of <36 h duration. All eyes underwent pars plana vitrectomy and a longitudinal incision of the anterior wall of the occluded arteriole in an attempt to remove the embolus. Outcome measures included visual acuity and arteriolar reperfusion, as evaluated with fluorescein angiography.

Surgical removal of the embolus was achieved in six of the seven (87.5%) patients, visual acuity improved from a median of 20/400 (range: hand movements 20/25) to 20/40 (range: hand movements 20/25), and reperfusion of the occluded vessel was angiographically confirmed in four of the six patients in whom the embolus was successfully removed.

Authors concluded that surgical removal of retinal arterial emboli seems to be an effective and safe treatment for RAO, but a randomised and controlled clinical trial will be necessary to establish an evidence base for the role, if any, of this intervention.

Bilateral cataract surgery and driving performance

Wood JM, Carberry TP
Br J Ophthalmol 2006; 90:1277-80.

Older people comprise the fastest growing sector of the driving population; this has important implications for road safety as they are also reported to have high crash rates per distance travelled. However, not all older driver's are unsafe, and many continue to drive safely well into older age. Recent research has sought to identify tests that can accurately differentiate between safe and unsafe drivers, recognizing that it is functional rather than chronological age that best predicts driving ability, as well as seeking interventions, which can extend the time that older drivers can drive safely. Cataract surgery has been suggested as an intervention that can potentially improve the performance of older drivers.

A growing body of evidence suggests that older drivers with cataracts are less safe to drive than their counterparts without cataracts. People with cataracts experience more problems when driving, drive shorter distances and avoid challenging driving situations. Nevertheless, despite limiting their driving exposure, drivers with cataracts have 2.5 times more crashes than controls, and crash involvement is predicted by deficits in contrast sensitivity. Further evidence comes from closed-road and open-road studies, which have shown that drivers with either simulated or true cataracts have considerably impaired driving performance compared with controls. The presence of cataracts has also been associated with driving cessation.

The positive benefits of cataract surgery on vision and quality of life have been widely reported;

however, fewer studies have investigated the impact of cataract surgery on real-world activities such as driving. Crash rates have been shown to halve after cataract surgery compared with controls, suggesting that cataract surgery can result in tangible benefits to road safety. Self-reported improvements in driving have been described within 1 year and 5 years after surgery, and the driving subscales of the activities of Daily Vision Scale improve after cataract surgery, particularly for night driving.

This study investigated the effect cataract surgery on real-world measures of driving performance for patients undergoing bilateral cataract surgery within a 3-month period, and determined how well these measures related to changes in visual performance.

29 older patients with bilateral cataracts and 18 controls with normal vision were tested. All were licensed drivers. Driving and vision performance were measured before cataract surgery and after second eye surgery for the patients with cataract and on two separate occasions for the controls. Driving performance was assessed on a closed-road circuit. Visual acuity, contrast sensitivity, glare sensitivity and kinetic visual fields were measured at each test session.

Patients with cataract had significantly poorer ($p < 0.05$) driving performance at the first visit than the controls for a range of measures of driving performance, which significantly improved to the level of the controls after extraction of both cataracts. The change in contrast sensitivity after surgery was the best predictor of the improvements in driving performance in patients with cataract.

Authors concluded with remarks that cataract surgery results in marked improvements in driving performance, which are related to concurrent improvements in contrast sensitivity.

Insights into the age-related decline in the amplitude of accommodation of the human lens using a nonlinear finite-element model

Schachar RA, Abolmaali A, Le T
Br J Ophthalmol 2006; 90: 1304-9.

The aetiology of the age-related decline in accommodative amplitude is not established. Mathematical modeling offers the opportunity of evaluating some of the lens parameters responsible for

presbyopia. This study uses the non-linear finite element method (FEM) in parametric assessment to determine the effect of varying the geometric and material properties of the lens on the ability of zonular traction to change central optical power (COP).

The purpose of this study was to understand the effect of the geometric and material properties of the lens on the age-related decline in accommodative amplitude.

Using a non-linear finite-element model, a parametric assessment was carried out to determine the effect of stiffness of the cortex, nucleus, capsule and zonules, and that of thickness of the capsule and lens, on the change in central optical power (COP) associated with zonular traction. Convergence was required for all solutions.

Increasing either capsular stiffness or capsular thickness was associated with an increase in the change in COP for any specific amount of zonular traction. Weakening the attachment between the capsule and its underlying cortex increased the magnitude of the change in COP. When the hardness of the total lens stroma, cortex or nucleus was increased, there was a reduction in the amount of change in COP associated with a fixed amount of zonular traction.

Increasing lens hardness reduces accommodative amplitude; however, as hardness of the lens does not occur until after the fourth decade of life, the age-related decline in accommodative amplitude must be due to another mechanism. One explanation is a progressive decline in the magnitude of the maximum force exerted by the zonules with ageing.

Acute Endophthalmitis in Eyes Treated Prophylactically with Gatifloxacin and Moxifloxacin

Deramo VA, Lai JC, Fastenberg DM, Udell IJ
Am J Ophthalmol 2006; 142: 721-5.

Endophthalmitis is an uncommon, but serious, consequence after intraocular surgery and can lead to severe visual loss. Recent studies have suggested that the incidence after cataract extraction has increased over the last decade. Fluoroquinolones are a class of broad-spectrum, bactericidal antibiotics that cover many gram-positive, gram-negative, and anaerobic organisms. They are commonly used to treat ocular

infections and are widely used as prophylactic agents before and following intraocular surgery to prevent endophthalmitis.

Second and third generation fluoroquinolone antibiotics, such as ciprofloxacin, ofloxacin, and levofloxacin, have excellent gram-negative coverage, but they are less potent against gram-positive organisms, notably *Staphylococcus* and *Streptococcus* isolates. Recently, two fourth generation antibiotics, gatifloxacin and moxifloxacin, have been developed. Both are available for topical ophthalmic use: 0.3% gatifloxacin (Zymar; Allergan, Inc, Irvine, California, USA) and 0.5% moxifloxacin (Vigamox; Alcon Laboratories, Inc. Fort Worth, Texas, USA). Gatifloxacin and moxifloxacin shown to have increased activity against both fluoroquinolone sensitive and fluoroquinolone resistant gram-positive organisms.

Antibiotic resistance is a clinically significant issue. Increasing resistance of *Staphylococcus aureus* (*S. aureus*) and other gram-positive organisms to ciprofloxacin and ofloxacin has been noted in several studies. Levofloxacin does not appear to have more activity against these resistant organisms. Recent reports have shown that a relatively high level of in vitro resistance to fourth-generation fluoroquinolone antibiotics may exist in methicillin-resistant *Staphylococcus aureus* (MRSA) ocular surface isolates and in archived MRSA isolates. The purpose of this study was to examine the prophylactic use of fourth-generation fluoroquinolones and bacterial sensitivity to gatifloxacin, moxifloxacin, and earlier generation fluoroquinolone antibiotics in cases of acute endophthalmitis.

Forty-two eyes of 42 patients with acute endophthalmitis occurring within six weeks after cataract surgery were identified. All patients were seen in a referral vitreoretinal practice over a two-year time interval. The number of patients using prophylactic gatifloxacin or moxifloxacin and results of bacterial culture and sensitivity to all fluoroquinolone antibiotics were recorded.

Thirty-one of 42 eyes (74%) were treated with perioperative gatifloxacin or moxifloxacin and 24 eyes (57%) were continuously taking one of these antibiotics at the time of diagnosis. Nineteen eyes (45%) had a positive bacterial culture. The most frequent organism isolated was coagulase-negative *Staphylococcus*. Sensitivities were performed for 14 gram positive organisms, and sensitivities to

ciprofloxacin (50%), ofloxacin (44%), levofloxacin (46%), gatifloxacin (38%), and moxifloxacin (38%) were noted. Five organisms were resistant to gatifloxacin and moxifloxacin with a minimum inhibitory concentration of 8 µg/ml. All gram-positive organisms were sensitive to vancomycin. Median visual acuity improved from hand motions to 20/40 at last follow-up.

Authors concluded with the remarks that acute endophthalmitis can develop after cataract surgery despite the prophylactic use of fourth-generation fluoroquinolone antibiotics. Gram-positive organisms causing acute endophthalmitis are frequently resistant to all fluoroquinolones, including a significant number of cases resistant to gatifloxacin and moxifloxacin.

Atopic Disease and Herpes Simplex Eye Disease: A Population-Based Case-Control Study

Prabripataloong T, Margolis TP, Lietman TM, Wong IG, Mather R, Gritz DC
Am J Ophthalmol 2006; 142: 745-9.

Following peripheral inoculation, herpes simplex viruses (HSV) undergo retrograde axonal transport and establish life long latent infections in sensory neurons of the trigeminal and dorsal root ganglia. Intermittent reactivation of HSV from latently infected neurons leads to peripheral shedding of infectious virus, which under favorable conditions cause inflammation and lesion formation on the skin and mucosal surfaces. Shedding of HSV in and around the eye occurs frequently and can cause sight threatening ocular disease including keratitis, iritis, and retinitis. Rarely, reactivation of HSV causes encephalitis or disseminated infection.

Clinical observation suggests that atopic disease is a risk factor for severe and recalcitrant HSV infection. Patients with chronic or disseminated HSV skin disease, including eczema herpeticum, frequently have a history of atopic dermatitis, as do patients with bilateral HSV ocular disease. Furthermore, it has been our experience that atopic patients with HSV ocular disease often require higher doses of antiviral therapy courses or longer antiviral treatment or both, compared with patients without atopy.

The goal of the current study was to determine if atopy is a risk factor for the development of ocular herpes simplex virus disease. To accomplish this,

authors performed a retrospective case control study using population-based data from the Kaiser Permanente Healthcare Program of Northern California and compared the prevalence of atopic disease among patients with ocular herpes simplex infection to age matched controls drawn from patients visiting the same eye clinics and from the health plan membership communities.

Electronic database search for HSV ocular disease and subsequent chart review determined study eligibility. Two age matched control groups (one population-based and one clinic based) were randomly chosen. Medical record review determined the presence of atopy. Severe atopic disease was defined by diagnostic code or illness requiring an emergency room visit, hospitalization, or treatment with a systemic corticosteroid. Presence of HSV eye disease, presence of atopy, and characterization of atopy severity.

HSV eye disease was found in 172 patients. HSV cases had a greater prevalence of atopy (34%, 58/172) than the clinic-based (25%, 43/172) or the population-based controls (21%, 36/172, odds ratio (OR) 1.5, 95% confidence interval (CI) 0.9 to 2.6 and OR 1.9, 95%, CI 1.1 to 3.3, respectively). The association of HSV ocular disease with severe atopy was even greater, with a history of severe atopic disease in 13% (22/172) of patients with HSV ocular disease as compared with 6% (11/172) of patients in the clinic control group and 3% (5/172) of patients in the population control group (OR 2.0, 95% CI 0.7 to 5.9 and OR 4.8, 95% CI 1.6 to 19.2, respectively).

Authors concluded that patients with HSV ocular disease are more likely to have a history of atopic disease, especially severe atopic disease, than age-matched controls.

Wavefront Analysis and Contrast Sensitivity of Aspheric and Spherical Intraocular Lenses: A Randomized Prospective Study

Rocha KM, Soriano ES, Chalita MR, Yamada AC, Bottos K, Bottos J, Morimoto L, Nose W
Am J Ophthalmol 2006; 142:750-6.

Modern cataract surgery and lens replacement attempt not only to restore visual acuity, but also to improve visual function and protect the retina against light toxicity.

Deficiencies on optical quality of vision not detected by visual acuity measurement can be effectively evaluated by wavefront analysis and contrast sensitivity test. Wavefront technology can quantify low and high-order aberrations (HOA) present in an optical system. The high-resolution imaging in ophthalmic optics can be affected by high order aberrations such as coma and spherical aberration. Conventional spherical intraocular lens (IOLs) can degrade imaging quality, increasing the spherical aberration of the optical system. The light rays at the peripheral zones of a positive lens are refracted with larger angles and intersect the optical axis closer to the lens than the paracentral rays, producing positive spherical aberration.

Aspherical IOL designs can optimize image quality by limiting rays diffraction. They have been describe to improve visual function by means of reducing spherical aberration. The benefits of an IOL with short wave absorbing chromophores in terms of elevating the threshold for photochemical damage may provide more retinal protection than usual IOLs. It was also described that UV-absorbing IOLs do not cause contrast sensitivity and chromatic vision disturbance. The AcrySof IQ IOL includes blue light filter properties associated with a posterior aspheric design.

This randomized prospective study aims to clarify the relationships between total and high-order wavefront aberrations (coma, spherical aberration, and other terms of HOA and contrast sensitivity under photopic and mesopic conditions in eyes implanted with three different IOLs: AcrySof IQ (aspheric IOL with blue light filter), AcrySof Natural (spherical IOL with blue light filter), and advanced medical optics (AMO) Sensor (spherical IOL with no blue light filter).

Sixty patients were randomized to receive three IOL types: Alcon AcrySof IQ (40 eyes), AcrySof Natural (40 eyes), and advanced medical optic (AMO) Sensor (40 eyes). Complete ophthalmologic examination including uncorrected visual acuity (UCVA), best-spectacle corrected visual acuity (BSCVA), corneal topography, and wavefront analysis were performed pre-operatively, 30 days, and 90 days postoperatively. Pelli-Robson chart test and functional acuity contrast testing (FACT-Optec6500) were performed approximately 50 days after surgery. Statistical analyses were performed using analysis X^2 , analysis of variance (ANOVA), and multiple comparisons Tukey test.

After 90 days, all eyes had postoperative BSCVA $\geq 20/32$. The AcrySof IQ IOL showed statistically significant less induction of spherical aberration ($P < .001$) when compared with the AMO Sensor and the AcrySof Natural IOLs. The AMO Sensor presented significantly less spherical aberration than the AcrySof Natural ($P < .05$). The Acry Sof IQ also had lower values of total and high-order aberration (HOA) ($P < .05$) when compared with the AMO Sensor and the AcrySof Natural. The mean values of trefoil 9, coma, and HOA root mean square (RMS) decreased between one and three months ($P < .001$, $P < .001$, $P = .023$, $P < .001$, respectively) in all groups. Mean Pelli-Robson contrast sensitivity values in photopic condition were similar between the groups. The Acry Sof IQ showed better results in 3cpd spatial frequency in mesopic condition using FACT-Optec 6500 ($P = .008$), although there were no statistical differences in photopic and mesopic with glare conditions.