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Empowering the Blind

Dear Friends,

We are happy to come out with yet another issue of KJO. This time we have major review on ROP contributed by Dr. Subhadra Jalali et. al., LVPEI, Hyderabad. Another interesting major review on OOKP from Govt. Dental College, Trivandrum and articles from all over state are highlights of this issue.

As ophthalmologists, we tend to be more interested in patients whose vision can be restored. This is only a tip of the iceberg as there are many diseases for which there is no cure. A typical example is retinitis pigmentosa, for which we are yet to offer a complete cure. Are we spending enough time for these unfortunate patients? Are we taking a serious effort to rehabilitate them? I recently visited LVPEI, Hyderabad and I was amazed to see that they have a full fledged rehabilitation centre for the visually challenged. Here I could see volunteers offering their services for making audio CDs for various academic courses in the university, which the blind could use to pass an examination. I could see mock kitchens fully equipped with gas stoves and utensils. Here visually challenged homemakers are taught the art of running a kitchen. There are also many interactive computer programmes available, with which a blind person could learn to read and write.

Visual impairment many a time is not an isolated problem. There are children who have associated mental retardation and autism. I could see trainers sitting patiently with children, teaching them the various skills required in life. Here the approach is totalistic in every sense. As ophthalmologists, we either say we will treat or say no treatment is available. This approach of helping a person going beyond visual impairment never struck me before in my life. This approach has changed the lives of hundreds of patients who cannot see. Now they are able to live and manage the activities of daily living by themselves. How many such centers can we boast of in Kerala? This should be an eye-opener to all of us and we should all come forward and take up this initiative in whatever way we can.

Jai KSOS!

Dr. Ashok Nataraj

Editor, KJO

Dr. L.Vijayalekshmi, MBBS, MD, MSc (Applied Nutrition)

Antioxidants in Ophthalmology

During metabolism, a number of toxic substances are produced in the body. When produced in large amounts, they cause tissue damage. To reduce the ill effects of such tissue damage, antioxidants are very useful. Uncontrolled tissue damage is kept in check by antioxidants. Antioxidants are defined as substances whose presence in relatively low concentrations significantly inhibits the rate of oxidation of target issues. Antioxidants can be classified as antioxidant enzymes, preventive antioxidants and chain breaking antioxidants.

Antioxidants are of vital significance in ophthalmology, especially for the prevention and management of eye problems including macular degeneration. It is emerging as a complementary approach to tackle systemic problems and specific ocular diseases. Presently the implications of antioxidants in eye care can be considered as both evolutionary and revolutionary. The previous concept of "advocating antioxidants as that of shooting in the dark" has now enormously changed.

Antioxidants play a vital role in maintaining macular health. The four carotenoids, lutein, zeaxanthin, meso-zeaxanthin and astaxanthin are concentrated superficially in the macular lutea and able to counter the light induced oxidative stress. They have a high potential protective action against ocular disease from infancy to old age and prevent age related macular degeneration.

Zinc, copper and manganese are vital constituents of superoxide dismutase, which primarily prevents oxidative damage in retina and lens. Selenium is found to prevent apoptosis and thereby able to regulate macular degeneration to a great extent.

Antioxidants in general can neutralize free radicals by donating an electron to these unstable atoms. After being neutralized, those free radicals will no longer attempt to damage the cells. Antioxidants protect the tissues in four ways. It physically separates the free radicals from the susceptible molecules of the human body. It provides molecules which effectively compete for oxygen. It repairs damage and helps in rapidly removing free radicals. Ophthalmologists should be able to give suitable advice on available sources of antioxidants to all their patients. Colourful fruits, vegetables, nuts, legumes, seed, milk, liver, butter and eggs are all rich sources of antioxidants. Appropriate use of antioxidants either as food or as supplements in selected cases will prevent or postpone eye problems.

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Major Review

Do's and Dont's in ROP

Dr Apoorv Grover, DNB, MNAMS, FICO, Dr Subhadra Jalali, MS, Dr Chintan Dedhia, MS, DNB, FICO

Introduction

With improved newborn care and swift socio-economic development, Retinopathy of Prematurity (ROP) has emerged as a severe challenge particularly in developing and middle-income group countries. Blindness and vision impairment in newborns and young children are on a rapid rise in India. The emerging epidemic of ROP blindness in India is the result of high birth rate, high rate of preterm births and survival of low birth weight children due to the advanced and expanded provision of medical care. ROP blindness has serious consequences due to the number of blind-years a person will have and also because cost effective treatment has been established to prevent such blindness. The blindness can largely be prevented by screening programmes that identify and treat premature babies who are likely to develop retinopathy[1,2,3]

Screening for Retinopathy of Prematurity- An emerging epidemic

The cutoff point for ROP screening in the West is a birth weight of 1,500 g or less and gestational age of 32 weeks or less. However, in a middle income country such as India, aggressive forms of ROP have often been seen in older and heavier babies[4]. This can be attributed to varying levels of neonatal care in the country. The harmful effects of giving prophylactic unblended oxygen causing severe zone 1 ROP in big babies has been highlighted[5]. In such a scenario, a modification to the existing screening criteria has been suggested (Table 1).

Table 1. Which infants to screen (screen in case any one is present)

a. Birth weight of less than 1700 gms
b. Gestational age at birth (length of pregnancy) of less than 34-35 weeks.
c. Exposed to oxygen for more **than 10 days.**
d. Infants weighing less than 1200 grams at birth and those born at 24-30 weeks gestational age were considered particularly at high-risk and screened early.
e. Any preterm infant with Gestational age unknown, irrespective of other criteria
f. Other premature babies (< 37 weeks and/or < 2000gms) who had:
   - Respiratory distress syndrome.
   - Sepsis
   - Multiple blood transfusions
   - Multiple births (twins/triplets etc.)
   - Apnoeic episodes
   - Intraventricular hemorrhage.
   - Pediatrician had index of concerns for ROP

Screening for ROP must be done within 3-4 weeks of birth to detect vision-threatening stage of ROP[6-9]. For ease of comprehension to the physicians, nursing staff and parents, we have adopted the 'Day 30' strategy for screening. One eye examination should be definitely over before day 30 of life of the premature infant. Earlier screening (Day 20) is recommended for very preterms (<30weeks) or birth weight of 2000 gms or less. [Table 2]

Table 2: When to screen: Follow Day 30 strategy

Screen all eligible babies before Day 30 of life. Smaller infants by Day 20.

- **31 weeks PCA (post conceptional age if known accurately) or 3-4 weeks after birth (whichever earlier) [USA / UK guidelines]**
- **Infants weighing less than 1200 grams at birth and those born at 24-30 weeks gestational age screen early, usually not later than 3 weeks after birth.**
- **No examination needed in first 2-3 weeks of life unless some abnormality noted on torch examination**
- **Next date of examination to be decided by the ophthalmologist based on initial findings**

In whom indicated, treatment with diode laser photocoaguation or cryopexy has to be carried out within 72 hours of detection of the condition[7-10]. Since most of the babies at this stage are in the neonatal intensive care units (NICU), ROP screening and treatment must be geared to address this situation.

Screening process- Do's & Don'ts

1) Fix one day/time a week- Do not miss an appointment; ensure staff knows this is emergency; alternate screener for vacation time
2) Contact one person in NICU
3) Maintain a register of the babies to be screened and those actually screened
4) Examination in a warm, clean place- Use hand rub
5) Keep the baby well fed & burped- Avoids hypoglycemia
6) Warm & well covered- Avoid hypothermia
7) Use correct dilating drops; dilate and examine promptly- 2.5% Phenylepherine +1% Tropicamide, thrice, 10 minutes apart. Wipe the eyelids with cotton to remove spilled droplets after instillation. Watch the pulse and respiration. Avoid using atropine or 5-10% phenylephrine for the risk of systemic toxicity. Note- Pupils may not dilate in severe Plus disease. Do not continue dilating, esp with phenylephrine,

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as this may cause systemic toxicity

8) Gentle examination- Use the speculum and depressor (wire vectis) gently; do not press the supraorbital ridge

Treatment for ROP

Whom to treat?

The indications for treatment of threshold ROP proposed by the Cryo-ROP study[11] were for those stages that would probably result in adverse visual outcomes in 50% of the eyes.[11,12] Concerns were raised regarding delayed treatment using these criteria, and so some physicians also initiated treatment in selected eyes with pre-threshold ROP[13,14]. Prethreshold ROP is now divided into high-risk or type 1 and low-risk or type 2, based on eyes that have a risk of 15% or more of adverse outcomes in the early treatment ROP (ETROP) study.[8] Retinal ablation must be considered for any eye with type 1 prethreshold ROP or worse. This includes zone I, any stage of ROP with plus disease; zone I, stage 3 ROP without plus disease; and zone II, stage 2 or 3 ROP with plus disease (See Table). Plus disease[15] is defined as at least two quadrants of dilation and tortuosity of the posterior retinal blood vessels [Fig. 2]. Newer methods of classification[15] also include aggressive posterior ROP (APROP), which need immediate and aggressive treatment.

Zone 1	No Plus	Stage 1	Follow
		Stage 2	Follow
		Stage 3	Treat
	Plus	Stage 1	Treat
		Stage 2	Treat
		Stage 3	Treat
Zone 2	No Plus	Stage 1	Follow
		Stage 2	Follow
		Stage 3	Follow
	Plus	Stage 1	Follow
		Stage 2	Treat
		Stage 3	Treat

Practical Tips for Treatment

Treat (Fig 3A, 3B)

1. All eyes with Plus disease
2. Eyes without plus having new extra retinal vessels (stage 3), especially if the condition has worsened since last visit.
3. All eyes with APROP should be treated urgently and aggressively.
1. Eyes with ROP in zone III
2. Zone II with no new vessels and no plus.

Aim of treatment

To ablate the entire avascular retina as rapidly and as completely as possible with minimum side effects, so as to minimise the risk of an unfavourable outcome and to achieve the best possible vision. The effect is usually apparent within one week of adequate therapy. The goal of achieving 20/40 or better in 80% or more eyes is possible [16] with appropriate and timely treatment.

Where to treat

Treat ONLY IN Operating Room / NICU equipped with

- Oxygen
- Suction apparatus
- Intubation
- Trained manpower- A neonatologist or anesthesiologist must be available on call

Mode of treatment

At present, the standard-of-care in ROP is the diode red (810 nanometer wavelength) laser indirect ophthalmoscope. Laser has many advantages over cryotherapy.There is less post treatment pain, adnexal edema, exudative retinal detachment, vitreoretinal traction, and vitreous hemorrhage, due to reduced breakdown of the blood-retinal barrier.

Treatment procedure- Do's and Don'ts

1. The treatment may be performed under topical or general anaesthesia. Our experience indicates that topical anesthesia usually suffices and allows the laser to be administered without any difficulty even in AP-ROP eyes. Use of topical anesthesia reduces systemic complications such as bradycardia or apnea
2. Precautionary measures- as mentioned above for the screening process
3. In case of inadequate treatment or poor response the laser can be repeated safely at short intervals of one to three days.
4. Use autoclaved or chemically sterilized instrument sets. Necessary materials include sterile pediatric eye speculum (Alphonso), wire vectis / pediatric scleral depressor, sterile cotton-tipped buds, dilating (as described above) and topical anesthetic eye drops, and sterile Ringer lactate in a syringe.
5. Laser settings

- Depend on the fundus pigmentation and the area to be treated.
- Usually, start with 250 milliwatts for 150 milliseconds

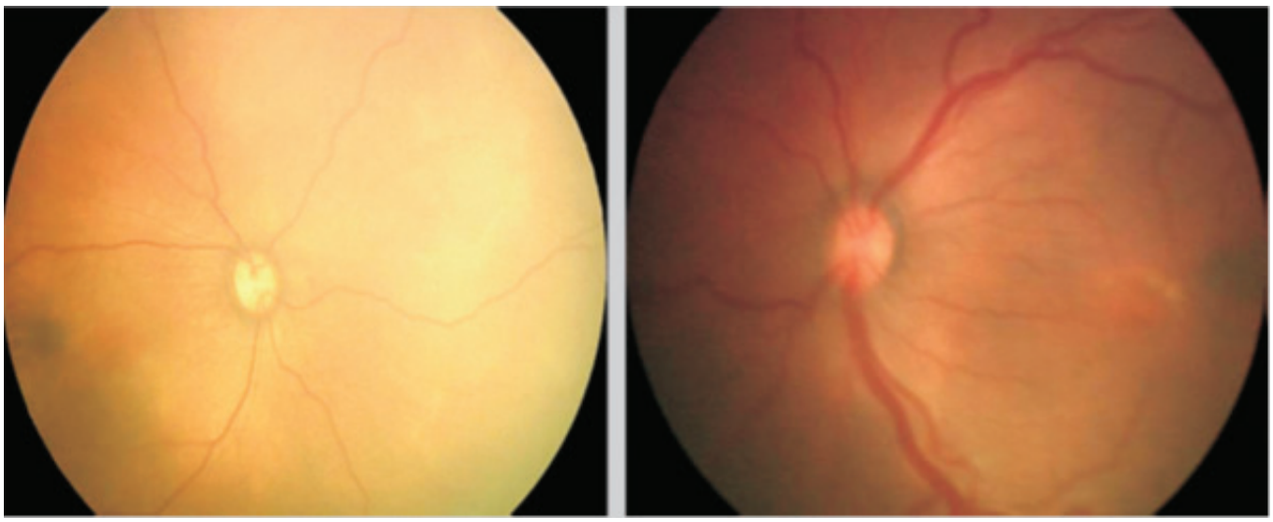


Fig 2; Normal vessel calibre (left) and Plus disease (right)

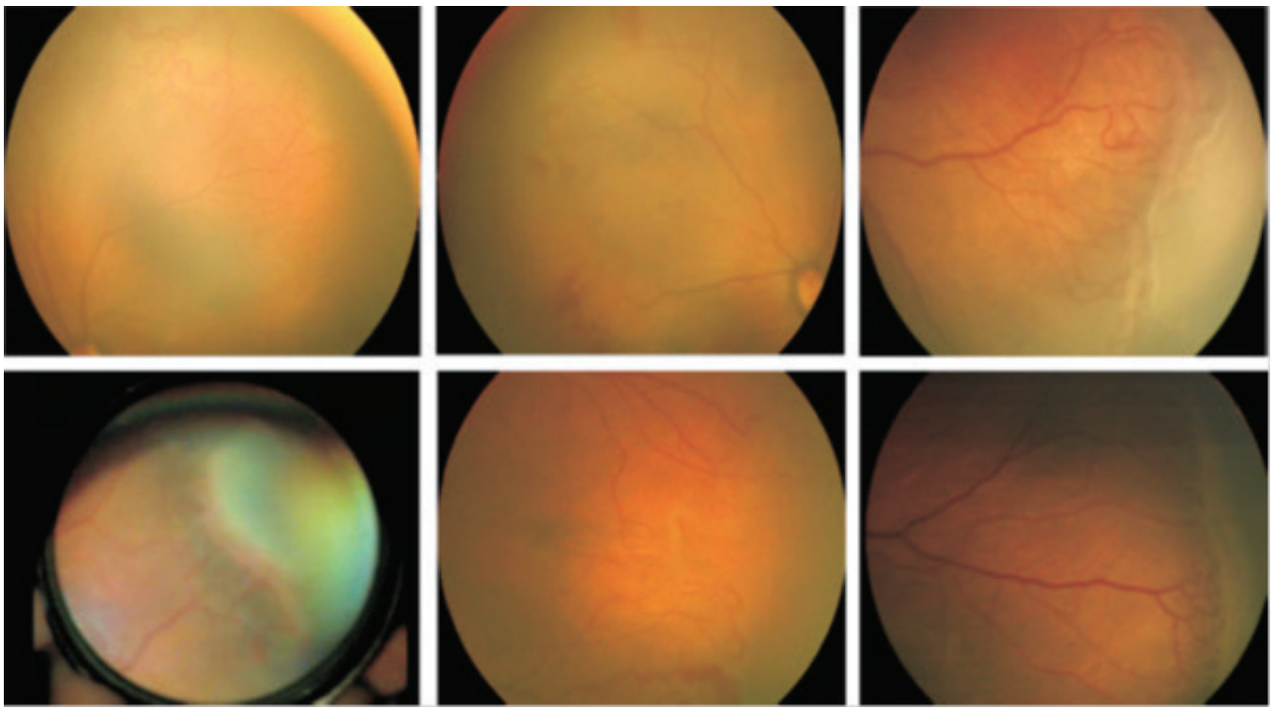


Fig 3A, 3B (poorly dilating pupil with engorged iris vessels)- Conditions where treatment must be considered

with the repeat mode set at 300 milliseconds. The treatment must not be faster as this can result in inadequate burns.

- The intensity must be grayish white rather than white and placement of spots must be nearly confluent[17]
- The laser power must be varied; use less energy for the anterior and superior retina compared to the posterior and inferior retina or to the retina close to the ridge.
- Treat the entire avascular retina from the ridge / vascular part of the retina up to the ora for 360 degrees.
- Do not leave any untreated 'skip' areas near the posterior ridge of the avascular retina. 'Skip' areas encourage new vessels to grow and prevent active vessels from regressing in that area, resulting in treatment failure.
- In a single session one may place 3000-4000 spots in each eye to cover the avascular retina including the enclosed avascular pockets, to adequately treat zone I disease / APROP eyes. A smaller number of spots, that is, 1000 – 2000, is needed to manage prethreshold / threshold zone II with non-APROP eyes.

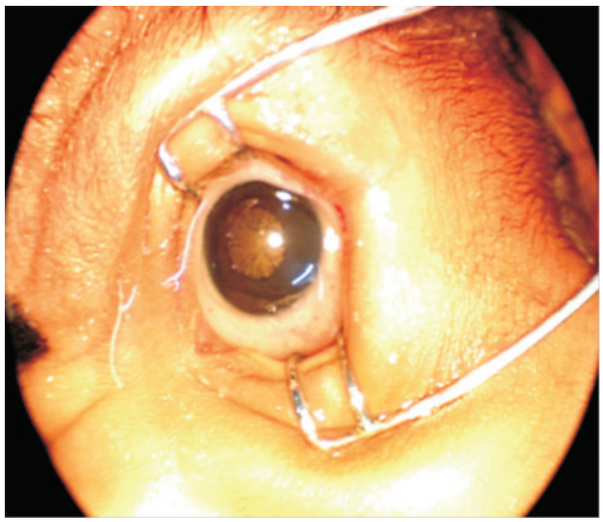


Fig 3B

6. Practical tips

- Keep the viewing angle more vertical, as the peripheral corneal aberrations are higher in infants' eyes than in adult eyes due to the steepness and small size of the cornea.
- Use the wire vectis/scleral depressor for rotation and stabilisation of the globe, by holding it against the forniceal conjunctiva, especially while treating the posterior retina. Avoid excessive pressure on the globe which may produce corneal haziness, and also increases the risk of hyphema and vitreous hemorrhage.
- In the infants' eyes the ora serrata is 1.0 mm beyond the limbus. To visualize the anterior retina, the same instrument is held against the bulbar conjunctiva close to the limbus. Avoid using the depressor 3 – 4 mm beyond the limbus as is usually done in adults, as this leads to difficulty in visualizing the ora serrata.
- The cornea must be kept adequately irrigated during treatment. Excess water in the fornices is removed by cotton-tipped buds and / or by tilting the baby's head.
- In a poorly dilating pupil, an attemp must be made to try and put a few spots[5-10] in an area, even if a little hazy. Simultaneously, firm, mild-to-moderate sustained pressure must be kept on the globe, with the depressor. This often dilates the pupil and allows one to focus the laser rays more accurately.[18]
- Ensure that while treating anterior retina, burns are placed up to but not beyond the ora. The ora serrata is identified by a white area with a leathery/ shiny texture bordered by the dull brown area of the ciliary body. Burns over the ciliary body will result in cyclophotocoagulation and cause serious complications such as, hypotony, cataract, and uveitis.
- The baby should be monitored with an infant pulse oxymeter throughout the procedure.
- A baby who is crying slowly and moving the limbs is reassuring. Ensure that the baby is making clear vocal sounds with no secretions in the throat. A very quiet child

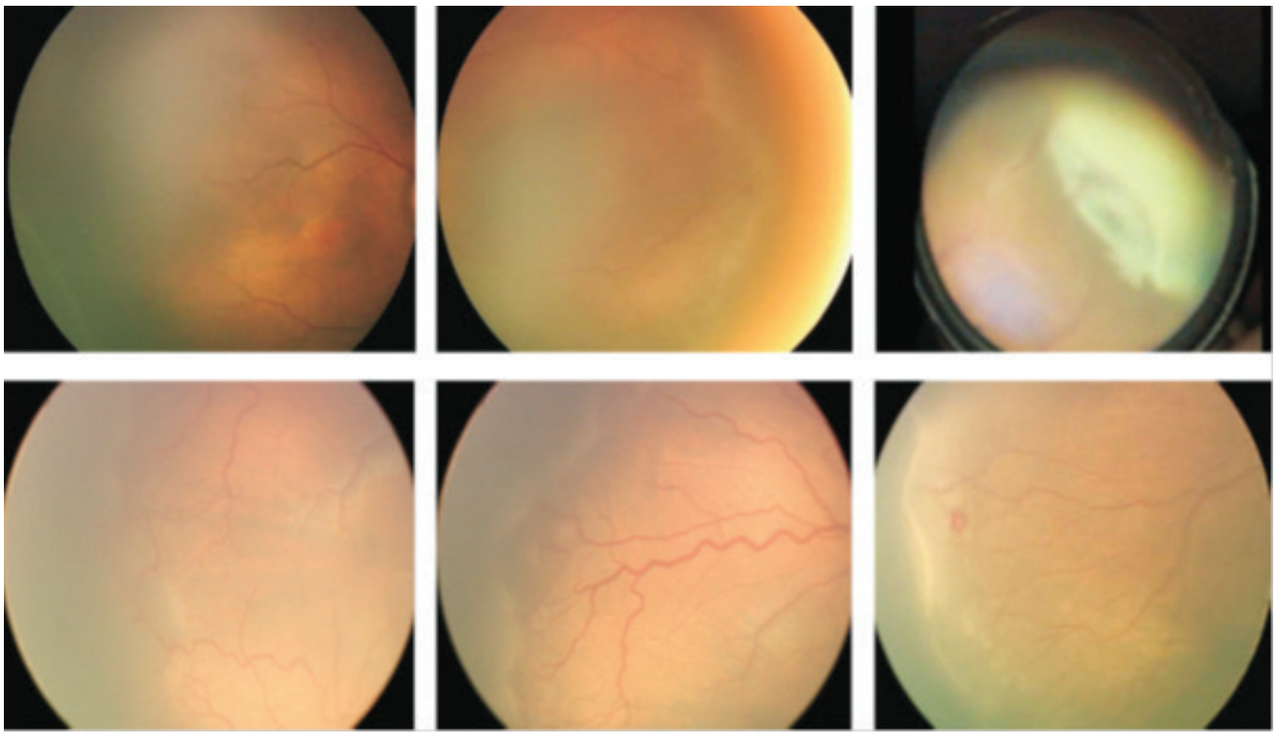


Fig 4 No treatment, with close follow up (every 7 – 10 days, to watch for regression or progression needing treatment)

must arouse immediate suspicion of apnea / cardiac arrest.

Follow up after laser

- One week- In patients with less severe disease, often in anterior zone II, where adequate laser treatment has been done in the first session.
- In zone I or APROP cases or in eyes with media haze, one session of treatment is usually inadequate. In such eyes, re-evaluation and completion of laser ablation must be done every three to four days.
- On each follow up visit, check for signs of regression. If adequate regression has not occurred or focal areas of active new vessels are seen, treatment is added to the areas skipped and around the active area.

Signs of regression

All signs of Plus disease must regress before discontinuing treatment sessions. Signs indicating a quiescent phase of ROP following treatment are shown in the table below.

Table 2: Signs of Regression of retinopathy of prematurity

Media clear
Pupil dilates fully and readily
No new vessels in the iris
No new vessels in the retina
All retinal / preretinal and vitreous hemorrhages cleared
Regression of dilatation and tortuosity of retinal vessels
No increase in retinal traction manifested by disc / macula / arcade drag
No elevation of retina / ridge at or posterior to area of laser
Feeder vessels to area of active new vessels / hemorrhages / elevated ridge and so on, achieve normal caliber
Demarcation between laser-treated and normal retina is quiet and flat in terms of vasculature, with adequate scar effect of the laser

Use of Anti VEGFs in ROP

Anti-VEGF's acts against already released VEGF causing rapid vascular regression. The most extensively studied Anti-VEGF for use in ROP is Avastin. The use of Avastin for early ROP stage 3 is usually successful as monotherapy. {23} Especially for zone 1 and posterior zone 2 cases, the benefits of monotherapy are many. Compared to laser therapy, Avastin

1) Is basically a less-destructive process and a more specific therapy on the basis of pathogenesis;
2) Prevents the inevitable loss of visual field and reduces the occurrence of high myopia
3) Has a more immediate effect
4) Avoids anterior ischemia and iris/lens complications
5) Is valuable when retinal visualization is decreased as the result of hemorrhage and/or poor iris dilation
6) Is easily administered without requiring general anesthesia and
7) Reduces the requirements of time, technical skill, and expense for treatment.

Thus Avastin monotherapy may prove to be ideal for the treatment of conventional and aggressive posterior (AP) ROP. Considerable clinical judgment and close follow-up are required if Avastin monotherapy is to be used for advanced ROP stage 3 or for ROP stage 4a. As in stage 3 with some degree of membrane formation, early Avastin monotherapy may be successful in preventing the progression of acute ROP but may need to be followed at a later time point by laser therapy to assure the longterm stability of the retina and to ablate the remaining hypoxic avascular retina.[24] However, a large percentage of ROP stage 4a patients treated by Avastin administration will require vitrectomy surgery or many retinal detachments will be precipitated because of membrane contraction. The use of Avastin for ROP stage 4b or 5 must be considered rescue or desperation therapy and should always be used in combination with vitrectomy. When the membranes are significant enough to cause extensive detachment, their contraction with further worsening of the ROP should be anticipated after the administration of Avastin. The primary benefits of Avastin in this setting are to make vitrectomy easier by making iris dilation better, clearing the media, decreasing hemorrhage, and so forth.[25] The use of anti-VEGF as a treatment for ROP remains off-label. It is not a one-and-done therapy. Issues of delayed normal retinal vascularization, late recurrence and reac¬tivation of disease, need for prolonged follow-up remain. However, the same questions remain regarding timing, dosage, and adverse events [26,27] when using anti-VEGF agents for ROP. Imaging and fluorescein angiography may play a critical role in the treatment of these patients, given the possibil¬ity of prolonged peripheral ischemia and abnormal vascular patterns[28]. Future studies will continue to add to our growing knowledge regarding the risks and benefits of anti-VEGF ther¬apy for ROP. Ideally, studies should seek to achieve the highest therapeutic effect of anti-VEGF agents with the lowest effective dose to minimize potential systemic adverse events.[29] Anti-VEGF agents in ROP, both as monotherapy and as rescue therapy, need thorough investigation, using well designed scientific protocols, with informed consent, and monitoring of the long-term ocular, systemic, and developmental outcomes.[30] Anti-VEGFs should be reserved for eyes at high risk of failure or not amenable to laser treatment such as poor mydria¬sis, opacified media, posterior zone 1 disease, and failure of laser therapy.

Surgery in ROP

Vitrectomy and/or scleral buckling is performed for retinal detachment in ROP (Stage 4 and Stage 5). Unlike scleral buckling, lens-sparing vitrectomy directly addresses the tractional components, allowing for secondary retinal settling after subretinal fluid and exudate are absorbed by the retinal pigment epithelium. Lens-sparing vitrectomy to correct early degrees of retinal detachment results in excellent lens clarity and vision in the majority of infants with retinopathy of prematurity. Jonathan L et al reported a favourable anatomical and functional outcome in children with Stage 4A ROP[19]. The goal of the vitrectomy is to dissect areas of tractional proliferation. However, the visual and anatomical outcomes for surgery in Stage 5 ROP have been reported to be poor. Yu et al[20] in 21 eyes of 20 patients reported anatomic success rates of 62% in stage 4B and 13% in stage 5 ROP after a mean follow up of 5.6 years. Bhende et al[21] in their study on 39 eyes of 31 patients presenting with Stage 4 retinal detachment secondary to ROP who underwent primary two or three-port lens-sparing vitrectomy reported a favourable anatomical outcome in 74% of the eyes with a single procedure (macula attached). The visual status was favorable in 63% with central, steasy and maintained fixation. The presence of plus disease at the time of surgery is the main risk factor of surgical failure[22], and reduced plus disease activity may be helpful for surgical outcome.

Conclusion

The critical factors to ensure better outcomes in ROP are to screen early, follow-up closely, watch out for plus and / or new vessels and treat such eyes vigorously for full avascular retina ablation. ROP is a continuous race against time with a very small window of opportunity of 7 – 10 days, where optimum treatment outcomes with least complications can be achieved. Newer modalities such as intravitreal injections have added to our armamentarium, although further studies are needed with regards to their safety and efficacy. Lens sparing vitrectomy with improvements in technology and skills has provided good visual outcomes in children with macula on retinal detachments secondary to ROP.

Major Review

Modified Osteo Odonto Keratoprosthesis(MOOKP)- "Tooth For An Eye"

Dr. Manikandan.G.R, Dr. Presanthila Janam

Abstract

Osteo-odonto-keratoprosthesis (OOKP) (also known as "tooth in eye" surgery is a medical procedure to restore vision in the most severe cases of corneal and ocular surface patients. It includes removal of a tooth from the patient or a donor. After removal, a lamina of tissue cut from the tooth is drilled and the hole is fitted with optics. The lamina is grown in the patients' cheek for a period of months and then is implanted upon the eye. This is an excellent innovative technique blending the ophthalmology and dentistry.

Keywords: OOKP, PMMA Cylinder,plastic cylinder, retroprosthetic membrane

Introduction

In some eyes, severe damage to the cornea and ocular surface occurs due to drug allergy, or chemical or thermal burns – resulting in a very dry, skin-like appearance of the corneal surface. In these eyes, corneal transplantation does not work, as the dry surface is unable to support the health of the transplanted biological tissue, unlike in a normal eye. To provide the patient with useful vision, an artificial cornea or keratoprosthesis is used. A keratoprosthesis is a cylinder made of a type of plastic polymer called polymethyl methacrylate (the same material used to make intraocular lenses). The cylinder is made such that the power of the cornea is built into it, so that not only does it provide a clear corneal window, but it also supplies the refractive power needed for the eye to see well. Since plastic and living tissue cannot form a firm and safe bonding, researchers have tried over the past many years to find a way to allow integration of the two tissues, so that the long-term success rate of the procedure is enhanced.

In some designs, researchers have implanted a plastic cylinder into a central hole in a donor cornea and retained the cylinder using a nut-and-bolt design. The donor cornea is then sutured to the patient's eye. This is relatively fast and easy to perform, but there may be some problems in the long-term retention of the prosthesis.[1]

The procedure was pioneered by the Italian ophthalmic surgeon Professor Benedetto Strampelli in the early 1960s. Strampelli was a founder-member of the International Intra-Ocular Implant Club (IIIC) in 1966.

Modified OOKP

To improve the chances of the plastic prosthesis being retained in the eye, tissues from the patient's own body are used. The tooth is ideal because it is a hard part to which the cylinder can be fixed and also it resides in the mouth where it co-exists with soft tissues, as in the eye. Originated by Prof Strampelli in Italy – this procedure has been refined and improved by Prof Falcinelli over the last 40 years.[2] We performed the first OOKP in HK and China with his and his son Dr Johnny's help. Since then they have traveled to HK many more times to help us with the procedure. Having performed more than 250 of these procedures, Prof Falcinelli is the most experienced surgeon for this procedure. He has also worked with Dr Rao in India 3 years ago to help start the procedure there. The procedure is at present performed only in a few centers in the world.3 This is a fairly complex procedure, and requires to be performed in 2 stages – each of which can take up to 4 to 6 hours. The patient can see after the second stage operation. The use of a tooth requires the help of a multi-disciplinary team including a dentist – and Dr Lee has been helping with the procedure here. The term MOOKP stands for modified - osteo (bone) – odonto (tooth) – keratoprosthesis (plastic cylinder).

Boston Keratoprosthesis

The Boston Keratoprosthesis is a collar button design keratoprosthesis. It consists of three components: a front plate with optical stem, a back plate and titanium locking c-ring (See Additional Resources 1 & 2). The most recent design is threadless; during assembly the front and back plates are snapped together with corneal tissue sandwiched in-between, which is then used to suture the device to the eye. It is available in type I and type II formats. (The type II format is reserved for severe end-stage ocular surface disease desiccation, and is similar to the type I device

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but requires a permanent tarsorrhaphy to be performed through which a small anterior nub of the type II model protrudes). [4] The type I Boston KPro is available in either a single standard pseudophakic plano power or customized aphakic powers (based on axial length) with adult (8.5 mm diameter) and pediatric (7.0 mm diameter) sized back plates. The device is currently machined from medical grade polymethylmethacrylate (PMMA) by a small, family owned and operated precision machine shop (J.G. Machine Co. , Inc.) in Woburn, Massachusetts.[5]

Recent advances in design have contributed to improved outcomes. First, the addition of holes (at present 16 holes) in the back plate allows diffusion of nutritive aqueous to support donor graft stroma and keratocytes [7, 8]. Second, in 2004, a titanium locking c-ring was added to prevent intraocular disassembly of the device. Third, in 2007, the design was changed from a threaded (screw-type) assembly to a threadless design which simplified assembly and produced less damage to the donor endothelium [9]. The most recent advance in design is the implementation of a titanium back plate which likely improves biocompatibility and retention, and may reduce complications such as retroprosthetic membranes (RPM) and stromal corneal melts [10-12].

History

The concept of an artificial cornea is over 200 years old. The first keratoprosthesis was described in 1789 during the French Revolution by Guillaume Pellier de Quengsy. The first reported human KPro surgery with a quartz crystal implant was performed by Nussbaum in 1855, although some modern KPro experts note that while Nussbaum may have reported the first human surgery, in fact, Guillaume Pellier de Quengsy's brother, also an ophthalmologist, may have actually been the first to perform the surgery in a human[6]

In recent decades multiple synthetic corneas have been pioneered and developed, though only three are principally used in practice: the Boston Keratoprosthesis (Massachusetts Eye & Ear Infirmary, Boston, MA), the AlphaCor (Addition Technology Inc., Des Plaines, IL) [5] and the osteo-odonto keratoprosthesis also known as the 'OOKP' (originally described by Strampelli, modified by Falcinelli)[7]

The Boston Keratoprosthesis has evolved from original concept to an established device over the past fifty years under the lifetime leadership of Claes Dohlman, MD, PhD. The device was approved by the FDA for marketing in 1992. An active keratoprosthesis research program continues in Boston, MA and other centers worldwide fostering continued innovation with the device.The Boston Keratoprosthesis is a collar button design keratoprosthesis. It consists of three components: a front plate with optical stem, a back plate and titanium locking c-ring The most recent design is threadless; during assembly the front and back plates are snapped together with corneal tissue sandwiched in-between, which is then used to suture the device to the eye. It is available in type I and type II formats. (The type II format is reserved for severe end-stage ocular surface disease desiccation, and is similar to the type I device but requires a permanent tarsorrhaphy to be performed through which a small anterior nub of the type II model protrudes).[8] The type I Boston KPro is available in either a single standard pseudophakic plano power or customized aphakic powers (based on axial length) with adult (8.5 mm diameter) and pediatric (7.0 mm diameter) sized back plates. The device is currently machined from medical grade polymethylmethacrylate (PMMA) by a small, family owned and operated precision machine shop (J.G. Machine Co. , Inc.) in Woburn, Massachusetts.[9]

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Indications For OOKP[12]

Bilateral blindness in severe cases of

1.Stevens-Johnson syndrome
2.Ocular cicatricial pemphigoid (stage 3 or 4)
3.Lyell syndrome
4.Epidermolysis bullosa acquisita
5.Trachoma (stage C0 according to WHO classification)
6.Chemical injury
7.Physical injury (fire, liquid aluminium, etc)
8.Loss of the lids (eg, Crouzon disease)
9.Vascularized corneas with complete stem cell loss and dryness following other causes (eg, other ocular surgeries, use of MMC)
10.Aniridia with severe corneal changes
11.Multiple failed penetrating keratoplasty

12.Corneal failure after vitrectomy with silicone oil filling that cannot be removed safely

Contraindications[13]

In some patients an OOKP should not be performed because of the high risk of failure. Absolute contraindications are:
Age below 17 years. Despite the fact that children will develop bilateral amblyopia if not treated, attempts at OOKP surgery did give very unsatisfying results: allografts (with the parents as donors) have been tried in two selected cases (the Salzburg group), but the laminae were found to be completely reabsorbed within months, possibly because ofthe high rate of turnover of bone during growth in this age group. One patient was lost to follow-up; the second retained light perception following penetrating keratoplasty and surgery for endophthalmitis. It is unknown whether additional attempts might yield more favorable results.[14]

In case of a phthitic eye, the risk for complications is very high, and a loss of the remaining perception of light is most often to be expected after such invasive surgery.

In eyes with no light perception there remains no hope forrestoring any visual acuity. Surgery will therefore only harm the patient.

Eyes with detached retina (which cannot be reattachedbefore OOKP) or other pathologies of the posterior segment that severely interfere with potential visual acuity should not be operated on either.[15]

Because a scleral shield with painted iris and a central opening to accommodate the optic can be provided, the majority of patients are willing to accept the postoperative cosmetic appearance. Nevertheless this problem has to be discussed with the patient and the relatives extensively prior to surgery.

Preoperative Ophthalmological Assessment[16]

VA (intact light perception)	Essential
Entoptic phenomena	Not mandatory
Electrodiagnosis (eg, positive flash-VEP)	Not mandatory
Ultrasonography (no pathologic findings)	Essential
A-scan biometry	Essential
Digital estimation of intraocular pressure	Essential
Examination for dry eye	Not mandatory

Preoperative Oral Assessment

Orthopantomography	Essential
X-ray of tooth	Essential
Spiral CT	Not mandatory

Preparation of the Mucous Membrane Covering
Mucous membrane as the ''physiological'' cover of the alveolar bone seems to be the best protection for the OOKP lamina. If sufficient buccal mucous membrane is not available,any other kind of mucous membrane, such as palatinal, lip, and vaginal mucous membrane, can be used. Oral hygiene should start as soon as the decision is made to go ahead with OOKP surgery.

Consider chlorhexidine and nystatin mouthwash a day or two before surgery.

Surgical Technique[17,18,19]

The OOKP procedure involves 2 stages performed over a period of 6-9 months.

Stage 1

It involves ocular surface reconstruction and fashioning of an osteo-odonto lamina and its optical cylinder. A large circular piece of buccal mucosa is harvested from the cheek. The graft is trimmed of excess fat and soaked in cefuroxime solution. A lateral canthotomy is performed, followed by division of symblephara and superficial keratectomy. The buccal mucous membrane graft is sutured to the sclera bounded by the insertion of the rectus muscles to create a new ocular surface. The crown of the harvested tooth is used as a handle; whilst the attached tooth root and surrounding bone is worked into a lamina with dentine on one side and bone on the other. Periosteum is conserved and where possible glued back with fibrinogen adhesive. A hole is drilled through the dentine to accommodate a PMMA optical cylinder, which is cemented in place. The resultant osteo-odonto lamina is placed into a sub-muscular pocket under orbicularis oculi, usually in the lower lid of the fellow eye, in order to acquire a soft tissue covering.[20]

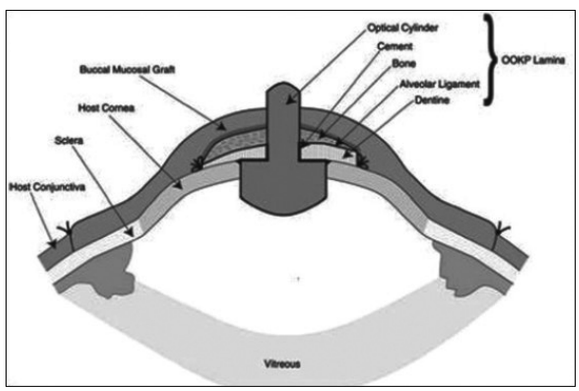
In the first stage, a canine tooth is harvested from the mouth of the patient after X-ray screening has determined that the tooth has a healthy and viable root structure. A surgical motorized saw is used to excise the canine root encased in alveolar bone from the jaw. The lamina is fashioned by sawing through the root of the tooth in a longitudinal fashion to expose the dentine and the root canal. The pulp in the root canal is scraped off and a hole is drilled in the widest part of the root – to a size of 3 to 4 mm depending on the

width of the root at that point. An appropriately sized plastic cylinder of suitable power (determined from the axial length of the eye) is then glued to the hole using dental cement. A subcutaneous pocket is created in the tissues of the cheek and the lamina-cylinder complex is placed in it and the pocket is sutured closed after instilling antibiotic powder.[21] In the eye, the symblephara are released, and scar tissue is excised as described earlier. A superficial keratectomy including the Bowman's layer is performed to expose the bare corneal stroma after which a full-thickness circular piece of cheek mucosa about 4 cm in diameter is placed over the cornea and sutured to sclera, also covering the muscle insertions.

PMMA Cylinder

A PMMA optical cylinder is cemented in the root with PMMA cement; the pulp chamber is obliterated with PMMA cement as well.[22] The completed keratoprosthesis consists of one sagittal half of the canine root with bone, ideally measuring 12 mm × 6 mm × 3 mm, carrying an optical cylinder with a margin of dentine of at least 1 mm all round. The OOKP optical cylinder comes in two different diameter sizes (3.5 and 4.0 mm) and a standard length of 8.75 mm; a wider diameter offers the benefit of a wider osteo-odonto lamina. The ideal lamina should be of a size measuring 12 mm × 6 mm × 3 mm. The surgeon does not find the lamina's surface large enough to allow the insertion of an optical cylinder, two teeth can be extracted to prepare two laminae, which are then glued together with acrylic resin to prepare a larger surface. A hole of an average diameter of 3.70 mm (range, 3.3-4.0mm) is prepared leaving an edge of dentine.

The optical characteristics of the PMMA optical cylinder are, mean intraocular diameter, 4.1 mm (range, 3.6-4.6 mm); mean extraocular diameter, 3.65 mm (range, 3.3-4.0 mm); mean length, 7.75 mm (range, 7.25-8.25 mm); mean radius of the convex extraocular surface, 16 mm; mean radius of the convex intraocular surface, 6.5 mm; refractive index, 1.49; and equivalent power, 50.8 diopters[23]



Stage 2

It starts with retrieval of the osteo-odonto lamina from its sub-muscular pocket and excess soft tissue is removed from the bone surface. On the dentine surface, no soft tissue is allowed to remain. The lamina is reinserted into its pocket until the eye is ready to receive it. The buccal mucosal graft is reflected to allow access to the cornea. A Flieringa ring is sutured in place. The centre of the cornea is marked, and a small hole is trephined, the diameter of which corresponds to that of posterior part of the optical cylinder[24]. Relieving incisions are made and total iridodialysis, lens extraction and anterior vitrectomy are performed. The posterior part of the lamina is inserted through the central corneal hole and the lamina is sutured onto the cornea and sclera. The eye is re-inflated with filtered air. The mucosal flap is replaced after cutting a hole to allow the protrusion of the anterior part of the optical cylinder Stage II surgery is performed 2 to 3 months later to allow time for a connective tissue cover to develop around the lamina implanted in the cheek. If required, the integrity of the lamina can be checked by performing a spiral computed tomographic evaluation.[25] During the second stage surgery, the lamina is retrieved from the subcutaneous location and excess connective tissue is removed from the two ends of the optic cylinder, and carefully trimmed over the rest of the lamina. The mucosal graft on the ocular surface is incised superiorly and reflected from the superior sclera and cornea, in a downward direction. The inferior attachment of the mucosal graft is left undisturbed to ensure that the blood supply is retained.

A Flieringa ring is sutured in place and a 3 mm opening is created in the center of the cornea. Three radial incisions are made in the cornea extending till the limbus. The iris is disinserted at the root and removed by gently pulling on the tissue and hypotensive anesthesia is used to control the ooze. Constant irrigation with balanced salt solution also helps wash the blood away and prevents a large clot forming in the anterior chamber. The lens is then cryo extracted and the radial corneal cuts are sutured closed.26 A limited anterior vitrectomy is performed and the lamina is then placed over the cornea, such that the posterior part of the optic cylinder is in the anterior chamber – entering through the central corneal opening. The lamina is sutured into position using the connective tissue covering and episcleral bites. Air injection through the pars plana using a 30-gauge needle is used to maintain the intraocular pressure and avoid severe hypotony. At the conclusion of suturing, indirect ophthalmoscopy is performed to ensure that there is a good view of the disc and posterior pole, with the eye in the primary position. If this is not seen, a

cylinder tilt may be responsible and the sutures are adjusted to straighten the cylinder position. Any bleeding into the vitreous cavity can also interfere with the visualization. After the cylinder and lamina are in satisfactory position, the mucosal flap is replaced and a small opening is created over the optic cylinder to allow the anterior portion of the cylinder to protrude through the mucosa. The superior edge of the mucosal flap is sutured in place and this completes the operation.

Since bleeding can occur during the ocular and oral surgical dissections, it is important that the patient is not on anti-platelet aggregators or anticoagulants. Infection is a major concern since oral tissues are used and extensive ocular surgery is performed. Intravenous antibiotics are used for the first week after surgery and oral antibiotics are continued for another week. This is more of a concern with stage I surgery. Treatment of the ocular surface mucosal graft is with antibiotic ointment and regular cleaning. Periodic follow-up is required to ensure early detection of problems with intraocular pressure and the stability of the graft. The presence of the lamina and the large mucosal graft preclude measurement of intraocular pressure using the current instrumentation. Intraocular pressure is estimated digitally and the health of the optic nerve is monitored using regular automated field measurements and visualization of the optic disc. The visual field provided by current cylinder designs is about 30 to 350 but this allows good ambulant vision to the patient. With the technique of osteo-odonto keratoprosthesis described in the previous paragraphs, prolonged retention times can be achieved with good visual function.

Complications[27]

The procedure is associated with complications. Awareness regarding these complications is necessary for early recognition and appropriate 5-7 management .

Ocular

1. Glaucoma 2. Retroprosthetic membrane
3. Vitritis 4. Expulsion of cylinder
5. Endophthalmitis 6. Retinal detachment

Mucous Membrane/Odal

1. MMG thining 2.MMG necrosis
3. Extrusion of prosthesis

Oral

1. Oroantral fistula 2. Damage to parotid duct
3. Damage to adjacent teeth 4. Mandibular fracture

During the removal of the tooth, a fracture of the tooth would render it useless as a lamina for the plastic cylinder. Sometimes, a small part of the tooth may be left behind in the bed and this would need to be extracted to prevent it from acting as a nidus for future infection. During the removal process, accidental entries into the maxillary sinus when the upper tooth is removed, and fracture of the mandible – during lower tooth removal, are possible. Both during tooth extraction and cheek mucosa excision, excessive bleeding may occur.

The fashioning of the implant is also critical. It is important to avoid damage to the periosteum and the alveolar dental ligament when the tooth is cut with the dental saw. Since the saw blades can generate a significant amount of heat, a constant stream of water must be directed at the saw to ensure that there is damage to these delicate structures. The hole that is drilled in the dentine should be perpendicular to the lamina to ensure that the plastic cylinder does not tilt. The dental cement that is used to ensure proper adhesion of the cylinder and the dentine should be used to ensure complete sealing of the hole in the lamina.

Once the tooth is removed, the absence of the canine(s) can pose both cosmetic and functional problems in the postoperative period. These stem from the fact that the oral cavity is no longer a closed chamber – due to the missing tooth – and can result in a lisp when speaking – and extrusion of liquids when eating.

In the eye, the scope of the surgery and the nature of the eyes operated on, both result in the potential for problems. These damaged eyes often have preoperative glaucoma. During the surgery, care must be paid when operating in the perilimbal area to avoid excessive cautery as this can damage the aqueous collecting veins and either create or worsen glaucoma. Thinned areas of the cornea and sclera must be handled with care to avoid perforations. Removal of the iris and the lens and the anterior vitrectomy can sometimes result in bleeding in the vitreous chamber. Prolonged hypotony during the implantation of the lamina should be avoided – as this can lead to expulsive hemorrhage. The use of hypotensive anesthesia during this stage is therefore, important.

After the surgery is completed, infection remains an important concern and antibiotics are essential in the postoperative period. Inflammation in the eye – due the surgical procedure – can sometimes occur and oral steroids can help. Increased intraocular pressure is not uncommon in the early postoperative period and should be carefully watched for – intravenous mannitol may be required in

addition to oral acetazolamide. Later in the postoperative period, glaucoma can sometimes occur and should be watched for using regular visual field evaluations and examination of the optic disc. Retroimplant membranes are rare – but can occur and may need excision – either with the YAG laser, or surgery[28]. Vitreoretinal complications can also sometimes occur, and need to be treated surgically. The mucosa covering the implant, can develop infections, or can retract and must be managed appropriately. Finally, the implant can develop periostitis – often infectious and this can compromise the integrity of the lamina.

Thus, the list of complications with MOOKP is long, but with careful attention to technique and close postoperative follow-up, many of these can be prevented or appropriately managed.[29]

Future Directions

Research actively continues on the Boston Keratoprosthesis to improve design and outcomes and to expand indications for its use. KPro patients are prone to develop inflammation, RPM and cellular debris within and around the PMMA back plate, and studies are investigating alternative keratoprosthesis materials including titanium The optimal management of glaucoma and projects aimed at accurately assessing IOP in KPro eyes utilizing intraocular pressure transducers with telemetry capabilities are underway .Given the permanent need for a BCL, investigators continue to explore drug-eluting contact lenses, which could circumvent the need for patient initiated delivery of topical medications and is likely to improve outcomes given enhanced, reliable delivery of drugs. Researchers continue to challenge the dogma that KPro surgery should not be done in patients with good vision in a fellow eye, and are investigating restoring useful binocular vision in patients with corneal disease Investigators are also pursuing improving clinical outcomes with the Boston KPro in autoimmune conditions and chemical burns which have traditionally been plagued with poorer outcomes. The Boston KPro has made remarkable strides over the past decade and its continued success is promising.

Conclusion

.A vast number of designs and materials of keratoprostheses with different methods of insertion have been developed and implanted in patients over the past two centuries with quite variable long-term results. Most studies report either a short follow up or a comparatively short lived visual recovery in majority of the cases. The technique with by far the best results and proven long term follow up is the osteo-odonto-keratoprosthesis (OOKP) invented by Strampelli and modified over the years by Prof. G. Falcinelli1. OOKP developed some 40 years ago by Strampelli uses a biological skirt in the form of the patient's own tooth root and alveolar boneto support a polymethylmethacrylate (PMMA) optical cylinder.The osteo odonto keratoprosthesis serves as an excellent innovation which is an amalgamation of both ophthalmology and dentistry.More research is needed to develop further modifications.

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Major Review

Phacotrabeculectomy: Dilemmas and Deliberations

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Cataract and glaucoma are the leading causes of blindness in the world, and as life expectancy is increasing, the prevalence and co existence of these two diseases is increasing. Also surgical expertise both for cataract and glaucoma is improving. Earlier trabeculectomy surgeons were not so familiar with phacoemulsification [Phaco], which led to less support for the combined procedure of phacotrabeculectomy, as either the vision recovery was suboptimal or intraocular pressure was inadequately controlled, but now the scenario is changing and surgeons are excelling in combined phacotrabeculectomy [PT] with very good visual outcome. Many now feel it is the ideal approach for managing cataract and glaucoma simultaneously.

The options for management when both cataract and glaucoma are [1] to tackle lens surgically with Phaco alone after doing a laser peripheral iridotomy [LPI] & manage the glaucoma with medications; [2] To do trabeculectomy alone & cataract surgery later; [3] do the combined procedure of phacotrabeculectomy. The combined surgical procedure in one sitting manages to both improve the vision and control glaucoma simultaneously.

In this review we will go through
1. The indications of phacotrabeculectomy.
2. How to optimize the outcome.
3. The complications and how to manage them.
4. Deliberate on the Literature review on phacotrabeculectomy.

The **indications for phacotrabeculectomy** are relative rather than absolute. It is uncommon for both cataract and glaucoma to simultaneously require surgical intervention. More commonly, a patient with medically well-controlled glaucoma may require cataract surgery, and a concurrent trabeculectomy is performed in hopes of reducing the medication burden. Alternatively, a patient with a moderate cataract but little or no visual complaints may require trabeculectomy for uncontrolled glaucoma, and concurrent cataract surgery is planned—knowing that filtering surgery often accelerates cataract formation—in order to improve vision and to obviate the need to perform later incisional surgery that might compromise the existing glaucoma filter. Zhang et al suggested that if the angle is closed for <180 degree, phacoemulsification may suffice, but if closure is more than 180degrees phacotrabeculectomy must be done [4] .Thus surgical decision is always individualised as per the case.

How to do it?

Anaesthesia

Phacotrabeculectomy is a combined procedure be, it a single site or two site surgery. The mode and method of anaesthesia is crucial. It can be done under topical anaesthesia or under peribulbar block. Topical anaesthesia using Lidocaine 2% gel may require repeated application during procedure, causing corneal haze and inadvertent eye movements which can hamper the surgical outcome [5].Hence, it is better to go for peribulbar blocks.

Pupils are dilated with topical mydriatics and cycloplegic agents.

There are many variables at various steps of Phacotrabeculectomy outlined in Table 1. It can be performed through one or two site. There are many studies comparing the two procedures. Superonasal quadrant has been suggested by CIGTS [6] as the preferred quadrant for the trabeculectomy. Inferior trabeculectomy is technically more difficult has higher chances of bleb infection so is best avoided. Also while making a conjunctival flap, areas of subconjunctival scarring or previous trabeculectomy are best avoided, as the chances of buttonholing and fibrosis are more.

Table 1

Variables when doing Phacotrabeculectomy	
• Type & Duration of glaucoma-PACG more decrease in IOP with phacotrab H/o Angle closure attack+/- and duration since attack LPI +/-	• Site-2 site/single site • Conjunctival flap-fornix based/limbal based • Mitomycin C-concentaration/duration • Scleral flap-triangular/ rectangular

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• Pre op medication and steroids • No. & Use of glaucoma drugs • Definition of success - With/without meds • Postop meds use	• Scleral flap sutures-releasable/non releasable, No. of sutures • Pre Cop Pupillary Dilation - + /- Method used to augment dilation -Hooks /Sphincterotomy /Intracameral Adrenaline • Phaco section suture +/- • Conjunctival suturing

One site Phacotrabeculectomy

For better exposure the globe is rotated inferiorly either with a bridle suture using 4-0 silk, passed under superior rectus or a corneal stay suture is passed adjacent to site of trabeculectomy. A fornix/ limbal based conjuctival flap is created usually temporal/ superotemporal, with minimal conjunctival manipulation dissecting far into the subconjunctival plane to allow posterior flow to the aqueous, avoiding buttonholing. Electrocautery is applied to attain hemostasis. A triangular/ Rectangular partial thickness scleral flap is then created using the side port/ diamond blade or 15 no.blade, it is dissected upto the limbus. A side port entry is made, and viscoelastic agents is injected. A shelved entry into the anterior chamber under the scleral flap is then made using a 2.8/3.2-mm blade keratome. Capsulorhexis followed by hydrodissection and hydrodelamination is done. Another side port is made left of the main incision Phacoemulsification is then performed and a foldable intraocular lens is implanted. After aspiration of all viscoelastic from anterior chamber, Pilocarpine is applied intracamerally and miosis attained. A Descemet's punch/ Vannas/ Diamond knife is used to remove 1-2mm of the trabecular meshwork under the scleral flap. A small basal iridectomy is performed in all cases and sclera flap is approximated with 2-3 sutures using 10–0 nylon suture, one or two of which are releasable. These sutures should not be tight like the corneoscleral sutures, can be taken loose and slanting to allow egress of aqueous, but again not so loose that hypotony occurs. They should be buried lest conjunctival buttonholing occurs. Some have even tried putting the anterior capsule removed after capsulorhexis under the sclera flap to keep it open. In fact Conjunctival flap is sutured using 8-0 vicyrl/ 10'0 nonabsorbable ethilon monofilament. Anterior Chamber is deepened with balanced salt solution through side port to visualise a good bleb elevation with no leakage.

Figure 1[single site PT]

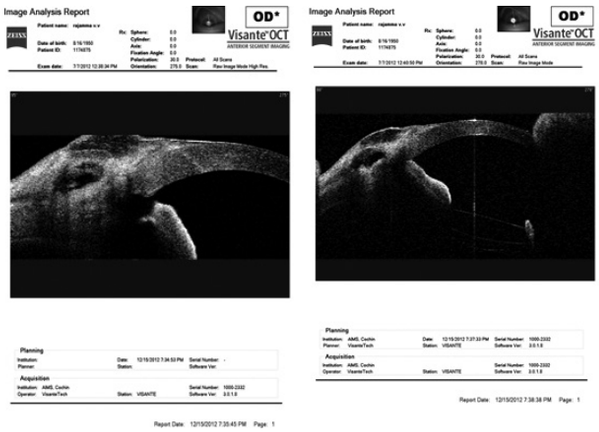


Figure 1 :Single site PhacoTrab +PCIOL

Two site phacotrab

First the conjunctival flap [Fornix/ lambal based] is made in the superonasal area after passing a corneal stay suture. A triangular/ rectangular partial thickness scleral flap is created in the same manner as in single site. Mitomycin-C [MMC] is applied 0.1-0.4mg% for 1-4 min depending on how much antifibrotic action is needed depending on the risk factors for subconjunctival fibrosis. It is washed off with 15-20 cc of fluid from under the conjunctival space and the cul-de-sac. Then a clear corneal Phacoemulsification is done with the surgeon seated temporally/ superotemporally, and PCIOL implantation is done. After this the surgeon then shifts his position superiorly/ superonasally, and completes the trabeculectomy. The sclerostomy, iridectomy, and scleral flap closure were performed in the same manner as for the one-site surgery. The conjunctival flap is closed with absorbable / non absorbable sutures. 2 site has the advantage of causing less manipulation of the incision during surgery and lesser postoperative astigmatism than single site PT. It just takes an extra 5-10 minutes during surgery.

In a study done in Tehran on patients operated in 2002-2005, although there was no difference between IOP control, BCVA and complications between the two groups, the endothelial loss was more in 2 site Phacotrab. Comparable IOP control, with similar improvement in vision and complications were found in a study comparing 2 site phacotrab with single site Bimanual microincision cataract surgery and trabeculectomy [7].

Limbal versus Fornix based incision in PT

Both can provide good exposure. Proper suturing ensures watertight closure in limbal based which can be done in two layers -Tenon's with absorbable vicryl 8'0 interrupted; and conjunctiva alone with continuous preferably done

with absorbable 8'0Vicryl sutures. Many lift the conjunctiva only with a small subconjunctival injection, and then cut the Tenon's in other plane, to prevent scarring in one plane. The disadvantage with limbal based is that the site of suturing although made 6-8mm from the limbus restricts posterior flow of aqueous-acts like a posteriorly placed restricting scar, forming what is referred to as 'Ring of Steel'. This results in pushing of the aqueous towards limbus, forming an 'Overhanging bleb' which presses on scleral flap obstructing egress of aqueous flow from inside the eye. This overhanging bleb ends up becoming thin walled with focal cystic areas which are more prone to infection & leakage.

Fornix based conjunctival flaps are time saving, more easy to make, but more care needs to be taken that they are sealed i.e. more prone to aqueous leak. They also give better exposure of the limbal area during surgery; have no posterior limit to aqueous flow- thus allowing more diffuse blebs to form. They are now being preferred. While suturing, needle will pass half-depth through peripheral cornea to begin the wing suture, then the needle takes several bites through the edge of the conjunctiva. The suture is then secured and locked to create a watertight closure. MMC can also be used with both types of flaps.

In a study done to comparable the results of limbal versus fornix based conjunctival flap in Phacotrabeculectomy, it was found that both were comparable with respect to postoperative IOP control and visual acuity. Posterior capsular opacification [PCO] requiring capsulotomy, interestingly was found to be more in limbal based cases. More bleb leaks were found in fornix based, which can be tackled with modifications of corneal suturing technique, using an anchoring suture or a mattress suture, taking a ledge onto the cornea. [8]

Figure 2 [limbus versus fornix based flaps]

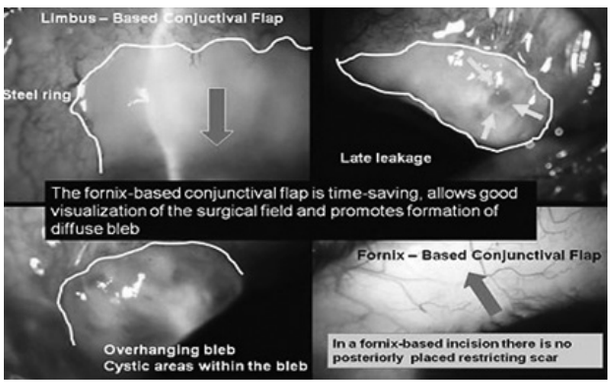


Figure 2: Limbal based vs Fornix based flap

Postoperative care after PT

Frequent Steroid eye drops [Prednisolone eyedrops] 2hourly to begin with, tapered more slowly as compared to a phaco alone forms the mainstay of the post operative regime. Homatropine eyedrops thrice daily for 2 weeks and then tapered over 2-3 weeks, along with the usual prophylactic Antibiotic {Moxifloxacillin}, Lubricants and NSAIDs. PT requires closer followup for the first one month weekly/ quarterly, followed by monthly till 3-4months, at 6months for a year and then yearly thereafter.

At each followup visit, apart from BCVA, IOP, slit lamp biomicroscopy is done to study the bleb morphology closely noting the bleb extent and heights, vascularistion, tortuosity of vessels is noted. Siedel's is done out to out bleb leak. Blebs can be graded by one of the many systems available, I prefer the Wuerzberg system where a score of >10 signifies a successful bleb [Table 2]. Also if available Anterior Segment-OCT should be done as it gives additional information regarding the functionality of the bleb [Fig 3].

Table 2- Wuerzberg Bleb Grading Score

Wuerzberg Bleb Grading Score	
Parameters	
Vascularity	3=avascular
	2=similar to adjacent conjunctiva
	1=increased
	0=massive
Cork screw vessels	3=none
	2=in one third
	1=in two third
	0=in entire bleb
Encapsulation	3=none
	2=in one third
	1=in two third
	0=in entire bleb
Microcysts	3=entire bleb
	2=lateral or medial to the flap
	1=over the scleral flap
	0=none

It is wise to recognize a failing bleb early by looking in to its features like absence of microcysts on AS-OCT and increased vascularity. Take timely measures to save the bleb, like subconjunctival 5 Fluorouracil [5FU] or remove the releasable suture.

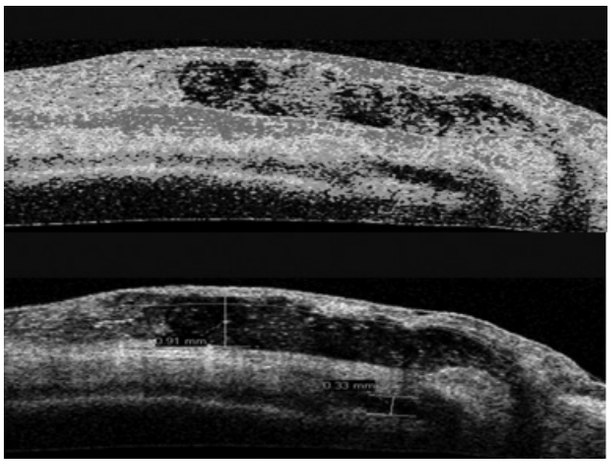


Figure 3-On AS-OCT
Multilayer multiform bleb, Multiform bleb wall refectivity, Low internal bleb reflectivity, Numerous microcysts, Patent internal ostium, Large posterior extent

Bleb morphology in Phacotrabeculectomy[PT] versus trabeculectomy[T]

Functional blebs achieving the required IOP lowering are shallower in PT, than T alone. In our study done on 20 cases of 10 in each group operated by a single surgeon, we found the bleb height to be significantly lesser in PT than in T alone on Anterior Segment OCT[AS-OCT]. Although not statistically significant more microcysyts, with a multiform pattern were seen when trabeculectomy was done alone. . Phacotrabeculectomy blebs were often uniform flat blebs inspite of being functional. Very few PT were successful with good bleb function if mitomycin C was not used. Chances of thin cystic blebs are less often in PT than in T, so it is safer to use MMC in phacotrabeculectomy. Hence it is recommended to use MMC in all cases of Phacotrabeculectomy.
Table 2 - Wuerzberg classification

Fig 4 – Functioning bleb

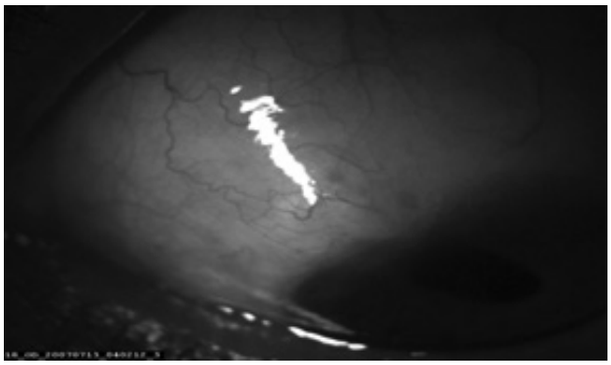


Figure 4 -On slit lamp examination-
Avascular , Absence of cork screw vessels, Presence of numerous microcysts, No encapsulation, Diffuse large bleb

Angle closure disease is considered as a surgical disease - needs surgery to control it. If peripheral anterior synechiae [PAS] is present for over 6 months or if control of IOP is suboptimal in spite of laser peripheral iridotomy [LPI] +/- laser iridoplasty, or is on maximum tolerable medical therapy - one has to intervene surgically and if cataract is also present, the answer is phacotrabeculectomy. [PT] which leads to greater deepening of AC, while trabeculectomy alone would cause further shallowing of AC and inadequate opening of anterior chamber angle. Studies have shown that phacotrabeculectomy in narrow angle /PACG has shown better results than phacoemulsification alone. [9]

Cataract is a well known complication after trabeculectomy, vision deteriorates in 50 % of patients due to cataract within a year of glaucoma surgery [10]. Thus it is better to tackle both simultaneously. Moreover a functioning trabeculectomy may fail when a cataract surgery is done at a later date [11,12].So in every case of glaucoma warranting surgical intervention if there is a visually disabling cataract surgery-it should be done simultaneously.

IOP does decrease after a phacoemulsification alone in patients of cataract with PACG [13], but such reduction in IOP is insufficient for neuronal protection and many patients may still require glaucoma medication or filtering surgery to control IOP.

Phacoemulsification done alone does open the drainage angle of anterior chamber [AC], with greater deepening of AC more than a combined phaco trabeculectomy . This occurs more in PACG patients than in POAG patients . In comparison to POAG patients, there is a greater decrease in IOP after PT in patients of PACG[3,13] although the overall success rates were not significantly different.

In a study comparing PT to trabeculectomy alone, in patients of PACG, it was found that the IOP reduction, surgical success and complications were similar in both groups. More postoperative interventions including cataract surgery and needling, were required in the trabeculectomy group [2] In comparison to POAG, patients of PACG had greater IOP reduction, although the overall success rates were not significantly different [3]. Also PT with MMC is more effective than phacoemulsification alone in controlling IOP in medically uncontrolled chronic ACG with coexsisting cataract [9]. The PT group needed fewer number of IOP lowering medications, had fewer complications and did not need surgical interventions in future.

Complications

It was found that complications of combined Phacotrabeculectomy were not worse than those of sequential surgery of each procedure done alone. Some studies found a lower rate of complications in combined phacotrabeculectomy [10]. Complications between PACG & POAG were comparable [10]. Inadequate mydriasis is an issue in many cases due to pseudoexfoliation or after prolonged use of miotics. Pupillary dilatation and use of Trypan blue helps in an uneventful phacoemulsification and does not adversely affect the outcome of the surgery in terms of visual acuity. Effective control of inflammation is warranted which is achieved by stepping up of steroids [14]. A study conducted in Asians by Chen DZ [15] found that the commonest postoperative complications up to three years were hypotony, hyphema and shallow anterior chamber. They found that complications were more in PACG group than in POAG. Most of them were self limiting and occurred in the first month of postoperative period. However, another large study conducted on Asians by Tan YL [16] et al found that complications were similar in both PACG and POAG groups, and that combined procedure has overall low rates of complications rather than trabeculectomy alone. Their study also found that prolonged hypotony is the most commonest complication, followed by hyphema and bleb leak. The occurrence of early postoperative hypotony is associated with higher risk of drainage failure. Since most complications occur in first month of post operative period, it is the most important period for post operative monitoring[14]. Some have found that hypotony occurs more often in males and in Non-Chinese population. Patients need to be cautioned not to rub their eyes or apply forceful pressure on the eye, as that can lead to hypotony. The need for wound care in the postoperative period is to be emphasized. It is wiser to use MMC with caution in myopes as they have a higher chance of going into choroidal detachment in the postoperative period. Snuffout of vision is luckily not encountered with Phacotrab as the size of the wound is small and entry into AC is gradual with the triplanar incision. Initially fibrin reaction after PT was found to be more than each of the surgeries alone, but now with improvement in surgical skills with time, surgeons do not encounter this anymore.

Conclusion

Long term IOP lowering occurs more with the combined procedure of phacotrabeculectomy. It effectively reduces IOP and simultaneously also improves vision [6]. Using Mitomycin C during the procedure enhances the chances of long term success of PT in terms of IOP control and glaucoma progression.

We recommend a 2 site phacotrabeculectomy with Trabeculectomy in the superonasal quadrant and Phaco in superotemporal or temporal quadrant, using a fornix based incision with a rectangular scleral flap with 1-2 releasable sutures and one nonreleasable suture on the scleral flap. This minimizes trauma to the operative tissues by separating the incisions and causes less astigmatism. Luckily incidence of snuffout of vision does not occur these days as IOP is decreased prior to surgery using Mannitol.

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Original Article

Prevalence of Subclinical Hypothyroidism in Patients with Primary Open Angle Glaucoma

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Abstract

Purpose: Prevalence of hypothyroidism in patients with glaucoma is conflicting. This study was performed to evaluate the incidence of subclinical hypothyroidism (SCH) in newly diagnosed patients with primary open angle glaucoma (POAG).

Methods: Eighty four patients (33 males and 51 females) of age 65.5 ± 11.5 years diagnosed as POAG were retrospectively studied for the incidence of SCH. Age and gender matched 79 subjects (34 males and 45 females) of age 63.6 ± 12.8 years were selected as control group. Serum Thyroid-stimulating hormone (TSH), total thyroxine and total triiodothyronine were analyzed in all subjects. Incidence of SCH was determined in genders of both groups and statistically analyzed.

Results: Prevalence of SCH was 10.7 and 14.6% in the POAG and control group, respectively. Female dominance of 8.3 and 11.3% were found respectively in the POAG and control group, whereas the prevalence of SCH in males in the respective groups was 2.3 and 5.0 %. No significant difference in the prevalence of SCH found among genders in POAG ($p = 0.472$, Odds ratio, 2.466) or control group ($p = 0.375$, Odds ratio, 1.35). Similarly, the incidence of SCH was not statistically significant ($p = 1.00$) among the POAG and control groups. Severe SCH (TSH > 10.0 mIU/L) was found in 1 female of POAG and 3 subjects (2 females and 1 male) in the control group.

Conclusions: Study revealed a 10.7% prevalence of SCH with female dominance in POAG patients. It was not statistically significant with respect to the healthy control.

Key words: Hypothyroidism; Primary open angle glaucoma; Intraocular pressure; Orbitopathy; Thyroid-stimulating hormone; glycosaminoglycans; Levothyroxine

Introduction

Hypothyroidism, the decrease in thyroid hormone production by the thyroid gland can range from subclinical to overt hypothyroidism. Subclinical hypothyroidism (SCH) is characterized by serum thyroid hormone concentrations within the normal reference range with a single rise in serum thyroid-stimulating hormone (TSH) level. Canaris et al. reported the incidence of SCH varying between 4 and 10% depending upon the gender, age and population studied.[1] Thyroid hormones have a central role in the neural development of the eye mainly for the development of retina and attainment of color vision. It regulates intrinsic mechanisms for controlling retinal cytoarchitecture and layering.[2]

Glaucoma is one of the important causes for blindness and results from a rise in intraocular pressure (IOP) and the associated optic disc damage. Despite the rare association of hypothyroidism, a strong association of Graves' hyperthyroidism with orbitopathy has been reported.[3,4] Some studies indicated the association between hypothyroidism and glaucoma [5,6], while others failed to demonstrate such association. 7-10 Smith et al. reported the prevalence of primary open angle glaucoma (POAG) in subjects with hypothyroidism which was high as high as 23 %, while that of the control population was 4.7%. Furthermore, the same study demonstrated a decrease of intra-ocular pressures (IOP) with treatment of hypothyroidism in a patient with glaucoma.[5] Centanni et al. also supported this with finding that the elevated IOP, even in patients with subclinical hypothyroidism at its early stages, could be reduced by treatment with levothyroxine.[11] The screening for subclinical hypothyroidism in subjects with glaucoma is not yet been established. Furthermore, the conflicting observation regarding the association of hypothyroidism and glaucoma in the literature prompted us to evaluate it's prevalence mainly the SCH in a subset of patients in our population who have been diagnosed as POAG.

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Aim: To evaluate the incidence of subclinical hypothyroidism in newly diagnosed patients with primary open angle glaucoma.

Subjects and Methods

This case-control study was conducted between Jan 2014 and April 2015. All the patients with recently diagnosed glaucoma were included in this study. Informed consent was obtained from the patients. The study was conducted adherence to the guidelines of the Declaration of Helsinki. POAG was defined by the presence of an open angle on gonoscopy, IOP more than 22 mm of Hg measured with applanation tonometer, typical glaucomatous cupping and visual field defect in at least one eye on standard automated permanently (HFA 24-2). The thyroid status was assessed by history, physical examination and thyroid function tests. Blood samples were taken from all POAG patients after an overnight fasting. The serum samples were frozen and transferred to Thyrocare laboratories (Thyrocare India, Navi Mumbai, India). Total T3, T4 and TSH in serum were determined using chemiluminescence immunoassay method with a fully automated immunoanalyzer according to the manufacturer's instructions.

Age and sex matched control subjects were selected. The control subjects, who visited the Ophthalmology clinic as a part of their eye check up were selected. Subjects who reported thyroid disease, ongoing treatment for thyroid disorders and with other co morbidities including congenital hypothyroidism, autoimmune diseases or any other inflammatory diseases were excluded from the study. Serum TSH level higher than 4.5 mIU/L with normal T3 and T4 levels was considered as SCH. Significant difference in the prevalence of SCH in POAG with that of control in both genders was statistically analyzed.

Statistical analysis

Statistical analysis was performed using the SPSS soft ware package version 16. Significant prevalence of SCH between the POAG, control group and between genders in these groups was analyzed by Fisher's exact test. The mean age and TSH level between subjects with SCH of both groups was compared by Student t test. P value less than 0.05 was considered as significant.

Results

In this study, 84 POAG patients (33 males and 51 females) with age of 65.5 ± 11.5 years and 79 healthy controls (34 males and 45 females) of mean age 63.6 ± 12.8 years were enrolled (table 1). No significant difference could be found between the ages of both groups. SCH was found in 8.3% of females and 2.4% of males. No statistically significant difference was found between the incidence of SCH among the genders (p = 0.472) in the POAG group (odds ratio, 2.466; 95% confidence interval, 0.47–12.66). Mild form of SCH was found in 10 and severe form in 1 POAG patient. No statistically significant incidence of SCH found between the genders of POAG and control group (p = 1.0; Odds ratio, 0.64; 95% confidence interval, 0.09–4.6).

Table 1. Distribution of subclinical hypothyroidism in patients with or without glaucoma

Sl no	Groups	Age	Subclinical Hypothyroidism		
			Total	Female	Male
1	Glaucoma (n= 84; 33 male and 51 female)	65.5 ± 11.5	9 (10.6%)	7 (8.3%)	2 (2.3%)
2	Control (n= 79; 34 males and 45 females)	63.6 ± 12.8	13 (14.4%)	9 (11.3%)	4 (5.0%)

Values are mean ± SD.

The incidence of SCH in the healthy control was 14.4% with female dominance of 11.3 %. But no statistically significant incidence of SCH could be found among the genders (p = 0.375) in the control group (odds ratio, 1.875; 95% confidence interval, 0.52– 6.7). The value of thyroid function test was depicted in table 2. The mean value of TSH was significantly different among the POAG with or without SCH. The TSH level in the SCH subjects of the POAG and control group was 7.4 ± 2.0 and 8.8 ± 3.2 mIU/L, respectively. However, we could not find any significant difference in the mean value of TSH among the SCH subjects of POAG and healthy control groups (p > 0.05). Further, the levels of T3 and T4 did not differ among the subjects in both the groups.

Table 2. Levels of TSH, T3 and T4 in patients with glaucoma and control groups

Sl no	Groups	Age (Years)	Thyroid function tests		
			TSH (mIU /L)	T3 (nmol /L)	T4 (μmol /L)
1	Glaucoma without subclinical hypo-thyroidism (n= 75)	64.6 ± 11.4	1.8 ± 1.1	8.3 ± 1.5	90.5 ± 16.2
2	Glaucoma with subclinical hypo-thyroidism (n= 9)	66.3 ± 11.7	7.4 ± 2.0*	6.9 ± 1.7	89.0 ± 9.3

3	Control group without subclinical hypothyroidism (n = 66)	61.8 ± 15.3	1.9 ± 0.9	8.6 ± 1.6	96.6 ± 16.9
4	Control group with subclinical hypothyroidism (n= 13)	65.3 ± 10.2	8.8 ± 3.2a	7.4 ± 2.7	90.2 ± 21.9

Values are mean ± SD, * p < 0.01 (Student t test) significantly different from the glaucoma patients without SCH and a p < 0.01 significantly different from the control subjects without SCH. Others are non significant p>0.05.

Discussion

Results of this study revealed no statistically significant prevalence of SCH among the POAG patients. The incidence of SCH among the healthy control was 14.4%. The population prevalence of SCH was reported as approximately 5–10%, being more frequent in women and with increasing prevalence with advancing age.[1,12] In this study, we found female dominance of SCH both in control and POAG groups. Association of thyroid disorders has been reported in orbitopathy and glaucoma. A strong association of Graves' hyperthyroidism with glaucoma has been reported with several plausible mechanisms. Among them, an increase in the volume of orbital contents that might cause orbital congestion and the associated increase of the episcleral venous pressure has been suggested for the incidence of glaucoma[13] Furthermore, the duration of active thyroid-associated orbitopathy is a marker of glaucomatous damage to the disc.[13] Hence, the clinicians should screen for glaucoma in subjects with thyroid disorders especially in the presence of additional, well-known risk factors for glaucoma.

Hypothyroidism may result in choroidal thickening probably due to the changes in the interstitial connective tissue matrix, increased capillary density and/or increased serum lipid levels. Smith et al., demonstrated that decreased thyroid hormone probably may increase the synthesis of glycosaminoglycans in the trabecular meshwork, result in the reduced aqueous out flow and hence increase in IOP.[14] Wittman reported the increased interstitial connective tissue in patients with hypothyroidism in an autopsy study.[15] The IOP and body mass index were significantly higher in hypothyroid patients compared to healthy subjects.[16] Ulas et al. demonstrated that IOP levels were significantly higher in patients with subclinical and overt hypothyroidism compared to euthyroid patients and healthy subjects.[17] However, treatment with thyroxine showed multiple responses in ocular parameters in patients with hypothyroidism. A recent study in patients with overt hypothyroidism (without glaucoma)showed levothyroxine therapy normalized thyroid hormone levels without any change in the ocular parameters such as IOP, central corneal thickness (CCT), anterior chamber parameters, retinal nerve fiber layer thickness, retinal thickness and cup to disc ratio.[17] Euthyroid patients receiving levothyroxine treatment had lower IOP level than patients with SCH and overt hypothyroidism.[14] Reversible increase of the CCT leading to a reversible IOP rise and a decreased CCT correlating with the decrease of TSH was reported by Bahçeci et al.[18] while Ozturk et al. found that neither hypothyroidism, nor its replacement therapy gave rise to any change of IOP, CCT, anterior chamber parameters, retinal thickness and cup to disc ratio.[16] Recent study by Lin et al. in Taiwan population found that untreated hypothyroid patients had a significantly increased risk for POAG development during the 5-year follow-up period[19] and levothyroxine was found to be protective.[5,19,20]

Several studies reported the prevalence of hypothyroidism in POAG patients of various populations. Screening of thyroid function test revealed hypothyroidism in only 2.6% of POAG patients, whereas 4% in the control group.[8] A similar observation was found in a large case control study in US elderly population by Motsko and Jones, which demonstrated prior hypothyroidism found in 17.2% POAG patients and in 17.6% control subjects. [10] However, none of these studies were focused on SCH in patients with POAG. Our study demonstrated the incidence of SCH was 10.6% of POAG patients at the early stages with female dominance. However, no significant prevalence evidenced when compared to the age and gender matched control subjects. SCH is generally classified according to the serum TSH level into mild (increased TSH 4.0–10.0 mIU/L) and more severe categories where serum TSH concentrations increased to >10.0 mIU/L.[21,22] In this study, only 1 subject in POAG and 3 subjects in control group have severe SCH. It has been demonstrated that the consequences of SCH are variable at several levels and may depend on the duration and the degree of elevation of the serum TSH.

A circadian fluctuation in serum TSH concentration was observed in both healthy individuals and those with SCH mainly in the early afternoon and approximately 30% higher concentrations being present during the evening and night.[23,24] The degree of variation in serum TSH was lower in SCH when compared to other thyroid disorders like euthyroid. Furthermore, reports found that in a healthy individual, TSH concentrations have a much smaller variation over time, approximating to a third of the reference interval.[25] The TSH level in this study did not differ among the subjects of both

groups. As a physiological adaptation to aging, a widening of the reference range for serum TSH with increasing age (>80 years old) should be considered.[26,27] However, none of the subjects in this study group have age above 80 years. TSH levels correlate with obesity and markers of insulin resistance. Serum TSH concentrations >3.5 mU/L are common in obesity.[28] The mean age of glaucoma patients in this study support the previous findings that the incidence of glaucoma was found to increases over 40 years.[29]

We could not repeat the test in subjects with an initially raised serum TSH with T3 and T4 within reference range. It has been recommended that such cases should be investigated with a repeat measurement of both serum TSH and FT 4, along with thyroid peroxidase antibodies, preferably after a 2- to 3-months interval.[30] Hence, this remains one of the limitations of this study. The other limitations are the small number of POAG patients with unknown period of SCH. This is the first study that reports the prevalence of SCH in POAG patients of this population.

Conclusion

The findings of this study concluded that the prevalence of SCH with female dominance found in the POAG patients may recommend the thyroid function tests to be done at the early stage for thyroxine therapy in order to prevent the worsening of glaucoma. Though the prevalence of SCH in POAG was not statistically significant with respect to the control group, a higher odd ratio was found in POAG group. This finding deserves critical prospective and a cohort study to find the association between preexisting hypothyroidism and development of POAG.

Conflict of interest: None of the authors have any proprietary interests or conflicts of interest related to this submission.

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Original Article

Correlation Between Diabetic Macular Edema and Choroidal Thickness Using Enhanced Depth Imaging Optical Coherence Tomography

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Abstract

Aim: To find out the correlation between Diabetic Macular edema (DME) and Choroidal Thickness (ChT) using Enhanced Depth Imaging Optical Coherence Tomography (EDI OCT)

To find out correlation between DME and ChT following interventions like intravitreal Bevacizumab (IVB), focal laser photocoagulation (FLP)

Materials and Methods: A prospective, interventional, case control study 273 patients with non proliferative diabetic retinopathy(NPDR) and 52 controls was done. ChT measurements are made of the subfoveal choroid and at 500mm, 1500 mm temporal and nasal from the centre of the fovea at baseline and at 4 weekly intervals after intervention upto 12 weeks.

Results: 474 eyes of 273 patients (134 males, 139 females) with NPDR were studied. 185 eyes of 126 patients had DME. Mean subfoveal ChT(SFCT) in DME was 311.4+/-64.3 microns, in NPDR no DME was 329.5+/-62.9 microns, in controls was 320+/-22.3 microns. The group which required further intervention had a lower SFCT, higher Central Macular Thickness (CMT), older age and poorer Best Corrected Visual Acuity(BCVA) at initial visit. Univariate linear regression analysis of final BCVA following IVB showed a statistically significant association with initial SFCT(F Ratio= 8.2506; P= 0.006, R2 =0.1675); with initial BCVA(F Ratio= 28.996; P< 0.001, R2 =0.4142; with initial CMT (F Ratio= 9.278; P= 0.004, R2 =0.1844) wheras that following FLP showed a statistically significant association with initial BCVA(F Ratio64.591; P< 0.001, R2 =0.594); with initial CMT (F Ratio= 16.239; P< 0.001, R2 =0.2696), but not with initial SFCT(F Ratio= 1.09; P= 0.301, R2 =0.024).

Conclusion : ChT was found to be higher in patients with NPDR than in normal individuals. It was found to be decreased in DME. The ChT has a prognostic value in determining the final visual acuity and CMT. The ChT also has a role in determining the number of interventions necessary for a patient.

Aim

To find out the correlation between DME and ChT using EDI OCT and to find out correlation between DME and ChT following interventions like IVB, FLP.

Materials and Methods

This study was approved by the Institutional Review Board, Clinical Research Ethics Committee before performing this study. After explaining to the patients the purpose of the study and the possible outcomes, informed consent was obtained from all patients. The procedures conformed to the tenets of the Declaration of Helsinki. This is a prospective, interventional, case control study done at a tertiary eye care centre in Kerala from 01-03-13 to 01-03-14.

Inclusion criteria: patients with NPDR; exclusion criteria: refractive error of more than -5 diopters in the study eye, previous treatment for DME, previous pars plana vitrectomy, signs of any other active retinal disease in the study eye such as Age Related Macular Degeneration, Choroidal neovascularisation, vitreoretinal diseases (i.e., Vitreomacular traction syndrome and epiretinal membrane). 52 eyes of 52 healthy controls also were enrolled in the study.

All patients had their Blood Pressure, HbA1c noted. BCVA is determined with Snellen's charts and converted to logMAR scale and refractive error is recorded. The diagnosis of NPDR was on the basis of slit lamp biomicroscopy and

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indirect ophthalmoscopy. All patients underwent EDI OCT with Cirrus HD -OCT 5000 (Carl Zeiss Meditec, Inc.). Automated CMT is generated by Cirrus HD -OCT 5000 (Carl Zeiss Meditec, Inc.); eyes with values more than 300 microns were designated as having DME. The ChT is measured from the outer portion of the hyperreflective line corresponding to the RPE to the hyporeflective line or margin corresponding to the sclerochoroidal interface using the caliper tool in Cirrus HD -OCT 5000 (Carl Zeiss Meditec, Inc.). These measurements are made of the subfoveal choroid and at 500mm, 1500 mm temporal and nasal from the centre of the fovea. Intervention (IVB/FLP) was given to all cases with DME which was decided on an individual basis and cases were followed up at 4, 8, 12 weeks after intervention. On each follow up visit after intervention, BCVA is recorded; Fundus examination is done; CMT and ChT measurements are repeated with EDI OCT.

Sample Size

Sample size and powering were based on a previous clinical trial on macular ChT in diabetic retinopathy1 in which ChT in eyes with DME was 190.8+/-48.4microns and in eyes without DME was 207.0+/-55.9microns. Therefore, to have 80% power to detect a difference of 16.2 microns between the 2 groups the sample size required in each group was 164 eyes. The sample size for the treatment group was based on the BOLT Study which required 40 eyes in each treatment group[2].

Statistical analysis

All analyses were performed with SPSS v.17.0 for Windows software (SPSS, Inc., Chicago, IL) with $P<0.05$. All values are presented as the mean +/- standard deviation. Mann–Whitney U test is used to compare independent samples. Wilcoxon rank-sum test is used to compare the variables before and after intervention and also to compare between the two eyes of the same patient. Bivariate relationships were analyzed using the Pearson correlation coefficient. Analysis of variance statistics were used to assess the various subgroups. Linear Regression Analysis was used to find out the factors influencing final visual acuity[3].

Results:

474 eyes of 273 patients (134males, 139females) with NPDR were studied. 185 eyes of 126 patients had DME. 52 eyes of 52 healthy controls also were enrolled in the study. Baseline characteristics of patients are shown in Table 1.

Average ChT was obtained by taking the average of SFCT, ChT at 500microns nasal, 1500microns nasal, 500microns temporal, 1500microns temporal to fovea.

Table 1 showing baseline characteristics

	NPDR/ DME+	NPDR/ DME-	Controls
Age (years)	60+/-7	60+/-10	61+/-9
Duration of DM (years)	12+/-7	13+/-7	NA
HbA1C	9.1+/-1.9	8.7+/-1.9	NA
BCVA (logMAR)	0.41+/-0.35	0.31+/-0.33	0.04 +/-0.1
MAP (mm of Hg)	96+/-7	97+/-8	94+/-6
Refractive error (spherical equivalent in dioptres)	+0.68+/- 1.2	+0.5+/-1.1	+0.47 +/-1.2

In the diabetics, the CMT was found to have a negative correlation with SFCT (Pearson's r=-0.16; P=0.0004), ChT at 500microns temporal (Pearson's r= -0.16; P=0.0004), ChT at 1500microns temporal (Pearson's r=-0.15; P=0.0013), ChT at 500microns nasal (Pearson's r= -0.14; P=0.002), ChT at 1500microns nasal to fovea (Pearson's r= -0.11; P=0.0161) and the average ChT (Pearson's r= -0.15; P=0.0008). SFCT was found to have a negative correlation with age (Pearson's r= -0.14; P= 0.0018), BCVA(Pearson's r= -0.15; P=0.0007), CMT (Pearson's r=-0.16; P=0.0004) and a positive correlation with ChT at 500microns temporal (Pearson's r=0.93 ; P<0.0001), 1500microns temporal (Pearson's r=0.82 ; P<0.0001), 500microns nasal (Pearson's r=0.93 ; P<0.0001), 1500microns nasal (Pearson's r=0.84 ; P<0.0001) to fovea. It did not show a significant correlation with duration of diabetes mellitus (Pearson's r=-0.07 ; P=0.1073), HbA1C (Pearson's r=-0.03 ; P=0.5884), Mean arterial pressure(MAP) (Pearson's r=-0.07 ; P=0.1264), refractive error (Pearson's r=-0.01; P=0.7599). The duration of Diabetes Mellitus factors showed a negative correlation with ChT at 500 microns temporal (Pearson's r = -0.1; P=0.0377), 1500 microns temporal (Pearson's r= -0.11; P=0.0162), 1500 microns nasal to fovea (Pearson's r= -0.1; P=0.0368). The MAP had a negative correlation with ChT at 1500 microns nasal to fovea (Pearson's r= -0.1; P=0.038).

There was no statistically significant difference in SFCT between males (323.9+/-68.7microns) and females (323.7+/-58.8microns) (P=0.8120) or between hypertensives and normals(P=0.1875) or patients with hyperlipidemia and patients without hyperlipidemia(P=0.1829). SFCT among myopic, hypermetropic and emmetropic eyes in diabetics was evaluated with one way analysis of variance which showed no statistically significant difference between the 3

groups (F- ratio= 1.029; P=0.358).

ANOVA(one way analysis of variance) was used to compare the 3 groups namely Controls; NPDR /DME- ; NPDR/ DME+ which showed statistically significant difference in ChT, CMT, MAP, BCVA. (Table2)

There were 36 eyes with DME and 70 eyes without DME whose HbA1C levels ranged from 4 to 7. Eyes with DME had a lower SFCT(P=0.0031), ChT at 500microns nasal (P=0.0062), 1500microns nasal (P=0.0347), 500microns temporal (P=0.005), 1500microns temporal to fovea (P=0.003).

70 eyes of 35 patients with 1 eye having NPDR with DME and fellow eye NPDR no DME was analysed which showed decrease in SFCT(P=0.0017), ChT at 500microns nasal (P=0.001), 1500microns nasal (P=0.0025), 500microns temporal (P=0.0026), 1500microns temporal to fovea (P=0.009) in eyes with DME.

100 eyes underwent IVB and 87 eyes FLP. 16 eyes (16%) which received IVB required 1 more intervention with 5 eyes receiving FLP and 11 eyes receiving IVB. 6 eyes (6.8%) which received FLP required 1 more intervention with all eyes receiving single dose of IVB. The group which required further intervention had a lower SFCT, lower average ChT, higher CMT, older age and poorer BCVA at initial visit. (Table3)

Initial SFCT had a statistically significant negative correlation with CMT on 1st (P=0.041), 2nd(P=0.016), 3rd(P=0.002) and 4th visit(P=0.026).

Baseline characteristics of eyes undergoing FLP/ IVB (Table4) were similar in terms of age, duration of Diabetes Mellitus, HbA1C, MAP, SFCT and average ChT but differed in terms of BCVA and CMT. The average ChT showed a statistically significant negative correlation with CMT at 8(P=0.004)and 12weeks (P=0.008) following IVB and a non statistically significant negative correlation following FLP(P=0.6816, P= 0.3178 respectively).

Table 3 comparing features of Group1 (further intervention was done) with Group2(no further intervention)

	Group1 (further intervention was done)	Group2 (no further intervention)	Z	P
SFCT	271.4 +/- 47.5	321.1 +/- 64.3	3.317	0.0009
Average ChT	233.0 +/- 42.6	277.9 +/- 54.9	3.476	0.0005
CMT	452.1 +/- 113.2	390.2 +/- 83.7	2.621	0.0088
BCVA	0.85 +/- 0.54	0.35 +/- 0.27	4.696	< 0.0001
Age	63 +/-9	59 +/-7	2.015	0.0439
Duration of DM	13 +/-6	12 +/-7	0.341	0.7333
HbA1C	9.43 +/- 2.28	9.04 +/- 1.80	0.816	0.4144
MAP	97 +/-6	96 +/-7	1.136	0.2559
Refractive error	0.41 +/- 0.97	0.72 +/- 1.20	1.294	0.1955

The changes following IVB and FLP has been summarized

Table 2 Comparison of the 3 groups

	NPDR/ DME+	NPDR/ DME-	Controls	F Ratio	P
SFCT	311.4+/-64.3	329.5+/-62.9	320+/-22.3	3.711	0.025
Nasal 500microns	270.4+/-59.7	293.3+/-57.5	294.5+/-26.7	3.361	0.035
Nasal 1500microns	244.1+/-55.0	251.1+/-55.4	270.7+/-26.1	4.52	0.011
Temporal 500microns	275.6+/-58.3	292.2+/-57.6	303.0+/-26.6	5.911	0.003
Temporal 1500microns	240.9+/-52.6	255.6+/-52.6	282.7+/-30.9	13.427	< 0.001
Average ChT	264.6+/-55.3	286.4+/-53.3	294.2+/-25.9	5.171	0.006
CMT	395.1+/-89.5	233.5+/-34.9	223.0+/-26.4	460.751	< 0.001
Age	60+/-7	60+/-10	61+/-9	0.19	0.827
MAP	96+/-7	97+/-8	94+/-6	3.774	0.024
Refractive error	+0.64+/- 1.2	+0.5+/-1.1	+0.47+/-1.2	1.615	0.2
BCVA	0.41+/-0.35	0.31+/-0.33	0.04+/-0.10	27.382	< 0.001

Table 4 Baseline characteristics of eyes undergoing FLP/ IVB

	FLP	IVB	Z	P
Age	60+/-7	60+/-8	0.0366	0.9708
Duration of DM	12+/-6	13+/-7	1.234	0.2173
HbA1C	9.21+/-1.98	8.99+/-1.75	0.543	0.5868
MAP	96+/-6	97+/-7	0.784	0.4332
BCVA	0.30+/-0.28	0.51+/-0.38	4.204	< 0.0001
SFCT	322.6+/-66.4	306.3+/-62.0	1.663	0.0963
Average ChT	278.2+/-59.3	264.5+/-51.0	1.784	0.0745
CMT	365.7+/-60.6	425.1+/-101.0	4.201	< 0.0001

Table 5 summarizing changes following IVB

	1st	2nd	P	3rd	P	4th	P
SFCT	308.3+/-62.0	296.1+/-60.6	< 0.0001	312.0+/-59.1	0.9878	315.5+/-58.6	0.0395
Average ChT	265.5+/-51.0	254.2+/-49.1	< 0.0001	270.3+/-50.3	0.3552	275.4+/-47.9	0.0025
CMT	426.1+/-101.0	323.8+/-89.6	< 0.0001	310.3+/-88.3	< 0.0001	300.6+/-70.6	< 0.0001

Table 6 summarizing changes following FLP

	1st	2nd	P	3rd	P	4th	P
SFCT	321.6+/-66.4	305.1+/-63.9	< 0.0001	301.3+/-55.7	< 0.0001	306.7+/-61.5	0.0006
Average ChT	279.2+/-59.3	266.3+/-54.2	< 0.0001	265.9+/-47.7	< 0.0001	270.1+/-52.1	0.0008
CMT	366.7+/-60.6	275.2+/-78.3	< 0.0001	271.9+/-78.7	< 0.0001	264.2+/-73.1	< 0.0001

in Tables 5 and 6 respectively. Univariate linear regression analysis of final BCVA following IVB showed a statistically significant association with initial SFCT(F Ratio= 8.2506; P= 0.006, R2 =0.1675); with initial BCVA(F Ratio= 28.996; P< 0.001, R2 =0.4142; with initial CMT (F Ratio= 9.278; P= 0.004, R2 =0.1844) wheras that following FLP showed a statistically significant association with initial BCVA(F Ratio64.591; P< 0.001, R2 =0.594); with initial CMT (F Ratio= 16.239; P< 0.001, R2 =0.2696), but not with initial SFCT(F Ratio= 1.09; P= 0.301, R2 =0.024).

Discussion

This study found that the SFCT in eyes having DME was lower than those without DME or controls. Regatieri et al found that the mean SFCT was thinner in patients with DME (170+/-15 microns; P<0.05) than in normal subjects (232+/-15 microns) or subjects with NPDR (222+/-22 microns)4. Querques et al found that the mean SFCT was reduced significantly in diabetic group compared with the control group (309.8 +/- 58.5 microns, P < 0.001).[1]

The subfoveal region is the thickest part of choroid, and the mean SFCT has been reported from 272 to 354 microns[5-9]. In this study, it was noted that the ChT decreased nasally and temporally in all eyes, a finding reported by several previous studies[5,7,9,10]

This study observed a negative correlation of ChT with age (Pearson's r= -0.14; P= 0.0018). Shin et al detected a reduction of ChT of the total ETDRS subfields of 0.97 microns for each year of age on regression analysis.[11] The Beijing Eye Study reported that the SFCT decreased with age (4 microns per year of age).[12]

In this study, the SFCT decreased significantly after IVB during 2nd visit at 4 weeks from 308.3+/-62.0microns to 296.1+/-60.6microns (P< 0.0001). At 8 weeks there was no statistically significant difference (312.0+/-59.1microns, P=0.9878) and at 12 weeks there was an increase in ChT which was statistically significant (315.5+/-58.6microns, P=0.0395). Tsuiki et al found out that SFCTdecreased

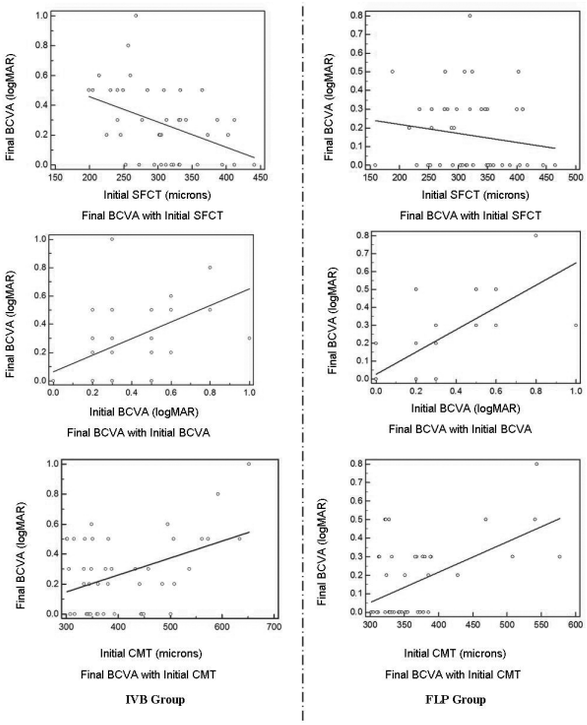


Figure 1. Regression analysis in IVB/ FLP groups

significantly after intravitreal bevacizumab treatment for macular edema in CRVO[13]

In this study the SFCT decreased significantly after FLP. In a study to evaluate the SFCTafter treatment of central serous chorioretinopathy, the mean ChT after laser photocoagulation changed from 345+/-127 microns to 340+/-124 microns at 4 weeks.[14] We did not find any literature regarding change in ChT following IVB or FLP in diabetic macular edema even after extensive literature search.

DRCR Network, BOLT study, PACORES study has reported reduction in CMT with IVB and FLP in diabetic macular edema.2,15,16,17 Similarly in this study the CMT decreased from 426.1+/-101.0microns to 300.6+/-70.6microns at 12 weeks with IVB and from 366.7+/-60.6microns to 264.2+/-73.1microns at 12 weeks with FLP.

This study showed a statistically significant association between initial SFCT and final BCVA as well as CMT. Yang HS et al reported that ChT was one of the main prognostic factors of subfoveal myopic CNV after IVB and that ChT was associated significantly with final BCVA (P=0.007). Baseline ChT was associated significantly with number of intravitreal injections required $P < 0.0001$)[18]

In a study to investigate the prognostic implication of SFCT on treatment outcome after intravitreal ranibizumab injections for typical exudative age-related macular degeneration, SFCT was significantly correlated with visual outcome (P=0.003) and treatment response (P0.018).[19]

This study has some limitations. Diabetics without diabetic retinopathy were not included. The choice of IVB versus FLP was not randomised.

Conclusion

In conclusion, Spectral-domain OCT is a noninvasive technology to assess the choroid. ChT was found to be higher in patients with NPDR than in normal individuals. It was found to be decreased in DME. The visual acuity and the CMT improves after IVB and FLP. The ChT has a prognostic value in determining the final visual acuity and CMT. The ChT also has a role in determining the number of interventions necessary for a patient.

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Original Article

Effectiveness of Part Time Occlusion Therapy in the Treatment of Amblyopia in Children Aged 3-10 Years

Dr. Prashob Mohan MS, Dr. Susan Philip MS

ABSTRACT

Purpose: 1) To evaluate the clinical profile and distribution of different types of amblyopia in patients aged 3-10 years. 2) To study the response to part time occlusion therapy for 6 hours per day in amblyopic children aged 3-10 years.

Methods: 100 children aged 3-10 years attending OPD and paediatric ophthalmology clinic of RIO, Thiruvananthapuram with amblyopia from March 2011 to September 2012 were included in the study.After taking informed consent from the parents, detailed history taking and clinical examination were performed. Appropriate refractive correction and part time occlusion therapy (patching of the dominant eye for 6 hours per day with one hour of near work) were prescribed to amblyopic children. BCVA and compliance to occlusion therapy were assessed at 2 monthly follow up visits for 6 months. Appropriate statistical tools and computer software were used for data analysis.

Results: Out of 100 children, 84 had unilateral amblyopia and 16 children with bilateral amblyopia. 45% had strabismic amblyopia, 20% had anisometropic amblyopia, 19% had combined amblyopia and 16% had ametropic amblyopia. The mean improvement of BCVA was 0.19±0.03 logMAR units and at the end of 6 months. BCVA of 80% of anisometropicamblyopes, 73.68% of combined amblyopes, 62.22% of strabismicamblyopes and 31.25% of ametropicamblyopes improved by at least 0.2 log units after 6 months. 52.21% of eyes with mild amblyopia, 58.33% of eyes with moderate amblyopia and 92.31% of eyes with severe amblyopia showed a similar improvement.

Conclusions: Strabismic amblyopia is the commonest form of amblyopia in children aged 3-10 years.Part time occlusion therapy is an effective treatment modality for amblyopia in this age group.The response to part time occlusion therapy was the best in combined and anisometropic amblyopia.Part time occlusion therapy was particularly effective in severe amblyopes.

Aim of the study

1. To evaluate the clinical profile and distribution of different types of amblyopia in patients aged 3-10 years
2. To study the response to part time occlusion therapy for 6 hours per day in amblyopic children aged 3-10 years.

Materials and methods: The study was a prospective case series analysis study conducted in Regional Institute of Ophthalmology, Trivandrum for a duration of 18 months (March 2011 to September 2012). 100 consecutive cases were included in the study.

Inclusion criteria: Children aged 3-10 years attending outpatient department and paediatric ophthalmology clinic of Regional Institute of Ophthalmology, Thiruvananthapuram with amblyopia.

Exclusion criteria:

1. Patients outside selected age group of 3-10 years.
2. Patients in whom visual acuity could not be measured due to intellectual disability.
3. Patients who have received prior occlusion therapy.
4. Patients who have undergone strabismus surgery.
5. Patients not willing for study.
6. Organic amblyopia.

After obtaining informed consent, baseline patient information was obtained and detailed history was taken. Assessment of visual acuity including cycloplegic refraction was done in all cases. Best corrected visual acuity was determined using Snellen's chart (or Cambridge Crowding cards in children less than 4 years) and its logMAR equivalent was calculated. A detailed evaluation of strabismus including Hirschberg corneal reflex test, cover test, cover-uncover test, alternate cover test, prism bar cover test, assessment of binocular single vision with Bagolini's striated glasses and ocular motility assessment was done. Anterior segment evaluation was done using slit lamp. Posterior segment evaluation by

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direct and indirect ophthalmoscopy was done.Glasses were prescribed based on retinoscopy and subjective refraction and visual acuity was reassessed after 4 weeks.All patients with best corrected visual acuity in the worse eye less than or equal to 6/12 Snellen's (logMAR 0.3) after wearing the necessary correction for 4 weeks were included in the study.Part time complete occlusion (6 hours per day) of the dominant eye with one hour of near work was prescribed. For bilateral amblyopes alternate day part time occlusion for each eye was prescribed.Patient was followed up by 2 monthly visits or earlier, if required for at least 6 months.Best corrected visual acuity and details regarding compliance to occlusion were assessed at each visit. A minimum of 4 hrs/day of occlusion and 1 hour of near work was considered compliant.

For data analysis, patients divided into 3 groups based on best corrected visual acuity Mild Amblyopia (6/12 – 6/18), Moderate Amblyopia (6/24 – 6/60), Severe Amblyopia (≤ to 6/60)

Amblyopia was defined as best corrected visual acuity of less than or equal to 6/12 Snellen equivalents (log MAR 0.3) which persisted after at least 4 weeks of spectacle correction.

Data was analysed using appropriate statistical tools and computer software.

Results: In this study, a total of 130 consecutive children were initially enrolled. 16 were not compliant and 14 did not come for follow up. 100 children were finally included in the analysis. 46 children were in the 3-6 age group and 54 children were in the 7-10 age group.Mean age at presentation was 6.78 ± 0.35 years. 52 were male children and 48 were female.

The major presenting complaint was defective vision (44 children). Other complaints at presentation were deviation of eyes (29 children), eye strain (5 children), both defective vision and squint (19 children), defective vision and eye strain (1 child) and squint and eye strain (2 children).

The distribution of the type of amblyopia was as follows: [Table 1]

Table 1. Types of Amblyopia

Type of amblyopia	Frequency	%
Strabismic	45	45.00%
Anisometropic	20	20.00%
Combined Strabismic and Anisometropic	19	19.00%
Ametropic	16	16.00%
Total	100	100.00%

Out of the 100 children who were included in the study, 64 had strabismus, of which majority had esotropia (41 children). There were 83 children with < 3D spherical equivalents of anisometropia and 17 children with ≥3D spherical equivalents anisometropia.

In this study 57.8% had mild amblyopia, 13% had moderate amblyopia and 11.2% had severe amblyopia. [Fig 1].26.32% of combined amblyopias and 17.78% of strabismicamblyopias were severe whereas severe amblyopia did not occur in ametropic and anisometropic groups. Mild amblyopia was the major grade of amblyopia in all types other than combined amblyopia in which more cases of moderate amblyopia (47.37%) were observed.

The mean best corrected visual acuity at presentation in the amblyopic eye was 0.57 ± 0.05 logMAR units.Anisometropic amblyopia had the best mean visual acuity at presentation (0.45±0.07) while combined amblyopia had the worst visual acuity at presentation (0.74±0.16).

Among the 116 eyes enrolled in the study, BCVA of 91 eyes (78.45%) improved by at least 1 Snellen's line (0.1 logMAR units) and 68 eyes (58.62%) improved by at least 2 Snellen's lines (0.2 logMAR units) at the end of 6 months following initiation of part time occlusion therapy.

The mean best corrected visual acuity at the end of 6 months of part time occlusion therapy was 0.38±0.04 logMAR units [Fig 3].

The mean improvement of best corrected visual acuity at the end of 2 months was 0.07±0.02 logMAR units, at the end of 4 months was 0.13±0.02 logMAR units and at the end of 6 months was 0.19±0.03 logMAR units which was statistically significant ($p<0.05$).

BCVA of 16 eyes (80%) with anisometropic amblyopia, 14 eyes (73.68%) with combined amblyopia, 28 eyes (62.22%) with strabismic amblyopia and 10 eyes (31.25%) with ametropic amblyopia improved by at least 2 Snellen's lines (logMAR 0.2) at the end of 6 months of part time occlusion therapy. [Fig 4]

The mean BCVA at different stages of follow up is given

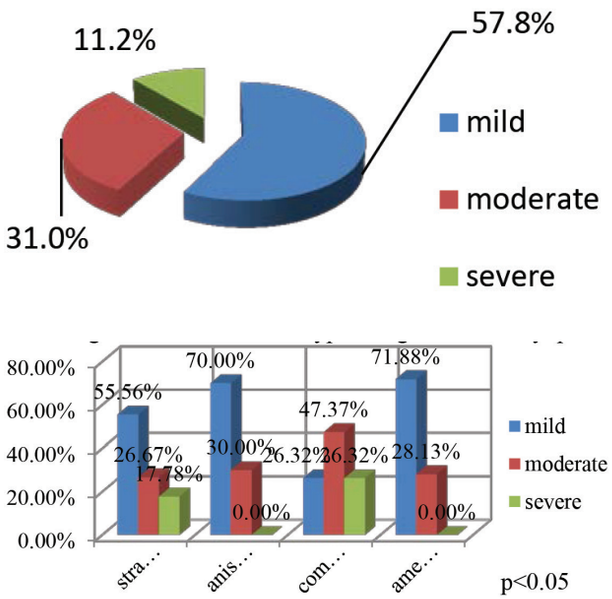


Fig 2. Relation between type and grade of amblyopia

in Fig 5. The mean improvement in BCVA at the end of 6 months of occlusion therapy was 0.28±0.05 log units for combined amblyopia, 0.26±0.05 log units for anisometropic amblyopia, 0.19±0.05 log units for strabismic amblyopia and 0.1±0.04 log units for ametropic amblyopia. This improvement in visual acuity was statistically significant ($p<0.05$)

There was a strong statistical correlation between pre-treatment BCVA and improvement in visual acuity at the end of 6 months. ($r=0.492$, $p<0.05$) [Fig 6]

52.21% of eyes with mild amblyopia, 58.33% of eyes with moderate amblyopia and 92.31% of eyes with severe amblyopia showed an improvement in BCVA by 0.2 log units or more at the end of 6 months of part time occlusion therapy.

The mean improvement in best corrected visual acuity in mild amblyopia was 0.15 ±0.03 log units, in moderate amblyopia was 0.2±0.04 log units, and in severe amblyopia was 0.38±0.14 log units. This difference was statistically significant ($p<0.05$). [Fig 7]

Among anisometropic and combined amblyopes, the degree of anisometropia showed a statistically strong association with the BCVA at presentation. ($r=0.795$, $p<0.05$).The mean BCVA at presentation for those children with anisometropia in spherical equivalent ≥3D was 0.81±0.16 and for those anisometropic and combined amblyopes with anisometropia<3D was 0.42±0.05.

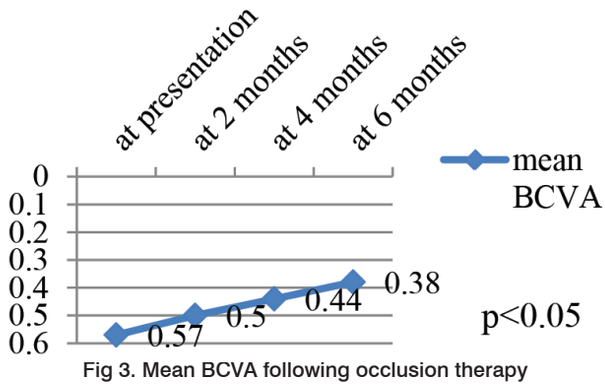


Fig 3. Mean BCVA following occlusion therapy

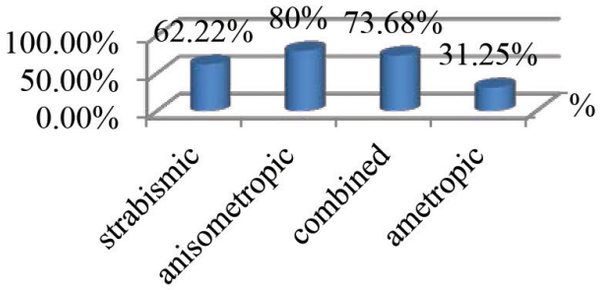


Fig 4. Responders to occlusion in different types of amblyopia

No statistically significant correlation was noted between age at initiation of therapy and improvement in BCVA at the end of 6 months. No statistically significant correlation was noted between birth weight and improvement in BCVA at the end of 6 months.

The mean improvement in BCVA at the end of 6 months of occlusion was 0.23±0.04 log units for unilateral cases and 0.1±0.04 log units for bilateral cases. This observation was statistically significant ($p<0.05$)

76.19% of unilateral cases and 28.13% of eyes of bilateral cases showed improvement by 0.2 log units or more at the end of 6 months of occlusion therapy.

Discussion

The proportion of males and females in the study was nearly equal (52 males and 48 females).The age at initiation of occlusion ranged from 3 to 10 years with a mean age of 6.78 ± 0.35 years.The commonest presenting complaint was defective vision (44%) followed by squint (29%).

The most common type of amblyopia was strabismic amblyopia (45 %) followed by anisometropic (20 %), combined (19 %) and ametropic amblyopia (16 %). According to the Amblyopia Treatment Study 1 (ATS1) the cause of amblyopia was strabismus in 38% of patients, anisometropia in 37%, and both strabismus and

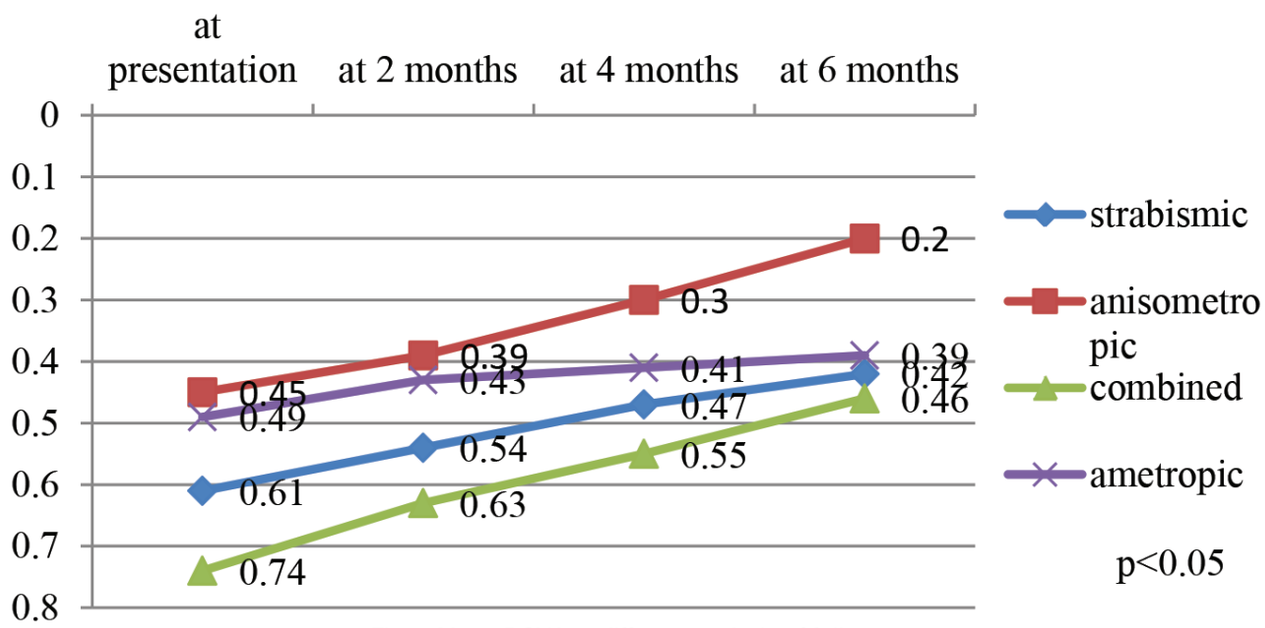


Fig 5. Mean BCVA at different periods of followup

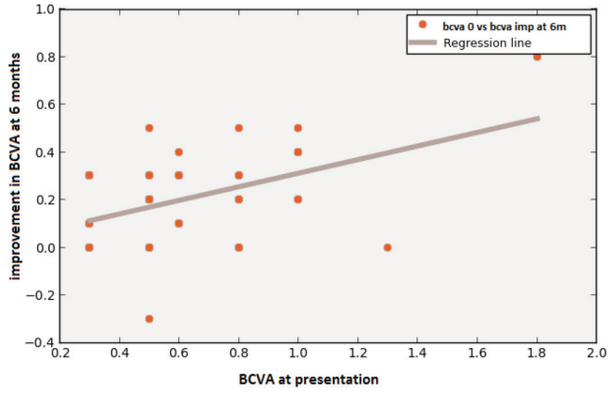


Fig 6

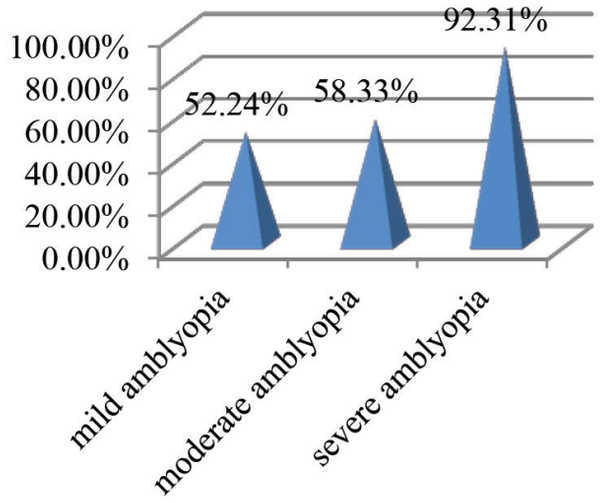


Fig 7. Responders in different types of amblyopia

anisometropia (combined-mechanism) in 24%[1,2]. This data was also comparable to a study conducted by Menon et al at AIIMS[3].

Out of the 100 children who were included in the study, 64 (64%) had strabismus of which majority had esotropia (41 children, 64.06%) and the rest had exotropia (23 children, 35.94%). This is comparable to the results of a study conducted by Menon et al in which 62.22% of children had strabismus of which esotropia was the most prevalent (56.47%)[3].

83% of children had anisometropia of spherical equivalent <3D and 17% had anisometropia ≥3D. This is similar to the findings of the Amblyopia Treatment Study 1 (ATS1) which found that 76.78% of patients had anisometropia<3D and 23.22% had anisometropia ≥3D[1, 2].

Most of the 116 eyes included in the analysis had mild amblyopia (57.8%). 31% had moderate amblyopia and 11.2% had severe amblyopia.

Within each type of amblyopia, mild amblyopia was the most common except in the combined group in which moderate amblyopia was more prevalent (47.37%).

The mean BCVA at presentation was the best for anisometropic amblyopia (0.45±0.07) and the worst for combined and strabismic amblyopia (0.74±0.16 and 0.61±0.1). The difference in mean BCVA at presentation

among the different types of amblyopia was statistically significant. This was in agreement with the results of study conducted by Menonet al3. Also several studies have suggested that strabismic and combined-mechanism amblyopia represent a more severe physiological deficit, due to active cortical suppression, than purely anisometropic amblyopia[4].

The mean BCVA at presentation for those children with anisometropia ≥3D was worse than those with lower degrees of anisometropia. These findings are similar to the results of the Amblyopia Treatment Study 1[1,2].

Among the 116 eyes enrolled in the study, BCVA of 78.45% improved by at least 1 Snellen's line and 58.62% improved by at least 2 Snellen's lines at the end of 6 months following initiation of part time occlusion therapy. This can be compared to the results reported by the Paediatric Eye Disease Investigator Group Amblyopia Treatment Study 3 (ATS 3)[5]. They obtained a 53% improvement with part time (2-6 hours + 1 hour near work) occlusion in the 7-12 years age group followed up for 24 weeks.

The mean improvement of best corrected visual acuity was 0.19±0.03 logMAR units and at the end of 6 months of part time occlusion therapy.

A statistically significant difference was noted between mean improvements in BCVA following part time occlusion therapy at the end of 6 months for each type of amblyopia. The improvement was the best for combined amblyopia (0.28±0.08) followed by anisometropic amblyopia(0.26±0.05), strabismic amblyopia (0.19±0.05) and ametropic amblyopia (0.1±0.04). The MOTAS study6 also reported that although statistically significance could not be established, the best response to occlusion was obtained in combined amblyopia.

BCVA of 80% of anisometropicamblyopes improved by at least 0.2 log units after 6 months of part time occlusion therapy.73.68% of combined amblyopes, 62.22% of strabismicamblyopes and 31.25% of ametropicamblyopes showed a similar improvement. In a study on amblyopia in children older than 7 years by Mintz Hittner7et al, 84% improvement was reported in anisometropic amblyopia, 22% in strabismic amblyopia and 50% in combined amblyopia.

There was a statistically strong relationship between pre-treatment BCVA and improvement of BCVA at the end of 6 months of occlusion therapy ($r=0.492$, $p<0.05$).

The highest magnitude of improvement was obtained in severe amblyopia. This is comparable to the findings of the Amblyopia Treatment Study 2A8.

52.21% of eyes with mild amblyopia, 58.33% of eyes with moderate amblyopia and 92.31% of eyes with severe amblyopia showed an improvement in BCVA by 0.2 log units or more at the end of 6 months of part time occlusion therapy. The response was higher than observed in the Amblyopia Treatment Study 3 (ATS 3)5 which reported that 36% of moderate amblyopes and 23% of severe amblyopes aged 7-17 years responded to occlusion therapy. This was probably due to the age inclusion criteria being lower in this study compared to ATS 3.

In this study 84% of children were unilateral amblyopes and 16 % were bilateral amblyopes. The mean improvement in BCVA at the end of 6 months of occlusion was more for unilateral cases (0.23±0.04 log units) compared to bilateral cases (0.1±0.04 log units). This observation was statistically significant ($p<0.05$). 76.19% of unilateral cases showed improvement by 0.2 log units or more at the end of 6 months of occlusion therapy whereas only 28.13% of eyes of bilateral cases showed a similar response.

Conclusions:

1. Unilateral amblyopia is more common than bilateral amblyopia in children aged 3-10 years.
2. Strabismic amblyopia is more common than anisometropic, combined strabismic and anisometropic or ametropic amblyopia in children aged 3-10 years.
3. Esotropia is more common than exotropia in strabismicamblyopes aged 3-10 years.
4. The mean pre- treatment best corrected visual acuity was the best in anisometropicamblyopes and the worst for combined and strabismicamblyopes. Strabismus causes significantly more depth of amblyopia in children aged 3-10 years than anisometropic amblyopia and therefore warrants more prompt detection in children.
5. The degree of anisometropia is strongly related to presenting best corrected visual acuity in the amblyopic eye in children aged 3-10 years. The BCVA at presentation is considerably worse when anisometropia is greater than or equal to 3 dioptres than when it is less than 3 dioptres.
6. Part time occlusion therapy for 6 hours a day with one hour of near work improves the best corrected visual acuity of amblyopic children by nearly 2 lines (0.19±0.04 log units) on an average in 6 months. More than three fourth (78.45%) of amblyopic eyes show at least a one line improvement and more than half

(58.62%) show at least a 2 line improvement in best corrected visual acuity within 6 months of part time occlusion therapy. Hence part time occlusion therapy is an effective treatment modality for amblyopia.

7. The response to part time occlusion therapy was the best in combined and anisometropic amblyopia and worst in ametropic and strabismic amblyopia.
8. Part time occlusion therapy was particularly effective in severe amblyopes in whom it improved best corrected visual acuity by an average of nearly 4 lines (0.38±0.14 log units) in 6 months.
9. Part time occlusion therapy is more effective in unilateral than bilateral amblyopes.

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Original Article

Clinical Outcome of Amniotic Membrane Grafting in Acute Chemical Injuries

Dr. Seema K.M. DO, DNB, Dr. Lilan Bhat MS, Dr. David Pudukkadan MS

Abstract

Purpose: To determine the efficacy of early amniotic membrane transplantation (AMT) in decreasing ocular complications in acute chemical injuries and to assess improvement in visual acuity following treatment.

Materials and Methods: Prospective, noncomparative, interventional case series from June 2013 to Feb 2014. 32 eyes of 30 patients who presented within 2 weeks of injury were included. Those cases which presented later than 2 weeks and where cicatricial changes were already present were excluded. Mild burns were managed medically. Moderate and Severe burns were managed with amniotic membrane transplantation, overlay technique and secured with sutures, fibrin glue. Fortnightly follow ups till complete epithelialisation. Monthly visits till 6 months. Primary outcomes studied were eyes with complete corneal epithelialisation by 21 days and visual outcome at 3 months. Secondary outcomes studied were eyes with symblepharon, LSCD, corneal neovascularisation, corneal scarring, and fibrovascular pannus.

Results: 32 eyes of 30 patients were studied. 29 cases were accidental ,1 case vitriolage. 16 patients had acid injury and 14 patients had alkali injury. All grade 1 eyes managed medically epithelialised completely in 2-8 days. AMT was performed in 17 eyes of 15 patients with grade 2, 3 ,4 chemical injuries. Time to epithelialisation was 14 -30 days in AMT. Repeat AMT had to be done in 3 grade 3 eyes. Visual acuity improved by 1- 6 lines in all grade 1 injuries. A gain of 1-3 lines by 3 months was seen in 67% grade 2, 25% grade 3 and 17% grade 4. A gain of more than 3 lines was seen in 33% grade 2 and 25% grade 3. Fibrovascular pannus developed in 25% grade 3 and 33.33% grade 4 burns. Symblepharon developed in 3 eyes. Perforation was not observed.

Introduction

Chemical injuries occur in all areas of our environment and walks of life, both domestic and industrial settings and often cause severe and prolonged complications. There are always major medical, personal, social, economic and occasionally surgical ramifications. Chemical injuries of the eye produce extensive damage to the ocular surface epithelium, cornea, anterior segment, and limbal stem cells resulting in permanent unilateral or bilateral visual impairment. Damage to limbal stem cells results in conjunctivalization of the cornea, vascularisation, chronic inflammation, and persistent epithelial defects. The successful management of chemical burns demands reducing the severity of damage to both limbal stem cells and conjunctival cells besides reducing inflammation and preventing progressive tissue melting.

The prospects for restoration of vision after chemical injury have been substantially improved over the years. When affixed to the inflamed ocular surface, amniotic membrane significantly decreases inflammation and provides temporary substratum for the growth of epithelial cells. There have been several reports of successful treatment of acute ocular burns using amniotic membrane transplantation. Meller et al1reported that AMT alone was sufficient to restore corneal and conjunctival surface in mild to moderate burns. In severe burns, it restored the conjunctival surface without symblepharon and reduced limbal stromal inflammation but did not prevent limbal stem cell deficiency that required further limbal stem cell transplantation. However, Dua et al2 reported failure of AMT to restore ocular surface or preserve the integrity of eye in severe acute burns. Kobayashi et al also emphasized that immediate amniotic membrane transplantation is useful for mild to moderate acute chemical burns and preserves ocular surface integrity.3 In the current study, we report our experience with the use of preserved amniotic membrane

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for the treatment of acute ocular chemical burns.

Aim: To determine the efficacy of early amniotic membrane transplantation in decreasing ocular complications in acute chemical injuries and to assess improvement in visual acuity following treatment.

Materials and Methods

We conducted a prospective, noncomparative, interventional case series from June 2013 to Feb 2014. All patients who attended Cornea Clinic with acute chemical injury [within 2 weeks of injury] were included. 32 eyes of 30 patients were studied. Chemical injuries which presented later than 2 weeks and where cicatricial changes had already set in were excluded. Chemical burns were classified into 3 categories - mild burns [grade 1 Roper-Hall and Dua], moderate burns [grades 2 and 3, Roper-Hall and Dua] and severe burns [grade 4 Roper- Hall, grades 4 to 6 Dua].

All patients received a detailed ophthalmic examination, including visual acuity, slit lamp, air-puff tonometry, and fundus examination (wherever possible). A detailed assessment of limbal ischaemia and conjunctival involvement in the form of necrosis, lime deposits, and ischaemia was made.

All the patients were initially treated with medical treatment consisting of copious saline irrigation, topical antibiotic, steroid, lubricants, cycloplegics, 10% citrate, topical antiglaucoma agent, systemic vitamin C (2 g/day) and systemic doxycycline 100mg bd.

We continued medical management in mild burns. All patients with moderate and severe burns had persistent inflammation, epithelial breakdown and limbal ischaemia. AMT was performed within 2 weeks after injury in these cases. Informed consent was obtained after explanation of the procedure being undertaken.

Surgical Technique : General anaesthesia was used in the 4 children in the series and peribulbar block was used in adults. Removal of deposits, especially from the forniceal areas and debridement of necrotic tissue was done. Tenonplasty was combined with amniotic membrane transplantation in grade 4 and two grade 3 injuries. Amniotic membrane grafting was done using the 'Overlay technique' – the membrane was spread over whole or part of the ocular surface with the epithelial side up and secured with sutures and/ or fibrin glue. In grade 2 burns it was used to cover the cornea and adjacent areas of conjunctival staining as a patch and secured with fibrin glue or sutures. 10-0 nylon pursestring suture was used at the corneal margins and 8-0 vicryl was used for conjunctival attachment. In grade 3 and 4 burns, membrane was used to cover the entire ocular surface and tucked into the fornices with muscle hook and secured to the lid margin. Fornix forming sutures were taken with 4-O double armed ethibond or mersilk and secured with bolsters. Large diameter(16mm) BCL was placed. Postoperatively all patients received moxifloxacin eye drops 0.5%, tear substitutes and topical ascorbate (10%) four times daily.Topical steroids were continued in tapering doses for 3 weeks. Patients followed up on day 1, 1 week, and then fortnightly visits till AMG integrated and complete epithelialisation took place. Thereafter monthly visits till 6 months.

Primary outcomes studied were the proportion of eyes with complete corneal epithelialisation by 21 days after the injury and visual outcomes at 3 month follow up. Secondary outcomes studied were proportion of eyes with symblepharon, proportion of eyes with limbal stem cell deficiency (LSCD), proportion of eyes with corneal neovascularisation, proportion of eyes with corneal scarring and fibrovascular pannus and the proportion of patients who reported pain reduction after AMT.

Results

32 eyes of 30 patients were studied. 26 were males(86.67%) and 4 were females (13.33%). Age ranged from 1-70 years with a mean age of 32.86 ±19years. 29cases were accidental, 1 case vitriolage. 16 patients had acid injury and 14 patients had alkali injury. Right eye was involved in 16 cases, left eye in 12 and both eyes were involved in 2 cases. 15 eyes had grade 1 injury, 3 eyes had grade 2, 8 eyes had grade3 and 6 eyes had grade 4 (Fig 1). Conjunctival staining of 10 -20% was noted in 2 eyes with grade 2 injury, 30- 50% in all grade 3eyes and more than 50% in all grade 4 eyes. AMT was performed in all grade 2,3 and 4 eyes within 2 weeks. 2 grade 3 eyes which presented

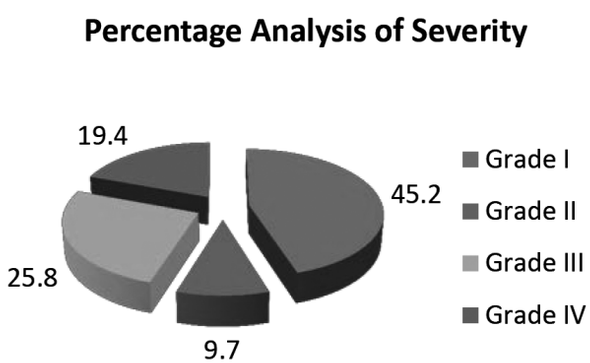


Fig 1:

at 1 week had corneal infiltration along with conjunctival necrosis which responded to debridement with AMT and fortified antibiotics. Follow up ranged from 1month to 6 months. One case was lost to follow up after AMT.

Presenting visual acuity could not be assessed in 3 patients, was ≤ 3/60 in 7 eyes, 3\60 - 6/60 in 4 eyes, 6/60 – 6/24 in 5 eyes and ≥ 6/24 in 13 eyes.

All grade 1 eyes managed medically epithelialised completely in 2 -8 days without sequelae. AMT performed in 17 eyes of 15 patients with grade 2, 3 ,4 chemical injuries. Time to epithelialisation ranged from 14 -30 days with AMT (Table 1). Re AMG had to be done at 6 weeks for PED in 3 eyes, all grade 3 injuries.

Table 1

	Grade 2	Grade 3	Grade 4
Epithelialisation within 21 days	100%	63%	50%
Epithelialisation more than 21 days	0%	25%	50%

Gain in visual acuity following AMT by 3 months is shown in Table 2.

Table 2: Gain in visual acuity following AMT

	Grade 2	Grade 3	Grade 4
Nil	0	50%	83%
1 – 3 Lines	67%	25%	17%
4 – 6 Lines	0	25%	0
7 Lines	33%	0	0

All grade 1 injuries showed 1- 6 line improvement on medical management in 3- 4 weeks, maintained at 3 months. Extensive symblepharon and forniceal shortening developed in 3eyes (one grade 3 and two grade 4) inspite of AMT. However globe integrity was salvaged. Perforation was not observed in any of the cases. Corneal neovascularisation in 2 quadrants at 3 months was seen in 5 grade 3 eyes and 1 grade 4 eye, in 3 quadrants in 2 grade 4 eyes and 4 quadrants in 3 grade 4 eyes.Fibrovascular pannus in 2 quadrants was observed in 1 grade 3 eye and 2 grade 4 eyes. All patients reported considerable relief of pain after AMT and by the end of 1 week all patients were free from any pain or discomfort.

Corneal infections and immune reactions to amniotic membrane was not noted. A significant correlation could be found between delay in presentation of greater than 1week and the development of symblepharon (p 0.029) and also corneal neovascularisation (p0.084) in grade 3 and 4 injuries.

Discussion

Ocular chemical burns cause extensive limbal and conjunctival cell destruction. But it is conceivable that some conjunctival and corneal stem cells remain at the basal level, even though fluorescein depicts large ocular surface defects. Persistent inflammation with leucocytic infiltration in the acute stage causes further gradual stem cell loss. Persistent inflammation prevents epithelialization and accelerates ulceration and melting with globe perforation. It also contributes to scarring sequelae like symblepharon and lid shortening, tear film deficiency, and inflammatory granuloma in the chronic stage. In addition, in severe burns ischaemic changes result in anterior segment necrosis and sterile corneal ulceration at an early stage after the injury.

It is believed that when used at an early stage, AMT would promote healing of ocular surface by preventing leucocytic infiltration, decreasing the duration and severity of inflammation and protecting the proliferating epithelial stem cell.

The importance of amniotic membrane lies in its ability to reduce inflammation and scarring, enhance epithelialization and wound healing, and in its antimicrobial properties. Amniotic membrane serves as a basement membrane which facilitates epithelial cell migration[4] and reinforces adhesion of basal epithelial cells[5] ,promotes epithelial differentiation[6] and prevents epithelial apoptosis.[7] It also improves corneal sensation and tear stability by an unknown mechanism.[8] It produces various growth factors which can stimulate epithelialization.[9] It has also been reported that amniotic membrane can act as a bandage contact lens allowing epithelialization to occur under its cover.[10] Moistened by tear, amniotic membrane can provide a wet media for ocular surface reepithelialization. It also has good permeability providing sufficient oxygenation for epithelial cells which is in contrast to many synthetic materials. It exerts an antiinflammatory effect suppressing expression of 1L-1a and 1L-1b. Amniotic membrane stromal matrix has a direct anti-scarring effect secondary to its suppression of TFG- b signalling and myofibroblast differentiation. All these act in combination to restore the micro-environmental conditions conducive to the growth of the epithelial progenitor cells.

Meller et al[1] treated 13 eyes of acute burns with AMT within 2 weeks after the injury. A total of seven eyes had grade

II–III burns and six eyes had grade IV burns. Epithelial defects of all but two patients healed in 2–5 weeks. Only one patient developed a symblepharon. All eyes with grade IV burns experienced limbal stem cell deficiency. Out of five patients with total limbal ischaemia, three required limbal stem cell transplantation, one required large penetrating keratoplasty and conjunctival flap for a corneal perforation, and the last patient had a persistent epithelial defect at the end of 4 months after which he was lost to follow up. AMT alone could not maintain the ocular surface for burns with total limbal ischaemia. Similarly, Dua et al[2] reported that in extremely severe burns AMT does not establish the ocular surface. In our study, AM rapidly restored the ocular surface in Grade II burns. Grade II burns, that involve partial stem cell loss usually have a good prognosis with conventional treatments. However, amniotic membrane by virtue of its anti-inflammatory and stem cell proliferating[9] activity leads to a favourable outcome for long-term ocular surface restoration and visual recovery. AMT was effective to a certain extent in Grade III burns also. AMT promoted epithelialization.[3] out of the[8] grade 3 eyes had persistent epithelial defects at 21 days. Re- AMT had to be done for the healing of the defect. Improvement in visual acuity was noted in all grade 2 eyes, 50% grade 3 eyes. None of the eyes developed ulceration or perforation. Although AMT was not totally effective in preventing symblepharon and corneal vascularization, their severity was mild to moderate except in one grade 3 eye. The utility of amniotic membrane in grade IV was found to be limited. 1-3 line visual improvement was noted in 17% grade 4 eyes. Corneal neovascularisation was noted in all eyes. Extensive symblepharon developed in 2 grade 4 eyes. Hence it is possible that in severe burns with extensive conjunctival damage it does not completely restore the conjunctival surface and with associated extensive limbal stem cell damage it does not prevent the sequelae of limbal stem cell deficiency. A less inflamed external ocular surface was achieved in most of the cases and this may aid in obtaining more successful results when limbal stem cell transplantation is resorted to at a later date. We succeeded in maintaining the tectonic integrity in all eyes. None of the eyes developed ulceration or perforation.

Conclusion

AMT is effective in promoting reepithelialisation ,decreasing inflammation and restoring corneal and conjunctival surfaces. The effects are more pronounced in grade 2 and grade 3 burns. It maintains the anatomic integrity in severe burns and restores surfaces. It decreases limbal inflammation and decreases symblepharon but it does not prevent limbal stem cell deficiency.

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Original Article

Outcomes of Cataract Surgery through Population Based Out-Reach Camps Conducted In Five Districts Of Kerala: A Four Year Prospective Interventional Study

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Introduction

Cataract accounts for 51% of global blindness.[1] Tackling cataract blindness is regarded as the key to the success of Vision 2020: the Right to Sight Initiative[2] and cataract surgery has been viewed as one of the most cost-effective health interventions.[3]

Cataract surgical rate (CSR) is a quantifiable measure of the delivery of cataract services in a country.[3,4] and is a good indicator of how well a country is organizing its efforts in tackling cataract-related blindness. Indian studies have documented an incidence of cataract between 23-30% of prevalence.[5] 4 million cataract surgeries are performed annually in India, 6 and the current cataract surgical rate for India is 40677. However, the rate of surgery falls short of that needed to reduce blindness caused by cataract. Therefore, efforts should be made to identify and address the barriers to cataract surgery. Also, CSR does not address the quality of surgery nor the proportion of the cataracts covered. The visual outcomes following cataract surgery, complications and the cost effectiveness of the surgery are valuable indicators regarding the achievement of aims of vision 2020. Adequate data on the magnitude of cataract induced blindness and resource utilisation is lacking in the State of Kerala. CSR of Kerala is 3610.2 as per the data obtained from Government registries.8 However disparities in district wise CSR exist and this interferes with resource utilization and assessment of visual impairment/ blindness in the community. Kerala, with its high human developmental index of 0.79 stands at par with developed nations[12]. Whether this is true in case of CSR also is a question we would like to probe into.

In this scenario, our study was undertaken to provide baseline data regarding the outcomes of community based free outreach camps and utilization of cataract surgical facilities in 5 districts of Kerala.

Aim: To assess the outcomes of free cataract surgeries conducted in 5 districts of Kerala through out-reach camps conducted by a tertiary care eye hospital in Kerala from May, 2009 to April, 2013 (4 years).

Study Design: Cross sectional survey and Prospective population based interventional study.

Materials And Methods: A total of 1,20268 patients screened through 584 free out-reach screening camps conducted in 5 districts of Kerala, namely, Ernakulam, Thrissur, Alappuzha, Kottayam, Idukki from May, 2009 to April, 2013 were included in the study. Patients were screened after examinations for visual acuity, refraction, flash light examination and dilated direct ophthalmoscopic examination in required cases. Those screened for cataract surgery were taken to the base hospital and underwent detailed evaluation including visual acuity (unaided and best corrected), slit lamp examination, lens status grading 10 and dilated fundus examination. IOL power was calculated using the IOL Master or autokeratometry with applanation A-scan. Those patients eligible for cataract surgery underwent surgery the following day after control of metabolic parameters in needed cases. Patients with preoperative ocular comorbidity (defined as history of retinal detachment, amblyopia, glaucoma, iridocyclitis, corneal opacity) were considered for cataract surgery if it was thought improve their visual status as per clinical judgement.

Cataract surgery was done by extra-capsular cataract extraction (ECCE) / small incision cataract surgery (SICS) / phacoemulsification (PE) with/ without intraocular lens (IOL) at the base hospital. Surgical procedures were performed by 3 cadre of surgeons- residents/ junior fellows / senior consultant. Pre-operative characteristics included were: age, sex, pre-op best corrected visual acuity, ocular comorbidity (ocular diseases other than cataract interfering with vision), previous ocular surgery (defined as previous

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vitreo-retinal surgery, corneal surgery), complicated surgery (defined as cases with pseudoexfoliation, miosis, significant corneal opacity, complicated cataracts).

Operative characteristics included were: type of surgery, type of intra-ocular lens inserted, cadre of surgeon, intra-operative complications (posterior capsular rent, vitreous loss, dropped nucleus, inability to insert IOL, need for repeat surgery). Post-operative characteristics include post-operative best corrected visual acuity (BCVA) at 6 weeks. Conveyance, lodging and food for the patients and one bystander was provided free of cost.

In case of poor visual outcomes, causes were classified as follows: poor selection (poor visual outcome from preoperative comorbidity, such as corneal opacity, glaucoma, or retinal or optic nerve pathology), poor surgical technique (intraoperative and immediate postoperative complications affecting visual acuity, including capsule rupture, iridodialysis, zonular dehiscence, residual lens matter, wound leak, severe uveitis, striate keratopathy), dependence on spectacles (absent or inadequate postoperative optical correction by IOL or spectacles).

Statistical Analysis: The variables were tested for their normality using D' Augustino Pearson test. Multivariable analysis of relationship between post operative BCVA (dependent variable) and independent variables (sex, pre-operative visual acuity, ocular comorbidity, type of surgery, cadre of surgeons) was calculated by multiple regression analysis. Association of good outcome (post-operative BCVA >6/18) and less than good outcome (post-operative BCVA<6/18) at 6 weeks with the period of surgery was analysed using Odds ratio. Correlation between CSR and composite developmental indices of individual districts were analysed using Spearman's correlation coefficient. Demographic characteristics were represented as bar diagrams and pie charts.

Results: A total of 1,20,268 people were screened through 584 free outreach camps conducted in 5 districts of Kerala, conducted from May, 2009 to April, 2013. This represents 0.6 % of the total population above 20 years in the above districts11. Out of these, 36,384 patients were referred to the base hospital for cataract surgery (10.41 %). 16,272 patients were referred to the base hospital for evaluation of ocular diseases other than cataract. 12,528 patients turned up at the base hospital for evaluation for cataract surgery (34.43 % of those referred) and 9,648 underwent cataract extraction at the base hospital. Demographic characteristics of the patients are represented in Table:1

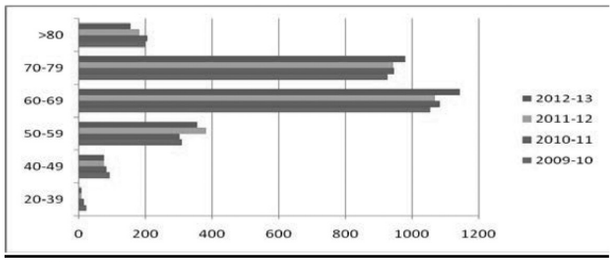


Fig:1 Multiple bar chart showing age wise distribution of the operated population:

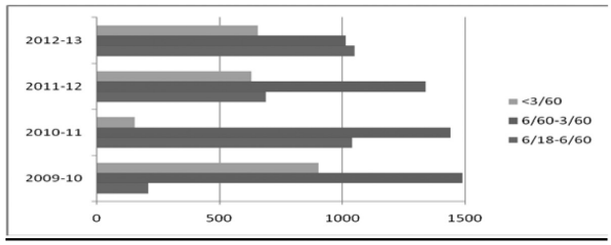


Fig:2 Bar chart showing the distribution based on pre-operative BCVA

BCVA of 6/6 to 6/18 was attained in 85.3 % cases, 6/18-6/60 in 13.0 % cases and < 6/60 in 1.1% cases at 6 weeks follow up. The pre and post op BCVA was compared using the paired t test and p value was significant (p<0.0001).

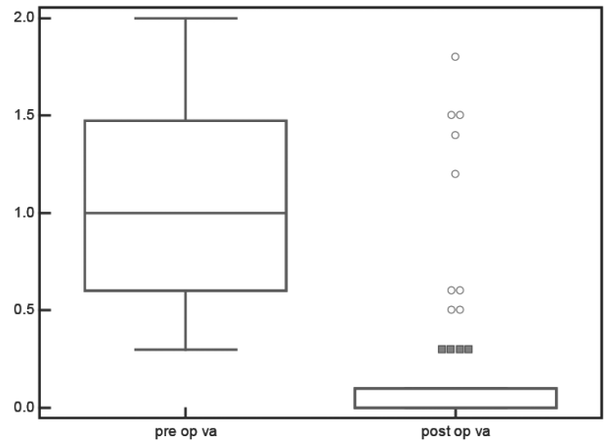


Fig:4 Box plot showing pre and post-operative BCVA

Multiple regression analysis was done to analyse the association between post-operative BCVA at 6 weeks (dependent variable) and other independent variables- type of surgery, cadre of surgeons, ocular comorbidity, intra-operative complications, pre-op visual acuity and sex.

Odds ratio for good outcome (defined as BCVA >6/18 at 6 weeks after surgery) and less than good outcome (defined as BCVA <6/18 at 6 weeks after surgery) in the years May, 2009-April, 2011 and May, 2011 to April, 2013 was 0.782 within 95% confidence interval (p< 0.0001).

Data on the number of CSR and cataract surgeries

		2009-10	2010-11	2011-12	2012-13	Total (%)
Total surgery		2602	2634	2658	2719	10613
Sex	Male	1142	1140	1163	1152	4597 (43.31)
	Female	1460	1493	1495	1567	5268 (49.64)
Laterality	Right eye	2053	2350	2143	2044	8590 (80.94)
	Left eye	549	284	515	675	2023 (19.06)
Ocular comorbidity		422	409	476	519	1826 (17.20)
	Corneal scar	22	48	40	30	140 (1.32)
	Old uveitis	39	23	34	20	116 (1.09)
	Retinal disease	186	134	167	216	703 (6.62)
	Glaucoma	97	118	137	121	473 (4.46)
	Others	78	86	98	132	394 (3.71)
Age	20-39	23	14	8	8	53 (0.50)
	40-49	92	82	76	76	326 (3.07)
	50-59	308	303	381	356	1348 (12.71)
	60-69	1054	1083	1068	1144	4349 (40.98)
	70-79	926	946	944	980	3796 (35.77)
	>80	199	206	181	155	741 (6.97)
Pre-op VA	6/18-6/60	209	1040	689	1051	2989 (28.16)
	6/60-3/60	1489	1442	1341	1013	5285 (49.80)
	<3/60	904	152	628	655	2339 (22.04)
Surgery	ECCE	154	134	155	121	564 (5.31)
	SICS	2252	2159	2179	2218	9108 (85.82)
	Phaco	350	365	324	380	1419 (13.37)
Post-op BCVA (6 weeks)	6/6-6/18	2120	2291	2283	2360	9054 (85.31)
	6/18-6/60	452	318	324	288	1382 (13.02)
	<6/60	28	23	50	14	115 (1.08)
Causes of poor outcome	Selection	14	8	16	6	44 (0.41)
	Intro-operative complications	8	7	16	5	36 (0.34)
	Post-op refraction	6	8	18	3	35 (0.33)

Table:1 Demographic characteristics of the operated population

performed in Kerala over the study period were available district wise from the Govt registries.8 Spearman's correlation coefficient was used to evaluate the correlation between CSR and a composite developmental index (DI) of these five districts. The composite developmental index was based on per-capita income, female literacy, infant mortality rate, availability of health care facilities in the corresponding districts.9 There was a positive correlation between CSR and composite developmental index (Spearman's correlation coefficient Rho=0.60, within 95% confidence interval, indicating that the districts with high DI had relatively high CSR and vice versa.

Dependent variable	Independent variable	Correlation coefficient	p-value
BCVA at 6 weeks	Sex	0.052 ± 0.010	0.891
	Pre-op visual acuity	0.081 ± 0.006	0.874
	Ocular comorbidity	-0.847 ± 0.177	0.008
	Type of surgery	-0.018 ± 0.196	0.362
	Cadre of surgeons	0.062 ± 0.108	0.994
	Intra-op complications	-0.613 ± 0.210	0.007

Table:2 showing the results of multiple regression analysis

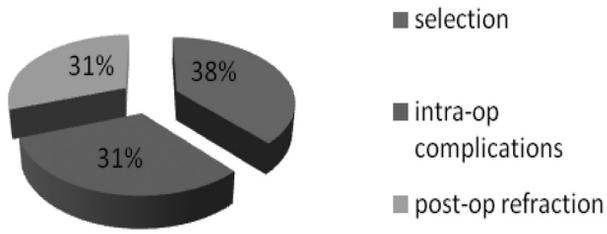


Fig:5 Pie chart showing causes of poor visual outcome (<6/60 at post-op 6 weeks)

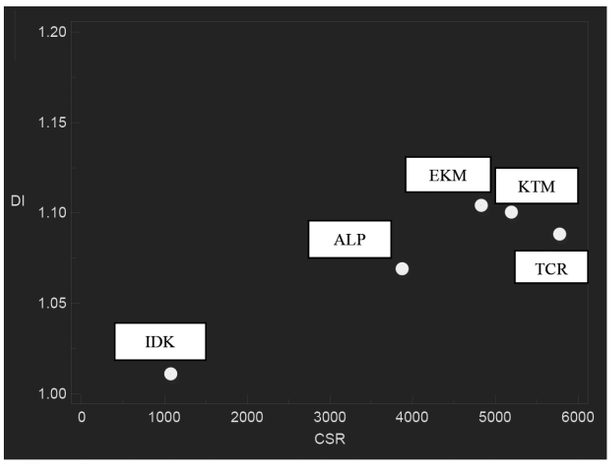


Fig:6 Dot plot showing correlation between developmental index (DI) and CS

Discussion

Our study indicates that 30.2 % of the population screened needed evaluation for cataract surgery and 13.5 % for ocular disorders other than cataract. 78% of those screened as having visually significant cataracts, underwent cataract surgery. Considering a margin of over diagnosis of 5 %, the estimated prevalence of visually significant cataracts >20 years population in the 5 districts of Kerala is calculated to be 30 ± 5%. This is much less than the National estimate of 51% of avoidable visual impairment/ blindness due to cataract[1].

In our study, there was an excellent outcomes in terms of post-operative BCVA at 6 weeks as per the WHO norms1 as shown in Table:3

Although literature contains many studies that report series of cataract surgeries with postoperative visual gain,[12,13] many population-based studies show lower rates of visual gain. A study conducted in Andhra Pradesh show that more than one-fifth of eyes had a presenting visual acuity worse than 6/60 after cataract surgery[14]. Another survey found that iatrogenic complications in cataract surgery contributed to 3% of the blindness[15]. However in our study, the surgical outcomes satisfied excellent standards according to the WHO criteria1 and patients with post-operative BCVA <6/60 were only 1.1%. Considering that 17% of the total operated cases had other ocular comorbidities, interfering with final visual gain, the percentage of low vision attributable to surgery alone may be still lower.

A few studies indicate that even if service and resources are provided, beneficiaries underuse them.[16,17] This is a fact evident in our study also. Out of the 36,384 patients screened, only 12,518 turned up at the base hospital despite providing free transportation, hospital expenses and food. This puts the rate of utilization of facilities at 34.43 %. This disparity is of much concern as underutilization of available resources may be a likely cause for unaccounted visual impairment/ blindness in the community, as sited by other studies in South India[17] and North India[16].

The age wise distribution of cataract in our study shows that

BCVA at 6 weeks	Our study	WHO standards for excellent outcome	Inference
6/6-6/18	85.3%	>80%	Satisfied
6/18-6/60	13.0%	<15%	Satisfied
<6/60	1.0%	<5%	Satisfied

Table:3 Comparison of post operative BCVA in our study with WHO standards.

most patients consistently fall in the 60-70 age group in the 4 years studied. This was similar in other studies also.[17,18] In all the four years, females outnumbered males. Though we could not epidemiologically analyse the causative factors behind this trend, certain assumptions could be made. One is that since most of the camps are organized on week days, male population in our area, which forms the major workforce of the State may not be able to attend the camps. Secondly, hospitalization is likely to affect the daily wage workers and results in loss of pay, which may contribute to less turnover rate of working males. Thirdly, a general trend in Kerala in the field of health care shows that females are more likely to seek for medical help[9]. Finally, the greater female-male ratio in the State, higher rates of survival of females and high female literacy rate can also have an impact on the above mentioned trend.

Preoperative visual acuity in the study population also showed some noteworthy trends. Over the four years, there was a relative decrease in the number of patients with presenting visual acuity <3/60 and an increase in the number of patients with presenting visual acuities 6/18-6/60. This indicates that the visual acuity norms for cataract surgery in the State are suffering a paradigm shift with more of 6/18-6/60 group seeking surgical help and the number of people with blindness as per the WHO norms1 is on the decrease in Kerala. This is a welcome trend, thanks to the commendable efforts by the eye care facilities in the Government and private sectors in the State.

Coming to the type of surgeries, SICS remained the major type of surgery, followed by PE. ECCE is performed only in the early periods of training of residents in our Institution and hence the number was comparatively less. There was no correlation between the type of surgery and final post operative BCVA at 6 weeks (correlation coefficient= -0.168 ± 0.196).

Similarly there was no correlation between the cadre of surgeons and the BCVA at 6 weeks (correlation coefficient= -0.062 ± 0.108). But there are several confounding factors in this finding. One is that all those cases belonging to the 'complicated group' including pseudoexfoliation, non-dilating pupil, subluxated lens, corneal scars, old uveitis etc were exclusively performed by senior surgeons. Secondly, any intra-operative complications encountered by the junior surgeons were promptly reported to the seniors and the surgery was taken over by the senior surgeons. Thirdly, only post operative visual acuity range >6/18 was taken as the cut off for good outcome and refraction was not considered in the final analysis. Hence this finding is to be considered with due caution.

The CSR of the studied districts for the year 2012-2013 stands high in comparison with the other states of India. Thrissur (5760.4) and Kottayam (5199.0) districts has higher CSR than the state CSRs of Andhra Pradesh and Tamil Nadu. Ernakulam (4833.7) and Alappuzha (3878.5) districts also has higher CSR than the National average of India1 (3123). However, the district of Idukki has a low CSR (1079.9) and is infact the lowest in the state. This disparity is explained by the correlation of CSR with the composite developmental index of the individual districts.

Coming to the comparison of CSR, the major determinants were geographic factors, urban/ rural segregation of population, educational status, developmental indices, access to health care facilities and female literacy. Idukki, being a high-range area and with limited access to health care facilities, fares low in the human development index (1.02). Thrissur (1.08), Ernakulam (1.10), Kottayam (1.09) and Alappuzha (1.06) have a grossly better CSR commensurate with the composite developmental indices. This increased performance is hopeful of reducing the prevalence of blindness and severe visual impairment in the State.

Conclusion

Our results indicate a high quality outcomes of outreach camp based cataract surgeries in the 5 districts of Kerala, in terms of post-operative BCVA. A high CSR, a consistent shift in pre-operative BCVA for undergoing cataract surgery to 6/18-6/60 in the 4 years and the higher rates of females undergoing cataract surgery is a welcome trend, correlating with the developmental indices. However, the overall turnover rates for cataract surgery were low (34.3%) despite providing quality care and economic support. These barriers in utilization of resources and services for cataract surgery needs to be analysed through population based studies.

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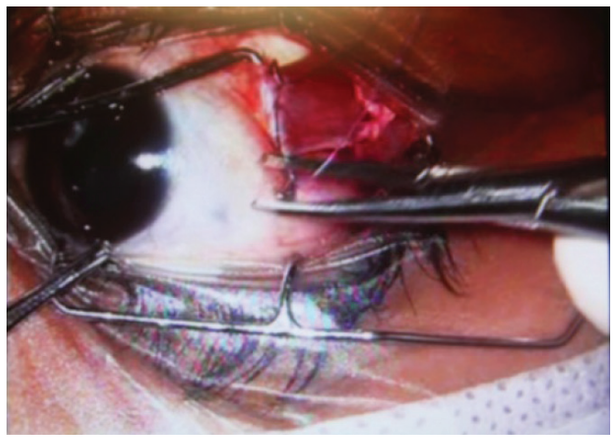
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Innovations In Strabismus Surgery Closed Conjunctival, Fornix Approach, Delayed Adjustable Suture Technique in Strabismus Surgery

Dr. Elizabeth Joseph MS

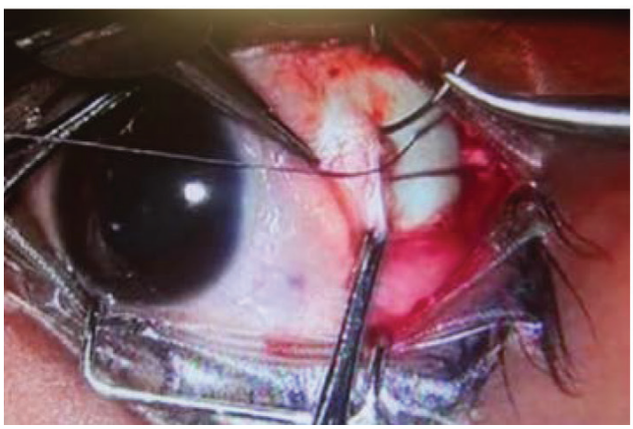
Adjustable suture surgery is a time tested procedure of strabismus correction.In the conventional surgery, the muscle sutures put during the surgery of recession or resection of extraocular muscle is adjusted within 24 hours. The knot is kept exposed in both the procedures of Bow Tie technique or the Noose technique. Both these techniques require a second procedure of adjustment/trimming of sutures .But more than half of the patients who undergo this surgery by adjustable suture do not require any adjustment because they would have attained orthotropia the next day. Delayed post op drift is another issue of concern. Both these issues are effectively addressed by the new innovation by the author where the sutures are buried inside the conjunctiva so that patient can be left alone without a second procedure if he has attained post operative orthotropia. This saves the surgeon and the patient a second procedure. Again, if adjustment is needed it can be done as late as 2 weeks so that if any post operative drift occurs , it can also be taken care of

Technique of Surgery - Lower conjunctival cul-de-sac incision is put , muscle identified,. 6 O Vicryl suture is passed through the muscle at the insertion,



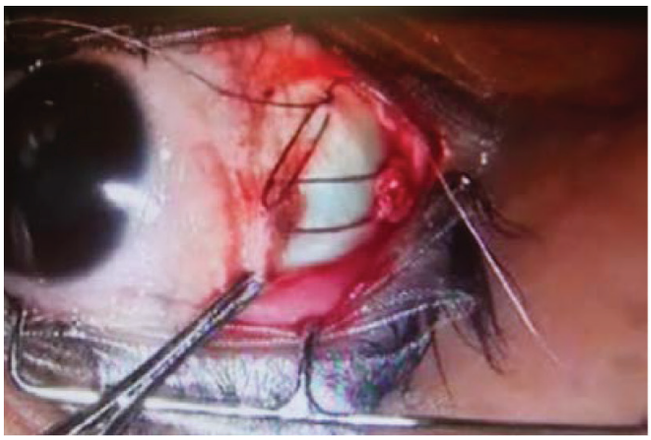
Muscle disinserted, and kept on a suspended recession, the length of which is decided by the angle of squint. Suture passed at the insertion, single throw knot is put at the insertion,

and then the sutures grasped and secured distally 10 mm from the site of original insertion. It is tied again and ends left long for any post op adjustment.





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The sutures are tucked inside the conjunctiva and conjunctiva closed

Post operative assessment of any deviation is made and if orthotropia, patient need not undergo any adjustment. If there is residual deviation , wait for a week , reassess the patient and make any adjustment after removing one or two conjuctival sutures. Post op adjustment can be done on the next day or as late as 2 weeks and hence is more convenient for the surgeon. This will assure a more permanent correction . Hence this technique benefits the patient as well as the surgeon.Many a time a postop procedure is not required unlike conventional adjustable suture procedure.

The detailed procedure is shown in the video

For video please visit: www.ksos.in

Dry Eye - Practical Guide to Ophthalmologists

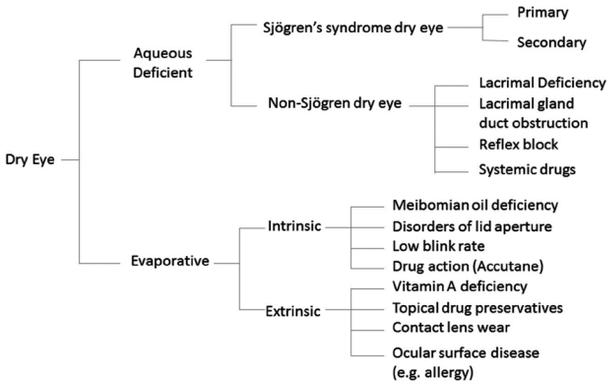
Dr. Ashwini DNB, Dr. Lilan Bhat MS

DEWS (Dry Eye WorkShop) defines dry eye as, "multifactorial disease of the tears and ocular surface that results in symptoms of discomfort, visual disturbance, and tear film instability with potential damage to the ocular surface".

In US, clinically diagnosed Dry Eye Disease(DED) is estimated to 0.4- 0.5% with prepondence for females and elderly individuals.[1] It has a very negative influence on functional quality of visual acuity and affects quality of life so it is a big burden to the public health sector. So there is a need to look at the better ways of diagnosing it and appropriate treatment for the same.

They are grossly classified as aqueous deficient dry eye (ADDE) and evaporative dry eye (EDE).

2007 DEWS REPORT- Etiopathological classification



Work-up of DED

History

DED patients come with complaints of foreign body sensation, burning sensation of eyes, redness, stinging, itching sensation , photophobia, heaviness and fatigue of eyes.. These symptoms will be typically exacerbated in certain environmental conditions like AC cabins, direct exposure to fans, prolonged reading or watching television. Validated questionnaires have been developed to ensure consistency in recording symptomatic information. A comparative listing of DE questionnaires is available in the report of the Epidemiology Subcommittee of the International DEWS 2007.[2] Patients with ADDE tend to worsen as the day progresses while those with EDE tend to be more symptomatic in the mornings. It is important to note complete past ocular and medical history, if on any medications (esp hormonal therapies) and any complaints of dry mouth, dental or gum disease(to rule out Sjogren's syndrome) or any systemic complaints associated with dry eye.

Examination

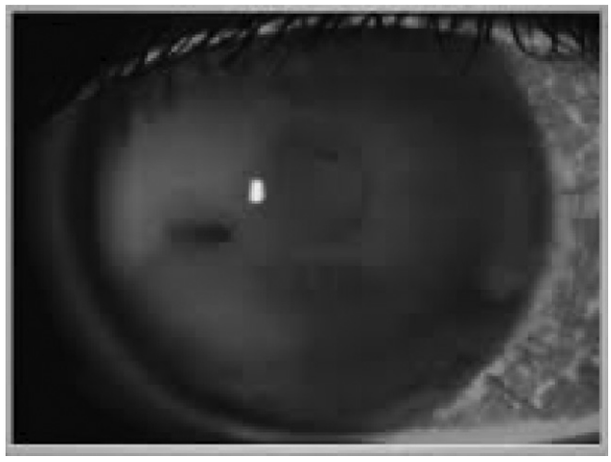
Examination of face, eyelid position, blink rate, size of palpebral aperture, malpositions of lids, dermatochalasis etc.

Slit-lamp evaluation should include:

a.) Lid margin-hyperemia, telangiectasia, thickening, scarring, ulceration, abnormal meibomian orifices.
b.) Eyelashes- misdirection, blepharitis, encrustations
c.) Conjunctiva- hyperemia, keratinisation, pinguecula
d.) Cornea- epithelial defect, infiltrates,scar,vascularisation, pterygium

Diagnostic tests:

1. TBUT test-



Tear film break-up test- instill preservative free saline wet fluorescein in inferior conjunctival sac and ask the patient

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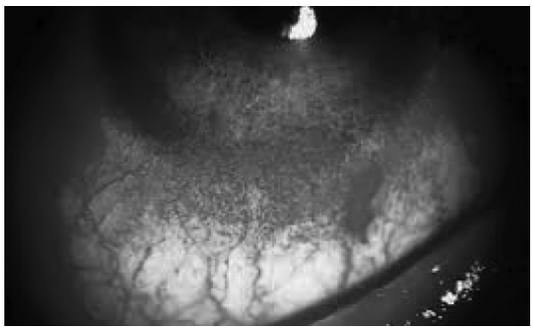
to blink so that the dye is uniformly distributed and then ask not to blink and note the time of appearance of first break of tear film on slit lamp. A cut-off of <10 seconds is used for screening of DED.

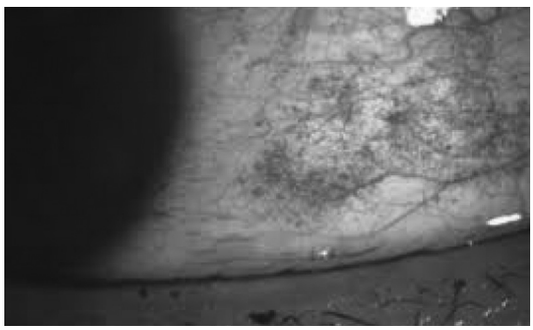
2. NIBUT test-



Project a target on convex surface mirror of tear film and record the time after blink upto first break-up of the image. Easily done with keratometry devices. . A cut-off of <10 seconds is used for screening of DED.

3. Dye staining test-





2% Fluorescein sodium dye is the most commonly used to assess the ocular surface with cobalt blue filter. It stains cornea better than conjunctiva. Pattern of punctuate or patchy staining, or filaments staining if present can be noted, graded and can be followed up after treatment.

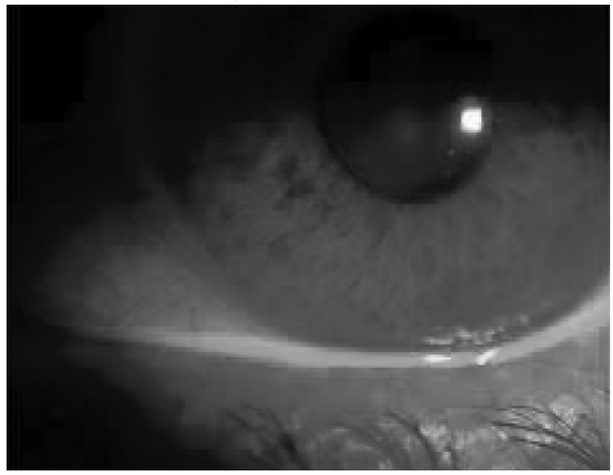
1% Rose Bengal dye is useful of better staining of conjunctiva compared to cornea. It stains devitalized epithelium as well as those which lack mucin cover over them. Van Bijsterveld grading scale is used from 0-3 in each area- nasal conjunctiva, temporal conjunctiva and cornea. Maximum score is 9(most severe). It is best visualized with red-free filter.

Lissamine green dye staining pattern is very similar to that of Rose Bengal and hence can be used as alternative to each other.

4. Tear Osmolarity-

Increased tear osmolarity value >308 mOsms/l is seen in mild DED, >312mOsms/l is seen in moderate to severe DED. It is measured by freezing point depression (FPD-gold standard), vapour pressure and electric conductivity or impedence of the tear sample.

5. Tear meniscus height-



Estimates the tear volume using width of slit-lamp beam or can be measured by reflective meniscomtery. Meniscus radius of curvature <0.25 or tear film height of <1mm is said to be indicator of DED.

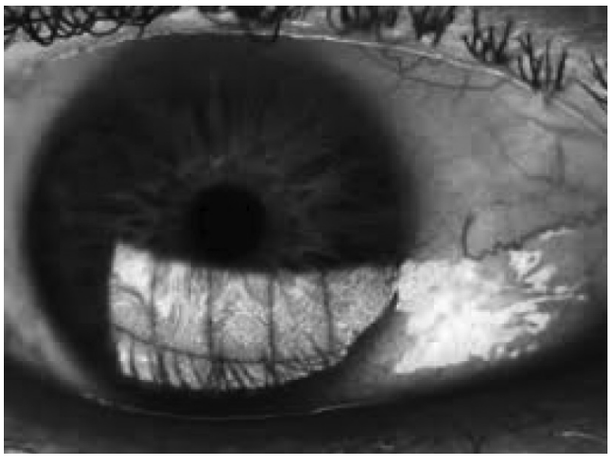
6. Schirmer's test-

Type 1 is done by placing the Schirmer's strip (3x35mm filter paper) in inferior conjunctival sac at junction of lateral 1/3rd and medial 2/3rd without applying anaesthesia,which measures reflex tear formation. <10mm of wetting after 5



mins is considered aqueous tear deficiency. Type 2 is done after instillation of anaesthesia and <6mm of wetting is considered aqueous deficiency.

7. Intereferometry-



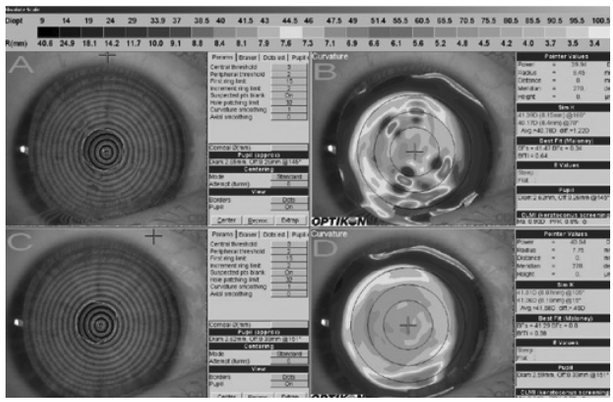
It measures the thickness,nature and rupture of lipid layer by noting the interference pattern between light reflected from junction of lipid-aqueous layer and that reflected from lipid layer. LipiView (TearScience Inc., Morrisville), which is commercially available canbe used to identify meibomium gland dysfunction.

8. Functional visual acuity-

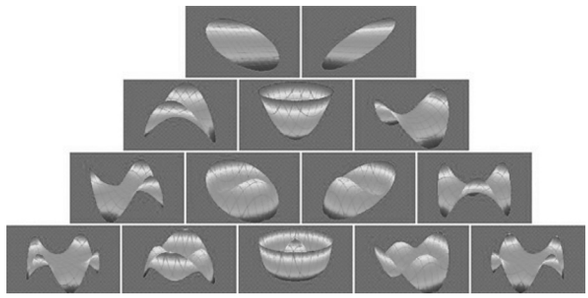
It is measure of visual acuity on sustained staring without blinking. In dry eyes, ocular surface gets disrupted while reading, driving or using computers, when normal blinking is suppressed so they complain of decreased visual acuity inspite of having normal conventional visual acuity. It is measured monocular visual acuity after 30s blink free period.

9. Topographic analysis-

Corneal topography systems like videokeratoscopy can be used to assess the corneal surface regularity index(SRI) and surface asymmetry index(SAI) which gives quantitative analysis of quality of tear film. Its commonly used in post-LASIK eyes to assess dry eyes.

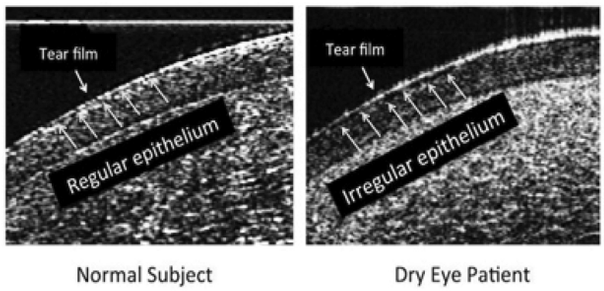


10. Aberrometry-



Change in tear volume and dynamics causes higher order aberrations which can be recorded by wavefront aberromtery. Its been noted that after instillation of artificial tears, there is an improvement of higher order aberrations so this method can be used for both diagnostic as well as for follow-up after treatment.

11. Optical coherence tomography-



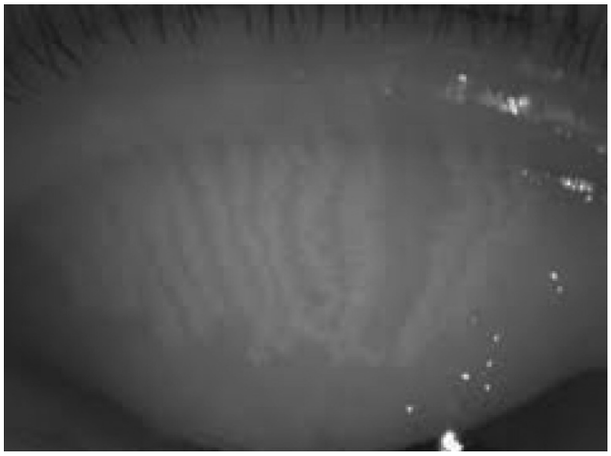
Anterior segment OCT is an noninvasive, high resolution, good accuracy tool to diagnose DED. Low meniscus height (<1.64mm) and radius of meniscus (<1.82mm) are good indicator of DED.[3]

12. Confocal microscopy-

It is an non invasive high resolution tool to visualize cornea at cellular level. In DED, it demonstrates decreased epithelial cell density, increased keraocytes, increase in number and abnormal morphology like beading, tortousity,sprouts of sub-basal and stromal corneal nerves. An increase in

inflammatory cell density reflects the severity of DED too.

13. Meibomian gland evaluation



It aids in diagnosis of evaporative dry eye(EDE). Meiboscopy is transillumination viewing of eyelids using white light. Meibography is quantitative analysis of MG drop-outs seen using infra red camera, which can be done using as simple as auto refractometers.

14.Impression cytology-

It is a fast, minimally invasive method of harvesting conjunctival epithelail, goblet and inflammatory cells from bulbar mucosa. Cytokine IL-1a, IL-1b, IL-1Ra are found to be greater percentage in DED compared to normal eyes.

15.Other tests-

Fluorophotometry measures fluorescein uptake by cornea hence checks epithelial integrity. In DED, there is increases epithelial permeability hence slow rate of elimination of fluorescein. Tear protein assay of Lysozymes, and Lactoferrin can be done which are seen decreased in DED. Main disadvantage is lack of specificity, which can be seen also in conditions like keratitis and conjunctivitis.

Systemic work-up

Anti-SS A and anti SS- B antibodies assay to be done in suspected primary Sjogren's syndrome. RA factor, ANA, ESR and C- reactive protein to be done in suspected secondary Sjogren's syndrome. An opinion of immunologist also should be sought.

MANAGEMENT OF DED

Tear supplements

Lubricants- artificial tears, ointments, gels are the mainstream therapy for mild to moderate DED. They mainly act by-

a. Replacement of deficient tears
b. Dilute the proinflammatory substances
c. Reduce the tear osmolarity

All lubricants are either hypotonic or isotonic buffered solutions with electrolytes, surfactant, and viscosity agents. An ideal lubricant should be preservative free, contains electrolytes, potassium and bicarbonates and a polymeric system to increase its retention time, with pH either neutral or slightly alkaline. Viscous agent, sodium hyaluronate is a superior one compared to other agents like CMC, HPMC in demonstrating better healing of DED which are usually used in severe DED. Lipid containing artificial tears like castor oil or mineral oil are useful in MGD. Two types of preservatives are used- detergent type and oxidative type. Detergent types like BAC(Benzalkonium chloride) has toxic effect on corneal epithelium with frequent use, unlike oxidative type like oxychloro complex which acts by dissipating on contact with eye. Ointments are used usually overnight to coat the surface when aqueous secretion is decreased and are composed of mineral oil and petrolatum. Gels contain carbomers which have longer retention period than artificial tears but have less vision blurring effect compared to ointments.

Cyclosporine A

Inflammation is mainstream pathogenesis of DED. This is the only FDA approved pharmacological treatment of DED. It acts by reducing proinflammatory cytokines, activated lymphocytes, and apoptotic markers. It also increases tear secretion and tear film stability by probably increasing local release of parasympathetic nervous system and increase in goblet cell density. It is used in 0.05% or 0.1% concentration.

Steroids

They are usually used as adjuvant to Cyclosporin A in reducing inflammation in DED. They are used as preservative-free short duration pulsed dose in relieving the symptoms and signs at the same time avoiding long term side effects caused by them. Adding oral/systemic asteroid do well in patients with Sjogren's syndrome. Loteprednol etabonate has better safety profile compared to other steroids as it is rapidly metabolized to inactive metabolite. Role of androgens has been proven in the normal functioning of meibomian glands and lacrimal glands, hence topical androgens and post menopausal androgen therapy is seen to benefit DED patients.

Antibiotics

Macrolides like Azithromycin and Tetracycline derived antibiotics have immunomodulator properties are found to decrease ocular surface inflammation and are particularly useful DED secondary to rosacea and blepharitis.

Essential Fatty Acids

Omega 3 fatty acids (found in fish oil) are anti-inflammatory in action as well as act by altering meibomian lipids. Oral capsules and topical derivative Resolvin E1 can be used to reduce the severity of DED.

Autologous Serum

20%- 50% autologous serum are usually used for severe DED as they are found to contain vitamin A, EGF, fibronectin, lysozyme which aid in proliferation, differentiation and maturation of ocular surface epithelium.

Secretagogues

Oral administered Cholinergic agents actingon muscarinic receptors, like Pilocarpine (5-7mg QID) and Cevilemine (15 or 30 mg TID) can be used for severe DED, with the latter one having lesser systemic side-effects than the former.

Tarsorrhaphy

Partial tarsorrhaphy can be done in severe and refractory DED where it reduces the exposed surface for tear evaporation thus conserving the tears of the patients.

Punctual occlusion

This procedure is done when medical management fails, and it helps by prolonging the stasis of tears by blocking its drainage using absorbable and non-absorbable/permanent punctual occlusion. Collagen pugs are usually short acting with effect ranging from 3 days to 6 months are absorbale ones while non absorbable ones are made of silicon or hydrophilic acrylic. Its contraindicated in DED with ocular surface inflammation.

Salivary gland transplantation

This procedure is done in end stage of DED with aqueous deficiency. Done with collaboration with maxillofacial surgeons. Submandibular gland transplantation (transfer to temporal region with duct transfer to upper fornix) with good anastomosis can have graft survival upto 80%. Minor salivary glands are also new promising treatment options.

The DEWS treatment recommendation as made in 2007 are as follows:
Dry eye severity grading scheme

Dry eye severity level	**1**	**2**	**3**	**4**
Discomfort, severity & frequency	Mild and/or episodic; occurs under environmental stress	Moderate episodic or chronic, stress or no stress	Severe frequent or constant without stress	Severe and/or disabling and constant
Visual symptoms	None or episodic mild fatigue	Annoying and/or activity-limiting episodic	Annoying, chronic and/or constant, limiting activity	Constant and/or possibly disabling
Conjunctival injection	None to mild	None to mild	+/-	+/++
Conjunctival staining	None to mild	Variable	Moderate to marked	Marked
Corneal staining (severity/location)	None to mild	Variable	Moderate to marked	Severe punctate erosions
Corneal/tear signs	None to mild	Mild debris, ↑↓ meniscus	Filamentary keratitis, mucus clumping, ↑ tear debris	Filamentary keratitis, mucus clumping, ↑ tear debris, ulceration
Lid/meibomian glands	MGD variably present	MGD variably present	Frequent	Trichiasis, keratinization, symblepharon
TBUT (sec)	Variable	≤10	≤5	Immediate
Schirmer score (mm/5 min)	Variable	≤10	≤5	≤2

Treatment recommendations by severity level

Level 1:

Education and counseling
Environmental management
Elimination of offending systemic medications
Preserved tear substitutes, allergy eye drops

Level 2:

If Level 1 treatments are inadequate, add:

Unpreserved tears, gels, ointments
Steroids
Ciclosporin A
Secretagogues
Nutritional supplements

Level 3:

If Level 2 treatments are inadequate, add:

Tetracyclines
Autologous serum tears
Punctal plugs (after control of inflammation)

Level 4:

If Level 3 treatments are inadequate, add:

Topical vitamin A
Contact lenses
Acetylcysteine
Moisture goggles
Surgery

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Cluster Endophthalmitis

Dr. Sasikumar S. MS

Three days after an uneventful cataract surgery one patient presented with sudden onset of redness, watering and defective vision. He had no history of any medical illness and the surgery was uneventful. On the first post operative day he was discharged with topical antibiotics and steroids. On third post op day his visual acuity was 1/60. He had circum corneal congestion, corneal edema and severe anterior chamber reaction with hypopyon. Exudative membrane was covering the pupillary area. Fundus view was very hazy. B scan showed moderate reflective echoes in the mid vitreous suggestive of endophthalmitis.

Patient was admitted and aqueous tap was taken for microbiology revealed staph epidermidis. Few more patients operated on the same day also presented with similar complaints.

Q1- How do you investigate "Cluster Endophthalmitis" ?
Q2- What are the preventive measures to be taken?

Dr Mohan P I
Former Medical Supdt and senior consultant
MGM Muthoot Hospital, Pathanamthitta

1. The isolated organism in this scenario is Staph. Epidermis which is normally present in the human flora.
a) Personal hygiene, cap, mask, scrubbing, gowning, gloving etc.
b) Hand hygiene of all personals who enters OT
c) Cleaning of surgical instruments. The cocci can form biofilm on the surface of surgical instruments and tubings. Sharing of IV lines, BSS, Viscoelastics, Phaco tubings etc increases the chances of infection.
d) Sterilisation process and validation
e) Topical medications prior to intraocular surgery, Usage of Povidone iodine drops, Lid margin hygiene, Per-operative intracameral antibiotic
f) OT enviornment:Air Handling Unit (AHU), HEPA filter .3 micron filter, Laminar flow, air exchange, disinfection, microbiological surveillance. The10 micron air filters at the AHU, should be cleaned with water jet, dip it in a disinfectant fo 20 minutes, and preferably sun dried once a month and keep a record. HEPA filter should be changed after 1000 hours of usage.

2. Once the calamity occurs: it may require step by step retrograde evaluation to pin point the source of infection
a) Cleaning, drying & sterilisation - check the records maintained - registers, Bowie Dick tests, biological indicator(BI) - physically verify the process of cleaning of instruments by the staff. You can do a Bowie Dick, BI, and sterilise few packs with Class 6 indicators inside the packs. You can use Process challenging device with Class 5/6 indicator to make sure that there is no air leakage into the autoclave during the sterilisation process. Check whether the drying phase of autoclave is working perfectly, that the packs are not wet at the end of auto claving process. Check how they have stored the autoclaved packs, and how it is transported to OT
b) Check the stored sterilised packages in CSSD, OT, Preop, post op and other areas for its expiry date, quality of storage, and protocol of supplying the stored items to OT and other service areas.
c) BSS / RL. The batch of the used fluid is to be inspected macro & micro. Culture the fluid
d) IV lines & tubings: can do a culture of the batch used.
e) Ask the staff to do the scrubbing and observe. check their personal hygiene. you may consider taking a throat swab of the persons present in the OR on that day.
f) Check the surgical enviornment: AHU, Filter at the AHU (culture), Air exchange, Disinfection protocol, Culture and sensitivity of samples taken from vital areas of OT.

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1. Managing Cluster Endophthalmitis
a. To Manage Endophthalmitis in each patient as per established protocol
i. Clinical Examination and B Scan
ii. Intra Vitreal Injection and Vitreous Tap

iii. Topical Antibiotics and Supportive Drugs
iv. To get Initial Reports of Microbiological Work Up
v. To Proceed with Vitrectomy if no response
b. To work up cause for Cluster – For Possible Source
i. OT Infrastructure work Up
ii. Sterilization Process
iii. Medication Batch samples
iv. Consumables including Water
v. Air Quality and HEPA Efficiency
vi. If Necessary even for a source in the OT Team Members
c. Important Points to remember
i. Ideal to manage these cases where there is a Vitreo Retinal Surgical Unit
ii. To Keep Case sheets in order with necessary documents like Informed Consent.
iii. Even one of the patients or attendars can take to streets and invite the attention of media and bring in a series of investigations by various Govt Departments.
iv. All Log Books, Protocols Surveillance etc should be in order

2. How to Prevent Cluster infections

There are many Protocols developed by different Groups for Prevention of Infection. Today one of the strict protocols that are acceptable and are almost fool proof is NABH Standards.

Based on compilation from Various Standards and Protocols the following are recommended

a) OT Lay Out which has Unsterile , Semi Sterile and Sterile Zones.
b) The flow of Instruments should be unidirectional and a separation of unsterile and sterile areas even in the Sterilization area.
c) Use of Vacuum Autoclaves and Flash Autoclaves
d) Air Quality achieved by HEPA Filtration and periodically monitored
e) Water quality to be absolutely non risky
f) OT Linen to be managed strictly as per protocols
g) Sterilization controls including Class V Indicators for each set, Biological Indicators, Bowie Dick's Tests.
h) Periodic OT Surveillance – At least Fortnightly
i) Maintenance of Log Books for OT, Autoclaves, to ensure proper processes
j) Periodic Maintenance and Calibrations
k) Even sporadic Episodes of Endophthalmitis need to be work up.
l) Sample from each batch of medicines to be worked up for contamination
m) Clear protocols for Blood Spill management
n) To develop protocols for management if infected cases are operated upon and strictly follow
o) To Ensure that members of OT Team with Infections do not enter OT
p) Whenever there is a cluster endophthalmitis irrespective of whether they are paying or free it is ideal to inform DBCS and take the help of IMA, AIOS and State Ophthalmic Association.

Dr Rajiv Sukumaran
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Vavvakkavu, Kollam

Managing cluster Endophthalmitis and prevention

Declare an emergency in the hospital. Call all staffs in the institution and inform them about the situation. Do not panic. Get in touch with the experts if they are not available in the institution. Handle the patients and relatives very carefully. Make sure all records are complete and accurate. If the experts are available in the institution, initiate the treatment immediately and if not, start the emergency treatment, including Intravitreal injections (if possible), and refer them to higher centres. Follow them up closely even after referring.

Then comes the investigation part of Cluster of Endophthalmitis. The Operation Theatre should be closed until all investigations are carried out. The materials used for the surgeries has to be identified by batches, samples from the fluids, viscoelastics should be taken and send for culture and sensitivity. The Autoclave process should be viewed. Swabs from the theatre should be taken to identify the organism.

The over all theatre procedures should be reviewed and the theatre staffs should be educated again.

The incident should be informed to the Emergency Management committee of KSOS, AIOS or PPS of IMA, whichever is appropriate. There is always a chance of Medico legal problem associated with such incidences. The medical records are very crucial in these situations. They usually visit the institution and give us good guidance to handle the situation and methods to prevent such incidence in future.

To prevent such a disaster, there should not be any compromise on any of the theatre procedures, starting from pre-operative preparation of the patients, autoclaving of instruments, maintaining the sterile atmosphere, checking the ventilation system and above all the attitude and regular updating of the knowledge of the staff and surgeons.

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The patient after an uneventful cataract surgery has presented with features of endophthalmitis on the 3rd day. It is to be presumed that the patient had good post op visual acuity on the 1st POD. VA recording and Slit lamp examination is mandatory within 24 hrs after any cataract surgery.

Patient factors. Patient is the most common source of an isolated endophthalmitis if many surgeries were done on the same day. In the case history it is mentioned that the patient had no medical illness. However the following points are worth noting.

In the preop assessment rule out foci of sepsis like

- Blepharitis and meibomitis. Should be treated with appropriate antibiotics and if needed a culture may be taken to ensure a clean lid. Lids and lashes should be properly segregated using lid tapes during surgery
- Naso Lacrimal Duct infection – Do ROPLAS. In case of c/c Dacryocystitis do a definitive surgery at least 2 weeks before Cataract surgery. Checking the NLD patency or ROPLAS on the day of surgery is not at all advisable
- Preop investigations like Biometry and IOP recording on the day of surgery also may be avoided
- Skin and Respiratory infection
- UTI. Elderly females are more prone to have UTI and the condition has to be treated properly before taking up for surgery
- Paranasal Sinuses and Oral cavity

Routine use of systemic antibiotic is not needed but specific conditions warranting use of antibiotics should be managed appropriately

Systemic factors like

- Uncontrolled Diabetis. Slight increase in blood sugar on the day of surgery can be ignored if the HbA1C is normal. Strict instruction should be given to monitor diabetic status in the post op period also.

Poor personal hygiene

- Method of instilling drops. Contamination of dropper tip is very common practice. If the second eye is operated immediately separate vials should be used for each eye. Try not to share eye drops in the pre operative ward.
- Cleaning eyes with unsterile cloth and water. Now sterile saline swabs in sachets are available for the purpose
- Patient to have face wash with carbolic soap before surgery
- They should be brought into the OT in clean OT clothes and not in street clothes
- Use antibiotic drops at least two days before surgery and continue for two weeks
- Instill 5% Povidone Iodine drops in the eye at least 3 minutes before surgery

Cluster infections

In case of cluster endophthalmitis the following factors are to be checked

- **Ventillation.** This is the most common cause of contamination in an OT. More than surfaces air can get uniformly contaminated. See that there is positive pressure in the OT. This can be effectively achieved by centralized airconditioning. Open plate cultures and swabs from the AC filters can help in identifying the contaminant. Take periodic open cultures from operating room (near the head end of the OT table with the AC switched on) and swabs from the microscope head. The general trend to take periodic cultures from the walls and floor is not needed. This can be done in case of a cluster infection. See that the AC filters are cleaned and disinfected periodically. Quality of the outside air should also be assessed. Even with the use of HEPA filter if the outside air is highly contaminated significant organisms can enter the OT.
- **Humidity and fungal growth.** The ideal humidity is 50-55% and temperature 20-22 degrees C. This is more important in a humid State like Kerala. One should be careful with amount of disinfectant solution used for fogging. Nothing more than 1 liter of the diluted disinfectant solution used for 5-10 minutes is needed for fogging. Use of more water will increase the humidity and chances of fungal growth.
- **Personnel and OT etiquette.** An assessment should be made of the traffic of clean and dirty linen and material in the OT. Reduce number of staff in the operating room (5 person per 180 sq.ft). Nasal swabs from the OT staff may give a clue to the source of infection from OT personnel.
- **Instruments.** Use autoclaved instrument sets for each case. Better to use separate sets if there are more number of cases per day. Use of Steriliser for sterilising instruments between cases should not be tried. Do not substitute Flash autoclave for the conventional horizontal autoclave. No steriliser should be kept in the operating room proper as the steam will increase the humidity. Better to use Autoclaves with separate steam chambers which can provide saturated steam. There should not be any chemical sterilisation of instruments (Glutaraldehyde or Acetone). All instruments should be cleaned immediately after every case to prevent formation of biofilms. Use of enzymatic cleaning and Ultrasonic cleaning facilitates removal of dirt. Repeated

flushing of all cannulae with distilled water and air at the end of the cleaning process should be done. In case of cluster infections cannulae and tubinmgs can be cultured to identify the organisms. Dry all instruments before packing. Similarly all packs coming out of the autoclave should be dry. Never use wet linen for surgery. Validate every autoclave cycle using class 6 indicators. Biological indicator may be used periodically for monitoring. Properly document every autoclave cycle and disinfection procedures(daily and weekly)

- **Consumables.** Use good quality Irrigating fluids, Ophthalmic Viscoelastic devices(OVDs), Trypan blue and other intracameral products. Check seal of the sterile pouches and look for suspended particles in the fluids. It is better to use products that come in double packed sterile pouches. Culture the samples of the consumables left after surgery or from the same batch. Check the pH of irrigating fluids as an altered pH can be the cause of post op inflammation (TASS). Use lint-free materials in the operating field. Avoid reuse of consumables in more than one case.

- **Water.** Ensure good quality running water in the OT as contaminated water is another common source of infection. Final handwash and instrument wash can be done using filtered water. Periodic cultures and chemical analysis of water should be done to ensure its quality.

Conclusion

Every case of endophthalmitis should be approached seriously. Priority should be given to treating the case. At the same time efforts should be made to identify the source of infection. In isolated case usually patient factors need to be analysed. In a cluster infection a variety of factors are to be considered like the layout, ventilation and humidity in the OT, processes involving sterilisation and validation of instruments & linen, disinfection protocols, quality of consumables & water and last but not the least the OT etiquette

In a case of endophthalmitis be it isolated or cluster, nobody cares about the condition of the surgeon who in every case will be depressed and dejected and will be at the nadir of self confidence. He/She needs guidance and help to find out the source and take corrective measures. Seeking the help of a specialist group or a professional body will go a long way in tackling the situation and restore confidence. As the saying goes a problem shared is a problem halved.

Brief Report

ILM Peeling In Sub – Internal Limiting Membrane Haemorrhage In Terson's Syndrome

Vandana Pradeep MBBS, Ashok Nataraj MS

A 21 year old lady who underwent fronto-temporo-parietal craniectomy following a train accident in June 2015, was brought to us 5 months later with complaints of defective vision in the left eye which was noted postoperatively. Visual acuities were 6/6 in the right eye and hand movements in the left eye. Intraocular pressures in both eyes were unremarkable. Examination of the right eye were within normal limits. Examination of the left eye revealed a grade 1 RAPD and a vitreous haemorrhage obscuring the view of the retina. A B scan echography was taken which showed an old vitreous haemorrhage with an attached retina.

She underwent a standard pars plana vitrectomy. After removing the vitreous and posterior hyaloid, a premacular sub-internal limiting membrane haemorrhage was noted. ILM peeling was performed with complete evacuation of the haemorrhage.1 week postoperatively,her best corrected visual acuity improved to 6/12p.

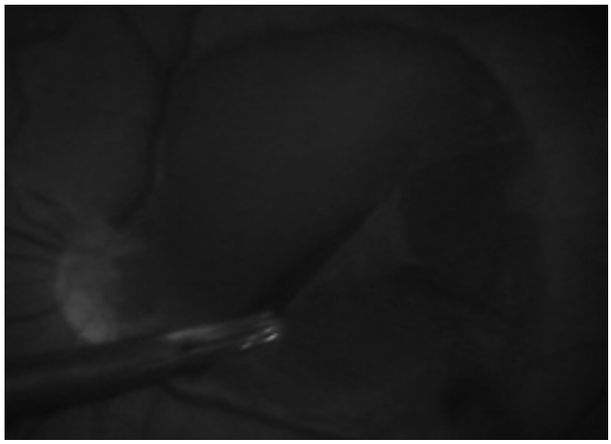
Discussion

The earliest description of intraretinal hemorrhage in association with subarachnoid hemorrhage was presented by Litten in 1881.Terson subsequently described vitreous hemorrhage in association with a subarachnoid bleed in 1900. Terson syndrome now encompasses any intraocular hemorrhage associated with intracranial hemorrhage and elevated intracranial pressures. Intraocular hemorrhage includes the development of subretinal, retinal, preretinal, subhyaloidal, or intravitreal blood.

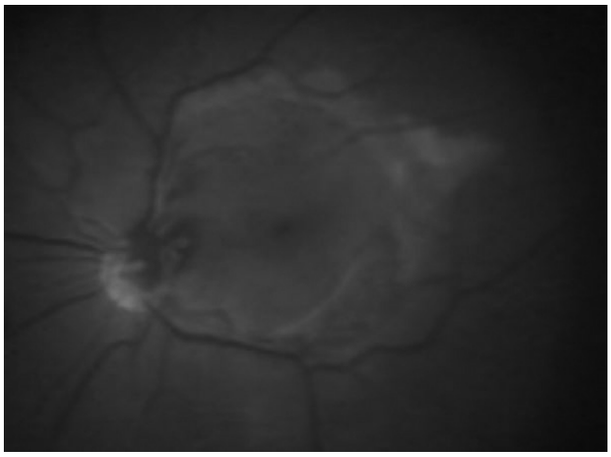
Less frequently, haemorrhages may also be located in the sub internal limiting membrane location. Kuhn et al reported a 39% incidence of macular haemorrhages in TS and reported that blood accumulates beneath the ILM.[1] Morris et al documented histologically the presence of a haemorrhage located between the 'nerve fiber layer and the ILM' but erroneously referred to it as 'preretinal haemorrhage'.[2] Recently, Friedman et al provided histological evidence that haemorrhage can be located posterior to the ILM in Tersons syndrome.[3]

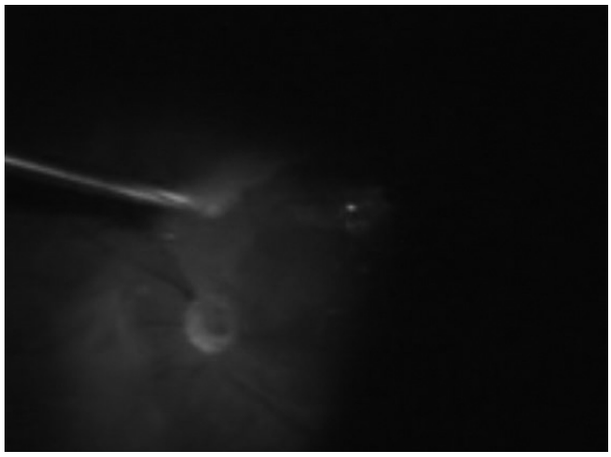
Sub ILM haemorrhagea are sharply demarcated dome shaped haemorrhages with a predilection for the macular region and leading to severe visual impairment. It cause elevation of the membrane, explaining the "macular ring"





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reported by Sadeh et al[4,5] ;as the sub-ILM haemorrhage contracts and serum is absorbed, the remaining ILM wrinkles and is seen as a folded,reflective surface.

There have been very few reports on the efficacy of surgical management in sub ILM bleeds seen in Tersons syndrome. De Maeyer[7] et al reported a case of a 42 year old lady with Tersons syndrome with sub ILM Haemorrhage who underwent vitrectomy after 4 months and gained excellent vision. Scott et al[6] reported another case of a 53 year old lady who underwent vitrectomy for both eyes and attained good visual acuity.

At the same time, Schultz et al concluded that the ultimate visual outcome was independent of the presenting visual acuity or the presence of sub ILM bleeds. They pointed out that visual recovery was significantly shorted by vitrectomy hence confirming the importance of surgical management in Tersons syndrome.

The case we reported above reinstates the importance of surgical management in Tersons syndrome. Post-operative visual improvement also is similar to the excellent visual outcomes that have been reported previously in similar cases.

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Brief Report

This Live Worm Can Swim Through Your Eye ! – A Case Series on Increasing Prevalance of Ocular Dirofilariasis: A Tropical Disease In South India.

Dr. Ranjakumar T C. MS, Dr. Sruthi Swaminathan MS, Dr. Lalith Sundaram MS

Abstract

The purpose is to report a case series of increasing prevalence of ocular dirofilariasis in tropical areas of South India and the importance of the disease with travel to tropical areas.

Human dirofilariasis, caused by Dirofilaria repens, have been reported to occur widely throughout Asia, Europe, and Africa. The dirofilaria are natural parasites of mammals and are transmitted to man by zooanthrophilic mosquitoes.
It is emphasized that both clinicians and microbiologists should have an increased awareness of this entity and include dirofilariasis in the differential diagnosis of patients presenting with subcutaneous nodules. Excision of the lesion is both diagnostic and therapeutic.

Keywords: DIROFILARIA, OCULAR DIROFILARIASIS, D. REPENS, D. TENIUS.

Introduction

Dirofilariasis is a parasitic infection transmitted in humans by Culex and Aedes mosquitoe, with primary host -dogs and cats, man as dead end. Common ocular infection sites in humans are eyelids, sub conjunctiva, sub-tenons or intraocular. D.tenuis and D.repens mainly involve eye.

Case 1

A 65-year-old female from Kannur district, Kerala, presented with acute onset of pain, redness and swelling in her right eye. It was associated with watering and foreign body sensation in the eye. There was no history of any injury, allergic manifestations, fever or recent travel. There was no other skin nodule anywhere on the body. Complete blood count and erythrocyte sedimentation rate (ESR) were within normal limits with no evidence of eosinophilia. Peripheral smear was unremarkable.

Slit-lamp examination revealed conjunctival chemosis with a coiled live worm in the subconjunctival space at temporal limbus.

Case 2

32 year old male, treated from elsewhere for conjunctivitis presented with similar complaints of foreign body sensation in his left eye. He presented to us on day 4 of his treatment with no improvement.

Case 3

63 year old house wife with foreign body sensation and no other ocular complaints in her right eye since one week.

Case 4

32 year old male, industry worker, presented with sudden onset redness and foreign body sensation in the temporal limbus right eye . Coiled worm was found in on slit lamp examination. Excision with conjuctival peritomy was advised. Slit-lamp examination revealed conjunctival chemosis with a coiled live worm in the subconjunctivalspace (case 1 ,3 & 4), at the temporal limbus, sub tenons space (case 2)

Slit-lamp examination revealed conjunctival chemosis with a coiled live worm in the subconjunctivalspace (case 1 ,3 & 4), at the temporal limbus, sub tenons space (case 2)

All patients had their visual acuity. Both eye -Visual Acuity 6/6 and Fundus normal.

Worm was removed under the operating microscope, topical anaesthesia (lignocaine)given. Conjuctival peritomy (2mm) was done and whole of live coiled worm was removed without snapping. It measured between 10-12 cm in length in all cases. Histopathology revealed female Dirofilaria species.

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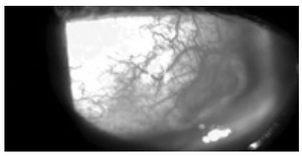


Figure Legend 1: case 2: subconjuctival dirofilaria at temporal limbus (B) - live motile worm was noticed at the temporal limbus under slit lamp.

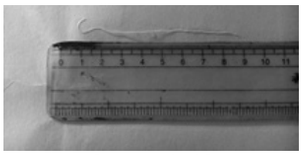


Figure Legend 2: case 1: 10 cm long worm

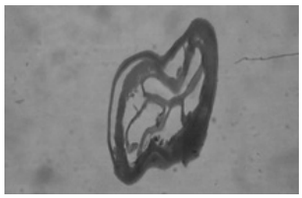


Figure Legend 3: Transverse section through a mature female Dirofilaria repens removed from the temporal limbus of a 65-year-old female (case1). Characteristic features are the arrangement of the longitudinal muscles and the multilayered cuticle, which is expanded in the region of the large lateral chords.

Literature reports different sites of ocular dirofilariasis as per following : Presence of ocular sites in anterior chamber, periorbital region, subcutaneous orbital mass, subconjuctival, orbital rim, as lidtumour & eyelids. Dirofilariasis due to Dirofilaria repens is also seen involving buccal mucosa in a patient who presented with a facial swelling in literature.[11]

Discussion

Dirofilaria species may be divided into two groups:
a) Subgenus Dirofilaria Dirofilaria represented by Dirofilaria immitis, which is characterized by a relatively smooth cuticle and normally found in the right heart and pulmonary vessels of dogs, the natural hosts. Pulmonary lesions are the most common findings in humans infected with D.immitis.

b) Subgenus Nochtiella, which parasitize the subcutaneous tissue. Species of this group have longitudinal ridges on the cuticle. Representative species are Dirofilaria (Nochtiella) repens found in dogs and cats, and Dirofilaria (Nochtiella) tenius found in racoons.1 The mature D. repens live in the tissues and organs of vertebrates, while their immature stages prefer the blood and lymph vessels. D. repens is a subdermal parasite in dogs. It has been proven that the parasite, called D. conjunctivae and normally found in humans, is not a different species from D. repens.[2]

The first two cases of human ocular dirofilarial infection in India were reported from same part of India (Kerala) in 1976 and 1978 respectively (Joseph et al 1976 ; George and Kurian 1978).

Several other incidences of ocular dirofilariasis were subsequently reported from India (Sekhar et al 2000; Mallick and Ittyerah 2003). Dirofilaria repens and Dirofilaria tenuis cause sub conjunctival dirofilariasis. Subconjunctival dirofilariasis due to Dirofilaria repens were reported in several reports from various parts of India (Nadgiret al 2001; Gautam et al 2002).

In 1989, the first case of subcutaneous infection with Dirofilaria showed a child manifesting portal cavernoma with pulmonary dirofilariasis from India (Badhe and Sane 1989). In another report, subcutaneous dirofilariasis due toD repens is reported in a 35 year old male recently (Padmaja et al , 2005).

In a recent study, Sabu et al identified twelve worms from different human patients as Dirofilaria repens based on morphology from southern part of India (Sabu et al 2005). In order to predict the natural history of dirofilarial infection in this region, 160 blood smears of dogs were also examined from this region. Microfilariae (D. repens) were detected in 11 samples (7%). This suggests that humans are at an enhanced risk of acquiring dirofilaria infection from dogs.

Human dirofilariasis is a rare helminthic infection. This may be due to the fact that the diagnosis of Dirofilaria infection in human beings remains difficult as symptoms exhibited by the patient are diverse. Symptoms vary in severity.

In most cases the infections are asymptomatic or mild and uncomplicated, especially until the worm dies. Only after their death insitu painful inflammatory reactions occur around the worms causing subcutaneous nodular lesions, necessitating excision. During the migration of the worm through subcutaneous tissue, inflammatory reactions may develop like mild fugitive swelling or subcutaneous nodule which can be painful and tender.[3]

The most common symptoms in ocular dirofilariasis are localized pruritus, pain, swelling, oedema, hyperaemia of the conjunctiva, sensation of movement under the skin of the conjunctiva.[4]

However allergic reaction with fever, urticaria and facial oedema may occur.[2] In majority of instances, parasites are found in excised nodule and tissue biopsy specimens. Less frequently they are removed from the tissues intact. Female

worms are found more frequently than male. [3,4]

The most important risk factors regarding human infections are mosquito density, warm climate with extended mosquito breeding season, outdoors human activities and the abundance of microfilaraemic dogs.[5]

Diagnosis is usually established with the surgical removal of the adult worm 4. Microfilaria have never been reported in humans 6. Eosinophilia occurs in less than 15 % cases with D. immitis and rarely with D.repens 6. In this case also, blood smears were negative for microfilaria and there was no eosinophilia. All dirofilaria have fine transverse striations on the cuticle and abundant somatic musculature. D.repens is a nematode with a long thin filiform appearance All except D.immitis and few others have prominent external longitudinal ridges. Longitudinal ridges of D.repens are broader and less distinct.

The number of reproductive tubes and their contents (eggs, microfilariae or sperm) help to determine the sex of the parasite and the reproductive state of female worm.[8] They have rounded anterior end with buccal cavity. In contrast to the rounded short tail of female worm the male worms have a coiled tail. Precise identification of Dirofilaria species may be achieved with DNA analysis, based on polymerase chain reaction but the large number of specific probes required limits, the usefulness of this method.[7]

Surgical removal of the worm not only establishes the diagnosis in most cases but presents a definitive cure. There is no need for chemotherapy as microfilaraemia is extremely rare.8 In a small number of cases, Ivermectin and/or Diethylcarbamazine has been tried with good results.[9]

The symbiosis of filarial nematodes and intracellular Wolbachia bacteria has recently been exploited as a target for antibiotic therapy of filariasis. Antibiotic treatment of filarial nematodes results in sterility and inhibits larval development and adult worm viability. In the first trial on human onchocerciasis, depletion of bacteria following treatment with Doxycycline resulted in a complete and long-term block of embryogenesis.[10]

Because of the variety of locations of the worm and the symptoms produced, cases of dirofilariasis in humans and animals may attract the attention of veterinarians, ophthalmologists, dermatologists, radiologists and general practitioners. Based on the present observations, it may be concluded that dirofilariasis in humans due to D. repens infection is a fast emerging zoonosis in India.

Conclusion:

Dirofilariasis is associated with travel to 'Foreign' lands. Literature shows predominance in South India especially Kerala, Karnataka, Tamil Nadu.Kerala is studded with a network of backwaters serving breeding ground of mosquitoes for transmission. World literature reviews diversity in Italy, Sri Lanka, Russia and Mediterranean regions. Surgical removal of the worms is the treatment of choice.

Acknowledgements

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Brief Report

An Unusual Cause of Proptosis in A School Girl

Joseph John DO, DNB, Ani Sreedhar MS, Sanitha Sathyan DNB

Abstract

We report the case of an 8 year old girl who presented with sudden onset prominence of left eye. An ophthalmological evaluation revealed axial proptosis with restriction of movements of left eye. Pupillary reactions were normal. Fundusexamination normal. MRI showed well defined minimally enhancing lesion in intraconal space of the left orbit with fluid level, haemorrhagic focus and causing mass effect in the form of anterior displacement of left eye. Needle aspiration was done following which the proptosis decreased, ocular movements improved.

Introduction

Orbital lymphangioma is an uncommon, benign cystic lesion affecting children. It usually presents with slowly progressive proptosis, displacement of the globe, ptosis and restriction of eye movements. Acute proptosis can occur in superadded spontaneous hemorrhage into the lesion. Such cases may lead to compressive optic neuropathy and loss of vision. We present the case of an 8-year-old girl who presented with sudden onset unilateral proptosis due to orbital lymphangioma with spontaneous intraorbital bleed. We report this case because of the rarity of presentation and to highlight the role of prompt diagnosis and less invasive procedures like needle aspiration in order to prevent sight threatening complications.

Case report

An 8 year old girl presented to the outpatient department of a tertiary level hospital with a complaint of sudden onset prominence of left eye of two days duration which was associated with pain, redness of the same eye. She also complained of binocular double vision, generalized fatiguability, head ache and vomiting. No history of trauma to eye. No history of fever recently. She is not on any regular medications.

The child was sick and irritable, best corrected visual acuity was 6/6 in both eyes. She had axial proptosis of left eye of 21mm with Hertel's exophthalmometer (15 mm in the right eye). Lid was ecchymotic. There was - 3 limitation of all movements of left eye. There was subconjunctival haemorrhage temporally, posterior limit not seen. Cornea was clear, anterior chamber was quiet, iris normal colour and pattern, pupillary reactions were normal. Fundus examination normal; there was no optic disc edema, no retinal vascular malformations or choroidal folds.

The differential diagnoses entertained at this stage were Orbital Lymphangioma with acute bleed, Orbital retinoblastoma, Granulocytic leukemia, Burkitt's lymphoma, Rhabdomyosarcoma, Metastatic neuroblastoma.

Pediatric opinion was sought and the patient underwent MRI brain and orbit. MRI of orbits showed well defined lobulated lesion in the intraconal space of left orbit (between optic nerve and lateral rectus muscle) measuring 2.4 x 1.6 x 1.9 cm. The lesion demonstrated fluid level with dependent relatively hyperintense contents on T1 weighted images and isointense contents on T2 weighted images. There was also a well defined T2 hyperintense focus measuring 1.2 x 0.5cm within the lesion, likely representing chronic haemorrhage. On post contrast images the lesion demonstrated subtle peripheral enhancement. The lesion was displacing the globe anteriorly and severely displacing the optic nerve so that the optic nerve is abutting the medial rectus muscle. Lateral rectus muscle is displaced laterally. No significant neuroparenchymal abnormality was detected.

Erythrocyte Sedimentation Rate was 55mm in 1st hour. Complete blood count, liver function test, renal function test, bleeding/ clotting profile - within normal limits.

The lobulated lesion in the intraconal space of left orbit with fluid level and the classical clinical setting was in favour of the diagnosis of orbital lymphangioma with spontaneous bleed.

Needle aspiration of the intraorbital cyst was done and 7ml of altered blood aspirated. Cytology was negative for malignant cells. Postoperatively the proptosis decreased, ocular movements improved.

On post op day 3, there was no proptosis. Ocular movements improved markedly and the child was symptom free.

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Figure: 1 showing proptosis of left eye



Figure :2 showing limitation of ocular movements of left eye.

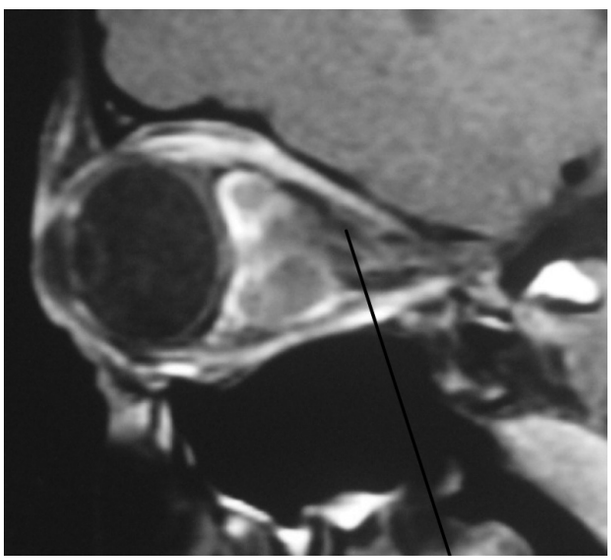


Figure :3 T1 weighted sagittal scan showing lobulated intraconal lesion

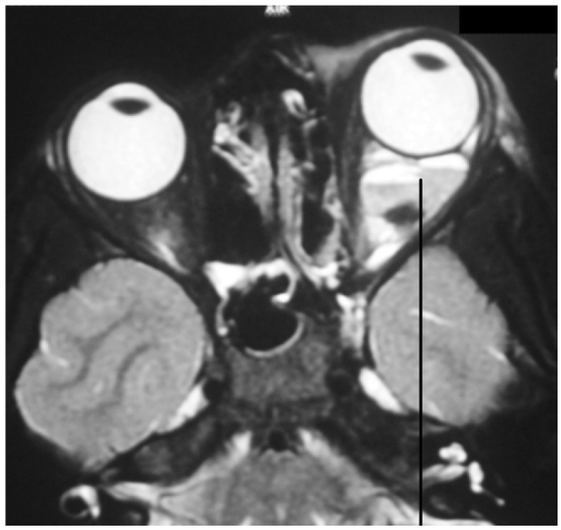


Figure 4 T2 weighted axial scan showing fluid levels within the intraconal mass

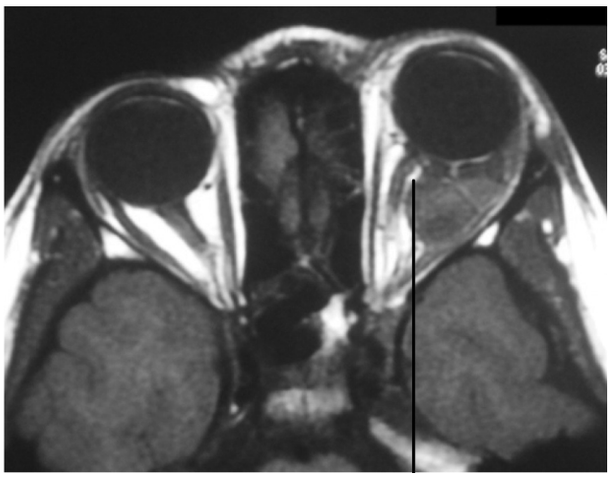


Figure :5 T1 weighted axial scan showing optic nerve compression



Figur: 6 Post operative Day1

Discussion

The causes of rapidly evolving proptosis in this age group are, orbital lymphangioma with acute bleed, orbital retinoblastoma, granulocytic leukemia, Burkitt's lymphoma, rhabdomyosarcoma, metastatic neuroblastoma.

Hemangioma and venous lymphatic malformation are the two most common orbital vascular lesions seen in this age group. Orbital lymphangiomas are benign hamartomatous tumors and are locally aggressive. They may enlarge slowly producing mild proptosis. However, intrinsic hemorrhage can occur within these lesions, thereby acutely increasing the size of the mass and hence its 'mass effect' leading to intractable, painful progressive sudden proptosis. Differentiation from orbital hemangiomas is important. Unlike hemangiomas, orbital lymphangiomas do not respect anatomic boundaries, tend to penetrate into normal structures and can bleed profusely during surgery. For these reasons, an early diagnosis is important. Orbital lymphangiomas are associated with noncontiguous, intracranial venous angioma[1,2] and with vascular abnormalities of the retina and iris[3].

Ultrasonography of hemangiomas show high amplitude closely packed echoes from vessel walls adjacent to blood filled spaces. Lymphangiomas have a similar ultrasound pattern, but with very wide separation of echoes due to larger fluid lakes. Although ultrasound has a high sensitivity and simplicity to be the first choice diagnostic test[4], it suffers from lack of objectivity and extra-orbital delineation of the disease. CT scan plays an important role in diagnosis as well as depiction of extent of the disease due to its multiplanar reformation capability and high spatial resolution. On CT scan, orbital lymphangiomas are poorly defined lesions that cross anatomic boundaries such as the conal fascia and orbital septum. Some degree of enhancement is the rule[5].

MR imaging can differentiate between the typical vascular tumors[5,6]. Moreover, MRI has unique ability to characterize hemorrhage with hemodynamic isolation. MRI has been found to be particularly sensitive to the presence of cysts within the tumor and is also able to predict the contents of the cysts. Tumor feeding vessels can also be detected on MRI by the flow-void phenomenon unique to MRI without the need for intravenous contrast.

The diagnosis of orbital lymphangioma can be made on imaging and biopsy is usually not required. Systemic corticosteroids have been used as an adjuvant treatment to surgery[7], although their role is controversial. The diffuse form of orbital lymphangioma is well known for its difficult surgical treatment and frequent recurrences[8]. Hsuan et al in 2004 suggested a surgical debulking with a carbon dioxide laser through a lateral orbitotomy combined with a 3-wall orbital decompression[9].

This case report highlights the importance of high index of clinical suspicion in cases with acute proptosis and the prompt management with less invasive methods like needle aspiration to prevent vision threatening complications.

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Figure :7 Post operative ocular movements

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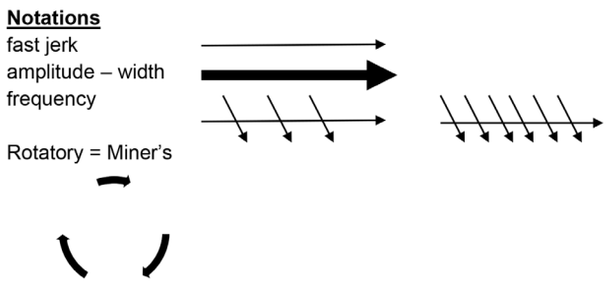
PG Tear Sheet

Nystagmus

Dr. Joseph John DO, DNB, Dr. Sanitha Sathyan DNB

Nystagmus is a rhythmic, involuntary oscillation of one or both eyes[1].

If the eyes appear to oscillate with equal speed in either direction, it is called "pendular" nystagmus; if movement in one direction is faster than in the other, it is called "jerk" nystagmus. True pendular nystagmus is sinusoidal, whereas jerk nystagmus has a slow drift away from the object of regard, followed by a fast corrective saccade toward the target. The direction of the fast component, by convention, defines the nystagmus direction[2,3].



Alexander's law

Gaze in the direction of the fast component increases nystagmus intensity, and gaze in the opposite direction decreases the intensity[3,4].

For example, in a right beating nystagmus the amplitude will increase on right gaze and decrease on left gaze. The severity of the nystagmus can then be graded as mentioned below:

Grade 1: Nystagmus is present on right gaze.

Grade 2: Nystagmus is present on right gaze and in the primary position but is absent on left gaze

Grade 3: Nystagmus is present even on left gaze

Physiological Nystagmus

- Endpoint
- Optokinetic
- Vestibular – caloric stimulation

o COWS- cold water in one ear- fast component opposite side; warm water in one ear- fast component same side

o CUP – cold water both ears – fast component upwards

Vestibular	Tumours	Act like cold water	Nystagmus to opposite side
Vestibular	Irritative lesions	Act like warm water	Nystagmus to same side

Workup

History

Age of onset

- Birth – congenital
- Recent – vestibular/neurological

Oscillopsia

- Objects appear moving – 'Oscillopsia' –acquired
- Objects appear stationary in congenital nystagmus

Diplopia –6th nerve paresis

Tinnitus, deafness -Vestibular

Drugs causing Nystagmus

- Phenytoin (Dilantin)
- SSRIs
- Amphetamines
- Barbiturates
- Benzodiazepines
- Ketamine
- Lithium
- Phencyclidine
- Salicylates
- Alcohol intoxication

Examination

Visual acuity – uniocular and binocular visual acuity

Nystagmus in primary position& cardinal positions of gaze

Head posture – measure the angle with protractor while patient is asked to fix at an object.

Head nodding

Watch for 1-2 mins - To look for Periodic Alternating Nystagmus seen in cerebellar disorders

Anterior segment examination

Fundus examination

Differentiating features between Peripheral and Central Nystagmus

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Characteristics[2]	Peripheral	Central
Duration	Days to weeks, improving with time	Chronic
Vertigo	Severe	Mild
Tinnitus/ Hearing loss	Common	Absent
Horizontal nystagmus with torsion	Typical	Not typical
Horizontal nystagmus without torsion	Rare	May be present
Pure vertical/ torsional nystagmus	Never	Diagnostic
Visual fixation	Damps nystagmus	No change

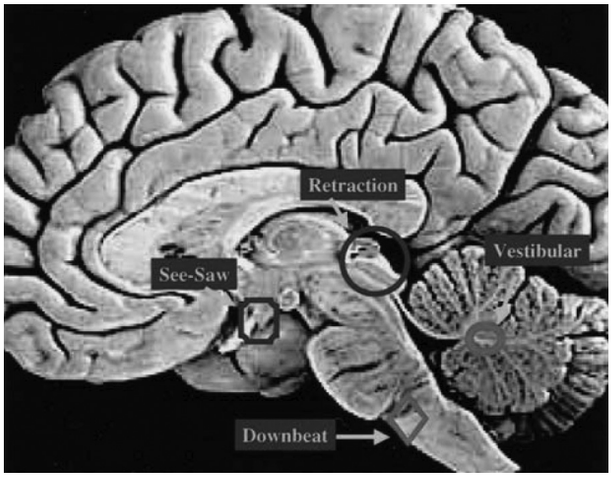


FIGURE 1. Sites within the brain responsible for the "localizing" forms of acquired nystagmus[1].

Maddox Nystagmus – see saw nystagmus
Chiasmal/ parachiasmal areas
Down beating nystagmus
Arnold Chiari malformation
INO – lesion at MLF – abducting eye has nystagmus
Cause
1. Multiple sclerosis
2. Myasthenia gravis

Upbeating – brain stem lesions
Retraction nystagmus
Eye ball move backward
Dorsal midbrain syndrome – Parinaud syndrome
Square wave jerks – inter saccadic interval
Parkinsonism
Heiman Beilschowsky phenomenon
Low frequency irregular vertical drifts seen in dense cataract
Ocular bobbing
Problem is with fast movement

National Classification of Eye Movement Abnormalities and Strabismus (CEMAS)[5]

CEMAS criteria for infantile nystagmus syndrome

Criteria Infantile onset, ocular motor recordings show diagnostic (accelerating) slow phases

Common associated findings

Conjugate, horizontal–torsional, increases with fixation attempt, progression from pendular to jerk, positive family history, constant, conjugate, with or without associated sensory system deficits, associated strabismus or refractive error, decreases with convergence, null and neutral zones present, associated head posture or head shaking, may exhibit a "latent" component, "reversal" with OKN stimulus or (a)periodicity to the oscillation. May decrease with induced convergence, increased fusion, extraocular muscle surgery, contact lenses, and sedation

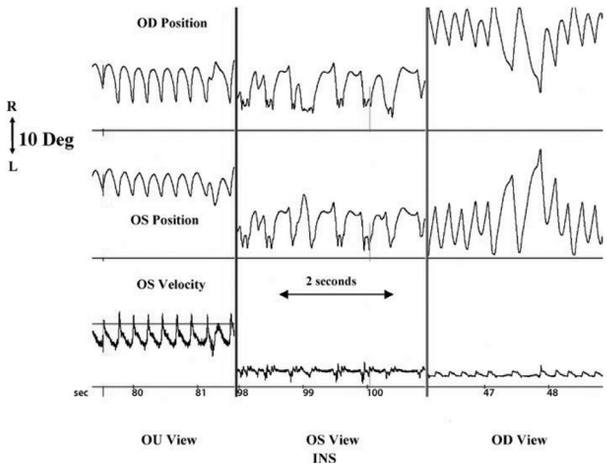


Figure 3: Eye movement recording of infantile nystagmus syndrome (INS) with "latent component."

With both eyes open there is right-beating nystagmus with increasing velocity slow phases (jerk with extended foveation). With the left eye viewing only there is a change in direction to left beating with a less stable jerk wave form and with right eye viewing the direction changes to right beating again, using the preferred eye.

CEMAS criteria for fusion maldevelopment nystagmus syndrome

Criteria Infantile onset, associated strabismus, ocular motor recordings show two types of slow phases (linear and decelerating) plus high-frequency, low-amplitude pendular nystagmus (dual-jerk waveform), jerk in direction of fixing eye

Common associated findings

Conjugate, horizontal, uniplanar; usually no associated sensory system deficits, may change with exaggerated convergence ("blockage"), head posture associated with fixing eye in adduction, no head shaking, may exhibit "reversal" with OKN stimulus, no (a)periodicity to the oscillation. Dissociated strabismus may be present. Decreases with increased fusion (binocular function).

CEMAS criteria for spasmus nutans nystagmus syndrome

Disease name Spasmus nutans syndrome

Criteria Infantile onset, variable conjugacy, small-frequency, low-amplitude oscillation, abnormal head posture and head oscillation, improves ("disappears") during childhood, normal MRI/CT Scan of visual pathways; ocular motility recordings – high-frequency (>10 Hz), asymmetric, variable conjugacy, pendular oscillations

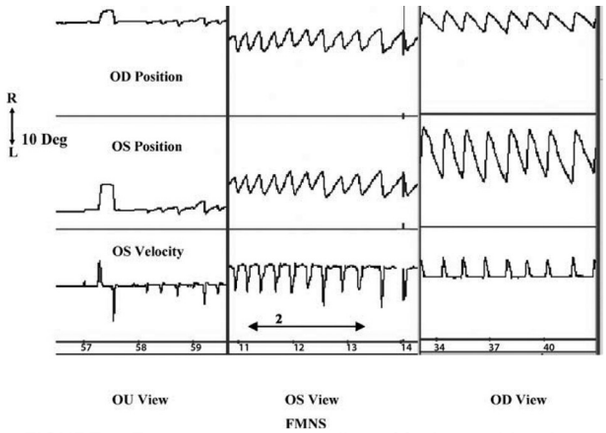


FIGURE 4. Eye movement recording of fusion maldevelopment nystagmus syndrome (FMNS). With both eyes open there is are small-amplitude left-beating movements with linear and decreasing velocity slow phases. With the left eye viewing only there is a change in intensity to clinically obvious left-beating nystagmus; with the right eye viewing the direction changes to more intense right-beating nystagmus because this is the non-preferred eye.

Common associated findings

Dysconjugate, asymmetric, multiplanar, family history of strabismus, may be greater in one (abducting) eye, constant, head posture/oscillation (horizontal or vertical), usually no associated sensory system deficits may have associated strabismus and amblyopia, may increase with convergence, head bobbing, head posture may be compensatory; normal fundus exam; decreases with increased fusion (binocular function)

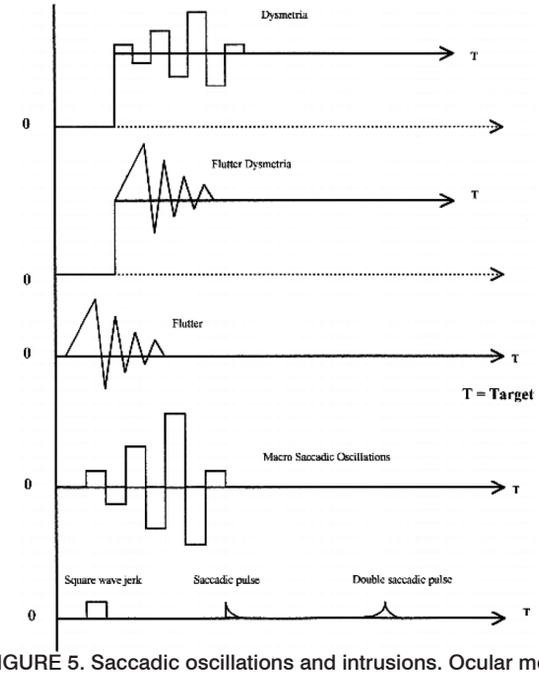


FIGURE 5. Saccadic oscillations and intrusions. Ocular motility recordings of major types of saccadic disorders. 0, the point of origin of eye[1].

Nystagmoid movements differ from nystagmus in that the former are non-rhythmic and usually result from a sensory rather than a motor defect.

Involuntary ocular oscillations containing only fast phases are referred to as "saccadic oscillations and intrusions"

Medical Treatment of Nystagmus[1,6]

Anomalous head/face posture
Prism spectacles (base-out adducting eye and base-in abducting eye)
Strabismus
Prism spectacles (promotion of fusion)
Topical Dorzolamide
Oscillopsia
Optical retinal image stabilization
Neurontin
Baclofen
Clonazepam
INS and "convergence damping"
Prism spectacles (base-out prism both eyes)
Decreased vision
Complete manifest/cycloplegic refraction
Contact lens correction
Optical retinal image stabilization
Low-vision telescopes (bioptics)

Surgical Treatment of Nystagmus[1,6]

Table 1: (Face turn present to the right; nomogram for shift of eyes from the null point in the left) – the Kestenbaum's Anderson's nomogram

Face turn (degrees)	RMR recession	RLR recession	LMR recession	LLR recession
<20 (Classical Kestenbaum's Procedure)	5mm	8mm	6mm	7mm
30 (Augmented KA Procedure)	6.5mm	10mm	8mm	9mm
45 (Augmented KA Procedure)	7mm	11mm	8.5mm	10mm
>45 (Augmented KA Procedure)	8mm	12.5mm	9.5mm	11mm
Other nomograms				
> 35 (Pratt-Johnson's procedure)	10mm	10mm	10mm	10mm
> 20 (Spielmann's Procedure)	KA nomogram with posterior fixation	KA nomogram	KA nomogram	KA nomogram with posterior fixation
Modified Anderson's procedure (Von Noorden)	10mm	-	-	12mm

Nomograms for improvement in vertical / torsional head posture	
Chin-up Position	Bilateral IR Recession + SR Resection (Parks and Mitchell, Roberts et al, Taylor and Jesse) IO Recession + SO Recession (Pierse)
Chin down position	□ IR Resection + IO advancement (Schlossman) □ SR Recession + IR resection (Parks) □ SR Recession + IO Myectomy (Taylor and Jesse) □ SR Recession + IO Anteriorization with recession (Roberts et al)
Torsional Torticollis	□ Advancement of the anterior part of the appropriate oblique muscles (Conrad and de Decker) □ Supra and infraplacement of the horizontal rectus muscles (de Decker) □ Slanting the insertions of the 4 recti muscles (Spielmann) □ Ipsilateral Anterior tenectomy of the SO with Contralateral IO Myectomy and Harada-Ito surgery on the SO (Pratt-Johnson) □ Transposition of the vertical recti muscles (von Noorden)
Nomograms for surgery intended to improve visual acuity by dampening the intensity of the nystagmus and increasing foveation time	
Bietti et al	□ Retroequatorial recession of all 4 horizontal muscles
Von Noorden et al	□ 10-12 mm recession of all 4 horizontal muscles
Helveston et al	□ MR placed 11.5 mm behind the nasal limbus and the LR placed 13 mm behind the temporal limbus in both eyes.

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A 4 year old girl presented with complaints of deviation of eyes, drooping of right eyelid and watering of right eye noticed since 6 months of age. No history of parental consanguinity or congenital malformations in the family. Developmental milestones were delayed in gross motor, fine motor, language and social spheres.

General examination

Short stature, mental retardation, facial dysmorphism, crowding of teeth, short stumpy fingers with broad digitalized thumb, broad deformed big toe in both feet.

On ocular examination, unaided visual acuity: 6/7.5 (Both eyes- Cardiff visual acuity chart), cycloplegic retinoscopy: normal. There was hypertelorism with broad root of nose, Right eye showed partial ptosis with marginal reflex distance +1 and fair levator function.There was esotropia of 10 degrees by Hirschberg test, extra ocular movements normal. Right eye: regurgitation of pus on pressure over the lacrimal sac region, puncta: normal.

ENT evaluation revealed moderate hearing impairment. Echocardiogram showed patent foramen ovale.

Fig:1 showing right partial ptosis, esotropia, epicanthic fold

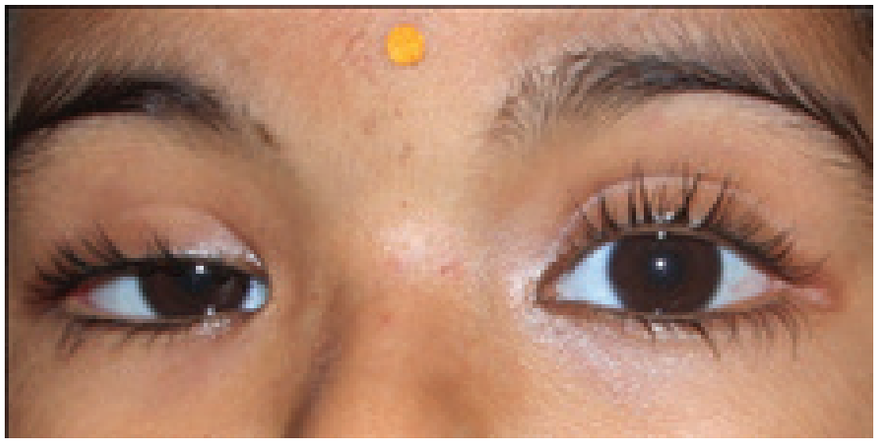
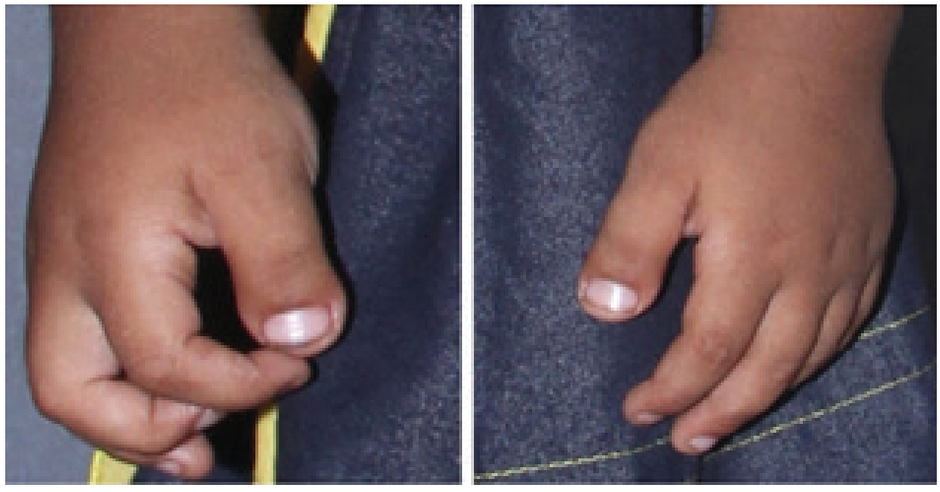


Fig: 2 showing broad thumb with digitalization, short stumpy fingers



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Fig: 3 showing broad malformed big toe of both foot with varus deformity



The findings were consistent with Rubenstein Taybi syndrome. Rubinstein–Taybi syndrome is a microdeletion syndrome involving chromosomal segment 16p13.3 and is characterized by mutations in the CREBBP gene. Mutations in the EP300 gene are responsible for a small percentage of cases. Other ocular features include high myopia, nystagmus, microcornea, microphthalmos, cataracts, congenital glaucoma, retinal pigmentary changes. As many as 5% of patients with Rubinstein-Taybi syndrome have an increased risk of tumors, including medulloblastoma, neuroblastoma, rhabdomyosarcoma, meninigioma, leukemias and lymphomas, relating to the role of the involved genes in signal transduction.

Comprehensive care to cataract surgery

MICRO LABS VISION

Moxigram

(Moxifloxacin 0.5%)Eye Drops

A step ahead in treating bacterial infections

Micronac

(Nepafenac 0.1%)Eye Drops

The NSAID care...

...for deep seated ocular inflammation

Dr. Sheera K. R. MBBS

SAFETY AND EFFICACY OF CONBERCEPT IN NEOVASCULAR AGE-RELATED MACULAR DEGENERATION
RESULTS FROM A 12-MONTH RANDOMIZED PHASE 2 STUDY: AURORA STUDY

Ophthalmology 2014; 121:1740-1747

Age-related macular degeneration (AMD) is a progressive disease of the macula and the leading cause of irreversible blindness. Between 2004 and 2006, three anti-VEGF drugs were introduced for the treatment of AMD. They exhibit important differences in their sites of activity, formulation methods, binding affinities, and biologic activities. These were Pegaptanib, Ranibizumab, Bevacizumab. In November 2011, aflibercept (Eylea) was approved by the US Food and Drug Administration. Similar to aflibercept, conbercept consists of the VEGF binding domains of the human VEGFR-1 and VEGFR-2 combined with the Fc portion of the human immunoglobulin G-1. The structural difference between conbercept and aflibercept is that conbercept also contains the fourth binding domain of VEGFR-2. This fourth domain is essential for receptor dimerization and enhances the association rate of VEGF to the receptor. The aim of this study was to assess the safety and efficacy of multiple injections of 0.5 and 2.0 mg conbercept using variable dosing regimens in patients with neovascular age-related macular degeneration.

It was a randomized, double-masked, multicentre, controlled-dose, and interval-ranging phase 2 clinical trial divided into a 3-month loading phase followed by a maintenance phase. Patients with choroidal neovascularization secondary to AMD with lesion sizes of 12 disc areas or less and a BCVA letter score of between 73 and 24 were enrolled. Patients were randomized 1:1 to receive either 0.5 or 2.0 mg intravitreal conbercept for 3 consecutive monthly does. After the third dose, each group was reassigned randomly again to monthly (Q1M group) or as-needed (PRN) treatment without changing the drug assignment. The main outcome measure was the mean change in BCVA from baseline to month 3, with secondary end points being the mean change in BCVA, mean change in central retinal thickness (CRT), and safety at month 12.

They enrolled 122 patients. At the primary end point at month 3, mean improvements in BCVA from baseline in the 0.5- and 2.0-mg groups were 8.97 and 10.43 letters, respectively. At month 12, mean improvements in BCVA from baseline were 14.31, 9.31, 12.42, and 15.43 letters for the 0.5-mg PRN, 0.5-mg Q1M, 2.0-mg PRN, and 2.0-mg Q1M regimens, respectively. At month 12, mean reductions in CRT in the 4 regimens were 119.8, 129.7, 152.1, and 170.8 mm, respectively. There were no significant differences for the pairwise comparisons between all study groups. The difference in the number of injections between the 2 PRN groups was not statistically significant. Treatment with conbercept generally was safe and well tolerated. Because of the limited sample size, this phase 2 study was not powered adequately to assess the significance of these differences in adverse effects among the treatment groups. They concluded significant gains in BCVA at 3 months were the same or better at 12 months in all conbercept dosing groups of neovascular AMD patients. During the 12 months, repeated intravitreal injections of conbercept were well tolerated in these patients. Future clinical trials are required to confirm its long-term efficacy and safety.

INTRAVITREAL AFLIBERCEPT INJECTION FOR NEOVASCULAR AGE-RELATED MACULAR DEGENERATION
NINETY-SIXE WEEK RESULTS OF THE VIEW STUDIES

The introduction of antiangiogenic therapy to treat neovascular age-related macular degeneration (AMD) has vastly changed common paradigms in this important entity. ANCHOR and MARINA studies showed clear superiority of monthly intravitreal ranibizumab administration compared with sham or with the previous gold standard, photodynamic therapy. Intravitreal aflibercept, a fusion protein of key domains from human VEGF receptors 1 and 2 with the constant region of human immunoglobulin G. Investigation of Efficacy and Safety in Wet AMD (VIEW 1 and 2) studies were the largest controlled trials of anti-VEGF agents in AMD ever performed, recruiting more than 2400 patients with treatment naïve neovascular AMD from more than 360 centres worldwide. The focus of the trials was to compare the standard of care (ranibizumab 0.5 mg at monthly intervals) with 2 doses (2 and 0.5 mg) of intravitreal aflibercept and 2 regimens (monthly and every 2 months after 3 initial monthly doses). All intravitreal aflibercept groups were clinically equivalent to monthly ranibizumab in

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maintaining visual acuity at week.

They conducted this study to determine efficacy and safety of intravitreal aflibercept in patients with neovascular AMD during a second year of variable dosing after a first-year fixed-dosing period. This is a randomized, double-masked, active-controlled, phase 3 trials. From baseline to week 52, patients received 0.5 mg intravitreal ranibizumab every 4 weeks (Rq4), 2 mg aflibercept every 4 weeks (2q4), 0.5 mg aflibercept every 4 weeks (0.5q4), or 2 mg aflibercept every 8 weeks (2q8) after 3 monthly injections. During weeks 52 through 96, patients received their original dosing assignment using an as-needed regimen with defined retreatment criteria and mandatory dosing at least every 12 weeks. Main Outcome Measure calculated the proportion of eyes at week 96 that maintained best-corrected visual acuity and change from baseline in BCVA.

Proportions of eyes maintaining BCVA across treatments were 94.4% to 96.1% at week 52 and 91.5% to 92.4% at week 96. Mean BCVA gains were 8.3 to 9.3 letters at week 52 and 6.6 to 7.9 letters at week 96. Proportions of eyes without retinal fluid decreased from week 52 to week 96 and more 2q4 eyes were without fluid at weeks 52 and 96 than Rq4 eyes. Patients received on average 16.5, 16.0, 16.2, and 11.2 injections over 96 weeks and 4.7, 4.1, 4.6, and 4.2 injections during weeks 52 through 96 in the Rq4, 2q4, 0.5q4, and 2q8 groups, respectively. The number of injections during weeks 52 through 96 was lower in the 2q4 and 2q8 groups versus the Rq4 group. Incidences of Antiplatelet Trialists' Collaboration defined arterial thromboembolic events were similar across groups from baseline to week 96.

They concluded all aflibercept and ranibizumab groups were equally effective in improving BCVA and preventing BCVA loss at 96 weeks. The 2q8(2 mg aflibercept every 8 weeks) aflibercept group was similar to ranibizumab in visual acuity outcomes during 96 weeks, but with an average of 5 fewer injections. Small losses at 96 weeks in the visual and anatomic gains seen at 52 weeks in all arms were in the range of losses commonly observed with variable dosing.

INITIAL VERSUS DELAYED PHOTODYNAMIC THERAPY IN COMBINATION WITH RANIBIZUMAB FOR TREATMENT OF POLYPOIDAL CHOROIDAL VASCULOPATHY

The Fujisan Study

FUMI GOMI, MD, PHD, YUJI OSHIMA, MD, RYUSABURO MORI, MD, MARIKO KANO, MD, MASAAKI SAITO, MD, AYANA YAMASHITA, MD,EIJI IWATA, MD, RUKA MARUKO, MD

RETINA 35:1569–1576, 2015

Polypoidal choroidal vasculopathy (PCV), a subtype of wet AMD, is characterized by polypoidal choroidal vascular dilatation with or without abnormally branching choroidal vascular networks on indocyanine green angiography. Photodynamic therapy (PDT) with verteporfin is the first approved treatment for wet AMD. Photodynamic therapy resolves the polypoidal lesions in PCV and also results in resolution of exudative fluid. However, recently, the first-choice treatment for wet AMD has shifted to anti-vascular endothelial growth factor (VEGF) drugs from PDT, and the vision-improving effect has been confirmed regardless of race or disease subtype. Therefore, eyes with PCV can be treated initially with anti-VEGF drugs; however, they are limited in their ability to resolve polypoidal lesions, for which PDT works effectively. Combination therapy of PDT and anti-VEGF drugs provides the complementary effects of both treatments, but it remains unknown whether PDT should have been administered at the beginning of treatment or during follow-up of anti-VEGF therapy. The purpose of this study was to compare the 1-year treatment results of initial and deferred PDT combined with ranibizumab for PCV.

This study conducted prospectively, 72 men with treatment-naive polypoidal choroidal vasculopathy were randomized to initial or later PDT combined with intravitreal Ranibizumab. In both groups, 2 additional monthly Intravitreal Ranibizumab followed. From Month 3, PDT and intravitreal Ranibizumab were administered according to the retreatment criteria. Mean changes in the best-corrected visual acuity between baseline and Month 12 and central retinal thickness, the rate of eyes showing regression of polypoidal lesions, and number of additional treatments were compared.

They found that the best-corrected visual acuity increased by a mean of 8.1 Early Treatment of Diabetic Retinopathy Study (ETDRS) letters in the initial PDT group and 8.8 ETDRS letters in the later PDT group, and there was a no significant difference. The mean central retinal thickness decreased significantly in both groups but more so with combination therapy within the first 4 months; the difference was not significant at Month 12. The rate of eyes showing resolution of polypoidal lesions at 12 months was 62.1% in the initial PDT group and 54.8% in the later PDT group and again, there was no significant difference. The mean number of additional intravitreal Ranibizumab was 1.5 in initial PDT and 3.8 in later PDT; that of additional PDTs was 0.14 and 0.45, respectively, and they were significantly different.

They concluded both initial and deferred PDT combined with intravitreal Ranibizumab to treat PCV show the similar visual and anatomical improvements at 12 months. Initial

PDT combination leads to significantly fewer additional treatments.

EPIRETINAL MEMBRANES IN NEOVASCULAR AGE-RELATED MACULAR DEGENERATION - Effect on Outcomes of Anti-vascular Endothelial Growth Factor Therapy.

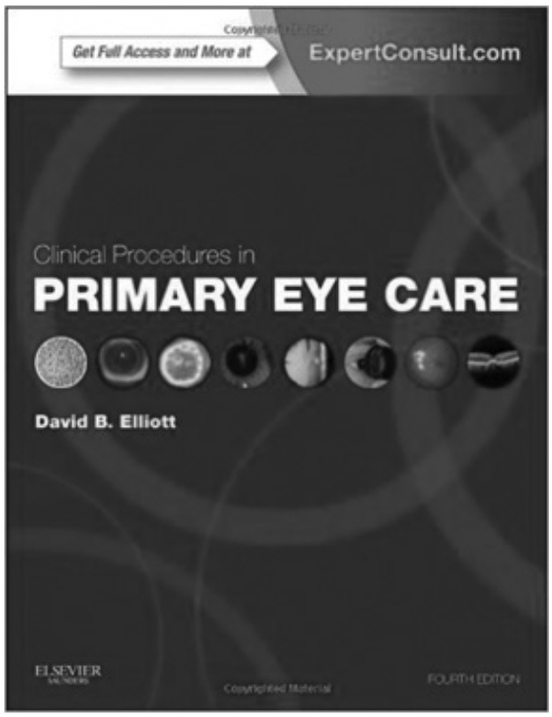
EMINE ESRA KARACA, MD, BURÇIN KEPEZ YILDIZ, MD, MEHMET ÖZGÜR ÇUBUK, MD, SxENGÜL ÖZDEK, MD
RETINA 35:1540–1546, 2015

Visual outcome in a patient with neovascular AMD depends on several factors. Vitreous is supposed to play an important role in neovascular AMD. Traction forces were suspected to contribute development and poor prognosis of neovascular AMD. Vitreomacular interface (VMI) changes of patients with AMD, such as posterior vitreous detachment (PVD), vitreomacular adhesion (VMA), and vitreomacular traction have been addressed in several clinical studies. The aim of this study was to elucidate whether the presence of ERM contribute additional problem in patients with neovascular AMD treated with anti-VEGFs.

This study was a retrospective observational case series and was conducted in Turkey. The reports of the patients with a diagnosis of new-onset neovascular AMD, aged at least 50 years and treated with intravitreal anti-vascular endothelial growth factors (ranibizumab or bevacuzimab) between October 2010 and September 2013 were reviewed for the vitreomacular interface changes. The study included 90 eyes of 90 patients with neovascular AMD. The mean age of the patients was 70 ± 7.5 years, with 38.9% being male and 61.1% being female. According to the examinations with optical coherence tomography and B-mode ultrasonography, 43 patients had "concurrent" vitreomacular adhesion (30 focal, 13 broad; Group 1). Twenty-nine patients had complete posterior vitreous detachment (Group 2) and 18 patients (Group 3) had ERM. The number of injections was highest for the patients with ERM (Group 3), and this difference was statistically significant. The mean interval between injections and the mean longest interval were shorter in Group 3.

The presence of ERM in association with neovascular AMD seems to increase the number of anti-vascular endothelial growth factor injections and decrease the injection intervals for the treatment of neovascular AMD. Although the anatomical and functional results are similar in eyes with or without ERM, the increased need for anti-vascular endothelial growth factors may mean that these membranes may decrease the penetration of the drugs through these membranes, which may act as a physical barrier. Additionally, increased inflammation in patients with ERM probably requires more frequent injections.

Vandhana Pradeep MBBS

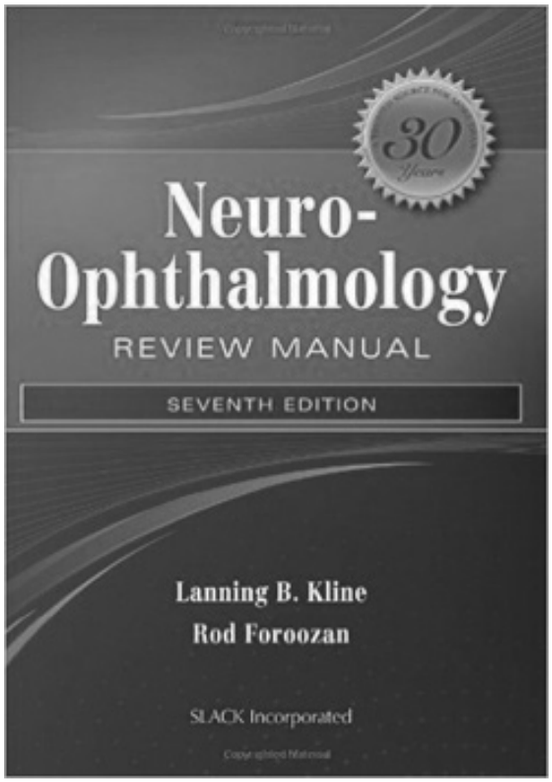


CLINICAL PROCDURES IN PRIMARY EYE CARE

AUTHORS: DAVID B ELLIOTT
PUBLISHING YEAR: 2014
EDITION: 4th EDITION
PUBLISHER: ELSEVIER
NUMBER OF PAGES: 318

This is a well organised and meticulously written textbook cleared aimed at beginners in ophthalmology. The nine chapters in the book gives the student a step by step approach in understanding the various aspects of patient examination. Though the book is limited to ophthalmic examination procedures and techniques, the author has kept it comprehensive and meticulously written as though to imprint the importance of detailed examination in the young clinician's mind. The interactive flavour however is maintained till the end. The book features full-colour photographs, eye diagrams, and colour plates making understanding much easier.

The book is definitely a must read for beginners in the subject and will definitely help them sharpen their clinical skills right at the early years of their career.



NEUROPHTHALMOLOGY REVIEW MANUAL

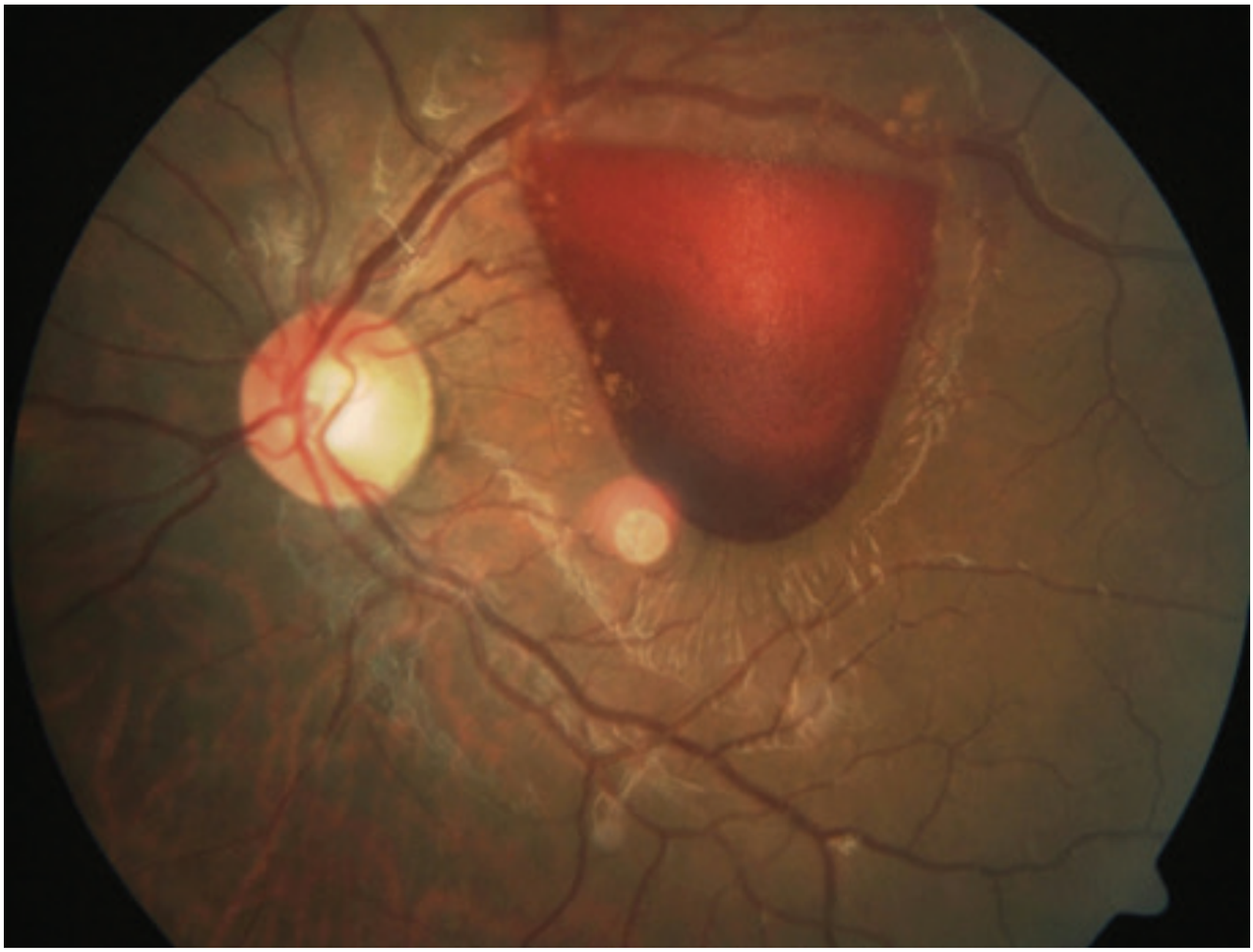
AUTHORS: LANNING B KLINE, ROD FOROOZAN, FRANK J BAJANDAS
PUBLISHING YEAR: 2013
EDITION: 7th EDITION
PUBLISHER: SLACK INCORPORATED
NUMBER OF PAGES: 288

This is a direct, concise, to the point textbook providing basic information about various principles of neurophthalmology. Although it may not be a comprehensive volume as looked forward by a postgraduate student or fellow, it does cover all the major topics briefly making it a handy reference for a general ophthalmologist. Essentials in both neurology and neurophthalmology have been covered in the book making it useful for practitioners from either speciality.

It features around 130 illustrations and 29 tables allowing a user friendly format. The book contains all the fundamentals in the subject spread out in 20 chapters and could turn out to be an excellent resource material.

Address for Correspondence: Little Flower Hospital & Research Centre, Angamaly. Email: vandana.pradeep89@gmail.com

Diagnosis?
Causes and Treatment for this condition?



Send your answers to: drashok.eye@gmail.com

Dear editor,

The article on new surgical technique "Thorny lash conquered" was interesting! We see so many long term follow-up patients with chemical injury, ocular surface disorders with trichiasis in our OPD coming every 3-4 weeks with complaints of pricking sensation/ irritation of eyes and we do is mostly epilation which just a short term relief. As the author has rightly pointed out that electrolysis is limited to higher centres mainly with not so encouraging results, this new surgical technique described looks innovative and simple. Though my concern and doubt is that whether we can implement this technique for trichiasis involving many lashes as it would be tedious procedure but looks very encouraging where few lashes are involved.

I once again thank the author for such a wonderful video demonstration too.

Dr. Ashwini H
Little flower hospital

Author's reply

Thank you Dr Ashwini for the encouraging words. We should come out with simple techniques which can be adapted by every Ophthalmologists easily and cost effectively.

Dr. Rajiv Sukumaran
Priyanka Eye Hospital, Kollam.

Dear Author,

Congratulations on the excellent article on Epiretinal membrane. The author has clearly highlighted the various aspects of this subject including the management. In your practice what kind of erm's do you advice surgery?Is vision a criteria for advising surgical removal?

Dr Awaneesh
Little Flower Hospital,Angamaly

Author reply

We thank Dr Awaneesh for his interest in our article as well as his comments regarding our article. Regarding his question, in our clinical practice, vision and patient symptoms are 2 main criteria we consider while advising surgery. We advise surgery for a significant epiretinal membrane with macular edema and /or traction in following situations:

-Very symptomatic patient (metamorphopsia) even if vision is good
-Visual acuity $\leq$ 6/18 with or without metamorphopsia
-Documented progression of structural changes in the retina along with documented drop in vision on periodic follow up.

Apart from these, patient expectations need to be kept in mind and proper patient counselling is also necessary prior to taking up these patients for surgery

Dr Bindu Rajesh
Giridhar Eye Institute, Kochi

Dear Author,

It is with great interest that I read the article titled- Macular changes following Cataract Surgery over a Six Month Period in the last issue of KJO. I would like to congratulate the authors for doing such an excellent work. A common posterior segment complication after an uncomplicated cataract surgery is post op CME which usually occurs by 4-6 weeks. A six month OCT scan was done only if it was required according to the study and the criteria for such a scan is not clearly mentioned. A scan at 6-8 weeks could have picked up more pathologies.

Dr Vandana
Little Flower Hospital, Angamaly

Author reply

The authors thank Dr Vandana for the in depth perusal of our article and the encouraging words.

In our study of OCT changes following SICS in 100 patients ,the schedule for OCT was pre operative, one week post surgery, one month post surgery and after six months in selected patients. The selection criteria for OCT scan six months post surgery were-

1)All patients who had posterior capsular rent (6/100 eyes)
2)Any eye with frank cystoid abnormalities in the macula demonstrated by OCT at one month.(1/100 eyes)
3)Our study clearly demonstrated a trend towards decreasing central macular thickness in OCT scans taken one month after surgery compared to the one week postoperative scans.Any eye which went against this trend and demonstrated an increased central macular thickness at one month compared to one week was taken up for follow up OCT at 6 months.

Of the 100 eyes in the study ,ten eyes fulfilled the third criterion .Of these ten,9 eyes had an increase of 20-30 microns only in CMT between one week and one month.CMT in these eyes touched baseline values by 6 months. But ,one eye which showed 100 microns increase in CMT in OCT done one month post surgery went on to develop full fledged CME on 6month follow up.
So the authors feel that an increase in CMT of less than 50 microns from one week post op to one month post op scans could be due to variability between two readings taken at different times .So it might have only very doubtful predictive value for future CME.As suggested by Dr Vandana , an additional OCT at six weeks ,at least in such eyes ,especially in affording patients would definitely help in conclusively proving this hypothesis.

Once again I thank Dr Vandana for her valuable comments and the keen interest shown in our article.

Thank you,

Dr Lathika . V. K
Associate Professor,Amala Institute Of Medical Sciences, Thrissur.

Notes

The Kerala Journal of Ophthalmology (KJO) is a quarterly; peer reviewed one, devoted to dissemination of the latest in ophthalmology to the General Ophthalmologists as well as to specialists in the various subspecialties of this discipline. It invites submission of original work dealing with clinical and laboratory materials.

Authors submitting materials to this journal are requested to adhere STRICTLY to the norms laid down below. The matter must be typed on one side of the paper. A margin of 1" must be left all around and the material must be double spaced. A page should contain not more than 25 lines. Two copies of the text in paper and one copy in a CD must be submitted to the Editor and the corresponding author is advised to keep another copy with him. The corresponding author must give it in writing in his covering letter that the same matter will not be submitted elsewhere if accepted. He must also enclose the copyright transfer of his work to this journal. The papers sent will be subjected to peer review. The accepted manuscripts become the permanent property of this journal. The author is informed that, if his work is returned to him for correction / clarification after peer review, he should effect the same and send the manuscript back to the Editor within one month. Each manuscript component mentioned here under must begin with a new page and the pages are to be numbered at the right tip corner starting from the Title page.

1. TITLE: The title of the work must be brief and precise. It should not exceed two lines and 40 characters (including comma, period) Author(s) full name (s) must be given along with his (their) degree and the affiliations. Corresponding author's name, correct address (including e-mail and Fax, if available) and phone number must be mentioned at the bottom left hand corner of the first page.

2. ABSTRACT: The abstract is to be given in the beginning itself. It should not exceed 200 words. It must contain the aim, methodology, results and conclusion. For case report, summary / conclusion alone is to be given.
KEY WORDS: (maximum five) in capitals are to be included at the end of Abstract.

3. INTRODUCTION: Describe the aim of the study, along with the hypotheses that were tested. Only necessary references are to be given.

4. METHOD: Give in detail the materials used and the methods employed. Describe the type of study. Pharmacological names only must be mentioned for the drugs used and, if proprietary name is used, then the manufacturers name must be given in parentheses. Except for standard, well-accepted abbreviations (including SI Units), all others must be introduced in parentheses when the full term is used for the first time in the article.

5. RESULTS: Giver only the results obtained by the study under discussion. State the statistics in the correct scientific form (P value, mean etc). Results based on assumptions must not be given. Indicate in the text the place where the tables have to be inserted.

6. DISCUSSION: The discussion should be to the point and relevant to the subject under discussion. This section can be combined with the previous one if the author desires. Avoid speculations. Use only standard abbreviations or the abbreviations already introduced.

7. ACKNOWLEDGEMENT: This is to be made only to those who were directly and scientifically involved with the preparation of the paper. Permitting authorities, technicians, photographers who assisted in the work need not be mentioned.

8. REFERENCES: The references should be given in numerical order in which they first appear in text and not in alphabetical order (Citation Order System). It should be numbered consecutively in the text. The references will not be checked by the Editor or by the Peer reviewer and hence the author is solely responsible for its completeness and the accuracy. Period should not be employed anywhere in the references. Personal communications, unpublished data and poster references, if mentioned, should be in the text itself and the source mentioned in parentheses. References should be in the following form:

Journal reference: Author(s) full title, Journal name (as abbreviated in Index Medicus), volume number, pages and year. If there are more than three authors, then mention the first three authors and then 'et al'.
Book reference: Author(s) (& Editor, if any), title of book (and chapter), publisher, place of publication, page number (s) of the cited portion and year.

9. THE LEGEND: The legend for the illustrations (and

tables, if necessary) must be given in a separate sheet of paper and should be typed double-spaced.

Illustrations: The photos and figures should be prepared in glossy prints with good contrast and of the size 6" x 4". Only salient details should be included. On the back of the illustration, the figure number in text, title of the paper, the first author's name and the top side (marked with an arrow) must be specified. Except for arrows, no text is to be on the photos. It is the duty of the author(s) to get the patient's written permission when the subject is identifiable in the photo. Submit two sets of illustrations. Illustrations from other Journals and books are usually not accepted. If used, it rests with the author(s) to get the copy right permission from the original author / publisher and this permission letter must be sent to the Editor at the time of submitting the manuscript. For Histological figures the stain and magnification used should be noted e.g.: H & E Stain x 70.

10. TABLE: It should be in double space. Each table must have an Arabic numeral (except for single table) and a title both in a single line. Each column in the table must have a short heading. If a table is large, then it must be continued in a second page, which also must have the table number and the title. Avoid vertical lines in the tables. Two sets must be submitted.

11.ALL MANUSCRIPTS ARE SUBJECTED TO EDITORIAL BOARD REVIEW.

12. OTHER CATEGORIES OF MANUSCRIPT

a) Original Articles should generally not exceed 3,000 words or 12 double – spaced pages.

b) Review Articles: can be on topics of relevance to clinical practice, research methodology, community ophthalmology or investigative work, of relevance to visual science. These articles should include up to date review of existing literature, and summarize the current status / preferred practice for that particular topic.

Brief reports are short communication of new instruments, new laboratory techniques or surgical techniques as well as interesting case reports with unique findings. These should not exceed 1000 words with a maximum of 2 illustrations. They should follow the format – introduction, case, and discussion. No more than 8 references should be cited. Each brief report must begin with a 75-100 word summary that highlights the significance of the articles.

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