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7. Editorial ........Dr. Rajesh Sinha

Major Review

9. Small Gauge Vitrectomy: Recent Update
Sumeet Khanduja, Sanjeev Kumar, Ashish Kakkar, Karandeep Rishi, Vishal Arora, Saptorishi Majumdar,
Meenakshi Gangwani, Rajpal Vohra, Satpal Garg

15. Primary Angle Closure Glaucoma: A Review
Gaurav Kumar, Anasua Ganguly, Mayank Bansal, Tanuj Dada

Original Article

23. Ultrasound Biomicroscopy in Evaluation of Complicated Pseudophakia
Hansa Thakkar, Kopal Mittal

29. Advantages of Intraocular lens Implantation in Ringer Lactate without Viscoelastic Substance in Small Incision Cataract Surgery
Pranay Singh, Ajay Prakash, Rahul P. Shah, Suraj Bhagde

Techniques

37. Safe Suture Burial in Trans-scleral Fixation of Posterior Chamber Intraocular Lens
Ruchi Goel, KPS Malik

Case Report

41. Pleomorphic Adenoma of an Ectopic Lacrimal Gland in the Eyebrow
Gurvinder Kaur, Jacob Koshy, Satish Thomas, S.M. Bharti

43. Graft Rejection with a Typical Khudadoust Line after Descemet’s Stripping Automated Endothelial Keratoplasty
Shveta Jindal Bali, Animesh Jindal, Namrata Sharma

49. Acute Hemorrhagic Conjunctivitis by Enterovirus 71
Brahm Prakash Guliani, Pratyush Ranjan, Anuragh Narula, Shashi Khare

Recent Advances

51. Anti Vascular Endothelial Growth Factor Agents in Corneal Neovascularization
Srivatsa Sehra, Reetika
Allied Ophthalmic Sciences

55. Millennium Development Goals and Vision 2020
   Noopur Gupta, Praveen Vashist

Brief Communication

59. Hydrogen Peroxide: A Household Risk for Ocular Injuries in Rural India
   Ritika Sachdev, Namrata Sharma, Ritu Arora

Photo Essay

65. Rosai-Dorfman Syndrome
   Sonam Angmao Bodh, Ruchi Goel, Saurabh Kamal, Sushil Kumar, Smriti Bansal

Industry News

67. The EX-Press Glaucoma Filtration Device
   Alcon

69. Innovative Preloaded Intra Ocular Lens System
   Hoya

Forthcoming Events

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Information to Author
‘The ear tends to be lazy, craves the familiar and is shocked by the unexpected; the eye, on the other hand, tends to be impatient, craves the novel and is bored by repetition.’


We at the Delhi Journal of Ophthalmology too reflect the innate ‘nature’ of the eye—curious, always seeking the new and exciting. As the science of ophthalmology progresses by leaps and bounds, we must do all we can to document this progress. Every innovation—big or small, conceptual or procedural—must be made available to each one of us. For what use is this age of information without accessibility?

Moreover, our intent at the DJO is not just disseminate more information to more readers with time, but also to better the quality of the information, and hence raise the bar on impact ratings.

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We hope to continue to inspire every reader, whoever you are—young or a veteran, academically inclined or clinically oriented. As the Editor, I am thrilled at the possibility of touching each one of you through our pages, and I promise that every editorial effort will only serve to make the Journal bigger and better.

Rajesh Sinha
MD, DNB, FIACLE, FRCS
Small Gauge Vitrectomy: Recent Update

Sumeet Khanduja MD, Sanjeev Kumar MD, Ashish Kakkar MD, Karandeep Rishi MD,
Vishal Arora MBBS, Saptorishi Majumdar MD, Meenakshi Gangwani MD, Rajpal Vohra MD, Satpal Garg MD

Abstract
The development and refinement of sutureless vitreoretinal intervention has been a revolution in the field of posterior segment surgery. The advantages of shorter surgical time and early postoperative recovery have to be weighed against the increased risk of complications viz. iatrogenic retinal tear, hypotony and risk of endophthalmitis. The article covers the historical, physical and outcome oriented aspect of sutureless vitreoretinal surgery.

Key Words: sutureless vitrectomy, 23 gauge vitrectomy, 25 gauge vitrectomy

The development of vitreoretinal surgical technology is one of the leading examples in the field of biomedical engineering. The history of pars plana vitreoretinal intervention dates to Robert Machemer1 who developed closed pars plana vitrectomy to eliminate the need for open sky approach and operate in a closed system with controlled intraocular pressure. This served as the starting of a distinct and separate vitreoretinal speciality. While Machemer developed the VISC (the vitreous infusion suction cutter), that needed a 17-gauge sclerotomy port, a major advancement happened when Conor O’Malley and Ralph Heinz developed three-port vitrectomy with a 20-gauge (0.89 mm) system as well as a lightweight, reusable, bellows-driven-en, pneumatic, axial cutter driven by the Ocutome 800 console (Berkley Bioengineering, 1972).2 At the same time Gholam Peyman developed the electric solenoid driven axial (guillotine) cutter and R. Kloti in Europe developed a three-port system with an electric cutter.3

De Juan developed a 25-gauge instrument set for pediatric use already in 1990, since the “conventional” 20-gauge vitreous cutters had proven to be big and lacking in precision, especially in children.4 DeJuan and Hickingbotham stated that due to reduced aspiration rate the 25-gauge vitrectomy was to be used solely in selected, delicate cases requiring particularly precise and careful intervention. It was 12 years later, when eventually a complete 25-gauge transconjunctival vitrectomy system was introduced by Fuji et al5, which consisted of microtrocara cannulas, affording ease and safety of instrument introduction and withdrawal, as well as an array of integrated 25-gauge instruments. The development of 23-gauge systems came into picture when a need was felt to combine the advantage of sutureless intervention and rigidity of 20-gauge system. Singh et al6 introduced the first electronic 23-gauge vitrectome as early as 1995. It was used only for carrying out vitreous biopsies and office procedures. Almost 10 years passed before a fully integrated 23-gauge vitrectomy system for routine clinical use had been designed, when in 2005 Eckardt7 in cooperation with DORC (The Netherlands) eventually introduced complete 23-gauge instrumentation and demonstrated its safety and efficiency in a first evaluation study. The advantages of these innovations in comparison to the classical 20-gauge system have now become obvious surgery time was shorter, recovery was more rapid and vision was restored more quickly. As a result of this, almost all vitreoretinal instruments available in 20-gauge are now available in 23-gauge and 25-gauge sizing. At the same time, however, a number of complications were encountered in higher rates, when these systems were used on a larger scale, in comparison to the 20-gauge approach, including postoperative hypotony, postoperative endophthalmitis and retinal detachment. The aim of the review is to discuss the science behind the feasibility of sutureless vitreoretinal intervention and analyze the conclusions of scientific work done in the recent past to help the reader adopt the technique in light of the current contemporary scientific literature.

Wound construction for sutureless vitrectomy
25 gauge vitrectomy

The 25-gauge Entry Site Alignment system (ESA) is the primary component of 25-gauge instrumentation. As the name suggests, the ESA system serves to maintain alignment between the entry holes in the conjunctiva and sclera as well as provide unobstructed instrument access. This is especially important due to the small size of 25-gauge wounds and the
technique of conjunctival displacement prior to the insertion of the ESA system. The ESA system components include: the 25-gauge trocar-mounted microcannulas, cannula plugs, and infusion line. The microcannulas are preloaded on the 25-gauge needle trocars and the combined components of the trocar needle, microcannula, and trocar handle is referred to as the trocar/cannula assembly. While inserting the trocar the conjunctiva is displaced laterally. Originally the direction of the trocar was kept perpendicular to the globe as in a 20-gauge vitrectomy but now many surgeons recommend an oblique entry to increase the length of the intrascleral canal.9

23 gauge vitrectomy

There are two techniques for wound construction using the 23-gauge technique. In the 2-step technique the incision is made using an angled microvitreoretinal blade and the cannula system is passed in the wound over a blunt trocar. In the newer one step entry system the cannula are mounted on a sharp trocar that is used to make the initial stab and introduce the cannulas, without using microvitreoretinal blade. The convention is to introduce the trocar at 45 degrees to the surface and insert intrasclerally, changing the direction to tangential to the ocular surface once the sclera is penetrated fully. This causes a valve like effect to occur and helps in wound apposition. In the one step technique various incision types have been described.

Zorrò’s incision: inserting the system obliquely without straightening modifies the incision direction. The blade is inserted at 4.0 mm from the limbus, at an oblique angle of 10–15°, and enters the vitreous without straightening.9

Pollack’s incision: Pollack has improved Zorrò’s direct and oblique technique by suggesting a biplanar insertion modality. The technique is the following: hold trocar bevel up with the tip at approximately 5° to the sclera, then insert trocar to 50% of the scleral depth, until just past end of beveled tip. Raise handle until trocar shaft is at about 30° angle to sclera and complete the insertion.12 The physics behind incision construction is that longer tunnel provides better sealing action. Trocar entry at 45 degrees results in a tunnel length of 1.154 mm compared to 30 degrees, which has the tunnel length of 1.414 mm, a 30% increase.9 It has been said that the 2-step technique results in a larger wound diameter than the one step technique however this claim has now been refuted. The 2-step technique though cumbersome has shown to have lesser leakage rates than the one step technique.11 In the one step technique itself the wound leakage is lowest for the extreme oblique entry followed by the oblique entry and the straight entry. There is no difference in the incidence of wound leakage between 23-gauge and 25-gauge incision.12 This has further been supported by imaging of the wound healing by anterior segment optical coherence tomography; after 25-gauge vitrectomy, the scleral wounds evaluated by OCT closed in 60.5% at 1 month and 63.9% at 3 months. After 23-gauge vitrectomy 57.4% of scleral wounds closed at 1 month and 61.1% at 3 months postoperatively.13 Sclerotomy flap apposition is not the only mechanism of wound closure. Endoscopic evaluations of the sclerotomies show vitreous plugging the wounds in both 23- and 25-gauge cases.14 It has also been shown that vitrectomy procedures done for macular indication have lesser wound leaks, which may be due to less extensive vitrectomy in these indications.15

Physics and dynamics of small gauge vitrectomy

Flow rates: Reduction in the internal diameter of the ports brings about critical change at two levels. First, at the level of infusion cannula; reduction in the diameter results in increased frictional forces and loss of pressure head and decrease of volume flow at the intraocular end of the infusion cannula. This can be explained on the basis of Poiseuille’s law that describes the volume flow rate of an incompressible viscous fluid through a tube of constant circular cross-section. If the inner radius reduces by half, the volume flow rate decreases by a factor of sixteen. To simplify the volume of fluid flowing inside the eye is compromised by narrower tube diameter, increased length of infusion cannula, lowered bottle height. The remaining terms show that the volume flow rate is directly proportional to the pressure differential, while inversely proportional to the fluid viscosity and the length of tube. Most 20-gauge vitrectomy is performed at intraocular pressures between 30 and 40 mm Hg. Vitrectomy with 23-gauge instrumentation can be performed at these infusion pressures, but 25-gauge vitrectomy is more efficient at higher infusion pressures, in the range of 40–50 mm Hg. The slower volume infusion rate is one of the factors postulated to be responsible for slow vitreous removal in these cases. The second factor that affects vitreous removal is the maximum aspiration pressure set on the machine console. The 20-gauge machines normally work at a suction pressure of 150 mm Hg. In the 23- and 25-gauge systems these suction pressures are kept at 250 mm Hg and 500 mm hg to be able to achieve comparative volume aspiration rates; (these are the authors preferences and may vary between surgeons). The third factor affecting vitreous removal is duty cycle time. The duty cycle time is the ratio of time for which cutter is open to the time it remains closed. While using pneumatic cutters with increase cut rate the duty cycle time is decreased decreasing rate of vitreous removal.

Traction: Traction is an important dynamic of vitrectomy. It is the pulling force that is applied to tissue due to aspiration flow. It is a complex relationship between the cutter port pressure differential, the port configuration, aspiration flow, cut speed, vitrectomy cutter movement, and the nature of the tissue (e.g., the ratio of fluid to tissue or the degree of tissue connectivity). A higher aspiration pressure leads to a larger volume of fluid and vitreous being pulled into the port per cut. The driving force for removal is high and the surrounding tissue feels a large removal force, corresponding to a high traction situation. When the aspiration pressure is lower, there is less volume of fluid
and tissue entering the cutter tip per cut, thus less traction. The factors and effects enumerated above hold when adjusting parameters for a certain cutter design and size; 25-gauge cutters have greater flow losses and lower flow than 20-gauge cutters operating at the same parameters. Thus, higher aspiration settings do not necessarily indicate that a 25-gauge cutter has greater traction than a 20-gauge cutter. For 25-gauge cutting, high cut speeds are important for reduced traction, and can have the added benefit of more consistent flow.

**Illumination systems:** The smaller diameter of the 23- and 25-gauge fiber optic light pipes also decreases illumination from conventional vitrectomy light sources. To obviate this high intensity discharge lamps (HID) are utilized. They have short arcs that are generated between two electrodes under high pressure. Although short, these arcs generate high temperature, efficiency and have a long life (20,000+ hrs) in an efficient package. There are four categories of HID lamps: mercury vapor, metal halide, high-pressure sodium and low-pressure sodium. Only two HID lamps: metal halide and high-pressure sodium are used in ophthalmology as primary light sources.

Metal halide lamps utilize mercury and argon gases inside the arc tube to improve efficacy and allow variable wattage of the lamp. Unfortunately, metal halides suffer from spectrum shifting with the change of voltage, and lower life than other HID lamps. Currently, metal halide lamps are used in the Millennium system from Bausch and Lomb Inc. (St. Louis, MO, USA). High-pressure sodium lamps consist of high-voltage starter ballast with an arc tube that is filled with gases such as xenon, sodium and mercury. These lamps can be used at high wattages, and have higher efficacy with minimal spectrum shifting. The disadvantage is that they require an additional cooling system. Currently, xenon lamps are used in the Accurus system from Alcon Laboratories, Inc (Fort Worth, TX, USA) and the Photon light source from Synergetics Inc. (O’Fallon, MO, USA).

**Instrument rigidity:** One of the mechanical challenges associated with small diameter instruments is instrument rigidity. It can be expressed scientifi cally as bending equation i.e. the displacement is directly proportional to the cube of intraocular length of the vitreous cutter and proportional to the modulus of elasticity of the instrument. Currently steel is used for the manufacturing of vitreous cutter. If more rigid materials are used chances of shaft fracture shall increase at the cost of less pliable instruments.

**Complications of small gauge vitrectomy**

**Intraoperative:** The force applied during insertion of trocar and cannula assembly is known to cause dehiscence of recently operated cataract wounds and iris prolapse. In vivo and experimental settings it was seen that the IOP rises to above 60 mm hg. This is due to the limited sharpness of the trocar and a difference between higher diameter of the cannula and the trocar. This creates frictional resistance to its entry through the scleral canal, causing more force to be applied insertion. A theoretical risk of increased IOP during port construction has been proposed in patients with compromise intraocular blood flow. It is advisable to close any recent corneal or scleral wounds before the trocar cannulas are inserted. Wu PC et al has proposed a simple modification of twisting maneuver for sutureless vitrectomy trocar insertion to reduce intraoperative intraocular pressure wherein the stab motion is replaced with twisting movement during wound placement. The highest IOP reached in the twisting maneuver was 30 mm hg, in sharp contrast to 63.9 mm in the conventional entry group.

Intraoperative retraction of infusion cannula is known to occur leading to choroidal detachment. In a retrospective series the complication was seen in 3.5% cases with serous and hemorrhagic detachments occurring at equal frequency. We in our own experience have seen this phenomenon in surgery being done in cases for failed scleral buckling. The intravitreal length of the infusion cannula is compromised due to choroidal edema. We had a similar case of intraoperative displacement during a ret detachment surgery. Repeated surgeries lead to scleral thinning and reduced friction between the cannula sleeve and globe wall causing predisposing cannula displacement. The cannula attached to the infusion line may also spontaneous dislocate during scleral depression, causing severe hypotony and choroidal detachment. Sometimes the cannula sleeve will be pulled out of the sclera when instruments are withdrawn from the eye as the result of friction between the instrument and inner wall of the cannula sleeve. The cannula sleeve can usually be reinserted through the same scleral incision by placing the trocar blade back through the sleeve, reinserting it into the same scleral tunnel. This generally happens when the instruments are resterlised. In situations where 20-gauge instrumentation for aspiration and 23- or 25-gauge ports are used for infusion, hypotony can occur. This situation generally arises when performing phacoemulsification or while performing PVD in difficulty situations. Jamming of the vitrectomy cutter and breakage of the vitrectomy cutter may occur with 25-gauge probes.

The rate of retinal tears discovered during sutureless vitreous surgery has been reported to be between 0% and 24%, with most series reporting an incidence of less than 5%. In the largest retrospective series of 177 consecutive 25-gauge PPV cases, the incidence of intraoperative retinal breaks was 15.8%, with roughly two thirds of these occurring away from the superior sclerotomy. In one comparative series of 25-gauge and 20-gauge cases, no statistically significant difference in the incidence of intraoperative retinal breaks was found (3.1% of the 25-gauge cases compared with 6.4% of the 20-gauge cases). Retinal toxicity has been reported in an eye with 23- and 25-gauge vitrectomy given subconjunctival gentamicin at the conclusion of the case, so aminoglycosides or any other retinotoxic agents such as 5-fluorouracil should not be given subconjunctivally if there are any sutureless sclerotomies.
**Postoperative complications**

Postoperative hypotony (defined as intraocular pressure <6 mmHg) has been reported in 0% to 25% of cases of sutureless vitrectomy. This hypotony is usually transient and in most cases heals on conservative measures. However, in some cases the hypotony may be severe leading to large choroidal mounds with accompanying hypotonic maculopathy and optic choroidopathy. Wound leak may be present if, reoperation done on a vitrectomized eye, multiple exchanges of instruments, younger patient age, extensive vitreous base dissection, and variations in wound construction. Angled (oblique) entry or biplanar (oblique-parallel) entry may reduce wound leak in contrast to direct insertion of the cannula perpendicular to the scleral surface by effectively lengthening the wound tract and maximizing scleral reapposition. Intentional conjunctival displacement during trocar insertion to misalign the conjunctival and scleral wounds also may decrease hypotony and improve wound reapposition.

**Endophthalmitis:** The small gauge vitrectomy received criticism in the initial phases, when reports of increased incidence of endophthalmitis started pouring in. The first reported case of endophthalmitis following 25-gauge surgery was published in 2005. It was cited that contamination with conjunctival flora during insertion of cannulas and exchange of instruments, ingress associated with postoperative hypotony, vitreous wick effect through unsutured conjunctival wounds, decreased bacterial clearance because of diminished infusional flow, and sequestration of bacteria in residual peripheral vitreous were responsible for increased incidence of endophthalmitis. Singh et al showed passage of India ink into the eye in over two-thirds of eyes with unsutured sclerotomies, while no eyes had entry of India ink if the 20-gauge or 25-gauge sclerotomies were sutured. A very large series of cases reported from the Wills Eye Institute showed an endophthalmitis rate of 0.23% (7/3,103 eyes) for 25-gauge vitrectomy compared with only 0.018% (1/5,498 eyes) for 20-gauge vitrectomy, representing a 12-fold increased risk for 25-gauge vitrectomy. Another large retrospective series of a total of 7,682 cases reported an even higher incidence of endophthalmitis in 25-gauge cases of (1/119) patients 0.84% compared to 0.03% (1/3,188 for 20G cases).

In a recent retrospective multicentric analysis from the Latino nations 5-year post-pars plana vitrectomy (PPV), endophthalmitis incidence rates were 0.020%, 0.028%, and 0.021% for 20-gauge, 23-gauge and 25 gauge, respectively, the difference of which did not reach statistical significance. Shimada H et al recommended irrigation of the ocular surface with 1.25% povidone iodine as it decreased the risk of bacterial contamination of the vitreous cavity. Some surgeons have advocated aggressive removal of the vitreous around the cannulas to prevent vitreous prolapse into the wounds. In one study by Shimada and colleagues, this method decreased the rate of vitreous prolapse from 20% to zero.

**Advantage of small gauge vitrectomy**

The chief advantage of sutureless vitrectomy is reduced operative time, though few studies found no difference in the total surgical time. The time gained by faster port construction was balanced against slower vitreous removal. Many of the studies with small gauge vitrectomy have also found postoperative decrease in pain and inflammation, and improved patient comfort. A recent study evaluated the feasibility of No-patch 23-gauge vitrectomy under topical anesthesia. In a study involving 5 patients 4 patients had grade 0 discomfort during trocar removal. Sutured sclerotomies induce astigmatism in many eyes following 20-gauge vitrectomy which is uncommon following 23- and 25-gauge vitrectomy is uncommon and is less than in 20-gauge cases helping rapid visual recovery.

**Outcomes**

Most studies examining 25-gauge and 23-gauge outcomes have found no significant difference when compared with 20-gauge instrumentation. Most published series are retrospective and include a variety of surgical indications: epiretinal membrane, macular hole, diabetic vitreous hemorrhage, tractional macular edema, rhegmatogenous retinal detachment. However, this might not be the case is retinal detachment. Most surgeons agree that the removal of peripheral vitreous is important in the management of retinal detachment by vitrectomy, and indentation of the periphery is helpful in locating retinal breaks. Both these steps are more difficult in 25-gauge surgery, and there were early reports of high re-attachment rates following 25-gauge vitrectomy. In a series of 53 eyes managed by 25-gauge vitrectomy, the primary success rate was only 74%, however more recent studies have reported reasonable success rates (primary success 92.9%) for 25-gauge vitrectomy and gas without the use of a supplementary buckle.

**Future directions and conclusions**

The success of 23-gauge and 25-gauge instrumentation is driving the vision engineers to further smaller instrumentation. 27-gauge instrumentation has been introduced recently and has been applied in selected situations. This may lead to true ultra minimally invasive vitreous surgery. In spite of the popularity of sutureless intervention 20-gauge surgery still has a significant role, especially in difficult situations as retinal detachments with advanced proliferative vitreoretinopathy. The second place 20-gauge has importance is in complex diabetic vitrectomies, which have compromised optic disc perfusion and are sensitive to high intraocular pressure, usually encountered in 23-or 25-gauge vitrectomy. Finally the issue of cost benefit cannot be ignored. In one large teaching centre, the cost of sutureless micro-incision vitrectomy surgery was calculated to be 3.4 times higher than that of sutured 20-gauge vitrectomy surgery. Giving the
patient the benefit of early postoperative recovery and earlier rehabilitation at thrice the expense especially in a developing nation is an issue to think upon.

**Method of Literature Search**

A PubMed search was performed in June 2011 terms small gauge vitrectomy, 23-gauge vitrectomy, 25-gauge vitrectomy, 27-gauge vitrectomy. There were no restrictions on date of publication but was restricted to articles in English or other languages if there abstracts were available.

**Disclosure**

The authors reported no proprietary or commercial interest in any product mentioned or concept discussed in this article.

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Primary Angle Closure Glaucoma: A Review

Gaurav Kumar M.S, Anasua Ganguly MBBS, Mayank Bansal MBBS, Tanuj Dada MD

Abstract

Primary angle closure glaucoma affects large number of people worldwide and it accounts for half of the cases of primary glaucoma. Primary angle closure is defined as appositional or synechial closure of the anterior chamber angle by contact between iris root and trabecular meshwork, iridotrabecular contact (ITC). Population based studies done in different parts of Asia have shown increased prevalence of primary angle closure glaucoma compared to other parts of the world. Mechanism of angle closure is better understood with the help of ultrasound biomicroscopy (UBM) and Anterior Segment Optical Coherence Tomography (AS-OCT). Now, the role of lens and plateau iris is well established as a cause of non-pupillary block mechanism of angle closure. Based on the natural history of angle closure glaucoma new classification has been proposed. Evidence based progression of the natural history of angle closure glaucoma starts first with occurrence of iridotrabecular contact (ITC) appositional or synechial, subsequently there is progressive rise in intraocular pressure due to trabecular meshwork dysfunction or damage which leads to glaucomatous optic neuropathy. There is recent interest in using removal of lens as a treatment modality of angle closure glaucoma. In this article we describe the recent changes in the concept, and management trend of primary angle closure glaucoma.

Key Words: angle closure glaucoma, synechial angle closure, appositional angle closure

Glaucmatous optic neuropathy is one of the leading cause of irreversible blindness. Primary angle closure glaucoma may account for half of the subjects with primary glaucoma worldwide. Primary angle closure glaucoma arises from the variation in the anatomical relationship of the anterior segment structure causing narrow angle and rise in intraocular pressure. This causes glaucomatous optic disc damage.

Epidemiology

Primary angle closure glaucoma (PACG) is important form of glaucoma and is more common in Asians. Primary angle closure glaucoma is 2 to 3 times more likely to cause visual impairment than is primary open-angle glaucoma. PAC and PACG tend to be higher in women than men. Population-based studies have shown that most cases of PACG are asymptomatic, whereas chronic PACG may develop after the resolution or precede the occurrence of an acute attack of angle closure. Two population based studies were carried out in South India. A survey conducted in Vellore by Jacob et al showed prevalence of primary angle closure glaucoma to be 4.32% and Andhra Pradesh Eye Disease study showed it to be 0.71%. Manifest PACG and occludable angles without ACG were present with age- and gender-adjusted prevalence (95% confidence interval [CI]) of 0.71% and 1.41% in participants 30 years of age or older, and 1.08% and 2.21% in participants 40 years of age or older, respectively. Kandy eye study is a population based study carried out in Sri Lanka, this study used ISGEO classification for analysis. Prevalence of PACS, PAC, and PACG in at least 1 eye was 2.35% (95% confidence interval [CI], 0.0–4.7; 32 subjects), 1.86% (95% CI, 0.6–3.1, 25 participants), and 0.57% (95% CI, 0.0–1.2; 7 participants), respectively. The overall prevalence of angle closure was 4.7% (95% CI, 1.1–9.3; 64 participants).

Mechanism of Angle Closure Glaucoma

Initial work in this direction was done by Curran, Barkan and Chandler. They established the concept of pupillary block glaucoma and its treatment by peripheral iridectomy. Pupillary block glaucoma was the most common form of PACG in Europe and America but the situation is different in Asia. They found that the disease is more chronic in Asia and it is less responsive to peripheral iridectomy. Lowe described a term creeping angle closure,
PAS slowly advanced forward circumferentially, making the iris insertion more anterior with time. This applied to most of the PACG patients in Asia. With advent of UBM better understanding of mechanism of angle closure was possible. Now mechanism of angle closure can be divided into two broad groups- Pupillary block and Nonpupillary block glaucoma. Later can be divided further into plateau iris, lens induced, choroidal effusion and multimechanism.

**Pupillary Block**

Pupillary block is based on the pressure gradient between the anterior and posterior chambers. This pressure gradient is created by the sequestration of aqueous humor in the posterior chamber because of inability to pass through the pupil. As this pressure gradient increases, the iris becomes more convex. Clinically significant pupillary block is present when increased iris convexity brings the iris into apposition with the trabecular meshwork.

**Plateau Iris**

Plateau iris is one of the important cause of nonpupillary block glaucoma. In 1940 it was first observed that few cases have shallow angle with deep central anterior chamber. Barkan noticed this configuration in 20% of his angle closure patients. Tornqvist in 1958 used the term plateau iris in describing the patient who had angle closure despite of flat iris and deep central anterior chamber. Wand et al. used the term plateau iris syndrome for patients who had this configuration after peripheral iridectomy and plateau iris configuration for patients who had this structure before iridectomy. Pavlin M. and Ritch R. first described the Ultrasound biomicroscopic finding of plateau iris. They showed that it was anteriorly rotated or anteriorly placed ciliary body which does not allow peripheral iris to fall back. Garudadri et al. from India reported that plateau iris was present in more than half of the cases. Plateau iris was found in 32.8% of PACG patients in Singapore and 31.7% of PACG patients in Thailand. Liwan eye study from China also documented this in 60% of PACS patients.

**Role of Lens in Pathogenesis**

The mean anterior chamber depth (ACD) in PAC eyes is approximately 1.8 mm, which is 1 mm shorter than in normal eyes. Angle closure becomes a rarity when anterior chamber depth exceeds 2.5 mm. Decreased AC volume, small corneal diameter, and short axial lengths are all characteristic of eyes with PACG. The most satisfactory explanations for the more shallow AC is the age related increase in lens thickness and more anterior position of the lens. The axial lens thickness is greater than in normal subjects and the thicker lenses are significantly more anteriorly positioned than in normal eyes. Lowe estimated that increased lens thickness causes 0.35 mm of AC shallowing, and forward lens position causes 0.65 mm of shallowing, accounting for the total of 1 mm difference in AC depth of the smaller eye compared to the normal eye. Growth of the lens, with an increase in the number of lens fibers continuing throughout adult life, results in an increase in lens thickness and anterior curvature. Many parameters has been developed to associate role of lens in angle closure.

Lens position equals anterior chamber depth ACD + ½ lens thickness. Relative lens position equals lens position/axial length. More recently Nongpiur et al. analysed relationship of lens vault and angle closure. Lens vault was calculated using Anterior segment optical coherence tomography (ASOCT), it was defined as perpendicular distance between the anterior pole of the crystalline lens and a horizontal line joining the scleral spurs. They concluded that lens vault is strongly and independently associated with angle closure compared with traditional biometric parameters. In addition they also found that there was no difference in position of lens and relative lens position between angle closure and age matched others. It proposed as one of the mechanism of acute primary angle closure in anatomically predisposed eyes by causing a forward movement of lens and greater iris convexity. In normal eyes increase in volume posteriorly compensated by fluid exit from anterior chamber without any shift in lens iris position. When transvitreal flow is insufficient to equalize the pressure differential, the result is forward movement of compressed vitreous, iris and lens. With time it compresses vitreous more and starts a vicious cycle. In small eyes that are predisposed to PACG, forward lens movement of even a small amount will cause acute angle closure.

**Classification and Nomenclature**

Von Graefe 1856 did first iridectomy in staphylomatous eye, which decreased the ocular pressure for acute inflammatory glaucoma. In 1856 and 1877 Knies published histological observation of glaucomatous eyes and noted adhesion between peripheral iris and cornea. Curran did lot of work on iridectomy. In 1941 Barkan after invention of gonioscope changed the terms of two form of glaucoma to trabecular glaucoma (wide angle glaucoma) and iris block glaucoma (narrow angle). The present term open angle and closed angle glaucoma was adopted by a symposium organized by the Council of International Organization of Medical Services. Primary angle closure glaucoma was classified in many different ways. According to type of closure it could be synechial closure or appositional closure. On the basis of symptoms and clinical findings, four form of pupillary block glaucoma can be distinguished.

Acute angle closure glaucoma – symptoms are sudden and severe, with marked pain, blurred vision and a red eye.

Intermittent/ subacute angle closure – in this symptoms are mild or absent and further course it can have repeat mild attack or convert to acute attack or there is increase in PAS and chronic elevation of IOP.
Chronic angle closure glaucoma – Portion of anterior chamber is permanently closed by PAS and IOP is chronically elevated which leads to optic neuropathy.

Combined mechanism glaucoma – in these eye both open angle and closed angle mechanism is contributing to disease. This is diagnosed when in a case of angle closure after peripheral iridotomy angle is open and IOP is elevated.

Creeping angle closure – Lowe11 used this term for a variant of chronic angle closure glaucoma. In this PAS slowly advance forward circumferentially, making the iris insertion appear more anterior.

The International Society of Geographical and Epidemiological Ophthalmology (ISGEO) Classification,29 the primary angle closure glaucoma is subdivided according to conceptual stages in natural history of angle closure of glaucoma into:

- **Primary Angle Closure Suspect (PACS)** - Irido trabecular contact (ITC) with normal optic disc and visual field. IOP is normal and PAS is absent.
- **Primary Angle Closure (PAC)** - ITC with either raised IOP or PAS.
- **Primary Angle Closure Glaucoma (PACG)** - ITC with structural glaucomatous changes in optic nerve with Visual field loss.

Sihota R30 has concluded that ISGEO classification is simple and extremely useful in surveys, but it did not take into account different grades of damage to the trabecular meshwork or optic nerve head, or acknowledge the importance of ocular hypertension in PAC. She proposed a new classification based on currently available evidence from primary angle closure disease studies. Classification consists of

- **Primary Angle Closure Disease (PACD)** suspect - ‘occludable’ angle, which amalgamates the two currently held views – an angle in which the posterior trabecular meshwork cannot be seen over at least 180° in primary gaze or an angle recess of less than 20°.

  PACD I - occludable angle as defined above, with definitive signs of angle closure, PAS or blotchy pigments in the angle and iris atrophy - pupillary ruff atrophy, whorling of the iris, sector iris atrophy, or a generalized loss of iris pattern. IOP should not be chronically raised.

  PACD II - occludable angle as defined above, with definitive signs of angle closure, especially PAS with chronically raised IOP after an iridotomy would be a hallmark. A suspicion of Glaucomatous Neurupathy (GON), with evidence of pallor or Retinal Nerve Fibre Layers (RNFL) damage could be present but no visual field defect should be present.

  PACD III - presence of definitive GON and generally a chronically raised IOP after an iridotomy, in an eye having an occludable angle, with a variable extent of PAS.

**Management**

Gonioscopy is the most relevant examination in a case of glaucoma. Angle closure is possible when peripheral anterior depth is <1/4 of corneal thickness, chamber opening is <20° or posterior pigmented trabecular meshwork is not visible on gonioscopy. Mechanism of angle closure can also be deciphered with the help of indentation gonioscopy. On indentation in case of

- Pupillary block – concave appearance upto periphery.
- Plateau iris – concavity will not extend upto periphery due to anteriorly placed ciliary body pushing it.
- When the lens has role – indentation cause iris to move only slightly backward.

After better understanding the pathophysiology of the disease with the help of newer investigations ultrasound biomicroscopy (UBM) and ASOCT,31 more knowledge of role of lens in angle closure glaucoma was found. Concepts of managing the condition have changed. Laser iridotomy should not be done in all cases at the outset and if there is cataract, first stage should be removal of cataract. If the pressure is not controlled we can do trabeculectomy as a second stage surgery. (In eyes with more than 3 clock hours of PAS chances of failure of IOP control by lens removal surgery alone is increased, so we can directly go for trabeculectomy or combined surgery in such cases). There no factual evidence supporting this, but almost all of the studies looking at IOP controlling effect of lens removal have taken more than 3 clock hours as exclusion criteria. Whatever may be the modality of treatment the main aim is to achieve target IOP which depends on extent of disc damage.

**Laser Iridotomy**

It provides alternative route for aqueous trapped in posterior chamber to enter the anterior chamber. Surgical iridotomy is only done when laser treatment cannot be accomplished. But it is not always effective. In cases of extensive PAC it does not work. A study in Asian eyes with acute PAC that had undergone laser PI showed 58.1% continued to have elevated IOP and 32.7% eventually required trabeculectomy.32 PI does not always provide long term efficiency, recurrent attack can cause PAS formation. A study showed 32.2% of 59 eyes with acute PAC had progression of PAS following a successful laser iridotomy.33 It is effective in preventing attack in fellow eye.

**Trabeculectomy**

When more than three quadrant synechial closure is present, there are chances of failure after lens removal, trabeculectomy is advised in these situations. But, in angle closure glaucoma, complications following trabeculectomy are more compared to open angle. Incidence of shallow
The effect of lensectomy in patients with PAC is logical. Hayashi et al has shown in their study that anterior chamber depth and angle width in Angle Closure Glaucoma (ACG) eyes approximates that of Primary Open Angle Glaucoma (POAG) eye and control normal eyes. In a study done on chronic angle closure patients showed mean increase in ACD and angle width from 2.04 mm to 3.44 mm this was due to exchange of the thickened lens (5mm) for IOL (1mm). However in plateau iris syndrome eyes after peripheral iridectomy effect of cataract extraction showed increase in central depth, the iris ciliary body approximation, peripheral iridectomy effect of cataract extraction showed increase in central depth, the iris ciliary body approximation, remained unchanged.

With advancement and increased skill of cataract it is possible to do safe and successful cataract surgery in angle closure patient. Surgical challenges in doing cataract surgery in angle closure patients are- there could be difficulty in access (small palpebral fissure), inflamed eye, high IOP, diminished red reflex, corneal epithelial and stromal edema, reduced working space due to shallow chamber and small pupil, PAS, large size of the lens. There are increased chances of iris prolapse, difficult capsulorhexis, high capsular bag tension, lens subluxation, posterior capsular rupture, malignant glaucoma and suprachoroidal hemorrhage. IOL power calculation in these patients may be inaccurate because of shifting of IOL bag apparatus.

To improve surgical results and decrease chances of complications certain points can be followed. Such as, decreasing the IOP preoperatively, for which intravenous mannitol can be used. If despite these measures, the intraoperative pressures are found to be raised, pars plana aspiration can be performed. While entering chamber gradual decompression is prudent. Complete pupil dilation should be ensured using atropine. Further, intraoperative intracameral adrenaline can be used to dilate pupil. In addition, iris hooks or pupil ring expanders can also be used in non-dilating pupil. Emphasis must also lie on wound construction to avoid iris prolapse. Straight phaco tip are preferable as the anterior chamber space is usually limited. Goniosynechiolysis is done in the presence of PAS, which can be confirmed by direct gonioscopy. It is possible that this also may not break pupillary block but it can allow for laser PI. Effect of this procedure is not sustained, there are chances of IOP rise within hours. Main complication of this procedure is shallowing of anterior chamber, other complications are lens trauma, choroidal effusion and choroidal hemorrhage. We do not recommend this as a treatment option.

It can be effectively done in cases of recent PAS formation within one year. It is done with the help of direct gonioscope, after entering the chamber viscoelastic injected and synechiae released with the help of blunt tip spatula. Ab interno technique is also described by Mirasahi and Scharioth. But it is associated with frequent complications like hyphema, fibrinous reaction and synechial reclosure of the angle. Recent concept is that PAS per se do not decrease aqueous drainage but the dysfunctional trabecular meshwork even at the area where synechia is not present is responsible for that. Generally we do this procedure in combination with cataract surgery.

This is used to open an appositionally closed angle in situations in which laser iridotomy either cannot be performed or does not eliminate angle closure. It is done by using long duration, low power and large spot size laser causing contraction burns in the extreme iris periphery. These contractures pull the iris and widens the angle. It is used in cases of plateau iris, in a case of acute angle closure if peripheral iridotomy is not possible, lens induced angle closure and to widen angle prior to argon laser trabeculoplasty.

Lam DS et al conducted randomized trial comparing early phacoemulsification versus peripheral iridotomy in acute primary angle closure. Patients were distributed in two groups each containing 31 patients. Prevalence of raised IOP at 18 months was 3.3% of the cases in phaco group vs 46.7%
in Laser Peripheral Iridectomy LPI group. Angle in phaco group was more open compared Laser PI group. Mean Shaffer gonio grading 2.10 ± 0.76 vs 0.73 ± 0.64. PAS were more in LPI group 228.6 ± 89.2 compared to 101.3 ± 74.6 in phaco group. Requirement for topical antiglaucoma drugs was more in LPI group after 18 month followup. There were no statistically significant differences in logMAR Visual accuracy (VA), Vertical Cup-Disc Ratio (VCDR), Mean Deviation(MD), Pattern Standard Deviation (PSD) and on Visual Fields (VF) informations between the 2 groups at 18 months. For the phacoemulsification group, numbers of complications were: intraoperative corneal edema (12 eyes), posterior capsular rupture (1 eye), intraoperative bleeding from iris root (1 eye), postoperative fibrinous AC reaction (7 eyes), and visually significant posterior capsular opacification (5 eyes). All these complications were manageable. For the Laser group, 1 eye had closed iridotomy and 3 eyes had small iridotomies that required supplementary laser. Thus they proved early phacoemulsification to be more effective in treatment of APAC. In a prospective nonrandomized trial done in Japan they compared primary phacoemulsification with laser iridotomy in patients with CACG and PAC. In IOL group IOP decreased from 14.8± 4.2 mm Hg to 10.8±1.6 mm Hg (p<.05), whereas in PI group 15.5±4.1 mm Hg to 14.7±4.7 mm Hg (p=.76). In IOL group postoperative 6 months no glaucoma medication was required, PI group 0.2±0.4 (p<.05) medication was required. Safety in both procedure was comparable.

Phacoemulsification vs Phacotrabeculectomy

Two Randomized Control Trial (RCT) were conducted in Hongkong comparing phacoemulsification with phacotrabeculectomy in medically controlled and medically uncontrolled chronic angle closure glaucoma. They showed lower intraocular pressures with phacotrabeculectomy than with phacoemulsification alone, but the difference was marginal and mostly statistically not significant. More complication and more glaucomatous optic neuropathy deterioration was with phacotrabeculectomy group. The approach to the patient with ACG should be done with the etiology of the disease

(Table 1). In following years many studies have been done and data are available showing the effect of lensectomy in PAC patients

<table>
<thead>
<tr>
<th>Study (Year)</th>
<th>Lens Procedure</th>
<th>Glaucoma Type (Number of Eyes)</th>
<th>Preop Gonioscopy</th>
<th>Follow up (Months)</th>
<th>Preop/Postop</th>
<th>Success % IOP &lt; 22 mmHg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greve38(1988)</td>
<td>ECCE PCIOL</td>
<td>AACG (5)</td>
<td>Near or complete closure PAC</td>
<td>Range 6–42</td>
<td>31 to 16</td>
<td>76%</td>
</tr>
<tr>
<td>Gunning39 (1991)</td>
<td>ECCE PCIOL</td>
<td>CACG (41)</td>
<td></td>
<td>Mean 14.3</td>
<td>22.6 to 15.6</td>
<td>65%</td>
</tr>
<tr>
<td>Gunning40(1998)</td>
<td>ECCE PCIOL vs</td>
<td>CACG (22)</td>
<td>PAS 77%eyes</td>
<td>Mean 53</td>
<td>28 to 17</td>
<td>Overall success of 68% reported in both groups</td>
</tr>
<tr>
<td>Roberts41(2000)</td>
<td>PHACO PCIOL</td>
<td>AACG (18)</td>
<td>3600 PAS (2)</td>
<td>36, 24 mos</td>
<td>39 to 17</td>
<td>67% (2 eyes)</td>
</tr>
<tr>
<td>Lai42 (2001)</td>
<td>PHACO PCIOL GSL DLPI</td>
<td>CACG (7)</td>
<td>3600PAS (7)</td>
<td>Mean 9</td>
<td>33 to 13</td>
<td>100%</td>
</tr>
<tr>
<td>Hayashi43 (2001)</td>
<td>PHACO PCIOL</td>
<td>CACG (68)</td>
<td>No data</td>
<td>Mean 25</td>
<td>21 to 15</td>
<td>41%</td>
</tr>
<tr>
<td>Jacobi44 (2002)</td>
<td>PHACO PCIOL CSI</td>
<td>AACG (43)</td>
<td>Partial closure (7)</td>
<td>Mean 10</td>
<td>41 to 18</td>
<td>72%, 35%</td>
</tr>
<tr>
<td>Kubota45 (2003)</td>
<td>PHACO PCIOL</td>
<td>CACG (13)</td>
<td>Partial closure (9)</td>
<td>Mean 14</td>
<td>13 to 14</td>
<td>62%</td>
</tr>
<tr>
<td>Nonaka46(2005)</td>
<td>PHACO PCIOL</td>
<td>PAC (13)</td>
<td>2 Q closed by UBM</td>
<td>3</td>
<td>19 to 15</td>
<td>No data</td>
</tr>
<tr>
<td>Lai47 (2006)</td>
<td>PHACO PCIOL</td>
<td>CACG (21)</td>
<td>&gt;90 – 270 closed</td>
<td>Mean 21</td>
<td>20 to 15.5</td>
<td>66.7%</td>
</tr>
<tr>
<td>Liu48 (2006)</td>
<td>PHACO PCIOL</td>
<td>PAC (29)</td>
<td>PAS 9 clock hours (17%)</td>
<td>3</td>
<td>15 to12</td>
<td>41%, 100%</td>
</tr>
<tr>
<td>Imaizum49(2006)</td>
<td>PHACO PCIOL</td>
<td>AAG (18)</td>
<td>No data</td>
<td>6</td>
<td>49 to13</td>
<td>100%</td>
</tr>
<tr>
<td>Panchimkul50 (2008)</td>
<td>PHACO PCIOL</td>
<td>AAGC (2)</td>
<td></td>
<td>6</td>
<td>23.3 to 14.8</td>
<td></td>
</tr>
</tbody>
</table>

AACG acute angle-closure glaucoma; CACG chronic angle closure glaucoma; CD choroidal detachment; CSI conventional surgical iridectomy; ECCE extracapsular cataract extraction; GSL goniosynechiolysis; IOP intraocular pressure; mos months; # number; PAC primary angle closure; PACG primary angle-closure glaucoma; PAS peripheral anterior synechia; PCIOL posterior chamber intraocular lens; PHACO phacoemulsification.
in mind. First we should go for lesser side effect treatment than go for filtering surgery. Laser remains the most common and safe mode of treatment of an angle closure but newer approaches including early lens removal adequately with the pathophysiology of the disease have proved to be a very useful treatment option.

References

36. Yang CH, Hung PT. Intraocular lens position and


Ultrasound Biomicroscopy in Evaluation of Complicated Pseudophakia

Hansa Thakkar MS, Kopal Mittal MS

Abstract

Aim: To evaluate the role of ultrasound biomicroscopy (UBM) in assessment of eyes with complicated pseudophakia.

Material and methods: A prospective investigational study was conducted from May 2006 to May 2009 on 150 pseudophakic patients with post operative visual acuity of less than 3 meters. All 150 patients were subjected to UBM examination (50MHz) for intra ocular lens (IOL) position, optic and haptic touch, lens remnants, corneal thickness, anterior chamber (AC) depth and signs of inflammation. Patients with paediatric cataract, traumatic cataract, pre existing ocular diseases, post operative endophthalmitis and IOL explantations were excluded from the study.

Results: Out of 150 patients, 82 (54.6%) were males and 68 (45.4%) were females with the age ranging from 24 to 93 years. Right eye was affected in less number of patients, RE: LE being 60:90. UBM revealed corneal edema in 98 (65.3%), shallow AC in 60 (40%), IOL malposition in 83 (55.5%), optic capture in 41 (27.3%), optic and haptic touch in 65 (43%), residual lens matter in 48 (32%), signs of inflammation in 34 (22%), pupil block in 19 (12.6%) and iris bombe in 16 (10%) of the patients. Descemet’s tear was noted in 4 (2.6%) of patients.

Conclusion: UBM is an important tool for evaluation of complicated pseudophakia. It helps to explain the aetiology of complication and hence guides for further management.


Key Words: UBM, complicated pseudophakia, IOL malposition

Despite advances in surgical techniques, instrumentation and Intraocular Lens (IOL) design, various complications related to IOL implantation are seen. The complications related to IOL implantation are due to surgical trauma resulting into blood aqueous barrier (BAB) breakdown which leads to increased protein leakage and cellular reaction in aqueous humour. In addition, IOL can act as a foreign body and provoke adverse reactions. Excessive uveal contact of IOL due to malposition can lead to IOL induced uveitis and secondary glaucoma.

Complications leading to corneal oedema and opacity, anterior chamber reaction and pupillary non dilatation make the clinical examination difficult. In such situations ultrasound biomicroscopy (UBM) visualizes the anterior segment of the eye with images similar to low magnification histological sections. UBM enables us to see the exact position of the IOL in vivo. Optics and haptics are easily imaged and their relationships to surrounding structures analyzed.

Methods

Between May 2006 and May 2009, patients referred to ultrasound clinic with poor vision of less than 3/60 were evaluated and a prospective investigational study was conducted. One hundred and fifty eyes of 150 patients with poor visual acuity of 3/60 or less after cataract extraction with IOL implantation were included in the study. Patients with paediatric cataract, traumatic cataract, pre-existing ocular diseases, post operative endophthalmitis or IOL explantations were excluded from our study. Surgeries were performed by surgeons at various eye clinics. After complete ophthalmologic examination, all the patients were subjected to B scan ultrasonography (10 MHz) and UBM (50MHz) examination. All UBM examinations were performed by the same ophthalmologist. Patients were examined for IOL position, optic and haptic touch, lens remnants, thickness of cornea, depth of anterior chamber and angle anatomy, ciliary body, pars plana, peripheral retina, anterior vitreous, patency of pupil and signs of inflammation. Complete visualization was achieved with fine manual movements of the probe and also by asking the patient to move the eye to different positions.
Results

Of 150 patients, 82 (54.6%) were male and 68 (45.4%) female. The age was ranging from 24 to 93 years (average 60.41 years). The left eye was affected in 90 patients while right eye in 60 patients. Post operative duration at the time of examination ranged from 15 days to 15 years. Following chart shows the common UBM findings encountered in patients with complicated pseudophakia. (Fig 1)

Of 150 patients, 98 (65.3%) had corneal edema with the central corneal thickness of more than 0.67mm. Shallow anterior chamber was noted in 60 (40%) eyes (depth less than 2.4mm). Eighty three (55.5%) patients had IOL malposition. Amongst the patients with IOL malposition, AC IOL was noticed in 23 (15.3%), tilted IOL in 21 (14%), posterior displacement into anterior vitreous in 15 (10%), anterior displacement in 9 (6%), and scleral fixated IOL in 5 (3.3%). (Fig 2)

Optic capture was evident in 41 (27.3%) and optic and haptic touch in 65 (43%) patients. The mal positioned IOLs were causing mechanical trauma to the endothelium in 3(2%), iris in 32 (21.3%), ciliary body in 18 (12%) and angle structures in 3 (2%) patients. (Fig 3)

Residual lens matter was present in 48 (32%) patients. Vitreous was in anterior chamber in 13 (8.7%). Nineteen (12.6%) patients had pupillary block, 15 (10%) had iris bombe and 3 (2%) patients had malignant glaucoma. Sixteen (10.6%) patients had peripheral anterior synechiae, 7 (4.6%) had exudative membrane, 5 (3.3%) had posterior synechiae. Other findings included acute uveitis in 6(4%) and Descemet’s tear in 4 (2.6%) patients.

Discussion

Decompensated cornea, chronic inflammation and secondary glaucoma following cataract surgery with IOL.
Implantation, result in drastically reduced vision with or without pain and congestion. We have used the term “complicated pseudophakia” for such eyes. Corneal edema and opacity (post cataract surgery) is usually due to surgical trauma damaging endothelium and Descemet’s membrane, persistent inflammation or secondary glaucoma. (Fig 4)

Intraocular Lens with haptics in the bag lying just medial to the ciliary processes reduce the post operative inflammation. Haptics of malpositioned IOL may be embedded in or touching and irritating the uveal tissues resulting into chronic inflammation. Significant lens remnants and acute uveitis post operatively also contribute to inflammation. (Fig 5)

Glaucoma following cataract surgery with IOL implantation can be due to inflammatory cells blocking trabecular meshwork, pupillary block, iris bombe, peripheral anterior synechiae (PAS), posterior synechiae, malignant glaucoma or adherence of the iris tip to a membrane on IOL surface or pupillary capture. Pseudophakic pupillary block is more common after AC IOL implantation. (Fig 6)

Ultrasound Biomicroscopy uses high frequency (50-100 MHz) ultrasound. It allows imaging of ocular anterior segment up to 5.0mm depth. It helps in locating misplaced IOL haptics and determining their relationships to surrounding structures. As peripheral parts of the haptics are hidden behind the iris, visualizing them in vivo by any other method is impossible. Before invention of UBM it was only possible on post mortem examination. UBM clarifies the mechanism of post operative complications and hence helps to decide further management options such as observation, medical treatment, rotation, removal or exchange of IOL, iridotomy or keratoplasty.

Conclusion

Ultrasound Biomicroscopy is an important tool for accurate evaluation of patients with complicated pseudophakia. In patients with hazy media and non dilating pupil UBM is the only method of examination. Thus UBM plays unique role in evaluating the etiological factors and hence deciding the line of management in complicated pseudophakia

References


Advantages of Intraocular Lens Implantation in Ringer Lactate without Viscoelastic Substance in Small Incision Cataract Surgery

Pranay Singh DOMS, Ajay Prakash DOMS, Rahul P Shah MS, Suraj Bhagde MS

Abstract

Purpose: To study the advantages of using ringer lactate instead of viscoelastic substance for implantation of intraocular lens (IOL) in small incision cataract surgery (SICS).

Methods: A prospective, randomized, interventional study was performed in which 100 patients of senile cataract were included. The patients were randomly divided in two groups; one in whom IOL was implanted in ringer lactate (ringer group) and other in which viscoelastic substance Hydroxypropyl Methylcellulose (visco group) was used for implantation of IOL. The outcome was evaluated on safety, efficacy, postoperative intraocular pressure (IOP), postoperative reaction, endothelial cell count and surgical time.

Results: The mean post operative IOP at 6, 24 and 48 hrs in ringer lactate group was 16.02, 13.46 and 12.44 mmHg and in viscoelastic group 22.24, 17.32 and 13.84 mmHg respectively. The difference between the groups was significant (p value <0.0001). The mean post operative reaction at 24 and 48 hrs in ringer group was 1.48 and 0.72 and in visco group 1.56 and 1.08 respectively (p value < 0.0001). Regarding position of IOLs, the two groups were comparable (odds ratio: 0.32; p value >0.05). The mean endothelial cell loss in visco group was 143.56 cells (6.08%), and in ringer group it was 210.68 cells (8.9%) (p= 0.055). The mean surgical time in visco group was 6.01 ± 0.93 minutes and in ringer group, the same was 5.08 ± 0.76 minutes (p value < 0.0001). There was no intra-operative complication in any group.

Conclusion: A small modification in one step of SICS can significantly control spikes of IOP with significantly lesser post operative reaction. With some experience, implantation of IOL in the bag under a continuous irrigation of ringer lactate is safe, accurate and less time consuming method without any significant extra loss of endothelial cells.


Key Words: hydroimplantation, small incision cataract surgery, SICS

Manual small incision cataract surgery has gone through many modifications and results have been recorded in terms of improvement in surgical and visual outcome. Classically in a cataract surgery we implant posterior chamber (PC) Intra Ocular Lens (IOL) after putting viscoelastic substance (visco) in anterior chamber (AC) which inflates capsular bag. However, there are common issues with retained visco in cataract surgery like postoperative spikes of intraocular pressure (IOP), pseudo anterior uveitis, capsular bag distension syndrome, extra surgical time, and endothelial trauma due to washing out of visco. To circumvent these problems we modified only one step of the surgery. We performed small incision cataract surgery using visco before cortical wash and after cortical matter wash we implanted the PCIOl under a continuous irrigation of ringer lactate solution using simco cannula inserted from a side-port, which helped to maintain the anterior chamber and keep the capsular bag inflated. We investigated the possible advantages of using ringer lactate for 3 piece polymethyl methacrylate (PMMA) rigid PCIOl implantation over visco including surgical efficiency, postoperative reaction, postoperative IOP spike, endothelial cell count and surgical time.

Methods

In a prospective randomized controlled interventional study done between April 2010 to May 2010, 100 eyes of 100 patients with cataract with nuclear sclerosis grade 2 - 3
were recruited. Patients with any previous ocular surgery, complicated cataract, mature and hyper mature cataract, patients with glaucoma, corneal opacity / degeneration, and non-dilating pupil were excluded. After selection of patients all required preoperative examinations were done like slit lamp examinations, keratometry by Bausch and Lomb keratometer super KMS 6 model, IOP measurement by Goldmann’s applanation tonometer, IOL power calculation using SRK-II formula, endothelial cell count by Topcon SP 3000 P model and fundus examination by indirect ophthalmoscope. The patients were evaluated similarly after the surgery.

The patients were randomly divided into two groups; one in whom IOL was implanted in ringer lactate (ringer group) and other in which viscoelastic substance Hydroxypropyl Methylcellulose (visco group) was used for implantation of IOL. All patients underwent small incision cataract surgery by the same operating surgeon with similar surgical steps. Surgery was performed under peribulbar anesthesia and a superior rectus bridle suture was taken. Firstly 1.5 mm size side port was made at 8 o’clock position at limbus and anterior capsule stained with trypan blue dye under air bubble. The anterior chamber was filled with viscoelastic substance. After creating a limbal based conjunctival flap, a 5.5 mm frown shaped partial thickness scleral groove was made 1.5 mm posterior to sclera and sclerocorneal tunnel dissected. The AC entry was made 1.5 mm inside the limbus by 3.2 mm keratome and a 5 mm size anterior central curvilinear capsulorhexis (CCC) made. After hydro dissection the nucleus was dialed in AC with hydro dissection cannula itself and brought out by irrigating vectis. The cortical matter was aspirated with simcoe cannula and after thorough cortical matter wash surgical steps were different in both the groups. In visco group AC was filled with visco and IOL implanted (Figure 1) and after that the visco was aspirated from AC as well as from the bag. In ringer group, after thorough cortical matter wash instead of visco we implanted the IOL under a continuous irrigation of ringer lactate using simco cannula (22G) inserted from a side-port which helped to maintain the anterior chamber and keep the capsular bag inflated (Figure 2 a, b, c & d).

The outcome was evaluated on safety (in terms of complications rate), efficacy (in terms of percentage of in-bag-fixation of IOL - complete/partial), post-operative IOP (6-8 hrs, 20-24 hrs and 48hrs), post-operative anterior chamber cells, endothelial cell count and surgical time. Data analysis was done by using SPSS statistical software version 17 with calculation of mean and standard deviation; student
test (paired) was utilized to look for statistical significance and odd’s ratio calculated.

**Results**

There were 50 (50%) patients in each group [Table 1]. The mean age of the patients in both the groups was comparable (p=0.10) [Table 2]. There was no intra operative complication in any group.

**Position of IOL**

Although the number of cases in which one haptic was in sulcus were more in ringer group, the difference between the groups was not statistically significant (odds ratio: 0.32; p >0.05) [Table 3].

**Intra ocular pressure change**

The mean IOP in visco group was 22.24 ± 8.42 mmHg at 6 hrs. which normalized after that. In ringer group it was in normal range throughout. The difference was significant at 6 hr and 24 hr (p value <0.0001).It was not significant at 48 hr. (p= 0.11) [Table 4]

**Discussion**

Small incision cataract surgery is a popular technique of performing cataract surgery and various modifications of the technique have been described. However, there

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**Figure 2 (a) Hydroimplantation of IOL, Change in the position of simcoe cannula from right to left hand (Nondominant); (b) Engaging simcoe cannula to side port from left hand and IOL Implantation from right hand; (c) Microscopic view of position of simcoe cannula holding in left hand inserted from side port; (d) Dialing of IOL under a continuous irrigation of ringer lactate; (e) Hydration of wound after completion of surgery.
are no published studies on hydro-implantation of IOL in SICS. Hydro-implantation of IOL has been tried in Phacoemulsification. Sharma et al in their study have reported significantly higher IOP on day 1, 2 and 7 in SICS using visco with the maximum rise on day one as compared to preoperative IOP. In our study IOP in visco group was high at 6 hours and gradually became normal at 48 hours but in ringer group there were lesser spikes of IOP. Tak et al have reported no rise in IOP in phaco during hydroimplantation of foldable IOL.

Shah et al in their study reported maximum anterior chamber reaction on day one after cataract surgery using visco. In our study the number of anterior chamber cells on day one was more than day two in both groups, but cells in visco group were significantly more than ringer group. Tak et al have reported that the average time of surgery was less in phaco during hydroimplantation of foldable IOL. A similar outcome was noted in our study. Thomas et al have reported that implantation of IOL by Blumenthal technique is easy and safe. In our study there were no complications during IOL implantation in any group. Gogate et al in their study reported 6.5% endothelial cell loss in SICS using visco. Another study by Malik et al has reported 5.5% endothelial cell loss in Blumenthal technique at three months. In our study we observed an endothelial cell loss of 6.08% in visco group and 8.9% endothelial cell loss in ringer group at 48 hrs. The weaknesses of our study were AC reaction calculation by slit lamp biomicroscope and absence of follow up data regarding endothelial cells and IOP. A long term follow up study may be planned comparing ringer lactate, BSS and BSS Plus for the same. We conclude that a small modification in one step of small incision cataract surgery can significantly control spikes of IOP with significantly lesser post operative reaction. With some experience, implantation of IOL in the bag under a continuous irrigation of ringer lactate is safe, accurate and less time consuming method without any significant extra loss of endothelial cells.

References

Safe Suture Burial in Trans-scleral Fixation of Posterior Chamber Intraocular Lens

Ruchi Goel¹ MBBS, DNB, FICS, KPS Malik² MS, MNAMS, FICS

Abstract

The commonest complication of trans-scleral fixation of posterior chamber intraocular lens (PCIOL) is suture erosion. The sutures though crucial for lens stability, if exposed cause discomfort and are a potential source of endophthalmitis. We describe a technique in which the IOL is suspended in the ciliary sulcus using 9-0 polypropylene by an ab externo approach at 2 and 8 o’clock positions through the scleral bed under 3X3 mm partial thickness scleral flaps. The 9-0 polypropylene suture, holding the PCIOL is then secured by an anchoring knot and the entire mesh of sutures are buried under the scleral flap by a simple modification in suturing technique wherein a bite through the undersurface of scleral flap pulls the flap snugly on the suture knot preventing suture erosion.


Key words: IOL, scleral fixation, sutured posterior chamber IOL

Several techniques of trans-scleral fixation of posterior chamber Intraocular lens (PCIOL) have been described. Efforts have been directed towards decreasing the suture related complications but suture erosion through the conjunctiva still remains a major concern. The pathogens besides gaining access to the eye at the time of surgery can be introduced via the exposed sutures which create a communication between intra and extra ocular environment. In the event of suture exposure, removal of suture is not a safe option as it may jeopardize the lens stability although Lubenski et al reported that lens stability depends on fibrous encapsulation rather than the integrity of suture. We describe a simple modification which allows safe burial of suture ends averting their exposure postoperatively.

Technique

The eye is anaesthetised with a peribulbar block using 3 cc of 0.5% Bupivacaine and 3 cc of 2% Lidocaine hydrochloride. Eye speculum and Bridle suture were applied. Conjunctival peritomy was performed at the limbus from 11 to 1 O’clock position, at 2 O’clock and at 8 O’clock position followed by cauterization. Anterior vitrectomy is performed if required.
Two fornix based partial thickness scleral flaps 3X3 mm are dissected at 2 and 8 O’clock positions (Figure 1 a&b). A 6 mm sclerocorneal tunnel is dissected. A 26 gauge(G) needle is introduced from the temporal scleral bed and a straight needle on 9-0 polypropylene from the nasal scleral bed 1 mm posterior to the limbus exactly 180 degrees apart. The needle is entered perpendicular to the scleral surface and once in the ciliary sulcus it is directed towards the opposite scleral bed, hugging the posterior surface of iris. The straight needle on 9-0 prolene is then docked into the lumen of 26 G needle (Figure 2 a,b&c). The 26 G needle is retrieved from the temporal scleral bed along with the prolene suture which is then seen stretched across in the posterior chamber. The sclerocorneal tunnel is completed using keratome. A 26 G needle bent in the form of hook is used to loop the prolene suture out from the section (Figure 2d). The 9-0 prolene is divided into two parts and tied to the eyelets on haptics of a single piece 6 mm polymethyl methacrylate (PMMA) PCIOL. The suture from the left scleral bed is tied to the trailing haptic and from the right scleral bed to the leading haptic (Figure 2e). The PCIOL is placed in the ciliary sulcus and the IOL holding prolene sutures are made taut. An anchoring knot is placed by taking a bite with the curved needle on 9-0 nylon adjacent to the exiting prolene suture on the scleral bed (Figure 3 a,b&c). The two are tied together (Figure 3d) and another bite with the same curved needle is taken from the undersurface of the scleral flap at its proximal end and tied (Figure 4 a&b). A controlled and balanced tension pulls the scleral flap back covering the mesh of suture knots (Figure 5 a&b). The sutures underneath the scleral flap are trimmed and similar procedure is repeated on the opposite scleral bed. The conjunctiva is repositioned with bipolar cautery or conjunctivo-limbal suture (Figure 6). The sclerocorneal tunnel is sutured with 10-0 nylon if required.

**Discussion**

Suture erosion of trans-scleral sutures holding the IOL in place through the conjunctiva is one of the most common complications of scleral fixated IOLs. The protruding suture ends produce a foreign body sensation and are a source of endophthalmitis. When the fixating sutures were tied directly under conjunctiva the rate of suture erosion was 24% which was reduced to 15% with use of scleral flaps. Lewis described a method of suture burial which decreased this complication but required four suture passes, meticulous placement of sutures to avoid lens tilt and difficulty in rotating and burying the knot. To avoid suture tract, a scleral bite taken behind the sclerotomy with suture tied on to itself which directs the free suture ends posteriorly and burying the prolene knots within the corneo-scleral incision beneath partial thickness scleral flap have been tried. To eliminate free suture ends and minimize the risk for knot slippage Chen et al have described a cow hitch suture fixation.

Measures taken to handle the suture if it erodes the conjunctiva are cautering the ends of the suture, cutting the

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**Figure 2 (a)** 26 G needle passed through temporal scleral bed into the posterior chamber; **(b)** Straight needle on 9-0 prolene docked into the lumen of 26 G needle in the posterior chamber; **(c)** Needle on 9-0 prolene docked into the lumen of 26 G needle in the posterior chamber as seen through air filled anterior chamber; **(d)** The prolene suture is brought out through the main wound; **(e)** The prolene suture is divided in two parts and tied to the eyelets on the IOL haptics.
loose ends flush with the knot and argon suture shrinkage. These interventions can threaten the lens stability. Other procedures like burying the knot below fresh conjunctiva, tenon’s capsule, half thickness corneal autograft, donor scleral patch and fascia lata have also been reported but require additional surgeries. To avoid the suture related issues altogether, glued IOLs are now being used where the IOL haptics are externalized and fixed using fibrin glue but long term results of this procedure are still awaited.

In our method, the anchoring suture served as a pillar of support offering better stability to the IOL even with two point fixation. The issue of increased number of knots was satisfactorily dealt by securely covering them with the 3X3 mm scleral flap. The bite taken from the undersurface ensured the flap to snugly cover the knots permanently. Difficulty was encountered if the flap dissected was too thin or too small which caused hindrance in obtaining a secure bite or was of insufficient size to cover the knots. It was pertinent to pass the suture through the undersurface of proximal half of flap. If bite was taken near the distal end, on tightening the suture the flap got elevated. The procedure is contraindicated in patients with thin sclera and scleral disorders. In our experience of 107 patients in the last 8 years, only 2 patients had suture exposure. This was

**Figure 3 (a)** Anchoring suture: A bite is taken from the scleral bed near the exiting prolene suture holding the IOL; (b) The prolene suture is tied to itself; (c) The prolene suture is tied to itself; (d) The longer end of the second prolene suture tied to the exiting prolene suture holding the IOL.

In our method, the anchoring suture served as a pillar of support offering better stability to the IOL even with two point fixation. The issue of increased number of knots was satisfactorily dealt by securely covering them with the 3X3 mm scleral flap. The bite taken from the undersurface ensured the flap to snugly cover the knots permanently. Difficulty was encountered if the flap dissected was too thin or too small which caused hindrance in obtaining a secure bite or was of insufficient size to cover the knots. It was pertinent to pass the suture through the undersurface of proximal half of flap. If bite was taken near the distal end, on tightening the suture the flap got elevated. The procedure is contraindicated in patients with thin sclera and scleral disorders. In our experience of 107 patients in the last 8 years, only 2 patients had suture exposure. This was

**Figure 4 (a)** A bite is taken from the undersurface of the scleral flap; (b) A bite is taken from the undersurface of the scleral flap and a knot is made.
related to the poorly dissected small scleral flaps which were unable to cover the knots completely. One patient required cauterization of suture ends and in the other, the knots were covered by cadaveric scleral graft. In conclusion, our modification of suture burial is simple, safe and effective in preventing suture erosion in trans-scleral fixation of PCIOL.

References

Pleomorphic Adenoma of an Ectopic Lacrimal Gland in the Eyebrow

Gurvinder Kaur MBBS, MS, Jacob Koshy MS, Satish Thomas MD, S.M.Bhatti MS

Abstract

This is a case report of an unusual presentation of an ectopic lacrimal gland in the region of the eyebrow. The tumour was removed surgically and histopathology revealed the tissue to be a pleomorphic adenoma. To the best of our knowledge, this is the first reported case of ectopic lacrimal tissue at this site.


Key Words: ectopic lacrimal Gland, Pleomorphic Adenoma

Ectopic tissue from the lacrimal gland is a rare clinical entity. Cases have been recorded in literature where ectopic lacrimal tissue has been found at varying sites in and around the eye. Ectopic lacrimal tissue has been described on the eyelid, conjunctiva, tarsal plate, cornea, in the orbit, within the globe and even under the nasal mucosa. This ectopic lacrimal tissue may pose a diagnostic challenge. This tissue may also undergo a malignant change. There have been 92 reported cases of ectopic lacrimal tissue in the literature. We present a case of ectopic lacrimal gland tissue in the region of eyebrow which to the best of our knowledge has not been reported so far in the literature.

Case report

A 28 year old female presented to the eye OPD with history of swelling around the right eyebrow for the past 6-7 months. The swelling was painless but progressively increasing in size. There was no history of trauma. There was no other systemic complaint and she enjoyed good health.

Systemic examination of the patient showed no abnormality. Local examination revealed a firm mass which was 1.5cm x 1.0cm in size palpable on the superolateral aspect of right eyebrow about in size (Figure-1). It was adherent to the overlying skin but was freely mobile over the underneath tissue. The mass was non-tender and the surface temperature was not raised. Visual acuity of both the eyes was 6/6, N6. Complete ocular examination of both the eyes was within normal limits. Surgical removal of the mass was planned. The mass was surgically approached through an elliptical incision because of its adherence to the skin. A firm mass was removed in toto by blunt dissection (Figure-2). The mass was free from the underlying structures. The mass measured 1.5x0.6x0.4cms. The deeper tissues were apposed using 6-0 vicryl. The skin was closed using 5-0 nylon interrupted sutures. The tissue was sent for histopathological evaluation and was diagnosed as a pleomorphic adenoma.
Delhi Journal of Ophthalmology

pleomorphic adenoma of the lacrimal gland without any malignant features. The tumour comprised of epithelial and myoepithelial cells arranged in sheets (Figure-3). Abundant myxoid and chondromyxoid stroma was present (Hematoxylin-eosin stain was used). The post-operative period was uneventful. Patient has been coming for follow-up for the last 16 months. No recurrence of the swelling has been noted.

Discussion

The occurrence of ectopic lacrimal gland tissue in and around the eye is a rare clinical entity. There have been 92 reported cases of ectopic lacrimal tissue in the literature (Table-1). Lacrimal gland tissue is normally present in the lacrimal gland, accessory glands of Krause and Wolfring. The lacrimal gland develops from the basal conjunctival cells as solid buds at 8 weeks of gestation. These buds gradually migrate and finally come to lie in the lacrimal gland fossa. The tissue continues to grow after birth and complete differentiation occurs only after three years of age. During this process of development a part of the gland may get sequestered and develop separately, unconnected to the main mass of the lacrimal gland leading to ectopic lacrimal tissue. The secretions from ectopic tissue may accumulate to produce inflammatory or non-inflammatory swellings in the abnormal site. Other theories proposed concerning the origin of ectopic lacrimal tissue include early aberrant implantation of embryonic cells destined to become lacrimal gland tissue, implantation with surface epithelium during the lens formation, pinching off of lacrimal gland buds by closure of the choroidal fissure when they are in proximity, possible intraocular extension of lacrimal tissue along pre-existing scleral defects which may later close and epithelial-mesenchymal interaction in which FGF-10, an inductive signal intensity for the lacrimal gland, acts directly on the conjunctival epithelium to stimulate proliferation. In our patient, the pleomorphic adenoma developed in an ectopic lacrimal gland tissue at the lateral aspect of the eyebrow. This is a very unusual site of presentation and a thorough search through the literature has revealed that this is probably the first case of ectopic lacrimal tissue in the region of the eyebrow to be reported. Another important thing is that this is a very common site for presentation of a dermoid cyst. Thus possibility of an ectopic lacrimal tissue should also be considered in cases presenting with ocular adnexal swellings of this nature.

To conclude, ectopic lacrimal gland tissue is a rare clinical presentation which may pose to be a diagnostic dilemma. A high level of suspicion is required to keep it as a differential diagnosis. The diagnosis can rarely be made on clinical grounds alone and requires confirmation by histopathology.

Table-1: The locations of reported ectopic lacrimal gland tissue.

<table>
<thead>
<tr>
<th>Location</th>
<th>Number of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conjunctiva, limbus, cornea</td>
<td>44</td>
</tr>
<tr>
<td>Orbit</td>
<td>23</td>
</tr>
<tr>
<td>Intraocular lesion</td>
<td>15</td>
</tr>
<tr>
<td>Upper lid or outer canthal area</td>
<td>6</td>
</tr>
<tr>
<td>Upper tarsal plate</td>
<td>1</td>
</tr>
<tr>
<td>Lower lid</td>
<td>2</td>
</tr>
<tr>
<td>Nasal mucosa</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>92</td>
</tr>
</tbody>
</table>

References

Graft Rejection with a Typical Khudadoust line after Descemet’s Stripping Automated Endothelial Keratoplasty

Shveta Jindal Bali1 MD, Animesh Jindal2 MD, Namrata Sharma2 MD

Abstract

We report a case of graft rejection four years after descemet’s stripping automated endothelial keratoplasty (DSAEK). The patient had stopped topical steroids three months before the rejection episode. Clinically, the patient was asymptomatic. Examination showed a corrected distance visual acuity of 20/60, localized graft edema and an endothelial rejection line (Khudadoust line) with linearly arranged keratic precipitates. The patient was managed with a single dose of pulse steroids and frequent instillation of steroid drops. The rejection episode reversed successfully with in 48 hours after the start of the treatment.


Kew Words: graft rejection, DSAEK

Endothelial keratoplasty (EK) is an accepted modality of treatment for conditions affecting the endothelial layer of the cornea. Like penetrating keratoplasty (PK), graft rejection is an important complication noted after EK. The estimated probability of a rejection episode has been reported to be 7.6% by first year and 12% by second year after descemet’s stripping endothelial keratoplasty (DSEK). Discontinuation of topical corticosteroids has been noted to be one of the factors inciting an immunological rejection episode. The common signs observed in a case of rejection after endothelial keratoplasty are diffuse keratic precipitates and stromal edema. We report the presence of a typical endothelial rejection line in a case diagnosed with graft rejection four years after descemet’s stripping automated endothelial keratoplasty (DSAEK).

Case Report

A 64 year old man presented to our tertiary care centre with complaints of poor visual gain after phacoemulsification and posterior chamber intraocular lens implantation in his right eye. Diffuse stromal edema was noted along with epithelial bullae and a diagnosis of pseudophakic bullous keratopathy was made. In the absence of stromal scarring, DSAEK was performed in his right eye. Intraoperatively, a 350 µm microkeratome head was used to prepare the 8.5mm donor lenticule. Postoperative regime included topical moxifloxacin hydrochloride 0.5% (Vigamox, Alcon, Texas, USA) three times a day, topical prednisolone acetate 1% (Predforte, Alcon, Texas, USA) four hourly instillation, and lubricants. Postoperatively, the graft was well centered and apposed to the host stroma. On follow up, the patient gained a corrected distance visual acuity (CDVA) of 20/40 in the operated eye. The frequency of steroid drops was reduced to four times a day after one month of the procedure. After one year of follow up, he was advised to continue instillation of topical steroids at a frequency of twice daily. The patient was on regular follow up in our keratoplasty clinic. At one of the regular follow up visits four years after the surgery, the CDVA was noted to be 20/60 in the right eye and 20/40 in the left eye. Careful slit lamp evaluation revealed the presence of localized stromal edema in the infero-nasal quadrant from 4 o’clock to 6 o’clock (Fig 1). The edema extended upto 2.5mm over the graft leaving central visual axis clear. The patient did not notice any recent decrease in the visual acuity. However, further questioning revealed that the topical corticosteroid drops had been discontinued by the patient three months before the present episode. Epithelial bullae were noted over the edematous cornea (Fig 2). The anterior chamber examination showed the presence of 10-20 cells/ mm2. The corneal thickness over the edematous cornea was 780 µm. A diagnosis of endothelial rejection was made and the patient was admitted to the hospital for management. The patient was given a single pulse of 200mg intravenous dexamethasone sodium phosphate and was started on hourly prednisolone acetate 1% (Predforte, Alcon, Texas, USA) drops during waking hours. Twenty four hours after the treatment was started, a decrease in the stromal edema was noted. Slit
lamp evaluation at this stage showed the presence of linearly
arranged keratic precipitates delineating the area where the
stromal edema was noted (Fig 3). This was identified to be
an endothelial rejection line or the Khodadoust line. Hourly
instillation of topical steroids was continued and the edema
was noted to completely disappear 48 hours after the start
of the treatment. The CDVA at this stage improved back to
20/40 in the patient’s right eye.

**Discussion**

The reported rates of graft rejection in cases with
endothelial keratoplasty vary between 7.5%-14% (Table 1). In a multicentric retrospective study of 199 deep lamellar
endothelial keratoplasty (DLEK) and DSEK cases, the 2-year
incidence of graft rejection episodes was 7.5%. This was
significantly lower than the 13% incidence of first-time
rejection events in a separate series of PKs performed in
Sweden to treat Fuchs dystrophy and bullous keratopathy.
In another retrospective study of 598 DSEK cases, it
was noted that the probability of experiencing an initial
immunological rejection episode was 3.6% within 6 months,
7.6% within 1 year and 12% within 2 years after DSEK. This
was compared to an earlier series of 30 PKs, performed
at the same centre for treatment of Fuchs endothelial
dystrophy, and the estimated probability of an initial graft
rejection episode was 14% within 1 year and 18% within 2

**TABLE 1. Rejection rates and patterns after endothelial keratoplasty in various reported series in literature**

<table>
<thead>
<tr>
<th>Authors</th>
<th>Type of Endothelial KP (n)</th>
<th>Rejection Rates</th>
<th>Follow up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price et al.² Jordan et al.³</td>
<td>DSEK (n=598)</td>
<td>9%</td>
<td>2 years</td>
</tr>
<tr>
<td>Allan et al.⁴, Cornea 2007</td>
<td>DLEK, DSEK (n=199)</td>
<td>7.5%</td>
<td>2 years</td>
</tr>
<tr>
<td>Koenig et al.⁵, Ophthalmology 2007</td>
<td>DSAEK (n=26)</td>
<td>11.5%</td>
<td>3 months</td>
</tr>
<tr>
<td>Covert et al.⁶, Ophthalmology 2007</td>
<td>DSAEK + Phaco (n=21)</td>
<td>14%</td>
<td>6 months</td>
</tr>
</tbody>
</table>

KP: Keratoplasty; DLEK: Deep lamellar endothelial keratoplasty; DSEK: Descemet’s stripping endothelial keratoplasty
DSAEK: Descemet’s stripping automated endothelial keratoplasty
years. Although the probability of an initial graft rejection episode was somewhat lower after EK compared with PK, the difference was not found to be statistically significant. One of the challenges with diagnosing and promptly treating rejection in cases of endothelial keratoplasty is that patients are often asymptomatic or have mild symptoms such as irritation. The common signs observed in these cases are the presence of corneal edema and/or diffuse keratic precipitates. There have been few reports of presence of endothelial rejection lines in such cases. Covert et al noted endothelial rejection lines and keratic precipitates in three patients with graft rejection after DSAEK with phacoemulsification. Discontinuation of steroids has been noted to be one of the important factors leading to graft rejection. Jordan et al noted that 39% of the cases were not using corticosteroids at the time of rejection episode, owing to poor-compliance. Recurrent graft rejection was noted in another case of DSAEK in a patient not compliant with the usage of corticosteroid drops during the postoperative period. Similarly, the occurrence of graft rejection in our case four years after the surgery can also probably be attributed to the discontinuation of the steroid drops by the patient. In conclusion, patients with operated endothelial keratoplasty should be kept on a long term regular follow-up. Clinically, the rejection episodes in such cases can be asymptomatic. Long term steroid therapy should be considered in these cases to prevent the occurrence of graft rejection. Prompt detection and management form the key to successful reversal of the rejection episodes in cases with endothelial keratoplasty.

References


Acute Hemorrhagic Conjunctivitis by Enterovirus 71

Brahm Prakash Guliani 1 MS, Pratyush Ranjan 1 MBBS, Anurag Narula 1 MS, Shashi Khare 2 MD

Abstract

Enterovirus 71 (EV71) infection is generally asymptomatic but it may cause hand foot mouth disease (HFMD), severe pulmonary edema, meningoencephalitis, acute flaccid paralysis and even death during epidemic outbreaks. We are presenting a case of an acute hemorrhagic conjunctivitis (AHC) in a fourteen year old female who presented to us with sudden onset of pain, redness, lid swelling & subconjunctival hemorrhage with watery discharge involving both the eyes for four days in which EV71 virus was isolated from conjunctival swab. To the best of our knowledge this is the first case of AHC reported to be due to EV71.


Key Words: hemorrhagic conjunctivitis, enterovirus 71

Enterovirus 71 (EV 71) was first isolated1 from feces of a nine month old suffering from encephalitis during 1969-1973 California outbreak, which also saw many deaths1. It is the newest member of enterovirus genus of picornavirus family which is single stranded positive sense RNA viruses. EV71 replicates in the intestinal and upper respiratory tract and is typically shed between two and four weeks. Thus transmission can be due to faeco-oral and respiratory route, by direct person-to-person contact, droplets or fomites2. In general, the enteroviruses have a distinct seasonal pattern of circulation that varies by geographic area. In tropical and subtropical countries, circulation tends to be year round, with more outbreaks in the rainy season.

Information regarding the recent seroepidemiology of EV71 is limited; however it is generally seen in approximately 50% of children of more than five years of age in Southeast Asia. We are presenting a case of acute hemorrhagic conjunctivitis caused by EV 71, which has never been isolated from conjunctiva or reported as a cause of acute hemorrhagic conjunctivitis.

Case Report

A fourteen year old female presented to us with sudden onset of pain, redness, lid swelling and watery discharge in both the eyes for four days. Symptoms were sudden in onset and did not progress. There was no associated history of photophobia, diminution of vision, fever, headache, weakness of limbs or diarrhea. A detailed examination of both the eyes was performed. There was presence of ecchymosis of both upper and lower lids, subconjunctival hemorrhage, conjunctival congestion and follicles in upper tarsal conjunctiva. Her visual acuity was 6/6 (20/20) in both the eyes. On further examination cornea was clear, fluorescein staining was negative and there was no evidence of uveitis. The fundus examination was normal in both the eyes. A provisional diagnosis of acute hemorrhagic conjunctivitis was made. No abnormality could be detected on systemic examination. A conjunctival swab for virus isolation was taken and sent to National Center for Disease Control (NCDC), New Delhi, India which is a regional center for Center for Disease Control (CDC), Atlanta, USA. At NCDC the samples were processed for virus isolation in RD & Hep2 cell lines. This was confirmed by neutralization tests using specific antisera and in Hep2 cell line obtained from National Institute for Public Health and the Environment, Netherland (RIVM). EV71 was isolated from the swab. The patient was treated with topical decongestant drops four times a day for two weeks. Patient improved symptomatically and lid hemorrhage resolved within 10 days of presentation. No sequelae were reported even after eight months of follow up.

Discussion

Acute hemorrhagic conjunctivitis (AHC) was first described in 1969 from Ghana3. It is also called Apollo II disease, because the epidemic coincided with Apollo II moon landing. AHC has been described in numerous other countries. In last five years the pandemic has been reported with increasing frequency, and have affected many countries around the globe45, putting at risk almost 1/3rd of population of world. These are the same areas where EV71 infection is also emerging and causing severe complications.

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2.National centre for disease control (NCDC) Delhi, India.

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and death. Coincidence is most striking, that both EV71 and AHC have been described for the first time in 1969, one in USA and another in Ghana. In all the epidemics of AHC reported till now, the causative agent has been either Coxsackie A24 or Enterovirus 70.

The presentation of AHC includes swollen lids, conjunctival follicles, chemosis and subconjunctival hemorrhages. Our patient besides conjunctival hemorrhage had lid hemorrhage which has not been reported previously. The cornea can exhibit superficial epithelial changes. Corneal involvement was not found in our case. The initial response to the viral infection in AHC is a mononuclear cell inflammatory response. A watery intercellular exudate is present, which is replaced by subconjunctival blood as the infection progresses. Rarely, neurological sequelae have been noted. Polio like paralysis has been reported in 1 case per 10,000. It is considered a major cause of aseptic meningitis and HFMD in children. Currently no treatment is available for AHC; it usually exhibits a self-limiting course. Treatment with topical steroids should be avoided because of reported microbial super infection of the cornea. Our patient improved with symptomatic treatment without any sequelae. Lid echymosis can indicate infection with EV 71.

References

Anti Vascular Endothelial Growth Factor Agents in Corneal Neovascularization

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Abstract

Corneal neovascularisation is a potentially blinding condition, an established risk factor for rejection and results in loss of immune privilege. It may occur as a normal physiologic healing response to various stimuli or as an inappropriate local tissue response to primary insult arising due to an imbalance between the angiogenic and antiangiogenic factors present in the normally avascular cornea. Medical and surgical treatment modalities have been described for the condition but there is no established treatment protocol. Anti vascular endothelial growth factor (Anti VEGF) agents are increasingly being used for the condition. In this article, we have presented the pathogenesis of corneal neovascularisation, role of VEGF and discussed the emerging use of anti VEGF agents as a treatment modality.


Key Words: Corneal neovascularization, vascular endothelial growth factor, bevacizumab

Corneal neovascularization (CNV) is a condition characterized by proliferation of new vessels and vascularization of the normally avascular cornea. CNV may occur as a part of the normal physiological healing process in response to an allergic, infectious, immunologic, anoxic, traumatic, or degenerative stimulus. However, pathologic CNV occurs due to an inappropriate local tissue reaction to the primary insult, which results in chronic and persistent upregulation of the angiogenic response. Pathological blood vessels are immature and lack structural integrity; their increased vascular permeability causes chronic corneal edema, lipid exudation, inflammation, and scarring. Pathological CNV is a potentially blinding condition. It is also an established risk factor for rejection and ultimate failure of subsequent penetrating keratoplasty.

The neovascular response also leads to a loss of immune privilege, manifested as the inability to sustain the anterior chamber–associated immune deviation.

Pathogenesis of Corneal Neovascularization

The normal cornea is an avascular structure. Corneal avascularity is actively maintained by a balance between antiangiogenic and angiogenic factors, which have been summarized by Chang et al and Qazi et al. Angiogenic factors include fibroblast growth factor and vascular endothelial growth factor (VEGF) while anti-angiogenic factors include angiostatin, endostatin and pigment epithelium derived factor. Besides these factors, additional defense mechanisms have been described, which help to maintain corneal avascularity, these include soluble vascular endothelial derived growth factor (VEGF) receptor-1 that inhibits the angiogenic effects of VEGF by acting as a decoy receptor and inactivates Flt, a membrane-bound VEGF receptor. Fas ligand (FasL), which induces apoptosis in invading inflammatory cells and endothelial cells that are Fas positive. Thrombospondin-1, which reduces the angiogenic response to corneal injury by activating CD-36, a transmembrane protein found on macrophages and endothelial cells, which downregulates VEGF secretion and targets endothelial cells for apoptosis. The heme–oxygenase system has also been shown to be an intrinsic cytoprotective and anti-inflammatory system in the cornea.

The etiopathogenesis of corneal neovascularization (CNV) involves an imbalance between angiogenic and antiangiogenic factors and a breakdown of these defense mechanisms.

Patterns of CNV include superficial vascularization, vascular pannus, and stromal vascularization. Superficial vascularization extends only beneath the epithelium; vascular pannus is mainly associated with ocular surface disorders and entails vessel and collagen growth onto the peripheral cornea; and stromal invasion of vessels extends between the Bowman and Descemet layers.
Development of CNV can be broadly divided into three phases, a latent prevascular phase, an active neovascularization (NV) phase and finally, a vessel maturation and regression phase. In the prevascular phase, there is limbal vessel dilation leading to increased vessel permeability and leukocyte and platelet migration. This is followed by an endothelial cell activation phase, in which there is cell retraction and decrease in the number of endothelial cell. This is followed by degradation of the endothelial lamina, simultaneous endothelial cell migration into the surrounding extracellular matrix, and replication. There is activation of matrix metalloproteinases and subsequent degradation of the extracellular matrix that allows the endothelial cells to invade and form vessels. This is followed by vessel lumen formation and vessel maturation.

Role of VEGF in CNV

Many studies have described the role of VEGF as a functional endogenous corneal angiogenic factor. VEGF is a member of a family of proteins, which include VEGF-A, VEGF-B, VEGF-C, VEGF-D, and placental growth factor. Among these, VEGF-A isoforms have received the most attention as mediators of pathologic CNV. VEGF-A is known to increase migration and mitosis of endothelial cells, increase methane monooxygenase activity, and play a role in the creation of blood vessel lumen and vessel fenestrations.

Anti-VEGF Agents

Various antiangiogenic therapy strategies have been used to interfere with the VEGF system: VEGF neutralizing antibodies, VEGF receptor antibodies, recombinant soluble VEGF receptor proteins, VEGF antisense nucleotides, ribozymes, and receptor tyrosine kinase inhibitors. The clinical focus at the present time for CNV is in the use of antibodies to VEGF. Bevacizumab (Avastin; Genentech, Roche, Switzerland) is a full-length recombinant humanized murine monoclonal anti vascular endothelial growth factor antibody (93% human origin and 7% murine origin) that binds to and inhibits biological activity of all human VEGF-A isoforms.

Role of Anti-VEGF agents in CNV

Experimental studies using bevacizumab have shown a statistically significant reduction in various parameters of CNV such as area and density. Cursiefen et al and Bachmann et al showed that neutralizing VEGF could promote graft survival in the murine model. Manzano et al in 2007 evaluated the effect of topically administered bevacizumab (Avastin) on experimentally induced corneal neovascularisation in rats following chemical injury and found a statistical significant limitation of the area of CNV in the treatment group as compared to the control group.

Habot-Wilner et al in 2010, evaluated the role of different concentrations of topical bevacizumab in rats and found that maximum limitation of experimentally induced CNV was with the highest used concentration of 4 mg/ml. Chen et al in 2009 studied the role of subconjunctival administration of bevacizumab, they found significant limitation of experimentally induced CNV in the treatment group. The effect has been the greatest on newly forming vessels rather than established vessels. Yoeruek et al in 2007, reported that bevacizumab is non-toxic to cultured corneal cells in doses usually used for CNV. None of the studies have reported any significant side effects. Clinical studies using bevacizumab are in the form of case reports and prospective interventional case series. There have been a range of etiologies treated: lipid keratopathy (LK) after herpetic keratitis, bullous keratopathy, corneal scars (after infection and exposure), corneal ulcers, pre-PK, post-PK, rejected PK, graft-versus-host disease, limbal stem cell deficiency, pterygium, Steven–Johnson syndrome, peripheral ulcerative keratitis, rheumatoid keratitis, interstitial keratitis, ocular cicatricial pemphigoid, herpetic stromal keratitis, Terrien marginal degeneration, postrauma, corneal melt after multiple operations, chemical injury, dry eye, and familial dysautonomia.

The route of drug administration were topical (range: 5–25 mg/mL, 2–5/d), subconjunctival injection (range: 1.25 mg/0.05 mL to 5 mg/0.2 mL, single monthly injections repeated if necessary) and soaked corneal light shield (weekly application of 1.25 mg/0.05 mL for 20 minutes for 11 weeks) using varying dosing regimens.

Most studies reported a reduction in CNV in measured parameters such as area of CNV and density. However, two studies by Mackenzie et al (keratoconus with previous failed PK) and Bahar et al (recurrent pterygium) reported no effect. In a 5 patient interventional case series Bock et al in 2008, reported that application of bevacizumab drops led to decrease in the area of CNV, which was refractory to conventional treatment. Awadein noted immediate regression of CNV and inflammation after topical bevacizumab drops, but the effect was transient and short lived, with eventual permanent failure in all 3 patients of graft rejection. He also noted that the initial regression was more marked in patients with smaller and/or fewer blood vessels. The largest reported case series of 29 patients is by You et al, where they have used Avastin in 6 patients of LK because of herpetic keratitis; 15 patients of corneal scars; 6 patients of PK; and 2 patients with bullous keratopathy. They concluded that a partial and transient reduction in CNV was found in cases where the dose was 2.5 mg or more, with no significant effect using a lower dose injection of 1.25 mg.

Anti-VEGF agents have not been successful in all cases and seem to be most effective for newly forming small-to-medium sized vessels. This is because VEGF is more likely to be actively secreted in newly forming vessels rather than established vessels. Other factors which may affect the
success of anti-VEGF treatment include the intensity of the angiogenic stimulus, the epithelial barrier function\(^{14}\) and the fact that the CNV may be etiology-specific and may depend on angiogenic cytokines other than VEGF that are not blocked by bevacizumab.\(^{39}\) Jo et al\(^{40}\) have pointed out that anti-VEGF therapy may not be as effective in the treatment of established CNV because once mature, the dependence of these new vessels on VEGF-A decreases. They have demonstrated that combination treatment with platelet-derived growth factor B inhibitors may be more effective. The optimal number of injections/applications per eye to reach the therapeutic concentration in the cornea to achieve maximal effect and the ideal time for repeat injections needs to be further studied. The clinical studies did not report any significant side effects. However, the safety data on its topical use is preliminary. There are concerns that bevacizumab may inhibit or delay the normal wound healing responses in the cornea and cause loss of epithelial integrity and stromal thinning.\(^{38}\)

### Conclusion

Currently, most studies that have been conducted on the role of anti-VEGF agents have been small and uncontrolled. Most of the studies do report some improvement in CNV with treatment; however a definitive role of bevacizumab and other anti-VEGF agents can only be established after data on long-term outcomes is available. At present, it seems likely that given the specificity of action of anti-VEGF agents, they will most likely find a role as an adjunct to other modalities of treatment rather than as a replacement for them.

### References


Millennium Development Goals and Vision 2020
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Abstract

VISION 2020 aims to eliminate the main causes of avoidable blindness by the year 2020 by bringing together governments, non-governmental agencies, eye care professionals, and other organizations involved in blindness prevention, to facilitate the planning, development and implementation of sustainable national eye care programmes. This vision is based on three core strategies of disease control, human resource development and infrastructure development, incorporating the principles of primary health care. The successful implementation of VISION 2020 would not only reduce individual suffering, but would also provide significant social and economic benefits. Visual impairment brings profound economic disadvantage to individuals, their families and societies. With 90% of blind people living in developing countries, it is not surprising that such investments make a significant contribution to the achievement of the Millennium Development Goals. The economic benefits of VISION 2020 can be translated positively into the Millennium Development Goals (MDGs). Seven of the eight MDGs depend on measures linked to the implementation of VISION 2020. This means that progress towards the goals of VISION 2020 will also help governments to achieve the MDG objectives – a win-win situation.

The number of blind people in the world is set to double over the next twenty years, despite the availability of highly cost-effective interventions. Four out of five people who will lose their sight will do so unnecessarily. It was in recognition of this unacceptable prognosis that the World Health Organization (WHO) and the International Agency for the Prevention of Blindness (IAPB) in 1999 launched the joint initiative known as VISION 2020: The Right to Sight. This provides the programmatic framework for eliminating avoidable blindness by the year 2020. If the political will and adequate resources can be galvanized in tandem, this goal is eminently achievable. United Nations launched the Millennium Development Goals (MDGs) in the year 2000 as a collaborative measure to end poverty in developing countries. The MDGs includes 8 goals that are refined into specific targets and measurable indicators to assess progress of achievements by 2015.\textsuperscript{1} It is an important and emerging issue that has a profound effect on VISION 2020: The Right to Sight.

India is committed to MDGs, which are achievable only if some changes are made.\textsuperscript{2} The activities related to blindness control are associated to MDGs and it will be difficult to achieve these goals without giving priority to blindness control programmes. The objective of eliminating avoidable blindness is relevant to the achievement of all 8 MDGs. It is estimated that with effective implementation of VISION 2020 in India, the number of blind people may reduce to 5 million by 2020 instead of projected 15 million. Effective eye care activities can augment the achievement of MDGs.

Blindness and Poverty Eradication

Blindness is considered as a cause as well as a consequence of poverty. Blindness leads to poverty, as blind people remain uneducated, unemployed and dependent on other people. A high proportion of these, are children. Vitamin A deficiency is the leading cause of blindness in children. A successful VISION 2020 programme could, potentially, cut the projected number of blind in 2020 from 75 million to 24 million. VISION 2020 recognizes the poverty trap of people with visual impairment and the real risk that they will be excluded from basic health and education services and suffer economic deprivation. Disability contributes to the risk of poverty, but conditions of poverty add to the risk of disability. Those who are blind are invariably amongst...
the poorest of the poor: UNESCO studies suggest only 1-2% of children with disabilities in developing countries receive an education. Inadequate nutrition (particularly Vitamin A deficiency), poor sanitation, lack of safe drinking water, and limited access to healthcare, all central elements of poverty, contribute to avoidable blindness. Blindness in the productive age group can result in loss of employment. In a study conducted in Madurai, 85% males and 58% females who had lost their job due to cataract blindness could resume their jobs after the cataract surgery. The surgery also helps people in regaining their social role in the community. Presbyopia affects the productive capacity of people over forty. The services for near vision spectacles can directly improve the productivity and quality of life. Globally, it is estimated that one in five of the world’s poorest people have a disability, and 82% of disabled people in developing countries live below the poverty line. It is estimated that 90% of the blind population in India live below the poverty line. The cumulative loss over the lifetime of the blind was US$ 77.4 million. It was estimated that surgical treatment for Cataract blindness could improve saving by USD 1.1 billion. Communities living in poverty are more likely to be affected by vitamin A deficiency, measles infection, and trachoma, all of which increase the risk of blindness. Conversely, individuals who are blind are less likely to be able to access eye care services, education, or rehabilitation. People who are blind remain ‘impoverished’ in the broadest sense of the word. VISION 2020 seeks to ensure the best possible vision for all people by adopting an integrated approach based on priority diseases in poverty stricken areas, development of eye care facilities and training of eye care personnel; thereby contributing directly to improvements in quality of life and creating more favourable economic, social and health conditions for individuals and society at large.

Blindness and Universal Primary Education

It is estimated that approximately 90% blind children are unable to attend school. Of the 75 million of primary school age children out of school, over 30% are disabled. In India, 50% of blind children never enroll in school. Approximately 90% of visually impaired children in low-income countries are deprived of schooling. Lack of infrastructure, affordable health care, production of accessible and suitable school materials and qualified teachers prevent visually impaired children from attending school in many low income countries. Blindness among adults in the family may result in decreased school attendance and performance. For instance, blind adults in many low-income countries are dependent on school-age children and other family members. In addition, low vision and refractive error resulting from lack of early interventions reduces school performance. VISION 2020 programmes improve access to educational and employment opportunities by using a wide range of public health interventions that enhance children’s access to education and reduce hunger, malnutrition and blindness. Strategies to control blindness in children include the provision of good primary health care, and the development of models to provide affordable optical correction and low vision aids.

VISION 2020 initiatives can contribute towards the MDG of universal primary education in four ways:-

- Reducing blindness in adults, so that sighted children do not need to stay at home as care takers.
- Preventing blindness in children.
- Ensuring that children with significant uncorrected refractive errors are identified and given the spectacle correction they need.
- Linking eye care services to special education or other educational services for children who are visually impaired or blind.

Myopia affects 5-10% of school children and may be an important reason for school dropouts. School vision screening programme (SVSP) and services for spectacles remains a priority to attain universal education among children. VISION 2020 partners include vision screening in schools, training in paediatric eye care, and early intervention for retinopathy of prematurity.

Blindness, Gender Equality and Women Empowerment

Blindness is more common among women due to high prevalence of cataract and trachoma as well as low uptake of services among them. Women usually wait for free camp surgeries. Change in people’s behavior against gender discrimination, vocational training, employment generation and empowerment of disabled women is needed. It is estimated that two thirds of all those who suffer blindness are women, around 80% of those suffering from severe trachoma are females and 75% of those with cataract are females. Vision 2020 programmes place a high priority on an inclusive approach which ensures that the needs of women are fully addressed. Gender equality is a key principle of VISION 2020 and a central feature of many national eye care strategies.

Blindness and Reducing Childhood Mortality

India is lagging behind in MDG for reducing child mortality. The target for under-5 mortality rate (key indicator for assessing magnitude of childhood blindness 7 by 2015 is < 42 per thousand live births (Current rate= 69 per thousand live births). Many conditions which cause childhood blindness are also causes of child mortality (eg measles, diarrhoeal disease and meningitis). Until the recent success of large-scale vitamin A supplement programmes, 60% of children died within a year of becoming blind.
Amongst pregnant women, vitamin A deficiency leads to night blindness and may increase the risk of maternal mortality. Vitamin A prophylaxis & treatment, measles and rubella vaccination, nutrition supplementation in Anganwadis and schools can substantially reduce childhood mortality and in turn reduce the prevalence of diarrhoea and malnutrition, major causes for childhood morbidity and mortality in India.

VISION 2020 supports the training of Primary Health Care and Community workers to ensure that eye care needs of children and pregnant women are identified and treated at an early stage. This has a direct bearing on maternal and child health, in the long term reducing under-five mortality rates. Global initiatives to control vitamin A deficiency and measles infection are succeeding not only in preventing child deaths, but also in preventing blindness. One of the VISION 2020 targets is to eliminate corneal scarring in children by the year 2020, and another is to almost halve the prevalence of blindness in children by controlling the avoidable causes. Both of these targets, if achieved, will contribute towards reducing child mortality. VISION 2020 activities can also reduce child mortality by improving water supplies and sanitation in areas where trachoma is endemic. This is likely to reduce diarrhoea, which is an important cause of vitamin A deficiency in children.

Blindness and Combat HIV/AIDS, Malaria

People living with disability may be equally - or more exposed to risk factors that lead to infectious diseases and have limited access to outreach and treatment services. Major ‘neglected diseases’, which include blinding conditions such as trachoma are endemic in rural and impoverished urban areas of low-income countries and can impair education and worker productivity. The disabled including blind people are at higher risk of developing HIV/AIDS, malaria, tuberculosis and other major diseases due to social abuse, illiteracy and unawareness about preventive measures. They have limited access to health care due to disability and unaffordability.

Blindness and Environmental Sustainability

SAFE strategy (lid surgery (S), antibiotics to treat the community pool of infection (A), facial cleanliness (F); and environmental changes (E)) for prevention and treatment of trachoma includes environmental modification and availability of clean water and sanitation facilities. Effective implementation of this strategy may help achieve MDG targets of drinking water and sanitation facilities and environmental sustainability. People in low income countries suffering disability are likely to be amongst the poorest with inadequate housing conditions.

Blindness Control Through a Global Partnership for Development

VISION 2020 is a joint programme of WHO, IAPB, NGOs and national blindness programme divisions of member countries. The policy formulation at international level, resource allocation at national level and planning and implementation at district level are the key features of the programme. The programme shows directions to other MDG programmes for achieving global partnership among different stakeholders. The Millennium Development Goals form a blueprint for action agreed to, by governments worldwide, as well as the world’s leading development organizations to address the needs of the world’s poorest people, whose numbers include the majority of those who are unnecessarily blind. It is necessary that all International and national stakeholders should realize the importance of eye care activities in achieving MDGs. This will further help in more resource allocation, participation at all level and effective implementation of eye care programmes.

References

We wish to draw the concern of the readers to the risk of chemical eye injuries caused by hydrogen peroxide, especially in cases of children. Hydrogen peroxide (H₂O₂) is a pale blue syrupy liquid, which appears colorless in dilute solution. It is a weak acid when dissolved in water, has strong oxidizing properties, and is a powerful bleaching agent. This chemical is available in various strengths and grades ranging from 3.5% to 90%. Low concentration, such as 3% widely available over the counter for use as an antiseptic. Higher concentrations are potentially hazardous and Material Safety Data Sheet should accompany such preparations. This sheet enlists potential health effects including corrosive action on the skin and mucus membranes. It also highlights that direct contact with the eye is likely to cause corneal damage and recommends immediate eye wash and ophthalmic evaluation.

Food grade hydrogen peroxide (35%) is commonly used in rural India as an anti-bacterial agent. It can be procured over-the-counter and the material safety data sheet is seldom provided. The lack of proper storage facilities like refrigeration makes hydrogen peroxide a popular and cheap agent for milk preservation in a large number of rural households. Fresh cow’s milk is mixed with hydrogen peroxide by the women-folk of the house. This is often carried out as a common household chore, oblivious to the potential dangers of this chemical. We have treated 5 patients with severe ocular injuries due to hydrogen peroxide in the last 6 months. Three of these patients were infants (2 months to 7 months of age) and presented with bilateral corneal burns. While they lay in their mother’s lap as she mixed hydrogen peroxide in milk, the accidental spillage of the chemical into their eyes caused these devastating bilateral injuries. Two older children (aged 4 and 6 years) had unilateral burns due to inadvertent splash of chemical in fellow child’s eye while playing. The features of ocular burns included marked conjunctival congestion, corneal edema and severe uveitis. While the uveitis subsided with steroid therapy, the entailing corneal opacification was the blinding sequelae.

The lack of specialist eye care in rural areas is a further impediment to appropriate and timely management of such chemical injuries, and this may potentially worsen the prognosis and final outcome in these cases.

Through this communication we wish to increase the public awareness regarding the dangers of hydrogen peroxide. Perhaps these cases are only the tip of the iceberg and this household disaster may be often unreported in many rural homes of developing countries such as ours. It should be made mandatory that material safety data sheets to be provided with all concentrated preparations of hydrogen peroxide. Moreover, it is recommended that this sheet, usually supplied in English, be accompanied with an appropriate translation in the local language to ensure that it fulfils its purpose.

References

Rosai-Dorfman Syndrome

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Rosai-Dorfman syndrome (Sinus histiocytosis with massive lymphadenopathy) is a rare idiopathic benign histiocytosis characterized by non-malignant proliferation of distinctive histiocytes within lymph node sinuses and other extranodal sites. The most common presentation is painless massive cervical lymphadenopathy (80%). The extranodal involvement occurs in 43% and involves the respiratory tract, visceral organs, skin, bone, central nervous system, urinary tract and orbit. In the present series of clinical photographs, we describe a case of bilateral lacrimal sac and skin involvement in Rosai-Dorfman syndrome. A middle age female was referred with complaints of intermittent watering and painless swelling near inner side of right eye since one year and that of left eye since two months. On examination, the patient had best corrected visual acuity (BCVA) of 20/20 OU, bilateral firm, fixed swelling in inferomedial quadrant of the orbit extending above the medial palpebral ligament and patent syringing (figure 1). The size of the swelling on right side was 2.5 × 2.5 × 2 cm and left side was 1.5 × 1.5 × 1 cm. There was bilateral limitation of adduction. There was also a well defined subcutaneous swelling of 10 × 10 cm in the thoracic area.

Figure 1: Bilateral swelling in infero-medial orbits; Figure 2: Subcutaneous swelling in thoracic area; Figure 3 (a,b): MRI scan showing bilateral well defined extraconal lesion, MRI scan showing extension of lesion into the upper naso-lacrimal ducts; Figure 4: FNAC of orbital tissue showing lymphocytes, macrophages, plasma cells; Figure 5: Excision biopsy of the mass; Figure 6 (a,b,c): Histopathology showing histiocytes, emperipolesis, lymphocytes and plasma cells Positivity for CD-68 immunostain, Positivity for HAM-56 immunostain.

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paramedian area on the back in the thoracic region (figure 2). The magnetic resonance imaging (MRI) showed the presence of well defined extracranal, lobulated lesion (figure 3a) with extension into the upper part of naso-lacrimal ducts bilaterally (figure 3b). The contrast enhanced computed tomography (CECT) scan of whole body was normal. The fine needle aspiration cytology (F.N.A.C.) of the both orbital swelling was carried out which showed similar pathology with presence of abundant population of reactive lymphoid tissue consisting of mature lymphocytes, follicular central cells, macrophages and plasma cells and absence of immature cells (figure 4). The systemic investigations were normal except for mild anaemia, raised ESR and serum electrophoresis showed the presence of polyclonal hyperglobulinemia. The excision biopsy of the right side was performed. The mass was involving naso-lacrimal duct and lacrimal sac, so it was removed piecemeal (figure 5 a,b). The histopathology of the excised tissue showed nodular collection of histiocytes dissected by the fibrous bands. They showed emperipolesis (lymphophagocytosis) with formation of giant cells. There was also an admixture of plasma cells and mature lymphocytes were seen (figure 6a). The plasma cells showed both kappa and lambda positivity indicating the presence of immunoglobulin. The cells were positive for S-100, CD-68 and HAM-56 (figure 6 b,c). The overall features were suggestive of Rosai-Dorfman disease. The FNAC of back swelling was also similar to the ocular specimens. The patient was started on oral prednisolone (50 mg OD) following which complete resolution of the thoracic swelling was seen in four months. However, diplopia in upgaze and mild watering persisted but was not troublesome to the patient. At one year of follow up, she had no recurrence or appearance of any other swelling. Rosai Dorfman syndrome typically presents in adult life with a mean age at diagnosis of 20.6 years. The reported ophthalmic manifestations of Rosai-Dorfman disease include orbital and eyelid involvement, lacrimal gland involvement, optic nerve compressive neuropathy, uveitis, serous retinal detachment and marginal corneal infiltrates. Adnexal involvement occurs in about 10% of patients with extranodal disease. Lesions may be restricted to epibulbar areas, lid, or may involve the intracranal and extracranal space, presenting with progressive proptosis, ptosis or restricted motility. While a majority of patients with orbital involvement have concurrent lymphadenopathy, some may present with orbit as the sole extranodal site of involvement without synchronous nodal disease, and a minority may have concurrent involvement of other extranodal sites. Laboratory findings include anemia, RBC autoantibodies, leukocytosis, elevated ESR, polyclonal hypergammaglobulinemia and reversal in CD4:CD8 ratio. In majority the disease is self limiting, but patients may suffer relapses and remissions over many years and death due to vital organ compression or immunological abnormalities. Ideal treatment is still to be established and about 50% of cases need some form of treatment. Management options include observation of cases with no cosmetic or functional abnormality or surgical excision/debulking for accessible location. Medical management includes systemic steroids, radiotherapy or chemotherapy for vital organ or optic nerve compression. Our case was atypical because of onset at an older age, absence of lymph node involvement and involvement of bilateral lacrimal sac. Previously only two cases of unilateral lacrimal sac involvement have been reported. To conclude Rosai-Dorfman syndrome may be suspected in a progressive mass with or without cervical lymphadenopathy.

References

The EX-Press Glaucoma Filtration Device

The EX-Press Glaucoma Filtration Device is a non-valved glaucoma filtration device, made of medical "grade stainless steel" and designed to regulate IOP diverting aqueous humor through an implant from the anterior chamber to the intra-scleral space. The Device is implanted beneath a sclera flap to increase resistance to aqueous outflow in the immediate postoperative period. This provides more uniform filtration control and a greater margin of safety than trabeculectomy with less hypotony and related choroidal effusion creating a more predictable result for the surgeon and patient. Additionlly unlike a trabeculectomy, there is no need for an iridectomy and removal of sclera tissue which reduces postoperative inflammation and the risk of hyphema.

Surgeons will find that the steps of implantation for the EX-PRESS Glaucoma filtration device are very similar to their standard trabeculectomy minus the iridectomy and sclerotomy.

First the surgeon should snip conjunctiva to introduce cannula for dissection of tenons from the sclera. Next, the surgeon performs a peritomy and a conjunctival flap is created.

The Surgeon then makes incision for the sclera flap. The surgeon dissects the sclera flap up to clear cornea. The scleral flap created should be between 33% to 50% thickness. The surgeon should ensure that the scleral flap is large enough to cover the entire EX-PRESS Glaucoma Filtration Device. No part of the device should be exposed outside of the scleral flap.

Next, the surgeon applies his or her standard wound management techniques to ensure long term bleb formation and function. Next, the surgeon should identify the area under the sclera flap where the EX-PRESS device is to be implanted. Proper placement is in the lower blue-gray zone. Before implantation of the EX-PRESS device the surgeon creates an incision track using a 25g/26 gauge needle or 25 g trocar blade. The incision track must be parallel to the iris. The is critically important to ensure proper placement and function of the EX-PRESS Glaucoma Filtration Device.

Figure 1: The EX-PRESS Glaucoma Filtration Device

Figure 2(a) The EX-PRESS Device in position before the surgeon closes the scleral flap; (b) The Cypass supraciliary device targets aqueous outflow through the supraciliary space; (c) The EX-PRESS Glaucoma Filtration Device comes with its own insereter. The surgeon positions his finger over the injector’s button and then applies downward pressure for a soft release.
Unlike, standard trabeculectomy, the surgeon does not do a sclerotomy or iridectomy thus helping to maintain intraoperative IOP control and minimizing the risk of post-operative hypotony, hyphema, choroidal effusion.

The surgeon will notice that the EX-PRESS Glaucoma Filtration Device is preloaded on the EX-PRESS Delivery System, also known as the EDS, for ease of implantation. The surgeon places his or her finger on the trigger of the EDS and then implants the EX-PRESS Glaucoma Filtration Devices by first rotating it 90 degree, gripping the sclera for counter pressure and then inserting the device. Once the EX-PRESS Glaucoma Filtration Device is inserted, the surgeon then rotates the device vertically and depresses the trigger on the EDS delivery system.

As soon as the EX-PRESS Glaucoma Filtration Device is inserted, the surgeon should verify that flow is exiting the EX-PRESS Glaucoma Filtration Device into the sub-sclera tissue. The surgeon will notice that the rate of aqueous flow out of the anterior chamber into the sub-sclera tissue is much more controlled with the EX-PRESS Glaucoma Filtration Device than standard trabeculectomy.

Once flow has been confirmed, the surgeon sutures the flap and conjunctiva is closed. It is important that the surgeon suture the flap tightly to mitigate the risk of hypotony. Suture tightness should be similar to the tightness used in the surgeon’s standard trabeculectomy. Once the sclera flap and conjunctiva have been sutured, the procedure is complete and a bleb will form.
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Focusing on the needs of surgeons & patients, HOYA Surgical is now in the processes of establishing direct office in INDIA. Mr Mukesh Sinha has been joining as a Country Manager. (mukesh.sinha@hoyasurgopt.com).

We are looking forward to serve you much better in the coming months with direct presence of Hoya Surgical in INDIA.
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- Methods
- Results
- Discussion
- References and acknowledgements
- Legends for display items (Figures and Tables)

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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.

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