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Creating a Safe and Stable Surgical Environment

Sprint is a new generation Phacoemulsification System. It has been designed to meet the expectations of today's surgeon. It's new innovations can expand the margin of safety for the patients, all the while improving the speed and efficiency of the procedure. The Sprint architecture incorporates five microprocessors and is capable of amazing speed of reactions responding in milliseconds to the changes in the ocular conditions.

It is extensively soft-wired permitting the generation of a variety of flow/vacuum and power curves that can meet the needs of exacting procedures and demanding surgical situations.

All new peristaltic pulse pump.
This new and sensational pump has a manifold design for ultra safe fluids. The 6 roller constructions of the pump, produces flow almost devoid of pulsation and keeping the system purged of air bubbles. It is capable of amazingly quick rise times and can reach vacuum levels of 600mm/Hg in about 0.56 of a second – making it possible to function like a venturi system.

Display
The Display unit is a high resolution 5" TFT color monitor. The on-screen graphics are large, easy to read for user friendly operation. A unique surgical screen is displayed as soon as the Footswitch is activated during the surgery.

Phako Handpiece
The light-weight and ergonomic 4 crystal handpiece comes with innovative modulations and cold Phaco. Its proven design provides durability and consistent performance for long periods of time.

Footswitch
This digital control Footswitch works in sync with the unique X-CUBE controls for precise and independent tracking of multiple variables.

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Retrospective Analysis of Accommodative IOL Implantation in Indian Eyes

Dr. Triveni Grover, Dr. M.S. Sachdev, Dr. Charu Khurana, Dr. Hemlata Gupta

Accommodative IOLs are the future of intraocular surgery. The 1st generation Crystalens- AT 45 was approved by FDA in Nov. 2003. Its first revision involved 360 degree square edge design AT 45 SE to reduce post-op capsular changes. Then came the Five-O with 5 mm optic diameter and square edge. The Crystalens HD launched in July 2008 is a blended bispheric, monofocal accommodating IOL. The HD design adds a 1.5 mm diameter circle of -0.045µ spherical aberration to the optical central region thus providing excellent depth of focus and better contrast sensitivity.

Mechanism of Action: Crystalens mimics the natural lens providing good distance, intermediate and near vision seamlessly. Works on the principle of axial displacement and accommodative arching.

To evaluate the visual outcome of accommodative IOLs.

MATERIALS AND METHODS

Retrospective analysis of 135 eyes of 95 patients ranging 29-77 yrs. who underwent uncomplicated phacoemulsification with Crystalens - HD implantation at a tertiary eye care centre in north India from Nov. 2009 to Jan. 2011.

Patient Selection: The Ideal Candidate

• Candidate for bilateral implantation with good ocular health.
• Potential for good visual acuity in each eye - Good binocularity.
• Plan for treatment of corneal astigmatism if above 0.75 D.
• Axial length was measured using IOL master and immersion.

Surgical Pearls

• Water tight incision that does not leak after surgery.
• Large rhexis larger than the size of the optic.
• Lens implanted in the capsular bag ‘right side up’ i.e. anterior hinge side facing anterior side of the eye.
Post-op: 0.5% atropine eye drop instilled at the end of surgery and patients encouraged not to read for 10 to 14 days after surgery.

RESULTS
Retrospective analysis of 135 eyes of 95 patients who underwent uncomplicated phacoemulsification with Crystalens- HD implantation at a tertiary eye care centre in north India from Nov. 2009 to Jan. 2011. Distance, intermediate and near VA was measured at 1, 3 and 12 weeks.

Demographics

<table>
<thead>
<tr>
<th>Total Patients</th>
<th>135 Eyes Of 95 Patients</th>
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<tbody>
<tr>
<td>Age Range</td>
<td>29 To 77 Yrs.</td>
</tr>
<tr>
<td>Males</td>
<td>58</td>
</tr>
<tr>
<td>Females</td>
<td>37</td>
</tr>
</tbody>
</table>

1. Distance Visual Acuity: 6/9 or better in 87.44%
2. Intermediate Visual Acuity Better Than 6/9 was seen in 91.1% Patients At 12 Weeks.
3. Near Visual Acuity ≥ N8 was seen in 60.7% And ≥ N10 In 84.4% patients At 12 Weeks.
4. Complications: a) PCO needing Yag capsulotomy seen in 3 cases. (b) Z syndrome seen in 2 cases managed by Yag laser shots placed behind the inferior optic haptic junction to relax the capsule. (c) In and out syndrome needing repositioning of the lens was seen in 1 case.

DISCUSSION
Crystallens HD provides good distance, intermediate and near visual acuity. In our study on 135 eyes of 95 patients 87.44% patients achieved a distance VA of 6/9 or better at 12 weeks post-op, 91.1% achieved UCIVA of 6/9 or better and 84.4% achieved UCNVA better than N10 which is comparable with other studies.

Marian et al. in their study on 112 eyes of 56 patients undergoing cataract surgery with crystallens implantation found that all patients achieved UCVA of 20/20 or better and near acuity better than J3 was achieved in 90% patients. US FDA trial of Crystallens AT- 45 in a 1 year follow up of 263 patients found near VA through distance correction of 20/40 or...
better monocularly in 90.1% patients and intermediate VA in 99.6%.
Vizzari et al. compared visual outcome following cataract surgery between crystalens AO and HD. The Crystalens AO was found to provide mildly better UCDVA with 90% eyes achieving 0.9 or more while Crystalens HD was found to provide better UCNVA. Mean UCIVA was nearly same in both groups with 93.3% of eyes achieving J3 or more.

In conclusion:

- Crystalens is closest to the natural crystalline lens
- Provides good visual acuity at all ranges- distance, intermediate and near.
- Minimal glare/ haloes
- No loss of contrast sensitivity
- Pre-op measurements must be accurate for good post-op results
- Expect improvement in near vision up to 3 months after surgery.

REFERENCES


Results of IOL Power Calculation for Cataract Surgery after Keratorefractive Surgery for Myopia

Dr. Ridhima Bhagali, Dr. Sudeep Das, Dr. Mathew Kurian, Dr. Rohit Shetty

Postoperative hyperopia is a frequent result of cataract surgery in eyes having previous keratorefractive surgery for myopia.1,2 One reason for the underestimation of the IOL power is the overestimation of central corneal power by keratometry and topography systems. Manual keratometers measure 4 points in central 3.2 mm zone and automated keratometers in central 2.6 mm. Postoperative hyperopia results from the incorrect estimation of effective lens position (ELP) by the third- or fourth-generation formulae when the postoperative corneal power values are used.
The purpose of this study was to assess the refractive result of post keratorefractive cataract surgery using the ASCRS (American Society of Cataract and Refractive Surgery) calculator; utilizing the Double K-Holladay 1 formula for IOL power calculation and the True Net Power (TNP) map and the Holladay Equivalent K-readings (EKR) of the Pentacam for estimating the central corneal power.

MATERIALS AND METHODS

In this single-centre prospective interventional case series, consecutive patients who needed cataract surgery after any keratorefractive surgery for myopia, from January 2011 to March 2011, were included.

Pre-operative evaluation: Details of the refractive surgery and pre-refractive surgery refraction and keratometry values were sought. A detailed ophthalmologic evaluation including uncorrected Snellen’s distance visual acuity (UDVA), corrected Snellen’s distance visual acuity (CDVA), refraction, slit-lamp evaluation, tonometry and dilated fundus examination was performed.

IOL power calculation: The central corneal power reading was estimated using the True Net Power Map of the Pentacam (Oculus, Optikgera GmbH). It was used as the average central power in the ASCRS calculator. The Holladay zonal Equivalent K-readings (EKR) provided by the Pentacam were fed in the calculator. Axial length was determined using the immersion A-scan (Alcon Ocuscan RxP) technique. The ASCRS calculator uses the Double K-Holladay 1 formula for IOL power calculation. A 0.5 to 1D myopic refraction was targeted.

Toric IOL implantation was planned in motivated patients with ≥1.5D astigmatism. Depending on the resting pupil size measured by the Pentacam, the corresponding zonal EKR were used as the flat and steep keratometry values for toric IOL calculation.

Surgical procedure: Two surgeons performed the standard limbal incision (superior/ temporal) phacoemulsification procedure. The phaco flow and
power settings were kept low, especially in eyes with previous radial keratotomy (RK). All patients had a hydrophobic acrylic, in-the-bag IOL implantation.

**Postoperative regimen:** Eyedrops moxifloxacin 0.3% qds for 2 weeks, prednisolone acetate 1% qds on a weekly taper and nepafenac 0.1% bid for 6 weeks.

**Postoperative evaluation:** Patients underwent complete ophthalmologic evaluation on postoperative day 1, 1 week, 6 weeks and 3 monthly thereafter. Refractive outcome was assessed at postoperative 6 weeks and 6 months.

**RESULTS**

11 eyes of 8 patients, 5 male and 3 female, with a mean age of 49.3 ± 11.41 yrs., were included in the study. Of the 11 eyes, 5 eyes had previous RK, 5 eyes had laser in situ keratomileusis (LASIK) and one eye had LASIK followed by RK done. One eye with LASIK and a mature cataract was excluded from further analysis on account of dense amblyopia.

Pre-refractive surgery data was not available with any patient. The mean duration from the refractive surgery was 17.3 ± 7.04 yrs. One patient with RK had an operated localised rhegmatogenous detachment 3 years prior to the present cataract surgery. Another patient with RK had a traumatic total cataract with a small corneal perforation following blunt trauma. The corneal perforation was sealed with cyanoacrylate glue 3 weeks before the cataract surgery. The third eye with RK was a known case of primary open angle glaucoma with medically controlled IOP. None of these conditions adversely affected the final visual outcome. One patient with bilateral uncomplicated RK underwent toric IOL implantation in both eyes and one patient with previous bilateral LASIK received multifocal IOLs in both eyes.

In one eye with RK, one radial scar gave way during phacoemulsification, which required 3 sutures that were removed after 4 weeks. No other eye suffered any intra or postoperative surgical complication.

At postoperative 6 months, UDVA was ≥6/9 in 50% patients and ≥6/12 in 70%. 80% patients had a spherical equivalent of refraction within 1D of emmetropia. Postoperative astigmatism was within 1D in 70% patients. The postoperative spherical equivalent of refraction was -0.15± 1.15D at 6 weeks and was stable at -0.29±1.41D at 6 months.

**DISCUSSION**

The estimation of central corneal power post keratorefractive surgery is a challenge. Lackerbauer *et al.* found the Pentacam system to be more accurate than keratography in estimating central corneal power after myopic LASIK. Qiongyan *et al.* concluded that the Pentacam Holladay EKR readings were
Standard graphs to report refractive surgery outcomes

1. Uncorrected Distance Visual Acuity
2. Change in corrected distance visual acuity
3. Spherical Equivalent Attempted vs Achieved
4. Spherical Equivalent Refractive Accuracy
5. Refractive Astigmatism
6. Stability of Spherical Equivalent Refraction
steeper than the true central corneal power. However, both did not apply their findings to IOL power calculation. Wang et al.\textsuperscript{5} concluded that the most accurate method of IOL power calculation was the combination of a double-K formula\textsuperscript{6} and corneal values derived from the adjusted effective refractive power (EffRP)[EyeSys].

In our study, we substituted the Pentacam EKR and TNP values for the Eyesys and Atlas values in the ASCRS calculator, on account of unavailability of the latter systems. This simplified calculation provided acceptable refractive accuracy and outcome; allowing the use of premium IOLs in this challenging situation.

In conclusion the use of the Pentacam True Net Power and Holladay Equivalent K-readings in the ASCRS calculator provided satisfactory refractive outcome in patients of post keratorefractive cataract surgery.

REFERENCES

Visual Quality Assessment of a Diffractive Multifocal Intraocular Lens Using Optical Quality Analysis System

Dr. Aditi Ghodke, Dr. Mathew Kurian, Dr. Rohit Shetty, Dr. Sudeep Das

Today, cataract extraction is not only considered a therapeutic procedure for cataract itself but also a refractive surgery procedure. Diffractive IOLs are a type of multifocal (bifocal) IOL that are based on the Huygens–Fresnel principle. Specifically, a diffractive IOL has concentric rings in its posterior surface that form 2 primary focal points independent of pupil size. This optical
behavior of the IOL can effectively restore far and near vision. The AcrySof ReSTOR SN60D3 multifocal (Alcon Laboratories) is an apodized diffractive IOL.

The aim of the current study was to evaluate the postoperative ocular optical quality and assess visual outcomes in eyes with an apodized multifocal IOL using double-pass system, Optical Quality Analysis System (OQAS). The MTF curve represents the attenuation percentage of the contrast of the retinal image at various resolutions and also includes the combined effects of scatter and high degree optical aberrations. An MTF of 30 cycles/deg corresponds to a visual acuity of approximately 20/20; lower the MTF, poorer the quality of vision. OQAS values at contrasts of 100%, 20% and 9% correspond to three specific frequencies of the MTF that describe the eye’s optical quality for the contrast values mentioned. In general, values higher than 1 are associated with good retinal image quality. The third measurement is the objective scattering index (OSI), which is an objective evaluation of intraocular scattered light. The higher the OSI value, the higher the level of intraocular scattering. The Strehl ratio is the ratio of peak focal intensities in the aberrated PSF and the ideal PSF.

**MATERIALS AND METHODS**

This prospective interventional comparative clinical study enrolled 50 eyes with implantation of AcrySof ReSTOR SN60D3 single-piece IOL. The study followed the tenets of the Declaration of Helsinki and institutional ethics review board approval was obtained. Inclusion criteria included visually significant cataract with corneal astigmatism lesser than 1.00 diopter. Exclusion criteria included a history of any ocular co-morbidity and ocular surgery. Patients were scheduled for clinical evaluation preoperatively and 1 day, 1 week, and 6 weeks postoperatively. A standard comprehensive ophthalmic examination, including manifest refraction, biomicroscopy, intraocular pressure measurement, and funduscopy, was performed at all visits. Keratometry was performed by Topolyzer vario (Allergo). Immersion ultrasound biometry was performed in all patients using the OcuScan RxP Ophthalmic Ultrasound System (Alcon Laboratories). Uncorrected and best corrected distance visual acuities were measured monocularly and binocularly in decimal units. Uncorrected, distance corrected, and best corrected near visual acuities were measured in reduced Snellen chart.

Optical quality analysis: Ocular optical performance was assessed 6 weeks postoperatively using the Optical Quality Analysis System (OQAS, Visiometrics S.L., Terrassa, and Barcelona). All measurements were performed by a trained and experienced operator using a standardized technique. Visual quality was analyzed by the MTF, OSI, Strehl ratio and contrast at 100%, 20% and 9% . Data entry was done on Excel worksheets (Microsoft Corp.) and analysis was done...
using a statistical software package for Windows (version 15.0, SPSS, Inc.) All statistical tests were bilateral with a level of significance of 0.05.

**RESULTS**

This study evaluated 50 eyes of 29 patients. The mean age of the 17 men and 12 women was 54.06 ± 10.51 years. Eight eyes had unilateral and 21 eyes had bilateral IOL implantation. At the end of 6 weeks the mean uncorrected distance visual acuity (UCDVA) and the mean uncorrected near visual acuity (UCNVA) in decimals were 0.82 ± 0.25 and 0.95 ± 0.55 respectively. The mean corrected visual acuity (CDVA) and mean corrected near visual acuity (CNVA) values were 0.98 ± 0.09 and 1.0 ± 0.04 respectively. The mean Refractive Spherical Equivalent (MRSE) improved to -0.25 ± 0.58D. Optical quality variables were; mean MTF value was 34.74 ± 11.70, visual acuities at contrast 100%, 20% and 9%
were 1.15 ± 0.38, 0.84 ± 0.37, 0.51 ± 0.29. Mean Objective scatter index (OSI) was 1.43 ± 0.54 and mean strehl ratio was 0.21 ± 0.14. The MTF and Strehl ratio were positively correlated to each other (r = .995, P < .001) and both were negatively correlated to the OSI (r = -.869, P = .001 and r = -.832, P = .003 respectively) at the 0.01 level.

**DISCUSSION**

The aim of the current study was to evaluate the postoperative ocular optical quality using a double-pass method and to assess the visual outcomes in eyes with an apodized diffractive multifocal IOL. The distance and near visual outcomes confirmed that the IOL restored distance and near visual function. These outcomes are consistent with those reported in previous studies of the same IOL model and of previous apodized IOL models. Regarding near vision, the improvement in UCNVA was significant in the multifocal IOL. This has been reported with other multifocal IOL technologies. Objective ocular optical quality with both IOLs was evaluated using a double-pass system, which has been shown to be valid for this purpose. In our study, the mean Strehl ratio and cut off MTF spatial frequencies in the IOL were similar to those in young healthy eyes and higher than those in older eyes. The mean ocular cut off MTF spatial frequency in our study was comparable with those reported for other diffractive IOL designs (36.81±9.56; Acri.LISA 366D, 31.28 ± 8.20; Tecnis ZM900). Strehl ratio and contrast at 100%, 20% and 9% were also consistent with other diffractive IOLs (Strehl 0.20 ±0.05; 100% contrast 1.23± 0.32; Acri. LISA 366D). OSI value in our study was slightly better than reported in other study (1.83 ± 0.91; Acri.LISA 366D).

According to the manufacturer, healthy eyes in young subjects have an OSI of 1 or less and a patient with cataract, of 4. In our study, the mean OSI values were 1.43 ± 0.54. OSI correlated inversely with the UDVA (r = -.365, P = 0.01) at the 0.01 level of significance. Astigmatism in diopter is paradoxically correlated directly with MTF and Strehl ratio (r =.504, P = 0.01) at the 0.01 level of significance. Thus, our study was performed 6 weeks postoperatively because the objective was not to assess patient satisfaction or subjective visual quality but rather to obtain a set of objective measures of visual quality using the double-pass system.
In conclusion, multifocal IOLs performed well in terms of MTF, PSF, and light scattering. The double-pass system we used was valuable in determining MTF, PSF, and scatters of the eye system and thus can provide objective measures of visual quality in eyes with different types of IOLs.

REFERENCES


Partial Coherence Laser Interferometry Vs Conventional Ultrasound Biometry in IOL Power Calculation

**Dr. Ravindra Vhankade**, Dr. Reema Raval, Dr. Tejas Desai, Dr. Rekha Singhal

Phacoemulsification and foldable intraocular lens (IOL) implantation has led to improved success rates and faster visual rehabilitation in patients undergoing cataract surgery. The refractive outcome following phacoemulsification cataract surgery is dependent on a number of factors. They include axial length measurement, keratometry, anterior chamber depth, IOL power formulae, and the quality of the IOL. Of these factors, inaccurate axial length measurements were shown to be the major deterrent to the predictability of the refractive outcome. Since the predictability of refractive outcome is based on the accuracy of preoperative biometry, the methods used in biometry continue to evolve. Conventional method of IOL measurement is measuring the corneal radii typically with the help of keratometry, while axial length is measured via immersion techniques or applanation in which the latter is more common.
The introduction of non contact optical biometry has revolutionized preoperative IOL selection by eliminating this conventional technique. One instrument (Intraocular Lens Master [IOLm]; Carl Zeiss Meditec, Jena, Germany), which uses partial coherence interferometry technology, was introduced in 2000. Since then, it has been touted for its fast operation without requiring corneal contact.

The purpose of the study was to compare optical biometry based on partial coherence laser interferometry (PCLI) principle with conventional ultrasound biometry for the accuracy of intraocular lens (IOL) power calculation thereby to evaluate the predictability of refractive outcome of emmetropes, myopes and hyperopes.

**MATERIALS AND METHODS**

In this prospective randomized clinical trial, 100 patients undergoing phacoemulsification cataract surgery by same surgeon were randomized to undergo biometry with either A-scan ultrasound or partial coherence laser interferometry (optical biometry).

Fifty eyes of 50 patients underwent biometry with ultrasonography and the other 50 patients underwent partial coherence laser interferometry. Confounding factor between two groups is axial length which is between 21-25 mm.

**PATIENT EXCLUSION CRITERIA**

- <40 or >80 years of age
- Mature cataracts, dense cataracts
- Retinal detachments, vitreous hemorrhages
- Corneal scars, tear film abnormalities
- Mentally challenged patients or patients with ocular disorders
- Motility disorder
- AL more than 25 and less than 21mm

The applanation A-scan, BIOMEDIX Echo RULE was used for ultrasound biometry and the IOL MASTER (Zeiss Humphrey Systems) was used for partial coherence laser interferometry. REICHERT KERATOMETER based on Bausch and Lomb principle was used for corneal curvature measurements for patients in the ultrasound group. The patients consented and the preoperative biometry was performed. IOL calculations were carried out by same person in both the groups.

The reliability of intraocular distance measurements was checked based on the sound to noise ratio (>2) in partial coherence laser interferometry and the
retinal spikes in ultrasonography. The SRK-T formula was used to calculate the IOL power in all the patients. The A-constant was kept constant for all the eyes in this study. The desired postoperative refraction, based on the pre-existing refractive error was decided prior to surgery.

The patients underwent phacoemulsification procedure through a 3.2 mm superior corneal tunnel and a foldable IOL was implanted. The patients were followed up on the first postoperative day, 1 week, 3 weeks and at 6 weeks. The postoperative refraction was carried out with an auto refractor and confirmed by subjective refraction.

The postoperative mean spherical equivalent (MSE) was calculated for each of the patients and it was compared with the desired refraction. The MEAN NUMERICAL ERROR (MNE) and MEAN ABSOLUTE ERROR (MAE) were derived based on the difference between the predicted and attained postoperative refraction. MAE defined as the mean of the absolute difference between the measured and the predicted postoperative spherical equivalent. The postoperative refractive outcome was compared between the groups that underwent biometry with ultrasound technique as opposed to partial coherence laser interferometry for statistical significance with independent sample T test.

**RESULTS**

The mean age of patients in the ultrasound group was 59.4 ± 8.79 yrs. (range 42–72 yrs) and 60.98 ± 9.02 yrs (range 40–80 yrs.) in the PCLI group. The mean preoperative axial length (AL) in the ultrasound group was 22.91 ± 1.2 mm (Range 21.01 mm - 24.58 mm) and 22.69 ± 1.1(Range 21.14 mm-24.36 mm) in the PCLI group respectively. All the eyes in the study had the IOL implanted in the capsular bag. The postoperative mean absolute error (MAE) was 0.86i in patients who underwent ultrasound biometry. The MAE in the PCLI group was 0.4775 D. There was no statistically significant difference between the groups in terms of postoperative refractive outcome (P = 0.19 >0.05) 79% of the eyes in

<table>
<thead>
<tr>
<th>Post-Op Refraction – PCLI vs US</th>
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<tbody>
<tr>
<td><strong>Ultrasound</strong></td>
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<tr>
<td><strong>Age</strong></td>
</tr>
<tr>
<td><strong>Range</strong></td>
</tr>
<tr>
<td><strong>Sex</strong></td>
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<tr>
<td><strong>AL mm</strong></td>
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<tr>
<td><strong>Post-Op. MAE</strong></td>
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<td><strong>Post-Op. MNE</strong></td>
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<td><strong>P Value MAE</strong></td>
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<td><strong>P Value MNE</strong></td>
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</table>
the ultrasound group achieved postoperative refraction of ±1 D of the predicted value as compared to 88% of patients in the PCLI group. When eyes with AL less than 21 and more than 25 mm were compared in different sample of 20 patients, 10 pts. of each group as described previously shows statistical significance with more precision in IOLM.

**DISCUSSION**

Our study compared the refractive outcome between applanation ultrasound and partial coherence laser interferometry. Both the groups compared favorably with no significant difference in functional outcome in the eyes with AL between 21-25 mm. However the patients who had partial coherence laser interferometry did better in reaching ±1 D of the expected post-op refraction (88%). Also when eyes with AL <21 - > 25 mm were compared although on small sample size of 20 pts, it showed statistical significance and IOLM proves more predictable in these eyes.

Partial coherence laser interferometry is a non-contact method and offers the ease of obtaining keratometry values, anterior chamber depth and AL measurements in a single sitting. This is a significant advantage when compared to conventional ultrasound biometry, which demands topical anesthesia for corneal applanation and is time consuming.

Recent publications have reported mixed conclusions about which technology has a better predictive value and in which clinical cases 1 or both technologies will fail to predict postoperative refraction. In a prospective study of 162 consecutive eyes undergoing cataract surgery, Gantenbein and Ruprecht concluded that contact axial biometry offered a better prediction of final refraction than the IOLm but that the IOLm was an easier and faster tool to use. In a prospective study of 140 consecutive eyes undergoing cataract surgery, Kutschan and Wiegand found that both contact ultrasound biometry and the IOLm were similar in their predictive capabilities and concluded that the IOLm was easier to use. Rajan et al. found that the use of optical biometry offered a better predictive value than the use of applanation axial biometry measurement. Verhulst and Vrijghem and Skorkovska et al. found that, in eyes with significant nuclear sclerotic cataract, axial biometry was still needed...
for accurate axial length measurement. More recently, Ueda et al. reported that axial length measurements taken with the IOLm were slightly affected by the cataract density but to a lesser extent than ultrasound biometry. Two small recent case series have examined the effect of macular disease on the 2 techniques with a qualified suggestion that the IOLm may be more accurate in these cases, but the conclusions have limited power because of the few patients.

In conclusion thus the dual beam partial coherence laser interferometry improves the predictive value of postoperative refraction in eyes undergoing cataract surgery. Also it is more precise in cases of high myopes and hypermetropes as compared to A-scan biometry. It is less time consuming and has the advantages of improved precision and patient acceptability when compared to conventional applanation ultrasound biometry.

REFERENCES

Quest for an Accommodating Gel IOL with Ex-Vivo Accommodation Simulator (EVAS) and Phaco Ersatz

Dr. Mukesh Taneja, Dr. Pesala Veerendranath, Dr. Virender Sangwan, Dr. Arthur Ho

Cataract formation, which results in a loss of lens transparency, is the most common eye disease related to the natural lens. Conventionally, a cataract is treated with a surgical procedure that involves removal of the cataractous lens material, followed by replacement with an IOL. However, conventional
IOL materials such as poly methyl methacrylate are very rigid materials and therefore do not provide accommodation due to their stiffness. Even the ‘soft’ foldable IOLs made of silicone, hydrogel, and acrylic are too stiff to allow effective accommodation. Therefore most of the pseudophakic patients have to be dependent on reading glasses for near work. Recently some mechanical accommodating IOLs have become available (e.g., Crystalens, Synchrony) and can provide a very low degree of accommodation (about 1D) by small relative axial movement of the optics in the eye, however there performance have been found to be inconsistent and they have not become very popular.

Restoring 3-4 dioptres (D) of true (dynamic) accommodation would meet most of the near vision needs of the pseudophakic patients and allow them a comfortable and prolonged reading of small print. Since the concept was first proposed by Kessler in the 1960s, researchers have been attempting to restore accommodation by replacing the hardened natural lens with a gel-like material, an injectable IOL. Unlike mechanical IOLs which are relatively rigid and have a preformed shape, injectable IOLs are significantly softer and render the capsular bag of the crystalline lens to take the shape of the natural lens. Lens refilling carries the significant potential of restoring accommodation due to greater impact of changes in optic curvature.

Phaco-Ersatz is a lens refilling procedure, that consists of removing the lens contents while preserving the lens capsule and its zonular attachments. The empty capsular bag is then refilled with a biocompatible and optically suitable clear gel. The polymeric gel is designed to mimic the natural performance of a young accommodating ocular lens.

The relationships between the accommodative forces and the resultant changes in biometric and optical properties of natural lenses in humans and nonhuman primates have been studied previously. The purpose of the present study is to evaluate the accommodative response (AR) of the human lenses in a mechanical lens stretching system (EVAS; Ex Vivo Accommodation Simulator) before and after lens refilling with a polymer gel.

**MATERIALS AND METHODS**

Forty five post-mortem human eyes from thirty seven deceased human donors, provided by the Ramayamma International Eye Bank, L V Prasad Eye Institute, Hyderabad, India were used to perform the experiments. The human donor eyes were obtained and used in compliance with the guidelines of the Declaration of Helsinki for research involving the use of human tissue. The age of the human donors ranged from 17 years to 54 years (Mean = 36.56 ± 10.75 years). The eyes were used between 18 and 48 hours post-mortem.
The eyes were dissected meticulously, leaving intact the lens, zonules, ciliary body, hyaloid membrane, anterior vitreous and a segmented scleral rim. The tissue preparation was mounted in the stretcher-EVAS and connected to the motorized translation stage of the stretcher. The translation stage was programmed to move a total of 2 mm in 0.25 mm increments corresponding to a total scleral stretch of 4 mm.

At each step of the stretching cycles, images of the lens with ciliary body were captured using a digital camera. The lens power during stretching cycles was measured with an optical system based on the Scheiner principle.

After the measurements for natural lens were taken, a minicapsulorhexis was created at the periphery of the lens immediately past the zonules anchors. The lens contents were removed by irrigation-aspiration technique. A minicapsulorhexis valve was inserted and the capsular bag was refilled with the gel made of soft polysiloxane polymers. The measurements for diameter and power were repeated for the refilled lens. The changes in lens power were compared before and after refilling. The difference in the lens power before and after stretching gave the measurement of the ex-vivo accommodation amplitude which would be referred to as accommodation response (AR).

**RESULTS**

Accommodation Response in the natural lens was found to be 2.0±1.8D (range 0.3–5.7D). After refilling with polymer gel this increased significantly to 4.5±2.1D (0.9–10.1D) (p<0.0001 Wilcoxon's SR test). After curing with UV light, accommodation response dropped to 2.9±1.8D (0.5–6.9D).
**DISCUSSION**

The mechanical stretching in the EVAS instrument approximates the 3 principal components of the accommodative apparatus, the ciliary body, the zonules and the lens. Each responds differently and some of their responses change with age.

Diametrical stretching by 4 mm increased the inner ciliary ring diameter by approximately 0.8 mm in the youngest eyes and 0.4 mm in the oldest. These are comparable to the in vivo responses. The similarity between the changes suggests that the effect of the stretcher on the inner portion of the accommodative apparatus (ciliary ring, zonules and lens) is similar to that in vivo, despite the major differences in the way these changes are produced (i.e. radial stretching simulates ciliary muscle relaxation, and de-stretching simulates ciliary muscle contraction).

Soft polysiloxane gels have potential for use as injectable, in situ curable accommodating intraocular lens to replace the aged hardening natural lens in the eye. Soft gels with desired properties can be achieved by altering the refractive index, viscosity (inject ability), and post-cure modulus. The resulting polymers are able to closely mimic both the optical and mechanical properties of a young natural lens and hence should enable the restoration of the eye’s ability to focus dynamically. The refilled lens maintains a higher accommodation compared to the natural lens at the same load, indicating the cured siloxane gel has the capacity to restore accommodation. In addition, their suitability for this application is further illustrated by their promising results in this lens stretching experiments. Cell growth inhibition assay and rabbit studies have shown that these polymers are non-cytotoxic and biocompatible. When used to replace the natural lens (Phaco-Ersatz surgery), clinical and histological examination of the implanted polymer was found to be well tolerated by ocular tissue in the rabbit model over 3 months.5
With the advent of Femtosecond laser assisted cataract surgery, Phaco-Ersatz, cataract surgery may soon become a reality with accurate sized minicapularhex is and nucleus softening being achieved with the help of Femtosecond laser in not so distant future.

In conclusion Lens refilling (Phaco-Ersatz) with injectable polymeric gel IOL shows great potential as a procedure for restoring accommodation in presbyopes and patients with cataract.

**REFERENCES**


**Combatting Pseudophakic Presbyopia with Crystalens**

**Dr. Vishal M. Shah, Dr. Ashok Shroff C., Dr. Anand Shroff**

Correcting pseudophakic presbyopia has always been a challenge. Modalities tried include monovision\(^1\,^2\) implantation of corneal inlays\(^3\) and implantation of multifocal\(^4\,^6\) IOL's. However none of these methods could satisfactorily correct pseudophakic presbyopia.

Magnetic resonance imaging studies have showed that ciliary muscle contractility is retained even in old age.\(^7\) Crystalens has been specifically designed to use this ciliary muscle contraction to increase vitreous pressure which allows forward movement of the lens thereby providing accommodation.

In this study we present the early post-operative visual outcomes of Crystalens HD-500 (Accomodating Intraocular lens, Bausch and Lomb) implantation after cataract surgery.

**MATERIALS AND METHODS**

**Study design:** Single centre, non comparative retrospective case series.
Outcome Measures: Effectiveness of the lens was assessed by evaluating uncorrected and best corrected distance (6 metres), intermediate (32 inches) and near (16 inches) visual acuities. During follow up period, an assessment of patient satisfaction, subjective vision quality and occurrence of visual disturbances was done.

Patients: Those patients who underwent cataract extraction with Crystalens HD-500 IOL implantation were included in the study.

Exclusion Criteria
1. More than 1 diopters (D) corneal astigmatism
2. Incomplete or damaged zonules
3. Any anterior segment pathologic characteristics (e.g., chronic uveitis, rubeosis iridis, corneal dystrophy)
4. Uncontrolled or undertreated glaucoma, retinal pathologic characteristics or history of retinal detachment, macular degeneration, proliferative diabetic retinopathy, congenital bilateral cataract, marked microphthalmos or aniridia, and previous ocular surgery.

Baseline preoperative examination included measurement of uncorrected and best corrected distance and near visual acuities, intraocular pressure by applanation tonometry, slit lamp examination and dilated fundus examination.

Examination Methods: Preoperatively, biometry was done using the 5.4 Advanced Technology V. IOL Master Interferometer (Carl Zeiss). In patients where axial length measurements couldn’t be obtained (density of cataract) by IOL Master, immersion biometry (Prager Shell, ESI Inc.) was used. IOL power calculation was done using the SRK-T/Holladay II formula depending on the keratometry and axial length values. Distance visual acuity was determined using the standard Snellen’s visual acuity chart at 6 metres. Intermediate and near visual acuities were determined using the standard chart at a distance of 32 inches and 16 inches respectively.

Study Device: The Crystalens HD-500 accomodating IOL is a posterior chamber modified plate-haptic IOL containing a high refractive index silicone material with an ultraviolet filter. The lens is hinged adjacent to the optic and has small T-shaped polyimide loops on the ends of the plate haptics. At the 2 tips of each of the polyimide loops are 2 small disks, round on the right and oval on the left. When the round disk is on the right, the lens is oriented with the hinge on its anterior surface. The overall length (loop tip to loop tip) is 11.5 mm. The optic diameter is 5.0 mm and the recommended A-constant in the FDA study was 119.0.

Surgical Technique: The SRK-T/Holladay II formula was used for IOL power calculation depending on the keratometry and axial length values. A-constant
of 118.8 was used. The refractive target for the first eye implanted was the first myopic value after emmetropia to avoid the possibility of post-operative hyperopic refraction. Lens power in the fellow eye was based on the refractive outcome of the primary eye. Phacoemulsification under topical anesthesia with a 2.8 mm posterior limbal incision in the steeper axis was done in all patients. A central continuous curvilinear capsulorhexis between 5.5-6 mm was made with an irrigating bent cystitome needle. Phacoemulsification with phacochop technique was used for cataract extraction. Meticulous cortical removal and cleaning of anterior and posterior capsule was done. The IOL was inserted in the capsular bag through the posterior limbal incision using standard instrumentation and technique. Thorough clean up of viscoelastic material was done. Atropine eye drops were instilled at the end of the surgery.

RESULTS
Demographical Information: 23 eyes of 14 patients were retrospectively analysed. There were 8 male and 6 female patients. 9 patients underwent binocular and 5 patients uniocular implantation. Age of patients ranged from 39 – 78 years (avg. 59.42 yrs.). Mean follow up was 2 months.

Visual Acuity: All (100%) patients achieved 20/40 or better uncorrected distant visual acuity with 17/23 eyes (74%) achieving uncorrected 20/20 distant visual acuity. All (100%) patients had 20/30 or better uncorrected intermediate visual acuities. Uncorrected near visual acuities of 20/40 (J3) or better were seen 20/23 eyes (87%) with 13/23 eyes achieving 20/32 (J2) or better. Binocularly, all patients achieved 20/20 or better uncorrected distant, 20/20 or better uncorrected intermediate and 20/40 (J3) or better uncorrected near visual acuities.

Patient Survey: All patients reported an improvement in the quality of vision. All patients were very satisfied with their surgical outcome. No patient complained of loss of contrast sensitivity, glare disability or haloes.

DISCUSSION
Cumming and Kammann had initially put forward that posterior chamber IOL’s could be specifically designed for allowing pseudophakic accommodation. Ciliary muscle contraction caused an increase in vitreous cavity pressure resulting in forward movement of the IOL optic.

In our series of 23 eyes, we evaluated the uncorrected and best corrected distance, intermediate and near visual acuities.

100% patients achieved 20/40 or better uncorrected distant visual acuity with no patient having loss of best corrected visual acuity. 74% eyes achieved uncorrected 20/20 distant visual acuity. 13/14 patients were independent of
spectacle correction for distance. The only patient who required spectacles for distance vision had a pre-existing cylinder and had been counselled for the same pre-operatively.

100% patients had 20/30 or better uncorrected intermediate visual acuities. No patient needed spectacle correction for intermediate vision.

Uncorrected near visual acuities of 20/40 (J3) or better were seen in 87% eyes with 56.5% eyes achieving 20/32 (J2) or better. Best corrected vision of 20/20 (J1) was achieved in all patients. The postoperative near add powers required in the eyes to achieve the best potential near acuity were significantly lower than usually prescribed. 83 % eyes required an add of +1.5 D or less to achieve monocular best corrected near acuity of J1.

Binocularly, all patients achieved 20/20 or better uncorrected distant, 20/20 or better uncorrected intermediate and 20/40 (J3) or better uncorrected near visual acuities. 71.4% of patients (10/14) achieved spectacle independence for all distances. Our results are in accordance with other studies reported in literature. In the limited number of patients that we have reported, there was no adverse event noted.

On subjective questioning in the postoperative period, all patients were extremely satisfied with the postoperative result. No patients reported a subjective loss or decrease of contrast sensitivity, problems of glare disability or haloes.

In our study of limited number of patients, we noted good uncorrected acuity results at all distances and absence of any serious safety concerns. Accurate biometry is of utmost importance in achieving good predictability of visual outcomes. This has to be combined with a good surgical technique. Good wound construction, adequate capsulorrhexis size, anterior and posterior capsular polishing alignment of hinges/haptics along the shortest rhexit diameter, rocking of IOL and chamber stability at the end of surgery are factors which could determine the end result.

Because our study was not conducted as a prospective, randomised clinical trial, it may be subject to many issues of bias and confounding factors and patients enrolled may differ from the general population in several ways. However, given our study limitations, we found successful distance, intermediate and near vision results with the implantation of Crystalens HD-500 accommodating IOL.

In conclusion the Crystalens accommodating IOL provides good uncorrected near, intermediate and distance vision in pseudophakic patients. Quality of vision is also very well preserved since it is a monofocal IOL. Given our study limitations, further studies to evaluate visual outcomes in a larger number of patients with a longer follow up are warranted.
REFERENCES

Ocular Aberration and Contrast Sensitivity after Ashperic Intra-ocular Lens Implantation – A Clinical Study

Dr. Jyoti S. Shetty, Dr. Sheetal Hegde, Dr. Abhishek Golwara

Cataract surgery for replacement of the cataractous lens with an artificial intraocular lens is the most frequent surgical procedure done worldwide. With advances in intraocular lens and phacoemulsification technique, cataract surgery has evolved from safe removal of cataract to one aimed at acquiring the best possible postoperative visual quality by restoring youthful
contrast sensitivity through the manipulation of ocular spherical aberration. Many studies have shown that contrast sensitivity is a robust indicator of functional vision. Its measurement evaluates visual function across a wide range of pupil size and conditions of luminance and glare that appears in the everyday environment, providing a more realistic assessment of the patient’s quality of vision. In order to restore high contrast sensitivity and minimize ocular aberration, aspheric intraocular lenses were introduced. These have a modified prolate aspherical anterior or both anterior and posterior surfaces. The aspherical intraocular lenses have a negative or zero spherical aberration, which offsets the average positive aberration of the cornea.

The aim of our study was to compare the following aspects after implantation of aspheric intraocular lenses- change in the preoperative to postoperative total and higher order aberrations in different pupil diameters and to study the status of postoperative contrast sensitivity in different conditions of luminance and glare with different pupil diameter.

**MATERIALS AND METHODS**

A prospective comparative study was conducted at Bangalore West Lions Superspeciality Eye Hospital on 44 eyes of 40 patients who were implanted with 3 different types of Aspheric IOLs as follows: Group 1- Combined negative and neutral aberration ZO XL STABI IOL (n=10); Group 2: Negative aberration (-0.27µm) Tecnis Z9000 (AMO) (n=20); Group 3 Negative aberration (-0.20 µm) Acrysof IQ (Alcon) (n=14).

Patients included were those with cataract grade II-III nuclear sclerosis or less in whom the density of the cataract did not hinder the test for capturing of ocular aberration picture. Wavefront measurement was done preoperatively and 6 weeks post operatively using Zywave aberrometer and wavefront error was described using Zernike polynomials according to VISA standard. Contrast sensitivity was tested at 6 weeks post-operatively using CSV- 1000E. Vector Vision test phase. Contrast sensitivity was tested at spatial frequencies of 3,6,12 and 18 CPD using black soft contact lens with central fixed diameter aperture of 3.5 and 5 mm. Contrast sensitivity was tested under photopic and mesopic conditions with and without glare.

**RESULTS**

All the 3 groups had similar age-wise distribution of patients. The average age of the patients was 63.63 ±10.36. Post-operative best corrected visual acuity was 6/6 in 100% patients. The mean post-operative cylindrical correction used in Group 1 was 0.64±0.13, Group 2 was 0.64±0.12, and Group 3 was 0.56±0.11. The axial length and IOL power in the 3 groups were comparable. In Group 1 the mean axial length was 23.10±0.53 mm, IOL power used was 21.10±1.54D.
Group 2 axial length was 23.30±0.45 mm and IOL power was 21.80±1.30. In Group 3 axial length was 22.80±0.26 mm and IOL power was 21.70±0.33D respectively.
Ocular Aberrations- Evaluation of ocular aberrations in the 3 groups was done. Total Zernike RMS values and HO Zernike values at 5 mm and 6 mm pupil showed statistically significant improvement in all 3 groups- Grp 1 (p value 0.007), Group 2 (p value 0.001) and group 3 (p value <0.001).

Comparison of postoperative Ocular Aberrations between the three groups showed improvement in total Zernike RMS values which were comparable in all three groups, whereas higher order aberrations were slightly better in the Group 1 at 5 mm and 6 mm pupil size with p value of 0.077 and 0.075 respectively.

Change in individual aberrations from pre-operative to post operative period in Group 1 showed that improvement in coma aberration was moderate, whereas spherical aberration improved significantly (p<0.001).

In photopic condition with glare, contrast sensitivity was same at 6 and 18 cpd in all three groups but moderately better contrast sensitivity was seen in Group 3 at 12 cpd and in Group 1 at 3 cpd.

No significant difference in contrast sensitivity was found post operatively in mesopic condition with and without glare between the three groups at 3.5 mm and 5 mm pupil size.
In group 2, there was moderate improvement in trefoil aberration post-operatively, whereas there was statistically significant improvement in spherical aberration (p<0.001).

In Group 3, there was statistically significant improvement in spherical aberration (p<0.001).

On comparing individual aberrations post-operatively between three groups no significant differences were found in astigmatism, coma and trefoil. Spherical aberration was significantly better in group 3 in comparison to group 1 with p value of <0.001 and moderately better than group 2 with p value of 0.013.

Contrast-sensitivity-Post-operative contrast sensitivity measured after 6 weeks in photopic conditions without glare was same at 3 and 6 cpd in all the three the groups whereas moderately better at 12 and 18 cpd in Group 1.

DISCUSSION

In this study we implanted three different types of aspheric IOLs- negative spherical aberration and combination of negative and neutral spherical aberrations to analyze the changes in total ocular aberration and improvement of contrast sensitivity. No study has been done comparing these three aspheric IOLs pre-operative aberration profile and change in total ocular aberration post operatively till date as far as our search goes. All the three groups showed almost similar change in total Zernike RMS value post-operatively. On comparing the three groups on the basis of individual aberrations no statistical difference was found in any of the parameters except the spherical aberration, where negative aberration lens group had better result than combined negative and neutral aberration lens group, with highly significant p value. In our study the mean age of the patient was 63.63 ± 10.36 and post operative value of spherical aberrations Z40 was 0.05 ± 0.07, which is much lower than both the studies done on young individuals. So our study stresses upon this fact that post operative spherical aberrations in pseudophakic older patients with aspheric IOLs are better than spherical aberrations in young phakic individual. In our study groups we found slightly better contrast sensitivity in combined neutral and negative aberration lens group compared to negative aberration lens group in photopic condition. As combined negative and neutral aberration aspheric IOL does not fully correct spherical aberration of the cornea, the remaining positive aberration may have been contributed to slightly better contrast sensitivity in that group.

In conclusion our study showed improved optical quality following implantation of an aspheric intraocular lens by improving the contrast sensitivity and decreasing the higher order aberrations. These benefits could
be attributed to the IOL specific design and reinforce the relevance of aspherical intraocular lenses in everyday visual perception of pseudophakic patients.

REFERENCES


Results of Acrylic Toric Intraocular Lens in Eyes with Pre-Existing Corneal Astigmatism

Dr. K. Vamsi, Dr. Chitra Ramamurthy, Dr. Shreesh Kumar. K, Dr. D. Ramamurthy

The goal in modern cataract surgery is emmetropia. Approximately 22% of cataract patients have >1.25 D of corneal or refractive astigmatism. Acrylic toric IOLs now provide a safe and predictable alternative for correction of aphakia as well as pre-existing or surgically induced astigmatism. Shift to smaller incisions, accurate intraocular lens power calculations and management of corneal astigmatism have contributed to significant improvement in visual outcomes.

In this paper we present the outcomes of a prospective single-centre study in which implantation of Toric IOL done in cases with significant pre-existing astigmatism.

Toric lenses are designed to focus the light otherwise scattered by corneal astigmatism and thereby minimize image distortion and also correct aphakia.

MATERIALS AND METHODS

This prospective single centre case series study done between November 2009 April 2011 includes 52 eyes of 39 patients with significant pre-existing corneal astigmatism between 1.00 D cylinder and 5.00 D cylinder who underwent phacoemulsification followed by Acrysof Toric IOL implantation after getting informed consent.
Preoperatively, patients had a complete ophthalmic examination including measurement of Snellen UCVA and snellen BCVA, manual B and L keratometry, applanation tonometry, slit lamp examination, fundoscopy. Exclusion criteria were tear film abnormalities, very small pupil and extensive macular disease.

**Intraocular Lens Calculation**

The Acrysof Toric IOL has open-loop modified C-haptics with 3 reference dots on each side that marks the axis of cylinder on its posterior surface (A constant 118.4). IOL power was calculated for each case using the appropriate formula depending on the axial length on the IOL master (Carl Zies Meditech) along with ultrasonic immersion biometry data. Comparison between both data done and the best IOL power chosen with emmetropia as the goal. Intraocular lens cylinder power and alignment axis were calculated using a web-based Toric IOL Calculator Program (http://www.acrysoftoriccalculator.com) taking into account the IOL master keratometry (K) readings as well as mandatory data input on the position of the incision and the estimate of the surgically induced corneal astigmatism by a superior (0.75D) or temporal (0.50D) limbal incision. The target induced astigmatism was defined as the maximum amount of astigmatism correction possible taking into account the pre-operative corneal astigmatism and the effect of the phaco incision and was calculated with the Toric IOL Calculator Program.

**Surgical Technique**

Pre-operatively with the patient sitting upright to correct for recumbent cyclotorsion 3 limbal reference marks on the 3, 6 and 9 o’clock were marked using toric reference marker intraoperatively, the actual implantation axis was marked using axis marker and phacoemulsification done using a standard technique with 360 overlap of the curvilinear capsulorhexis which is best to help maintain centration. Toric foldable IOL implanted through a 3.00 mm incision, preferable on steep axis. Monarch II injector used to inject Toric IOL and IOL rotated to its final position by exactly aligning the toric reference marks with the limbal implantation axis marks.

**Post-Operative Management**

Post-operatively, all patients were prescribed a fixed combination of Prednisolone 1% eye drops 2 hourly for the 1st week followed by QID for remaining 5 weeks and then tapered weekly along with Moxifloxacin 0.5% and ketorolac tromethamine 0.5% QID for 6 weeks. Measurement of UCVA and BCVA, applanation tonometry, a complete slit lamp examination were performed at day 1, 1st week, 6 weeks and 3 months. Toric rotational stability was assessed at 3 months using slit beam and digital retro illumination photographs.
Outcome Analysis

For analysis of post-operative outcomes, the patients were divided into groups according to the Toric IOL implanted to correct the pre-existing astigmatism. Total No. n=52. The T3 group n=5, T4 group n=12, T5 group n=12, T6=8, T7=6, T8=5, T9=4. All data were gathered after a mean follow up of 6 months.

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<tr>
<th>Toric IOL’s</th>
<th>IOL Plane</th>
<th>Corneal Plane</th>
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<tr>
<td>SN 60 T3</td>
<td>1.50D</td>
<td>1.03D</td>
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<td>2.25D</td>
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Patient Demographics And Preoperative Data

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<th>T6</th>
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<td>12</td>
<td>8</td>
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<td>Meal IOL spherical</td>
<td>19.52</td>
<td>22.12</td>
<td>19.58</td>
<td>18.58</td>
<td>17.93</td>
<td>19.73</td>
<td>19.10</td>
<td>19.62</td>
</tr>
</tbody>
</table>

RESULTS

Table 1 shows the patients demographics and preoperative data. The mean age of all patients was 60.2 yrs (Range 45-70yrs).

Visual Acuity

At 6 months 96.20% achieved a best corrected visual acuity of 6/12 or better of which 61.53% achieved uncorrected visual acuity of 6/6. 9.54% achieved best corrected visual acuity of 6/6. In one eye (5%) the best corrected visual acuity was 6/12.

Residual Refractive Cylinder

61.53% of eyes had full correction, 38.47% of eyes had residual astigmatism of which 21.15% had ≤ 0.75 Dcyl and 9.16% had ≤ 1.0 Dcyl. 7.69% had ≥ 1.50 Dcyl.
Misalignment. One eye in T7 group required redialing as residual astigmatism in 1st post-op week was -1.75 Dcyl.

DISCUSSION

Good outcome in treating pre existing corneal astigmatism can be achieved when there is high precision in diagnosis, defining of the axis and marking the axis and treatment.

Pre existing corneal astigmatism can be treated depending on amount of astigmatism by several ways like on axis cataract incisions, opposite clear corneal incisions, limbal relaxing incision. Implantation of a toric IOL has the potential to be a predictable way to manage astigmatism in patients with cataract and corneal astigmatism.3

Accurate corneal astigmatism measurements to determine the actual amount of cylinder requiring correction and the spherical power of the IOL were done. Corneal astigmatism was measured using manual keratometry(B&L) and automated keratometry by optical biometry (IOL master) Both gave comparable results.4 For accurate IOL calculation biometry was done in both IOL master and immersion ultrasound biometry. Amount and axis of astigmatism measured by IOL master was the standard choice for calculating non toric IOL spherical power. The Acrysof toric IOL calculator was an excellent tool for determination the type of toric IOL to be implanted and calculation of the implantation axis.

Finally of utmost importance when using toric IOLs is accurate IOL placement and IOL rotational stability, for with each degree of misalignment the yield of astigmatism correction is reduced by 3.3% with complete loss of cylinder power when IOL is misaligned by 30 degree. A study by Weinand et al. using digital photographic analysis of IOL position in the 6 months period found excellent rotational stability of the single piece AcrySof IOL, which has a design similar to the toric IOL we used.5

In our study 61.53% of eyes had 6/6 vision without any residual astigmatism 21.15% had residual astigmatism ≤ 0.75 Dcyl.

Thus in conclusion we believe that implantation of an AcrySof toric IOL is an efficient, safe and predictable method of managing corneal astigmatism in cataract patients that warrants only slight modification of the routine cataract surgery technique.

REFERENCES

2. Werner L, Olson RJ, Mamalis N. New technology IOL optics. Ophthalmol Clin
The advent of phaco-emulsification, foldable IOLs, and improved incision designs has decreased the incidence and amount of surgically induced astigmatism in cataract patients. However, approximately 15% to 20% of cataract patients have more than 1.5D of keratometric astigmatism. Interest in reducing preexisting astigmatism simultaneously with cataract surgery has grown in recent years. Options available are:

1. Clear corneal incision along the steep meridian.
2. Astigmatic keratotomy
3. Toric IOL implantation
4. Opposite clear corneal incisions
5. Limbal relaxing incisions.
6. LASIK for post operative astigmatism.

All the above stated procedures have their own advantages and disadvantages. Herein we will be discussing the efficacy as well as the accuracy of limbal relaxing incision in different corneal astigmatic conditions.

MATERIALS AND METHODS

30 eyes of 30 patients who underwent phacoemulsification with foldable IOL implant by a single surgeon between November 2010 to February 2011 were included. This is a prospective study performed on patients with senile cataract with significant corneal astigmatism. Significant corneal astigmatism was defined as the difference between the two meridians as more than or equal to 0.75D as documented on automated kerometer Nidek RKT 7700.
Exclusion criteria were previous ocular surgery, ocular trauma, pre-existing ocular disease, dry eye, high intraocular pressures, corneal opacity, strabismus, amblyopia, diabetes.

**Procedure**

All patients underwent clear corneal temporal phacoemulsification and foldable IOL implant performed through 2.8 mm incision with concomitant LRI done prior to phacoemulsification. Pre operative as well as post operative keratometry were recorded at 1 week and 1 month on Nidek RKT 7700. All LRIs were placed inside the surgical limbus at a depth of 600micrometer with a diamond knife, paired LRIs were made along the steep corneal meridian, the degree of arc was decided by the nomogram given by Nichamen. For patients with against the rule astigmatism the temporal hinge incision for phaco was oriented to align with placement of LRI, a second LRI was performed on the nasal side before phacoemulsification.

LRI Nomogram for clear corneal phacoemulsification-

**“Against-The-Rule”: Steep Axis 0-30°/ 150-180°):**

<table>
<thead>
<tr>
<th>Preop cylinder</th>
<th>30-40 yr.</th>
<th>41-50 yr.</th>
<th>51-60 yr.</th>
<th>61-70 yr.</th>
<th>71-80 yr.</th>
<th>81-90 yr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>+0.75 - +1.25</td>
<td>55deg</td>
<td>50deg</td>
<td>45deg</td>
<td>40deg</td>
<td>35deg</td>
<td>30deg</td>
</tr>
<tr>
<td>+1.50 - +2.00</td>
<td>70 deg</td>
<td>65deg</td>
<td>60deg</td>
<td>55deg</td>
<td>50deg</td>
<td>45deg</td>
</tr>
<tr>
<td>+2.25 - +2.75</td>
<td>90 deg</td>
<td>80deg</td>
<td>70deg</td>
<td>60deg</td>
<td>50deg</td>
<td>45deg</td>
</tr>
<tr>
<td>+3.00 - +3.75</td>
<td>90 deg</td>
<td>90deg</td>
<td>85deg</td>
<td>70deg</td>
<td>60deg</td>
<td>50deg</td>
</tr>
</tbody>
</table>

degrees of arc to be incised

**“With-The-Rule”: (Steep Axis 45°- 145°):**

<table>
<thead>
<tr>
<th>Preop cylinder</th>
<th>30-40 yr.</th>
<th>41-50 yr.</th>
<th>51-60 yr.</th>
<th>61-70 yr.</th>
<th>71-80 yr.</th>
<th>81-90 yr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>+1.00 - +1.50</td>
<td>50 deg</td>
<td>45deg</td>
<td>40deg</td>
<td>35deg</td>
<td>30deg</td>
<td></td>
</tr>
<tr>
<td>+1.75 - +2.25</td>
<td>60 deg</td>
<td>55deg</td>
<td>50deg</td>
<td>45deg</td>
<td>40deg</td>
<td>35deg</td>
</tr>
<tr>
<td>+2.50 - +3.00</td>
<td>70 deg</td>
<td>65deg</td>
<td>60deg</td>
<td>55deg</td>
<td>50deg</td>
<td>45deg</td>
</tr>
<tr>
<td>+3.25 - +3.75</td>
<td>80 deg</td>
<td>75deg</td>
<td>70deg</td>
<td>65deg</td>
<td>60deg</td>
<td>55deg</td>
</tr>
</tbody>
</table>

degrees of arc to be incised

**RESULTS**

The effectiveness of LRI was evaluated by comparing the pre and the post operative astigmatism. Mean and standard deviation were evaluated at 1 week and 1 month postoperatively.

**Preoperative Demographic Data**

<table>
<thead>
<tr>
<th></th>
<th>Number</th>
<th>Mean Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>20</td>
<td>63.9</td>
</tr>
<tr>
<td>Females</td>
<td>10</td>
<td>65.3</td>
</tr>
</tbody>
</table>
**Pre operative cylinder Range**

<table>
<thead>
<tr>
<th>Astigmatism (Diopters)</th>
<th>Number of Patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.75 – 1.25</td>
<td>15</td>
<td>50%</td>
</tr>
<tr>
<td>1.26 – 1.75</td>
<td>10</td>
<td>33.3%</td>
</tr>
<tr>
<td>1.76 above</td>
<td>5</td>
<td>16.7%</td>
</tr>
</tbody>
</table>

Mean pre operative astigmatism 1.44, Range- 0.75-2.75

**Post operative cylinder Range (At 1 Month)**

<table>
<thead>
<tr>
<th>Astigmatism (Diopters)</th>
<th>Number of Patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.50 – 1.25</td>
<td>23</td>
<td>76.7%</td>
</tr>
<tr>
<td>1.26 – 1.75</td>
<td>4</td>
<td>13.3%</td>
</tr>
<tr>
<td>1.76 above</td>
<td>3</td>
<td>10%</td>
</tr>
</tbody>
</table>

Mean post operative astigmatism 1.01, Range- 0.5 – 3.5

**Analysis of Change in Pre and Post operative cylinder**

<table>
<thead>
<tr>
<th></th>
<th>Number of Patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decreased</td>
<td>21</td>
<td>70.0%</td>
</tr>
<tr>
<td>Increased</td>
<td>3</td>
<td>10%</td>
</tr>
<tr>
<td>Same</td>
<td>6</td>
<td>20%</td>
</tr>
</tbody>
</table>

Mean post operative astigmatism 1.01

T test analysis shows p VALUE = 0.02 (Statistically significant)

**DISCUSSION**

Limbal Relaxing incisions reduce the pre operative corneal astigmatism by statistically significant amount. In our study we have seen that 70% of our patients had post operative reduced astigmatism, mean reduction being 0.43D. Kaufmann C9 in JCRS 2005 compared LRIs with on axis placement of incisions and found that astigmatic reduction achieved at the intended meridian was significantly more favourable with the LRI technique.

Although decrease in postoperative astigmatism was seen in 70% of cases, there is a trend of undercorrection. Undercorrection was not uncommon in previous reports. In our study we have found that 6 out of 30 patients had almost same amount of astigmatism left post LRI.

On further analysis we found that astigmatism above 1.75D showed variable results. Two patients having with the rule astigmatism or steep vertical meridian (horizontal LRI was performed) had increase in astigmatism post LRI. This particular finding correlates with the study done by Li Wang et al.7 in JCRS 2003 wherein they found that there was a marked difference between the effect of vertical versus horizontal LRIs. Horizontal LRIs produced a change of 2.02 to 2.72D whereas vertical LRIs produced a change of 0.55 to 1.18D.
In conclusion simultaneous LRI during phacoemulsification surgery appears to be safe and fairly effective for mild to moderate amounts of corneal astigmatism (upto 1.75D).

Undercorrection is one of the major set backs seen, which could be attributed to various factors like surgeons factor, oblique angulation of blade (rather than perpendicular), and site of incision.

Beyond 1.75D of astigmatism, LRIs have very inconsistent results, so it is safer to go for toric IOLs or post operative LASIK in these patients.

REFERENCES
astigmatically neutral incisions in phacoemulsification, astigmatism correction by aphakic toric intraocular lenses (IOLs) became conceivable. Toric IOLs offer higher predictability over keratorefractive procedures. Recent studies have analyzed the results of several toric IOL models’ implantation after cataract surgery and have shown good rotational stability and good functional results.1-4

The purpose of this study was to perform an evaluation of the effect of toric IOL implantation in the correction of preoperative astigmatism after small-incision clear corneal phacoemulsification and to assess visual outcome, contrast sensitivity and rotational stability of the AcrySof toric IOL.

**MATERIALS AND METHODS**

Prospective interventional clinical study comprised 20 eyes with more than 1.00 D of preexisting corneal astigmatism. Power calculation and axis placement to achieve emmetropia were performed using an internal company program of Alcon. Phacoemulsification was performed through a 2.8 mm superotemporal corneal incision after axis marking with Mendez gauze and toric IOL injected and positioned along the marked axis. Uncorrected (UCVA) and best corrected (BCVA) visual acuity, refraction, contrast sensitivity and IOL axis were measured 3 months postoperatively. The rotational stability of a toric IOL was evaluated using digital photographs as well as slit lamp graticule. Astigmatic data was converted into power vectors (J0, J45 and Spherical equivalent (SE)) for statistical analysis and blur strength calculation.

**RESULTS**

20 eyes of 17 patients with cataract and preexisting astigmatism underwent phacoemulsification and implantation of toric IOL. Six eyes were implanted with SN60T4, 9 with SN60T5, SN60T6 in 2, SN60T8 for 1 and SN60T9 was implanted in 2 eyes.

**Visual Acuity**

95 % of eyes achieved 20/40 or better UCVA and 55 % achieved 20/30 or better. All eyes achieved 20/30 or better BCVA. All 5 eyes in which toric IOLs of more than T5 model were implanted achieved 20/40 or better visual acuity.

Difference between preoperative and postoperative blur strength was statistically significant (p =0.001).
Astigmatism analysis
Regarding the vector components, at J0 and J45, 95% of eyes are within ± 0.75 D of the attempted change. Our results are comparable to those in prior studies reported by Mendicute et al.2 The changes in the mean keratometry values from before surgery to after surgery were not statistically significant (P=0.82 for J0, and P= 0.59 for J45).

Figure 1 shows the astigmatic component of the power vector, represented by the 2-dimensional vector (J0, J45). The origin in the graph (0, 0) represents an eye free of astigmatism. The spread in the presurgical data was converted into a concentrated data set around the origin after surgery

Figure 1. Representation of the astigmatic vector (J0 and J45 of manifest refraction) before surgery and 3 months after surgery in the toric IOL group

Contrast sensitivity
The mean log10CS values as measured at 3 months was 1.76 ± 0.10.

Rotational Stability
The mean postoperative IOL rotation was 3.8 ± 2.38 degrees at 3 months. Maximum rotation was 10 degrees seen in case which was implanted with SN60T5. IOL rotation equal to or less than 4 degrees was seen in 8 cases. SN60T9 IOL rotated more than 5 degrees.

DISCUSSION
Corneal astigmatism can be surgically managed using corneal, relaxing, or limbal incisions and excimer laser keratectomy. Limitations, advantages, and disadvantages have been fully discussed in the literature.5 The use of toric IOLs to correct corneal astigmatism is one surgical option. We implanted a foldable toric single-piece IOL in 20 eyes with preexisting corneal astigmatism greater than 1.00 D. To our knowledge, this is the article to report the efficacy and rotational stability of toric IOLs including IOLs of higher toricity (more than T6 model Alcon AcrySof )in series of cataract patients.

The mean IOL rotation seen in our study was less than 5 degrees (Range 0-10 degrees). Our results compare well with those in other studies of the same toric IOL design.1-4 Mendicute et al.2 have reported a mean rotation of 3.53 ±1.97 degrees (Range 0-8 degrees), Koshy et al4 less than 3 degrees and Ahmed et al6 reported ± 5 degrees. However, none of the studies have evaluated rotational stability of IOLs with higher toricity (T6, T8, and T9). In present study T9 model of AcrySof toric IOL rotated more than 5 degrees but IOL in T6-T8 group did not rotate by more than 4 degrees. No correlation between toric power and rotational stability could be established as our study had too few cases to reach sufficient power required for such analysis.
In conclusion, the results in our study show that implantation of the AcrySof toric IOL is an effective surgical option to correct preexisting corneal astigmatism during cataract surgery. Even in patients with high astigmatism who were implanted with toric IOLs of higher toricity (SN60-T6, T8, T9) for astigmatism reduction, these IOLs were associated with satisfactory uncorrected distance visual acuity and were rotationally stable. Future studies with larger samples and longer follow-ups needed to evaluate the efficacy and safety of implantation of IOLs with higher toricity in cataract patients having high astigmatism.

REFERENCES

Astigmatic Profile of Patients who are booked for Cataract Surgery in A Tertiary Eye Care Centre

Dr. Debashis Dutta, Dr. Prashant Kumar Singhal, Dr. Sudip Datta

Cataract extraction with Intraocular lens implantation has now transcended to refractive surgery. Patients demand a panacea for all refractive errors in cataract surgery. Crisp unaided distant vision or emmetropia has become the basic and standard goal of cataract surgery. Spherical errors are taken care of by accurate biometry to a great extent; but astigmatism has to be taken care of at the time of surgery itself to have predictable and gratifying post surgical outcomes. There are two ways of quenching the corneal astigmatism. One is at the level of cornea itself by keratorefractive procedures like steep axis clear corneal incisions, limbal relaxing incision, cornea relaxing incision, laser procedures etc. The drawback of the corneal procedures is that there is...
a limit to amount of astigmatism that these procedures can correct and there 
is definite evidence of regression. The tremendous advantage lies in the fact 
that these are inexpensive and calls for little or no learning curve. Moreover 
it can take care of majority of astigmatism in cataract surgery. The other way 
to correct or compensate for corneal astigmatism is by implantation of toric 
IOLs. Moreover corneal astigmatism changes with age. This study shows the 
prevalence of corneal astigmatism in patients booked for cataract surgery 
in different age groups. Thus it will help to assess the need of astigmatically 
neutral surgery vis-a-vis toric intraocular lenses. This study also throws light 
on how one can use surgically induced astigmatism to one’s advantage.

MATERIALS AND METHODS
It is a prospective non randomised analytical study of the corneal astigmatism 
of patients due to undergo cataract surgery. The study was approved by 
institutional ethics committee. Informed consent was obtained from all the 
patients enrolled.

All eyes were thoroughly examined for refraction, tonometry, fundoscopy 
and slit lamp examination. Patients with history of any irregular astigmatism, 
corneal or ocular disease any ocular inflammation or surgery were not taken 
up for study. One operator noted tilted keratometric readings (K₁ and K₂) on a 
Bausch and Lomb model of keratometer. Another operator in a sister hospital 
noted K₁ and K₂ in IOL Master. Age, laterality and sex of the patients were 
also noted.

RESULTS
Majority 66.3% patients reported in 5th, 6th and 7th decade of life. 28% belonged 
to the 6th decade. The study comprised of 5322 eyes. The demographic 
distribution of data is as follows,

Total No of eyes 5322,
Mean age 61.24 yrs. +/- 8.76
Age range 32-87
Gender :Male /Female 1.1:1
Mean Corneal astigmatism 0.70 D : SD =0.95
Mean of keratometry 43.50D.
Range of Keratometry 36.25 to 49.50.
12.6 % eyes did not show any astigmatism.
The overall mean astigmatism 0.70 D +/- 0.95 D
The mean astigmatism of Males is 0.77D +/- 0.96 D
The mean astigmatism of Females is 0.58D + - 0.90 D (Median is 0.75D)
The mean astigmatism of RE is 0.70 D + - 0.96 D.
The mean astigmatism of LE is 0.70 D + - 0.94 D.
The data was divided into 5 age groups, 40 to 49, 50 to 59, 60 to 69, 70 to 79 and 80 and above. In each group KH was greater than KV and the astigmatism progressively increases through 0.36, 0.52, 0.68, 0.97 and 0.98 respectively.
Against the rule astigmatism increases with age and is clearly seen here. It is postulated that vertical corneal meridian progressively flattens as we grow older due to constant pressure of the upper lid and lower lid. This leads to a relative steepening of the orthogonal (horizontal) meridian thus we get progressive ATR.

**DISCUSSION**

Corneal astigmatism can be managed surgically using steep axis incision, opposite clear corneal incision, corneal relaxing incision or limbal relaxing incision and excimer laser keratometry. There are limitations, advantages and disadvantages. The use of toric IOL to correct corneal astigmatism is an established option. This study is aimed to determine the prevalence of corneal astigmatism as a function of age sex and laterality. 29% of eyes had astigmatism more than 0.95D. The accepted fact that with age astigmatism with the rule changes to against the rule is clearly seen here. Majority of astigmatism is within 0.87 D and is well manageable by existing inexpensive surgical means. Only the ones with more than 1.50 D astigmatism need toric IOLs.

There are two extremes the ones with no or minimal astigmatism 0 to 0.25 (13%) and the ones with astigmatism more than 1.0 D (31%). For the first group we need to adopt surgical means whereby no astigmatism is induced viz. 1.2 mm incision micro phaco etc. While the other extreme having astigmatism more than 1.5D can be managed by toric IOLs. The middle portion having astigmatism of 0.5 D to 1.5 D can be taken care of by various surgical means like steep axis incisions of 2.8 mm to 3.2 mm. It may be supplemented by limbal or corneal relaxing incisions or opposite clear corneal incisions. About 50% patients have astigmatism between 0.50 D to 1.00 D.

The high prevalence of low astigmatism calls for inexpensive surgical modification like steep axis 2.8 mm to 3.2 mm incision size in phacoemulsification combined with LRI or opposite clear corneal incision. The need of astigmatically neutral surgery is restricted to 13% (Astigmatism 0.0 D to 0.25D) where 1.2 mm incision or the so called micro phaco is well accepted. But if Cataract Surgery is taken up for other cases there is always some benefit with surgical modifications and 2.8 mm incisions.
REFERENCES


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Safety and Efficacy of Phacoemulsification in Various Types of Post-Uveitic Cataracts

Dr. Manish Mahendra, Dr. Mahendra Y.K, Dr. Shally Mahendra

Cataract surgery has become very demanding as all patients are expecting to be operated on with a no-injection, no-stitch, no-patch procedure and to achieve a perfect refractive outcome without any complications. However, our ability to meet these demands is challenged by various situations, including in eyes with post-uveitic cataracts. Cataract is a common complication of uveitis and is caused by the recurrence of chronic inflammation itself or long term use of corticosteroidal agents. Cataract surgery is often indicated for visual rehabilitation and to allow assessment and management of posterior segment pathology. Phacoemulsification with posterior chamber intraocular lens (PCIOL) implantation is the preferred choice of surgery in patients with uveitis. The factors that influence the surgical approach in post uveitic cataracts are a)indications and timing of surgery, (b)surgical technique and (c) pre and postoperative treatment.

MATERIALS AND METHODS

Categorization of the clinical features of the 56 cases of post uveitic cataracts at our centre highlights the challenges that are faced by the cataract surgeon when operating on eyes with these cataracts. We did a study of 56 eyes of 48 patients with post uveitic cataract that were operated with temporal clear corneal phacoemulsification in a period of two years between 1st January 2009 to 1st April 2011. The study included various types of post uveitic cataracts namely 26(46.4%) eyes with a festooned pupil, 19 (33.9%) eyes with a nondilating miotic pupil, 5(8.9%) eyes with post trabeculectomy cataract, 4(7.1%) with a mature hard white cataract, and 2 (1.8%) with occlusio pupillae.

In all cases, cataract surgery was withheld until the eye had demonstrated at least 3 months of quiescence. To control the level of surgery-induced inflammation, patients were started 1 week pre-operatively on a standard regimen of corticosteroids consisting of oral prednisone 1 mg/kg body weight and topical prednisolone acetate 1% QID. Both the systemic and topical corticosteroid were continued after surgery on a tapering schedule, and perioperatively, patients remained on existing medications being used to treat any systemic disease.
All phacoemulsification procedures were performed through a clear corneal temporal incision using peribulbar anaesthesia by a single surgeon.

**RESULTS**

Complications encountered intraoperatively included linear mark imprints at the pupillary border due to use of iris retractors (25 eyes, 44.6%), floppy iris (12 eyes, 21.4%), uncontrolled capsulorhexis formation (2 eyes, 3.6%), anterior chamber instability (2 eyes, 3.6%) and Descemet’s stripping (1 eye, 1.8%). Postoperatively, 23 eyes (41.1%) had corneal edema on the first day after surgery and 11 eyes (19.6%) developed PCO after a follow up of more than 6 months who required Nd:YAG laser capsulotomy. Seven eyes had CME (12.5%), IOP was elevated in 5 eyes (8.9%), 6 eyes had a fibrinous reaction (10.7%), and there was a single case of pupillary capture (1.8%). Overall visual acuity outcomes were favorable, with BCVA of 20/40 or better achieved in 78.5% of eyes.

**DISCUSSION**

More complications were observed in eyes with hard uveitic cataracts than in those with a softer lens. However some of the complications resolved in due course of time. Postoperative corneal oedema gradually improved with persistence use of topical steroids which were tapered on weekly basis. Visual acuity of 11 cases of PCO improved following Nd:YAG laser capsulotomy. Cystoid macular edema were treated with topical corticosteroids, topical non steroidal anti-inflammatory drugs and oral acetazolamide. 3 cases required the use of posterior sub-tenon triamcinolone acetonide to resolve the edema. IOP was also controlled using antiglaucomatous drugs and 6 cases of fibrinous reaction required frequent instillation of topical steroids and use of oral steroids (Oral Prednisolone 1mg/body kgwt in tapering doses) to control the uveitis.
In conclusion Eyes with a post-uveitic cataract present a challenge for removal by small incision phacoemulsification. However, with appropriate technique, including a medication regimen to control inflammation and pupillary management strategies to assure adequate exposure, the surgery can be performed with reasonable safety and result in a favorable BCVA outcome.

This study shows that with thorough presurgical evaluation, thoughtful planning, and skillful and diligent technique, including attention to achieving adequate exposure of the pupillary area, the potential for complications can be minimized and these eyes can undergo phacoemulsification with good safety and efficacy.

**Does Foveal thickness Determine Visual Acuity after Cataract Surgery?**

Dr. Sayan Das, Dr. Vikram Bhalla, Dr. Arindam Deb, Dr. Kumar Saket, Dr. Tapobrata Guharay

Advances in cataract surgery have made improvement of visual acuity a predictable and achievable goal. But reality shows that this golden goal is not always achieved, despite an uneventful per-operative course.

The aim of this study was to find if there is any correlation of the best corrected visual acuity (BCVA) with foveal thickness (FT) following uncomplicated cataract surgery in an otherwise normal eye.

**MATERIALS AND METHODS**

The study population included patients who had already undergone uneventful torsional phacoemulsification (Infinity, Alcon) with Acrysof IQ (SN60WF, Alcon) IOL implantation by either of two authors (SD, AD). Criteria for inclusion included clear cornea, quiet anterior chamber, well centered IOL in capsular bag, clear posterior capsule, clear media and no abnormal fundus findings. Those with intraoperative complications, postoperative complications and coexisting ocular morbidity were excluded from the study. BCVA and FT were determined at least 1 month after surgery. Distance BCVA was measured on Snellen chart. All patients underwent visual acuity testing in the same refraction lane. BCVA was regarded as 6/6 if the patient could read more than 3 letters of 6/6 line, and as 6/9 if the patient could read 3 or less letters of 6/6 line. FT was calculated as mean of the thickness of the center of foveal depression in horizontal and vertical line scans (Stratus OCT). Mean FT of patients with VA of 6/6 was compared with mean FT of patients with 6/9 group using Student’s t – test.
RESULTS

59 eyes of 54 consecutive patients were included in the study. 26 eyes were in the 6/6 group and had a mean FT of 158.60 micron (SD 15.97). 33 eyes were in the 6/9 group and had a mean FT of 167.56 micron (SD 37.28). Statistical analysis with Student’s t-test showed a t-value of 1.145 (p > 0.05). None of the eyes had visual acuity of 6/12 or less.

DISCUSSION

This study was conducted to find out if foveal thickness determines postoperative best corrected visual acuity following uneventful phacoemulsification in eyes with no ocular comorbidity. On comparing the mean FT of patients in 6/6 group with the mean FT of patients in 6/9 group, the mean FT of patients in 6/9 group was found to be more, but the difference did not reach statistical significance on application of Student’s t-test,

On advanced Pubmed search with the keywords (visual acuity) AND (foveal thickness) AND (phacoemulsification), the only study to perform a similar comparison was by Nicholas et al. They found a significant correlation between foveal minimum macular thickness and best-corrected visual acuity at day one and six week after surgery. Out of 62 patients, 10 patients with greatest macular thickness had significantly lower visual acuity than the other patients.

There have been several studies dealing with the change of macular thickness following surgery, with conflicting results. Von Jagow et al. observed mild increase in foveal thickness following surgery, which did not correlate with surgical or biometric parameters. They have suggested that this could be due to subclinical changes or due to change of media opacification following surgery. Nicholas et al., Biro et al., Kurz et al., Cagini et al. and Perente et al. have also described increase in retinal thickness following surgery, but it was variously described as minimal, mild, subclinical and significant. However, Georgopoulos et al. found an increase in foveal thickness in the early postoperative period which came back to preoperative levels within one month. Biro et al. and Degenring et al. have also found that there was no significant difference in change of macular thickness among diabetic and nondiabetic patients.

In contrast to all of the above studies, Ching et al. and Cohen et al. found a decrease in retinal as well as foveal thickness following surgery. To obviate these conflicting results, we attempted to find a correlation between postoperative FT and postoperative BCVA.

In conclusion no statistically significant correlation between FT and postoperative BCVA was found.
REFERENCES


Incision Integrity after Phaco with Longitudinal and Torsional Ultrasound: Experimental and Clinical Trial

Dr. Viraj Abhayakumar Vasavada

Advances in phacoemulsification technology as well as techniques have enhanced surgical performance and outcomes. Further, there is a trend to go for smaller and smaller incisions to perform phacoemulsification. However, even with the smallest of incisions, wound integrity could still be a concern.
as these techniques use tight wound geometry. Moreover, with the advent of torsional ultrasound, it is reported to have superior intraoperative performance and early postoperative outcome as compared to longitudinal ultrasound. However, the effect of different phacoemulsification modalities on incision architecture is not clearly understood. This prospective study was conducted in two phases. In Phase 1, we evaluated rabbit eyes comparing the histomorphology of corneal incisions in terms of damage. The results of this experimental study were carefully extrapolated and substantiated in a clinical setting. In Phase 2, we assessed the stability of the clear corneal incisions in a clinical setting by directly comparing the two popular phacoemulsification modalities.

**MATERIALS AND METHODS**

**Phase 1: Experimental Trial**

A single surgeon operated on all the rabbits using standardized surgical techniques comprising of an anterior capsulorhexis, hydrodissection, and lens removal. The Infinity Phacoemulsification System (Alcon Laboratories Inc, USA) was used in all the surgeries. The left eyes of rabbits were randomly assigned to phacoemulsification using longitudinal ultrasound (Group 1, n = 15) or phacoemulsification using torsional ultrasound. Group 2 (n = 15). The right eye of each rabbit served as a control, in which only an incision was made and no further surgical procedure was carried out. For both groups, a 2.2 mm single-plane clear corneal incision was fashioned with a metal keratome with an internal entry of approximately 1.5 mm inside the clear cornea. The phaco parameters were standardized for both the groups and are described below. Using these 2 techniques, we examined three areas of the incision, namely, the external entry, the tunnel in the corneal stroma, and the internal entry.

**Histomorphology**

The methodology is described elsewhere. The findings recorded were at the roof and floor of the incision tunnel and were evaluated for characteristics of the incision by observing alterations in the arrangement and appearance of the epithelium, stromal fibers, keratocyte nuclei, tunnel margin, Descemet’s membrane, and endothelium.

**Immunofluorescence**

The methodology is described elsewhere. Localization of collagen type I was carried out using primary anti-collagen type I antibody, that does not bind to denatured collagen type I, and alexafuor 488 tagged secondary antibody (green).

**Dot blot**

Five samples of each in Groups 1 and 2 were subjected to the dot blot assay for collagen denaturation.
Phase 2: Clinical Trial

This prospective, randomized, masked, observational study comprised 80 consecutive patients with age-related cataract undergoing phacoemulsification at Iladevi Cataract and IOL Research Centre, Ahmedabad, India, from February to July 2009. The study was approved by the Institutional Review Board and informed consent was obtained from all the patients prior to enrollment. Patients with nuclear sclerosis grades 1 to 3 as per the Emery and Little Classification with maximal pupillary dilatation of > 7 mm were included in the study. The following exclusion criteria were exercised: glaucoma, shallow anterior chamber (ACD < 2.1 mm), pupillary dilatation < 6 mm, extremely dense cataracts (grade 4 and 5 according to the Emery and Little classification), posterior polar cataract, subluxated cataract, white mature cataract, diabetic retinopathy, high myopia (defined as AL > 25 mm), uveitis, or previous ocular trauma / surgery. Patients were randomized into one of two groups. In Group I (40 eyes), phacoemulsification was performed using longitudinal ultrasound. The parameters used during different stages of surgery varied according to the density of the nuclear sclerosis. The microburst mode was used with the burst width set between 10 and 30 milliseconds and a subsequent off-time of 0 milliseconds. In Group 2 (40 eyes), microcoaxial phacoemulsification was performed using the torsional ultrasound. The torsional amplitude was Ozil continuous with linear control, up to 80. In both groups, the vacuum limit was preset between 250 and 650 mm/Hg with an aspiration flow rate between 20 and 30 cc/minute.

Surgical Technique

All the surgeries were performed by a single surgeon (ARV) using the Infinity Vision System™ (Alcon Laboratories, USA). A 0.9 mm mini-flared 45° ABS Kelman tip was used with an Ultra sleeve (Alcon Laboratories, USA). At the end of cataract surgery, stromal hydration was performed on all the incisions. A 2.2 mm single-plane, temporal clear corneal incision was made, that had an internal entry of at least 1.5 mm. The internal entry in all eyes was measured using specially designed calipers (Titanox, India). Standardized parameters were used in both groups for emulsification, depending on the grade of nuclear sclerosis. A standardized surgical technique was used, which is described elsewhere. At this time point, following hydration of the incisions, the speculum was removed from the eye. Thereafter, Trypan blue (TB 0.0125%, pH=7.39, osmotic pressure=1.22, Shah and Shah) was applied over the conjunctival surface using a micropipette. After a waiting period of 2 minutes, the surface was irrigated with balanced salt solution (BSS) to wash away the residual Trypan blue on the ocular surface. Anterior chamber aspirates of 0.1 ml were obtained in all eyes using a 27-gauge needle mounted on a tuberculin syringe through the paracentesis incision. Trypan blue levels were measured
from this aspirate. After the aspirate was taken, the speculum was reinserted, and 0.1 ml of preservative-free moxifloxacin (Vigamox®) was injected into the anterior chamber.

**Quantifying Trypan Blue Ingress**

Trypan blue measurements were obtained following microcoaxial phacoemulsification, as described in our previous publication. An ultraviolet visible spectrophotometer (Perkin Elmer, Lambda 25) was used to measure the optical density of the Trypan blue solution. The dilution factors were then converted into log values that were used for statistical analysis.

The Mann-Whitney test and Kruskal Wallis test was used for statistical analysis to compare values between the two groups.

**Sample Size Calculation (Clinical)**

The sample size was calculated based on the results of a pilot study comprising 10 eyes in each group. A difference of 0.175 log units or more was considered significant. Based on this assumption, a sample size of 30 eyes in each group would have a power of 80% to detect the difference between the groups. Forty eyes were recruited in each group as per statistical norms.

**RESULTS**

**Phase 1**

Light microscopy of the PAS-hematoxyline sections in control eyes documented an intact epithelium at the outer end and a smooth tunnel margin. The stromal fibers were multi-lamellar with a wavy appearance. Narrow spindle-shaped spaces were present between the stromal fibers. The keratocyte nuclei were linear and intact. The Descemet’s membrane was attached to the stroma and the endothelial cells were attached at both the roof and floor of the inner end of the incision tunnel. In the control group, we did not observe any differences between the incision tunnels made for the longitudinal and Ozil tips.

In the longitudinal group, the incision tunnels were long and swollen with the epithelium, attached to the external end. The corneal stroma was swollen and the stromal fibers were evenly distributed. The keratocyte nuclei were linear and intact. The tunnel margin was smooth without any sign of a tear at both the roof and the floor. At the internal end, the Descemet’s membrane was intact with endothelial cells.

In the Ozil group, the incision tunnels were longer and swollen. The incision tunnel was broad at the ends and narrow in the center. Both the roof and floor of the tunnel were swollen. On the roof of the tunnel, the epithelium was well-preserved, while on the floor, at the tunnel margin, sloughing of the epithelium was noted. Stromal fibers were well-separated and multi-lamellar.
The keratocyte nuclei were intact and condensation was not observed. The tunnel margin was smooth. The Descemet’s membrane was detached and endothelial cells were minimal at the roof of the incision.

**Immunofluorescence staining**

The incisions in the control group revealed collagen bundles of stroma stacked in a lamellar array and collagen free spaces between the collagen bundles. Within an individual collagen bundle, collagen fibrils lay parallel to each other. The incision tunnels exposed to the longitudinal tip revealed compactly arranged collagen bundles with narrow spaces between them. The collagen fibrils near the tunnel margin were also arranged in parallel format. In the incision tunnels exposed to Ozil tip phacoemulsification, the arrangement of corneal bundles and collagen free spaces was similar to that of the incision tunnels in the control and longitudinal group. The collagen fibrils were parallel to each other.

**Dot blot assay**

The density was highest in the standard group (STD) and it was taken as 100%. The density of the other dots was represented as % of the standard. There was a decrease in the density of the dot containing denatured collagen type I (DN). The density of the dot obtained from the corneal tunnel of the longitudinal group was 74.52%, and in the Ozil group it was 79.64% than that of control tunnels. There was no significant difference observed between the density of the dots between 2 groups \( P = 0.75 \) (Table: 1)

**Clinical Trial Results**

The mean age of the patients was 59±3.1 years in the torsional group and 53±2.7 years in the longitudinal ultrasound group; the differences between the groups were not statistically significant \( P =0.63 \). Intraoperatively we found significantly lower values for total surgical time, cumulative dissipated energy (CDE), and total fluid volume used in Ozil group (Table 2). Table 3-- shows the mean log of denominators in both groups. Lower values indicate higher Trypan blue content in the solution and therefore, a higher level of ingress into the anterior chamber from the ocular surface. The mean log dilution of Trypan blue in the anterior chamber aspirate was higher in the Ozil group, the difference being statistically significant \( p=0.007 \). This indicates that the Trypan blue ingress was greater with the longitudinal group as compared to the torsional group. There was no clinically apparent thermal injury in either group.

**DISCUSSION**

Recent innovations have increased the interest in surgery performed through increasingly smaller and presumably self-sealing incisions, resulting in
an improved prognosis for uncorrected visual acuity and a lower risk for surgically induced astigmatism. Torsional ultrasound (OZiL, Infinity Vision System; Alcon Laboratories, Fort Worth, TX) uses rotational oscillations at ultrasonic frequencies to emulsify cataractous lens material in a seamless cutting motion from a tip that oscillates laterally producing minimal repulsion of lens material from the phaco tip, resulting in improved followability.9,10,11 Despite the popularity of these new cataract surgical technologies, concerns have been raised about wound morphology and integrity.

The integrity of sutureless clear corneal incisions has been scrutinized in experimental models.12-14 Previous studies effectively used rabbit models to evaluate alterations in the corneal structure.14 In the present study, we found

<table>
<thead>
<tr>
<th>Groups</th>
<th>Integral density</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td>Negative control</td>
<td>1701.6±102.1</td>
</tr>
<tr>
<td>Standard</td>
<td>26412.4±907.1</td>
</tr>
<tr>
<td>Denatured collagen</td>
<td>3184.6±449.4</td>
</tr>
<tr>
<td>Control incision</td>
<td>24474.4±1269.1</td>
</tr>
<tr>
<td>Longitudinal incision</td>
<td>20117.8±1024.7</td>
</tr>
<tr>
<td>Torsional incision</td>
<td>21383.2±1367.2</td>
</tr>
</tbody>
</table>

Table 1: Distribution of the integrated density of each dot using dot blot assay among the groups which is represented as percent-integrated density

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Torsional U/S</th>
<th>Longitudinal U/S</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgical clock time (minutes)</td>
<td>4.40±1.37</td>
<td>6.65±2.48</td>
<td>0.001</td>
</tr>
<tr>
<td>Fluid volume used (ml)</td>
<td>101±40.44</td>
<td>125±37.76</td>
<td>0.001</td>
</tr>
<tr>
<td>CDE</td>
<td>9.73±6.70</td>
<td>15.18±7.52</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Table 2: Comparison of intraoperative surgical time, fluid used, and CDE between 2 groups

P value (Kruskal Wallis test)

<table>
<thead>
<tr>
<th>GROUP</th>
<th>N</th>
<th>Mean + SD</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ozil TM</td>
<td>40</td>
<td>3.77 + 0.82</td>
<td>1.0</td>
<td>4.75</td>
</tr>
<tr>
<td>Longitudinal ultrasound</td>
<td>40</td>
<td>3.40 + 0.60</td>
<td>1.6</td>
<td>4.75</td>
</tr>
</tbody>
</table>

Table 3: Comparison between the 2 groups of logs of denominators of trypan blue ingress into the anterior chamber after IOL implantation

Mann Whitney U Test P = 0.007
that the longitudinal tip documented denaturation of collagen type I in the area near the tunnel. It is well known that type I collagen forms a chief component of the corneal stroma. It consists of three polypeptide chains organized into a central triple helix configuration stabilized by extensive hydrogen bonds between the polypeptide chains. In both the techniques, the mechanical and thermal stress induced by the phaco tip may lead to a breakdown in the hydrogen bonds between the polypeptide chains. Subsequently, this may cause unwinding and denaturation of collagen resulting in the observed shrinkage of collagen fibers and a ragged tunnel margin. This occurrence was documented in the incisions made with both the techniques. Further, in the present study, we found a partially compromised corneal epithelium and an endothelium along with Descemet’s membrane in the Ozil tunnels. We believe that the lateral oscillation of the Ozil tip may be responsible for the damage observed to the corneal epithelium and endothelium. The observations in this current study were in concordance with that reported in literature. In a study by Dr. Weikert’s, microcoaxial MICS was performed on human cadaver eyes using the mini-flared 45-degree Kelman tip with an ultra sleeve through a 2.2 mm incision. Three modalities were assessed: Ozil torsional (continuous), pulsed longitudinal and a blend of Ozil and longitudinal.

The scanning electron microscopy (SEM) analysis showed that all eyes demonstrated peri-incisional loss of corneal endothelial cells and tearing of the Descemet’s membrane. In the Ozil group there was a slightly greater loss of peri-incisional endothelial cells, but these eyes had proportionately larger values of continuous dissipated energy (CDE). No differences were found in the tears observed in the Descemet’s membrane. When the results were normalized to the CDE level, no differences were noted between the different ultrasound modalities. It was concluded that both endothelial cell loss and Descemet’s membrane trauma may increase with exposure to increasing phaco energy, independent of the method of delivery. (Sanchez M, Weikert M. Torsional Ultrasound raises the bar for phacoemulsification. Eurotimes, January 2008, page 9.) In another experimental study on human cadaver eyes on SEM demonstrated a partially compromised endothelium and Descemet’s membrane in all eyes studied after torsional and mixed phacoemulsification. In recent clinical studies found that torsional ultrasound is more efficient and safe in cataract removal. In the present study, although Trypan blue ingress occurred in both groups, it was statistically significantly higher in the longitudinal group. We speculate that the lower levels of ingress in the torsional group could be because the impact of the oscillatory movement was confined to the opening of the internal entry. However, we believe that with longitudinal ultrasound, the ingress could be more due to the nature of the stroke length, which spreads the impact along the entire incision including
the tunnel and the internal and external entry points. This impact on the entire length of the incision could compromise its integrity allowing increased ingress of trypan blue in some eyes. Further it has been clinically documented that torsional ultrasound generates less heat as compared to longitudinal phacoemulsification. Based on this, we suggest that the minimal amount of ingress in the torsional mode could be due to decreased frictional movement within the incision providing thermal protection intraoperatively.

It is well known that rabbits have a very different corneal anatomy and physiology as compared to humans and therefore may not reflect the same behavior. Rabbit corneas are thinner than human corneas (400 mm versus 500 mm), and their elasticity and self-sealing properties may be different. As structural differences exist between rabbit and human corneas, these observations should be carefully extrapolated into a clinical scenario. To our knowledge, no other peer-reviewed study has compared the histomorphology of corneal incisions in rabbit eyes and extrapolated the results in a clinical trial as we have done. On the basis of the experimental trial along with gross, microscopic, and histopathologic observations, the corneal incisions exposed to torsional ultrasound were comparable to that of longitudinal phacoemulsification. Further in the torsional group, the section of missing Descemet’s membrane was minimal in all cases and therefore was unlikely to be of clinical significance. In the clinical trial, in incisions with longitudinal ultrasound, the trypan blue ingress into the anterior chamber was significantly higher when compared with torsional ultrasound. Thus incisions with torsional phacoemulsification had favorable wound integrity when compared with longitudinal ultrasound.

REFERENCES


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**Prospective Study of Endothelial Loss in Relation to Nuclear Grade and use of Torsional Ultrasound**

**Dr. Shweta Rao, Dr. Vijay Shetty, Dr. Maninder Singh Setia, Dr. Haldipurkar S.S**

With newer advents in phacoemulsification giving better and better results, we are now interested in new technologies that can expand our margin of safety. Historically, main safety related concerns with phacoemulsification have been thermal damage to the incision and endothelial trauma associated with prolonged ultrasound time.

Corneal endothelium plays a key role in maintaining corneal transparency by maintaining steady state with constant solute gradient across endothelium,
the corneal cell layers on one side and aqueous on the other. Postulated ATPase driven corneal endothelial pump transports solute out of the stroma to balance the solute that leaked in across the imperfect semi permeable corneal endothelium.¹ Sometimes transient postoperative corneal edema is noted after uneventful phacoemulsification surgery even in normal eyes, indicating effects on the corneal endothelial pump function.²,³ These have been ascribed to ultrasonic thermal or mechanical trauma from the phacoemulsification procedure.⁴ Corneal endothelial cell loss (ECL) is a useful postoperative variable, because it is associated with the long-term risk for corneal decompensation (pseudophakic bullous keratopathy).⁵ Quantification of the endothelial cell loss requires specular microscopy which is not often performed in routine clinical practice.

There are various factors documented which are responsible for the loss of endothelial cells after phacoemulsification. Intraoperative parameters play a major role, which includes phaco power i.e. energy generated during emulsification for definite amount of time and is indicated as phacotime. The parameters depend on grade of cataract. More ultrasonic energy and time is needed for hard nucleus removal than for softer ones, thus increasing the risk of surgical trauma, especially corneal endothelial loss.

In 2005 “Ozil” technology for torsional ultrasound was introduced. The oscillatory movement of its phaco tip theoretically increases efficiency. Multiple comparative studies are done in vivo and in vitro to understand the correlation between cataract surgery techniques and its effects on endothelium.

Our study was designed to assess endothelial cell loss with torsional technology in relation to nuclear grade and intraoperative use of phaco energy.

**MATERIALS AND METHODS**

This randomized comparative study was conducted from April 2009 to November 2010. 30 Patients above the age of 40 years, from urban and semi-urban area with a diagnosis of senile cataract were included. Exclusion criteria included: patients with a history of ocular inflammatory disease or previous intraocular surgery, if they needed combined surgical procedures, if they had other eye disorders capable of compromising vision (e.g., amblyopia, glaucoma, diabetic retinopathy, macular degeneration), if the axial length of the eye was more than 26.5 mm (pathologic high myopia), patients with corneal opacity obscuring central vision, patients with an endothelial cell count of less than 1,500 cells/mm² before surgery, patients who underwent eventful cataract operation, patients who could not complete all the follow up visits.

Pre operative examination included recording of visual acuity uncorrected and best corrected, Slit lamp examination of anterior segment and posterior segment with 90D biomicroscopy. IOP measurement was done by non contact
Tonometry. Endothelial cell count was done with optical specular microscope Tomey EM 3000. Number of analyzed cells was minimum 100.

Recordings were done by either of 3 observers. The intra and interobserver for both CCT and ECD measurements is less with this machine as compared to Laser Scanning in Vivo Confocal Microscopy HRT. The grade of cataracts was determined before surgery after complete dilatation of pupil by single observer (blinded), according to the Lens Opacities Classification System III. 93 Nuclear opalescence NO and color NC 1 and 2 were included in group A, NO/NC 3 and 4 in group B and NO/NC 5 and 6 were included in group C. All patients underwent temporal clear corneal phacoemulsification with foldable IOL implantation under topical anesthesia by single surgeon using Alcon Infinity System (Alcon, Fort Worth, TX). Phacotime and Cumulative dissipated energy (CDE) was noted. Follow up visits were done on post-op days 1(±2), 8(±2) and month 1(±5 days) and 3(±5 days). ECD was recorded each visit. The data were entered in Microsoft Excel 2007 and were analyzed using Stata Version 10.1 (StataCorp, College Station, Texas, US).

**RESULTS**

Mean age of 30 patients included in study was 60.4 years 63.3 % were males and 36.7 % were females. Group A had 2 patients, B had 18 and C had 10 patients. Mean preoperative ECD was 2558.1 cells/mm². Mean intra op CDE and UST respectively was 9.1 units (0.3), 7.0 seconds (0.6) for group A, 15.2(4.1) and 18.1 sec. (5.3) for group B, 20.1 (2.3) and 29.6 sec. (3.2) for group C.

We used a linear random effects model for analyses of these data over a three month period. Negative sign indicates loss of cells while positive sign indicates gain or number of salvaged cells.

The unadjusted estimates showed that in torsional method of phacoemulsification, we had mean loss of 8.8 endothelial cells over the 3-month follow-up period (95% CI: -11.3, -6.4) with each second rise in phacotime. After adjusting for age, sex, calendar time, and hardness of cataract, the mean loss was 202.5 (-334.4, -70.6) in hard cataracts of group 3 compared with softer cataracts of group 1. The loss was statistically significant with p value <0.05.

The next models were built using CDE as one of the explanatory variables in the adjusted models. We found that there was very strong association between CDE and endothelial cell count.
Age and sex did not influence endothelial cell loss in any grade of cataract. Endothelial cell loss was significantly more with higher grade of cataract over 3 month follow up period in torsional phacoemulsification.

**Table 1: Linear random effects model for ECL per second phacotime in torsional phacoemulsification, unadjusted and adjusted according to age, sex and group of cataract**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Unadjusted Model</th>
<th>Adjusted Model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
<td>Model 2</td>
</tr>
<tr>
<td>Phacotime</td>
<td>-8.8 (-11.3, -6.4)</td>
<td>-7.5 (-12.2, -2.7)</td>
</tr>
<tr>
<td>Age</td>
<td>-6.5 (-10.4, -2.6)</td>
<td>1.3 (-0.9,3.6)</td>
</tr>
<tr>
<td>Sex</td>
<td>-</td>
<td>Reference</td>
</tr>
<tr>
<td>Male</td>
<td>6.3 (-70.9, 83.4)</td>
<td>31.6 (-12.8, 76.0)</td>
</tr>
<tr>
<td>Female</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Group Of Cataract</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Group 3</td>
<td>-202.5 (-334.4, -70.6)</td>
<td></td>
</tr>
<tr>
<td>Group 2</td>
<td>-117.7 (-214.0, -21.3)</td>
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<tr>
<td>Group 1</td>
<td>Reference</td>
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</tbody>
</table>

**Table 2: Linear random effects model for ECL per unit CDE in torsional phacoemulsification, unadjusted and adjusted according to age, sex and group of cataract**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Unadjusted Model</th>
<th>Adjusted Model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate (95% CI)</td>
<td>Estimate (95% CI)</td>
</tr>
<tr>
<td>CDE</td>
<td>12.6 (-17.2, -8.0)</td>
<td>-8.6 (-17.2, -0.03)</td>
</tr>
<tr>
<td>Age</td>
<td>-6.3 (-10.6, -1.9)</td>
<td>Reference</td>
</tr>
<tr>
<td>Sex</td>
<td>-</td>
<td>Reference</td>
</tr>
<tr>
<td>Male</td>
<td>-33.1 (-111.5, 45.3)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>Reference</td>
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</tbody>
</table>

**DISCUSSION**

Phacotime is highly correlated with grade of cataract. As phacotime increases with grade of cataract, more amount of energy is required to emulsify the nucleus. It causes damage to surrounding endothelium. Harder the cataract more is the endothelial damage. Endothelial cell loss is the major concern even after uneventful phacoemulsification. We calculated endothelial cell loss at each visit, till 3 month post operatively. Mean endothelial cell loss gradually increased at each post operative follow up, highlighting damage to endothelium.

Another intraoperative parameter we recorded was Cumulative dissipated
energy (CDE) for torsional mode. It is a built-in measurement of the Alcon Infinity® Vision System (Alcon Labs, Hünenberg, Switzerland), which is specifically designed to monitor the energy delivered during phacoemulsification. In this study, CDE was higher with higher grade of cataract. Less CDE in phacoemulsification during cataract surgery translates to less energy used and is considered better for cornea recovery.

CDE also correlated well to endothelial cell loss when stratified with group of cataract. When compared with early nuclear sclerosis group 1, in moderate and hard cataracts of group 2 and 3, there was loss of more than 200 cells per unit rise in CDE.

Grade of cataract was found to be a confounding factor in this study. Confounding is the distortion of the exposure/outcome relation as a consequence of the association of another factor with both disease and exposure. In our study, grade of cataract was associated with phacoemulsification as well as its outcome i.e. endothelial cell loss and it affected the outcome independently. Adjustment for this confounding factor was done with multivariate linear regression analysis which estimated the causal relationships and it is best suited for this type of study.

Conclusion: Higher grade of cataract needs higher phacoemulsification energy in terms of CDE and phacotime with proportional increase in endothelial cell loss. A strong correlation was found between phacotime and endothelial cell loss. Phacoemulsification advances aim to reduce the phacoenergy and shorten the phacotime.

Low CDE measurements may correlate to more efficient energy delivery, faster surgery and less endothelium cell loss. Using CDE measurements as a guide may improve technique and instrument-setting abilities.

REFERENCES

Night Mares- Phaco Beginners: Study of Problems by Surgeons during First 20 Cases

Dr. Sharmistha Behera, Dr. Pranamita Pujari, Dr. Prasanta Kumar Nanda, Dr. Jayesh

Cataract extraction is the commonest intraocular surgery performed worldwide. In India alone, the number of cataract surgery performed in a year exceeds 5 million.

Cataract surgery has always been perceived as complicated by beginners. As the skills of the surgeon develop, surgery becomes easier and complications become rarer.

Techniques for cataract surgery have come a long way from the times of couching to state of the art micro-incisional phacoemulsification. Phacoemulsification is more difficult to master because it requires simultaneous hand and feet coordination. However, this technique has its own advantage in the sense that it has the potential to obtain better results than any other procedure. In expert hands this technique is highly predictable and reproducible with unmatched quality of vision in the absence of complications. Phacoemulsification can be considered worthwhile if it can be done quickly and safely, and if it has a short learning curve.

In this study we retrospectively analyzed the complications and visual outcomes in the initial 20 phacoemulsifications (100 cases) performed by 5 surgeons competent in manual SICS and trained for Phaco.

**MATERIALS AND METHODS**

100 cases by 5 different surgeons (20 each) were studied retrospectively and problems were analyzed in the Ophthalmology department of VSS Medical College and Hospital, Burla, Sambalpur, Odisha.

Grade 2 and 3 nucleus immature cataracts were included.

**Exclusion criteria**

- Associated glaucoma
- Uveitis
- Pseudoexfoliation
- Diabetic retinopathy
- Corneal disease
- Ocular trauma
- Children
Cases with insufficient information in the record

Patients with other preoperatively diagnosed ocular comorbidities

Pre-operative data collection included patient demographic information, pre-operative visual acuity, and details of anterior segment with slit lamp, grade of nuclear density and a dilated fundus examination.

Operative data included the name of the surgeon, date of surgery, technique of surgery employed including the details of each step, adjusted phacoemulsification time (total phacoemulsification time multiplied by phacoemulsification power used) and occurrence of intraoperative complication.

All procedures were done under local anesthesia with 3% sodium hyaluronate and foldable intraocular lens on a peristaltic machine.

Phacoemulsification was performed by the surgeons with relatively uniform technique for all cases. A continuous curvilinear capsulorrhexis was performed. The lens was then phacoemulsified, usually with a “divide-and-conquer” technique. When possible, foldable acrylic or silicone intraocular lenses were inserted into the capsular bag. Alternatively, foldable or polymethylmethacrylate lenses were placed within the ciliary sulcus.

Postoperative data was documented on first day, between 1-3 week and finally at 4-6 week visit. Patients were examined and any abnormal findings were noted and visual acuity was recorded.

RESULTS

Out of 100 eyes operated 67 were male and 33 were female. Maximum cases were in the age group of 46-65 yrs. Mean phacotime was 2.02±0.30 mins. Intraoperative complications were iris capture in 9 cases, posterior capsule rupture in 15 cases, nucleus drop in 4 cases, detached Descemet in 2 cases, zonular dehiscence in 1 case, and difficulty in implantation of foldable intraocular lens in 15 cases. 6 cases were converted to manual SICS. In 3 cases lens could not be implanted and they were left aphakic. Post operatively corneal edema was seen in 27 cases. Intraocular lens was decentered in 3 cases. There was corneal decompensation in 11 cases. When refraction was performed 25 cases showed astigmatism.

DISCUSSION

Post-op first day corneal edema was the commonest complication in our study with an incidence of 27%, which is similar to the findings by Alan L et al. (28.8%). Posterior capsule rupture was the second most common (15%) complication . The ability to manipulate the nucleus away from the posterior capsule, iris, and the corneal endothelium probably comes with increasing
skill and the complication rates observed in our study are likely to be related to the surgeons’ overall level of skill. Patients expectation now a days is not only limited to simple removal of their cataracts, but also freedom from their refractive error, a high degree of safety, and immediate recovery of sharp vision. In spite of sophisticated operative techniques, increased accuracy of calculating IOL power and lesser degree of intraoperative complications, achieving a clear cornea and sharp vision in the immediate postoperative period still continues to pose a challenge.

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IOL Assisted Posterior Capsular Tear Management (IPM)
Dr. Narayan Bardoloi

Posterior Capsular Rupture (PCR) during phacoemulsification surgery is a complication that is always fraught with danger. Despite tremendous development in technology PCR continues to embarrass even the best of the hands. The incidence of PCR in phacoemulsification surgery ranges from 0.7% to 16% seems to be quite high in this era of cataract surgery where patients’ demands are very high.1 PCR, on many occasions, is associated with increased incidence of Endophthalmitis, Retinal Detachment, Cystoid Macular Edema (CME).2-6 This naturally accounts for unfavorable outcome. Despite taking all measures and precautions any surgeon may land up in PCR sometimes in
easy or unexpected situation. Proper management of PCR goes a long way in reviving the situation to patient’s utmost satisfaction.

We present a technique by which PCR associated with retained nuclear fragments can be managed effectively by using a foldable Intra Ocular Lens (IOL) as shield.

**MATERIALS AND METHODS**

As soon as the PCR is detected the phaco tip is kept inside the eye and the second instrument is withdrawn. Through the side port ample amount of dispersive OVD (combination of Sodium Hyulurinic acid and Chondroitin sulphate) is injected by the side of the nuclear fragments to hold back the vitreous. Then, with the help of the chopper and the iris spatula the nucleus fragments are maneuvered out of the posterior iris plane into the Anterior chamber. Once the fragments are brought into the Anterior chamber a foldable IOL of one Dioptre less than the original one is injected into the AC behind the lens fragments. The unfolded IOL is allowed to sit on the anterior iris surface. Dispersive OVD is now put over the IOL. Slow motion phaco is performed and the fragments are taken out one by one. At the completion of the phacoemulsification the capsular apparatus is inspected for presence of residual cortex, epinucleus or vitreous. If the capsular apparatus is clean as it occurs in many brunescent, black and white matured cataracts cohesive OVD is put inside the eye and the IOL is simply maneuvered to place in the sulcus.

If cortex and epinucleus are present more dispersive OVD are injected behind the IOL. Cortex and epinucleus are taken out first by dry aspiration and then by bimanual I/A. During I/A the bimanual cannulas are so placed that the aspiration cannula is placed behind the IOL and the irrigation one in front of the IOL. This procedure keeps the AC formed and at the same time vitreous remain undisturbed. All cortex and epinucleus can be easily removed by this way. At the completion of the bimanual I/A the IOL is slid into the sulcus first placing the haptics.

If vitreous is there Bimanual vitrectomy is done using the same technique, i.e., placing the vitreous cutter behind the IOL and the irrigation cannula in front of the IOL. At the completion of the procedure the IOL is placed at the sulcus.

**RESULTS**

We have so far managed nine cases of PCR with retained nuclear with the help of this technique. The patient demography, Grade of nucleus, place of final IOL insertion, additional procedures undertaken, BCVA on third month and post-op complications.

Six cases had BCVA of 20/-20/40 at 3 months check up. Of the 3 cases that
had BCVA of 20/60, one had AMD, one thick ERM and another advanced glaucomatous optic neuropathy. In six cases no I/A or vitrectomy had to be done.

Case no 3 and 6 required I/A to bring out the residual cortex. Case no 4 needed vitrectomy as additional procedures. This was a case of combined glaucoma and cataract surgery.

IOL was placed in the sulcus on 8 of the 9 cases. In the 5th case the IOL was fixed to the sclera.

Case no 5 was a case of hyper matured cataract with sunk nucleus and adhesion between the anterior and posterior capsule on the upper part. During initial phacoemulsification the entire capsular bag was sucked into the phaco tip. The fragments were mobilized into the AC and the foldable IOL was put in behind the fragments as was done in the other cases. Slow motion phaco done as usual. The IOL was fixated to the sclera by temporary externalization of the haptics.7

In case no 4 a nuclear fragment was seen floating behind the IOL on the first post-op day. The fragment was taken out on the 7th post-op day through pars plana vitrectomy with fragmatome.

Except for the case no 5, where sceral fixation was done, all other cases were managed under topical anaesthesia. Sub tenon anaesthesia was given intra operatively in this patient to facilitate scleral fixation.

None of the cases developed any major post-op complication except high IOP in three cases on first post-op day and transient corneal edema in four cases.

DISCUSSION

Only one case out of nine needed vitrectomy. This signifies that IPM is very atraumatic procedure.

Leaving behind of the viscoat does not cause significant rise of IOP as only three cases showed high IOP on the first post-op day. The IOP came down to normal on medication in all the three cases on the 7 Th post-op day. Low molecular weight OVDs like Viscoat does not produce protracted IOP spike than high molecular weight cohesive OVDs.8-10 Except for the the sole case where vitrectomy was done the other 8 cases remained with some amount of Viscoat in their vitreous cavities. In 5 cases where neither vitrectomy nor I/A was done, the Viscoat remained totally untouched. In the 2 cases which needed bimanual I/A the Viscoat largely remained intact as the irrigation cannula was always kept in front of the IOL, no fluid went in to break the Viscoat shield lying in front of the vitreous.

In our first two cases we put the IOL into the ciliary sulcus on the first instant.
This caused little uncertainty as the IOL was sitting on the anterior capsular flap only. In the later 7 cases we decided to place the IOL on the anterior surface of the iris. This change has made our life easy as there is not slightest of a chance of the IOL getting dropped.

In PAL technique a sheet glide is used to prevent falling down of the fragments during Phacoemulsification. (C. Kelmen, MD, “Posterior Capsular Rupture: PAL Technique” Video Journal of Cataract and Refractive Surgery, Volume 12, 1996).

The sheet glide needs a bigger entry and it is needed to be brought out at the end of the procedure. The foldable IOL needs only a 2.2mm entry and it is to be slipped in to the ciliary sulcus before the completion of the procedure.

In our case series none of the cases needed retrieval of the nuclear fragments behind the posterior capsule or from near sinking situation. For that reason we did not have to employ the PAL technique. If situation demands any of the PAL techniques can be easily incorporated into the IPM technique. (11-12)

In conclusion IOL assisted PCR Management (IPM) is technique for everybody as it does not involve any learning curve and acquiring of separate equipment. In fact, it makes life easier for everybody as it hardly necessitates vitrectomy.

REFERENCES
9. Probst LE, Hakim OJ, Nichols BD. Phacoemulsification with aspirated or retained
Analysis of The Outcome of Combined Phacoemulsification and Pterygium Autograft

Dr. Shreesh Kumar, Dr. Debadatta Dash, Dr. Ramamurthy D, Dr. Ulka Pankar

A pterygium-induced refractive change often leads to visual impairment. Lin and Stern found a significant correlation between the pterygium size and corneal astigmatism; they reported pterygium to induce significant degrees of astigmatism once it exceeded >45% of the radius of cornea. Tomidokoro et al. evaluated the percentage extension of pterygium on cornea and found larger pterygia to adversely affect astigmatism, asymmetry and irregularity of the cornea.

The average corneal power reduced significantly in Grade II or larger pterygium. Hence theoretically it has been suggested that for patients with pterygium requiring cataract surgery, decision of surgery should be taken depending on the grade of pterygium; in cases with Grade I, atrophic and non-progressive pterygium one can consider cataract surgery directly. However, pterygium Grade II or larger significantly affects the refractive component of cornea which can lead to erroneous intraocular lens power calculation and post-cataract refractive surprise. Hence in cases with pterygium Grade II or larger, a stepwise approach should be followed; pterygium excision should be performed prior to cataract surgery. By time-course analysis, cornea has been shown to stabilize one month after pterygium surgery. Hence, cataract surgery or refractive surgery if considered should be performed at least one month after pterygium surgery. Simultaneous cataract and pterygium surgery should not be done in cases with large pterygium as one may have an unexpected refractive surprise postoperatively.

Due to lack of adequate documentation and study reports on combing both cataract and pterygium surgeries, this study has been attempted to report the biometric outcome of combining cataract with pterygium surgery in a single sitting.
MATERIALS AND METHODS

A retrospective study of 210 eyes of 189 patients with pterygium and cataract, undergoing surgery for both in a single sitting was done.

Patient having visually significant cataract were included in this study. All patients underwent phacoemulsification with foldable IOL implantation through 2.8 mm incision, temporal or superior. Complicated cataracts and subluxated cataractous lens were excluded from study.

IOL power calculation was done using manual keratometry, Immersion A-scan and IOL master.

Patients having Grade I and Grade II and recurrent pterygium were included under this study. Pterygium surgery was done with conjuntival autograft using either suture (10’0’ MFN) or TISSEL glue. Patients with irregular cornea and Grade III and IV pterygium were excluded from the study.

Post operatively the patients were on Topical Antibiotic and steroid combination for 6 weeks, along with lubricating eye drops for 6 weeks. Follow up schedule was on Day 1, 1 week, 1 month, 3 months, 6 months and every 6 months thereafter. The results were analysed to assess the UCVA, BCVA, biometric errors in the form of residual spherical or cylindrical errors.

RESULTS

Under this study, 178 eyes had nasal pterygium, 4 eyes had temporal pterygium, 22 eyes had double head pterygium and 6 eyes had recurrent pterygium. Post-operatively no residual spherical error was found in 54.5% and residual refractive error was in 45.5%. The distribution of residual refractive error is shown below in the graph.

Comparing pre-operative astigmatism of less than 1D in 62.3% eyes, post-operative astigmatism of less than 1.0D was present in 77.1% eyes. The distribution of astigmatic power in both pre-operative and post operative is shown in the following graph.
Higher astigmatism of more than 1.25D was reduced from 37.6% in pre-op eyes to 19.3% post op. 4.2% of total eyes with no astigmatism increased to 25.4% of total eyes post operatively.

Complications that occurred during the surgery were hemorrhage under the graft (2% eyes) and graft edema (3% eyes) respectively. None of the complication had any bearing on the outcome of the procedure.

In conclusion Operating on both cataract and and pterygium at a single sitting baseing on manual keratometry values and proper IOL power calculations can result in reasonably good refractive outcome. Combining both the procedures is safe and has successful outcome.

REFERENCES

Complicated Cataracts with Fixed Undilated Pupils: Phaco with Iris Hooks vs Stretch Pupiloplasty

Dr Kanan Chaudhari, Dr. Mahavir Dattani

To compare surgical outcome and complication of two techniques for cataract surgery in cases of cases with chronic uveitis with fixed undilated pupil due to severe posterior synechia.

Ours is a retrospective study of 23 eyes of 19 patients of chronic uveitis and complicated cataract of varying severity with fixed undilated pupil due to posterior synechia which underwent cataract surgery at RNC Free Hospital, Valsad, Gujarat from June 2010 to April 2011.

Inclusion Criteria:
All cases included satisfied the following criteria

• Fixed undilated pupil (<3mm) due to posterior synechia not dilating after any pharmacotherapy
• History of recurrent uveitis
• Complicated cataract
Exclusion Criteria

- Minimal posterior synechia leading to irregular but somewhat semidilated pupil more than 3 mm probably due to single episode of uveitis.

MATERIALS AND METHODS

A retrospective analysis of 23 cases of cataract surgery in chronic uveitis with complicated cataract with fixed undilated pupil. All the cases were taken for cataract surgery after 2 weeks course of systemic steroid preoperatively which was continued on the day of surgery as well as up to 1 month after the surgery. Data were collected to analyse incidence of intraoperative complication, insertion of PCIOL, post operative visual outcome and complication. Preoperative evaluation included Bscan, IOP evaluation, grading of cataract. There was IOP evaluation in 3 patients, which was considered for surgery after Nd Yag PI to alleviate pupillary block.

All cases were divided into 2 groups on the basis of the technique used for the surgery. First group included 12 eyes which underwent SICS with stretch pupilloplasty while 11 eyes which underwent phacoemulsification with iris hooks were included in Phaco Group. Visual outcome and complication from the 2 group were compared.

TECHNIQUE

Group I: SICS with Stretch Pupilloplasty

Pupillary synechiae are broken with an iris spatula or the cannula of the viscoelastic syringe, taking care not to damage the anterior capsule. A stretch pupilloplasty is accomplished by using two hooks, (Kuglen or Sinskey hooks). One of the hooks is passed through the paracentesis and the other through the main wound. They are engaged at the pupil margin at the 6 and 12 o'clock positions and stretched to a maximum. This was repeated at the 3 and 9 o'clock positions followed by viscodilatation. A second instrument (eg, Kuglen hook) was used to temporarily retract the iris during capsulorrhexis to extend it beyond the actual pupil margin in some cases. Tryphan blue dye was used to augment anterior capsule visibility. 6mm PMMA PCIOL insertion was done whenever possible.7

Group II: Phacoemulsification with Application of 4 Nylon Iris Hooks

Phacoemulsification was performed either through sclera tunnel or through clear corneal tunnel with incision placed along the steeper meridian to reduce astigmatism. 4 nylon iris hooks were inserted into the AC one by one through entry point of 26G needle at limbus and then finally applied to the pupillary margin leading to square pupil sufficient in size (5-6mm) to provide adequate visualisation of anterior capsule. Trypan blue dye was used to augment visualisation of pupil in all the cases.
The phacoemulsification technique is modified taking the pupil size into account, starts with a longer incision to minimize the risk of iris prolapse. An endocapsular, vertical chopping phaco-technique was preferred, though horizontal chopping can be done comfortably when iris hooks are used. This may be supplement by a modified phaco-flip of the respective nuclear halves. (7) 5.25 mm PMMA PCIOL insertion was done in all the cases.

**RESULTS**

Age of the patients ranged from 30 yrs to 70 yrs with average age of 54.4 yrs. Male female ratio was 12:7.

<table>
<thead>
<tr>
<th>Complications</th>
<th>PHACO Group (11 eyes)</th>
<th>%</th>
<th>SICS Group (12 eyes)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incomplete rhexis</td>
<td>1</td>
<td>9%</td>
<td>5</td>
<td>41%</td>
</tr>
<tr>
<td>IOL capture</td>
<td>3</td>
<td>27%</td>
<td>2</td>
<td>16.6%</td>
</tr>
<tr>
<td>Recurrent iritis</td>
<td>4</td>
<td>36%</td>
<td>3</td>
<td>25%</td>
</tr>
<tr>
<td>Iridodialysis</td>
<td>1</td>
<td>9%</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>increase in iop</td>
<td>3</td>
<td>27%</td>
<td>2</td>
<td>16.6%</td>
</tr>
<tr>
<td>Pcotomy</td>
<td>4</td>
<td>36%</td>
<td>5</td>
<td>41%</td>
</tr>
<tr>
<td>CME</td>
<td>5</td>
<td>45%</td>
<td>4</td>
<td>33%</td>
</tr>
<tr>
<td>Irregular Iris</td>
<td>4</td>
<td>36%</td>
<td>4</td>
<td>33%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Criteria</th>
<th>PHACO Group</th>
<th>%</th>
<th>SICS Group</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completion of rhexis</td>
<td>10 out of 11</td>
<td>91%</td>
<td>7 out of 12</td>
<td>58.3%</td>
</tr>
<tr>
<td>IOL insertion</td>
<td>11 out of 11</td>
<td>100%</td>
<td>9 out of 12</td>
<td>75%</td>
</tr>
</tbody>
</table>

The most common problem encountered in SICS group was with completion of capsulorrhexis, which was achieved in 90% of cases in phaco group while only in 60% cases in SICS group. IOL insertion was possible in all the cases (100%) in phaco group while in 9 cases (75%) in SICS group.

Other complications like pupillary IOL capture, irregular pupil, and early PCO was equally common in both the groups. However, in one case in Phaco group, there was iridodialysis during insertion of phaco probe. The most common factor affecting the visual outcome was incidence of post-operative uveitis (overall 30.4%) and incidence of CME (overall 47.8%). However, incidence of recurrent uveitis was 36.3% in Phaco group while only 25% in SICS group. However there appears to be marginal increase in incidence of recurrent uveitis in the phaco group, the difference however was not statistically significant (Fisher test, p value 0.33).

Use of iris hooks in phaco not only increased incidence of complete rhexis leading to safer cortical aspiration but also increased chances of PCIOL insertion with improved visual outcome. However there appears to be
Cataract Free Papers

marginal increase in incidence of recurrent uveitis in the phaco group, which though not statistically significant needs to be confirmed by larger studies

DISCUSSION

Complicated cataract as we all know is complicated, not only in terms of technical aspects of the surgery itself but also because of the higher incidence of severe and recurrent postoperative inflammatory response. Adequate visualization of the operative field is perhaps the most critical physical parameter of phacoemulsification, and the surgeon’s view is compromised greatly by a fixed undilated pupil. With the advent of nylon iris hooks, Phacoemulsification can be safely performed in such cases. Though it adds to the total cost of the surgery, it is most effective in terms of the visual outcome (completion of rhexis, placement of IOL, complete cortical cleanup) achieved. However, there are some disadvantage like loss of sphincter function, irregular pupil postoperatively leading to poor cosmetic appearance and sometimes hindrance of the probe movement caused by mild elevation of the plane of iris which can lead to iridodialysis.

Inappropriate use of the flexible iris retractor causes an atonic, chronically enlarged postoperative pupil and poor cosmetic appearance (10). This can be avoided by taking care not to overstretch the pupil, aiming for a total diameter of 5–6 mm and place 5 retractors sequentially, gradually increasing the stretch on each of them to preserve sphincter function. (7) This can be prevented by placing the hooks on the limbus and also by using a fifth hook under the main incision as suggested in technique by Oetting et al. A study by Birchall et al. reported that the addition of a fifth hook to create a pentagonal pupil reduces pupil stretching by 17% and suggested marking the limbus before hook insertion to ensure equidistant hook separation and thus minimize pupil stretching (11).

Another aspect is incidence of recurrent uveitis. There are various studies which incriminate type of IOL, age, type of uveitis, perioperative steroids, etc as various factors which influence the incidence the incidence of postoperative uveitis. Result in our study is comparable to other studies as seen in the table below. Lower incidence of uveitis in Yoerek et al. is probably due to higher use of systemic and topical immunomodulators.

<table>
<thead>
<tr>
<th>Study</th>
<th>year</th>
<th>Technique</th>
<th>Study size</th>
<th>Incidence of uveitis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Youerek et al. (1)</td>
<td>2010</td>
<td>Phaco</td>
<td>180</td>
<td>8.3%</td>
</tr>
<tr>
<td>Estafanous et al. (3)</td>
<td>2001</td>
<td>Phaco</td>
<td>32</td>
<td>41%</td>
</tr>
<tr>
<td>Suresh and Jones (4)</td>
<td>2001</td>
<td>Phaco</td>
<td>86</td>
<td>36%</td>
</tr>
<tr>
<td>Akova et al. (5)</td>
<td>2006</td>
<td>Phaco</td>
<td>37</td>
<td>34%</td>
</tr>
<tr>
<td>Okhravi et al. (2)</td>
<td>1999-2000</td>
<td>ECCE</td>
<td>101</td>
<td>34%</td>
</tr>
</tbody>
</table>
In conclusion with the advent of more and more advanced surgical techniques like the use of iris hooks, pupil expanders, viscoelastic material, small incision phacoemulsification techniques, etc., the misadventures that used to be so common in cases with small pupil has significantly reduced. Despite these advances, the visual outcome of cataract surgery in the patient with recurrent history of uveitis is far from satisfactory.

There are two drawbacks of the study – bias induced by the cause of uveitis and low number of cases. In context of the above results, influence of surgical technique in postoperative inflammation needs to be further analysed.

REFERENCES


Comparison and Analysis of Outcome of 2.2mm and 2.8mm Coaxial Phacoemulsification in Hard and Soft Cataract

Dr. Vikram Singh Khoisnam, Dr. P. Ratan Kumar, Dr. Anshu Sahai

The quest in performing the cataract operation is on since centuries. The invention of irrigation and aspiration system, implantation of IOL, phacoemulsification are the major milestones in this long journey. Today the race is between microincision, mini incision and conventional phaco. But as we know whatever may be the procedure the goal is maximum safety, minimum invasiveness, lesser SIA, better fluidics, faster recovery, lesser tissue damage and inflammation. “The question now we have is, does the reduction in incision size helps in achieving these goals, and if it helps does it work well with all types of cataract”. The aim of this study is to compare the outcomes of phaco done with 2.2mm and 2.8mm incision in different grades of cataract.

MATERIALS AND METHODS

Prospective study was done on 128 eyes presented with senile nuclear cataract in Sahai Hospital and research centre during January to March 2011. The inclusion criteria was all patient within 40 to 80 years with nuclear senile cataract, clear cornea, Normal fundus. Cases with Astigmatism more than 3.0 Diopters (D), Zonulysis and Zonular defects, pseudoexfoliation, history of other ocular surgeries are excluded from the study.

All the patient were divided into two groups namely group A (soft cataract) and B (hard cataract) according to LOCS III by a single observer under slit lamp.

Surgery: All the surgeries were performed under complete informed consent by single surgeon. Coaxial phacoemulsification was performed randomly in both the groups under topical anasthesia (paracaine 0.5%) with either 2.2mm or 2.8mm clear corneal tunnel incision. Diamond keratome was used in both the type of incision. All the incisions were made temporarily. Two side ports was created 90 degrees away using a 1.2 mm clear cut side port knife. The ophthalmic viscoelastic device was used in both groups. Phacoemulsification was performed by Slim-shaft Strong-bevel Phaco Needles for Co-axial Mini-phacoemulsification (easy Tip® 2.2mm, 19G). All the cases was done by direct chop method. Foldable IOL was implanted (hydrophilic acrylic) by wound assisted injection technique in 2.2mm incision group. Parameters used were, Bottle height 60 to 65cm, Flow rate 35 to 40ml/min, vacuum- 400mmhg, maximum preset phaco power percent – 65%.

Mean phaco time (MPT), phaco power percent (PPP), effective phaco time (EPT), volume of basal salt solution(BSS) used were recorded. EPT was
calculated by multiplying total phaco time in seconds by the average power percent used.

Follow-up examinations were performed at day one, day five, and one month after surgery. At every follow up, BCVA, keratometric astigmatism, corneal status, wound status, AC cells and flare were recorded.

The surgically induced astigmatism (SIA) was calculated using vector analysis method. SIA calculator version 2.1 © Dr. Saurabh Sawhney, Dr. Aashima Aggarawal was used.

**RESULTS**

The results of the study is shown in the tables 1,2,3,4.

<table>
<thead>
<tr>
<th>Table 1: Group A and B by LOCS III</th>
</tr>
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<tbody>
<tr>
<td>LOCSIII</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>NO1NC1</td>
</tr>
<tr>
<td>NO2NC2</td>
</tr>
<tr>
<td>NO3NC3</td>
</tr>
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</table>

<table>
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<tr>
<th>Table 2: Operative outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>PhacoTime (sec)</td>
</tr>
<tr>
<td>EPT (sec)</td>
</tr>
<tr>
<td>BSS used (ml)</td>
</tr>
<tr>
<td>PhacoTime (sec)</td>
</tr>
<tr>
<td>EPT (sec)</td>
</tr>
<tr>
<td>BSS used (ml)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 3: Comparison between group A and B</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROUP A</td>
</tr>
<tr>
<td>Phaco time (sec)</td>
</tr>
<tr>
<td>Phacopower</td>
</tr>
<tr>
<td>EPT</td>
</tr>
<tr>
<td>BSS used (ml)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 4: SIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIA</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>1st day</td>
</tr>
<tr>
<td>5th day</td>
</tr>
<tr>
<td>3rd day</td>
</tr>
</tbody>
</table>
DISCUSSION

The phaco time, EPT, and BSS significantly depend on hardness of cataract (p=<0.001). There is no significant difference between 2.2mm and 2.8mm.

The magnitude of SIA is lower in 2.2mm incision compared to 2.8mm and in 1st and 5th post operative day which is statistically significant (p=<0.002). The SIA of 2.8mm gradually decreases by 30th day whereas in 2.2mm the SIA remain relatively stable. This can be seen in both the groups A and B. On 30th day follow up there is no significant difference. There is no relation of hardness of cataract in SIA in both type of incision.

The BCVA has no significant difference in both groups and both incision. The post operative AC reaction and effect on cornea is observed slightly more in hard cataract but not significant.

The corneal wound remain sealed in all the cases in both the group and both type of incisions.

In conclusion as evident from the study that the 2.2mm phaco reduces SIA and remains stable in postoperative periods (1 month) more than conventional phaco in any grade of cataract.

The Phaco time, EPT and BSS used does not depend on size of incision rather to hardness of cataract. The BCVA outcome shows no difference in both types in both groups.

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Retropupillary Fixation of The Iris Claw IOL—An Alternative Approach

Dr. Jenin Patel

After a cataract surgery implantation of the IOL in the capsular bag in its physiological position is now a standard procedure. Whenever there is an anatomical damage to the capsular bag, such that the implantation of the intraocular lens in the bag or sulcus fixation is not possible, our options for the lens implantation are ACIOL (anterior chamber intraocular lens) or SFIOL (scleral fixation of the lens) either with glue or sutures. Also, in cases of primary aphakia secondary lens implantation has proved its benefits over aphakic glasses for the BCVA. The ACIOL has the advantage of easy implantation but also the complications rate is high and they can cause corneal decompensation, UGH syndrome, i.e. uveitis, glaucoma and hyphema. There may be transient rise in the intraocular pressures, iritis, and photophobia. On the other hand, though technically challenging and a time consuming procedure, SFIOL, has all the advantages of the posterior chamber lens that in more in the anatomical position, better cosmesis, closer to the nodal point, better magnification of the image. The retropupillary fixation of the IOL has the good of both techniques, i.e. easy implantation technique that is easy to master even by a novice and the position is posterior to the iris, and so has all the advantages of the posterior chamber IOL.

Ultimately the choice of technique for the lens implantation depends on the surgeon choice and his level of expertise.

We conducted a non-comparative interventional case series where the retropupillary fixation of the lens was carried out. The purpose of the study was to see the efficacy and the safety of this procedure in patients with inadequate or no zonular support.

MATERIALS AND METHODS
Sixteen eyes of sixteen patients, of these ten who were primary aphakic and six had a loss of the capsular bag either by a posterior capsular rent or bag dialysis during surgery such that a posterior chamber or sulcus fixated lens is not possible underwent this procedure. The lens used was Excel company with a A-constant of 117.0 with overall diameter of 9.0mm and optic size of 5.5m (no financial interest).
Surgical Technique

A 5.0mm scleral tunnel made, two paracentesis made on either side at the limbus. In all the cases a good anterior vitrectomy was done. Viscoelastic agent used to deepen the chamber as and when the surgery needs. Intracameral Pilocarpine is used to constrict the pupil. The lens is held in the lens holding forceps and introduced into the anterior chamber, one haptic was tilted down and pushed under the iris with gentle manipulation. Simultaneously an iris repositor was passed through the paracentesis from the opposite the side. Once the haptic of the IOL was behind the iris, the haptic was tilted up to produce an indent on the iris. The iris was enclavated into the haptic claw with gentle push with the repositor then with similar maneuver the other haptic enclavation was done. Peripheral iridotomy done either with a vitrectomy or surgical scissors. Viscoelastic was aspirated, anterior chamber formed with BSS and conjunctiva reposited.

Postoperative care

All the patients were started on topical steroids, that is prednisolone acetate four times a day along with topical antibiotics and tapered over fortnight and then started on NSAIDS for fifteen days. Patients were followed up post operatively on first day, then after one week and then fortnight. Slit lamp examination, visual acuity and intraocular tension recorded on all follow-ups. One month later patients underwent an OCT. 6 Monthly and yearly follow up was done.

RESULTS

Retrospective analysis of 16 eyes of 16 patients done in which 31% were females and 69% were males and their ages ranged from 40yrs-77yrs. In the primary aphakic group the pre-op BCVA ranged from 0.06 LogMAR to LogMAR 0.4. pre-op BCVA in patients with on table complications ranged from LogMAR 0.24 LogMAR 0.6. Specular microscopy was done for all the patients pre operatively. Mean BCVA was 0.25 LogMAR in all patients during a mean follow up of 1 year. Mean postoperative SE value was -1.205D with S.D.+/- 0.738 at six months after surgery. All patients had a post-op visual acuity better than their pre-op visual acuity. There was
no significant intraoperative complication or postoperative complications. 1 patient developed ERM and one developed CME.

Lens position confirmed by UBM was parallel to the iris plane. All patients had clear cornea postoperative and the IOL well centered.

DISCUSSION

Intraocular lens implantation after cataract surgery is ideally, done with the lens placed in the capsular bag, which provides stable fixation at a position closest to the nodal point of the eye, also the lens is in its physiological position. However, there will be instances where this will not be possible as for example cases of congenital weakness of the lens zonules in various conditions, trauma, and surgical complications of cataract surgery. The literature supports the safe and effective use of anterior chamber, scleral-sutured posterior chamber, and iris-sutured posterior chamber IOLs for the correction of aphakia in eyes without adequate capsular support for capsular bag or ciliary sulcus implantation. Angle fixated anterior chamber IOLs have the disadvantage of having a physical location closer to the endothelium and inability to be implanted in eyes with angle pathology like angle recession and peripheral anterior synichae. The scleral fixated lens has a better anatomical location also has the disadvantage of the lens tilt, vitreous haemorrhage or suture erosion, apart from the technically challenging technique and long surgical time.11

We studied the safety and efficacy of retropupillary iris fixation of iris claw. IOLs remained stable in all the cases at one year. UBM was done in these to confirm the position of the lens which was parallel to the iris plane.

Iris fixated IOLs have attracted a lot of debates and controversies. The studies with iris fixation have been with clawing of IOL to iris and suturing of the IOLs to the iris. This technique is not without its set of problems. There could be ovalling of the pupil if the tuck has happened close to the pupillary edge and not in the mid periphery where it should ideally be. There could be disenclavation if enough iris tissue is not tucked in. Sometimes there could be
pigment dispersion and also loss of pigments at the area of clips. Most of the problems and complications with iris fixed IOL were solved with improved design, manufacturing technique and surgical technique. A similar study by Baykara et al. found that this technique is safe and effective.

Thus we conclude that retropupillary posterior iris fixation of iris claw lens has the advantages of easy implantation and a true posterior chamber location in eyes having no capsular or zonular support with a low intra and postoperative risk profile. This technique has a potential to replace the scleral fixated IOLs and become the preferred method of posterior chamber lens implantation in eyes with compromised zonular or capsular support.

REFERENCES

11. Safe and Effective technique for Surgical Correction of Aphakia – PosterirIrisClawLensTDr. Sreeni Edakhlon, Dr. Gopal S Pillai, Dr. Abhijeet M Khake.
Modified CTR Delivery System

Dr. Surya Gupta, Dr. Arnab Biswas, Dr. Satyajit Bhattacharyya, Dr. Supratim Biswas

Capsular tension rings (CTR) are one of the most important accessories in the armament of cataract surgeons to combat subluxated or compromised integrity of the capsular bag. Almost all cataract surgeons have used the ring at some point or the other and it has saved many from sleepless nights.

CTR can be inserted in the eye either manually or with the help of either disposable or metallic injectors. One of the problems faced during either manual insertion or with the help of current injectors is that the trailing end sometimes get lost in the sulcus and complicates further a complicated situation. Another important point is that, when we inject the CTR by the common current methods, it puts a lot of stress on the remaining zonules and may further weaken or damage them. Some have advocated threading one eye of the CTR segment for easy retrieval if it dislocated posteriorly.

We needed a design which could overcome these problems, but was not only easy and fast to make but also cheap. Hence, we designed this new CTR delivery system.

Purpose is to evaluate a new CTR delivery system.

MATERIALS AND METHODS

Conventional CTR was used. Initially, a 10-0 Nylon suture with straight needle and 16G or 18G IV Catheter was used to make the delivery system. The needle of the canula was passed from the opposite end of the canula, through the whole length and brought out from the other side. Then both the eyes of the CTR was threaded and again the suture needle was threaded into the silhouette IV needle and passed from the tip of the IV canula and brought out from the other end. Now we have a CTR with both eyes threaded and the both the ends of the suture passed through the IV canula with free ends coming out from the hub end of the canula. Now gently both ends of the sutures are pulled uniformly and the CTR is pulled into the canula tip till only about 1-2 mm of folded CTR remains outside the tip. Care must be taken not to pull the CTR in very fast or too much or the folded loop of the CTR might snap and break. The needle was then inserted in the conventional manner into the canula till it lightly pushed the CTR. Now the foldable CTR delivery system was ready for use. The CTR was injected similar to injecting a foldable lens, into the bag. The sutures remained threaded and were secured to one side of the main phaco wound. After completion of surgery, a spatula was inserted through the side port. Both the sutures were slightly pulled away from the capsular margins.
with the spatula, one end was cut outside the wound and the other end was pulled gently to remove the sutures from the CTR without damaging the bad or dislocating the CTR. This method was used in first three cases.

In the fourth case, one end of the suture was lost in the canula before the CTR was injected and could not be retrieved. Here, both the ends of the suture was taken out from the canula tip while the CTR was still threaded. The suture ends were secured with a knot a little distally. A 26G needle was taken and the IV canula was punctured about 1 cm from the tip with the 26G needle. The tip of the 26G needle was taken out from the canula tip. The needle of the suture was fed into the 26G needle and both ends of the suture was taken out from the side of the canula in a rail-road fashion. Then, the sutures were gently pulled to fold the CTR into the canula tip as before and the rest of the surgical steps were repeated as previously mentioned. In subsequent cases, this technique was used as it was faster and convenient.

**RESULT**

CTR injection and delivery was smooth and in the bag. To extra complications were noted during surgery. In no case, the CTR was required to be removed. In no case was there any need to convert to peri-bulbar block when the case was started under topical anaesthesia. No patient complained of any extra discomfort during insertion of the ring. No difficulty was noted during phacoemulsification or during insertion of the lens, with the sutures in situ.

In conclusion the modified CTR delivery system was easy to use. The materials are freely available and the delivery system is easy to make. It can be prepared before surgery or during surgery. It can be used through conventional phaco ports and instruments.

**DISCUSSION**

CTR have come to the rescue to many surgeons in difficult situations to stabilize the capsular bag but they are not free from complications. CTR being lost in the sulcus while insertions can be very difficult and traumatic to retrieve. Dislocation of CTR during insertion or during surgery after inadvertent posterior capsular rent can be nightmare. Stress on the remaining zonules during insertion in a bag with compromised stability is also something to worry about with current delivery methods.

This new CTR delivery system tries to overcome most of these complications. The insertion in a folded manner in the bag ensures equal stress in all quadrants of the bag without undue stress in any one segment. This helps in reducing stress in the remaining segments or in areas with weak zonules. Since both the eyes of the CTR are threaded, if need be, the CTR can be removed in a foldable manner by simply pulling the stay sutures and pulling
the CTR back into the IV cannula. The stay sutures also ensure that the ends of the CTR are always accessible when dislodged out of the bag or in case of posterior capsular rent, when they need to be removed. The materials used in this new delivery system are freely available and the system if easy and fast to make. Either they can be prepared beforehand in cases of planned implantation or they can be prepared per-operatively if bag stability is noted to be compromised. We recommend this delivery system to be used in all cases where CTR implantation is indicated or needed.

This new delivery system is easy to use and requires minimal learning curve for surgeons who are already using foldable lens. The materials used are freely available and can be used with current phaco incisions. It’s beauty lies in its simplistic design and the rapidness with which it can be made, when needed. With further design modification and refinement, we hope to improve this further and make our lives a little more peaceful.

REFERENCES

Effect of Size and thickness of Posterior Polar Cataract on Surgical outcome in SICS

Dr. Pranay Singh, Dr. Rahul Shah, Dr. Ajay Prakash, Dr. B.K. Jain

Posterior polar cataract is an uncommon type of developmental cataract. It usually develops before birth or early ages of life without any sexual predilection and it has bilateral tendency. Symptoms are glare and other disturbing visual images especially in night while driving and diminution of vision in day. The indication for surgery consists of visually significant cataract impairing the patient’s quality of life. The purpose of study was to know relation between size and thickness of posterior polar cataract (PPC) with incidence of posterior capsular rupture (PCR) in small incision cataract surgery (SICS). No other authors had studied the risk of posterior capsule tear according to thickness of polar opacities.
MATERIALS AND METHODS

In this prospective nonrandomized controlled interventional study 66 eyes of 66 patients with PPC with or without nuclear sclerosis were recruited for surgery. Patients with complicated cataract, glaucoma, corneal opacity/degeneration, retinal pathology and undilated pupil were excluded from the study. All patients underwent complete ophthalmologic examination including vision, slit-lamp Biomicroscopy, IOP measurement and posterior segment examination. Size of the polar opacity was measured using slit-lamp by adjusting the height of slit beam. We used Ultrasound Biomicroscopy (UBM) with 30 MHz probe to measure central thickness of PPC. All patients underwent small incision cataract surgery by the same operating surgeon with similar surgical procedure.

Incidence of PCR was calculated for both, size of PPC < 4 mm or > 4 mm and thickness of PPC < 0.4 mm or > 0.4 mm. For analysis of two categorical variables Fischer’s exact test was used. p value of <0.05 was considered statistically significant.

RESULTS

66 eyes of 66 patients were included.

### Mean patients’ age

<table>
<thead>
<tr>
<th>Size of PPC</th>
<th>Mean patients’ age (yrs)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPC &lt; 4 mm</td>
<td>60.24 (SD±9.2)</td>
<td>0.10</td>
</tr>
<tr>
<td>PPC &gt; 4 mm</td>
<td>64.2 (SD±7.3)</td>
<td></td>
</tr>
</tbody>
</table>

p value of mean patient age difference was not significant (p=0.10) in both groups.

<table>
<thead>
<tr>
<th>Thickness of PPC</th>
<th>Mean patients’ age (yrs.)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPC &lt; 0.4 mm</td>
<td>62.12 (SD±9.2)</td>
<td>0.12</td>
</tr>
<tr>
<td>PPC &gt; 0.4 mm</td>
<td>65.23 (SD±7.3)</td>
<td></td>
</tr>
</tbody>
</table>

p value of mean patient age difference was not significant (p=0.12) in both groups.

Total incidence of PCR – 7 (10.6%)

### As regards size of PPC

<table>
<thead>
<tr>
<th>Size of PPC</th>
<th>Number of cases</th>
<th>Incidence of PCR</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPC &lt; 4 mm</td>
<td>39 (59.09%)</td>
<td>1 (2.56%)</td>
<td>0.0298</td>
</tr>
<tr>
<td>PPC &gt; 4 mm</td>
<td>27 (40.90%)</td>
<td>6 (22.23%)</td>
<td></td>
</tr>
</tbody>
</table>

Incidence of PCR is less when size of PPC is small and the difference is significant. The one-tailed P value equals 0.0298 (Significant).
As regards Thickness of PPC

<table>
<thead>
<tr>
<th>Thickness of PPC</th>
<th>Number of cases</th>
<th>Incidence of PCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPC &lt; 0.4 mm</td>
<td>30(45.45%)</td>
<td>0(0%)</td>
</tr>
<tr>
<td>PPC &gt; 0.4 mm</td>
<td>36(54.54%)</td>
<td>7(19.44%)</td>
</tr>
</tbody>
</table>

Incidence of PCR is less when Thickness of PPC is less and the difference is significant. The one-tailed P value equals 0.0198.

**DISCUSSION**

Posterior polar cataract is a challenge for the cataract surgeon as these cataracts predispose to PC rents and vitreous loss. The incidence of posterior capsule rupture has been reported nearly from 5% to 35% in SICS and Phaco. In our study it was 10.6%. There are various techniques telling about how to prevent PCR in Phaco as well as in SICS.1–6 During surgery careful attention should be taken while gentle separation of polar opacity from the posterior capsule. We didn’t tried hydrodissection because posterior polar opacities adhere firmly to the posterior capsule and strong hydrodissection may leads to PCR around the opacity.

Relation between size of PPC measured by slit lamp and incidence of PCR has been reported in study by J Ram at el7 in Phaco. Our results are similar to that in SICS incidence of PCR was more when size of PPC was > 4 mm. We also tried to analyze relation between thickness of PPC and incidence of PCR. It has not been reported. For measuring central thickness of PPC we used UBM with 30 MHz probe for better penetration. UBM has various roles in ophthalmology (8).Incidence of PCR was more when thickness of PPC was > 0.4 mm.

This finding suggests that one should be more careful while operating in eyes with larger and thicker posterior polar opacities.

In conclusion thickness of PPC (as determined by UBM) and its size are significant predictors of PCR in Posterior Polar Cataract.

**REFERENCES**


Comparative Evaluation of ‘In The-Bag’ Intraocular Lens [IOL] Implantation with Cionni Ring V/S Pars Plana Lensectomy – Vitrectomy With Anterior Chamber IOL Implantation in Subluxated Lenses

Dr. Anju Rastogi, Dr. Yuvika Bansal, Dr. Sweta Singh, Dr. Kamlesh, Dr. Shilpa Goel

Subluxated crystalline lenses are commonly encountered, and they often create management problems. Lens displacement may be traumatic, hereditary and spontaneous. Subluxation of the lens occurs with various disorders, including Marfan’s syndrome, Homocystinuria, Sulfate oxidase deficiency, Weill-Marchesani syndrome, and Pseudoexfoliation syndrome. Management initially involves optical refraction but may require lens removal when visual acuity becomes uncorrectable,1 the refraction status is unstable, there is significant or progressive subluxation in children along with amblyopia which cannot be treated by conventional means and there is an anterior or posterior subluxation risk.

This study was done to assess and compare the advantages and disadvantages, the post operative visual outcome and post operative complications of Cionni’s ring with PCIOL versus pars plana lensectomy-vitrectomy with ACIOL in subluxated lenses in children.

MATERIALS AND METHODS

The study was conducted in the department of Ophthalmology, Guru Nanak Eye Centre. A prospective comparative study was done in 20 eyes (18 children) in the age group 8-18 years, randomly allocated by chit system into two groups comprising 10 eyes each. Group A: Comprised of 10 eyes which underwent surgery with Cionni Modified Capsular Tension Ring with in the bag PCIOL. Group B: Comprised of 10 eyes which underwent pars plana lensectomy-vitrectomy with ACIOL. Inclusion criteria: Age group 8-18 yrs, subluxation 90 to 210 degree, ectopia lentis, traumatic subluxation. Exclusion criteria:
Best corrected visual acuity (BCVA) better than 20/40, any posterior segment pathology, gross anterior segment anomaly, traumatic mydriasis, glaucoma, inflammation, uveitis.

A detailed history regarding the ocular and systemic complaints was obtained. Ophthalmological examination included BCVA, slit lamp examination to note the degree of subluxation and the status of zonules after full pupillary dilatation, presence or absence of vitreous in anterior chamber, detailed dilated fundus examination, specular microscopy, anterior chamber depth using ultrasonic method, intraocular pressure using non contact tonometer, B-scan ultrasound for posterior segment evaluation if the fundus was not visible, Ultrasound biomicroscopy where ever possible [to assess the zonular status in cases of non dilating pupil], biometry for IOL power calculation, OCT where ever possible [to assess the macular status]. If subluxation was suspected to be due to any heritable disease, opinion was sought regarding the diagnosis of the disease.

**Surgical Technique**

**Group A:** All patients underwent surgery by the same surgeon. A localized conjunctival peritomy was performed. A partial thickness scleral flap was made 1.5 mm behind the limbus in the area of maximum zonular weakness. A 3.0 mm clear corneal incision was made, 2 side ports were made. A 26-gauge cystotome was used to initiate the capsular tear, and the capsulorrhexis was created with Utrata forceps, then multiquadrant hydrodissection was performed. Lens aspiration was done using irrigation aspiration under low aspiration flow rate, low vacuum and low bottle height. Anterior vitrectomy was performed in cases with vitreous prolapse in anterior chamber. 10-0 prolene suture was threaded to the fixation eyelet on the Cionni ring, then Cionni ring was passed in the main incision and suture was brought out beneath the scleral flap via ab externo approach, using rail roading by 26 gauge needle. The Cionni was dialled so that the eyelet was in position of maximum subluxation and the eyelets were above the capsulorrhexis margin. The sutures were then tied. PCIOL was implanted in the bag. The main incision, side port and conjunctiva were sutured with 10-0 Vicryl.

**Group B:** 180 degree conjunctival peritomy was made. 2 sclerotomies were created 3 mm posterior to the limbus. A 6 mm tunnelled incision was created at the superior limbus. Subluxated lens removal was made with vitrectomy instrument. Scleral depression was performed to ensure that no residual peripheral lens matter remained, anterior vitrectomy was done and pupil was constricted using pilocarpine. Kelmen Multiflex open loop ACIOL was implanted through the superior incision. Peripheral iridectomy was done and wound was closed with 10-0 Nylon. Sclerotomies were sutured with 6-0 Vicryl.
Patients were followed at day 1, 1 week, 1 month, and then at 3 months for complications of surgery, intraocular pressure, endothelial count, lens centration, fundus evaluation, best corrected visual acuity.

RESULTS
Out of the 18 patients, 6 were diagnosed with Marfan’s syndrome, 2 had inherited lens dislocation without any other medical condition, 6 had traumatic subluxation, 1 had unilateral high myopia, and 3 had idiopathic lens dislocation. Group A: Preoperative BCVA ranged from 20/1200 to 20/80, with an average of 20/300 (Log MAR 1.187). Postoperative BCVA after 3 month follow up ranged from 20/60 to 20/20, with an average of 20/30 (Log MAR 0.195). Group B Preoperative BCVA ranged from 20/1200 to 20/80, with an average of 20/300 (Log MAR 1.188). Postoperative BCVA after 3 month follow up ranged from 20/120 to 20/30, with an average of 20/40 (Log MAR 0.32). There was no significant difference between groups in terms of final BCVA (p = 0.124). There was significant difference between preoperative and postoperative BCVA in both the groups.

Complications of the Cionni group included Posterior capsular opacification in 8 patients, vitreous prolapse in anterior chamber with pupillary capture and lens decentration in 1 patient. Vitreous haemorrhage occurred in one of the patients, which resolved spontaneously. In the ACIOL group one patient had pupillary block with vitreous haemorrhage. One of the patients had pupillary block and later cystoid macular edema. The pupillary block resolved after laser iridotomy, there was no persistent post operative ocular hypertension. The vitreous haemorrhage resolved spontaneously.

The mean cell density in the Cionni group was 3388.05 pre-operatively, and 3034 postoperatively at 3 months. The mean cell density in the ACIOL group was 3414.8 pre-operatively, and 2942 postoperatively at 3 month. The Cionni group had 0.9% endothelial cell loss after 3 months of surgery and ACIOL group had 1% endothelial cell loss. There was no significant difference between the groups in terms of endothelial cell loss. In patients with pupillary block there was a drop in endothelial count initially, which was stabilised later.

DISCUSSION
Various operative techniques and results have been reported for management of subluxated lenses. Nevertheless, the management of subluxated lenses remains challenging and certain controversies remain unsolved in children. The use of Cionni ring is a standard approach and has gained acceptance over other approaches as it involves the placement of IOL in the bag with better stability and centration of the capsular bag. Despite all its advantages it has
certain limitations and a high incidence of posterior capsule opacification has been noted. There have been reports of suture degradation leading to IOL decentration and pseudophacodonesis and sometime complete dislocation of the bag with Cionni and IOL into the vitreous. The Cionni ring cannot be implanted in patients with extensive subluxation, in patients with scleral disorders, in cases of posterior capsular tear, and if complete continuous capsulorrhexis is not attained. The technique has a long learning curve and long intra operative time.

Anterior Chamber IOL has been implanted from ages and was quite popular till 1980. The early lenses were rigid ones and perfect sizing was important. Viscoelastic were not freely available and implantation was done under air, which was very traumatic. The complication rates were high with closed loop old ACIOL, which soon fell into disrepute, but the modern day ACIOL model have flexible loops and a highly polished surface which are less likely to cause corneal decompensation. Study done by Hirashima et. al. comparing the endothelial cell loss after ACIOL with PCIOL showed no statistically significant difference between the groups. Six months follow up showed 8% cell loss in ACIOL. The newer ACIOL have an anterior vault minimizing the risk of IOL iris touch and iris chafe, and with open loop four point fixation, synechial progressions are less. These lenses are generally implanted in an unplanned fashion after a complicated cataract surgery, which itself is predisposed to several complications.

However in case of large subluxation, the implantation of a planned ACIOL with proper case selection with preoperative good specular count and implantation of open loop ACIOL under viscoelastic with a large surgical peripheral iridectomy is a viable option.

The limitation of our study was short term follow up which restricts our ability to definitively interpret these data.

REFERENCES


Opposite Clear Corneal Incision in Manual SICS with Superior Tunnel in Eyes with Atr Astigmatism

Dr. Shashi Agarwal, Dr. Shashank Sen, Dr. Rathore M.K., Dr. Eva Rani Tirkey

Today cataract surgery is regarded as “Refractive Cataract Surgery” and aims not only in removal of cataract, but also pays encompassing attention to both spherical and astigmatic component of refraction. The main objectives of modern cataract surgery are emmetropia, minimal or no surgically induced astigmatism and a satisfied patient.

Although phacoemulsification has become the biggest surgical achievement, it is still not being practiced by majority of surgeons in developing countries like India, due to its high cost, complex equipment and lengthy learning curve. In order to obtain the advantage of self sealing sutureless incision at low cost, easy and short learning curve, minimal intra-operative complication and universal applicability to all types of cataract, including suprahard nucleus, manual SICS is preferred by many ophthalmologist in India. After having so many advantages, manual SICS induces significant amount of corneal astigmatism, which has been accepted for decades as an undesirable but inevitable by-product of cataract surgery. In the last two decades many modalities have been tried to reduce the post-operative astigmatism, like Arcuate keratotomy, Limbal relaxing incision, Toric intraocular lens, placement of main incision on steeper axis.

Opposite clear corneal incisions (OCCIs) have been tried by many in phacoemulsification cataract surgery and have been found to have better neutralizing effect on astigmatism than single clear corneal incision.

Aim is to compare post operative astigmatism after single and paired full thickness corneal incision in manual SICS in patients with ATR astigmatism.

MATERIALS AND METHODS

We enrolled 162 eyes of 131 patients with keratometric against the rule corneal astigmatism for cataract surgery by manual SICS method. Patients were interviewed for any ocular systemic or medical history. Pre operative evaluation consisted of comprehensive ophthalmic checkup, uncorrected and best corrected visual acuity (BCVA), slit lamp biomicroscopy, grading of cataract with LOCS III system, intraocular pressure by applanation tonometer, keratometry, IOL power calculation with A-scan biometry and fundus examination. The patients were randomly assigned into two groups, Group A single clear corneal and Group B had opposite clear corneal.
Surgical technique – All patients had undergone manual SICS with superior tunnel frown incision with 6 mm external incision, the most anterior part of the incision was 2 mm behind the limbus. Corneoscleral tunnel was dissected upto 1 mm in the clear cornea, internal incision was made with help of keratome blade. Clear corneal incisions were made 1 mm inside the limbus with 2.6 mm keratome blade. In Group B two clear corneal incisions were made one at 3 o’clock and other at 9 o’clock, in group A single clear corneal was made at 9 o’clock followed by continuous curvilinear capsulorhexis, hydrodissection, nucleus delivery by phaco sandwich technique. 6 mm PMMA intraocular lens was implanted in the capsular bag after complete cortical clean up.

Post operatively all patients received topical prednisolone and antibiotic drops for 6 weeks. Follow-up were done at 1st, 4th and 8th week. During each follow up slit lamp examination to see the wound integrity, UCVA, BCVA, keratometry were done. Final refraction was done on 8th week.

Surgically induced astigmatism was calculated by vector analysis using the Holladay- Cravy-Koch method.1

RESULTs
Total number eyes in the study were 162 of 131 patients with 96 female and 66 male. The age group of the patients ranged from 53-75 years with a mean of 63.5 yrs.

<table>
<thead>
<tr>
<th>Pre-op. Astigmatism</th>
<th>No. of Patients in Group A</th>
<th>No. of Patients in Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.01 - 0.50D</td>
<td>37</td>
<td>33</td>
</tr>
<tr>
<td>0.51- 1.00 D</td>
<td>33</td>
<td>40</td>
</tr>
<tr>
<td>1.01 – 1.50 D</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>1.51 – 2.00 D</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>≥ 2.00</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

All patients had Pre-operative against the rule astigmatism, ranging from 0.25 to 2.25D. Mean pre-operative astigmatism in Group A was 0.57 D and in Group B was 0.65 D.

<table>
<thead>
<tr>
<th>VA</th>
<th>Group A (No. of Patients)</th>
<th>Group B (No. of Patients)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>UCVA</td>
<td>BCVA</td>
</tr>
<tr>
<td>6/36 – 6/18</td>
<td>43</td>
<td>0</td>
</tr>
<tr>
<td>6/12 – 6/9</td>
<td>33</td>
<td>4</td>
</tr>
<tr>
<td>6/6</td>
<td>5</td>
<td>77</td>
</tr>
</tbody>
</table>
Most of the patients in Group A had post operative UCVA 6/36-6/18 as compared to 6/12-6/9 in group B. UCVA of 6/6 was found in 5(6.2%) patients of group A as compared to 12(14.8%) patients in group B. BCVA was comparable in both the groups.

### Table 3: Post operative Keratometric Astigmatism

<table>
<thead>
<tr>
<th>Post-op. Astigmatism</th>
<th>No. of Patients in Group A</th>
<th>No. of Patients in Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Astigmatism</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>0.01 - 0.50D</td>
<td>17</td>
<td>24</td>
</tr>
<tr>
<td>0.51 - 1.00 D</td>
<td>23</td>
<td>30</td>
</tr>
<tr>
<td>1.01 – 1.50 D</td>
<td>31</td>
<td>17</td>
</tr>
<tr>
<td>1.51 – 2.00 D</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>≥ 2.00</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

In group B, 73 eyes had keratometric ATR astigmatism, and 8 had no astigmatism (with mean 0.61D +-0.30D). In Group A all patients had ATR astigmatism (mean 1.24+-0.75D) and 40 eyes (49.4%) had Post operative Keratometric Astigmatism ≤ 1.00 D as compared to 62 (76.5%) in group B.

### Table 4: Cylinder prescription at 8th week follow-up

<table>
<thead>
<tr>
<th>Cyl. Prescription</th>
<th>No. of Patients in Group A</th>
<th>No. of Patients in Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.00 – 1.50 D</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>1.50 – 1.00 D</td>
<td>26</td>
<td>13</td>
</tr>
<tr>
<td>1.00 – 0.50 D</td>
<td>25</td>
<td>35</td>
</tr>
<tr>
<td>0.50 – 0.00 D</td>
<td>19</td>
<td>31</td>
</tr>
</tbody>
</table>

54.3% patients in Group A had cylinder prescription ≤1.00D (Against the Rule) as compared to 81.5% in group B. Average cylinder prescription 1.16 Din. group A and 0.68D in Group B.

Mean surgically induced astigmatism was 0.97D in Group A and 0.49D in Group B on 8th week follow-up.

There were no incision related complications.

**DISCUSSION**

Manual small incision cataract surgery with superior corneoscleral tunnel tends to induce flattening along the vertical meridian and steepening along the horizontal meridian due to coupling effect and thus resulting in a post operative against the rule astigmatism, with surgically induced astigmatism ranging from 1.06-2.27 D.\(^2\,^3\)

So, the patients with pre operative against the rule astigmatism will have more...
post operative astigmatism with superior tunnel incision. Single clear corneal incision is routinely used by many surgeons as an extra port for manipulation. It also has some flattening effect on the horizontal axis, but the effect is mainly limited to the hemicornea of the side of incision. As to enhance the flattening effect of this CCI we added another CCI just opposite to this incision to counterbalance the curvatural changes produced by the main port incision. The difference of surgically induced astigmatism between the two groups was statistically significant (p = 0.02).

Lever and Dahan used this opposite clear corneal incisions to reduce the pre-existing corneal astigmatism during phacoemulsification cataract surgery and found it easy to make, self-sealing, and required no extra instruments. These extra incisions can be used for cortical matter removal. OCCIs are associated with surgically induced astigmatism ranging from 0.55 D to 2.25D.

In conclusion of our study we found Opposite clear corneal incisions are simple safe and effective way to reduce the surgically induced astigmatism and thus the post operative astigmatism. Larger studies are required, so that a nomogram may be put up and make manual small incision cataract surgery an astigmatically neutral surgery with no additional risk and provide patients, better visual function and satisfaction.

REFERENCES
To Evaluate the Efficacy of MD–II Procedure in Managing Cataract in Cost Effective Way

Dr. Dharmendra Nath, Dr. Kumar Sambhav

To evaluate the efficacy of MD–II procedure in managing cataract in cost effective way

Setting

- Geeta Eye Hospital, a rural eye care setting in northern – central India
- Study duration /consent
- From all patients written informed consent was taken before surgery and were explained about the risk and benefits associated.

Inclusion criteria

- All patients undergoing senile cataract surgery were included (cataracta nigra, rock hard cataract, morgagnian cataract, small pupil, anterior chamber depth less then 1.5 mm, low endothelial cell counts, corneal dystrophies, keratoconus, failure of machine power, exfoliation cataracts, compromised zonular apparatus and others).

Exclusion criteria

- Associated ocular problem which might impair the visual outcome (diabetic retinopathy, glaucoma, corneal scar, macular dysfunctions).
- Patients undergoing combined surgeries.
- Mentally challenged.

MATERIALS AND METHODS

Methods will be discussed under 3 main headings. These being, cannula and surgical technique.

Cannula

It is a 23g needle with two bends, first at 1.5 mm away from the tip and second one at 4.5 mm away from the tip together makes 90° curve with shaft. Tip of cannula is blunt, for very soft matter the tip is bulbar. Before use it is mounted on syringe filled with viscoelastic. It has a total length of about 20 mm. The above mentioned cannula is named as Nath Cannula.

Surgical technique

It has following steps, incision, capsular opening (can opening or CCC),
dissection, delivery, and cortical aspiration and IOL implantation. After making a conjunctival flap on the steeper meridian of the astigmatism a sclera tunnel is made entering anterior chamber. A side port entry is made 90 degree to main entry to it. About 5 mm sclera tunnel is made, 2 mm behind limbus with side pockets helping nucleus delivery. Anterior chamber is filled with visco elastic and capsular opening is performed, which can be CCC or can opening. Dissection is done with Nath cannula. In this Nath cannula mounted on visco filled syringe is taken in anterior chamber and glided over nucleus and guided between the epinucleus and the nucleus. A gentle lift is given to nucleus creating a space between the nucleus and cortical matter. Visco elastic is injected in the created space. For nucleus delivery Nath cannula is passed flat in the space created and rotated 90 degree to engage nucleus in the curve of cannula. A gentle pull force applied pressing the posterior lip of the sclera tunnel. Nucleus comes out leaving behind the epinucleus at the mouth of tunnel (like mango seed delivery leaving pulp and pericarp). Nucleus comes out from bag to the exterior without touching the endothelium. All the time anterior chamber is maintained with viscoelastic.

**RESULTS**

Total of 8331 eyes of 6671 patients were included in the study. Male: Female (4131:2540). Total of 10,684 eyes were evaluated but for the final analysis 8,331 eyes were taken into consideration as the rest did not meet the inclusion criteria. Best corrected visual acuity were compared at the 6 weeks post operative to that of pre operative stage. The comparison is mentioned in Table 1. Surgically induced astigmatism (SIA) ranged from 0.25 D to 1.50 D. Mean SIA was 0.75D.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Pre operative VA</th>
<th>Post operative VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Log MAR BCVA</td>
<td>1.0 (20/200)</td>
<td>0.1 (20/25)</td>
</tr>
<tr>
<td>Range</td>
<td>1.6 – 0.3 (20/1000 – 20/40)</td>
<td>0.3 – 0 (20/40 – 20/20)</td>
</tr>
</tbody>
</table>

**Complications**

Posterior capsular rent was noted in 66 (0.99%) patients. Only one case of endophthalmitis was noted. No long term complications were noted.

In conclusion MD-II is a new way of manual small incision cataract surgery. The final outcome and surgical time is comparable to phacoemulsification. It is cost effective and time saving to justify the high back log of cataracts in developing and underdeveloped nations. MD-II is a technique with small learning curve which can address all types of cataracts. Even cataracts with zonular dialysis and cases of small pupil can be managed well.
Pseudoexfoliation as Risk Factor for Peripheral Vascular Disease – A Case-control Study

Dr. Samaresh, Dr. Srivastava S, Dr. Rasesh Diwan, Dr. Praveen M.R., Dr. Vasavada AR

PEX is linked to glaucoma and intraoperative and postoperative complications during cataract surgery. Slit lamp biomicroscopy are used during the clinical examination to detect the white dandruff like material as well as other signs such as parapapillary transillumination defects. It is also a generalized disorder that involves the abnormal production and/or turnover of extracellular matrix material. Recent investigations have revealed the presence of PEX fibril in several extracellular tissues. These studies have shown that the PEX material is found in many parts of the body such as the eyes, skin, heart, lungs, liver, kidney, gall bladder, blood vessels, optic nerves, and meninges. PEX has also been shown to affect smaller vessels. With studies hypothesizing that hypoxia plays an important contributory role in the development of PEX, there is the question of a possible link between the presence of ocular PEX and vascular disease.

The presence of peripheral vascular disease indicates widespread atherosclerosis in the coronary, carotid, and cardiovascular arteries. There is a four- to six-fold increase in cardiovascular mortality rate among patients with objectively documented peripheral vascular disease as compared to healthy, age-matched individuals. To the best of our knowledge, the association between ocular PEX and peripheral vascular disease has not been reported.

Ankle brachial index (ABI) is used to diagnose peripheral vascular disease of the extremities in symptomatic patients as well as to assess vascular risk in asymptomatic ones. ABI has a high sensitivity (90%) and specificity (98%) for detecting ≥50% stenosis in the leg arteries. A low ABI indicates both the presence of flow limiting atherosclerosis in a peripheral artery and generalized atherosclerosis. There is a higher prevalence of low ABI in patients with systemic disorders like diabetes mellitus, hypertension, smoking, angina, acute myocardial infarction and transient ischemic attacks.

The aim of this case control study is to determine the association between ocular PEX and peripheral vascular disease using the ABI values derived from Color Doppler Imaging (CDI) measurements.

**MATERIALS AND METHODS**

An observational case control study was undertaken at Iladevi Cataract and IOL Research Center, Ahmedabad, India, from 1st June, 2006 to 30th June, 2007.
One hundred and sixty consecutive patients over 60 years of age with senile cataract were recruited. Subjects with PEX were designated as cases (n=40 patients) and those without PEX constituted the controls (n=120 patients). The diagnosis of PEX required the presence of a classic (late stage) pseudoexfoliation deposition pattern on the anterior lens capsule as a central gray disc, mid-peripheral clear ring, and peripheral grey rim. Eyes with a history of any intraocular intervention previously were excluded.

A detailed medical history was recorded including that of hypertension, diabetes mellitus, cerebro vascular stroke, and ischemic heart disease. While the pupils were dilating, the participants were subjected to an interview where the examiner (MRP) knew the hypothesis and also the diagnosis and asked participants whether they had ever been told by their doctors that they suffered from any of the following: angina or a heart attack, ischemic heart disease (IHD) a transient ischemic attack, a cerebrovascular stroke, diabetes (DM), hypertension (HT) and if so, whether they were taking any medication. The examiner also asked participants whether they had undergone bypass surgery or angioplasty.

We selected subjects from patients examined during the period June 2006-June 2007. When a case with PEX was encountered, five matching patients without PEX were randomly selected over the next 3 days to constitute a frame for a second stage of selection. Once the number reached five for a particular age group, three patients from this frame of five were randomly selected for final inclusion. All the patients underwent a complete ocular examination comprising undilated and dilated slit lamp biomicroscopy, applanation tonometer, and fundus examination. In addition to detecting PEX material, the presence of phakodonesis or zonulolysis was specifically recorded.

As PEX is relatively rare, the sample size was calculated on the basis of the mean ABI determined amongst cataract patients posted for surgery. The mean “lowest” ABI value (defined later) in controls was found to be 1 with a standard deviation of 0.11. Assuming the difference in the mean lowest ABI value to be 5% or more in PEX patients, it was necessary to recruit 40 cases and 120 controls in order to have 80% power to detect a 5% difference in ABI between cases and controls. Although the mean lowest ABI did not vary significantly across age groups in controls, it was decided that controls would be recruited in a ratio of 3:1 with appropriate age group matching.

A Color Doppler machine Shimadzu SDU 2200 (Shimadzu Corporation Japan) was used to measure ABI in all the patients by recording the blood pressure in the four limbs of the patients in a supine position. The Doppler imaging records blood flow, which is super-imposed in color on a conventional gray scale ultrasound picture. The color image is used as a guide to detect the blood
vessels. The Doppler spectral analysis also allows quantitative assessment of the blood flow velocities within the blood vessels. ABI is the ratio of the ankle to brachial systolic blood pressure and a value of <0.90 indicates the presence of flow-limiting arterial disease affecting the limbs. The patient was placed in a supine position and the Doppler ultrasound was used to obtain the brachial and ankle systolic pressure measurements in each arm and in the dorsalis pedis arteries in each ankle. CDI demonstrates simultaneous two-dimensional imaging of anatomic structures and blood flow. All the ultrasound examinations were performed by a single radiologist and two or more recordings were made for each side. The radiologist was aware of the study hypothesis but masked to the ophthalmic diagnosis. The higher systolic pressures obtained in the 2 arms and ankles were taken. The right and left ABI values were determined by dividing the higher ankle pressure in the right and left legs by the higher arm pressure in either arm. Of the two values of ABI obtained from each patient, the lower value was used to assess increased risk of occurrence of peripheral vascular disease in patients with and without PEX; this was done for both cases and controls. An ABI ratio of less than 0.90 was considered abnormal.

**RESULTS**

The mean age of the patients was 68.83±4.62 years in the controls and 69.0±5.82 years in the cases. The lowest mean ABI documented in the controls was 0.98±0.03 (Range 0.86-1.08, Median 0.97) while in the cases, it was 0.88±0.02 (Range 0.79-0.92 Median 0.89) (P<0.001). The odds ratio (OR) of abnormal ABI in cases as compared to controls was 58.50 (95% CI 15.80-216.59).

The distribution of subjects in the 2 groups by systemic illnesses (HTN, DM and IHD, cerebro vascular stroke) was not statistically significant except for cerebrovascular stroke. In the presence of systemic illness, the cases (n=22) had a lower mean least ABI 0.88±0.02 when compared with the controls (n=45) (0.99±0.04); P <0.001. Similarly, in the absence of systemic illness, the cases (n=18) had a lower mean least ABI (0.88±0.03) compared to the 75 controls (0.97±0.02); P<0.001. ABI was found to be significantly lower in cases as compared to controls irrespective of the state of systemic illness.

For the logistic regression analysis, patients were classified into two groups on the basis of the mean lowest ABI value, viz. normal ABI and abnormal ABI. An ABI ratio of less than 0.90 was considered abnormal. This binary variable was taken as a dependent variable in order to detect the odds of falling into the abnormal ABI group. Dummy variables representing four
systemic diseases (HT, DM, IHD, cerebro vascular stroke) and PEX were taken as predictors. Table 4 shows the odds of belonging to the abnormal ABI group in the presence of hypertension (HT), diabetes mellitus (DM), ischemic heart disease (IHD), cerebrovascular stroke, and PEX. Except for PEX (P<0.001), the other predictors did not attain statistical significance. It can be inferred that after adjusting for the influence of HT, DM, IHD, and cerebrovascular stroke, the very presence of PEX increases the odds of abnormal ABI by 66 times. The logistic model achieved a high predictive accuracy of 87.5% and the Nagarkerke’s R-square of 0.58.

DISCUSSION

Extraocular deposits of PEX have been localized to the connective tissues or septa traversing the organ tissue. These deposits are associated with the presence of elastic fibers, collagen fibers, fibroblasts, and the walls of small blood vessels, suggesting the systemic nature of PEX. An over expression of the basic fibroblast growth factor, an imbalance in the matrix metalloproteinases (MMPs)/tissue inhibitors of MMPs (TIMPs), and increased cellular and oxidative stress, describe a part of the pathological process that is characterized by an elastic microfibrillopathy. The presence of fibrillopathy in the palpebral or bulbar conjunctiva and around the posterior ciliary vessels indicates that PEX was not just an intraocular disease. That it is a more diffuse process was demonstrated by the presence of similar material in the lid skin, orbital tissues and other more remote areas of the skin and visceral organs. Further it has been reported that in cases of established PEX, plasma homocysteine levels are elevated. Recent work suggests that PEX is a form of elastosis and elastin is a major part of the ECM of arterioles. It has also been reported that there is a significant association between PEX and the DNA sequence variants in the gene coding for LOXL1 (lysyl-oxidase-like 1), a protein responsible for elastin. PEX has been associated with transient ischemic attacks, Alzheimer’s disease, asymptomatic myocardial dysfunction, sensorineural hearing loss, stroke, myocardial infarction, systemic hypertension, and aneurysm of the abdominal aorta. To the best of our knowledge, the association between ocular PEX and peripheral vascular disease has not been reported. The purpose of this study was to investigate the association of PEX with peripheral vascular disease by measuring ABI.

In the present study, the mean least ABI value was lower in subjects with established PEX as compared to those without PEX. Further, the mean least ABI value was also lower in cases with established PEX in presence as well as absence of systemic illness. Further after adjusting for HT, DM, IHD, and CVS, logistic regression analysis demonstrated that the presence of PEX increased the odds of belonging to the abnormal ABI group by 66 times. This suggests a strong association between pseudoexfoliative material and peripheral
vascular disease. PEX has also been shown to affect smaller vessels rather than the major ones.

The clinical importance of this systemic manifestation is still unknown. Considering the above association, a slit lamp examination of the eye could help in identifying an important marker that indicates the risk of a systemic vascular disease. To the best of our knowledge, this is the first reported association between PEX and low ABI, which indicates the presence of a peripheral vascular disease. The possible role of PEX as a risk factor or marker for peripheral vascular disease merits further investigation.

REFERENCES


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**The Capsular Tension Ring in Eyes with Traumatic Subluxated Cataracts: A Retrospective Study**

**Dr. Kanan Chaudhari, Dr. Mahavir Dattani**

To analyze surgical results and complication of cataract surgery in cases of subluxated traumatic cataract when performed with Low parameter slow motion phacoemulsification as compared with SICS.

**Study design:** Ours is a retrospective study of 23 eyes of 23 patients of traumatic subluxated cataract of varying severity which underwent cataract surgery at RNC Free Hospital, Valsad, Gujarat from Feb. 2010 to April 2011.

**Inclusion Criteria:** All cases included satisfied the following criteria

Subluxated cataract undergoing cataract surgery performed by 2 surgeons

Minimal Follow up of upto 1 month.

**Exclusion Criteria:** Subluxated cataract due to other causes like Pseudoexfoliation, hypermature cataract.

Cases performed by other surgeons

**MATERIALS AND METHODS**

Our study is a retrospective analysis of 23 cases of traumatic subluxated cataract. Data were collected to analyse history of trauma, slit lamp examination for severity of subluxation, Bscan, IOP evaluation, grading of cataract and the technique of the surgery.
All the cases were divided into 2 groups on the basis of the technique used for the surgery. Those cases which underwent SICS were included in one group while cases which underwent Phacoemulsification comprised other group.

Incidence of intraoperative complication like vitrectomy, use of CTR ring as well as post operative visual outcome and complication were recorded, analysed and compared in the two groups.

**Surgical Technique**

All the cases either underwent SICS or Phacoemulsification. Cases with minimal subluxation (<90°) were managed by placing the IOL with haptic along the direction of the subluxation. Majority of the cases with subluxation from 90 degrees to 180 degrees required the insertion of CTR ring. CTR insertion was done using manual technique with the help of McPherson forceps and Kuglen's hook. Insertion was done just after completion of phacoemulsification and before cortical wash followed by insertion of PMMA PCIOL. Vitrectomy was performed in cases depending on the incidence of vitreous prolapse. Thorough, gentle but careful multi quadrant hydrodissection was performed.6

The technique used was slow motion Phacoemulsification with low parameters. In this technique, Phacoemulsification was performed using power appropriate for the grade of cataract with low vacuum and aspiration setting with minimal bottle height - a slow motion phaco technique developed by Cionne and Osher4 and Buratto *et al.*5 Using the stop-chop-chop and stuff technique and stepdown technique with smaller fragments helps to keep the flow and vacuum rates at safe levels, thus preventing inadvertent capsule touch and vitreous prolapse.6

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**RESULTS**

Age of the patients ranged from 25 yrs. to 73 yrs. with average age of 55.4 yrs. Male female ratio was 12:7. Cataracts were of varying grade in severity with majority being of 2-3 nuclear sclerosis grade in severity. 15 cases underwent SICS while only 8 cases underwent Phacoemulsification through Clear Corneal Tunnel.

Associated abnormalities were Angle recession glaucoma in 3 cases, corneal scar in 2 cases and Traumatic mydriasis in 2 cases.

**Severity of subluxation was as follows:**

<table>
<thead>
<tr>
<th>Zonular Dehiscence</th>
<th>PHACO group</th>
<th>SICS GROUP</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 90°</td>
<td>2</td>
<td>5</td>
<td>33%</td>
</tr>
<tr>
<td>90-180°</td>
<td>6</td>
<td>5</td>
<td>33%</td>
</tr>
<tr>
<td>&gt;180°</td>
<td>0</td>
<td>5</td>
<td>33%</td>
</tr>
</tbody>
</table>
Incidence of complications were as shown in the table below:

<table>
<thead>
<tr>
<th>Complications</th>
<th>PHACO Group</th>
<th>%</th>
<th>SICS Group</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitrectomy</td>
<td>3</td>
<td>37.5%</td>
<td>9</td>
<td>60%</td>
</tr>
<tr>
<td>Decentred IOL</td>
<td>1</td>
<td>12.5%</td>
<td>2</td>
<td>13.2%</td>
</tr>
<tr>
<td>Increase in IOP</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>6.6%</td>
</tr>
<tr>
<td>Aphakia</td>
<td>2</td>
<td>25%</td>
<td>6</td>
<td>40%</td>
</tr>
<tr>
<td>Uveitis</td>
<td>1</td>
<td>12.5%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nucleus drop</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>6.6%</td>
</tr>
<tr>
<td>Ctr drop</td>
<td>1</td>
<td>12.5%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>PCR</td>
<td>1</td>
<td>12.5%</td>
<td>2</td>
<td>13.2%</td>
</tr>
</tbody>
</table>

Visual outcome

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>PHACO Group (8 cases)</th>
<th>SICS Group (15 cases)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTR insertion</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>IOL placement</td>
<td>6</td>
<td>9</td>
</tr>
</tbody>
</table>

However, incidence of PCIOL insertion was 75% in Phaco group while only 60% in SICS group.

Postoperative decentration of PCIOL was observed in 2 cases in SICS group which while in one case in phaco group where PCIOL insertion was done without CTR insertion but it was not visually significant.

On the whole, incidence of PCIOL insertion and the overall visual outcome was correlating well with the severity of the subluxation as can be seen from the table below:

<table>
<thead>
<tr>
<th>Severity of subluxation</th>
<th>Total pt in PHACO Group aphakic</th>
<th>SICS GROUP aphakic</th>
<th>Total aphakic</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;180</td>
<td>5</td>
<td>0</td>
<td>5</td>
<td>5 out of 5</td>
</tr>
<tr>
<td>90-180</td>
<td>11</td>
<td>2</td>
<td>1</td>
<td>3 out of 11</td>
</tr>
<tr>
<td>&lt;or = 90</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0 out of 7</td>
</tr>
</tbody>
</table>

DISCUSSION

Management of Subluxated traumatic cataract is tricky situation since cataract surgery in such cases can lead to further weakening of zonules with disastrous complication. There are greater chances of postoperative complication like decentring of PCIOL. With the advent of Capsular Tension Ring these complication have significantly decreased, with improvement in postoperative PCIOL stability, centring and overall visual outcome.

Phacoemulsification was performed using power appropriate for the grade of cataract, low vacuum and aspiration setting with minimal bottle height - a slow motion phaco technique developed by Cionne and Osher and Buratto et al.5
Similar results have been found by Lanzetta et al. in their series of 27 cases of CTR implantation of which 3 were due to traumatic subluxated cataract. The placement of the ring allowed the completion of surgery and IOL implantation without complications in the eyes with zonular dehiscence.\(^1\)

A study by S Jacob et al. of Phacoemulsification in 21 eyes with zonular dialysis of up to approximately 150 degrees had a success rate of 90.47\%.\(^2\)

In another large series of CTR implantation by Tribus et al. in 69 eyes, 23 were due to traumatic zonular dehiscence. Incidence of IOL insertion following CTR insertion was 98\% and incidence of postoperative IOL decentring was 8\%(5 cases).\(^3\)

A study by Vasavada et al. in 22 eyes with subluxated cataract of which 11 were traumatic which underwent Phacoemulsification, incidence of successful overall CTR insertion with PCIOL insertion was 68\%.\(^7\)

Use of Slow motion technique in phacoemulsification decreases the anterior chamber fluctuations along with CTR insertion which improves bag stability leads to safer cortical aspiration and higher incidence of successful PCIOL insertion.

In conclusion with the advent of Capsular Tension Ring and with the use of more careful low parameter, slow motion technique of phacoemulsification, successful PCIOL insertion along with visual outcome appears to have significantly increased in traumatic subluxated cataracts.

REFERENCES


Various Techniques of Scleral Fixated IOL - Our Experience

Dr. (Prof.) Pushpa Varma, Dr. Shweta Walia, Dr. Monika Wani, Dr. Nishant Tiwari

PCIOL implantation is an integral part of modern cataract surgery. However, if capsular support is inadequate it may not be possible to implant a PCIOL. Scleral fixated PCIOL have evolved as a very promising option in such eyes. To observe visual outcome and complications of sutured and sutureless SFIOL.

Material and method - Prospective interventional study conducted on 23 aphakic eyes of 23 patients, in dept. of ophthalmology, MGMMC, MYH, INDORE. All surgeries were performed by a single surgeon from September 2009 to May 2011.

Data collected included: general demographic data, type of surgical technique, preoperative and postoperative snellen BCVA, introperative and postoperative complications.

23 patients were randomly divided into two groups. Group -1 comprised 14 eyes that underwent sutured SFIOL which was further subdivided in group-1(A) 5 eyes (sutured sfiol with scleral flap) and group-1(B) 9 eyes (sutured SFIOL with scleral tunnel). IOL used in group-1 was single piece PMMA lens (both haptic and optic) size 13.00 mm (optic – 6.5 mm), eyelets in haptic, A-constant- 118.50. The suture used was 10-0 double armed polypropelene suture with 2 straight needles.

Group-2 included 9 eyes which underwent sutureless SFIOL. This group was further subdivided in group-2 (A) 7 eyes (sutureless SFIOL with sclera flap) and group-2 (B) 2 eyes (NO suture and NO flap SFIOL). Type of IOL used in group-2 was 3 piece (PMMA lens), size 13.5 mm(optic- 6.00 mm) and angulation 10 degree, A-constant- 118.50.

Surgical procedure

Initially Two conjunctival flaps were made 180° apart (2 and 8 o’clock) in all type of techniques.

(1) Sutured SFIOL

(A) Scleral fixation with flap - Ab externo 4-point scleral fixation of IOL was done with scleral flaps. Internal knots were exteriorized and buried under flaps. Flaps were then sutured.

(B) Sclera fixation with tunnel- The technique was modified by using a scleral tunnel in place of scleral flap and there was no need of suturing the flap.
(2) Sutureless SFIOL

(A) Sutureless SFIOL with sclera flap

Two partial thickness scleral flaps (3x3 mm) were created at 2 and 8 o’clock. Two sclerotomies were made at a distance of 1.5 mm from the limbus below the sclera flap, with the help of a 24-gauge needle.

Two intrascleral tunnels (50% sclera thickness) parallel to limbus, adjacent to the sclerotomy incision were made by 26G needle.

A standard three-piece IOL was inserted into the anterior chamber. The trailing haptic was left temporarily externalized through the 6 mm SICS incision. While the leading haptic was held with Mcpherson forceps and fed into microrhexis forceps (23G) which was inserted through sclerotomy (hand-shake technique) and then externalized with microrhexis forceps. The same procedure was done for other haptic. The haptic tips were then tucked within the scleral tunnel one by one.

(B) No flap and No suture SFIOL

After making conjunctival flaps, direct full-thickness sclerotomies were made at 2 and 8 o’clock (1.5m from limbus). Through these sclerotomy the haptic were exteriorized and tucked into tunnel which were made at the edge of sclerotomy. So no suture and no sclera flap was required.

In all cases anterior vitrectomy was performed. Patients follow-up was done at 1, 3 and 6 months.

RESULTS

Pre operative UCVA ranged from hand movement-5/60. Postoperative BCVA of 6/18 or better was achieved in 13 eyes (56%) cases. Mean preoperative astigmatism was 1.09 Dcyl (0 to 3D) and mean postoperative astigmatism was 1.272 Dcyl (0.5 to 3.5D cyl).

Common complications observed in our study were macular edema, early rise of IOP and vitreous hemorrhage. These complications resolved by 3 months. The remaining complications at 6 months were tilting, decentration and optic capture of lens.

DISCUSSION

Lewis J S et al., in 1993 compared partial thickness scleral flap technique with their new surgical procedure. This new technique buries the knot within the eye. On 60 patients, partial thickness scleral flaps were used to protect the knot from exposure. Twelve (20%) of these patients had some degree of externalization of the suture. Of the 40 patients in whom knots were buried and no scleral flap was used, no (0%) erosion was observed. In our study we
also buried the knots and no suture erosion was observed.

Mar Chakarbarti *et al.* (1999) retrospectively studied 25 patients: Twenty-two patients (88.0%) had a visual acuity of 6/12 or better at final follow-up. They observed macular edema present in 2 cases in our study. 13 (56%) cases had a BCVA 6/18 or better (7/14, 50% in group-1 and 6/9, 66% in group-2) and macular edema was observed in 5/23 (21%) cases (3/14, 21% in group-1 and 2/9, 22% in group-2).

Buckley *et al.* (1999) (4), implanted scleral fixated (sutured) PCIOL in children. Mild IOL decentration was observed in one patient and elevated IOP was seen in one patient. We observed IOL decentration in 1/23 (4.3%) case (1/9, 11% in group-2) and early rise of IOP in 2/23 (8.7%) cases (1/14, 7% in group-1 and 1/9, 11% in group-2) which was resolved with medication within 1 month.

Johnston RL *et al.* 2000 (5) describe the surgical technique, visual acuity results, and complications of sutured posterior chamber intraocular lenses with complete pars plana vitrectomy in 63 patients. They observed pupil capture in 9 cases. In our study optic capture was present in 1/23 (4.3%). case (1/9, 11% in group-2).

Scharioth *et al.* (3) (2010) used sutureless technique in 60 eyes and observed that BCVA

<table>
<thead>
<tr>
<th>Group-2</th>
<th>Sutureless SFIOL</th>
<th>Total</th>
<th>Group-1</th>
<th>Sutured SFIOL</th>
<th>Total</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group-2</td>
<td>Group-1</td>
<td>Group-1 Total</td>
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<td>A</td>
<td>B</td>
<td>A+B</td>
<td>A+B</td>
</tr>
<tr>
<td>Age range</td>
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<td>8-70</td>
<td>8-70</td>
<td>18-69</td>
<td>60-70</td>
<td>18-70</td>
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<td>M:F</td>
<td>3:2</td>
<td>4:5</td>
<td>4:5</td>
<td>6:1</td>
<td>7:2</td>
<td>14:9</td>
</tr>
<tr>
<td>Post op BCVA</td>
<td>6/18 or better</td>
<td>2/5(40%)</td>
<td>5/9(55%)</td>
<td>7/14(50%)</td>
<td>5/7(71%)</td>
<td>1/1(150%)</td>
</tr>
<tr>
<td>Mean postop. Astigmatism</td>
<td>1.37 D cyl</td>
<td>1.22 D cyl</td>
<td>1.26 D cyl</td>
<td>1.28 D cyl</td>
<td>1.25 D cyl</td>
<td>1.272 D cyl</td>
</tr>
<tr>
<td>Macular edema</td>
<td>1/5(20%)</td>
<td>3/14(21%)</td>
<td>2/14(14%)</td>
<td>1/7(14%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Vitreous hemorrhage</td>
<td>1/5(20%)</td>
<td>0</td>
<td>1/9(11%)</td>
<td>0</td>
<td>1/9(11%)</td>
<td>2/7(29%)</td>
</tr>
<tr>
<td>Early rise of IOP</td>
<td>1/5(20%)</td>
<td>0</td>
<td>1/9(11%)</td>
<td>0</td>
<td>1/9(11%)</td>
<td>2/7(29%)</td>
</tr>
<tr>
<td>Optic capture of lens</td>
<td>1/5(20%)</td>
<td>0</td>
<td>1/9(11%)</td>
<td>0</td>
<td>1/9(11%)</td>
<td>2/7(29%)</td>
</tr>
<tr>
<td>Tilting of lens</td>
<td>1/5(20%)</td>
<td>0</td>
<td>1/9(11%)</td>
<td>0</td>
<td>1/9(11%)</td>
<td>2/7(29%)</td>
</tr>
<tr>
<td>Lens decentration</td>
<td>1/5(20%)</td>
<td>0</td>
<td>1/9(11%)</td>
<td>0</td>
<td>1/9(11%)</td>
<td>2/7(29%)</td>
</tr>
</tbody>
</table>
improved in all eyes, and no serious complications were reported. In four cases, the haptics were dislocated but could be easily reimplanted, and they had one vitreous hemorrhage. These complications all occurred in the first 10 cases and in the first postoperative weeks. In our study we observed vitreous hemorrhage in 3 (13%) cases (2/14,14% in group-1 and 1/9,11% in group-2).

In conclusion Our study showed that both the techniques did not have any significant difference.

Both the techniques are comparable in terms of visual outcome and complications except that sutured SFIOL is more time consuming and technically more difficult.

So whatever is the cause of aphakia, proper preoperative evaluation and good intra operative vitrectomy followed by SFIOL implantation gives good postoperative VA and comfort.

REFERENCES

Fibrin Glue Assisted Scleral Fixated IOL in Cases Lacking Posterior Support – Our Experience
Dr. K. V. Satyamurthy, Dr. A.S. Guruprasad, Dr. Arti Goyal

In eyes with insufficient or no capsular support, intraocular lens implantation and fixation technique are still controversial. Scleral-fixated IOLs using suture require a precise surgical technique and prolonged surgical time. They may also cause suture-induced inflammation and suture degradation may lead to delayed IOL subluxation or dislocation. The surgeon must also adjust the suture length and tension of a scleral-fixated IOL to ensure good centration. Therefore to avoid such complications a new technique of SFIOL is under evaluation where the IOL is fixed in place with the help of fibrin glue. To evaluate safety and efficacy of newly described technique of sutureless transscleral fixation of Abstract posterior chamber IOL using fibrin glue. The
eyes were assessed for the intra op and post operative complications of lens
decentration, inflammation, vitreous haemorrhage. Patients were followed up
for 3 months period for visual improvement.

MATERIALS AND METHODS
This is a prospective, non-randomized, interventional, clinical study conducted
between September 2009 to July 2010 at M M Joshi Eye Institute, Hubli. During
the above mentioned period a total of 50 cases were operated and were followed
up to assess the visual outcome and analyze the postoperative complications.
50 patients fulfilling the selection criteria were included in the study and
informed consent was taken. All patients underwent scleral fixation of PCIOL
using fibrin glue.

Exclusion Criteria
1) Patients with corneal opacity, corneal dystrophy, corneal degeneration.
2) Optic atrophy, retinal macular problems.
3) Secondary glaucoma.

Lenses used in our study: Three piece, polymethylmethacrylate (PMMA), UV
absorbing, modified C PMMA loops, biconvex optic., with optic diameter of
6.0 mm, overall diameter of 13.5 mm, Aurolab lens was used.

Fibrin Glue: The commercially available glue which we used in our study is
Reliseal.

Preoperative assessment
• Each patient underwent thorough systemic and ocular examination.
• A complete history was taken including history of trauma and timing of
previous surgery.
• Ocular examination
  BCVA with snellen’s chart,
  Intraocular pressure was recorded with applanation tonometer,
  Detailed anterior segment examination,
  Detailed Posterior segment examination ,
  Patients with hazy media underwent B scan ultrasonography,
  Keratometry and A scan biometry,
Intraocular lens power was calculated using the SRK 2 formula.

Preoperative preparation
Written consent was undertaken duly explaining the risks, benefits and
complications of the surgical procedure. Institutional thesis ethical committee
clearance was obtained for the study.

Physician fitness for the surgical procedure was taken with the due consideration to the systemic status. Anticoagulants like aspirin were stopped two days prior to the surgery. Topical Gatifloxacin 0.3% was administered hourly, 24 hours prior to the surgery. 1% Tropicamide and 10% Phenylephrine was administered twice, one hour prior to the surgery to achieve pupillary dilatation.

**Anaesthesia**

All the patients underwent surgery under peribulbar anaesthesia with 2% lignocaine with adrenaline (1:20,000) and 0.5% bupivacaine.

One drop of povidone iodine was administered in the operating eye 10 minutes before surgery. The skin around the eye was painted with 10% povidone iodine and draped with sterile disposable drapes.

The commercially available glue which we used in our study is Reliseal.

**Surgical technique**

**Preparation of fibrin glue (Reliseal)**

All the 3 vials and the plastic ampoule of sterile WFI, LP are kept in the water bath preheated to 37°C (but not beyond 40°C) for 2 to 3 min.

**Preparation of fibrinogen solution**

- Caps of the vials removed and the rubber stoppers of these vials are disinfected,
- Entire content of Aprotinin solution was aspirated in a 2 ml syringe,
- This solution was injected into the vial containing fibrinogen,
- Swirl the vial,
- Reconstituted vial was kept in the preheated water bath for another 10 min.
- 0.5 ml of the reconstituted Fibrinogen solution was aspirated in to a 2 ml syringe.

**Preparation of thrombin solution**

- Vial dried for 1 min.
- 0.5 ml of sterile WFI from the plastic ampoule was aspirated and was injected into the vial containing Thrombin,
- 0.5 ml. of reconstituted solution was aspirated into the 2 ml syringe.

**Applicator system**

- The plastic triangular white mixing chamber was applied to the tip of the applicator,
• Each filled syringe one by one was placed into the applicator housing Barrel gets locked into the applicator housing with a click,
• Piston ends fixed into the groove of the plunger guide,
• Blunt application needle (20G) was fixed to the mixing chamber,
• Then the plunger guide of the applicator was pushed with the hand till the liquid sealant ejects out from the application needle on the predried wound surface.

Procedure
• After inserting the anterior chamber maintainer, localized peritomy was performed. Two partial thickness limbal-based scleral flaps of approximately 4 mm x 4 mm were created exactly 180° diagonally apart and about 1.5 mm from the limbus.
• This was followed by anterior vitrectomy to remove all vitreous traction. Using a 23G trochar two straight sclerotomies were made under the existing scleral flaps, about 1.5 mm from the limbus.
• A scleral tunnel incision for introducing the IOL is prepared about 2 mm from the limbus. IOL was introduced with the help of McPherson forceps through main tunnel.
• The tip of the leading haptic was then grasped with the help of ILM forceps and pulled out through the sclerotomy following the curve of the haptic and externalized under the inferior scleral flap. Similarly, the trailing haptic was also externalized through the sclerotomy on the other side under the scleral flap.
• Small scleral tunnels were made with the help of 26G needle at the edge of the flaps to place the ends of the externalized haptics. Then the externalized haptic was inserted into the tunnels
• The reconstituted fibrin glue was then injected through the cannula of the double syringe delivery system under the superior and inferior scleral flaps.
• Pressure was applied locally over the flaps for about 10 to 20 seconds to aid the formation of fibrin polypeptides. The anterior chamber maintainer was removed, and the conjunctiva was closed with the same fibrin glue.

Postoperative management
• Postoperatively, a detailed slit lamp examination was done. All patients were evaluated for the corneal edema, anterior chamber reaction, intraocular lens centration, intraocular lens tilt and patent peripheral iridectomy.
• A detailed fundus examination was done.
• Unaided and best spectacle corrected visual acuity were recorded.
Intraocular pressure was recorded with applanation tonometer.

Patients were put on topical steroid (prednisolone acetate) QID, topical antibiotic (gatifloxacin) QID, and topical non-steroidal anti-inflammatory drug (ketorolac) QID. Topical steroids were tapered gradually over a period of 4 wks. Topical antibiotics were continued for 4 weeks and stopped. Topical non-steroidal anti-inflammatory drug were prescribed for 1 month.

Patients were evaluated at 1st day, 1st week, 1st month, 3rd month and 6th month. Any postoperative complications that occurred were managed as per standard protocol.

**RESULTS**

<table>
<thead>
<tr>
<th>Age Group</th>
<th>SFIOL Using Fibrin Glue</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
</tr>
<tr>
<td>41-50</td>
<td>10</td>
</tr>
<tr>
<td>51-60</td>
<td>22</td>
</tr>
<tr>
<td>61-70</td>
<td>16</td>
</tr>
<tr>
<td>71-80</td>
<td>2</td>
</tr>
</tbody>
</table>

The mean patient age was 58.28 years with standard deviation of ± 7.96 years. (range 51 to 65 years)

**Sex Distribution**

<table>
<thead>
<tr>
<th>SEX</th>
<th>No</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>MALE</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>FEMALE</td>
<td>20</td>
<td>40</td>
</tr>
</tbody>
</table>

60% patients were males and 40% patients were females.

**Laterality**

<table>
<thead>
<tr>
<th>Eye Operated</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>RIGHT EYE</td>
<td>22</td>
</tr>
<tr>
<td>LEFT EYE</td>
<td>28</td>
</tr>
</tbody>
</table>

We included 30(60%) who underwent SICS with PC rent previously, 8(16%) patients had dropped nucleus, 06(12%) patients had spontaneously dislocated cataractous lens, 04(8%) patients had subluxated IOL, 2(04%) patient had dislocated IOL.

Out of 50 eyes the final postoperative BCVA after 6 months of follow up was 6/6 − 6/12 in 42 (80%) of patients, 6/18 − 6/36 in 08(16%) of patients.

2 pt developed severe inflammation, one patient had vitreous haemorrhage who required anterior vitrectomy and 1 patient had retinal detachment. Lens centration was good in 49 patients.
DISCUSSION

We did a one year prospective, non-randomized, interventional, clinical study at M. M. Joshi Eye Institute Hubli from September 2009 to July 2010.

The study was done to describe the indications, analyze postoperative complications and to assess the visual outcome in patients undergoing SFIOL using fibrin glue.

The BCVA was 6/6 in nearly 80% of the patients. The good visual recovery was due to better centration, minimal inflammation, IOL stability and no CME.

Relatively poor vision was due to pre-op. poor visual acuity, intra ocular inflammation in 4% of the cases which were conservatively managed, vitreous haemorrhage due to bleeding from sclerotomy site, self limiting in most of the situations. only in one patient vitrectomy was done to clear the vitreous.

One patient developed retinal detachment which was surgically managed. This complication was not attributable to the technique as the equally high incidence is seen following sutured IOL.

There were no other serious sight threatening complications noticed.

In conclusion scleral fixation of posterior chamber intraocular lens is an excellent procedure for the correction of aphakia in patients with inadequate or no capsular support, who have difficulty in achieving functional visual acuity if they cannot tolerate contact lens or spectacles.

With the development of newer types of intraocular lenses, viscoelastic substances and improved microsurgical techniques, SFIOL can be performed routinely in appropriately selected patients.

In our study, careful selection of the patients was done for SFIOL. The SFIOL was done for various indications like SICS with PC rent, dropped nucleus, subluxated or dislocated lens and spontaneous dislocation of cataractous lens and traumatic dislocation of lens into AC following trauma.

Our results show that there is no statistically significant difference in the post operative best corrected visual acuity between both the groups. Complications such as corneal edema, uveitis and rise in IOP were less. We did not notice any lens tilt or dislocation of the lens even after 6 months of follow up in the glued group.

We found that the gluing technique is better than suturing for SFIOL in terms of centration and post operative complications. But it still requires a long term follow up, and large sample size to conclude.

REFERENCES

21. Serrhel Adams, MD, PhD, Bryan Huffman, MD, ShaleshKaushal, MD, PhD Received 31 March 2008; received in revised form 19 August 2008; accepted 20 August 2009.
surgery in the presence of zonular weakness or subluxated lens was a great surgical challenge. The surgery being difficult led to complications. Use of endocapsular ring has changed the surgical approach in such cases. CTR stabilizes the loose lens and allows the surgeon to place the IOL in the most beneficial position, the capsular bag. Other advantages are, it reduces vitreous herniation, provides counter-traction to all traction maneuvers, avoids IOL decentration and prevents posterior capsular opacification.

MATERIALS AND METHODS

We retrospectively screened database of 6000 consecutive cataract surgeries done at Sahai Hospital and Research centre, Jaipur and identified 45 cases in which CTR implant was done. All the records were screened for indication of a CTR implantation, and subsequently clinical outcome on day 1, 1 month and 6 month follow up were analyzed. BCVA, complete ocular examination with slit lamp, direct ophthalmoscope, fundus examination with +78 D/90 D were noted. CTR was implanted in cases where zonular dialysis of more than 3 clock hours was present or capsular bag instability was detected during capsulorrhexis or subsequent intraoperative maneuvers. In cases with capsulorrhexis extension, CTR was not implanted. All cases were done by a single surgeon under topical anaesthesia except 3 under general anaesthesia. CTR type 3(12-10) and Cionni Ring-12 was used for implant. Phacoemulsification was done by direct chop method and CTR was inserted through main port by two Mcpherson forceps. Gentle hydrodissection and dialing was done to bring the open ends opposite to dialysis.
RESULTS
Out of 45 patients included in study, 30 were males (66.66%) and 15 were females (33.33%), ranging in age from 10 yrs. to 70 yrs., mean age being 50 yrs. The indications of CTR implant were hypermature senile cataract in 9 cases, hypermature senile cataract with lens induced glaucoma in 9 cases, pseudoexfoliation syndrome in 9 cases, post blunt trauma cataract in 6 cases, cataract with iridochoroidal coloboma in 6 cases, hypermature senile cataract with pseudoexfoliation in 3 cases, Marfan’s syndrome in 3 cases. Endocapsular ring implant was done after hydrodissection in 39 cases, during phacoemulsification in 3 cases, after cortical clean up in 3 cases. In all the cases, in the capsular bag implantation of PCIOL was performed. Decision of CTR implant was intra-operative in 42 cases, in 3 cases it was pre planned.

Post Operative Results

Day 1

<table>
<thead>
<tr>
<th>Cornea</th>
<th>Clear – 27 Patients</th>
<th>Keratitis – 18 Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iritis</td>
<td>Occasional Cells – 33 Patients</td>
<td>2 To 4 Cells – 12 Patients</td>
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<tr>
<td>Iol</td>
<td>In The Bag – Centered</td>
<td></td>
</tr>
<tr>
<td>Bcva</td>
<td>≥ 6/36 In 39 Patients             ≤6/60 In 6 Patients</td>
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1 Month

<table>
<thead>
<tr>
<th>Cornea</th>
<th>Clear</th>
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</thead>
<tbody>
<tr>
<td>Iritis</td>
<td>Nill</td>
</tr>
<tr>
<td>Iol</td>
<td>In The Bag – Centered</td>
</tr>
<tr>
<td>Bcva</td>
<td>≥ 6/12 In 39 Patients, ≤ 6/60 In 6 Patients</td>
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6 Months

<table>
<thead>
<tr>
<th>Cornea</th>
<th>Clear</th>
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</thead>
<tbody>
<tr>
<td>Iritis</td>
<td>None</td>
</tr>
<tr>
<td>Iol</td>
<td>Centered – 42 Patients, Decentered – 3 Patients</td>
</tr>
<tr>
<td>Bcva</td>
<td>≥ 6/12 In 39 Patients, ≤ 6/60 In 6 Patients</td>
</tr>
</tbody>
</table>

DISCUSSION

The present study was performed to address two subjects: First, to evaluate the frequency of CTR implantation in a large consecutive series of cataract surgeries. Second was to investigate whether an anatomically and visually reasonable outcome could be reached by the insertion of a CTR in a variety of complicated cataract surgeries. Although keratitis and iritis was present in 40% and 30% of patients respectively in immediate post-op period, subsequently resolved in one month. IOL was well centered, in the bag in all patients till 1 month. Only 3 patients (6.67%) showed mild decentration of IOL at 6 months.
but without any subjective visual complaint. Visual acuity that was achieved by one month was maintained in all the patients. Only 6 (13.33%) patients had visual acuity ≤ 6/60 which was because of pre existing ocular pathology. Frequency of CTR implant came out to be 0.75% and most common indication is Hypermature senile cataract (40%) followed by pseudoexfoliation syndrome (26.67%), blunt traumatic cataract (13.33%), coloboma (13.33%), Marfans syndrome (6.67%). The indications for CTR implantation are in line with other authors who also used the CTR in eyes with intraoperative signs for loose or broken zonules like decentration of the crystalline lens, movement of the lens during capsulorhexis, phacoemulsification or irrigation/aspiration.

In conclusion although CTR is used very infrequently but they are very effective adjunctive device that converts a potential catastrophic phacoemulsification procedure into a success story, provides good post operative results and creates satisfied patients.

REFERENCES