Abstracts

Edited by Dr. Tahir Mahmood

Effect of phacoemulsification on intraocular pressure in eyes with pseudoexfoliation Single-surgeon series

Shingleton BJ, Laul A, Nagao K, Wolff B, Donoghue MO, Eagan E, Flattem N, Desai-Bartoli S,
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Pseudoexfoliation (PFX) is characterized by the abnormàl production and accumulation of a fibrillar extra- cellular material with a gray appearance in the anterior segment of the eye and other tissues of the body. It is the most common identifiable cause of open-angle glaucoma, and there is an etio1oical association between PFX and cataract formation. Complication rates for cataract surgery in eyes with PFX are higher than in eyes without PFX. Because of the association of PFX with glaucoma and cataract, there is a need to assess the effect of cataract surgery on intraocular pressure (lOP) in such eyes. Several small series of PFX eyes having phacoemulsification show a small, but significant decrease in lOP after relatively short follow-up. The purpose of this study was to assess the short-term and long-term effects of uneventful phacoemulsification with posterior chamber intraocular lens (PC IOL) implantation for visually significant cataract in a large series of PFX eyes with and without glaucoma using the following parameters: best corrected visual acuity (BCVA), IOP, and glaucoma medication requirements.

This retrospective analysis comprised 1122 eyes with PFX having uneventful phacoemulsification with IOL implantation. Of the eyes, 882 did not have glaucoma (PFX group) and 240 had glaucoma (PXG group). A comparative outcomes analysis was performed; the analysis focused on lOP and change in glaucoma medication requirements between the groups.

The mean was statistically significantly reduced through 7 years postoperatively compared with preoperatively in the PFX group. The PXG group had reduced mean lOP for 1 year and reduced glaucoma medication requirements at almost all postoperative time intervals. Higher mean preoperative was associated with a greater reduction in mean lOP postoperatively in both groups. Intraocular pressure spikes (>30mm Hg) 1 day postoperatively occurred in 4% in the PFX group and 17% in the PXG group. Postoperatively, 2.7% of PFX eyes progressed to a need for glaucoma medication and 3.7% of PXG eyes progressed to a need for laser and/or glaucoma surgery.

Author concluded with the remarks that a long-term reduction in mean IOP occurred in PFX eyes with and without glaucoma. The IOP reduction was proportional to the preoperative lop; higher preoperative IOP was associated with a greater reduction in IOP. Glaucoma progression in both groups was low, suggesting a protective effect of phacoemulsification on IOP in these eyes.

Polypropylene suture-guided valve tube for posterior chamber implantation in patients with pseudophakic glaucoma

Moreno-Montafles J, Fantes F, GarcIa-Gomez P
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Authors described a new surgical procedure for implanting a glaucoma drainage tube in the posterior chamber. A needle with a 10-0 polypropylene suture is introduced into the posterior chamber, and a 23-gauge needle is also introduced as the barrel on the polypropylene needle tip. After the 23-gauge needle is withdrawn from the posterior chamber, the polypropylene needle tip is pulled and the suture crosses the anterior and posterior chambers. A sliding knot is made around the drainage tube. The tube is pushed into the scleral tunnel and posterior chamber as the suture is pulled to position the tube. The knot is loosened and the suture removed from the eye by pulling from either side. This procedure is easy and effective for implanting a tube in the posterior chamber in pseudophakic eyes and is indicated after penetrating keratoplasty or in eyes with compromised endothelial function.

Implantation of a glaucoma drainage device (GDD)) successfully controls surgical intraocular

pressure (IOP) and optic nerve damage. A study comparing GDD) implantation in the anterior chamber and trabeculectomy showed similar IOP reductions with both procedures alter 1 year. The incidence of postoperative complications was higher after trabeculectomy with mitomycin-C than with a GDD during the first year of follow-up. However, in some eyes, implanting a GDD in the anterior chamber may result in endothelial decompensation and corneal edema. These eyes include those with low endothelial cell density, Fuchs endothelial dystrophy, a shallow anterior chamber, extensive synechial angle closure, or need for posterior keratoplasty. Some reports have suggested that in these high-risk cases, it is advisable to insert the GDD into the posterior chamber if the patient is pseudophakic. However, in some eyes, it is difficult to implant a flexible silicone tube in the posterior chamber because the tube is pushed into the posterior chamber in restricted space under the iris without a clear microscopic view. In some cases, the iris or an intraocular lens (IOL) may complicate adequate implantation of the tube. We describe an easy and effective technique to facilitate implantation of the tube in the posterior chamber using a 10-0 polypropylene (Prolene) suture.

Topographically guided laser in situ keratomileusis for myopia using a customized aspherical treatment zone

Dougherty PJ, Waring III G, Chayet A, Fischer J, Fant B, Bains BS
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Customized corneal ablations to treat refractive errors using laser in situ keratomileusis (LASIK) or photorefractive keratectomy (PRK) can be based on corneal topography, whole-eye wave front, or corneal wavefront. Topography-based ablations treat irregularrities in corneal elevation in addition to the spherocylindrical refractive error. Alternatively, wavefront-based treatments address the wavefront aberrations of the cornea or of the entire eye in addition to the refractive error. Several studies show that topography-based ablations are safe and effective for the treatment of primary myopia and astigmatism. Custom ablation, whether topography based or ocular-wavefront based, was developed to address disadvantages of conventional spherocylindrical ablation. The unoperated, normal cornea is prolate, with an average positive asphericity of approximately + 0.24. Conventional excimer laser ablations for myopia create an oblate cornea and induce positive spherical aberration, which can cause bothersome mesopic and scotopic symptoms such as glare, halos, and difficulty driving at night.

The advantages of topography-guided treatments over wavefront-guided treatments are that topography-guided treatments deliver the treatment based on the shape of the cornea! surface, which (with the tear film) is the major refractive surface of the eye; topographers can measure and the excimer laser can treat a wider area because topographers measure a much wider diameter on the cornea (out to 11.50 mm) than aberrometers, which are limited by a 5.0 or 6.0mm pupil aperture; the treatments are not confounded by the presence of a cataract, an intraocular lens, or significant refractive gradients, as are whole-eye aberrometry measurements; topographers have a higher number of data points than aberrometers; the cornea is generally stable throughout life so a topography guided treatment is also more likely to be more stable than aberrometry measurements that take into account lenticular aberrations, which change throughout life.

The purpose of this study was to assess the efficacy, predictability, safety, and quality-of-life effects of topography- guided laser in situ keratomileusis (LASIK) for the correction of myopia with astigmatism using the EC-5000 CXII excimer laser equipped with a customized aspheric treatment zone algorithm.

In a multicenter United States Food and Drug Administration study of topography- guided LASIK, 4 centers enrolled 135 eyes with a spherical manifest refraction error ranging from -0.50 to -1.00 diopters (D) and astigmatism ranging from 0.50 to 4.00 D. All eyes were targeted for emmetropia. Refractive outcomes, higher-order aberrations (HOAs), and contrast sensitivity were analyzed preoperatively and postoperatively. Patient satisfaction was assessed using 2 questionnaires.

Six months postoperatively, the mean manifest refraction spherical equivalent in all eyes was -0.09 D ± 0.31 (SD); of the 131 eyes, 116 (88.55%) had an uncorrected visual acuity of 20/20 or better and 122 (93.13%) had an MRSE within ± 0.50 D. The best spectacle-corrected visual acuity (BSCVA) increased by 2 or more lines in 21(16.03%) of 131 eyes; no eye lost 2 lines or more of BSGVA. The total ocular HOA increased by 0.04 µm. Patients reported significantly

fewer night driving and glare/halo symptoms postoperatively than preoperatively.

Author concluded with the remarks that use of a customized aspherical treatment zone in eyes with myopia and astigmatism was safe, effective, and predictable and reduced symptoms associated with night driving, glare, and halos.

Corneal elevation and thickness in relation to the refractive status measured with the Pentacam Scheimpflug system

Uçakhan Ö Ö, Gesoglu P, Ozkan M, Kanpolat A
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Corneal topography is invaluable in the diagnosis of corneal disorders and in the screening and treatment of patients with refractive errors. With the increasing popularity and application of several types of refractive surgical procedures, cornea topography has become of utmost importance in determining patient suitability for refractive surgery and in monitoring corneal changes postoperatively. Diligent analysis of preoperative topography is required to avoid postoperative complications, in particular cornea! ectasia. Although the etiopathogenesis of cornea! ectasia is not completely understood, preoperative central corneal thickness less than 500 µm, patient age 25 years or younger, attempted correction greater than -8.00 diopters (D), refractive astigmatism that is not with the rule and is greater than 2.00 D, residual stromal bed thickness less than 250 µm, mean keratometry greater than 47.00 D, and preexisting forme fruste keratoconus (FFK) are proposed to be the main risk factors.

Although it may be difficult to differentiate FFK from normal keratoconus with reflection-based topography systems, numerous studies with relatively new systems that can measure anterior and posterior corneal elevation have linked high corneal elevation with FFK.On the other hand, although evidence on what is a truly safe preoperative central corneal thickness is lacking, most surgeons have generally accepted a pachymetry value thinner than 500 µm as a cutoff value for safe refractive surgery. Despite this, several studies report good results in thin cornea, while others report corneal ectasia in patients with a preoperative corneal thickness greater than 500 µm.

Unfortunately, little is known about the anterior or posterior elevation or corneal thickness distribution in the normal population. The aim of this study was to determine the range and distribution of elevation and thickness data in patients without keratoconus and with different types of refractive errors applying for refractive correction. This information may help better define normal from abnormal in refractive surgery screenings.

After the refractive errors in 215 consecutive patients were determined, corneal topography measurements with the Pentacam Scheimpflug system were taken in the right eye of all patients and the right eye of 31 healthy emmetropic volunteers. The eyes with refractive errors were assigned to 1 of the following 4 groups: myopia, myopic astigmatism, high myopia, and hyperopia. The means of the parameters of 3 Pentacam measurements were evaluated and compared.

Eyes with high myopia had significantly lower mean corneal thickness and volume measurements and higher mean anterior chamber depth (ACD) and anterior chamber volume (ACV) measurements than eyes in the other groups. The mean ACD, ACV, and anterior chamber angle were significantly lower in hyperopic eyes than in the other groups. The mean keratometry readings were statistically significantly flatter in the hyperopia group than in the other 4 groups.

Authors concluded with the remarks that eyes with high myopia had thinner corneas and deeper anterior chambers than emmetropic eyes and eyes in the other ametropic groups. Excluding eyes with hyperopia, which had significantly flat anterior and posterior elevation measurements, the elevation measurements in eyes with myopic refractive errors did not differ from each other or from those in emmetropic eyes. These findings may help clinicians and refractive surgeons using the Pentacam to better define normal from abnormal in the clinical setting.

Anti-vascular endothelial growth factor and retinopathy of prematurity

Jonathan E Sears JE
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Retinopathy of prematurity (ROP) has been at the nexus of a progressive understanding of neovascularisation, in large part because of the mouse model of oxygen-induced retinopathy (OIR) developed by Lois Smith. This model has been very

instructive, because it has crystallised the hypothesis that ROP in general is caused by a two-step or two-phase process, namely oxygen-induced vascular obliteration (phase I) followed by a hypoxia-induced over-production of vasoactive cytokines (phase II), such as vascular endothelial growth factor (VEGF), that is fuelled by increased metabolic demand, decreased oxygen supplementation and widespread local retinal ischaemia created by phase I hyperoxia.

The crucial experiments that truly shaped the concept of phase I and phase II were performed separately in Eli Keshet's and Lois Smith's laboratories in 1996, in which they showed that timely injection of VEGF during phase I could prevent retinopathy. This observation confirms the causative role of hyperoxia in downregulating the tonic production of growth factors critical to retinal development. Hyperoxia creates larger areas of unvascularised retina that are carried into phase II, providing a larger substrate for pathological angiogenesis, as it is the unvascularised retina that secretes excessive VECF. Additional studies have shown the effect of other growth factors, such as erythropoietin (Epo), in the OIR model. Each has a uniform finding - it is the timing of the application of these factors that decides whether they are harmful or helpful. Proangiogenic molecules, such as VEGF, Epo or other factors in the angiogenic cascade, prevent ROP when administered in phase I and exacerbate ROP when administered in phase II. This naturally suggests that anti-VECE therapy should be administered in phase II of the human disease.

These experiments also demonstrate that the levels of growth factors can be fine-tuned by adjusting the one drug that stimulates or inhibits their production: oxygen. These studies report that lower oxygen saturation targets at age less than 32 weeks corrected gestational age, with higher targets at age greater than 32 weeks, reduces the incidence of threshold ROE. Flynn et al. suggested that keeping children at 100% oxygen saturation after premature birth was non-physiological and therefore an irrational target saturation, because in utero, infants average 80% oxygen saturation.

The safety and efficacy of ranibizumab in the treatment of exudative age related macular degeneration has led to the speculation that VEGF therapies will also become a valid therapy for ROP. VECF protein concentration is elevated in the vitreous of ROP patients. ROP is unique in that there is a window of opportunity, which suggests that a single injection may lessen the need for destructive thermal treatments.

Corneal biomechanics, thickness and optic disc morphology in children with optic disc tilt

Lim L, Gazzard G, Chan Y-H, Fong A, Kotecha A, Sim E-L, Tan D, Tong L, Saw S-M
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Central cortical thickness (CCT) may be a surrogate marker for glaucoma susceptibility. Structural changes in the optic nerve head have been shown to precede or even predict functional deficits in glaucoma, while correlations between CCT and various optic nerve head morphological parameters have been demonstrated. CCT is significantly correlated with retinal nerve fibre layer (RNFL) thickness in both normal subjects and ocular hypertensives, and a thin RNFL may predispose to glaucoma. Larger optic discs are also more susceptible to glaucomatous damage, and, in a study on 212 eyes of 137 adult primary open angle glaucoma (POAC) patients, Pakravan it at described an inverse relationship between CCT and disc size. Similarly, Cankaya et al have described negative correlations between CCT and disc area, rim area, rim volume and RNFL area in 208 normal adult patients. Viestenz et al however, found that large discs were instead associated with thicker CCT in a population of 180 normal adult subjects.

The Reichert Ocular Response Analyser (ORA; Reichert Ophthalmic Instruments, Depew, New York) is a recently introduced device that measures the biomechanical properties of the cornea in vivo. The principal biomechanical parameter measured by the ORA is corneal hysteresis (CH). Low values of CH are often generally described to indicate a "soft" or "floppy" cornea-it is perhaps more accurate to say that a lower CH suggests that the viscous properties of the "visco-elastic" character are more prominent. CR is correlated with CCT, such that a thicker cornea has a larger CH, **or** greater dampening properties, and it has also been proposed that CH may likewise be a surrogate marker of glaucoma susceptibility through a relationship with the resistance of the optic nerve head to intraocular pressure (IOP) related deformation. In the only study of 230 adults examining the relationship between corneal hysteresis and glaucoma damage to date, Congdon et al reported that a lower CR but not CCT was associated with visual-field progression in glaucomatous eyes.

The aim of this study is to determine the associations between the corneal biomechanical parameters (CR, CRF; as measured by ORA), CCT and optic disc morphological measures and retinal nerve fibre layer thickness in normal Singaporean children.

The purpose of this study was to determine the associations between corneal biomechanical parameters as measured by the Reichert Ocular Response Analyser (ORA) and disc morphology and retinal nerve fibre layer thickness (RNFL) measured by the Heidelberg Retinal Tomograph (HAT) II in Singaporean children.

This is a cross-sectional study conducted on a subset of children enrolled in the Singapore Cohort Study of the Risk Factors of Myopia (SCORM). Corneal hysteresis (CH), corneal resistance factor (CRE) and central corneal thickness (CCT) were measured with the ORA. Optic disc morphology and ANFL thickness were assessed by the HRT II, Cycloplegic refraction and ultrasound A-scans were also performed, and disc tilt was assayed from stereo photographs.

102 subjects (mean age 12.01 (SD 0.57) years; range 11-14 years) were included in the study. The mean CH was 12.00 (1.40) mm Hg, the mean CRF was 11.99 (1.65) mm Hg, and the mean CCT was 581.12 (33.53) rim. Eyes with tilted discs had significantly longer axial lengths and more myopic refraction than eyes without tilted discs. There were no significant correlations between CH, CRF or CCT and the HAT II parameters, after the application of the Bonferroni correction. When stratified for disc tilt, however, the global disc area was significantly correlated with CCT ($r = -.49$, $p = 0.001$).

Authors concluded with the remarks that the corneal biomechanical properties as measured with the ORA do not vary with optic disc parameters or RNFL Central corneal thickness is correlated with disc area in Singaporean schoolchildren with tilled discs. This relationship may influence glaucoma risk in myopic subjects.