KARNATAKA OPHTHALMIC SOCIETY
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From Darkness to light

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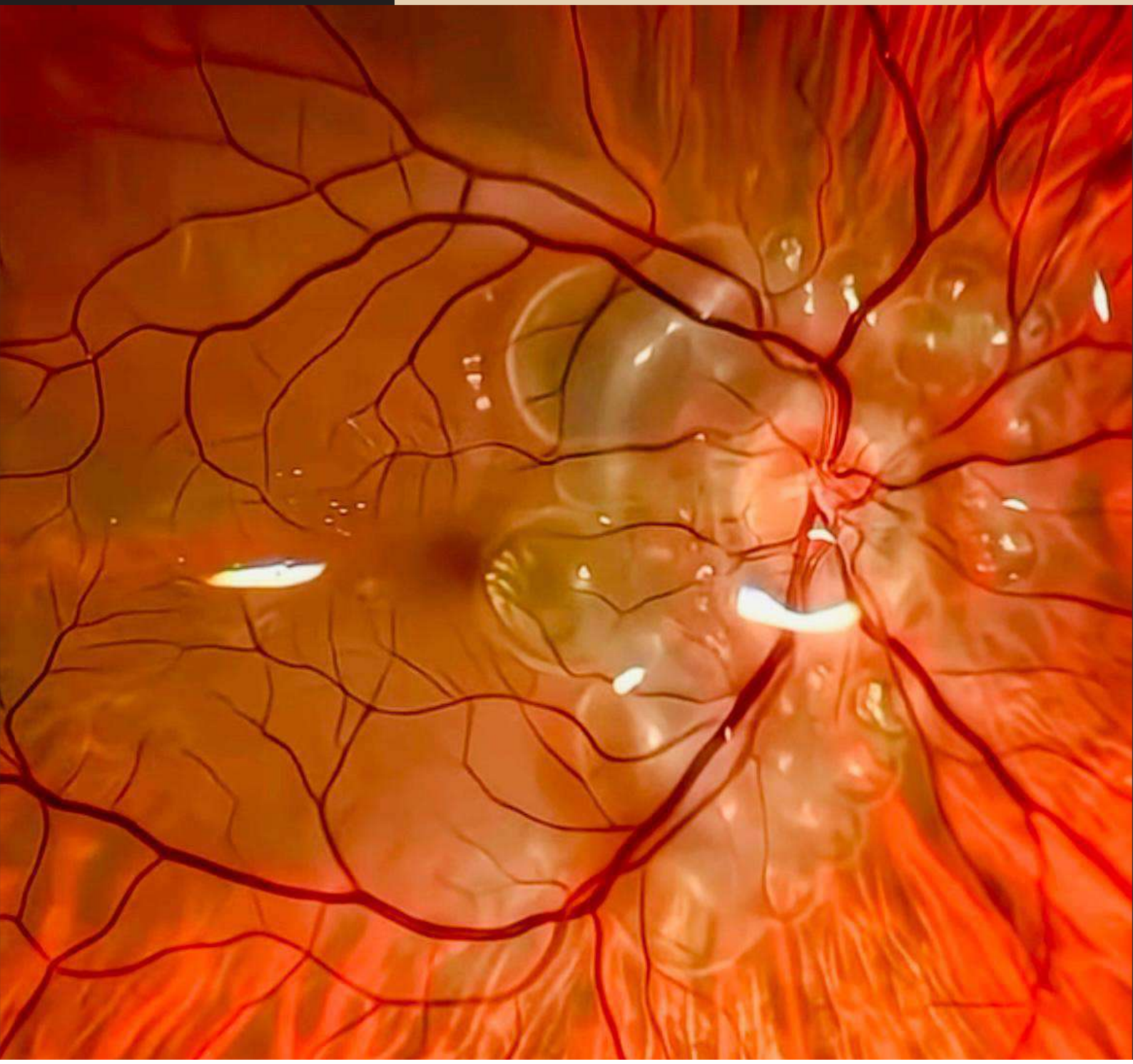

Courtesy
Dr Sunil Ganekal
Associate Editor

Dr Kavitha V
Editor in Chief

EDITOR'S DESK

Warm Greetings to one and all!

It is indeed my pleasure to release the 3rd Scientific Journal - "Journal of Vision Sciences", with the next collection of interesting articles: guest editorials-interesting topics and NOT to MISS READING, original and review articles, case reports and surgical techniques.

My **sincere gratitude** to all the **Authors** for their contribution and **all the young and dynamic Reviewers** for sparing their valuable time in giving suggestions for the betterment of the articles. I **thank** the entire **editorial team** for their tireless efforts and wholehearted commitment in the release of the journal. JVS is an online, peer reviewed, open access journal. Articles are invited in the form of original article, review article, case report, case series, brief communications, surgical pearls, PG corner and clinical images/ Photo essay. Articles can be shared to the editor's email id.

Looking forward for your contributions and continuous support.

Let us together enhance the standard of our Journal.

Warm Regards & Best Wishes

Dr. Kavitha V
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From President's Desk

From President's Desk

With Warm Regards
Dr Ravindra Banakar
President, KOS

Hello Everyone

Seasonal greetings.

At this juncture of release of 3rd Scientific Journal of our state society, I am sure we will all be benefitted by the quality scientific content comprising of Guest editorials, original articles, review articles, surgical techniques, and case reports. Dr.Kavitha has put in lot of efforts and her dedication and commitment is reflected by the quality of the contents in the Journal. I congratulate her for her good work.As you are all aware KOSCON-2025 is being held from November 14th-November 16th, 2025 at **"NAMMA DAVANGERE"**. I take this opportunity to invite each one of you for the conference, which will be a very memorable one.

Table of Contents

Importance of Orthoptics: Today

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Orthoptics is one of the crucial fields of eye care. The word "orthoptics" has his origin in Greek words orthos(straight) and optikos(ocular). The foundations of orthoptics were laid in the early 20th century, with Mary Maddox being a pivotal figure in the development of the profession. Mary Maddox, the daughter of the renowned ophthalmologist Ernest Maddox, is often credited with establishing orthoptics as a distinct healthcare.

Orthoptics, as a whole, is essential for diagnosing, managing, and rehabilitating vision disorders, abnormalities in eye alignment, movement and binocular single vision (BSV). On the other hand, orthoptics therapy includes different tools and specialized exercises, playing a vital role in improving vision (in amblyopia), treating misalignment and improving ocular motility in strabismus, and restoring BSV in both congenital and acquired, strabismic and non strabismic anomalies.[1]

Importance of Orthoptic Evaluation

A preliminary orthoptic evaluation provides vital information in understanding as to what exactly is happening with respect to deviation, ocular motility, accommodation, convergence and binocular vision. This helps in arriving at a correct diagnosis and appropriate planning and management. Timely intervention by orthoptists can help preserve vision, enhance visual performance, and improve the overall quality of life for individuals with various anomalies.[2]

Prevalence of Non Strabismic Binocular Vision Anomalies (NSBVAs) are highly significant among young adults, more so with the increasing use of electronic gadgets. The diagnosis of such anomalies is based on the evaluation of both accommodative and vergence parameters.[3] Given India's vast population and the high prevalence of binocular vision anomalies estimated at around 30–34% the need for targeted intervention in this area is both significant and highly anticipated.[4] Non-strabismic binocular vision anomalies (NSBVAs) are recognized as visual disorders that impact clarity, disrupt binocularity, and reduce both the comfort and efficiency of visual performance. Clinical diagnostic signs associated with each type of anomaly (accommodative anomalies include accommodative insufficiency, accommodative infacility, accommodative fatigue; vergence anomalies include convergence insufficiency, divergence insufficiency, convergence excess, divergence excess etc) are different.[5]

The increased prevalence of use of electronic devices in our daily lives has raised concerns about the impact on eye health. Studies have shown that prolonged use of electronic devices can lead to a variety of eye problems, including dry eyes, eye strain, blurred vision, and headaches. Digital eye syndrome is thought to be related to the short-term (acute) and long-term (change) effects of interference caused by focusing on the accommodation and vergence systems.[6] As the usage of smartphones is continuously on the rise, there is also tremendous increase in the incidence of ocular or visual problems among the smartphone users.

Accommodation, the capacity to change focus from distant to near, has been known to be the contributor factor to the symptoms associated with prolonged use computer or smart phones.[7] A study by Wiki Safarina Narawi, investigated on the effect of smartphone usage on accommodation status, showed that after 20 minutes of smartphone usage, there is significant change in the accommodation status leading to weakness of accommodation.[8] Convergence insufficiency(CI) which is the inability of the fusional convergence system to maintain BSV at near, results in asthenopic symptoms like headache, blurry vision, and eye strain.[9] A study by Sania Abdul Jalil investigated on the effect of smartphone use on convergence among undergraduate students and the results showed that those subjects whose usage of mobile was more than 4 hours had an excess of convergence along with worse symptoms.[10]

With these concepts in mind, the **"20-20-20 rule"** has been recommended: *for every 20 minutes a 20 second break has to be taken, by looking at something which is at 20 feet.* Alternatively in individuals with significant asthenopic symptoms, orthoptic exercises, prisms, and other optical aids are used to help achieve better visual function and coordination.

To conclude, orthoptic evaluation includes a detailed history taking (a mandate), evaluation of vision and best corrected visual acuity for both distance and near, strabismus evaluation step by step, checking smooth pursuits, saccades and most importantly all parameters related to accommodation and convergence. This helps us in pin pointing as to where exactly the problem is in the stage of interplay of various factors.

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Minimally Invasive Glaucoma Surgery

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MIGS-A ray of hope in the glaucoma management

Traditionally surgery is considered as the last option in the management of primary open angle glaucoma. With the current available diagnostic modalities like OCT, early detection of the glaucoma is possible. That brings us to the question do we have to treat the patients with long term anti glaucoma medications [AGM]. With the well-known side effects of prolonged AGM, the economic burden to the patient, the opinion regarding the surgery as the last choice in the management of glaucoma is changing.

Timeline of glaucoma surgery

1856: Von Graefe performed the first effective glaucoma surgery, an iridectomy, to treat angle-closure glaucoma

1867: De Wecker described the first external filtration procedure, the anterior sclerectomy

1892: De Vincentiis developed a form of goniotomy, which became popular in 1936

1900: Internal filtration (cyclodialysis) was developed

1967: Molteno developed the first aqueous shunt to an external reservoir

1970: Watson introduced modifications to the trabeculectomy procedure, which is still the standard filtration procedure today

1995: New implantable devices, such as SOLX, iStent, and Ex-PRESS shunt, were introduced.

Between 1970 to 1995 for nearly quarter of a century there were not many advances in surgical management of primary glaucoma**.**

Limitations of traditional surgery

The traditional surgical approaches, while effective in lowering IOP, are associated with significant risk of both intraoperative and postoperative complications, extensive postoperative care, including frequent follow-up visits and adjustments. The risk of sight-threatening complications, coupled with the need for prolonged healing time could be the reason for delayed surgery in the management of primary open angle glaucoma. Traditional surgery like trabeculectomy is less desirable for patients with mild to moderate glaucoma. The success of these surgeries is heavily dependent on the surgeon's expertise and the patient's individual response to surgery. As a result, the outcome is unpredictable.

What is the answer to the potential for serious complications and the invasive nature of these traditional procedures? The answer is Minimally invasive glaucoma surgery- MIGS.

MIGS includes procedures that could be performed through small incisions, causing minimal trauma, with a rapid postoperative recovery and a more favorable safety profile.

MIGS offer a less invasive alternative to traditional glaucoma surgeries, primarily aimed at reducing intraocular pressure, minimizing tissue trauma, and providing a safer profile.

In 2004, the first MIGS, Trabectome[1], was approved by US FDA. Since then, there have been lot of advances in the MIGS. The milestones in MIGS development represent a significant shift towards patient-centered, minimally invasive glaucoma care, offering a blend of safety, efficacy, and quicker recovery times. The acceptance and adoption of MIGS have seen a significant rise across various regions of the world, profoundly impacting global glaucoma management practices. This global acceptance is a testament to the growing recognition of the benefits MIGS in terms of safety, efficacy, and patient satisfaction. Based on the location of surgery, MIGS procedures are classified into Schlemm's canal based, Suprachoroidal space, subconjunctival space surgeries. Bleb forming minimally invasive surgeries are now grouped as minimally invasive bleb surgeries. Trabectome, Hydrus implant, Kahook dual blade goniotomy[2], Gonio assisted transluminal trabeculotomy, Visco360 mini [OMNI][3] are some of the Schlemm's canal-based procedures. Success of these procedures depends on the viability of distal flow, and IOP lowering is limited by the episcleral venous pressure.

Suprachoroidal and subconjunctival based procedures, theoritically more effective in lowering the IOP, are associated with possible risk of hypotony. Cypass Microstent[4], iStent Supra are placed in the suprachoroidal space. XEN Gel[5], InnFocus microshunts drain aqueous into the subconjunctival space. Endocyclophotocoagulation is a type of MIGS where the ciliary processes are coagulated under direct visualization.

Impact of MIGS on glaucoma management

With the introduction of MIGS, there is a drastic shift in the management of glaucoma. Many surgeons consider early surgery with one or other type of MIGS, as it can very well be combined with the phacoemulsification. As a result, there is enhanced patient acceptance and satisfaction. Apart from the surgical benefit, MIGS offers economic advantages to the patients, as antiglaucoma medications are expensive, and the treatment is for lifelong. There is a significant impact on the training and education of residents, fellows in ophthalmology. Until MIGS came into the scenario, the glaucoma as a subspeciality for ophthalmologist didn't appear very exciting.

Limitations of MIGS

MIGS are suitable in patients with mild to moderate severity of glaucoma. The role of MIGS in the management of advanced glaucoma is debatable[6,7]. There are reports to support the efficacy of MIGS in advanced, refractory glaucoma, where the authors have observed it is safe to perform MIGS in patients with advanced glaucoma. Implantable MIGS are expensive. May not be freely available in the developing countries. This can be an obstacle for the widespread adoption of the procedure. Long term efficacy data are not available. When MIGS was introduced first, they were to be performed along with cataract surgery. Of late there are many reports where MIGS was performed a standalone procedure, and the results are encouraging[8,9]. Further research is needed to support the long-term beneficial effect of MIGS. Some of MIGS require training of the surgeon to acquire device and technique specific skills. This should be made part of the glaucoma training. So future generations of glaucoma specialists are well trained to perform MIGS. Continuous education, developing guidelines, proper patient selection can go a long way in the success of MIGS, patient care.

Conclusion

Arora KS etal[10] in their article' published that despite the increase in the medicare beneficiaries, the number of traditional glaucoma procedures performed have decreased. There is a significant increase in the use of MIGS, include canaloplasty, mini shunts (external approach), aqueous shunt to extraocular reservoir, and ECP. Trabeculectomy use continued its long-term downward trend.

As MIGS continue to evolve with new devices and techniques, their role in global glaucoma management is likely to expand further, offering promising avenues for enhanced patient care

Future

With the advancement in technology, the newer possibilities like drug eluting MIGS, better imaging techniques for the accurate placement of MIGS devices may not be far away. MIGS will make glaucoma care better.

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Safe Eye Surgery: Non-Technical Aspects

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Abstract

Analyses of the reasons for adverse events in surgery have revealed that many underlying causes originate from behavioural or non-technical aspects of performance (e.g., poor communication among members of the surgical team) rather than from a lack of surgical (i.e., technical) skills. Therefore, technical skills appear to be necessary but not sufficient to ensure safe surgery. Paying attention to non-technical skills such as team working, leadership, situation awareness, decision making, and communication, will increase the likelihood of maintaining high levels of error-free performance. Identification and training of non-technical skills has been well-established in high-risk careers, such as civil aviation and nuclear power. Ophthalmic surgery has some substantial differences compared with other surgical areas, for example, high volume of surgery, use of local anaesthetics, an awake patient and very sophisticated equipment. This is the first of a 2-part review of recent developments in identifying non-technical skills relevant to eye surgeons and their implications on safe-surgery.

Keywords:
surgery; complications; safety; non-technical skills; ophthalmology; patient safety; human factors

Introduction

Ophthalmic surgery is undoubtedly one of the most frequently performed surgeries around the world. In 2022-2023, 8.3 million cataract surgeries were performed across India. Despite improvements in safety protocols, surgery remains inherently risky, and safety practices vary across institutions and individual practitioners.

In the UK, the National Reporting and Learning System and the NHS Strategic Executive Information System (STEIS), showed that between 2018 and 2022, ophthalmology-related incidents were 21,000, representing 3.8% of all surgical incidents.

Recent studies continue to demonstrate that medical errors frequently stem from 'behavioural' aspects of performance rather than deficiencies in technical expertise. A systematic review by Hull et al [1], examined 28 studies between 2012 and 2016 and found that communication failures were implicated in up to 52% of surgical errors. Additionally, Nowicki et al. [2] identified poor situation awareness as a contributing factor in 38% of near-miss events in ophthalmic surgery. Parikh et al. [3]

analysed 275 wrong intraocular lens (IOL) implantation cases and found that while technical errors constituted only 13% of causes, the remaining 87% were attributable to non-technical factors including verification failures (46%), communication breakdowns (22%), and situational awareness lapses (19%). Similarly, a multicentre study by Chen et al.[4] of surgical confusions in ophthalmology found that wrong-site surgery was attributable to non-technical factors in over 80% of cases. These non-technical skills—cognitive and social skills necessary for safe and effective practice complement technical skills and remain essential to safe surgery.

Non-Technical Skills in Modern Ophthalmic Practice

The unique characteristics of ophthalmic surgery that differentiate it from other surgical specialties include

1. **Higher volume and faster turnover**: Cataract surgery and intravitreal injections have become the most common intraocular procedures worldwide. Errors such as wrong implant, wrong eye surgery etc in this high volume and fast turnover settings can easily creep in
2. **Local anaesthesia predominance**: Majority of ophthalmic surgery is performed under local anaesthesia with the patient awake. Verbal communication among team members in this operative environment needs special attention. For example, if a complication occurs, or if a manoeuvre by a resident need to be corrected, interaction between the surgeons and other members of the team needs to take into account that the patient is aware of the conversations. Research by Moorfields Eye Hospital (2019) showed that appropriate communication techniques during awake surgery correlate with reduced patient anxiety and improved surgical outcomes.
3. **Evolving day-case practice**: One-stop surgery has become more prevalent, with "rapid-assessment" clinics now common across the world. Such practice lessens the opportunity for patient–doctor interaction and the potential for overlooking serious medical morbidity in patients that can lead to an intraoperative adverse event.

The discussion of risk and benefits of surgery often is done by other staff not involved in the surgery, and the surgeon may not be aware of patient expectations. Studies by the NSPS (National Surgical Patient Safety) [5]demonstrated that standardized communication protocols in high-turnover settings reduce adverse events by up to 37%.

4. **Complex Technology**: Ophthalmic operating rooms are highly technical environments requiring specific non-technical skills for equipment management. The surgical team needs to have a clear understanding of what needs to be calibrated and checked, when, and what to do when the equipment fails. A study by the American Academy of Ophthalmology [6] found that 28% of intraoperative complications were associated with equipment-related issues, half of which involved human-machine interface problems rather than equipment malfunction.
5. **Complex patient demographics**: The aging population presents increasingly complex medical comorbidities. New anticoagulants, more complex drug interactions, and higher patient expectations create additional challenges. Research by the European Society of Cataract and Refractive Surgeons [7] demonstrated that comprehensive pre-assessment protocols focusing on non-technical aspects reduced intraoperative adverse events in complex patients by 42%.
6. **Evolving surgical teams**: The introduction of non-medical surgical care practitioners, extended-role nurses, and physician associates has created more diverse surgical teams requiring excellent non-technical skills to function effectively. Research by Mathew et al. [8] demonstrated that teams with formalized non-technical skills training had 47% fewer adverse events compared to traditionally trained teams.

Lessons from aviation industry:

Other safety-critical work settings, such as the aviation or energy industries (e.g. flight decks and air traffic control centres) may appear to be very different environments from hospital operating theatres, yet from a psychological perspective, the behaviours required to maintain safety and maximise performance appear to be strikingly similar. Crew Resource Management (CRM) is a training programme developed by the aviation industry to teach or train commercial and military pilots in human factors, leadership and crew management with the ultimate goal of improving patient safety. Initiatives to study behaviour in aircraft flight decks such as Line Operations Safety Audit (LOSA) helped further refine the content and methods of delivery of training programmes for airline crew. The Surgical NOTECHS behavioural analysis system is based on the aviation NOTECHS system.

Framework of Non-Technical Skills for Ophthalmology:

The main categories of non-technical skills identified by a review by Yule et al [9] are listed in Table 1. Specific non-technical skills particularly relevant to ophthalmology are listed below:

Interpersonal skills	Cognitive skills
Communication	Situation awareness
Leadership	Mental readiness
Teamwork	Assessing risks
Briefing/planning/ preparation	Anticipating problems
Resource management	Decision-making
Seeking advice and feedback	Active strategies/ flexibility
Coping with pressure/ stress/fatigue	Workload distribution

Table 1: Main categories of surgeons' non-technical skills identified in a review by Yule, et al. [9](Reproduced with permission)

Using task analysis with subject matter experts in trials utilising standardised video scenarios and real surgical procedures, several frameworks [10,11] have been developed to assess and educate on these non-technical skills. The key components of such a framework are:

Situation Awareness	
Intraoperative awareness	Being vigilant of any changes to the operative environment for example, recognising that the heart rate of patient has dropped while busy at cataract surgery, scrub assistant moving away from operating environment or equipment failure etc

Risk assessment	Continuous re-evaluation of risk, particularly during complicated cases
Patient monitoring	Recognizing patient distress when patients are awake
Projecting and anticipating future state	Knowledge of team members' capabilities in spotting and alerting/managing an unexpected event
Decision Making	
Selecting and communicating options in the context of an unexpected event	Ability to rapidly changing the surgical approach based on intraoperative findings. A clear plan for every adverse situation must be thought through before-hand. Example would be to stop any further steps of the procedure in cases of suspected suprachoroidal haemorrhage during cataract surgery
Implementing and reviewing decisions	Review a decision taken to ensure it is the most appropriate one. For example, decision to implant a primary
Time management	Balancing efficiency with safety in high-volume lists. This may mean the resident will not get to operate on the last few cases on the list
Communication	
Exchanging information in a precise and effective way	A closed-loop method of communicating to team members and patient. For example, verifying primary IOL implant power by more than one team member, instructing a resident to stop the procedure in a coded manner that does not alarm an awake patient etc
Inter-professional dialogue and establishing a shared understanding including non-verbal communication	Communicating effectively across disciplines. For example, knowing names of team members will greatly help in providing instructions to change course of surgery and using visual cues in noisy environments
Teamwork	
Clarity of roles	Understanding responsibilities in diverse teams. A team brief at the start of each surgical procedure (or at the start of the operation list in case of high-volume surgery) can help
Mutual support and co-ordination	Providing and accepting assistance appropriately and synchronizing actions in complex procedures
Respect for team members and valuing their contributions	Creating an environment where concerns can be voiced by any team member. This may involve collapsing the hierarchy in the operative environment i.e. the surgeon may not always take the correct decision. This needs appropriate training and may even need change of traditional attitudes on roles of individual team members.
Leadership	
Directing	Providing clear guidance during routine and emergency situations
Setting and maintaining standards	Establishing safety culture within teams
Supporting others	Facilitating team members' performance
Coping with pressure	Maintaining composure during complications. The leader will need to become the role model for other team members. Simulation exercises help in training for this.

Task Management	
Planning and preparation	Anticipating equipment and resource needs. Typical example would be to check if the instruments for an anterior vitrectomy are present at the start of a cataract operation or ensure an alternative IOL is available. Checklists can help
Prioritization	Managing competing demands in high-pressure environments. For example, patient in severe discomfort at the time of PC rupture. The priority would be to attend to the discomfort first by supplementing an anaesthetic rather than proceeding with anterior vitrectomy

Stress Management	
Recognition and mitigation	Identifying signs of stress in self and team members. Unwell team members are unlikely to perform their best. Implementing strategies to reduce stress
Maintaining performance	Sustaining technical skills under pressure. This may involve more simulation exercises
Debriefing	Processing stressful events constructively will help reinforce good practice amongst team members and boost team morale

Assessment tools/methods and training in non-technical skills

Several assessment tools to evaluate competencies in these non-technical skills such as OphtNOTS (Non-Technical Skills for Ophthalmic Surgery), Ophthalmic Crisis Resource Management (OCRM) and behavioural marker systems such as the Ophthalmic Surgery Behaviour Marker System (OSBM) exist.

The focus of surgical training still favours technical skill acquisition, yet surgeons increasingly operate in teams with whom they may be unfamiliar, especially in an emergency setting. Several questions pertinent to training arise:

- At what stage of the residency should specific training in the non-technical skills be introduced?
- What should the format of training be? Lectures? Workshops? Workplace Based Training?
- Who should be the trainers? Consultant trainers in respective units? Nominated trainers in each region/unit?
- What level of training should the trainers have? Non-technical skills training and methods of training in non-technical skills
- Should the training involve a 'top-down approach' (start with the trainers and cascade to the residents) or a 'Bottom-up' approach (start with the residents and train the trainers later)?The second part of this review will focus on tools and methods to assess competencies in non-technical skills, the training programs to impart these skills, and their integration into the curriculum to promote patient safety in an evolving healthcare environment.

Conclusion:

As ophthalmic surgery continues to evolve with new technologies and changing healthcare systems and patient expectations, attention to non-technical skills will be increasingly vital to maintaining and improving patient safety and to enhance professional satisfaction of the team members working in the operating room environment.

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A practical approach to informed consent process in research

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Background

Informed consent in research is the starting point of researcher-participant relationship. It is not merely the signing of an "*I agree*' form, but a systematic and extensive process, underpinned by the recognition of a respect for the participant. The ICMR's National Ethical Guidelines for Biomedical and Health research involving human participants - 2017 elaborates on informed consent.[1] The New Drugs and Clinical Trials Rules- 2019 mandate prior, voluntary and written consent from participants in clinical trials.[2] Lack of appropriate consent for trials is considered as misconduct by the National Medical Council.[3] For researchers including students, it is therefore vital to understand the intricacies of informed consent and implement it effectively. This article hopes to disentangle this complex thread that binds the researcher to the researched.

The informed consent document (ICD) comprises a participant information sheet (PIS), an informed consent form (ICF), and at times a comprehensive assessment test. Most institutional ethics committees (IEC) provide templates for constructing the PIS and ICF. The researchers must use only that version of the ICD, approved by their local IEC.

Designing the PIS:

PIS provides a detailed description of the research, which enables the prospective participants to understand what their consent entails, and empowers an informed choice. Let's look at the construct of the PIS, step-by-step:

1. **Use of simple language in the PIS:** While designing the PIS, careful attention is paid to describing the research details in a simple language understandable by a layperson. Complicated medical jargon or scientific terms are translated and/or described in simple words. The descriptions, although lengthy, are crucial to make the layperson understand. Some examples:

a. The term 'glaucoma' is described as *'a condition in which the pressure inside the eye is high and leads to damage to the nerve, causing loss of vision'*.

b. Terms like trabeculectomy, are described as *"a surgery in which a connection is created between the eye and the surrounding space to reduce the pressure in the eye".*

c. For complicated procedures, illustrations, diagrams, charts or audiovisual aids are used to enhance comprehension of complex topics.[4]

d. For participants with visual impairment, audio PIS or assistive devices are employed to improve comprehension.[5]

2. **Introduction:** The research team, the number of trial sites and the research title are introduced in the beginning. *Example: "We, Dr. A and Dr. B from the Department of Ophthalmology, XYZ Medical College, invite you to participate in this research titled 'An observation study on dry eyes in patients on medical management of glaucoma'.* Descriptions of the gaps in knowledge, need and purpose of research helps them in better understanding of the context of research. Example: *"This study is to understand whether dry eyes occur in patients with glaucoma who have been using eye drops for a long time"*.

3. **Avoiding therapeutic misconception:** Patients often confuse research interventions with therapy. A patient attending the OPD for glaucoma follow-up, undergoes investigations like tonometry, gonioscopy, perimetry as a part of routine glaucoma care. However, if the research involves investigations like identifying biomarkers in tear film, etc, which are not a part of routine healthcare, this can lead to therapeutic misconception leading to a belief that the additional *new* tests are for their benefit or enhanced care. It is therefore crucial to emphasise on the term '*research*'. *Example: "Please understand that the intervention/tests are part of this research and not intended for your healthcare/diagnosis/treatment"*

4. **Details of participants**: The PIS must state reasons for inclusion helping patients to understand why they are invited and how many individuals are included. For example, in a study on dry eyes in patients with glaucoma on medical management, add this statement *"We invite you to participate in this research, since you are using eye drops for the management of glaucoma for more than 6 months.*

We intend to include 100 participants like you, in this study". If participants are included in control group in the same study, relevant statements can be ticked for cases and control, respectively. *"You are invited to participate in this research in the control group, since you do not have glaucoma and are not using any eye drops"*.

5. **Methodology**: A brief, but simple description of the tests planned for research helps in comprehension of what entails in this research. Active voice is preferred for clarity on who will be doing what in the research. Example: *"In this research, the researchers will perform a few tests on your eyes using filter paper strips and dyes. Your eyes will be examined in the slit-lamp biomicroscope (a machine used to examine the eyes). These tests help in detecting the presence of dry eyes. The entire procedure will take about 30 minutes."* Interventions with drug, surgeries, medical devices, including placebos or sham surgery are described in detail. Details of randomisation and blinding are also described. *"You will be included in group A or group B and will receive either the new drug or a placebo (a medicine which looks like the new drug but will have no effect at all). However, neither you, nor the researcher will know what you will be receiving."* Description of whether and how, blood/tissue samples are collected for the purpose of research, and what will be the fate of these samples are provided. The disclosure is ensured to be complete, accurate, and not misleading, since it has a bearing on the final decision to participate in research.
6. **Benefits:** Benefits of participating in research are described and stated even if there are no direct benefits to participants, as in an observational study. *"You have no direct benefits from undergoing these tests; however, the results of the study will benefit the researchers in understanding about dry eyes in patients with glaucoma, and will guide in better management of patients like you"*. Details of reimbursement or healthcare benefits are stated. Financial and other possible benefits to the researcher are good to be included. In case you are not giving any reimbursement, state that clearly too. Example *"The researcher is receiving a funding from the Government of India for this research, however, there is no provision for reimbursement to the participants"*. This ensures complete disclosure.
7. **Harms:** Describe the possible harms caused by participating in the research. Example *"The filter paper tests can cause irritation to the eyes for a few minutes, but these are mild and temporary. We will instil eyedrops to enlarge the pupils. This will cause blurring of vision, particularly for near, for 4-5 hours. You will experience difficulty in near work (including use of mobile phone) and driving a vehicle*." Other possible issues like inconvenience caused by follow-up visits, additional costs, time spent for data collection or questionnaire are described. In clinical trials, details of free healthcare for management of adverse events and compensation are also included.
8. **Privacy and confidentiality**: Maintenance of privacy of participants and confidentiality of data are adequately described in the PIS. Example: *"We will not collect your personal identifiers in order to protect your privacy. To maintain confidentiality, the data will be coded and presented/published as group data. Your photographs will be masked to deidentify you."*. While it is not possible to blackout the eyes in ocular cases to mask patient identity, it is prudent to get consent or even a later re-consent for use of final edited image for presentation/publication. Sharing of data with regulatory authorities, funding agency, IEC or auditors while maintaining confidentiality must be mentioned.
9. **Responsibilities**: Participant responsibilities are clearly described to minimise harms. Example *"the instillation of eyedrops will cause blurring of vision for 4-5 hours. Please refrain from driving until your vision returns to normal"*. For studies involving investigational new drugs, responsibilities include not enrolling in multiple trials simultaneously, contraceptive measures, maintaining diaries, avoiding certain concomitant drugs, keeping follow-up visits on schedule, bringing back empty tablet strips/bottles, and reporting adverse events are included.
10. **Voluntariness:** It is vital to emphasise that consent is voluntary and the participant has the right to free decision making. Example *"Your decision to participate in the study is voluntary. You have the right to decide to participate,*

refuse to participate or even withdraw your consent to participate. Your decision is free and will not affect your rights as a patient. You may take your own time to decide".

11. **Clarify doubts:** Participants are encouraged to interrupt, ask questions, clarify doubts, consult, and then take as much time as they like to decide. Contact details of the researcher to clarify research-related doubts, and contact details of the ethics committee member to address any concerns about the rights of a research participant are provided.
12. **Comprehension:** After all the information is disclosed and discussed, it is crucial to test the participant's comprehension by asking crucial set of questions relevant to the research like *"How many times do you have to visit the hospital? What harms are expected in the study? How many hours should you not drive after the test? How many times should you instil the eyedrops".* Avoid questions that can be answered with a simple yes/no.
13. A copy of the PIS and the signed ICF is provided to the participant and this is mentioned in the PIS and ICF.
14. **For parental or surrogate consent:** The whole PIS is written with wordings modified to refer to the participant. Example: *"The tests will be done on your child/relative. Your child/relative may develop red eyes and itching, after instillation of the eyedrops"*

Designing the ICF:

The ICF is the form for the final agreement between the researcher and the participant for recruitment in research. ICF is always read in continuation of the PIS. Here's how to construct the ICF:

1. The ICF will include statements to declare that appropriate disclosure of information was done, doubts were clarified, and opportunities given to make a voluntary informed consent. As opposed to the PIS, where the second person pronoun "you" dominates, here, in the ICF, first-person pronoun "I" is used. *Example: "I agree to participate in this study. I have been informed about the study, the procedures, the benefits, harms, rights and responsibilities in my own native language. I was given adequate time to understand, clarify doubts and make a decision. My decision to participate is voluntary and free of any force or influence. I have been assured that privacy and confidentiality will be maintained during presentations and publication of the results".*
2. For parental and surrogate consent forms, the wordings are modified to *"I agree for my child's participation in the study" or I agree for the participation of my relative…"*
3. For child's assent, the wordings are modified accordingly as a separate document.
4. Space is provided for signatures of the participant and researcher along with name, date and place. Space is provided for signature of the independent witness in case of illiterate participants along with a provision of space for the left-hand thumb impression.
5. Space for contact details of the participant's nominee in case of serious adverse events (including death) is added for clinical trials.

Translations of the ICD:

Once the English ICD is prepared, the same is translated into languages/dialects spoken by the patient populations. This enables better communication, understanding and trusted relationship with the participant. The translation is validated by experts in that language/dialect. In industry-sponsored clinical trials, additional back-translation and translation certificates of ICD are required. Example: The Kannada translations are back translated into English and certified if the translation is accurate and complete. This is carried out by experts or registered companies who issue certified translations. These are generally not required for observational studies.

IEC approval:

All ICDs must be approved by the IEC. Only the version approved by the IEC is followed. Any subsequent changes in the ICD, after initial approval, need prior approval from the IEC. Other forms of consent like online or electronic consent are drafted on similar lines and require IEC review and approval. Some studies can be conducted without a prior consent (example: retrospective record-based studies with delinked data), however, this requires approval from the IEC.

Conduct of the informed consent process:

Informed consent process is conducted in the language best known to the participant, providing adequate privacy and time, using only the IEC approved version. The steps are provided in figure 1 and the requirements of consent and signatories in Table no. 1.

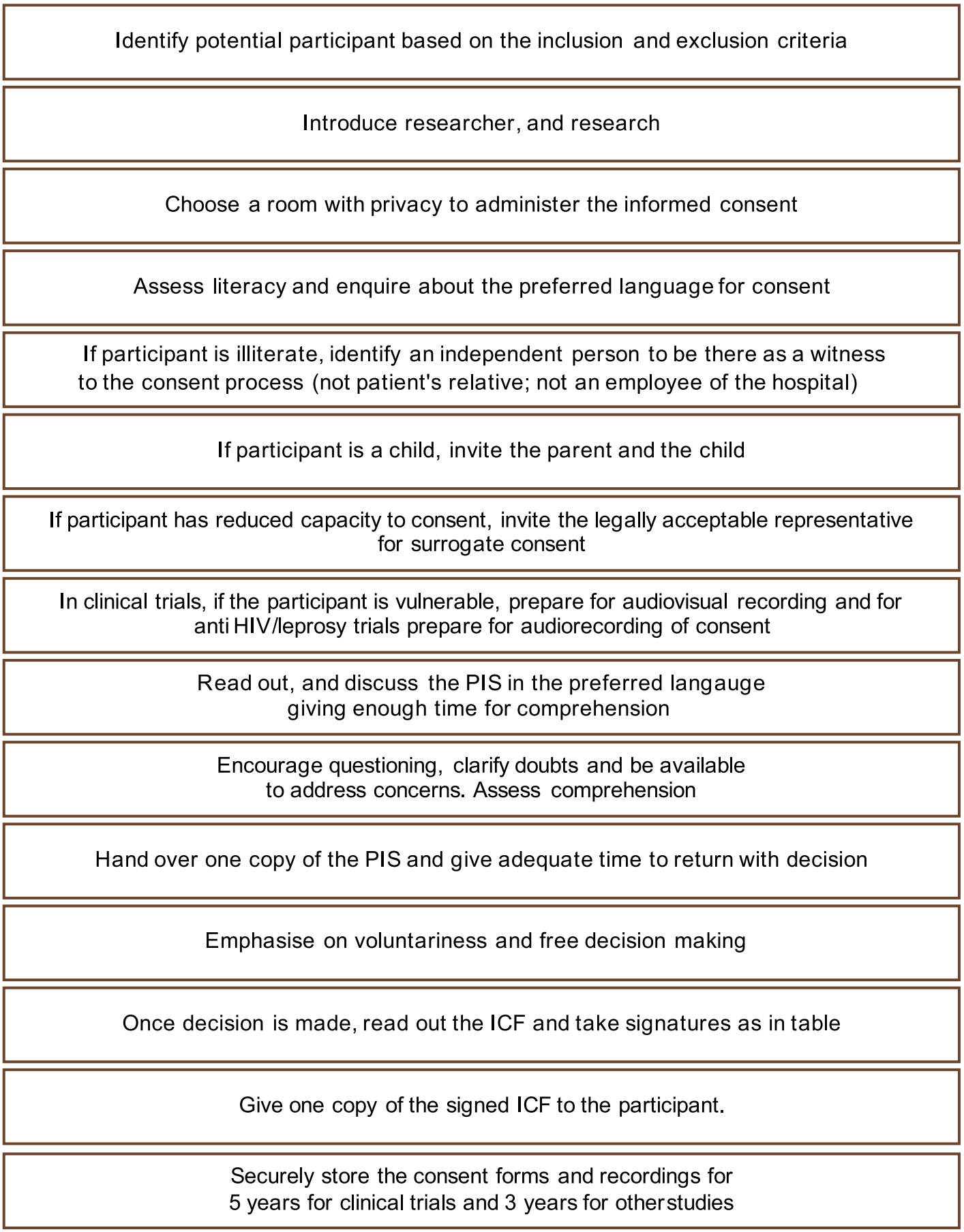

Figure 1: Flowchart showing steps in informed consent process

Table 1: Consent requirements for research:

Participant	Consent	Signatories
Adult- literate	Written consent	1. Participant 2. Researcher
Adult- illiterate	Written consent; and the process evidenced by a witness	1. Participant (LHTI) 2. Researcher 3. Independent witness
Adult with reduced capacity to consent	Written surrogate consent	1. Legally acceptable/authorised representative 2. Researcher
Child 0-7 years	Parental consent	1. Parent 2. Researcher
Child 7-12 years	Documented child's oral assent Parental consent	Documented oral assent 1. Parent 2. Researcher Parental consent 1. Parent 2. Researcher
Child 12-18 years	Child's written assent Parental consent	Child's written assent 1. Child 2. Parent 3. Researcher Parental consent 4. Parent 5. Researcher
Vulnerable participant in regulatory clinical trial	Audio-visual recording of the consent along with written consent	1. Participant 2. Researcher
Anti-HIV or anti-leprosy regulatory clinical trial	Audio recording of the consent along with written consent	1. Participant 2. Researcher
Tribal or specific community groups	Community consent Individual consent	Community consent by community head/ representative Individual consent 1. Participant 2. Researcher
For anonymous data/ data in public domain/ less than minimal risk	Waiver of consent	To be approved by IEC

Conclusion:

Informed consent is an ethical and legal requirement in clinical research. It is time and energy-consuming; however, it is the cornerstone for making the researcher-participant relationship, a trusted one by making it mindful, methodical and meaningful.

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Plagiarism in Medical Writing: A Persistent Ethical Challenge

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Abstract
Plagiarism is a universal challenge in scientific and medical writing, often manifesting in subtle or overt forms. In Ophthalmology, where clinical images, surgical innovations, and case reports form a significant part of the literature, ethical writing practices are essential. This article explores the concept of plagiarism, its types and causes, methods of detection and prevention, the evolving concerns related to artificial intelligence (AI), and a way forward for academic integrity in ophthalmic research and publication.

Introduction
Scientific integrity is the cornerstone of credible medical literature. However, with the increasing pressure to publish, the temptation to cut ethical corners is growing. Plagiarism, defined as the appropriation of another person's ideas, processes, results, or words without appropriate credit, poses a significant threat to academic integrity in medical research and education.[1] For healthcare professionals, engaged in both clinical and academic practice, awareness of plagiarism and its consequences is crucial - not only for maintaining personal credibility but also for preserving the trustworthiness of the specialty's body of knowledge. In today's era of evidence based practice, it assumes even far greater significance. The need to understand, detect, and prevent plagiarism is more relevant than ever in today's interconnected and AI-assisted academic ecosystem.

Understanding Plagiarism
The word “plagiarism” was derived from the Latin word “plagiarius,” which means “kidnapper” .[2] The World Association of Medical Editors (WAME) defines plagiarism as “the use of others' published and unpublished ideas or words (or other intellectual property) without attribution or permission and presenting them as new and original rather than derived from an existing source.” WAME further states that “this applies whether the ideas or words are taken from abstracts, research grant applications, Institutional Review Board applications, or unpublished or published manuscripts in any publication format (print or electronic).[3]
Hence it can be understood further that Plagiarism extends beyond mere copying of text. It includes the unacknowledged use of ideas, data, figures, clinical photographs, or even surgical techniques originally published by others. In medical literature, especially in case reports and surgical innovations, the boundary between inspiration and imitation can be dangerously thin. The Office of Research Integrity (ORI) and the Committee on Publication Ethics (COPE) categorize plagiarism as a form of research misconduct with significant ethical implications. [1,4].

Types of Plagiarism in Medical Writing and Understanding Plagiarism in Ophthalmology
Plagiarism in medical writing is multifaceted. It includes not only the direct copying of text but also the unacknowledged use of ideas, images, tables, surgical procedures, and previously published data. In a field like ophthalmology, where clinical photography, OCT imaging, slit-lamp visuals, and intraoperative photographs are often central to manuscripts, the misuse or duplication of these materials without attribution constitutes a serious breach of publication ethics.
For example, reusing a fundus image or an OCT scan from an earlier publication without proper citation, even when it involves the same patient, amounts to **self-plagiarism** and misleads readers about the novelty of the case. Even cropping, rotating, or digitally enhancing previously published images to present them as new can be considered **visual plagiarism.**[5]

Types of Plagiarism with Ophthalmology Specific Examples
1. Direct and Mosaic Plagiarism
Direct plagiarism refers to the verbatim copying of content without quotation or citation. It involves word-for-word copying of another author's content without citation. This is often detectable and universally condemned. In contrast, ***mosaic plagiarism*** is more nuanced, where fragments of text from multiple sources are stitched together without appropriate attribution, often under the pretext of paraphrasing.

Example: In a literature review on anti-VEGF therapies for macular degeneration, an author copied text from multiple existing review articles, modifying some words but retaining original sentence structure and references. Without appropriate citations, such mosaic plagiarism misrepresents the author's own understanding.[6]

2. Self-Plagiarism and Redundant Publication

Self-plagiarism occurs when authors recycle their own previously published material - text, images, or data - without proper citation or acknowledgment. Self-plagiarism, or *redundant publication*, is particularly relevant to surgical fields. Authors may submit similar manuscripts describing the same surgical technique with minor variations in datasets, thereby inflating their publication record. This *"salami slicing"* practice dilutes scientific novelty and misleads the academic community.[7]

Example: An ophthalmologist submitted a case report on phacoemulsification in subluxated lenses, using identical slit-lamp images and intraoperative photographs from a previously published report, but with a changed title and slightly altered discussion. The duplicated content was not disclosed to the new journal, leading to an ethical violation.[8]

3. Visual Plagiarism

Ophthalmology relies heavily on visual documentation. Reusing clinical images or figures from previous publications without acknowledgment, even if altered, is unethical unless prior permission has been obtained. Reusing clinical photographs, slit-lamp images, OCT scans, or fundus photographs across multiple articles without permission or citation violates copyright and misrepresents originality. Even reusing schematic illustrations without credit whether hand-drawn or AI-generated, can constitute plagiarism.

Example: A fundus photograph depicting retinal vein occlusion, originally published in an atlas, was reused in a CME article submitted to a regional journal. The image was cropped to avoid recognition, but no citation or credit was provided, violating the principles of copyright and authorship. [8]

4. Plagiarism in Case Reports

Ophthalmic case reports often involve rare presentations, making it tempting to replicate existing content.

Example: A Fellow in ophthalmology drafted a report on bilateral optic neuritis mimicking Leber's hereditary optic neuropathy, drawing heavily from a previously published similar case. Several paragraphs in the background and discussion sections were copied without citation, leading to rejection and prompting institutional review.

Why Does Plagiarism Occur?

While it has been present since the ancient times, the rise of computing, beginning in the 40s and growing through the 80s, the transitioning from analog to digital increased the cases of plagiarism exponentially and it kept growing. The invention of copy and paste in the mid 70s probably had Ctrl C and Ctrl V made it very easy for people to copy and paste the work into a new document eliminating the need for an individual have to copy work by hand.[9]

Plagiarism is rarely the result of malicious intent alone. In many cases, it arises from a combination of systemic pressures and individual shortcomings. The relentless demand to publish for academic promotions, lack of training in scientific writing, poor understanding of citation norms, challenges in paraphrasing scientific content and language barriers all contribute to this misconduct.

Medical trainees and young researchers in ophthalmology may be unaware of how to properly attribute sources or paraphrase scientific literature. Additionally, with the proliferation of online resources and copy-friendly formats, the boundary between legitimate reference and intellectual theft has become increasingly blurred.

Cultural perceptions about knowledge ownership also play a role. In some contexts, replicating the language or diagrams of a respected expert may be seen as a tribute rather than misconduct. Such misconceptions underscore the need for consistent and culturally sensitive training in research ethics.[8,10]

Detecting Plagiarism

Detecting plagiarism requires both human judgment and technological assistance. Most journals employ plagiarism-detection software such as iThenticate or Turnitin, which compare submitted manuscripts against extensive databases of published literature. These tools generate a similarity index, flagging content that closely matches existing publications.

However, a word of caution here - similarity is not synonymous with plagiarism. Legitimate overlaps may occur in methods sections or standard descriptions of procedures. In our experience, we have also seen that these tools sometime flag content which is not plagiarized or a generic or general content and may be difficult to replace or reword. Hence, human review remains essential to interpret these findings contextually, especially in methods sections where technical descriptions often overlap. Editors and reviewers must interpret similarity reports with discernment, distinguishing between unethical copying and contextually justified resemblance.

Visual plagiarism detection is more complex. Journal editors increasingly rely on metadata analysis and reverse image search engines to detect duplicate use of clinical or illustrative images. Tools like Google Reverse Image Search or TinEye can assist in identifying reused images. Ophthalmologists submitting images must retain original files with timestamps and consent documentation to validate authenticity. Editors are also encouraged to request original image files, patient consent forms, and submission of raw data to ensure authenticity.

Preventing Plagiarism: Responsibilities and Strategies

Preventing plagiarism begins with awareness and education. Institutions and professional bodies must take the lead in sensitizing students, residents, and faculty about ethical research practices. Workshops on scientific writing, referencing techniques (e.g., Vancouver style), and use of reference management tools such as Mendeley or Zotero can reduce unintentional plagiarism.

Mentorship plays a vital role. Senior professionals and academicians should guide juniors not only in research methodology but also in upholding academic integrity. If feasible, manuscripts could undergo peer review within departments prior to submission, allowing time to detect and rectify potential issues.

Authors must also familiarize themselves with journal guidelines regarding originality and avoid simultaneous submission of similar content to multiple platforms. Case reports, for example, must be written with unique perspectives and discussions, avoiding the temptation to replicate standard language or figures from previously published material.

Plagiarism in the Age of Artificial Intelligence

The emergence of AI-powered language models such as ChatGPT, Gemini, Deepseek and Claude has added a new layer of complexity. While these tools can assist with grammar, style, and idea generation, they can also produce content that closely resembles existing literature. If such content is used without thorough human editing and proper attribution, it may inadvertently constitute plagiarism.

AI can also “hallucinate” references, generating citations that appear real but are non-existent, thereby compromising the integrity of scientific writing. Moreover, repeated use of similar prompts across institutions may lead to near-identical AI-generated abstracts or discussions, raising concerns about originality.

Professional organizations like the World Association of Medical Editors (WAME) and the International Committee of Medical Journal Editors (ICMJE) recommend transparent disclosure when AI tools are used in the writing process. AI should assist but not replace human critical thinking and responsibility for authorship.[11,12]

The Way Forward

Ophthalmology, as a rapidly evolving and image-rich specialty, bears a special responsibility in upholding publication ethics. Journals, institutions, and individual researchers must collectively foster a culture of integrity. Policies on plagiarism should be clearly articulated, consistently enforced, and periodically reviewed.

Inclusion of medical ethics and scientific integrity in undergraduate and postgraduate curricula will create a strong foundation. Encouraging open discussion around authorship dilemmas, proper data usage, and image rights can prevent inadvertent misconduct. Faculty members must lead by example, modelling ethical scholarship and responsible authorship. Plagiarism undermines not only individual credibility but also the scientific trust upon which evidence-based ophthalmology is built. As the tools of research evolve, so too must our commitment to ethical conduct.

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Fine-tuning fusion : A review of Microtropia

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Abstract
Microtropia is a small-angle unilateral strabismus, typically less than 5 degrees or less than 8–10 prism diopters (PD), often associated with harmonious anomalous retinal correspondence (HARC). It shares overlapping characteristics with monofixation syndrome, which includes small-angle ocular misalignment, reduced but not absent stereopsis and potential amblyopia. This review discusses the etiology, classification, diagnostic approaches and management strategies for microtropia, with a focus on its clinical significance and implications for visual development.

Keywords
Monofixation syndrome, HARC- Harmonious Anomolous retinal Correspondence, Amblyopia.

Introduction

Microtropia is a form of strabismus characterized by a minor misalignment of the eyes, usually undetectable in casual observation. Despite its small angle, it has significant implications for binocular vision, often leading to eccentric fixation, reduced stereoacuity, and suppression scotomas.[1] It frequently coexists with monofixation syndrome[2] where fusion is present but stereopsis is diminished. Understanding its pathophysiology is essential for accurate diagnosis and appropriate management.

When to suspect Microtropia?

Microtropia should be suspected in cases of unilateral reduced visual acuity or sub-optimal vision without an organic cause, as recognizing it early can help avoid unnecessary neurological testing. It is defined as a small, comitant horizontal deviation (less than 5 prism diopters) associated with anomalous retinal correspondence, some degree of motor fusion and diminished stereoacuity with no obvious phoria/tropia.[2-10]

Etiology [A1] Microtropia may arise due to various underlying causes, including:

- **Anisometropia**
  Unequal refractive errors between the two eyes.
- **Macular lesions**
  Resulting in central scotomas that disrupt fixation.
- **Infantile strabismus surgery**
  Residual post-surgical misalignment.[2]

Classification Microtropia can be classified into two main types:

1.Primary (Lang's Microtropia):

- ✓Described by Lang in 1968.
- ✓Involves an inherent inability to achieve bifoveal fusion in early life.
- ✓Often hereditary.
- ✓Leads to decreased stereopsis.

2. Secondary (Park's Monofixation Syndrome):

- ✓Occurs as a result of residual deviation after strabismus surgery.
- ✓Can be secondary to a macular scotoma or anisometropia (>1.50D).
- ✓ Patients generally retain good peripheral fusion and gross stereopsis.

Diagnostic Approach

Diagnostic Criteria:

A diagnosis of microtropia requires:

- Angle of deviation <8–10PD.
- Presence of amblyopia (visual acuity typically reduced to 6/9 or 6/12).
- Eccentric fixation due to suppression scotoma.
- HARC (Harmonious Anomolous Retinal Correspondence) as confirmed by the Bagolini striated lens test or Mallett unit.[3]

Additional Features:

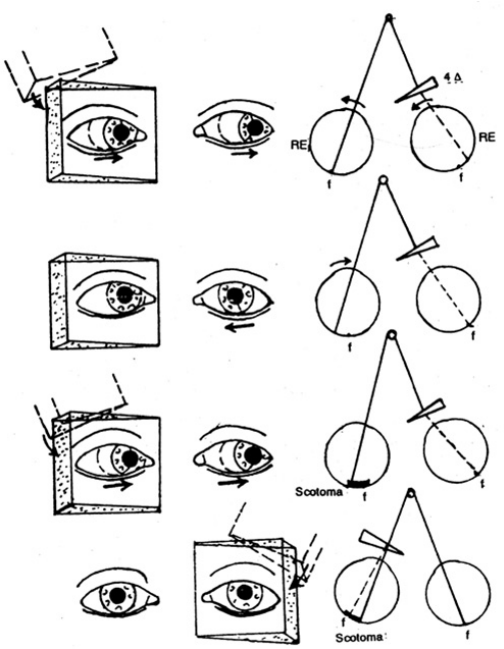
At least three of the following should be present:

- Angle of deviation <6PD.
- Anisometropia >1.50D.
- Microtropia with identity (angle of deviation = angle of eccentric fixation).
- Monofixation syndrome (small shift in position on cover test).
- Presence of motor fusion where patient can align their eyes voluntarily to some extent as measured by prism tests.
- Low-grade stereopsis (100 seconds of arc or more with Titmus circles or Randot test).
- Positive response to the 4PD base-out prism test.
- Lang's one-sided scotoma , ie; blind spot in one eye that corresponds to fovea in other eye shown by Amsler grid testing.[3]

Additional Tests:

4PD Base-Out Prism Test[A2] :
When a 4 prism dioptre base-out prism is placed before the *deviating eye* in microtropia, no movement is observed because the image falls within the suppression scotoma.

However, placing the same prism in front of the *fixating (non-deviating) eye* results in an inward movement of the deviating eye as it attempts to maintain fusion.[4]



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Clinical methods in ophthalmology-2nd edition-by Himadri D ***et al***.
(Video link for test provided here:-
https://**www.youtube.com/shorts/FSOY0LT4awU**)

Cover Test:
Often missed due to adaptation and suppression.
No fixation shift when the normal eye is covered.

Fixation Preference Testing:
Induced tropia test or vertical prism test.
Used to differentiate facultative suppression scotomas.

Stereoacuity Testing:
Typically shows stereopsis between 200–3000 seconds of arc.[4,5,6)8]

Worth 4-Dot Test & Bagolini Striated Glasses:
Evaluates suppression and binocular function.

Visuoscopy:
Determines the uniocular fixation point using a central graticule.[4]

Management The management of microtropia aims to correct refractive errors, improve visual acuity, and optimize binocular vision[7,8]

Refractive Correction:
- Essential in cases of anisometropia, especially in children <5 years.[9]

Amblyopia Treatment:
The patching therapy is advised based on best corrected visual acuity -
Mild cases ie; 6/9 or better - 2 hours daily
For cases with 6/18 to 6/9p - 2 to 3 hours daily
For cases worse than 6/18 - 3 to 4 hours daily[4-6]

Surgical Considerations:
- Typically not required unless there is progression to a larger heterotropia.
- Strabismus surgery may be indicated in adulthood if there is diplopia or patient develops manifest deviation. [2,10]

Conclusion
Microtropia is a subtle yet clinically significant condition affecting binocular vision. Early diagnosis and appropriate management, particularly in childhood, are crucial for optimizing visual outcomes and preventing further progression. Future research may focus on refining diagnostic techniques and evaluating long-term outcomes of various treatment strategies.

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Traumatic Glaucoma-When to intervene and how ?

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Abstract
Ocular trauma is a major cause of avoidable blindness. Injuries ranging from blunt force to penetrating trauma can lead to secondary glaucoma through various mechanisms. Beyond the health-care costs, it can diminish quality of life, lead to social isolation, and cause mental distress. Managing glaucoma after ocular trauma presents several significant challenges. One primary difficulty in diagnosing glaucoma is that it may develop weeks or even months after the initial injury. Treatment is further complicated by the unpredictable response of these eyes to medical therapy and the potential need for surgical intervention. The increased risk of complications and uncertain outcomes often leads ophthalmologists to opt for non-surgical treatments rather than proceed with surgery. We present three interesting cases of secondary glaucoma following ocular trauma, each with significant management challenges, where strategic intervention proved effective.

Key words Trauma, angle recession, hyphema

Introduction
Traumatic glaucoma is a serious form of secondary glaucoma that can develop after blunt or penetrating eye injuries. It results from various mechanisms that raise intraocular pressure (IOP), making early recognition and understanding of its pathophysiology essential for effective management.
Blunt trauma, especially from forces aligned with the visual axis, can displace the cornea and sclera backward, causing equatorial expansion and potential tearing of ocular structures due to the incompressibility of aqueous and vitreous humor. [1]
In the early phase, elevated IOP is mainly due to hyphema, uveitis, and lens-related issues, while angle recession contributes to late-onset glaucoma. [2]
Diagnosing and treating post-traumatic glaucoma is challenging due to delayed onset, variable response to therapy, and surgical risks. We present three complex cases where timely and strategic intervention led to successful outcomes.

Case 1
A 17-year-old female presented with sudden vision loss in the right eye following shuttlecock trauma one day prior to presentation. She was on treatment for bronchial asthma. Examination of right eye revealed best corrected visual acuity (BCVA) of 6/36, hyphema with dispersed blood in the anterior chamber, a fixed dilated pupil, and IOP of 32mmHg. Fundus view was obscured, but B-scan was normal.

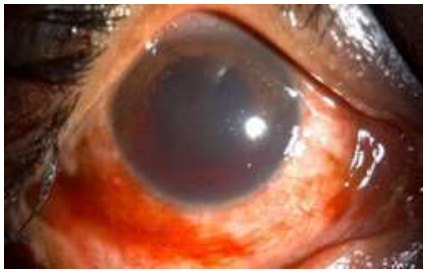

Figure 1- Case 1 Traumatic hyphema

Initial management included oral acetazolamide, topical Brinzolamide, topical steroids, and cycloplegics. Despite adding eyedrops Brimonidine and Netarsudil, IOP increased to 60 mmHg by day 5, necessitating
anterior chamber washout.
At one month post-operatively, IOP was 12 mmHg on Brinzolamide monotherapy. Gonioscopy showed angle recession in the superior and nasal quadrants. The patient remained stable on follow-up.

Case 2
A 56-year-old male presented with sudden, painless visual loss in the right eye following blunt trauma from a tennis racket. On examination, BCVA in right eye (RE) was hand movements and in left eye (LE) was 6/6 , with IOP of 56 mmHg and 18 mmHg, respectively. Slit lamp examination revealed corneal edema, grade 1 hyphema, and a semi dilated pupil in the right eye. The left eye was normal.

Initial management included topical corticosteroids, cycloplegics, and antiglaucoma medications. On follow-up, pupillary sphincter tears were noted, and gonioscopy revealed angle recession in the inferior and temporal quadrants. Fundus examination showed a cup-disc ratio (CDR) of 0.3 bilaterally with healthy neuro-retinal rims (NRR). The patient was diagnosed with angle recession glaucoma in the right eye.
At 1 month, IOP reduced to 17 mmHg with topical Brimonidine-Timolol and Dorzolamide. Visual fields were initially normal.

Over seven years, right eye showed progressive optic nerve damage with CDR 0.7 and inferior rim thinning along with a corresponding superior arcuate scotoma, despite escalated antiglaucoma therapy. Patient then underwent right eye trabeculectomy with mitomycin C (MMC).

At two-year postoperative follow-up, IOP remained stable at 10–12 mmHg without medications, with stable visual fields and fundus.

Case 3

A 15-year-old male presented with decreased vision in the right eye, 10 months after blunt trauma. BCVA was 3/60 (RE) and 6/6 (LE). The right eye showed iridodonesis, lens subluxation with cataract, and 360° angle recession. Fundus exam revealed inferior retinal detachment with macula off.

He underwent scleral buckling, but developed IOP of 42 mmHg postoperatively. Buckle removal was performed after one month to reduce IOP. A redetachment with PVR occurred, requiring revision buckle surgery. Persistent high IOP (~40 mmHg) led to Ahmed Glaucoma Valve (AGV) Implantation.

Post-AGV, IOP stabilized at 10–14 mmHg on one medication. Four years later, phacoemulsification with IOL implantation was done. Thirteen years post-AGV, BCVA is 6/24, IOP is 16 mmHg on two medications, with stable fundus and CDR of 0.7.

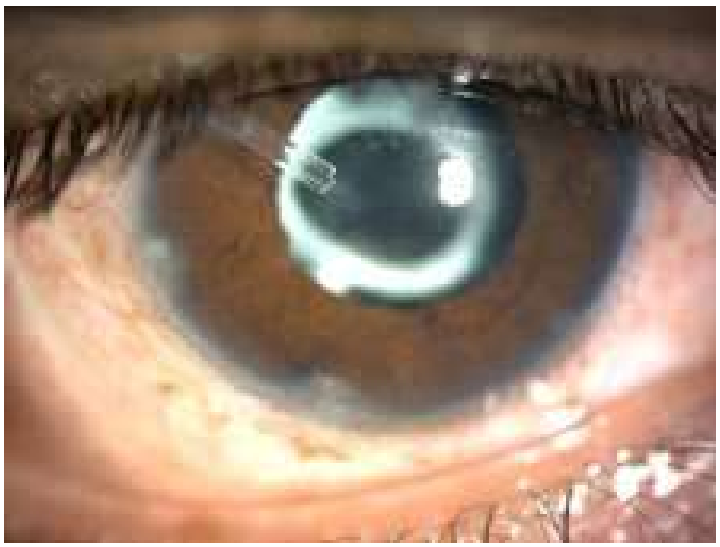

Figure 2- Case 3 AGV tube in situ 13 years after implantation

Discussion

Incidence of traumatic glaucoma following blunt trauma is reported to be between 11-35%. [2,3] Sihota, et al. suggested that an increased pigmentation of the angle, elevated baseline IOP, displacement of the lens, hyphema, and an angle recession of more than 180 degrees were the factors associated with glaucoma after a closed globe injury.[4]

Medical management for hyphema includes topical corticosteroids, cycloplegics, antifibrinolytics, and antiglaucoma drugs. Surgical intervention for hyphema is typically indicated when intraocular pressure (IOP) remains uncontrolled, as seen in Case 1. Persistent hyphema can result in chronic trabeculitis, which may lead to trabecular meshwork (TM) fibrosis and subsequently cause secondary glaucoma. However, surgical management such as irrigation and aspiration, peripheral iridectomy, trabeculectomy and AC paracentesis carries a risk of secondary hemorrhage, which ranges from 0% to 38%.[5,6,7]

Baig ***et al***. found that 86.3% of patients with high IOP due to total hyphema achieved complete success with trabeculectomy at their last follow-up.[8] In our patient, anterior chamber washout alone was effective in lowering intraocular pressure.

In Case 2, the patient with angle recession glaucoma demonstrated progressive disease despite medical management; however, following trabeculectomy, both visual fields and optic disc findings stabilized without the need for additional antiglaucoma medications. This is similar to the study published by Senthil et al where they followed up 32 patients of angle recession

glaucoma who underwent trabeculectomy. They found that complete success rate of Trabeculectomy with MMC was 88% at 1 year and was 77% from 2 to 5 years, with only 4 patients developing complications that were managed conservatively. Complications such as hyphema, choroidal detachment, tenons cyst, late bleb leak were noted in 6 eyes.[9] Study by

Manners et al showed a similar result with 76.7% patients achieving complete success, and 9.3% patients undergoing repeat surgical intervention.[10]

In the study by Kaushik et al., involving 52 patients with angle recession glaucoma, primary AGV implantation in 38 cases resulted in significant IOP reduction. At 3 years, the mean IOP was 15.6 mmHg, with a 90% success rate based on Kaplan-Meier survival analysis.

Complications such as hyphema and hypotony were observed in 13.5% of patients. The study concluded that AGV implantation is a safe and effective option for long-term IOP control in medically uncontrolled post-traumatic glaucoma. [11]

As seen in case 3, we recommend glaucoma drainage devices as primary intervention in complicated cases where multiple ocular surgeries have been performed.

Conclusion

Despite significant challenges, surgical intervention should not be delayed when indicated in cases of traumatic glaucoma. Timely intervention is essential to prevent disease progression and mitigate the risk of vision loss in affected patients.

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Argon laser photocoagulation versus collagen cross linking as adjunctive treatment in refractory Fungal corneal ulcer

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Abstract

Purpose- To compare argon laser photocoagulation and collagen cross linking (CXL) as adjunctive treatment modalities in cases offor resistant mycotic corneal ulcers

Methods -Two groups, each of them including ded 20 cases of resistant mycotic corneal ulcers. Both groups were treated with local and systemic specific antimicrobial drugs guided with culture and sensitivity results. In one group, argon laser photocoagulation was used as an adjunctive therapy to the specific antifungal drugs. Iand in the other group, conventional CXL was done besides alongside the specific antifungal drugs. The 40 cases included in the study were proven according to culture and sensitivity to be comprised of 28 cases with pure fungal results and 12 cases with mixed (fungal and bacterial) infections. In argon laser group, argon laser irradiation of the corneal ulcer was performed using a argon laser 532 nm wavelength argon laser after fluorescein staining. In the other group, conventional CXL was done. All cases were followed up for 3 months after healing was achieved.

Results-Complete healing of the epithelial defect and resolution of stromal infiltration with no adverse effects were achieved in argon laser group, with in duration ranged ranging from 2-4 weekswk in 90% of cases. In CXL group, 16 cases healed in duration ranged from 2-6wk (80% of cases). Conclusion- Argon laser photocoagulation is superior to CXL in treatment of resistant fungal corneal ulcers.

Keywords: Mycotic keratitis, argon laser, collagen cross linking

Introduction

Fungal keratitis is a serious pathological corneal condition that commonly ends in great significant visual impairment. In many ost of the developing countries, fungal keratitis represents a major health problem concern due to the poor socioeconomic status of many peoplecitizens, lack inadequate access toof proper medical care, unavailability of topical antifungal agents and difficulties in its clinical diagnosis & , laboratory work.[1-3] Fungal corneal pathogens included belong to four families: filamentous fungi, yeast, yeast- like fungi and dimorphic fungi. From the filamentous fungi, *Aspergillus, fusarium and Cladosporium* are the most common pathogens, while *Candida albicans* is the most common member form of the yeast family.[4-5]Mycotic keratitis occurs due to invasion by the pathogenic fungal strains, and helpedsupported by poor host immunity and defense mechanisms due to local or systemic causes. Certain fungal strains have the ability to adhere to the cell wall and to produce secrete proteolytic enzymes and toxins that further destroy the host defense mechanisms.[6-8] Fungal corneal infections especiallyinfections, especially with filamentous agents, are usually predisposed by trauma with vegetativeble or organic materials. On the other hand, *Candida albicans* commonly attacks in the corneas of immunoe-compromised corneasindividuals.[9-10] Detection of pathogenic corneal fungi is based on culture and sensitivity tests using corneal swabs or biopsies. Other methods for fungus detection are based on the types of enzymes produced by the invading fungus, including like immunoe-diffusion, electrophoresis and ELISA.[11-12] There are many antifungal agents used in for treatment of different fungal infections., Tthree major groups can be identified:; polyenes, such: as amphotericin B and nystatin;, azoles, such: as itraconazole and fuconazole; and lastly pyrimidines, such: as flucytosine.[13-14]In the last fewrecent years, argon laser photocoagulation was introduced as an adjunctive therapy in the treatment of resistant infected corneal ulcers includingulcers, including fungal cases, with promising results.[15] CXL has also is usedbeen used nowadays to increase the effectiveness of antifungal therapy against mycotic pathogens that attack the cornea.[16-17]

Methods

Patients included in this study attended sought medical consultation at Davangere Netralaya forNetralaya medical consultation in the period from August 2021 to August 2023. Theose patients were suffering from resistant mycotic corneal ulcers. They were divided into 2 groups of each one included 20 cases, each comprised of resistant fungal corneal ulcers with or without hypopyon level. Both groups were initially treated with local and systemic specific antifungal drugs guided with by culture and sensitivity results. After one week of specific antifungal therapy,

with no obvious improvement, those patients who displayed no significant improvement were included in the study. Of the The 40 cases of in the study, included 28 had pure fungal ulcers and 12 had mixed (fungal and bacterial) cases, as proven with microbial culture and sensitivity results. Thirty-three cases of the included patients were associated with hypopyon. Informed consent was obtained from every participant in this study, and ethical committee approval was obtained. In the first visit, careful ophthalmological examination using the slit lamp was done, and detailed history was investigated to detect and address any predisposing factors that may be incriminated in such cases and so can be corrected if they are correctable. Prior The previous medications taken by the patients were stopped for 1 day,d and continued only the non-specific drugs like atropine sulphate and lubricants were used to give a chanceallow for accurate microbial culture and sensitivity to be doneperformed. Routine ocular ultrasonography was done for assessment of the posterior segment in order to detect its involvement and adjust treatment accordingly. that would change the approach of treatment. The size of cornealThe size of the corneal ulcers, as examined with by the slit lamp, ranged was determined to range from 1.5-9.0 mm in both horizontal and vertical diameters. CThe culture and sensitivity results showed identified multiple fungal isolates, including *Aaspergillus Fflavus, Ccandida Aalbicans, Ffusarium Ssolani,* and others.

According to the culture and sensitivity results, the specific treatment was prescribed for each case. The Ttopical antifungal drugs prescribed included voriconazole 1% , amphotericin B 0.15% prepared as fortified drops, natamycin 5% , fluconazole 0.2% taken directly from the vial, and itraconazole 1% . The topical antibiotics prescribed according to culture and sensitivity results included gatifloxacin 0.5% , ofloxacin 0.3%, moxifloxacin 0.5% and tobramycin 0.3%, as per culture and sensitivity results .Every day followDaily follow- up for one week was done in all cases of both groups. When improvement was achieved, we continued the medical treatment only and the case was excluded from the study.Afterstudy. After one week of specific therapy, if and no obvious improvement was noticed, the ulcer was considered resistant and included in the study. The 40 cases included in the study were divided into 2 groups; one group of 20 cases treated with CXL, and the other 20 cases included in the argon laser treatment group.

In the laser treatment group, a drop of Proparacaine (Propaercaine hydrochloride 0.5%) and flourescein staining done with sterile strips was performed. Fluorescein sodium stained the epithelial defect of the treated corneas to allow the chance offaciltate argon laser beam energy to be absorbedabsorptiob by the corneal tissue- otherwise the argon laser beam traverses the unstained cornea without absorption as in pan-retinal photocoagulation treatment for diabetic retinopathy. Argon laser therapy was done using argon green wavelength (532 nm). A spot size of 500 µm, pulse duration of 0.2s, and power of 900 mW were used. Number of shots varied from one case to anotheron a case-by-case basis, depending on the size of ulcer where we targeted the bed and edge of the ulcer during argon laser therapy with laser shots. Number of laser shots ranged from 18-165 shots as shown on the device counter, including the missed shots due to unexpected eye movement in certain cases. In the collagen cross linking group, CXL was performed under sterile conditions in the operating room. proparacaine drops (0.5%) were used for topical anesthesia. After removal of the loose epithelium around the ulcer, riboflavin drops (riboflavin 0.1%/dextran solution 20%) were instilled every 3 min over the surface of cornea for 30 min. Thereafter, the cornea was irradiated for 30 min using a UVX lamp with 365 nm wavelength, irradiance of 3 mW/cm^2 and distance of 5 cm. During the period of UVA irradiation, riboflavin was administered every 3-4 min. Follow-up of each case was done daily till until complete healing was achieved. In each case we assessed size of the epithelial defect, density and edge of infiltration, corneal edema, depth of the ulcer and hypopyon level. EThen each case was followed up for 3months to detect any relapse or recurrence. Statistical presentation and analysis of the present study was conducted, using the mean, standard deviation, Chi-square and *t*-test by SPSS V.20.

Results

Slit lamp examination of patients of both groups revealed that the size of corneal ulcers ranged from 1.5-9.0 mm long in both vertical and horizontal meridians. The right eye was affected in 26 cases, and the left eye in 14 cases. Age of the patients ranged from 24-63y in the argon laser group with a mean of 42±8.7y while it ranged from 27-59y in the CXL group with a mean of 40±6.4years. The argon laser group included 14 male and 6 female patients while the CXL group included 17 male and 3 female patients. As regards duration of healing; in the argon laser group healing was achieved after about 2wk in 11 cases, 3wk in 2 cases and 4wk in 5
cases (Figure 1).

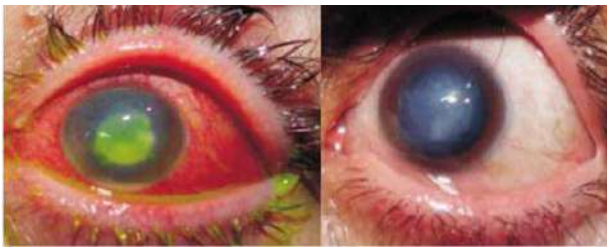

Figure 1-- Resistant Mycotic corneal ulcer before and after 2 weeks of argon laser treatment

Two cases did not show improvement after argon laser therapy and amniotic membrane grafting (AMG) was done to help healing that was achieved after about 6wk from the first visit.Statisticallyvisit. A statistically significant difference was obtained when comparing the healing results of both groups. Healing duration in laser group ranged from 2-4wk and in the CXL group ranged from 2-6wk (χ^2=26.81, *P*=0.001). (Figure 2)

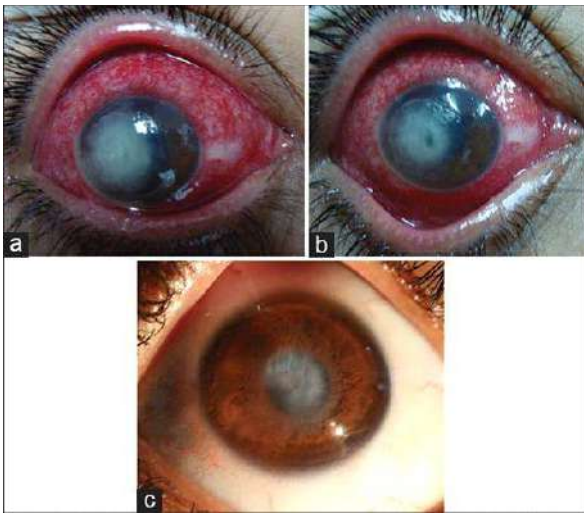

Figure 2-(a) Large corneal infiltration (b) The same eye 2 days after CXL showing a decrease in peripheral and central corneal infiltration (c) The same eye 3 months after CXL showing a small corneal ulcer

Two cases needed AMG in laser group while 4 cases needed AMG in CXL group(χ^2=3.922, *P*=0.047) (Table 1, ,2).

Table1- percentage and duration of healing mycotic corneal ulcer in both laser and CXL group

Duration	Laser	CXL	X^2	P
2 WK	11(55)	7(35)	26.810	0.001
3 WK	2(10)	5(25)		
4 WK	5(25)	2(10)		
5 WK	0(0)	1(5)		
6 WK	0(0)	1(5)		

Table2- percentage & duration of healing mycotic c orneal ulcer in laser & CXL group with AMG

AM grafting	Laser	CXL	X^2	P
Healing without AMG	18(90)	16(80)	3.922	0.047
Healing with AMG	2(10)	4(20)		

As regards the visual acuity results, we found that at time of first presentation, all cases of both groups ranged from hand motion to 0.2 (decimal system). No visual acuity improvement was achieved after healing in 9 cases (45%) in laser group while 7 cases (35%) in the CXL group did not show visual acuity improvement. One line gain was achieved in 7 cases (35%) and 11 cases (55%) and two or more line gain was achieved in 4 cases (20%) and 2 cases (10%) in laser group and CXL group respectively with statistically significant difference (χ^2=9.031, *P*=0.011) (Table 3).

Table 3- visual outcome in both the groups

VA improvement	Laser	CXL	X^2	P
No improvement	9(45)	7(35)	9.031	0.011
One line improvement	7(30)	11(55)		
Two or more line improvement	4(20)	2(10)		

Discussion

Resistant mycotic corneal ulcers represent a great challenge to ophthalmologists all over the world. Surgical interference was the way to solve this problem in many instances. In India, penetrating keratoplasty was done in 34% of cases according to certain reports and in 47% of the cases in other reports.[18-19] Many antifungal drugs were used for the treatment of resistant mycotic corneal ulcers according to culture and sensitivity results. In many instances, topical use of those drugs was not sufficient alone for treatment,to treat those cases and so adjunctive treatments were described. From these adjunctive strategies: subconjunctival injections of antifungal agents as fluconazole and amphotrericin B, intrastromal injection of voriconazole, cross linking, AMG and conjunctival flaps[20-25]

Different laser types are currently used in many ophthalmic procedures like argon, YAG, excimer, and

femtosecond lasers. Argon laser absorption by the ocular tissue targets is maximally achieved by melanin and hemoglobin present in the retina not in the cornea. To be absorbed by the cornea, it needs an exogenous dye that can absorb the energy in the argon laser beam. Emission and excitation of fluorescein dye can be best achieved by wavelengths around 500 nm. Argon laser used in our study is produced by the machine (Carl Zeiss LSL 532s AG; Meditec, Inc.), so this argon laser with 532 nm can be absorbed by fluorescein dye when staining the corneal epithelial defect producing its thermal damaging effect. Over-heating of corneal tissues causes suppression of cellular enzymes (40°C -45°C), damage of the cellular proteins (above 60°C) and damage of DNA (above 70°C). Over-heating damage affects both the host tissue and the organism itself. [15,26] The ulcer bed debridement is frequently done in cases of fungal keratitis to enhance penetration of antifungal drugs. Argon laser photocoagulation may produce similar effects to debridement, as where it produces over-heating of the ulcer bed and so shrinkage of the thick area of keratitis. In addition, argon laser also produces a fungicidal effect due to its thermal damage of the infected tissue. It has been reported that the temperature in corneal tissue rises over 90 degrees due to argon-tissue interaction.[15,27].To the best of our knowledge, there are not many reports that had investigated the use of argon laser photocoagulation in the treatment of resistant fungal corneal ulcers. In our study, the parameters of argon laser used was adjusted to a power of 900 mW, spot size of 500 µm and a pulse duration of 0.2s. During the procedure we noticed blanching of the corneal stroma and small bubble cavitations in the stroma. The therapeutic effect of CXL in corneal ulcers could be related to its toxic action against the pathogens and the increase in collagen resistance against enzymatic degradation. UV irradiation has antimicrobial activity and has been traditionally used for disinfection of blood transfusion products, drinking water and air or surfaces. Gao *et al* studied the effect of CXL on prevention of melting in rabbit corneas after alkali burn and found that it could prevent and delay corneal melting. They showed that CXL reduced the destruction of corneal collagen fibers and infiltration of inflammatory cells in the cornea.[26] In our study, complete healing was achieved in 90% of cases in argon laser group (18 cases) and duration of healing ranged from about 2 to 4wk. While in the CXL group, healing was achieved only in 16 cases (80%) in a longer duration ranged from 2-6wk with statistically significant difference (χ^2=26.81, *P*=0.001) as shown in Table 1. Two case of argon laser group (10%) needed AMG to achieve complete healing in comparison to 4 cases (20%) of CXL group with statistically significant difference (χ^2=3.922, *P*=0.047) as shown in Table 2. As In regards to visual acuity results, improvement with two or more line gain (decimal system) was achieved in 4 cases (25%) and 9 cases (45%) did not show any improvement in argon laser group . In the CXL group, owhile only 2 cases of CXL group showed similar improvement and 7 cases (35%) did not improve at all. Statistical analysis of visual acuity results showed significant results (χ^2=9.031, *P*=0.011) as shown in Table 3.

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Pigmented lesions of the conjunctiva: clinicopathological evaluation and surgical results

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Abstract

Purpose : This study aims to analyse pigmented lesions of the conjunctiva to determine whether they are benign, premalignant, or malignant, and to evaluate the surgical outcomes in these patients. It also helps in studying the recurrence of lesions in these patients after initial treatment.

DESIGN: This descriptive study on 35 patients with pigmented lesions of conjunctiva was conducted during the period from August 2022 to January 2024 to analyse its clinical appearance and histopathological features.

Methods: The clinical profile of each patient was analysed by detailed anterior segment examination by slit lamp biomicroscopy and anterior segment photographs. Histopathological features to evaluate the type of lesion and the surgical outcome was assessed. The data was statistically analysed using descriptive statistics and Chi-square test.

Results: Among the conjunctival lesions, most common site of involvement was found to be temporal bulbar conjunctiva(22 cases,24.4%).The size of conjunctival lesions in this study had a mean size of 22.08±25.94 mm^2 with a range of 3 to 116mm^2.Out of the 35 conjunctival lesions, most of the lesions were less than 10mm^2,which was 19(54.28%).Subepithelial nevus was the most common histopathological finding found in 8 patients(22.85%) among the conjunctival lesions. Other findings included junctional nevus in 6(17.1%),compound nevus in 6(17.1%),juvenile inflammatory conjunctival nevus in 6(17.1%),PAM(primary acquired melanosis) without atypia in 4(11.4%),PAM(primary acquired melanosis) with atypia in 3(8.5%) and malignant melanoma in 2(5.7%).Among conjunctival lesions,25 patients did not require any intervention(71.4%),4 patients were started on 0.04% Mitomycin C eyedrops(1 malignant melanoma and 3 PAM with atypia)(11.4%),5 patients required close observation and follow up(14.2%) and 1 patient(2.8%) who was diagnosed with malignant melanoma with extensive conjunctival involvement underwent secondary procedure for excision of lesions as much as possible with wet amniotic membrane grafting and was then started on 0.04% Mitomycin C drops and closely followed up. Recurrence was noted in 9 patients.

Conclusion: Pigmented lesions of conjunctiva were found to be more predominant in the female population. Benign lesions were more common in the younger age group while the malignant lesions were predominant in elderly population. Pigmented lesions were far more common in Caucasian population. Although benign lesions are more common than premalignant or malignant lesions, clinical evaluation and histopathological examination is important for early diagnosis and management of such lesions.

Keywords: Pigmented lesions, Conjunctiva, Nevi, Benign, Premalignant, Malignant.

Introduction:

Pigmented lesions on the ocular surface mainly include conjunctival melanoma(CMM), primary acquired melanosis (PAM) with and without atypia, nevus and complexion associated melanosis(CAM).[1] The IARC(International Agency for Research on Cancer) introduced the 2018 WHO classification of tumors of the eye. Based on this new classification, melanocytic tumors of the conjunctiva are categorized into conjunctival nevus (junctional, compound and subepithelial), conjunctival melanocytic intraepithelial neoplasia(C-MIN) that include primary acquired melanosis(PAM) with and without atypia, conjunctival melanoma and others(benign epithelial melanosis of the conjunctiva, inflammed juvenile conjunctival nevus, blue nevus, Spitz or spindle cell nevus)[2] Conjunctival melanoma is a malignant tumor that can destroy locally the tissues of eye and can spread systemically and result in lymphnode and distant metastasis. PAM can transform into CMM but clinically it cannot be distinguished from PAM without atypia. Nevus on the contrary has a very small risk of developing into CMM. CAM is always benign. [1] In order to reduce the rate of metastatic disease and mortality associated with conjunctival melanoma, it is of prime importance to recognize the clinical features at an early stage which inturn helps in precise diagnosis and early intervention.[4]

This study aims to analyse pigmented lesions of the conjunctiva to determine whether they are benign, premalignant, or malignant, and to evaluate the surgical outcomes in these patients.

Material and Methodology

Source of data included OPD/ IPD of Department of Ophthalmology , Minto Ophthalmic Hospital, Regional Institute of Ophthalmology, Bangalore Medical College and Research Institute, Bangalore, Karnataka. It was a hospital based, descriptive study done during the period- August 2022 to January 2024 at Minto Ophthalmic Hospital, Regional Institute of Ophthalmology, Bangalore Medical College and Research Institute, Bangalore, Karnataka. Institutional review board approval was taken before the study was stared. The inclusion criteria included- 1) Patients of all age groups 2) Patients willing to give informed consent for the study and e exclusion criteria included- 1) Patients not willing for surgical management/ biopsy 2) Patients presenting with other inflammatory disorders. The tools used for assessment included -1.Detailed history 2.Slit lamp biomicroscopy 3.Anterior segment pictures 4.Histopathological specimen(biopsy). The biopsy was incisional biopsy and histopathological examination on the sample was done. The follow up was done as follows- post op day 1, 1 week post op with biopsy report, 1 month, 6 month and 1 year post op. in case of premalignant lesion or suspicious lesions, follow up was done closely as monthly follow ups. The sample size was calculated and data was collected in forms designed by the investigator using pen and paper and later entered into Microsoft Excel Spreadsheets. Data was analysed using SPSS (statistical package for the social science) software. Descriptive statistics namely mean, standard deviation, percentage was used for the collected data. Chi square test was used to determine the significance among the variables and p less than 0.05 was considered statistically significant.

Results

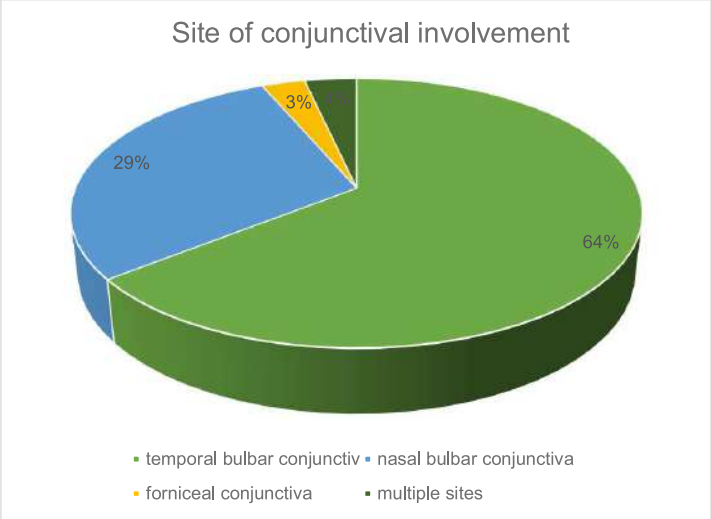
Gender and age distribution-

Out of the 35 patients, 23(65.71%) were females and 12 (34.28%) were males.

	<50 years		>50 years	
	Males	Females	Males	Females
Benign	9	10	2	5
Premalignant	1	4	0	2
Malignant	0	1	0	1
Total	25		10	

Table 1: Age distribution in benign, premalignant and malignant conjunctival lesions

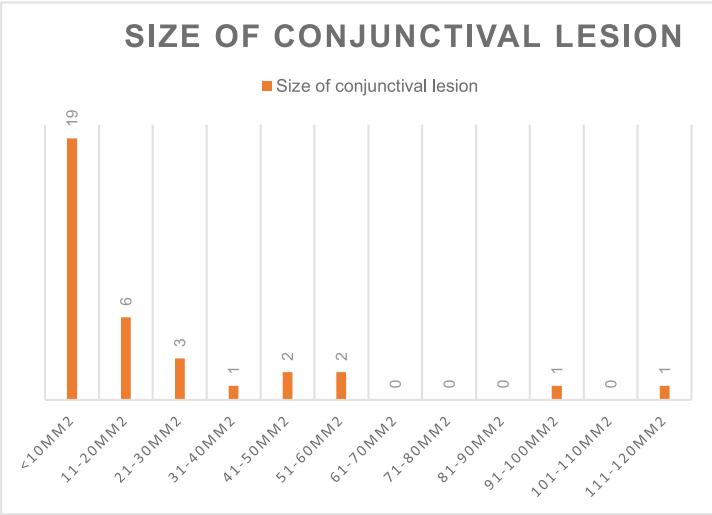
1.Site of conjunctival involvement-



Graph 1: Site of lesion in conjunctival involvement

Size of conjunctival lesions

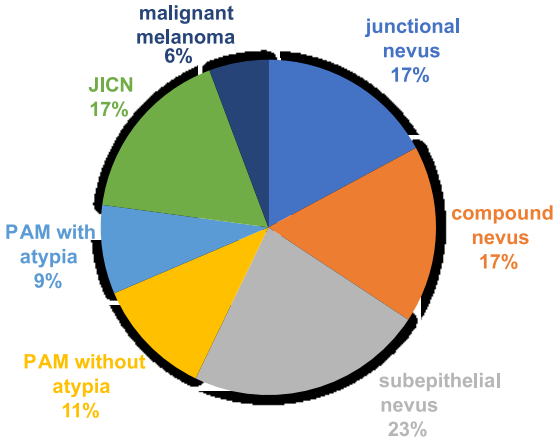
The size of conjunctival lesions in this study had a mean size of 22.08±25.94 mm^2 with a range of 3 to 116mm^2. Out of the 35 conjunctival lesions, most of the lesions were less than 10mm^2, which was 19 (54.28%). The size of the lesion was measured using Castroviejo caliper in lesions less than 60mm^2 (length*breadth) and for lesions more than 60 mm^2, transparent ruler was used.



Graph 2: Size of conjunctival lesions

Histopathology of conjunctival lesions-

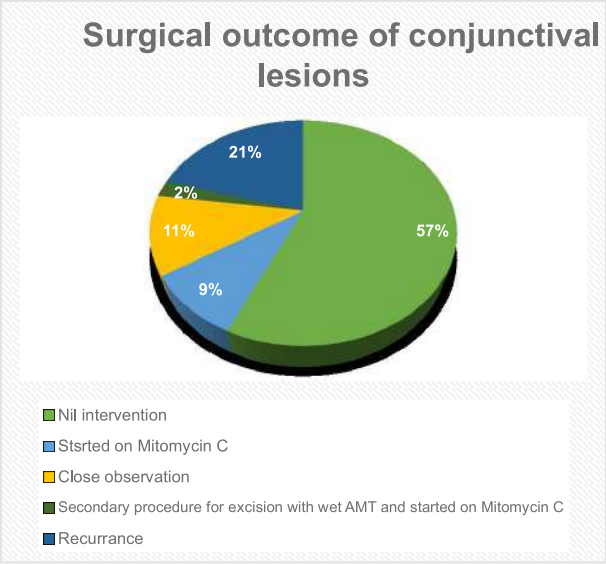
Out of the 35 conjunctival lesions reported, subepithelial nevus was the most common finding found in 8 patients (22.85%), junctional nevus in 6 (17.1%), compound nevus in 6 (17.1%), juvenile inflammatory conjunctival nevus in 6 (17.1%), PAM without atypia in 4 (11.4%), PAM with atypia in 3 (8.5%) and malignant melanoma in 2 (5.7%).



Graph 3: Histopathology of conjunctival lesions

Surgical outcome of conjunctival lesions

Out of the 35 conjunctival lesions, 25 patients did not require any intervention due to benign nature of lesion (71.4%). 4 patients were started on 0.04% Mitomycin C eyedrops after excision due to premalignant or malignant nature of lesion (1 malignant melanoma and 3 PAM with atypia) (11.4%). MMC was given as 6 cycles where each cycle consisted of 1 week on (where patient was instructed to use 0.04% MMC 1 drop 4 times per day) followed by 1 week off (where only 0.5% carboxymethylcellulose drops were instructed to be used). The patients were then closely observed and followed up.5 patients required close observation and follow up due to premalignant nature of lesion and to look for recurrences. (14.2%) Thus, out of the 7 premalignant lesions, 3 patients were started on MMC drops followed by close observation and follow up and the rest of the patients were only closely observed and followed up.1 patient (2.8%) who was diagnosed with malignant melanoma with extensive conjunctival involvement underwent secondary procedure for excision of lesions as much as possible with wet amniotic membrane grafting and was then started on 0.04% Mitomycin C drops and closely followed up. The clinical parameters assessed during follow up included- the size, shape, colour of lesion, any change in size, shape or colour of lesion, and vascularization of lesion, any signs of clinical suspicion for change in nature of lesion. The patients were followed up monthly for 1 year. 9 patients had recurrence on 1 yearly follow up out of the 35 conjunctival lesions patients. Out of the 9 recurrences, 2 were diagnosed cases of malignant melanoma, 2 were PAM with atypia, 2 were PAM without atypia, 2 were junctional nevus and 1 was subepithelial nevus.
The patients who had recurrence had increase in size of lesion and increase in vascularity. The previously diagnosed benign lesions on follow up did not have clear cysts.



Graph 4: Surgical outcome of conjunctival lesions

Discussion

The present study was done at Minto Ophthalmic Hospital, Regional Institute of Ophthalmology, BMCRI, Bangalore. This study included 35 patients presenting with pigmented lesion involving conjunctiva. The cases included in this study were compliant with the inclusion and exclusion criteria.

	Study by Lee YJ et al[3](2019)	Study by Alkatan et al[6](2010)	Study by Shields et al[5](2004)	Our study
Age	27.1±19.8 years (range from 1 to 78 years)	26±21 years (range 1 to 74 years)	Mean of 30 years (range 2 to 93 years)	35.57±22.04 years(range from 7 to 75 years)
Sex	Female predominance (55.2%)	Equal distribution	Female predominance (51%)	Female predominance (73%)(M:F= 1:2.72)
Laterality (R:L)	37:48	54:50 Both in 1	209:195 Both in 6 cases	47:43
Anatomical location Bulbar conjunctiva Palpebral conjunctiva Juxta limbal Caruncle Fornix Multiple	 76.5% 8.2% 1.2% 14.1%	 83% 1% 12%, 4%	 72% 26% 11%	 Temporal 64% Nasal 29% 3% 4%
Size	Mean size: 7.4±6.6mm (range 1.5-42mm)	Size not mentionedin the study	The mean size was 3.5mm in diameter and 0.5mm in thickness	mean size : 22.08±25.94 mm^2 (range 3 to 116mm^2. Out of the 35 lid lesions, most of the lesions were between less than 10mm^2, which was 19 (54.28%).
Type of lesion Benign Premalignant Malignant	 81.1% (69) 11.7% (10) 7.05% (6)	Lesions were benign in 79%, suspected malignancy in 8% and not stated in 13%	Most common was benign, followed by premalignant and then malignant	 74.28% (26) 20% (7) 5.71% (2)
Colour of lesion Brown Tan tobrown Grey Brown to black Non pigmented	Not mentioned	Not mentioned	 65% 19% 16%	 63.33% (57) 7.77% (7) 5.55% (5) 23.33% (21)
Histological type Compound nevus Junctional nevus 8.2%	 67.1%	 72% (76) 3% (3) 24% (25)	 70% 3% 4%	 17.1% (6) 17.1% (6) 22.85% (8)
Subepithelial nevus JICN Blue nevus PAM 7.1% Malignant melanoma Others	 11.8% 6% includes Junctional naevus, spindle cell naevus, and benign epithelial melanoses		 3% 3 patients	17.1% (6) Without atypia 11.4% (4) With atypia 8.5% (3) 5.7% (2)

Table 2 : Comparative analysis of conjunctival lesions

In our study, out of the 35 conjunctival lesions reported, subepithelial nevus was the most common finding found in 8 patients (22.85%), junctional nevus in 6 (17.1%), compound nevus in 6 (17.1%), juvenile inflammatory conjunctival nevus in 6 (17.1%), PAM without atypia in 4 (11.4%), PAM with atypia in 3 (8.5%) and malignant melanoma in 2 (5.7%).

In a study done by Lee et al[3] on clinicopathological analysis of conjunctival melanocytic lesions in the Korean population, compound naevi (67.1%) was the most commonly diagnosed pigmented lesion of conjunctiva followed by PAM (11.8%), subepithelial-naevus (8.2%) and conjunctival melanoma (7.1%). Junctional naevus, spindle cell naevus, and benign epithelial melanoses altogether account for the remaining 6 %.

A study done by Shields et al[5] on 410 conjunctival naevi in Philadelphia described that out of 148 histopathologically confirmed naevi, 72% were compound naevi, 4% were Junctional naevi, 23% were Subepithelial and Blue naevi < 1%.

As compared to the above studies, in our study the most common histopathological type of nevus was sub epithelial followed by compound and junctional type. This could be because of difference in the type of population and the difference in sample size.

Out of the 35 conjunctival lesions, 25 patients did not require any intervention due to benign nature of lesion (71.4%).

4 patients were started on 0.04% Mitomycin C eyedrops after excision due to premalignant or malignant nature of lesion (1 malignant melanoma and 3 PAM with atypia) (11.4%).

5 patients required close observation and follow up due to premalignant nature of lesion and to look for recurrences. (14.2%)

1 patient (2.8%) who was diagnosed with malignant melanoma with extensive conjunctival involvement underwent secondary procedure for excision of lesions as much as possible with wet amniotic membrane grafting and was then started on 0.04% Mitomycin C drops and closely followed up.

9 patients had recurrence on 1 yearly follow up out of the 35 conjunctival lesions patients. Out of the 9 recurrences, 2 were diagnosed cases of malignant melanoma, 2 were PAM with atypia, 2 were PAM without atypia, 2 were junctional nevus and 1 was subepithelial nevus.

The surgical management of the conjunctival lesions in other studies may differ from our results depending on age of the patients, type of lesion, extent of the lesion, individual patient health parameters and surgeons' preferences.

Fig 1: Conjunctival lesion with clear cystic spaces in bulbar conjunctiva

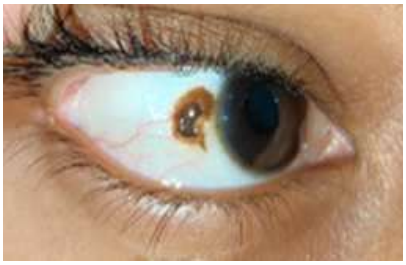


Fig 2: Suspicious conjunctival pigmented lesion with feeder vessels

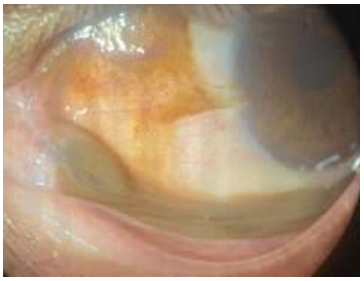


Fig 3 & 4: Extensive conjunctival pigmentation involving upper and lower forniceal conjunctiva, bulbar conjunctiva with rapid growth

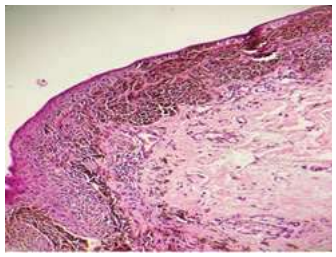


Fig 5: Histopathology of conjunctival compound nevus

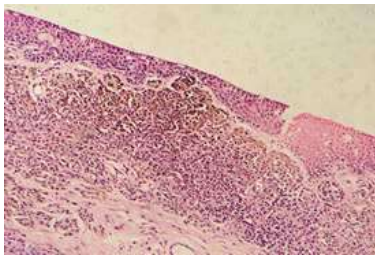


Fig 6: Histopathology of conjunctival subepithelial nevus

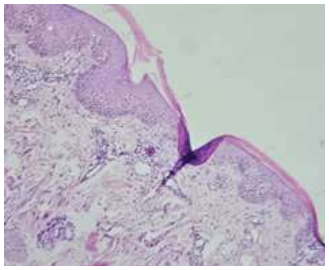


Fig 7: Histopathology of junctional nevus

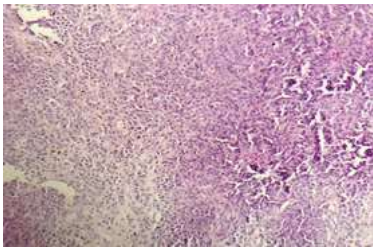


Fig 8: Histopathology of conjunctival melanoma

Conclusion

In conclusion, pigmented lesions of the conjunctiva represent a broad spectrum of conditions, ranging from benign to malignant. Our study highlights the importance of a thorough clinical evaluation, including slit-lamp examination and, when necessary, histopathological analysis to differentiate between various types of lesions. While many conjunctival pigmented lesions are benign, early detection of suspicious or atypical features is crucial for preventing potential complications, including malignancy. Additionally, regular follow-up is essential for monitoring changes in the lesion's appearance over time. Further research into the pathophysiology, genetic predispositions, and treatment outcomes of these lesions will enhance diagnostic accuracy and improve patient management strategies.

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Zoledronic Acid-Induced Ocular Inflammation: Clinical Implications for Eye Care Professionals

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Abstract:
Zoledronic acid, a third-generation bisphosphonate, is widely used to manage conditions like osteoporosis, Paget's disease and malignancy-associated hypercalcemia owing to its strong ability to inhibit bone resorption. While generally well-tolerated, it is associated with rare adverse effects, including ocular inflammation such as anterior uveitis. Ocular inflammation related to bisphosphonates, though infrequent, is clinically significant, with reported incidence rates of up to 0.8 to 1%. Pathophysiology involves immune activation, resulting in the release of cytokines that cause inflammation. Early recognition and treatment are crucial to prevent vision-threatening complications. Clinicians should educate patients about potential ocular symptoms, balancing the benefits and risks of bisphosphonate therapy.

Key-words: Zoledronic acid, anterior uveitis, drug-induced uveitis, bisphosphonates, ocular inflammation

Introduction:

Zoledronic acid (ZA), first identified in 1987, is a third-generation nitrogen-containing bisphosphonate used for treating conditions like osteoporosis, Paget's disease of bone, and hypercalcemia of malignancy. Zoledronic acid acts by inhibiting the enzyme farnesyl pyrophosphate synthase (FPPS) in the mevalonate pathway. This inhibition prevents the synthesis of essential isoprenoid lipids necessary for protein prenylation, leading to osteoclast apoptosis and subsequent reduction in bone resorption, thereby reducing the risk of fractures and skeletal complications. [[1]] It is a long-acting, high-potency drug administered by intravenous infusion, often annually or every six months. Although generally well tolerated, it has been associated with various acute phase reactions (APRs) like low-grade fever, headache, myalgia, arthralgia, nausea, flu-like illness, and relatively rare but clinically significant ocular inflammation. Studies and case reports suggest that ocular adverse effects, such as conjunctivitis, scleritis, episcleritis, uveitis, and orbital inflammation occur infrequently but are important to recognize due to their potential impact on vision.[[2]] ,[[3]]

Case history:

Figure 1 shows the anterior segment photograph of a 72-year-old female with a history of postmenopausal osteoporosis and diabetes (on oral hypoglycaemic medication and vitamin D and calcium supplements), who presented with acute onset of right eye pain, redness, and photophobia three days after receiving her first infusion of ZA. There was no significant history of trauma, systemic infections, prior eye disease, ocular surgery, use of topical medication or corticosteroids. On examination, her vital signs were stable. Her best corrected visual acuity was 20/25 in the right eye and 20/20 in left eye. Intraocular pressure was 12mmHg in both eyes. The ophthalmic examination of the right eye revealed conjunctival, circumciliary and episcleral congestion, small keratic precipitates, 2+ anterior chamber cells and 1+ flare (SUN classification)[4] along with posterior synechiae, consistent with anterior uveitis (Figure 1a). Both eyes had immature cataract. Dilated fundoscopy showed quiet anterior vitreous with normal fundus. The left eye was normal, with no signs of inflammation. Systemic workup including complete blood count, C-reactive protein and basic metabolic panel were within normal limits. Other causes of uveitis, including infectious aetiologies (e.g., syphilis, tuberculosis), sarcoidosis and autoimmune diseases (Antinuclear antibody test, HLA B-27) were excluded through serological testing. Given the temporal association with the recent ZA infusion and the absence of any other identifiable cause, a diagnosis of zoledronic acid-induced moderate anterior uveitis was made.

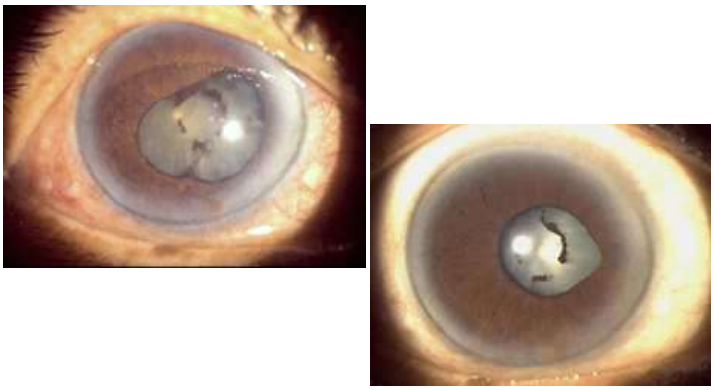

Figure 1: Right eye slit lamp photograph showing: (a)anterior uveitis with congestion and posterior synechiae at presentation, (b)after treatment with topical steroids.

The patient was started on topical corticosteroid drops (prednisolone acetate 1%) along with cycloplegic drops (homatropine 1%). She was treated with 6 weeks of tapering topical steroids. Over the next weeks, her ocular symptoms gradually resolved with no relapse or visual impairment during the next six months of follow up.

Discussion:

Zoledronate is approved by the US Food and Drug Administration (FDA) for various indications, including the prevention and treatment of osteoporosis in males and postmenopausal females, glucocorticoid-induced osteoporosis, Paget disease of bone, hypercalcemia of malignancy, multiple myeloma and solid tumours bone metastases.[1] Bisphosphonates have been associated with various well documented side effects like nausea, anorexia, hypocalcaemia, nephrotoxicity and atrial fibrillations.[3] Acute phase reactions(APR) are commonly associated with bisphosphonate infusions, the risk factors being reported as non-Japanese Asians and Pacific Islanders, young age, NSAIDs users and low vitamin D levels. Conversely, APRs are less frequent among smokers, individuals with diabetes, those taking calcitonin, and previous users of bisphosphonates.[[5]] For bisphosphonates as a class, ocular inflammation has been reported in approximately 1% or less of patients, depending on the specific medication and study population.[[6]],[[7]]

The HORIZON-Pivotal Fracture Trial was a large-scale, multicentre randomized study involving 7,765 postmenopausal women. Ocular inflammation was reported in 0.4% of participants within three days of ZA infusion.[2] Bisphosphonates are primarily used to prevent bone loss by inhibiting osteoclasts. The mechanism of ZA-induced ocular inflammation involves its potent stimulation of γδ T cells, which release pro-inflammatory cytokines such as IL-1, IL-6 and tumour necrosis factor α. This immune response, similar to acute phase reactions, is hypothesized to underlie ZA's ocular side effects.[1],[[8]] Trace amounts of bisphosphonates have been reported to be found in the tears. [[9]]

Ocular inflammation caused by bisphosphonates can affect one or both eyes, with about two-thirds of cases involving only one eye.[3][6],[7],[[10]],[[11]] Diagnosing zoledronic acid (ZA)-induced ocular inflammation involves a thorough medical history, comprehensive clinical examination, and, in some cases, supportive imaging or laboratory investigations. Critical factors that aid in establishing the diagnosis include a clear temporal relationship with ZA administration, exclusion of alternative causes, and corroborative findings from relevant diagnostic tests.

Various ocular side effects have been documented with bisphosphonates including conjunctivitis, scleritis, episcleritis, anterior uveitis, optic neuritis, and ophthalmoplegia.[2],[5] Orbital inflammation has also been reported in the literature with around 30% of such eyes having concurrent anterior uveitis.[2],[5],[[12]] Vision threatening complications like posterior scleritis, macular edema, optic neuritis and acute retinal pigment epithelitis have also been reported following intravenous bisphosphonate administration.[[13]],[[14]],[[15]]

The majority of these reactions occur shortly after administration, often within 24 to 72 hours. [[16]] Patel et al reported an incidence of 0.8% of mild to severe anterior uveitis occurring within 7 days in a large cohort of cases (1001 subjects).[3] Symptoms can include eye pain, redness, blurred vision, swelling and photophobia. [6]Ocular inflammation following ZA responds well with topical steroids and cycloplegic agents. Mild form of conjunctival and episcleral congestion can be treated with non-steroidal anti-inflammatory agents.[[17]] Severe inflammation may need oral or intravenous steroid treatment in cases of sight threatening and orbital inflammation.[7],[2],[8]

Though there is insufficient data regarding the risk of recurrence of ocular inflammation on subsequent administration of ZA, the incidence and severity of ocular inflammation has been reported to reduce with subsequent infusions.[4],[5],[7],[11]

Conclusion

Zoledronic acid associated adverse effects like acute phase reactions and rare ocular inflammation, including anterior uveitis have been reported in literature. Patient should be informed regarding possible side effects including ocular inflammation while administering bisphosphonates. As ZA becomes increasingly common in both oncologic and metabolic bone disease therapy, it is essential for ophthalmologists to recognize its ocular side effects, understand the underlying mechanisms, and manage patients effectively to prevent ocular morbidity. Educating healthcare providers about this rare adverse effect can help optimize patient outcomes by balancing treatment benefits with minimized risks. A high index of suspicion, detailed drug history, and prompt anti-inflammatory therapy form the cornerstone of effective management.

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A Wooden Stick That Aimed Bullseye (Consecutive Optic Nerves) – A case report of single largest Orbito-Sino-Cranial wooden foreign body severing consecutive optic nerves.

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Abstract

Here we report a rare case of one of the largest, single, orbito-Sino-cranial wooden foreign bodies, which, along its trajectory course, had severed both the optic nerves and got lodged deep into the intracranial cavity, leaving the patient bilateral PL-negative. We would also like to bring forward the point as to how such injuries might appear trivial and masquerade as only a protruding superficial lying foreign body particle from the periorbital region, like in this below mentioned case of ours, where the foreign body appeared superficial and only early radiological investigation could identify the serious life threatening condition lying underneath such clinical scenarios.

Case report

A 34-year-old/male presented to our hospital with bilateral sudden-onset blindness for a day, following an injury with a wooden stick, which he sustained while chopping the wooden logs using an electronic wood cutter at a construction site. On examination, his vision was PL negative in both eyes. Left eye adnexal examination revealed retrobulbar hemorrhage with periorbital edema, proptosis, and a protruding wooden foreign body from the infero-temporal region of the left orbit as depicted **in Fig. 1A**. There was absent to little ocular movement in the left eye. Anterior segment examination of the left eye showed dispersed subconjunctival hemorrhage and a fixed non-reacting pupil **(Fig. 1B)**, within normal limits. Right eye adnexal and anterior segment examination was within normal limits, except for a non-reacting pupil. Fundus evaluation of the left eye showed dense vitreous hemorrhage, and the right eye was within normal limits. The patient was conscious and co-operative at the time of ophthalmic evaluation and was sent for CT orbits to assess the depth of the peri-orbital foreign body. CT report mentioned a wooden F. B **(Fig 2.a)** with entry wound from left infero- temporal orbit had severed retro-orbital part of left optic nerve **(Fig 2.b)**, later entered the posterior aspect of right orbital cavity via the ethmoidal sinuses **(Fig 2.c)** severing the right optic nerve in the immediate extraconal compartment and lodged deep into the right temporal lobe of intracranial cavity **(Fig 2.d).** The patient, after the scan, reported by afternoon to our hospital with deterioration of senses and was immediately referred to a neurosurgeon. The patient was admitted to the neurosurgical ward and started on intravenous antibiotics with antiepileptics, but progressively deteriorated with the development of severe encephalitis and succumbed on day 5 of admission.

Discussion

An intra-orbital foreign body is an object that lies within the orbit but outside the ocular globe. These objects can be classified according to their composition as (1) metallic (steel); (2) non-metallic, which may be a) inorganic, such as glass; and b) organic, such as wood or vegetable matter. In general, injuries caused by metal and glass are well-tolerated and, if they do not have any symptoms or signs, may be left *in situ*. In contrast, organic matter, such as wood and vegetable matter, is poorly tolerated and triggers an intense inflammatory reaction and needs to be removed urgently as in our case. Injuries caused by metallic objects and glass are more frequent than organic foreign bodies (1). The orbital bones are particularly thin and can easily be fractured by high-velocity fragments. The capacity of an object to penetrate the bone and later enter the intracranial cavities is determined by several variables: energy, features of the object (tip shape, velocity), and angle of approach. After the initial impact, which causes separation and cavitation, all damage in the target tissue is caused by the radially redirected kinetic energy of the expanding tissue itself (2). Wooden foreign bodies are more commonly low-velocity punctures and may enter the orbit through the eyelid, be deflected by the resilient globe, and be directed toward the apex of the orbit to the superior orbital fissure or optic nerve foramen, enabling intracranial access without a fracture of the orbital bones (3). A wooden particle may present with a wide distribution of Hounsfield unit on computed tomography, when freshly cut wood has higher water content, later as the wood dries, the water content is replaced by gas and the CT attenuation value decreases, mimicking muscle, water, fat and air. Green and hydrated wood may be difficult to identify from surrounding orbito-cranial soft tissues, hence MRI plays a major role in identifying these kind of foreign bodies(4). In a nut shell on CT scan a wooden foreign body may appear hypodense and mimic air , while a well hydrated fragment of wood may appear similar to density of soft tissues.

On MRI wood appears hypointense on T1- and T2-weighted sequences and does not enhance with gadolinium .The fragment may become iso- to hyperintense over time (5). In our case the wooden foreign body was a high velocity injury which entered the left orbit away from globe and moved in a backward, superior fashion to the contralateral orbit crossing the ethmoidal sinuses and in its due course served both the optic nerves at different levels and later via the optic foramen of right eye entered the cranial cavity and rested in the right temporal lobe. The serious issue concerning retained wooden peri-orbital foreign bodies is that it can result in a draining fistula, panophthalmitis, foreign body granuloma. If there is intracranial extension, then it can cause encephalitis and brain abscess. In our case, there was already a delay in presentation from the time of injury, which had led to the development of encephalitis. Wood embedded in soil is a good culture medium for the growth of various organisms. In a series study by Miller et.al (6) various organisms like staphyococus and Enterobacteriaceae were isolated, and the importance of early tetanus shot with intravenous antibiotics to control infection has been elaborated.

Conclusion

All peri-orbital foreign bodies which might appear to be superficial and tempt a surgeon to pull it out must be subjected to radiological imaging before taking into the OR. Although an intra-orbital presence of a wooden foreign body is common, wooden foreign bodies in the orbit extending to the intracranial space are uncommon and may appear trivial and the evidence of intracranial extension requires a high suspicion and may not be identified until Radiological investigations are done early.

Fig 1 A,B,C,D

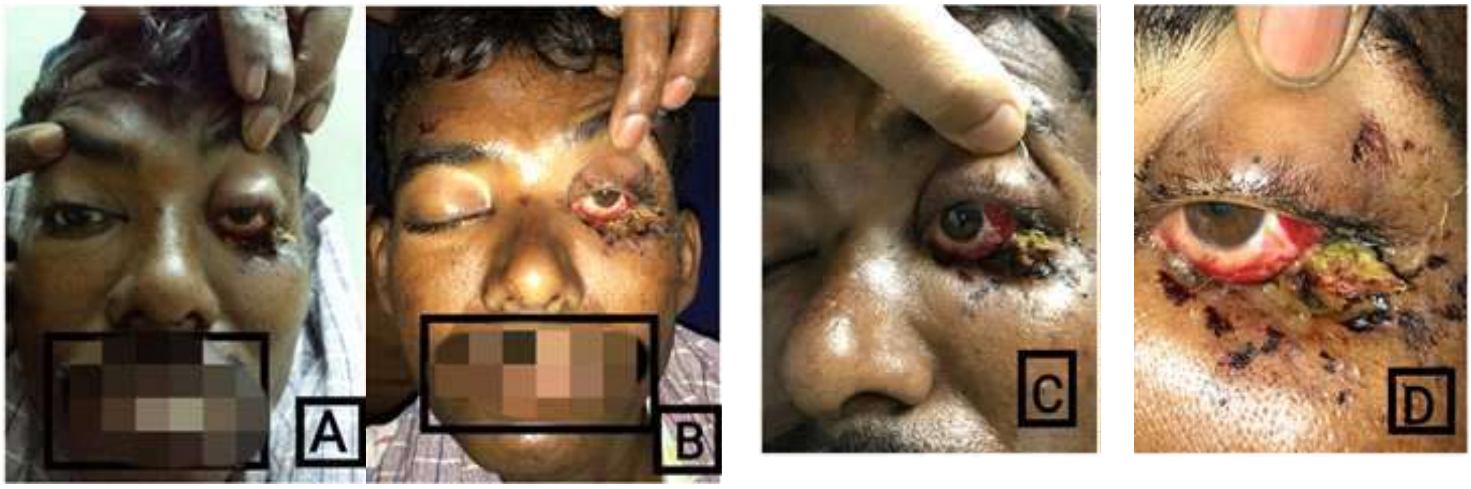

Fig 1 A,B,C,D

Fig 1A and Fig 1C-Protruding wooden foreign body from the infero-temporal region of the left orbit as depicted.

Fig 1B and Fig 1D- demonstrate dispersed subconjunctival haemorrhage and a fixed non-reacting pupil.

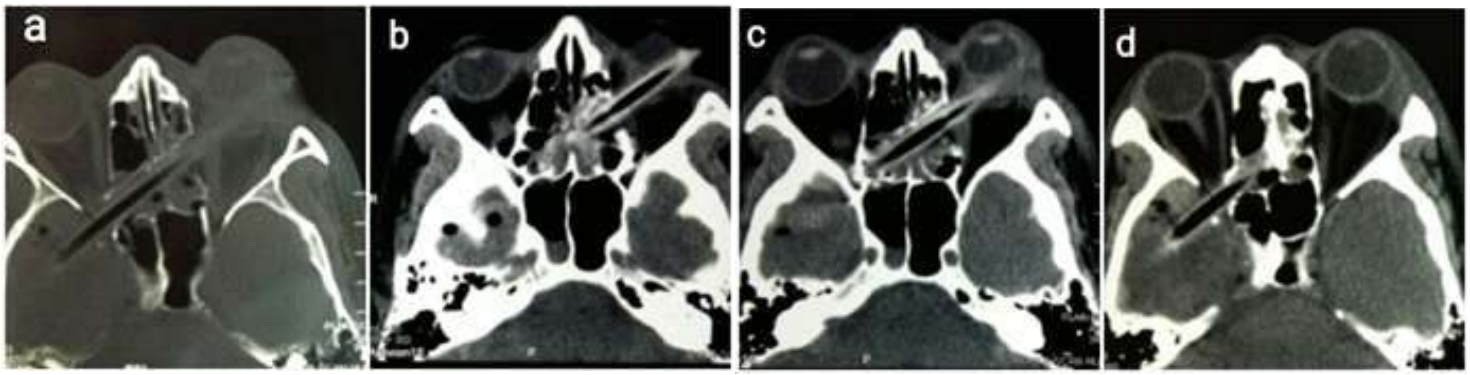

Fig 2a- The CT orbit report revealed that a large 11cm *0.5 cm wooden foreign body

Fig 2b - entry wound from left infero- temporal orbit had severed retro-orbital part of left optic nerve.

Fig 2c – the foreign body entering the posterior aspect of right orbital cavity via the ethmoidal sinuses.

Fig 2d – the foreign body severing the right optic nerve in the immediate extraconal compartment and lodged deep into the right temporal lobe of intracranial cavity.

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Skew Deviation and Isolated Superior Rectus Palsy: An unusual Neuro-Ophthalmic Presentation of Thalamic Infarction

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Abstract

Aim:

To highlight the importance of comprehensive neuro-ophthalmic evaluation in identifying central nervous system causes of binocular diplopia and vertical strabismus.

Methods:

A 41-year-old male with a known history of Protein C deficiency and prior percutaneous transluminal coronary angioplasty presented with acute onset binocular diplopia and dizziness, worsened on up-gaze. Clinical examination included best-corrected visual acuity assessment, ocular motility testing, and complete neuro-ophthalmic evaluation.

Results:

Ophthalmic examination revealed normal visual acuity in both eyes, abnormal head posture, and a right hypertropia. A detailed clinical neuro-ophthalmic evaluation findings were consistent with left superior rectus palsy and right skew deviation. MRI of the brain revealed a right thalamic infarct. The patient was referred for urgent neurological and cardiac evaluation and managed symptomatically with Fresnel prisms to relieve diplopia.

Conclusion:

This case underscores the critical role of detailed clinical neuro-ophthalmic examination in identifying central neurological causes of vertical diplopia. Even isolated ocular motor deficits can reflect serious intracranial pathology, necessitating prompt imaging and systemic evaluation.

Introduction

Acute onset dizziness and visual disturbances can be debilitating symptoms, often necessitating a thorough neuro-ophthalmic evaluation to identify the underlying etiology. While peripheral vestibular disorders are common causes of dizziness, central nervous system lesions, particularly those affecting the brainstem or cerebellum, can manifest with similar yet distinct oculomotor abnormalities.

We present the case of a 41-year-old male who presented with acute dizziness exacerbated on up gaze and binocular diplopia. His medical history, notable for Protein C deficiency and a past percutaneous transluminal coronary angioplasty, raised suspicion of a thrombotic event. This case report details the comprehensive diagnostic workup, which ultimately led to the diagnosis of a right thalamic infarct causing left superior rectus palsy with skew deviation, underscoring the critical role of timely neuroimaging in such presentations.

Materials and methods

A 41-year-old male presented to our facility with acute onset dizziness and abnormal vision. The dizziness increased on up-gaze.

His past history revealed percutaneous Transluminal Coronary Angioplasty 13 years back (records unavailable). He is a known case of Protein C deficiency. He was a not hypertensive or diabetic.

A detailed neuro-ophthalmic examination protocol was set and was done in the following order

1. Vertical diplopia confirmation
2. Cover test/ cover- uncover test
3. Alternate prism cover test
4. Park's 3 step test
5. Diplopia charting
6. Double maddox rod test
7. Fundal torsion test
8. Alternate prism cover test in supine position

Results

An ocular examination revealed BCVA to be 6/6 in each eye with **binocular vertical diplopia.**

Abnormal head posture with head tilted to left and a left face turn was noted.

Cover Test (CT) and Uncover Test (UCT) revealed R/L (right hypertropia or left hypotropia) – Indicating the possibles

1. over-action of right elevators (Right Superior Rectus R-SR/ right Inferior Oblique R-IO) or left depressors (left Inferior rectus L-IR or left superior oblique L-SO)
2. Under-action of right depressors (right inferior rectus R-IR or right superior oblique R-SO) or left elevators (left superior rectus L-SR/left inferior oblique L-IO)

❖ ***Alternate Prism Cover Test (APCT)*** with 9 gaze and right and left tilt (in Prism Diopters) as shown in Fig. 1

R				L
	8	14	**18**	
	8	12	14	
	8	10	14	
	8		16	

Figure 1: APCT values in Prism Diopters in all 9 gazes and right and left tilt

This Indicates

1. Maximum measured vertical deviation in left up-gaze- indicating the possible Under-action of left elevators- L-SR or L-IO right depressors- R-IR or R-SO
2. Increased measured deviation in head tilt- indicating the need of park 3 Step test

Park's 3 Step test

Step 1: Right hypertropia (RHT) of 12 PD in primary gaze - could be under-action of R- IR, R-SO, L-SR or L-IO

Step 2: RHT worsens on left gaze (18 PD)- could be under-action of R-SO or L-SR

Step 3: RHT worsens on left head tilt (16 PD)

Indicating **left SR under-action**

Diplopia charting:

(with red coloured glasses in front of right eye) as shown in Fig 2

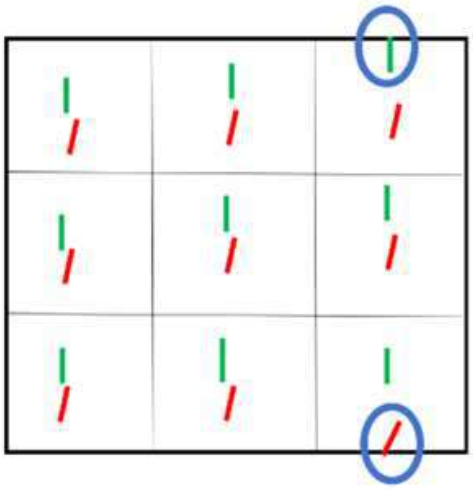

Figure 2: Diplopia charting with vertical slit and Red filter in front of right eye and green in front of left eye These reveal, left maximum vertical separation in levo-elevation and levo-depression indicating

With green being displaced up- **left SR under-action**

With red being displaced down- **Right SO under-action**

❖ ***Double Maddox rod test***

indicated 10-15 degrees of Right intorsion (it should have been extorted in R- SO underaction)

❖ ***Fundus evaluation for torsion***

showed right eye in +2 intorsion and left eye in +2 extorsion indicating **skew deviation** rather than R-SO under-action

❖ ***Supine position deviation measurement***

(for skew deviation confirmation)

On Supine position, the RHT decreased (8PD) confirming **Skew deviation.**

A diagnosis of **Left Superior rectus palsy with Right skew deviation** was made after a complete clinical neuro-ophthalmic evaluation as explained MRI revealed Right Thalamic Infarct. Patient was referred to neuro sciences department and cardiac department for timely intervention.For temporary ophthalmic symptomatic relief, patient was prescribed Fresnel prisms and kept on close follow up.

Discussion:

This case presents a compelling neuro-ophthalmic challenge in a 41-year-old male with a complex medical history, highlighting the interplay of vascular risk factors and precise neurological localization. The acute onset of dizziness and abnormal vision, particularly the increase in dizziness on up-gaze, immediately pointed towards a posterior fossa or brainstem pathology. The comprehensive neuro-ophthalmic examination, meticulously detailing binocular diplopia, abnormal head posture, and specific ocular motility defects, was crucial in narrowing the differential diagnosis.

The presence of binocular diplopia, increasing in left up-gaze and right head tilt, strongly suggested a restrictive or paretic strabismus. The Parks 3-step test, a cornerstone in diagnosing vertical strabismus, initially pointed towards a left superior rectus under-action. This was further supported by diplopia charting. However, the subsequent finding of 10-15 degrees of left torsion on Double Maddox rod test, confirmed by fundus evaluation, added another layer of complexity. Ocular torsion is a hallmark of lesions affecting the otolith-ocular pathway, which integrates vestibular signals with ocular motor control.

A pivotal diagnostic step was the observation of 8 PD of right hypertropia in the supine position. This finding, crucial for differentiating skew deviation from trochlear nerve palsy, suggests a skew deviation rather than an isolated superior oblique palsy. Skew deviation is a vertical misalignment of the eyes caused by supranuclear lesions affecting the brainstem, cerebellum, or vestibular pathways, often in association with ocular torsion and head tilt, forming the ocular tilt reaction (OTR)[1,3]. Unlike a trochlear nerve palsy, which typically shows no change in vertical deviation with head position, skew deviation often demonstrates a decrease in vertical deviation in the supine position (upright-supine test)[3]. The patient's presentation with a combination of left superior rectus palsy with right skew deviation, and cyclotorsion aligns well with the concept of an OTR, indicating a disruption of the vestibular-ocular pathways.

The definitive diagnosis of left superior rectus palsy with skew deviation, ultimately attributed to a right thalamic infarct on MRI, underscores the intricate neuroanatomy involved. Thalamic lesions, particularly those involving the paramedian region or extending to the midbrain, can manifest with a variety of ocular motor abnormalities, including isolated superior rectus palsy and skew deviation[1,2]. The interstitial nucleus of Cajal (INC) in the rostral midbrain tegmentum plays a crucial role in vertical gaze control and the generation of the OTR[1,2]. Unilateral superior rectus palsy can rarely be caused by a contralateral midbrain infarction, because fibres from the subnucleus subserving the superior rectus decussate within the oculomoter nerve complex. In this case the crossing fibres toward the contralateral superior rectus may have been selectively involved by a tiny lesion in the area of the oculomotor nucleus[5,6]

The patient's past medical history of Protein C deficiency is highly relevant. Protein C is a natural anticoagulant, and its deficiency is a known risk factor for thrombotic events, particularly venous thromboembolism[4]. While its association with arterial thrombosis, including ischemic stroke, is less definitively established in adults compared to children, case reports and some studies suggest an increased risk, especially in younger patients or those with additional risk factors[4].

Management of acute stroke involves timely intervention, which necessitated referral to neurosciences and cardiology. For symptomatic relief of diplopia, Fresnel prisms were prescribed. Fresnel prisms are a practical temporary solution for diplopia, especially in cases of evolving or unstable deviations, as they can be easily applied to existing spectacle lenses and adjusted as the deviation changes[7]. They provide immediate relief by shifting the image seen by one eye, thereby fusing the two images and restoring single binocular vision, albeit with some visual degradation due to the prism's inherent properties[7].

This case emphasizes the importance of a detailed neuro-ophthalmic examination in localizing neurological lesions.

Conclusion

This case highlights how a detailed neuro-ophthalmic exam can pinpoint neurological issues. Following a proper clinical neuro-ophthalmic protocol helped us cinch the diagnosis in a timely fashion.

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Intravitreal injections for retinopathy of prematurity: Surgical technique:

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Background:

Retinopathy of prematurity (ROP) is the leading cause of childhood blindness worldwide. [1] Intravitreal anti-vascular endothelial growth factor (Anti-VEGF) therapy is considered the first line of treatment in the management of zone 1 ROP and aggressive ROP (A-ROP). Bevacizumab (off-label use) is sill considered to be the best drug in the management of ROP. Ranibizumab[2] is the first food and drug administration (FDA) approved anti-VEGF agent followed by aflibercept (Eylea) in the management of ROP. [3] Anti VEGF therapy is associated with improved structural and functional outcomes. Though it is technically a simple procedure compared to laser photocoagulation, it is not free of complications which includes lens injury, displacement of lens, retinal injuries resulting in retinal tears, retinal detachment, scleral perforation and endophthalmitis partly owing to the unconventional technique and non-operation theatre setup while injecting in neonatal intensive care unit (NICU) at times.[4]

Technique:

The technique of intravitreal injection for adult population is standardized to ensure safe and adequate drug delivery. However, standardized guidelines for anti-VEGF administration in ROP are lacking.

An informed written consent is obtained from the parents after explaining the need for the procedure, the possible outcomes and the complications associated with the procedure.

In our practice, injections are preferably performed in the operation theatre except in babies who are ventilator/ oxygen dependent and cannot be shifted out of the NICU. Adequate aseptic precautions are taken in such a setting. We perform bilateral simultaneous injections in most of the cases whenever the therapy is required in both the eyes. We consider sequential treatment in babies with conjunctivitis in resolution phase if the treatment cannot be delayed further after explaining the risks and benefits to the parents. Topical proparacaine followed by 5% povidone iodine eyedrops are instilled twice, once in the operation theatre shifting area and the second time before shifting into the operating room. An intravenous access is secured. The instruments and drugs required for resuscitation, endotracheal intubation, ventilation are kept handy as a precautionary measure. A standby anesthetist monitors the pulse rate, oxygen saturation and blood pressure.

The vial is cleaned with alcohol swab (figure 1a). The drug is loaded in a 1 ml syringe from the vial (figure 1b). 0.025 ml (1 unit on insulin syringe) of drug is transferred to a hypodermic syringe (insulin syringe) with an integrated 32 G 4 mm thin-walled stainless steel needle (figure 1c). In our practice, the procedure is performed under topical anesthesia with the eye anesthetized topically with 0.5% paracaine. The baby is swaddled with a warm towel and the head of the baby is stabilized by an assistant to avoid inadvertent head movement during the procedure. Operative field of both the eyes is cleaned with betadine 10% solution. An eye body towel with a small opening is used to drape the operative field of one eye. An Alfonso eye speculum is used to keep the lids apart. A caliper is used to mark the site of injection 1.0 mm posterior to the limbus. The globe is stabilized with a cotton bud. The needle is introduced through the sclera parallel to the visual axis to avoid lens touch and the drug is injected (figure 1d). Once the needle is removed, 5% povidone iodine drops are instilled and the eye is patched. Similarly, the procedure is repeated in the fellow eye. It is important to remember that there should be a separate set of instruments for each eye.

The eye patch is removed the next day and topical antibiotic (Tobramycin) eye drop is prescribed for 1 week. The babies are reviewed within three days to look for any evidence of infection.

Discussion

Intravitreal anti-VEGF therapy being the mainstay of treatment in A-ROP needs a standardized protocol describing the technique considering the medicolegal issues associated with it. Beck et al described SAFER-ROP which states a safe and dependable protocol for intravitreal injections in ROP. It includes (S) short needle (4-mm length), (A) antiseptic/ antibiotic (5% to 10% topical betadine), (F) follow-up (48 to 72 hours post-injection), (E) extra attention to detail (clean environment, injection site 0.75 mm to 1.0 mm posterior to limbus), and (R) recheck (1 to 2 weeks following injection and until mature vascularization or laser).[5] Wright et al described the use of 4 mm needle with small volume syringe (0.5-1cc) inserted 0.75 mm to 1.0 mm posterior to the temporal limbus and stated this technique allows for optimal control and avoidance of incorrect volume delivery.[6] Islam et al described a technique of 'tape, fix and inject' to avoid inadvertent

head movement by fixing swaddled baby's head and body with adhesive tape strips to the operating table.[7]

Conclusion

Use of short needle (4mm) with a small volume (0.5-1cc) syringe, injection site at a distance of 1mm posterior to the limbus and introduction of needle parallel to the visual axis during the injection prevents most of the adversities and provides optimum results.

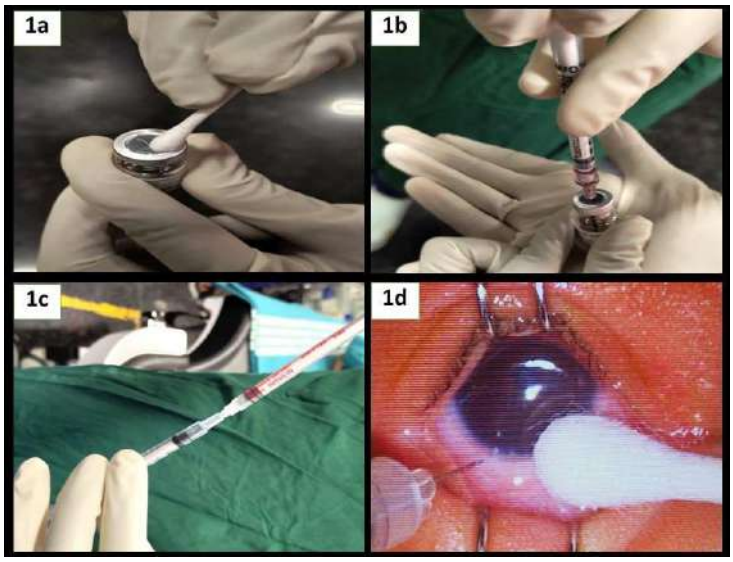
Figure legends:

1a: Photograph showing cleaning of the vial with cotton bud soaked in alcohol.

1b: Photograph showing the loading of drug from the vial into a 1ml syringe.

1c: Photograph showing the drug transfer to the insulin syringe.

1d: Photograph depicting the injection of drug.



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Descemet's Detachment : Diagnosis & Management

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Abstract

Descemet membrane detachment (DMD) is a rare but potentially visually significant complication of intraocular procedures such as cataract surgery, glaucoma surgery, and penetrating keratoplasty. Small detachments are usually self-healed and need no intervention, but large detachment can be persistent and detrimentally affect patient's visual acuity due to the development of corneal edema. Anterior segment optical coherence tomography (AS OCT) has been used to confirm and classify DMD and can also aid in deciding the management plan. Small and peripherally located DMD are often managed conservatively, but large (2mm or more) and central DMD require surgical intervention. Descemetopexy is preferred intervention for the management of DMD. Prompt diagnosis and timely management often leads to a good visual outcome.

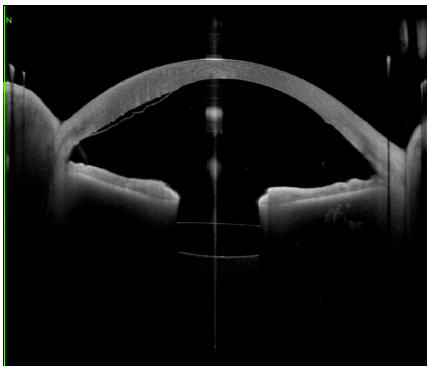
Introduction

Descemet's membrane (DM) is the basement membrane of corneal endothelium, and helps keep the endothelial monolayer in place to maintain corneal clarity.[1] When it is detached, the corneal stroma loses its endothelial pump, resulting in severe corneal oedema and, at times, irreversible bullous keratopathy and loss of vision.[2] A high index of suspicion is required to look out for Descemet's membrane detachment in prolonged or nonresolving corneal oedema after intraocular surgery. On slit lamp examination DMD is usually seen as a translucent membrane in the anterior chamber, at the site of corneal incision or DM perforation. It presents early as localized or diffuse corneal edema over the area of DMD and later progresses to persistent corneal edema (>2 weeks). A double anterior chamber might also be seen in cases with central and extensive DMDs.[3] Anterior segment optical coherence tomography is a very useful tool for the diagnosis of DMD, and for guiding subsequent treatment and monitoring.[1,4] Early surgical intervention should be considered for scrolled, extensive and sight-disabling DMD. Pneumodescemetopexy is an effective method to repair DMD.[4]

Surgical technique :

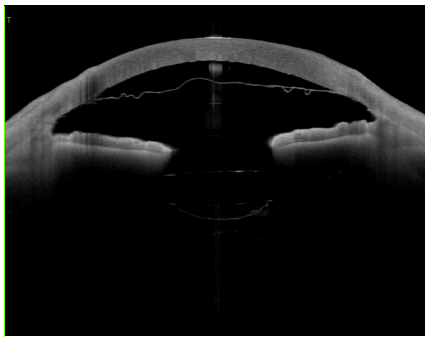
DMD was evaluated on ASOCT for its location, configuration, and extent along with areas where DM was attached. procedure was done in the operating room using a surgical microscope. A prior informed consent was obtained from the patient. The surgical procedure of pneumodescemetopexy was performed under a low dose, 5.0 ml; of lignocaine hydrochloride 2% inj. (Lo × 20 mg/ml Neon Laboratories, India). The eyelid skin was cleaned with povidone-iodine. The eye was draped and cleaned using aseptic measures. One drop of povidone iodine solution (5%) was instilled into the conjunctival sac. The ocular surface was exposed by using a Barraquer eye speculum. The conjunctival sac was irrigated with Ringer's lactate solution to wash off the povidone solution. Descemetopexy was performed using intracameral air (100%) injection. The air was injected at the limbal site where the cornea was relatively compact and Descemet membrane appeared apposed. A 30-gauge needle was introduced with the bevel down, some aqueous was released by gently pressing the entry wound with needle. Direction of injection was from attached DM to detached area. Position of the needle tip was adjacent to the plane of the detached Descemet membrane, and slow injection of air was attempted to tamponade Descemet membrane. The needle was then gently withdrawn and the site of entry sealed with a surgical sponge for 1 minute to prevent the air from escaping. In all eyes, complete air fill of the anterior chamber was targeted and a supine position was maintained for 15 to 20 minutes, similar to the practice when attaching a posterior lamellar graft in endothelial keratoplasty. After 15 to 20 minutes, partial, controlled release of air was performed in all eyes to maintain an air fill of approximately two-thirds of the anterior chamber. One drop of tropicamide and phenylephrine was instilled to prevent pupillary block in the immediate postoperative period. Patient was instructed to be in supine position for next 2 hours. Post operative medications included topical moxifloxacin 0.5% (5 mg/mL) eye drops (Vigamox, Novartis India Ltd.) four times a day, prednisolone acetate 1.0% eye drops (Predforte, Allergan India Pvt. Ltd.) four times a day, homatropine 2% w/v eye drops (Homide, Indico Remedies Ltd., India) two times/day and oral acetazolamide 250 mg(capsule Avva SR 250, INTAS) stat followed by twice a day for 3 days. The patients were examined postoperatively at 1 day, 1 week, and after 4 to 6 weeks. Visual acuity measurement, slitlamp examination, intraocular pressure (IOP) assessment and ASOCT were performed at each visit.

Figure 1.



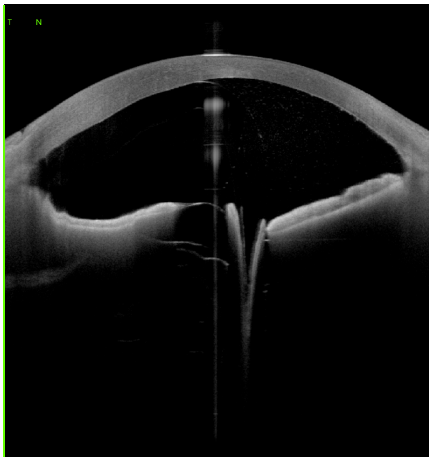
ASOCT radial section image showing small peripheral DMD, spontaneous reattachment is possible.

Figure 2.a



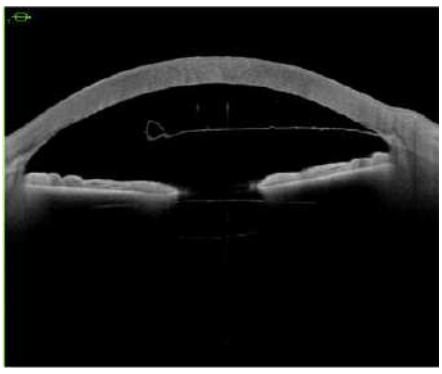
ASOCT radial scan showing Total DMD, before pneumodescemetopexy

Figure 2b.



After Pneumodescemetopexy, complete reattachment of DM along with air bubble in situ.

Figure 3.



ASOCT radial scan showing Complex Total DMD with scroll.

Discussion :

DM and corneal endothelium play a pivotal role in maintaining corneal clarity. DMDs usually occur as aqueous enters the predescemetic space along a tear in the DM, created by a corneal incision or trauma During ocular surgeries.[5] Corneal edema appears over the area of DMD and bullous keratopathy may occur, if not managed appropriately.[2] There have been several attempts at classifying DMD based on pathology, clinical features, and imaging techniques.[1,6] Kumar et al, introduced an algorithm that classified DMD based on AS-OCT imaging parameters. The classification is made according to the height and length of the detachment, as well as the area affected and whether it involves the pupil.[1] Mackool and Holtz distinguished between planar and non-planar DMD based on the degree of separation in the detached membrane. A planar DMD, with less than 1 mm of separation (Figure 1), typically reattaches on its own and has a more favorable prognosis compared to non-planar DMD, which has a separation greater than 1 mm and usually requires surgical management.[6] Surgical repair aims to reapproximate the DM against the stroma using a tamponading agent until it adheres. Currently, Descemetopexy, injection of gas/ air into anterior chamber, to reposit the detached Descemet's membrane, is well accepted for the management of post-cataract surgery DMD due to its ease of execution and subsequent good outcomes.[7,8] The success rates with intracameral injections have been reported to be 90– 95%. Tamponading agents successfully used for this purpose include 100% air, sulphur hexafluoride (15– 20% SF6), and perfluoropropane (12–14% C3F8). SF6 and C3F8 with their longer resorption time were selected for cases of failing reattachment with air or of detachment for a prolonged period of time.[9] Advantage of isoexpansile gas is longer tamponade, Disadvantage is that it can cause pupillary block and secondary glaucoma.[10] We use air bubble for our cases as first line of option (Figure 2a,2b) and use isoexpansile gas only in complicated cases (figure 3). Removal of predescemetic fluid along with pneumo-descemetopexy has been used to attach DMD. We did not perform the removal of predescemetic fluid in our case. Liu et al described a technique to reattach the DMD, following cataract surgery, they ejected aqueous humor completely by decompressing clear corneal entry incision that allowed apposition of the cornea to the iris for approximately 3 s followed by Sterile air is injection through a paracentesis 180 degrees away from the DMD, to maintain a complete air-filled chamber for 20 minutes.

This procedure ensured, the fluid in the space between the stroma and DM is ejected prior to air tamponade that increases the success rate, disadvantage is that it caused addition endothelial cell loss.[11] In our technique we plan the air injection in slow and controlled manner from the attached DM towards the detached part that facilitates removal of predescmatic fluid as air starts pushing the detached part towards corneal stroma and complete air fill maintained the attachment of DM with overlying stroma for 20 minutes. Advantage of Pneumodescmetopexy is that it caused minimal endothelial layer trauma. Disadvantage of this procedure is that it would not be helpful in complex and scrolled dm detachments. Sharma etal published a novel surgical approach, double-bubble pneumo-descemetopexy. The surgical procedure included unrolling of DM with small air bubble and descemetopexy with big bubble. Benefit of this procedure it that it allowed unscrolling of DM prior to air tamponade and can be used in cases of subtotal scrolled DM detachment where air injection alone may not achieve anatomical success.[12] Sutures may be used in rare large DMD.[13] Air tamponade with venting incisions have been used for recurrent dmd with variable success. If all the mentioned interventions fail, endothelial keratoplasty may be needed to restore vision.

Conclusion

pneumo-descemetopexy, is a simple and effective approach to manage DMD following cataract surgery, provides satisfactory anatomical and visual outcome.

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Toric IOLs in Private Practice

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Abstract

Toric intraocular lenses (IOLs) have become a boon in modern day cataract surgery, addressing pre-existing corneal astigmatism and significantly improving visual outcomes. For ophthalmologists in private practice, the adoption of toric IOLs not only raises the standard of clinical care but also enhances patient satisfaction and strengthens practice differentiation. This article outlines the clinical rationale, workflow integration, and strategic advantages of toric IOLs in a private Ophthalmic setting.

Introduction

Cataract surgery is now refractive surgery in which we are able to offer correction of pre existing astigmatism to our cataract patients. Toric IOLs serve as an effective modality to correct corneal astigmatism intraoperatively, leading to enhanced unaided vision and reduced postoperative spectacle dependence. Today's patients understand these nuances of vision correction during cataract surgery when we are able to show them through various tools as to how a toric lens will improve their vision as compared to a non toric offering.

In private practice, where patient satisfaction and outcomes directly influence reputation and revenue, toric IOLs are more than a clinical tool—they are a strategic differentiator.

The Prevalence of Astigmatism in Cataract Patients:[1]

Astigmatism is prevalent in a large proportion of cataract patients. A study by Hoffman et al. (JCRS 2010) reported the following:

- **56.7%** had corneal astigmatism >0.7D
- **40.5%** had >1.0D
- **73.7%** had ≥0.5D

These numbers highlight the necessity of routinely addressing astigmatism during cataract surgery. Leaving corneal astigmatism uncorrected leads to suboptimal visual outcomes and dissatisfaction in otherwise uneventful surgery.

Traditional teaching has been to correct only higher degrees of regular astigmatism with toric IOLs. However, we now know that toric IOLs can be offered to low astigmatism patients and sometimes to patients with irregular astigmatism as well.

Low Astigmatism[2,3]

- Even **0.75D** of astigmatism can impact quality of vision, especially in patients with high expectations or those opting for monovision/multifocal strategies.

Irregular Astigmatism[4]

- Mild central irregularity may still benefit from toric correction after optimizing ocular surface.
- Toric IOLs can be used in irregular astigmatism with a regular central component, with better refractive outcomes when compared to using a monofocal IOL alone for these patients.

Patient Selection and Preoperative Evaluation

Proper patient selection and meticulous pre operative evaluation leads to successful outcomes as follows:

1.History and Prior Prescriptions

- Elicit history of spectacle and contact lens wear in younger age.
- Review old spectacle prescriptions for existing cylindrical corrections.

2. Slit Lamp Examination

- Evaluate the **ocular surface**, particularly for **dry eye disease**, which can alter keratometry.
- Grade the **cataract** and ensure clear visualization of anterior segment anatomy. CL users need to delay keratometry and biometry(soft CL wearers after 1 week of discontinuing and rigid CL wearers after 2 weeks of discontinuing CL)

- Look for presence of pterygium and degenerative peripheral corneal lesions- these may give rise to irregular astigmatism.
- Meibomian gland dysfunction and Dry Eye Disease may confound our measurements . these need to be managed adequately prior to keratometry and biometry.

4. Pupil Size

- Measure pupil diameter both before and after instilling mydriatic eye drops. This is to know pupil status in case patient opts for a toric trifocal or toric extended depth of focus (EDOF) implant and also to plan surgery in cases of small pupil to utilize pupil expansion devices to ensure proper visualization of toric markings on the IOL during surgery.

Biometry and Imaging

Accurate measurements are critical for selecting the correct toric IOL and determining alignment.

1. Keratometry

- Needs to be measured with at least 2 different devices: commonly used devices being manual keratometer (e.g Bausch and Lomb, Javall's), auto-refracto-keratometer(Topcon, Nidek), optical biometer (Lenstar LS 900, IOL Master 700) and corneal topographer/corneal tomographer (Sirius Plus, Pentacam HR).
- We should look for agreement in K values between 2 devices. If there is poor agreement, then repeat measurement after lubricant eye drops or after MGD therapy, depending on the situation, is warranted.

Bausch and Lomb manual keratometer.

Topcon Auto- Refracto- Keratometer.

2. Optical Biometry

- Optical biometers like the IOLMaster 700, Lenstar_LS 900, Argos or Tomey optical biometer provide accurate axial lengths and keratometry. Measurements should be taken **before** using any drop on the eye.

Lenstar LS-900 Optical Biometer by Haag-Streit

Zeiss IOL Master 700

3. Corneal Topography/Tomography

- Essential for detecting **irregular astigmatism** and evaluating posterior corneal curvature. Also, aids in biometry in keratoconus and other degenerative corneal disease.

Sirius Plus Corneal Tomographer.

Pentacam HR Corneal Tomographer.

Toric IOL Power Calculation

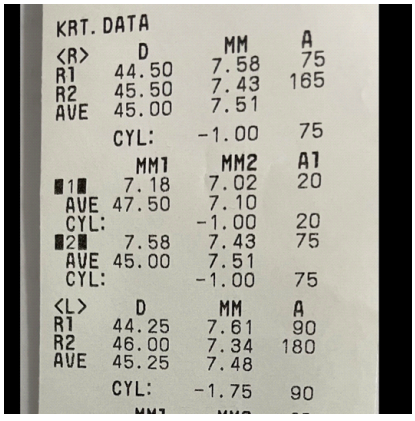
This can be done on the optical biometer being used.

In case immersion biometry is done, then the online toric calculator of the manufacturer may be used. Most online calculators use the Barrett toric calculator and we may choose to include posterior corneal astigmatism while performing the IOL power calculation.

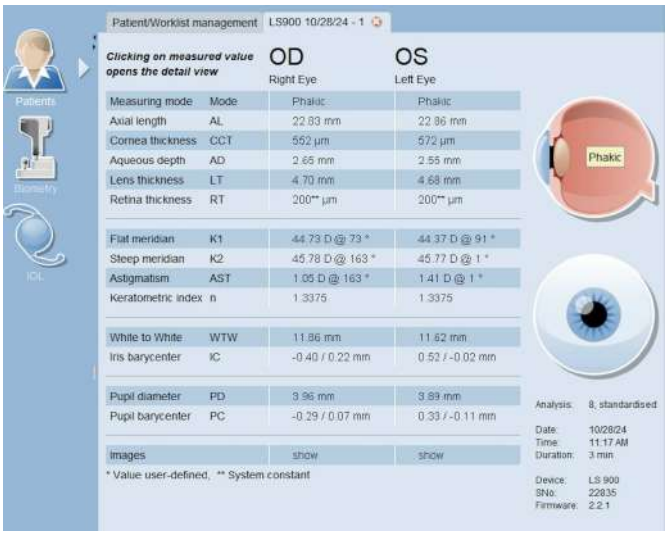
Case Examples:

1.Agreement between devices:

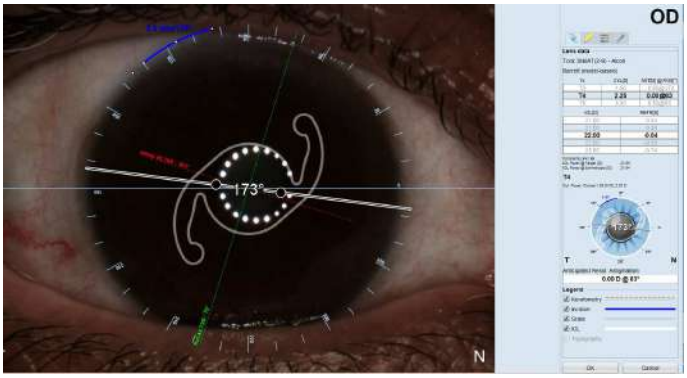
68 year old lady with immature cataract in right eye, had 1D corneal astigmatism on the auto refracto-keratometer.



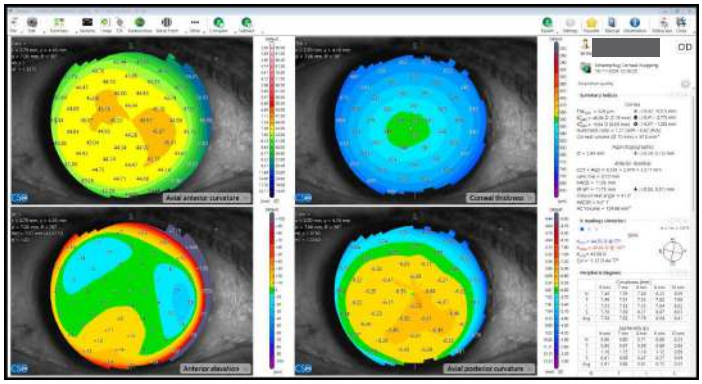
➢ The Lenstar LS 900 shows the same astigmatism.



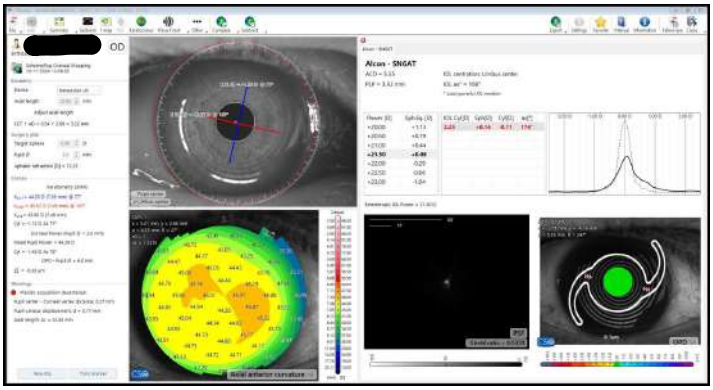
➢ It is useful to spend chair time with the patient and show them their toric calculation sheet



Corneal tomography shows regular astigmatism of 1.1D.



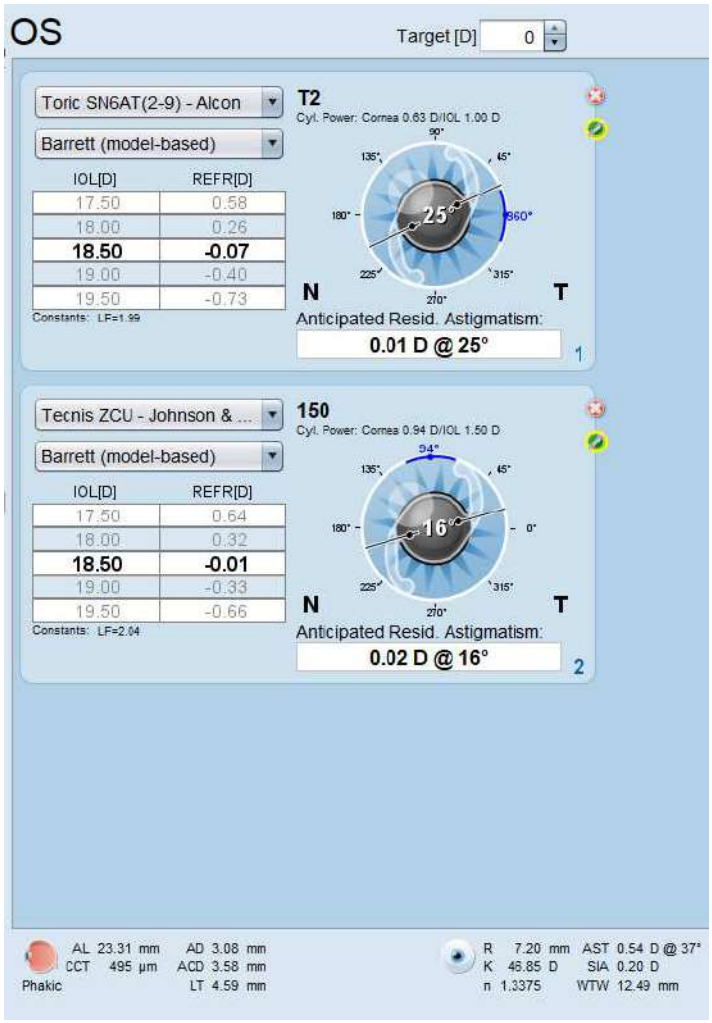
Tomographer also has a toric IOL suite for calculation



Thus, when we get close agreement between devices, such cases are good to proceed for toric IOL implantation.

2.Low astigmatism correction:

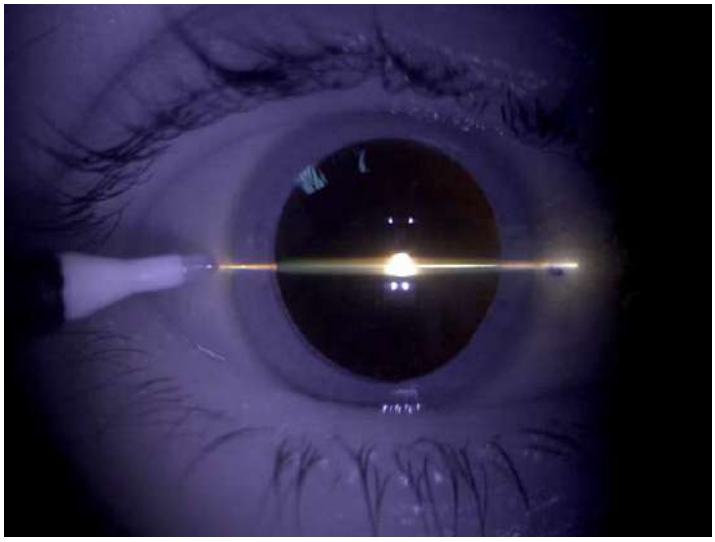
Coming to an example for low astigmatism correction, in this patient, pre exisiting corneal astigmatism of 0.54 D can be almost fully nullified using a toric IOL.



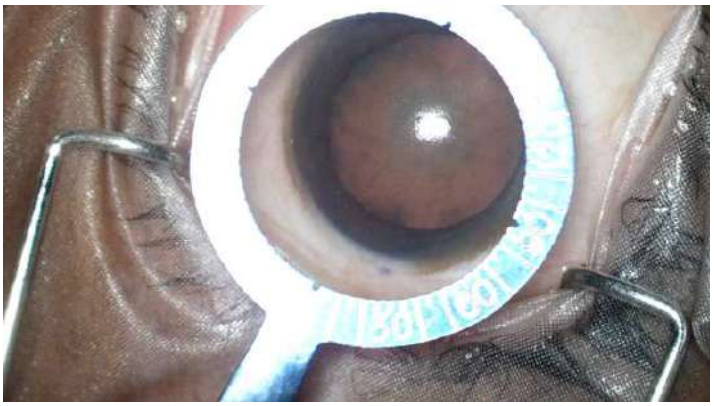
Surgical Technique

Preoperative Marking[6]

- The horizontal reference axis (0 and 180 degrees) is marked at the slit lamp with the patient in an upright position . This is to prevent cyclotorsional errors which happen when marking lying down.



IOL Insertion and Alignment: Video[5]



- During routine micro incision cataract surgery, after placing toric IOL in the bag, rotate the IOL gently into place, aligning with the planned axis.
- Remove viscoelastic thoroughly, especially from behind the IOL, to prevent post operative rotation.
- Confirm final positioning before concluding surgery.

Advantages in Private Practice

Incorporating toric IOLs brings multiple benefits to private ophthalmology practices:

- **Improved Patient Outcomes:** Achieving emmetropia or near-emmetropia enhances postoperative satisfaction.
- **Practice Differentiation:** Offering toric IOLs positions the clinic as a provider of advanced, personalized care.
- **Increased Revenue:** Toric lenses are typically premium offerings and add to the financial sustainability of the practice.
- **Stronger Referrals:** Satisfied patients lead to increased word-of-mouth referrals and positive online reviews.

Conclusion

Toric IOLs represent a powerful opportunity in private ophthalmic practice. Their ability to deliver precise refractive outcomes makes them essential in today's patient-centered model of cataract care. With meticulous patient selection, thorough preoperative planning, and careful surgical execution, toric IOLs can significantly improve patient satisfaction and elevate a practice's clinical reputation.

As expectations continue to evolve, embracing advanced technologies like toric IOLs will not just meet demand—but define excellence in modern cataract surgery.

1. Analysis of biometry and prevalence data for corneal astigmatism in 23 239 eyes

·Peter Christian Hoffmann, MD, Werner W. Hu¨ tz, MD

·Journal of Cataract & Refractive Surgery. 36(9):1479-1485, September 2010.

2. Visual performance in cataract patients with low levels of postoperative astigmatism: full correction vs spherical equivalent correction. Robert Lehman et al, Clin Ophthalmol, 2012

3. Assessing the astigmatism reducing effects of toric intra-ocular lenses in eyes with low astigmatism: randomised masked bilateral comparison. Heinert Julius et al, JCRS August 2023.

4. Effectiveness of toric intraocular lens implantation for correcting irregular corneal astigmatism in cataract eyes. Xiteng Chen et al , Nature scientific reports. Sci Rep. 2024 Apr 17;14:8868.

5. https://youtu.be/YdyTCcy7DUc

6. https://youtu.be/3qYaU6KxHPU

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Surgical Management of Glaucoma in Sturge Weber syndrome

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M.S Ramaiah Medical College, Bangalore

Introduction

Glaucoma presents in 30-70% of patients with Sturge Weber syndrome (SWS).[1]The two main mechanisms seen in SWS are malformation of the anterior chamber angle and an elevated episcleral venous pressure.

[2]An abnormal anterior chamber angle has been noted in these patients, such as a wider uveal meshwork, a ciliary muscle that is directly attached to the trabecular meshwork, an under-developed scleral spur, and an iris root that is inserted anteriorly.[3]Since the approach of combined deep sclerectomy and trabeculotomy alter the anterior chamber angle structures by gently peeling the cribriform trabeculum and Schlemm's canal dissection to facilitate better drainage, it is the most apt procedure for SWS.

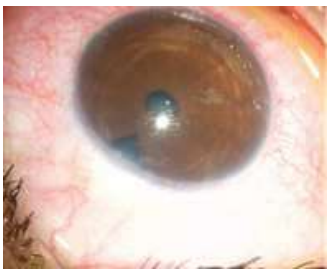
A patient with classical port wine stain and secondary glaucoma also known as bisymptomatic SWS (sturge Weber syndrome) presented with diminution of vision in right eye and raised intra-ocular pressures. On examination the visual acuity was measured at 6/6 in the right eye with refractive correction of -6.5 DS/ -1.50 DC @ 60^0 and 6/18 in the left eye. Anterior segment assessment of both eyes revealed corneal conjunctivalisation, relative afferent pupillary defect (RAPD), scleral thinning, buphthalmos with a corneal diameter of 14mm, and sensory exotropia in the left eye. Intra-ocular pressure (IOP) by applanation tonometry was elevated, measuring 36mmHg in the right eye and 32mmHg in the left eye. Gonioscopy showed open angles in both eyes. Fundus examination indicated a Cup disc ratio (CDR) of 0.8:1 in the right eye and CDR of 0.9:1 in the left eye, with nasalization of vessels in both eyes.

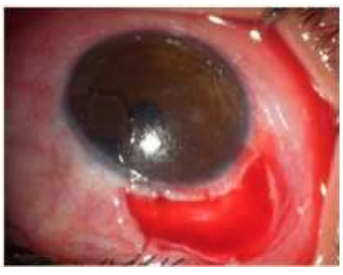
The patient underwent trabeculectomy with trabeculotomy surgery for both eyes. The IOP (intra-ocular pressure) post op was 16 mm of Hg in the right eye and she was on regular follow up. Over a period of one year her intra ocular pressure (IOP) progressive increased to 26 mm of Hg with a four-line decrease in visual acuity. Since it was the eye with better visual acuity, given its functional importance, immediate surgical intervention was undertaken. Trabeculectomy in Sturge-Weber syndrome (SWS) has a reported failure rate of up to 64%, even when augmented with mitomycin C, hence deep sclerectomy was done to enhance the likelihood of long-term pressure control.[4]A combined procedure of deep sclerectomy and repeat trabeculotomy was performed. Postoperatively, intra ocular pressure (IOP) was successfully lowered to 18 mm of Hg.

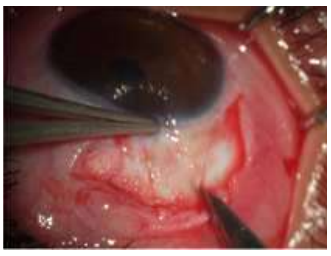
Final refractive error was -7.50 dioptric sphere (DS) of myopia with aided visual acuity of 6/9, which did not progress after one year of filtering surgery.

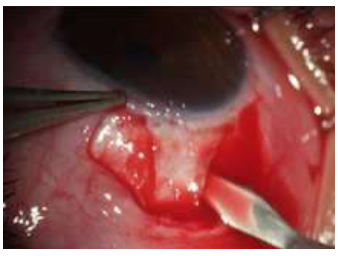
SURGICAL TECHNIQUE - Right eye deep sclerectomy with trabeculotomy in the supero-temporal quadrant was performed.

1) (Fig B) Conjunctival dissection -Under general anaesthesia a limbal-based conjunctival dissection was performed. The conjunctiva and Tenon's opened posteriorly, about 10 mm from the limbus, and an anterior dissection toward the limbus was performed.
2) Application of anti metabolite- Mitomycin C 0.02%, soaked in Merocel sponge.
3) Superficial scleral flap- (Fig C and D) a supero-temporal rectangular, one third thickness, 3 x 5 mm, with a 15° blade was created. Crescent blade used for flap dissection.
4) Deep scleral flap- (Fig E and F) The plane was advanced anteriorly, to identify the scleral spur and the canal of Schlemm. Very gently the cribriform trabeculum and Schlemm's canal were peeled with a sinskey hook and excised at its base.
5) Trabeculotomy was performed with Harm's trabeculotome.(Fig G)
6) Patency is confirmed with trypan blue dye. (Fig H)
7) Deep scleral flap excised. (Fig I)
8) Repositioning of flap- Superficial scleral flap repositioned with 10-0 nylon suture and conjunctiva sutured. AC formed with air. (Fig J, K and L).


A) Pre-op


B) Supero-temporal peritomy

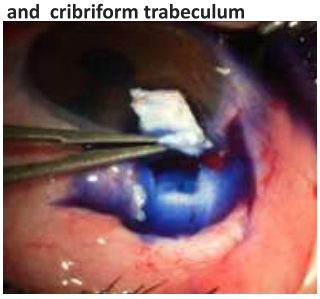

C) Superficial scleral flap marked


D) Superficial scleral flap raised

E) Raising deep scleral flap

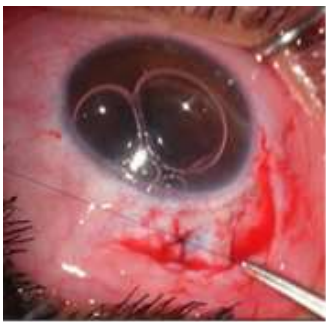
F) Gentle peeling of schlemms canal and cribriform trabeculum

G) Trabeculotomy done with Harm's trabeculotome

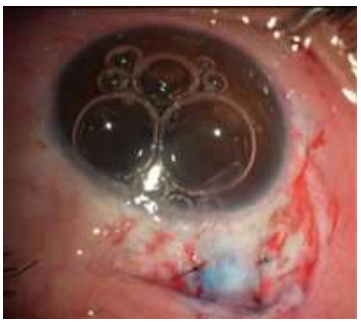


H) Tryphan blue dye used to confirm patency

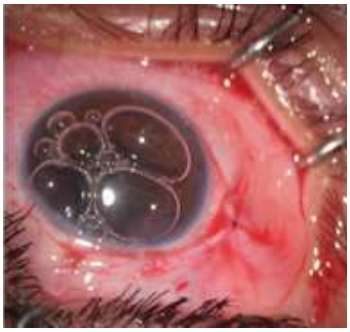
I) Deep scleral flap excised



J) Superficial scleral flap sutured and AC formed with air



K) 4 10-0 Nylon sutures places



L) Conjunctiva sutured

DISCUSSION

The treatment of patients with secondary glaucoma in SWS patients is extremely challenging and may be associated with devastating complications, such as choroidal effusions, retinal detachments, or severe hemorrhages. Since these patients are usually refractory to medical therapy, surgical management is the best option to control IOP. However, the disease can be refractory even to surgical management.

Glaucoma is one of the most challenging ocular manifestations of SWS. In all types of open-angle glaucoma, the main resistance to aqueous humour outflow lies at the level of the trabecular meshwork. Outflow can be dramatically improved by surgically removing this resistance.

In our case, trabeculectomy was the initial procedure of choice, as the left eye responded well with sustained intraocular pressure (IOP) control. However, the right eye failed to achieve adequate IOP reduction post-trabeculectomy, necessitating a subsequent deep sclerectomy.

We attribute the trabeculectomy failure in the right eye to the underlying Sturge-Weber Syndrome (SWS), due to its vascular malformations. These malformations can lead to bleb encapsulation, impairing filtration despite a patent ostium. The presence of port wine patch over the right side of the face, might have its bearing on the aqueous outflow. This risk is amplified in paediatric patients due to the presence of a thicker Tenon's capsule and a robust healing response, both of which contribute to increased postoperative fibrosis. Additionally, high myopia and secondary ocular changes, particularly those related to glaucoma-induced buphthalmos, can result in axial elongation and scleral remodelling, further complicating trabeculectomy outcomes.

Given these anatomical and pathological considerations, deep sclerectomy was selected as the preferred surgical approach for the left eye.

Deep sclerectomy offers the advantage of slow decrease in the intraocular pressure during the entire surgical procedure which prevent hypotony related complications and the non-penetration of the anterior chamber with avoidance of iridectomy reduces the postoperative inflammatory reaction. This reduces the changes in aqueous humour metabolism and maintains the anterior chamber depth and integrity of the lens.

CONCLUSION

Deep sclerectomy offers significant reduction in the postoperative complications, and decrease in long periods of medical treatment, making it the most suitable surgical technique for young patients with a clear lens in order to avoid any lens opacities and the need for secondary cataract extraction.

Trabeculectomy and deep sclerectomy are both preferred surgical options in the paediatric age group for managing glaucoma. However, the choice of procedure should be tailored to the individual patient's underlying condition and ocular anatomy, with treatment planned on a case-by-case basis. In some cases, combining both procedures or using one as a revision surgery following the failure of the other can yield optimal outcome.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s)/guardian has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patient(s) understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Panacea to the Impending Doom of CVI!

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Dear editor,

The two major entities cropping up in the newborns and high-risk babies today is ROP and CVI. Retinopathy of Prematurity (ROP) has received significant attention and efforts in recent years, and rightly so. However, it's concerning that Cerebral Visual Impairment (CVI) seems to be flying under the radar.

CVI is a significant cause of visual impairment in children, and its impact can be just as devastating as ROP, yet it receives less attention. Approximately 10% of the total number of the global estimate of ROP comes from India alone.[1,2] On the contrary, developing countries show a prevalence of CVI-related visual impairment in approximately 10 cases per 10,000 births.[3] In terms of the total number of blind person-years that contribute to global statistics, this comes in second only to cataract.[4] Given the high prevalence rates of CVI, it is crucial to raise awareness about CVI and dedicate resources to effectively address this pressing issue.

As practicing ophthalmologists in this fast-paced world the question that we need to ask ourselves and our collective conscious is, have we developed a simultanagnosia of being able to look only at cataract and ignore the slow-paced world of CVI? The burden is enormous and incremental.

The primary reason for the lack of attention towards Cerebral Visual Impairment (CVI) is not merely

ignorance but also a pathological loss of patience. Though poor financial returns could be a factor to reckon. Moreover, this ignorance stems from the fact that it is neither taught in curriculum to a student of Ophthalmology nor are they exposed to it clinically, leading to a lack of familiarity. Evaluation of CVI is a work of time and passion. Even then there aren't enough resources to evaluate and intervene.

So, what is the missing link? It is the future generation. Unfortunately, lack of awareness amongst teachers of future ophthalmologists in itself is the root cause for this impending doom. By addressing these gaps, we can work towards better recognition, diagnosis, and care for individuals.

But how can it be accommodated without overwhelming the already packed national curriculum? A proposed solution is to implement a 16-hour Value-Added Course (VAC) providing comprehensive, multidisciplinary exposure to CVI as tried and adopted by our institution. This VAC raises awareness and provides education not only to ophthalmology postgraduates but also to paediatric postgraduates, optometrists, psychologists, psychiatrists, speech therapists, physiotherapists, as well as students and consultants across these fields. This, in turn, promotes a multidisciplinary approach to effectively addressing CVI.

The structure of such a course would broadly include:

1. Didactic lectures on brain physiology and CVI

2. Introduction to functional vision concepts

3. Hands-on workshop on CVI behaviours and characteristics.

In today's world of shortcuts, let's leverage this to our advantage by implementing a VAC as a practical solution to bridge the knowledge gap; thereby making the stock holders aware of this entity which in itself will open doors to early diagnosis and intervention before it is too late.

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thank you

I sincerely thank all the young and dynamic reviewers for sparing their valuable time in reviewing the articles in a short span of time. I take this opportunity in requesting each one of you to continue your support in reviewing as well as getting your research work published.

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