

Abstracts

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Quality-of-life improvements in cataract patients with bilateral blue light-filtering intraocular lenses.

Espindle D, Crawford B, Maxwell A, Rajagopalan K, Barnes R, Harris B, Hileman K.

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Progressive vision impairment due to cataract growth can result in significant reduction in patients quality of life (QOL). Specifically, patients may have difficulty driving, reading, and performing other daily activities that depend on vision. Cataract extraction with implantation of intraocular lens (IOLs) has become a widely used treatment for cataract patients and can result in improvements in patient's self-reported visual function and QOL.

Because cataract surgery can change patients' QOL, self-assessment of visual function and health-related quality of life (HRQOL) are important outcome measures.

The purpose of this study was to compare change in patient-reported vision-related and health-related functioning and quality of life (HRQOL) following bilateral implantation with a new blue light-filtering intraocular lens (IOL) with the results of a similar IOL that does not filter blue light.

Patients were enrolled from 6 clinical sites in the United States that performed a high volume of cataract surgeries. The HRQOL assessments occurred via telephone while patients were at home. Patients requiring bilateral cataract extraction were randomly assigned to 1 of the 2 IOL groups for the first eye. The second eye was later implanted with the same type of IOL. Patients and HRQOL data collectors were treatment-masked, but investigators could not be. Health-related functioning and quality of life was measured with the 39-item National Eye Institute Visual Functioning Questionnaire (NEI VFQ-39) and 12-item Short Form Health Survey (SF-12). Assessments were at baseline before implantation in the first eye and 30 to 60 days and 120 to 180 days after implantation of the lens in the second eye.

Both IOL types improved most aspects of patients' HRQOL including color vision and driving. The

largest gains occurred on the VFQ composite, general vision, near activities, distance activities, driving, mental health, peripheral vision, and role difficulties scales. Significant gains also occurred on color vision and other vision-specific scales as well as the SF-12 physical component summary score. There were no significant differences in HRQOL gains between the IOLs.

The authors concluded with the remarks that the blue light-filtering IOL improved color vision, driving, and other aspects of HRQOL in a manner similar to that of a lens that does not filter blue light.

Effect of postoperative refractive error on visual acuity and patient satisfaction after implantation of the Array multifocal intraocular lens

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In the management of cataract surgery, using a state of the art surgical technique, accurate biometry, and third generation power calculation formulas have made it possible to improve uncorrected distance visual acuity (UCDVA). This eventually leads to a high quality of life. Currently available monofocal intraocular lenses (IOLs) have a single focal distance and therefore require the patient to wear glasses to focus at near distances.

Various approaches have been proposed to give patients good vision through a range of distances after cataract surgery. Accommodating IOLs are currently in use but have limitations in that anterior posterior movements are not sufficient to provide the degree of accommodation required. Capsule filling with flexible polymeric gels is another approach, but preliminary animal experiments have revealed limitations such as capsule fibrosis. Bifocal and multifocal IOLs have had the most success in restoring a range of functional vision after cataract surgery.

The Array multifocal IOL (SA40N), Advanced Medical Optics) uses a series of 5 concentric rings on the apical surface, alternating between distant-

dominant zones and near dominant zones with a + 3.50 diopter (D) add. Unlike bifocal IOLs, the Array multifocal IOL provides functional near, intermediate, and distance vision and has a zonal progressive design to provide a smooth transition between zones and to diminish glare and night halo.

The purpose of this study was to determine the ideal target refraction to optimize visual acuity (VA) and patient satisfaction after implantation of Array SA40N multifocal intraocular lens.

The study prospectively enrolled 188 eyes of 163 patients and assigned them to 1 of 3 groups according to their postoperative refractive status: Group 1 (43 myopic eyes, 0.50 diopter [D] to -1.50 D), Group 2 (114 emmetropic eyes, -0.50 D to +0.50 D) and Group 3 (31 hyperopic eyes, + 0.50 D to +1.50 D). Uncorrected distance visual acuity (UCDVA), uncorrected near visual acuity (UCNVA), UCDVA under glare conditions, contrast sensitivity, and patient satisfaction were then compared between the 3 groups.

Three months postoperatively, UCDVA, UCNVA, UCDVA under glare conditions, and contrast sensitivity were good in all eyes and more than 72% of patients never wore glasses for near vision. In Group 2, UCDVA was significantly better (0.74 ± 0.20 ; $P < .05$) compared with Groups 1 and 3 (0.40 ± 0.24 and 0.38 ± 0.30 , respectively); UCNVA was also significantly better in Group 2 (0.68 ± 0.08 ; $P < .05$) than in Groups 1 and 3 (0.45 ± 0.21 and 0.41 ± 0.17 , respectively). However, there were no significant differences in patient satisfaction, contrast sensitivity, and UCDVA under glare conditions between the 3 groups ($P > .05$).

The authors concluded with the remarks that the aiming for emmetropia rather than myopia when calculating the power for the multifocal intraocular lens may improve visual acuity. However, patients must be considered on an individual basis to meet their expectations and requirements.

Effect of preoperative counseling on patient fear from the visual experience during phacoemulsification under topical anesthetics

Voon LW, Eong KGA, Saw SM, Verma D, Laude A. *J Cataract Refract Surg* 2005; 37:7966-9.

Cataract surgery is the most common eye surgery performed worldwide. Cataract surgery rates are

estimated to be about 3500 to 3000 per million of the general population in developed countries. With advances in technology, a large proportion of cataract surgeries are currently carried out using phacoemulsification performed under topical anesthesia.

The subjective visual experience of patients during cataract surgery has been reported in several studies. In general, these papers report similar visual experiences during cataract surgery: no perception of light, light perception, perception of 1 or more colors, flashes of light, movements, instruments, and surgeon's hands or fingers. Of clinical significance is that some patients have found these visual sensations frightening.

The purpose of this study was to determine whether preoperative counseling about potential intraoperative visual experience during phacoemulsification under topical anesthesia reduces fear in patients having cataract surgery.

In this prospective multicenter randomized clinical trial, patients with cataracts having elective phacoemulsification under topical anesthesia were recruited and randomized into 2 groups. Both groups received routine preoperative counseling regarding risks and benefits of cataract surgery. One group received additional counseling on the potential intraoperative visual experience during phacoemulsification; the other group did not. The patients were then interviewed within 24 hours following phacoemulsification regarding their intraoperative experience.

Two hundred nineteen patients were recruited over an 11-month period. There were 104 men and 115 women. The mean age was 68 years (range 20 to 89 years). There were 188 Singaporeans, comprising 168 Chinese, 13 Malays, and 7 Indians, and 31 British patients, all of whom were white. The mean fear score was 0.3 in the group that received additional counseling and 0.9 in the group that did not receive additional counseling ($P = .036$). The effect of counseling on fear was significant ($P = .002$) even after controlling for sex, age, and whether first or second cataract surgery.

The authors concluded with the remarks that the Preoperative counseling about the potential intraoperative visual experience during phacoemulsification under topical anesthesia helped to reduce the fear from the visual sensations in patients having cataract surgery.

Predicting patients' night vision complaints with wavefront technology

Tuan KA, Chernyak D, Feldman ST.
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If the human eye were a perfect optical system, the appearance of a point source of light would be limited only by diffraction effects, and the source would appear as a single point to the observer. In addition to spherocylindrical components, the optical system of the human eye generates other complex optical aberrations, which contribute to the distortion of retinal images and determine the quality of the image formed on the retina. The optical imperfections of the eye cause rays of light traveling from a point source through the eye's optics to intercept the retina at different locations, thereby blurring the appearance of the point. The distorted appearance of the point on the retina is called a point-spread function (PSF).

The recent development of wavefront aberrometers for use in ophthalmology has given clinicians an objective measurement method for optical aberrations other than sphere and cylinder. The wavefront maps generated by such devices represent deviations from the ideal diffraction limited optical systems and enable the physician to precisely diagnose visual impairment. In addition to guiding customized refractive surgery, wavefront sensors can be used to evaluate the source of visual complaints. The appearance of the PSF can be computed directly from the wavefront measurement and corroborated by the patient with a simple drawing.

The purpose of this study was to evaluate the accuracy of the diagnostic capabilities of optical metrics generated from wavefront measurements in relationship to post-laser-assisted in situ keratomileusis (LASIK) visual complaints as expressed and drawn by patients.

Patient wavefront data from an investigational device exemption study for wavefront-guided ablations were used to derive normative modulation transfer function (MTF), encircled energy (EE), and Strehl ratio. These optical metrics and their point-spread functions (PSF) were compared with data from five postoperative patients with night vision complaints. Patients were asked to draw their symptoms, which were elicited by testing with a Fenthoff muscle light, while using their best-corrected distance vision.

The MTF, EE, and Strehl ratio of most patients were markedly different from those of the averages of 208 normal myopic eyes before and after LASIK surgery. The spatial extent of the PSF correlated positively with the severity of the visual complaints. Wavefront-derived PSFs were markedly similar to the patients' drawings.

The authors concluded with the remarks that the results of this study demonstrated the diagnostic capability of the wavefront system in predicting visual symptoms and complaints of patients with high-order aberrations. Objective visual metrics from patients with night vision complaints were different from those of normal myopic eyes that had undergone LASIK procedures.

Comparison of three methods of measuring corneal thickness and anterior chamber depth

Buehl W, Stojanac D, Sacu S, Drexler W, Findl O.
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Parallel to the developments of surgical technique in cataract and refractive surgery, the accurate measurement of corneal topography, anterior chamber depth, thickness of the crystalline or artificial lens, and eye length has gained in importance. Until recently, ultrasound biometry has been a common method for measuring corneal thickness (CT) and anterior chamber depth (ACD). However, this method is operator dependent. The most common method is applanation ultrasound, requiring corneal contact, which may lead to false results due to indentation of the cornea. The measuring results also depend on the exact axial placement of the probe relative to the center of the cornea. Like all contact methods, it may be uncomfortable for the patient or even lead to damage of the corneal epithelium. Thus, noncontact methods are preferred for biometry of the eye.

An accurate noncontact ocular biometry technique, based on the dual laser beam partial coherence interferometry (PCI) principle, has been developed in the past decade. The PCI technology has been used for precise axial length measurements and resulted in the commercially available IOL Master (Carl Zeiss Meditec, Jena, Germany). However, the IOL Master uses a photographic (not PCI) technique for measuring ACD. Therefore, the AC-Master (Zeiss Meditec) has been developed for PCI measurements of central corneal thickness (CCT) and ACD as well as

lens thickness. The precision of this technique is in the micron region, and it is highly reproducible.

In addition, several other optical (non-PCI) methods for imaging and measuring the corneal surface and the anterior chamber of the eye have been developed recently and are already commercially available. One of these is the Pentacam (Oculus, Wetzlar, Germany), which uses a rotating Scheimpflug camera to image the anterior segment of the eye. It is also a noncontact method, and it is specifically designed to calculate a three dimensional model of the anterior segment, including data for corneal topography (also of the posterior corneal surface), CT pachymetry), ACD measurements, and measurements of lens opacity and lens thickness.

An already established instrument for analysis of cornea and anterior chamber, which does not make use of the Scheimpflug principle, is the Orbscan (1) scanning slit topography system (Orbtek Inc, Salt Lake City, Utah, USA). It uses a horizontally moving slit beam to produce multiple slit images of the anterior segment and provides data for (anterior and posterior) corneal topography and ACD.

The purpose of this study was to compare three different methods of measuring corneal thickness (CT) and anterior chamber depth (ACD).

Central CT (CCT), CT at four peripheral points, and central ACD were measured in 88 eyes of 44 healthy subjects with the Pentacam (rotating Scheimpflug camera; Oculus, Wetzlar, Germany), Orbscan I (scanning-slit topography system; Orbtek Inc, Salt Lake City, Utah, USA), and AC-Master (partial coherence interferometry; Zeiss Meditec, Jena, Germany), and the results were compared.

The upper (lower) limits of agreement for CCT measurements were 7.9 (-22.2) μm between AC-Master and Pentacam, 17.6 (-32.5) μm between AC-Master and Orbscan, and 25.2 (-25.9) μm between Pentacam and Orbscan. Correlation was high between all three methods ($r = 0.94$ to 0.97). The upper and lower limits of agreement for ACD were 0.174 (-0.251) mm between AC-Master and Pentacam, 0.406 (-0.004) mm between AC-Master and Orbscan, and 0.384 (0.095) mm between Pentacam and Orbscan. Correlation was high between the three methods ($r = 0.96$ between Orbscan and Pentacam; others 0.92). Correlation was lower for the CT measurements at the four peripheral points.

The authors concluded with the remarks that the CCT and ACD values obtained by Pentacam, Orbscan, and AC-Master measurements correlated well and

showed few outliers. The two new systems (Pentacam, AC-Master) provide a reliable, easy-to-use, noncontact method of measuring CCT and ACD. Larger differences occurred only when measuring peripheral CT values, especially between AC-Master and the other two methods.

Categorizing the stage of glaucoma from pre-diagnosis to end-stage disease

Mills RP, Budenz DL, Lee PP, Noecker RJ, Walt J, Siegartel LR, Evans SJ, Doyle JJ.
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In the united states glaucoma is the second leading cause of blindness in the general population and the leading cause of blindness in black patient. Although only half of the individuals who have the disease are aware of their condition, glaucoma affects approximately 2.5 million people, including three percent of the age 55 years and older. Annual US healthcare costs glaucoma total an estimated \$2.5 billion, including \$ 1.9 billion in direct costs and \$0.6 billion in indirect costs. Additionally, costs for the treatment of a newly diagnosed case of open-angle glaucoma have been estimated at \$1055 per year. For the approximately 120,000 patients who have become blind as a result of glaucoma, costs benefits, healthcare, and reduced tax revenues total \$1.5 billion per year.

Primary open-angle glaucoma (POAG), accounting more than 90% of US cases of glaucoma, is a chronic progressive disease characterized by optic disk cupping and visual field loss. Although this form of glaucoma commonly associated with elevated intraocular pressure (IOP), more than two-thirds of patients with IOP exceeding 21 mm Hg do not have glaucoma. As 15% of patient with glaucoma have a normal IOP of 21 mm Hg or less on a consistent basis, there are factors other than IOP that likely contribute to disease development.

A glaucoma staging system (GSS) provides a way measuring the progress of glaucoma in patients who have the disease. With clearly defined stages of disease progression, it becomes possible to observe disease progression, and thus gauge the effectiveness of treatment at each stage. The definition of each disease stage needs to be adequately precise to allow patients at different stages of disease and from different glaucoma treatment centers to be

meaningfully compared. Further, such a system must allow for precise categorization without ambiguity, and must be easily usable and provide consistent (reliable) results.

The purpose of this article is to provide a reliable, comprehensive staging system to assess glaucoma stage in the absence of an universally accepted glaucoma staging system (GSS) on the basis of visual field results.

After a review of published GSSs was conducted, the Bascom Palmer (Hodapp-Anderson-Parrish) GSS was selected as an appropriate platform for a retrospective GSS on the basis of visual fields. The system was modified by a panel of glaucoma specialists, and additional modifications were made after pilot testing to cover the full range of disease progression, from preglaucoma diagnosis to complete blindness; the ordered stages reflect the typical progression of glaucoma.

The GSS is comprised of six ordered stages and is on the basis of the Humphrey visual field. The completed GSS was validated by reviewing patient charts from 12 US glaucoma centers.

The authors concluded with the remarks that the GSS allows accurate staging of 100% of glaucoma on the basis of visual fields and other data, enabling evaluation of disease progression and resource utilization at various glaucoma stages. Additionally, treatment costs may be assigned to determine cost-effectiveness of treatment. Research utilizing the GSS has found that cost of care increases with increasing disease severity. The GSS may be used as the basis for creating treatment guidelines, which have the potential to delay glaucoma progression and lower treatment costs.