General Information

Delhi Journal of Ophthalmology (DJO), once called Visiscan, is a quarterly journal brought out by the Delhi Ophthalmological Society. The journal aims at providing a platform to its readers for free exchange of ideas and information in accordance with the rules laid out for such publication. The DJO aims to become an easily readable referenced journal which will provide the specialists with up to date data and the residents with articles providing expert opinions supported with references.

Contribution Methodology

Author/Authors must have made significant contribution in carrying out the work and it should be original. It should be accompanied by a letter of transmittal. The article can be sent by email to the Editor or a hard copy posted. Articles received will be sent to reviewers whose comment will be emailed to the author(s) within 4-6 weeks. The identity of the authors and the reviewers will not be revealed to each other by the editorial team. Detailed instructions to the contributors and for advertisement are included at the end of the journal.

Editorial Process

The DJO has Dr Rajesh Sinha as its Editor who is assisted by a team of renowned ophthalmologists and an illustrious editorial board. The reviewers, who are leaders in their respective fields, form the back bone of the journal by setting standards for the published work.

Disclaimer

The journal does not take any responsibility for the articles published in the journal unless it is explicitly stated so. The views expressed in the articles and editorials are of the authors and do not in any way reflect the policy of the Delhi Journal of Ophthalmology. The journal does not endorse or guarantee the quality or efficacy of any product or service mentioned or advertised in the journal issues. Advertisements carried in this journal are expected to conform to internationally accepted medical, ethical and business standards.

Published by
Dr Rajesh Sinha,
Editor DJO,
Delhi Ophthalmological Society

Cover Page Designed By Amit Chauhan

Vol. 23, No.3, January - March, 2013
editorDJO@gmail.com
## Contents

### 163. Editorial

...Dr. Rajesh Sinha

### Major Review

165. Difluprednate: An Overview  
Charu Mithal, Shilpa Singh, Sonali Gupta, Sandeep Mithal

169. Blepharoplasty in Ageing Lids  
Ruchi Kabra, Nitin Trivedi, Deepak Mehta

### Original Article

175. To Compare Percentage of Incisional Fluid Loss During Different Stages of Phacoemulsification and its effect on Anterior Chamber Stability in Micro Coaxial and Bimanual Phacoemulsification  
Dharmik Sharma, Dipan Desai, Kaushik Solanki

183. Outcome of Cataract Surgery in Patients with Pseudoexfoliation  
Surekha Bangal, Akshay Bhandari, Pratik Gogri

### Technique

189. Implantation of Multipiece Intraocular Lens with Injector by Hand Rotation: A Simplified Technique  
Himanshu Shekhar, Sandeep Gupta, Sana Tinwala, Anita Gangar, Rajesh Sinha, Jeewan S Titiyal

### Case Report

193. A Rare Case Report of Cyst of Wolfring  
Sanjiv Kumar, Rishi Jhalani, Rani Bansal, VK Malik, KPS Malik

199. Clear Cornea with Large Central Descemets Membrane Tears following Birth Trauma  
Shweta Agarwal, N Radhika, Prema Padmanabhan

203. Iridotomy in Pigmentary Glaucoma - ASOCT perspective  
Prakash Agarwal, VK Saini, Saroj Gupta, Anjali Sharma, Reena Sharma, Tanuj Dada

207. Central Retinal Artery Occlusion and Simultaneous third Nerve Palsy in HIV Patient  
Raghnandan Kothari, Priyanka Dhaytadak, Pratik Gogri

---

**Contents (Contd.)**
Recent Advances

211. Tacrolimus for Ophthalmic Use: An Update
    Sana Ilias Tinwala, Himanshu Shekhar, Sandeep Gupta, Rajesh Sinha, Jeewan S Titiyal

Allied Ophthalmic Sciences

221. Sclerosing Agents in Ophthalmology
    Smriti Nagpal, Ruchi Goel, Sushil Kumar, Sonam Garg

Brief Communication

227. Eyelash in Lacrimal Punctum
    Rachna Meel, Shashi Vashisht

Brief Communication: Letter to editor

228. Response
    Ram Lal Sharma

Photo Essay

229. Pterygium Masking Bifid Medial Rectus Insertion and Strabismic Amblyopia
    Malvika Gupta, Vishal Vohra, Anshu Anind, Om Prakash Gupta, Ashok Pathak

Industry News

231. MICS Preloaded IOL in Both Clear and Yellow Platform: Isert 250/Isert 251

Copy Right Form

Information to Author
May all your troubles last as long as your New Year’s resolutions.

.... Joey Adams

Everything that starts has to end and so is the case with the year 2012. End of one year brings fresh start of a new year. The Year’s end is neither an end nor a beginning but a going on of the same process and the same work just with a different date. However, it perhaps gives us a feeling of getting another chance to get things right. A new vigor, perception of a new beginning that brings a special atmosphere that motivates action.

The New Year brings in a lot of hopes and new resolutions and also provides an opportunity to forget the setbacks and the disappointments of the previous year. There are very few people who stick to their resolutions. But the whole idea of making resolutions is to think positive and think ahead.

Many people look forward to the New Year for a new start on old habits. We don’t start over; but we begin again right where we are, making things better in our lives. To make things better, you set goals to work for. Setting goals focuses you and gives you the strength to continue in spite of the uncertainties and difficulties.

The Delhi Journal of Ophthalmology is not making big resolutions. But, Yes! There are certain goals set in 2013 which we will strive to achieve.

I wish you all a very happy and prosperous New Year 2013.

Rajesh Sinha
MD, DNB, FIACLE, FRCS

DOI : http://dx.doi.org/10.7869/djo.2012.62
Difluprednate: An Overview

Charu Mithal MS, Shilpa Singh MBBS,
Sonali Gupta MBBS, Sandeep Mithal MS

Abstract

The mainstay in the treatment of ocular inflammation, either post-surgical or endogenous, is the use of steroids. While these agents effectively address inflammation, they are not without their risks, including ocular hypertension and acceleration of cataract formation. The most notorious culprits are the strong steroids, such as prednisolone acetate and betamethasone. This review aims to cover the biochemistry and drug development of difluprednate, a novel synthetic strong steroid emulsion. In vivo pharmacokinetics as well as ocular distribution and metabolism are discussed, followed by a comprehensive summary of phase I, II, and III clinical trials evaluating safety and efficacy in patients suffering from postoperative inflammation, posterior segment inflammation or anterior uveitis.

Key Words: difluprednate, steroid, emulsion, ophthalmic surgery.
DOI: http://dx.doi.org/10.7869/djo.2012.63

Controlling and preventing inflammation is the most important concern of the ophthalmologist in achieving optimal results following surgery. Surgical manipulation of anterior segment structures triggers the release of arachidonic acid from cell membranes, leading to the production of prostaglandins and leukotrienes. These inflammatory mediators, in turn, lead to cellular reaction and protein leakage. Although often self limited, untreated inflammation can lead to complications such as pain, discomfort, photophobia, corneal edema, synechiae, glaucoma, and cystoid macular edema. Even though some ocular surgeries, such as phacoemulsification, do not generally result in significant inflammation, there are still, a portion of patients that will experience some form of postoperative inflammation, which can potentially lead to sight-threatening issues such as cystoid macular edema.

As such, the majority of physicians employ a prophylactic regimen of anti-inflammatory medications in the perioperative period. Because of their broad anti-inflammatory activity, corticosteroids are typically the cornerstone of these treatment regimens. These agents are continued until the anterior chamber (AC) reaction has resolved and the blood–aqueous barrier has been reestablished. Currently, the most widely prescribed strong topical corticosteroid is prednisolone acetate 1%. While it controls inflammation effectively, it has not been shown to consistently address postoperative pain and discomfort in a large clinical trial. In June 2008 difluprednate ophthalmic emulsion 0.05% was approved by the US Food and Drug Administration (FDA) for the treatment of inflammation and pain associated with ocular surgery the first strong ophthalmic steroid approved by the FDA since 1973. Difluprednate is the first ophthalmic steroid developed in the past 35 years with high potency, a favorable safety profile, and the ability to reduce postoperative pain.

Indications and Usage

Difluprednate ophthalmic emulsion 0.05%, a topical corticosteroid, is indicated for the treatment of inflammation and pain associated with ocular surgery (only FDA approved indication).

Dosage and Administration

It is prescribed in a twice daily (BID) or 4 times daily (QID) dosage depending upon the severity of inflammation.

Dosage Strengths

Difluprednate 0.05% as a sterile preserved emulsion for topical ophthalmic administration.

Pharmacology and Drug Development

Difluprednate (difluoroprednisolone butyrate acetate, or DFBA) is a synthetic difluorinated prednisolone derivative. Originally developed for dermatologic applications, the molecule derives its potency from fluorination at the C6 and C9 positions. Its anti-inflammatory activity is further augmented by replacing the 17-hydroxyl group with butyrate, while its lipophilicity and hence corneal penetration is enhanced by substituting the 21-hydroxyl group with acetate (Figure 1).

Pharmacokinetics

Once instilled, difluprednate emulsion is rapidly deacetylated in the aqueous humor to difluoroprednisolone butyrate (DFB), the drug’s active metabolite, which has a
similar corticosteroid activity profile. Endogenous tissue esterases then metabolize DFB to the inert metabolite hydroxyfluoroprednisolone butyrate (HFB), which limits systemic exposure to the active compound.

**Drug Dose Uniformity**

The drug is formulated as an emulsion to avoid the potential problems associated with a suspension like flocculation, caking, and poor redispersibility, all of which can lead to dosing errors during administration. Difluprednate ophthalmic emulsion demonstrates excellent and consistent dose uniformity compared with the suspensions, suggesting that the clinical use of difluprednate may produce more predictable efficacy and safety.

**Large Randomized Clinical and Comparative Trials**

**Post Operative Inflammation**

A phase 3 multicenter randomized double-masked parallel group comparative noninferiority trial conducted in Japan assessed the safety and efficacy of 0.05% difluprednate to 0.1% betamethasone for the treatment of postoperative inflammation following cataract or vitreous surgery. At the completion of the study period, postoperative inflammation was similarly reduced in both groups, verifying the study’s noninferiority hypothesis (P < 0.01). Analysis of secondary endpoints revealed no differences between difluprednate and betamethasone in either AC flare or total sign score, except for day 7 when the difluprednate arm showed a statistically significant improvement in total sign score, including hyperemia, chemosis, and keratic precipitates.

The difluprednate group also showed a statistically significant improvement compared to the betamethasone group in subjective symptoms, including pain, photophobia, foreign body sensation, and blurred vision at all time points after the initiation of therapy. A few patients in each group experienced elevated intraocular pressure (IOP), all of which resolved spontaneously or with the addition of a topical agent. This study verified that difluprednate was at least as effective as betamethasone in treating postoperative inflammation, and that it had a favourable safety profile. As early as day 3, there was a mean decrease in grade of AC cell, with an 87% reduction in AC cell count in the difluprednate groups versus only a 30% reduction in the placebo groups. Difluprednate also reduced pain as early as day 3, with 38.2% of the bid patients (P = 0.012) and 45.3% of the four times daily patients (P < 0.0001) claiming to be pain and discomfort free, versus 24.8% of patients in the placebo group. On day 3, patients randomized to difluprednate had a substantial reduction in photophobia from baseline (p = 0.0041 in the BID group, p < 0.0001 in the QID group), while scores for placebo-treated patients worsened. This multicenter randomized trial once again demonstrated the safety and efficacy of difluprednate emulsion. More important, however, was the finding that the signs and symptoms seen following ocular surgery were effectively treated with twice-daily dosing. Less frequent dosing may engender better patient compliance and reduce total steroid exposure.

**Anterior Uveitis**

In a phase 3 noninferiority study conducted in Japan, difluprednate 0.05% was compared to betamethasone 0.1% in patients with endogenous anterior uveitis. At day 14, improvement in AC cell scores were comparable between both treatments, corroborating the study’s noninferiority hypothesis. However, difluprednate produced a substantially more rapid improvement, by day 7 more patients in the difluprednate group had AC cell scores of 1 or lower (P = 0.0298). Similar findings were noted when examining secondary efficacy measures such as AC flare score (P < 0.05) and total sign score (P = 0.035).

The incidence of elevated IOP was equal between the two groups, and resolved with or without medical treatment. None of the patients in the difluprednate arm withdrew from the study due to symptom aggravation, compared to 3 patients in the betamethasone group. The safety and efficacy of difluprednate ophthalmic emulsion 0.05% was further evaluated in an open-label phase 3 trial of 19 patients with severe refractory endogenous anterior uveitis (<50 cells per high-powered field in the anterior chamber). These patients had not responded to previous treatment with betamethasone 0.1%, even when given at a frequency of 0.05% BID.

**TABLE 1. Sirion Phase 3: Ocular AEs ≥ 2%**

<table>
<thead>
<tr>
<th></th>
<th>BID (N=111)</th>
<th>QID (N=107)</th>
<th>Placebo (N=220)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posterior capsule opacification</td>
<td>15.3</td>
<td>11.2</td>
<td>14.5</td>
</tr>
<tr>
<td>Punctate keratitis</td>
<td>7.2</td>
<td>5.6</td>
<td>3.6</td>
</tr>
<tr>
<td>IOP increase</td>
<td>2.7</td>
<td>1.9</td>
<td>0.9</td>
</tr>
<tr>
<td>Intraocular pressure</td>
<td>4.5</td>
<td>1.9</td>
<td>1.4</td>
</tr>
<tr>
<td>Vitreous detachment</td>
<td>2.7</td>
<td>1.9</td>
<td>1.8</td>
</tr>
<tr>
<td>Conjunctival haemorrhage</td>
<td>2.7</td>
<td>0.9</td>
<td>0.5</td>
</tr>
</tbody>
</table>
greater than the recommended qid dosing specified on its label; most had been dosed between 8 and 12 times per day. Difluprednate 0.05% dosed qid demonstrated a statistically significant improvement in mean AC cell score from baseline [4.0 ± 0.0 (mean ± standard deviation)] to day 14 (1.3 ± 0.8) (P < 0.0001) in the 18 patients who completed the study. Significant improvements from baseline were also observed on day 3 (P < 0.0001) and day 7 (P < 0.0001). In 13 of the 18 patients (72.2%), the AC cell score had improved to 1 or less by day 14, with 2 patients reaching 0. Significant improvement from baseline in AC flare, total sign and total symptom scores were noted at days 3, 7, and 14 (P < 0.0002 at all measures). In all patients, difluprednate was well tolerated, with only 2 participants experiencing IOP elevation, both controlled with topical beta blocker. Most recently, a multicenter randomized double-masked trial compared the efficacy and safety of difluprednate 0.05% qid to prednisolone acetate 1% qid (N=111) and QID (N=107) Placebo (N=220) for 2 weeks. In the trial, difluprednate demonstrated a statistically significant improvement in mean AC cell score from baseline to day 14 (P < 0.0001). At day 14, the mean cell grade reduction was 2.1 in the difluprednate arm, compared to 1.9 in the prednisolone acetate arm, confirming the noninferiority of difluprednate qid to prednisolone qid (P < 0.0001). A prospective multicenter, double-masked, randomized, contralateral-eye trial was conducted in 63 patients (126 eyes). We found that the administration of difluprednate in a pulse-dosing fashion provided better vision and less corneal edema (measured via pachymetry) on day 1 compared to prednisolone. Also in the difluprednate arm, there was significantly less endothelial loss at day 15, with a difference of 180 cells between the two groups. This was interesting, since it shows that a pulse dosing regimen may help to preserve endothelial cells, and that more potent steroids may have an added effect. In addition, OCT measurements revealed thinner retinas at days 15 and 30 in the difluprednate group. By day 15, the mean retinal thickness in the eyes treated with difluprednate was 7.74 μm less than the prednisolone treated eyes (P = 0.011).

**Difluprednate: Efficacy in Posterior Segment**

In a recently published preclinical study by Tajika et al, a single instillation of radiolabeled difluprednate resulted in detectable posterior segment levels (anterior retina/choroid = 273 ngeq/g; posterior retina/choroid = 59 ngeq/g), suggesting that topical administration may have possible effectiveness in the posterior segment. The study also demonstrated that the glucocorticoid binding affinity for the active metabolite of difluprednate was 56 times stronger than prednisolone. The greater binding affinity may be attributed to the unique molecular structure of difluprednate. While no large studies have specifically explored the use of difluprednate in retinal disease, two small case control studies published by Nakano et al demonstrated potential utility. In the first, difluprednate was compared with a sub-tenons injection of triamcinolone and was found to have similar effects at reducing retinal thickness in patients with refractory diabetic macular edema (DME). In the second, difluprednate was compared with betamethasone in treating diffuse DME prior to vitrectomy, and difluprednate was found to reduce retinal thickness and improve visual acuity (VA) more effectively than betamethasone after 1 month of treatment. While these studies must be interpreted cautiously, due to their size and design, they provide interesting hypotheses. Nonetheless, given difluprednate’s high potency and strong affinity for the glucocorticoid receptor, there may be a place for this topical steroid in treating posterior segment disease with an inflammatory component.

**Safety & Tolerability**

Extensive clinical testing has demonstrated that difluprednate 0.05% emulsion causes an elevation in IOP in a small minority of patients. This increase resolved in all patients after stopping the medication or with topical pressure-lowering drops. Compared with betamethasone dosed at equal frequency, the incidence of IOP elevation was essentially equal between the two groups indicating an acceptable safety level. Difluprednate ophthalmic emulsion does not contain benzalkonium chloride (BAK), and instead uses sorbic acid as a preservative. Sorbic acid causes little damage and irritation to the ocular surface and is recommended for use in sensitive eyes.

**Use In Specific Populations**

**Pregnancy**

Pregnancy Category C: Difluprednate has been shown to be embryotoxic (decrease in embryonic body weight and a delay in embryonic ossification) and teratogenic (cleft palate and skeletal) anomalies when administered subcutaneously to rabbits and rats during organogenesis.

It is difficult to extrapolate these doses of difluprednate to maximum daily human doses of difluprednate, since it is administered topically with minimal systemic absorption, and difluprednate blood levels were not measured in the reproductive animal studies. However, since use of difluprednate during human pregnancy has not been evaluated and cannot rule out the possibility of harm, difluprednate should be used during pregnancy only if the potential benefit justifies the potential risk to the embryo or fetus.

**TABLE 1. Sirion Phase 3: Ocular AEs ≥ 2%**

<table>
<thead>
<tr>
<th>Condition</th>
<th>BID (N=111)</th>
<th>QID (N=107)</th>
<th>Placebo (N=220)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conjunctival Hyperemia</td>
<td>9.9</td>
<td>15.0</td>
<td>34.5</td>
</tr>
<tr>
<td>Eye pain</td>
<td>10.8</td>
<td>4.7</td>
<td>20.0</td>
</tr>
<tr>
<td>Photophobia</td>
<td>6.3</td>
<td>4.7</td>
<td>28.2</td>
</tr>
<tr>
<td>Corneal edema</td>
<td>8.8</td>
<td>6.3</td>
<td>20.5</td>
</tr>
<tr>
<td>Ciliary hyperemia</td>
<td>5.4</td>
<td>9.4</td>
<td>25.5</td>
</tr>
<tr>
<td>Conjunctival edema</td>
<td>6.3</td>
<td>4.7</td>
<td>12.3</td>
</tr>
<tr>
<td>Reduced Visual acuity</td>
<td>5.4</td>
<td>1.9</td>
<td>16.8</td>
</tr>
<tr>
<td>Eye inflammation</td>
<td>2.7</td>
<td>4.7</td>
<td>7.7</td>
</tr>
<tr>
<td>Foreign body sensation</td>
<td>2.7</td>
<td>1.9</td>
<td>7.3</td>
</tr>
<tr>
<td>Anterior chamber cell</td>
<td>4.5</td>
<td>3.7</td>
<td>18.2</td>
</tr>
<tr>
<td>Anterior chamber flare</td>
<td>2.7</td>
<td>0.9</td>
<td>14.1</td>
</tr>
</tbody>
</table>

Delhi Journal of Ophthalmology

Vol. 23, No.3, January - March, 2013 editorDJO@gmail.com
Nursing Mothers

It is not known whether topical opthalmic administration of corticosteroids could result in sufficient systemic absorption to produce detectable quantities in breast milk. Systemically administered corticosteroids appear in human milk and could suppress growth, interfere with endogenous corticosteroid production, or cause other untoward effects. Caution should be exercised when difluprednate is administered to a nursing woman.

Pediatric use

Safety and effectiveness in pediatric patients has not been established.

Geriatric use

No overall differences in safety or effectiveness have been observed between elderly and younger patients.

Contraindications

The use of difluprednate, as with other opthalmic corticosteroids, is contraindicated in most active viral diseases of the cornea and conjunctiva including epithelial herpes simplex keratitis (dendritic keratitis), vaccinia, and varicella, and also in mycobacterial infection of the eye and fungal disease of ocular structures.

References

Blepharoplasty in Ageing Lids

Ruchi Kabra¹ MS, Nitin Trivedi² MS, Deepak Mehta³ MS

Abstract

Blepharoplasty is a common aesthetic procedure performed among affluent Asians. The most common group of population addressed with this surgery consists of elderly patients. Blepharoplasty is about sculpturing and contouring of the upper lid. As with any cosmetic surgery, patient expectations are high and sometimes unrealistic, hence it is of paramount importance to thoroughly understand, evaluate and establish the plan of surgery. The aim of this article is to highlight the pathophysiological changes occurring in ageing lids and the various techniques for perfecting upper and lower lid blepharoplasty.

Key Words: ageing lids, blepharoplasty
DOI: http://dx.doi.org/10.7869/djo.2012.64

The word “Blepharoplasty” has originated from Greek language where “Blepharon” means eyelids and “plastikos” means to mould. Karl Von Graffe¹ coined the phrase blepharoplasty in 1818 when the technique was used to repair deformities due to cancer. The two world wars then laid the foundation for modern reconstructive surgery.² Blepharoplasty is a procedure done to rejuvenate the cosmetic look of the patient along with correction of any functional abnormality. Cosmetic surgical procedures can present some of the biggest challenges any surgeon can encounter. Patient expectations can be very high and unrealistic. With increasing elderly population, problems due to age related changes in all layers of skin and surrounding supporting structure are on the increase.

Pathophysiology

The orbicularis oculi muscle, orbital septum, capsulopalpebral fascia, fat and overlying skin are all interdependent on each other for their function. Age related micro infarction of tissue along with atrophy and gravity result in decreased resilience and laxity of periorcular tissues. The orbicularis sags like a hammock carrying the skin with it. Without adequate support the lid succumbs to stretching and this in turn leads to increased burden on canthal ligaments. Depending on the positive or negative vector force along with ligament laxity, senile entropion or ectropion develop. Age related changes like increase in collagen and decrease in elastin¹ leads to relaxation of connective tissue which causes overstretching of orbital septum and causes weakness or dehiscence of retractors of lid leading to senile ptosis. Atrophy of subcutaneous fat is the hallmark of facial ageing. The skin loses its elasticity and becomes thin and parchment like. There is proliferation of melanocytes, loss of turgor and development of wrinkles on skin. Discoloration of hair around eyebrows and lashes is also a cosmetic blemish to the elderly. To summarize, the common age related changes in eyelids are:
1. Senile entropion and senile ectropion
2. Dermatochalasis
3. Senile/Aponeurotic ptosis
4. Brow ptosis
5. Skin changes: wrinkles, pigmentation, soft tissue atrophy

Hence, depending on the pathophysiological changes in the elderly the need for blepharoplasty in the elderly is variable. Some patients seek oculoplasty opinion due to decrease in visual field due to dermatochalasis and brow ptosis. The decrease in visual field is either due to blockage of the visual axis either by skin or by the in turning of lashes which cause keratitis and opacity as in senile entropion. Headache is a complaint which can be attributed to constant lifting of brow in cases of severe senile ptosis. Sometimes it is the desire to improve cosmetic outcome which is the main reason to undergo blepharoplasty. In Indian setup, blepharoplasty is generally done to address both functional and cosmetic aspect of disease.

Examination

Examination of patients comprises of complete ophthalmic examination and specific examination of lids and brows. A complete medical and ophthalmic history is taken with attention to systemic diseases like diabetes, hypertension, drug history, and drug sensitivity. Visual acuity is documented so that any postoperative decrease in visual acuity can be investigated. During examination, presence of frontalis overaction, browptosis, lid crease position, dermatochalasis, fat prolapse or fullness in the lid area, symmetry between two lids and peripheral visual loss should be specially noted.⁴ Any corneal pathology, dry eye and Bells phenomenon are to be particularly looked...
Upper Eyelid Blepharoplasty

The surgical goals in upper lid blepharoplasty include:

1. Excision of skin and muscle
2. Excision of skin with correction of prolapsed fat where appropriate
3. Correction of aponeurotic weakness/dehiscence if present
4. To create a symmetrical upper lid crease at an appropriate height
5. To avoid postoperative lagophthalmos
6. Rejuvenation of skin

Technique of Upper lid blepharoplasty: Transcutaneous

Upper lid blepharoplasty is generally done with the transcutaneous approach. Generally, local anesthesia suffices for all patients. Lignocaine 2% and adrenaline in concentration 1:1,00,000 is injected to achieve anaesthesia and hemostasis. Local anaesthetic injections should be placed immediately below the skin avoiding the orbicularis muscle to prevent occurrence of a haematoma. Incisions are marked prior to giving anaesthesia to ensure a proper lid crease height. The incisions are best marked in sitting position. In this way one can determine and mark the borders of excision. The eyelid crease in women is generally well demarcated and runs at least 7-8 mm above the lash line. The typical male lid crease is usually lower than the female lid crease and is generally 5-6 mm above lash line. It is more subtle than the female lid crease. The incision is marked at the level of supratarsal fold which is about 7-10 mm from lid margin in females and about 5-8 mm in males. In Asian patients the range may sometimes be 3-6 mm centrally. Laterally the incision dips to pick up some temporal hooding if present. The excess skin is measured by the ‘Pinch technique’ where the skin is measured by pinching skin with a nontooth forceps and the upper limit is marked. The other way to assess the placement of the second upper incision is to mark it about 10 mm below the lower margin of brow.

Grossly the distance between inferior eyebrow and upper lid crease on downgaze should be approximately two third of the distance between inferior limit of the eyebrow and the lid margin. In the ideal situation we should excise the minimum amount of musculocutaneous flap which would correct the dermatochalasis and allow physiological lid closure normally. To excise the musculocutaneous flap either the traditional steel blade is used or the radiofrequency cautery can be used. Closure should be done at this stage if only dematochalasis is present. But the presence of fullness of the lid calls for additional fat pad excision. It is important to differentiate between prolapsed orbital fat and retroorbicularis orbital fat (ROOF). After dissection of the musculocutaneous flap, the orbital septum is visualized. If required, with gentle pressure on the globe, the fat is made to protrude and identification of septum is done. The septum should be opened just above its insertion into aponeurosis. The septum is excised horizontally across full extent to provide ‘open sky’ approach to underlying structure. Most of the fullness in the upper lid is the result of the herniation of large central fat pad, but occasionally nasal fat pad may also contribute to the fullness existing in the upper lid. For reducing this fullness in the upper lids due to fat prolapse, a guarded excision of central and medial fat pads is accomplished in a piecemeal fashion with cautery after coagulating the remaining stump properly.

An adequate amount of fat is left behind so that it serves its function of physiological sliding between tissues during lid excursion. Excessive pulling of fat pads should be avoided so as not to inadvertently damage orbital vessel which may run through these fat compartment. Excessive fullness in the lateral part of the upper lid may be because of the descent of lacrimal gland in the preaponeurotic tissue plane. The lacrimal gland if seen prolapsing, is best repositioned in its place in the lacrimal fossa and the sheath is sutured to overlying periosteum with a nonabsorbable suture. In cases of senile aponeurotic ptosis coexisting with dermatochalasis, after the lid crease incision is made, the septum is identified and then levator aponeurosis is identified just below the fat pads. The preaponeurotic fat is the key landmark in upper lid surgery. Any detachment and dehiscence of the aponeurosis is then looked for carefully. Reattachment of the detached part of levator aponeurosis to the tarsus with 6-0 nonabsorbable suture corrects the...
Lower Eyelid Blepharoplasty

The surgical goals in lower lid blepharoplasty include:
1. Skin muscle excision - transcutaneous approach
2. Skin muscle excision with attachment of retractors of lid if required
3. Removal or repositioning of the herniated fat where required - transcutaneous or Transconjunctival approach
4. Address any associated ligament laxity
5. Avoid postoperative ectropion and secondary epiphora
6. Skin Rejuvenation

Technique of lower lid blepharoplasty

In lower lid blepharoplasty, a skin muscle excision is done only in cases of lid laxity alone. In cases of senile entropion, attachment of lower lid retractors along with tarsal strip procedure generally corrects the defect. The presence of baggy lower lids calls in for a simultaneous fat prolapse repair. Following injection of local anaesthesia 2% lignocaine and adrenaline in concentration 1:1,00,000 by conjunctival or skin route the surgeon proceeds with either transconjunctival or transcutaneous approach.

A. Transcutaneous approach: After the infiltration of local anesthesia as in the upper lid, subciliary incision is given about 2-4 mm from the lid margin. The lower lid crease is usually situated approximately 4-5 mm below the eyelid margin. Then skin and muscle is raised as a myocutaneous flap till the orbital rim. If here it is noted that the capsulopalpebral fascia is disinserted from its attachment then it is reattached to the tarsus with nonabsorbable 6-0 suture. Reattachment of the capsulopalpebral fascia corrects the inturning of lid margins. Atrophy of the septum with age permits orbital fat to herniate anteriorly creating typical 'baggy lids'. The septum is identified and excised horizontally and fat is exposed by pressing on the globe gently. Excess fat is gently elevated, clamped and cauterized at the base. Nowadays, alternative surgical procedure which have gained prominence is the advancement of the orbital fat and septum as a unit onto the periosteum of the maxilla inferior to the orbital rim so as to to conceal the underlying bony structure of orbital rim and impart a more youthful look. In cases where canthal support is adequate, patients with excess skin benefit from excision of a conservative amount of skin only. In patients where age related canthal laxity is present, a lateral tarsal strip surgery for canthal tightening is simultaneously performed to decrease the risk of development of unnatural contour of the lid. This lateral tightening procedure is to be performed prior to septum repositioning. Skin resection, if required is to be performed last. Interrupted suture, which includes skin-muscle and attached part of retractor helps to form a barricade of orbicularis muscle to close the incision. Subcuticular wound closure can also be opted for at this stage.

B. Transconjunctival approach: For lower lid blepharoplasty the transconjunctival approach is generally the preferred approach for patients with fat prolapsed but no significant skin excess. It comprises of two approaches – the postseptal and the preseptal. In the postseptal approach the conjunctiva and the lower lid retractors are incised directly over the fat with the needle tip directed 1-2 mm posterior to the inferior orbital rim at least 4 mm from the punctum. After excising the conjunctiva and the retractors yellow orbital fat can be seen prolapsing in the field. The assistant grasps the posterior edge of the wound and lifts it. Excision or trimming of fat and repositioning of remaining fat over inferior orbital rim is done carefully with a tight watch on the external contour. Care is taken not to injure the inferior oblique muscle. The fat at its base is clamped, cauterised and haemostasis achieved. The conjunctiva can be left as such or can be closed with a single interrupted absorbable suture. In the preseptal conjunctival approach the incision is made 2-3 mm below the tarsal plate and entry between the skin muscle and capsulopalpebral fascia is made. The further surgical steps are the same as the transcutaneous approach. Septum is excised, fat exposed and trimmed and conjunctiva is closed with absorbable inverted suture.

Skin Rejuvenation

Laser resurfacing is a potentially newer technique that allows skin to be removed in a measured and controlled fashion. Lasers are used for reducing wrinkles around the mouth and the eyes, ablating areas of actinic damage and tightening loose skin due to elastosis. New generation Carbon dioxide (CO2) pulsed laser, KTP laser, Erbium:yttrium-aluminium-garnet (Er:YAG) laser with sapphire scalpel tips are the ones commonly used lasers in blepharoplasty. Laser resurfacing improves the appearance and texture of photodamaged skin and makes it more youthful. The CO2 laser removes 50-100 microns of tissue with each pass of laser. The Er:YAG laser removes 25-30 micron of tissue. There is less collateral dermal energy with the latter and hence adverse effects like scarring may be less. The Er:YAG laser is the treatment of choice for fine lines and superficial scars, whereas the CO2 laser is better for deeper rhytides and scars in facial rejuvenation. Injectable fillers
may be combined with neurotoxins to resolve superficial wrinkles and restore facial volume. These modalities may be used with laser resurfacing or chemical peels to address epidermal and superficial dermal problems. It is to be remembered that lasers have their own side effects due to a lack of precise depth control and unwanted damage to the lower layers of the dermis. Nevertheless, if appropriate criterions are met, combining injectable soft-tissue augmentation treatment and skin resurfacing appear to be promising new technique to address the multiple effects of facial aging.6

**Postoperative Care and Complications**

Only topical antibiotic can be applied to the wound for about a week in otherwise healthy patients.9 Dressing need not be given. We, at our, institute apply an antibiotic ointment and patch the eye for a day. Ice compresses can be applied immediately for the edema. Nonsteroidal pain killers can be prescribed for minimal discomfort. Postoperative lid infections after blepharoplasty are rare, though isolated cases with severe infections like orbital cellulitis and necrotizing fasciitis have been reported.7,8 The rarity of infections is probably due to high vascularity of lid tissues and hence systemic antibiotics are not really needed postoperatively in otherwise healthy individuals.10 In patients who are to undergo surface laser treatment systemic antibiotics are routinely recommended6,11,12. A number of complications can occur after blepharoplasty surgery. Fortunately serious complications are rare. Complications include dysrhythmias from oculocardiac reflex, dry eye, lagophthalmos, asymmetrical lid crease, epiphora, hollowing of the eyelids, ptosis, corneal abrasion, chemosis, lower lid retraction and ectropion. The most common complication associated with blepharoplasty is inadequate fat excision ranging from 0-20%.13 Redundant skin and lid laxity are other common complications. Blindness after blepharoplasty is the most dreaded complication with an incidence of approximately 1:40,000. This generally due to insufficient cauterization in deeper planes and blood entering the postseptal orbital compartment. Such a situation is to be recognized at the earliest and orbital decompression is done by performing a lateral cantholysis. Strabismus is generally transient and can lead to diplopia if the muscle is injured so, careful dissection in both the lids so as to prevent any damage to muscle or tendons should be done. In lower lid blepharoplasty, the inferior rectus and inferior oblique are susceptible to damage and in upper lid blepharoplasty superior oblique tendon is prone to injury.14,15

Majority of patients who seek blepharoplasty are generally elderly individuals who either have functional or cosmetic abnormality. It is important to understand that blepharoplasty is not just skin and muscle excision, it is the sculpturing and contouring of eyelid complex as a whole. In conclusion, blepharoplasty combined with laser resurfacing is fast becoming an important aspect in facial aesthetics. As average life expectancy increases, active screening, proper evaluation and definitive management for ageing lids in elderly individuals will not just rejuvenate the lids but also improve the confidence and happiness of elderly patients.

**References**

To Compare Incisional Fluid Loss During Different Stages of Phacoemulsification and its effect on Anterior Chamber Stability in Micro Coaxial and Bimanual Phacoemulsification

Dharmik Sharma MBBS, DNB, Dipan Desai MS, Kaushik Solanki MS, DO

Abstract

Purpose: To compare incisional fluid loss during different stages of phacoemulsification and its effect on anterior chamber stability in microaxial and bimanual phacoemulsification.

Materials & Methods: This prospective randomized study comprised of 80 consecutive patients, 40 patients in each group having routine uneventful cataract surgery. All patients were operated on the same phaco machine by the same surgeon. Intra-operative parameters were constant for all patients in each group. Volume of incisional fluid leak was measured during different stages of phacoemulsification. Along with volume of fluid aspirated in cassette, total volume of balance salt solution used, frequency of visually significant surges during different stages of phacoemulsification and post-operative best corrected visual acuity & central corneal thickness were measured in microcoaxial and bimanual phacoemulsification.

Results: The mean percentage of incisional fluid leak during nucleus removal in microaxial phacoemulsification was 21.22±6.07% and was 24.73±5.06% in bimanual phacoemulsification (P value: 0.006). The mean percentage of incisional fluid leak during irrigation/aspiration/polishing in microaxial phacoemulsification was 38.60±7.22% and was 57.70±6.59% in bimanual phacoemulsification (P value: < 0.0001). Average frequency of visually significant anterior chamber surges in microaxial phacoemulsification was 6 and was 36 in bimanual phacoemulsification. Postoperative mean increase in central corneal thickness (CCT) in microaxial phacoemulsification was 4.93±3.11 on Day 1 and was 0.70±1.11 on Day 7 and in bimanual phacoemulsification it was 9.55±4.77 on Day 1 and 1.55±1.72 on Day 7 (P value, Day 1: <0.0001 & Day 7: 0.01).

Conclusion: Significant increase in incisional fluid loss was observed in bimanual phacoemulsification. This led to more surges during surgery along with increase in central corneal thickness in immediate postoperative period. This suggests that microaxial phacoemulsification has better fluidics and anterior chamber stability.


Key Words: phacoemulsification, anterior chamber, microaxial surgery

DOI: http://dx.doi.org/10.7869/djo.2012.65

Kelman introduced phacoemulsification in 1967 which revolutionized cataract surgery and made it possible to abandon more invasive procedures. In particular, incision size decreased from the 10.0 mm required for the intra-capsular cataract extraction to 7.0 mm for extra-capsular cataract extraction and ultimately to the small incisions (3.2 to 2.8 mm) used for phacoemulsification. Advancements in technology allowed the use of micro surgical instruments and foldable intraocular lenses (IOLs). Change in fluidics and phaco power modulations with more advanced management software for the phaco units further reduced incision size, tissue trauma and promoted faster visual recovery. Today, conventional standard phacoemulsification can be performed through a 2.65 to 3.2 mm incision. Whereas, microaxial phacoemulsification is done through a 1.8 to 2.2 mm incision. Microincision phacoemulsification (Bimanual MICS) is done through a 1.2 to 1.4 mm incision. Anterior chamber stability is critical for maintaining intra-operative control of microenvironment and minimizing the risk for complications. The anterior chamber can be viewed for all practical purposes as a closed system that is influenced by atmospheric and posterior vitreous pressure. Anterior chamber is primarily influenced by the balance between the influx of irrigating fluid and its efflux through...
the main corneal incision and side ports. As a result, any incisional fluid loss can adversely affect anterior chamber stability with potential severe complications.

Dr. Liyanage (2009) reported that it is important for surgeons to create precise wound incisions and correctly matching the size of instrumentation to the wounds minimizes unnecessary wound leakage, which lessens the amount of fluid turnover in the anterior chamber. The present study aims to find out percentage of incisional fluid leakage from main incision and side port in different stages of surgery namely nucleus and epinucleus removal and irrigation aspiraton and polishing in microcoaxial and bimanual phacoemulsification.

Along with volume of fluid aspirated in cassette, total volume of balanced salt solution (BSS) used, frequency of visually significant surges during different stages of phacoemulsification and post-operative best corrected visual acuity (BCVA) and central corneal thickness (CCT) were measured in microcoaxial and bimanual phacoemulsification.

**Materials and Methodology**

This prospective randomized study comprised 80 consecutive patients, 40 patients in each group having routine uneventful cataract surgery. Informed consent was taken from all patients and ethical consent was taken from the institute.

Group I: Microcoaxial group where phacoemulsification was done through a 1.8mm Incision.

Group II: Microincision (Bimanual) group where phacoemulsification was done through a 1.4 mm Incision.

**Inclusion Criteria**

Patients of either sex, age between 45 yrs to 75 yrs and nuclear or cortico-nuclear cataract of grade III to IV according to the Lens Opacities Classification System III (LOCS III) scale were included.

**Exclusion Criteria**

1. **Preoperative**
   - Cataract hardness greater than nuclear opalescence (NO) V on the LOCS III scale
   - Ocular co-morbidty (an axial length greater than 26.0 mm or less than 21.0 mm)
   - Corneal pathology - corneal dystrophy
   - Corneal scarring, patients who had previous ocular surgery or eye disease that might affect the final visual acuity (e.g., glaucoma, retinal or macular disorders)
   - Systemic exclusion criteria - immuno-compromized state, uncontrolled diabetes, connective tissue disorders, scleritis, use of oral steroidal agents, dermatological disease.

2. **Intra-operative**
   - Patients who had an eventful cataract surgery and required to undergo extension of incisions intra-operatively to facilitate surgery.

3. **Post-operative**
   - Patients who developed severe post-operative inflammation requiring prolonged and excessive use at corticosteroids than normal
   - Patients with inadequate follow up

**Preoperative Evaluation**

- Meticulous history taking
- BCVA (Snellen’s test type, converted it into Log MAR and recorded)
- Slit-lamp examination for anterior segment evaluation
- Fundus examination for posterior segment evaluation (Indirect ophthalmoscopy using +20D lens)
- Corneal curvature
- Axial length calculation by ‘A scan ultrasonography’ using Immersion Scan
- IOL power calculation by SRK T (Sanders, Retzlaff & Kraff) formula
- Anterior chamber depth measured by ‘A scan ultrasonography’ using Immersion Scan
- Corneal thickness by ‘Ultrasound Pachymetry’ with the patient fixating on a target positioned straight ahead
- Intra Ocular Pressure

**Surgical Technique**

In all eyes, after draping, speculum was applied & washed with betadine solution and BSS. The main incision was made in clear cornea in the steeper axis with respective microkeratome for all groups and viscoelastic was injected to inflate the anterior chamber & side incision at 90° away from main incision with 15 degree microkeratome. Continuous curvilinear capsulorrhexis (ccc) was performed with 26 G bent needle and size of ccc was recorded. Hydrodissection and hydrodelineation was performed with BSS in 2 ml syringe with 23 G cannula after which anterior chamber was inflated with same viscoelastic. Phacoemulsification was performed after proper priming and tuning the phaco hand piece with proper needles and sleeves for respective groups. While inserting the Phaco tip the digital volume in cassette (ml) was recorded from the screen of stellaris machine. The fluid from the side collection bag was aspirated with 50 ml syringe after that each and every stage of surgery as mentioned previously. Recording of cassette fluid on screen of stellaris & recording of leaking fluid was done in same manner. For irrigation-aspiration (IA), coaxial IA was used for group I whereas a bimanual IA set was
used for group II. We polished the capsule in all the cases after injecting viscoelastic in the eye, a foldable IOL was inserted through 2.2 mm incision & the IOL was inserted through wound assisted delivery. The residual viscoelastic was removed. Pilocarpine was injected in the eye. After 45 seconds the pilocarpine was washed by IA. Both incisions were hydrated & checked for leak.

**Intra-operative data**

Pupillary diameter was noted with pupillometer when pupil was fully dilated under mydriatic effect. Capsulorrhexis diameter was recorded by measuring with same pupillometer in approximation with pupillary diameter. All patients were operated on the same phaco machine Stellaris vision enhancement system by the same surgeon using same standard vacuum tubing set and some intra-operative parameters which affect the fluidics and anterior chamber stability as mentioned in Table-1 for each phaco technique. A clear corneal incision was made in all eyes depending upon toricity of cornea. Different keratomes were used for respective groups as mentioned below in Table-2.

Amount of fluid leak during different stages of surgery were recorded by aspirating the fluid from collection bag with 50 ml syringe and confirmed with measuring cylinder (Figure 1). To get actual amount of incisional fluid leak, surgeon made efforts to restrict unnecessary fluid loss (e.g., turning off irrigation when outside the eye and avoiding habitual washing of cornea with irrigation fluid, even phaco probe was inserted in eye after proper priming and tuning and at the beginning & at the end of each stage, fluid was aspirated from the bag with 50 ml syringe). Amount of fluid collected in cassette during different stages of phacoemulsification were digitally recorded in ml on the screen of Stellaris Vision Enhancement System Phaco machine. (Figure 2)

![Figure 1](image1.png)

**TABLE 1**

<table>
<thead>
<tr>
<th>Stages Parameters</th>
<th>Micro Coaxial</th>
<th>Bimanual</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>bottle height (mm)</td>
<td>Vacuum (mmHg)</td>
</tr>
<tr>
<td>Phaco-I (Sculpting)</td>
<td>90</td>
<td>50</td>
</tr>
<tr>
<td>Phaco-II (Chop)</td>
<td>125</td>
<td>450</td>
</tr>
<tr>
<td>Irrigation-Aspiration</td>
<td>90</td>
<td>450</td>
</tr>
<tr>
<td>Polishing</td>
<td>90</td>
<td>100</td>
</tr>
<tr>
<td>Visco-elastic Removal after IOL Implantation</td>
<td>100</td>
<td>550</td>
</tr>
<tr>
<td>Visco-elastic Removal after Using Pilocarpine</td>
<td>100</td>
<td>550</td>
</tr>
</tbody>
</table>

**TABLE 2**

<table>
<thead>
<tr>
<th>SITES</th>
<th>Group I</th>
<th>Group II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Incision at Steeper Axis</td>
<td>1.8mm</td>
<td>1.4 mm Trapezoid diamond knife</td>
</tr>
<tr>
<td>Side Incision at 90° away from main Incision</td>
<td>15 degree</td>
<td>15 degree</td>
</tr>
<tr>
<td>For IOL Implantation Extension of Incision</td>
<td>2.2mm</td>
<td>2.2mm</td>
</tr>
</tbody>
</table>
The percentage of fluid collected in cassette and percentage of incisional fluid leak were measured (The percentage of fluid collected in cassette for particular stage = The amount of fluid in collected cassette at particular stage x 100/ The amount of total fluid consumed for that particular stage).

The percentage of incisional fluid leak for particular stage was measured (The amount of incisional fluid leak for particular stage x 100/ The amount of total fluid consumed for that particular stage).

Anterior chamber stability was recorded by noting visually significant surges (anterior chamber collapse) during different stages of phacoemulsification and were graded as below:
- No collapse: 0
- One time collapse: 1
- Two times collapse: 2
- Three times collapse: 3
- Four times collapse: 4

Effective Phaco Time (minutes: seconds: 1/10 seconds) was recorded as shown digitally on the screen of machine and total surgical time was recorded in minutes:sec (Time between the creation of incision and closure of the corneal incision by stromal hydration at the end of surgery). Intra-operative complications like posterior Capsule Tear, vitreous loss were recorded.

Post-operative ophthalmic examinations were performed at day 1, day 7 and day 30 by measuring BCVA, slit-lamp examination, fundus examination, and central corneal thickness and recorded in same manner as preoperatively. Postoperative complications were recorded.

All preoperative, intra-operative & post-operative data were statistically analyzed using microsoft excel software and med calc. Paired t-test were used for comparison between two groups. Result which had p value of < 0.05 considered as statistically significant.

**Observation and Results**

**A) Preoperative characteristics:** All Patients belonged to same demographic area. Their preoperative characteristics in both groups and their level of significance were mentioned as below as per table 3

**TABLE 3**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Group I</th>
<th>Group II</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eyes/Patients(n)</td>
<td>40/40</td>
<td>40/40</td>
<td></td>
</tr>
<tr>
<td>Males/Females(n)</td>
<td>22/18</td>
<td>25/15</td>
<td>0.43</td>
</tr>
<tr>
<td>Mean Age(y)± SD</td>
<td>61.48±7.04</td>
<td>61.65±7.42</td>
<td>0.92</td>
</tr>
<tr>
<td>Mean BCVA(log MAR)± SD</td>
<td>0.35±0.10</td>
<td>0.37±0.11</td>
<td>0.39</td>
</tr>
<tr>
<td>Mean Cataract Hardness ±SD</td>
<td>3.45±0.50</td>
<td>3.45±0.50</td>
<td>1.00</td>
</tr>
<tr>
<td>Mean-Axial-Length(mm)±SD</td>
<td>23.51±0.73</td>
<td>23.22±0.64</td>
<td>0.06</td>
</tr>
<tr>
<td>Mean Keratometry in Diopters ±SD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean Kx(180°)±SD</td>
<td>43.38±1.53</td>
<td>43.36±1.25</td>
<td>0.95</td>
</tr>
<tr>
<td>Mean Ky(90°)±SD</td>
<td>43.78±1.66</td>
<td>43.98±1.40</td>
<td>0.56</td>
</tr>
<tr>
<td>Mean ACD(mm)±SD</td>
<td>3.22±0.24</td>
<td>3.27±0.20</td>
<td>0.31</td>
</tr>
<tr>
<td>Mean CCT(μm)±SD</td>
<td>531.63±27.35</td>
<td>527.75±36.14</td>
<td>0.59</td>
</tr>
<tr>
<td>Mean IOP(mm Hg)±SD</td>
<td>16.71±1.84</td>
<td>16.40±1.93</td>
<td>0.46</td>
</tr>
</tbody>
</table>

**SD= Standard Deviation, BCVA= Best Corrected Visual Acuity, Kx= Keratometry in 180°, Ky= Keratometry in 90°, ACD= Anterior Chamber Depth, CCT= Central Corneal Thickness, IOP= Intra Ocular Pressure**

**B) Intra-operative parameters** were as per table 4

- Mean amount of Total fluid exchange (ml) during different stages of surgery in different phaco techniques was as per Figure 3

**Figure 2**

**Figure 3**

During Phaco: In Group I: 32.96±12.34 ml and Group II: 37.65±3.63 ml. It was statistically significant between two groups (P value = 0.049).

During Irrigation-Aspiration-Polishing: In Group I: 15.06±3.60 ml and Group II: 23.93±3.63 ml. It was statistically significant between two groups (P Value = <0.00001).
Mean Percentage (%) of fluid aspirated and collected in cassette during different stages of surgery in different phaco techniques was as per Figure 4.

During Phaco: In Group I: 78.78±6.07 ml and Group II: 75.27±5.06 ml. It was statistically significant between two groups (P Value = 0.006).

During Irrigation-Aspiration-Polishing: In Group I: 61.4±7.22 ml and Group II: 42.3±6.59 ml. It was statistically significant between two groups (P Value = <0.00001).

Mean Percentage (%) of Incisional Fluid Leak during different stages of surgery in different phaco techniques: was as per Figure 5.

During Phaco: In Group I: 21.22±6.07 % and Group II: 24.73±5.06 %. It was statistically significant between two groups (P Value = 0.006).

During Irrigation-Aspiration-Polishing: In Group I: 38.6±7.22 % and Group II: 57.7±6.59 %. It was statistically significant between two groups (P Value = <0.00001).

Frequency(Numbers) of Visually Significant Surges (Anterior Chamber Collapse): was as per Figure 6.
During Phaco: In Group I: 3 and Group II: 14. It was statistically significant between two groups (P value = <0.000001).

During Irrigation-Aspiration-Polishing: In Group I: 3 and Group II: 22. It was statistically significant between two groups (P value = <0.000001).

C) Postoperative data & their significance level: were as per table 5.

### TABLE 5

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Group I</th>
<th>Group II</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean BCVA(log MAR)± SD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day 1</td>
<td>0.18±0.09</td>
<td>0.26±0.07</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Day 7</td>
<td>0.06±0.11</td>
<td>0.12±0.09</td>
<td>0.009</td>
</tr>
<tr>
<td>Day 30</td>
<td>0.00±0.07</td>
<td>0.04±0.10</td>
<td>0.04</td>
</tr>
<tr>
<td>Mean CCT(μm)±SD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day 1</td>
<td>536.55±27.00</td>
<td>537.30±36.06</td>
<td>0.91</td>
</tr>
<tr>
<td>Day 7</td>
<td>532.30±27.33</td>
<td>529.39±35.78</td>
<td>0.68</td>
</tr>
<tr>
<td>Day 30</td>
<td>530.38±27.79</td>
<td>526.43±36.04</td>
<td>0.58</td>
</tr>
<tr>
<td>Mean increase in CCT(μm)±SD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day 1</td>
<td>4.93±3.11</td>
<td>9.55±4.77</td>
<td>&lt;0.00001</td>
</tr>
<tr>
<td>Day 7</td>
<td>0.70±1.11</td>
<td>1.55±1.72</td>
<td>0.01</td>
</tr>
<tr>
<td>Day 30</td>
<td>-1.25±1.90</td>
<td>-1.32±1.59</td>
<td>0.85</td>
</tr>
</tbody>
</table>

SD= Standard Deviation, BCVA= Best Corrected Visual Acuity, CCT= Central Corneal Thickness.

The mean best corrective visual acuity (logmar scale) on different post-operative days:

- On day 1: In group I: 0.18±0.09 and group II: 0.26±0.08. It was statistically significant between two groups (P value = <0.0001).
- On day 7: In group I: 0.06±0.11 and group II: 0.12±0.09. It was statistically significant between two groups (P value = 0.009).
- On day 30: In group I: 0.00±0.09 and group II: 0.04±0.10. It was statistically not significant between two groups (P value = 0.04).

The mean increase in central corneal thickness in μm on different post-operative days:

- On day 1: In group I: 4.93±3.11 and group III: 9.55±4.77. It was statistically significant between two groups (P value = <0.00001).
- On day 7: In group I: 0.70±1.11 and group II: 1.55±1.72. It was statistically significant between two groups (P value = 0.01).
- On day 30: In group I: -1.25±1.90 and group II: -1.32±1.59. It was statistically not significant between two groups (P value = 0.85).

**Discussion**

All patients belonged to same demographic area and had similar preoperative characteristics. Intra-operative results as are mentioned below:

The mean cataract hardness was same in both groups. The mean effective phaco time (sec) was more in group I (5.5±3.14) than group II (4.0±2.09) (P value = 0.016) because bimanual technique helps to reduce chatter turbulence & increases the followability.

During phaco stage, the mean amount of total fluid consumed (ml) was more in group II (37.6±8.31) than group I (32.6±12.34) (P value = 0.049). The mean percentage of fluid collected in cassette (%) was more in group I (78.7±6.07) than group II (75.2±5.06) (P value = 0.006). The mean percentage of incisional fluid leak (%) was more in group II (24.7±5.06) than group I (21.2±6.07) (P value = 0.006). Frequencies of surges were higher in group II (14) than group I (3) (P value = <0.000001). In group I, the mean amount of total fluid exchange was less and the mean percentage of fluid collected in cassette was more associated with less frequency of surges than group II because the micro incision silicone sleeve allowed least leak as it fitted well in incision, also allowed less fluid in eye. While in group II, the mean total fluid exchange was more associated with higher frequency of surges because incisional fluid leak was more due to following reasons -

1) There was no silicone sleeve over phaco tip.

2) Desai Leak Phenomenon:14,15: Each time the phaco tip buzzed, fluid leaks out through the incision & practically a fine spray can be observed. When phaco tip is vibrating, it is emulsifying and aspirating the nuclear pieces with BSS. Simultaneously fluid is leaking out through the incision. This compounded effect causes unwanted instability of anterior chamber and surges.

3) It is possible that the exposed phaco tip gets heated and can cause corneal burns which can allow more leak as the coagulated tissue contracts away from the incision.

4) These surges required the whole procedure to be toned down with more time was given in between each time phaco power was used to allow fluid in the eye to be built up.

During irrigation-aspiration-polishing stage, the mean amount of total fluid consumed (ml) was more in group II (23.9±3.63) than group I (15.0±3.60) (P value = <0.000001). The mean percentage of fluid collected in cassette (%) was more in group I (61.4±7.22) than group II (42.3±6.59) (P value = <0.00001). The mean percentage of incisional fluid leak (%) was more in group II (57.7±6.59) than group I (38.6±7.22) (P value = <0.00001). The frequencies of surges were higher in group II (22) than group I (3) (P value = <0.000001). In group I, the mean percentage of fluid was going more into the cassette and then were less mean percentage of leak associated with fewer surges than group II because the micro incision silicone sleeve allowed least leak as it fitted well in incision, also allowed less fluid in eye. While in group II, the mean percentage fluid was going less into cassette with more mean percentage of fluid leak and higher frequency of surges because of use of bimanual I/A which had no sleeve and the metal cannula deformed the incision which increased...
leak. Post-operative group I had less mean increase in pachymetry with better mean BCVA compared to II because of fewer surges, less time during phaco stage and optimum fluidics. While in group II, the mean increase in pachymetry on immediate post-operative days was more with relatively less mean BCVA compared to group I because here

1) To prevent surge, more fluid was needed to come in eye so bottle height had to be increased to 140 cm and this caused raise in IOP and also increased fluid exchange.

2) Increased time during phaco stage was needed because continous phaco was not used but the fluid was allowed to build up to prevent surges. Thus the whole procedure is slowed up and the flow rate and vacuum are also toned down to prevent surges.

**Conclusion**

Significant increase in incisional fluid loss was observed in bimanual phacoemulsification. This led to more surges during surgery along with increase in central corneal thickness in immediate postoperative period. This suggests that micro coaxial phacoemulsification has better fluidics and anterior chamber stability.

**References**

15. Dipan Desai. Dynamics of Temperature Control in Microphaco with New Insulated Phako Tip; Mastering the Art of Bimanual Microincision Phaco (Phakonit/MICS)2005; Jaypee Brothers Publications; Chapter 16: Page no-193-5.
Outcome of Cataract Surgery in Patients with Pseudoexfoliation

Surekha Bangal MBBS, MS, Akshay Bhandari MBBS, Pratik Gogri MBBS

Abstract

Purpose: To study the surgical outcome & the complications encountered during & after cataract surgery in Indian patients with pseudoexfoliation.

Materials & Methods: In this hospital based retrospective study, 50 patients above 50 years of age having cataract with pseudoexfoliation & having normal Intraocular Pressure (IOP) who underwent extracapsular cataract surgery were included. Patients with other associated ocular pathology were excluded. Patients were followed up for various complications up to 30th postoperative day.

Results: Fifty patients with pseudoexfoliation underwent extra capsular cataract surgery. Problems encountered during surgery were small nondilating pupil (26%), zonular dialysis (2%), posterior capsular rupture (6%), vitreous loss (4%), residual lens matter (10%), iridodialysis (4%) hyphema (2%). Post-operative complications were irregular pupil due to sphincterotomy (8%), significant anterior chamber reaction (30%), and exudative membrane formation (6%), corneal oedema with striate keratopathy (32%), iris pigment dispersion (16%), raised intraocular pressure (6%), posterior synechiae (2%) and intraocular lens decentration (2%).

Conclusion: Patients with pseudoexfoliation are at increased risk for development of surgical and postsurgical complications. Awareness about complications and ability to manage these complications by experienced surgeon is key to success.


Key Words: pseudoexfoliation, cataract, complications.

DOI: http://dx.doi.org/10.7869/djo.2012.66

Pseudoexfoliation (PEX) is a senile condition, more common in males, familial and seems to be genetically inherited disease characterized by deposition of bluish white fibrillogranular material on the lens epithelium, iris stroma and blood vessels, corneal endothelium, anterior hyaloid face, zonular fibres, trabecular meshwork and subconjunctival tissue. The deposit is most prominent on the anterior lens capsule at its centre as thick translucent membrane and on periphery of lens as granular deposits. Although no clear hereditary pattern has been established the condition is particularly common in Scandinavia and is associated with a gene locus at 2p10.

Pseudoexfoliation was first described by Lindberg in 1917 and in 1925 full description of pseudoexfoliation was made by a Swiss Ophthalmologist Alfred Vogt and later its association with ‘glaucoma capsulare’ was made. It is most commonly seen between 60 and 70 years. It has been associated with a number of ocular diseases such as cataract, glaucoma, iridocyclitis, macular edema, vitreous traction, retinal tears and detachment, and various forms of macular and pigmentary retinopathy. It is also associated with non-ocular diseases such as neurodegenerative diseases and cardiovascular diseases along with various renal and connective tissue disorders.

In this hospital based retrospective study, 50 patients above 50 years of age of both sexes having cataract with pseudoexfoliation & having normal IOP who underwent extracapsular cataract surgery were included. Patients with other associated ocular pathology were excluded. Patients were followed for various complications up to 30th postoperative day. All the patients were examined on slit lamp before and after pupillary dilatation to diagnose pseudoexfoliation (Figure 1-3).

Pseudoexfoliation is frequently associated with open angle glaucoma and poor pupillary dilatation. Cataract surgery in eyes with pseudoexfoliation has high incidence of intra operative complications like posterior capsular rupture, zonular dialysis and vitreous loss during surgery. Patients with pseudoexfoliation are reported with delayed spontaneous dislocation or subluxation of intraocular lens after uncomplicated cataract surgery. The objectives of this study are to determine the frequency and types of complications during cataract surgery in Indian patients having Pseudoexfoliation syndrome and cataract.
of pupil. Patients were admitted to the ophthalmology ward of the hospital. A detailed proforma was devised containing all essential details for each individual. A thorough examination including visual acuity, anterior segment, posterior segment and measurement of intraocular pressure (IOP) was performed before the cataract surgery. The diameter of pupil of each patient was measured. Intra-operative maximum pupillary dilatation was obtained and its size measured. Extra capsular cataract surgery was performed in all these eyes with implantation of intraocular lens (IOL). The patients were examined with slit lamp on 1st post operative day. The follow up of the patients was carried out on 8th day post operative, the data analysis was done for quantitative and qualitative measures. The operative and postoperative complications were recorded and best-corrected visual acuity after 30 days were measured.

**Inclusion Criteria**

1. Patients above fifty years of age belonging to either sex diagnosed to have cataract with pseudoexfoliation on the basis of slit lamp examination.
2. All the patients with senile cataract associated with pseudoexfoliation with normal IOP (<20 mm of hg).

**Exclusion Criteria**

1. Patients below 50 years of age
2. Patients with traumatic cataract, congenital cataract
3. Patients with raised IOP (>20 mm of hg)
4. Patients with uncontrolled diabetes mellitus, other severe systemic and cardiovascular diseases
5. Patients with other associated ocular pathologies

**Table 1: Age wise distribution**

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-69</td>
<td>9</td>
<td>24</td>
<td>33 (66%)</td>
</tr>
<tr>
<td>70-89</td>
<td>11</td>
<td>5</td>
<td>16 (32%)</td>
</tr>
<tr>
<td>&gt;90</td>
<td>1</td>
<td>0</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>Total</td>
<td>21</td>
<td>29</td>
<td>50</td>
</tr>
</tbody>
</table>

**Results**

Fifty patients of cataract with pseudoexfoliation underwent extra capsular cataract surgery. Among 50 patients, 29 (58%) were female whereas 21 (42%) were male (Figure 4). The ages of these 50 patients ranged from 50 years to 95 years with 33 patients (66%) in age group of 50-69, 16 patients (32%) in the age group of 70-89 and 1 patient (2%) in age group of >90 years (Table 1).

**Figure 4: Sex wise distribution**
Preoperative features show that 13 patients (26%) had small pupil (<7mm). In 1 patient (2%), posterior synechiae was seen. Different procedures were conducted for cataract surgery. Sixteen patients (32%) underwent conventional ECCE, 32 patients (64%) underwent SICS and 2 patients (4%) underwent phacoemulsification with IOL implantation. Peripheral iridectomy was done in 6 patients (12%) & sphincterotomy was done in 4 patients (8%). Table 2 shows distribution of various surgical complications occurred during cataract surgery.

Post-operative complications are listed in Table 3. Post operatively corneal oedema with striate keratopathy and severe AC reaction were seen in 16 (32%) and 15 (30%) patients respectively. Best-corrected visual acuity was checked on 30th post-operative day and is given in Figure 5.

**Discussion**

Although pseudoexfoliation occurs in every race, its prevalence varies considerably. It has been reported with increasing frequency in Pakistan, the latest study shows incidence of 1.99% out of 1604 patients. Patients with age related cataracts are elderly and often have coexisting pseudoexfoliation. This study indicates that the incidence of the disease is higher among females (58%) than males (42%). Comparing the frequency of monocular versus binocular involvement our study indicates bilateral involvement to be more common. Many series have reported similar results. Pseudoexfoliation is associated with constricted pupil. Adequate pupillary dilatation is necessary for standard extra capsular extraction. In the present study, poor pupillary dilatation (<7mm) was seen in 26% of the patients. Constricted pupil exposes the patient to more complications. Cataract surgery in eyes with pseudoexfoliation has higher incidence of operative complications like posterior capsular rupture, zonular dialysis, intraocular bleeding and vitreous loss. Pupillary diameter and zonular fragility have been suggested as the most important risk factors for capsular rupture and vitreous loss. Zonular fragility increases the risk of lens dislocation, zonular dialysis or vitreous loss up to ten times. In our study posterior capsular rupture was found in 6% of patients. This is consistent with previous report that capsular rupture is more common in patients with pseudoexfoliation. Our data indicates 4% vitreous loss, which is related to capsular rupture. Iridodialysis occur intra operatively as a result of the manipulation of intraocular tissues. It is one of the established, although rare, complications of cataract surgery. In this study, only two patients (4%) had this complication.

Post-operatively, these patients are at greater risk of developing an immediate elevation of IOP. In our study 6% had raised IOP in immediate postoperative period. Post-operative inflammation is more common in eyes with pseudoexfoliation. Our data indicates similar results; 30% cases had severe anterior chamber reaction in immediate post-operative period and 16% of our cases had pigment deposition on IOL in post-operative period. Intraocular lens decentration is more common even when the lens is entirely in the capsular bag, primarily due to decentration of the entire bag. In our study 2% of cases had IOL decentration. Subluxation of the IOL can occur if the zonules break or the capsular bag dislocates.
Limitation of our study was that our follow-up period was 30 days, so late post-operative complications were not evaluated. Further, a control group was not available for comparison. Our study was small-scale descriptive study; a larger scale study is required to test the findings in larger population.

Cataract surgery, like any surgical procedure, has associated complications. Patients with pseudoexfoliation are at increased risk for development of intraoperative and postoperative complications. Pseudoexfoliation is more common in males over 50 years of age and is usually bilateral. Awareness about complications & ability to manage these complications by experienced surgeon is the key to success.

### Table 2: Intra operative complications

<table>
<thead>
<tr>
<th>Intraoperative complications</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zonular dialysis</td>
<td>1</td>
<td>0</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>Difficulty in nucleus delivery</td>
<td>2</td>
<td>2</td>
<td>4 (8%)</td>
</tr>
<tr>
<td>Sphincterotomy</td>
<td>2</td>
<td>2</td>
<td>4 (8%)</td>
</tr>
<tr>
<td>PC rent</td>
<td>1</td>
<td>2</td>
<td>3 (6%)</td>
</tr>
<tr>
<td>Iridodialysis</td>
<td>1</td>
<td>1</td>
<td>2 (4%)</td>
</tr>
<tr>
<td>Vitreous loss</td>
<td>0</td>
<td>2</td>
<td>2 (4%)</td>
</tr>
<tr>
<td>Hyphaema</td>
<td>1</td>
<td>0</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>Residual cortical matter</td>
<td>3</td>
<td>2</td>
<td>5 (10%)</td>
</tr>
</tbody>
</table>

### Table 3: Postoperative complications

<table>
<thead>
<tr>
<th>Postoperative complications</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posterior synechiae</td>
<td>1</td>
<td>0</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>Iris pigment dispersion</td>
<td>4</td>
<td>4</td>
<td>8 (16%)</td>
</tr>
<tr>
<td>Corneal oedema with SKs</td>
<td>6</td>
<td>10</td>
<td>16 (32%)</td>
</tr>
<tr>
<td>Severe AC reaction</td>
<td>6</td>
<td>9</td>
<td>15 (30%)</td>
</tr>
<tr>
<td>Postoperative rise of IOP</td>
<td>3</td>
<td>0</td>
<td>3 (6%)</td>
</tr>
<tr>
<td>Irregular pupil due to sphincterotomy</td>
<td>2</td>
<td>2</td>
<td>4 (8%)</td>
</tr>
<tr>
<td>Exudative membrane</td>
<td>2</td>
<td>1</td>
<td>3 (6%)</td>
</tr>
<tr>
<td>Decentred IOL</td>
<td>1</td>
<td>0</td>
<td>1 (2%)</td>
</tr>
</tbody>
</table>

References

Implantation of Multipiece Intraocular Lens with Injector by Hand Rotation: A Simplified Technique

Himanshu Shekhar MD, Sandeep Gupta MS, Sana Tinwala MD, Anita Gangar MS, Rajesh Sinha MD, DNB, FRCS, Jeewan S Titiyal MD

Abstract

Implantation of multipiece intraocular lens (IOL) has been evolving over time. Earlier, it was implanted using the holder-folder system. With the advent of new injector system all the IOLs are now implanted with these systems. Injecting the multipiece IOL is not as smooth and easy as a single piece IOL. We herein describe a technique of implantation of multipiece IOL in the ciliary sulcus by rotation of wrist using the injector system. It provides a smooth implantation of the IOL and minimizes the risk of complications as well as damage to the IOL.


Key Words: multipiece IOL, injector system, cartridge rotation

DOI: http://dx.doi.org/10.7869/djo.2012.67

With recent advances in intraocular lens (IOL) technology, cataract surgery has transitioned from being solely a treatment for visual rehabilitation to also being a refractive procedure with the aim of gaining visual function comparable to that of the noncataractous elderly eye. Self-sealing, small-incision cataract surgery using a foldable intraocular lens (IOL) has become popular, and the incidence of complications has significantly decreased.1,2 Although in-the-bag implantation is most physiological and desirable, there are some situations in which sulcus implantation is required. The 3 piece hydrophobic acrylic (Alcon, MA60AC) is more suitable for sulcus implantation. The haptic of this IOL is made of PMMA which is a rigid material and sometimes it is difficult to properly implant it. We propose a safe method of insertion of a 3-piece acrylic lens (AcrySof MA30BA, Alcon) using a Monarch III injector system. This IOL was either implanted in eyes with a posterior capsular tear with an intact anterior capsular rim or was implanted secondarily in eyes with defect in the posterior capsule with more than three quarters of intact capsular rim or after performing membranectomy in absorbed membranous cataract or in pediatric eyes with aphakia and posterior capsular opacification.

Surgical Technique

A clear corneal tunnel is made at the steep axis with a 2.8 mm keratome and a side port is created with microvitreoretinal blade. The preceding procedure in the form of anterior vitrectomy or membranectomy is performed. The IOL can be inserted through the ‘A’ cartridge provided with the multipiece IOL. However it requires an incision size of 3 mm. We implant this IOL through the ‘C’ cartridge provided with the single piece IOL and it does not require enlargement of the incision size.

Insertion of IOL

An AcrySof MA30BA (Alcon laboratories, Fortworth, TX) acrylic foldable IOL is placed straight in the cartridge

![Figure 1: The cartridge tip being inserted in the eye through the corneal tunnel keeping the bevel downward.](image-url)
after putting very little viscoelastic and saline in the cartridge. Part of the back haptic is taken out and placed on a hook at the distal end of the cartridge. The haptic tip spontaneously tucks into the cartridge. The cartridge is then attached to the body of a Monarch III injector. The plunger is pushed forward and is confirmed to be pushing the optic from the rear so that the plunger tip does not become entangled with the optic. After injecting some viscoelastic substance into the anterior chamber, the cartridge tip is inserted in the eye through the corneal tunnel keeping the bevel downward (Figure 1). The plunger is slowly pushed to push the lens forward. With the rotation of the wrist, the cartridge is rotated clockwise by nearly 180° (Figure 2). The haptic tip appears first, directed towards the left side of the surgeon (Figure 3). The plunger is further pushed so that the leading haptic is placed in the sulcus (Figure 4). The wrist and the injector is now rotated anticlockwise so that the bevel of the injector body is turn downward again and the optic gently pushed out of the cartridge (Figure 5). The rod is turned counterclockwise, catching the back haptic, and the rear haptic is guided into the sulcus gently. The rear haptic can also be dialed into the sulcus with a Sinkey hook or a dialer. After the lens is inserted in the sulcus, the viscoelastic material is removed using an irrigation/aspiration (I/A) system. The corneal tunnel and the side port are hydrated with balanced salt solution (BSS) to make the incision watertight. Occasionally if the rigidity of the coats is not adequate and the tunnel is not becoming...
watertight, a single suture with 10-0 monofilament nylon is placed. A subconjunctival injection of gentamicin and dexamethasone is given. Postoperatively, the patient is prescribed moxifloxacin 0.5% eye drops thrice daily for 3 weeks, prednisolone acetate 1% eye drop 4 times daily for 3 weeks, and tropicamide 1% eye drops twice daily for 1 week.

**Results**

This technique has been used successfully in many patients; however the records of only 56 patients available with us. There were 36 males and 20 females. Of these, 38 were secondary implantation in pediatric eyes with or without membranectomy. Ten adult eyes were implanted secondarily after fibrosis of capsular remnant following an intraoperative posterior capsular rupture (PCR) in a previous cataract surgery. In 8 eyes, the technique was used to implant the IOL in the primary surgery due to PCR but with adequate anterior capsular rim. The mean power of the implanted IOLs was 22.0 ± 2.1 diopters (D) (range 16.5 to 29.0 D). There was no case of lens drop occurring during IOL insertion. There was no incidence of haptic or optic damage during the implantation.

**Discussion**

The preferred IOL for implantation in the sulcus is a multipiece IOL. The implantation of these IOLs can be done either by using holder-folder or an injector system. Injector system is preferred these days for implantation of foldable IOLs. The implantation of multipiece IOL can be sometimes tricky and fraught with complications. The haptics may be deformed during the implantation procedure, causing slight kinking of the haptics that is not visible during unfolding in the eye. Further, the optic–haptic junction is more friable than with the thicker hydrophobic acrylic haptic of a single piece IOL. Sometimes while injecting a multi-piece IOL, if the hand is not rotated, there is risk of reverse unfolding of the IOL inside the anterior chamber. At times it may stand erect and may touch the endothelium. The insertion of an acrylic 3 piece IOL by rotation of the injector is a simple and controlled method of implanting these IOLs. The leading haptic points to the right within cartridge barrel. Therefore, to ensure that the leading haptic points left and down the injector needs to be turned clockwise first so as to keep the haptic in correct position and direction. The returning of the cartridge in its previous bevel down position by rotating in anticlockwise direction enables the optic to be injection in the correct position and direct keeping it flat. Once this done the trailing haptic can either be pushed with the plunger into the sulcus or can be pushed into the anterior chamber and then dialled into the sulcus. By either way, the IOL can be positioned properly.

The technique provides a controlled implantation of a multipiece IOL into the sulcus. It is safe and there is negligible risk of complications in the form of damage to the haptic or optic of the IOL, corneal endothelial damage or reverse unfolding of the IOL.

In conclusion, insertion of a 3-piece acrylic IOL using rotation of injector is a safe and effective technique.

**References**

A Rare Case Report of Cyst of Wolfring

Sanjiv Kumar¹ MS, Rishi Jhalani¹ MBBS, Rani Bansal² MD, VK Malik¹ MS, KPS Malik¹ MS, FICS

Abstract

Ductal cysts of the accessory lacrimal glands of Wolfring and Krause are uncommon and are rarely reported in the ophthalmic literature. We report a rare case of cyst arising from accessory lacrimal gland of Wolfring in a young male boy. A 17 year old male patient came with painless bulging mass under conjunctiva of lower fornix near medial canthus of right eye. It was gradually increasing since one year. Magnetic resonance Imaging (MRI) scan revealed 20x20x14 mm well defined smooth walled cyst. Cyst was removed under general anaesthesia through conjunctival route. Histopathological examination was consistent with cyst arising from accessory lacrimal gland of Wolfring.

Key Words: wolfring, cyst, lacrimal gland

Tear secretion is a function of both the major and the accessory lacrimal glands. The accessory lacrimal glands (Wolfring and Krause) are dispersed among the conjunctival fornices and the upper tarsal border and are responsible for basal tear secretion. Obstruction of the excretory duct of any lacrimal gland results in the entity called dacryops, or simple ductal cyst.¹ A new classification is proposed based on these locations: palpebral lobe cysts (simple dacryops), orbital lobe cysts, cysts of the accessory lacrimal glands of Krause and Wolfring and cysts of ectopic (choristomatous) lacrimal glands.² We are reporting a rare case of cyst (mucocele) arising from accessory lacrimal gland in the conjunctiva from gland of wolfring in a young male boy.

Case report

A 17 year old male patient presented with a painless bulging mass under the conjunctiva of lower fornix near medial canthus of the right eye. The parents of the boy noticed the small pea size swelling since birth which remained of same size till one year back. This swelling was gradually increasing in size since last one year. At the time of presentation swelling was so much enlarged that his eye was deviated temporally (Figure 1). On examination a 1x1 cm size soft, painless mass with pigmented rough overlying conjunctiva without distinct margins was present near the medial canthus of right inferior fornix (Figure 2).

Figure 1 Cyst causing outward deviation of right eye

Figure 2 Cyst at anteromedial aspect of right eye

¹.Dept. of Ophthalmology, Subharti Medical College Meerut.
². Dept. of Pathology, Subharti Medical College Meerut.

Correspondence to : Dr. Rishi Jhalani
E-mail : rishijhalani@gmail.com
Regurgitation test was negative. On syringing right naso lacrimal duct was patent and there was no effect of syringing on the size of swelling. His vision at the time of presentation was 6/9 in the right eye and 6/6 in the left eye. There was no history of trauma or surgery.

MRI scan of the orbit revealed 20x20x14 mm well defined smooth walled cyst (following fluid signal) near the antero-medial aspect of right eye ball anterior to insertion of medial rectus and superior to the right inferior oblique muscle (Figure 3,4). This cyst was displacing the eyeball laterally and superiorly and there was an associated change in the course of right optic nerve. A provisional diagnosis of epidermoid cyst, likely to be arising from inferior eyelid was made on MR imaging.

This cyst was removed surgically under general anesthesia through the conjunctival route. Encapsulated cyst was removed without rupturing the cyst wall just to eliminate the risk of recurrence (Figure 5,6). Gross examination revealed an oval soft tissue mass measuring 20 x 15 x 8 mm with grayish white smooth outer surface. Cut surface of excised cyst showed unilocular, smooth thin walled, cystic cavity filled with gelatinous material (Figure 7). The microscopic features showed cyst wall made up of fibro collagenous tissue and lined by cuboidal to columnar epithelium which at places appeared bilayered. Lumen was filled with gelatinous, mucoid material. It showed many congested dilated vessels, hyalinized tissue, large areas of hemorrhage and foci of chronic inflammatory cell infiltrate made up of plasma cells, lymphocytes and mast cells (Figure 8).
- 8). The histopathological examination was consistent with cyst (mucocele) arising from accessory lacrimal gland in the conjunctiva (gland of Wolfring).

**Discussion**

Benign ductal cysts of the accessory lacrimal glands are uncommon lesions of the orbit, arising from the glands of Wolfring or Krause. Cysts of the accessory lacrimal gland of Wolfring are uncommon in Europe; they are commoner in areas where trachoma is endemic and usually occur in eyes with some evidence of past trachomatous scarring. The accessory lacrimal glands of Wolfring and Krause are responsible for basal tear secretion and also differ from the major gland with respect to their location. Wolfring glands are located in and around the upper tarsal border and, to a lesser extent, in the lower tarsal border. Krause glands are located within the conjunctiva of both upper and lower fornices. The sole duct of each accessory gland empties directly onto the adjacent conjunctival surface. The formation of a ductal cyst require two successive, interrelated events. The first is an ongoing active secretory process, and the second is an occlusion of the duct. The sequential occurrence of these two events is forwarded as the explanation of dacryops formation. A ductal cyst of the major lacrimal gland, or dacryops, is a rare clinical entity, encountered mainly in its palpebral lobe. Ductal cysts of the accessory lacrimal glands of Wolfring and Krause are even more uncommon than those of the major lacrimal gland and are rarely reported in the ophthalmic literature. Clinically, cysts of the accessory gland develop insidiously and present as painless cystic masses of the lids. Most frequently, these cysts occur in patients with previous traumatic or inflammatory conditions of the conjunctiva, particularly in patients with trachoma. Less commonly, a congenital anomaly of an excretory duct or alteration in the composition of secretions may be the cause of cyst formation. Histopathologically, these lesions are simple benign cysts lined by a layer of nonciliated cuboidal epithelial cells and occasional goblet cells, with an underlying layer of myoepithelial cells. The cyst wall consists of fibrous tissue of variable thickness, often infiltrated by lymphocytes and plasma cells. Decapitation secretion has been described in many cysts. The double-layered lining of these cysts supports their ductal origin. These histologic features (which were noted in present case also) differentiate the accessory lacrimal gland cysts from the more common dermoid and epidermoid cysts of the orbit. These latter cysts are in fact lined by stratified squamous epithelium and do not contain goblet cells. The main differential diagnosis of these benign ductal cysts is dermoid or epidermoid cysts. Histopathologic examination can help to differentiate these entities. The management of choice of ductal cysts of the accessory lacrimal glands is total surgical excision of the intact cyst through a conjunctival route. Failure to do this may lead to recurrence or fistula formation.

**References**

Clear Cornea with Large Central Descemets Membrane Tears following Birth Trauma

Shweta Agarwal DO, N Radhika FRCS, Prema Padmanabhan MS

Abstract

To report a case of clear cornea with absent descemets membrane following birth trauma. Clinical history was taken and a detailed ophthalmic examination including slitlamp biomicroscopy, anterior segment ocular coherence tomography (ASOCT), pentacam, corneal topography, specular microscopy and pachymetry done. A large 6 mm diameter central area of clear cornea devoid of descemets membrane was seen in the affected eye. A case of clear cornea despite a large area of absent descemets membrane with a reasonably well functioning endothelium following birth trauma.


Key Words: absent descemets membrane, birth trauma to cornea.

DOI: http://dx.doi.org/10.7869/djo.2012.69

Case Report

A 13 year old male child reported with a history of loss of vision in the left eye for the last 3 months. The mother, who was the informant, gave history of birth by forceps delivery.

The post natal ophthalmic notes revealed Descemets tear and corneal edema in the left eye. The child had undergone a glaucoma surgery in the same eye at 9 months of age. The patient claimed to have had some near vision in the left eye until recently. An ophthalmic examination showed the right eye to be normal in all respects. Vision in the left eye was light perception. Slit lamp biomicroscopy of left eye showed a cystic filtering bleb superiorly from the previous glaucoma surgery (Figure 1). An area of apparently absent DM about 6 mm in diameter was seen involving the visual axis, with scrolls of folded detached DM along the edges (Figure 2). The overlying cornea was clear and compact with minimal protrusion but no thinning. However no other clinical signs of keratoconus were present. Remaining peripheral cornea was normal with no guttæ. There was a partially absorbed cataractous lens.

Figure 1 Slit Lamp Photo Showing (a) Absent Central DM (b) Overlying Clear Cornea

The mean anterior and posterior corneal curvatures of the left eye on Pentacam (Oculus Pentacam Version 6.02r28) were 56.1D and -7.9D (Figure 3). Specular microscopy (Topcon SP 3000) showed right eye - CD 3194, CV 31%-64, SD-98, HEX -95% and left eye - CD 1992, CV-32%, SD-160, HEX-0% (Figure 4). Pachymetry (Tomey SP-3000) revealed a...
central corneal thickness of 565 microns OD and 513 microns OS thus indicating reasonably well functioning endothelium even with a low cell count and marked pleomorphism in the left eye. Lensectomy with retinal detachment surgery was performed by a vitreoretinal surgeon with guarded visual prognosis in the left eye. The post operative period was uneventful. At 6 weeks the visual acuity in the left eye had improved to 2/60. The central cornea remained clear and compact in the left eye with pachymetry values and endothelial count comparable to the pre-operative values.

**Discussion**

Abnormal and abrupt steepening of the posterior cornea is seen in patients with either posterior keratoconus or large DM tear. Posterior keratoconus is most often localized to the central cornea and is associated with posterior stromal opacity, pigment and thinning. The visual loss is only moderate. It is considered to be congenital in origin. Trauma has been proposed as an alternative cause but there is little theory to support it. Our case had early corneal clouding as noted in the post natal ophthalmic notes with scrolls of detached descemets membrane at the edges which is not noted in posterior keratoconus. The anterior corneal steepening in our case can be explained as anterior bowing of the corneal tissue due to absence of the posterior corneal layers as noted in Anterior Segment Ocular coherence Tomography (ASOCT) and on slit-lamp examination. Damaged cornea due to birth trauma frequently appears cloudy initially but clears within weeks or months, leaving residual single or multiple breaks in DM. The breaks appear as striae in the DM and are oriented in vertical or oblique meridian. Stromal scarring overlying the breaks is occasionally present. DM tears are usually unilateral and result in high corneal astigmatism along the axis of tear, axial myopia and amblyopia early in life and later corneal decompensation. Only 1 bilateral case has been reported. A range of 24-44 years has been reported for corneal decompensation to occur.

The DM has less tensile strength than full thickness stroma, therefore conditions in which cornea is stretched may produce breaks in this membrane. The size of these defects is enlarged by retraction and coiling of DM along the edge of the break. The retracted coiled edges of DM tears do not reapproximate, even when endothelial continuity is reestablished. The late sequelae of these injuries consist of secondary corneal changes from decompensation of previously compromised endothelium. Under age 5, the endothelial population is fairly uniform, in the range of 3000cell/mm. As the endothelium cells age, some die and the remaining cells enlarge and migrate to maintain the intact monolayer. By the age of 80 the cell count ranges from 900 to 4000 cells/mm. The corneal endothelium does not divide under normal circumstances. The wounded endothelium repairs itself primarily through limited migration and hypertrophy, and secondarily through cell division. Mass culture of the human endothelial cells done in vitro showed that endothelial cells in persons younger than 20 yrs grow better than older ones. Although cells adjacent to the wound participate most actively in the early
reestablishment of an intact endothelial layer, the entire endothelial population may participate to some degree. Trauma to the superior endothelium during cataract surgery creates a disparity in the cell size, with larger cells superiorly and smaller inferiorly.18 Similar mechanism of healing is noted in keratoconus patients post hydrops.14 Stromal edema resolves once the endothelial monolayer and pump function are reestablished.

In our case, the mother gives a history of birth trauma during forceps delivery. The post natal ophthalmic notes revealed an early corneal clouding which cleared within weeks. As reported earlier8 our case also had an axial myopia with high corneal astigmatism and amblyopia. But what was unique in our case was a unusually large central area of absent descemets membrane about 6 mm in diameter with overlying clear cornea instead of the routine single or multiple linear tears reported earlier.17 The high degree of endothelial cell pleomorphism indicates the extent of migration and proliferation a young endothelium is capable of undergoing to cover the large area of absent DM. Scrolls of folded detached descemets membrane were seen at the edges as has been reported13 thus confirming our diagnosis of absent Descemets membrane post birth trauma.

To conclude we report a case of clear cornea with a large central area of absent DM with a reasonably well functioning endothelial layer having a low cell count with marked pleomorphism, thus making a regular follow up mandatory.

References

10. Spencer WH, Ferguson WJ, Shaffer RN. Late degenerative changes in the cornea following breaks in DM. Trans Am Acad Ophthal Otolaryngol 1966; 70:973-83.
Case Report

Iridotomy in Pigmentary Glaucoma - ASOCT perspective

Prakash Agarwal1 MD, VK Saini1 MS, Saroj Gupta1 MS, Anjali Sharma1 MS, Reena Sharma2 MD, Tanuj Dada2 MD

Abstract

A pigmentary glaucoma is a form of secondary open angle glaucoma caused by pigment liberated from the posterior iris surface in patients with pigment dispersion syndrome. The pigment cells slough off from the back of the iris due to its concave configuration causing it to rub against the zonules and lens. These pigment cells accumulate in the anterior chamber in such a way that it begins to clog the trabecular meshwork causing elevation of intraocular pressure. Anterior segment optical coherence tomography (ASOCT) is a non-contact, easy to use, reproducible method for examination of the anterior segment. It allows detailed evaluation of the cornea, the angle of eye and the iris. It has extensively been used to evaluate angle closure glaucoma. It can also be used in cases of pigmentary glaucoma. We present a male, myopic patient with advanced stage of pigmentary glaucoma at a relatively young age. We used ASOCT to demonstrate the concave iris configuration in our patient and its disappearance following laser iridotomy. We thus highlight the importance of use of ASOCT in patients of pigmentary glaucoma.


Key Words: pigmentary glaucoma, ASOCT, laser iridotomy

DOI: http://dx.doi.org/10.7869/djo.2012.70

The relationship of pigment and glaucoma was first given by von Hippel in the 20th century.1 The modern concept of pigmentary glaucoma was conceived by Sugar in 1940 when he described pigment dispersion and glaucoma in a 29 year old man.2 The term “Pigment glaucoma” was described in a series published by Sugar and Barbour in 1949.3 Campbell suggested that the pigmentation resulted from friction of the zonules rubbing on the neuroepithelium of the iris.4 In 1993, Karickhoff gave the mechanism of reverse pupillary block which caused iris to rub against the zonules.5 The concave midperipheral iris drapes over the lens, working as a flap valve, which does not permit movement of aqueous, trapped in the anterior chamber, to the posterior chamber causing pigment release and rise of intraocular pressure (IOP). Anterior segment optical coherence tomography (ASOCT) can be used for imaging the iris and its configuration in patients of pigmentary glaucoma. This is a case report of a patient of pigmentary glaucoma presenting with advanced disease and low IOP at an early age. ASOCT was used to document the loss of concave iris configuration following Yag laser iridotomy.

There is only one study evaluating the role of ASOCT in assessing the anterior chamber parameters in pigmentary glaucoma.6 However, there is no study, using ASOCT, documenting the iris changes after iridotomy in these patients.

Case report

A 25 year old male patient presented to department of ophthalmology at our hospital with decrease in vision in right eye for 6 months. On Snellen visual acuity chart, vision of right eye was hand movement close to face with inaccurate projection of rays in two quadrants and in left eye was 6/36 with inaccurate projection of rays in nasal quadrant.

The anterior chamber was deep. Pupillary examination revealed a relative afferent pupillary defect in the right eye. Goldmann applanation tonometry revealed IOP of 27 mm Hg OD and 22 mm Hg OS. Fundus examination revealed total glaucomatous disc cupping in right eye and near total cupping in the left eye (Figure 1a, b). Gonioscopy using Goldmann single mirror gonioscope revealed homogenous brown pigment dispersion in both the eyes (more in right eye) and open angles in both the eyes (Figure 2a,b). Detailed examination revealed pigment dispersion over the endothelium. Configuration of the iris was concave with atrophy of the peripheral iris as compared with central portion of iris with heterochromia iridium (Figure 3). Confrontation perimetry revealed grossly constricted visual fields in both eyes. Right eye visual field assessment using

1 Peoples College of Medical Sciences and research centre, Bhopal.
2 Dr Rajendra Prasad centre for ophthalmic sciences, All India Institute of Medical Sciences, New Delhi

Correspondence to : Dr. Reena Sharma
E-mail : drreenasharma98@gmail.com
Humphrey perimetry could not be done due to poor vision. Left eye visual field assessment was not reliable due to high loss of fixation. On retrospective questioning there was no history of trauma or intraocular surgery. There was no history of chronic medication or significant medical illness. There was no family history of glaucoma.

ASOCT of the angles revealed concave iris configuration with extensive irido-lenticular touch and reverse pupillary block in both the eyes (Figure 4). Central corneal pachymetry using the OCT revealed 533 microns OD and 534 microns OS. The patient had concave iris configuration which was documented on ASOCT. Based on the deposition of pigment at the angles and typical concave iris configuration, a diagnosis of reverse pupillary block and pigmentary glaucoma was made (Figure 1,4). The differential diagnosis which could be possible in such a scenario was juvenile open angle glaucoma (JOAG). However, points against JOAG were concave iris configuration well shown by ASOCT, atrophy of peripheral iris and pigment dispersion at the angles. Secondary glaucoma was ruled out in view of no relevant history. There were no ophthalmic signs of uveitis, hyphaema, trauma, melanosis or any other ocular disease.
Figure 3 Heterochromia iridum with atrophy of the peripheral iris compared to the central portion of iris

Figure 4 Anterior segment OCT images showing concave iris configuration in both eyes

giving rise to secondary elevation of IOP. The patient underwent a neodymium-yttrium aluminum garnet laser (YAG) laser iridotomy in both eyes and post iridotomy, the flattening of iris was also documented with ASOCT (Figure 5). In view of advanced glucomatous cupping of both eyes; the target IOP of 10-12 was set for the patient. The patient was started on topical bimatoprost (Lumigan 0.01%, Allergan, USA) and topical combination of timolol (0.5%) and Brimonidine (0.15%) (Combigan, Allergan, USA). The patient responded well and tolerated the medications without significant side effects. The IOP was lowered to 11 in right eye and 12 in left eye at 3 month follow up.

Discussion

Pigmentary glaucoma is recognized as one of the most common forms of secondary open-angle glaucoma. It affects a younger patient population more than most other forms of open-angle glaucoma, and has a predilection for Caucasian males with myopia. The pigment is released due to iridocorneal contact owing to reverse pupillary block and blocks the filtering trabecular meshwork leading to decreased outflow and rise in IOP. The concave iris configuration on gonioscopy is a strong clue to the diagnosis of pigmentary glaucoma. ASOCT is a simple, non-contact technique for evaluation of anterior chamber parameters and serves as an adjunct to gonioscopy.

Our case was a 25 year old patient with advanced stage of pigmentary glaucoma and low IOP. Our patient is relatively young for presentation with advanced disease; however pigmentary dispersion has been described in as young as 14 year old patients. The patient presented with relatively low IOP which is uncommon. The IOP in pigmentary glaucoma is typically higher, 35-40 mm Hg and difficult to treat medically. The absence of iris transillumination defects and corneal endothelial deposits is not unusual as...
they are less common in black population. Thus, advanced optic nerve damage with relatively lower values of IOP (22 and 27 mm Hg) at a relatively younger age as seen in our patient, is uncommon in pigmentary glaucoma. The use of ASOCT aided in our diagnosis by showing the concave iris configuration and the iridolenticular touch responsible for the reverse pupillary block. The changes in iris configuration after iridotomy could also be documented.

The ASOCT is a good tool for documenting the concave iris configuration required for the diagnosis and its changes following laser iridotomy in pigmentary glaucoma.

References

Central Retinal Artery Occlusion and Simultaneous Third Nerve Palsy in HIV Patient

Raghnandan Kothari MS, Priyanka Dhaytadak MBBS, Pratik Gogri MBBS

Abstract

Ocular manifestations can occur in approximately 70% of human immunodeficiency virus acquired immune deficiency syndrome patients and posterior segment involvement seen in about 50% cases is the most common presentation. We report a case of 39 years old HIV positive male who presented with unilateral central retinal artery occlusion with simultaneous third nerve palsy. Magnetic resonance imaging brain revealed acute infarct in thalamo-capsular region on right side and old lacunar infarct involving pons on left side. We report this case for its rare presentation of CRAO and simultaneous third nerve palsy in HIV infection.

Key Words: nerve palsy, HIV, central retinal artery occlusion
DOI: http://dx.doi.org/10.7869/djo.2012.71

Case report

A 39 year old male patient presented with sudden, painless loss of vision in right eye of 15 days duration. Following this two days later, he also developed drooping of upper eyelid and outward deviation of the same eye. Six months back he had a febrile episode and was found to be HIV positive, however no anti-retroviral therapy was initiated. He was not a known case of hypertension, diabetes mellitus or any other systemic disease. He was also not on any medication. He was non-smoker and consumed alcohol occasionally. He did not had any significant past history. On ocular examination, visual acuity in right eye was perception of light and left eye was 20/20. Right eye had mild ptosis, exotropia of 15 degrees, with complete restriction of adduction and mild restriction of depression and elevation (Figure-1a,b). Left eye ocular movements were normal. Anterior segment was within normal limit in both eyes, except for relative afferent pupillary defect in right eye. Intraocular pressure was normal in both eyes. Ophthalmoscopic examination, right eye showed diffuse microvasculopathy is one of the most common ocular manifestation, seen in about 40% to 60% of human immunodeficiency virus (HIV) positive patients. Large retinal vessel occlusion is relatively uncommon and occurs in less than 1% of patients and appears to be more common in severely immunosuppressed patients. Retinal veins are affected more often than retinal arteries.

Neuro-ophthalmic manifestations occur in 3-8% of HIV positive patients. Most common findings include optic nerve head edema, nonspecific optic atrophy, cranial nerve palsies, especially of sixth nerve. We report a case of HIV positive patient who presented with sudden, unilateral loss of vision due to central retinal artery occlusion (CRAO) and simultaneous 3rd nerve palsy.

Figure 1(a) Right eye Mild Ptosis with Exotropia in Primary Gaze.

Figure 1(b) Right eye Restricted Adduction (Left eye Pupil Under Mydriatic Effect)

Rural Medical College, Loni, Maharashtra, India

Correspondence to : Dr. Pratik Gogri
E-mail : pratikgogri@yahoo.com
CD4 count was 350 cells/mm³. Cerebrospinal immune sorbant assay (ELISA) for HIV was positive. The protein (CRP) were negative. Serum enzyme linked (ESR) was 74 mm/hr. Rheumatoid factor (RA) & C-reactive were within normal limits. Erythrocyte sedimentation rate artery occlusion was noted in only about 3% cases.6 The 48.5% involving central retinal vein whereas central retinal retinal vascular occlusion in patients infected with HIV, Dunn JP et al have reported 1.3% risk of non-infectious oculomotor mononeuropathies are common in older patients and are attributed to microvascular atherosclerotic injury exacerbated principally by hypertension, diabetes mellitus or hypercholesterolaemia.15 Our patient was young and had no relevant vascular risk factors, however due to lack of facilities at our set up, we could not estimate antithrombin III, protein S and C levels. Premature atherosclerosis is frequent in HIV-infected patients though the exact mechanism is not known.16 HIV itself also has been identified as an etiologic agent of Ocular Motor Nerve Palsy (OMNP) either by its direct effect on the nerves or by indirect immune mechanisms. Jean-Claude Mwanza et al reported 3 HIV-positive patients of OMNP in absence of any obvious cause.17

In summary, though non-infectious CRAO and 3 rd nerve palsy is seen in HIV patients, simultaneous involvement of central retinal artery and third nerve palsy, in our case is a rare presentation in HIV infection.

Discussion

Thromboembolic phenomenon associated with HIV infection is relatively less common as compared to opportunistic infections and malignancies. Cases have been reported of isolated cranial nerve palsy and vascular occlusions, arterial occlusions being very uncommon.4,5 Dunn JP et al have reported 1.3% risk of non-infectious retinal vascular occlusion in patients infected with HIV, 48.5% involving central retinal vein whereas central retinal artery occlusion was noted in only about 3% cases.6 The specific etiopathy of the vasculopathy has not been elucidated completely. However, increased plasma viscosity, immune-complex deposition, and a direct cytopathic effect of the virus on the retinal vascular endothelium are believed to play a role.7,8 Isolated retinal vasculitis has also been associated with HIV infection. Increased erythrocyte aggregation and increased leukocyte rigidity in HIV infected patients have also been attributed to reduced microvascular blood flow in the posterior retina.9 HIV infection has been recognized as a prothrombotic condition and there is two to ten fold increased risk of venous thromboembolism with HIV infection.10 It is associated with elevated levels of cytokines, tumour necrosis factor-alpha (TNF-alpha), which decreases the fibrinolytic potential leading to vaso-occlusive events. Low CD4 count is one of the risk factors. In our case CD4 count was 350, however there are reports of thrombosis occurring with CD4 count as high as 800cells/mm³.11 Recently, Venkatesh et al, reported presence of retinal arterial plaques in AIDS patient, resembling fibrin emboli probably leading to branch or central retinal artery occlusion.12 However, no such plaques were seen in our patient. Neuro-ophthalmological disturbances have been widely described in both asymptomatic HIV positive subjects and in those with full blown AIDS. In addition, it has been shown that asymptomatic HIV infected subjects, even in early stages of the infection, exhibit ocular electrophysiological and psychophysical abnormalities. The prevalence of neuro-ophthalmic manifestations in patients with HIV cases regardless of the presence of neurological symptoms, has been reported to range between 3% and 8%.1,3,5 In the series reported by Helweg-Larsen et al only 17 of 589 patients with neurological manifestations (3%) had ocular nerve palsy.14

Cranial neuropathies in patients with HIV always prompt a search for opportunistic infections or lymphoma. In our case presence of acute infarcts on MRI and simultaneous occlusion of central retinal artery are suggestive of thromboembolic phenomenon / microvascular abnormality. The cerebral microvascularisation is frequently altered in HIV-infected patients and disturbed vasoreactivity contributes to microinfarcts. Ischaemic oculomotor mononeuropathies are common in older patients and are attributed to microvascular atherosclerotic injury exacerbated principally by hypertension, diabetes mellitus or hypercholesterolaemia.15 Our patient was young and had no relevant vascular risk factors, however due to lack of facilities at our set up, we could not estimate antithrombin III, protein S and C levels. Premature atherosclerosis is frequent in HIV-infected patients though the exact mechanism is not known.16 HIV itself also has been identified as an etiologic agent of Ocular Motor Nerve Palsy (OMNP) either by its direct effect on the nerves or by indirect immune mechanisms. Jean-Claude Mwanza et al reported 3 HIV-positive patients of OMNP in absence of any obvious cause.17

In summary, though non-infectious CRAO and 3
References

Tacrolimus for Ophthalmic Use: An Update

Sana Ilias Tinwala MD, Himanshu Shekhar MD, Sandeep Gupta MS, Rajesh Sinha MD, FRCS, Jeewan S Titiyal MD

Abstract

Tacrolimus, a macroclide isolated from a strain of Streptomyces, is an immunosuppressant and is used in cases of organ transplantation. It has a mechanism of action similar to that of cyclosporine. It is a lipophilic molecule which blocks the early phase of T-cell activation, thus inhibiting both T-lymphocyte signal transduction and IL-2 transcription. It is also inhibits the release of histamine from mast cells and impairs prostaglandin synthesis. Tacrolimus has shown to be effective in the treatment of immune-mediated diseases such as corneal graft rejection, ocular inflammation, ocular pemphigoid, and uveitis. In this article, we have tried to update the uses of tacrolimus in ophthalmology.

Key Words: tacrolimus, immunosuppressives, ocular inflammatory conditions
DOI: http://dx.doi.org/10.7869/djo.2012.72

Tacrolimus (FK506) is a novel macrolide immunosuppressant isolated from a strain of Streptomyces and is now used for transplantation worldwide. It has a mechanism of action similar to that of cyclosporine. Clinical trials of tacrolimus in liver, kidney, and pulmonary transplantation have shown it to be more effective than cyclosporine, and less likely to induce systemic hypertension and lipid abnormalities.

Outside the field of transplantation, tacrolimus ointment is currently available for treatment of atopic dermatitis in some countries. Tacrolimus ointment has higher efficacy and fewer adverse effects than corticosteroid ointments. In 1989, Kobayashi et al. first reported that tacrolimus suppressed corneal graft rejection in rabbits. Since then, the use of tacrolimus has been of special interest in ophthalmology because it was shown to be effective in the treatment of immune-mediated diseases such as corneal graft rejection, ocular inflammation, ocular pemphigoid, and uveitis.

Tacrolimus: Mechanism of Action

Tacrolimus is an 822 kDa immunosuppressant in the macrolide family, which is grouped with cyclosporine. Its action is initiated by binding to a class of peptidyl-prolyl cis-trans isomerases (PPases), designated FK506-binding proteins (FKBPs). The predominant FKBp in the T lymphocyte is a cytosolic protein of approximately 12 kDa, and is designated as FKBp-12. It is a lipophilic molecule which blocks the early phase of T-cell activation, thus inhibiting both T-lymphocyte signal transduction and IL-2 transcription. Furthermore, it is also reported that tacrolimus inhibits the release of histamine from mast cells and impairs prostaglandin synthesis in its de novo way. It also suppresses the histamine release and these three actions together may reduce allergic symptoms.

Systemic Use of Tacrolimus as an Immunosuppressant and Immunomodulator

Systemically administered tacrolimus was introduced to prevent rejection of solid organ transplants. It was first approved by the US FDA for use in liver transplantation. Tacrolimus is available as an intravenous formulation (5mg/mL) and as sustained-release capsules (0.5, 1, 3, and 5 mg). Dosages are titrated to target blood levels. The large differences in the pharmacokinetics of tacrolimus between individuals make it hard to predict what drug concentration will be achieved with a particular dose or dosage range. Systemically administered tacrolimus immunosuppressive therapy has been useful in controlling rejection following limbal allograft surgery, as well as for severe ocular inflammatory conditions such as uveitis and Behcet’s disease. Daily doses of 1-2 mg/day are used for ocular inflammatory conditions.

Pharmacokinetics of topically administered Ophthalmic Tacrolimus

Tacrolimus is a hydrophobic molecule which means that aqueous solutions at clinically useful concentrations are
likely to be unstable. Attempts to overcome this have led to ophthalmic tacrolimus prepared in castor oil, olive oil, and dextrin. However, burning, redness, itching and epithelial keratitis limit the use of such oil vehicles. To address the problem of tacrolimus’s limited ability to penetrate the cornea and reach effective therapeutic intraocular concentrations, several vehicles have been tested to improve its intraocular penetrability. Tacrolimus encapsulated in cyclodextrin has shown good intraocular distribution to prevent or delay corneal allograft rejection. Liposome was also found effective as a carrier to deliver higher tacrolimus concentrations into all ocular tissues compared with olive oil. Because of the extremely low blood concentration of tacrolimus after topical administration in animal models, systemic adverse effects are not anticipated, which will ease short-term safety concerns in clinical use.

**Pharmacology of Ophthalmic Tacrolimus**

Reduction of proinflammatory cytokines: Tacrolimus dramatically decreases CD4+ and CD8+ T-cell infiltration in corneal allografts, when administered topically. This is the result of the immunosuppressive role of tacrolimus in suppressing T-cell mediated lymphokines, IL-2 receptor expression, and the generation of cytotoxic T cells. CD68 is a marker of antigen-presenting macrophage cells and plays an important role in allograft rejection. Corneas treated with tacrolimus showed fewer CD68+ cells. This indicates that tacrolimus may inhibit the migration of macrophages into corneal grafts, thus reducing the amount of allograft antigen presented to naïve T cells through indirect pathways.

- **Reduction of Activated T Lymphocytes:** Tacrolimus forms a complex with FKBP intracellularly, and the complex eventually inhibits T-lymphocyte signal transduction.

- **Effect on Conjunctival Epithelium and Goblet Cell Density:** Squamous metaplasia, a condition of increased proliferation and abnormal differentiation of the conjunctival epithelium, may be observed by stained impression cytology and biopsies from aqueous tear-deficient dry-eye patients. It was shown in several animal models that tacrolimus eye drops inhibited inflammatory cell infiltration and also inhibited both the loss of conjunctival epithelium and decrease in the number of goblet cells, which play an important role in mucus secretion. Tacrolimus may confer protection of barrier function in the eyes, via normalization of the allergen-exclusion system.

- **Neuroprotective Effect:** Tacrolimus has been shown to exert profound neuroprotective and neuregenerative effects in vivo and in vitro. It has been shown that intravitreal injection of tacrolimus up-regulated the gene expression of neuroprotection-related molecules as well as decreased the expression of inflammatory responses related genes. These data support the notion that increased expression of neuroprotection-related genes by intravitreal injection of tacrolimus may play a potential role in retinal protection of the eyes with ongoing ocular inflammation, as well as in immune regulation.

- **Reduced Markers of Apoptosis:** Molecular markers of apoptosis, such as CD40, CD40 ligand (CD40L, also known as CD154), and Fas, have been shown to be elevated in the conjunctival epithelia of ocular inflamed patients. The anti-inflammatory and antirejection effects of tacrolimus may be partly due to blockade of CD40-CD154 interaction.

**Clinical Effects of Ophthalmic Tacrolimus**

**Corneal Graft Rejection**

Corneal transplantation is the most commonly performed transplant procedure in human medicine. Despite immune privilege, immunologic rejection represents one of the main reasons for corneal allograft failure. Immunohistologic studies showed a massive infiltration of CD3+, CD4+, CD8+ and CD68+ cells, and macrophages in rejected corneal allografts, all of which are considered to be responsible for graft rejection. The mainstay therapy of corneal rejection is the use of topical corticosteroid eye drops in the form of prednisolone acetate 1%. Because of the effect in reducing activated T cells, several recent studies have investigated the efficacy of topical ophthalmic tacrolimus in preventing corneal graft rejection. Topical tacrolimus ointment 0.03% is being evaluated as a second-line treatment in patients with high-risk corneal grafts.

**Inflammatory Conjunctival and Corneal Diseases**

- **Vernal Keratoconjunctivitis (VKC):** Though increased serum levels of total and specific IgE and the response to anti-allergic therapy are common features ascribed to VKC and to other allergic diseases, the accumulation of a large amount of immunologic data has proved that the pathogenesis of VKC is much more complex than a mere type 1 hypersensitivity reaction. In the past several years, many experimental and clinical studies about the cells and mediators involved in initiating and perpetuating the ocular allergic inflammation have shown that Th2 cells and their cytokines, corneal fibroblasts, and epithelium, along with various growth factors, play an important role in the pathogenesis of VKC. Histologically, eosinophilic infiltration is seen within giant conjunctival follicles and in the limbal Trantas dot. CD4+ T cells are found abundantly in conjunctival scrapings and biopsy specimens. These CD4+ cells had been cloned and were demonstrated to exhibit Th2 phenotypes. These T-cell mediated events are likely targets of tacrolimus therapy of VKC. Tacrolimus alleviates the symptoms of and improves visual acuity with few or no adverse effects in patients with VKC.

- **Atopic Keratoconjunctivitis (AKC):** The pathophysiology of AKC is still unclear. It appears to develop in the setting...
of atopic eyelid dermatitis, as a result of hypersensitivity reactions localized to the ocular surface or changes in eyelid function and anatomy. Immunopathologic changes include invasion of the epithelium by eosinophils and mast cells, and significant infiltration of the stroma by activated T cells that produce IL-2 and interferon-g. Elevated levels of the proinflammatory cytokines, tumor necrosis factor-a and interferon-g are found in tears of AKC patients. Topical corticosteroids may improve signs and symptoms but carry a risk of complications with chronic treatment. Tacrolimus ointment appears to offer a safer option for long-term therapy of this T-cell-mediated ocular surface disorder.

- **Atopic Blepharoconjunctivitis:** The efficacy and safety of tacrolimus ointment on conjunctival cytokine has been evaluated in a retrospective study of ten patients with severe atopic blepharoconjunctivitis or keratoconjunctivitis who were treated with 0.03% tacrolimus ointment once daily as an intermittent treatment. Marked clinical responses in blepharitis and conjunctivitis symptoms were observed after an average of 6 weeks of follow-up. A statistically significant decrease was observed in conjunctival eosinophils (decreased by 85%; p = 0.01), neutrophils (decreased by 50%; p = 0.01), and lymphocytes (decreased by 58%; p = 0.02).

- **Intractable Allergic Conjunctivitis:** In patients with intractable allergic conjunctivitis tacrolimus 0.03% ointment has been described. Tacrolimus 0.03% ointment is applied into the conjunctival sac of both eyes twice daily for 8 weeks, followed by a 2-week washout period. Benefits of topical tacrolimus are partially sustained for 2 weeks after termination of drug treatment, although there is a degree of clinical relapse in most cases. Blood tacrolimus levels are mostly undetectable. It has been seen that application of tacrolimus 0.03% ointment into the conjunctival sac appears to be effective and well tolerated in the treatment of allergic conjunctivitis refractory to traditional treatment.

- **Mooren’s Ulcer:** In a retrospective, interventional, consecutive case series, it was seen that compared with corticosteroid treatment, topical 0.1% tacrolimus used alone or combined with keratoplasty is an effective and well tolerated therapy for patients with recurrent Mooren's ulcer.

### Uveitis

Recent studies have shown that intravitreal injection or sustained release of tacrolimus can be effective for experimental uveitis. A multicenter, open, clinical trial in Japan first examined the use of tacrolimus in 53 patients with non-infectious uveitis. Diseases such as Behcet’s disease, sympathetic ophthalmia, refractory uveitis (to corticosteroids and cyclosporine), idiopathic retinal vasculitis, and sarcoidosis have been treated orally with tacrolimus. Most uveitis symptoms improved in a dose dependent manner, with effective doses of 0.1–0.15mg/kg. Severe adverse effects with tacrolimus treatment (including renal dysfunction and neurologic disorders) were observed, though these effects ceased when the drug treatment was discontinued. Therefore, tacrolimus is effective in patients with uveitis, but it is important to monitor the occurrence of adverse effects.

### Graft-Versus-Host Disease (GVHD)

GVHD is a severe and life-threatening complication of allogenic stem cell transplantation (ASCT) to treat leukemia or lymphoma. Ocular manifestations occur in about half of GVHD cases, with signs and symptoms of dry eye and meibomian gland disease being the most common. In a series of 130 patients who underwent ASCT, ocular manifestations were seen in 29 (22.3%) of those with chronic or acute GVHD. They were thought to be due to infiltration of the lacrimal glands and conjunctiva with T cells and consequent inflammatory mediated dysfunction of the secretory epithelium in these tissues.

Lacrimal gland inflammation was accompanied by increased numbers of stromal fibroblasts and fibrosis. Treatments for ocular manifestations of GVHD have included systemic immunomodulators and topical corticosteroids. Ocular GVHD can be very severe and unresponsive to standard GVHD treatment. A report by Ogawa and Masataka suggested that tacrolimus is effective in the treatment of chronic GVHD with ocular involvement. In another report, by Ahmad et al., of acute GVHD with extensive ocular involvement, >90% corneal epithelial defects in both eyes responded dramatically to systemic tacrolimus. To avoid the potential morbidity and mortality of long-term systemic immunosuppression, Tam et al. reported the use of topical tacrolimus 0.03% ointment in the treatment of ocular surface inflammation due to chronic GVHD.

### Proliferative Vitreoretinopathy (PVR)

Burak Turgut et al. investigated the effect of intravitreal tacrolimus on an animal model of PVR. When assessing the average PVR stages in terms of severe PVR rates, the PVR/ tacrolimus group had significantly improved when compared with the PVR/ saline group. The PVR/ tacrolimus group demonstrated significantly decreased levels of transforming growth factor-b, platelet-derived growth factor, and fibroblast growth factor when compared with the PVR/ saline group and also demonstrated significant improvement in epiretinal membrane formation and retinal fold in the presence of histopathologic levels.

The difference in degradation of photoreceptor cells between the two groups was not statistically significant. This study suggests that intravitreal tacrolimus application may suppress PVR development and that tacrolimus may merit investigation for the prophylaxis of PVR.
**Glucoma Filtering Surgery**

Sermal Arslan et al. investigated the effects of topically administrated tacrolimus and octreotide on modulation of postoperative scarring in experimental glaucoma filtration surgery. It was seen that topical administration of tacrolimus and octreotide effectively reduced the subconjunctival scarring 2 weeks after experimental glaucoma filtration surgery.

**Conclusion**

Tacrolimus is an immunosuppressant that was discovered after cyclosporine. It has a mechanism of action similar to that of cyclosporine, but is 50–100 times more potent. The pharmacology of tacrolimus includes reduction of proinflammatory cytokines, activated T lymphocytes, and markers of apoptosis; it also exerts neuroprotective effects as well as inhibits the loss of conjunctival epithelium and decrease in the number of goblet cells. Many chronic ocular disorders share similar mechanisms, and the effects of tacrolimus on corneal graft, inflammatory conjunctival and corneal diseases, uveitis, and GVHD have been reported by various studies mentioned above. These chronic disorders appear to be refractory to other available treatments in many patients. As a result, the patients must rely on prolonged courses of corticosteroids, with the attendant risks of cataract formation and corticosteroid induced glaucoma. Therefore, ophthalmic tacrolimus is a welcome addition to the therapeutic armamentarium for these corneal and ocular surface diseases, particularly in light of its excellent safety profile to date.

**References**

**5th DOS Teaching Programme**

16th & 17th February 2013  
Jawahar Lal Auditorium, AIIMS, New Delhi  
**Comprehensive Ophthalmology**  
Nearest Metro Station AIIMS on yellow line

---

**Registration Fee**

<table>
<thead>
<tr>
<th>Category</th>
<th>Till 24.01.13</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOS Member</td>
<td>₹ 300*</td>
</tr>
<tr>
<td>Non Member</td>
<td>₹ 500*</td>
</tr>
</tbody>
</table>

*Inclusive Service Tax @12.36%

---

**General Information**

The Delhi Ophthalmological Society is organising its fifth Teaching Programme “DOST-5” aimed at teaching the Post Graduate (MD/MS/DNB/DO Ophthalmology) students. It will be a two day exhaustive course covering all important topics. All the Members & Students are welcome to attend!

---

**64th DOS Annual Conference**

12th to 14th April 2013  
Hotel Ashok, Chanakyapuri, New Delhi  
**Gen Next**  
Nearest Metro Station Race Course on yellow line

---

**Registration Fee**

<table>
<thead>
<tr>
<th>Category</th>
<th>Till 23.01.13</th>
<th>Till 11.03.13</th>
<th>Spot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Member Delegate</td>
<td>₹ 1800**</td>
<td>₹ 3000**</td>
<td>₹ 3600**</td>
</tr>
<tr>
<td>Member Spouse</td>
<td>₹ 1200**</td>
<td>₹ 2400**</td>
<td>₹ 3600**</td>
</tr>
<tr>
<td>Member Resident*</td>
<td>₹ 1200**</td>
<td>₹ 2000**</td>
<td>₹ 3200**</td>
</tr>
<tr>
<td>Non Member Delegate</td>
<td>₹ 3000**</td>
<td>₹ 5000**</td>
<td>₹ 6000**</td>
</tr>
<tr>
<td>Non Member Spouse</td>
<td>₹ 2200**</td>
<td>₹ 4200**</td>
<td>₹ 5400**</td>
</tr>
<tr>
<td>Non Member Resident*</td>
<td>₹ 1600**</td>
<td>₹ 2800**</td>
<td>₹ 4000**</td>
</tr>
<tr>
<td>Exhibitor Delegate</td>
<td>₹ 3200**</td>
<td>₹ 5300**</td>
<td>₹ 6400**</td>
</tr>
<tr>
<td>Foreign Delegate/Spouse/Resident</td>
<td>US$ 120**</td>
<td>US$160**</td>
<td>US$ 180**</td>
</tr>
</tbody>
</table>

---

**IMPORTANT NOTES:**

- For Spot Registrants: Complete Kit subject to availability.
- Photo I-card will be required at the time of collection of registration kit.
- *Proof of residency required from HDD along with the registration form.
- *Inclusive Service Tax @12.36%
- There will be no refund on cancellation.
- Registration limited to 5000 delegates.
- Pre-Registration closes on 11th March 2013
- Entry to Scientific Sessions & the Exhibition Area will be Restricted to Registered Delegates only.
- Lost badge will be replaced at the registration counter for a fee of Rs.300/-
- Past Presidents of DOS or AIOS and Senior Member (>70 years) will be registered complimentary.

---

**HIGHLIGHTS**

- Live Surgery
- Exhibition
- Instruction Courses
- Scientific Sessions
- Video Assisted Courses
- Free Paper
- Metro Pick & Drop
- E-Posters
- Gala Dinner
- DOS Annual Quiz

---

**Call for Abstract**

Free Papers / E-Posters / Videos  
Only Online Submission through the DOS website: www.dosonline.org

Last Date for Abstract Submission for Free Papers, E-Posters & Videos: 1st February, 2013

- Free Paper Session – 1: Dr. A.C. Agarwal Trophy Session (DOS Member). Best Free Paper will be sent to AIOS-2014. The winner will be given a travel grant to attend the same and must agree to present the paper in AIOS-2014.
- Free Paper Session – 2: Dr. T.P. Agarwal Trophy Corna Session (DOS Member)
- Free paper Session – 3: Winner of Best Paper in this session will be awarded “Certificate of Merit”

---

**Conference Secretariat**

Dr. Rohit Saxena  
Organising Secretary  
Room No.: 473, 4th Floor, Dr. R.P. Centre for Ophthalmics Sciences, AIIMS, Ansari Nagar, New Delhi – 110029, India  
Email: dosrecords@gmail.com Website: www.dosonline.org
Delhi Ophthalmological Society

5th DOS Teaching Programme
16th & 17th February 2013
Jawahar Lal Auditorium, AIIMS, New Delhi

64th DOS Annual Conference
12th to 14th April 2013
Hotel Ashok, Chanakyapuri, New Delhi

Gen Next
Sclerosing Agents in Ophthalmology

Smriti Nagpal MBBS, Ruchi Goel MS, DNB, FICS, Sushil Kumar MD, Sonam Garg MS, DNB, FAICO

Abstract

Sclerotherapy is a surgical procedure used for vascular and lymphatic malformations, in all age groups, wherein a sclerosing agent is injected into a vessel to make it shrink. It involves injection of the agent intravascularly intralesionally or topically, under direct vision or under the guidance of radiological imaging. Sclerotherapy has primarily been used in ophthalmology for treatment of arteriovenous malformations like hemangiomas and carotico-cavernous fistulas, and lymphatic abnormalities like lymphangiomas. Sclerosing agents are chemical compounds which cause endothelial injury leading to inflammation and vascular thrombosis. They may be classified into various categories like detergents, hyperosmotic agents, corticosteroids, cytotoxic agents etc. A short description on beta-blockers has also been included in this article, even though beta-blockers are not sclerosants per se. Polyvinyl alcohol, sodium tetradecyl sulphate (STS) and ethanol may be used for arterio-venous malformations, while for lymphangiomas agents like sodium morrhuate, STS, doxycycline and OK-432 are used. In hemangioma patients, corticosteroids and beta-blockers are amongst the first line therapy.

Sclerosing Agents/ Sclerosants

These are chemical compounds which cause endothelial injury leading to inflammation and vascular thrombosis. An intact endothelium aggressively lyses the thrombus, therefore, vascular fibrosis and obliteration occurs only in response to irreversible endothelial cellular destruction and exposure of the underlying subendothelial cell layer. Sclerosant is diluted with blood as it diffuses away from the site of injection, thus if a strong sclerosant is injected there will be three zones of action. (Figure 1)

Types of Sclerosants

Historically various foreign substances have been used for producing venous endothelial trauma. These include, among others, ‘a slender rod of iron’, reportedly used by Hippocrates himself and absolute alcohol, introduced in the 1840’s. However, early sclerosing agents caused many deaths from sepsis and from pulmonary embolism, as well as a high incidence of allergic reactions, local tissue necrosis, pain, and failed sclerosis.

Ideal Characteristics of a Sclerosant:

- No systemic toxicity
- Effective only above some threshold concentration
- Require a long period of contact to be effective, hence, more effective in areas of stasis and relatively safer in the deep veins where there is high flow.
Non-allergenic
• Strong enough to sclerose even the largest vessels, yet it would produce no local tissue injury if extravasated
• Not cause staining or scarring or telangiectatic matting
• Perfectly soluble in normal saline
• Painless upon injection
• Inexpensive

At present, such an agent does not exist.

**Classification of Sclerosants**

> **Detergents**

This class of drugs came into use in the 1930’s. They work by a mechanism known as protein theft denaturation, in which an aggregation of detergent molecules forms a lipid bilayer in the form of a micelle, which then disrupts the cell surface membrane and may steal away essential proteins from the cell membrane surface leading delayed cell death.

**Determinants of activity of detergent solutions:**

1) **Concentration:** Micelle formation occurs only above a threshold concentration called the Critical Micellar Concentration (CMC), below which the agent causes no injury.
2) **Temperature:** Detergent molecules are much more soluble in cold solutions than in hot ones. Hence, their sclerosing effect is higher at warmer temperatures.
3) **Mixing:** The surface area of lipid bilayer structures is maximized when the solution is shaken and because it is the surface of these structures that causes protein theft denaturation, a solution that has been shaken will be a more effective. Unfortunately, foamy bubbles that are injected into the veins, run the risk of causing air embolism.

**Currently available detergent agents:**

- Sodium morrhuate
- Ethanolamine oleate
- Sodium tetradecyl sulphate (Sotradecol)
- Polidocanol
- Scleremo

> **Hypertonic and Ionic Solution (Osmotic Sclerosants)**

These solutions were thought to cause endothelial death by osmotic cellular dehydration. But recent evidence suggests that these agents probably work by causing conformational denaturation of cell membrane proteins in situ. Like the detergents, they can be diluted to the point where they have no further cellular toxicity. These include:

- Hypertonic saline
- Sclerodex
- Polyiodinated iodine

> **Cellular Toxins**

They probably act by a direct or indirect chemical toxicity to endothelial cells. Such agents are less useful since they are also toxic to other body cells and also they remain toxic to some degree even after extreme dilution, so that there is no real threshold below which injury will not occur. These include:

- 5 Fluorouracil
- Bleomycin

> **Corticosteroids**

> **Others Include**

Ethibloc, Alcohols (polyvinyl alcohol, ethanol)
OK-432, doxycycline, fibrin glue, cyanoacrylate glue and beta blockers**

**Although these agents are not classified as sclerosing agents, yet they are now being widely used in the treatment of infantile hemangiomas.**
Sclerotherapy of some common ophthalmic pathologies

- Arteriovenous malformations

  Polyvinyl Alcohol (PVA): PVA is used as a suspension form. The particles are mixed in a combination of saline and contrast. PVA has a tendency to flocculate or settle out of solution. Hence, immediately prior to injection, the material should be resuspended so that uniform injection can be obtained. PVA has been used as an add-on treatment in orbital AVM’s.1,2

  Ethanol (95% to 98% conc.): Firstly, high flow lesions are excluded using various imaging techniques. Then, under ultrasound guidance, the AVM is cannulated and ethanol is injected. The volume depends upon size of the lesion. It’s left in place for 5-10 mins and then aspirated out. Repeat sessions may be needed several weeks apart. The volume of ethanol that can be injected should be small (0.5-1 mL/kg) to minimize systemic complications and is, therefore, often ineffective. Max upto 60 ml may be used at one time. Having a low viscosity, it passes readily through arteriovenous shunts making it suitable for embolisation of AVM in conjunction with supra-selective catheterization of the nidus.

  **STS**: 1.2 ml intraarterial injection was used in a study. It was injected into the ophthalmic artery, with the cannula just beyond the central retinal artery.3

  **Fibrin glue** can also be combined with different sclerosing agents to aggregate the drugs and increase the time of pharmacological effect.4

- Lymphangiomas

  The endothelial lining of lymphangiomas is vulnerable to infections and chemical irritants, and spontaneous infection of lymphangiomas can lead to total regression of the lesion. However it is essential to exclude coexisting venous or arteriovenous malformations, since intravascular injection of sclerosing agents could damage normal vessels. Hence, hemodynamic assessment of deep orbital lesions is necessary pre-treatment.

  **Sodium morrhuate 5%**: It should be used only in superficial orbital lymphangiomas because of the potential for severe deep orbital inflammation and fibrosis. For this intralesional sodium morrhuate 5% can be injected under direct visualization or under radiographic guidance. The lesions regress in 1 to 6 injections of 0.2 to 2.1 ml sodium morrhuate 5%. Reported complications are orbital hemorrhage and transient keratopathy.

  For deep lymphangiomas adjunctive intraoperative injection of sodium morrhuate 5%, under direct visualization into lymphangioma channels prior to surgical excision is performed. Because injected tissues are partially excised shortly after injection, deep orbital sclerosis and inflammation are lesser. Furthermore, the sclerosing agent remains in residual lymphangioma tissue, causing further sclerosis and involution. Because lymphangiomas lack communication with surrounding tissues, residual sclerosing agent remains within the lesion and mostly spares normal tissues. This leads to maximal debulking of the lymphangioma mass, with minimal deep inflammation. In the orbit, incremental volumes of 0.2 ml can be injected beneath the tumor surface, turning the surface dark from clotting. Injected tissues are then excised. Cycles of dissection, injection, and excision can be repeated until the majority of tumor bulk is removed.

  **STS**: It is a widely used, safe and effective solution for destroying unwanted veins. Several authors reported good results after intralesional injection into orbital lymphangiomas.5 The lesions are punctured directly under CT guidance and 3% STS is injected intralesionally. One to three injections in total, spaced at least 3 months apart, with each injection involving a volume of 1.5-2 ml of STS can be administered.6 After the injection, the patients are given intravenous dexamethasone (0.3 mg/kg) and cloxacillin (50–100 mg/kg) divided into 4 doses, followed by oral prednisolone (1 mg/kg/per day) and oral cloxacillin (50–100 mg/kg) for 1 week.7

  **Polidocanol**: Jain et al8 achieved a volume reduction of 96% to 100% in 3 patients with lymphangiomas after sonographically guided percutaneous injection of 1% polidocanol 1-6 ml, depending on the size of the lesion.

  **Ethanol**: Sclerotherapy can be affected using CT-guided technology, under sedation or general anesthesia, using <1.0 ml/kg of body weight.

  Shiels et al9 reported good results after dual-drug chemoablation (sequential intracystic sodium tetradeetyl sulfate [STS] and ethanol) of macrocystic lymphangiomas. They hypothesized that STS effectively releases transmembrane lipoproteins from the lymphangioma cell membrane and leads to increased membrane permeability and, therefore, allows greater membrane penetration of ethanol. Bleomycin has also been used in lymphangiomas, mostly in combination with surgery.

  **Doxycycline (5-20 mg/ml)**: Available as a powder that can be suspended in saline or contrast medium. Since the injection is very painful, use of general anesthesia may be preferred. The effect is usually seen after 4 to 6 weeks. An alternative application of doxycycline in cases of massive lymphangiomas is an irrigation of the lymphangioma via a drainage catheter.

  Ethibloc and OK-432 are also used.

- Haemangiomas10

  Since most capillary hemangiomas undergo spontaneous involution, treatment is reserved for patients at risk for permanent visual impairment, which maybe due to amblyopia, compressive optic neuropathy or proptosis with exposure keratopathy. Drug therapy is also indicated
for mixed hemangiomas, proliferative hemangiomas, and hemangiomas that affect vital organs or are life-threatening. Several treatment modalities exist, used depending on the lesion location and size and the potential adverse effects of intervention.

**Corticosteroids:** are the most commonly used agents.

- **Systemic:** are generally considered first-line treatment, especially helpful in diffuse or deep orbital lesions. Effectiveness depends on the dose used. The best results are seen at <6 months of age. Oral prednisolone is more effective than intravenous injection of methylprednisolone. Oral prednisolone (2.0–5.0 mg/kg) is used, every other morning for 6-8 weeks and then tapered. The treatment can be repeated for 2 or 3 cycles if needed, at 4-6 week intervals. Rebound growth after corticosteroid discontinuation can prolong treatment, leading to increased systemic side effects.

- **Intralesional:** A combination of short- and long-acting intralesional corticosteroids (1:1 mixture of triamcinolone acetate @ 1-2mg/kg to a max of 60 mg, 40 percent and betamethasone sodium phosphate or acetate 6 mg/ml) often results in an initial rapid regression, followed by a sustained response over the next 6-8 weeks. Posterior sub-Tenon’s injection has also been used for cutaneous, anterior and focal orbital hemangiomas. Local complications include dystrophic periocular calcifications, skin hypopigmentation and fat atrophy, eyelid necrosis, central retinal artery occlusion (CRAO) and adrenal suppression.

- **Topical (clobetasol propionate 0.05 percent):** Are best used as adjunctive therapy. They are most effective in superficial cutaneous lesions and have significantly fewer side effects, although adrenal suppression can occur when used in large doses over a prolonged period.

**Immunomodulators.** They may be especially effective for lesions with an orbital component.

- **Vincristine** has been moderately successful in treating the diffuse visceral hemangiomas of Kasabach- Merritt syndrome.

- **Cyclophosphamide** (10 mg/kg/day) has been used as monotherapy or in combination with systemic corticosteroids. Long term use may lead to myelosuppression and hepatotoxicity.

- **Interferon alfa-2a** is less commonly used due to its neurotoxic side-effects (spastic diplegia).

In an effort to shorten the treatment period, a recent retrospective case series used a combination of cyclophosphamide (10 mg/kg/day for three days, then every two weeks) and interferon alfa-2a (3 million U/m2/day subcutaneously). Treatment was limited to maximum 6 months, with fairly good results.

- **Imiquimod** can be used for small and intermediate-sized hemangiomas located in inconspicuous sites, with alternate day topical application, for a cycle of 3 to 5 months. (Advantages: easy to use, safe, and no local irritation or systemic effects. Disadvantage: may cause hyperpigmentation).

**Bleomycin:** Administered intralesionally in complicated cutaneous hemangiomas and in proliferative hemangiomas which respond poorly to steroids and/or laser therapy. Technique: 8 mg is dissolved with 2% lidocaine and then mixed with normal saline and dexamethasone (5 mg/1 mL). The injection infiltrates evenly within the lesion until the surface of the lesion appears pale and is followed by compression for 15 to 30 minutes. The injection can be repeated every 2 to 3 weeks; each dosage is not more than 8 mg.

**Vincristine:** It is used for hemangiomas that are unresponsive to steroids or rebound after steroids. 0.5 to 1.0 mg/kg is given i.v. once a week for 6 weeks. This cycle may be repeated if necessary.

In cases with fulminant life-threatening platelet consumptive coagulopathy, diluted ethanol embolotherapy was reported to be very effective.

**Commonly Used Agent**

A) **Sodium morrhuate** (concentrate 5%, pH 9.5, iv use only)

- Mixture of saturated and unsaturated fatty acids, derived from cod liver oil.

- Contraindications: Allergy, DVT, vasculitis, uncontrolled DM, thyrotoxicosis, TB, neoplasms, asthma, sepsis, blood dyscrasias, acute respiratory or skin disease and in bedridden patients. Use with caution in pregnant/lactating mothers.

- Extravasation may cause extensive tissue necrosis

- Side effects: Aching or burning sensation at injection site with discoloration, redness, swelling or ulceration; allergic reactions. Pulmonary embolism and anaphylaxis have been documented. (test dose of 0.25-1 mL recommended).

B) **Sotradecol** (Sodium Tetradecyl Sulphate (STS), 0.1-3%)

- Synthetic long chain fatty acid.

- Adverse Effects: Nausea, vomiting, cough, shortness of breath; pulmonary embolism; pruritus; redness of conjunctiva; injection site problems (hyperpigmentation, ulcer or necrosis following extravasation); hypersensitivity reaction and anaphylaxis (test dose of 0.5ml of 1% solution is recommended).

Contraindications: hypersensitivity, pregnancy, thrombophlebitis, hyperthyroidism. Acute infections, TB, prolonged recumbency, cardiac insufficiency, uncontrolled diabetes, arterial disease and asthma.
C) **Polidocanol** (1%, max upto 2mg/kg/day, iv use only)
- Synthetic long-chain fatty alcohol.
- Advantages: Painless upon injection, does not produce necrosis, and has been reported to have a very low incidence of allergic reactions.
- Side effects: Injection site problems (hematoma, irritation, discolouration, pain, pruritus, thrombosis, ischemia); neovascularization; anaphylaxis and cardiac arrest have been documented
- Contraindications: Hypersensitivity and acute thromboembolic disease
- Pregnancy Category C, Lactation: caution advised.

D) **Polyvinyl Alcohol** (Foam particles, 50-2000 microns)
- PVA is utilised predominantly for tumor embolisation as well as pre-operative devascularisation of other lesions.
- Aggregation of PVA particles may result in occlusion of the delivery catheter or a more proximal vascular occlusion than intended.
- MoA: Direct mechanical obstruction as well as induction of a foreign body type granulomatous reaction. Over time this reaction subsides and the vessel may recanalise.

E) **Ethanol** (95%-98%, @0.5–1 mL/kg, max upto 60ml)
- Complications: nerve injury, skin necrosis, and systemic effects (hypotension, respiratory depression, cardiac arrhythmias, CNS depression, seizures, pulmonary hypertension and hypoglycaemia)
- There is an intense sclerotic reaction, and easy passage into normal adjacent vessels causing damage.
- Impractical in small children due to high risk of systemic toxicity.
- MoA: Denaturation of endothelial proteins, results in immediate thrombosis.

F) **Doxycycline**
- Broad spectrum antibiotic
- Relatively nontoxic, hence, large volumes can be used in a single session.
- The exact MoA is unknown, but an inflammatory process causing fibrosis and involution of cysts is speculated. Also causes inhibition of MMP’s and suppression of vascular endothelial growth factor (VEGF)-induced angiogenesis and lymphangiogenesis.
- Side Effects: local erythema and pain. Systemic absorption may cause long-term effects on tooth and skeletal development in children.

---

**Beta-Blockers**

The recent accidental discovery of accelerated involution of infantile hemangioma induced by propranolol (nonselective beta-blocker) and acebutalol (beta1-adrenoreceptor blocker), has resulted in a significant paradigm shift in the treatment of proliferating infantile hemangiomas. Propranolol is now the preferred treatment for the same.

MoA: Unknown. Their effects on beta-receptor stimulation, down-regulation of angiogenic growth factors, reduction in expression of MMP’s and induction of apoptosis have been suggested.

Propranolol is used as a 2-3mg/kg/day dose in two to three divided doses, over 6 weeks to 7 months. Acebutolol is used in doses of 8-10 mg/kg/day. The optimal duration of treatment remains to be determined. Topical beta-blockers (eg, Timolol maleate 0.5% BD or as a gel preparation with BD local application) have shown promising results.

Although beta-blockers are relatively safe, they should be used with caution, especially in premature babies and normotensive infants. The potential adverse effects of propranolol include bradycardia, hypotension, and hypoglycaemia.

**Conclusion**

Sclerotherapy is a treatment modality for management of various ophthalmological lesions like hemangiomas, caroticocavernous fistulas, lymphangiomatous tumors etc. which is based on the principle of vessel regression following injection of sclerosing agent intravascularly, intralesionally or topically and oral administration.

**References**


---

**Announcement**

**Delhi Journal of Ophthalmology**

The Best “Original article” published in the Delhi journal of ophthalmology in a calendar year will be awarded in the **DOS Annual Conference**.

**Editorial Office**

Dr. Rajesh Sinha
Editor, DJO & Associate Prof. of Ophthalmology
Room No. 479, Dr. R.P. Centre for Ophthalmic Sciences,
AIIMS, Ansari Nagar, New Delhi - 110029
Eyelash in Lacrimal Punctum

Rachna Meel MS, Shashi Vashisht MS

A 30-years-old male patient presented with watering and foreign body sensation for 3 days. Ocular surface examination on slit lamp did not reveal any foreign body or cilia. Fluorescein staining revealed scratches on cornea near the medial limbus. Examination of the eyelid margin revealed an eyelash protruding from the upper punctum (the hair bulb was in the canaliculus) (Figure 1). There was no associated inflammation of the draining canaliculus or any eyelid disease likely to cause trichiasis. Moreover, the eyelash could be easily removed with a forceps without the use of any sharp movement that is required for epilation, thereby proving that the eyelash was not actually growing from the punctum but was just lying there.

Discussion

Eyelashes are shed regularly like body hair. Usually shed eyelashes do not cause any symptoms. However, sometimes such cilia may get misplaced and have been reported to end up in the lacrimal puncta, meibomian gland orifice, subconjunctival space and corneal stroma. An eyelash when it gets misplaced into the punctum has the potential to cause additional problems. Therefore, it is important to identify shed cilia in this location, which may be easily overlooked. Eyelashes are normally arranged in two or three rows on upper and lower eyelids. They are more numerous on upper eyelid, approximately 150 eyelashes being present on upper and 75 on the lower eyelid. These are regularly shed every 100 to 150 days. Normally, shedding of an eyelash does not cause any symptoms. Sometimes, however, an eyelash may settle down in an unusual location after being shed. Such misplaced cilia have been reported in the lacrimal puncta, meibomian gland orifice, subconjunctival space and even corneal stroma. The patient usually presents with a history of foreign body sensation and watering. Unless the treating ophthalmologist is aware that a shed out eyelash may be found at such an unusual location, one may not look for it or misdiagnose it for an abnormally grown or metaplastic eyelash.

Once an eyelash is shed onto the external ocular surface, it causes foreign body sensation. This causes reflex tearing that carries away the eyelash to the lacus lacrimalis and thus brings it in close contact with the lacrimal puncta. From here it may travel into the punctum either due to propelling action of the eyelids or due to negative pressure created in the canaliculus in each blink cycle. Once the eyelash enters into the punctum, the barbs on the hair prevent it from being expelled. It can further obstruct the canaliculus, causing epiphora, or cause inflammation and/or infection, causing canaliculitis or dacryocystitis. Eyelashes are reported to enter the upper punctum more frequently than the lower punctum. To conclude, in patients with nonspecific eye symptoms, a misplaced eyelash may be the cause which can be easily overlooked and treated inappropriately. Therefore it's important to examine the eyelid margin carefully in such cases.

References

Response

Dear editor,

I really appreciate the comment given by a fellow on my article Minimal Duration Cataract Surgery (MIDC..... in April - June, 2012, DJO Vol.22 No.4). SICS is a surgery of comfort, speed and simplicity. I want to respond to the two queries in the letter in DJO July - September, 2012.

➢ Q-1. We feel that it is difficult to create a scleral incision as well as scleral tunnel without a conjunctival flap ?

I also felt so in the beginning but if the incision is on the part where conjunctiva is adherent it is easy. So the incision has to be closer to the limbus cutting conjunctiva and making a mark on the sclera. The touch and feel of sclera with crescent knife leads one to the appropriate depth in limbus. The incision can be curved particularly when one expects larger incision.

➢ Q-2. However superonasal incision and tunnel creation as well as manipulation through it are difficult over the brow. It becomes even more difficult in patients with high brow as well as deep seated eye ?

Yes i agree that surgery is slightly difficult in left eye particularly in deep set eye and in high eyebrow but it is possible by rotating the eye ball down downwards during the delivery of nucleus by holding it at the lower limbus or one can change the approach to supero-temporal as suggested by you.

Ram Lal Sharma MS

Department of Ophthalmology, Indira Gandhi Medical College, Shimla, (H.P), India
Pterygium Masking Bifid Medial Rectus Insertion and Strabismic Amblyopia

Malvika Gupta DO, DNB, Vishal Vohra MBBS, Anshu Anind MBBS, Om prakash Gupta MS, Ashok Pathak MS

Anomalous muscle insertions are infrequently seen in daily clinical practice, presenting in most cases with strabismus. We, in case of a patient with pterygium, peroperatively discovered bifid insertion of medial rectus muscle. No preoperative complaints of ocular deviation were present. Proper orthoptic evaluation had been skipped, in view of evident pterygium encroaching onto the cornea. Postoperative exotropia of 15 degrees was seen.

Anomalous orbital structures are a rare cause of strabismus. These structures attach to the globe and produce a mechanical restriction, resulting in incomitant motility disorders. Three types of anomalous structures have been described by Lueder in 2002. The first ones arise from the extraocular muscles and insert in abnormal locations. The second are fibrous bands located beneath the rectus muscles. The third are discrete anomalous muscles that originate in the posterior orbit and insert in abnormal locations on the globe. These structures have been associated with unusual patterns of strabismus. Nussbaum first reported this anomaly in 1893 in a patient with an accessory muscle that arose from the lateral rectus muscle and divided into three heads.
The extraocular muscles arise from mesodermal tissue in the orbit, which begins to differentiate into early myoblasts approximately 5 weeks after conception and acquires the characteristics of mature muscle by approximately 14 weeks. All six extraocular muscles develop simultaneously along their entire length. The mesenchymal tissue that condenses to form the muscles is separated into inferior and superior complexes. The superior rectus and superior oblique muscles develop from the superior complex, and the inferior rectus and inferior oblique muscles develop from the inferior complex. The medial and lateral rectus muscles develop from both complexes. This explains the etiopathology of bifid horizontal recti.

A 50 year old lady presented with a reddish mass growing in her left eye. Visual acuity was 6/6 in right eye and 6/18 in left eye. A pterygium was noted on the nasal side of left eye. She was disturbed by the cosmetic disfigurement but denied any visual complaints. Keratometry showed steepening of horizontal axis with K value of 45.5 D in horizontal and 42.0 D in the vertical axis. Regular orthoptic screening was skipped, in view of an asymptomatic patient with pterygium tissue encroaching onto the cornea.

Patient was prescribed non-steroidal antiinflammatory agents. No regression was seen over a 3 week period and an excision of the pterygium was planned with autologous conjunctival transplantation. Peroperatively, we were in for a surprise as beneath the pterygium tissue was an anomalous bifid medial rectus muscle (Figure 1), accessory limb being confused initially with remnant of pterygium tissue. This was similar to Lueder’s first type of anomaly. The muscle was composed of two distinct parallel muscular heads and insertions (Figure 2), seen to originate from a common point. The wider superior limb of this muscle inserted in a fan like fashion, 2.5 mm from the limbus, widest diameter being 4.5 mm while the narrower, much thinner, inferior limb, measuring 1.5 mm wide, inserted farther behind, 5 mm from the limbus. The two limbs were 1 mm apart. These were carefully dissected and remaining pterygium tissue was excised and autologous conjunctival autografting (AL-CAT) was done. Forced duction testing was negative. Cover testing revealed exo deviation of 15 degrees (Figure 3), confirmed on prism bar cover test (PBCT) to be of 30 prism dioptres (PD). Final postoperative outcome looked good (Figure 4,5) though the acuity did not improve. Poor acuity, which was initially being considered to be secondary to astigmatism, could now be attributed to strabismic amblyopia. No craniofacial anomaly, as has commonly been reported, was evident. Few other cases have been reported with similar bifid medial rectus insertions which are mostly seen in association with strabismus. Some are seen without strabismus, but the anomaly in those is usually bilateral. No case has been seen to present with pterygium. We now plan medial rectus strengthening surgery by disinserting both ends of the muscle, suturing the two limbs together and reinserting them 5.5 mm posterior to the limbus as would be the normal anatomic configuration and location. Poor visual prognosis in view of amblyopia has been explained.

References

Industry News

MICS Preloaded IOL in Both Clear and Yellow Platform: Isert 250/Isert 251

Recently Hoya Launches iMICS1 Preloaded IOL In Both Clear and Yellow Platform.

iSert 251(Yellow) iSert 250 (Clear) is a preloaded system. The entire system is completely disposable. This unique concept has the following advantages:

➢ Simple
➢ Clean
➢ Small Incision

iSert Preloaded System provides more

Safety, Precision and Predictability

Efficient One Step Implantation

During the implantation, the unique hybrid chemically bonded PMMA and soft acrylic non-stick haptics of the iMics1 provide optimal visibility, controlled unfolding, and self centration of the Optic.

Image Sharpness

HOYA’s Aspheric Balance Curve (ABC) compensates for decentration and reduce spherical aberration. The iMics1 uses the proven AF1 material. The square edge design of this IOL is also enhanced through the new pad-polishing manufacturing process that not only retains optical quality of the optic but also achieve the PCO-inhibiting feature of the iMics1.

Isert 250(Clear) gives excellent, gentle and controlled insertion due to the screw plunger and is compatible with MICS. There is no jerky movement as it happens with many cartridges and push system injector. The safety margin is very high since it is in the preloaded platform.

Dr. Arup Chakraborty, Amulyajyoti Eye Foundation, Kolkata West Bengal
Authorship responsibility, Disclosure and Copyright transfer

Manuscript title (including all supplementary digital content such as tables, diagrams, figures, photographs, flow charts, videos, etc) : __________________________________________________________

_____________________________________________________________________________________

_____________________________________________________________________________________

Manuscript type: □ Original article □ Case report □ Technique □ Photoessay
□ Major Review □ Brief Communication □ Allied Ophthalmic Sciences
□ Recent Advances

Corresponding Author (Full name with designation details) : ____________________________________

_____________________________________________________________________________________

_____________________________________________________________________________________

Complete Mailing Address: _______________________________________________________________

Email ID: _____________________________________________________________________________

Telephone / Mobile number / Fax: __________________________________________________________

I, ___________________________________________ on behalf of all my co-authors of the manuscript
entitled _______________________________________________________________________________

_____________________________________________________________________________________

_________________________ declare that the submitted work is original and does not infringe upon any copyright. I guarantee that this
work does not contain any material that is libelous / contentious. The authors accept full responsibility for
the views expressed in the manuscript and hereby give consent for its publication in the Delhi Journal
of Ophthalmology (both print and electronic media). The authors hereby also identify any financial interests,
affiliations to institutions/organizations/companies relevant to the manuscript.

Financial Disclosure / Conflict of Interest: __________________________________________________
(Write None if there is no financial interest)

Signature: _____________________________________________________________________________

Date & Place: __________________________________________________________________________

The corresponding author is required to sign the authorship responsibility, disclosures and copyright
transfer form on behalf of all authors and send in the signed form ( by fax or email) to the Editor,
Delhi Journal of Ophthalmology, Room No 479 4th Floor, Dr R P Centre, AIIMS, Ansari Nagar, New Delhi
110029.

E-mail: editor@djof.org

Dr. Rajesh Sinha

Editor

Delhi Journal of Ophthalmology
Information for Authors

Delhi Journal of Ophthalmology accepts articles which are original and not being considered for publication in any other journal. All submitted manuscripts are subject to review by independent experts in the field. You may submit your manuscripts with a covering letter to the Editor of the journal.

Manuscript Submission

At Delhi Journal of Ophthalmology, we are soon starting the online submission of manuscript, the information regarding which will be soon provided in DOS times, DJO and the website of DJO and DOS. Till date we have managed our relationship with authors on a personal level and authors have been sending their manuscript by e-mail to the editorial office.

Editorial policy

Delhi Journal of Ophthalmology endorses the Uniform Requirements for Manuscripts Submitted to Biomedical Journals, issued by the International Committee for Medical Journal Editors, and Code of Conduct for Editors of Biomedical Journals, produced by the Committee on Publication Ethics.

Author disclosure, copyright transfer & conflict of interest policy

Authors are responsible for the content of material and views expressed in the manuscripts. Authors must state explicitly whether potential conflicts do or do not exist (e.g. personal or financial relationships that could influence their actions) and any such potential conflict of interest (including sources of funding) should be summarized in a separate section of the published article.

Details of relevant conflicts of interests (or the lack of) must be declared in the ‘Disclosure’ section of the manuscript. The corresponding author of articles accepted for publication, will be required to send us a signed copyright transfer form on behalf of all the authors.

Policies on ethical conduct of research where articles include publication of original data related to human or animal experimental investigations, appropriate institutional review board approval is required and should be described within the article. For those investigators who do not have formal ethics review committees, the principles outlined in the Declaration of Helsinki should be followed. In attempting to maintain patient anonymity, identifying details should be omitted where they are not essential. However, patient data should never be amended or falsified. Informed consent should be obtained whenever there is any doubt regarding assurance of anonymity.

Preparation of Manuscript

Manuscripts of the following types may be submitted:

- Major Review
- Original Article
- Techniques
- Case Reports
- Recent Advances
- Allied Ophthalmic Sciences
- Photo Essay
- Brief Communication

All types of articles should include the following:

- Forename(s) and surnames of authors
- Author affiliations: department, institution, city, state, country
- Abstract: 200-250 words; Structured only in Original Article
- 3–4 keywords
- Running header (shortened title)
- Corresponding author: name, address, phone, fax, email
- Original Article to be prepared under following headings
  - Introduction
  - Methods
  - Results
  - Discussion
  - References and acknowledgements
  - Legends for display items (Figures and Tables)
- Tables and figures to be quoted in text as superscript in order of appearance
- The preferred electronic format for text is Microsoft Word
- Spell out acronyms in the first instance of appearance in the abstract and paper
- Word counts: Major Review and Original article: 3000-4000 words
  - Techniques and Recent Advances: 1000-1500 words
  - Case Reports and Photo Essay: 750–1000 words
Suppliers of drugs, equipment, and other brand-name material are to be credited in parentheses (company, name, city, state, country)

All articles to be referenced in accordance to the Vancouver format.

Figures and Tables are to be submitted as separate files. They are to be numbered in the sequence of appearance in the text, with a descriptive heading/legend provided for each. Abbreviations and footnotes are to be placed immediately below the table. Figures are to be submitted as JPG/ TIFF files, or in their originating graphics application.

Graphics/ contents downloaded from web pages are NOT ACCEPTABLE.

All original articles are subject to peer review and editorial approval.

Contact Details:
For further queries about your contribution, please contact:

Dr Rajesh Sinha MD, DNB, FIACLE, FRCS
Editor, DJO
& Associate Professor of Ophthalmology
Room No.479, 4th Floor,
Dr. R. P. Centre, AIIMS, New Delhi
E-mail: editordjo@gmail.com