Capsular complications are 3 times more common in patients operated by inexperienced cataract surgeons

**Objective:** To identify preoperative and intraoperative factors associated with an increased risk of capsular complications during phacoemulsification.

**Design:** Case-control study.

**Participants:** 324 patients and 331 controls.

**Methods:** Data from the Swedish National Cataract Registry were used to identify patients who experienced a posterior capsule rupture or zonular dehiscence during phacoemulsification. Controls who underwent cataract surgery and did not experience such a complication were also selected randomly from the database. Medical records were reviewed of all subjects to identify preoperative demographic and clinical characteristics, and surgical records were evaluated to identify intraoperative factors. A multivariate logistic regression analysis was performed to identify independent factors associated with the occurrence of a capsular complication. Surgeon inexperience was defined by surgeons having been in independent practice ≤3 years at the time of performance of cataract surgery.

**Results:** Preoperative factors associated with capsular complications included prior ocular trauma, presence of a white and hard/brunescent cataract, and small pupil size after maximal pharmacologic dilation. In addition, surgeon inexperience was significantly associated with a higher risk of capsule complications. Patients with previous ocular trauma had an odds ratio (OR) of 15.6, indicating a nearly 16-fold increased occurrence of capsular complications associated with this factor. A similar magnitude of increased risk was associated with preexisting phacodonesis prior to surgery. OR for a white or brunescent cataract was in the range of 3.0 to 3.5. Similarly, inexperienced surgeons were overrepresented by a 3-fold factor among cases in comparison to controls.

**Conclusions:** A variety of preoperative clinical factors, as well as surgeon inexperience, contribute to an increased risk of capsular complication during cataract surgery.

**Reviewer's Comments:** Identification of the risk factors noted in this study, with the possible additional influence of pseudoexfoliation, is important in order to properly counsel patients on the risks of cataract surgery. Patients who have these risk factors should be informed that the likelihood of a routine surgery is significantly less than in other patients. In addition, inexperienced surgeons should carefully consider potential difficulties associated with performing surgery in patients with these risk factors, and should schedule cases that they are prepared to handle so that their experience can increase without compromising patient outcomes and without shaking their own confidence as cataract surgeons. (Reviewer-Scott D. Smith, MD, MPH).

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Keywords: Cataract Surgery, Complications, Preoperative, Intraoperative

Print Tag: Refer to original journal article
Objective: To measure spectacle dependence after bilateral phacoemulsification with monofocal intraocular lens (IOL) implantation and to assess the influence of postoperative refractive error on spectacle dependence.

Design: Prospective, comparative interventional clinical study.

Participants: 300 patients ages ≥30 years with bilateral visually significant cataracts.

Methods: Each patient underwent bilateral, sequential phacoemulsification with implantation of a monofocal IOL. Patients with ocular pathology expected to reduce postoperative visual acuity were excluded, as were those with >1.5 diopters of astigmatism. Patients underwent a clinical examination 4 months after the second eye was operated, including measurement of visual acuity and refractive error, and a subjective assessment of their spectacle dependence for distance and near tasks.

Results: 78% of patients reported never requiring distance glasses. Of patients, 17% reported needing distance glasses only for driving and watching television, while 5% reported always requiring distance glasses. Spherical equivalent refractive error was not significantly different between these groups. In contrast, those patients who always required glasses had significantly greater astigmatism, with nearly 1.25 diopters in comparison to 0.75 diopters in those who required glasses for driving and television only and 0.50 diopters for those who never required glasses. Of patients, 67% reported always requiring reading glasses, while 28% reported requiring them for fine print only and 5% never required reading glasses. Those patients who never required reading glasses had significantly greater myopic spherical equivalent refractive error of -0.6 diopters, compared to emmetropia in the other groups.

Conclusions: Presence of postoperative astigmatism is predictive of greater dependency upon distance glasses in patients undergoing cataract surgery with monofocal IOL implantation. Greater myopic refractive error, at least in 1 eye, is predictive of less dependency upon reading glasses in these patients.

Reviewer’s Comments: It is important to understand that in patients having monofocal or multifocal IOLs, management of corneal astigmatism is essential if distance spectacle independence is to be anticipated. In this study, even levels of corneal astigmatism as small as 0.75 diopters resulted in greater distance glasses dependency. If patients choose not to undergo implantation of a toric intraocular lens, or some other procedure to manage astigmatism, then counseling them in advance of surgery that glasses are likely to be needed is important in order to avoid unrealistic expectations after surgery. (Reviewer-Scott D. Smith, MD, MPH).

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Keywords: Cataract Surgery, Patient Satisfaction, Spectacle Use

Print Tag: Refer to original journal article
Long-term visual outcomes are worse for patients who experience posterior capsule rupture or zonular dehiscence during cataract surgery.

**Objective:** To evaluate long-term visual outcomes after cataract surgery, comparing patients with and without capsular complications at the time of surgery.

**Design:** Case-control study.

**Participants:** 171 cases and 198 controls.

**Methods:** Data were collected from the *Swedish National Cataract Registry* to identify patients who experienced capsular complications at the time of cataract surgery. Control patients who experienced no complications were also identified randomly. Study subjects were invited to return for a follow-up evaluation 3.5 years after cataract surgery in order to evaluate clinical outcomes and visual acuity. In those patients who were found to have posterior capsule opacification, final visual acuity was re-measured after performance of a laser capsulotomy in order to get a more accurate reflection of the visual potential.

**Results:** Visual outcome was significantly worse in cases compared to controls, with 26% having visual acuity of worse than 20/40 compared to 10% in the control subjects (*P* < 0.001). Of cases, 27% had visual acuity less than or equal to preoperative levels, compared to only 14% of controls (*P* < 0.005). Mean intraocular pressure was higher in cases compared to controls (16.2 vs 15.0 mmHg, *P* = 0.001). In addition, persistent corneal edema was more commonly seen in cases than controls (6.4% vs 1.0%, *P* < 0.01). Cases also experienced more subjective difficulties with their vision (34.3% vs 15.8%, *P* < 0.001). Refractive outcome was also less stable with low myopia and more astigmatism in cases than controls.

**Conclusions:** Visual outcomes are affected by the occurrence of capsular complications at the time of phacoemulsification.

**Reviewer's Comments:** This study confirms that long-term visual outcomes are indeed affected by capsular complications, and that patients with risk factors must be counseled about the increased risk. This should be weighed into the decision-making process. In addition, less experienced surgeons should consider referral of patients that they are not prepared to handle independently to a more experienced surgeon until their level of experience in more routine cases increases. (Reviewer-Scott D. Smith, MD, MPH).

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*Keywords: Cataract Surgery, Complications, Long-Term Outcomes*

*Print Tag: Refer to original journal article*
Excessive bottle height can lead to turbulence of irrigating fluid in the anterior chamber that damages the corneal endothelium.

**Objective:** To measure the effect of bottle height on intraocular pressure (IOP) during phacoemulsification and its influence on corneal endothelial cell loss after the procedure.

**Design:** Prospective laboratory and clinical investigation.

**Methods:** Simulated phacoemulsification performed in porcine eyes with phacoemulsification equipment and instrumentation that permitted continuous monitoring of IOP during the procedure. Surgery was performed with the irrigating bottle height set to 2 different levels, 65 cm and 19 cm above the level of the eye. IOP was compared between groups. The clinical study consisted of measurement of corneal endothelial cell density and corneal edema by quantitative Scheimpflug photography in 63 patients undergoing phacoemulsification. Patients were randomly assigned to undergo the procedure with the bottle height set either at 60 cm or 30 cm above the level of the eye. Follow-up specular microscopy and Scheimpflug photography was performed at periodic intervals for 3 months after surgery.

**Results:** In the simulated phacoemulsification in animal eyes, IOP was significantly greater with a higher bottle height. Mean IOP was 53 mmHg compared to 22 mmHg with the lower bottle height ($P < 0.05$). In the clinical study, a higher bottle height was associated with significantly greater corneal endothelial cell loss and a longer duration of corneal edema following surgery.

**Conclusions:** IOP elevation and a higher irrigation fluid flow rate caused by an increased bottle height appear to result in damage to the corneal endothelium during phacoemulsification.

**Reviewer's Comments:** Cataract surgeons should remember that the rate of irrigating fluid inflow into the anterior chamber is determined by the difference in height of the irrigating fluid bottle and the eye, and may differ depending on the height of the operating table and anatomy of the patient. While sufficient inflow rate is required to maintain a deep anterior chamber, minimum bottle height necessary to provide anterior chamber stability should be used in order to minimize volume and turbulence of irrigating fluid in the anterior chamber, and thus minimize trauma to the corneal endothelium. (Reviewer-Scott D. Smith, MD, MPH).

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Keywords: Cataract Surgery, Complications, Cornea, Bottle Height

Print Tag: Refer to original journal article
Use of a structured surgical curriculum beginning in the first year of residency can significantly reduce third-year resident surgical complication rates.

Objective: To determine whether the institution of a structured surgical curriculum for ophthalmology resident cataract surgery training alters the rate of surgical complications in third-year resident cases.

Design: Retrospective, comparative clinical study.

Participants: 1832 cases.

Methods: A review was performed of third year ophthalmology resident surgical outcomes at a Veterans' Administration hospital during a 10-year period. Cases where a posterior capsule rupture or vitreous loss occurred during a resident-performed case were identified. Study population was divided into 2 groups based upon the institution of a structured surgical curriculum in the ophthalmology residency training program. Those residents who participated in the new program were evaluated separately from those who had not participated during the first and second years of residency.

Results: After institution of the new surgical curriculum, a significant reduction in surgical complications was observed (7.2% vs 3.8%, P=0.01). Although complications occurred more frequently with less experienced surgeons, a reduction in surgical complication rate was seen both in less experienced surgeons who had performed <60 cases, as well as those where the ophthalmology residents had already performed ≥60 cases.

Conclusions: Implementation of a structured surgical curriculum for cataract surgery training significantly reduces the complication rate in resident-performed cataract surgery.

Reviewer's Comments: The Accreditation Counsel for Graduate Medical Education (ACGME) has pushed for a shift in residency training to a competency-based model where residents, rather than simply being required to perform a specific number of cases, must demonstrate proof of competence. Implementation of the surgical curriculum evaluated in this study came as a result of this process, and showed a significant impact on the surgical outcomes of third-year residents. Implementation of similar programs in residencies across the country could lead to a significant benefit both to ophthalmology residents, the patients they care for, and their future patients as they will leave residency better prepared to perform ophthalmic surgery independently. (Reviewer-Scott D. Smith, MD, MPH).

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Keywords: Cataract Surgery, Complications, Curriculum, Residents

Print Tag: Refer to original journal article
Post-LASIK dry eye symptoms occur significantly less frequently in patients who undergo flap creation with the femtosecond laser.

**Objective:** To compare incidence of laser in situ keratomileusis (LASIK)-associated dry eye symptoms in patients undergoing the procedure with flap creation by the femtosecond laser or a mechanical microkeratome.

**Design:** Randomized, controlled clinical trial.

**Participants:** 113 eyes of patients without other eye disease undergoing routine myopic LASIK.

**Methods:** Patients were randomly assigned to have 1 eye included in the study, which was then randomly assigned to have flap creation with either a Hansatome microkeratome or the IntraLase femtosecond laser. Postoperative evaluation 1 month after surgery was performed to determine the presence of superficial punctate epitheliopathy, which was graded according to the standardized grading scale. In addition, patients underwent subjective evaluation with a questionnaire to determine the presence and severity of dry eye symptoms.

**Results:** Clinical and demographic characteristics between groups were similar. Mean flap thickness was greater in the microkeratome group than the femtosecond laser group (131 vs 111 µm, \( P < 0.0001 \)). LASIK-induced neurotrophic corneal epitheliopathy was significantly more common in the microkeratome group, occurring in 46% of patients in comparison to only 8% in the femtosecond group (\( P < 0.0001 \)). In the microkeratome group, there was no significant association between corneal flap thickness and incidence of LASIK-induced dry eye.

**Conclusions:** LASIK-induced dry eye symptoms occur significantly less frequently when corneal flap creation is performed with the femtosecond laser rather than with a mechanical microkeratome.

**Reviewer's Comments:** LASIK-induced dry eye symptoms have been attributed to neurotrophic epitheliopathy related to injury to the corneal nerves during flap creation and stromal ablation. Although the reason that corneal nerve injury appears to be more extensive with the mechanical microkeratome is not clear, this clinical study clearly shows a rather dramatic difference in incidence of this common complication after LASIK. As the femtosecond laser becomes more widely used in the performance of this procedure, even higher levels of patient satisfaction and lower complication rates may be observed. (Reviewer-Scott D. Smith, MD, MPH).

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Keywords: Refractive Surgery, Dry Eye

Print Tag: Refer to original journal article
Objective: To evaluate long-term clinical results of intrastromal corneal ring segment (ICRS) implantation for the management of progressive keratoconus.

Design: Retrospective consecutive interventional clinical case series.

Methods: Clinical records of 35 eyes of 28 patients who underwent implantation of ICRS for the management of progressive keratoconus were reviewed. Most patients required surgery due to progressive intolerance to contact lens wear, progression of ectasia, or both. Patients were excluded if they had advanced keratoconus with maximum corneal curvature >62 diopters, significant apical opacity or scarring, excessive thinning <300 µm in the anticipated ICRS track, or other ocular diseases aside from keratoconus. Patients included in the study had ≥5 years of follow-up data.

Results: Significant improvement in best-corrected visual acuity was seen at the 1-year follow-up time point, with improvement to 20/30 from a baseline of 20/50. In addition, this level of visual acuity was maintained throughout 5 years of follow-up. Similarly, improvement in the maximum corneal curvature was seen from a mean of 54 diopters to 48 diopters, which also remained stable through 5 years of follow-up.

Conclusions: Long-term stability of best-corrected visual acuity and corneal topography can be achieved with implantation of ICRS in patients with progressive keratoconus.

Reviewer's Comments: In patients who have become contact lens intolerant and where surgical intervention is required, ICRS implantation offers the possibility of avoidance of penetrating keratoplasty and may be considered as a good surgical option. However, in patients who have apical scarring where best corrected visual acuity would be reduced even if improvement in the corneal topography were achieved, penetrating keratoplasty remains a better surgical option. (Reviewer-Scott D. Smith, MD, MPH).
The ice pack test is reasonable in the evaluation of patients with diplopia.

**Background:** Myasthenia often presents with strabismus and/or ptosis. The ice test has been reported to have high sensitivity and specificity for ptosis.

**Objective:** To describe the ice test among patients with diplopia, ptosis, or both.

**Design:** Prospective cohort study.

**Participants:** 89 patients from a single center in Greece.

**Methods:** Patients were included if they had symptoms of ptosis, diplopia, or both for <1 month of unknown cause. Each patient had an ice pack placed over both eyes for 5 and/or 10 minutes. Ocular motility, cover testing, and eyelid position in primary gaze were assessed before and after ice application. Laboratory testing included acetylcholine receptor antibody (AchRAb) testing, Westergren erythrocyte sedimentation rate, fasting glucose and glycosylated hemoglobin, BUN, creatinine, and antinuclear antibodies. Anti muscle-specific antibodies were checked if AchRAb were normal. The neostigmine test was administered in patients considered suspicious for myasthenia. The ice test was considered positive if the margin reflex distance improved by ≥2 mm or if the ocular alignment measured by cover testing improved by ≥50%. Each patient was followed for 6 months to assign a cause to the diplopia or ptosis.

**Results:** There were 56 men and 33 women with a mean age of 54 years. Mean follow-up was 9 months. Of patients, 48 had isolated diplopia (Group 1), 25 patients had both ptosis and diplopia (Group 2), and 16 had isolated ptosis (Group 3). Of patients, 15 were diagnosed with myasthenia gravis: 2 in Group 1; 11 in Group 2; and 2 in Group 3. The 5-minute ice pack test was positive in 9 of 73 patients with diplopia and 8 of those were diagnosed with myasthenia. The ice test was positive in 15 of 41 patients with ptosis and 13 of those were diagnosed with myasthenia. Sensitivity of the ice pack test for diplopia was 77%. When the ice test was applied to either ptosis or diplopia, sensitivity rose to 93%. Only 1 patient experienced a positive 10-minute test when the 5-minute test was negative.

**Conclusions:** The ice pack test showed reasonable sensitivity and high specificity for myasthenic diplopia. A positive result is if the misalignment improves by at least half the deviation measured by cover testing.

**Reviewer’s Comments:** These patients need to be measured in primary position within 2 minutes of removing the ice. In order to call this a positive test, I would recommend you see a dramatic improvement in alignment to eliminate any bias. This is a reasonable test since it is quick, inexpensive, and has low morbidity. (Reviewer-Michael S. Lee, MD).

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Keywords: Diplopia, Ptosis, Myasthenia, Ice, Testing

Print Tag: Refer to original journal article
Isolated fourth nerve palsy secondary to an isolated trochlear nerve schwannoma has a good prognosis.

**Background:** Schwann cells support peripheral nerves. Rarely, proliferation of these cells can lead to schwannomas on the ocular motor cranial nerves.

**Objective:** To describe the clinical course of patients with fourth nerve palsy secondary to an isolated schwannoma.

**Design:** Retrospective observational case series.

**Participants:** 37 patients from 9 tertiary care centers in the United States.

**Methods:** Patients were eligible for inclusion if they had the clinical characteristics of an isolated fourth nerve palsy and a brain MRI showing an isolated schwannoma. Masses needed to be along the course of the fourth nerve isointense to brain parenchyma on pre-contrast images and demonstrate gadolinium enhancement. Each patient had to have ≥1 follow-up MRI that continued to show the lesion. Patients were excluded if the lesion disappeared on subsequent MRI or another cause for the trochlear nerve palsy was discovered.

**Results:** Initial case reviews suggested 37 cases; however, 7 were excluded for lack of information. Patients were predominately men with a mean age of 51 years. Median follow-up was 2 years. Diplopia began suddenly in approximately half. Of patients, 15% had relapsing and remitting diplopia and the rest experienced slowly progressive symptoms. One fourth noted headache. Only 1 patient had neurofibromatosis. The tumor was located just in front of the midbrain in all but 1 patient (cavernous sinus). Median longest dimension of tumor was 5 mm. Median vertical deviation in primary gaze at presentation was 4 prism diopters. One fourth used prisms and one fifth had strabismus surgery with good results. Of patients, 10% had neurosurgical intervention. Almost half did not undergo any treatment. Follow-up MRI showed the tumor size remained stable.

**Conclusions:** Isolated fourth nerve palsy secondary to trochlear nerve schwannoma has a good prognosis. Most patients can benefit from prism adaptation, strabismus surgery, or observation. Neurosurgical intervention should be reserved for patients with brainstem compression.

**Reviewer's Comments:** If you send a patient to a neurosurgeon who resects the schwannoma, you are almost guaranteeing that the patient will have a larger and permanent deviation. Although not specifically mentioned in this paper, another consideration might be stereotactic radiation therapy if the tumor continues to enlarge. Otherwise treating these patients like an unremitting fourth nerve palsy is reasonable. (Reviewer-Michael S. Lee, MD).

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Keywords: Trochlear Nerve, Fourth Nerve, Schwannoma, Treatment

Print Tag: Refer to original journal article
Optical coherence tomography may represent a noninvasive, quantitative assessment of papilledema over time.

**Background:** Optical coherence tomography (OCT) is not able to distinguish between pseudopapilledema and mild papilledema. Once one has established a diagnosis of true papilledema the question remains if you can reliably follow the retinal nerve fiber layer (RNFL) on OCT.

**Objective:** To evaluate RNFL thickness in patients with papilledema secondary to pseudotumor cerebri.

**Design:** Prospective observational cohort study.

**Participants:** 22 patients and 22 controls from a single center in Spain.

**Methods:** Patients who met the modified Dandy criteria for idiopathic intracranial hypertension (IIH) and had mild papilledema were eligible. Exclusion criteria involved refractive error >6 diopters or cylinder >3 diopters. Fast RNFL protocol using OCT was utilized and images with signal strength <6 were discarded. Age and gender matched controls underwent the same OCT testing. All patients were treated with acetazolamide 1 g per day and nutritionist-directed diet and exercise. Of patients, 2 underwent lumboperitoneal shunting.

**Results:** There were 16 women and 6 men with a median age of 40 years. Median Frisen grade was 2 and median acuity was 20/20. Median opening pressure was 29 cm H₂O. At presentation, mean RNFL was 78 µm thicker than controls. At 1-year follow-up, mean RNFL was significantly thinner than at presentation; 91% of eyes showed mean RNFL falling within the normal range and the rest were thinner than normal. Of eyes, 10 showed thinning of ≥1 quadrants and 7 showed a thickened quadrant. There was no significant difference in mean RNFL between cases and controls. RNFL thickness inversely correlated with mean deviation. All eyes with thinning of the RNFL demonstrated a permanent visual field defect.

**Conclusions:** RNFL thickness in patients with mild papilledema correlated with visual field loss suggesting that OCT may be used to monitor patients with IIH.

**Reviewer’s Comments:** Keep in mind that these data apply to mild papilledema only. You also have to be careful as you see the RNFL thickness improving with treatment. It could mean that the patient is experiencing atrophy and permanent field loss. If RNFL stabilizes, then you can establish that the patient may have finished their course. If a patient continues to have a stable RNFL within normal range of age matched controls, and yet the visual field declines, this could suggest functional visual loss. (Reviewer-Michael S. Lee, MD).

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Keywords: Optical Coherence Tomography, Idiopathic Intracranial Hypertension, Papilledema

Print Tag: Refer to original journal article
Objective Measure of Visual Fields Using Pupillography

Multifocal Pupillographic Visual Field Testing in Glaucoma.
Maddess T, Bedford SM, et al:
Clin Experiment Ophthalmol 2009; 37 (September): 678-686

It may be possible to assess objectively the visual field using pupillographic responses to multifocal stimuli.

**Background:** Visual field testing requires accurate, subjective responses from the patient. Unfortunately, they are fraught with variability and reliability errors.

**Objective:** To evaluate visual fields objectively using pupillary responses to multifocal stimuli.

**Design:** Prospective observational case series.

**Participants:** 26 patients with glaucoma and 20 controls from a single center in Australia.

**Methods:** Each subject took a 24-2 Humphrey visual field test using the Swedish Interactive Threshold Algorithm Fast method (SITA-Fast). Field defects were classified by mean deviation (MD): -6 to -12 dB were moderate and worse than -12 was severe. Each subject needed acuity of at least 20/40, spherical error of <5D, cylinder of <2D, and a pupil of ≥2.5 mm. Both eyes were tested concurrently using glasses with built-in LCD displays. Each display presented a dartboard of 24 regions covering 30°. Recording took place over 8 segments of 30 seconds each. Pupillography was performed using infrared cameras. Blinks and fixation losses were discarded. Four different protocols were presented and pupil response for each region tested was calculated using a regression analysis. The authors tracked the inferior 75% pupil response to allow for ptosis.

**Results:** 5 fields were classified as moderate damage and 2 were classified as severe damage. Each eye produced 24 direct and 24 consensual pupillary responses. Of the 4 protocols, a constant stimulus to each dartboard segment produced the best signal-to-noise ratio. The authors found that they could calculate visual field data based on 1 working pupil. Using relative changes in pupil size, the authors could remove artifact from very large or very small pupils, anisocoria, or sectoral pupil dysfunction. Segments did not require repeated testing unless >15% of the segment was compromised. The concordance to perimetry measured by area under the curve was between 80% and 84%.

**Conclusions:** Multifocal pupillographic perimetry may provide an objective measure of visual fields.

**Reviewer's Comments:** This will be great, if we can measure the visual field objectively instead of subjectively. The nice thing is that it provides error measurement on each point and only requires one pupil to test both fields. It also only takes 4 minutes to do BOTH eyes. The authors acknowledge in the discussion that many factors can affect the pupillary response and it is unclear how that affects this test. Some examples include tonic pupil, diabetic retinopathy, pilocarpine use, antidepressant use, floppy iris syndrome, and pseudophakia. (Reviewer-Michael S. Lee, MD).

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Keywords: Visual Field, Perimetry, Multifocal, Glaucoma, Pupillography, Dichoptic

Print Tag: Refer to original journal article
Torsional ultrasound generates less heat than longitudinal ultrasound and is probably less likely to lead to corneal wound burn, even when high ultrasound energy is required.

**Objective:** To compare heat generation of longitudinal and torsional phacoemulsification in a laboratory model of cataract surgery.

**Design:** Laboratory investigation.

**Methods:** Silicone test chambers filled with balanced salt solution were used to test heat production during ultrasound activation of the Infiniti phacoemulsification instrument. A thermal imaging camera was used to photograph the system during ultrasound activation and measure heat temperatures in the system during the experiment. Heat measurements were made during use of both torsional and longitudinal ultrasound at power settings varying between 40% and 100% using 2 different instruments. Testing was performed under different conditions, including matching the stroke length of the phaco tip, and matching applied energy levels.

**Results:** Under all testing conditions, torsional ultrasound resulted in lower temperature measurements at all time points during each experiment. The maximum temperature rise measured using torsional ultrasound was 30°C. Under testing conditions comparable to energy levels used during typical cataract surgery, longitudinal ultrasound led to temperature increases up to 42°C more than torsional ultrasound.

**Conclusions:** Heat generation with torsional ultrasound is significantly less than that which occurs with traditional longitudinal ultrasound.

**Reviewer's Comments:** Corneal wound burn can occur during phacoemulsification when heat generated by friction between the phaco needle and the irrigation sleeve is sufficient to coagulate tissue. Crimping of the irrigation sleeve around the phaco needle, slowing or stopping the flow of irrigating fluid around the phaco needle can exacerbate this problem since fluid flow around the needle helps cool it. Since the magnitude of rotational oscillation of the shaft of the needle with torsional ultrasound is substantially less than the magnitude of longitudinal oscillation with traditional ultrasound in order to achieve the same stroke length at the tip of the needle, significantly less friction and heat generation occur, even when high ultrasound energy is used.

(Reviewer-Scott D. Smith, MD, MPH).

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Keywords: Cataract Surgery, Technique, Heat Generation, Longitudinal, Torsional

Print Tag: Refer to original journal article
Torsional ultrasound allows more efficient removal of the lens nucleus with lower total ultrasound energy and shorter aspiration time than with traditional ultrasound.

Objective: To compare efficiency of torsional and longitudinal ultrasound in removing the lens nucleus during cataract surgery.

Design: Prospective comparative clinical study.

Participants: 400 patients undergoing routine phacoemulsification.

Methods: Nucleus density was graded (grade 1 to 4) preoperatively using standardized criteria. Surgery was performed with the Infiniti instrument using either torsional or traditional, longitudinal ultrasound settings. All patients underwent surgery using a phaco-chop technique. Parameters measured included total phaco time, cumulative dissipated energy, mean phaco power, and aspirational time.

Results: Cumulative dissipated energy was significantly lower in torsional mode for nucleus grades 1 to 3, but not for grade 4. Aspiration time was also significantly lower, particularly in more dense nuclei of grade 3 to 4. These characteristics resulted in an overall increase in efficiency of phacoemulsification with torsional ultrasound for most nucleus densities.

Conclusions: Under most conditions, torsional ultrasound is more efficient than longitudinal ultrasound in removing the lens nucleus during cataract extraction by phacoemulsification.

Reviewer’s Comments: Traditional ultrasound involves high frequency, forward and backward, longitudinal movement of the tip of the phaco needle. This “jackhammer” movement fragments the nucleus, but tends to push lens material away from the tip rather than maintaining continuous contact with the lens material. Torsional ultrasound involves rotational movement of the angled phaco needle tip, and results in less repulsion of the lens material from the tip. This is likely to be the underlying reason that torsional ultrasound appears to be more efficient in removing nuclear fragments than traditional ultrasound. In my experience, the difference between these ultrasound modes is very obvious during surgery, with a much greater tendency for the nucleus to stay on the phaco tip rather than being fragmented into small pieces and to be scattered around the anterior chamber. This study and my experience both indicate that for very dense nuclei, torsional ultrasound needs to be supplemented by traditional ultrasound energy to efficiently fragment the lens. (Reviewer-Scott D. Smith, MD, MPH).

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Keywords: Cataract Surgery, Technique, Torsional, Longitudinal, Ultrasound

Print Tag: Refer to original journal article
Even when given explicit written instructions, many patients continue to avoid acceptable activities of daily living after phacoemulsification.

**Objective:** To evaluate patient behavior following routine cataract surgery with regard to restriction of activities of daily living and to assess the impact of different methods of patient instruction on this behavior.

**Design:** Non-randomized interventional clinical study.

**Participants:** 150 consecutive patients.

**Methods:** Each patient had visually significant cataract, and underwent routine phacoemulsification without complication. Patients were divided into 3 groups, 1 of which received standard verbal instructions including acceptable and unacceptable activities of daily living during the first 2 weeks after surgery. Group 2 received a written instruction sheet providing the same information, while Group 3 received an additional sheet with photographs of people performing safe activities of daily living (appropriate method of bending, cooking, gardening, shopping, washing hair, etc). At the 3-week follow-up visit, patients underwent an interview that assessed their activities of daily living following surgery.

**Results:** In group that received standard instructions, 64% reported avoiding one or more acceptable activities of daily living. The corresponding proportions of patients in the written and photo instruction groups were 44% and 30%, respectively; differences were statistically significant ($P=0.001$).

**Conclusions:** Many patients unnecessarily avoid acceptable activities of daily living following phacoemulsification. Although written instructions can reduce unnecessary avoidance of acceptable activities, photographic instruction sheets illustrating acceptable activities are more effective in influencing patient behavior.

**Reviewer’s Comments:** Modern, small incision cataract surgery by phacoemulsification offers the benefit of rapid recovery of vision and less need to restrict activity postoperatively. Advice on what activities to avoid is often provided by relatives, friends, or other acquaintances who may be health care providers. This advice is often based upon recommended restrictions for large incision extracapsular cataract extraction that was more commonly performed in the past. In order to ensure that patients receive and remember accurate information about necessary restrictions, this study suggests that a photographic instruction sheet is more effective than simply providing written instructions. Providing such information prior to discharge can help cataract surgery patients to benefit more fully from the advantages modern small incision cataract surgery. (Reviewer: Scott D. Smith, MD, MPH).

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Keywords: Cataract Surgery, Patient Compliance

Print Tag: Refer to original journal article
Incidence of intraocular lens dislocation after cataract surgery is 0.6% in a population with high prevalence of pseudoexfoliation.

**Objective:** To estimate incidence of intraocular lens (IOL) dislocation and pseudophakodonesis following cataract surgery.

**Design:** Prospective population-based cohort study.

**Participants:** 810 patients who underwent routine cataract extraction in a Swedish population.

**Methods:** Patients were monitored prospectively for 10 years following surgery. Of the surviving population at the 10-year follow-up time point, 73% underwent an ophthalmic examination which allowed the identification of patients with IOL dislocation and pseudophakodonesis. In addition, the presence or absence of pseudoexfoliation was identified during slit lamp examination. A review of interim medical records allowed the identification of ophthalmic surgical procedures following the cataract surgery such as IOL exchange or repositioning.

**Results:** 98% of patients underwent sutureless clear corneal phacoemulsification. Pseudoexfoliation was present in 40% of subjects. Cumulative incidence of IOL dislocation was 0.6%. All dislocations occurred late after surgery, and the IOL dislocated within the capsular bag. Pronounced pseudophakodonesis was present on examination in 0.7% of patients, and moderate pseudophakodonesis was present in 1.4% of patients.

**Conclusions:** Late IOL dislocation is an uncommon complication following cataract surgery, even in a population with a high prevalence of pseudoexfoliation syndrome.

**Reviewer's Comments:** The low incidence of late IOL dislocation in this population is encouraging, and is actually likely to be an underestimation of the rate of this complication in the United States. This study took place in a Swedish population of older adults where there was a prevalence of pseudoexfoliation syndrome of 40%. Since pseudoexfoliation is associated with progressive zonular weakness which likely increases the likelihood of late IOL dislocation, the incidence of this complication in the Swedish population is probably considerably higher than in the overall American population. (Reviewer-Scott D. Smith, MD, MPH).

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Keywords: Cataract Surgery, Complications, Pseudophakodonesis

Print Tag: Refer to original journal article
When necessary, intraocular lens (IOL) exchange is a feasible option for managing dissatisfied patients after refractive IOL placement.

Objective: To evaluate surgical outcomes following intraocular lens (IOL) exchange for management of patient dissatisfaction after implantation of a refractive IOL.

Design: Retrospective interventional clinical case series.

Methods: Medical records were reviewed of a consecutive series of 12 eyes of 10 patients who had subjective visual symptoms after placement of a refractive (ReZoom, ReSTOR, or Crystalens) IOL. Complaints included blurry vision, halos/glare, and/or decreased contrast sensitivity. A monofocal IOL was placed in the capsular bag if possible, or in the ciliary sulcus if this was not possible based upon intraoperative findings.

Results: With a mean follow-up of 9 months, resolution of the preoperative 84% of patients reported complete resolution of their preoperative symptoms. Mean postoperative visual acuity was 20/25. One patient experienced a complicated course after IOL exchange, requiring another procedure with scleral fixation of the IOL due to lack of adequate capsular support.

Conclusions: IOL exchange is a feasible option for the management of patient dissatisfaction after refractive IOL implantation.

Reviewer's Comments: Proper patient selection is a key factor in maximizing patient satisfaction following refractive IOL implantation. Identifying patients who are highly motivated to reduce spectacle dependence, and those particularly sensitive to glare/halos is important in selecting good candidates for these lenses. In those rare occasions where patient selection has not been effective in eliminating patient dissatisfaction, and where modifiable problems such as residual refractive error, astigmatism or IOL/pupil decentration are absent, IOL exchange can be a definitive solution to the problem. Of course, patients must understand that such intervention will invariably result in increased dependence upon reading glasses, and as with any surgery, patients must understand that a small proportion of patients fail to experience resolution of symptoms after surgery. (Reviewer-Scott D. Smith, MD, MPH).

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Keywords: Intraocular Lens Implantation, Complications, Patient Dissatisfaction

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A variety of different automated and manual keratometers give very similar results, suggesting that they can be used interchangeably for purposes of intraocular lens power calculations.

**Objective:** To compare the reproducibility and correlation of keratometry measurements made by 4 different instruments.

**Design:** Prospective comparative clinical study.

**Participants/Methods:** 20 subjects were enrolled in this study. Each subject underwent 3 repeat keratometry measurements using each of 4 different devices. These devices included the IOL Master and Humphrey Atlas Topographer, the Galilei Dual Scheimpflug Analyzer, and a manual keratometer. Intra-instrument and inter-instrument variability in keratometry measurements were determined to compare the reproducibility of measurements with each device, and to identify the comparability of measurements between devices.

**Results:** For each device, the coefficient of variation of repeated measures was very low, with a maximum value of 0.22%. Standard deviation of repeated measures ranged from 0.04 D to 0.09 D for the 4 devices. Intraclass correlation coefficients were >0.99 with all devices. Differences in mean keratometry values between devices ranged between 0.07 D and 0.14 D. Similarly high correlations were seen between devices with regard to the mean astigmatism and axis of cylinder.

**Conclusions:** Corneal power measurements made by 4 different keratometers were highly reproducible, and provided statistically and clinically similar measurements.

**Reviewer's Comments:** This study suggests that a range of different automated and manual methods of performing keratometry provide results that are not statistically or clinically different from each other. This should provide reassurance to cataract surgeons that the exact method of keratometry does not dramatically affect intraocular lens power calculations. Very small, systematic differences in the measurements obtained between different keratometers may, of course, still exist, and personalization of A-constant by individual cataract surgeons using a standardized method of performing both surgery and ocular biometry could further reduce errors in IOL power calculations. (Reviewer-Scott D. Smith, MD, MPH).

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Keywords: Cornea, Keratometry

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Self-reported moderate alcohol consumption had no apparent relation to the prevalence of cataract, glaucoma, macular degeneration, retinal vein occlusion, or other common eye diseases.

Objective: To evaluate the association between alcohol consumption and occurrence of common ocular diseases in an adult population.

Design: Cross sectional population-based study.

Participants: 4141 subjects for whom complete clinical information was available.

Methods: Data for this study were derived from the Beijing Eye Study, a population-based epidemiologic study of eye disease in rural and urban regions of China. All study subjects underwent a comprehensive ophthalmic examination including anterior segment and fundus photography, visual field testing, and anterior segment and fundus examination by an ophthalmologist. Based upon the results of the examination and ancillary testing, subjects were classified with regard to the presence or absence of cataract, primary open-angle glaucoma, angle closure glaucoma, and a variety of other common anterior segment and posterior segment diseases. Alcohol consumption was assessed on the basis of a questionnaire completed by each subject at the time of enrollment. Statistical analysis was performed to determine the association between alcohol consumption and the presence or absence of each ophthalmic disease.

Results: 13.3% of subjects reported consumption of alcohol. After adjustment for gender, age, socioeconomic status, and other potential confounding factors, no association was seen between alcohol consumption and the prevalence of any ophthalmic disease investigated.

Conclusions: Self-reported moderate consumption of alcohol does not appear to increase the risk of developing a variety of common ophthalmic diseases, including cataract, glaucoma, macular degeneration, and retinal vascular disease.

Reviewer's Comments: This study indicates that alcohol, consumed in moderation, should not be considered to be a risk factor for the progression of common ophthalmic diseases. It must be emphasized that this study was not designed to evaluate the risk of heavier alcohol consumption on eye disease. In addition, even if in the absence of association with ophthalmic disease, heavy alcohol consumption has other serious health consequences. (Reviewer-Scott D. Smith, MD, MPH).

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Keywords: Eye Disease, Epidemiology, Alcohol Consumption

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**Objective:** To investigate the association between visual impairment and all-cause mortality in a population of older adults.

**Design:** Population-based epidemiologic study.

**Participants:** 3654 subjects aged ≥49 years.

**Methods:** Data for this study were taken from the Blue Mountains Eye Study, a population-based epidemiologic study of eye disease conducted in a suburban region near Sydney, Australia. Subjects underwent follow-up examinations 5 and 10 years after enrollment. Visual impairment was defined by visual acuity of <20/40 in the better seeing eye. Data on mortality in the study subjects were obtained from the Australian National Death Index. Structural equation modeling pathway analysis was used to model the relationship between visual impairment, survival, and other variables that influenced mortality. In this way, both direct and indirect effects of visual impairment on mortality were identified.

**Results:** After 13 years of follow-up, 1273 participants had died. After adjustment for demographic and clinical factors associated with mortality, non-correctable visual impairment was associated with an increased risk of mortality (odds ratio 1.35; 95% CI, 1.04 to 1.75). Disability in walking was an important risk factor for mortality that was also associated with visual impairment, demonstrating a significant indirect pathway for the link between visual impairment and mortality.

**Conclusions:** Visual impairment is a predictor of mortality, with both direct and indirect pathways for its influence on the risk of mortality in affected individuals.

**Reviewer's Comments:** This study shows evidence for multiple pathways by which visual impairment is associated with excess risk of mortality. Direct associations between visual impairment and mortality risk suggest that causes of visual impairment is a marker of poor health in general, and thus is associated with a higher mortality rate. Indirect associations were also identified, demonstrating the effect of visual disability on other identifiable factors such as mobility that can lead to increased mortality. Although not proven by this study, this study implies that intervention to improve visual function can reduce mortality risk by altering these indirect associations between visual impairment and death. (Reviewer-Scott D. Smith, MD, MPH).

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Keywords: Visual Impairment, Mortality, Older Adults

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Infectious crystalline keratopathy may occur in conjunction with Acanthamoeba keratitis, especially in cases demonstrating atypical progression of the condition.

**Objective:** To report the presentation and clinical features of combined Acanthamoeba keratitis (AK) and infectious crystalline keratopathy (ICK).

**Design:** Retrospective, non-comparative interventional clinical case series.

**Methods:** Medical records were reviewed of a consecutive series of 111 patients treated for AK at a single institution during a 5-year period. Diagnosis of AK was based on the presence of ≥2 of the following clinical criteria: confocal microscopic evidence of amoeba, positive histology from a corneal specimen, pathologic features on clinical examination, or positive culture results. Patients were identified who had additional clinical evidence of bacterial keratitis. Clinical data were also obtained to identify factors associated with the simultaneous occurrence of AK and ICK.

**Results:** 5 patients with AK were identified that demonstrated evidence of bacterial keratitis at the same time as the initial diagnosis of AK, or during the subsequent course of treatment. All 5 patients demonstrated clinical evidence of ICK. The occurrence of ICK was associated with topical steroid use in only 3 patients. All patients demonstrated clinical improvement with early recognition and initiation of treatment with topical antibiotics. In contrast to earlier reports of ICK occurring strictly in patients treated with topical steroids, 2 patients in this series developed the condition in the absence of steroid exposure or preexisting corneal epithelial defect.

**Conclusions:** ICK can develop in patients with AK even in the absence of steroid use and an epithelial defect. A high index of suspicion must be maintained while monitoring these patients to detect ICK early and initiate appropriate medical therapy.

**Reviewer's Comments:** Although each of these conditions is quite rare, this study reports that they can occur concurrently, suggesting that patients with AK may be predisposed to this condition. This concept is further supported by the fact that while ICK has generally been reported to occur in patients being treated with topical steroids, 2 of the AK cases in this series developed ICK in the absence of exposure to steroids. While ICK can be very difficult to treat, and often requires penetrating keratoplasty to eliminate the infection and associated corneal opacity, in this series patients appeared to respond well to medical therapy. It is possible that the absence of steroid use and early recognition of ICK in these patients that were under careful surveillance for monitoring of their amoebic keratitis resulted in a better response to medical therapy. (Reviewer-Scott D. Smith, MD, MPH).

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Keywords: Cornea, Infection, Acanthamoeba Keratitis, Crystalline Keratopathy

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Excess Lead in Retina Associated With Macular Degeneration

Excess Lead in the Neural Retina in Age-Related Macular Degeneration.
Erie JC, Good JA, Butz JA:


Excess lead present in the retina associated with age-related macular edema suggests that metal hemostasis in the retina is abnormal in this condition.

Objective: To measure lead and cadmium levels in retinal tissue of human cadaver eyes affected by age-related macular degeneration (AMD) and to compare these levels to those in eyes of individuals not affected by this condition.

Design: Laboratory investigation.

Methods: 50 postmortem donor eyes of 25 individuals affected by AMD were obtained. An additional 72 donor eyes of 36 individuals not affected by AMD were also obtained. Retinal specimens were used to measure concentrations of lead and cadmium from each eye by inductively coupled plasma mass spectroscopy; these were then compared between groups with and without AMD. Severity of AMD was also graded based upon fundus photographs obtained before death in donors with AMD.

Results: Increased lead concentrations were found in retinal specimens of individuals with AMD. Median concentration in those with AMD was 12 ng/g of retinal tissue compared to 8 ng/g in those without AMD ($P =0.04$). No significant difference in cadmium concentration was seen between groups.

Conclusions: AMD is associated with an increased retinal concentration of lead, suggesting that heavy metal hemostasis may be altered in this condition.

Reviewer's Comments: Lead and cadmium toxicity have been implicated in a variety of diseases associated with aging, including hypertension, peripheral vascular disease, and cognitive decline. These associations prompted this investigation. The mechanism by which lead may influence the pathogenesis of AMD remains unclear, and the results reported in this study need to be confirmed by additional research. However, these results suggest that lead hemostasis is abnormal in patients with AMD and that heavy metal toxicity may play a role in the disease process. (Reviewer-Scott D. Smith, MD, MPH).

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Keywords: Macular Degeneration, Lead, Retinal Tissue

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