KERALA JOURNAL OF OPHTHALMOLOGY

VOL. XVIII **ISSUE 3** **SEPTEMBER 2006**

EDITOR

Dr. Meena Chakrabarti

EDITORIAL BOARD

Dr. Charles K. Skariah (Thrissur)
(Chairman, Scientific Committee)
Dr. Rajiv Sukumaran (Kollam)
(Associate Editor)
Dr. Valsa Stephen (Trivandrum)
Dr. Leila Mohan (Kozhikode)
Dr. Mini Jayachandran (Kollam)
Dr. Meenakshi Dhar (Cochin)
Dr. Mohammed Haneef (Alapuzha)
Dr. Amitha Varghese (Thiruvalla)
Dr.Bindu Das (Kozhikode)
Dr. Sunil (Kasargod)
Dr. Merine Paul (Thrissur)

EX- OFFICIO MEMBERS

Dr. George Thomas (President)
Dr. Sahasranamam (Secretary)

ADVISORS

Dr. Shobhana Mohandas
Dr. Thomas Cherian
Dr. Sai Kumar S.J.
Dr. Giridhar A.

The Kerala Journal of Ophthalmology is the official scientific publication of the Kerala Society Ophthalmic Surgeons (KSOS) and 4 issues are published every year.

It welcomes original articles, interesting case reports, update articles, book reviews, journal abstracts and research papers in Ophthalmology. Dates of the coming conferences and CME's are also published. Original articles are accepted on condition that they have not been published in any other journal.

SUBSCRIPTION RATE

Annual : Rs. 300 (4 issues)

Single Copy : Rs. 100

Life membership fee–KSOS–Rs.1050.

Subscription should be sent by demand draft in favour of Kerala Journal of Ophthalmology payable at Trivandrum.

ADDRESS FOR ALL CORRESPONDENCE: Dr. Meena Chakrabarti, Editor KJO, Chakrabarti Eye Care Centre, Kochulloor, Medical College PO, Trivandrum 695 011, Ph-0471-2555530, 2449599 Fax:- 0471-2558530, E-mail: tvm_meenarup@sancharnet.in

KERALA SOCIETY OF OPHTHALMIC SURGEONS

(Registered under Societies Registration XXI of 1860. No.387/2003)

President

Dr, George Thomas
Tc.4/1040-1, Near Kowdiar Jn.
Trivandrum – 695 003.
Ph:- 0471-2431143, 2433333
Mobile:- 98473 15150

General Secretary

Dr. V Sahasranamam
No-30, Vinayaka Nagar
Trivandrum 695 018
Ph:- 0471-2490421
Mobile:- 9846020421

Treasurer

Dr. B V Bhat
Bhat's Eye Clinic
Asoka Hospital
South Bazar, Kannur
Ph:-0479 2700715

President Elect

Dr. T A Alexander
Thottumughath,
Kusumagiri
Kakkanad, Kochi – 682 030
Ph:- 0484-2721161

Vice President

P Rajagopalan Nair
Raj Bhavan,
Palakkad – 676 013
Ph:- 0491-2535676

Scientific Committee Chairman

Dr. Charles K Skariah
12/382, Kakkuzhiyil House,
Mundupalam, Kuriachira
Thrissur -680 006
Ph:- 0487 2252807

Joint Secretary

Dr.Elizabeth Joseph
L F Hospital
Angamali – 683 572
Ph:- 0484-2452141

Web Site Editor

Dr. Arup Chakrabarti
Chakrabarti Eye Care Centre
Kochulloor, Trivandrum – 695 011
Ph:-0471 2555530

Journal Editor

Dr. Meena Chakrabarti
Chakrabarti Eye Care Centre
Kochulloor, Trivandrum – 695 011
Ph:- 0471-2555530

Immediate Past President

Dr. E J Mani
Little Flower Hospital
Angamali -683 572
Ph:- 0484-2608919

Dr. Alex Joseph
Leavea Villa, Gandhi Nagar
Peringavu, Thrissur -680 018
Tel: 2331199

Dr. N Jayanth
Nethra, Fort Road, Kannur

Immediate Past Secretary

Dr. R R Varma
Ambikalayam, Warriam Road
Ernakulam – 682 572
Ph:- 0484-2352010

Managing Committee Members

Dr. A Giridhar
Dr. Varghese Joseph

Executive Committee Members

Dr. Suresh
Kasargode

Dr. Raj Issac Oommen
Kannur

Dr.Leila Mohan
Kozhikode

Dr. Govinda Babu
Malappuram

Dr. A Rohan
Palakkad

Dr. C V Anthrayose Kakkanatt
Thrissur

Dr. S Sasi Kumar
Ernakulam

Dr. Mohammed Haneef
Alapuzha

Dr. S Sabitha
Pathanamthitta

Dr. Sarojam
Kottayam

Dr. S Venugopal
Kollam

Dr. Thomas George
Trivandrum

NEW

combined

power that gets

Control, Comfort & Convenience back on track



- ***COMBIGAN™*** significantly reduced IOP by up to 33% (7.6 mmHg) from an untreated baseline of 23.3 mmHg[1]
- ***COMBIGAN™*** dual mechanism of action — increases outflow and decreases inflow[2]
- ***COMBIGAN™*** low level of preservative — 0.005% BAK[2]
- ***COMBIGAN™*** BD convenience

New Combigan™
(brimonidine tartrate/timolol ophthalmic solution) 0.2%/0.5%

ALLERGAN INDIA PRIVATE LIMITED

1st Floor, North Wing, Silver Jubilee Block, Unity Building Complex,
Mission Road, 3rd Cross, Bangalore-560 027 Tel: 91-80-2229 9125/35/40
Fax: 91-80-2229 9130 Email: allergan@agnindia.com

® & ™ marks are owned by Allergan Inc.
For the use of a registered medical practitioner, hospital or laboratory only.

References:
1. Craven ER, et al. One-year comparison of efficacy and safety of brimonidine tartrate 0.2 %/ timolol 0.5 % fixed combination (b.i.d.) with timolol 0.5% (b.i.d.) or brimonidine tartrate 0.2% (t.i.d.). Poster presented at the Annual Meeting of the American Academy of Ophthalmology, October 20-23, 2002, Orlando, Florida. 2. Combigan™ Prescribing Information.

Why perform surgery in the clouds?



Make the transition to clarity -Alcon BSS® Balanced Salt Solution



- BSS® is physiologically balanced
- BSS® contains the five essential ions found in human aqueous humour: Sodium, Potassium, Calcium, Magnesium and Chloride
- BSS® solution is buffered with citrate and acetate
- Imported Viaflex® Bag - Highest Standards of Quality & Sterility

Physiologically Balanced

Comparison between the ions found in intraocular fluid and commercially available irrigating solutions.

Table 1 Composition of Hartmann's solution, BSS® and aqueous fluid*

	Aqueous	BSS®	Hartmann's Solution (Lactated Ringer's)
Sodium	136	156	131
Potassium	4	10	5
Calcium	1.5	3.4	2
Chloride	108	130	111
Magnesium	1	1.5	-
	lactate	acetate	lactate
	ascorbate	citrate	
	protein		
Osmolality:	300	304	255

*Electrolytic concentration, mmol/l; osmolality, mosmol/l

This chart shows that BSS® is physiologically balanced. It has many of the same ions as the intraocular fluid, particularly the aqueous humour. For this reason, as verified by clinical studies, BSS® has fewer adverse effects than other ocular-irrigating solutions.
Edelhauser HF et al. *Am J Ophthalmol* 81 (1986): 473

Improved Surgical Outcomes

• Minimize postop complications • Minimize corneal edema • Maximize quality

Alcon BSS® is the only *real* BSS®



Alcon INDIA

Alcon Laboratories (India) Pvt. Ltd.
154, Amaiyoti Layout, Domlur, Inner Ring Road, Bangalore - 560 071, Karnataka, India. Tel: +91 80 25359065 / 25359075 Fax: +91 80 2535 5003

For the use of Registered Medical Practitioners, Hospitals & Laboratories only

Viaflex® is the Registered Trademark of Baxter Healthcare Corporation

165 **EDITORIAL**

167 **GUEST EDITORIAL**

Protein Glycation and Eye Disease
Dr. P. Achutha Kurup

174 **MAJOR REVIEW**

Management of Thyroid Eye Disease
Dr. Ravindra Mohan, Dr. Malay Verma, Dr. Charuta Bhadre

189 **MINOR REVIEW**

IOL Power Calculation for Pediatric Cataracts
Dr. Rupal H Trivedi, Dr. Edward Wilson Jr.

ORIGINAL ARTICLES

194 Multifocal Intraocular Lens: A Long Term Outcome Analysis
Dr. Sabitha

198 Ocular Toxicity of Antituberculous Treatment
Dr. Lavanya V. Rao, Dr. Sulatha V. Bhandary, Dr. Anjana Devi, R., Dr. Anju Ninan, Dr. Vikram Jain, Dr. Himabindu Veluri

201 Pterygium: Is The 'P' Silent or 'Premalignant'?
Dr. S. Shankar, Dr. Roshny Jacob, Dr. Smitha P Babu

206 Silicone Oil Surgery in Children
Dr. Meena Chakrabarti, Dr. Arup Chakrabarti, Dr. Valsa Stephen, Dr. Sonia Rani John

210 OCT-3 Predicts Visual Loss in Glaucoma Suspects
Dr. Chandrima Paul, Dr. Ajoy Paul, Dr. P.K.Bakshi, Dr. Partha Biswas

214 **OCULAR PHARMACOLOGY**

Steroids and Immunosuppressives in Ophthalmology
Dr. Sonia Rani John

221 **OPHTHALMIC INSTRUMENTATION**

Non-contact Tonometers
Dr. Merine Paul

224 **OPHTHALMIC SURGERY**

Management of Congenital cataract
Dr. Elizabeth Joseph

231 **CURRENT CONCEPTS**

Target Pressure
Dr. Devendra Sood

234 **COMMUNITY OPHTHALMOLOGY**

Evidence Based Medicine In Clinical Practice
Dr. Amit K Ghosh

CASE REPORTS

241 Autobiography of A Fanta Bottle
Dr. Elizabeth John, Dr. Mohammed Haneef, Dr. Radha Nair, Dr. Mini P A, Dr. Manoj Venugopal

244 Subretinal Lesion: A Diagnostic Enigma
Dr. Sonia Rani John, Dr. Valsa Stephen, Dr. Arup Chakrabarti, Dr. Meena Chakrabarti

249 Intraocular Mass Lesion: A Diagnostic Dilemma
Dr. V. Sahasranamam

252 Bilateral Cataract Following Electrical Injury
Dr. Valsa Stephen, Dr. Sonia Rani John, Dr. Meena Chakrabarti, Dr. Arup Chakrabarti

PHOTO ESSAY

255 Vogt Koyanagi Harada
Dr. Anuradha Rao, Dr. Rajashree, Dr. Biju Raju

260 **CONSULTATION SECTION**

272 **JOURNAL REVIEW**

274 **BOOK REVIEW**

277 **CME PROGRAMMES**

279 **PG TEAR SHEET**

281 **GENERAL INSTRUCTIONS TO AUTHORS**

Peer-reviewed Results : How Truthful are they ?

The concept of Evidence Based approach[1] (EBHC-Evidence Based Health Care) has gained considerable attention among health care professionals. EBHC ensures that the practicing physician is aware of the estimated risk or probability of a patient having a particular disease and also understands the risks and benefits of the tests or treatments involved in alleviating it. This depends on the physicians ability to understand the critical information provided by current medical literature and to grasp the essence of the study results published in peer reviewed journals [2]. Cost free easy access to MEDLINE/ PUBMED[3] (a reference data base of the US National Library of Medicine) has remedied a major barrier to access medical literature. However a medical practitioner has reasons to be skeptical about the results of the latest peer reviewed studies.

A review conducted by the Greek epidemiologist John Ioannides MD[4]; from the University of Ioannida School of Medicine offers proof that you have the right to be skeptical of what you read. He reviewed 49 important research articles published in top medical journals between 1990 and 2003. These important articles were subsequently cited more than thousand times by other researchers in their papers. Over time, almost one third of these papers were proved wrong ! Let us look at a few glaring examples [6]. *One reputed study looked into whether hormone replacement therapy was safe for women* ***(first it was , then it wasn't)****. Another much publicized study looked at whether Vitamin E protected against heart disease* ***(first it did, then it didn't)*** *and yet another, whether stents are better then balloon angioplasty for coronary artery disease* ***(they are, but not as much as originally thought)***

There are various reasons for arriving at false results. Inadequate sample size, poor study design, researcher bias (and we all have our own biases) unhealthy financial interest and faulty statistical analysis [5] were some of the important factors contributing to studies falsely purporting to reveal new medical truth ! Even a large well designed study with minimal investigator bias will only give the right answer 85% of times according to Dr. Ioannides calculations[4].

In general researchers aren't trying to deceive us. But even the most meticulously structured study[5] performed by well intentioned medical researchers are imperfect. And let us also face the fact that full time academicians are under constant pressure to bring out ***break - through research*** work. They need to publish in reputed peer reviewed journals to get grants, secure promotion, and also ensure a long tenure in a coveted faculty position.

So they are least willing to wait for confirmatory evidence before publishing a break through land mark study that offers a new cure for cancer, ARMD or other diseases[6].

So as practicing physicians we have the right to be skeptical of new claims, or in refusing to incorporate new modalities of investigation or therapy until and unless convincing evidence to its efficacy are published by a different group of workers in different peer reviewed journals[7]. We are justified in waiting till the new exciting claim is validated before changing how we care for our patients. Then alone evidence based health care concept will have any value.

References

1. Ghosh A K; Ghosh K Translating evidence based information into effective risk communication: current challenges and opportunities J.Lab Clin Medicine 2005; 145:171-80.
2. Sackett DL et al; Evidence based medicine. How to practice and teach EBM second Edition : 2000 Churchill Livinstone, 1-261.
3. Delamothe T, Is that it? How on line articles have changed over the past five years. BMJ 2002; 290:1475-1478
4. Ioannides J P Why most published research findings are false PLOS Med 2005; Ag 2; (8) e 124 Epub 2005, August 30
5. Scientific Accuracy and statistics. Just how reliable are scientific papers? The Economist Sept 3 2005.
6. Peter J Mc Donnel Are you skeptical of the latest peer reviewed results Ophthalmology Times, Feb 15 2005, Vol31, no:4

Protein Glycation and Eye Diseases

Dr. P.A. Kurup M.Sc, PhD.

The major causes of blindness worldwide are diabetes and age related eye disorders. While the exact pathogenic mechanism for many of these disorders are not clearly known, there are evidences that protein glycation may play an important role in their etiology. Advanced glycation end products (AGEs) formed by Maillard reaction accumulate in the intracellular and/or extracellular environment of the ocular structure leading to crosslinking of various proteins, which may be involved in the development of various ocular diseases including cataract[1]. This review attempts to evaluate the link between AGEs, and various eye diseases such as diabetic retinopathy, cataract formation etc.

The non-enzymatic reaction between amino groups of proteins, lipids or nucleic acids and glucose or other reducing sugar results in the formation of a Schiff base that slowly rearranges to form the relatively stable Amadori product[2,3]. This reaction was first studied by Maillard in the early 1900 & is known as **Maillard reaction**[4]. This reaction was initially described in the context of food science where its products were found to impart changes in food texure, bioavailability, flavour & preservation. Maillard chemistry is now known to be very relevant invivo with important implications for health and disease. In the body the reaction between reducing sugars and / or carbonyls with amino group results in the formation of advanced glycation end products (AGEs) and these products then accumulate intracellularly and extracellularly on proteins, lipids and nucleic acids. Over the last 25 years enough evidence has accumulated to indicate that AGE modulation of these macromolecules represents a major factor in aging and in a spectrum of human diseases such as diabetic complications, neurodegenerations including Alzheimer's disease, atherosclerosis etc[5-9]. There is accumulating evidence that AGEs could play an important pathogenic role in eye diseases[1]. Ironically, Maillard's speculation made in the early nineties about the importance of this reaction in various diseases was too far ahead of time and received very little serious consideration.

The process of Amadori product formation is termed glycation and the protein bearing Amadori product is referred to as glycated protein distinguishing them from enzymatically glycosylated proteins. The Amadori product can undergo further oxidation or degradative reaction giving rise to additional protein bound compounds collectively termed AGEs[10].

The Amadori product can breakdown to form reactive alpha dicarbonyl compounds such as glyoxal, methyl glyoxal etc which cross link proteins[11].

Protein – protein crosslinking is thought to be responsible for a major share of the deleterious effect of AGEs in diabetes and ageing. Many of these AGEs have fluorescent properties which are used for their detection. Pentosidine, an advanced glycation end product, with fluorescent properties is one such AGE [13].

It is essential to maintain the structural integrity, optical clarity and adequate nutrition of the highly specialized cells of the eye for visual function. For eg., an opaque lens will prevent light from penetrating to the retina and thereby reduce visual acuity. Many of the differentiated cells of the mammalian eye have little or no regenerative capacity which makes them highly susceptible to the ageing process and systemic diseases that alter structural proteins. Ophthalmologist and various scientists have long recognized that eye is

(Formerly Prof. & Head, Dept. of Biochemistry, University of Kerala), Director, Metabolic Disorders Research Centre, Jagathy, Thiruvananthapuram

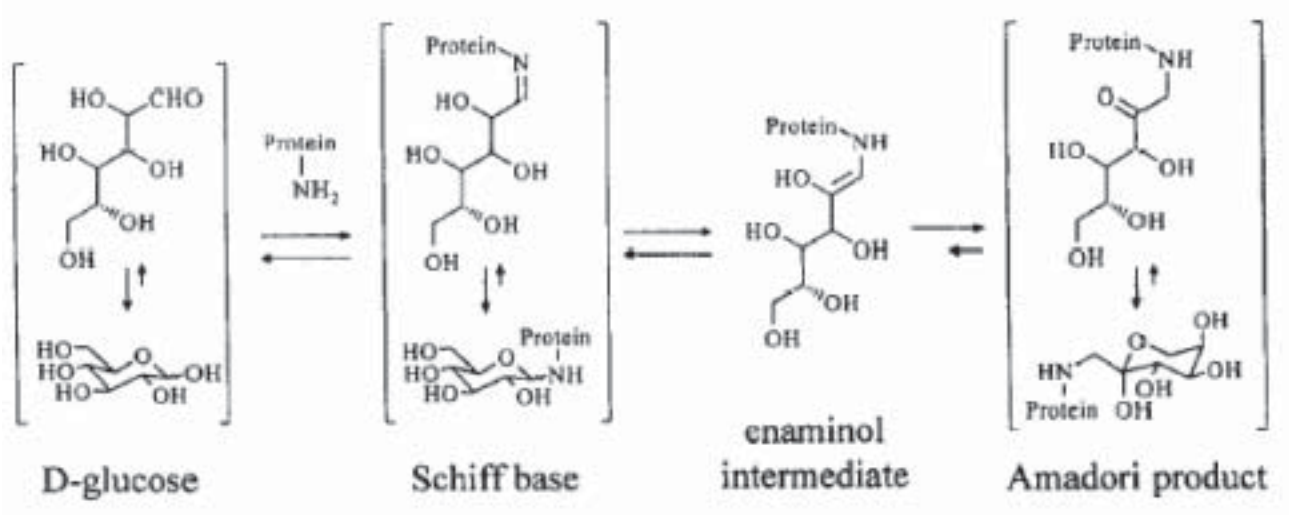


Fig. 1. Formation of glucose – protein Schiff base & the Amadori rearrangement.

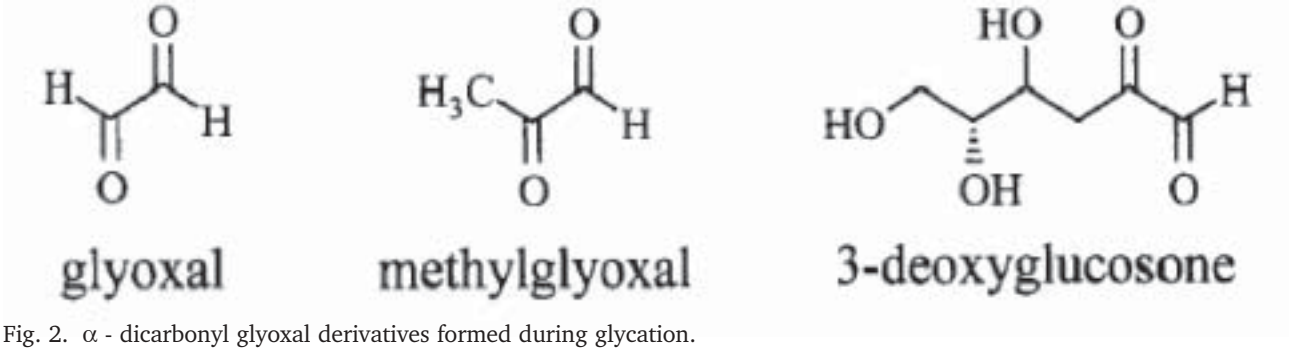


Fig. 2. α - dicarbonyl glyoxal derivatives formed during glycation.

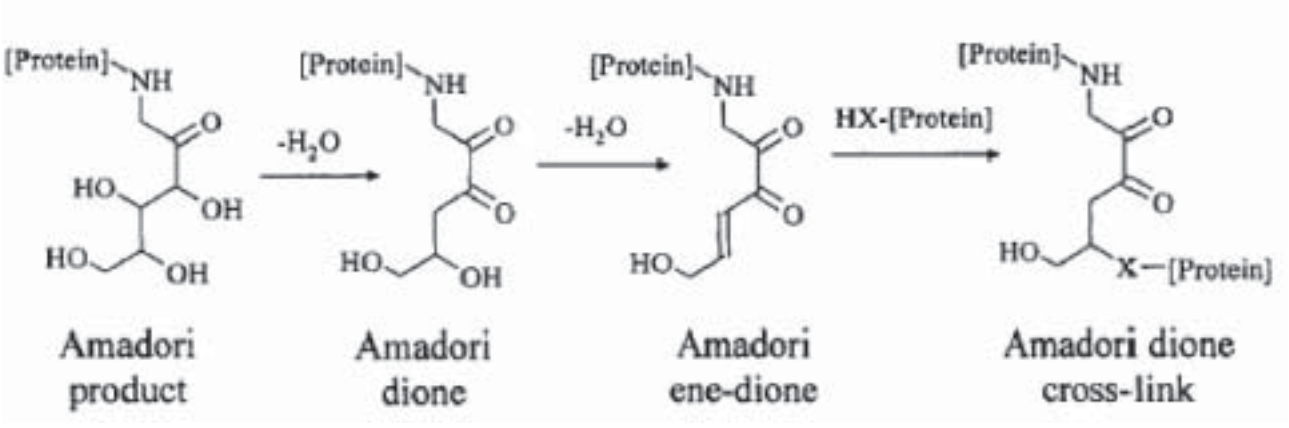


Fig. 3. Dehydration of the Amadori product to form Amadori dione and Amadori ene-dione and conjugate addition of a protein to form a protein-protein crosslink[12].

profoundly influenced by diabetes and age related dysfunction which together account for the leading cause of visual impairment world wide.

Lipid peroxidation can also form a class of Maillard products called advanced lipoxidation end products (ALEs)[14]. Indeed lipid peroxidation forming aldyhydes/carbonyl compounds which form Schiff's base with the amino group of proteins is important in the lipid rich, highly oxidative environment, such as in the retina and dyslipidemia may be an important factor in retinopathies.

Products of advanced glycation (AGEs) / lipoxidation (ALEs) are constantly formed under physiological conditions. Existence of complex receptor systems which bind these receptors have been suggested to instigate diabetic complication[15-17].

AGEs in ocular tissues

a. Cornea

As mentioned earlier, the role of AGEs in eye diseases is not well understood, but available data indicate that they have a role in age and diabetes related ocular disorders. The hyperglycemic state in diabetes promotes formation of AGEs which then produce alteration in structural proteins in the cornea leading to thickening of the corneal stroma & Descemet's / Bowman's basal laminae with morphological abnormalities in the epithelial and endothelial layers. [18, 19]

These alterations in the diabetic cornea are accompanied by decreased protein stability and increased immunoreactive AGEs[20, 21]. Bowman's membrane is highly glycated in diabetic patients[21,23]. Descemet's membrane is also very susceptible to AGEs [23].

AGEs accumulate also in the ageing cornea, as they do in the extracellular matrix proteins in other tissues[24, 25.]

b. Lens

Cataract formation is by far the leading cause of visual impairment across the globe[26]. Ageing and diabetes are the major risk factors involved in cataract formation[27, 28].

The role of Maillard reaction in cataract formation has been extensively studied in both aged & diabetic lens where AGEs are significantly elevated[29 - 31]. Glycation generates age related alterations in lens fiber membrane integrity and tertiary structure of lens proteins, leading to aggregation and covalent crosslinking of lens crystallins. The action of dicarbonyls such as glyoxal and methylglyoxal is enhanced in diabetes and ageing leading to AGE cross links on a-crystallins with resultant loss of chaperone activity, increased ab-crystallin content and dense aggregate formation[32,33]. It is known that diabetic patients accumulate these products faster than age matched non-diabetic controls[34].

Smoking has been demonstrated to lead to high circulating levels of peptides in serum[35]. Tobacco smoking, which involves Maillard Chemistry, may be a rich source of reactive glycation products, capable of promoting AGE cross links formation invivo. In a study of cataractous lenses, a significantly higher level of immunoreactive AGEs has been demonstrated in patients with a history of smoking[36]. Smoking remains a clear risk factor for cataract formation[37] and tobacco related elevation in serum AGEs may act in concert with heavy metal deposition & oxidative stress to precipitate cataract formation. There is significant accumulation of copper in diabetic lens and copper catalysed Fenton's reaction results in generation of hydroxyl radicals with pathogenic significance in cataract formation[38].

c. Vitreous

The vitreous gel that interfaces with retina is composed largely of complex net work of cross linked collagen and glycosaminoglycan (hyaluronic Acid)) [39].

Glycations can induce abnormal cross links between vitreous collagen fibrils leading to dissociation from hyaluronic acid and resultant destabilisation of gel structure[40]. AGEs accumulate in the vitreous of aged people and diabetic patients[41].

Even though nonglycational physiological and biochemical processes also contribute to vitreous degeneration, it seems likely that AGEs may play a significant role in diabetic and aging vitreous dysfunction.

AGEs are important in the development of age related macular degeneration (AMD). Evidence linking AGE accumulation in AMD can be surmised from the composition of several proteins such as vitronectin, TIMP – 3, Clusterin, apoliprotein E, amyloid[44-47] etc. Some of these proteins have been shown to be readily modified by AGEs and / or ALEs during aging.[48-51] AGE cross links accumulation is a feature of matrix dysfunction during diabetes. Bruch's membrane is known to thicken progressively in older patients and become less permeable[52-54].

AGEs causes apoptotic death in the cells of retinal pigment epithelium[55]. AGEs have been detected within the collagenous matrix of the lamina cribrosa and within the optic nerve head indicating their role in the pathogenesis of chronic open – angle glaucoma[56,57]. The lamina criborosa plays an important role in supporting the optic nerve axonal structure and AGEs mediated crosslinking of this matrix may reduce

flexibility and perhaps induce age – related axon damage characteristic of advanced glaucomatous disease[57].

d. Diabetic Retinopathy

Retinopathy is the most common microvascular complication of diabetes and remains an important cause of blindness[58]. With type 1 diabetes of 10 year duration, the prevalence of retinopathy is around 80% and increase to over 95% by 20 years[58]. Hyperglycemia is the underlying cause of the disease in both type 1 and type 2[59,60] diabetes In terms of Maillard products and diabetic retinopathy, clinical studies have demonstrated that the levels of AGEs in the serum[61], skin[62] or cornea[63] correlate with the onset or grade of diabetic retinopathy. AGEs are significantly increased in diabetic retinopathy patients.

AGEs are localized in retinal vessels and neuroglia of diabetic patients where they exert a range of deleterious effects on cell function[64-68]. Invivo and invitro studies suggest that elevated AGE level occurring in diabetes may be an important factor in retinopathy initiation and progression.

AGEs are known to cause significant upregulation of vascular endothelial growth factor (VEGF)[69-72] which is also a potent vasopermeability and angiogenic factor in the retinal microvasculature[73]. Extensive vasopermeability and angiogenesis are the pathophysiological hall marks of diabetic retinopathy.

Therapeutic options in glycation mediated ocular diseases

Inhibition of Maillard reaction and prevention of AGE/ALE mediated cell toxicity have exciting possibilities.

The possible approaches are:-

(1) Inhibition of Amadori product formation

(2) Breaking of the preaccumulated AGEs

(3) Identifying substances with post Amadori product scavenging potential.

Amadori product formation is the crucial step in Maillard Chemistry in biological systems, because progression to crosslink requires chemical rearrangement to create reactive intermediates before the formation of irreversible AGEs. A **simple hydrazine compound, aminoguanidine (Pimagedine)**[74] has been shown to inhibit AGE mediated cross linking and to prevent a range of diabetic vascular complications in experimental animals including diabetic retinopathy[64-68].

Aminoguanidine has been evaluated in a multicentre clinical trial, where it showed positive signs towards slowing the progression of retinopathy[69]. However further extensive clinical trials are required.

Breaking the preaccumulated AGEs is an exciting approach. Two related compounds have been described to attack and break AGE cross links in experimental diabetes[70,71]. One is **ALT – 711** which has been reported to improve arterial compliance in aged patients with cardiovascular stiffness[72]. However the effect of ALT 711 on retinopathy is yet to be evaluated.

The third approach is to screen for compounds with post – Amadori product scavenging potential, since it is an important route for AEGs formation in vivo. **Pyridoxamine,** a derivative of pyridoxine has been described to be an effective and specific post - Amadori inhibitor with the ability to prevent renal dysfunction in diabetic rats. [73] It also reduced retinal AEG accumulation. [74]

To sum up, the Maillard reaction may play a pathogenic role in diabetic and age related dysfunction of the eye. The pathogenesis of such disorders is multifactorial and advanced glycation which may play a significant role, is not the only process leading to cell or tissue dysfunction. Important events in diabetic and aging such as free radical generation may also have important links to or are secondary consequences of Maillard Chemistry. Therefore any useful agent which may have therapeutic application in diabetic and age related ocular dysfunction should reduce glycation by decreasing hyperglycemia, inhibiting Amadori product formation and exerting antioxidant effect. *There has been one study on the curcuminoids from Curcuma longa on experimental cataractogenesis in rats with promising results*[75]. These are a number of medicinal plants which are reported to have hypoglycemic effect and antioxidant activity. These plants deserve a scientific study from the point of view of their antiglycating properties. There is immense need to unravel novel pharmacological intervention strategies to prevent / alleviate some of the sight threatening complications of diabetes and ageing.

References

1. Alan W. Stitt 2005, The Maillard reaction in Eye Diseases, Ann. N.Y Acad. Sci. 1043: 582-597.
2. Baynes, J.W. & V.M. Monnier. 1989. The Maillard Reaction in Aging, Diabetes, and Nutrition. Alan R. Liss. New York.
3. Krajcovicova-Kudlackova, M. *et al.* 2002. Advanced glycation end products and nutrition. Physiol. Res. 51: 313-316.
4. Maillard, L.C., and Gautier, M.A. (1912). C. R. Seances Acad. Scl. I/I 154,66-68.
5. Vlassara, H., R. Bucala & L. Striker. 1994. Pathogenic effects of advanced glycosylation endproducts: biochemical, biologic, and clinical implications for diabetes and aging. Lab. Invest. 70: 138-151.
6. Stitt, A.W., A.J. Jenkins & M.E. Cooper. 2002. Advanced glycation end products and diabetic complications. Exp. Opin. Investig. Drugs 11: 1205-1223.
7. Munch, G., J. Gasic-Milenkovic & T. Arendt. 2003. Effect of advanced glycation endproducts on cell cycle and their relevance for Alzheimer's disease. J. Neural Transm. Suppl. (65): 63-71.
8. Stitt, A.W., R. Bucala & H. Vlassara. 1997. Atherogenesis and advanced glycation: promotion, progression, and prevention. Ann. NY Acad. Sci. 811: 115.127; discussion 127-129.
9. Stitt, A.W. *et al.* 1997. Elevated AGE-modified ApoB in sera of euglycemic, normolipidemic patients with atherosclerosis: relationship to tissue AGEs. Mol. Med. 3: 617-627.
10. Bucala, R., Vlassara, H., and Cerami, A. (1992). In "Post-Translation Modification of Proteins" (J.J. Harding and M.J.C. Crabbe, eds.), pp. 53-79. CRC Press, Inc, Boca Raton, Fla.
11. Huber, B., and Ledl, F. (1990). Carbohydr. Res. 204, 215-220.
12. Estendorfer, S., Ledl, F., and Severin, T. (1990). Angew. Chem. Inf. Ed. Eng 29, 536-537.
13. Sell, D.R., Nagaraj, R.H., Grandhee, S.K., Odetti, P., Lapolla, A., Fogarty, J., and Monnier, V.M. (1991). Dmbeies Metab. Rev. 7, 239-25 I.
14. Onorato, J.M. *et al.* 2000. Pyridoxamine, an inhibitor of advanced glycation reactions, also inhibits advanced lipoxidation reactions. Mechanism of action of pyridoxamine. J. Biol. Chem. 275: 21177-21184.
15. Sano, H. *et al.* 1999. Receptors for proteins modified by advanced glycation endproducts (AGE)—their functional role in atherosclerosis. Mech. Ageing Dev. 107: 333-346.
16. Schmidt, A.M., S.D. Yan, S.F. Yan & D.M. Stern. 2000. The biology of the receptor for advanced glycation end products and its ligands. Biochim. Biophys. Acta 1498: 99-111.
17. Vlassara, H. 2001. The AGE-receptor in the pathogenesis of diabetic complications. Diabetes Metab. Res. Rev. 17: 436-443.
18. Schultz, R.O. *et al.* 1983. Diabetic corneal neuropathy. Trans. Am. Ophthalmol. Soc. 81: 107-124.
19. Schultz, R.O. *et al.* 1981. Diabetic keratopathy. Trans. Am. Ophthalmol. Soc. 79: 180-199.
20. Sady, C. *et al.* 2000. Maillard reactions by alpha-oxoaldehydes: detection of glyoxalmodified proteins. Biochim. Biophys. Acta 1481: 255-264.
21. Kaji, Y. *et al.* 2000. Advanced glycation end products in diabetic corneas. Invest. Ophthalmol. Vis. Sci. 41: 362-368.
22. Mcdermott, A.M. *et al.* 2003. Non-enzymatic glycation in corneas from normal and diabetic donors and its effects on epithelial cell attachment in vitro. Optometry 74: 443-452.
23. Kaji, Y. *et al.* 2001. Advanced glycation end products in Descemet's membrane and their effect on corneal endothelial cell. Curr. Eye Res. 23: 469-477.
24. Monnier, V.M. & A. Cerami. 1981. Nonenzymatic browning in vivo: possible process for aging of long lived proteins. Science 211: 491-493.
25. Sell D.R., N.R. Kleinman & V.M. Monnier. 2000. Longitudinal determination of skin collagen glycation and glycoxidation rates predicts early death in C57BL/6NNIA mice. FASEB J. 14: 145-156.
26. Brian, G. & H. Taylor. 2001. Cataract blindness—challenges for the 21st century. Bull. World Health Org. 79: 249-256.
27. Delcourt, C. *et al.* 2000. Light exposure and the risk of cortical, nuclear, and posterior subcapsular cataracts: the Pathologies Oculaires Liees a l'Age (POLA) study. Arch. Ophthalmol. 118: 385-392.
28. Taylor, H.R. 1999. Epidemiology of age-related cataract. Eye 13: 445-448.
29. Agalou, S. *et al.* 2003. Removal of advanced glycation end products in clinical renal failure by peritoneal dialysis and haemodialysis. Biochem. Soc. Trans. 31: 1394-1396.
30. Ahmed, N. *et al.* 2003. Methylglyoxal-derived hydroimidazolone advanced glycation end-products of human lens proteins. Invest. Ophthalmol. Vis. Sci. 44: 5287-5292.
31. Argirov, O.K., B. LIn & B.J. Ortwerth. 2004. 2-ammonio-6-(3-oxidopyridinium-1-yl)hexanoate (OP-lysine) is a newly identified advanced glycation end product in cataractous and aged human lenses. J. Biol. Chem. 279: 6487-6495.
32. Nagaraj, R.H. *et al.* 2003. Enhancement of chaperone function of alpha-crystallin by methylglyoxal modification. Biochemistry 42: 10746-10755.
33. Derham, B.K. *et al.* 2003. The molecular chaperone alpha-crystallin incorporated into red cell ghosts protects membrane Na/K-ATPase against glycation and oxidative stress. Eur. J. Biochem. 270: 2605-2611.
34. Pokupec, R. *et al.* 2003. Advanced glycation endproducts in human diabetic and nondiabetic cataractous lenses. Graefes Arch. Clin. Exp. Ophthalmol. 241: 378-384.

35. Cerami C., F.H. Nicholl, I. Mitsuhashi, *et al.* 1997. Tobacco smoke is a source of toxic reactive glycation products. Proc. Natl. Acad. Sci. USA 94: 15-20.

36. Nicholl, I.D. *et al.* 1998. Increased levels of advanced glycation endproducts in the lenses and blood vessels of cigarette smokers. Mol. Med. 4: 594-601.

37. Shichi, H. 2004. Cataract formation and prevention. Exp. Opin. Investig. Drugs 13: 691-701.

38. Saxena, P. *et al.* 2000. Transition metal-catalyzed oxidation of ascorbate in human cataract extracts: possible role of advanced glycation end products. Invest. Ophthalmol. Vis. Sci. 41: 1473-1481.

39. Bishop, P.N. 2000. Structural macromolecules and supramolecular organisation of the vitreous gel. Prog. Retin. Eye Res. 19: 323-344.

40. Sebag, J. *et al.* 1992. Biochemical abnormalities in vitreous of humans with proliferative diabetic retinopathy. Arch. Ophthalmol. 110: 1472-1476.

41. Stitt, A.W. *et al.* 1998. Advanced glycation end products in vitreous: Structural and functional implications for diabetic vitreopathy. Invest. Ophthalmol. Vis. Sci. 39: 2517-2523.

42. Hageman, G.S. *et al.* 2001. An integrated hypothesis that considers drusen as biomarkers of immune-mediated processes at the RPE-Bruch's membrane interface in aging and age-related macular degeneration. Prog. Retin. Eye Res. 20: 705-732.

43. Johnson, P.T. *et al.* 2003. Drusen-associated degeneration in the retina. Invest. Ophthalmol. Vis. Sci. 44: 4481-4488.

44. Hammes, H.P. *et al.* 1999. N (epsilon) (carboxymethyl) lysin and the AGE receptor RAGE colocalize in age-related macular degeneration. Invest. Ophthalmol. Vis. Sci. 40: 1855-1859.

45. Handa, J.T. *et al.* 1998. The advanced glycation endproduct pentosidine induces the expression of PDGF-B in human retinal pigment epithelial cells. Exp. Eye Res. 66: 411-419.

46. Handa, J.T. *et al.* 1999. Increase in the advanced glycation end product pentosidine in Bruch's membrane with age. Invest. Ophthalmol. Vis. Sci. 40: 775-779.

47. Farboud, B. *et al.* 1999. Development of a polyclonal antibody with broad epitope specificity for advanced glycation endproducts and localization of these epitopes in Bruch's membrane of the aging eye. Mol. Vis. 5: 11.

48. Li, Y.M. & D.W. Dickson. 1997. Enhanced binding of advanced glycation endproducts (AGE) by the ApoE4 isoform links the mechanism of plaque deposition in Alzheimer's disease. Neurosci. Lett. 226: 155-158.

49. Tabaton, M. *et al.* 1997. Is amyloid beta-protein glycated in Alzheimer's disease? Neuroreport 8: 907-909.

50. Hammes, H.P. *et al.* 1996. Modification of vitronectin by advanced glycation alters functional properties in vitro and in the diabetic retina. Lab. Invest. 75: 325-338.

51. Schutt, F. *et al.* 2003. Proteins modified by malondialdehyde, 4-hydroxynonenal, or advanced glycation end products in lipofuscin of human retinal pigment epithelium. Invest. Ophthalmol. Vis. Sci. 44: 3663-3668.

52. Moore, D.J., A.A. Hussain & J. Marshall. 1995. Age-related variation in the hydraulic conductivity of Bruch's membrane. Invest. Ophthalmol. Vis. Sci. 36: 1290-1297.

53. Okubo, A. *et al.* 2000. Ultrastructural changes associated with accumulation of inclusion bodies in rat retinal pigment epithelium. Invest. Ophthalmol. Vis. Sci. 41: 4305-4312.

54. Okubo, A. *et al.* 1999. The relationships of age changes in retinal pigment epithelium and Bruch's membrane. Invest. Ophthalmol. Vis. Sci. 40: 443-449.

55. Reber, F. *et al.* 2002. Alteration of the intracellular pH and apoptosis induction in a retinal cell line by the AGE-inducing agent glyoxal. Graefes Arch. Clin. Exp. Ophthalmol. 240: 1022-1032.

56. Albon, J. *et al.* 2000. Age related compliance of the lamina cribrosa in human eyes. Br. J. Ophthalmol. 84: 318-323.

57. Albon, J. *et al.* 1995. Changes in the collagenous matrix of the aging human lamina cribrosa. Br. J. Ophthalmol. 79: 368-375.

58. Aiello, L.P. *et al.* 1998. Diabetic retinopathy. Diabetes Care 21: 143-156.

59. UK Prospective Diabetes Study Group. 1998. Effect of intensive blood-glucose control with metformin on complications in overweight patients with type 2 diabetes (UKPDS 34). Lancet 352: 854-865.

60. Diabetes Control And Complications Trial Research Group. 1993. Hypoglycemia in the Diabetes Control and Complications Trial. Diabetes 46: 271-286.

61. Dolhofer-Bliesener, R., B. Lechner & K.D. Gerbitz. 1996. Possible significance of advanced glycation end products in serum in end-stage renal disease and in late complications of diabetes. Eur. J. Clin. Chem. Clin. Biochem. 34: 355-361.

62. Sell, D.R. *et al.* 1992. Pentosidine formation in skin correlates with severity of complications in individuals with long-standing IDDM. Diabetes 41: 1286-1292.

63. Sato, E. *et al.* 2001. Corneal advanced glycation end products increase in patients with proliferative diabetic retinopathy. Diabetes Care 24: 479-482.

64. Gardiner, T.A., H.R. Anderson & A.W. Stitt. 2003. Inhibition of advanced glycation end-products protects against retinal capillary basement membrane expansion during long-term diabetes. J. Pathol. 201: 328-333.

65. Hammes, H.P. *et al.* 1999. Differential accumulation of advanced glycation end products in the course of diabetic retinopathy. Diabetologia 42: 728-736.

66. Murata, T. *et al.* 1997. The relationship between accumulation of advanced glycation end products and expression of vascular endothelial growth factor in human diabetic retinas. Diabetologia 40: 764-769.

67. Schalkwijk, C.G. *et al.* 1999. Amadori albumin in type 1 diabetic patients: correlation with markers of endothelial function, association with diabetic

nephropathy, and localization in retinal capillaries. Diabetes 48: 2446-2453.

68. Stitt, A.W. *et al.* 1997. Advanced glycation end products (AGEs) co-localize with AGE receptors in the retinal vasculature of diabetic and of AGE-infused rats. Am. J. Pathol. 150: 523-531.
69. Hammes, H.P. *et al.* 1994. Aminoguanidine inhibits the development of accelerated diabetic retinopathy in the spontaneous hypertensive rat. Diabetologia 37: 32-35.
70. Sharma, N.K., T.A. Gardiner & D.B. Archer. 1985. A morphologic and autoradiographic study of cell death and regeneration in the retinal microvasculature of normal and diabetic rats. Am. J. Ophthalmol. 100: 51-60.
71. LU, M. *et al.* 1998. Advanced glycation end products increase retinal vascular endothelial growth factor expression. J. Clin. Invest. 101: 1219-1224.
72. Yamagishi, S. *et al.* 2002. Advanced glycation end products-induced apoptosis and overexpression of vascular endothelial growth factor in bovine retinal pericytes. Biochem. Biophys. Res. Commun. 290: 973-978.
73. Treins, C. *et al.* 2001. Regulation of vascular endothelial growth factor expression by advanced glycation end products. J. Biol. Chem. 276: 43836-43841.
74. Stitt, A.W. *et al.* 2000. Advanced glycation end products induce blood-retinal barrier dysfunction in normoglycemic rats. Mol. Cell. Biol. Res. Commun. 3: 380-388.
75. Antonetti, D.A. *et al.* 1999. Vascular endothelial growth factor induces rapid phosphorylation of tight junction proteins occludin and zonula occluden 1. A potential mechanism for vascular permeability in diabetic retinopathy and tumors. J. Biol. Chem. 274: 23463-23467.
76. Brownlee, M. *et al.* 1986. Aminoguanidine prevents diabetes-induced arterial wall protein cross-linking. Science 232: 1629-1632.
77. Hammes, H.P. *et al.* 1991. Aminoguanidine treatment inhibits the development of experimental diabetic retinopathy. Proc. Natl. Acad. Sci. USA 88: 11555-11558.
78. Kern, T.S. & R.L. Engerman. 2001. Pharmacological inhibition of diabetic retinopathy: aminoguanidine and aspirin. Diabetes 50: 1636-1642.
79. Kern, T.S. *et al.* 2000. Response of capillary cell death to aminoguanidine predicts the development of retinopathy: comparison of diabetes and galactosemia. Invest. Ophthalmol. Vis. Sci. 41: 3972-3978.
80. Agardh, E., B. Hultberg & C. Agardh. 2000. Effects of inhibition of glycation and oxidative stress on the development of cataract and retinal vessel abnormalities in diabetic rats. Curr. Eye Res. 21: 543-549.
81. Bolton, W.K. *et al.* 2004. Randomized trial of an inhibitor of formation of advanced glycation end products in diabetic nephropathy. Am. J. Nephrol. 24: 32-40.
82. Cooper, M.E. *et al.* 2000. The cross-link breaker, N-phenacylthiazolium bromide prevents vascular advanced glycation end-product accumulation. Diabetologia 43: 660-664.
83. Wolffenbuttel, B.H. *et al.* 1998. Breakers of advanced glycation end products restore large artery properties in experimental diabetes. Proc. Natl. Acad. Sci. USA 95: 4630-4634.
84. Vasan, S., P. Foiles & H. Founds. 2003. Therapeutic potential of breakers of advanced glycation end product-protein crosslinks. Arch. Biochem. Biophys. 419: 89-96.
85. Degenhardt, T.P. *et al.* 2002. Pyridoxamine inhibits early renal disease and dyslipidemia in the streptozotocin-diabetic rat. Kidney Int. 61: 939-950.
86. Stitt, A. *et al.* 2002. The Age inhibitor pyridoxamine inhibits development of retinopathy in experimental diabetes. Diabetes 51: 2826-2832.
87. Palla Suryanarayan *etal.* Effect of Curcumin induced cataractgenesis in rats. Molecular vision, 2003, 9; 223-230.

Management of Thyroid Eye Disease

Dr. E. Ravindra Mohan, MD, FRCS[1], **Dr. Malay Verma,** MS[1], **Dr. Charuta Bhadre,** MS, DO, DNB[2], **Dr. S. Meenakshi,** MS, FRCS[2]

Thyroid eye disease is an autoimmune disease producing symptoms related to inflammation, accumulation of fluid in the orbit and also to adipogenesis raising intraorbital pressure. The management strategies revolve around reducing this inflammatory response, providing symptomatic support and preventing complications.

Assessment of clinical activity as well as staging of the disease is of prime importance because it determines the management strategies, timing of intervention and is important for follow up. Different staging methods and classifications like Rundel's staging, Mourits scale and Werner's NOSPECS classification have been proposed but none of them are universally acceptable.

Medical Management

Basically thyroid eye disease consists of three different phases: - active, stable and burnt out. Medical management is tailored according to these phases. As far as prevention is concerned, the occurrence of the disease cannot be prevented however its progression can be arrested by avoiding smoking and controlling thyroid dysfunction with the help of the endocrinologist. [1] Smokers have more severe form of the disease as compared to non-smokers.[2] Smokers respond poorly to the treatment in a dose dependent manner.[3] Tertiary prevention (preventing complications) can be achieved by early diagnosis and institution of anti-inflammatory treatment.

[1] *Department of Orbit & Oculoplasty service, Medical and Vision Research Foundation, 18, College Road, Chennai – 600 006 India Tel: 91-044-28271616 E-Mail: drerm@snmail.org*

[2] *Department of Paediatric Ophthalmology, Medical and Vision Research Foundation, Sankara Nethralaya, 18, College Road, Chennai – 600 006 India, Tel: 91-044-28271616, Fax: 91-044-28254180, E-Mail: mrf@sankaranethralaya.org*

Before instituting any treatment, patients should be explained about the self-limiting nature of the disease, prolonged course over one or more years, non-availability of any immediate cure and the importance of follow-up.

Broadly management modalities are:

1. Supportive treatment
2. Steroids
3. Immunosuppressants
4. Radiotherapy
5. Antithyroid therapy
6. Others

Supportive treatment

Supportive treatment forms the mainstay of medical management in early stages of the disease. Aim is to reduce the dryness of eyes due to exposure, reduce morning lid edema and to prevent the progression of the disease.

Modalities

A. Artificial tear supplement : Gel preparations of tear supplements have the added advantage of reduced dosing while preventing any blurring of vision. Ointments can be used at bedtime.

B. Moisture chambers are used at night. These are commercially available. Alternatively they can be made simply from any clean transparent plastic or cellophane sheet available at stationary shops and can be pasted using strips of adhesive material. Direct taping of the eyes to avoid exposure keratopathy should be avoided as there is a risk of the tape getting

stuck to the already compromised cornea due to the lids opening up during sleep.

C. Head end of the bed can be elevated to reduce the accumulation of fluids which results in periorbital puffiness and increased symptoms in the mornings.

D. Spectacles are prescribed. Bifocal spectacles are avoided as limitation of ocular motility may prevent the eye from looking through the near segment. Fresnel prisms are prescribed for diplopia resultant from small angle deviations.[4] As a temporizing measure in cases with large angle strabismus waiting for surgery, occluders can be tried.

Steroids

Glucocorticoids are the mainstay of the therapy by virtue of their immunomodulatory and anti-inflammatory action. The beneficial role of corticosteroids in thyroid eye disease has been documented in early 1950s by Kinsell et al.[5] Brown et al used high doses of prednisone and reported good improvement in all the patients. [6]

Corticosteroids reduce the inflammation by reducing the cytokine synthesis and reduce the fibroblast activation. This reduces the mucopolysaccaride synthesis and reduces fluid accumulation.[4] They also reduce the irritation and the dull aching pain associated with eye movements thereby providing symptomatic relief to the patient. Steroids are reserved for cases with moderate to severe inflammation or in cases with compressive optic neuropathy. It is also used as a temporizing measure in cases that are waiting clearance for orbital decompression. Steroids are also used as a co-therapy with radiotherapy or immunosuppressants.

Steroids can be given orally as prednisolone 1- 1.5 mg/kg/day for 1 month and then tapered over 2-3 months. Several groups have used intravenous methylprednisolone (IVMP) as a pulse therapy.[7, 8] It is given as 500–1000 mg infusion in 500 ml of 5% dextrose or normal saline over 2 – 3 hours, daily for three days. IVMP is followed by oral steroids which is tapered over 4-6 weeks. The response to the treatment is evident within the first week.[9] However the pulse can be repeated after 6 weeks if required. The rationale behind using intravenous steroid is that it provides higher immunosuppressive dose with lesser side-effects.[7] Overall, the efficacy of corticosteroids by intravenous route is more than by oral route.[10] Apart from that, some studies have found that the response to steroids depends upon the duration of the disease. Better response is seen in conditions of recent onset.[7] Some studies have advocated titrating the steroid according to the thyroid status as there is reduced response to steroids in hyperthyroidism.[11]

Adverse effects noted with steroid therapy are peptic ulcer disease, weight gain, psychosis, aseptic necrosis, acne, hepatotoxicity and glucose intolerance. Oral antacids, H2 blockers and calcium supplements are warranted to prevent the risk of gastrointestinal bleeding. Monitoring of electrolytes and blood sugars is necessary as long term steroid therapy can cause potassium depletion and glucose intolerance.

Corticosteroids are contraindicated in hypertension, diabetes mellitus, peptic ulcer disease, tuberculosis, epilepsy and pregnancy. However in some of these conditions steroids can be used under strict monitoring if the benefits outweigh the risks.

Immunosuppressants

Immunosuppressives act by inhibiting the activation of cytotoxic T cells and by preventing cytokine synthesis. They also activate suppressor T cells. The immunoglobulin release by activated B lymphocytes is also reduced by them. They have been used to prevent relapse, co-therapy with steroids for nonresponsive cases and as a temporizing measure while awaiting definitive treatment.[12]

The various drugs used are Azathioprine 1-4 mg/kg/day in two divided doses, Cyclosporin A, 5-7 mg/kg for 4-12 months (maximum daily dose 5.0 mg/kg/day) or cyclophosphamide.[12, 13, 14]

The immunosuppressive agents are inferior to prednisolone in efficacy as a monotherapy. However the response is much better if given as a combination therapy with oral steroids.[11, 14] Combination therapy reduces the risk of relapse also.[15] Kahaly et al found that cyclosporine reduced the clinical activity of the disease faster if given after a course of high dose steroids. It also reduced the muscle thickness faster as evident on CT scan.[15] Immunosuppressive agents stabilize the condition faster thereby reducing the interval before corrective surgery.[12]

The adverse effects noted with cyclosporine therapy are hypertension, liver enzyme elevation, renal insufficiency, gum hypertrophy, hypertrichosis and paresthesias. With azathioprine bone marrow depression is the main concern. Other side-effects are rashes, nausea/vomiting, reversible jaundice and hyperuricemia.

Taking the medications after meals reduces the nausea and vomiting associated with it. Use of azathioprine is not recommended during pregnancy. . It may cause birth defects if *either the male or the female* is using it at the time of conception. Azathioprine passes into breast milk also so it is not recommended in nursing mothers. As the patient is immunosuppressed , use of or contact with people who had live vaccines should be avoided while on immunosuppressant therapy. Total leucocyte count and platelet counts should be done every 2 weeks in patients on azathioprine therapy. Azathioprine should be stopped if the total leucocyte count falls below 4,000/cmm and platelet count falls below 1,00,000/cmm. Patients on azathioprine should be instructed to report immediately if they notice petechiae or bruising which suggests bone marrow depression.

In patients on cyclosporine therapy, nephrotoxicity is the main concern. Serum creatinine should be routinely checked in such patients as baseline and subsequently. Feutren et al have suggested a maximal daily dose of 5 mg/day. The dose should be modified to prevent the serum creatinine from increasing above 30% of the baseline value.[16]

Antithyroid therapy

It is well known that control of hyperthyroidism can reduce the sign and symptoms of thyroid eye disease.[17, 18] However the modality of choice to achieve this still remains elusive. The thyroid function can be improved by antithyroid drugs or by radio-iodine therapy or total thyroidectomy. Carbimazole/methimazole (30-60mg/day for 12-18 months) and Propylthiouracil (300-450 mg/day in 3 divided doses) in cases of hyperthyroidism and thyroxin replacement therapy in a dose sufficient enough to suppress TSH, in hypothyroidism can be used.[19] The therapy can be given either by the Block-Replace regimen (where a higher dose of antithyroid drug is used with a replacement dose of thyroid hormone) or by the Titration regimen (where the antithyroid drug dose is reduced by titrating treatment against thyroid hormone concentrations). The Titration regimen is as effective as the Block-Replace regimen and has significantly lower incidence of adverse effects. The optimal duration of anti-thyroid drug therapy for the Titration regimen is 12–18 months.[19] Agranulocytosis is the main complication so total and differential leucocyte count should be done regularly. Patients having agranulocytosis often present with sore throat and the patient must be warned about this.

The role of radioiodine therapy or total thyroidectomy is controversial. The ophthalmopathy may worsen after radioiodine administration or thyroidectomy because of release of thyroid antigens and activation of the autoimmune response.[18] However total thyroidectomy and radioiodine therapy result in less potential for Major Review relapse of hyperthyroidism as compared to oral antithyroid drugs and require less visit to the clinics. Surgical treatment and radioiodine therapy can be considered in cases where the eye disease has not yet manifested or is in early stages. Oral steroids need to be added after the therapy.[20]

Radiotherapy

Radiotherapy as a treatment modality was tried when poorly focused rays directed to pituitary gland resulted in reduction of the thyroid eye disease.[21] Donaldson et al first described the use of orbital radiotherapy for thyroid eye disease. They found that nearly 65% of their patients showed good response to the treatment.[22] Later on several studies were conducted to assess its impact but a well-controlled study free from any confounding factor is lacking.

Radiotherapy is postulated to arrest the fibroblast activation and lymphocyte proliferation thereby reducing glycosaminoglycan deposition and inflammation.[23] It has been used in severe congestive phase, in compressive optic neuropathy prior to decompression, as a temporizing measure while awaiting definitive therapy or in patients in whom steroids are either contraindicated or who develop serious side effects of steroid therapy. Radiation therapy has also been used after surgical decompression if optic nerve function shows only mild improvement.

Radiotherapy is given in 8-10 daily fractions of 2 Gy each over a period of 2 weeks. It is preferable to use a

megavoltage linear accelerator for the delivery of well collimated, high energy beams. This delivers the dose exactly to the retro-orbital structures minimizing damage to the lens and the retina.[24]

The role of radiotherapy is still controversial. Maalouf et al found that following radiotherapy improvement of the amplitude of gaze and reduction of the thickness of extraocular muscles were not statistically significant even after a gap of 3 months.[25] However Mourits et al found that ocular dysmotility was the only factor which showed some response to radiotherapy.[26] Conditions where fibrosis has already set in are not responsive to radiotherapy.[27] Orbital inflammatory signs and symptoms are eliminated within weeks of the therapy when radiation is combined with oral corticosteroids. Optic nerve compression is alleviated within 1 month.[27] However there is minimal improvement in proptosis. The best response is seen if the treatment is started within 7-8 months of the onset of the disease when the patient is in congestive phase. Claridge et al noted that combined radiotherapy and immunosuppression using azathioprine and low dose steroids was able to control the disease most effectively.[28] Mourits felt that use of radiotherapy atleast enables the rehabilitative surgery like decompression and strabismus correction to be done at an earlier stage by controlling the disease activity.[29]

Radiotherapy usually results in an increase in irritation and inflammation due to the release of antigens after 2 weeks of the therapy hence concomitant oral steroids are needed that are tapered over 2-3 months. Radiotherapy is relatively contraindicated where vascular insufficiency in any form is present e.g. diabetes mellitus, vascular diseases and in children because of the risk of retinopathy.

Adverse effects noted with radiotherapy are usually limited to local irritation. The risk of cataract and retinopathy has reduced with better collimated beams avoiding unwanted radiation to the anterior orbit.

Other modalities

Various other modalities have been tried out but none of them have shown good response consistently hence, they are not universally accepted. They are:-

1. Somatostatin analogue like octreotide are postulated to reduce the lymphocyte proliferation and activation. However Wemeau et al didn't find any significant benefit after 16 weeks of therapy.[30]
2. Studies on the use of plasmapheresis have found mixed results. However all the studies are confounded by the fact that immunosuppressants have been used after the therapy. It is not being advocated for the treatment of thyroid eye disease as yet.[31, 32, 33]
3. Guanethidine eye drops in various concentrations to reduce lid retraction, lid lag and palpebral fissure width. However, due to a high frequency of local irritation and unpredictable effectiveness, this form of therapy is rarely encouraged today.[4]

Newer Modalities

1. Botulinum toxin in the dose of 5-10 IU as a single subconjunctival injection is now being used for eyelid retraction in patients on active inflammatory stage as a temporizing measure. Self-resolving ptosis and vertical diplopia are the adverse effects. The effect stays for 1-3 months**.**
2. Pentoxyphilline and nicotinamide are thought to reduce the cytokine synthesis. However their role in the treatment of thyroid eye disease is not well defined as yet and studies are on to better define their role in the treatment of thyroid eye disease.[4]

Special conditions

Pregnancy: Thyroid eye disease increases in severity in pregnancy. Most of the patients just require observation. However if compressive optic neuropathy develops then it is better to control with steroids. Steroids are safe in pregnancy. However they should be used when benefits outweigh risks. Surgical decompression and radiotherapy are best reserved till the delivery of the baby. Immunosuppressants are contraindicated in pregnancy. In severe, sight threatening conditions not responding to oral steroids, orbital decompression can be done as a last measure after explaining risks associated with general anesthesia.

Diabetes: Radiotherapy is contraindicated in diabetics. For severe congestive phase, steroids can be used as an extreme measure, with suitable modification in antidiabetic treatment and regular monitoring of blood sugar. Steroid sparing immunosuppressants can also be used with low dose steroids.

Follow-up

Most patients with thyroid eye disease can be observed over time; the follow-up interval and frequency will depend on the disease activity: every 2 months for severe disease and at 6 months interval for milder condition.

Disease activity is probably the prime determinant of response. Monitoring is particularly required for vision loss as a result of exposure keratopathy and optic neuropathy as well as for development of strabismus. At follow up, investigations should be tailored to screen these parameters. Visual field and color vision testing may help in early detection of visual loss. Ultrasonography is useful in cases with muscle enlargement; however CT scan is better able to pick up the 'nerve-at-risk' due to apical crowding. Thyroid function tests particularly free T4 and TSH are important for the assessment of thyroid status and activity. Anti-Thyroid stimulating hormone receptor antibodies are considered to be the most sensitive indicator of euthyroid Graves ophthalmopathy. Their levels in serum closely mimic the disease activity.[34]

Recommendations

Active phase:

I. Ocular discomfort, transient oedema and mild proptosis

1. Tear supplements
2. Non-Steroidal Anti-Inflammatory Drugs
3. Supportive treatment

II. Eyelid retraction, conjunctival oedema, ocular ache and moderate proptosis

1. Oral steroids for 4-8 weeks (or oral NSAIDS for 4-6 weeks).
2. Supportive treatment

III. Ocular motility disturbance with diplopia, chemosis and marked proptosis.

1. Oral prednisolone (starting with 1-1.5 mg/kg for 4 weeks and then tapering down over a further 8 weeks).
2. Steroid-sparing agents such as Azathioprine 50-150 mg/day or Cyclosporin A, 5-7 mg/kg for 4-12 months in cases with persistent diplopia.
3. Orbital radiotherapy is a controversial option.

IV. Optic nerve dysfunction with reduction of color vision and visual acuity loss.

1. Intravenous methyl prednisolone (0.5-1 gram/day for 3-5 days) followed by 1mg/kg oral steroid and/ or a steroid-sparing agent.
2. In cases of poor response 10 sessions of 2 Gy orbital radiotherapy should be considered.
3. In cases of persistent nerve compression, surgical orbital decompression with immunosuppression cover may be necessary.

Stable phase (stable condition for 5-6 months):

1. Review of patient's thyroid status.
2. Prismatic correction for diplopia.
3. Avoid smoking.
4. Lubricants if required

Burnt out phase (decreased signs and symptoms or stable for more than 5-6 months):

1. Selective or cosmetic orbital decompression (24mm proptosis or more)
2. Extra-ocular muscle surgery
3. Finally, eyelid surgery (levator recession, blepharoplasty).

Surgical Management

The majority of patients with thyroid eye disease do not need any form of surgical treatment, either for functional, or cosmetic reasons.

Broadly, the indications for surgical management are

- compressive optic neuropathy, severe orbital congestion or cosmetically unacceptable proptosis (orbital decompression surgery)
- intractable diplopia in functional positions of gaze (strabismus surgery)
- severe ocular discomfort or cosmetically unacceptable appearance resulting from eyelid retraction (eyelid surgery)
- sight threatening corneal exposure (tarsorrhaphy)

Surgery on patients with thyroid eye disease is challenging for many reasons. The presence of a serious multi system disease has important implications in terms of anesthesia risk and potential life threatening conditions like thyroid crisis / storm. In general, surgical

operations are performed on an elective basis in a patient who has been euthyroid for several months, with stable eye findings. In patients with serious optic nerve compression or exposure related to severe proptosis, however, this may not be possible and the decision regarding surgery often needs to consider the serious risks and the potential to preserve or improve vision.

In a small subset of patients, there may be need for more than one of the above mentioned types of operations. In such cases, the orbital surgery is performed first placing the eyeball in a more normal position within the bony orbit, followed by aligning the eyes better, and lastly correcting the eyelid position.

Each of the operations for thyroid eye disease – orbital, eyelid and strabismus is plagued by relative unpredictability of outcome. Hence, the techniques have evolved over time, and constant modifications and innovations characterize these operations, the aim of greater predictability being a driving force. Also, while these operations are based on fairly simple, mechanical principles of creating greater space for orbital soft tissues (orbital decompression), weakening eyelid retractors (eyelid retraction surgery) or weakening – strengthening of relevant extraocular muscles (strabismus surgery), the outcomes vary to a great extent and patient's education regarding this aspect is of immense importance. A brief review of each of these categories of surgical operations is presented.

Orbital Decompression Surgery

History

Dollinger is credited with the earliest reported orbital decompression, in 1911, removing the lateral wall. In 1931, the famous neurosurgeon Naffziger advocated orbital roof decompression. Sewall's approach, half a decade later was via an external ethmoidectomy. Hirsh, 1950 developed an inferior orbitotomy approach. In 1957, Walsh and Ogura used a transantral Caldwell – Luc approach, a procedure of choice for the next nearly four decades. In 1981, Mc Cord described the 'swinging eyelid' or canthoforniceal approach which has thence been promoted by Jack Rootman and other orbital surgeons. Since 1990, when Kennedy described the use of transnasal endoscopic approach, this technique has gained increasing popularity.[35]

Indications

Severe orbitopathy with optic nerve compression and risk of progressive visual loss has been the most important indication for orbital decompression surgery. As the techniques of surgery and safety of anesthesia have improved over time, with fewer complications, the indications for surgery presently include exposure related problems, orbital pain or related symptoms, unacceptable side effects of medical therapy and disfiguring proptosis. An increasing cosmetic awareness, and the demands of present day life have resulted in the cosmetic consideration being the sole indication for an increasing number of orbital decompression operations.

Approaches

Numerous ones have been described and practised. In the recent years, the trend has been in the direction of minimal scar visibility and the transconjunctival, transcaruncular approach is a widely preferred one.[36] In addition, the nasal endoscopic approach also has gained popularity.[37] Centres with specific interest and expertise persist with less used approaches like the transcoronal approach.[38] Incisions resulting in skin scarring are only occasionally used and the 'swinging eyelid' approach possibly is the single most used.

Walls

Techniques have been described for one-two-three and four wall bony orbital decompression. While orbital roof decompression and 4 wall decompression are very rarely used, if at all, at the other extreme, a single wall decompression is also rarely used. Effectively, most patients receive a two or three wall orbital decompression.

While controversies exist and opinions vary, the greater the extent of bone removed the greater is the degree of reduction in proptosis achieved.[39] The floor and medial wall are most commonly decompressed, while the role of lateral wall removal is being increasingly described for achieving maximal reduction in proptosis.[40]

The concept of a 'balanced decompression' involves the removal of lateral and medial walls, sparing the floor with the aim of limiting inferomedial globe displacement and consequent motility disturbance and diplopia.[41] The preservation of the inferomedial strut at the junction of maxillary and ethmoid sinuses is another surgical innovation with this end in mind.[42] Another

increasingly described modification involves deep sculpting of the lateral orbital wall in the area of the lacrimal gland fossa.

Soft tissue decompression

Fat removal orbital decompression (FROD) aims to reduce the increased intra orbital fat content, thereby achieving a degree of reduction of proptosis.[41] Fat removal is achieved through appropriate approaches to extra and intraconal fat. The operation is associated with lower motility disturbances than bone removal orbital decompression (BROD). Broadly speaking, while FROD is often combined with BROD, it's role, in isolation for achieving significant orbital decompression is rather limited, if at all.

Timing of surgery

In view of the serious risks associated with anesthesia and surgery in a patient with uncontrolled thyroid status, appropriate therapy, Endocrinologist opinion and clearance is essential prior to surgery. In progressive compressive optic neuropathy, the operation being a relatively early intervention in the interest of preservation of vision, stability of signs is not important. In surgery for other indications, e.g. Cosmetic, having stable findings and eye signs for a few months, six months or so, is vital to surgical decision making and success.

Complications

A large number of complications have been described including strabismus, infraorbital anesthesia, CSF rhinorrhea, nasolacrimal duct obstruction, oro-antral fistula, blindness and hypoglobus.[35] Other complications, depending on the approach used include complications associated with craniotomy, nasal endoscopic surgery, and general surgical complications eg. skin scarring, infection, bleeding.

Of these, the most common and troublesome is possibly persistent diplopia, strabismus and motility disorder. The management of this condition is a challenging one both for the strabismologist and the treating orbital surgeon.

Our technique

At Sankara Nethralaya, we have used a combined approach two wall, bony orbital decompression involving a canthoforniceal swinging eyelid approach for the removal of the floor or lateral wall, and a nasal endoscopic approach by an Otorhinolaryngologist for the medial wall.

In our initial series of cases, 12 orbits in 7 patients underwent combined approach orbital decompression with a mean reduction in proptosis of 5.72 mm, no major surgical complications, and excellent cosmesis. In 10 orbits of 6 patients with compressive optic neuropathy, vision improved in 8 eyes and was maintained in 2 eyes and a mean proptosis reduction of 6.88 mm was achieved . Disc edema resolved and visual field defects improved in all cases.

Eyelid surgery

Eyelid retraction, the commonest cause of which is thyroid eye disease, involves the displacement of the eyelids towards the respective superior or inferior orbital rim, exposing sclera between the corneal limbus and the eyelid margin.

Apart from the obvious cosmetic blemish and startled, staring appearance it confers on the affected patient, lagophthalmos resulting in symptoms of corneal and ocular surface irritation and leading to sight threatening exposure keratitis can result from eyelid retraction.A lateral 'flare' is commonly seen in eyelid retraction resulting from thyroid eye disease.

Milder degrees of eyelid retraction are managed conservatively with lubricants and avoidance of exposure to dust, smoke, bright sunlight etc. Surgical correction is performed for significant degrees of eyelid retraction. Except for the rare patient who needs the operative correction on an urgent basis for corneal exposure related problems, the surgical correction is

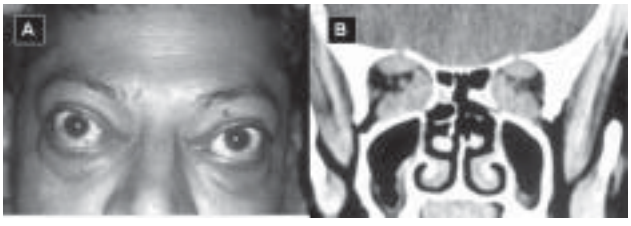


Fig. 1. A. Preoperative photograph of a patient showing proptosis, eyelid retraction and conjunctival congestion in both eyes. B. Preoperative coronal CT scan of the patient showing bilateral enlargement of the extraocular muscles producing apical crowding.

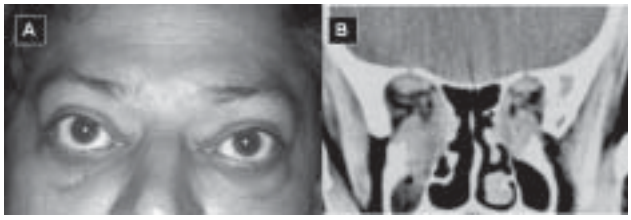


Fig. 2. A. Postoperative photograph of the patient in figure 1 showing reduction in the proptosis and resolution of lid retraction and conjunctival congestion. B. Postoperative coronal CT scan of the patient showing the reduction in the apical crowding and increased volume of the orbit following two wall decompression surgery.

an elective procedure performed in a patient with stable findings preferably for six months or more. [43]

Upper eyelid retraction

Broadly the operations for correction of upper eyelid retraction are

i) Excision or recession of Mullers' muscle

ii) Recession of levator aponeurosis

iii) Myotomy of levator muscle

iv) Insertion of a spacer material between the distal end of levator aponeurosis and the tarsal place. [43]

Lower eyelid retraction

Treatment involves tightening of the eyelid lateral canthal unit combined with grafting of a spacer material between the lower eyelid retractors and inferior tarsal border. Autogenous materials used include hard palate mucosa, auricular cartilage and fascia lata. While preserved sclera and banked fascia lata have also been used, the inflammatory reaction is greater. Spacer material made of porous polyethylene (Medpor) has been used but the superficial location of its implantation in a mobile organ makes functional and cosmetic success a challenge.

Non surgical management

In addition to lubricants medications, a variety of moisture retaining techniques are used including swim goggles, moisture chambers, punctal plugs and temporary tarsorrhaphy. In addition, while guanethidine was reported as being useful as a topical drug effective in treatment of milder forms of eyelid retraction, its lack of availability and side effects have limited its use. Botulinum toxin is also useful in chemical reversal of upper lid retraction.

Upper Eyelid Retraction – Surgical Correction

- **Levator recession:** Usually performed through a conjunctival approach and combined with a Mullerectomy. A skin approach via lid crease incision is used as a alternative. Precautions taken during surgery include avoiding use of epinephrine in any form, avoidance of patient sedation and use of a traction suture to keep the lid on a stretch in the early postoperative period.
- **Marginal myotomy:** This involves the making of incisions in the levator aponeurosis much in the fashion of such operations used in strabismus surgery as a weakening procedure.

Spacers

These are used for greater degrees of eyelid retraction and for revision operations and are needed for retraction of more than 3 mm. Spacers can be introduced through an anterior or posterior approach after performing a levator recession.

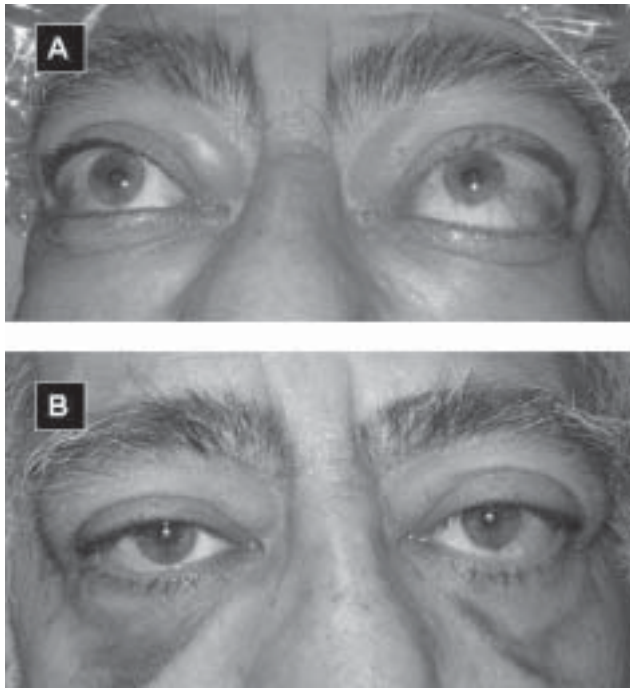


Fig. 3. Photograph of a 55 year old patient showing reduction in soft tissue changes and proptosis following three wall orbital decompression surgery. (A- preoperative, B- 1 week postoperative stage)

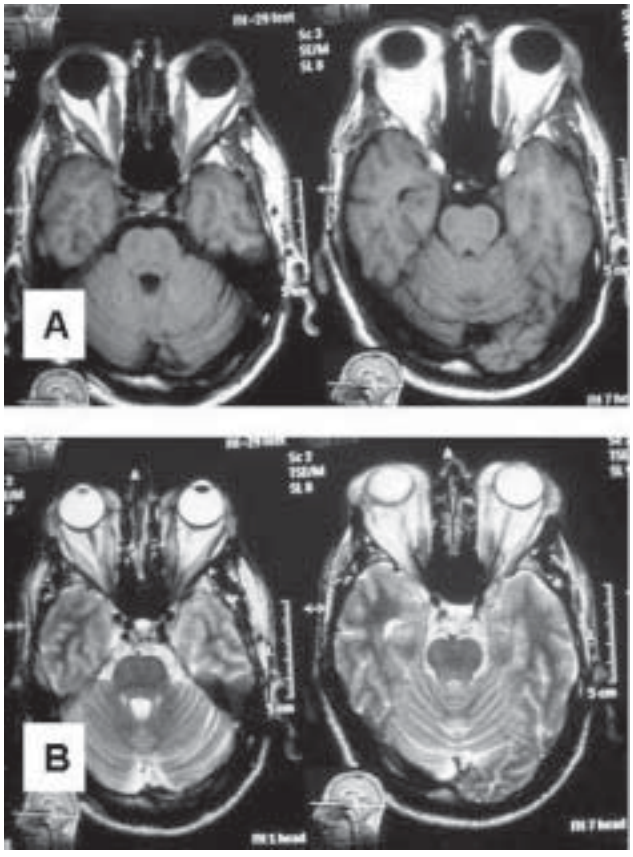


Fig. 4. Preoperative axial MRI scan(A- T1WI, B- T2WI) of the patient in Figure 3 showing the enlargement of the extraocular muscles and the optic nerve compression.

All the operations described above have complications of a similar nature – under correction, overcorrection, lid contour abnormalities, scaring persistent edema, corneal complications resulting from exposure or suture knot contact. [43]

Since postoperative under correction is almost a rule, the target eyelid position at the end of surgery is an overcorrection by 2 mm or so.

Strabismus in thyroid eye disease

Grave's Disease is an autoimmune disease in which there is inflammation of extraocular muscles.

Pathogenesis

Genetically abnormal suppressor T-cells fail to abort proliferation of abnormal plasma cells, leading to production of auto-antibodies. These cause target somatic cells like the extraocular muscles to be coated with auto-immune complexes that cause stimulation of fibroblasts. These in turn release muco-polysaccharides and collagen which causes hypertrophy of muscles with degeneration of muscles fibres. The site of involvement is the muscle belly. The tendon is spared. [44]

Phases of the disease

1. Acute phase – in this initial phase there is lymphocytic infiltration of the muscles, leading to their enlargement, especially posteriorly. This leads to increased muscle tension and decreased elasticity, which in turn causes muscle dysfunction.

2. Chronic/ Cicatricial phase - there is quiescence of inflammation with replacement of muscle fibres by fibrous tissue, leading to secondary contracture, inability to relax and restrictive strabismus. [45]

Frequency of involvement of muscles

In decreasing order of frequency – Inferior rectus, Medial rectus, Superior rectus, Lateral rectus. [46]

It is postulated that the reason for the most frequent involvement of inferior rectus may be due to the proximity between the inferior rectus and oblique muscles with each other and with the ligament of Lockwood. Inflammation causes anomalous connections between them, causing restriction.

The oblique muscles are rarely involved. There are reports in literature of superior oblique involvement in thyroid ophthalmopathy. [47]

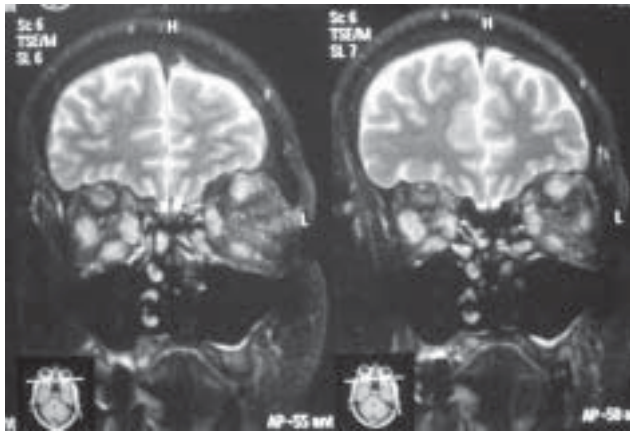


Fig. 5. Coronal MRI scan of the same patient as in Figure 3 showing the enlargement of the extraocular muscles and active disease.

Clinical features:

Symptoms

i) Diplopia : Insidious onset

ii) Asthenopia

iii) Staring look

iv) Pain on ocular movements : in initial phase

Signs

i) Periorbital oedema

ii) Lid retraction especially on upgaze : due to spill over of the increased innervation required by superior rectus to counteract tight inferior rectus.

Restrictive strabismus

It is usually bilateral, but may be unilateral or asymmetric. Most common form is vertical strabismus with hypotropia of involved eye, with small degree of excyclotorsion and esotropia due to involvement of inferior rectus. It is incomitant with greatest deviation in upgaze. It may occur in absence of other thyroid eye signs. Esotropia may be due to inferior rectus involvement itself, or if large may be due to involvement of the medial rectus. This can be assessed intra-operatively by a forced duction test for abduction after recession of the inferior rectus.

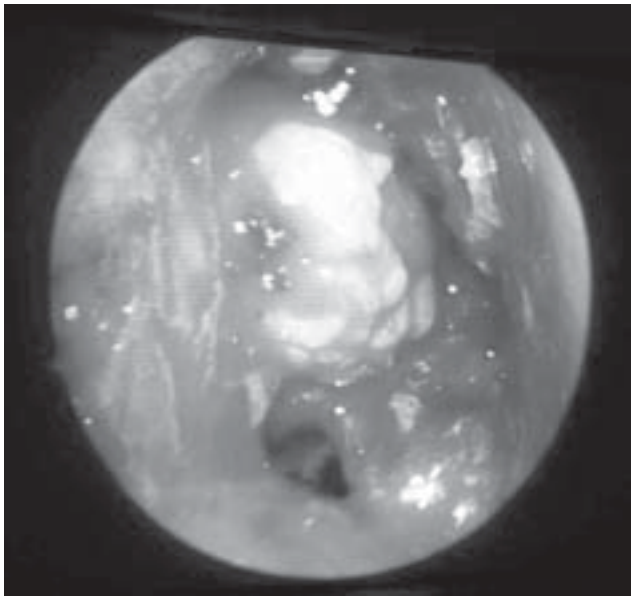


Fig. 6. Endoscopic image of the right nasal cavity showing the prolapsed orbital fat in the nasal cavity following endoscopic medial wall orbital decompression.

Ocular motility findings

In decreasing order of frequency, there is limited elevation, limited abduction, limited depression and limited adduction. Restriction is described as "leash-like" as the eye rotates fairly well upto a point where marked restriction is encountered. Saccades are less conjugate than normals. Paresis of lateral rectus may co-exist due to pressure on nerve supply to muscle from enlargement of muscle cone. Limited motility may come even before the onset of proptosis.

Special tests

Increased intra-ocular pressure on upgaze is not reliable as it can occur in normals also. Forced duction test is positive for inferior rectus. Force generation test and tensilon tests are performed if the restrictive component does not fully explain the ocular motility deficit. CT Scan of the orbits is an essential investigation in the assessment of thyroid eye disease.

Treatment

In the acute phase, treatment includes the following:

1. Systemic steroids
2. Immunosupressive therapy: Cyclophosphamide, Azathioprine, Cyclosporine
3. Radiotherapy : it is not much effective in improving restrictive strabismus.
4. Prisms: These can be used as a temporary measure. If the deviation is less than 12-14 prism diopters (PD) prisms can be ground into the glasses, vertical and horizontal into each lens. If the deviation is larger Fresnel prisms can be used. Problems in prescribing prisms are the incomitance of the deviation in different positions of gaze, variability of deviation with time, decreased visual acuity with prisms of larger power.
5. Occlusion (Segmental/ Complete): Frosted glasses can be prescribed if prisms are not tolerated.
6. Botulinum toxin: It has been found to be effective in acute stage and may allow patient to regain fusion. In chronic stage it is not effective.

Surgical principles

In the chronic phase, surgery is contemplated only when the acute phase has subsided and the deviation has been stable for at least 6 months. Earlier surgery

can lead to exacerbation of inflammation, post-operative complications and improper alignment. Orbital decompression if required should be performed before strabismus surgery. 2/3rd patients with motility restriction ultimately require surgery. Aim of surgery is to restore single binocular vision in those positions of gaze which are functionally important for the patient, most commonly primary position and downgaze; and some increase in the range of rotation. It is not to restore full range of versions. It is important for the patient and clinician to have realistic expectations to avoid late over-corrections. Recessions are the surgery of choice. Resections will cause further restriction of motility. If hypotropia in primary position is less than 15PD, ipsilateral inferior rectus recession can be performed. About 3PD of correction can be expected from 1mm of recession. If hypotropia in primary gaze is more than 18-20PD, inferior rectus recession of more than 5mm may be required. In severe cases recession of contralateral superior rectus is performed.

An under-correction is aimed at as there is 50% chance of late over-correction after 4-6 weeks.

Adjustable sutures are preferred due to the unpredictability of the results. There are several studies in literature showing it as an effective technique.[48, 49] However late over-corrections have been observed with adjustable sutures due to loss of strength of the suture allowing the tight muscle to retract posteriorly. Some authors did not find any advantage of adjustable over non-adjustable sutures.[50] Randomized control trials will be required to reach a conclusion in this respect. Inferior rectus should be separated nicely from ligament of Lockwood to avoid lid retraction. This may however be difficult due to the tightness of the muscle. If there is excessive tightness recession can be performed on hang-back suture. Recession of conjunctiva and tenon's capsule should be performed in long-standing cases. Small esotropia and excyclotorsion gets corrected by inferior rectus recession alone. For significantly limited abduction large recession of medial rectus is performed. If alignment is good immediate post-operatively, a satisfactory long term outcome is more likely. 40% cases require re-surgery. Further muscles may get involved. In bilateral cases asymmetrical bilateral inferior rectus recession can be performed. Subconjunctival injection of steroids decrease scarring.

Post-operative complications

Over-correction can cause asthenopia in downgaze. Prisms can help. If significant, recession of contralateral superior rectus or advancement of ipsilateral inferior

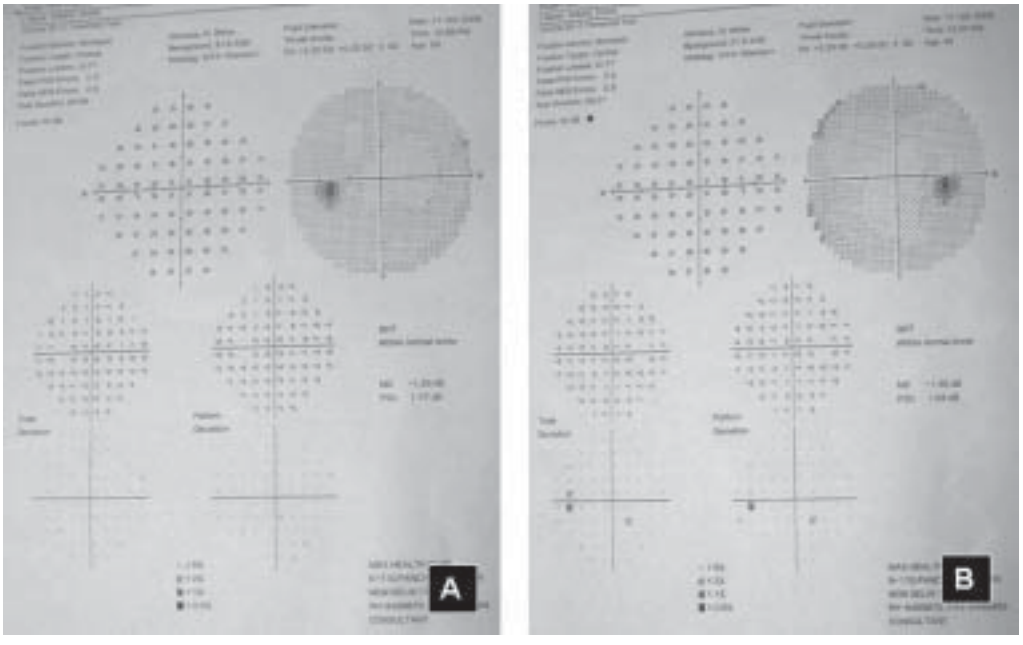


Fig. 7. Baseline visual fields of the patient in figure 3 showing normal fields bilaterally prior to onset of compressive optic neuropathy. (Humphrey visual field analyzer, 30-2 strategy).

rectus is performed. Under-correction is treated with re-recession of ipsilateral inferior rectus if initial recession is small. Otherwise recession of contralateral superior rectus is performed.

Marked post-operative inflammation is treated with steroids. Late slippage of inferior rectus is prevented by using non-absorbable adjustable sutures. Lower lid retraction is due to recession of tarsal attachment of lower lid retractors. It can be avoided by proper separation and suturing of retractors to sclera. A-pattern exotropia may be seen after bilateral inferior rectus recession due to weakening of adduction in downgaze. It can be prevented by displacing each inferior rectus insertion nasally by ½ -1 tendon width.

Challenges in Management

The majority of patients with thyroid eye disease have mild, self limited disease needing supportive therapy and simple measures for treatment. It is the smaller population of patients with moderate and severe disease who need aggressive management. Thyroid eye disease is one of the few conditions in ophthalmology where most of the subspecialities of ophthalmology have to work in tandem for optimal management. The oculoplastic and orbital surgeon, neuro-ophthalmologist, glaucomatologist, strabismologist, and corneal surgeon need to be variably involved in the management of this complex, ill understood disorder. This need for a team care approach with close coordination poses one of the challenges in the management of moderate to severe thyroid eye disease.

Since the underlying cause of thyroid eye disease is only slowly being unraveled, with a still unclear understanding of the exact pathophysiology of the disease, the management remains essentially symptomatic. Being so, patients need close follow up, particularly during the active phase of the disease. The steps of management are hence, in a manner of speaking, reactive rather than proactive. The lag between disease damage onset, and appropriate steps in management determines tissue injury and complications of thyroid eye disease. The avoidance of this lag, and consequent complications, poses yet another challenge in the management of thyroid eye disease.

A third, and a serious challenge posed by the disease concerns the treatment modalities available. Moderate and severe thyroid eye disease is treated with oral or intravenous steroids, antimitotic chemotherapy,

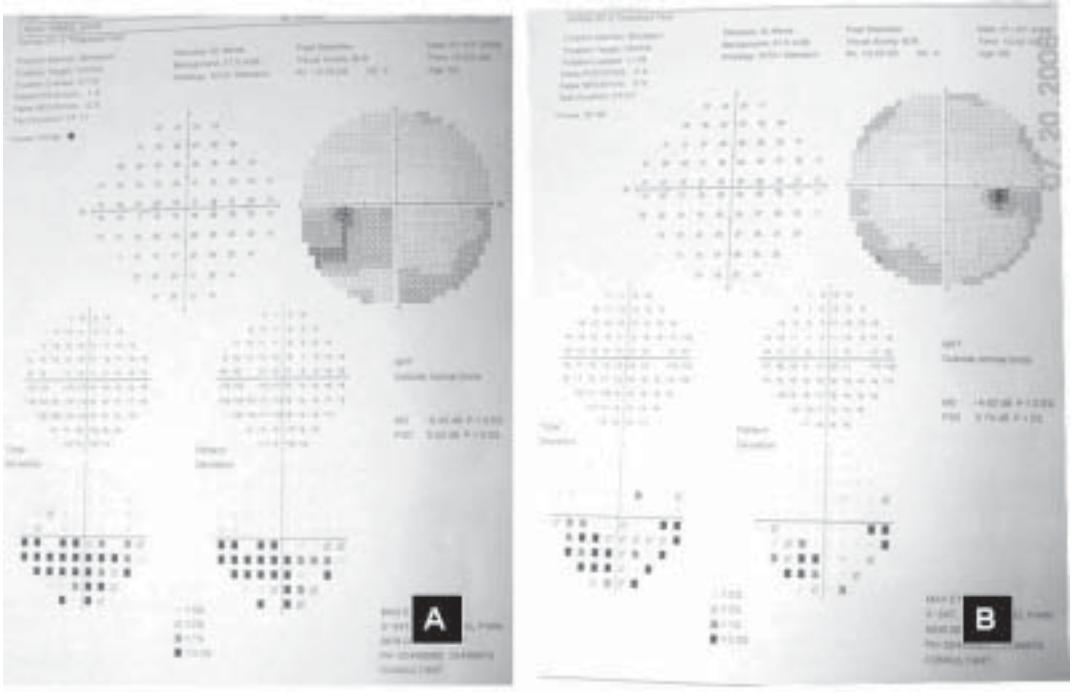


Fig. 8. Preoperative visual fields of the patient in figure 3 showing inferior visual field defects bilaterally suggestive of compressive optic neuropathy. (Humphrey visual field analyzer, 30-2 strategy).

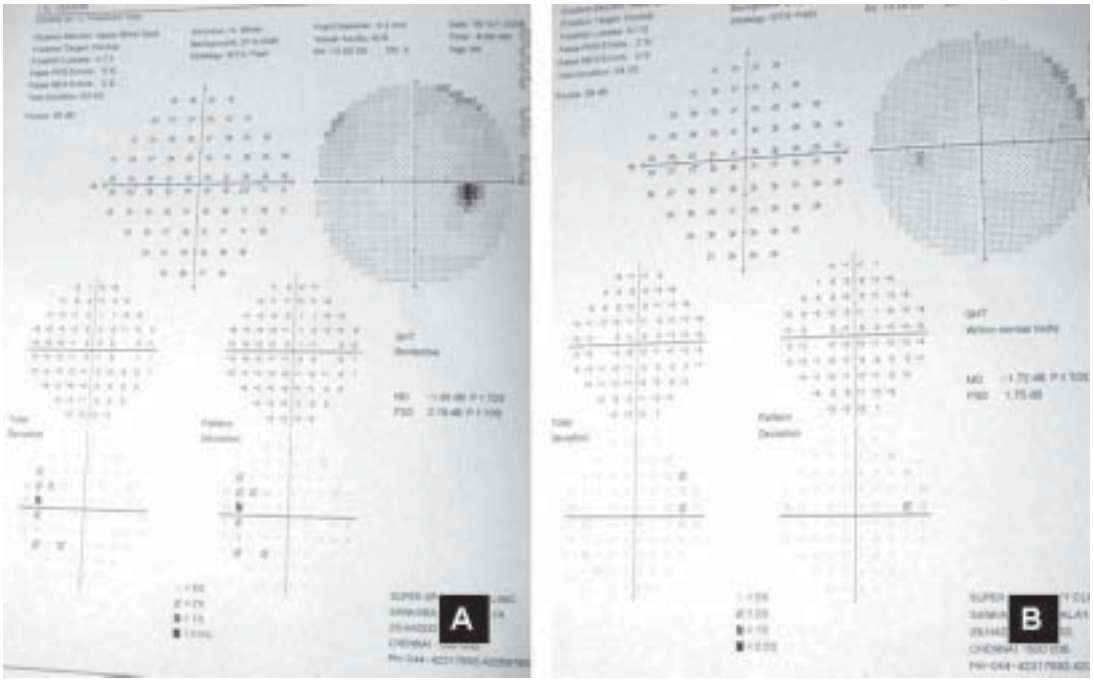


Fig. 9. Postoperative visual fields of the patient in figure 3, 1 week following three wall orbital decompression showing marked improvement. (Humphrey visual field analyzer, 30-2 strategy).

radiation therapy or orbital decompression surgery or a combination of these forms of treatment. Each of these poses hazards to the patient in the form of serious systemic side effects or local (orbital) problems or a combination. Judicious selection of the modality of treatment importantly involves the weighing in of this factor of potential risks.

Yet another challenge is the unpredictability of treatment outcome. In addition to disease severity, the individual response to treatment also varies greatly and hence, the need to customize and individualize treatment.

The fifth challenge in the management of thyroid eye disease of moderate to severe nature is the inevitability of sequelae. These range from functional problems like diplopia to a cosmetic appearance of 'stare' and 'bulgy eyes'. Hence patients with sequelae need prolonged follow up, long after the active phase of thyroid eye disease is over.

Lastly, and importantly, patients with the more severe forms of thyroid eye disease are seriously affected psychologically. The striking changes in their facial features, double vision and the real risk of loss of vision and blindness, is seriously disturbing to the patient and close family. Added to this are the difficulties in continuing with gainful employment, and in fruitful social interactions. The side effects of treatment, frequent need for hospital visits and financial loss compounds the psychological problems. Serious depression is a real risk. The treating ophthalmologist needs to provide a caring and supportive role for these disturbed patients. [51]

References

1. Wiersinga WM, Bartalena L. Epidemiology and prevention of Graves' ophthalmopathy. Thyroid, 2002;12(10):855-60.
2. Shine B, Fells P, Edwards OM, Weetman AP. Association between Graves' ophthalmopathy and smoking. Lancet,1990; 335:1261–1263
3. Eckstein A, Quadbeck B, Mueller G, Rettenmeier AW, Hoermann R, Mann K, et al. Impact of smoking on the response to treatment of thyroid associated ophthalmopathy. Br J Ophthalmol, 2003;87(6):773-6.
4. Ing E, Bednarczuk T. Thyroid Ophthalmopathy. *http//: www.emedicine.com.* Accessed on 6th December, 2005.
5. Kinsell LW, Partridge JW, Foreman N. The use of ACTH and cortisone in the treatment and in the differential diagnosis of malignant exophthalmos: a preliminary report. Ann Intern Med,1953; 38:913-917.
6. Brown J, Coburn JW, Wigod RA, Hiss JM, Dowling JT. Adrenal steroid therapy of severe infiltrative ophthalmopathy of Graves' disease. Am J Med 1963; 34:786-794.

7. Kendall-Taylor P, Crombie AL, Stephenson AM, Hardwick M, Hall K . Intravenous methylprednisolone in the treatment of Graves' ophthalmopathy. Br Med J 1988; 297:1574-1578.
8. Guy JR, Fagien S, Donovan JP, Rubin ML. Methylprednisolone pulse therapy in severe dysthyroid optic neuropathy. Ophthalmology, 1989; 96:1048-1053.
9. Hart RH, Kendall-Taylor P, Crombie A, Perros P. Early response to intravenous glucocorticoids for severe thyroid-associated ophthalmopathy predicts treatment outcome. J Ocul Pharmacol Ther, 2005; 21(4): 328-36.
10. Bartalena L, Marcocci C, Tanda ML, Piantanida E, Lai A, Marino M, et al. An update on medical management of Graves' ophthalmopathy. J Endocrinol Invest. 2005;28(5):469-78.
11. Frey F.J., Horber F.F., Frey B.M. Altered metabolism, decreased efficacy of prednisolone, prednisone in patients with hyperthyroidism. Clin Pharmacol Ther, 1988; 44:510-521.
12. Prummel MF, Mourits MP, Berghout A, Krenning EP, van derGaag R, Kornneef L, et al. Prednisone and cyclosporine in the treatment of severe Graves' ophthalmopathy.N Engl J Med, 1989; 321:1353-1359.
13. Burrow GN, Mitchell MS, Howard RO, Morrow LB. Imunosuppressive therapy for the eye changes of Graves' disease. J Clin Endocrinol, 1970;31:307-311.
14. Wall JR, Strakosch CR, Fang SL, Ingbar SH, Braverman LE. Thyroid binding antibodies and other immunological abnormalities in patients with Graves' ophthalmopathy: effect of treatment with cyclophosphamide. Clin Endocrinol, 1979; 10:79-91.
15. Kahaly G, Schrezenmeir J, Krause U, Schweikert B, Meuer S, Muller W, et al. Ciclosporin and prednisone in treatment of Graves' ophthalmopathy: a controlled, randomized, prospective study. Eur J Clin Invest, 1986; 16:415-422.
16. Feutren G, Mihatsch MJ. Risk factors for cyclosporine induced nephropathy in patients with autoimmune diseases.N Engl J Med, 1992; 326:1654-1660.
17. Prummel MF, Wiersinga WM. Medical management of Graves' ophthalmopathy. Thyroid, 1995;5(3):231-4.
18. Prummel MF, Wiersinga WM, Mourits MP, Koornneef L, Berghout A, van der Gaag R. Effect of abnormal thyroid function on the severity of Graves' ophthalmopathy. Arch Intern Med. 1990 May; 150(5): 948-50.
19. Abraham P, Avenell A, Park CM, Watson WA, Bevan JS. A systematic review of drug therapy for Graves' hyperthyroidism. European Journal of Endocrinology, 2005;153: 489-498.
20. Marcocci C, Bartalena L, Bogazzi F, Bruno-Bossio G, Pinchera A. Relationship between Graves' ophthalmopathy and type of treatment of Graves' hyperthyroidism. Thyroid, 1992;2(2):171-8.
21. Dobyns BM. Present concepts of the pathogenesis of exophthalmos. J Clin Endocrinol, 1950; 10:1202-1230.
22. Donaldson SS, Bagshaw MA, Kriss JP. Supervoltage radiotherapy for Graves' ophthalmopathy. J Clin Endocrinol Metab 1973;37:276–85.
23. Kimberley P Cockerham, John S Kennerdell. Controversies In Ophthalmology: Does radiotherapy have a role in the management of thyroid orbitopathy? View 1. British Journal of Ophthalmology 2002;86: 102-107
24. Char DH. Thyroid eye disease: Natural history, response to hyperthyroidism treatment. In: Char DH (ed) Thyroid Eye Disease, 1990. Churchill Livingstone Inc, New York, pp 111-122.
25. Maalouf T, Angioi-Duprez K, Beckendorff V, Malet T, George JL, CHU Nancy-Brabois, et al. Effects of external orbital radiotherapy on the oculomotor muscle in Graves disease. J Fr Ophtalmol, 1996;19(12):748-54.
26. Mourits MPh, Van Kempen-Harteveld ML, García García MB, et al. Radiotherapy for Graves'orbitopathy: randomised placebo-controlled study. Lancet 2000; 355: 1505–9.
27. Hurbli T, Char DH, Harris J, et al. Radiation therapy for thyroid eye diseases. Am J Ophthalmol 1985; 99: 633–7.
28. Claridge KG, Ghabrial R, Davis G, Tomlinson M, Goodman S, Harrad RA, et al. Combined radiotherapy and medical immunosuppression in the management of thyroid eye disease.Eye. 1997;11 (Pt 5):717-22.
29. Mourits MPh. Controversies In Ophthalmology: Does radiotherapy have a role in the management of thyroid orbitopathy? View 2. British Journal of Ophthalmology 2002;86:102-107.
30. Wemeau JL, Caron P, Beckers A, Rohmer V, Orgiazzi J, Borson-Chazot F, et al. Octreotide (long-acting release formulation) treatment in patients with graves' orbitopathy: clinical results of a four-month, randomized, placebo-controlled, double-blind study. J Clin Endocrinol Metab. 2005 Feb;90(2):841-8.
31. Kelly W, Longson D, Smithard D, Fawcitt R, Wensley R, Noble J, et al. An evaluation of plasma exchange for Graves' ophthalmopathy. Clin Endocrinol (Oxf), 1983; 18:485-493.
32. Glinoer D, Schrooyen M. Plasma exchange therapy for severe Graves' ophthalmopathy. Horm Res, 1987; 26:184-189.
33. Berlin G, Hjelm H, Lieden G, Tegler L. Plasma exchange in endocrine ophthalmopathy. J Clin Apheresis, 1990; 5:192-196.
34. Eckstein AK, Plicht M, Lax H, Hirche H, Quadbeck B, Mann K, et al. Clinical results of anti-inflammatory therapy in Graves' ophthalmopathy and association with thyroidal autoantibodies. Clin Endocrinol (Oxf). 2004 Nov;61(5):612-8.
35. Siracuse – Lee DE, Kazim M: Orbital decompression: Current concepts. Curr opin ophthalmol 2002, 13: 310-316.
36. Perry JD, Kadakia A, Foster JA. Transcaruncular Orbital Decompression for Dysthyroid Optic Neuropathy. Ophthal Plast Reconstr Surg 2003;19(5):353-358.
37. White WA, White WL, Shapiro PE. Combined Endoscopic Medial and Inferior Orbital Decompression

with Transcutaneous Lateral Orbital Decompression in Graves' Orbitopathy. Ophthalmology 2003; 110: 1827-1832.

38. Cruz AAV, Lema VR. Orbital Decompression: A comparison between Trans-Fornix/Transcarunculur Inferomedial and Coronal Inferomedial Plus Lateral Approaches. Ophthal Plast Reconstr Surg 2003; 19(6); 440-445.
39. Kikkawa D.O, Pornpanich K, Cruz RC et al: Graded orbital decompression based on severity of proptosis. Ophthalmology 2002; 109: 1219-1224.
40. Bailey KL, Tower RN, Dailey RA. Customized, Single-Incision, Three-wall Orbital Decompression. Ophthal Plast Reconstr Surg 2005; 21(1):1-10.
41. Unal M, Ileri F, Konuk O et al – Balanced Orbital Decompression Combined with Fat Removal in Graves' Ophthalmopathy. Do we Really Need to Remove the Third Wall? Ophthal Plast Reconstr Surg 2003; 19(2): 112-118.
42. Kim JW, Goldberg RA, Shorr N: The Inferomedial Orbital Strut. Ophthal Plast Reconstr Surg 2002; 18(5): 355-364.
43. Karesh JW. Eyelid Retraction: Evaluation, Management and Treatment. In J A Mauriello (Ed). Unfavouable Results of Eyelid and Lacrimal Surgery. Prevention and Management . : Butterworth –Heinemann, 2000;275
44. Kenneth W. Wright. Complex Strabismus: Restriction, Paresis, Dissociated Strabismus, and Torticollis. In: Kenneth W. Wright, Peter H. Spiegel, editors. Pediatric Ophthalmology And Strasbismus. 2nd ed. New York: Springer-Verlag, Inc.;2003. pp. 250-77.
45. Henry S. Metz. Strabismus related to Grave's Ophthalmopathy. In: Arthur L. Principles & Surgical Techniques. W.B. Saunders Company; 1999. pp. 285-95.
46. Gunter K. von Noorden, Emilio C. Campos. Binocular Vision and Ocular Motility. Theory and Management of Strabismus. 6th ed. St. Louis, Missouri: Mosby, Inc.; 2002.
47. Thacker NM, Velez FG, Demer JL, Rosenbaum AL. Superior oblique muscle involvement in thyroid ophthalmopathy. J AAPOS 2005;9(2):174-8.
48. Kose S. Uretmen O, Emre S, Pamukcu K. Recession of inferior rectus muscle under topical anesthesia in thyroid ophthalmolopathy. J Pediatr Ophthalmol Strabismus 2002; 39(6):331-5.
49. Sharma P, Reinecke RD. Single stage adjustable strabismus surgery for restrictive strabismus. J AAPOS 2003;7(5):358-62.
50. Bishop F, Doran RM. Adjustable and non-adjustable strabismus surgery: a retrospective case-matched study. Strabismus 2004;12(1):3-11.
51. E Ravindra Mohan, Challenges in management. Insight 2005;23(2):3-5. [editorial]

MINOR REVIEW

IOL Power Calculation for Pediatric Cataract

Rupal H. Trivedi, MD, M.S.C.R.*, **M. Edward Wilson, Jr.,** MD

Calculating and selecting an "optimum" intraocular lens (IOL) power for the small eye of a growing child presents unique challenges. The need to implant a fixed-power lens into an eye that is still growing makes it difficult to chose an "optimum" IOL power that best benefits the child's eye. The younger the child at the time of surgery, the more difficult is the problem. This is a challenging task to the ophthalmologist of the industrial countries, but probably more so for the ophthalmologist in the developing world setting. The lack of instrumentation in many of the developing world operating-room settings, such as the handheld keratometer and the A-scan ultrasound, increases the difficulty of calculating the IOL power to use for pediatric cataract surgery. Even with the availability of the A-scan and automated keratometer in the operating room, small eyes of children possess unique challenges when calculating an IOL power. Also remember, we are using formulas that were originally designed for adult eyes.

Implanting an IOL at the calculated emmetropic power in children risks significant myopia at ocular maturity.[1-12] For each individual case the IOL power needs be customized based on many characteristics including the age, laterality (one eye or both), amblyopia status (dense or mild), likely compliance with glasses, and family history of myopia. Herein again, the developing world ophthalmologist faces additional challenges. Many patients present relatively late in their disease, and already have dense amblyopia. In addition, compliance to amblyopia therapy and required regular follow-up are also issues of concern. Thus, besides calculation, selecting an IOL power is also much more challenging to the ophthalmologist in the developing world setting.

* *Corresponding author: MUSC - Storm Eye Institute, 167 Ashley Avenue, Charleston, SC 29425-5536 E-mail: trivedi@musc.edu*

The authors have no financial or proprietary interest in any product mentioned herein.

Supported in part by the NIH/NEI grant EY-014793; the Grady Lyman Fund of the MUSC Health Sciences Foundation; and an unrestricted grant to MUSC-SEI from Research to Prevent Blindness, Inc, New York, NY

Miles Center for Pediatric Ophthalmology, Storm Eye Institute, Department of Ophthalmology, Medical University of South Carolina, Charleston, SC.

IOL Power Calculation

Biometry: A-scan ultrasound and keratometry measurements on children can be very difficult or unattainable in the office. Most children need an examination under anesthesia (EUA). The NPCB in India published the 1999 results of evaluation of training for ophthalmic surgeons in extracapsular cataract extraction (ECCE) and IOL implantation. It may have changed by now, but those results showed that 14 of 66 cites did not have an A-scan ultrasound machine, and 28 didn't have a keratometer. This was the scenario in the adult cataract surgery setup.[13] The chances of having A-scan ultrasound unit and keratometry capability in the operating room for pediatric patients are low.

Error in axial length (AL) measurement is the most significant of errors in IOL power calculation and equates to almost 2.5 D/mm. However, this error jumps to 3.75 D/mm in very short eyes (20 mm). Thus, it is crucial that we take every possible step to minimize error in AL measurement. Readers are urged to refer to the specific technical instructions of the machine they are using. *Important details to keep in mind include the velocity that needs to be used for a specific eye (phakic/aphakic/pseudophakic), the A-constant for the specific IOL being used, and the characteristics of a good A-scan tracing with a spike from each layer of the eye*. A-scan

ultrasound can be done with either contact or immersion methods. If contact A-scan is used, it is important to make sure that the tip does not indent the cornea. It has been reported that AL measurements made with a contact technique were, on the average, 0.24 to 0.32 mm less than measurements made using an immersion technique.[14-15] We use the immersion technique. We take repeated measurements until three equal measurements are obtained with sharp retinal spikes.

For keratometry measurement, we use a Nidek Auto Keratometer, model KM-500. The measurements should be taken without the use of an eyelid speculum. To avoid the problems associated with corneal dryness, measurements should be taken as soon as possible (following IOP measurement) after induction of anesthesia. Balanced salt solution should be instilled as necessary to maintain a smooth corneal surface. Accuracy using the hand-held keratometer for the cylinder axis measurement is reported to be less reliable. However, as we are concerned here with only refractive power and not with the axis – it may be reasonable to use this instrument. Harvey and colleagues[16] showed that the Alcon autokeratometer produces accurate measurements of curvature of the cornea in pediatric eyes. Therefore, to avoid inaccuracy when taking repeated measurements, it is recommended to take an average of these readings for IOL power calculation. The error is negligible this way. However, we admit that we have noted wide variation in individual keratometery values. In practice, we take multiple measurements until we get two or three readings with a difference of less than 1 D, and select one reading from that. Dahan and Drusedau[7] recommended using standard adult K-readings in children, as the K-reading changes rapidly during the first year of life. However, we have noted that the keratometry value of cataractous eyes is significantly different from that of noncataractous eyes (Trivedi RH, Wilson ME et al. Axial length and keratometry in eyes with pediatric cataract. Poster presented at ASCRS, 2002), and prefer not to use standard K-values.

IOL Power Calculation Formulas: Which IOL formula should be used for children? Because of the relatively large IOL formula errors demonstrated in pediatric studies, it is not clear that any formula can be considered accurate for all children.[17-18] Andreo and coworkers[17] reported that all formulas were slightly less accurate in eyes with a shorter AL. In this group, the Hoffer Q formula had the lowest error (1.4 D) and the SRK-II had the highest error (1.8 D). Authors concluded that in our pediatric study eyes, all four IOL power calculation formulas predicted mean refractive outcome within 1.4 D. Theoretical formulas did not outperform the regression formula. Mezer E and colleagues[18] evaluated refractive outcome using 5 IOL calculation formulas to determine which best predicts refraction after pediatric cataract surgery. The authors tested SRK, SRK II, Holladay, Hoffer Q, and SRK/T formulas. Authors concluded that all 5 IOL power calculation formulas were unsatisfactory in achieving target refraction. Although no formula has been proven to have an advantage, it is preferable to use the theoretical formulas (e.g., SRK-T, Holladay I and Hollday II, Hoffer I and II, Hoffer Q and Haigis) because they are generally more accurate for small eyes, and in the pediatric studies they appear to be slightly more accurate overall.

IOL Power Selection

Children have growing eyes and rapidly developing visual systems. The eyes of normal children grow from an average of 16.8 mm at birth to 23.6 mm in adult life. Most of the axial growth occurs in the first two years of life, but there is no sharp cut-off; instead the rate of change gradually decreases throughout childhood. As eye size increases, the power of the optical component decreases proportionately. The natural lens power decreased from 34.4 D to 18.8 D.[19] Pediatric cataract surgery results in loss of the natural crystalline lens prior to completion of a complex process known as emmetropization. After the crystalline lens is removed surgically, every millimeter of axial growth of the globe changes the refractive error of the eye by more than 2.5 D. In contrast to -0.9 D refractive change in normal phakic eyes, the aphakic eyes have an average myopic shift of 10 D from infancy to adulthood. Note this is a myopic shift of refraction, and not myopia. In pseudophakic eyes, the main modifiable factor is how much undercorrection to aim for at the time of surgery. Historically three major approaches have been used for IOL power selection in children: initial high hypermetropia, initial emmetropia, or initial low hypermetropia. Note that whatever option you chose, the refraction is changing, and not stable probably until 20 years of age. Thus, regular follow-up visits, and

regular change of correction of residual refraction is required with any of the options described below. Initial high hypermetropia offers the advantage that with the axial growth of an eye, the hyperopia will improve, and adult refraction would probably be at or near plano - either low myopia or low hypermetropia. However, this advantage must be balanced by the fact that the uncorrected hyperopic refractive error in children may cause or deteriorate amblyopia. To help treat amblyopia, some surgeons prefer to aim for initial emmetropia. It simplifies the battle against amblyopia. However, the price to pay is that the significant late myopia will be more and more apparent as the years pass since young children's eyes continue to grow. Thus, a better solution may be in finding a compromise between these two extremes. Most physicians who have been implanting lenses in young children have chosen a power intermediate between what the formulas would predict for that eye at the time of implantation and what the expected adult power would be for the specific eye. Most physicians implanting an IOL consider the age at the time of surgery, status of the fellow eye, the likelihood of compliance with amblyopia therapy, etc.

Age at cataract surgery: When an IOL is implanted in infancy, marked axial growth must be expected over the first 1 to 2 years after surgery. Therefore, IOLs implanted in infancy are usually selected to produce a 20% or more undercorrection. The closer to birth, the more marked this undercorrection will need to be. Our recommendations to minimize late myopia based on age at surgery are shown in Table 1. However, these recommendations need to be balanced with many other variables, and thus we end up using less undercorrection than that which is recommended based on age alone, as shown in Table 1.

Table 1. Age at cataract surgery and residual refraction: Our current (2006) recommendations*

1st year	+ 12 to +7
1 – 2 years	+ 6
2 – 4 years	+ 5
4 - year	+ 4
5 - year	+ 3
6 - year	+ 2
7 – year	+1.5
8 – 10 year	+ 1
10 – 14 years	+ 0.5
>14	Plano

*Other factors described here must be taken into consideration before IOL power – fellow eye status, degree of amblyopia, assumed compliance, and parental refractive error

We recently analyzed our data (Trivedi RH, Wilson ME. Presented at World Congress of Ophthalmology, Brazil, 2006) to see how much we actually undercorrect our pediatric eyes, and found that typically we do less undercorrection than is described in Table 1. This reflects our tendency to look at multiple reasons while selecting the IOL power for a child (e.g., laterality of cataract, visual acuity, parental refractive error, etc.).

***Status of the fellow eye*:** More hyperopia can be left when the surgery will be done bilaterally since non-compliance with glasses is less amblyogenic in these children, or in an eye with monocular cataract, if the fellow eye is pseudophakic – it is important to look for refractive status in the fellow eye. Attempts should be made to minimize the anisokonia in these eyes.

Visual acuity: Dense amblyopia may prompt a decision to leave less hyperopia (or even emmetropia) in an effort to help recover vision by emphasizing the occlusion therapy, but minimizing the need for glasses. In this instance, late myopia is acceptable to us if it helps to recover vision during the amblyopia treatment years. Current advances in ophthalmology suggest that it will be difficult to treat amblyopia. Myopia can probably be more easily handled with refractive surgery.

Expected compliance of child/family to glasses/ contact lens/occlusion therapy: If compliance with glasses or contact lenses for the residual refractive error is poor, amblyopia may worsen or improve more slowly even when appropriate patching is being done. If poor compliance is expected – it is better to leave the least possible refractive error.

Parent's refractive error: Last, but certainly not least, it is also important to ask about high refractive error in parents. It has been noted that if both parents are myopic, 30% to 40% of their children become myopic, whereas if only one of the parents is myopic, 20% to 25% of their offspring will become myopic. If neither of the parents is myopic, fewer than 10% of their children will become myopic. Anticipating more eye growth, these children may be left with more hypermetropia than stated in Table 1.

IOL power: In general, the higher the IOL power the more undercorrection is needed. For example, at age 1 month, if one child has an emmetropic power of 50 D and another child at same age has an emmetropic power of 40 D, the first child will necessitate a higher residual refraction. In other words, we may use approximate expected refraction in the first child as +12 D, while in second child we would use + 10 D.

Implantation in-the-bag, sulcus, or in the anterior chamber: If a decision regarding the site of fixation needs to be changed after opening an eye and before IOL implantation – an appropriate adjustment may need to be made. A plus-power IOL that is more anterior in the eye will have a greater refractive effect than if it were relatively posterior. Intraocular positioning of the IOL will affect the prediction error, with sulcus fixation producing a relative myopic shift from the estimated refraction. The IOL intended for capsular bag placement should be decreased by 0.75 D to 1.00 D (depending on the IOL power) when placed in the ciliary sulcus.

Secondary IOL Implantation

Errors in keratometry readings can occur after wearing hard contact lenses. Even 2 weeks after the use of hard contact lenses, the patient had a reported increase of 0.8 mm. Since the effect of hard contact lens wear on corneal curvature and resultant IOL calculations is variable and unpredictable, it is important that IOL calculations be made well after discontinuation of hard contact lens wear. For secondary IOLs, the power can be calculated without AL or K-values simply by using the aphakic refraction.[20] The Pediatric IOL Calculator can also be used for IOL power calculation in secondary implantation. Add the child's age, the A-constant of the IOL, and an approximate K and AL-value. Put in a power of "0" for "IOL power", and the program will tell you the predicted "resulting refraction". Next, adjust the value of AL until the "resulting refraction" equals the measured refraction for that eye. Finally, put in your "goal refraction"; the resulting "IOL to use" output should be accurate.[1] The pediatric IOL calculator can be downloaded from the AAPOS website: ***http://www.aapos.orgproinfo/downloads.html.*** We use axial length and keratometry readings and calculate IOL power with an "aphakic setting" on the A-scan machine.

Despite all our efforts, it is not uncommon to see refractive surprises in children undergoing cataract surgery and IOL implantation. It is important to remind our readers that we are trying to take into account all known factors affecting axial growth. Besides these, several other factors (e.g., gender, race, etc.) have been reported to affect growth of the normal eye, and may also influence eye growth after cataract surgery. Surgeons who implant IOLs in young children must be prepared for a wide variance in the long-term myopic shift. Both the magnitude of the myopic shift and the variance in this shift are likely to be greatest in children having surgery in the first few years of life. Anticipation of this myopic shift, and appropriate correction or compensation, will help achieve better anatomical and functional outcomes of young eyes undergoing cataract surgery. With all that said, we must remember that an IOL implanted in a child's eye must stay there for many years, perhaps 70 years or more. Long-term outcome will certainly remain an open question for years to come. Long-term outcome of refractive error in these eyes will help us to develop formulas specially-suited for IOL power calculation for childhood cataract.

References

1. McClatchey SK, Hofmeister EM. Intraocular lens power calculation for children. In: Pediatric Cataract Surgery: Techniques, Complications, and Management (Wilson ME, Trivedi RH, Pandey SK, eds.). Lippincott, Williams & Wilkins: Philadelphia. Chapter 7, p. 30-38, 2005.
2. Trivedi RH, Wilson Jr ME. Growth of aphakic and pseudophakic eyes. In: Pediatric Cataract Surgery: Techniques, Complications, and Management (Wilson ME, Trivedi RH, Pandey SK, eds.). Lippincott, Williams & Wilkins: Philadelphia. Chapter 42, p. 230-235, 2005.
3. Wilson ME, Trivedi RH, Pandey SK. Pediatric cataract surgery: Technique, complications and management. Lippincott, Wiliams & Wilkins: Philadelphia. pp. 323, 2005.
4. McClatchey SK. Intraocular lens calculator for childhood cataract. Journal of Cataract & Refractive Surgery. 1998;24:1125-9.
5. McClatchey SK, Dahan E, Maselli E, Gimbel HV, Wilson ME, Lambert SR, et al. A comparison of the rate of refractive growth in pediatric aphakic and pseudophakic eyes. Ophthalmology. 2000;107:118-22.
6. McClatchey SK, Parks MM. Theoretic refractive changes after lens implantation in childhood. Ophthalmology. 1997;104:1744-51.
7. Dahan E, Drusedau MU. Choice of lens and dioptric power in pediatric pseudophakia. J Cataract Refract Surg. 1997;23 Suppl 1:618-23.

8. Enyedi LB, Peterseim MW, Freedman SF, Buckley EG. Refractive changes after pediatric intraocular lens implantation. Am J Ophthalmol. 1998;126:772-81.
9. Plager DA, Kipfer H, Sprunger DT, Sondhi N, Neely DE. Refractive change in pediatric pseudophakia: 6-year follow-up. J Cataract Refract Surg. 2002;28:810-5.
10. Crouch ER, Crouch ER Jr, Pressman SH. Prospective analysis of pediatric pseudophakia: myopic shift and postoperative outcomes. J AAPOS. 2002 ;6:277-82.
11. Tromans C, Haigh PM, Biswas S, Lloyd IC. Accuracy of intraocular lens power calculation in paediatric cataract surgery. Br J Ophthalmol. 2001;85:939-41.
12. McClatchey SK, Parks MM. Myopic shift after cataract removal in childhood. J Pediatr Ophthalmol Strabismus, 1997;34:88-95.
13. National program for control of blindness. Evaluation of training of ophthalmic surgeons in ECCE/IOL cataract surgery: results of study done between July to October 1999. New Delhi: NPCB, Ministry of Health & Family Welfare, Government of India.
14. Schelenz J, Kammann J. Comparison of contact and immersion techniques for axial length measurement and implant power calculation. J Cataract Refract Surg. 1989;15:425-8.
15. Giers U, Epple C. Comparison of A-scan device accuracy. J Cataract Refract Surg. 1990;16:235-42.
16. Harvey EM, Miller JM, Dobson V. Reproducibility of corneal astigmatism measurements with a hand held keratometer in preschool children. Br J Ophthalmol, 1995;79:983-90.
17. Andreo LK, Wilson ME, Saunders RA. Predictive value of regression and theoretical IOL formulas in pediatric intraocular lens implantation. J Pediatr Ophthalmol Strabismus. 1997;34:240-3.
18. Mezer E, Rootman DS, Abdolell M, Levin AV. Early postoperative refractive outcomes of pediatric intraocular lens implantation. J Cataract Refract Surg. 2004;30:603-10.
19. Gordon RA, Donzis PB. Refractive development of the human eye. Arch Ophthalmol. 1985;103:785-9.
20. Hug T. Use of the aphakic refraction in intraocular lens (IOL) power calculations for secondary IOLs in pediatric patients. J Pediatr Ophthalmol Strabismus. 2004; 41: 209-11.

ORIGINAL ARTICLE

Multifocal Intraocular Lens : A Long Term Outcome Analysis

Dr. Sabitha, MBBS, DOMS

Abstract

The aim of the study was to evaluate the outcome of multifocal intraocular lens implantation in a rural population and to undertake a long-term outcome analysis. 1000 patients underwent small incision cataract surgery with multifocal intraocular lens implantation (either rigid or foldable) .The outcome of the procedure was assessed by the final visual acuity and the dependence on glasses. Analysis of results showed that 98% achieved a visual acuity of 6/6 – 6/9 and 70% were not dependent on glasses.

Introduction

Cataract extraction with IOL implantation is the most effective, safest and most accepted modality of treatment for cataracts. Whatever be the method of surgery (extra capsular cataract extraction, small incision cataract surgery, phacoemulsification or microphaco) the accommodative power of the eye is lost irrespective of the age of the patient. Thus, postoperatively, the patient is faced by the need to wear +3 .00 D glasses if he has satisfactory full unaided distant vision, or if he is corrected for near work by the IOL implant he will need to wear spectacles to clear his distant vision. Thus, there is a strong dependence on spectacles to achieve a clear vision both for distance and near. To avoid this dependence on spectacles and to achieve the goal of emmetropia, multifocal intraocular lens was introduced.

* *Sabitha Eyecare Centre, Pathanamthitta*

Rigid patient selection criteria has to be enforced while choosing patients for multifocal IOL implantation. Patient satisfaction can be enhanced by selecting the right patient through rigid enforcement of the patient selection criteria, by proper counseling of the patient and repeated confirmation of IOL biometry and power calculation.

The aims of this study were to:-

1. Assess the feasibility of performing MF IOL implants in a rural population.
2. Assess best unaided distant, intermediate and near visual acuity.
3. Assess degree of dependence on glasses.
4. Level of visual comfort in the postoperative period

Materials and methods: This study was a prospective non randomized interventional study. The data collected from the first 1000 cases who underwent multifocal IOL implantation and had follow-up of five years formed the study group. The criteria for exclusion in the study are given is Table 1.

Table I. Exclusion Criteria for MFIOL Study

1.	Preexisting astigmatism ATR > 1.5 D
2.	Preexisting astigmatism WTR > I D
3.	Age 5 – 50 yrs
4.	Retinal / Optic Nerve Pathology
5.	High Ametropia
6.	Small pupils (< 2.5 mm)
7.	Tense and anxious patients
8.	Professional drivers
9.	Professionals with high demand for close reading and near work.

Cataract of all grades of severity was included in the study. A small percentage of the study population was myopic.

Emphasis was placed on the preoperative counseling and a thorough counseling was carried out in all patients. Counseling was done by the surgeon herself. The patient was explained that he/she may get reasonably clear near, intermediate and distant vision. He was also made aware of the fact that he may need to wear glasses for long periods of reading or fine work.

IOL power calculation was carried out very carefully with no room for error. A-scan biometry was repeated at least twice to confirm the IOL power.

The surgical procedure adopted in all the patients was a manual small incision cataract surgery. A 5.5 – 6 mm sized frown shaped incision was fashioned depending on the grade of cataract. Nucleus removal was performed either by viscoexpression or sandwich method after a good capsulorhexis. In majority (90%) of cases in the bag placement of the IOL was possible and all precautions were taken to ensure that good centration was achieved. The pupil was constricted with intracameral pilocarpine. Anterior chamber was reformed with air.

The intraocular lenses used were of the powers ranging from +3.00 D to +25.00 D (+3.00 D to +15.00 D were foldable lenses and over +15.00 D were rigid multifocal). The specifications for the rigid and foldable intraocular lenses implanted in our series are given in table 2.

The patients were followed up after 1 week, 3 weeks and 2 months postoperatively. At each postoperative visit, enquiries were made regarding 1) presence of glare 2) Difficulty in driving at night 3). History of seeing ghost images 4) degree of dependence on glasses 5) level of satisfaction regarding visual recovery after surgery. The unaided distant and near visual acuity was evaluated at each visit. A dilated slit lamp evaluation to assess centration as well as a refraction was preformed.

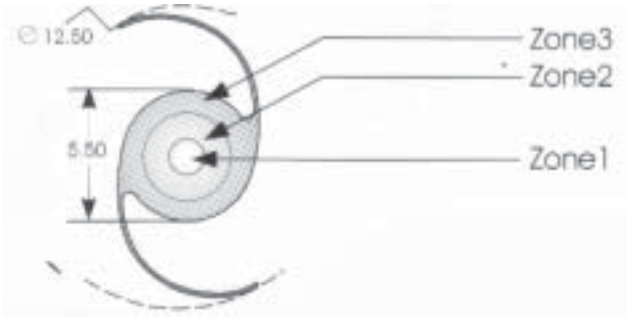


Fig: 1. Specifications of a foldable Intraocular lens showing its modified C loop design with 3 zones. Zone 1 : For distance Vision of 1.5 mm Diameter, Zone 2 : For near Vision of 2.6 mm Diameter, Zone 3 : Peripheral Zone of 5.5 mm Diameter

Table 2.

Specifications	Rigid MFIOL	Foldable MFIOL
1. Material	PMMA UV	UV Hydrophilic Acrylic
2. Optic size	5.5. – 6 mm	5.75 mm
3. Overall length	12.5 mm	12 mm
4. Design	Modified 'C' loop	—
5. A constant	118	118
6. Refractive Index	1.496	1.46

Results

MF IOL study included 1000 patients who underwent intraocular lens implantation following small incision non instrumental manual cataract surgery in a rural population at Pathanamthitta District in Kerala. All surgeries were preformed by the same surgeon (S) over a period of 5 years.

The rural population of Pathanamthitta who attended Government General hospital was divided into Office goers (23%) and non office goers (77%). The males constituted (48%) and females (52%) of the study population. The age distribution of the patients ranged from 51 yrs – 80 yrs.

Table 3. Age Distribution

Age Group	No. of Patients
51-60	591
61-70	282
71-80	127

Intraoperative complications included

1. Decentering of IOL (0.3%)
2. Posterior Capsular rent (0.05%)

Postoperative review was carried out on the 2nd postoperative day, 1 week, 3 weeks and 8 weeks postoperatively. Postoperative complications included:

1. Posterior Capsular Opacification (0.02%)
2. Pupil dilatation > 3mm (0.05%)

Table 4. Range of Visual Recovery (Unaided)

Visual Acuity	No.of patients	%
6/6 N6	378	37.8
6/6 – 6/9 N6	602	60.2
6/12 – 6/24 < N8	13	1.3
6/24 – 6/60 < N8	7	0.7

At each postoperative visit the unaided distant and near vision was recorded and a slit lamp biomicroscopy to assess centration as well as a detailed refraction was performed and the results tabulated in Table 4.

The patients were also assessed for their degree of dependence on glasses and enquiries pertaining to the level of visual comfort, glare, difficulty in night driving and seeing phantom images were analyzed (Table 5)

Discussion

Criteria for selection of patients for MFIOL

Not every patient can be pleased by any single technique. Patients satisfaction after a surgical procedure can be enhanced by:-

1. Selection of the right patient
2. Proper patient counseling
3. Careful calculation of IOL power

1. Selection of the right patient

This can be done by considering same exclusion criteria.

A. Physical Factors

i. Ocular pathology - Patient should be free from any pathology that could affect the visual outcome e.g. poor macular function.

ii. High Astigmatism – More than 1.5 D of astigmatism may reduce near visual function and may be avoided.

iii. High ametropia – abnormally long or short eyes give inaccurate IOL power calculation.

iv. Small pupils – Those with pupils smaller than 2.5 mm are not good candidates because the central 1.5 mm of the lens is distant dominant.

B. Psychological Factors

Patients with flexible easy going personality are better candidates.

C. Occupational Factors

Multifocal IOLs are not advisable for professional drivers or those who frequently drive at night. Doctors, architects, engineers, photographers and artists, who have high demands for close reading and fine work are also not good candidates for multifocal IOL implantation.

2. Counseling of Patients

The surgeon must personally counsel the patients and not leave this task to their clinical or counseling staff. The patient should be thoroughly counselled that he will not be totally independent of spectacles but most of the time he can achieve good vision for distance and over a range of intermediate and near distances. For long periods of reading or fine work, glasses will be more comfortable.

3. Careful calculation of IOL Power

A very careful calculation of IOL power is mandatory and the surgeon should be personally involved in the biometry and keratometry. Establish a personalized SURGEON CONSTANT. It is better to err on the side of very low hyperopia-preferably 0.1 to 0.5 D. This may vary depending on the visual requirements of patients. Better results occur with the multifocal IOL when the patient has binocular vision with good stereopsis. Also, 2 multifocals are better than one.

Conclusion

With better surgical techniques and proper patient selection multifocal IOLs can offer the patients a

Table 5. Level of visual comfort postoperatively

Criteria	Present	Percentage	Absent	Percentage
Dependence on glasses	22	2.2	978	97.8
Glare	66	6.6	934	93.4
Difficulty in night driving	2	0.2	998	99.8
Seeing Phantom Images	51	5.1	949	94.9

continuous range of focus through distance, intermediate and near vision and total or near total spectacle independence.

References

1. Simson J.M The diffractive Multifocal Lens Eur Implant Refract Surg. 1:115 1989
2. Holladay JI,Van DijKA, LangA et al – Optical performance of multifocal intraocular lenses J.Cataract Surgery 16:413 - 1996
3. Olsen.T, Corydon L: Contrast sensitivity as a function of focus in patients with diffractive multifocal lens, J Cataract Surgery 16:703 1990
4. Ellingson FT: Explanation of 3M diffractive intra ocular lenses. J.Cataract Refract Surg. 16:997, 1990
5. Hansen.S.O, felz MR, Solomon KD et al : Decentration of flexible loop posterior chamber lenses. Ophthalmology 95:344: 1988
6. Apple D.J. Mamais, Brady SI, et al Biocombatability of implant material. A review and electron microscopic study. American Implant society J 10-53 – 1980
7. Sanjay Chowdary, How Multifocal IOLs work – Opthalmology Times 2006

ORIGINAL ARTICLE

Ocular Toxicity of Anti-Tuberculous Treatment

Dr. Lavanya V. Rao*, Dr. Sulatha V. Bhandary, Dr. Anjana Devi R., Dr. Anju Ninan, Dr. Vikram Jain, Dr. Himabindu Veluri

Aim

To study the incidence of ocular complications in patients treated with anti tuberculous therapy.

Inctroduction

Ethambutol one of the major oculotoxic agents among the anti tuberculous drugs continues to be widely used especially with the increased incidence of atypical and resistant mycobacterial infections in immuno compromised patients. Although Isoniazid and Streptomycin are also known to cause oculotoxicity Ethambutol remains the drug widely studied for its toxicity.

The incidence of ethambutol toxicity has been reported as varying from 0.5-4.3%(2% in some studies[3], in some others as 1.1-4.3%[2] and in yet another as 0.5-1.5%[1])

Ethambutol causes two types of optic neuritis one is axial neuritis causing decreased visual acuity, colour vision abnormalities and central scotoma, and the other one is the less common paraxial neuritis resulting in peripheral visual field defects, but the colour vision and visual acuity remains unaffected[3]in this type.

Toxicity with Ethambutol is quite rare and can occur after two months of therapy although the average time is around seven months. Prognosis is good following the cessation of the drug but recovery may take upto 12 months and a minority of patients may have residual visual impairments.

*Address for correspondence: Dr. Lavanya G. Rao, OEU Institute of Ophthalmology, Kasturba Hospital, P.O. Box. 7, Manipal 576104, Karnataka

INH has also been documented as a cause of bilateral optic neuritis especially when used in combination with Ethambutol. INH is presumed to be responsible for optic neuritis if visual abnormalities persist even after 3 months of discontinuation of therapy Ethambutol[4].

Materials and Methods

It was a retrospective study done on 100 patients on ATT attending eye OPD of Kasturba Hospital in the year 2004 from January to December.

Patients were assessed for visual acuity with Snellens chart, near vision with near vision charts and colour vision with Ishihara's chart .Field charting was done with Humphrey's 30-2 and Goldmann's perimeter. Slit lamp anterior segment evaluation and fundus evaluation with direct and indirect ophthalmoscopy were also done.

Patients were diagnosed to have ocular toxicity if they had fundus changes like temporal or total disc pallor ; colour vision abnormalities not attributable to any other cause or field changes like paracentral scotoma or peripheral visual field constriction which could not be explained by other causes.

Results

Out of the 100 patients, 7 patients (7%) belonged to the age group of <20 years, 31 (31%) belonged to the age group of 20-40 years; and 47 patients (47%) belonged to the age group of 40-60 years. 68 out of 100 patients were males and rest were females.

Visual acuity assessment showed that 2 patients had vision <6/60, one with bilateral optic atrophy (RE-CF 4M, LE CF 1M) and the other with senile mature cataract of the lens in BE. In this patient we could not do colour vision assessment, fields, or fundus examination. 15 patients had visual acuity between 6/60 – 6/12. They had either immature cataract of lens or changes of age related macular degeneration. Rest of the 83 patients had visual acuity of >6/12.

10 patients (8 men and 2 women) showed ocular manifestations like changes in visual acuity, colour vision or visual field. Of these only 5 cases could be attributed to ATT as they had no other ocular abnormality like cataract or retinal lesions to account for the abnormalities detected. Two of the remaining five patients had optic disc changes suggestive of glaucoma and another two patients had fundus changes suggestive of age related macular degeneration and one patient had post meningitic optic atrophy.Hence in these patients their field changes or changes in visual acuity or colour vision could not be attributed to ATT alone.

Among the five patients with changes suggestive of ATT toxicity 3 patients, who had no other ocular disease had colour vision abnormalities-One patient was a 65 year male,who could not identify any colour. He had total optic atrophy in BE. This patient had been on ATT (INH 300mg OD, Rifampicin 450mg OD and Ethambutol 800mg OD) for the past 8 months. He had visual loss for past 2 months and his vision was CF 4m in the RE and CF 1m in the LE and hence his visual fields could not be assessed because of low vision. On confrontation testing, he had right homonymous hemianopia. His CT scan showed left occipital infarct. 2 other patients showed colour vision abnormalities. These were a 16 year old boy on 2 months of ATT (INH – 300 OD, Ethambutol 1200 OD on alternative days, Rifampicin 600 OD on alternative days and streptomycin 1g I/m OD on alternate days) and a 50 year old male on 6 months of ATT(INH-300 mg

S.No.	Colour vision	Visual acuity	Fundus	Fields	Type of Tuberculosis	Drug details and duration
1	Could not identify any colours	RE-CF 4m LE-CF 1m	Total optic atrophy both eyes	Right homonymous hemianopia (confrontation)	Pulmonary TB	INH 300m 1-0-0/day RIF 450mg 1-0-0/day ETH 800 1-0-0/day X7M
2	Difficulty in identifying primary colors especially green	RE-6/6 LE-6/6	Temporal pallor (RE>LE)	Normal	Tuberculous lymphadenitis	INH 300 1-0-0/day ETH 800mg 1-0-0 on alternate days Streptomycin 1g ¼ on alternate days All X2M
3	Difficulty in identifying primary colours especially green	RE-6/5 LE-6/5	Temporal pallor LE>RE	Normal	Pulmonary TB	INH 300 1-0-0 RIF 450 1-0-0 ETH 800 1-0-0 PZA 1-5g 1-0-0 All X 6M
4	Normal	RE-6/9 LE-6/9	Normal	Paracentral field defect	Pulmonary TB	INH 300 1-0-0 ETH 800 1-0-0 PZA 1-0-0 SM D 75g ¼ OD All X7M
5	Normal	RE-6/18 LE-6/9	Normal	Paracentral field defect	Pulmonary TB	ATT x 8 months then INH 300 1-0-0 Strepto 0.75g ¼ ETH 1g 1-0-0 All X3M

OD, Rifampicin 450 mg OD, Ethambutol 800 mg OD and Pyrazinamide 1.5 g OD) x 6 months. Both these patients had difficulty in identifying colours especially green. Their fundi showed bilateral temporal pallor. However their visual fields were found to be normal.

Paracentral field defects were found in two patients, a 55 year old female on ATT for seven months and a 70 year old male on 11 months of ATT. But these patients had no colour vision abnormalities or fundus changes.

Discussion

In this study the incidence of toxicity of ATT has been found to be about five percent which matches with the earlier studies. The period after which the ocular manifestations occurred were found to be an average of 6.6 months, which was found to be similar in literature given earlier (about seven months). The colour vision abnormalities found in the presence of good central vision could not be attributed to any other cause other then toxicity of ATT. The visual field defects were paracentral in two patients and right homonymous hemianopia in one patient with optic atrophy. The remaining two patients out of the five patients had no detectable defect in visual fields. This could explain the good visual acuity in four out of five patients. The one with poor visual acuity had bilateral optic atrophy.

Conclusion

Our study showed an incidence of five percent of ocular toxicity among patients treated with ATT and this included changes in colour vision, fundus changes or field defects. Timely baseline and follow up ophthalmological evaluation would lead to early detection and prevention of severe visual impairments in such patients.

References

1. B. C. Polak, M. Leys, C. H. M. Van Lith – Blue yellow colour vision changes as early symptoms of Ethambutol toxicity – Ophthalmologica, 191 : 223-226 (1985).
2. Danuta Trusiewicz – Fansworth 100 Hue test in diagnosis of Ethambutol induced damage to optic nerve. Ophthalmologica. 171:425-431 (1975).
3. G. J. Barron MD, Leo Tepper, MD and Gino Iovine MD, Ocular toxicity from glutametheol, AJO, Fek 1974, Vol 77 No.2, 257-260.
4. Jimenez – Lucho VE, Del Busto R, Odel J Isoniazid and Ethambutol as a cause of optic neuropathy, European J of respiratory disease, 1987; 71:401-5.

ORIGINAL ARTICLE

Pterygium-Is the 'P' Silent or Premalignant? A Clinicopathological Study of 60 Cases of Pterygium

Dr. S. Sankar[1], Dr. Roshny Jacob[2], Dr. Smitha K. Babu[3]

Background

Pterygium is a common conjunctival degenerative lesion often excised for cosmetic reasons. Due to various reasons the biopsy material is often not submitted for histopathological examination.

Methods

A clinicopathological study of 60 cases of histopathologically diagnosed pterygium operated at the Regional Institute of Ophthalmology, Trivandrum during a period of one year was performed. Surgical excision of pterygium is done either for cosmetic reasons or when it encroached on to the cornea and caused visual difficulty. The clinical details such as site, duration of the lesion were noted. Both primary and recurrent cases of pterygia were checked separately for the differences in histological changes.

Results

Majority of patients with pterygia were in the 41-60 year age group, with a male to female ratio of almost 1:1. 68 % of the pterygia were located nasally. In the pterygia specimens many histological changes were observed, which include goblet cell hyperplasia, squamous metaplasia,dysplasia, carcinoma in situ, micro invasive squamous cell carcinoma, melanosis, scarring, calcification, implantation dermoid cyst and Jadassohn phenomenon etc. A spectrum of metaplasia, dysplasia and in situ carcinoma were noted.

Conclusion

These results highlight the premalignant nature of pterygium and the importance of careful histological examination of all cases of pterygium.

Introduction

A pterygium is an elevated, superficial, external ocular mass that usually forms over the perilimbal conjunctiva and extends onto the corneal surface. Pterygia can vary from small, atrophic, quiescent lesions to large, aggressive, rapidly growing fibro-vascular lesions that can distort the corneal topography and in advanced cases, obscure the optical center of the cornea.

Pterygium is a condition characterized by a triangular or wing-shaped mass which forms over the perilimbal conjunctiva and encroaches on to the cornea. Two clinical presentations of pterygium has been described. Pterygia[3] can be a small, slow growing atrophic mass with low incidence of recurrence or can be an aggressive fibro vascular proliferation which rapidly progresses onto the cornea which may recur after an excision.(3) Pterygium[3, 4] is prevalent in periequatorial and tropical regions. Risk factors reported for pterygium include environmental influences such as dust, wind, particulate and chemical air pollution and solar

[1]Associate Professor of Pathology, RIO, Trivandrum, [2]Senior Lecturer in Pathology, RIO,Trivandrum, [3]PG in Ophthalmology, RIO,Trivandrum

radiation. Within solar radiation, ultraviolet radiation seems to be most harmful.[11,12,13] In the spectrum of solar induced[5] lesions pterygia and pinguecula are considered to be in the most benign end, with solar induced carcinoma in the other end. Large number of studies on conjunctival biopsies have been published with similar findings.[6,7]

Pterygium is found to occur twice as commonly in males as females with a higher prevalence in the age group above 40 years and an increased incidence rate[3] in the 20-40 age groups. It is rare below the age of 20.

Pterygium is more common on the nasal aspect but can also occur on the temporal side. The patients may be asymptomatic or present with redness, ocular irritation and foreign body sensation due to inflammation at the site of the pterygium. In advanced cases when the pterygium encroaches the cornea, there may be blurring of vision due to obstruction of the visual axis. It can also cause corneal astigmatism due to scarring of the corneal stroma. Being considered a benign condition, mostly pterygia need only observation with symptomatic treatment. But surgery is advised once it progress towards the cornea. While considered a relatively benign condition, pterygia can be locally invasive and can exhibit varying degrees of abnormality ranging from mild dysplasia to carcinoma in situ.[1]

Pathophysiology[5] of pterygia reveal it to be a case of elastoid degeneration of collagen and fibro vascular proliferation which underlies a normal conjunctival epithelium.The collagen at the region of elastic degeneration gives a basophilia with haematoxylin and eosin staining. But recent studies consider it to be a growth disorder due to reduction in apoptosis[8,9,10]. UV light[11,12,13] and human papilloma virus[5] were suspected aetiology for these lesions. Considering the proliferative nature of fibro vascular tissue, the treatment modalities have been altered which include radiation as well as local application of mitomycin etc.

In this clinical setting, a study was done to learn the prevalence of pterygia in our population and to evaluate changes in primary and recurrent pterygia by means of histopathological parameters. The specimens were investigated for any chance of premalignancy or malignancy arising in pterygia and to study whether the changes correlated with duration of the disease.

Materials and methods

The records of 64 patients who underwent surgery at Regional Institute of Ophthalmology for conjunctival lesions, which were diagnosed histopathologically as pterygia in the past one year were analyzed. A detailed histopathologial study was conducted and the findings were correlated with the clinical course of the disease. All the specimens underwent routine paraffin processing and were stained with haematoxylin and eosin stain.

Results

Clinical presentation

All the cases which were diagnosed histopathologically as pterygium were included in the study. The clinical presentation was variable. Among the 60 reported cases of pterygium only 45 cases were clinically diagnosed as pterygium.Of the remaining fifteen cases, six cases were clinically described as limbal nodule.Conjunctival nevus were suspected in two cases and four cases were described only as a conjunctival lesion. In one case there was redness and pain and granulation tissue was doubted in this case.The remaining two case did not have a definitive clinical diagnosis.

Primary or recurrent pterygia

Among the 45 clinically diagnosed cases of pterygia, there were 42 cases of primary pterygia (93.3%) and 3 cases of recurrent pterygia(6.66%)

Sex Preponderance

Among the primary cases 17 occurred in males (40.47%) and 25 occurred in females(59.52%).2 of the recurrent cases were seen in males. But the clinically undiagnosed cases were more common in males. Considering all the cases in the study the male to female ratio was 1:1.14

Age and site

Very few cases were seen below 20 years (2 cases) and recurrent cases were absent in this age group.. The bulk of cases were seen in the 41-60 year age group (37 cases). Recurrent cases were mostly seen in the 51-60year age

group. Most of the pterygia were located nasally 71.1%, (32 cases). One case was located in the temporal side(2.22%) and 10 cases limbal (22.2%). bilateral nasal pterygia were detected in a patient.

Histopathology

On Histopathologial examination, pterygia was diagnosed by the presence of basophilic degenerative material beneath the conjunctiva. Normally conjunctiva is lined by squamous epithelium comprising of three to four layers of cells. Goblet cells are normally seen in the conjunctival epithelium. All cases showed elastoid basophilic degeneration thus all the clinically diagnosed cases of pterygia were confirmed by histopathology. Pterygium was reported also from the rest 15 clinically undiagnosed cases.

1. Findings in Recurrent Pterygia

All the 3 cases of recurrent ptergyia showed the scar of the previous surgery and was accompanied by inflammation and vascular proliferation. One case showed features of mild dysplasia.

2. Clinically Conjunctival Nevus

Two cases of conjunctival nevus diagnosed clinically showed the classical features of pterygium, among which one case showed pseudoepitheliomatous hyperplasia and mild dysplasia.

In 5 cases of pterygium, the clinical description given was conjunctival lesion or nodule. Two of these lesions which were black in color were found to have acquired melanosis and micro invasive squamous cell carcinoma along with pterygium. A conjunctival lesion of just three months duration had pterygium and implantation dermoid cyst.)

3. Clinically Limbal Nodule

There were five cases described clinically as a limbal nodule/lesion. All these five cases were diagnosed as pterygium. Features of dysplasia. metaplasia,and actinic keratosis were noted in three of the above cases, with one of them showing the characteristic Jadassohn phenomenon.

4. Clinically Primary Pterygium

All the forty two clinically diagnosed cases of primary pterygia, were confirmed by histopathology. Among these cases six cases showed features of Squamous cell hyperplasia, metaplasia and dysplasia, dysplasia being of the severe nature in one case.Three cases of carcinoma in situ and a single case of micro invasive Squamous cell carcinoma were reported.

5. Duration related changes

In fourteen cases, duration of the lesion was 6 months. Among this, five cases showed proliferation of vessels in and around the degenerative material. One case showed hyperplasia and dysplasia of the epithelium. This case on subsequent biopsy showed micro invasive Squamous cell carcinoma. Histopathological examination of cases with duration of 6 months or more revealed proliferation of vessels in and around the degenerative material. One case showed hyperplasia and dysplasia of the epithelium which on subsequent biopsy showed micro invasive squamous cell carcinoma Among patients having pterygium for more than one year, Seven had dysplasia of the overlying epithelium. All the four cases of carcinoma in situ had a duration less than two years. The average age for the appearance of squamous metaplasia and dysplasia in patients with clinical pterygia was forty nine years and that for carcinoma in situ was fifty two years. But the single case of Micro invasive Squamous cell carcinoma which was clinically diagnosed as pterygia, occurred in a 38 year old female with just six months duration. This case was chosen for surgery because there was irregularity on the surface of the lesion.

6. Clinically Conjunctival Lesion

Two of the cases clinically described as conjunctival lesion/nodule was reported to be pterygia. In one case a tiny dermoid cyst also was noted.

7. Clinically redness and pain

The case with redness and pain was diagnosed to have pseudoepitheliomatous hyperplasia and dysplasia with pterygium. Severe dysplasia of the overlying epithelium was reported from the doubted granulation tissue.

8. Incidence of dysplasia

There were fourteen cases of dysplasia, with nine case of mild, one case of moderate and four case of severe dysplasia,among which actinic changes were noted in three cases.

7. Sequence of events

There was a case of a 38 year old female who presented with pterygium of 6 months duration,surgical excision was done as the pterygium had an irregular appearance. The histopathology showed pterygium with hyperplasia and dysplasia with actinic changes of the overlying epithelium. A subsequent biopsy after 8 months showed microinvasive squamous cell carcinoma. Considering all the cases together, of all the total of 60 cases of pterygium diagnosed histologically,45 presented with classical pterygium picture and 15 came with history of other complaints.

Conclusion

To date there have been several studies on pterygium in literature. Most of them have been to study the aetiology and pathogenesis of pterygium. In the present study, emphasis was given to the altered presentations of pterygium and the associated lesions seen in the epithelium overlying the pterygium like premalignancy. It has been proved beyond doubt that it occurs in the tropical countries and sunlight is the contributing factor. India being a tropical country, the incidence and prevalence of pterygium is very high.This was reflected well in our study which was set in the southern city of Trivandrum. In our study most of the patients (75%) had presented with complaints of classical pterygia,but there were altered presentation in many cases (25%).This aspect could not be compared with previous studies because in the literature pterygia cases have been evaluated only on clinically diagnosed cases and in the present study contrary to the previous studies, the histopathological appearance of pterygia was the inclusion criteria. Pterygia occurs more commonly in males and it has been thought to be due to more exposure to sunlight. But in this study male to female ratio was 1:1.14. While primary pterygia was found to be more common in females,the clinically undiagnosed cases and altered presentations of pterygia were more common in males. As to the site of the lesion, as in the literature, pterygium was more common in the nasal side. Dysplasia, carcinoma in situ and microinvasive carcinoma were more common in males (12 cases) (60%). There were 8 cases (40 %) in females. This closely relates to the rate in the literature.[2] In a previous study on ocular surface changes in pterygium, impression cytology has been used as a technique. The author has posed the difficulty regarding decreased cell yield from the surface of pterygium. But in our study such difficulties have been bypassed by working on the histopathological material.[15] Moreover subtle changes of dysplasia occur first in the basal layers of the epithelium and tend to be missed when study is done on impression cytology material. This could be a reason for the increased incidence of dysplasia seen in our study. Chan et al's[15] study showed a higher incidence of squamous metaplasia with reduction in the number of goblet cells. In our study there were only 2 cases of squamous metaplasia. Both of them associated with dysplasia. Goblet cell hyperplasia was noted as a separate feature in 2 cases. Our study correlates with studies in the field to date regarding the progression of dysplasia[14] to squamous cell carcinoma in cases of pterygia. Such a sequence of events can be clearly found in one of our case. It is evident from our study that many cases of dysplasia and squamous cell carcinoma may be remaining dormant in pterygium cases. In Mc Kelvie's[1] study on 26 cases of squamous cell carcinoma, 7 of them arose in a clinical picture of pterygium (26.9%).

In the present study, incidence of frank squamous cell carcinoma in the form of microinvasive squamous cell carcinoma is 3.3%. The incidence of dysplasia is 21.6% and that of carcinoma in situ is 6.66% Our study confirms the importance of a detailed histopathological study of all pterygia coming in the outpatient department. In the present study, cases with a history of even 6 months showed dysplasia on histopathological examination. This shows that surgical excision needs to be done in the early stage itself. All the excised specimens of suspected pterygia should be subjected to histopathological examination. Follow up is necessary for all cases of pterygia. Since the incidence of dysplasia increases with the duration of the disease, all cases of pterygia need to be excised very early in their course.

References

1. Squamous cell carcinoma of conjunctiva: A Panda, M S Bajaj, H S Sethi, N Pushker, H Kumar and V K Dada British Journal of Ophthalmology 2002;86:1
2. emedicine article on pterygium.Jerome Fischer. www.emedicine.com/OPH/topic542.htm
3. Pterygium:Prevalence,demography and risk factors. Saw and Donald Tan.. Ophthalmic Epidemiology

Publisher: Taylor & Francis Issue: Volume 6, Number 3 / September 1999 Pages: 219 - 228

4. Effect of ambient solar ultraviolet radiation on incidence of squamous cell carcinoma of the eye. Newton R, Ferlay J, Reeves G, et al. Lancet 1996;347:1450-1451
5. Risk factors in the development of ocular surface epithelial dysplasia. Lee GA, Williams G, Hirst LW, et al. Ophthalmology 1994;101:360-364
6. Apoptosis and apoptosis related changes in normal conjunctiva and pterygium Tang et al. Br J Ophthalmol 2000;84:212-216)
7. P53 expression in altered limbal basal cells of pingueculae, pterygia, and limbal tumors Dushku N.; Reid T.W. Current Eye Research, Volume 16, Number 12, December 1997, pp. 1179-1192(14)
8. Expression of p63 in Pterygium and normal conjunctiva.. Cornea. 23(1):67-70, January 2004.
9. Risk analysis in the development of pterygium Mackenzie FD, Hirst LW, Battistutta D, et al Ophthalmology 1992;99:1056-1061
10. Pterygium and ultraviolet radiation: a positive correlation. .. Moran DJ, Hollows FC. Br J Ophthalmol 1984;68:343-346. Ophthalmology 1992;99:1056-1061
11. Ultraviolet radiation and the eye: an epidemiologic study. Taylor HR Trans Am Ophthalmol Soc 1989; 87: 802-853
12. Solar keratosis, pterygium and squ amous cell carcinoma of the conjunctiva in Malawi .Clear, AS, Chirambo, MC, Hutt, MSR (1979) Br J Ophthalmol 63,102-109
13. Ocular Surface Changes in Pterygium Chan, Cordelia et al Volume 21(1) January 2002 pp 38-42 Cornea
14. Taylor HR. Ultraviolet radiation and the eye: an epidemiologic study. Trans Am Ophthalmol Soc 1989; 87:802-853
15. Clear, AS, Chirambo, MC, Hutt, MSR (1979) Solar keratosis, pterygium amous and squ cell carcinoma of the conjunctiva in Malawi Br J Ophthalmol 63, 102-109
16. Chan, Cordelia et al Ocular Surface Changes in Pterygium Volume 21(1) January 2002 pp 38-42 Cornea:

Does the leisurely practice of Ophthalmology give its practitioners time for other pursuits?
Beginning a new series on famous people who were also Ophthalmologists…….

Little Known Ophthalmologist

SIR ARTHUR CONAN DOYLE

[Prof. Padmaja Krishnan, Calicut]

Which of us has not been spellbound by Sherlock Holmes and his deductive powers? Yet what do we know about the creator of this larger-than-life detective?

Arthur Conan Doyle was born in Edinburgh on 22 May 1859. His parents were Roman Catholics from Ireland. Charles, his father was a civil servant who painted pictures to supplement his income. After coming to Edinburgh, Charles, who had epilepsy, became an alcoholic and had to be institutionalized.

His mother, Mary was interested in literature and encouraged Arthur to read books and to write. Conan Doyle started writing early in life and his first story was published when he was not yet 20 years old.

His early education was in a Jesuit preparatory school and he was deeply influenced by their teaching. However, by the time he left school at the age of 16, he had rejected Christianity and become an agnostic.

He studied Medicine at the University of Edinburgh and graduated in 1881. He was an all-rounder in sport, and played on the cricket team with P.G. Wodehouse and J.M Barrie, the creator of Peter Pan.

Immediately after graduation, he became a ship's doctor and travelled all the way to Africa. Returning to England, he set up Medical Practice at Plymouth in 1882 and moved to Portsmouth in 1884.

The subject for his doctoral thesis in 1885 was Tabes Dorsalis. He was not a successful doctor and it was while waiting for the patients who never came that he began writing stories. His first significant work was "A Study in Scarlet", published in 1887. This novel, in which Holmes and Dr. Watson first appeared was written in 3 weeks' time in 1886.

He modelled Holmes on Dr. Joseph Bell, his Professor at Edinburgh, a popular teacher renowned for his deductive powers. His Sherlock Holmes stories quickly became very popular and he went on to write 56 short stories and 4 novels featuring Holmes.

(Contd. on pg. 209)

ORIGINAL
ARTICLE

Silicone oil surgery in children

Dr. Meena Chakrabarti, Dr. Arup Chakrabarti, Dr. Sonia Rani John, Dr.Valsa Stephen

Introduction

Vitreo-retinal diseases requiring surgical intervention in children differ from those in adults. Rhegmatogenous retinal detachment has an annual incidence of 12.4 cases per 100,000 in the adult population. Rhegmatogenous retinal detachment occurring in the pediatric age group (birth to 15 years of age) accounts for only 3.2% to 5.6% [1] of the total with over 40% of cases secondary to ocular trauma[2]. Other causes of retinal detachment in pediatric age group include high myopia, retinopathy of prematurity, familial exudative vitreoretinopathy, acute retinal necrosis, prior ocular surgery and retinoschisis. Given the 89% frequency of vision – threatening abnormalities in the fellow eyes, preserving vision in the detached eye is of great importance. The eye with the retinal detachment may be the better seeing eye in the long run.

The use of silicone oil as a temporary tamponade agent in cases with complex retinal detachment is often associated with serious complications[3] like recurrent detachments (14%) following silicone oil removal, glaucoma (2%), keratopathy (15-20%) and hypotony (25%-30%). The goal of this study was to evaluate the results and complications of temporary silicone oil tamponade in consecutive cases of pediatric retinal detachments.

Materials and Methods

We reviewed the charts of consecutive children (age less than 18 years) who underwent repair of retinal detachment with silicone oil injection in our hospital between January 1999 to December 2004. Thirty eyes of thirty patients with a minimum follow up of 20 months were included in the study.

Chakrabarti Eye Care Centre, Trivandrum

The following data were collected from the case records of these patients: age, sex, detailed ocular history, preoperative diagnosis, details of preoperative evaluation, operative procedure, duration of silicone oil tamponade, complications if any following silicone oil injection and after its removal.

Preoperative and postoperative best corrected Snellen visual acuity (also with pinhole correction) and pre and postoperative tonometry (Goldmann applanation tonometry or non contact tonometry) were recorded. All causes for poor visual acuity following retinal detachment repair were noted. These included macular degeneration, macular hole, cystoid macular oedema, recurrent retinal detachment under oil, glaucoma, hypotony and optic atrophy. Postoperative slit lamp examination details documented were presence of keratopathy, silicone oil in the anterior chamber, evidence of oil emulsification, presence of any iris neovascularisation and the status of the lens. Details of fundus examination included presence of buckle, presence or absence of a peripheral retinal detachment at time of silicone oil removal and grading of proliferative vitreo retinopathy according to the Retina Society Classification (1983).

All operations were performed by the same surgeon (MC). Our vitrectomy technique with silicone oil tamponade included the following: - scleral buckling with encirclage and standard three-port parsplana vitrectomy. The vitreous removal was as complete as possible and shaving of the vitreous base was performed. The retina was mobilised by removing all epiretinal and subretinal membranes and strings. Relaxing retinectomies were performed only as a last resort in cases where the retina remained rigid. Lensectomy was carried out if the lens opacities precluded visualisation for vitrectomy and in eyes with anterior proliferative

vitreoretinopathy. Subsequently in these eyes a peripheral iridectomy was made at the 6 o'clock position. In all cases mechanical retinal flattening was achieved using perfluoro carbon liquid, which was exchanged for silicone oil (1000 centistokes). Four or five rows of endolaser photocoagulation were applied as a standard procedure over 360 degree and around any pre-existing breaks or retinectomies. Reoperations were preformed under silicone oil for recurrent retinal detachment. During reoperation all the aqueous and emulsified silicone oil were removed from anterior chamber and from beneath the silicone oil bubble, epi and subretinal membranes were removed and the Japanese iridectomy opened up. When a partial peripheral retinal detachment existed anterior to the encircling element it was treated locally by barrage laser. In all patients 6 weeks prior to silicone oil removal a 360 degrees additional laser retinopexy was performed using the Laser Indirect Ophthalmoscopic delivery system Fig (1).

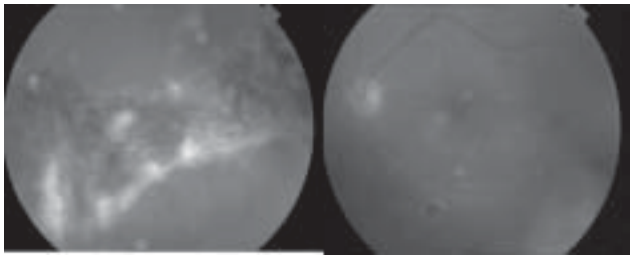


Fig. 1. Conduct photograph showing laser marks after 360°. Barrage reinforcement is performed using LIO delivery system prior to silicone oil removal

Indications for silicone oil removal was a stable situation with an attached retina posterior to the encircling scleral buckle, presence of silicone oil emulsification or anterior segment complications like keratopathy, glaucoma or oil cornea touch. Our technique of silicone oil removal was through 2 parsplana sclerotomies. When additional procedures had to be carried out such as endolaser photocoagulation, lensectomy or phacoemulsification, removal of epi retinal membrane or removal of subretinal membranes a three-port vitrectomy was performed.

Results

Of the 30 patients, 20 were males (66.7%) and 10 females (33.3 %). The mean age was 8 years and the mean follow up was 20 months. The mean duration of silicone oil tamponade was 7.0±2 months. All patients had complicated retinal detachments associated with the following conditions (Table 1).

Table 1 Aetiology Of Paediatric Retinal Detachment

Ocular Condition	No. of Eyes
High Myopia	12 (40%)
Penetrating Injury	2 (6.6%)
Giant Retinal Tear	4 (13.3%)
Familial Exudative Vitreo Retinopathy	2 (6.6%)\
Retinoschisis	4 (13.3%)
Acute Retinal Necrosis	2 (6.6%)
PVR Following SB Procedure	4 (13.3%)

Following the initial retinal detachment repair anatomic reattachment was achieved in 20% of eyes with one surgery and 40% of eyes in 2 surgeries. On follow up reproliferation caused recurrent RD in 81% of eyes undergoing reoperation under silicone oil. Complications during SO tamponade are given in Table 2.

Table 2. Complications During SO Tamponade

Complication	% of Eyes (Present Study)	Silicone Oil Study
Glaucoma	10%	5 - 10%
Keratopathy	7%	20%
Hypotony	9%	27.30%
Recurrent RD	40%	43%

Silicone oil removal was performed in all eyes. Redetachment after silicone oil removal occurred in 19% of eyes at a mean period of 2.6 weeks. Causes of redetachment were persistent traction due to proliferative vitreoretinopathy, opening up of preexisting breaks or retinotomy drainage sites or formation of new breaks. In 45% of patients there was a 2-line improvement in visual acuity following silicone oil removal. 80% of patients achieved a visual acuity of ≥ 2/60. Final anatomic reattachment rate achieved was 64% after silicone oil removal. Macular degeneration (10%), macular hole (3.3 %), epi macular membrane (10 %), Glaucoma (10 %), and Optic atrophy (3%)were the main causes for poor vision.

Discussion

The silicone oil study was designed to evaluate the benefits and risks of using a long acting gas bubble or silicone oil as an intraocular tamponade following vitrectomy in eyes with severe proliferative vitreo retinopathy. The study enrolled patients[5] had

proliferative vitreoretinopathy of at least Gr C_3 (Retina Society Classification) , were at least 18 years of age or more, had visual acuity better than no light perception (NPL) and had sufficient contracture so that intraocular dissection was required. The complications [6] following semi permanent tamponade with silicone oil included incomplete reattachment, macular detachment, persistent elevation of intraocular pressure (5-10%), chronic hypotony (27.3%) and keratopathy (20%).

The removal of silicone oil [7], although not with out risk provides certain potential benefits, most important being an improvement in visual acuity, opportunity to eliminate media opacities and preretinal membranes. Development of recurrent retinal detachment following silicone oil removal in 14% of cases occurred within 6 months of silicone oil removal. The rapidity of retinal detachment after silicone oil removal suggest residual traction or in some instances anteriorly located retinal detachment could extend to the posterior pole after silicone oil removal, new breaks from surgical manipulation or reopening of preexisting breaks due to release of silicone oil tamponade. Reinforcement of choroidal adhesion by Laser Indirect Ophthalmoscopic delivery system prior to silicone oil removal, elimination of significant residual pre retinal traction at the time of oil removal will decrease the rate of retinal detachment. Those eyes with retinal detachment present at the time of silicone oil removal had a particularly poor prognosis.

The primary rationale of oil removal after retinal reattachment is avoidance of long term complications. Unfortunately the silicone study data indicates that oil removal does not entirely prevent future problems. Appearance of late onset keratopathy in 30% of eyes is due to damage to the endothelium caused by small oil droplets which may remain even after meticulous removal and due to the surgical trauma of removing the silicone oil.

Temporary silicone oil tamponade can be effectively used in children for repair of complex retinal detachments. Indeed silicone oil tamponade is preferred in children due to various reasons including the complex nature of the detachments in childhood and the difficulty in positioning a child post operatively following gas tamponade.

The complications following silicone oil tamponade and the incidence of recurrence following removal of silicone oil are comparable to that in adults in the silicone oil study. Semi permanent tamponade with silicone oil in children differed from that in adults in the lower incidence of sterile post operative reaction (3.3%), lower incidence of keratopathy (7% Vs 20%) and lesser incidence of hypotony (9% Vs 27.3%). These results could be attributed to the lower rate of macula off recurrent detachment under oil and the better tolerance to systemic steroids administered post operatively to counter intraocular inflammation. Redetachment following silicone oil removal was slightly higher (19% Vs 14%) than reported in the silicone oil study population and occurred at a mean period of 2.6 weeks following silicone oil removal. Visual acuity improvement to 5/60 following silicone oil removal was observed in 45% of our series and is comparable to the silicone oil study. Prior to silicone oil removal it is mandatory to perform a detailed and thorough fundus evaluation if needed under short general anaesthesia and to reinforce the laser barrage by Laser Indirect Ophthalmoscopic delivery.

Visual rehabilitation by contact lens correction or aphakic glasses after silicone oil removal, occlusion therapy for amblyopia, regular scheduled examination of fellow eye, regular monitoring of IOP all contribute to the final visual recovery.

Temporary silicone oil tamponade can be effectively used in children for repair of complex retinal detachments. The complications following SO tamponade and the incidence of recurrence following silicone oil removal are comparable to that in adults in the silicone oil study. However the incidences of Keratopathy (7% Vs 20%) and Hypotony (9% Vs 27.3%) were surprisingly lower than in the silicone oil study indicating that children tolerated silicone oil tamponade much better than adult. Silicone oil tamponade is preferred in children due to various reasons including difficulty in postoperative positioning following gas tamponade and the complex nature of retinal detachment, which occur in childhood.

Reference

1. Haimann MH, Burton TC, Brown CK Epidemiology of Retinal Detachment Arch Ophthalmol 1982; 100: 289-292
2. Winslow R L, Tasman W Juvenile rhegmatogenous retinal detachment Ophthalmology 1978, 85: 607-18

3. Silicone Study Report 2 Vitrectomy with silicone oil or C3F8 Gas in eyes with severe PVR Arch Ophthalmol 1994 June 112(6) 778-85
4. George D Fivgas, MD, Antonio Capone, Jr, MD Pediatric Rhegmatoginous Retinal Detachment Retina 21: 107–114, 2001
5. Silicone Study Report:1 Vitrectomy with silicone oil or SF6 in eyes with severe proliferative Vitreoretinopathy: Results of a randomised trial Arch Ophthalmol 1992, June 110(6) 770-9
6. Silicone Study Report: No: 3 Vitrectomy with Silicone oil or C_3F_8 gas in Eyes with severe proliferative vitreoretinopathy Retina 1993 13(4) 279-84
6. Silicone Study Report:6 The effects of silicone oil removal Arch Ophthalmol 1994, 112, 778-785.

Sir Arthur Conan Doyle *(Contd. from pg. 205)*

In 1890 he went to Vienna to study Ophthalmology and moved to London in 1891 as an ophthalmologist. Patients continued to elude him, so in 1891 he finally gave up the practice of Medicine and became a fulltime writer.

Around this time he wanted to stop writing Sherlock Holmes' stories so that he had the time for more "important" things. In November 1891, he wrote to his mother that he was thinking of slaying Holmes and winding up the series for good. However when he actually did this in 1893, in a short story called "The Final Problem", the public outcry and indignation was so great that he was obliged to bring Holmes back. This he did in 1903 in a story called "The Adventure of the Empty House".

His last book featuring Sherlock Holmes was a collection of short stories called "The Case Book of Sherlock Holmes" published in1927.

Conan Doyle possessed some of the qualities Holmes had and with his keen sense of justice was able to set free two men who were wrongly convicted and imprisoned. This was partly responsible for the setting up of the Court of Criminal Appeal in1907.

By 1920, Doyle had become one of the most highly paid writers in the world. Though best known for his detective stories, Doyle also wrote historical novels, science fiction, plays, romances, poetry and non-fiction. His historical novels include "The White Company" and "The Adventures of Brigadier Gerard". His Science fiction stories featured Professor George Edward Challenger, modeled after another of his teachers at Edinburgh.

During the Boer War (1899 – 1902) in South Africa, Doyle served in a field hospital. He wrote a pamphlet, "The War in South Africa" and a longer book "The Great Boer War" in which he justified the much criticized role of Britain in that war. Doyle was knighted in 1902 for having supported his country. He displayed the same uncritical attitude to the British Empire in his history of World War I which he published in 1928.

Conan Doyle ran for Parliament in 1900 and again in 1906. He was unsuccessful both times yet polled a significant number of votes.

He was a keen footballer and a lover of cricket. He helped form the Portsmouth Football Club and was its goalkeeper.

Doyle married twice and had five children in all. His first wife Louisa died of tuberculosis in 1906 and he married Jean Leckie in 1907.

Towards the end of his life and following the deaths of his son, brother, two brothers-in-law and two nephews in World War I, Doyle became depressed. He found solace in Spiritualism and its belief in existence beyond the grave. He wrote a Professor Challenger novel on the subject and "The History of Spiritualism" in 1926. He also believed in fairies and wrote a book "The Coming of the Fairies" in 1921.

Sir Arthur Conan Doyle died of heart disease on July 7 1930, aged 71, at his home in Sussex. He was buried in Minstead, New Forest, Hampshire.



Statue of Conan Doyle at Crowborough, Sussex, where he lived for 23 years



Statue of Sherlock Holmes Picardy Place, Edinburgh, where he was born

ORIGINAL ARTICLE

OCT-3 Predicts Visual Loss In Glaucoma Suspects

Dr Chandrima Paul, Dr Ajoy Paul, Dr Partha Biswas, Dr P. K. Bakshi

Introduction

Standard Automated Perimetry has poor sensitivity for detecting glaucoma. Clearly there is a compelling need for more sensitive glaucoma diagnostic tests. Assessing the Retinal Nerve Fibre Layer Thickness (RNFLT) could be a step forward in this direction because of the following reasons: Structural tests to assess the Retinal Nerve Fibre Layer correlates well with retinal ganglion cell loss and clinical and scientific evidence suggests that Retinal Nerve Fibre Layer loss occurs before standard visual field loss and optic disc changes. Retinal Nerve Fibre Layer assessment and documentation using Optical Coherence Tomography are vital for diagnosing and monitoring glaucoma in clinical practice. Optical Coherence Tomography 3 produces 512 A-Scans with 1024 data points per A-Scan for a total of 525,000 pixels with a resolution of 8-10 μm. Image acquisition time is $<$ 1 sec. 512 A-Scans are used to create a single standard OCT image. OCT calculates retinal thickness which is the distance between vitreoretinal interface and junction between inner and outer segment of photoreceptors above the retinal pigment epithelium. Retinal Nerve Fibre Layer thickness is measured directly from the Scan using an automated computer algorithm and summarized by quadrants and clock hours. The overall mean thickness is also obtained using the optical coherence tomogram.

Aim

To evaluate whether peripapillary Retinal nerve fibre layer thickness loss as estimated by the Optical Coherence Tomography 3 (OCT 3) in patients labelled as glaucoma suspects, actually converted to Short Wavelength Automated Perimetry (SWAP) changes within a study period of two years and to establish that Retinal nerve fibre layer thickness loss was the earliest evidence of primary open angle glaucoma.

Materials and Methods

332 eyes of 212 Indian individuals in the age group of 30- 70 years attending the glaucoma service of B B Eye Foundation over a period of two calendar years were labelled as glaucoma suspects on the basis of 1. BCVA of atleast 20/20 with a correction not $\geq$+5 or -5 Dsph and =+2 or -2 Dcyl,(2) IOP = 22mmHg (3) Central Corneal Thickness-within normal limits (4) Asymmetrical Cupping$>$0.2 difference in two eyes or $>$0.6 in either eye (5) Open angles on gonioscopy (6) Transparent ocular media (7) Humphrey Visual Field Analysis – within normal limits(24-2 Full Threshold) (7) SWAP-within normal limits

All 332 eyes who met the inclusion criteria were subjected to SWAP(blue on yellow 24-2 Full Threshold) every month and RNFLT analysis – peripapillary 3.4mm circular scans by the OCT3 every month.

Abnormal SWAP was defined as 4 points depressed at P$<$5% or a cluster of 3 points depressed at P$<$1%. Short Wavelength Automated Perimetry average Pattern Deviation of 21 visual field zones were determined and 2 repetitive short wavelength automated perimetry fields were considered to avoid false positives. **RNFLT loss** was defined as (1) 1 quadrant abnormal at the $<$5% level or (2) 1 clock hour abnormal at the $<$1% level

Correlations between deviation from normal (thinner than 95% of normal) Retinal Nervefibre layer thickness measurements taken at 30º sectors (12 sectors described as clock hours) and short wavelength automated perimetry average Pattern Deviation of 21 visual field zones were determined. The number of Optical Coherence Tomography measured retinal pigment epithelium sectors outside normal limits and the number of Visual field zones outside normal limits were also compared.

The Optical Coherence Tomograpy measured retinal never fibre layer thickness was analyzed and the subjects were divided based on whether nerve fibre layer loss was present or not and again subdivided based on conversion to field changes in the short wave automated perimetry (TABLE1). Out of 332 eyes which were serially followed up 274 eyes (Group α) had retinal nerve fibre thickness loss on analysis. 196 of these eyes (Group β) converted to visual field loss on the short

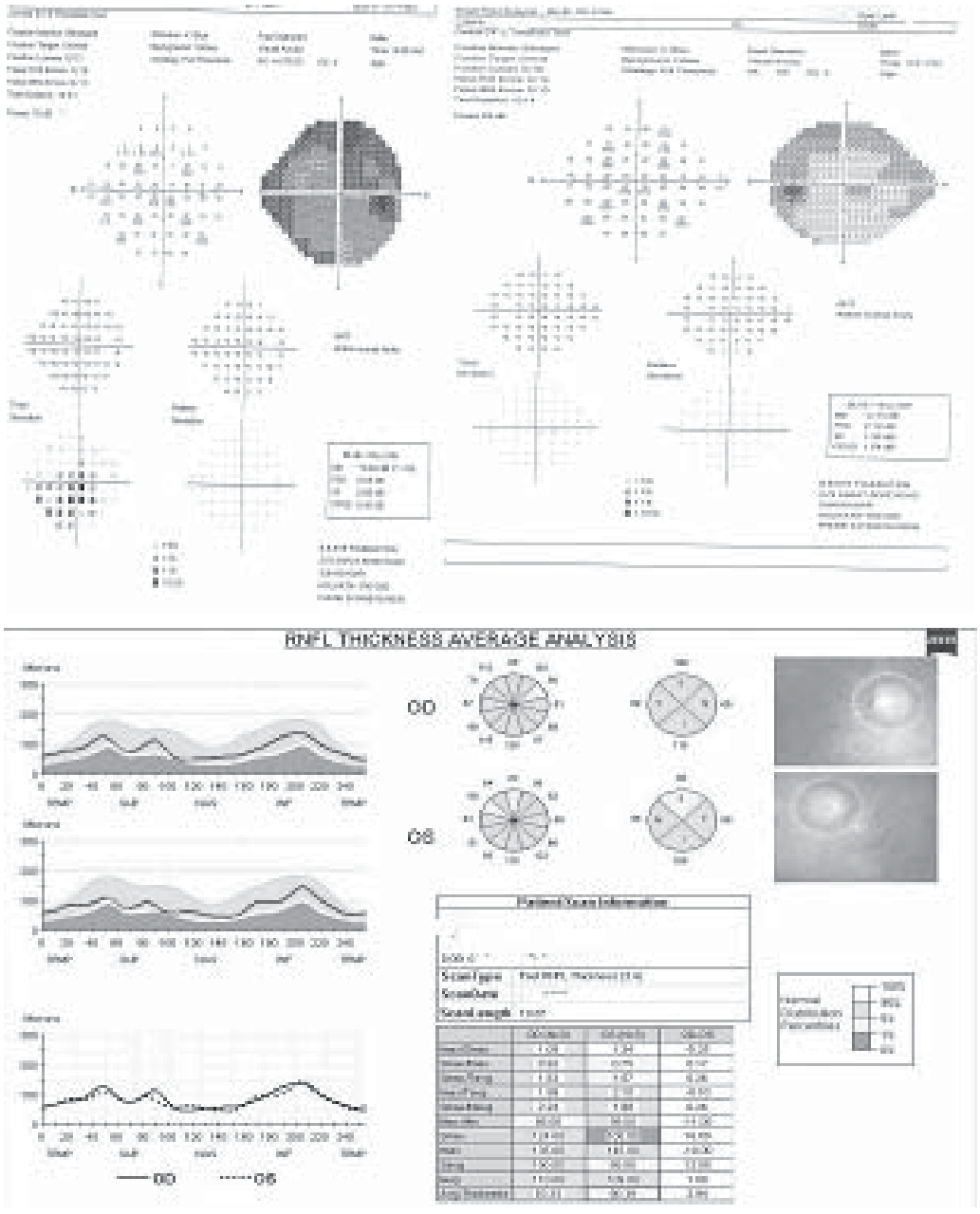


Fig 1. Demonstrating SWAP changes in a patient with RNLFT loss on OCT:3

Table 1. RNFLT Analysis Results

The total of 332 eyes were divided into 4 groups	
Group α	- 274 eyes had RNFLT loss
Group β	- 196 eyes had RNFLT loss & converted to SWAP changes
Group γ	- 58 eyes had no RNFLT loss
Group δ	- 10 eyes converted to SWAP changes without any RNFLT loss

wave automated perimetry. 58 eyes (Group γ) did not exhibit evidence of retinal nerve fibre thickness loss on follow up. However 10 of these patients (Group δ) converted to visual field changes on Short wavelength automated perimetry during follow up. Table (2) gives the peripapillary retinal nerve fibre layer thickness data analysis results quadrant wise.

The RNFL areas most frequently outside normal limits were the inferior and inferior temporal regions.The least sensitive Visual Field(VF) zones were in the superior hemifield.Linear regression showed OCT sectors 6 0'clock, 7 0'clock and 8 0'clock (inferior and inferior temporal) was best correlated with SWAP pattern deviation in VF zones 13, 14, & 16 (superior hemified, central and arcuate areas).

RNFLT loss measured with OCT3 is topographically correlated with glaucomatous VF defects measured with SWAP.

The conversion time from detection of RNFLT loss to SWAP changes was 5.4 to 9.8 months. The average lead time was 7.6 months.

Conclusions

Using this study results, the positive predictive Value (diagnostic performance) of RNFL analysis, which is the most relevant index for early detection of glaucoma is 72%.RNFL areas most frequently outside normal limits are the inferior & inf temporal regions.

Least sensitive VF zones were the superior hemifield. OCT sectors 6,7, & 8 o'clock best correlated with SWAP pattern deviation VF zones 13, 14 & 16. RNFLT loss measured by OCT 3 is topographically correlated with glaucomatous VF defects measured with SWAP.

Conversion time from detection of RNFLT loss was 5.4 – 9.8 months and the average lead time was 7.6 months.

The principle finding of the study is that a statistically significant number of glaucoma suspects with RNFLT loss converted to SWAP abnormalities ($p<0.01$).We used SWAP VF results as the criteria since SWAP has been shown to have better sensitivity than SAP for early detection of glaucoma.

Table 2. The Peripapillary OCT RNFL Thickness Data Analysis Quadrant wise

Groups of Glaucoma suspects	Average	Superior temporal	Supero-temporal	Temporal	Infero-	Inferior	Nasal
Group(α) RNFL LOSS (n= 274 eyes)	100±10	120±18	135±15	93±18	105±10	85±12	83±18
Group(β)CONVERTERS WITH RNFL LOSS (n=196 eyes)	100±12	112±20	100±12	88±22	95±15	80±16	80±20
Group(γ) NO RNFL LOSS (n=58 eyes)	125±15	150±20	165±17	94±20	160±12	140±22	80±20
Group δ CONVERTORS WITHOUT RNFL LOSS(n=10)	125±15	150±20	165±17	94±20	160±12	140±22	80±20

Table 3. Swap Analysis

Abnormal Swap	RNFLT Loss 1 Quadrant	RNFLT Loss 1 Clock Hr	RNFLT Loss >1quadrant	RNFLT Loss > 1 Clock Hr	No RNFLT Loss
4 Points	6	0	72	36	7
3 Points	4	0	54	24	3

Chi square test showed Group α : Group β ($p<0.01$) Group γ : Group δ ($p>0.05$)



Fig. 1. Pie Chart Showing RNFLT data analysis

The Positive Predictive Value of 72% for early detection of glaucoma by the OCT3 is a relevant index.The OCT3 predicts visual loss in glaucoma suspects and establishes RNFLT loss as the earliest evidence of POAG.

Discussion

Joel. S. Schuman[6,10] et al in their pilot study reported that VF defects were strongly related to thinner NFL(p=0.0001).Inferior VF defects correlated with thinner superior NFL, while superior defects were associated with thinner inferior NFL.Our study showed similar association between RNFL and VF. Cesar A Sanchez-galeana[9] et al reported OCT sectors 6O'clock,7O'clock & 8O'clock(inferior and inferior temporal) and SWAP VF zones 13, 14, 16, (superior hemifield, central and arcuate areas) were the most frequently damaged.We found the same zones to be frequently affected in our study. RNFLT loss measured with OCT3 is topographically correlated with glaucomatous VF defects measured with SWAP. Nouri-Mahdavi K et al reported the sensitivity of OCT for detection of glaucoma to be 71%.Our Positive Predictive value is 72% for the OCT for detection of glaucoma. Quigley et al has proved that "SAP has poor sensitivity for detecting glaucoma". Clearly there is a compelling need for more sensitive glaucoma diagnostic tests. Assessing the RNFL would lead to earlier detection of glaucoma and therefore earlier commencement of treatment and thus prevent visual loss. OCT 3 predicts visual loss in glaucoma suspects and establishes RNFLT loss as the earliest evidence of POAG.

References

1. Baker-Shaffer's Diagnosis & therapy of the glaucomas: 7th Edition; Chapter 17; Pg 302.
2. Handbook of glaucoma : Azuara-Blanco.Costa.Wilson: Chapter 1; Pg 14 & 15.
3. Imaging in glaucoma : Joel S. Schuman : Chapter 5;
4. Optical coherence tomography of ocular diseases: Schuman. Puliafito. Fujimoto : Section III ; Chapter 12.
5. Kwok Hei Mok etal. Retinal nerve fiber layer measurement by optical coherence tomography in glaucoma suspects with short wavelength automated perimetry abnormalities:Journal of glaucoma 2003,12:45-49
6. Joel S. Schuman etal.Quantification of nerve fiber layer thickness in normal & glaucomatous eyes using OCT-pilot study: Arch Ophthalmol. 1995; 113:586-596
7. Christopher Bowd etal. Detecting early glaucoma by assessment of retinal nerve fiber layer thickness & visual function. INV ophthalmology&visual science, Aug 2001, vol 42 no 9.
8. El Beltagi et al. Retinal nerve fibre layer thickness measured with Optical Coherence Tomography is related to visual function in glaucomatous eyes. Ophthalmology Nov 2003 110(11): 2185-91
9. Cesar A. Sanchez-geleana et al. Short Wave Length Automated Perimetry results were correlated with Optical Coherence Tomography retinal nerve Fibre layer thickness measurements in glaucomatous eyes. Ophthalmology Volume 111,Issue 10, Oct 2004, pages1866-1872.
10. Joel S Schumen, Daniel M Stein, Gadi Wollstein. Imaging in glaucoma. Ophthalmol, Clin N Am 17 (2004) 33-52
11. Leske MC, Heijl A, Hussein M, et al . Factors for glaucoma progression and the effect of treatment: the early manifest glaucoma trial. Arc Ophthalmol 2003; 121(1): 48 – 56.
12. Goldberg I. Relationship between intraocular pressure and preservation of visual field in glaucoma. Surv Ophthalmol 2 48:S3 – 7.

Steroids and Immunosuppressives in Ophthalmology

Dr. Sonia Rani John DNB*, **Dr. Valsa Stephen** MS. DO. DNB,
Dr. Meena Chakrabarti MS. DO.DNB, **Dr. Arup Chakrabarti** MS.DO

For many years in the past, natural and synthetic corticosteroid preparations were the only therapeutic agents available for immunosuppression.With the advent of other immunosuppressives in 1960's, they are beginning to occupy an increasingly important role in the management of ocular inflammatory, immune mediated diseases and in cases of severe corticosteroid unresponsive ocular inflammation. The use of immunosuppressive agents by ophthalmologists has greatly increased over the past three decades. This has been mainly possible because of better understanding of the immunopathology of many ocular disorders and the complex pharmacologic and therapeutic properties of these immnosuppressives and their use, in conditions other than in the treatment of malignant neoplasms. Earlier their use was limited to the treatment of corticosteroid resistant sight threatening ocular dieases. Today these drugs occupy the first line in management of diseases like Wegener's granulomatosis and Behcet's disease, by inducing long term remission and cure.

Corticosteriods

Mechanism of action

Corticosteroids inhibit the cyclooxygenase and lipooxygenase pathways by inhibiting phospholipase A_2 thereby inhibiting the release of arachidonic acid.

Corresponding author: Dr. Sonia Rani John, Chakrabarti Eye Care Centre, Kochulloor, Trivandrum, Kerala, India, E-mail:- tvm_meenarup@sancharnet.in

1. Antiinflammatory Effects:

Neutrophils	- Inhibit neutrophil migration
	- Decreases neutrophil adherence to vascular endothelium
	- Decreases bactericidal activity of neutrophils

2. Immunosuppressive Effects:

Mononuclear Phagocytes	- Inhibits chemotaxis
	- Decreases clearance of antibody coated particles
	- Reduces production of IL – 1 and TNF α
Lymphocytes	- Redistribution of T lymphocytes (CD4>CD8)
	- Inhibit T lymphocyte activation, proliferation and lymphokine production
	- Inhibit IgG production by B cells
Other Effects	- Decreases oedema, neovascularisation, serum IgG and IgA and reduces complement concentration.

The indications for steroid therapy in Ophthalmology are given in Table 1. There are three ways in which steroids can be effectively used in the treatment of uveitis.

A) Corticosteroid Drops

It is imperative that initial treatment of anterior uveitis

Table 1. Indications of Steroid therapy in Ophthalmology

Contact dermatitis of lids	Disciform keratitis
Squamous blepharitis	Episcleritis and scleritis
Allergic conjunctivitis	Sclerosing keratitis
Phlyctenular kerato conjunctivitis	Chemical injury
Ocular pemphigus	Iridocyclitis
Acne rosaceae keratitis	Posterior uveitis
Mooren's ulcer	Optic neuritis
Interstitial keratitis	Orbital pseudotumor
Sympathetic ophthalmitis	Post surgical (Cataract, PKP, Glaucoma, Pterygium excision)

be aggressive. Initially, hourly instillation during waking hours is advisable. Once the eye responds to treatment as evidenced by a decrease in the flare and cells in the eye, a slow tapering of the drops is advised[1].

Hydrocortisone acetate	2.5 %
Prednisolone acetate	0.12% (Predforte – 1%)
Dexamethasone phosphate	0.1%
Fluorometholone	0.1% - FML, 0.25% - FML forte

Side Effects : Glaucoma, Posterior subcapsular cataract, Temporary ptosis, Increased predisposition to infections – herpes, fungal, Dermatitis, Delayed wound healing

B) Injection

1) Periocular Injection

This permits relatively high concentration of the drug to be given rapidly and ensures delivery of the drug to the site of pathology.

Indications: Resistant anterior uveitis, Intermediate uveitis, Pars planitis, Posterior uveitis, Cystoid macular oedema, Patients in whom systemic steroids are contraindicated

Dose: Depo-Medrone (0.6 ml of 80 mg/ml solution)
(Methyl prednisolone acetate)
or
Triamcinolone acetonide (Kenalog)

Inject every 2 weeks, if there is response to the first 2 to 3 injections[2]

Side Effects: Posterior subcapsular cataract,Glaucoma
[Drug related] Scarring between conjunctiva and globe
Subdermal fat atrophy,
Ptosis, extraocular muscle fibrosis

Complications related to injection:

- Inadvertent intraocular injection
- Retrobulbar hemorrhage
- Subconjunctival hemorrhage

2) Intravitreal Injection

- Decreases growth factors
- Stabilises endothelial cell tight junctions
- Reduces permeability to water and solutes

Triamcinolone acetonide is the corticosteroid that has been shown to be useful in adjunctive therapy for uveitic CME, exudative ARMD, diabetic macular oedema and proliferative diabetic retinopathy[3].

Advantages of Intravitreal injection:

- Controlled and consistent
- More targeted delivery
- Ability to bypass the blood / ocular barrier for the drug.
- Immediate achievement of therapeutic ocular concentration
- Reduced systemic toxicity
- Eliminates long term side effects

Dosage of IVTA -1 mg to 25 mg

Commonest – 4 mg in 0.1 ml

0.1 cc of 40 mg/ml (Kenalog) is injected into the vitreous cavity, 4 mm posterior to the limbus using ½ inch 30 gauge needle and a tuberculin syringe

Following injection, indirect ophthalmoscopic examination, with special attention to patency of CRA is carried out[4].

Additives in commercially available Triamcinolone acetonide[5] include

- Benzyl alcohol, Carboxy methyl cellulose and Polysorbate 80.40 mg TA suspended in 0.1 ml vehicle contains 7.5 mg/ml sodium CMC, 0.4 mg/ml polysorbate 80, 9.25 mg/ml benzyl alcohol.

Complications of Intravitreal injection:

Injection related
- localized SCH
- Acute traumatic cataract

	- RD due to increased vitreous traction or direct needle perforation of retina - Vitreous hemorrhage - Infectious endophthalmitis
Drug related	- Non infectious endophthalmitis due to migration of drug into the anterior chamber - Ocular hypertension - Cataract

Intravitreal sustained drug delivery devices for steroid administration:

Fluocinolone, Dexamethasone, combination of Dexamethasone and Cyclosporine

Fluocinolone acetonide -

- is the steroid of choice for intravitreal injection
- it has a high potency similar to dexamethasone, a low solubility [1/24th of the solubility of dexamethasone]and being more lipophilic, it has more affinity to the posterior pole

Indications

i) Recalcitrant vision threatening noninfectious uveitis

ii) Unacceptable systemic side effects due to corticosteroids and immunosuppressive agents[5]

Complications

- Intraoperative - mild vitreous hemorrhage
- Postoperative - hypotony, IOP rise, vitreous hemorrhage, dislocation of implant, retinal detachment, recurrence of uveitis

C) Oral Corticosteroids

Oral corticosteroids are an effective therapy for the control of acute and chronic inflammation attendant to autoimmune diseases. With long term administration of these drugs, the adverse effects temper the overall effectiveness.

Systemic corticosteroids remain the initial drug of choice for most patients with bilateral endogenous sight threatening uveitis[6]. Prednisone is the most commonly used oral corticosteroid, but for patients with serious liver dysfunction, prednisolone, the active form of prednisone is prescribed[6].

Guidelines for the use of prednisone in chronic ocular inflammation:

Initial dose	1mg/kg/day
Maximum adult oral dose	60 – 80 mg/day
Maintenance dose (adult)	= 10mg/day
Tapering schedule	> 40mg/day, decrease by 10mg/day every 1-2 weeks 40–20mg/day, decrease by 5mg/day every 1-2 weeks 20–10mg/day, decrease by 2.5mg/day every 1-2 weeks

10-1 mg/day, decrease by 1-2.5mg/day every 1-4 weeks

Monitor-Blood Pressure, Weight, Blood Glucose level every 3 months and annually. Measure bone density within first 3 months and annually thereafter.

Supplementary treatment - Calcium 1500 mg daily and Vitamin D 800 IU daily. Estrogens as needed.

In selected situations, where an immediate effect is needed, intravenous methylprednisolone can be started at a dose of 1gm/day x 3 days given as slow IV infusion and then start oral prednisone.

Typically high dose oral corticosteroids are continued for no longer than one month[7]. If the disease worsens or if there is no response after 2 – 4 weeks, an immunosuppressive agent should be added. Similarly if the disease is not completely quiet after 4 weeks of high dose oral prednisone, an immunosuppressive drug should be considered[8].

Side effects of systemic steroid therapy are enumerated in Table 2.

Taking into consideration all these effects, patients who require chronic oral corticosteroid therapy, especially at doses > 10mg/day, should be switched over to immunosuppressive agents.

Immunosuppressive Agents:

The potentially toxic newer immunosuppressive agents when administered in properly adjusted doses with careful monitoring, produce fewer adverse effects than chronic treatment with corticosteroids. They can be grouped as :

I Antimetabolites – Azathioprine and Methotrexate.

II Alkylating agents–Cyclophosphamide and Chlorambucil

III T Cell Inhibitors - Cyclosporine

Table 2. Side Effects of Systemic Steroid Therapy

1. Fluids and Electrolytes	– Sodium retention Potassium loss Fluid retention Hypokalemic alkalosis Hyperosmolar coma
2. Musculoskeletal et al	– Muscle weakness Steroid myopathy Osteoporosis Aseptic necrosis of femoral and humeral heads.
3. Gastrointestinal	– Nausea Increased appetite Peptic ulcer Intestinal perforation Pancreatitis
4. Dermatologic	– Poor wound healing Increased sweating
5. Neurologic	– Convulsions Headache Pseudotumor cerebri Psychosis
6. Endocrine	– Cushingoid state Suppression of growth in children Hirsuitism Suppression of adrenocortical pituitary axis Diabetes
7. Ocular	– Posterior subcapsular cataract, Glaucoma Central serous retinopathy Activation of herpes keratitis
8. Others	– Weight gain Thromboembolism

Immunosuppressive drug regimen for initial therapy of ocular inflammation typically include high dose oral corticosteroids, since most of the above drugs take several weeks to have an effect. If the disease is quiet, in a patient who is on oral corticosteroid regimen, then the immunosuppressive drug is added at the appropriate dose and tapering of oral corticosteroids begun 4-8 weeks later. If the disease is active despite corticosteroid therapy then the patient is treated with high dose corticosteroids and the immunosuppressive drug[9]. Immunosuppressive agents are given only in the absence of infection, when there is progressive visual loss and the disease is reversible.

I Antimetabolites

They competitively inhibit the utilization of normal substrates in nucleic acid synthesis.

1. **Azathioprine**: Is a purine nucleoside analogue.

Mechanism of action: It interferes with DNA replication and RNA transcription.

Indications :- Chronic Uveitis, Behcets disease, Sarcoidosis

Dose :- 1-3 mg/kg/day

Side effects:- Bone marrow suppression

A complete blood count and platelet count should be done every 4 to 6 weeks in patients who are on azathioprine. Liver function tests should be performed every 12 weeks[10]. When toxicity occurs (i.e., LFT > 1.5 times the upper limit of normal) dose should be decreased by 25-50 mg/day and the liver enzyme level re-evaluated after 2 weeks. The drug is stopped if total WBC<3000/mm^3 or platelet count <1,00,000/mm^3 [(10)].

Tradename: Imuran, Azoran

2. Methotrexate:- It is a folic acid analogue.

Mechanism of action: It inhibits dihydrofolate reductase which converts dihydrofolate to tetrahydrofolate. This inhibits synthesis of thymidilate which is essential for DNA replication.

Indications:- Panuveitis, Intermediate uveitis, Vasculitis, Scleritis, Orbital pseudotumor

Dose: 7.5 to 25 mg/week in a single dose (15 mg/week) Folate (1 mg/day) is administered concurrently to minimize nausea[11].

Side effects: Bone marrow suppression, hepatotoxicity, gastrointestinal-nausea,stomatitis, anorexia

Complete blood count and LFT to be done every 1 to 2 months.

Tradename : Mexate, Oncotrex

II Alkylating Agents

1. Cyclophosphamide: A natural product of fungi.

Mechanism of action: The active metabolites alkylate

purines in DNA and RNA resulting in cross linking which results in cell death. It decreases the number of activated T lymphocytes.

Indications: Severe bilateral sight threatening uveitis, Behcet's disease, Intermediate uveitis, Scleritis, Wegener's granulomatosis, Sympathetic ophthalmitis.

Dose:- 2mg/kg/day (starting dose – 150-200 mg/day)

The drug should be taken on empty stomach. The white blood cell count with differential must be monitored constantly beginning with a baseline value. Once there is a drop in the WBC count, the dosage may be decreased by 25-50 mg so that the count stabilizes at no lower than 3000/mm^3 [(12)]. Intermittent cyclophosphamide therapy combined with steroid therapy yields long term failure rate in patients with Wegener's granulomatosis. Adding systemic steroids permits lower dosage of both and there by avoids some of the side effects of both drugs.

Side effects:- Bone marrow suppression, hemorrhagic cystitis (Monitor for microscopic hematuria once a month) teratogenicity, ovarian suppression, azoospermia.

Tradename: Cytoxan, Endoxan

(2) Chlorambucil

Mechanism of action: It is an alkylating agent. DNA to DNA cross linking and DNA to protein cross linking occurs which leads to interference in DNA replication, DNA transcription and nucleic acid function.

Indications: Behcet's disease, Sympathetic Ophthalmitis

Patients typically require concomitant oral corticosteroids initially, and one goal of chlorambucil therapy is to taper and discontinue oral corticosteroids over a 2 month to 4 month period[13].

The typical duration of short term high dose treatment is 3-6 months.

Dose: 0.1 to 0.2 mg/kg/day.

Side effects

1. The primary side effect of chlorambucil is bone marrow suppression which is typically reversible.
2. Opportunistic infections, particularly viral infections. Prophylaxis for Pneumocystis carinii pneumonia should be considered.
3. Permanent sterility in men and amenorrhoea in women.
4. Teratogenicity.

III Immunomodulators

Cyclosporine

Mechanism of action: Affects preferentially immuno competent T lymphocytes. Cyclosporine inhibits transcription in these cells blocking replication as well as their ability to produce lymphokines especially interleukin-2.

Indications:- Used as a steroid sparing agent in a wide variety of uveitis.

Dose:- 2-5 mg/kg/day in equally divided twice daily doses. Intravitreal sustained drug delivery devices which delivers the drug by diffusion mechanism has also been recently introduced.

Side effects:- The most serious and common side effect is nephrotoxicity (75%)[14] . Others include hypertension, hepatotoxicity, gingival hyperplasia, myalgia, tremor, paraesthesia, hypomagnesemia and hirsuitism. Monthly monitoring of blood pressure and serum creatinine levels are essential.

Tradename: Sandimmune, Neoral.

IV New Immunosuppressive Agents

1. **Mycophenolate Mofetil:-**

Mechanism of action :- It metabolizes to mycophenolic acid which reversibly inhibits inosine monophosphate dehydrogenase that inhibits guanosine nucleotide synthesis without incorporating into DNA. Its major effects are on T and B lymphocytes. This prevents lymphocyte proliferation, suppresses antibody synthesis, interferes with cellular adhesion to vascular endothelium and decreases recruitment of leucocytes to sites of inflammation.

The drug has high oral bioavailability but should be ingested on an empty stomach.

Indications: Mycophenolate mofetil has been reported to be effective in the prevention of allograft rejection in cases of renal and cardiac transplantation and multiple autoimmune diseases When compared to azathioprine, mycophenolate was associated with reduced rate of early graft failure[15].

Dose:- 2g/day (1g twice daily)

This should be used with caution in patients with renal impairment and in those with gastrointestinal disorders which might affect absorption.

Side effects:- Most common side effect – gastro intestinal effects, hepatotoxicity, bone marrow suppression.

Tradename: Cellcept

2. Tacrolimus : It is an immunomodulator.

Mechanism of action: It inhibits activation of T lymphocytes by inhibiting transcription in these cells.

Indications:-

1. Tacrolimus is used for prevention and treatment of organ transplant rejection.
2. The main use for ocular illness is in infectious uveitis.

Dose: Initial dose of 0.05 mg/kg/day

Monitoring of blood counts is necessary.

Side effects:- Major side effects include

1. Renal impairment (28%)
2. Neurologic symptoms (21%)
3. Gastro intestinal symptoms (19%)
4. Hyperglycemia (13%)

Others – hypomagnesemia, tremor, headache, paraesthesia and hypertension.

Tacrolimus should not be given with cyclosporine because of the similar risks of renal toxicity[16]. Patients should undergo weekly laboratory assessment of the following: liver enzymes, bilirubin, blood urea nitrogen, creatinine, electrolytes including calcium, magnesium and phosphate, glucose and complete blood counts at least initially. With stable dosing the frequency may be reduced monthly.

Tradename: FK 506

3. Daclizumab

Mechanism of action:- The IL-2 receptor system is a well characterized lymphokine receptor system that plays a central role in the induction of immune responses. Daclizumab builds to the alpha chain of IL-2 receptor and blocks the IL-2 mediated responses.

Indication: Non infectious uveitis

Dose: 1 mg/kg two weekly

Side effects:

Cutaneous lesions, Upper respiratory infections, Bronchitis, Herpes zoster infections.

4. Etanercept: It contains 2 identical soluble tumor necrosis factor receptors (TNF) that have been fused with IgG Fc fragment. This molecule binds to and inactivates TNF.

Indication: Rheumatologic disorders – Adult and juvenile rheumatoid arthritis.

Dose: 25 mg subcutaneously twice weekly.

Side effects:-

1. The major side effect is infection (including sepsis) (35%)
2. Most frequent side effect was injection site reactions (37%)
3. Others – headaches (17%) rarely – malignancies

Tradename:- Enbrel

5.Infliximab:- It is a chimeric monoclonal antibody directed against tumor necrosis factor – alpha. It interferes with the binding of TNF to the receptors. TNF – α enhances leucocyte migration and activates the proinflammatory cytokines like interleukin-1 and interleukin – 6. Infliximab by interfering with the binding of TNF to the receptors, decreases proinflammatory cytokines.

Indications

HLA B 27 associated anterior uveitis, Behcet's disease

Dose: 5mg/kg

1st dose on the first day of therapy

2nd dose at the end of 2 weeks &

3rd dose at the end of 6 weeks

Infliximab is available as 100 mg lyophilized powder which has to be reconstituted with 10 ml sterile water.

Side effects:-

1. Major side effect is increased risk of infections, particularly tuberculosis and histoplasmosis capsulatum, aseptic meningitis[17].
2. The use of infliximab may enhance brain lesions associated with multiple sclerosis.
3. Autoimmunity – Lupus like syndromes
4. Rarely malignancies

Tradename: Remicade

6. Oral retinal S antigen:- Oral tolerance is an approach that has received much clinical interest recently.

Indications:- Pars planitis, Behcet's disease, Multiple sclerosis, Rheumatoid arthritis

Dose: 30 mg of S antigen 3 times a week. No specific significant toxic effects attributable to S antigen therapy has been reported[18].

Patients on immunosuppressive therapy require strict, periodic follow up with periodic complete blood counts, liver function tests, renal function tests etc.

References

1. Robert B. Nussenblatt – Philosophy, Goals & Approaches to Medical therapy of uveitis Chapter 7, 1992; 129: 165-201
2. Complications of Corticosteroid & Immunosuppressive drugs – Benjamin Rubin & Alan G Palestine 1993; 341, 1620-2
3. Guidelines for the use of Immunosuppressive drugs in patients with ocular inflammatory disorder – Douglas A Jabs, James T Rosenbaum – Am J Ophthalmol 2000; 130: 492-513
4. Biswas J Rao NA Management of intraocular inflammation, Rejan S J Ed. Retina, Vol. 2. 1989, PP. 139-146.
5. Kanski J Trans Ophthalmol Soc UK 1981; 101: 387-390
6. Borel J F, Feurer C – Biological Effects of cyclosporine 1976:6:468
7. Towler H M, Forrester J V – Therapy of ocular inflammation 1992 ;5:295-64
8. Klein R Diabetic Retinopathy Annie Rev Public Health 1996; 17:137-158
9. Wilson C A, Berkonitz B A, Sato et al. Treatment with I/V Steroid reduces bd.retinal barrier breakedown due to retinal PHC. Arch Ophthalmol 1992; 110: 1155-1159
10. Hida et al AJO Steroid therapy in uveitis. 1986;101: 190-195
11. Akira Nishimura et al. Retina Side effects of syst. Immunosuppressives in VKH Syndrome 23, 777-779, 2003
12. Rama D Jager et al. Risks of intravitreal injection: A Comprehensive Review: Retina 24, 676-698, 2004
13. Nauck M, Karakiulakin G, et al.Corticosteroids inhibit expression of VEGF, Eur. J. Pharmacol 1998; 341: 309-315.
14. Graefes Archives Clin Exp Ophthalmol 2002 Side effects of newer immunosuppressive agents; 240; 423-429
15. Hiroshi Enaida et al. Possible benefits of TA assisted PPV for retinal disease, Retina 23:764-770, 2003.
16. Rosenbaum J T Immnosuppression therapy of uveitis - Ophthalmol Clin North Am 1993; 6: 167-175.
17. Immunosuppressive therapy of Ocular Inflammatory diseases – Vernon G Wong, Bethesda _ Arch Ophthalmol 85: 93 -102, 1971.
18. Antcliff R J, Spalton D J et al Intravitreal triamcinolone for uveitis CME: an optical C T study. Ophthalmology 2001; 108:765-772

Non-contact Tonometry

Dr. Merine Paul, MS

Anyone who has undergone the procedure of conventional IOP measurement will vouch for the fact that it is a very uncomfortable procedure. Comfort and the fact that contamination between patients is minimized is what makes non contact tonometers, "the coolest!". It uses an "air puff" to measure IOP, but is different from the pneumatic tonometers where there is contact between the tonometer and the patients eye.

Principle of NCT

The NCT was the brainchild of Grolman and was introduced in 1972. A puff of air creates a constant force, which momentarily deforms the cornea. It is difficult to determine the exact nature of corneal deformation, although it is postulated that the central cornea is flattened at the moment the pressure measurement is made.

Types of NCT

1. Table mounted – Xpert NCT (Fig. 1)
2. Hand held - Pulsair tonometer from Keeler (Fig. 2)

Parts of the Instrument

- Alignment system
- Opto electronic applanation monitoring system
- Pneumatic system

Alignment System

- Allows the operator to optically align the patients cornea in three dimensions – axial, vertical and lateral
- In present models the air puff is automatically triggered when alignment criteria are satisfied.

Monitoring System

This consists of a transmitter, which directs

a) A collimated beam of light at the corneal vertex

b) a receiver and detector, which accepts only parallel and coaxial rays, reflected from the cornea

Pneumatic System

Generates a puff of room air which is directed against the cornea.

At the moment the central cornea is flattened, the greatest numbers of reflected rays are received, which is recorded as the peak intensity of light detected. The time from an internal reference point to the moment of maximum light detection is converted to IOP based on prior comparison with readings by Goldmann tonometry. In the newer version the force of air required

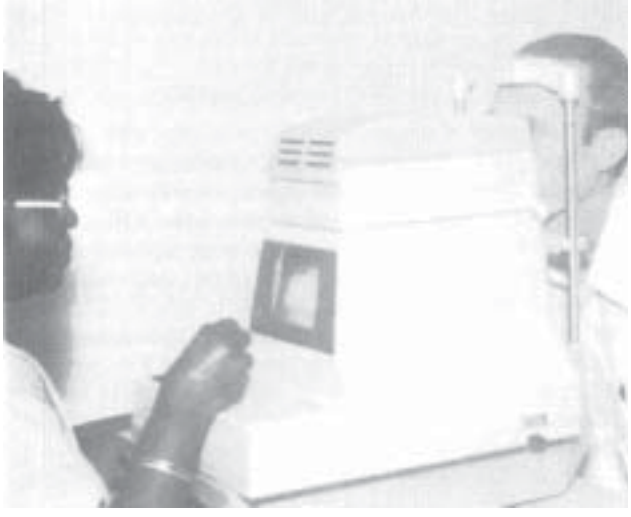


Fig. 1. Xpert Tonometer

Vijayashree Hospital, Thrissur

to achieve peak light detection is the measured variable when air puff is automatically triggered on meeting the alignment criteria (Fig. 3).

Technique of IOP Measurement

Manual

Patient observes an internal target while the operator aligns the cornea by superimposing a reflection of the target from the patient's cornea on a stationary ring. During this time the light from the transmitter is reflected from the undisturbed cornea. When the cornea is aligned the operator depresses the trigger. The air puff is released which depresses the cornea and the IOP is displayed in a digital format.

Automatic

From a distance of about 25 cm the operator aligns the cornea with the instrument looking through an eyepiece. Maintaining alignment, the instrument is moved closer to the patient's eye. At a distance of 15 m from the eye an image of a bow tie appears (Fig. 4). On centralizing this image the pulsair automatically fires the air puff. IOP is shown as a digital display.

Fallacies With NCT

The time interval for an average measurement is 1 to 3 ms (1/500th of the cardiac cycle) and is random with respect to the phase of the cardiac cycle, so that the ocular pulse becomes a significant variable and it cannot be averaged as with other tonometers. Glaucomatous eyes have significantly greater range of momentary fluctuations in IOP. It is recommended that more than 3 readings within 3 mm Hg range be taken and averaged as IOP.

Accuracy

Comparisons against Goldman applanation tonometers indicate that NCT is reliable with in normal IOP range. The reliability is reduced in the higher pressure ranges and is limited by abnormal corneas and poor fixation. One study indicated that central corneal thickness has a greater influence on NCT than on Goldmann tonometry.



Fig. 2. Pulsair Tonometry

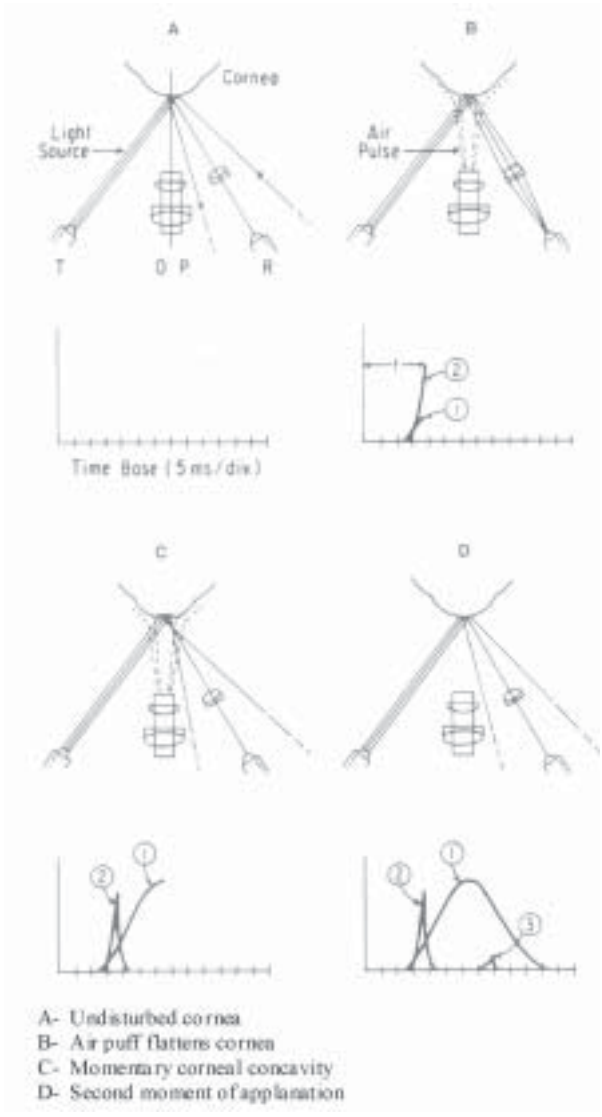


Fig. 3. Principle of NCT

Advantages

- comfort
- no contamination
- no chance of corneal abrasion
- no reactions to topical anaesthetics

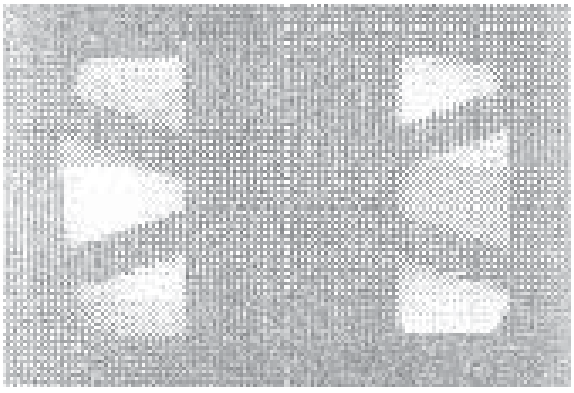


Fig. 4. Bow-tie image on alignment of Tonometer

- of value in mass screening and in studies of newer antiglaucoma drugs

Caution

There have been reports of sub epithelial air bubbles after repeated use of NCT.

NCT is a safe and reliable method of measuring IOP. Caution to be used when measuring glaucomatous eyes as lower pressure may be recorded at IOPs above the normal range as in abnormal corneas. Overall a handy tool in a busy ophthalmic OP.

References

1. Shields' Textbook of Glaucoma. Fifth edition 47-48
2. Shields MB The non contact tonometer: its value and limitations, Surv. Ophth. 1980; 243:211

HUMOUR IN OPHTHALMOLOGY

This Happened in My Practice

Dr. R.R. Varma

The year was 1981. And the place, the headquarters of a 'backward' taluq in South Malabar. The author with a fresh D.O. was in charge of a nonexistent Ophthalmology Department of the Taluq HQ Hospital. Even though the hospital didn't have any ophthalmic facilities, 'home practice' was moderately heavy.

One afternoon the very handsome and brand new son-in-law of a prominent local family walked into my consultation room, accompanied by his obviously distressed wife and a puzzled brother-in-law. The presenting complaint was sudden and severe defective vision of both eyes. His external eyes were normal and so were his fundi and other parameters. But his vision was less than 6/60 in either eye. I was totally at a loss, vaguely thinking of bilateral Occipital infarcts and other diagnosis of poor prognosis. After consoling his wife, who was on the verge of tears, I put some Drosyn in his eyes and asked him to wait, more to get some time to think than anything else.

When I came out to call another patient, I saw his eyes following Kanaran, the coconut-tree climber all the way up the tall palm. And suddenly I remembered that he did not walk with the typical 'narrow-field gait'. When his turn came, I called him in – alone.

Even though he hemmed and hawed initially, when I got tough he confessed. This boy, handsome like a Bollywood hero was illiterate. His looks coupled with a 'Gulf job' had mesmerised his wife's family. The poor chap was at his wits end and begged me not to give him away. I consoled him by telling that Malayalam language had only 51 alphabets and he could master it in a short time. So I prescribed some innocuous eye drops and vitamin tablets and asked him *NOT TO READ FOR THREE WEEKS (of course in presence of his relatives)*.

The next time he came, he had a confident smile on his face and a knowing one on his wife's.

Management of Congenital Cataract

Dr. Elizabeth Joseph, MS, DO

Abstract

Pediatric cataracts remain a very important and difficult problem to manage, in spite of dramatic advances that have occurred in the field over the past few years. The aim of the present review is to update the reader on advances in the field of pediatric cataract surgery and to present concepts of the three important problems in the management of congenital cataracts 1) Technical aspects of cataract surgery 2) Changing refraction 3) Unpredictability of functional outcome.

Bilateral Congenital Cataract is the most common cause of treatable blindness in children, world wide. In developing countries, the prevalence of blindness from cataract is higher, about 1 to 4 per 10,000 births.

Etiology

The cause of bilateral congenital cataract in most cases is idiopathic. The most common etiologies include intrauterine infections like Rubella, Toxoplasmosis, Herpes Simplex and Varicella.

About one third of cases are hereditary, without a systemic disease. Inherited cataracts differ morphologically within the same pedigree. These are mainly autosomal dominant, but autosomal recessive and X linked traits occur.

Galactosaemia and Hypocalcemia, are metabolic disorders with congenital cataract. Infants with classical galactosaemia develop oil droplet cataracts, and if left untreated, these progress to lamellar and then total cataracts due to accumulation of galacitol in the lens. However if galactose is eliminated from the diet of these children, the cataracts may become transparent again. Hence it is important to test for the presence of reducing substances in the urine after a galactose containing meal [milk] in all infants with cataract. Enzymatic assays and DNA studies can then be used to confirm the diagnosis.

Hypocalcemia leads to seizures,failure to thrive, and irritability in children. Altered permeability of lens capsule results in cataract. These cataracts generally begin as fine white punctate opacities scattered throughout the lens cortex which may then progress to lamellar cataracts. Serum Calcium and Phosphorus levels should be measured in infants with congenital cataracts.

Cataracts are manifested in large number of syndromes with systemic abnormalities like, Trisomy 21, Turners syndrome, Trisomy 13, Lowes syndrome, Alports syndrome, Nance Horan syndrome, Martsolfs syndrome, Marinesco-Sjogren syndrome, etc to name a few. Associated mental retardation is common. Many genes involved in cataractogenesis have been identified.

Investigations

In unilateral cases and in an otherwise healthy infant with one parent involved by the disease, an extensive preoperative investigation may not be necessary to establish the cause for cataract. Antibody titres for rubella, toxoplasmosis, herpes simplex and urine examination for reducing substances should be done in all cases. Further investigations like plasma electrolytes, amino acid studies, enzyme studies and chromosome studies need be carried out only in appropriate cases and with the collaboration of a pediatrician and is often not rewarding.

Consultant Pediatric Ophthalmologist, Little Flower Hospital, Angamaly

Morphology

Nuclear cataract is usually present at birth and is non progressive. In cases with dense cataracts present at birth it is usually nuclear. The opacification is located in the embryonic and fetal nuclei between the anterior and posterior Y sutures and is usually very dense in the center. The eyes may be smaller than normal. The cataract is bilateral in 80% of cases, and inheritance can be demonstrated in 30 % to 50% of cases.

Posterior cataract in infants and children is commonly associated with PFV (Persistent Foetal Vasculature), and the affected eye is microphthalmic. The retrolental vasculature may be in contact with the lens capsule and may bleed during surgery. Traction retinal detachment and secondary glaucoma are common post operative complications.

Lamellar cataract usually develops after fixation is established, is usually progressive and involves the lamellae surrounding the fetal nucleus peripheral to the Y sutures. Eyes are normal sized with normal corneas, and the cataract is uniform bilaterally and has an autosomal dominant inheritance. Surgery can often be delayed and is undertaken when visual demands are compromised.

Other morphological types like sutural cataract, anterior polar cataract etc have less influence on vision.

Assesment

Visual loss and development of amblyopia depend on the size, location, and density of the opacity.If the opacity is large enough to obscure fundus view through an undilated pupil, amblyopia development can be expected. If the retinal details such as the larger vessels can be distinguished through the central portion of the cataract, conservative treatment can be considered, but occlusion therapy is necessary in unilateral cases and constant follow up to evaluate the monocular and binocular visual behavior should be undertaken.

Visual assessment should be performed using patterns of fixation and supplemented when possible by preferential looking charts, or pattern visual evoked potentials. Measurement of corneal diameter, intraocular pressure, pupillary reflexes, ultrasonography and indirect ophthalmoscopy should be carried out. (Table 1 & Table 2)

Examination Protocol in Paediatric Cataracts

Table 1.

History

1. Duration
2. F/H of Congenital Cataract
3. Visual Status: Ambulation in familiar and unfamiliar surroundings
4. Behavioural Pattern and School Performance

Birth History

1. History and Degree of consanguinity
2. H/O maternal infection in 1st Trimester
3. Gestational Age & Birth Weight
4. Birth trauma
5. Supplemental O_2 therapy in Perinatal period
6. Developmental Milestones.

Table 2.

Ocular Examination

1. Visual Acquity and Fixation Pattern
2. Refraction
3. Cover – Uncover test (Hirschberg's)
4. Note Nystagmus if any
5. SLIT LAMP EXAMINATION
   - Associated Congenital Anomalies of iris, lens
   - Type of Cataract
   - Iridodonesis / Phacodonesis
6. Tension applanation if possible
7. Fundus examination if possible
8. B.Scan USG if there is no fundus view.

Timing of Surgery

Dense Congenital Cataract- From the available data it would appear that the optimal time to remove a dense congenital cataract in an infant and to initiate treatment is when the child is 4-8 weeks of age. Cataract surgery before 4 weeks of age appears to increase the risk of secondary glaucoma, whereas waiting beyond 8 weeks of age compromises visual outcome.The visual system which is immature at birth has a latent period of approximately 6 weeks before it becomes sensitive to

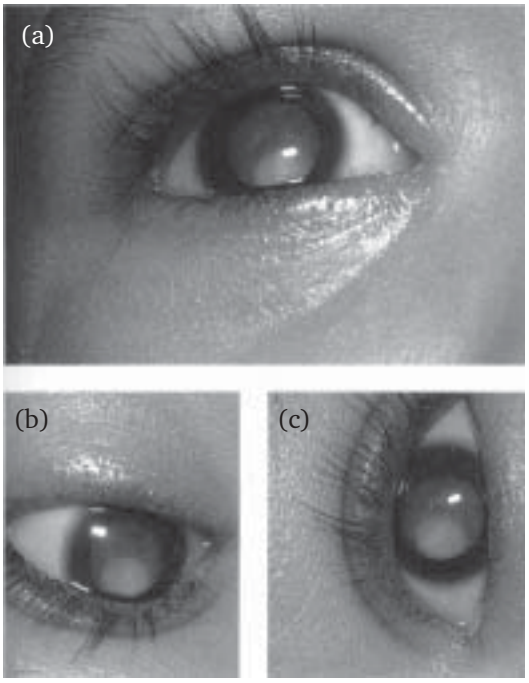


Fig. 1. Congenital cataract with liquefied cortex which allows the nucleus to move to different positions depending on posture (a) Right way up (b) upside down (c) sideways

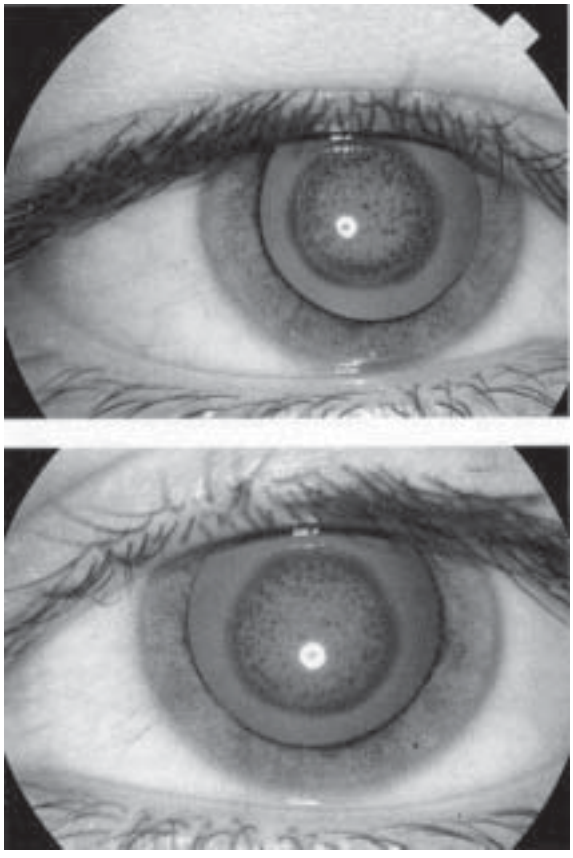


Fig. 2. Bilateral symmetrical lamellar cataracts on retroillumination. The acuity is 6/9 in both eyes

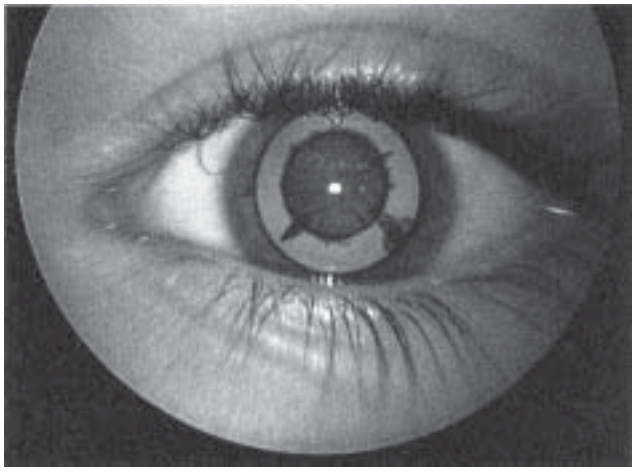


Fig. 3. Lamellar cataract with riders, the acuity is 6/24

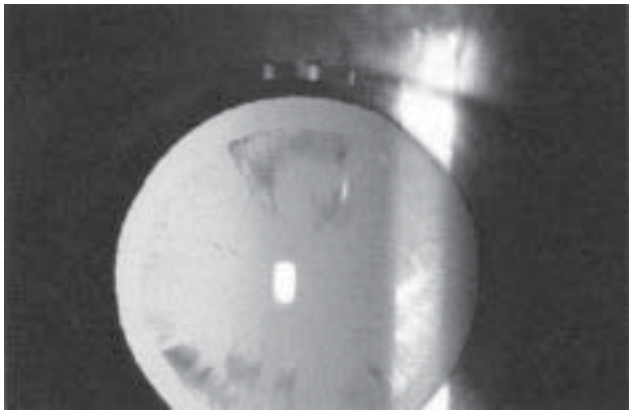


Fig. 4. Wedge shaped cataracts as part of a lamellar cataract

visual deprivation, and binocular vision first appears at approximately 3 months of age. The pathophysiology of aphakic glaucoma is poorly understood. Its aetiology has been attributed to the damage of the trabecular meshwork by inflammation, the loss of mechanical support of the trabecular meshwork, or a toxic substance gaining access to the trabecular meshwork from vitreous and may present as an early angle closure glaucoma or late open angle glaucoma. It has been reported to occur after both limbal and pars plicata based surgeries.

If the cataract is incomplete at birth, close follow up is advised. Visual acuity should be followed and history about the visual interaction with parents should be noted. Evidence of squint or nystagmus is an indication for immediate intervention. If the child has unilateral partial cataract, occlusion therapy should be considered.

Counselling of the parents is very important and should be overstressed. It is important to make the parents

understand that the treatment of the child starts only after surgery. The necessity for regular follow up, need to enforce the constant wearing of glasses, or contact lens despite IOL implantation and the requirement of occlusion therapy after surgery should be emphasized during counselling.

Pre operative examination under short anaesthesia with fully dilated pupils is mandatory before surgery. Examination under the operating microscope or hand held slit lamp biomicroscope is performed to assess the type and degree of cataract. The examinations performed under anesthesia include 1) Tonometry to rule out any associated glaucoma, 2) Measurement of corneal diameter 3) Posterior Segment evaluation with an indirect ophthalmoscope whenever fundus view is possible 4) Performing a B.Scan Ultrasonography in situations where there is no fundus view 5) Keratometry with a hand held keratometer and 6) A.Scan biometry for IOL power calculation.

Surgical Technique in Children

In infants with bilateral cataracts it is advantageous to perform surgery in both eyes at the same time, to prevent an amblyopia in the second eye. If both eyes are operated at the same time, sterility must be maintained during the whole procedure, changing all instruments for the second surgery.

The lens can be approached through the limbus or pars plicata. Although temporal clear corneal incisions are favoured in adults, it may not be a good choice in pediatric cataracts. Most pediatric patients have with the rule astigmatism and temporal incisions may induce further worsening of with the rule astigmatism. Hence a superior limbal or scleral tunnel incision is preferred. Using the limbal approach, a high viscosity ophthalmic viscoelastic material should be used to overcome the vitreous pressure and prevent the shallowing of the ant. chamber. If the pupil is small, flexible iris retractors can be used to enlarge the pupil. Anterior Capsule staining with Trypan blue makes the anterior capsulorhexis easier. If an IOL is implanted the anterior capsulorhexis should be round, smaller than the optic and placed in the center. The capsule is thick and elastic in children, which makes it more difficult to perform a manual continuous capsulorhexis. The capsulorhexis opening tends to be larger than intended. The anterior capsulorhexis can be created preferably with a needle and forceps or it can also be created using a diathermy. Mechanised capsulotomy by a vitrector is easier to perform and is the third option for anterior capsule management. The vitrector should be placed with its cutting port posteriorly in contact with the intact anterior capsule. The cutter should be turned on and suction increased. Cutting rates of 150-300 cuts per minute and aspiration of 150-250 cc/min should be used for vitrectorhexis.

After rhexis most surgeons perform a hydrodissection to separate the lens capsule from the cortical material and to shear the epithelial cells away from the capsule. Hydrodissection has a shearing effect on lens epithelial cells and retards PCO. Multi quadrant hydrodissection helps in wash out of equatorial lens material. For removal of the cortical material, a phacoemulsification hand piece, a vitrectomy tip, or an automated irrigation aspiration device can be used. It is usually possible to remove the nucleus and cortex with irrigation and aspiration and heparin can be used in irrigating solution to minimize the inflammation after surgery. Phaco probe and ultrasound energy is sometimes needed in dense cataracts. The aqualase liquefaction technique using a warm waterstream would probably be helpful in removing these dense cataracts. It is important to remove all the lens epithelial cells to prevent later posterior capsule opacification.

Since the intact posterior capsule opacifies rapidly in children and maintenance of a clear visual axis is necessary to prevent amblyopia., a posterior capsulorhexis is preferred by most surgeons. The posterior capsule is thinner and inelastic than the anterior capsule and a posterior capsulorhexis smaller than the anterior capsulorhexis is performed. Sometimes rhexis is impossible and a vertical posterior capsulotomy with a needle may suffice. If fibrotic parts are found in the posterior capsule, scissors can be used. If persistant hyaloid artery is found adherent to posterior lens capsule, it should be cut with scissors , and cautery is seldom indicated. The IOL should be placed in the bag rather than the ciliary sulcus because of the complications like pupillary capture and IOL decentration after sulcus fixation.

It is debatable whether an anterior vitrectomy should be performed at the primary surgery. Inflammatory reaction in anterior vitreous is severe in children and can result in fibrous membrane formation. This acts as a scaffold for lens epithelial cell (LEC) migration and proliferation. Anterior vitrectomy is necessary in children < 2 years of age along with a posterior capsulorhexis as they are subject to severe posterior capsular opacification and intense uveal inflammation. It may not be necessary in children > 2 years or when you are implanting an IOL which has good biocompatibility with the anterior vitreous face. It can be performed through the pars plana or through limbal incision upto a depth of 2 mm. This technique appears to be a good way of preventing the formation of after cataract.

Another technique involves performing an optic capture, where, the IOL is pressed through the posterior capsulorhexis while the haptics remain in the bag. However this technique does not appear to fully prevent the formation of aftercataract and it is reported that anterior vitreous face becomes semiopaque and opacification of anterior and posterior IOL surfaces can occur. Optic capture might be good technique in some cases since it provides a good centration of the IOL which is necessary after trauma and in incomplete capsulorhexis. However optic capture is difficult or impossible with single piece IOL that does not have angulated haptics. Table 3 gives a synopsis of various types of optic capture that can be performed[5].

The viscoelastic should be completely removed , and no vitreous should be in the anterior chamber. The sclera is soft and elastic in children and it is hard to achieve a self sealing incision in most cases. So the incision should be closed by sutures. Endophthalmitis is the most serious complication and prophylatic antibiotics are indicated in all cases.

Correction of Aphakia

IOL Implantation-. Today most children are implanted with an IOL during surgery and the criteria of IOL implantation depend on the childs age and whether the cataract is unilateral or bilateral. It is perfectly safe and acceptable to perform primary implantation in a child older than one year. In children younger than 1 year IOL implantation is controversial. A foldable acrylic hydrophobic IOL is the most biocompatible IOL as of today. A single piece IOL is for in the bag insertion and a 3 piece for sulcus fixation. The use of multifocal IOL in young children have been studied by Jacobi et al and the results are encouraging.

Contact Lens- If no IOL is implanted, contact lenses are given as early as possible to prevent stimulus deprivation amblyopia. Frequent retinoscopy should be performed to decide the power of CL and an overcorrection of +2 to +3D is manadatory. Silicon lenses or soft hydrogels are well tolerated.

Spectacles- In some children with bilateral aphakia spectacles are better tolerated than contact lenses. In addition a secondary strabismus may be manipulated by prismatic effect of spectacles. . Bifocal glasses should be prescribed when the child is about to start school. (Table 4)

Factors to Consider When Deciding Between Aphakic Glasses and Contact Lenses

Unilateral or Bilateral Aphakia

Aphakic glasses are not suitable for monocular aphakia because of relative magnification differences.

Institutional and Parent Compliance Factors

When contact lens care cannot be provided by the institution or when there is poor parental compliance aphakic glasses can be prescribed.

Table 3. Optic Capture Technique (Courtesy: Trivedi R.H. & Wilson[5])

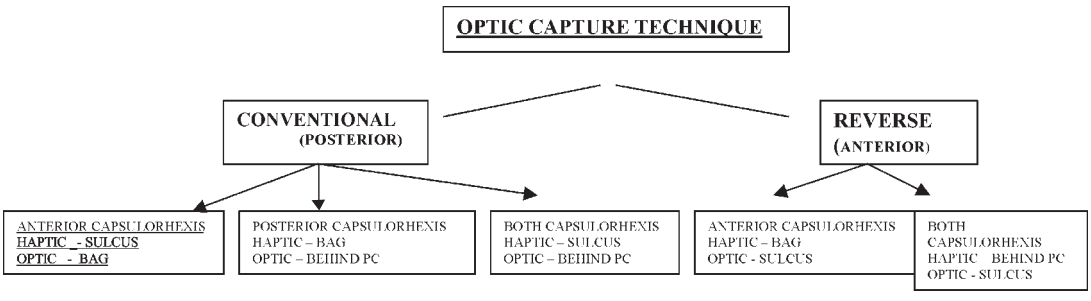


Table 4. Arguments for and Against Different Modalities to Correct Aphakia

1. Aphakia Glasses	Safe, power easily adjusted, less expensive ➢ 30% magnification of images ➢ Unsuitable for monocular aphakia ➢ Distorsion of image and prismatic effect ➢ Heavy weight of glass cumbersome	➢ Restriction of visual field to 30^0
2. Contact Lenses Suitable for U/L aphkia	Power can be easily adjusted safe ➢ Difficulty in insertion ➢ 5-9% image magnification ➢ Frequent lens loss ➢ Corneal complications	➢ Non compliance of parents and patient
3. Epikeratophakia	Reversible, extraocular No damage to recipients cornea ➢ Difficult to achieve target refraction	➢ Tissue not readily available ➢ Graft failure
4. IOL	Immediate and Constant Visual input Maximum compliance with Amblyopia therapy Minimum Anisometropia	➢ Frequent changes of residual refractive concern for long term safety ➢ High incidence of VAO

Cost factor

Silicone lenses are expensive. The need to change contact lenses frequently due to change in refraction as well as frequent lens loosage adds on to the expenditure in contact lens wearers.

Occlusion Therapy- In unilateral cases occlusion therapy is started as soon as the media are clear and refraction is corrected. In bilateral cases occlusion is sometimes useful if one eye is more amblyopic than the other. These children should be followed up into adulthood.

Postoperative Complications

Secondary opacification of the visual axis (VAO) is common and is treated by an ND Yag laser or surgical intervention. Secondary glaucoma is better prevented than treated. Some cases can be controlled by local medications but surgical intervention is often required. Amblyopia and strabismus, endophthalmitis, retinal detachment, cystoid macular oedema etc are to detected and treated when needed.

Conclusion

Dense congenital cataract requires prompt surgery and the optimum time is at 4 to 6 weeks of age. To remove cataract before 4 weeks appears to increase the risk of secondary glaucoma, while waiting beyond 8 weeks compromises visual outcome. Nystagmus and strabismus are indications for immediate intervention. The treatment regimen consists of surgery within 2 months combined with immediate optical correction. IOL implantation is safe in children older than 1 year of life. Anterior capsulorhexis is mandatory. In all children younger than 2 years the posterior capsule needs to be opened during surgery or soon thereafter by ND Yag.

Anterior dry vitrectomy is recommended often, though not always. Incomplete cataracts are followed up and the timing of surgery depends on the visual status.

References

1 Vasavada A R, Nihalani B R Pediatric cataract surgery, Curr.opin.ophthalmol 2006 Feb 17[1]54-61

2 Lambert S R , Lynn M J, Reeves R, Plager D A, Is there a latent period for surgical treatment of children with dense bilateral cong. Cataract JAAPOS 2006 Feb10[1] 30-6

3 Zetterstrom C, Lundvall A, Kugelbang M. Cataract in children. J. Cataract Refract Surg 2005 April 31[4] 824-40

4. Simsek T, Mutluay A, H Elgin U, Gurul R, Batman A. glaucoma and increased central corneal thickness in aphakic and pseudophakic patients after cong. Cat. Surgery Br. J Ophthalmol 2006 May 17

5. Wilson M E Jr. Trivedi R H Low mol weight heparin in the irrigating solution in pediatric cataract & intraocular lens surgery. Am J Ophthalmol 2006 March 141{3} 537-8

6. Rumelt S, Stolovich C, Intraoperative enoxaparin minimizes inflammatory reaction after ped. Cat. Surgery. Am J Ophthalmol. 2006 March 141 [3] 433-7
7. Birch E E . Chang C. Stager DR Jr Felius J Visual Acuity Development after the implantation of unilateral IOL in infants &young children. JAAPOS 2005 Dec. p. [6]527-32
8. Bayraular H, Colak A, Advantages of scleral incision in pediatric cat. Surgery J Cataract Refract. Surg. 2005 Nov 31[11]2039
9. Spierer A. Nahum A Eye 2002 jul 16 [4]466-8
10. Grieshaber M C, Pienaar A, Stegman R, Posterior vertical capsulotomy with optic entrapment of IOL in cong. Cataract . J Cataract Ref. Surg 2005 May 31 [5] 886-94
11. Vishwanath M Cheong- Leon R, Taylor D Is early surgery for congenital cat. a risk factor for glaucoma Br. J Ophthalmol 2004 jul 88 [7] 905-10
12. Lambert SR treatment of cong cataract Br. J Ophthalmol 2004 Jul 88 [7] 854-5
13. Scott Lambert Lens- Text book of Pediatric Ophthalmology by David Taylor
14. Wilson Jr, Trivedi Rupal, Pandey Suresh-Paediatric Cataract Surgery
15. Brian J Forbes, and Suqin Guo Update on the surgical management of pediatric cataracts. J Pediatr Opthalmol Strabismus May- June 2006 43 143-151.

Target Pressure

Dr. Devindra Sood, DNB

Once the diagnosis of glaucoma has been made based on the intraocular pressure (IOP), optic nerve head (ONH) and characteristic visual field changes, further follow up of such patients involves:

I. Establishing baseline values with regard to
   a) Intraocular pressure
   b) ONH changes
   c) Visual field responses
   d) Status of outflow structures

II. Ideal / Target Pressure

III. Lowering of IOP (medically/ surgically)

IV. Follow up of
   a) IOP
   b) ONH
   c) Visual field responses

V. Modifying the goal and hence the treatment.

Glaucoma as defined today, is an optic neuropathy, characterized by a specific pattern of ONH changes and nerve fibre defects, which can occur by pressure dependent / independent factors. As our understanding of the glaucomas is getting better day by day, extra effort is now being made to prevent the end point in glaucoma (ONH damage). The concept of Neuroprotection – protecting the axons of the optic nerve from getting damaged is the outcome of such efforts. At this point in time, we can modulate only pressure dependent factors. Hence the goal in the treatment of optic neuropathy to date has been lowering of IOP alone.

For every patient diagnosed as glaucoma, there exists a level of IOP, beyond which the optic neuropathy progresses rapidly. But if the IOP remains below this level, the progression is less likely to occur. This level of IOP below which damage to the ONH is less likely is called ***Ideal Pressure/ Target Pressure or Safe Level of IOP.***

This Ideal Pressure/ Target Pressure is not to be seen as an absolute value but rather in continuum where the Ideal Target Pressure represents one end of the IOP spectrum, where the risk of progression is very little. An "***Acceptance target pressure"*** would include a reasonable ideal pressure where risk for further damage to optic nerve is low. Borderline Target Pressure is one where the risk of progressive damage is significantly increased.

e.g. 1. For a patient with a healthy optic nerve head and no visual field changes and an intraocular pressure 0f 28 mmHg, ***an Ideal Target pressure would be 20 – 22 mmHg, Acceptable Target pressure 23 – 24 mmHg and Borderline Target pressure 25 – 26 mmHg***

e.g. 2. For a patient with near total cupping of the ONH with corresponding visual field changes and an intra ocular pressure of 18 mmHg, ***an Ideal Target pressure would be 8 – 10 mmHg, Acceptable Target pressure 11 – 13 mmHg, Borderline Target pressure 14 – 15 mmHg.***

After the initial target pressure has been attained the patient needs to be followed up regularly. If the Optic Neuropathy progresses, in terms of the ONH changes and visual field response, a new target pressure needs to be established.

e.g. 3A 56 year old patient was diagnosed to have glaucoma with 0.4 and 0.6 cupping of the ONH with corresponding visual field changes and an IOP of 28 and 32 mmHg in the presence of open angles.

Consultant; Glaucoma Imaging Centre, New Delhi

In this case an ideal target pressure would be 20 – 21 mm Hg. Medical treatment with a single drug lowered the IOP to 23 mmHg in both eyes. On regular follow up the ONH and visual field responses remained constant and no progression occurred. The IOP range in this period was between 20 – 24 mmHg in both eyes. In the middle of the third year, early progression was demonstrated and confirmed on Automated Perimetry in the left eye. Since damage had occurred at a lower pressure in the left eye, further lowering of IOP was desired (new target pressure) and another medication was added.

Had the neuropathy progressed from 0.6 to 0.8 – 0.9 in the left eye despite medical treatment, glaucoma filtering surgery could have been considered to lower the IOP to the desired 8 – 12 mmHg.

Important :- In glaucoma, goals keep varying. In other words, target pressure is a continuously evolving process.

The target pressure can be arrived at by

a. Numerical methods

b. Theoretical methods

A. <u>Numerical Methods</u>:

I. Always aim for an IOP <21 mmHg. However despite attaining an IOP of <21 mmHg the neuropathy can progress, because this is based on the assumption that all optic nerves respond in the same way. Also, it assumes that all ONH have the same target pressure.

II. Lower the IOP by 30%. This has been the rationale of the Low Tension Glaucoma Collaborative Study. However it is based on minimal factual data.

III. Lower the IOP by 1/3 of the baseline. This again is an empirical method, which does not take into account the diurnal fluctuation. Also the frequency of monitoring is likely to be questionable.

IV. Lower the IOP, as much as possible. This remains, the best maxim for patients with advanced glaucomas. There is also a greater possibility to prevent non pressure dependent damage to the ONH.

V. $$\text{Target Pressure} = \frac{\left(\begin{matrix}\text{1-Reference} \\ \text{Pressure}\end{matrix} + \begin{matrix}\text{Visual Field} \\ \text{Score}\end{matrix}\right)}{100} \times \text{Reference Pressure}$$

(Reference Pressure = baseline pressure before treatment. Visual Field score determined by a computerized program developed for the Advanced Glaucoma Intervention study)

A highly complicated method established by the Collaborative Initial Glaucoma Treatment Study.

A. Theoretical Methods: By this method factors in addition to IOP are considered. These include:

1. Highest IOP recorded
2. Age of patient – (greater the age, lower the IOP needed)
3. Extent of optic nerve head damage
4. Course of the disease – Is it slowly progressive or rapidly deterorating
5. Systemic illness: Diabetes, hypertension, hypotension, haemodynamic crisis, vasospastic disorders

A clinically more useful way of estimating the target pressure is based on

a. IOP with optic nerve head changes

b. IOP with visual field response

a. Target Pressure based on ONH changes:

ONH Changes	Percent Decrease in pre-treatment I.O.P.
Upto 0.3 cupping	20%
0.4 – 0.5	30%
0.6 – 0.7	40%
0.8 – total cupping	60%

Target Pressure based on visual field changes

Visual Field Loss	Pre Treatment IOP		
	20	30	40
Mild	16	23	25
Moderate	14	20	25
Severe	10	15	20

Target pressure is that level of IOP, below which progression of the optic neuropathy is less likely to occur. Every glaucoma patient needs to be followed up regularly for Target Pressure is a continuously evolving process.

It helps to:-

- Tailor the various treatment modalities available to suit the patient.
- Evaluate the efficacy of the medication/ procedure.

- Determine the need for additional medication/ procedure.
- Maintain Quality of life
- Prevent haphazard treatment by ensuring
    a. good patient compliance
    b. considering diurnal fluctuation
    c. extent of optic neuropathy
    d. systemic illness

Conclusion

Elaborated herein is the concept of Target Pressure, in light of the current concepts in the management of the Glaucomas. In numerical values, target pressure can be calculated based on the initial IOP as also the cup disc ratio and visual field changes. The value of systemic factors is also emphasized.

References

1. Tuulonen A, Airaksinen PJ, Erola E, et al. The Finnish evidenec – based guidline for open – angle glaucoma. Acta Ophthalmol Scand 2003;81:3.
2. Damji KF, Behki R, Wang L. Canadian prespective in glaucoma management: setting target intra ocular pressure range. Can J Ophthalmol 2003;38:189.
3. American Academy of Ophthalmology Preferred Practice Patterns Committee Glaucoma Panel: Primary Open Angle Glaucoma. 2003.

Evidence-based Medicine in Clinical Practice

Amit K. Ghosh, MD, FACP

Abstract

Evidence based medicine provides for health care providers a skill to decipher effectively the vast amount of medical literature and assist patients with health care decision making. Understanding the different types of studies performed and being able to better comprehend the strength of a particular study in its justification of a specific treatment will enhance a practitioner's ability to care for patients. This publication will provide an introduction to primary and specialty providers in the use of evidence-based medicine to maximize communication and quality of care in their patients.

Introduction

The concept of evidence-based medicine (EBM) ensures that the physicians are familiar with the calculated estimate of the patient's probability of having a disease and understand the estimated risks and benefits of tests and treatments [1]. These estimates are derived from the physician's ability to locate critical information from the current medical literature and their willingness to incorporate the patient's relevant values in the decision-making process. Hence the future competence of the physician is not measured by his/her ability to recall facts, but by the ability to incorporate the best current evidence into the patient's personal values and come to a shared decision acceptable to both the patient and the physician.

Associate Program Director, General Internal Medicine Research Fellowship, Consultant Internal Medicine, Mayo Clinic College of Medicine, Rochester, MN, USA 55905

Evidence-based health care (EBHC) and its approach to the practice of medicine has gained considerable acceptance among health-care professionals. Spurred by the vision and innovative genius of Prof. David Sackett and Prof.Gordon Guyatt and colleagues from McMaster's University, Canada and subsequently popularized by International EBM workshops conducted by Oxford University, University of London and McMaster University, instructions on teaching EBM has become a global phenomenon. In fact, the introduction of EBM in the medical school curriculum can definitely qualify as one of the greatest innovations in medical education in the past 2 decades. The Association of American Medical Colleges (AAMC) advocates the integration of principles of EBM into undergraduate training and EBM has been incorporated into the curriculum of an increasing number of US medical schools. In a recent report, the Liaison Committee on Medical Education revealed that 122 of the 126 Liaison Committees on Medical education-accredited schools included EBM as a required course and devoted a mean of 20 hours to it [2]. Similar initiatives have been introduced in medical schools in several parts of Europe and Australia.

The benefit of evidence-based treatment is becoming increasingly evident. Adequate selection of patients with carotid artery stenosis for carotid endarterectomy, based on center and surgeon's experience decrease postoperative morbidity and mortality[3]. Salutary benefits have been reported in delaying renal failure by using Angiotensin-converting enzyme inhibitor in treating patients with proteinuria[4], and peri-operative

Beta-blockers use to reduce post operative cardiac complications in high risk patients[5].

Although much of the progress in medical education and health care has been attributed to the increasing popularity of evidence-based medicine, there still seems to be considerable resistance in many academic centres. The conventional apprentice approach to imparting medical knowledge revolves around the authoritative decision-making process of a well-meaning senior physician. A diagnostician's brilliance is measured by the speed by which s/he can make a diagnosis rather than by a careful, reflective, open, and shared process of decision making as stressed in EBM. Medical students and residents might face numerous hurdles when trying to learn the principles of EBM. The students are exposed to numerous medical educators in the inpatient setting who vary considerably in their attitudes toward and expertise in EBM. Application of the tenets of EBM could be perceived as a challenge to authority. A recent survey of surgical residents from McMaster University in Canada indicates there are several barriers that limit the application of EBM in daily rounds. Residents perceived a lack of training in EBM, time constraints, lack of priority, and staff disapproval of EBM as major challenges to applying EBM. They also felt that there was a lack of readily available surgical EBM resources in their hospitals [7]. In a study performed in the USA, 33% of community physicians as compared to 5% of full-time academic faculty did not apply EBM principles in teaching students in outpatient settings [8]. Community faculty considered EBM skills to be less important in daily practice than full-time academic faculty and were less confident about their knowledge of EBM.

Despite an agreement on the definition of evidence-based health care, there remains considerable debate evolving around the what constitutes an evidence-based case. Physicians are encountering difficulties in entrenching EBM in mainstream clinical practice due to conflicting attitudes, different degrees of appreciation, onsite applicability, and ability to critically appraise articles[6]. I will discuss concepts of the steps in evidence-based medicine, identify the challenges of practicing EBHC including retrieval and critical appraisal of literature, application of EBHC to patients, examine the practicality of implementing EBHC in situations of medical uncertainty and enumerate educational interventions to enhance the practice of EBHC.

The 5- steps of evidence based medicine

The traditional model of evidence-based medicine (EBM) as proposed by the Evidence-based Medicine Working Group involves: 1) transforming the clinical problem into a 3- or 4-part question, 2) finding external evidence to answer the question, 3) critically appraising the external evidence, 4) applying the evidence to the patient incompliance with the patient's personal values, and 5) evaluating the decision-making process [1].

Hence when faced with a challenging patient's problem an EBM trained physician could convert the dilemma to a four part query using the PICO format (P- patient, I-intervention, C-comparison, O-Outcome), demonstrate aptitude for conducting a literature search, using a secondary sources (ACP Journal Club, Best Evidence, etc.) or Primary source (MEDLINE or Pub Med), possess the necessary skill to assimilate the scientific evidence, weigh in patient's problems along with their personal values and make a decision based on the current best evidence.

Sackett and colleagues [1] identified numerous misconceptions of the term evidence-based medicine among many physicians: 1) *It's what we've always done.* Although much of medicine is based on traditional medical education and subjective judgment, this view is no longer totally correct since the widespread access to electronic databases. 2) *It will replace clinical judgment.* This is currently no evidence of this. 3) *I don't have time for it*. Lack of time is a major barrier. However, recent cost-free availability, easy access, and familiarity prompt most clinicians to access MEDLINE/PubMed (a premier bibliographic database of the US National Library of Medicine) for their scientific literature. MEDLINE/Pub Med is the world's first and probably largest biomedical literature database, containing citations from over 4600 journals dating back to 1966. Additionally, secondary analysis of evidence-based guidelines and articles, which can be assessed at a fraction of the time required to read the primary literature, are easily available. 4) *It will lead to "cookbook medicine".* The process of evidence-based medicine requires the incorporation of patients' values prior to making any medical decision.

As we will discuss subsequently the process of medical decision making is often more complicated. However, understanding the process and current limitation of evidence may allay the physicians anxiety and assist them in negotiating the almost endless barrage of medical information.

Challenges with retrieval of medical literature

Reading is determined, among other things, by the ease in attaining literature. Scientific articles on MEDLINE/ Pub Med are available as either FUTON (Full Text on the Net) or NAA (No Abstracts Available) articles [9]. The innate tendency to pick the low-hanging fruit greatly enhances the odds that a FUTON article will be read or cited. This can create a bias, the FUTON or NAA bias, which may influence the visibility of research.

EBM in its effort to keep abreast with rapidly-evolving scientific findings, relies on seeking current best evidence from virtual libraries or online sources and integrating them into patient values after ascertaining the validity of the evidence by critical appraisal. This process helps avoid relying on obsolete and archaic information from traditional textbooks [1]. Nevertheless, it is probable that visibility and easy user availability may determine whether "available evidence" is adopted as "current best evidence" in health care. "Invisible" research may be ignored or overlooked. Ignoring relevant NAA articles may limit the use of medical literature just as publication bias or citation and language bias do [10].

More than 50% of Internet sessions end with the downloading of a full text article [11]. Articles which are available either as full text or abstract only in the Online have been found to have a higher impact factor than articles which are available without any abstracts [24]. As more research is being communicated electronically, health-science libraries have increasingly adopted the policy of online subscriptions. This trend in conjunction with the FUTON bias may have broad implications on future medical education. Residents and medical students tend to rely heavily on articles that are available online for selective reading on a subject [9].

Critically appraising medical literature

Critical appraisal of articles is an essential part of the EBM curriculum. The appraisal of articles in medical schools is taught in small focus groups as team learning and in journal clubs. Several institutions use standard worksheets for critical appraisal, summarize them as CATs (critical appraisal of topics), post them on their departmental web-sites[1]. Acquiring skill in critical appraisal is an essential part of EBM workshops worldwide. Having finally identified a suitable article, the physician ought to be able to critically appraise the paper. The common questions one needs to ask while interpreting an article on primary studies (those that provide original data on a topic) are summarized in Table 1. Articles are appraised for their internal validity (closeness to truth). One can read the abstract and often decide whether the question has been well structured and if the results were collected appropriately and well summarized. Evidence-based medicine is not restricted to randomized trials and meta-analyses. To be able to answer our question, one needs to identify the best article, check the validity, and see if a more detailed review is indicated to answer the two important questions, i.e., what were the results, and will they benefit my patients? Interpretation of the results often requires a knowledge of basic statistics and familiarity with EBM terminology. Some commonly-used terms in describing the results of a new diagnostic test include sensitivity, specificity, positive predictive value, and likelihood ratio.

In therapy questions, randomized control trials (RCT) and systemic review of several randomized trials provide the best information to aid in the management of a patient [12]. The number needed to treat (NNT), describes the number of patients that need to be treated

Table 1. Checklist for critical appraisal of articles with valid results

Diagnosis	Was there an independent, blinded comparison with a gold standard? Did the patient sample include an appropriate spectrum of patients similar to those found in general practice?
Therapy	Was the study randomized and double blinded? Were all enrolled patients included in the conclusion of study?
Harm	Were the exposures and outcomes measured similarly in both groups? Was the comparison group similar to the outcome group in all respects except for the variable in question?
Prognosis	Was the patient sample selected from a well-defined point in the course of disease? Was the follow-up adequate and complete?

to avoid one adverse effect [13]. This useful parameter considers the patient's baseline risk, as opposed to risk reduction (RR) and relative risk reduction (RRR), which don't tell us the magnitude of the absolute risk. The main problems are lack of physician time to conduct primary appraisal of each paper and information overload. A survey of physicians conducted in UK revealed that only 5% believed that identifying and appraising the primary literature or systemic reviews was the most important step in moving from opinion-based medicine to evidence-based medicine [14]. The majority of physicians (57%) thought that the most appropriate method to adopt an evidence-based practice was to apply evidence-based guidelines and protocols developed by colleagues. Several secondary sources are available which conveniently provide summaries of critically-appraised topics. These sources include ACP Journal Club (USA), Best Evidence (USA), InfoPOEMS (http://www.infopoems.com), Bandolier (UK), and the Cochrane Library. InfoPOEMs is also available for palmtop computers (PDA), which are used frequently by residents and physicians and provided updated information on medication and medical texts. It is unclear at present how helpful these secondary sources of information are in clinical decision making. In one study, physicians reported that these sources were helpful in 15%–17% of cases [14].

Applying evidence to patients

Having carefully evaluated the patient's condition and the best available evidence, clinicians need to understand the patient's preferences to identify the best available treatment for that particular patient [15]. Table 2. provides some common rules to aid the clinician in assessing the external validity of a paper. It is increasingly becoming clear that evidence alone is not enough to make a good clinical decision. Patients may vary quite widely in their tolerance of side-effects, thus nullifying anticipated therapeutic benefit. Communicating risks and benefits language understood by patients could greatly influence their decision in making a well-informed choice [16,17]. A combination of quantitative (ARR, NNT, RRR) and qualitative (unlikely, very likely) terms should be applied to explain the results of a study to a patient [16].

However, over a decade of experience in teaching EBM has emphasized that the translation of medical information from journals to practice has numerous challenges[6]. It has been increasingly identified that often significant modifications have to be made before best evidence is applied to patient. These modifications are often dictated by clinical state of the patient, to their unique circumstances, their personal preferences and the clinical expertise of the medical practitioner. In addition, there is considerable center to center variability in the EBM instruction provided to students. Students often fail to pursue patient-focused question due to lack of access to medical information, skills in searching medical literature, time, personal initiative and institutional culture. Also several schools lack qualified instructors in EBM and don't possess resources to practice EBM at the point of care.

Practising EBM in a developing countries also present unique challenges including limited resources, library facilities, lack of role models, inability to attend workshops. There may be a tendency to in developing countries to trivialize evidence-based medicine as just another western innovations which is expensive and of little use[18].

While explaining the risk to patients, clinicians often provide the details of the risk and the probability that it may occur (objective information), whereas the patient is also interested in knowing how important a bad outcome would be for him/her (subjective information). It is important to identify of the risk

Table 2. Application of the result of a study

Diagnosis
Is the test affordable, accurate, and available in my hospital?
Can I estimate the pretest probability of the disease in question?
Will the post-test probability affect my management?
Therapy
Is the patient so different from the study group that the results cannot be applied?
According to the study results, how much would my patient truly benefit from the treatment?
Are the treatment and consequences consistent with my patient's values and beliefs?
Harm
Can the study results be extrapolated to my patient?
What is the patient's risk of adverse events?
Can the patient's preferences and expectations be met by an alternative therapy?
Prognosis
Is my patient similar to the patients in the study group?
Will the evidence alter the choice of treatment

(death, disability, pain), its inception (early versus late), and the nature of the bad event (temporary, permanent).

The mnemonic **CARE** is often used to improve risk communication and includes: **C**ite basic risk in general terms, **A**dd estimated probabilities for positive and negative outcomes to descriptive terms, like low risks; **R**einforce effectiveness by using visual aids for risk communications; **E**xpress encouragement and hope to the patient [17].

Uncertainty in clinical practice and the application of EBHC

Medical uncertainty is inherent in clinical practice and contributes variability in medical practice[19]. Physicians have a differing levels of tolerance to uncertainty. Gerrity et al. [20] using a validated physician-response-to-uncertainty scale demonstrated that primary-care physicians (psychiatry, general medicine, family medicine, pediatrics, and OB/GYN) are more tolerant to uncertainty than anesthetists, orthopedists, and urologist.

Despite well defined, evidence-based guidelines, physicians often fail to implement these in their clinical practice. In a qualitative study conducted in the UK, six themes were identified which seem to affect the implementation of evidence-based guidelines. These included: the personal and professional experience of the physician, the patient-physician relationship, perceived tensions between primary-care physicians and specialists, physicians' attitudes towards their patients and evidence, the language used by the physicians, and the logistics of general practice [21].There is a tendency to continue current therapy to which patient is accustomed rather than prescribe a new drug based on the best available evidence. Physicians reported that perceived patient stress surrounding initiation of new therapy as it lead to frequent home visits for dose titration and reassurance of patient. Also being aware of patient's domestic situation, few physicians were hesitant to anti-coagulate their elderly patients.

The complexity of medical problems, along with variability in individual physician reaction to uncertainty, might alter the perception of a problem (Fig. 1). Application of the principles of EBM, while not completely eliminating uncertainty, could provide a common language to discuss causes for disagreements.

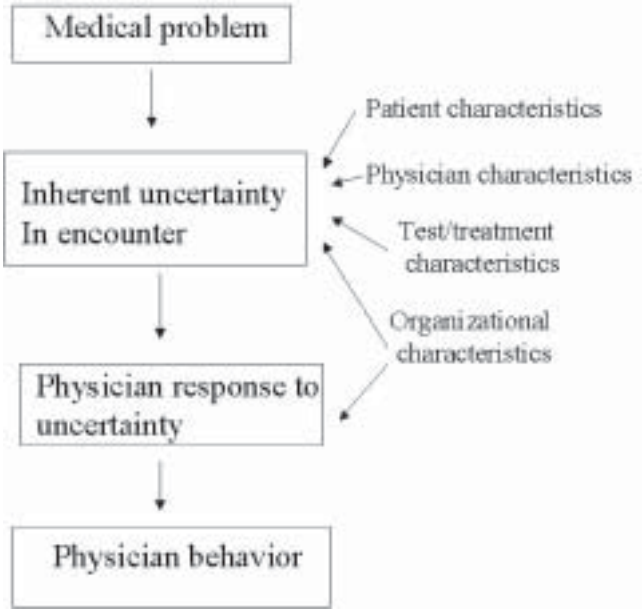


Fig. 1. Factors which influence physicians' uncertainty and behavior (adapted from Gerrity[20])

Shared decision making, meticulous evaluation, exclusion of possible, severe differential diagnoses, and establishing patients' trust are all techniques of managing uncertainty [6,22].

Educational interventions to enhance evidence-based practice.

Numerous workshops and training sessions on how to teach and learn EBM have been developed at various local, national, and international levels. These sessions are mainly directed towards improving technical EBM and cognitive skills. The main focus of these sessions has been to enhance specific aspects of EBM skills, especially asking a clinical question, conducting literature searches, and critical appraisal of topics. While most of these sessions test the EBM knowledge and skills of learners, there is good evidence to show that there are other factors which inhibit practitioners' ability to practice EBM, i.e., time pressures, lack of peer support, limited accessibility to quality sources (articles and secondary critically appraised topics). Hence recent efforts have been dedicated not only to the EBM curriculum, but also to the learning environment. Although there exist several validated tools to assess EBM knowledge and skills of learners, the attitude of learners towards EBM (KAB, Knowledge, Attitude, behavior) must also be understood [23].

In spite of a few enthusiastic reports about using EBM in the inpatient medical wards, pediatrics, and general practice [24,25,26], numerous personal, interpersonal, and institutional barriers still impair the uniform application of EBM in many institutions. Strategies to overcome this inertia could include hiring preceptors and role models who are experts in EBM, improving EBM training, reducing innumeracy among physicians and patients, implementing strategies for improving patient-physician communication, and improving attitudes towards evidence-based medicine. Shaughnessy and colleagues [27], have described the usefulness of medical information as:

$$\text{Usefulness of information} = \frac{\text{relevance X validity}}{\text{work}}$$

The most relevant information should be relevant to the practice, highly valid, and should take very little work to acquire.

Numerous recent developments have made the practice of evidence-based health care more practical. Ebell and colleagues found that 85% of family physicians were willing to carry a hand-held computer [28]. Among the most desired software were: drug information, current treatment recommendations, ability to update information, and ability to print patient educational material. Many hospitals currently provide computers at or near care units. The development of organizations like the Cochrane Collaboration, development of evidence-based journals of secondary publications (ACP Journal Club, Best Evidence, Evidence-based Nursing), availability of information systems which bring relevant evidence in seconds (InfoPOEMs), and learning the strategies of EBM for lifelong learning have created an invigorating environment to bring EBM into the mainstream of medical education.

Future Directions in EBM

Increasing efforts are currently in place to ensure that physicians are able to go beyond the evidence presented in literature and demonstrate that they are able to apply that evidence within the practical realm of their local communities. The Internal medicine residency programs accredited by the Accredited Council for Graduate Medical Education (ACGME) have to demonstrate that their residents demonstrate competency in practice-based learning and improvement (PBLI) and system based practice (SBP)[29,30]. For demonstrating competency in PBLI the residents must be able to investigate and evaluate their patient care practice, appraise and assimilate scientific evidence and modify or improve their patient care practices. For SBP, residents must demonstrate an awareness of the responsiveness to the larger context and system of health care and the ability to effectively call on system resources to provide care that is of optimal value. Active instruction on PBLI and SBP are in effect in all residency programs in the US, and periodic reviews by the Residency and Review Committee (RRC) - an independent review body, is performed to ensure that programs have an effective and consistent modality of instruction on these topics. Lack of compliance with providing effective program could result in loss of accreditation for residency programs.

Although it well recognized that the ability to critically appraise an article forms the premise of understanding the evidence, it is often impractical to review original articles due to time constraints. Prof. Brian Haynes of McMaster University, has recommended the 4S hierarchical approach with original 'studies' at the base, articles that 'synthesize' evidence from other articles (systematic reviews) just above the base, 'synopses' of studies and synthesis, and the highest form of evidence based on computer decision support 'systems' (CDSS) on the top [31]. The CDSS would attempt to integrate all relevant and important research about clinical problems and link it automatically through an electronic medical record (EMR) to the patient's unique problem. Currently, these systems are available in research settings, although with advances in biomedical informatics and EMR could make CDSS a reality in the near future.

The one factor that remain the main focus of EBM is the patient's well being. While numerous advances continue to be made and new modalities of evaluation and dissemination of new information develop, one needs to be mindful of the needs of the ailing patient and involve them to find out their values and preferences and involve them in their decision making process. Having this central focus, i.e., patient-centered care, should direct all subsequent research and educational innovation. For the present, a thorough understanding of the strengths and limitations of current best evidence and understanding of patients' values, will steer the physician towards the most optimal care of the patient.Self reflection and evaluation of ones' attitude towards critical inquiry of medical problems,

and periodic checking ones' skills in practicing and communicating evidence-based health case, could greatly enhance the practitioners ability to keep up with the ever changing medical information and the answer questions posed by the patient.

References

1) Sackett, D.L., et.al., eds. Evidence based medicine: How to Practice and Teach EBM. Second Edition. 2000, Churchill Livinstone, 1-261
2) Barzansky, B, Etzel SI. Educational programs in US medical school, 2002-2003. JAMA 2003;290: 1190-1196
3) Halliday A, Mansfield A, Marro J, et al. Prevention of disabling and fatal strokes by successful carotid endarterectomy in patients without recent neurological symptoms: randomised controlled trial. Lancet. 2004;363:1491-502.
4) Effects of ramipril on cardiovascular and microvascular outcomes in people with diabetes mellitus: results of the HOPE study and MICRO-HOPE substudy. Heart Outcomes Prevention Evaluation Study Investigators. Lancet. 2000 ;355(9200):253-9. Erratum in: Lancet 2000 Sep 2;356(9232):860.
5) Poldermans D, Boersma E. Beta-blocker therapy in noncardiac surgery. N Engl J Med. 2005 ;353(4):412-4.
6) Ghosh AK, Ghosh K. Translating evidence-based information into effective risk communication: current challenges and opportunities.J Lab Clin Med. 2005; 145:171-80.
7) Bhandari M. Montori V, Devereaux PJ, et.al. Challenges to the practice of Evidence-based medicine during residents' surgical training: A qualitative study using grounded theory. Acad Med 2003;78:1183-1190.
8) Beasley BW, Woolley DC. Evidence-based medicine knowledge, attitudes and skills of community faculty. J Gen Intern Med 2002;17:632-640
9) Wentz R. Visibility of research: FUTON bias. Lancet 2002;360:1256
10) Murali NS, Murali HR, Auethavekiat P, Erwin PJ, Mandrekar JN, Manek NJ, Ghosh AK. Impact of FUTON and NAA bias on visibility of research. Mayo Clin Proc. 2004;79(8):1001-6.
11) Delamothe T. Is that it? How online articles have changed over the past five years. BMJ 2002;290:1475-1478
12) Ebell MH, Siwek J, Weiss BD, Woolf SH, Susman J, Ewigman B, Bowman M. Strength of recommendation taxonomy (SORT): a patient-centered approach to grading evidence in the medical literature.J Am Board Fam Pract. 2004;17(1):59-67.
13) Cook RJ, Sackett DL, Roberts RS. An assessment of clinically useful measures of treatment effect. BMJ 1995;310:452-454
14) McColl A, Smith H, White P, Field J. General practitoners' perceptions of the route of evidence based medicine. A questionnaire survey. BMJ 1998; 316: 361-365
15) Haynes BR, Devereaux PJ, Guyatt GJ. Clinical expertise in the era of evidence-based medicine and patient choice. ACP J Club. 2002; 136: A11
16) Borgardus ST, Holmboe E, Jekel JF. Perils, pitfalls and possibilities in talking about medical risks. JAMA 1999;281:1037-1041
17) Paling J. Strategies to help patients understand risk. BMJ 2003;327:745-748
18) Dans AL, Dans LF, Guyatt GH, Richardson S. Users' guides to the medical literature: XIV. How to decide on the applicability of clinical trial results to your patient. Evidence-Based Medicine Working Group. JAMA. 1998; 279(7):545-9.
19) Ghosh AK: Dealing with medical uncertainty: A Physicians' perspective. Minn Med 2004;87:48-51
20) Gerrity MS, Earp JAL, DeVilles RF. Uncertainty and professional work:Perceptions of physicians in clinical practice. Am J Sociol 1992;97:1022-1051
21) Freeman AC, Sweeney K. Why general practitioners do not implement evidence: quantitative study. BMJ 2001;323:1-5
22) Ghosh AK. On the challenges of using evidence-based information: the role of clinical uncertainty. J Lab Clin Med. 2004;144(2):60-4.
23) Johnston JM, Leung GM, Fielding R, et.al. The development and validation of knowledge, attitude and behaviour questionnaire to assess undergraduate evidence-based practice teaching and learning. Med Edu 2003;37:992-1000
24) Ellis J, Mulligan I, Rowe J, Sackett DL. Inpatient general medicine is evidence based. Lancet 1995;346:407-410
25) Kenny SE, Shankar KR, Rintala R, Lamont GL, Lloyd DA. Evidence-based surgery: Intervention in a regional surgical unit. Arch Dis Child 1997;76:50-53.
26) Gill P, Dowell AC, Neal RD, Smith N, Heywood P, Wilson AE. Evidence based general practice. a retrospective study of interventions in one training practice. BMJ 1996;312:819-821
27) Shaughnessy AF, Slawson DC, Bennett JH. Becoming an information master: a guidebook to the medical information jungle. J Fam Pract 1994;39:489-499
28) Ebell MH, Gaspar DA, Khurana S. Family physicians' preference for computerized decision-support hardware and software. J Fam Pract 1997;45:137-141
29) ACGME Outcome Project. General competencies <http://www.acgme.org/outcome/comp/compFull.asp#3).Accreditation Council for Graduate Medical, Education, Chicago, Ill, 2001
30) Ziegelstein RC, Fiebach NH. The mirror and the village: A new method for teaching Practice-based learning and improvement and Systems-based practice. Acad Med 2004;79:83-88
31) Haynes BR. Of studies, syntheses, synopses, and systems: the "4 S" evolution of services for finding for finding current best evidence. ACP J Club. 2001; 134: A11-A13

CASE REPORT

Autobiography of A Fanta Bottle Chip

Dr. Elizabeth John MS, DO, **Dr. Mohammed Haneef** MS, DO, **Dr. Radha Nair** MS, DO, **Dr. Mini P.A** MS, DO, **Dr. Manoj Venugopal** MS, DNB, FRCS Ed[1]

Introduction

Though portrayed in a lighter vein, this is a true-life incident of a forty-year-old male with history of alleged assault who reported to the busy casualty of the Medical College Hospital, Alleppey with a retained orbital foreign body that was overlooked at the time of primary wound closure, getting it subsequently removed intact. The foreign body was a chip off a Fanta bottle, which measured a whooping 5.5 cm x 3 cm x 1cm ! It had entered the orbit through a lacerated wound below the lateral end of the right lower lid and was seen below the eyeball in the orbit without damaging it and extending up to the middle turbinate of left nasal cavity.

What more to expect from the autobiography of a Fanta bottle than getting filled up with that bubbly orange drink again and again only to quench someone's thirst. The cycle continues until its life ends tragically due to careless handling.

My autobiography was to be no different until it happened. An experience, a unique one which I never dared to dream even in my wildest dreams- to be trapped with in the orbit of a human for almost three days !!!. Yes, believe me, it did happen.

On that fateful November night, my life took an unexpected turn. It was 10 in the night. I was in the stands of a shop at a busy junction near MCH Alleppey. All of a sudden, two men appeared in front of this shop. A dispute resulted in quarrel and before I realized, one of them pulled me out from the stands and banged me against the others face. I broke into pieces injuring his face. He started to bleed profusely. People at once gathered around him and he was rushed to the casualty of MCH Alleppey. Little did anyone realize that a large portion of me bearing my name was lodged in his orbital cavity.

10:30 PM Casualty MCH : We (me within the patients orbit) were duly received by an intern who informed the duty Medical Officer. She arrived to examine 'us' and me heard her tell the intern that there were multiple soft tissue injuries on the cheek, preauricular and infra orbital regions of right side of his face and that the wounds being contaminated with glass particles, needed to be cleaned well before being sutured.

The intern carried out the order immediately and began to suture the wound in the casualty while the duty MO was busy with medico legal documentation. The intern copiously washed the wounds. I hoped that I would be spotted. However, it didn't happen. I guessed I was not visible because I was at a deeper plane. He began to suture the wound. Oh God! Am I destined to be here for the rest of my life! The very thought send shivers down my 'spine'. I cried out for help, but my desperate cries felt on deaf ears. The enthusiastic intern continued suturing while I hoped against hope that at some point I would succeed in making my presence felt. .The last nail was also driven into my coffin! Yes, the last suture was also in place. The wound was cleaned with spirit which burnt my 'eyes' and my spirits. A pad and bandage was given and the patient was admitted to ward. I was in a dark world amidst warm blood and flesh.

Day 2; 8.30AM: I woke up to a team of doctors narrating the incident to Chief. The patient complained of severe pain in his right eye. The chief's examination reveals a

[1] *Department of Ophthalmology, Medical College Hospital, Alleppey, Kerala- 688 001, e-mail: manojvenu@sify.com*

proptosis with restriction of eye movements. She instructs to get an X ray of skull done. Could it be a ray of hope! An hour later, the wet film is ready. Everyone was surprised and the thought of making it out, makes me jubilant! As the bewildered intern wonders what went wrong, the chief is convinced that I escaped notice during the primary wound repair .She asks him to have an emergency CT done since the trauma inflicted by the glass bottle has left some fragment inside. Therefore, I get the good fortune of being scanned by a CT machine, something that never happens to a glass piece in normal course!

Day 3: All are convinced that I am inside his orbit .The chief made it clear that no damage had been made to the eyeball as I am comfortably placed between his eyeball and orbital floor extending up to the nasal cavity. The patient along with my pictures was sent to meet the specialists at the Oro Maxillo Facial Surgery and ENT departments .They understood the gravity of the situation and planned to operate as a team the very next day.

Day 4: 10 AM Trauma O T: We were taken to the OT. The patient had been fasting overnight. I am on cloud nine, as I would be seeing light soon. We were on the operating table. The surgeons were discussing the modus operandi. The sutured wound in the infraorbital region was opened up as it is most likely to be the one through which I got in. They explore the site. One of them spotted me and drew everyone's attention on me. I felt a metal hug me and drag me out gently. I was waiting for this moment. I was placed on a draped table. Surgeons looked at me in wonder. They identified me to be a chip off a Fanta bottle as evident from the broken nameplate. They felt me and measured my dimensions. My pictures are taken and I give the best shot as if I am a model on the ramp.

I am then wrapped in a polythene cover and stuck to the patient's case sheet.

Day 5: Wards: Now that I am out, the patient is getting better. The intensity of pain is coming down, with a regression of proptosis and soft tissue reaction, though his eyeball movements are a bit restricted. The patient is told that I injured some of his muscle fibres. I feel sorry for my misdeed.

He is discharged from hospital after a few days of observation. I am sent to the Medical Records Library



Fig 1. Proptosis with wound of entry below the right lower lid.



Fig 2. CT Scan picture showing the foreign body in mid orbit extending to the nasal cavity



Fig 3. Foreign body being removed



Fig 4. The foreign body

safely sheltered in his case sheet. Now it is almost a year and a half since I am an inmate in this dark dusty room dumped along with other case records. I wonder whether I should have ever come out of his orbit.

As I spend my days not knowing what next, the only consolation is that I am probably the first ever Fanta bottle to find a place in a human orbit though many glasses pieces have been there before! (Medline search confirmed)

Strange are the ways of nature. I am convinced and so must be you. If you wish to correspond and know more about my adventure, send your queries to

'The Lost & Found Fanta chip'
Medical Records Library
Medical College Hospital
Alleppey- 688001
e- mail: fantachip@ orbit.com

So readers, thank you for your kind attention! Should you ever come across a patient with proptosis and restricted ocular movements following trauma to orbit, be sure to bear in mind the possibility of a retained kith or kin of mine!

CASE HISTORY

Subretinal Lesion – A Diagnostic Enigma

Dr. Sonia Rani John, Dr. Valsa Stephen, Dr. Arup Chakrabarti, Dr. Meena Chakrabarti

The association of tuberculosis[1] with intraocular inflammation is well known, and the diagnosis should be strongly suspected in Asian patients in the setting of (1) Isolation of M. tuberculosis from ocular fluid/tissue specimen (2) presence of ocular signs suggestive of tuberculosis in the presence of proven systemic disease (3) presumed ocular tuberculosis without associated systemic disease. In the last 2 situations the diagnosis remains largely presumptive[2]. In a country like India, where tuberculosis is endemic, absence of evidence of systemic tuberculosis, does not necessarily rule out tuberculosis as the causative factor in ocular inflammation. Making a definitive diagnosis is of utmost importance as the patient needs specific therapy that is prolonged, expensive and has significant side effects.

A 38 year old female presented to our OPD referred for the management of a non ischaemic central retinal vein occlusion in her left eye. She gave a history of sudden onset of defective vision in her left eye which was painless and progressive, associated with photopsia. She was illnourished and looked debilitated. She gave

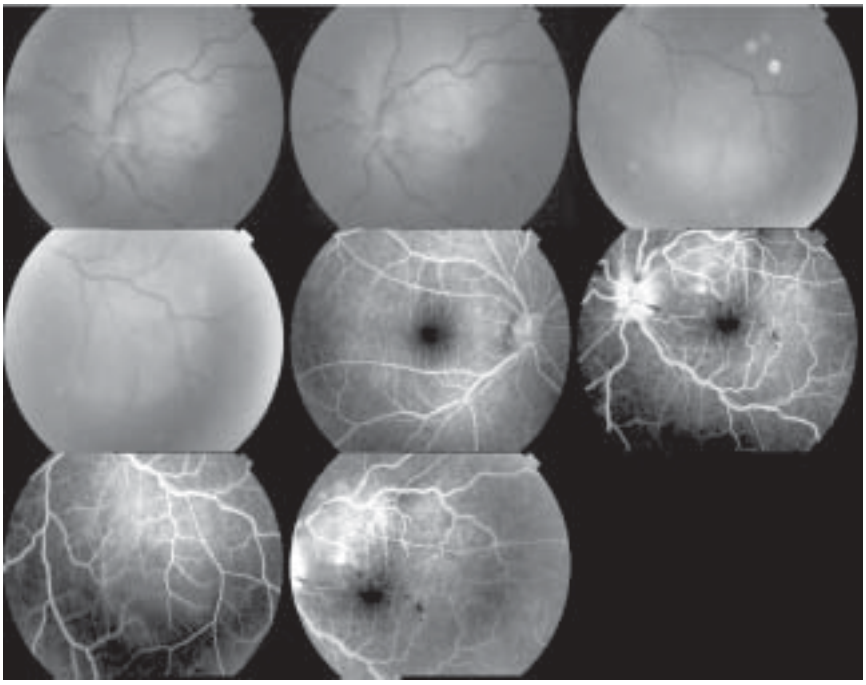


Fig. 1. a-d : Fundus Photography showing an elevated lesion of 5 DD within the arcades and another lesion inferiorly with overlying retinal detachment. e – h Fluorescein angiography showing progressively increasing leakage.

Address for correspondence: Chakrabarti Eye Care Centre, H. No. 102, Kochulloor, Trivandrum 695 011, E-mail tvm_meenarup@sancharnet.in

a history of having undergone subtotal thyroidectomy 2 months prior to the onset of visual loss. Her thyroid surgery was complicated by a bilateral recurrent laryngeal nerve paralysis from which she was still recovering and had hoarseness of voice. The histopathology report of the surgically excised thyroid tissue was of Hashimotos Thyroiditis. She was a non diabetic and non hypertensive and gave a history of having undergone bone marrow aspiration 10 years back for evaluation of anaemia. Ocular examination revealed a best corrected vision of 6/6 (RE) and 4/60 (LE) not improving further with glasses or pinhole, a normal anterior segment, clear lens and clear vitreous cavity. Fundus examination revealed a normal posterior segment in the right eye. The left eye showed a clear media, hyperaemic disc with striate peripapillary hemorrhages, venous engorgement and tortuosity. Superior to the fovea, was a raised yellowish lesion 5 DD in size with intra-retinal hemorrhages on its surface and perilesional as well as macular oedema. A similar

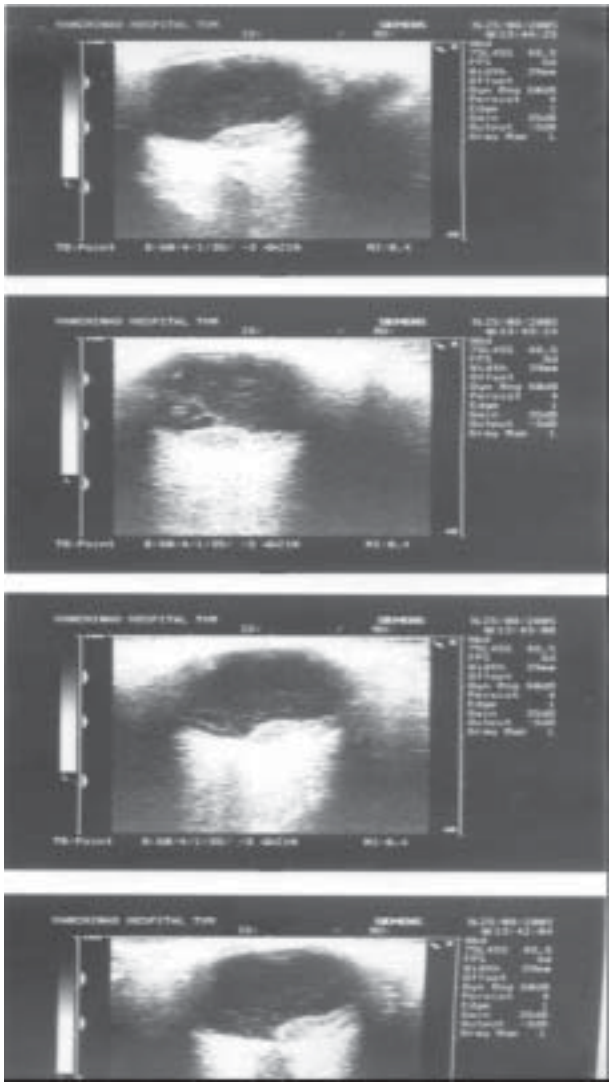


Fig. 2. B Scan Ultrasonography showing a solid lesion at the posterior pole.

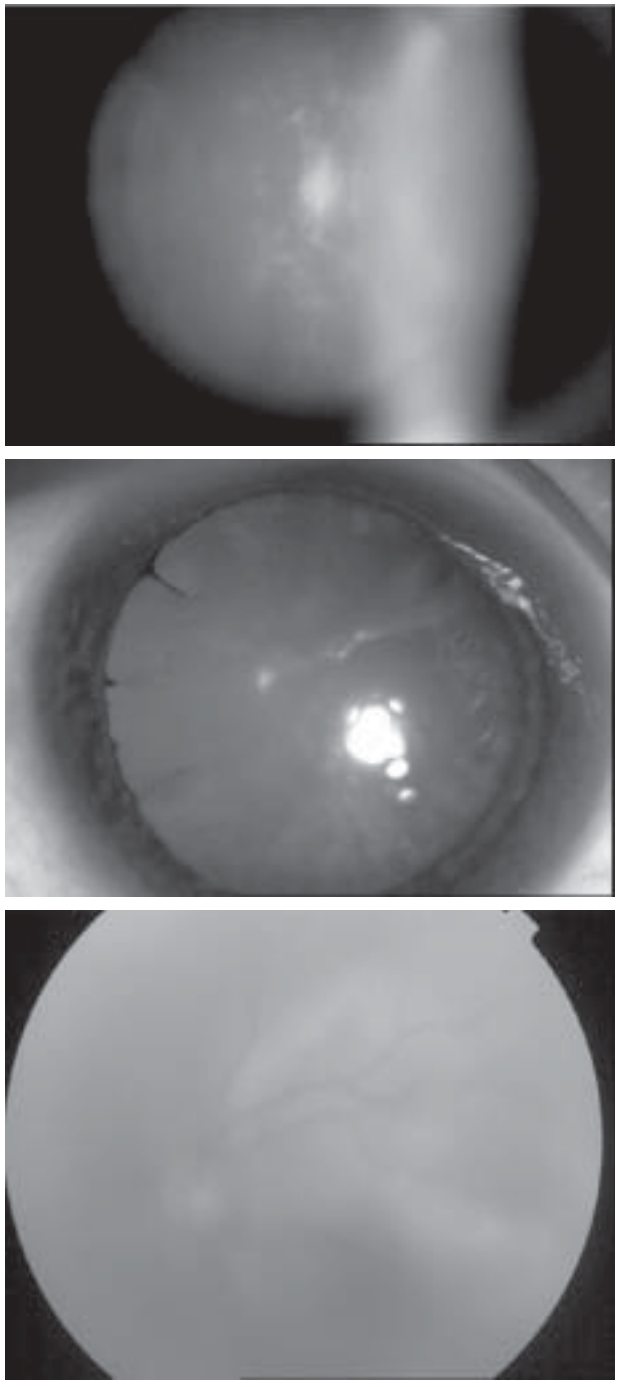


Fig 3 a : White lardaceous deposits in anterior vitreous. b : Anterior chamber reaction with KPs flare and posterior synechiae. c : Progressing mass lesion with severe vitreous reaction

Table 1. Subretinal Lesion : Investigations

• Routine Blood Counts	* Mantoux
• Blood Picture	* HIV
• LFT	* ANA
• ELISA for TB	* CMV Serology
• ELISA for Toxo	* B. Scan USG
• TPHA	* Systemic Workup for Choroidal Metastasis & NHL
• Serum ACE levels	
• X-Ray Chest PA view	* Consultation with Pulmonologist

appearing lesion was seen inferiorly below the inferior arcade with overlying exudative retinal detachment.

Fluorescein fundus angiography showed progressively increasing pinpoint hyperfluoresence (Fig 1a –h)

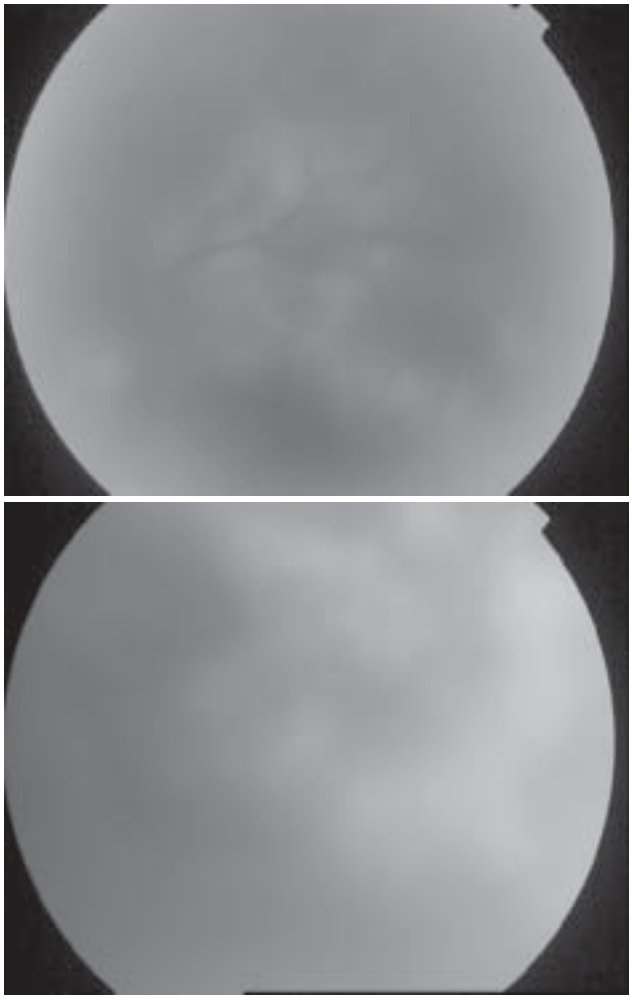


Fig. 4 (a) Clearing of the media haze followingvitreous biopsy. (b) Progression of the mass lesion following vitreous biopsy

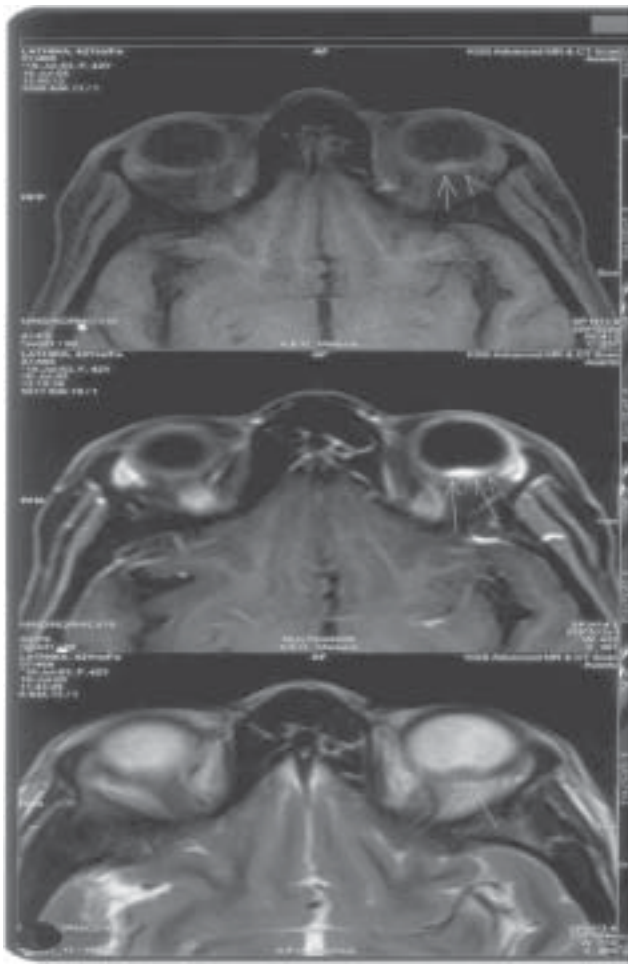


Fig. 5. CT SCAN demonstrating mass lesion in the left globe

Investigations performed are given in Table 1.

B. Scan ultrasonography showed an elevated hyperreflective lesion, with homogenous texture and absence of choroidal excavation or orbital shadowing (Fig 2).

The lesion remained quiescent for 2 months after which the patient presented with severe pain, uveitis and secondary glaucoma. There was documented progression of the lesion, progressing vitreous haze with lardaceous white deposits in the anterior vitreous (Fig 3- a, b and c).

Vitreous biopsy with intravitreal injection of Vancomycin and Amikacin was performed. Aqueous obtained by anterior chamber tap and vitreous biopsy specimen were subjected to Smear examination – Gram Stain, AFB Stain, KOH Mount 2) Culture: Bacterial, fungal and for mycobacterium 3) PCR for Mycobacterium. The diagnostic probabilities considered were subretinal abscess, TB granuloma, fungal abscess, non Hodgkins lymphoma and secondaries. Since all investigation

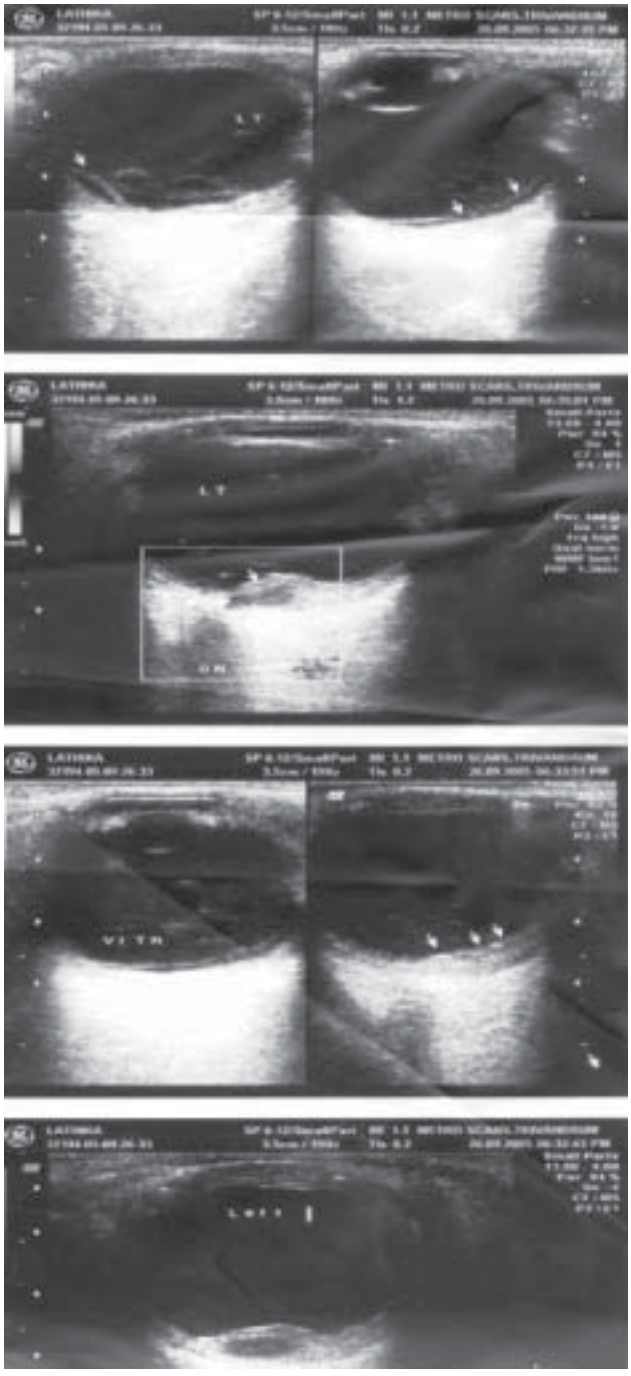


Fig. 6. B Scan USG showing central cavitation of the initial solid lesion.

results were negative, the patient was started empirically on a combination of systemic antibiotics, antifungal antibiotics and systemic steroids. Although the ocular media cleared significantly with this regimen (Fig 4a) there was a relapse after 2 weeks with severe pain, uveitis, recalcitrant secondary glaucoma with progression of the lesion (fig 4b). Since the patient was in severe pain and her vision was no light perception, she was counselled to undergo enucleation of her left eye and histopathological examination. Fig (5) & Fig (6) shows the MRI scan with mass leison in left eye B.Scan USG showed a central cavitation of the previously solid lesion.

Histopathological examination showed an inflamed and opacified vitreous, lymphocytic infiltration of the choroids with areas of casseation suggestive of Tuberculous granuloma (Fig. 7).

The aqueous samples and vitreous biopsy from the enucleated eye ball showed a positive culture in Lowenstein Jensen Media for mycobacterium tuberculosis. Tissue obtained from the subretinal lesion also showed a positive culture and positive PCR thereby confirming the diagnosis of subretinal tuberculous abscess. Systemic foci of the disease was excluded after consultation and discussion with the pulmonologist. However the patient was put on a three drug anti tuberculosis chemotherapy and maintained on it for 9 months.

Discussion

The pathogenesis of intraocular TB remains largely unclear. Tuberculous infection elicits a response initially that results in a primary complex. At this time there is hematogenous spread of organisms that results in seeding in various organ systems. These foci of infection may remain quiescent for the life time of the individual or may get activated later depending upon the

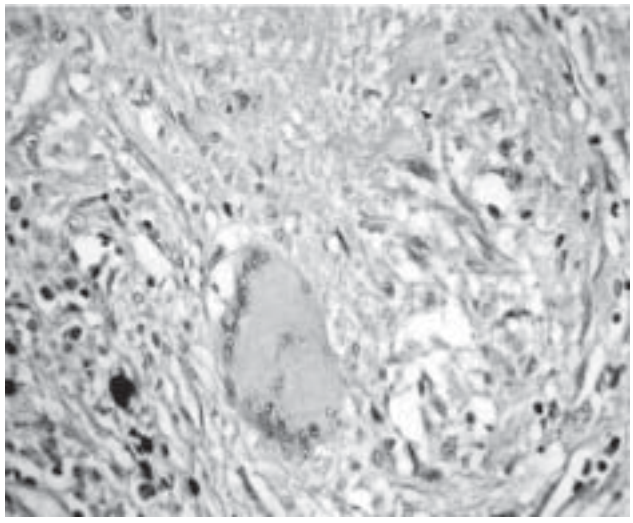


Fig. 7. HPE of lesion showing a chronic granulomatous reaction with casseation

suppression of cell mediated immunity. Intraocular tuberculosis is most likely to occur as a post primary infection or as a granulomatous hypersensitivity reaction. Choroidal tubercles caused by miliary spread consists of caseating granulomas resulting from haematogenous spread of active mycobacterium.

Persistence of M. Tuberculosis in the macrophages invites a chronic granulomatous inflammatory reaction manifesting clinically as disc oedema, neuroretinitis, choroiditis, vitreous snow ball opacities and vasculitis [3]

Detection of Mycobacterium Tuberculosis DNA in PCR samples is highly significant and in the presence of ocular inflammation mandates immediate initiation of anti tuberculous chemotherapy which may be combined with an appropriate dose systemic steroid therapy [4]. Treatment of ocular inflammation in PCR positive patients with no evidence of systemic involvement with corticosteroids alone is not recommended as miliary spread of tuberculosis poses a definite risk [5]

References

1 Amod Gupta et al PCR- Positive Tubercular Retinal Vasculitis – Clinical Characteristics and Management RETINA, 2001, Vol 21, No:5 435-444

2 Biswas J, Madhavan H, Gopal L, Badrinathnath S S Intraocular tuberculosis, Clinicopathological study of five case RETINA 1995, 15: 461 – 468

3. Helm CJ, Holland GN Ocular Tuberculosis Survey Ophthalmol 1993, 38:229-256

4. Gupta V, Arora S, Gupta A, Ram J, Bambery P Management of presumed intraocular tuberculosis; Possible role of polymerase chain reaction Acta Opthalmol Scand; 1998:35:237-239

5. Rosen P H, Spalton D J, Graham E M Intraocular Tuberculosis Eye 1990; 4:486-492.

WEBSITE FOR KSOS

Please log into the new reformatted interactive KSOS website

www.ksos.in

For any queries regarding the website, please contact

Dr. Arup Chakrabarti
Website Editor
Tel: 0471-2555530/2449599
E-mail: tvm_meenarup@sancharnet.in

Intraocular "Mass" Lesion - A Diagnostic Dilemma

Dr. V.Sahasranamam, MS. DO.

Routine clinical and imaging studies confirm the diagnosis in most of the intraocular mass lesions. But, a few cases present with varying features which make diagnosis difficult, clinically and with imaging techniques. And in some cases where the clinical diagnosis is made easily, the histopathological report may be surprisingly different.

Case report

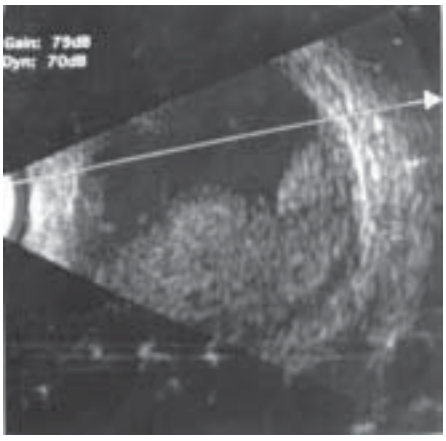
A 70 year old male presented with a history of sudden onset of painless and gross visual loss of a week duration in his right eye. His last ophthalmic check up was done at a local hospital, a few years back, when he was diagnosed to have an incipient cataract. He did not give any history of ocular pain or redness in his eyes. He is a known hypertensive and diabetic of 4 years duration, on regular treatment and under reasonably good control. His past medical history was uneventful except for chronic bilateral parotid gland swelling of more than 40 years duration, which had persisted without any increase in size.

Ocular examination revealed a visual acuity of perception of light with inaccurate projection in his right eye. Anterior segment examination was normal except for the presence of a significant cataract. There was no neovascularisation of the iris. The right eye had a relative afferent pupillary defect, a normal intraocular tension on applanation, and a significant cataract which precluded adequate fundus visualization. Examination of the left eye revealed a visual actuity of 6/60, not improving further with glasses or pin hole, and moderate (Gr II-III) nuclear sclerosis. Fundus examination was possible in the left eye, however significant pathology could not be made out.

Investigations including blood sugar levels, peripheral smear examination, bleeding time, clotting time, blood pressure were all within normal limits.

With a presumptive diagnosis of vitreous hemorrhage, B Scan Ultrasonography was done. It showed multiple dome shaped solid elevations with high surface reflectivity (Fig. 1 & 2). Choroidal complex was not well defined, with a suspecious area of scleral dehisence. With a high suspicion of choroidal melanoma or secondaries, he was advised to undergo an MRI, to rule out any extrascleral extension and to confirm the intraocular mass. Due to financial reasons, the patient was unwilling to undergo MRI studies. Hence enucleation was suggested, explaining the possible complications of a mass lesion and the need for histopathological examination of the enucleated specimen was discussed. The patient was not willing for surgery. However a month later he came back with severe pain in his right eye. Examination revealed a congested right eye, with total hyphema and unrecordably high intraocular pressure. Vision was now reduced to 'no light perception'. Now that it has become a painful blind eye, patient consented for enucleation which was done under local anesthesia. Intra-operative and post operative periods were uneventful. The enucleated eye ball did not show any macroscopic evidence of scleral dehisence.

Address for correspondence: Dr. V. Sahasranamam, Regional Institute of Ophthalmology, Trivandrum



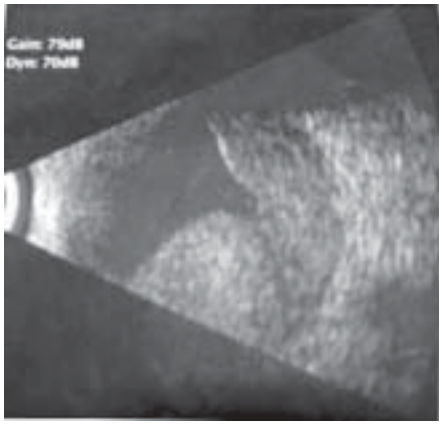
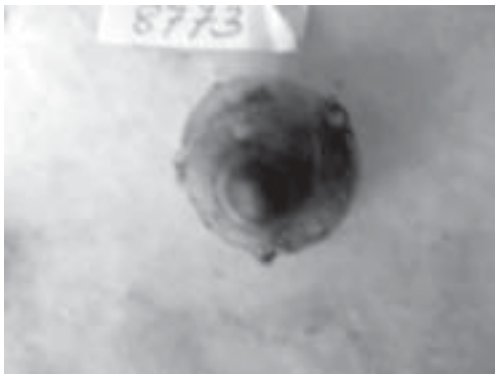


Fig. 1 & 2 Ultrasound B. Scan of right eye showing multiple domeshaped solid elevations.



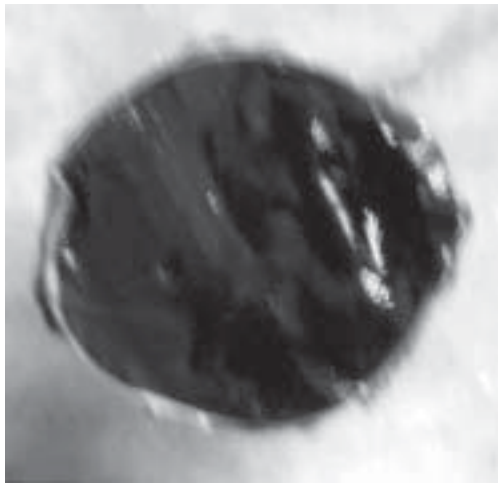


Fig 3 and 4. Gross features of the enucleated specimen showing the posterior segment filled with a large brownish mass

Histopathology report

Macroscopy (Figure 3 and 4)	Eye ball measuring 3 x 2 x 2.6 cm Cross section-the whole posterior segment is filled with a large brownish mass.
Microscopy (Figure 5 and 7)	Section from eye ball showed detached retina with haematoma at the level of external limiting membrane splitting retina into two. In the haematoma few scattered retinal pigment epithelial cells were noted. The vitreous and anterior chamber also showed hemorrhage. No tumor was seen.

Discussion

Historically, 20% of enucleated eyes with a diagnosis of malignant choroidal melanoma, were proved to be benign lesions[3] on histological examination. More recent studies, based on improved ancillary tests have shown a diagnostic precision of more than 95%.

The collaborative ocular melanoma study group (COMS)[1] found only 2 false positive cases in 413 eyes with a clinical diagnosis of malignant choroidal melanoma.

Among lesions that might simulate ophthalmoscopic features of malignant melanoma, hemorrhages of the choroid is an important differential diagnosis. Hemorrhage may be due to inflammatory causes, trauma, vascular diseases or might even be spontaneous. It's corollary should also be borne in mind, when a case may clinically look like a choroidal hemorrhage but may harbour a malignant growth beneath it. The Ultrasound B. Scan[2] feature of low internal reflectivity is characteristic of a choroidal malignant melanoma. But an associated choroidal haemorrhage may produce high internal reflectivity. Rarely extensive necrosis in a tumour mass could also produce high internal reflectivity. However choroidal haemorrhages may also present with low internal reflectivity making the diagnosis even more difficult.

Using colour Doppler[2,3], the presence of arterial

vascularisation may be observed in the interior of the tumour, providing further support in diagnosis.

In atypical cases, to make a proper diagnosis one can resort to fine needle aspiration biopsy (FNAB).

FNAB has been recommended in cases where,

1. Diagnosis and distinction between a benign and malignant lesion is difficult and where the therapeutic decision will have to be made on cytological diagnosis.
2. There is metastatic disease in the choroid but primary is not identified.
3. The patient refuses a recommended treatment modality without histopathological confirmation.

The FNAB has a sensitivity and specificity rate[5] of 84% and 98% respectively. The reported complications of the procedure include, intraocular haemorrhage, retinal break formation and needle track dissemination.

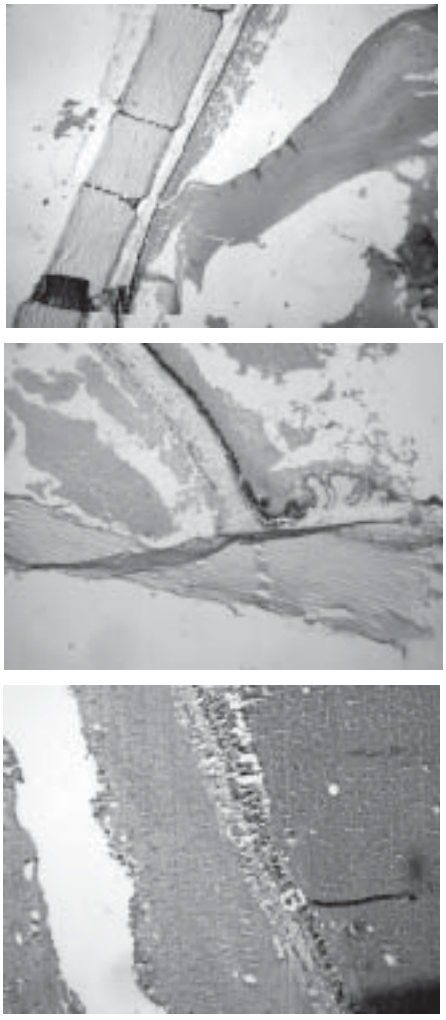


Fig. 5, 6 & 7. Histopathological examination of the enucleated globe showing the haematone in the subretinal space and overlying retinal detachment

Intraocular haemorrhage as a complication of FNAB is very common and it usually leads to some degree of vitreous and subretinal bleeding. These haemorrhages are usually of small quantity and clears with time.

Retinal break is created when transvitreal approach is used to pierce the tumour through the retina. This break almost never leads to a retinal detachment as it gets sealed by the blood clot.

Experimental studies have been done on needle track dissemination in FNAB[5]. These studies have been done on enucleated eye balls. Studies have shown tumour cells in upto 67% of direct needle tracks[4,5] (direct penetration of sclera over the tumour) and in 53% of indirect needle tracks (transvitreal approach). However, it was concluded that the number of cells seeded were not large enough for tumour growth in experimental animals.

In general FNAB[6] should not be attempted in retinoblastoma as it is a friable tumour and carries risk of extraocular seeding with FNAB. It should be done only in very atypical clinical situations, and in possible cases, a transcorneal approach for FNAB is preferred.

FNAB is a specialised technique which is not to be used in routine diagnosis of intraocular tumours. But judicious use of this technique in selected group of atypical intraocular mass lesions, is of immense value in diagnosis.

References

1. Accuracy of diagnosis of choroidal melanomas in the Collaborative Ocular Melanoma Study. COMS report no. 1. Arch Ophthalmol. 1990;108:1268-73.
2. Char DH, Stone RD, Irvine AR, Crawford JB, Hilton GF, Lonn LI, et al. Diagnostic modalities in choroidal melanoma: sensitivity, specificity, and reproducibility. AM J Ophthalmol. 1980;89:223-30.
3. Ferry AP. Lesions mistaken for malignant melanoma of the posterior uvea. A clinicopathologic analysis of 100 cases with ophthalmoscopically visible lesions. Arch Ophthalmol. 1964;72:463-9.
4. Karcioglu ZA, Gordon RA, Karcioglu GL. Tumour seeding in ocular fine needle aspiration biopsy. Ophthalmology 92:1763-1767, 1985.
5. Glasglow BJ, Brown HH, Zargoza AM, Foos RY. Quantitation of tumour seeding from fine needle aspiration of ocular melanomas. Am J Ophthalmol 105:538-546, 988.
6. Shanmugam MP, Biswas J.Fine needle aspiration biopsy in the diagnosis of intraocular mass lesions. Indian J Ophthalmol 1997;45:105-108

CASE REPORT

Bilateral Cataract Following Electrical Injury

Dr. Valsa Stephen MS. DO.DNB, **Dr. Sonia Rani John** DNB, **Dr. Arup Chakrabarti** MS. DO.*,
Dr. Meena Chakrabarti MS. DO.DNB

Electrical injuries can result in a wide range of ocular complications. Of these, electrical cataract can occur after a latent period and then progress with startling rapidity. However proper surgical management can result in good and stable visual acuity as is seen in this case.

Case Report

A case of bilateral cataract which developed following electrocution injury in which there was rapid progression of the cataract in the left eye, its clinical history, surgical management and outcome is reported.

A 35 year old electrician reported to our outpatient department two months following electric injury – high tension wire(11,000 Volt) falling on his head, with redness in the left eye of one week duration. On examination, there was a sagittal linear deep raw area on the scalp and on both soles, with superficial burns on the face including periocular area (Fig 1 and Fig. 2).



Fig. 1. Entrance wound on scalp

* Corresponding author : Dr. Arup Chakrabarti, Chakrabarti Eye Care Centre, Kochulloor, Trivandrum, Kerala, India E-mail:- tvm_meenarup@sancharnet.in



Fig. 2. Exit wound on soles of both feet.

The best corrected visual acuity was 6/6, N 6 right eye and 6/12, N 12 in the left eye. Slit lamp examination showed anterior subcapsular cataractous changes in both eyes with anterior uveitis in the left eye (Fig. 3a & b). Fundii in both eyes were within normal limits

He was started on topical steroids and cycloplegics with which uveitis was controlled and vision in the left eye improved to 6/6 by three weeks. However, over one

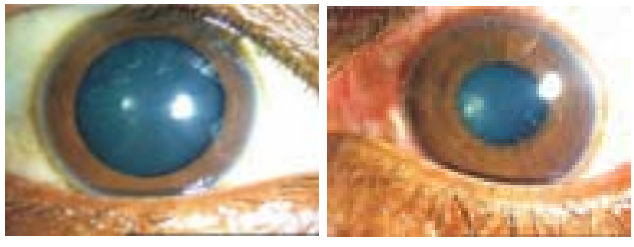


Fig. 3 a, b Early anterior subcapsular cataractous changes in both eyes with uveitis in the left eye

week, his vision in the left eye deteriorated to counting fingers at one metre. On examination, right eye remained status quo while left eye showed an intumescent cataract with phacomorphic glaucoma (Fig. 4). Appropriate antiglaucoma medications were instituted and IOP was brought down to normal range.



Fig. 4. Total white cataract left eye.

He was scheduled for temporal clear corneal phacoemulsification with foldable PCIOL implantation under peribulbar anesthesia after controlling the IOP and intraocular inflammation. Ocular hypotony was achieved with digital massage. The anterior capsule was stained with trypan blue. Intraoperatively,the anterior chamber was very shallow, the anterior capsule of the cataract was convex with underlying fluid clefts. An attempt was made to decompress the capsular bag by aspiration of fluid cortex after a direct puncture with a 26 G needle. Since significant decompression could not be obtained with single needle puncture, cortical material was removed by bimanual I/A taking care to maintain the anterior chamber depth throughout the procedure. Capsulorhexis was continued with Utrata forceps under 1.4% sodium hyaluronate. The soft lens matter was aspirated with the phaco needle. A hydrophylic acrylic PCIOL was implanted in the capsular bag.

Postoperatively, there was mild anterior chamber reaction. The intraocular lens was well centred (Fig. 5) and fundus examination was normal (Fig. 6).

On review two weeks later, the PCIOL continued to be well centred with a best corrected visual acuity of 6/6, N6 in left eye. However right eye showed signs of uveitis with progression of the anterior subcapsular cataract.

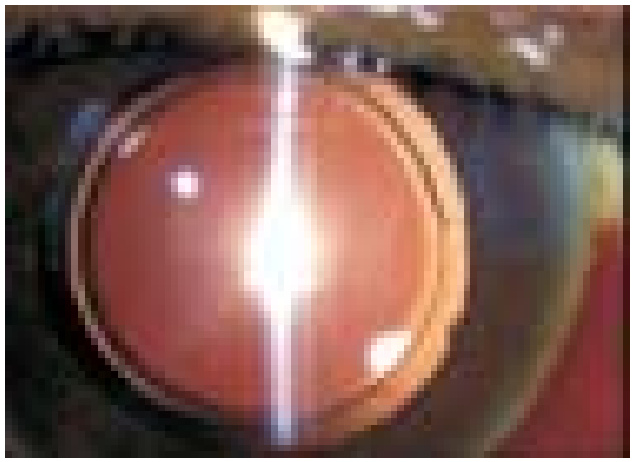


Fig. 5. Well centred PCIOL postoperatively in the left eye

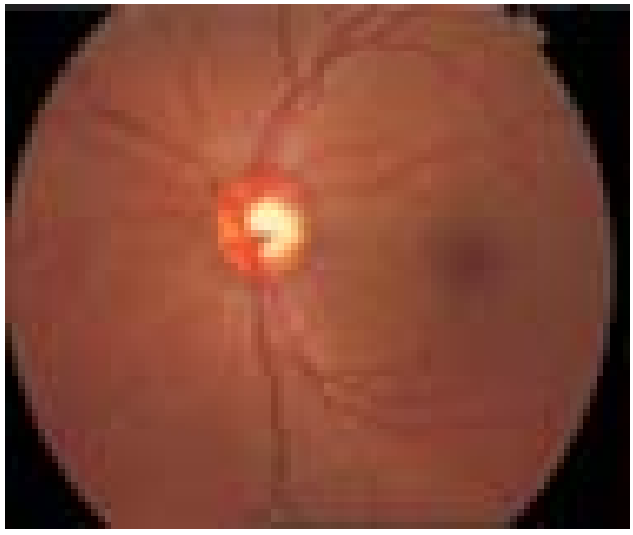


Fig. 6. Normal Fundus left eye

Vision had come down to 6/12, N8 in that eye. The uveitis was brought under control with topical steroids and the patient was kept on a maintenance dose of topical steroids. On review two months later, vision had further come down to 6/18, N12, with further progression of cataract in right eye. The IOP was raised to 48 mm of Hg and the angle was open on gonioscopy. He has been started on topical antiglaucoma medications with which IOP is well controlled and he is awaiting cataract surgery.

Discussion

Electrical cataracts may occur following contact with high tension conductor[1], lightning[2] or electric shock therapy. Only few cases of electric cataract have been reported in the literature probably because few patients

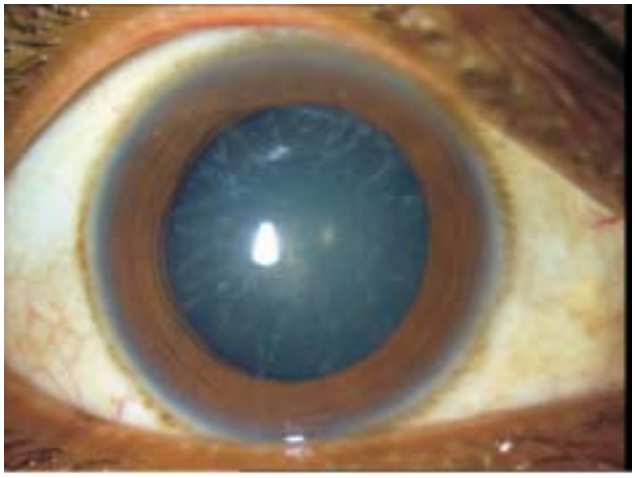


Fig. 7. Progression of cataract in right eye on review 2 months later

survive the high voltage of current that induces cataract formation. Cataract usually occurs 1-12 months[3] after the accident and is frequently associated with no other observable ocular damage. An incidence of 6.2% of cataracts is seen following electrical injury[3]. However the degree of lenticular change seems to bear no definite relation to the strength of the current[4]. In most cases, the electric current has passed through the head in the vicinity of the eye with a contact electrical burn. Entrance and exit wounds are seen. It is found that the young lens is more liable to damage than the sclerosed lens of age. The exact pathogenesis of cataract development is unknown. Direct coagulation of lens proteins and the osmotic changes following damage to the subcapsular epithelium are thought to be responsible[5]. Scale like grey opacities may form in the capsule and more characteristically in the subcapsular layers of the cortex, usually the anterior cortex, though posterior cortex may also be affected. The clinical course of the cataract varies. Regression may occasionally occur, they may remain stationary, or maturation may occur slowly over an average period of 6 months. Sometimes with startling rapidity after a long static period, the cataract may mature to complete milkiness resembling hammered silver or mother of pearl. The cataract may become intumescent and as a rarity cause acute angle closure glaucoma as it swells, as in this case.

A typical electric burn may occur at the point of contact leaving its imprint as a sharply defined necrotic mark without surrounding hyperemia. A similar exit wound may be seen. Other lesions affecting the eye are conjunctival hyperemia, interstitial corneal opacities, uveitis which may be mild or severe, miosis, spasm of accommodation etc. Electric energy can damage lens, retina and choroid. Optic nerve coagulation, necrosis of retina, choroid and optic atrophy have been reported[6]. Retinal oedema, papilloedema and haemorhages with patches of chorio-retinal atrophy in the periphery, rupture of choroid, optic neuritis or even retinal detachment may occur. Macular oedema may lead to development of macular cysts or holes. Pareses of extraocular muscles have been frequently observed.

In the given patient typical entrance and exit wounds could be seen. Except for the anterior uveitis and cataract, the eyes had otherwise not been damaged. Following the episode of uveitis, the cataract in one eye was found to progress rapidly over a week leading to an intumescent cataract with phacomorphic glaucoma. However phacoemulsification followed by posterior chamber intraocular lens implantation in the bag resulted in stable and good visual acuity. Thus, proper surgical management of electric cataract will result in a good visual rehabilitation if the eye has otherwise escaped damage as in this case.

References

1. Boozalis GT, Purdu GF : Ocular changes from electric burn injuries: A literature review and report of cases. J.Burn Care Rehab 12: 458, 1991.
2. Noel L P, Clark W N:Ocular complications of lightning J Paediatric Ophthalmol Strabismus 17: 245, 1950
3. Saffle J R, Crandall A :Cataracts a long term complication of electrical injury. J Trauma 1985 Jan; 25(1): 17-21.
4. Stewart Duke Elder, Peter A Macfaul, System of Ophthalmology, Vol XIV-2, Non-Mechanical Injuries, The C V Mosby Company,St Louis, 1972, p 815-835
5. Manuel Batiles, Benjamin V Magno, Duane's Clinical Ophthalmology Vol I,Chapter 73, Cataract-Clinical Types,Lippincott-Raven Publishers, Philadelphia, New York, 1996, p 22
6. Archer DM: Injuries of posterior segment of eye. Tran Ophthal Soc UK 104: 597, 1985
7. Paul Dieckert, Albert and Jakobiec, Principles and Practice of Ophthalmology, Vol. 5, Chapter 277, Posterior Segment Trauma,W B Sonders Company, Philadelphia, 1994, p 3419

Vogt Koyanagi Harada –A Case Report

Dr. Anuradha Rao, Dr. Rajashree N., Dr. Biju Raju

Introduction

VKH is characterized by severe bilateral panuveitis with serous retinal detachment with or without signs of meningeal irritation and auditory disturbances, also called uveomeningitic syndrome. VKH is difficult to diagnose and requires an astute clinician to tie together the seemingly unrelated signs and symptoms. There is no single test to make the diagnosis, and hence the diagnosis is purely clinical.

Case Report

A 53 yr old woman presented with bilateral diminution of vision of one month duration. Visual loss was progressive, rapid and more pronounced in left eye than right. She complained of floaters in both eyes since 1 week.

There was no history of ocular pain or redness, nor was there any history of ocular trauma or surgery. There was no history of diabetes, however she was a known hypertensive on treatment.

General examination showed areas of hypopigmentation over face, around lips, arms, and fingers (Fig. 1 and 2).

The right eye had a visual acuity of 6/24 improving with pinhole to 6/12. The vision in her left eye was 2/60 not improving further with pin hole.

Ocular Findings

Anterior segment examination of the right eye was normal except for poliosis on eyelashes.

Fundus examination showed the Media to be relatively clear. Retina appeared elevated inferior to the disc involving macula suggestive of exudative retinal detachment (Fig. 3a).

Correspondence: Amritha Institute of Medical Sciences, Kochi

Optical coherence tomography showed serous retinal detachment (Fig. 3b).

Anterior Segment examination of left eye, showed 2 + flare and 2+ cells, posterior synechiae at 12 clock and 6 clock and cataractous changes in the lens. The vitreous showed 3+ cells. (Fig. 4a)

Posterior segment evaluation of left eye showed 2+ vitreous opacities (Fig. 4b). Details could not be visualized due to hazy media. Intraocular pressure was normal in both eyes.

Ultrasound B scan of right eye showed choroidal thickening as well as localized retinal detachment. Left eye showed opacities in the vitreous.

A detailed general examination was performed which was normal.

ESR was 54mm/hr. and CSF study was also normal. Audiometry showed bilateral sensorineural hearing loss (Fig. 6)

Based on clinical criteria in International uveitis study, the diagnosis of Vogt Koyanagi Harada Syndrome was made.

She was managed with systemic steroids. A high dose of IV Methyl prednisolone 1 gm /day was administered for 3 days. On the third day she developed glucose intolerance and was treated with insulin and continued on oral prednisolone 60 mg x 3 months along with topical steroids, non steroidal anti inflammatory drops and cycloplegics in the left eye.

On follow up after one week, vision improved in right eye to 6/12 (PH 6/9) and in left eye 2/60 (PH 6/18). Retinal examination of right eye showed a remarkable reduction in exudative retinal detachment. Vitreous opacities had cleared in left eye enabling the view of disc and vessels.

On follow up after 1 month, vision in right eye improved to 6/6 and left eye to 6/18.

Retinal examination in both eyes showed clear media with multiple areas of RPE defects. Exudative RD had resolved in the right eye.

OCT findings confirmed the same (Fig 7a & b).

She presented with a relapse after 4 months with diminution of vision this time more pronounced in right eye. vision in right eye was 3/60 (PH 6/18) and that in the left eye 6/18 (PH 6/12). Retinal examination of right eye showed vitreous opacities and fundus finding suggestive of exudative retinal detachment (Fig. 8). FA done showed pinpoint leaks and pooling of dye in late phase in right eye (Fig. 9 a, b, c). Left eye showed leakage of dye from disc

OCT confirmed the findings (Fig. 10a, b)

She was managed with oral prednisolone 40 gm/day and Tab azathioprine 50 mg BD and is being followed up.

Discussion

VKH is an autoimmune process in which the immune system mistakenly attacks ones own tissues.

Because of varied clinical manifestations the American Uveitis society adopted the following diagnostic criteria:

1. No history of ocular trauma or surgery
2. At least 3 out of 4 criteria
    a. Bilateral chronic iridocyclitis
    b. Posterior uveitis –multifocal exudative retinal and RPE detachments and disc hyperaemia
    c. Neurological signs of tinnitus, neck stiffness, cranial nerve or CNS dysfunction
    d. Cutaneous findings of aloplecia,poliosis or vitiligo

VKH presents with diverse manifestations categorized by prodromal, uveitic, convalescent and recurrent phase.

Fluorescien angiography, ultrasonography, lumbar puncture and other studies substantiate the diagnosis especially in atypical cases.

Flourescien angiography is very characteristic and reveals hyperflourescence at the level of RPE with pooling of the dye into subpigment epithelial or subretinal spaces delineating the serous retinal detachment.

The goal of therapy is to suppress the initial inflammation with early aggressive use of systemic corticosteroids followed by a slow taper over 3 – 6 months. This results in rapid recovery of vision however full recovery of vision is not likely because of secondary side effects like cararact. Cytotoxic agents are prefered when steroids are contraindicated. Cases with prominent CNS feature and in cases resistant to steroids, intravenous immunoglobulins are used.

Patients adequately treated with high dose steroids have fair visual prognosis with nearly 2/3 of them retaining 20/40 or better vision.



Fig. 1. Showing hypopigmentaion of lips



Fig. 2. Hands and elbow showing vitiligenous patches



Fig. 3a. Fundus photograph of right eye showing inferior exudative retinal detachment

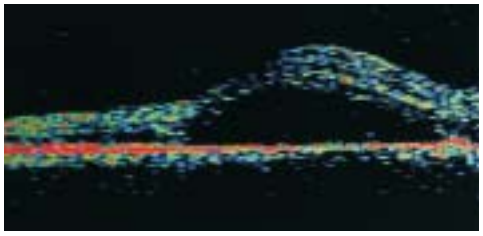


Fig. 3b. OCT of right eye showed a serious retinal detachment

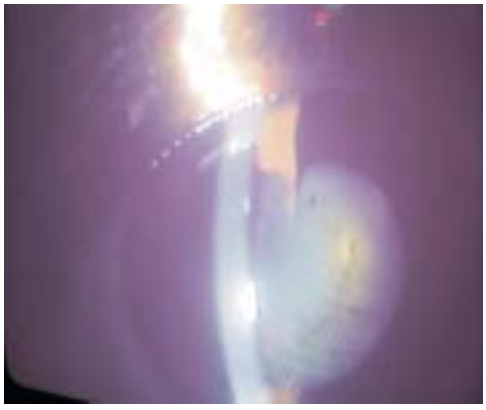


Fig. 4a. Slit lamp examination of left eye showed 2+flare and cells with a posterior synechiae at 12 O'clock and a cataractous lens.

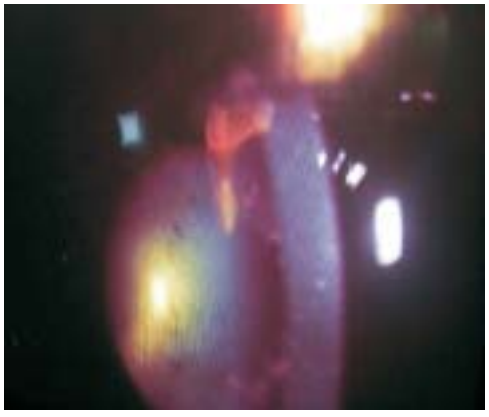
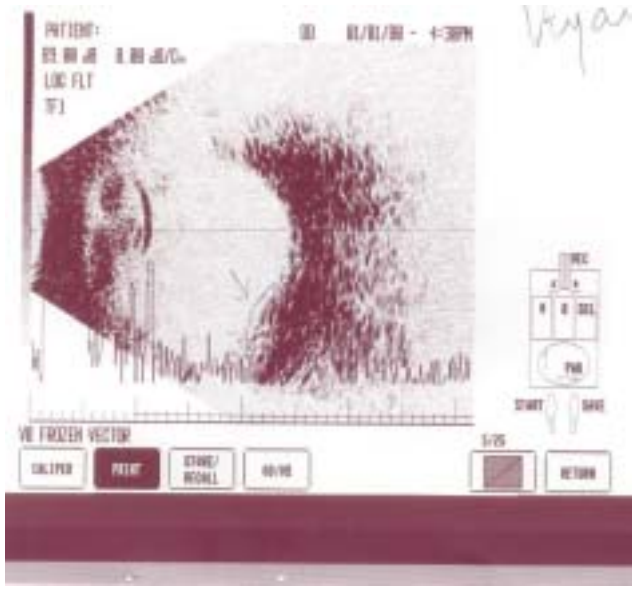


Fig. 4b. Slit lamp biomicroscopic evaluation of the vitreous cavity of left eye showing a cataractous lens and plenty of vitreous opacities.



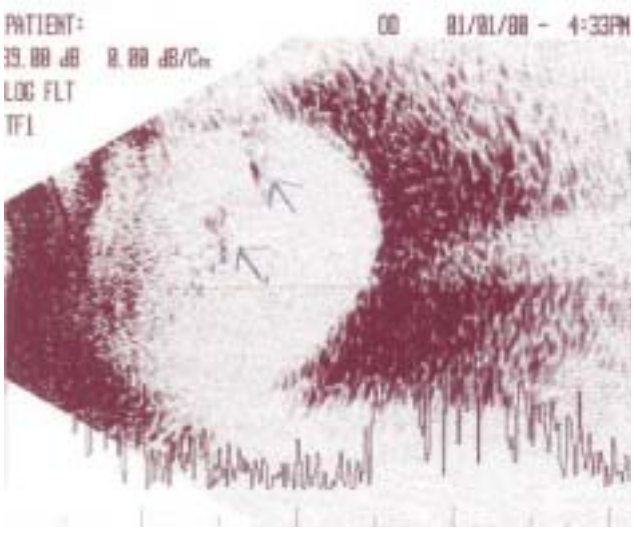


Fig. 5a & b B Scan ultra sonogram of both eyes show diffuse choroidal thickening, localized retinal detachments and vitreous opacities

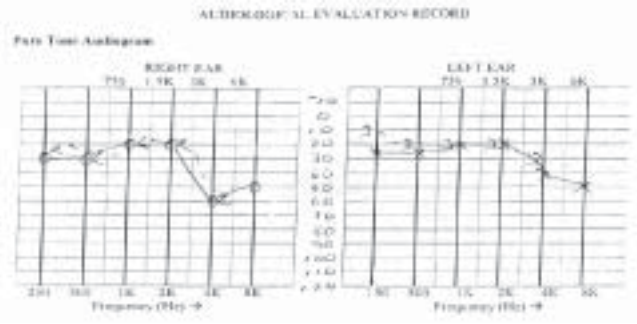


Fig. 6. Audiometry reading : Pure tone audiogram showing bilateral sensorineural deafness.

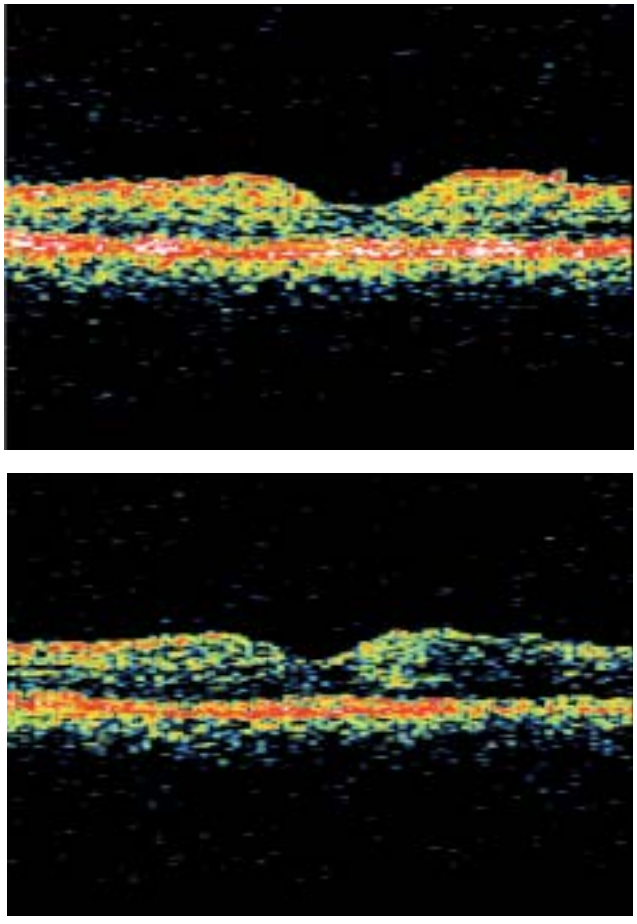


Fig. 7a and b. OCT evaluation in both eyes at 1 month follow up showed resolution of Retinal detachment and a normal retinal contour.

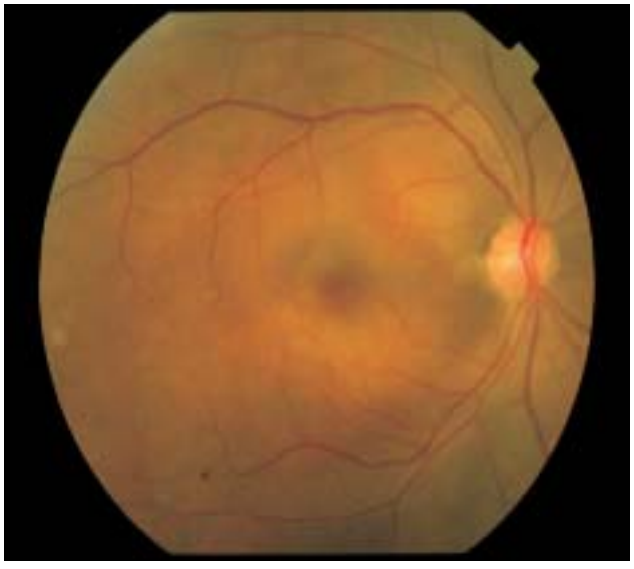


Fig. 8 Fundus photograph of right eye taken during a relapse 4 months after the initial eisode showing exudative retinal detachment

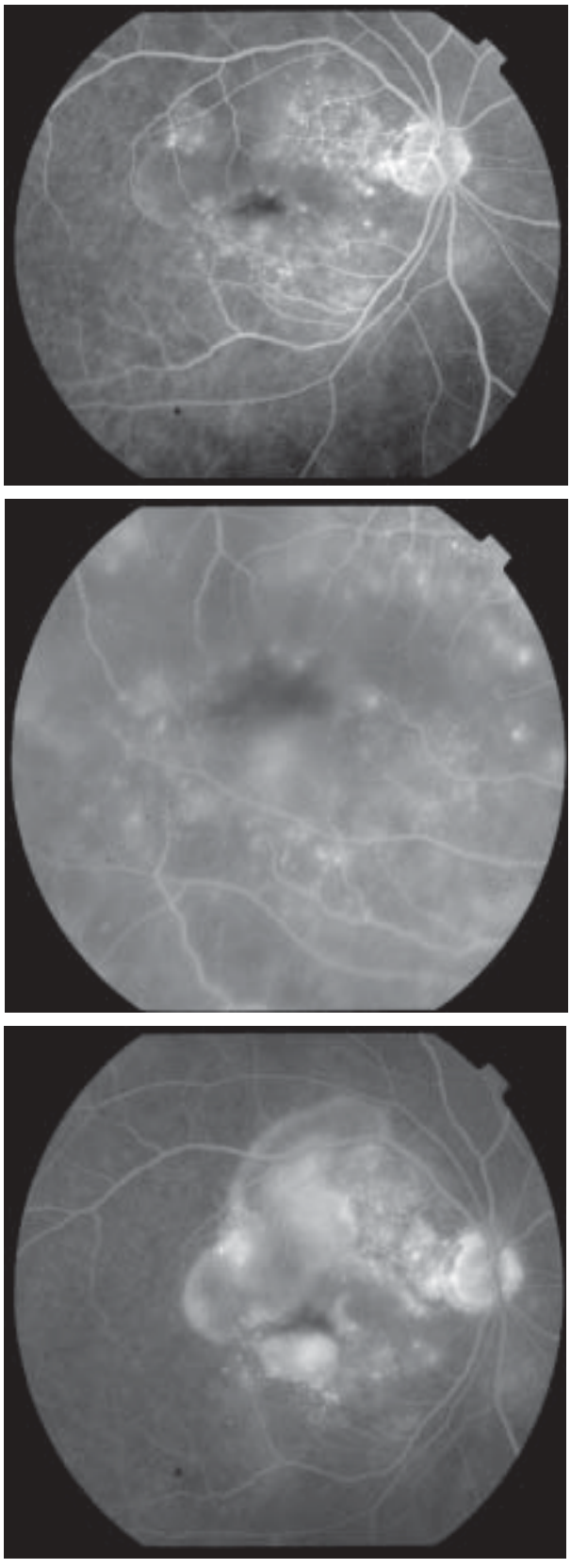


Fig. 9 a,b & c Fluorescin fundus angiography during the recurrence showing pinpoint leaks with progressively increasing leakage and late pooling of days.

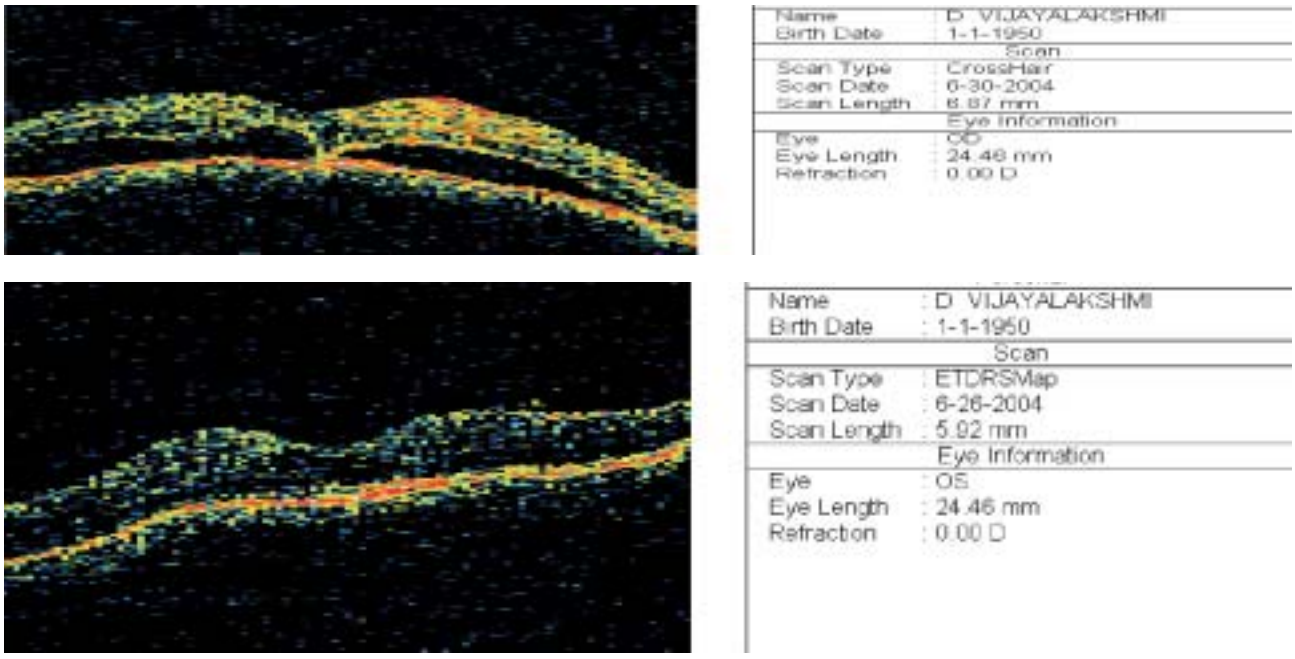


Fig. 10 a & b OCT during recurrence showing presence of exudative retinal detachment in both eyes

References

1. Cowper AR: Harada s disease and Vogt koyanagi syndrome: Uveoencephalitis. Arch Ophthalmol 1951: 45: 367
2. Pattison EM: Uveo-meningoencephalitic syndrome. Arch Neurol 1965;12:197-205
3. Perry H.D, Font RL: Clinical and histopathologic observations in severe Vogt – Koyanagi – Harada syndrome Am J Ophthalmol 1977 Feb 83(2) 242-54
4. Rubsamen PE, Gass JD: Vogt Koyanagi Harada syndrome Clinical course ,therapy and long term visual outcome Ophthalmol 1991: 109; 682-7

Consultation Section

Dr. Devindra Sood[1], Dr. Jacob Mathew[2], Dr. Minu Mathen[3], Dr. Radha Ramanan[4], Dr. Rajesh Radhakrishnan[5], Dr. Saikumar[6], Dr Suhas Haldipurkar[7], Dr. Suven Bhattacharjee MS. DNB.[8], **Dr. Uday Devgan,** MD[9], **Dr. Vinay Nangia,** MS, FMRF, FRCS, FRC Ophth.(U.K.),[10]

A 60-year-old man, with Parkinsonism, on treatment with Glucomol 0.5% for 18 months, presented with progressive diminution of vision in his left eye. He gave history of blunt trauma in the same eye 2 years back. He had a best-corrected visual acuity of 6/6 and 6/36 and an IOP of 18 and 26 in the right and left eye respectively. Gonioscopy revealed a narrow angle in the right eye and very narrow to closed angle in the left eye. The left eye had a subluxated cataract with 3 + nucleus sclerosis and posterior subcapsular changes. His visual field showed depression in the superior areas in both eyes.

He underwent Yag peripheral iridectomy (PI) both eyes. Subsequent dilated evaluation revealed 4 to 5 clock hour temporal subluxation of the cataract in the left eye (Fig. 1). The right eye had 2 + nuclear sclerosis and no iridophacodonesis (Fig. 2). He also had cup disc ratio of 0.6 in the RE and 0.8 in the LE with inferior polar notching (Fig. 3a and b). His IOP is currently stable (14 and 10 respectively) with Glucomol and Brimonidine in the RE and Glucomol, Brimonidine and Bimatoprost in the left eye.

He wants visual rehabilitation in the left eye. How will you manage him?

Dr. Devindra Sood

Let me reiterate important points:

1) 60 year old with Parkinsonism on treatment (treatment not defined) with Glucomol 0.5% eye drops and Brimonidine in the right eye and Glucomol 0.5% eye drops, Brimonidine eye drops and Bimatoprost eye drops in left eye.

   There are several issues here. I would be hesitant to use beta blockers in Parkinsonism, not knowing the kind of drug treatment the patient is taking for Parkinsonism.

   The other concern would come from the fact that this gentleman is on Bimatoprost in one eye only. Bimatoprost has a higher reported prevalence for periocular pigmentation amongst the prostaglandin analogous and unilateral use needs to be discussed with the patient. Uniocular periocular pigmentation could be cosmetically discomforting for this gentleman. It might be worth shifting to other prostaglandin analogoues with a lesser potential for periocular pigmentation.

   In an elderly, caution is desirable with the use of Brimondine not just because of the high incidence of allergy but also because of the dryness of the mouth and throat which may force an elderly gentleman to get up more frequently at night. Brimonidine use can also cause drowsiness. Actually these are much more common than we think and need to be kept in mind particularly with elderly people.

2) As we make out from the history, this gentleman also has a feature of a subluxated lens following trauma. Very rightly gonicoscopy has been done in the other eye and this has actually lead to the diagnosis of primary angle closure glaucoma (both eyes) with a super added secondary glaucoma following trauma in the left eye. Just like to mention that gonioscopy

[1]Senior Consultant, Glaucoma Imaging Centre, New Delhi [2]Vasan Eye Hospital, Kochi, [3]Chaithanya Eye Hospital, Trivandrum, [4]Little Flower Hospital, Angamaly, [5]Adithyakiran Eye Care Center, Palakkad,[6]Giridhar Eye Institute, Ernakulam, [7]Lakshmi Eye Institute, Panvel, [8]M.M. Medical Centre, Calcutta, [9]Chief of Ophthalmology, Olive View-UCLA Medical Center, Asst. Clinical Professor, Jules Stein Eye Institute, UCLA School of Medicine, Los Angeles, California, USA. [10]Fellow- Harvard University, Boston. Suraj Eye Institute 559, New Colony, Nagpur.

needs to done very carefully in view of the subluxated lens and posterior pressure should be minimized as much as possible. Post iridotomy a gonioscopy should be done again to rule out any angle recession, which may not be visible initially.

3) The iridotomy is appropriate for both eyes because of the primary angle closure glaucoma. This would facilitate ease of dilation to assess the cataract and fundus and also allow for comfortable conduct of the cataract surgery.
4) The treated IOP is a reasonable target pressure for this gentleman.
5) Is this patient actually interested in visual rehabilitation in the left eye ?

I would rather re-phrase the question differently, does this patient have a significant visual handicap which needs a priority surgery ? I might reason my argument against cataract surgery at this stage keeping the risk to benefit ratio in an elderly with a subluxated lens post trauma. Also there is a possibility of intraoperative manipulation leading to a poor control of eye pressure.

Perhaps, actually my suggestion for a cataract surgery would arise more from hardening of the lens in case a phacoemulsification procedure is being planned .

Acknowledgement: Supported in part by the S K Glaucoma Care Foundation, New Delhi, India

Dr. Jacob Mathew

Here is my view regarding this particular patient's condition –

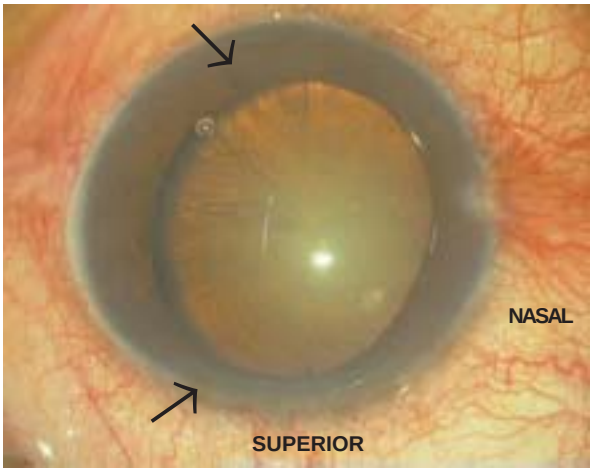


Fig. 1. Intraoperative surgeon's view of the left eye demonstrating 4 to 5 clock hours temporal subluxation of cataract.

The decision I would like to make before I embark on any surgical intervention on this particular patient would depend on quite a few factors, which has been



Fig. 2. Anterior segment photo of the right eye showing Yag PI opening at 10 o' clock and 2+ Nuclear sclerosis

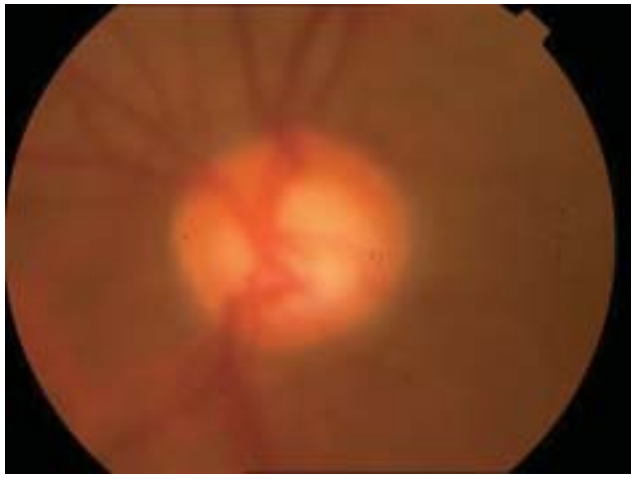


Fig. 3a. Disc Photo LE

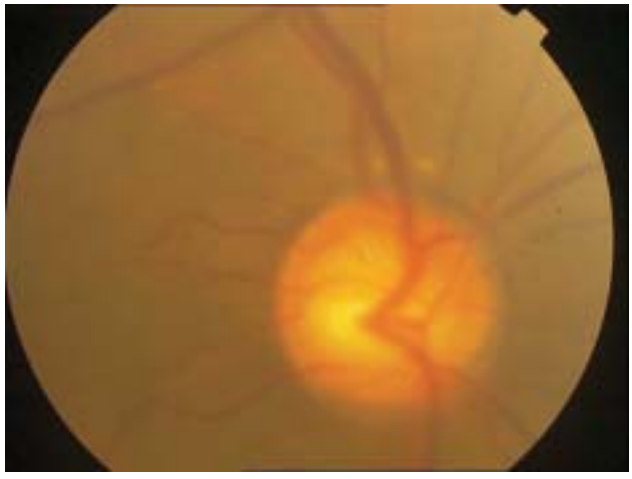


Fig. 3b. Disc Photo RE

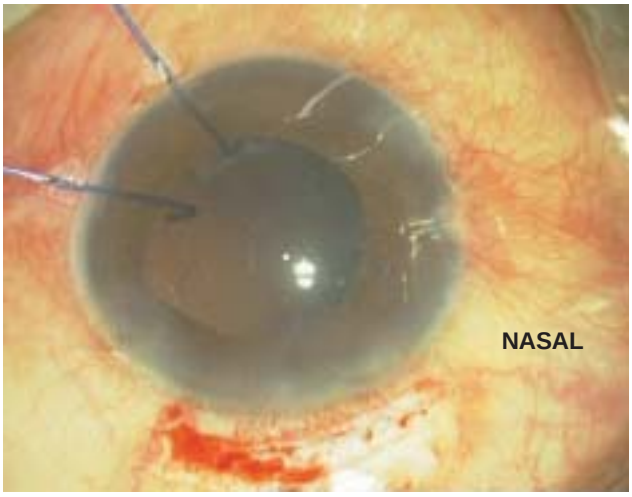


Fig 4. Intraoperative surgeon's view of the left eye. Capsular bag stabilised by iris hooks

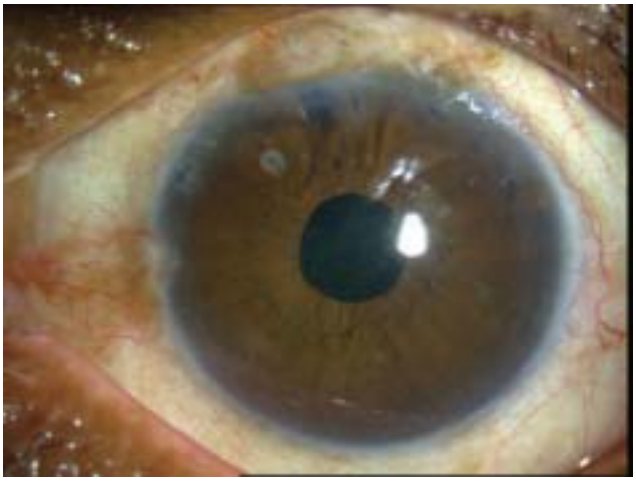


Fig 5. Anterior sement photo of the left eye 3 months post operatively showing a functioning filtering bleb

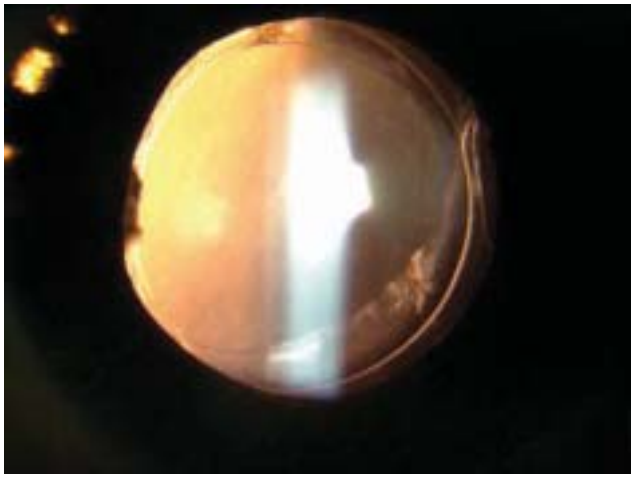


Fig 6. Well centred PCIOL : 3 months postoperatively

mentioned in the history of the patient. These are first of all the age of the patient - which at 60 years, I would still consider him as a person who would apparently have another 10 to 15 years of active life ahead of him. Noting that he is already handicapped with Parkinsonism – I would again try to modify my decision as to what sort of refractive correction I am planning for him, especially if he is wanting a spectacle free vision – may be a monocular vision with the right eye being planned to end up emmetropic and the left eye slightly myopic (minus -1°). Though his IOP is well under control after the very narrow angle in the left eye has been managed with the YAG PI and then with the three antiglaucoma drugs he is on – I gather he is having a combined glaucoma or that more than 180 degree of the angle in the left eye is closed if he is having only a angle closure element. The trauma to the left eye would have again damaged the angles – causing angle recession.

Again, with the IOP controlled with medications should I do just a phacoemulsification with IOL, using measures to stabilize the subluxated capsular bag or does it require a phaco triple is the next decision to be made. With a relatively good rim of the left eye disc remaining (where the CD ratio is 0.8) and with the superior arcuate scotoma on the fields – and the difficulty that the patient would have applying the medications, which has slowly been increased from one to three drops and finally taking into consideration his extrapyramidal disability and the need for quality life ahead, I would go in favour of a phaco triple with Endocapsular ring (ECR) to support the bag. This decision of mine to go for a phaco triple is also supported by the fact that the eye had history of trauma and thus keeping in mind the angle recession element contributing to the glaucoma being more resistant to just one or two medications along with the Yag PI which was done – and if the angle recession is not present the very narrow angles would be blocked more than 180 degrees thus again calling for a trabeculectomy along with the phacoemulsification. The target pressure I would aim for would be in the region of 12 mm Hg after surgery.

Now the last thing to be thought of is how I am going to tackle the relatively hard (Grade III nucleus) which is in a subluxated bag which has more than 90 degrees of the zonules compromised due to the trauma. Should I go for a separate site phaco (clear corneal temporal

phaco) and a superior trabeculectomy or whether to do a same site phaco triple? Though I have not come across any major difference in the way the postoperative trabeculectomy bleb functions between the above two methods, I would prefer the former – as the approach to the hard and subluxated cataract would be always smooth than if I am seated at the head end of the patient for a superior single site phaco triple. Thus the safety and ease of surgery makes me opt for the separate site phaco and trabeculectomy – more so because the angles are very narrow. I would like to take a last look at the Left eye on the slit lamp to do a specular reflex and note the endothelial status, especially noting the central cornea for any guttata and any resistance to dilatation of the pupil to the mydriatics or pseudoexfoliation. Often, the eyes which have undergone Yag PI for very shallow angles have an irregular AC depth and the PAS and the floppy nature of the iris would contribute to the burden of the surgeon while operating on such eyes even with the very safe method of phacoemulsification – a closed chamber technique.

Thus, finally having decided upon the surgery to be done and the way it has to be carried out – I would prepare myself for the day of surgery as well as ask the patient to stop the glaucoma medications which would contribute to the congestion of the eye to be operated– about two weeks prior, along with which he is made to consult a physician to confirm that he is systemically fit for the surgery. On the D-day I would again check the IOP of the left eye and if the IOP is above 30 mm Hg I would start patient on I/V Mannitol 20%, 100 ml and allow the IOP to drop to a safer level (of course provided his cardiovascular status is not put at risk), I would also make sure that the pupillary dilatation is sufficient – many of these eyes end up with a poorly dilated pupil and as I have mentioned earlier the floppy nature of the iris and the PAS would make the procedure quite difficult. I would resort to using a high viscosity viscoelastics, if economy permits Viscoat to allow a soft shell technique while carrying out the phacoemulsification. The decision as to when the ECR has to be implanted is often made on the table when I start to get a feel of the support the remaining healthy zonules afford the hard cataract – often the hard nature of the cataract makes me hesitant to use the ECR prior to the phacoemulsification, provided the support is good. The Iris hooks can also be made use of, if the bag is found tremulous during the course of the surgery (I hardly use it, even for more degrees of subluxation) – thus I would reserve the ECR implantation to the stage where the hard nucleus has been safely removed from the bag. Meanwhile I would take care of my parameters set on my machine which is extremely important, in my opinion this is more important than all the reinforcements we have recently come out with, like the ECR and the Iris hooks – going for a lower bottle height and thus also reducing on my vacuum and flow rate, each by 25% of what I usually would prefer while I do a normal cataract of the same hardness. Thus once the safe removal of the nucleus has been accomplished I would implant the right sized ECR (taking note the corneal size), probably a 10-12 mm ring for the small eye with a shallow anterior chamber. Once the ECR is in the bag I would take note of the centration the bag has attained, which often is very good even in more subluxated capsular bags and then go in for the implantation of preferably a 6 mm optic IOL, in-the-bag. Maintaining some viscoelastic in the anterior chamber I would switch my seating position to the head end of the patient and do the trabeculectomy at the superior site selecting a slightly nasal location and go for a triangular partial thickness scleral flap under which I would do a trabeculectomy with a Kelly's punch and then the peripheral iridectomy before suturing back the scleral flap using a releasable 10-0 nylon suture at the apex of the triangle and one or two interrupted sutures at the sides after titrating the leak under the sutured flap. I would suture the conjunctiva on either side with 6-0 vicryl making sure that the conjunctival apposition is very good at the end of the surgery.

After the surgery I will keep the patient in my postoperative care for 24 to 36 hours – during this time I will assess how my trabeculectomy bleb is functioning and also see the anterior chamber depth maintenance and any aqueous leak through the conjunctival wound. If the bleb is found functioning well and the anterior chamber is maintained even at the end of this observation period I will discharge the patient to follow him up after 2 days and thereafter once every week for the first 2 or 3 weeks. During the second visit, which would be within a week after the surgery I will make a decision as to whether the releasable suture has to be removed and thereafter if any digital massage is required and maintenance of the bleb is noted during

the subsequent visits to attain the target pressure of around 12 mm Hg.

Dr. Minu Mathen

The problems:

1. Traumatic subluxated cataract
2. Narrow angle glaucoma

Management is obviously surgical.

Preoperatively (other than all the routine evaluations) he should be examined in the supine position to check for the posterior tilt of the cataract as some subluxated cataracts can be right behind the iris when the patient sits at the slit lamp but might dip so much into the vitreous on supine position on the table making an anterior approach for surgery impossible.

Evaluation of the macula is important by indirect ophthalmoscopy or OCT (in this case the signals might not pass through adequately due to the dense cataract) as a possible post traumatic macular degeneration can make the postoperative visual outcome poor.

An informed consent regarding the guarded visual prognosis, possibility of a sutured IOL (scleral or iris) or a second stage IOL implantation has to be obtained.

It should be confirmed whether the patient is on adequate anti parkisonism treatment. Involuntary movements (chorea and athetosis) sometimes seen association with Parkinsonism can make microsurgery difficult. To alleviate pre operative anxiety, systemic anxiolytics and beta-blockers can be given. But if the involuntary movements are not controlled, then one might have to perform the surgery under general anesthesia.

The surgery should be preformed under adequate peribulbar anaesthesia (with complete orbicularis block) expecting the longer duration this surgery is going to take. Digital ocular massage should be avoided to prevent further damage to the zonules. To have optimum hypotony, one Tab. Iopar-SR and 100 ml of IV mannitol (× 20%) preoperatively are desirable.

The procedure of my choice for this patient will be phacoemulsification with PC IOL implantation (along with a capsular bag stabilizing device) plus a trabaculectomy. Phaco has the advantages of being a closed system surgery and the nucleus can be divided into smaller pieces and brought out of the capsular bag to prevent further zonular damage.

Modifications required in steps of surgery for this patient:

Incision - Its better to make a scleral tunnel,1 mm posterior to the limbus so that at any point of time if its required to convert into an SICS this tunnel can be extended without compromising the stability of the wound. I would prefer always a temporal approach (as I am more comfortable by this approach) but placing the incision opposite the area of absent zonules is better. Also this case needs a trabeculectomy to be dome at the 12 o' clock position

Capsulorhexis. It is mandatory to have an intact rhexis in this case without which phaco will not be possible. High molecular weight Ocular viscosurgical device (OVD) should be used. Try to avoid going closer to the equator near the area of absent zonules. To ensure achieving a complete capsulorhexis, aim for a smaller one to start with.

Hydroprocedure. A very gentle (avoiding stress to the zonules) hydrodissection should be preformed which can be repeated many times to ensure complete dissection and rotation of the nucleus.

Capsular bag stabilization. I would ensure maximum capsular bag stability before starting phacoemulsification. Although the case looks to have only 4 to 5 clock hours of subluxation, it can be confirmed only on the table after we check the exact extent of zonular loss by retracting gently the pupillary margin. If it is upto 5 clock hours, I would at this stage, support the CCC margin with three iris retactor hooks (capsular hooks are not so freely available) and then insert a capsular tension ring into the bag. If the subluxation is more than 6 clock hours, I would prefer a Cionni ring sutured to the sclera, with the eyelet of the ring located at the area of maximum subluxation.

Phacoemulsification. The dictum should be slow motion phaco using the phaco chop technique. For this case, my power setting would be 50%, bottle height of 80 cms, AFR 18 cc / min and vacuum of 100 mm of Hg. After an intial partial trench, the rest of the nucleus can be chopped (the pulse mode gives better followability and control in fragment removal.) Minimising turbulence in the anterior chamber is crucial. The chopper of my choice will be a sharp tipped 1 mm long one which would help me perform vertical chopping. Whenever vitreous presents in the anterior

chamber (through the area of absent zonules), adequate anterior vitrectomy has to be performed before proceeding with phaco.

Cortex aspiration - Usually there will be a layer of cortex which would get entrapped between the CTR and the equator of the capsular bag. So rather than pulling radially at such cortex, careful teasing out of cortex using tangential force would help prevent further loss of zonules.

IOL Implantation. I would fill the capsular bag with Healon and would choose a foldable acrylic three piece IOL to be implanted into the capsular bag with the haptics aligned in the axis of absent zonules.

Trabaculectomy. I prefer a fornix based conjunctival flap and would construct the partial thickness scleral flap before proceeding to the temporal aspect to create the tunnel for phaco. After finishing phaco and before aspirating the OVD from the anterior chamber, I would return to the 12 o' clock position to complete the trabeculectomy and the peripheral iridectomy. As a routine I put three sutures to the scleral flap of which one will be a releasable suture. The conjunctival flap is then closed with 8-0 vicryl suture. Then the OVD is aspirated from the anterior chamber and the adequacy of drainage under the flap is confirmed. I would complete the procedure by giving a subconjunctival injection of gentamycin and dexamethasone

I would expect moderate to severe anterior chamber reaction in this case and so would intensify the post operative topical steroid therapy and antiglaucoma therapy.

Dr. Radha Ramanan

This 60 year old man with Parkinsonism having subluxated cataract and glaucoma is a challenging task for any ophthalmic surgeon. One thing that is definite about this case is we have to remove his cataract. Procedures should be discussed with him and his relatives. We have two options:

(1) To do a cataract removal alone with regular phacoemulsification through superior clear corneal incision without disturbing the conjunctiva, which may be preserved for future trabeculectomy if needed. Since he is 60 year old with only +3 nuclear sclerosis we have to hope that phaco-procedure may not be that difficult with CTR. But the surgeon should be prepared for suture fixation and should be ready with iris hooks if needed for the capsule holding.

(2) Or to go for a single site combined procedure with mitomycin. But the procedure becomes more complicated. Since he is having temporal subluxation, it is better to avoid temporal incision for the cataract surgery.

I personally prefer to go for the first option and will ask the patient to continue the medical treatment for glaucoma. In this patient we may be able to reduce pre operative 3 drug therapy to two or one drug post operatively. Since he is a Parkinsonism patient, he may find it difficult to self administer the drops. But his case history indicates that he was using the glaucoma medicines for the last two years.

Dr. Rajesh Radhakrishnan

The following observations can be made from the details provided.

1. The fundus picture (although indistinct) shows a reasonably healthy neuro-retinal rim in either eye, not really suggesting advanced glaucoma but maybe a moderate damage. If the exit of the circumlinear vessels, from what appears to be the edge of the cup, are considered the vertical cup-disc ratio in both eyes will be around 0.65. The disc size and rim-disc ratio in all clock hours need consideration before qualifying the cup as glaucomatous.
2. The pre-treatment IOP, of 18 mm Hg, in the right eye needs further assessment to confirm its relationship to the optic nerve head appearance. A diurnal phasing and the central corneal thickness measurement will provide additional data. Provocative tests may also have a role in the right eye.
3. IOP reduction in left eye is almost 62% with three drugs. Such a steep reduction of IOP can precipitate hypotony induced maculopathy in presence of vitreous disturbance. Macular oedema following the trauma and subsequent scarring could also contribute to poor vision in left eye. This should be ruled out if the visual acuity does not correspond with the lens changes.
4. Unilateral use of bimatoprost can cause an asymmetrical eye lash growth and peri-ocular pigmentation (more than any other PG derivative) that becomes cosmetically unacceptable. This, and use of multiple

medications, may consequently be responsible for non-compliance.

5. Visual field printouts are not available so a definitive comment is not possible. Standard automated perimetry through a cataract is unlikely to be reliable; a flicker perimetry may provide more information. In any case, automated perimetry, whatever the program selected, in a patient with Parkinsonism can be difficult especially in presence of significant bradykinesia and rigidity. The flexed posture of patients with Parkinsonsism can be a hindrance to head positioning and may induce an artifact in the superior field. Therefore the reliability of a single field is doubtful.
6. If the VF defects are unconfirmed we needn't be unduly aggressive, especially in the right eye, as glaucoma is a forgiving disease if we don't forget about its presence.
7. Indentation gonioscopy will reveal if the angle closure in the left eye is appositional (more likely) or synechial. Anti-Parkinsonism drugs like L-dopa, anticholinergics, MAO inhibitors and anti-depressants can aggravate angle closure glaucoma.

Management strategy

1) Both eyes have to be reassessed taking into consideration all observations noted above.
2) If the data collected for the right eye shows insufficient evidence to prove glaucoma induced damage the eye may just need regular monitoring.
3) The three drug therapy in the left can induce non-compliance. Instead, a fixed drug combination of timolol and brimonidine or latanoprost may achieve adequate target IOP range (of about 14 to 17 mm Hg) in the left eye. The unwelcome unilateral cosmetic side effects of bimatoprost can also be avoided.
4) The pre-treatment level of IOP in the left eye suggests a recent onset of elevation and could be due to a combination of two mechanisms; the pupillary block induced by a gradually swelling subluxated cataract and appositional angle closure consequent to it. A cataract extraction with a sulcus fixated IOL or scleral fixated IOL (assuming poor PC support due to zonule rupture) will solve both the problems.
5) Presence of extensive synechial angle closure in left eye induced by the post-traumatic inflammation or angle recession, if evidenced by indentation gonioscopy, may warrant a combined procedure (single-site cataract extraction with trabeculectomy).
6) A post operative VF analysis and correlation with ONH findings may provide more information that decides further follow up protocol.

Dr. Saikumar

The case explained here is very interesting and challenging. The patient has bilateral primary angle closure glaucoma with field changes. On top of that he has sustained a blunt trauma producing a subluxated cataractous lens.

The IOP has already been controlled with 3 drugs in the LE and 2 drugs in the RE. Obviously the cataractous lens has to be removed. Phacoemulsification is preferred over SICS since this is the procedure with relatively less stress on the zonules. Capsule hooks may be necessary during the initial stages of the procedure. A capsule tension ring is absolutely essential in this case.

One major decision to be made is whether a phaco alone should be done or it should be combined with trabeculectomy. With so many extra maneuvers needed in this case, I wouldn't be very comfortable with an additional step in the form of filtering surgery. Since the other eye needs glaucoma medications any way, I would prefer to do cataract alone and then continue with the anti glaucoma medications.

Dr Suhas Haldipurkar

In my opinion he can undergo safe phaco with the help of capsular support system using modified or simple endocapsular ring and in the bag implantation and wait and watch. If the IOP is controlled well fine or else at a later date I may consider taking him up for trabeculectomy.

Dr. Suven Bhattacharjee. MS. DNB.

There appear to be two issues which need to be addressed here. The first is the raised IOP which has persisted even after YAG PI but is controlled with topical medications. The second is the subluxated cataract with visual impairment.

In the Left Eye, the YAG PI has not been able to bring down the IOP adequately despite narrow to closed angle

to start with. Since we have no information on the gonioscopy post YAG PI, there could be two possibilities. If the angle remained closed it would suggest chronic angle closure glaucoma. On the other hand, if the IOP was raised even though the angle opened up after a YAG PI, it would suggest a combined mechanism glaucoma.[1] If the patient still requires 3 topical medications and has C:D of 0.8 with field defects in the left eye, he definitely requires a trabeculectomy.

I would prefer a closed chamber phaco surgery to preserve the capsular bag and implant an IOL in the bag. I would also like to ensure that an IOL placed in the bag remains stable and well centered for the rest of his life. However, since a traumatic subluxated cataract could behave quite unpredictably on the operation theatre table, I would rather be prepared with back up plans and bail out options.

Since we have to combine a trabeculectomy with phaco in this case, I would like to spare a thought about the choice of site of trabeculectomy. The issue is not that of the success rate of a single site or 2 site trabeculectomy[2]. A subluxated cataract is a predisposing factor for vitreous loss and may lead to blockage of the internal ostium by vitreous causing failure of filtration in trabeculectomy.[3] It is also absolutely imperative that every effort be made to keep a functional trabeculectomy in this case since he already has 80% cupping. My concern is to select a trabeculectomy site which would eliminate the potential threat of blockage of the internal ostium by vitreous postoperatively. In this specific case, the temporal subluxation is large enough to threaten presence of vitreous at the internal ostium postoperatively, if a single site phaco trabeculectomy incision is planned at 12 O'clock. I would prefer to keep the trabeculectomy in the superonasal quadrant 10 – 11 O' clock in the LE in this patient. This would ensure that the trab site is away from the subluxated area and would not have any vitreous incarceration. Since this is a very inconvenient site for the phaco incision, it automatically would mean that we would have to perform phaco through a separate superior 12 O' Clock incision.

During the phaco surgery, I would like to ensure bag stabilization throughout surgery and preferably use the same means to provide a permanent support. The CTS (Capsular Tension Segment) designed by Dr. Ike K Ahmed, Asst Professor in the University at Toronto and Clinical Asst Professor in the University of Utah in Salt Lake City, probably fits the bill exactly.[4] This CTS could be held in place temporarily by Iris hooks during phaco, and be sutured to the sclera like the Cionni ring at the end of the surgery. Since they are lodged in the equator of the capsular bag, they prevent collapse of the bag. Being smaller in size these segments can be placed as soon as we have completed the capsulorhexis. They also do not trap cortical matter like the CTR.[4] However, if availability of the CTS is a problem, the next best choice would be to use a Capsular retractors designed by Dr. Richard Mackool, Astoria, New York. These retractors also known as 'Capsule support system' could be used during phaco followed by a Cionni ring prior to the implantation of the IOL .[5] Compared to the CTR, The Capsular retractors are safer and allow for a bail out option incase the capsulorhexis or posterior capsule is torn.[5]

I would prefer to perform the direct chop technique considering the hardness of the cataract and the minimal zonular stress that this technique causes. I would aim to keep the anterior chamber stable at all times to avoid further zonular damage.

However, since things may not work out as we plan, we must be well prepared for adjunctive procedures like vitrectomy. It would be always advisable to have a back up 'Plan B' in all such cases. In the event of the bag showing greater instability than expected or if the rhexis is not satisfactory or if the rhexis is damaged by the Iris retractors (I have had this misfortune), I would be prepared for a vectis removal with good anterior vitrectomy followed by a Scleral Fixated IOL.

References

1. Ritch R, Tham Clement CY. Glaucoma, Angle Closure, Chronic. eMedicine from webMD, Ophthalmology, Intraocular Pressure, updated June 2,2006.
2. Wyse T, Meyer M, Ruderman JM, et al. Combined trabeculectomy and phacoemulsification: a one-site vs a two- site approach. Am J Ophthalmol. 1998; 125(3): 334-339.
3. Pascotto A, Soreca E. Glaucoma, Complications and Management of Glaucoma Filtering: eMedicine from webMD, Ophthalmology, Intraocular Pressure, updated March 17, 2005.

4. Ahmed IK. Rings versus Segments. Cataract and Refractive surgery today. January 2004. 42-45.
5. Chang DF. Capsular Tension Rings versus Retractors. Cataract and Refractive surgery today. January 2004. 39-41.

Dr. Uday Devgan, MD

There are multiple issues to discuss in this patient:

1. History of Parkinsonism and the potential for head tremor during surgery.
2. Underlying glaucoma with narrow angles and baseline optic nerve damage as shown by the cup:disc ratio of 0.8 and the visual field defects.
3. Use of a prostaglandin analogue in the left eye, which may contribute to an increased risk of post-operative cystoid macular edema.
4. Narrow angles and likely a shallow anterior chamber and likely a hyperopic eye with a shorter than average axial length.
5. History of trauma and lens subluxation with 4 to 5 clock hours of zonular loss

To address these issues, I would proceed as follows:

1. I would still opt for topical anesthesia with mild intravenous sedation. My topical agents of choice are tetracaine 0.5% and bupivicaine 0.75% and the intravenous sedation is usually a small dose of a benzodiazepine such as midazolam. Having an IV drip of propofol is helpful in cases like this where additional supplementation with a deep yet short-acting agent is needed. Taping the patient's head to the operating table is helpful to remind the patient to try his best to keep still.
2. I often recommend combined glaucoma and cataract surgery, either with a combined phaco-trabeculectomy or a combined phaco-Ahmed Valve implantation. However, in this case, I would proceed with just one procedure at a time: first phaco/IOL placement in the left eye. Then at a later date, should he have issues with medical control of his IOP, a glaucoma procedure could be performed.
3. I would stop the use of the prostaglandin analogue a couple weeks before surgery, as well as start the patient on a newer generation topical fluoroquinolone and topical NSAID a few days prior to the surgery as well.
4. The narrow angles and likely shallower anterior chamber can be managed well with the cohesive or supercohesive viscoelastics. Use of an agent like Healon GV or Healon 5 are ideal in these situations. They will allow deepening of the anterior chamber and can even be injected posterior to the subluxed cataract to provide some support.
5. The greatest challenge in this patient is the management of the subluxed cataract. This will require more discussion (see below):

Determine if there is vitreous in the anterior chamber. First, it is important to determine if there is vitreous prolapse into the anterior chamber around the area of zonular loss. Injecting a small amount (0.1 – 0.2 cc) of dilute, preservative free triamcinolone (5 to 10 mg/cc) into the anterior chamber will stain any prolapsed vitreous. Make a small anterior chamber paracentesis and inject the triamcinolone.

Perform an anterior vitrectomy if needed.

If there is prolapsed vitreous then I prefer to perform a small incision (25 gauge) pars plana anterior vitrectomy. Insert the infusion line into the anterior chamber paracentesis, and insert the trochar for the 25GA vitrector via the pars plana under the area of zonular loss and vitreous prolapse. Then using a high cut rate, cut and draw the vitreous posterior, back into the vitreous cavity. Remove as little vitreous as needed.

Support the subluxed cataract

Injecting viscoelastic behind the cataract is helpful to provide support and to provide a barrier to further vitreous prolapse. Again, moderation is key, and only inject as little viscoelastic as you need. Once the capsulorhexis is performed, one or two iris hooks can be used to support the capsule at the area of zonular loss.

Remove the cataract without stressing the zonules

Using a vertical or horizontal chop technique would be ideal in order to prevent further zonular stress and loss. Even prolapsing the nucleus via a larger capsulorhexis would be a good option. Divide and conquer and one-handed bowling techniques should definitely be avoided due to the stress that they can place on the zonules.

Insert a capsular tension ring

After nucleus removal, I would insert a capsular tension ring. The level of zonular loss is just about the most

that can be treated with a simple capsular tension ring without having to suture it. I would opt for this choice. Should the IOL/CTR/capsular bag complex de-center or show instability, then it could be sutured to the iris at the site of weakness. However, this will not likely be necessary. Once the CTR is in the capsular bag, it is important to perform the cortex removal with the I&A hand-piece in a circumferential manner and not radial.

Insert the IOL

With this patient, there is certainly the possibility of IOL de-centration, even with perfect placement in the capsular bag. Therefore, using an aspheric IOL of the variety with zero spherical aberration is ideal. Make sure that your aspheric IOL is the "aberration-free" type and not the negative spherical aberration type, which is quite sensitive to de-centration.

Check for IOL stability

After gently removing the viscoelastic, fill the anterior chamber with balanced salt solution and hydrate the corneal incisions. With the eye at a physiologic IOP, check for IOL stability by moving the eye in various meridians. If the IOL seems unstable or loose at the site of zonular loss, then a suture may be needed. A 10-0 polypropylene can be used to suture the IOL haptic and/or the CTR to the iris. However, I would think that with 4-5 clock hours, the CTR along should provide enough stability and there would be no need for further suturing.

Finally, I would provide a very controlled post-op regimen for the patient. During the first 2 weeks, using the topical medications and avoiding further trauma are key to achieving the optimum visual outcome. I would prescribe a topical steroid such as Prednisolone Acetate 1% QID x 3 weeks, an NSAID such as bromfenac (0.09%) BID x 6 weeks, and a fluoroquinolone QID x 1 week. The patient could resume his beta-blocker and brimonidine drops on post-op day 1. I would not use the bimatoprost at all.

If the patient's IOP is not well controlled after 2 or 3 months, I would consider performing a glaucoma procedure. Finally, I would recommend video-taping the entire surgery as this case would make a great teaching film.

Dr. Vinay Nangia

I think the examination done as well as the approach to the management of glaucoma is appropriate. The view of the optic disc in the left eye is hazy and I was not convinced about the inferior polar notching. Also there did not appear to be much difference in the overall appearance of the optic disc in the two eyes, suggesting that the damage if any to the optic nerve in the left eye due to the elevated pressure may have been very mild. However an appraisal post cataract surgery of the optic discs would be a good idea. The visual fields may be repeated at this stage. The earlier visual fields only showed depression in the superior area, and post cataract surgery we would get a more reliable field.

If the visual fields are not significantly affected, we may need to consider reducing the topical medication. An IOP of mid teens to high teens would suffice in the absence of any significant visual field loss and retinal nerve fiber layer defect, and you may chose accordingly which medicine to put the paient on depending on the pressure lowering efficacy, systemic and local tolerability and cost effectivity.

You have achieved good results with the surgery. The technique of surgery would have been the same at our end. Corneal incision, viscoelastic, anterior capsulorrhexis done gently depending on easy or difficult tearing of the capsule, and the movement of the lens due to the zonular dehiscence. Hydrodissection, iris hooks/endocapsular ring, phacoemulsification done with minimal turbulence and manipulation, cortical aspiration and foldable lens implantation. The only thought I had was whether this was a patient who needed trabeculectomy along with the cataract surgery. Sometimes there is no way of knowing that and the decision is partly clinical and partly arbitrary. Since the angle was narrow in the right eye and it was felt that an iridectomy was indicated, perhaps there was a possibility that the subluxation may have closed the angles for a prolonged period of time. The appearance of the angle post cataract surgery would give a clinical clue. Also it is a good idea to define the narrow angle for onself, as this would lead to uniformity in diagnosis and enhances clinical decision making for doing laser iridotomy.

Compilation and comments: Dr. Arup Chakrabarti

The patient, an ex-serviceman, was very keen for his visual rehabilitation in the left eye. His subluxated cataract was visually significant right at the time of

presentation. However, he wanted to temporize till a convenient date and with that in mind medical therapy was stepped up in the left eye and bimatoprost was added on to control the IOP. There are issues pertaining to the unilateral use of bimatoprost, which were clearly explained to him. He was quite compliant with the medical therapy and I was quite comfortable with the IOP status achieved and maintained in both the eyes. There were no issues with the right eye. However, with respect to the left eye, which was on 3 antiglaucoma medications, patient had expressed his wish to consider a filtering surgery (along with his visual rehabilitation) to reduce his financial burden. As such, a patient with coexisting visually significant cataract and glaucoma with significant cupping and on three antiglaucoma medications is a candidate for combined surgery. The confounding factor in this particular situation is the subluxated cataract and the unpredictable nature of the course of the surgery in a subluxated cataract.

A special informed consent was taken from the patient. He was acquainted with the possibility of aphakic status in the least desirable surgical scenario which he was motivated enough to accept!

The surgical strategy was to perform a single site combined cataract surgery with a foldable IOL and mitomycin-augmented trabeculectomy. Scleral tunnel was preferred due to the ease of conversion should converting to a non-phaco technique be required during the course of the surgery due to intraoperative difficulties.

The degree and range of manipulations that may be required to handle this hard, subluxated cataract may get a bit uncomfortable for the patient if performed under topical anaesthesia. Hence the surgery was performed under peribulbar anaesthesia. Ocular hypotony was achieved with 150 cc of IV mannitol (20%) and mild digital ocucompression.

With regard to the type of conjunctival flap whether fornix or limbus based the literature doesn't show the superiority of one over the other. A 4 mm, superiorly located fornix based conjunctival flap was created since that happens to by my preferred approach for a number of reasons. After gentle cautery of the bleeders, a 2.8 mm scleral tunnel was fashioned 2.5 mm from the superior limbus at the 12 O' clock meridian. A weck cel, soaked in 0.04 % of mitomycin C was applied on the scleral bed for duration of 2 minutes and was washed off by copious irrigation with BSS. Two side port entries were created at 2 O' clock and 9 O' clock limbus and the aqueous was exchanged with 1.4% sodium hyaluronidate. Care was taken to adequately tamponade the area of subluxation.

The anterior chamber was entered with a 2.8 mm keratome. The degree of subluxation was noted by retracting the iris (in the area of zonular dialysis) with a Kuglen's hook. The lens was found to be subluxated from 2 O' clock to 7 O' clock hour area. Capsulorhexis was initiated with a bent 26G needle a little above the centre of the anterior capsule, with the initial nick towards the subluxated area and a triangular flap was raised. This particular maneuver reduces the zonular stretch at the time of initiating the rhexis. The rhexis was completed with Utrata forceps maintaining a deep anterior chamber all the time. A rhexis of 4 to 4.5 mm diameter was achieved. Two additional paracenteses were created along the temporal limbus, and iris hooks were inserted to hook around the rhexis margin (Figure 4) in an attempt to stabilize the capsular bag for subsequent nucleus management maneuvers. A very gentle and meticulous multiquadrant hydrodissection was performed and free mobility of the nucleus was ensured. The nucleus was removed by the vertical, direct phacochop technique. The Bausch & Lomb Millennium machine with the CCS (Custom Control Software) was employed. The following precautions were taken: (1) the infusion bottle height was adjusted at a low level (2), A relatively low vacuum level (150 mm Hg) was set; (3) Phaco power of 30% was employed in a burst mode. The 1.5 mm Chang vertical chopper was employed and nucleus chopping was carried out with minimum stress to the capsulozonular apparatus. The anterior chamber was never allowed to shallow at any stage of the procedure. After the nucleus removal, the capsular bag was inflated with 1.4% sodium hyaluronidate and a 10-12 mm capsular tension ring (Aurolab) was inserted into the bag with minimal stretching of the zonules. The residual cortex was removed by the bimanual I/A technique. The cortex in the subluxated zone was stripped in a circumferential manner. A hydrophilic acrylic posterior chamber IOL was inserted into the capsular bag through the 2.8 mm scleral tunnel with the aid of a shooter. The pupil was constricted with an intracameral injection of pilocarpine at the end of the procedure.

An adequate trabeculectomy was created with a Kelly's punch and a peripheral iridectomy was performed through the fistula site. The scleral flap was reposited, the tunnel was closed with a single 10-0 nylon suture and the knot was buried within sclera. The residual viscoelastic was removed from the anterior chamber. The conjunctival flap was reposited and anchored to the cornea with multiple 10-0 nylon sutures in a watertight manner.

On the first postoperative day, his IOP in the left eye was 22 mm Hg with a flat bleb. The bleb formed well with an adequate digital massage and the IOP dropped to 10 mm Hg with slight temporary shallowing of the anterior chamber. The digital massage had to be repeated over the next two weeks owing to the IOP being in the early 20's. One has to be careful during digital massage in these eyes with weak/damaged zonules and shallow anterior chamber is not very desirable. Laser suturolysis was performed on the 17th postoperative day with 900 mw power for a duration of 300 ms. Post laser suturolysis the bleb formed very well with the IOP dropping to 10 mm Hg. His best-corrected vision (with –1.0 Diopter sphere) improved to 6/6. The IOP in the left eye has stabilized around 13 to 14 mm Hg and he continues to be only on tear substitutes in the left eye. He continues to instill timolol and brimonidine in his right eye.

Compiled by Dr. Arup Chakrabarti, Chakrabarti Eye Care Centre, Trivandrum

Intracameral Cefazolin as Prophylaxis Against Endophthalmitis in Cataract Surgery

Pedro Romero et al, J cataract refract surg 2006; 32:438-441

This non controlled retrospective observational study was conducted between January 2001 to December 2004 on all patients undergoing phacoemulsification and hydrogel intraocular lens implantation. The first group of patients (n=3650) did not receive intracameral cefazolin. The second group of patients (n=3618) received 0.1mg of cefazolin diluted in 0.1ml saline to 0.9%. Patients with a history of hypersensitivity to cephalosporins were excluded from both study groups.

The rates of postoperative endophthalmitis was lower in the cases with intracameral cefazolin (0.055%) than those without cefazolin injection (0.63%). Out of the 23(0.63%) endophthalmitis cases in the first group, 9(39.13%) of staphylococcus epidermidis, 4 (17.39%) of Staphylococcus aureus and 2(8.70%)cases of Streptococcus species were cultured. Klebsiella pneumoniae was cultured in (4.35%) There were no toxic effects on the cornea or retina. The authors conclude that intracameral cefazolin in cataract surgery demonstrates prophylactic effect in diminishing the rate of post operative endophthalmitis without toxic effects on cornea or retina.

An ESCRS study conducted by Peter Barry et al has also reported a lower rate of post operative endophthalmitis after intracameral cefuroxime injection and/or perioperative levofloxacin eye drops after phacoemulsification cataract surgery.

Intravitreal Bevacizumab Treatment of Choroidal Neovascularization Secondary to Age Related Macular Degeneration

Richard F Spaide et al, Retina 26:383-390, 2006

This is a retrospective study to assess the short term anatomical and visual acuity response after an intravitreal injection of 1.25 mg Bevacizumab in patients with choroidal neovascularization secondary to age related macular degeneration.

Best corrected Snellen visual acuity, optical coherence tomography, ophthalmoscopic examinations were done at baseline and follow up visits over a 3 months period.

266 eyes of 266 patients were included in this study and follow up information for 251(94.4%) were available. The mean age of the patients was 80.3 years, mean baseline visual acuity was 20/184 and 175 (69.7%) had inadequate response to alternate methods of treatment. At one month and two months there was significant improvement in visual acuity ($p<0.001$) At 3 month follow up data available for 141 patients, mean visual acuity was 20/109($p<0.001$) and 54(38.3%) patients had visual acuity improvement. The mean central macular thickness at baseline was

340 microns and decreased to a mean of 213 microns at month 3($p<0.001$). No endophthalmitis, increased intraocular pressure, retinal tear, or retinal detachment occurred. At 1 month, two patients had mild vitritis as did one patient at month two who had a history of recurrent uveitis. The short term results show a favorable outcome though the follow up is too short to make any specific treatment recommendations.

Trabeculectomy with Mitomycin C in Pseudophakic Patients with Open Angle Glaucoma: Outcomes and Risk Factors

Hector Fontana et al., AJO April 2006, Vol. 141

This study was a retrospective cohort study of patients who underwent trabeculectomy with mitomycin-C as an adjunctive. The study was conducted between August 1997 and December 2003. Data was obtained by chart review of 89 consecutive pseudophakic eyes of 73 patients.

Patients with primary open angle glaucoma, normal tension glaucoma, pseudoexfoliation, pigmentary glaucoma, previous cases of cataract extraction with with PCIOL implantation were included in this study. All patients were above 40 years.

Patients who had undergone previous combined surgery, those who had ACIOL, presence of vitreous in anterior chamber before trabeculectomy, patients with coexisting neurological or retinal diseases were excluded from the study. The indications for surgery were IOP values associated with high probability of glaucoma progression, deterioration of field and disc damage

The same surgeon performed all surgeries. A limbus or fornix based flap was made.

Cellulose acetate sponge soaked in 0.3 mg/ml Mitomycin C for 1 to 3 minutes was placed at the scleral flap site. Duration depended on the risk for failure such as previous ocular surgery, location of cataract incision, clear corneal or scleral tunnel, characteristics of conjunctival hyperemia or inflammation. Post operatively all patients were put on corticosteroid drops four times a day for 2 weeks and tapered by 6-8 weeks. Laser suture lysis was done in cases of too low filtration and too high IOP for target pressure.

Success was based on the following criteria.

Criteria A - Final IOP ≤ to18 mm of Hg, and ≥ 20% reduction of IOP reduction of at least 2 medications

Criteria B -Final IOP ≤ 15 mm of Hg and ≥ 25% IOP reduction OR reduction of at least 2 medications

Criteria C -Final IOP ≤ 12mm.HG and ≥ 30% IOP reduction OR reduction of at least 2 medications

For all criteria final IOP should be less than baseline IOP, or equal to baseline IOP when baseline IOP is already less than target IOP

89 eyes of 73 patients were included in the study. The mean age was 80.8 ± 8.9 years with a range from 56 to 95 years. There were 26 males and 47 females, 67 white and 3 black and 3 Asian patients. 80 patients had POAG, 2 had NTG, 6 had pseudoexfoliation, 1 patient had pigmentary glaucoma. Mean preoperative IOP was 18.8 ± 8.8 mm of Hg with a range of 9 to 50 mm Hg. Number of preoperative medications was 3.0 ± 1.1 Ranging from 0-5. Limbus based flap was performed in 45 patients and fornix based flap in 44 patients. Laser suture lysis was needed in 30 patients. 11 patients required a second glaucoma procedure. The mean IOP decreased from 18.8 ± 6.6mm Hg to 10.2 ± 5.1 mm Hg at first year 10.0 ± 4.2 mm Hg at the end of 2 years. Average number of preoperative medications decreased from 3.0 ± 1.1 to 0.5 ± 1.0 at first year and 0.5 ± 0.9 at 2 years.

For criteria –A, Success Rate at 1st & 2nd year were 87%+/- 4% & 67%+/-4%

Criteria- B, 83%+/-5% & 58%+/-8%

Criteria –C, 76%+/-5% & 50+/- 7%

The authors conclude that increasing age, use of a limbus based flap and performance of laser suture lysis were factors that were associated with a smaller risk of failure. Trabeculectomy +Mitomycin C in pseudophakic eyes provides acceptable long-term success rates in pseudophakic patients with low incidence of complications.

Contributed by Dr. Joe Philip, DO, Little Flower Hospital, Angamaly

Eyelid Tumors –Clinical Diagnosis and Surgical Treatment

Second Edition, By Jay Justin Older, Mansion Publishing Ltd 2003; 128 pages indexed with 394 illustrations

It is a lucid book that would help an ophthalmologist to diagnose eyelid tumors in the clinical setting and beautifully illustrates and guides the surgeon to remove the tumors as well as repair the defect. Inspite of being a short and precise handy book, it gives a comprehensive and complete overview of all lid tumors both benign and malignant, as well as a description of other related lid lesions. The histopathology of tumors, frozen and Moh's techniques are described well.

The book is very handy, readable, photographs are excellent. The benign lesions are also covered well with photographs that will leave a lasting impression on the reader's mind.

The surgical anatomy, general principles of eyelid reconstruction are well elucidated, helpful not only for the oculoplastic surgeon but also for every postgraduate to ensure clear understanding of the complex lid anatomy. Description of radiosurgery is unique and make for an interesting read.

The management of lesions is tackled depending on the tumor location and size. Depending on the site, there is a section each on surgical resection followed by reconstruction of the lid defects according to the site of the lesions -upper lid, lower lid, medial canthus and lateral canthus. All this is explained beautifully with illustrations. There is separate chapter on repair of lesions not involving eyelid margin, as well reconstructions of medial and lateral canthi.

The surgical technique is clearly illustrated, with good photographs, and so a reader can apply the knowledge in managing patients.

The entire clinical panorama of lid tumors both benign and malignant unfolds clearly without going into the details of etiopathogenesis, demography or pathology.

Strabismus Simplified

1st edition 3rd reprint

By Pradeep Sharma, Modern Publishers, 2004, 236 pages, indexed with 404 illustrations

Strabismology has been the lesser understood, forever so confusing subspecialty of Ophthalmology, with only few stalwarts who understand it, teach it and practice it appropriately. Everyday ophthalmology practice commonly deals with problems of binocular vision and ocular motility that challenges our knowledge on this subject which is akin to mathematics. This is the maiden book on strabismus by an Indian author. It is an excellent book, makes understanding of the subject lucid and interesting. His book is easy to understand in contrast to the standard books on Strabismology that end up confusing the beginner.

The text is, as the name suggests simple to read and understand. It starts with basic anatomy and physiology of ocular muscles. Then it explains the various phenomenona that occur in strabismus and the methods to assess them, followed by assessment of such a patient. After building this background the book proceeds to explain the various types of strabismus. It has a separate chapter each on A-V phenomena, paralytic and restrictive squint. Nystagmus, an even more mind-boggling subject is very concisely represented making it's understanding easier. The book includes a chapter each, on medical and surgical management of strabismus and lastly on its complications.

A separate chapter is written on the various instruments used in squint assessment. This would be of great help to a beginner and to an optometrist to familiarise and optimally use these orthoptic appliances.

The whole arrangement of the book is such that it makes the topic interesting, and the reading enjoyable. The suggested references at the end of each chapter can guide the strabismic enthusiast for further quest of knowledge.

The tables, diagrammatic and photographic illustrations, enhance understanding of the complex subject. The glossary is a useful addendum to the book that helps for quick reference with basic definitions related to ocular motility disorders. Having it indexed is an advantage although it seems to be slightly insufficient and can be improved upon.

It is a very good book for beginners. A beginner who has read this book would find reading other squint books much easier.

Incidentally also worth mentioning is the fact that two third of the author's royalty from this book goes to *CRY [Child Relief and You]*

This book is small, handy and easy for quick reference especially in the outpatient clinic. It is so modestly priced that it can be a handy reference for all. Dr. Pradeep Sharma's excellence in teaching can be taken advantage of by the means of this book by ophthalmologists far and wide.

Book reviewed by Dr. Meenakshi Dhar, Dr. H. Sujithra, Dr. Abhijeet Khake,
Amrita Institute of Medical Sciences and Research Centre, Cochin

CME Programmes

STATE CONFERENCES

17th September 2006
Ocular Emergencies
Amritha Institute of Medical Sciences, Cochin
Dr. Meenakshi Dhar
Ph : 0484 – 2801234, 93888 39080

Drishti 2006: November 17th -19th
33rd Annual Conference of Kerala Society of Ophthalmic Surgeons
Hotel Avenue Centre, Panampalli Nagar, Kochi
Organising Secretary : Dr. Sasikumar
Ph : 0484–2357135, 2357098, 94474 75101

7th – 9th December 2006
XV Annual Conference of Vitreoretinal Society of India
Conference Venue: Hotel Riviera Suites, Kochi, Kerala
Conference Secretariat: Giridhar Eye Institute, Kochi
Ph: 91-484-2316791/2312303
Mobile: 093886 77899 E.mail: conference@vrsi2006.com
Web: www.vrsi2006.com

NATIONAL CONFERENCES

1st, 2nd & 3rd Septmber 2006
India Habitat Centre, New Delhi
Dr. Mahipal S. Sachdev
B 5/24, Safdarjung Enclave
Opposite Deer Park & Near DLTA Stadium,
New Delhi - 110029

9th – 10th September 2006
BOA Pan Orbit 2006
Annual Conference of Bombay Ophthalmologists' Association
Contact: Dr. Arjun Ahuja, Bldg. No.2,
1st Floor, R.no. 4 & 5 Lamington Road,
Navjeevan Society, Mumbai – 400 008.
E.mail: dr_ arjunahuja@yahoo.com

15th, 16th & 17th September 2006
30th AP State Conference 2006, Kakinada
" Bhavanetra"
Venue: Kantipudi Subbamma Kamma Mahajana Sangham and IMA Halls
Organising Secretary: Dr. S.V. Raju
Ph:
E-mail:

6th, 7th & 8th October 2006
VIth International Congress on Advances in Ophthalmology
Eye Advance 2006 Mumbai
Live Surgery: 6th October 2006 (8 Am – 2 Pm)
Organising Secretary : Dr. Keiki. R. Mehta
Ph: 91-22-2215 0103, 2215 1676, 5571 6196
Fax:91-22 2215 0433, E.mail: admin@eyeadavance.com
Web: www.eyeadvance.com

14th & 15th October 2006
XIII Annual Conference of Strabismological Society of India
Science City, Kolkata
Organising Secretary : Dr. Paromita Sanatana
Mobile: 94330 16080
E.mail: athena_eye@vsnl.com

20th – 29th October 2006
17th Annual Conference of Oculoplastics Association of India
Contact: Dr. Apjit Kaur Chhabra
Associate Professor
Eye Dept., King George Medical University, Lucknow-226 003
E.mail: opaicon06@rediffmail.com

1st – 3rd December 2006
SEAGIG – 2006
International Glaucoma Convention at Chennai Convention Centre
Organising Chairperson:
Dr. L Vijaya, Director, Glaucoma Services
Sankara Nethralaya, No.18, College Road, Chennai 600 006
Ph: 91-44-2827 1616, 2823 3556
Fax : 91 44 2825 4180
E.mail: seagig_2006@yahoo.com
Web: www.seagigchennai.org

INTERNATIONAL CONFERENCES

9th – 13th September 2006
XXIV Congress of the European Society of Cataract and Refractive Surgery (ESCRS) London, UK
Web: www.escrs.org

20th – 24th September 2006
VIIIth Ophthalmological Congress of The SAARC Countries & XVth Annual Scientific Session of the College of Opthalmologists of Sri Lanka,
Website: www.ocscsrilanka.org
E.mail :ocsc_srilanka@yahoo.com

11th – 14th November 2006
Joint Meeting of The American Academy of Ophthalmology and Asia Pacific Academy of Ophthalmology (APAO) 2006
At Sands Expo/Venetian In Las Vegas, Nevada.

SPECIFICATION of the Journal

Size	1/4 Demy (210 x 280 mm)
Frequency	Quarterly (4 Issues in a year)
Model of Printing	Offset
Mode of Binding	Perfect Binding
Advertisement Material	Screen 175 LPI
Double Spread Full Page	42 x 28 cm + 6 mm gutter space
Black & White	Positive / Bromide / CD
Colour	CD with colour proof
Payment	All payment to be made in advance by DD in favour of Kerala Journal of Ophthalmology payable at Trivandrum
Mailing and Contact	**Dr. Meena Chakrabarti,** Editor, KJO Chakrabarti Eye Care Centre Kochulloor, Medical College P.O. Trivandrum 695 011 Ph: 0471-2555530, 2449599 Fax: 0471-2558530
E-mail	tvm_meenarup@sancharnet.in
Meeting Time	Please fix by calling on phone

MANAGEMENT OF OCULAR TOXOPLASMOSIS

Aetiological Agent	:	Toxoplasma Gondi (Obligate Intracellular Parasite)
Definite Host	:	Members of Cat family
Human Infection	:	Eating contaminated partly cooked meat, contaminated water

Infective Forms In Humans

TACHYZOITE	CYST
Obligate Intracellular Organism which proliferates to cause active disease	200μm cysts containing hundreds of organisms, with propensity for Cardiac and Neural tissue especially Retina

CLINICAL MANIFESTATION

- SYSTEMIC : Fever, Malaise, Sorethroat, lymphadenopathy
  Affects muscle, skin, brain, heart, kidney
  Fulminant CNS disease in Immunocompromised.
- OCULAR : Congenital: Chorioretinal scars (B/L)
  70% of Infected children show scars.

Reactivation/Recent Acquisition

- Focal Retinochoroiditis
- Satellite Lesions ("Headlight in the fog")
- Toxoplasmic AION
- Grey White Punctate Lesions of Deep Retina & RPE.
- Papillitis
- Pars Planitis
- Scleritis
- Retinal Vasculitis
- Retinal Vascular Occlusions
- Bullous Inflammatory lesion

Loss of Vision in Toxoplasmosis

- Involvement of Macula by lesion or perilesional retinal oedema
- CNVM
- Retinochoroidal Anastamosis
- Retinal Vascular Occlusions
- Papillitis
- RD/RT

Pregnancy & Toxoplasmosis

- New Accquisition of Disease during pregnancy:
  - 40% risk of transmitting infection to foetus
  - Risk of foetal infection highest in 3rd Trimester
- Prior Toxo Infection in mother, (Toxo Antibody + in pregnancy)
  - Foetus is protected !!!
- One child with symptoms of Ocular Toxo : Succeeding siblings protected

Management of Ocular Toxoplasmosis in Pregnancy

- New Accquisition during pregnancy
- Reactivation of prior ocular disease
  1) Follow –up lesion if it is not sight threatening
  2) Reports Available on successful management by Intravitreal Inj of Clindamycin and Dexamethasone along with Systemic Sulphadiazine
  3) Safety & Efficacy of 'SPIRAMYCIN' in pregnancy

Diagnostic Tests

Presence of Elevated Igm Suggest Recent Infection

- SABIN FELDMANN Methylene Blue dye test
- Immunofluorescent Antibody test
- Elisa for 1gG & 1gM Antibodies
- PCR

NEGATIVE TEST indicates

1. Absence of Antibody to Toxoplasma
2. Lab Error
3. Immuno compromised patient
4. Infection confined to eye; Systemic Immune response meagre

Therapy in Ocular Toxoplasmosis

(Self Limiting disease in Immunocompetent patients)

CRITERIA FOR TREATING

1. Lesions within Temporal arcade
2. Lesions abutting on Optic Nerve
3. Lesions threatening large retinal vessel
4. Lesion that has induced large areas of haemorrhage
5. Vitreous Inflammation sufficient to reduce VA to 6/18 or at least a sustained 2 line drop.
6. Multiple Recurrences with marked vitreal inflammation.

Drug Combinations in Ocular Toxoplasmosis

Therapeutic Regimens

1. Pyrimethamine + Sulphadiazine + Steroid
2. Clindamycin + Sulphadiazine + Steroid
3. Trimethoprim + Sulphamethoxazole
4. Azithromycin + Sulphadiazine + Steroid
5. Azithromycin + Steroids
6. Atavaquone
7. Spiramycin

Duration of therapy 3-4 weeks at least.

Name of Drug	Dosage	Side Effects	Miscellaneous
1. Sulphadiazine	1gm oral 4 times daily	Allergy Steven Johnson	Combined usually with other drugs
2. Pyrimethamine (Daraprim)	50 mg loading dose 25 mg orally twice daily	Reduce Platelet count	Folinic Acid 3-5mg thrice a week. If unavailable advise 'Yeast' granules which is a rich source of Folinic acid
3. Clindamycin	150mg-300 mg orally 3-4 times daily	Pseudomembraneous Colitis	S/C inj 50 mg I/Vit 1.0mg/ml
4. Trimethoprim Sulphamethoxazole (Septran DS) (Bactrim DS)	One twice daily	Terratogenecity	Contraindicated in Pregnancy
5. Atovaquone (Mepron)	750 mg 4 times daily X 3 months		Can kill cysts Prevents Recurrence
6. Azithromycin	500 mg daily X 1 day 250 mg daily X 5 Wks	Minimal well tolerated	Can kill cysts and Tachyzoites in vitro Does not prevent recurrence. Can cross Blood Brain Barrier

Steroids in Ocular Toxoplasmosis

- Lesion in posterior pole
- Lesion threatening Optic Nerve head

20-40mg/day. Start 12-24 hrs after initiation of Specific Antimicrobial therapy.

Followup daily

Taper & Stop steroids before Anti Toxo antimicrobial therapy is discontinued

DO NOT USE PERIOCULAR STEROID INJECTION

Additional Therapeutic Regimen

- Cryotherapy of peripheral lesions: [Excessive 'Cryo' in 'hot' eyes → Inflammation, membrane formation & peripheral TRD]
- Laser to Active lesion: Aims to "Kill" the lesion [Rupture/reactivate Dormant Cyst → activity]
- PPV+PPL

Surgery in Toxo(+) Patient

- Definite Risk of Reactivation
- Start Antimicrobials prior to planned procedure & continue it into post-op period.

General Instructions to Authors

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 I" 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**: Give 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 communication, 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: Authors(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.

The manuscripts are to be sent to The Editor by Courier Mail or by Registered post. The corresponding author will receive communication from the Editor within two weeks of receiving the manuscript.

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 2 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.

c) 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.

DORC

CPC

Innovative Ideas for Surgical Success

STANDARD 2500 CUTS VITRECTOMY





associate® 2500 Dual System

Peristaltic and Venturi Pump, both selectable for phaco vitrectomy.

associate® 2500

The Total Solution

Advanced Dual System, Phaco and Vitrectomy Twin Pump System, Peristaltic and venturi High Vacuum Occlusion Techonology High Speed Vitrectomy 2500 Cuts



High Vacuum Sensor Cartridge

- Closed System for optimal sterile barrier.
- High vacuum technology for advanced capsular protection.
- Real Time Vacuum Sensor.



associate® Compact System

Phaco System with Peristaltic Pump.

DLIQ JAS-ANZ

ISO 9001: 2000

CPC

CONSOLIDATED PRODUCTS CORP. PVT. LTD.

Corporate Office: F-1/8, Okhla Industrial Area. Phase-I, New Delhi-110020
Tel: 011- 26816624, 26815924, 26814972 Fax : 91-11-26818615.
E-mail : conpro@nda.vsnl.net.in; products2002@eth.net

• Mumbai • Chennai • Bangalore • Kolkata • Ahmedabad • Hyderabad

aurolab presents

TRUEDGE

360° Square Edge Intraocular Lens

Steep Vault Single Piece (PMMA)

- 360° Posterior Square Edge
- 0.1mm Posterior Projection
- Rounded Anterior Edge



RETIBLUE

(Trypan blue 0.15% w/v)

The Vital Tool for Macular Hole Surgery



- Stains ILM, ERM and Retina
- Facilitates successful P.V.R and Macular Pucker surgery
- Reduced risk of retinal damage
- Facilitates removal of posterior hyaloid remnants in traction diabetic retinopathy

aurolab
Excellence . . . in sight

For further details, contact:
Area Development Manager
Mr. Pradeep Stanley - 9342232296
Authorised Dealers
Mr.Anthony V Kanju, AV Sight Care
Mobile: 09447509554
Mr.Prakashan, PEECEE Medicare
Mobile: 9447114127

Aravind Eye Hospital , LAICO Building ,
72 KKSalai, Gandhi Nagar, Madurai 625 020, India
Phones: 91 452 2535573/4356560 - 4 (5 lines)
Fax: 91 452 2535274/2530984
E-mail: sales@aurolab.com Web: www.aurolab.com

aurolab
ISO 9001 : 2000
File No.: A6187

ARAVIND EYE CARE SYSTEM

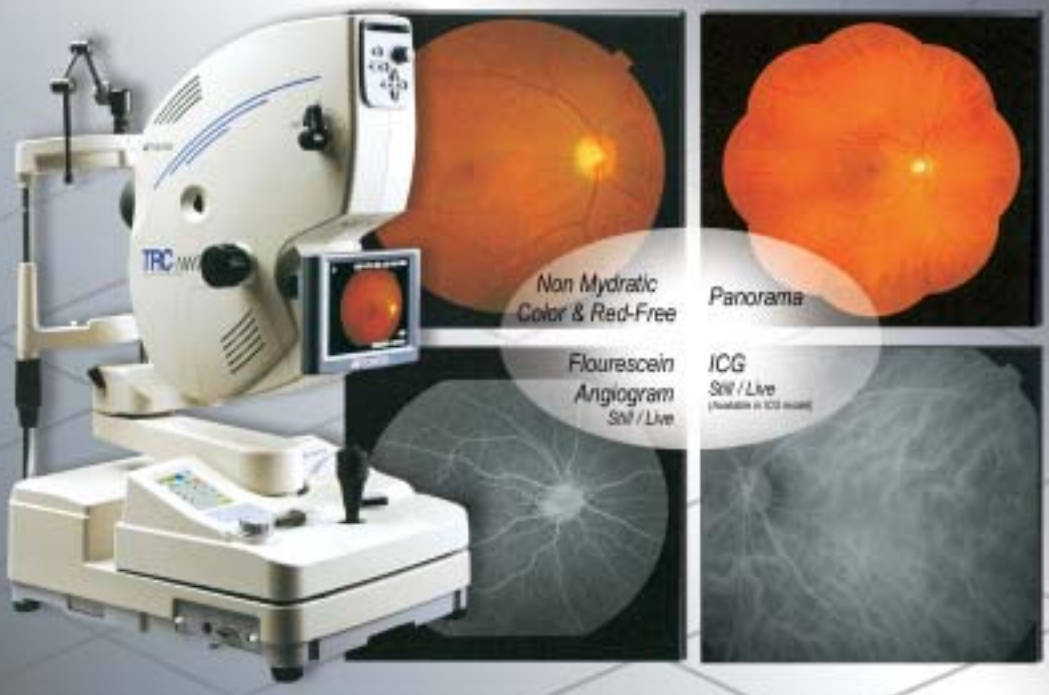
TOPCON

Technology For Today...
And For The Future

Integrated Solution - Mydriatic And Non Mydriatic In One Retinal Camera

IMAGEnet2000
DIGITAL IMAGING SYSTEM

New RETINAL CAMERA
TRC-NW7SF



TRC-NW7SF handles small diameter pupils down to 3.7mm
Simple Screening Applications Of Color Fundus Imaging
TOPCON's unique built - in Digital Camera
9 points Internal Fixation LEDs
No View Finder !
IR illumination


Swing and Tilt


Tilting 6.4 inch
Color LCD Monitor


Easy Alignment
And Focus


Touch Panel Operation

MEHRA EYETECH PVT. LTD.
54, Kailandas Udyog Bhavan, Near Century Bazar, Prabhadevi, Mumbai- 400 025.
Tel: 022- 5660 3121 Fax: 022- 2437 8531 E-mail: mehraitech@vsnl.net

Acryfold®

FOLDABLE INTRAOCULAR LENSES



Model : 502



Model : 701

Model : 501





Model : 601

GALAXYFOLD

FOLDABLE INTRAOCULAR LENSES



Model: CENTER FIX



Model: CENTER FIT



Model: ULTRA SMART

Marketed by :

APPASAMY ASSOCIATES

20, SBI Officers' Colony, First Street, Arumbakkam, Chennai - 600 106, India.
Tel: (91-44) 32980153, 32980154, 32932405, 32932406, 23630363, 23631039. Toll free: 1800 4251945.
Fax: (91-44) 2363 0721, 2363 1208. E mail: appasamy@vsnl.com Website: www.appasamy.com
Branch: 65, 3rd Cross, Jawahar Nagar, Boomiyanpet, Pondicherry - 605 005.



Bridging the gap between the latest Ophthalmic technologies For all your Ophthalmic needs your reliable partner for over 30 years

Imaging capabilities progressive functionality

The difference is inside...

HAAG-STREIT INTERNATIONAL

Haag-Streit slit lamps one of them is for you



BD 900® NEW
- intregrated C-mount video adapter
- built in yellow filter



BM 900®
- the classic Haag-Streit slit lamps



BP 900® NEW
- joystick integrated illumination control
- easy imagining solutions for digital video and photo



BQ 900®
- the versatile slit lamp system



BX 900® NEW
- professional photography
- fully synchronised flash
- 100% light to camera

...timeless quality in every detail.

JAS-ANZ

ISO 9001: 2000

CONSOLIDATED PRODUCTS CORP. PVT. LTD.

Corporate Office: F-1/8, Okhla Industrial Area. Phase-I, New Delhi-110020
Tel: 011- 26816624, 26815924, 26814972 Fax : 91-11-26818615.
E-mail : conpro@nda.vsnl.net.in; products2002@eth.net

• Mumbai • Chennai • Bangalore • Kolkata • Ahmedabad • Hyderabad

VITRECTOMY SYSTEM
The High lights

ECKARDT 23 GAUGE VITRECTOMY SYSTEM & ACCESSORIES

23 GAUGE VITRECTOMY SYSTEM



ECKARDT 23 GAUGE CANNULA SYSTEM CONSISTING OF:
- 3 X INSTRUMENT CANNULAS
- 2 X INFUSION CANNULAS
- 3 X BLUNT INSERTORS
- 3 X CLOSURE PLUGS
- STERILIZATION BOX

1272-23

ECKARDT 23 GAUGE CANNULA SYSTEM CONSISTING OF
• 2 X INSTRUMENT CANNULAS • 1 X INFUSION CANNULAS
• 3 X BLUNT INSERTORS • 2 X CLOSURE PLUGS • 1278 ECKARDT CANNULA FORCEPS
• 2115 PRESSURE PLATE STERILIZATION BOX

1272-ED06



DISPOSABLE ECKARDT 23 GAUGE CANNULA SYSTEM CONSISTING OF:
- 2 X INSTRUMENT CANNULAS
- 1 X INFUSION CANNULAS
- 3 X BLUNT INSERTORS
- 1 X INFUSION LINE
- 2 X CLOSURE PLUGS
- BOX/1 STERILE

1267-NMD06



PNEUMATIC VITRECTOME, 23 GAUGE / 0.6 mm. FOR MOST VITRECTOMY UNITS WORKING WITH 30 PSI MAX 1500 CUTS/MIN (BOX/1,STERILE)

1278



ECKARDT 23 GAUGE / 0.6 mm. CANNULA FORCEPS

2115



ECKARDT PRESSURE PLATE

1272-E-DIS



DISPOSABLE ECKARDT 23 GAUGE VITRECTOMY KIT CONSISTING OF:
•1272-ED-06 •1267-NMD-06 •3269-D-06 • BOX/1 STERILE

23 GAUGE REUSABLE MICRO-FORCEPS



1286-B06



END-GRIPPING FORCEPS, 23 GAUGE / 0.6 mm.

1286-C06



SERRATED JAWS FORCEPS, 23 GAUGE / 0.6 mm.

1286-WO6



ECKARDT END GRIPPING FORCEPS, 23 GAUGE / 0.6 mm.

2286-K06



ASYMMETRICAL ENDGRIPPING FORCEPS, 23 GAUGE / 0.6 mm.

23 GAUGE DISPOSABLE MICRO FORCEPS



1286-CD06



23 GAUGE / 0.6 mm. (BOX/1,STERILE)

1286-WD06



ECKARDT END-GRIPPING FORCEPS 23 GAUGE / 0.6 mm. (BOX/1,STERILE)

23 GAUGE REUSABLE MICRO-SCISSORS



1286-E06



VERTICAL SCISSORS, 23 GAUGE / 0.6 mm.

1286-J06



STRAIGHT SCISSORS, 23 GAUGE / 0.6 mm.

1286-M06



CUVERED HORIZENTAL SCISSORS, 23 GAUGE / 0.6 mm.

23 GAUGE DISPOSABLE MICRO-SCISSORS



1286-MD06



1281-A5D06



REPLACEMANT BACKFLUSH NEEDLE 23 GAUGE / 0.6 mm. (BOX/10,STERILE)

1281-C1



REPLACEMANT BACKFLUSH RESERVOIR (BOX/10)

1281-A506



REPLACEMANT BACKFLUSH NEEDLE STRAIGHT 23 GAUGE / 0.6 mm.

1281-B1D06



REPLACEMANT BACKFLUSH NEEDLE 23 GAUGE / 0.6 mm. (BOX/10,STERILE)

1281-C



ECKARDT 23 GAUGE / 0.6 mm. PASSIVE BACKFLUSH INSTRUMENT WITH EXTRA LARGE RESERVOIR FOR INCREASED BACKFLUSH CAPACITY.

CURVED SCISSIORS, HORIZENTAL 23 GAUGE / 0.6 mm. (BOX/5,STERILE)

SURAJ EYE INSTITUTE

A well equipped eye center with a commitment to excellence in clinical sciences and research.

1. General Consultants: Fresh post graduates post MS/DNB/FRCS may apply to join. During their consultancy they may opt to do a subspeciality fellowship. No. of positions – 2.

2. Subspeciality Consultants: Ophthalmologists with subspeciality training may apply to join as a consultant. No. of positions - 2

3. **Fellowships in glaucoma and cataract are offered for a duration of 1 year to 2 years:** Intensive clinical, surgical, academic and research experience. All fellows are expected to do a significant amount of surgery and become surgically accomplished in phacoemulsification and glaucoma surgery. Course curriculum includes clinical diagnostics, automated perimetry, FDP, Heidelberg retina tomography, disc and macular analysis, medical management, surgical management, academics and research presentations. Follow on opportunity to join as consultant is available for various subspecialities. No. of Positions - 2

4. Phacoemulsification Fellowships: The institute will take short term fellows in phacoemulsification. Duration will be 3 months. Fellows may join in October November, December, January, and February. Fresh post graduates and those who have graduated in the last 3 years will be preferred. No. of Positions - 4

5.Observerships in glaucoma, general ophthalmology and Phacoemulsification: Observers may come from November to March. They need to apply with biodata stating the period of observation. They will need to organize their own accommodation. Duration may vary from 1 week to 1 month.

6. Fellowships: MBBS graduates may apply for Pre DO/MS/DNB fellowships in clinical sciences and research in ophthalmology. Duration 6 months - 1 year. No. of positions -2

7. Diploma in Ophthalmic Technology (DOT). Course duration 3 years. Eligibility 12th pass science stream with 45% marks or more. No. of seats - 6

Write to:

Dr. Vinay Nangia, FRCS
Suraj Eye Institute, 559, New Colony
Nagpur. 440 001.
Tel.: (0712) 2595600, 2595636
Email: vinaynangia@eth.net
surajeye_ngp@sancharnet.in
Web site: www.surajeyeinstitute.org

KERALA SOCIETY OF OPHTHALMIC SURGEONS
APPLICATION FOR LIFE MEMBERSHIP

1. Full name (in capitals).....
2. Father's/ Husband's name.....
3. Sex..... 4. Date of birth.....

5. Permanent address.....
.....
6. Mailing address.....
.....
7. Phone Nos. Hospitals.....Residence.....
8. Mobile No.....Fax No.....
9. E-mail Address.....
10. Qualifications

.....

Degree/Diploma Institution University Year passing

.....

Non-medical

.....

Medical

.....

Honorary

.....

11. Whether registered for basic qualification / speciality training Yes/No
if yes Number Date State Council

.....

12. Are you a member of All India Ophthalmological Society? Yes/No
if yes, quote AIOS number.....
13. Introduced by: Name and address of life member.....
.....Signature.....

I hereby apply for life membership of Kerala Society of Ophthalmic Surgeons and agree to abide by the rules and regulations of the Society.

Place : Signature of applicant
Date :

Specimen signature for ID card

INSTRUCTIONS FOR APPLICANTS FOR KSOS MEMBERSHIP

1. Please enclose a Photostat copy of your Degree/Diploma certificate and Medical Registration Certificate.

2. Please send two stamp size photographs for issuing your photo identity card.

3. Life Membership Fee : Rs. 1000

   Reg.Fee : Rs. 50

   Bank commission for outstation cheques : Rs.50

4. Cheque/Demand draft is to be made in favour of Kerala Society of Ophthalmic Surgeons payable at Cochin.

5. The completed application form along with relevant certificates and Cheque/DD is to be sent to:

Dr. V. SAHASRANAMAM M.S, D.O
EYE SPECIALIST
No.30, VINAYAKA NAGAR
PAPPANAMCODE PO
TRIVANDRUM - 695 018
PH:- 0471-2490421

KSOS ELECTION
NOMINATION FORM

POST :

NAME OF CANDIDATE : KSOS NO:

PROPOSED BY

NAME : KSOS NO:

SIGNATURE :

SECONDED BY

1. NAME : KSOS NO:

SIGNATURE :

2. NAME :

SIGNATURE : KSOS NO:

CREDIT POINTS :
(ATTACH PROOF)

SIGNATURE OF CANDIDATE :
(INDICATING CONTENT)

COMPLETED PROPOSALS SHOULD REACH THE SECRETARY ON OR BEFORE OCT. 15TH 2006

Dr. V. SAHASRANAMAM
NO. 30
VINAYAKA NAGAR
THIRUVANANTHAPURAM - 695 018
PHONE: 0471-2490421

Credit Point System

Attending

- AIOS Annual Conference 25 points
- KSOS Annual Conference 25 points
- AIOS/KSOS CME/Workshop 15 points

Publishing articles in

- I J O or any other index journal 15 points
- K J O 15 points

Post to which elections are to be held

AIOS Managing Committee members (Two)

Any member of ten years standing in the Society, residing and practising in Kerala, with 100 credit points, (out of which 25 or more should be for attending AIOS annual conference) is eligible to become AIOS managing committee member.