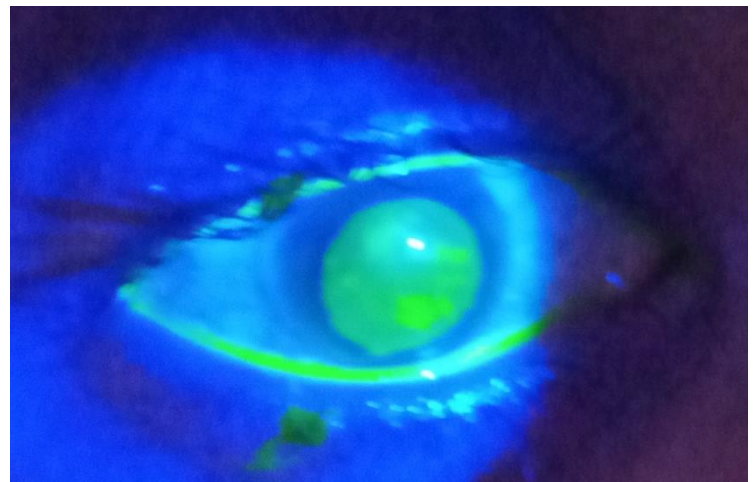
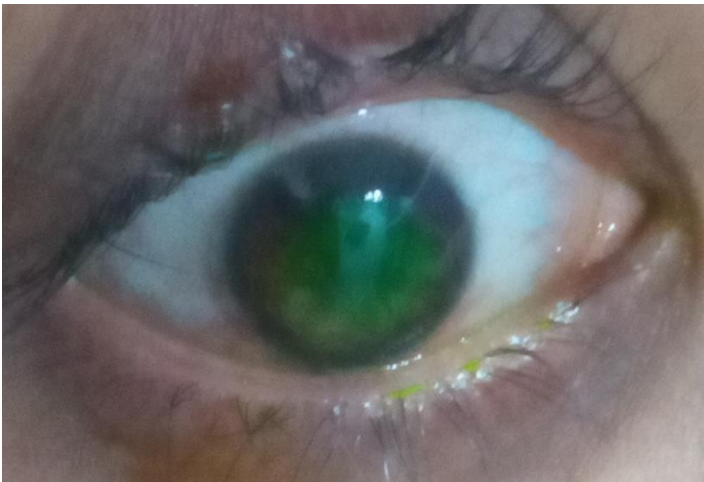


Journal of Ophthalmological Society of Assam (JOSA)



**Official publication of
Ophthalmological Society of Assam
www.osa.ind.in**



Vol 4, Issue 1, December 2020

Guwahati, Assam, India

OPHTHALMOLOGICAL SOCIETY OF ASSAM
Regd. No: KAM (M)/240/A 23/273 of 2010-2011
(Valid upto 02.04.2022)
(Life affiliated to All India Ophthalmological Society)



Executive Body (2019-2020)

President	Premeswar Nath
Vice President	Subhra Kinkor Goswami
General Secretary	Jayanta Kumar Das
Assistant General Secretary	Amarendra Deka
Treasurer	Kruto Kalita
Chairperson Scientific Committee (CSC)	Arundhati Borthakur
Chairperson Academic & Research Committee (ARC)	Biraj Jyoti Goswami
Editor Journal, Editor Proceedings, Webmaster	Madhurjya Gogoi
Members:	
Central Zone	Gopal Chandra Das
East Zone	Anup Jyoti Bora
North Zone	Sanjib Buragohain
South Zone	Haimanti Choudhury
West Zone	Dhrubajyoti Sarmah
Regional Institute of Ophthalmology, Guwahati	Pankaj Baruah
Silchar Medical College	Nilanjan Kaushik Thakur
Assam Medical College, Dibrugarh	Rajiv Kumar Das
Immediate Past President	Harsha Bhattacharjee
Immediate Past General Secretary	Rajendra Nath Gogoi
Immediate Past Treasurer	Arup Deuri

Website : www.osa.ind.in

Email : ophsoccassam1967@gmail.com

Journal of Ophthalmological Society of Assam (JOSA)

Volume 4 Issue 1 December 2020

Editor: Madhurjya Gogoi

Members, Editorial Board:

Arundhati Borthakur, Ex-Officio, Chairperson, Scientific Committee

Biraj Jyoti Goswami, Ex-Officio, Chairman, Academic and Research Committee

Editor, Proceedings , Ex-Officio

Advisors

Premeswar Nath, President

Harsha Bhattacharjee

Jayanta Kumar Das, General Secretary

CK Baruah

Dipali Deka J.J. Kuli

HK Choudhury

Ruma Das

Mitali Sandilya Borooah

Asish Deb

P.K. Goswami

Sandip Swapan Dhar

Narayan Bordoloi

Gautam Saikia

Reviewers

Cornea

Yogita Gupta

Kalyan Das

Jnanankar Medhi

Retina

Satyen Deka

Nilotpal Bora

Glaucoma

Prafulla Sarma

Pranob Kalita

General Ophthalmology

Gutimoni Sarmah

Paediatric Ophthalmology

Damaris Magdalene

Tanie Natung

Oculoplasty & Aesthetics

Kasturi Bhattacharjee

Cataract and Refractive

Gautam Paul

Sachindra Laishram

Narayan Bordoloi

About the Journal

Journal of Ophthalmological Society of Assam (JOSA), is the official scientific publication of Ophthalmological Society of Assam (OSA). It is a peer-reviewed open access semiannual online journal. The journal's full text is available online at <http://www.osa.ind.in/journal.htm>. The journal allows free access (Open Access) to its contents and permits authors to self-archive the final accepted version of the articles on any OAI-compliant institutional/subject-based repository.

Scope : Journal of Ophthalmological Society of Assam covers all aspects of clinical, experimental, basic science, interdisciplinary, multidisciplinary and translational research studies related to ophthalmology and vision science, with a preference for articles of applied interest.

Copyrights : The entire contents of the Journal of Ophthalmological Society of Assam are protected under Indian and international copyrights. JOSA, however, grants to all users a free, irrevocable, worldwide, perpetual right of access to, and a license to copy, use, distribute, perform and display the work publicly and to make and distribute derivative works in any digital medium for any reasonable non-commercial purpose, subject to proper attribution of authorship and ownership of the rights. The journal also grants the right to make small numbers of printed copies for their personal non-commercial use under Creative Commons Attribution-Noncommercial-Share Alike 3.0 Unported License.

Editorial Office: Dr Madhurjya Gogoi, 113, 1st Floor, Excelcare Hospitals, Paschim Boragaon, NH 37, Guwahati-781033, Assam, Ph: 9954237312, email: journal.osa@gmail.com

Contents

Editorial	Madhurjya Gogoi	3
Invited articles		
Covid-19 Pandemic & Eye Care Services at Regional Institute of Ophthalmology (RIO), Gauhati Medical College	Jayanta Thakuria, Abdul Latif, Prof. Bharati Gogoi Prof. Dipali Deka	4
Understanding Ophthalmology in the last four decades	Prof. Ratul Charan Deka	5-7
Academics in time Of Covid-19 Pandemic at Silchar Medical College	Prof. Ashish Kr. Deb Nilanjan Kaushik Thakur, Shibashis Deb	8-9
Ophthalmology practices during Covid-19 pandemic: measures taken in Department of Ophthalmology in Assam Medical College, Dibrugarh	R. N Gogoi, R.K Das, Dr. Bikram Dam, Liza Kuli, Anjani Agarwalla	10-14
Review article		
Surgical management of peripheral ulcerative keratitis: Beyond keratoplasties	Swapnali Sabhapandit	15-24
Letter to editor	Jonalee Das	25-26
JOSA Instruction for authors		27-35

Editorial

Madhurjya Gogoi

19 December 2020

Guwahati, Assam

JOSA endeavours to publish good quality research work. For this year, the submissions have been fewer and the peer review process affected as well. As such, this issue largely comprises invited articles that highlight the challenges of the present situation and the way ahead. It is clear that the first year of the pandemic has effectively relegated research to the background.

A point of note is that, since the inaugural edition of 2017, a disconnect is being noticed between the presentations at the annual conference, and the articles that are being published in the journal. It is once again emphasized that ICMJE recommendations be adhered to.

JOSA shall continue with 'Open Access' policy. Articles can be submitted at any time by email only at journal.osa@gmail.com. Authors shall not be charged, other than for including more than a permissible number of colour photographs. JOSA shall try to bring out a biannual publication, and go through metrics like indexing, abstracting and impact factor. JOSA emails the digital copy in PDF format to all life members. The print issue shall be made available to life members in due course.

JOSA would like to gratefully acknowledge all contributors, editorial board members, reviewers and well wishers. Inadvertent errors of omission and commission may have crept in; and for that the editor takes responsibility. JOSA would also like to extend its eternal gratitude to all health care workers, who have responded to the need of the times and become frontline covid warriors. We pray for the continued safety of one and all, and hope that this fight comes to a successful end in the near future.

JOSA fact file:

Year	Received/Invited	Accepted	Under Review	Withdrawn	Rejected
2017	8	7	1	0	0
2018	7	6	0	0	1
2019	15	9	2	2	2
2020	7	4	2	0	1
Total	30	22	3	2	3

Erratum: JOSA V3 I1, article 'Clinical profile and risk factors for Chronic Central Serous Chorioretinopathy at a tertiary eye care institute in North East India. The co-authors had been erroneously omitted. The corrected list of authors is available in reprints and the digital version of JOSA V3 I1.

The error is deeply regretted.

Suggestions / feedback are welcome at: journal.osa@gmail.com

Website: www.osa.ind.in; Weblink to JOSA: <https://www.osa.ind.in/journal.php>

Facebook group 'Ophthalmological Society of Assam'

Invited article

Covid-19 Pandemic & Eye Care Services at Regional Institute of Ophthalmology (RIO), Gauhati Medical College

Dr. Jayanta Thakuria, Dr. Abdul Latif, Dr. Bharati Gogoi, Dr. Dipali Deka

When the Novel Corona virus-caused Covid-19 pandemic hit us, most of us were shell shocked. Nobody really knew how to respond to it. Our government made great efforts to contain it both at the center and the state levels. In the beginning there were hiccups, which were understandable but soon the various departments including the Health Department got their acts together to contain the Pandemic.

On 24th March 2020, Nationwide LOCK-DOWN was called. The Gauhati Medical College and Hospital (GMCH) being the biggest & best equipped hospital of the region was converted to a Covid-19 Hospital with emergency upgrading of ICU facilities. The news coming from China, European countries like Italy, Spain, France, U.K. etc., and the United States of America had already alerted our authorities about the necessity of mechanical ventilation in the severely affected patients. Therefore, our government rightly went about increasing the number of ICUs and getting ventilators, and also training adequate numbers of staff at various levels starting from Doctors, Nurses, Paramedics and others. All of this was done on a war footing! Of course, that resulted in some collateral damage.

One such being the eye care services in the Regional Institute of Ophthalmology, GMCH. The Eye Wards had to be converted to medicine wards as medicine wards were converted to Covid-19 wards. Regular surgeries including eye surgeries were stopped as we were still very confused about the protocol to be followed for surgical cases. However, emergency services for eye care continued, though the flow of patients almost stopped due to the Nationwide Lock Down. Except for dire emergency, no body dared to come to the GMCH as now it was a declared Covid-19 hospital. Besides, some newspapers

carried wrong reports that the eye department was closed down. Such reporting caused great damage, especially for those who may have required urgent treatment for conditions like Glaucoma, Diabetic Retinopathy, Corneal Infections, etc.

However, as all of us began to learn about the virus and also how to keep ourselves safe while examining patients, we formulated some Standard Operating Procedures (SOPs) after getting various feed backs from the All India Ophthalmology Society and other Ophthalmology Bodies. Cataract surgery was restarted on 2nd June 2020 with adequate precautions and now flow of work is beginning to improve day by day. Post Graduate examinations were conducted successfully in the midst of the pandemic. Now though we are still in the midst of this crisis, the department is trying its utmost to keep the teaching and training programs of the Post-graduate Trainees (PGTs) going, in-spite of their Covid-19 duties, which keep them away from the department for half of every month.

We are hoping that people will really take the simple but extremely important preventive measures like keeping their nose and mouth covered by wearing masks when in the presence of other people, maintain social distance, avoid overcrowding, and wash hands frequently with soap and water or use alcohol based sanitizers with sincerity. We hope that as responsible citizens we may all come together and conquer this pandemic.

Correspondence to :

Prof Dipali Deka, HOD, RIO, GMCH

Guwahati-781032

Email: dipali_deka@yahoo.com

Received 24 October 2020

Accepted 31 October 2020

Invited article

Understanding ophthalmology in the last four decades

Prof. R .C. Deka

Gone are the days when the result of ophthalmic surgery was taken for granted. If I look back at the early eighties, intracapsular extraction of a crystalline lens without vitreous disturbance was considered an achievement. Inadvertent vitreous disruption was managed by swabbing the vitreous in the wound and putting stitches as early as possible. If you could push the vitreous back by injecting air into the anterior chamber, the operation theatre would breathe a sigh of relief!

Since 1976, the eye-camp approach was the preferred strategy to address the backlog of cataract surgeries, under the National Programme for Control of Blindness. We would travel with mobile units to remote parts of north-east India and spend days operating on patients, raising awareness, interacting with the local communities, and socializing. Patients were happy to receive a +10 D spectacle supplied by the organizing NGO or the Government after 6 weeks.

Eventually, it was realized that surgery induced blindness was becoming a major cause of blindness in India due to various complications of cataract surgery. A sentinel surveillance programme was introduced to ascertain the gravity of the situation. Eye camp surgery approach was gradually withdrawn, followed by surgery in fixed facilities.

The seats for post graduate studies were limited and whatever equipment was available in those days was not easily accessible to post graduate students. They mostly learned from their seniors in their day to day interactions. Now, the scope of learning has widened. They have access to a variety of equipment. Search for medical journals is becoming so easy that at times students are confused with the overload of information.

Paradoxically, now even after post-graduation, doctors are often not confident enough to start

their own practice, which was not so earlier. Fellowships are a relatively a new phenomenon. It started in early eighties along with the rise of private sector ophthalmic institutes. They attracted the young post-graduates for better exposure to modern equipment and to acquire the know-how of advanced practice patterns. In that process the institutions acquired a workforce and fellows were expected to work like modern day slaves. After such training in modern ophthalmology their options are limited as they would have to either join as junior consultant in a particular institute or opt for group practice. At times they keep themselves away from reality and tune into the current practice pattern, which is heavily dependent on multinational ophthalmic companies. They usually do not prefer government institutions. Economic factors have always impacted career choices, but financial considerations are increasingly playing a more prominent role in post qualification choices of doctors.

There has been tremendous improvement in ophthalmic care in India since globalization. Financial institutions are no longer reluctant to finance the equipment. Presence of multinational companies in India has made it easier for us to get their product locally. Now everyone has a choice of equipment and products. Along with this, percolation of knowledge worldwide through the internet has made it easy to acquire skills in different subspecialties. The number of training facilities has also increased. Newer surgical tools

Correspondence to :

Prof Ratul Charan Deka, Principal, Katihar Medical College, Bihar

Email: drratulcharandeka@gmail.com

Received 10.01.2020

Accepted 07.12.2020

and better operating microscopes made it possible to intervene in varied situations, hitherto considered impossible.

Our ability to perform cataract surgery through a small and safe incision and availability of different foldable intra ocular lenses to correct even pre-existing astigmatism is the game changer.

Likewise, posterior segment exploration was never so easy. Till the early eighties it was virtually a forbidden area and a limited few had the courage to intervene. Now we see several centers treating posterior segment defects. However, many deficiencies remain in term of infrastructure and qualified manpower in treating posterior segment diseases.

Retinal detachment surgery has improved a lot. At least anatomical attachment is possible in a majority of cases. Aphakic retinal detachment was very common earlier and was difficult to treat as it was multi factorial. Routine evaluation of peripheral retina in high risk cases and preventive application of laser has reduced the incidence of retinal detachment. Practice of closed vitrectomy has revolutionized the success of retinal detachment surgery.

Broadly, medical ophthalmology remains at a standstill, barring a few cosmetic changes. Management of primary open angle glaucoma is a sector which has not changed much. My personal feeling is that if I attend a conference on glaucoma, many new things are told, new nomenclatures, new abbreviations, but at the end I leave the venue more confused, only to be enriched with a bagful of unnecessary papers. Tools for surgical reduction of intra ocular pressure are plenty in the market e.g. drainage devices. However its superiority over conventional trabeculectomy in routine cases is yet to be established. Of course, a new discovery is always welcome.

The optical industry is flourishing due to their efforts in research and development.

The present decade belongs to ophthalmic surgical and pharmaceutical companies. Ophthalmic science as we understand, as ophthalmologists, has taken a backseat. Many of the leading ophthalmologists worldwide now act like spokespersons for multinational companies with varying intensity.

Several innovations in our practice have been driven by the efforts of molecular scientists and biomedical engineers. We, the clinicians, are usually passive recipients of these innovations and we utilize them as per the therapeutic need and market demand e.g. anti VEGF. It is being used almost routinely even though we, the clinicians, are not sure of its long-term effects. Until our knowledge in primary control of the diseases remains limited, such ad-hoc breakthroughs will continue in our clinical practice.

Ophthalmologists, though prescribing glasses, have relatively less information about new developments in the optical industry. It may be useful to include the applied aspect of this science in the ophthalmology curriculum for medical students.

Fortunately, incidence of infective diseases like mucopurulent conjunctivitis, dacryocystitis, corneal ulcer etc. is declining. Nevertheless, they still constitute a substantial part of the overall morbidity pattern. Corneal haze is one of the major causes of visual loss in India. If one eye is affected, it is taken lightly in the general population, but our armamentarium is also not well equipped.

It is encouraging to note that corneal tissue transplant surgeries have improved substantially due to the efforts of a limited number of doctors focusing on the area. However, getting a cornea easily is still an issue to be resolved.

We have not progressed much in understanding amblyopia, optic nerve diseases, uveitis, macular degeneration, retinitis pigmentosa etc. Preventing congenital ophthalmic diseases is another challenge.

We need to find a mechanism through which we can address the main hindrances of ophthalmic care that affect most ophthalmologists. Cataract treatment does not mean ophthalmology. Until mainstream research bodies make some concerted efforts to understand the challenges of ophthalmic science, coping with the burdens of blindness would be a slow and time-consuming process

2020 has been exceptionally challenging for medical professionals. The medical practice scenario has changed all over the world because of the COVID-19 pandemic, and ophthalmology is no exception. Despite the initial confusion in early-2020, most ophthalmologists are gradually implementing protocols to incorporate higher distancing and sanitization measures in their practice. Although standard operating procedures have been issued and recommended, there is many a slip between the cup and the lip. As an administrative head of a medical college, my role is to actively identify issues of policy implementation and plug the loopholes between

the theoretical guidelines and implementation at the ground level. As a word of caution, I would like to highlight that the avoidance of catastrophe is not necessarily indicative of a well-functioning mechanism and policies must be framed with ground realities in mind and impact assessment. We now realize that the management of COVID-19 is as much a social issue as it is a medical issue. Consequently, decision makers outside the medical profession have been involved in planning COVID-19 management and hence we often experience implementational challenges. However, we must change with changing times and this could be an opportunity to improve cross-functional coordination within and beyond the medical profession. Biological safety, for patients and caregivers, has become a new frontier as we reevaluate and improve traditional forms of biological safety in the medical profession. Ophthalmologists must be mindful of these developments as procedures in ophthalmology require close interactions with patients.

Invited article

Academics in time of Covid-19 pandemic at Silchar Medical College

Ashish Kr. Deb, Nilanjan Kaushik Thakur, Shibashis Deb

The COVID-19 pandemic, is an ongoing pandemic of coronavirus disease 2019 (COVID-19) caused by the transmission of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), first identified in December 2019 in Wuhan, China. The first case of the COVID-19 pandemic in Assam was reported on 31st March 2020 and was admitted at Silchar Medical College, Silchar, Assam. Thus we have had the unique opportunity of experiencing first-hand how the pandemic has affected the routine day-to-day academics of our prestigious institute.

In view of minimizing the spread, the government has implemented stringent protocols of maintaining social distancing and lockdown of government and private institutions. This has greatly disrupted daily lives, global economies, and educational systems. Schools and colleges in India and abroad are under lock-down to maximize social distancing and minimize the spread of infection amongst students and teaching staff. Health sciences related universities and researchers are forced to adopt non-contact teaching and research methods. United Nations Children's Fund (UNICEF) has estimated that there has been a disruption in the education of over 1.57 billion students in more than 190 countries constituting 91% of the worldwide learners.

Correspondence to :

Prof Ashish Kr. Deb, Prof and HOD, Dept of Ophthalmology, SMCH, Silchar, Assam

Email: dashish1956@gmail.com

Received : 02 December 2020

Accepted : 14 December 2020

To combat this unprecedented crisis, perhaps the biggest ever seen by our generation till date, every institution for higher education has adopted various policies and innovative technologies to minimize the disruptive effect of this pandemic on the education. Ophthalmic education in our institute is not an exception to the upheaval. As we, both teachers and students together, explore new avenues to continue our education, it has forever changed our outlook on the traditional teaching methods that we have been following for so long. In a way, this COVID-19 scare has given us the thrust that we needed to modernize our education and incorporate newer advancements in our training methods.

The Department of Ophthalmology of Silchar Medical College has also faced a dual challenge in this time of crisis. Our indoor ward has been converted to COVID-19 patient zone further limiting our patient intake capacity. To meet this challenge we have shifted all indoor procedures and the office to our OPD and patients are admitted in ENT indoor.

In our department, offline didactic lectures, clinical grand rounds, and routine elective surgeries had to be suspended during the lockdown period. As the COVID-19 cases soared, post-graduate trainees had to be rotated out of their routine roster and engaged in COVID-response teams. The number of patients attending out-patient ward also saw a huge decline along with number of surgeries done monthly.

These have all factored in to greatly hamper both the theoretical and surgical training of our residents and post-graduate trainees.

However not all hope is lost; amidst this bleak picture, digital platforms like Zoom, Google chat, Skype etc. has stepped in as a beacon. Physical lectures have been replaced with routine online classes and seminars have been replaced by webinars, for both under-graduate and post-graduate students. Our focus has been in achieving excellence in three important domains – patient care, academic teaching, and research while taking proper care for the health and safety of the teachers and the trainees.

These digital platforms have also enabled us to conduct our Post-Graduate Finals by allocating virtual case scenario, thus ensuring the safety of both the examiners and the examinees. We are also happy to report that we have successfully conducted our inspection by the Medical Council of India over Zoom amidst this crisis period during our Post-Graduate Finals examination.

Due to reduced number of patients attending our out-patient ward, that time has been utilized to organize routine discussion between the teachers

and the post-graduate trainees by selecting virtual cases. Virtual grand rounds have also been undertaken by faculties discussing clinical cases to ensure uninterrupted learning of all residents. The silver lining in the pandemic is that, our institution is now be better prepared to integrate the new technological solutions to our academic programs and modalities.

Hands-on surgical training and getting proficiency in surgical techniques have been difficult due to limited number of surgeries. Although the nuances of different steps, can only be learned while performing live surgeries, we have been mitigating the negative impact on our post-graduate trainees by organizing virtual surgeries. Also, we routinely show videos of different operative procedures and organize virtual discussion between the teachers and trainees on each step and their potential pit-falls.

In conclusion, even though this pandemic has greatly affected the smooth functioning of our academic activities, we are proud to say that we have risen to the challenge. Through newer innovative techniques and digital technology we have continued to maintain our academic excellence even in these trying times.

Invited article

Ophthalmology Practices during Covid-19 Pandemic: Measures taken in Department of Ophthalmology in Assam Medical College, Dibrugarh

R. N Gogoi, R.K Das, Bikram Dam, Liza Kuli, Anjani Agarwalla

Introduction

“You never let a serious crisis go to waste. It is an opportunity to do things you think you could not do before”

--Rahm Emanuel

Being a pandemic but mostly a respiratory illness with various deceiving symptoms & multi systemic manifestations, the 2019 novel corona virus disease also has been affecting the ophthalmological fraternity to a large extent¹.

There is a risk of possible conjunctival transmission, as well as risk of contamination during phacoemulsification procedures, contact procedures such as applanation tonometry, various operative and anesthetic procedures, human to human transmission due to large crowds in hospitals which puts the health staff and doctors at an increased risk².

The quantum and magnitude of the disease is so devastating that there is an emergent need to explore all the preventive and therapeutic strategies to contain or lower the spread of the disease. The transmission, even by asymptomatic carriers, possess a grave threat to the health staff all around the world. By this time vaccine trial has been started and mass vaccination has been going on in few countries which brings a possible ray of hope for a better future.

Correspondence to:

Dr. Rajiv Kumar Das, Dept. of Ophthalmology,
Assam Medical College, Dibrugarh-786002

Email- rajivdasmajuli@gmail.com

Received : 19 December 2020

Accepted : 28 December 2020

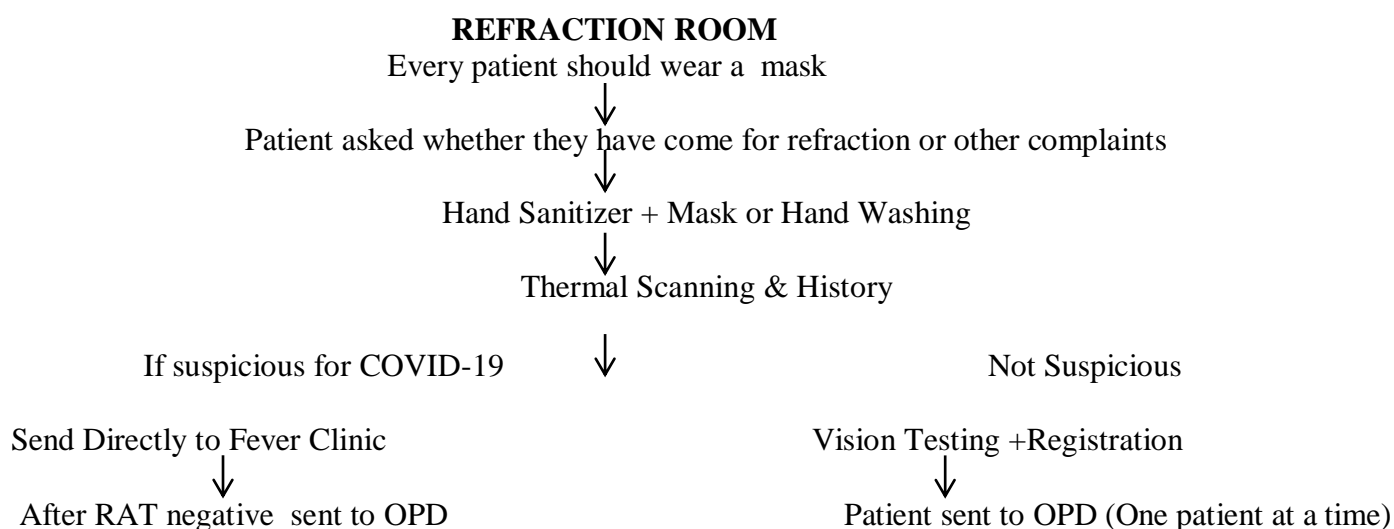
Here in this article we are trying to give a glimpse into the patient care and management at Department of Ophthalmology, Assam medical college & Hospital, Dibrugarh during this pandemic period.

The All India Ophthalmological society drafted comprehensive & inclusive guidelines named **“Ophthalmic practice guidelines in the context of covid 19 era.”**³ All umbrella associations of AIOS have been actively involved in the process to publish this dynamic document. Keeping an eye on the guidelines issued by the government of India, Indian Council of Medical Research, the AIOS guidelines encompassed all the relevant and required information for a preferred practice pattern during covid 19 period. In our department we have been following the directives issued by competent authorities as well as protocols laid down by the government of Assam.

We have formulated a protocol regarding patient examination in our out-patient department while doing procedures such as refraction, fundus examination and also during operative and other contact/invasive procedures.

As this upgraded department has been conducting residency programs in ophthalmology since long, most of the residents and faculties are actively associated with direct covid care patient management on a periodic basis apart from taking part in usual ophthalmological routine duties.

PRECAUTIONARY MEASURES AGAINST COVID-19 (AMCH, Ophthalmology)



- Refraction was suspended for the month of May
- Refraction was limited to upto 5 patients during April to July, upto 10 Patients for August & September, upto 20 patients for October.
- Admission of patients was suspended from March till August.
- Emergency cases were admitted after the month of August, limited to less than 5 cases.
- Elective cataract surgeries were postponed till after August.
- Fundoscopy: To use only indirect ophthalmoscope.

Precautions for Doctors in Refraction Room

- Wear gloves and N-95 mask.
- Wear face shield or gown
- Use hand sanitizer frequently
- Sanitize respective instruments after every patient examination .
- Proper disposal of gloves, mask, cap etc.
- Maintain social distancing as much as possible.

The OPD & Refraction room statistics are as summarized below :

Month and Max No. of Patients per day	Total Patients in a month	Male (Adult)	Female (Adult)	Children (<18 Yrs)
May	Refraction	Suspended		
June (5pts/day)	75	42	32	1 male
July (5pts/day)	60	37	23	–
August (10pts/day)	114	62	49	1 Female 2 Males
September (10-15pts/day)	263	135	121	3 Female 4 Male
October (20 pts/day)	413	208	186	9 Female 10 Male

PROTOCOLS & PROCEDURES IN OT

- Elective surgeries were suspended from the month of April to September
- Only emergency surgeries were performed limited to 0-2 cases per month as per situation
- Elective surgeries were resumed from the month of October, limited to <3 cases per day, same days even without surgeries
- All surgeries were only performed if patient is fit for surgery & recent rapid antigen test (RAT) or RT-PCR test for covid-19 is negative.
- GA procedures were suspended during the active phase
- Phacoemulsification procedures were also halted.
- All precautionary measures and universal safety precautions were applied.

PROTOCOLS FOR WARD

- Patients and attendants should be screened before visiting wards.
- Only 1 attendant per patient can be allowed.
- Patients to be kept by maintaining adequate distancing.
- Regular sanitation of ward with 1% sodium hypochlorite to be done frequently. Instrument sterilization is to be done after seeing every patient.
- In case a covid-19 patient with eye condition is to be admitted, a separate room or isolation ward should be used.

The Upgraded Department of Ophthalmology has a pool of 27 residents in the MS academic curriculum with 14 faculties. 3 number of faculties have been admitted in the covid hospital with moderate to severe symptoms and only one

post graduate student was having mild symptoms who were all treated successfully. The residents from the ophthalmology department have been involved in almost three rounds in both screening and designated covid hospitals during the time of pandemic and though there was limited suspension of academic activities in the active phase of the disease, online classes, seminars, workshop were held regularly. By this time of diminished curve of the disease the usual rush of the OPD is going on and all the subspecialty clinics are functioning with usual operative procedures. The usual safety protocols and strict measures have been implemented in the ophthalmology workups. The Major & Minor OT statistics are summarized below ;

Major OT Cases

Month	Total no. of cases operated (Male/Female)	Diagnosis	Treatment
April	Major OT suspended	Until further notice	
May	DO	DO	
June	DO	DO	
July	DO	DO	
August	2 cases (1M/1F)	LIG	SICS WITH PCIOL R/E
Sep	1 Male	LIG	SICS R/E
October	4 Male	Cataract	SICS WITH PCIOL Implantation

Minor OT Cases

Month	Total no. of cases operated Male/Female)	Diagnosis	Procedures
April	OT suspended	Until further notice	
May	6 cases (5 Male, 1 Female)	- Corneal laceration with iris prolapse (4) - Foreign body cornea (1) - Foreign body ant chamber(1)	
June	3 cases (2 Female, 1	- Hyphaema	Paracentesis UNDER

	Male)	- Limbal ruptures with iris prolapse - BCC LLL	GA. Repair Incisional biopsy
July	3 Cases (Male)	- Rt. Upper eyelid mass and sebaceous gland tumour - H/R PDR with vitreous haemorrhage.	Wide local excision + HPE Inj. Avastin Intravitreal
August	NO Minor	OT CASES	
September	4 Cases (Male)	Corneal perforation with iris prolapsed High risk PDR with Vitreous haemorrhage PDR with CSME	Repair Retina clinic workup and Inj. Avastin intravitreal.
October	12 Cases (10 Male, 2 Female)	- Panophthalmitis (1) - Scleral laceration with full chamber hyphaema - PDR - LSME - ARMD - BRVO - Lacrimal stunt (I) in-situ (IDCR)	- Evisceration GA - Repair - INJ Avastin - Lacrimal stunt reversal

Discussion :

Ophthalmologists have been particularly affected by the pandemic as there has been a significant downscaling of ophthalmological patient encounters & procedures. Majority of ophthalmological surgical procedures are elective such as cataract surgeries and a significant proportion of patients are older with a greater risk of co- morbidities. Reduced patient volume continues to affect ophthalmologists financially as well as skill development especially for young surgeons.

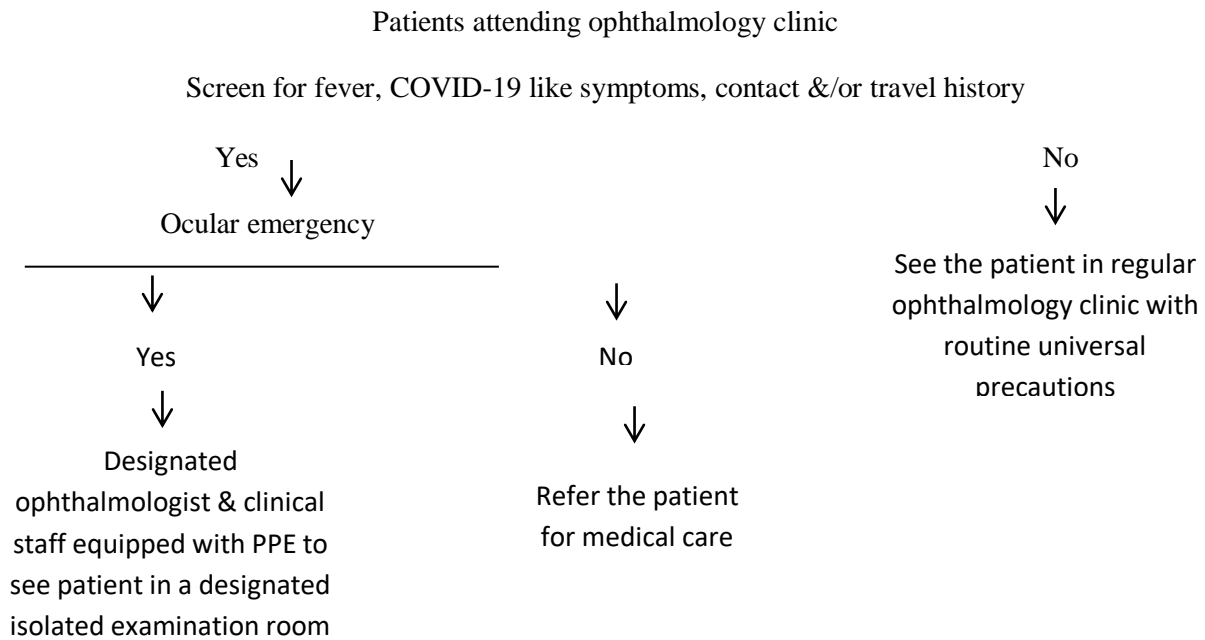
Elective cataract surgeries postponed during the pandemic invariably led to longer wait period resulting in an increase in cataract burden and progression to mature stages of cataract, fear of further loss of sight due to delayed review & treatment, hampering the quality of life and causing disability. Though the human resource of our department are actively utilized in all emergency, routine ophthalmological

procedures, active covid management, the exposure to the disease has been well antagonized with standard safety protocols. The picture is well documented in our article.

(II) ASSAM/INDIA GOVT. ADVISORY REGARDING SAFE OPHTHALMOLOGY PRACTICES IN COVID-19 SCENARIO

1. Eye and facilities in containment zones shall remain closed and only those outside containment zones will be allowed to open up.
2. Basic preventive measures that include simple public health measures like physical distancing, use of face masks, sanitizers, respiratory etiquettes are to be followed by all, as well as self-monitoring of health & reporting of any illness at the earliest.

3. PROTOCOLS FOR OPD SERVICES



Paediatric cases also suffered due to the current pandemic as paediatric surgeries are performed under general anaesthesia which requires a negative RT-PCR COVID-19 report before proceeding .

Ocular trauma cases also presented late due to pandemic induced barriers . Also, emergency trauma cases with unknown covid status poses a risk for infection to the health staff

The findings in our article were in concurrence with similar studies on the impact of covid -19 in Indian ophthalmology setups.^{4,5}

Conclusion

Corona virus pandemic has been one of the worst crisis in history of public health which has affected entire spectrum of health care services with ophthalmology being no exception. This pandemic has taught us that with proper care and adequate precautions with increased use of teleophthalmology and utilizing the benefits of digitalization , better patient care can be achieved. Cost management ,increased awareness about public health is the need of the hour.

References :

1. Gupta PC, Kumar MP, Ram J. COVID-19 pandemic from an ophthalmology point of view. *The Indian journal of medical research.* 2020 May;151(5):411
2. Lin JY, Kang EY, Yeh PH, Ling XC, Chen HC, Chen KJ, Hwang YS, Lai CC, Wu WC. Proposed measures to be taken by ophthalmologists during the coronavirus disease 2019 pandemic: Experience from Chang Gung Memorial Hospital, Linkou, Taiwan. *Taiwan Journal of Ophthalmology.* 2020 Apr 1;10(2):80
3. Vashist P, Senjam SS, Gupta V, Manna S, Agrawal S, Gupta N, Sharma N, Sinha R, Saxena R, Sachdev MS. Community eye-health and vision center guidelines during COVID-19 pandemic in India. *Indian journal of ophthalmology.* 2020 Jul;68(7):1306
4. Sindhuja K, Lomi N, Asif MI, Tandon R. Clinical profile and prevalence of conjunctivitis in mild COVID-19 patients in a tertiary care COVID-19 hospital: A retrospective cross-sectional study. *Indian Journal of Ophthalmology.* 2020 Aug;68(8):1546
5. Goel R, Arora R, Khanam S, Saxena S, Manchanda V, Pumma P. Is it essential to perform COVID-19 testing prior to ophthalmic procedures?. *Indian Journal of Ophthalmology.* 2020 Nov 1;68(11):2335.

Review article

Surgical management of peripheral ulcerative keratitis: Beyond keratoplasties

Swapnali Sabhapandit

Abstract:

Peripheral ulcerative keratitis (PUK) is a necrotic condition of the peripheral cornea that can lead to corneal perforation and visual loss if not managed adequately. It can occur due to infectious or non-infectious etiologies. The condition is mainly managed by medical therapy. However, severe disease process may necessitate surgical management for tectonic stability and removal of cause of the pathology.

Surgical treatment can be either in an emergency setting or for visual rehabilitation after stabilising the necrotic cornea. Different methods of conjunctival resection, tissue adhesive or amniotic membrane grafting or corneal transplantation are used to treat the disease, with varied results. However, availability of donor corneal tissue for emergency surgery in advanced PUK is a major challenge in our country. This review attempts to analyse surgical modalities in the management of PUK other than corneal transplantation and their outcomes.

Key words: Peripheral ulcerative keratitis, Mooren's ulcer, tissue adhesive, amniotic membrane, keratoplasty.

Correspondence to :

Swapnali Sabhapandit, MS, Head, Department of Ophthalmology, Asian Institute of Gastroenterology Hospitals, Mindspace road, Gachibowli, Hyderabad India 500032
 Email: drswapnali@gmail.com
 Conflict of Interest: None
 Funding source: None
 Received : 29 October 2020
 Accepted : 16 December 2020

Introduction

Peripheral ulcerative keratitis (PUK) is a potentially devastating inflammatory condition characterized by presence of a crescentic area of epithelial defect with stromal necrosis in the margin of the cornea (Figure 1). Subepithelial infiltrate at the edge of the necrotic area and progressive corneal thinning are other features of PUK. It may be unilateral or bilateral.^[1] The condition may be associated with contiguous involvement of surrounding conjunctiva, episclera and sclera or with an anterior chamber reaction.^[2]

PUK may be due to local or systemic causes. Systemic association of collagen vascular disease may be present in as high as 50% of the cases of PUK with high risk of morbidity and mortality.^[3] This includes rheumatoid arthritis, Wegener's granulomatosis, systemic lupus erythematosus, relapsing polychondritis, Churg Strauss disease and other autoimmune entities. Untreated cases can rapidly progress to corneal perforation and its sequelae.⁴ Timely and adequate management of systemic disease is necessary for such cases.^[3, 4]

Local causes of PUK can be infective or autoimmune. Bacterial, fungal, herpetic and *Acanthamoeba* etiology have been found in PUK.^[5, 6, 7] Mooren's ulcer is a common manifestation of localized PUK due to immunological reaction. The differentiating feature of this condition is the lack of scleral involvement.^[8, 9]

Medical management is the mainstay of treatment for PUK associated with systemic disease or with

ocular infections. The principle behind treatment of the systemic conditions is immunosuppression and control of inflammation.^[3, 4, 10, 11] Microbial keratitis is managed by proper identification of organism from corneal scraping and appropriate antimicrobial therapy.^[12] For treating early cases of Mooren's ulcer also, immunosuppression is the first line of treatment.^[8, 9]

Surgical intervention for PUK is required in following conditions-

- a. *Tectonic integrity of the globe is threatened:* This can occur with localized sterile corneal melts leading to descemetocele and corneal perforation.
- b. *Removal of causative agent:* In Mooren's ulcer, the adjacent conjunctiva is the primary source of antibody-producing inflammatory cells present in the ulcer.^[13, 14] When medical therapy fails to control the destructive immune process, surgical resection of the conjunctiva with adjuvant procedures are needed to control the disease. Similarly, in infective PUK, surgical debulking may be needed in aggressive disease not responding to antimicrobial therapy.^[15, 16]
- c. *Visual rehabilitation:* Once the active disease process is controlled in PUK by medical or emergency surgical methods, optical surgeries such as penetrating or lamellar keratoplasty can be undertaken for visually rehabilitating the patient.^[16, 17]

3. Surgical techniques (Table 1)

The surgical options for managing PUK are varied with non-availability of an in-depth analysis in scientific literature of the case selection, methodology and outcome of each technique. There are sparse randomized controlled trials comparing these surgeries.^[18] Poor

availability and logistic issues regarding donor cornea for grafting limits the use of this technique for surgical management of advanced PUK. This review attempts to analyze the outcomes and benefits of different surgical techniques used for PUK management apart from corneal transplantation.

2. Methods of literature search:

PubMed and MEDLINE search was done with combinations of following search terms: Peripheral ulcerative keratitis; peripheral corneal ulcers; infective peripheral ulcers; immunological peripheral ulcers; surgical procedures; complications; diagnosis; treatment and management. Relevant articles from literature search and their references when applicable were included. Articles published after 1940 and articles published in non-English languages were included if there was an English comprehensive summary of the article. Clinical studies, randomized control trial, review articles, case series, and case reports were included in the review.

3.1 Diathermy coagulation: As early as 1957, the use of diathermy coagulation was reported for treating Mooren's ulcer. E J Somerset reported good outcome after repeated application of light diathermy to the edges of the ulcer in a single case.^[19] Similar case report was mentioned by P Vancea in 1958. However, with understanding of the pathophysiology of Mooren's ulcer, diathermy coagulation is no longer practiced for managing this form of PUK.

3.2 Conjunctival resection with cryotherapy: E. Aviel in 1972 reported a series of 5 cases treated with conjunctival peritomy adjacent to an area of Mooren's ulcer along with thermocautery of bleeding vessels.^[20] This was followed by

cryotherapy to the center and edges of the ulcer at -40 to -50 degree Celsius for 20 seconds in each application. There was improvement in the ocular condition with a maximum follow up of 5 months.

Cryotherapy as a treatment option was also mentioned by P Comte et al in Mooren's ulcer. [21] G Genvert et al have used cryotherapy with either conjunctival resection or recession for PUK. [21] The case series included Mooren's ulcer, collagen vascular disease related and cataract surgery related PUK. In 10 of 13 cases, conjunctival recession and suturing at 3mm behind limbus was done, while in 3 eyes, conjunctiva was resected. The methodology for

cryoapplication was identical with Aviel's technique. [20] In a period of 1-50 months, vascularized pannus was noted in all cases, though one eye needed resurgery. Recently, a case report of cryotherapy with conjunctival flap suturing over ulcer area was reported in a 70 year old male suffering from granulomatosis with polyangiitis by Cheng et al. [22] The patient was started on immunosuppressives, but with corneal necrosis persisting, surgery was undertaken. At 2 months follow up, the ulcer was healed with no recurrence. In South West Nigeria, Fasina et al used cryotherapy with conjunctival resection for treating 14 patients with progressive Mooren's ulcer with good anatomical stability. [23]

Surgical technique	Advantage	Disadvantage
Diathermy coagulation	Easy, cost effective	Recurrence
Conjunctival resection with cryotherapy	Easy, low recurrence	Corneal tissue damage if repeated cryotherapy done
Conjunctival recession or resection	Easy, cost effective	Recurrence
Conjunctival flap	Easy, cost effective	Recurrence
Cyanocrylate glue	Tectonic strength, curative for perforation < 3mm, barrier to inflammatory cells	Non-biodegradable, temporising measure for perforations > 3mm, induces vascularisation
Fibrin glue	Biocompatible	Poor tectonic strength, cost factor
Amniotic membrane grafting	Biocompatible, promotes early healing, suppresses inflammation	Availability, cost factor, poor tectonic strength
Corneal patch graft	Tectonic support, permanent therapy in some cases	Cost and availability of tissue, surgical skill, risk of rejection

Table 1: Different non keratoplasty surgical techniques for managing peripheral ulcerative keratitis and their advantages and disadvantages

3.3 Conjunctival recession or resection: Brown et al had hypothesized that the limbal conjunctiva is the source of collagenase and other enzymes that causes corneal necrosis by destroying the collagen and ground matrix. [14] Based on this theory, Wilson et al performed conjunctival recession in 7 patients having varied etiology of PUK. [24] The conjunctival peritomy adjacent to

the ulcer area was followed by suturing the recessed conjunctiva around 1 mm behind the limbus. Cryotherapy was not used in these cases. There was positive response in 6 cases, while one case had multiple recurrences. Mondino et al performed conjunctival resection in Mooren's ulcer cases and healed 3 of 4 unilateral ulcers and 3 of 3 bilateral nonsimultaneous ulcers, but only 2

of 15 bilateral simultaneous ulcers. ^[25]Need for medical management with immunosuppressives is necessary for aggressive, bilateral simultaneous cases and in young patients. ^[1, 3, 26]

3.4 Conjunctival advancement or flap: In 1989, Portnoy et al mentioned conjunctival flap as a mode of therapy for PUK due to infections or collagen vascular diseases for tectonic support. ^[27] However, two recent reports showed that such flaps do not control aggressive forms of PUK. Tan et al reported a case of corneal perforation lesser than 2 mm in PUK due to Crohn's disease where conjunctival flap with immunosuppression failed. Sectorial penetrating keratoplasty was needed for tectonic stability of the eyeball. ^[28] Similarly, Li et al reported two cases of Mooren's ulcer, where conjunctival flap technique led to rapid deterioration of the ulcer. Penetrating keratoplasty with immunosuppressive therapy was ultimately successful in halting the disease process. ^[29] With recent advances in surgical techniques, conjunctival flap is seldom used nowadays in management of PUK.

3.5 Use of tissue adhesives: Tissue adhesive was first used by Refojo and Webster in 1968 in the form of cyanoacrylate glue. ^[30, 31] Two types of tissue adhesives—synthetic cyanoacrylate derivatives (butyl monomers) and biological fibrin glue – are used for corneal pathologies such as extreme thinning and perforations. ^[30-35]

a. Cyanoacrylate glue - These compounds have optimum strength and rapid polymerization; hence they are useful for closure of corneal perforations up to 3 mm in diameter. ^[31, 33, 34] However, these adhesives are non-biodegradable which may lead to inflammatory reaction, papillary conjunctivitis, corneal neovascularization, secondary infection and tissue necrosis. If inadvertently leakage of this glue

occurs into anterior chamber, it can cause iris adhesion, pupillary block glaucoma or secondary glaucoma due to peripheral anterior synechiae, granulomatous reaction and cataract. ^[34-37]

Cyanoacrylate glue has been widely used in PUK for multiple reasons. In 1968, Webster demonstrated the use of this glue in closing corneal perforation. ^[38] The use of this glue in treating PUK with impending or actual perforation has been well documented in literature. ^[39-43] The role of this adhesive in healing PUK is twofold; firstly, for tectonic strength, and secondly for acting as a barrier to the influx of inflammatory cells into the necrotic corneal stroma. ^[43-46] In Mooren's ulcer, application of cyanoacrylate glue is combined with trimming of the overhanging necrotic ulcer lip and conjunctival resection adjacent to the ulcer (Figure 2). The glue is allowed to remain for at least a month till it spontaneously dislodges due to underlying epithelial healing. ^[42, 43] A bandage contact lens is placed over the cornea to prevent foreign body sensation and papillary conjunctivitis due to the rough texture of the glue. Resolution of ulcer has been reported from 42 to 83% of cases. ^{40, 42, 43}



Figure 1: Peripheral ulcerative keratitis (PUK) with epithelial defect, stromal ulceration and peripheral corneal thinning

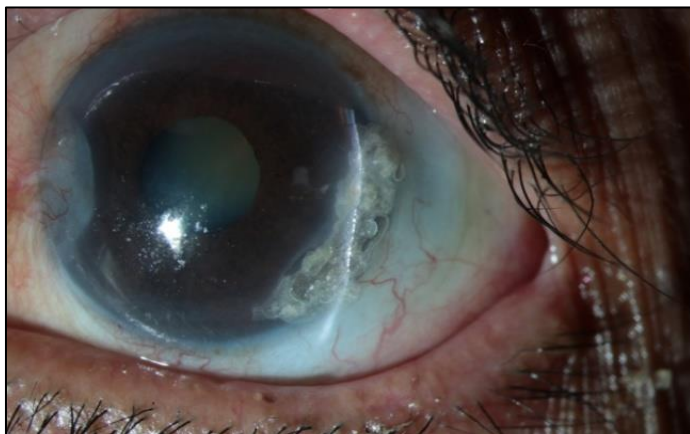


Fig 2: Conjunctival resection with cyanoacrylate glue and bandage contact lens application in a Mooren's ulcer (post-operative 1 month)



Fig 3: Amniotic membrane grafting with bandage contact lens in peripheral ulcerative keratitis (post-operative 2 weeks)

In 2013, A Sharma et al reported a series of 16 eyes where PUK related corneal perforation between 3.5 to 4.5 mm was sealed with scleral patch graft using cyanoacrylate glue. 14 eyes healed in 5-9 weeks, with 2 eyes needing redoing of the procedure following loosening of the glue. 5 grafts needed few 10-0 nylon sutures for reinforcement of tectonic support. Once the graft fused with the host cornea, the glue was removed.⁴⁷ Similar technique was used by Hinduik et al in their case series in a 16-week period.⁴⁸

Bernauer et al had used cyanoacrylate glue for sealing corneal perforations in rheumatoid arthritis (RA) melts up to 3mm diameter without concurrent use of immunosuppressives. Though temporary closure of perforations occurred in all 6 eyes, the PUK continued due to aggressive disease.¹⁷ Similar anatomical success was reported by Weiss et al and Messmer et al as a temporary measure in PUK cases.^{40,49} Use of a surgical drape in a 2-mm diameter size with cyanoacrylate glue to seal a perforated PUK till a penetrating keratoplasty was done 7 days later has also been reported.⁵¹

b. Fibrin glue - This biological adhesive is prepared from fibrinogen and thrombin component of blood.^{35,51} Being a biological compound, it is biocompatible with no risk of foreign body reaction or tissue necrosis. It is completely biodegradable also. The rate of complications related to fibrin glue use is very low, including granuloma and cyst formation, foreign body sensation due to glue residue on ocular surface and non-adherence of material to underlying tissue.^{52,53} Fibrin glue also lacks tectonic strength unlike cyanoacrylate derivatives.

Lagoutte et al had used fibrin glue to treat 8 cases of preperforated and perforated peripheral corneal ulcers with favorable results.⁵⁴ The size of the perforations was up to 2.5mm. However, re application of the glue was needed for few cases where the fibrin plug dissolved leading to wound leak. Due to weak tectonic strength, the use of this adhesive along with biological membranes or tissue grafts for healing corneal thinning and perforation in PUK cases is widely practiced nowadays.

3.6 Amniotic membrane graft (AMG): Amniotic membrane was first used in 1910.⁵⁵ Due to advances in preservation techniques in the 1940s,

AMG was widely used in different surgical subspecialties. For use as a corneal graft, AMG transplantation was attempted by De Rotth and Sorsby in the 1940s. ^[56, 57] Though De Rotth did not report successful outcome in his cases, Sorsby et al had improved results in alkaline injury of the cornea. Use of AMG in corneal surgery, however, gained popularity in 1997 due to the published works of Schaffer Tseng's group. ^[58, 59] Later Dua had good results with AMG use in ocular surface reconstruction. ^[60]

AMG stroma suppresses the expression of multiple inflammatory cytokines expressed by damaged ocular surface epithelia. ^[61] AMG also contains protease inhibitors, thus facilitating rapid apoptosis of inflammatory cells. ^[60, 61] AMG promotes rapid epithelialization over its basement membrane and has a high content of nerve growth factor for epithelial nerve regrowth. ^[62]

Solomon et al used multiple layers of AMG in single or multiple sittings for corneal perforations less than 0.5mm size with mixed results. ^[63] In PUK cases due to autoimmune disease, there was repeat perforation with need of additional procedures. One case of Mooren's ulcer healed with focal scarring while on immunosuppressives. In infected cases, the location of the perforation was not mentioned.

The use of AMG for treating aggressive Mooren's ulcer is controversial. Reports of satisfactory outcome has been reported by some authors. ^[64] Motowa et al used a double layered AMG sandwich technique for a single case of Mooren's ulcer. ^[65] AMG use in addition to lamellar graft with good outcome has also been reported. ^[66] In both cases, immunosuppressive drugs were continued. Good outcome has also been reported in single cases with additional conjunctival resection or serum eye drops. ^[67, 68] However,

Chen et al noted recurrence in a multilayered AMG with conjunctival autografting done for Mooren's ulcer. ^[69] With immunosuppression, repeat AMG along with conjunctival resection, the lesion healed slowly. Schallenberg et al reported relapse of aggressive Mooren's ulcer in 6 of 7 eyes which underwent AMG transplantation with conjunctival resection, even on oral immunosuppression. ^[70]

The use of AMG with fibrin glue for sealing corneal perforations in PUK has been reported. In Figure 3, AMG was used with fibrin glue and 10-0 nylon sutures to seal a sterile perforation due to rheumatoid arthritis. The AMG was further secured with a bandage contact lens. Hicks et al reported good outcome (80% success rate) in perforations less than 3mm in diameter.

^[71] Hanada et al had success with multilayered AMG in a Mooren's ulcer, but recurrence of corneal perforation in two cases with rheumatoid arthritis. ^[72] Similarly, Rodrigues-Ares et al reported success in 2 cases of rheumatoid arthritis with failure in an Erythema multiforme major case. ^[73] In a series of 45 eyes with perforation lesser than 3mm, Fan et al reported healing with good visual outcome in 6 cases with marginal ulcers. ^[74] They employed a technique of filling the perforation with a rolled-up AMG, covered by 3 layers of larger sized AMG, followed by injection of 0.3ml of 20% perfluoropropane to form the anterior chamber. However, 3 cases had anterior iris synechiae post operatively.

Liu et al conducted a meta-analysis of visual outcome and epithelial healing following cryopreserved AMG use in infectious and noninfectious corneal ulcers. ^[75] The use of AMG was found to benefit in early epithelialization and stromal healing. Multilayered AMG was found to be better for repair of deep ulcers. Freeze dried AMG has recently been used to treat different

ocular surface disorders. [76, 77]

3.7 Corneal patch graft: As early as 1989, Portnoy et al had used periosteal graft from anterior tibia for closing peripheral corneal perforations due to PUK. [27] They also reported about using crescentic or round corneal patch grafts for treating PUK.

In 1991, Kinoshita et al used donor corneal lenticules with intact epithelium along with conjunctival resection for treating 20 eyes with aggressive Mooren's ulcer. [78] Additional corneoscleral lamellar grafts were done in 5 eyes. With a follow-up period of 3.1 years, 90% eyes had complete recovery while on steroid therapy. Soong et al used free hand dissected lamellar corneal patch grafts in 31 eyes with PUK, either having descemetocoele or perforation. Majority of the cases had underlying autoimmune disease. With an average follow up period of 1 year, 17 cases maintained stable grafts with good visual outcome. Few complications noted were corneal melt necessitating repeat patch graft, cataract and need of penetrating keratoplasty for visual recovery. [79]

Krysiak et al performed patch graft for peripheral lesions (29% of cases with total 247 eyes) with infective, autoimmune and traumatic etiology. [16] Common complication noted were persistent epithelial defects, graft melt (mostly in autoimmune disease related eyes) and early loosening of sutures. 50% grafts developed vascular ingrowth. Compared to the penetrating keratoplasty cases, visual acuity at follow up was better in this group of cases.

In 2013, Lin et al used patch grafts from glycerol preserved corneas in rheumatoid arthritis related PUK with perforation or descemetocoele. [80] Except one case with graft melt, all cases had

stable though opaque grafts. The use of glycerol has been postulated to remove the immune cellular components in the donor cornea. Similar result with use of glycerol preserved cornea in patch graft was noted by Shi et al earlier in 8 cases of PUK. [81] The same group also studied the results in 25 eyes with perforated Mooren's ulcer who underwent a two-step corneal surgery, first with a posterior corneal donor button having intact endothelium, covered by glycerine preserved lamellar graft. [82] Both grafts were sutured to host cornea with 10-0 nylon sutures. The immunosuppressive regime was maintained. 87.1% eyes had anatomical and visual recovery with clear grafts. The dendritic cell population was monitored in the grafts to understand the antigenic tendency and need for immune-suppression. A gradual decline of this cell population was observed in the patch grafts over 6 months' period.

In 2015, Sharma et al used crescentic (match and patch technique) and circular corneal patch grafts for 4 cases of moderate level and 5 cases of severe level of involvement in PUK. [83] They achieved 100% anatomical success in moderate cases with maximum follow up of 3 years. The resolution rate was 83.3% in the severe cases.

A novel technique of using the lenticule obtained during small incision refractive lenticule extraction (SMILE) technique for myopia correction as donor patch graft in PUK cases was reported by Jiang et al. [84] In 14 cases, the donor lenticule was sutured to the ulcer area after debridement of necrotic tissue. In deep ulcers, multiple layers of lenticule were used to fill the crater area of the ulcer. There was stability of globe and vision in all cases till around 1 year. 3 cases needed a repeat procedure in 3 months. Anterior segment OCT was done before surgery to determine the depth and width of the ulcer.

Discussion

The quality of published literature regarding surgical management of PUK is low in scientific evidence as most of the studies are case series or case reports. There are no randomized controlled trials (RCT) published till date. Alhassan et al conducted a meta-analysis of the medical and surgical management of Mooren's ulcer in 2014.^[85] They concluded that there is no scientific evidence in the form of RCT to prove the effectiveness of different treatment options in Mooren's ulcer. With recent advances in the understanding of the pathogenesis of various autoimmune diseases and corneal inflammation, the need for well-designed RCTs to assess the methodology, benefits, timing and concurrent medical management of different surgeries for PUK is paramount.^[86] Increased use of femtosecond laser in corneal grafting is another

References

1. Galor A, Thorne JE. Scleritis and peripheral ulcerative keratitis. *Rheum Dis Clin N Am*. 2007; 33:835–854
2. Robin JB, Schanzlin DJ, Verity SM, et al. Peripheral corneal disorders. *Surv Ophthalmol* 1986; 31:1–36.
3. Tauber J, Sainz de la Maza M, Hoang-Xuan T, Foster CS. An analysis of therapeutic decision making regarding immunosuppressive chemotherapy for peripheral ulcerative keratitis. *Cornea*. 1990; 9:66–73
4. Ladas JG, Mondino BJ. Systemic disorders associated with peripheral corneal ulceration. *Curr Opin Ophthalmol*. 2000; 11:468–471
5. Asbell P, Stenson S. Ulcerative keratitis: survey of 30 years' laboratory experience. *Arch Ophthalmol*. 1982; 100:77e80
6. Baum J, Fedulowica HB, Jordan A. A survey of Moraxella corneal ulcers in a derelict population. *Am J Ophthalmol*. 1980; 90:476e80
7. Polack FM, Kaufman HE, Newmark E. Keratomycosis: medical and surgical treatment. *Arch Ophthalmol*. 1971; 85:41e6
8. Srinivasan M, Zegans ME, Zelefsky JR, Lietman T, Whitcher JP, Cunningham ET Jr. Clinical characteristics of Mooren's ulcer in South India. *Br J Ophthalmol*. 2007; 91:570–575.
9. Garg P, Sangwan VS. Mooren's ulcer. In: Krachmer JH, Mannis MJ, Holland EJ, editors. *Cornea: Fundamentals, Diagnostic, Management*, 3rd ed. St Louis, MO: Elsevier; 2011
10. Galor A, Jabs DA, Leder HA, et al. Comparison of antimetabolite drugs as corticosteroid-sparing therapy for noninfectious ocular inflammation. *Ophthalmology*. 2008; 115:1826–1832.

interesting avenue to explore for managing such complicated pathologies.^[84, 87, 88]

Conclusion

This review is the first attempt in amalgamating the published data on surgical management of PUK apart from corneal grafting till date with their outcomes.

Acknowledgement: The author acknowledges the contribution of S Banu, librarian of L V Prasad Eye Institute, Hyderabad, in the access, collection and reassessment of all references mentioned in the article.

Disclosures:

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

11. Senolt L, Vencovský J, Pavelka K, Ospelt C, Gay S. Prospective new biological therapies for rheumatoid arthritis. *Autoimmun Rev*. 2009 Dec;9(2):102-7.
12. Chung G. Phlyctenular keratoconjunctivitis and marginal staphylococcal keratitis. In: Krachmer JH, Mannis MJ, Holland EJ, editors. *Cornea: Fundamentals, Diagnostic, Management*, 3rd ed. St Louis, MO: Elsevier; 2011.
13. Sangwan VS, Zafirakis P, Foster CS. Mooren's ulcer: Current concepts in management. *Indian J Ophthalmol*. 1997; 45:7-17.
14. Brown S. Mooren's ulcer. Treatment by conjunctival excision. *Br J Ophthalmol*. 1975; 59:675-82.
15. Hideaki Yokogawa, Akira Kobayashi, Natsuko Yamazaki et al. Surgical therapies for corneal perforations: 10 years of cases in a tertiary referral hospital. *Clinical Ophthalmology*. 2014; 8: 2165–2170
16. Katarzyna Krysik, Dariusz Dobrowolski, Anita Lyssek-Boron et al. Differences in Surgical Management of Corneal Perforations, Measured over Six Years. *J Ophthalmol*. 2017;2017:1582532.
17. W Bernauer, LA Ficker, PG Watson. The management of corneal perforations associated with rheumatoid arthritis: an analysis of 32 eyes. *Ophthalmology* 1995; 102:1325-1337
18. Charles C. de Farias, Norma Allemann, José Á. P. Gomes. Randomized Trial Comparing Amniotic Membrane Transplantation with Lamellar Corneal Graft for the Treatment of Corneal Thinning. *Cornea*. 2016; 35:438–444
19. E. J. Somerset. Mooren's ulcer treated by diathermy coagulation. *Br J Ophthalmol*. 1957 Sep; 41(9): 570–573
20. E. Avieal. Combined cryoapplications and peritomy in Mooren's ulcer. *Br J Oph* 1972; 56: 48
21. Genvert G, Sakauye CM, Arentsen JJ. Treatment of marginal corneal ulcers with cryotherapy and conjunctival recession or resection. *Cornea*. 1984-1985;3(4):256-61

22. Cheng-Wei Lu, Dan-Dan Zhou, Jiao Wan. Surgical treatment of peripheral ulcerative keratitis and necrotizing scleritis in granulomatosis with polyangiitis. *Saudi Med J* 2016; 37 (2): 205-207
23. Fasina O, Ogundipe AO, Ezichi EI. Mooren's ulcer in Ibadan, Southwest Nigeria. *J West Afr Coll Surg.* 2013 Jul-Sep; 3(3): 102-119
24. Fred M Wilson II, Merrill Grayson, Forrest D. Ellis. Treatment of peripheral corneal ulcers by limbal conjunctivectomy. *Brit J Ophthal.* 1976; 60: 713
25. Bartly J, Mondino BJ. Inflammatory diseases of the peripheral cornea. *Ophthalmology.* 1988; 95: 463-472
26. Chow C, Foster CS: Mooren's ulcer. *Int Ophthalmol Clin* 36:1-13, 1996.
27. Portnoy SL, Insler MS, Kaufman HE. Surgical management of corneal ulceration and perforation. *Surv Ophthalmol.* 1989 Jul-Aug; 34(1):47-58.
28. Tan MH, Chen SD, Rubinstein A et al. Corneal perforation due to severe peripheral ulcerative keratitis in Crohn disease. *Cornea* 2006; 25:628Y630
29. Saiqun Li, Yuqing Deng, Caiyuan Du. Rapid deterioration of Mooren's ulcers after conjunctival flap: a review of 2 cases. *BMC Ophthalmology.* 2017; 17: 93
30. Refojo MF, Dohlman CH, Ahmad B, et al. Evaluation of adhesives for corneal surgery. *Arch Ophthalmol* 1968; 80:645-56.
31. Webster RG Jr, Slansky HH, Refojo MF, et al. The use of adhesive for the closure of corneal perforations: report of two cases. *Arch Ophthalmol* 1968; 80:705-9.
32. Setlik DE, Seldomridge DL, Adelman RA, et al. The effectiveness of isobutyl cyanoacrylate tissue adhesive for the treatment of corneal perforations. *Am J Ophthalmol.* 2005; 140:920-921. [SEP]
33. Weiss JL, Williams P, Lindstrom RL et al. The use [SEP] of tissue adhesive in corneal perforations. *Ophthalmology* [SEP] 1983; 90:610-5. [SEP]
34. Leahey AB, Gottsch JD, Stark WJ. Clinical experience with [SEP] N-butyl cyanoacrylate (Nexacryl) tissue adhesive. *Ophthalmology* 1993; 100:173-80. [SEP]
35. Radosevich M, Goubran HI, Burnouf T. Fibrin sealant: scientific rationale, production methods, properties, and current [SEP] clinical use. *Vox Sang* 1997; 72:133-43. [SEP]
36. Sridhar MS, Mandal AK, Garg P, et al. Pupillary block glaucoma after tissue adhesive application and anterior chamber reformation with air [letter]. *Cornea* 2000; 19:250-1.
37. Rohrbach JM, Wohlrab TM, Nolle B et al. Cyanoacrylate injuries of the eye [German]. *Ophthalmologie.* 2000; 97: 878-80.
38. Webster RA Jr, Slansky HH and Refejo MF. The use of adhesive for the closure of corneal perforations, Report of two lenses. *Arch Ophthalmol.* 1968; 80:705-709.
39. Golubovic S, Parunovic A. Cyanoacrylate glue in the treatment of corneal ulcerations. *Fortschr Ophthalmol.* 1990; 87:378-381.
40. Weiss JL, William P, Lindstorm RL, et al. The use of tissue adhesive in corneal perforations. *Ophthalmology.* 1983 90:610-615.
41. Bodaghi B, Levy C, Votan P et al. Value of cyanoacrylate tissue adhesives in peripheral corneal ulcers of inflammatory origin. *J Fr Ophtalmol.* 1996; 19(2):127-32.
42. Agrawal V, Kumar A, Sangwan V et al. Cyanoacrylate adhesive with conjunctival resection and superficial keratectomy in Mooren's ulcer. *Indian J Ophthalmol.* 1996 Mar; 44(1):23-7.
43. Lal I, Shivanagari SB, Ali MH et al. Efficacy of conjunctival resection with cyanoacrylate glue application in preventing recurrences of Mooren's ulcer. *Br J Ophthalmol.* 2016 Jul; 100(7):971-975.
44. Fogle JA, Kenyon KR, Foster CS. Tissue adhesive arrests stromal melting in the human cornea. *Am J Ophthal.* 1980; 89:795-802.
45. Berkavitz PT, Arentsen JJ, Felberg NT, et al. Presence of circulating immune complexes in patients with peripheral corneal diseases. *Arch Ophthalmol* 1983; 101:242-245
46. Schaap OL, Feltkamp TEW, Bregtoart AC. Circulating antibodies to corneal tissue in a patient suffering from Mooren's ulcer (ulcus rodens corneae). *Cli Exp Immunol.* 1969; 5:365-370.
47. Ashok Sharma, Kanwar Mohan, Rajan Sharma. Scleral Patch Graft Augmented Cyanoacrylate Tissue Adhesive for Treatment of Moderate-Sized Noninfectious Corneal Perforations (3.5-4.5 mm). *Cornea* 2013; 32:1326-1330
48. Hyndiuk RA, Hull DS, Kinyoun JL. Free tissue patch and cyanoacrylate [SEP] in corneal perforations. *Ophthalmic Surg.* 1974; 5:50-55. [SEP]
49. EM Messmer, CS Foster. Destructive corneal and scleral disease associated with rheumatoid arthritis. Medical and surgical management. *Cornea* 1995; 14 (4): 408-417
50. Yousuf M. Khalifa, MD, M. Rami Bailony, Michele M. Bloomer. Management of Nontraumatic Corneal Perforation with Tectonic Drape Patch and Cyanoacrylate Glue. *Cornea* 2010; 29:1173-1175
51. Spotnitz WD, Mintz PD, Avery N et al. Fibrin glue from stored human plasma. An inexpensive and efficient method for [SEP] local blood bank preparation. *Am Surg* 1987; 53:460-2. [SEP]
52. Dal Pizzol MM, Roggia MF, Kwitko S et al. Use of fibrin glue in ocular surgery. *Arq Bras Oftalmol.* 2009 May-Jun; 72(3):308-12.
53. Halil Huseyin Cagatay, Gokcen Gokce, Alper Mete et al. Non-Recurrence Complications of Fibrin Glue Use in Pterygium Surgery: Prevention and Management. *The Open Ophthalmology Journal.* 2015; 9: 159-163
54. Lagoutte FM, Gauthier L, Comte PR. A fibrin sealant for perforated and preperforated corneal ulcers. *British Journal of Ophthalmology* 1989; 73: 757-761
55. Davis JW. Skin transplantation with a review of 550 cases at the Johns Hopkins Hospital. *Johns Hopkins Med J.* 1910; 15:307-396.
56. DeRöth A. Plastic repair of conjunctival defects with fetal membranes. *Arch Ophthalmol.* 1940; 23(3):522-525.
57. Sorsby A, Haythorne J, Reed H. Further experience with amniotic membrane grafts in caustic burns of the eye. *Br J Ophthalmol.* 1947; 31(7):409-418.
58. Tseng SC, Prabhasawat P, Lee SH. Amniotic membrane transplantation for conjunctival surface reconstruction. *Am J Ophthalmol.* 1997; 124(6):765-774.
59. Lee SH, Tseng SC. Amniotic membrane transplantation for persistent epithelial defects with ulceration. *Am J Ophthal.* 1997; 123(3):303-312.
60. Dua HS. Amniotic membrane transplantation. *Br J Ophthalmol.* 1999; 83(6): 748-752. [SEP]
61. Solomon A, Rosenblatt M, Monroy D, et al. Suppression of interleukin 1 and interleukin 1 in human limbal epithelial cells cultured on the amniotic membrane stromal matrix. *Br J Ophthalmol* 2001; 85:444-9. [SEP]

62. Touhami et al, Invest Ophthalmol Vis Sci 2001; 41[Suppl]: S303
63. Abraham Solomon, Daniel Meller, PinnitaPrabhasawat. Amniotic Membrane Grafts for Nontraumatic Corneal Perforations, Descemetocelles, and Deep Ulcers. Ophthalmology 2002; 109:694 –703
64. Ngan ND, Chau HT. Amniotic membrane transplantation for Mooren's ulcer. Clin Experiment Ophthalmol. 2011;13(5):386–392.
65. Saeed Al Motowa, Mohammed Al Zobidi. Amniotic Membrane Transplant with a Special Technique (Motowa's Sandwich Technique) in Mooren's Ulcer. Middle East Afr J Ophthalmol. 2015 Jul-Sep; 22(3): 386–388
66. Vipul Bhandari, K.S. Siddharthan. Bilateral Mooren's ulcer – Customised corneal graft with additional amniotic membrane graft. Saudi Journal of Ophthalmology 2015; 29: 235–237
67. Lambiase A, Sacchetti M, Sgrulletta R et al. Amniotic membrane transplantation associated with conjunctival peritomy in the management of Mooren's ulcer: a case report. 2005;15(2): 274-6.
68. Lavaju P, Sharma M, Sharma A et al. Use of amniotic membrane and autologous serum eye drops in Mooren's ulcer. Nepal J Ophthalmol. 2013; 5(1):120-3
69. Ko-Hua Chen, Wen-Ming Hsu, Chih-Kai Liang. Relapsing Mooren's Ulcer after Amniotic Membrane Transplantation Combined with Conjunctival Autografting. Ophthalmology 2004; 111:792–795
70. Schallenberg M, Westekemper H, Steuhl KP, Meller D. Amniotic membrane transplantation ineffective as additional therapy in patients with aggressive Mooren's ulcer. BMC Ophthalmol. 2013; 13:81.
71. Hick S., et al. "Amniotic membrane transplantation and fibrin glue in the management of corneal ulcers and perforations: a review of 33 cases". Cornea 24.4 (2005): 369-377
72. Hanada K, Shimazaki J, Shimmura S et al. Multilayered Amniotic Membrane Transplantation for Severe Ulceration of the Cornea and Sclera. Am J Ophthalmol. 2001 Mar;131(3):324-31.
73. M. Teresa Rodríguez-Ares, Rosario Touriño, M. Jesús López-Valladares. Multilayer Amniotic Membrane Transplantation in the Treatment of Corneal Perforations. Cornea 2004; 23:577–583
74. Junhua Fan, Meihua Wang, Fulu Zhong. Improvement of Amniotic Membrane Method for the Treatment of Corneal Perforation. Biomed Res Int. 2016; 2016:1693815
75. Liu J, Li L, Li X. Effectiveness of Cryopreserved Amniotic membrane transplantation in Corneal Ulceration: A Meta-Analysis. Cornea. 2019 Apr;38(4):454-462
76. Nakamura T, Yoshitani M, Rigby H. Sterilized, freeze-dried amniotic membrane: a useful substrate for ocular surface reconstruction. Invest Ophthalmol Vis Sci. 2004 Jan;45(1):93-9.
77. Allen CL, Clare G, Stewart EA. Augmented dried versus cryopreserved amniotic membrane as an ocular surface dressing. PLoS One. 2013 Oct 30;8(10): e78441
78. Shigeru Kinoshita, Yuchi Ohashi, Masahito Ohji et al. Long-term Results of Keratoepithelioplasty in Mooren's Ulcer. Ophthalmology 1991; 98:438-445
79. H. Kaz Soong, M.D., Ayad A. Farjo, M.D., Douglas Katz. Lamellar Corneal Patch Grafts in the Management of Corneal Melting. Cornea 2000; 19(2): 126–134.
80. Hsin-Chiung Lin, Yung-Sung Lee, Ju-Hsin Chia. Management of Rheumatoid Arthritis-Related Peripheral Ulcerative Keratitis Using Glycerol-Preserved Corneas. Asia-Pac J Ophthalmol 2013; 2: 291-294
81. Weiyun Shi, Mingna Liu, Hua Gao. Penetrating Keratoplasty With Small-Diameter and Glycerin-Cryopreserved Grafts for Eccentric Corneal Perforations. Cornea 2009; 28: 631–637
82. Juncai Liu, Weiyun Shi, Suxia Li. Modified lamellar keratoplasty and immunosuppressive therapy guided by in vivo confocal microscopy for perforated Mooren's ulcer. Br J Ophthalmol 2015; 99:778–783.
83. Namrata Sharma, Gautam Sinha, Himanshu Shekhar et al. Demographic profile, clinical features and outcome of peripheral ulcerative keratitis: a prospective study. Br J Oph 2015; 0:1–6.
84. Yang Jiang, Ying Li, Xiao-Wei Liu. A Novel Tectonic Keratoplasty with Femtosecond Laser Intrastromal Lenticule for Corneal Ulcer and Perforation. Chin Med J 2016; 129:1817-21
85. Alhassan MB, Rabi M, Agbabiaka IO. Interventions for Mooren's ulcer. Cochrane Database of Systematic Reviews. 2014; Issue 1. Art. No.: CD006131
86. Swapnali Sabhapandit, Somasheila I. Murthy. Peripheral Ulcerative Keratitis: Clinical Syndromes, Classifications, and Differential Diagnosis, in: **Tandon, R., Galor, A., Sangwan V** et al. Peripheral Ulcerative Keratitis: A Comprehensive Guide, Vol 1, Springer, January 2017, pp 61-81
87. Mian SI, Soong HK, Patel SV, et al. In vivo femtosecond laser-assisted posterior lamellar keratoplasty in rabbits. Cornea. 2006; 25(10): 1205e9
88. Soong HK, Mian S, Abbasi O, Juhasz J. Femtosecond laser-assisted posterior lamellar keratoplasty: initial studies of surgical technique in eye bank eyes. Ophthalmology. 2005; 112(1): 44e9

Letter to the editor-1

Dear Editor,

Due to the current COVID-19 situation, Ophthalmologists all over the world are facing the dilemma of making the right decision of saving sight without causing any risk to life. The UK is overwhelmed by the pandemic and we at the NHS are trying to change our practice and adapt to the new shielding/safety rules to keep our patients, staff and ourselves safe. Currently, we are transitioning from a full lockdown, when only urgent care was provided, to partial restoration of clinic services.

We are offering virtual consultation which involves notes review or telephonic consultation and deferring further follow-ups if deemed safe. Patients are communicated via letters and telephone to keep them updated on the changing services.

Those triaged as at risk of losing vision, are offered face to face consultation following proper social distancing and safety protocol. Every effort is taken to reduce actual contact time with the patient. No accompanying attendants are allowed in the clinic unless there is any communication or mobility issue. We are provided with surgical masks, visors and PPE as per WHO guidelines and slit lamps with breath guards. Visual acuity is measured by starting from the bottom of the chart. We are entirely depending on OCT and OCTA as FFA service is temporarily halted. Visual fields are done if highly essential. A thorough wipe down including door handles after every patient is practised.

Unfortunately, those at risk of losing sight, mainly those patients with active CNVM, highly active PDR and uncontrolled glaucoma, also fall in the most vulnerable age group for COVID-19 infection. Those on anti-VEGF treatment are offered a further course of injections. Those who are stable without treatment for the past 4 to 6 months or are self-isolating are offered virtual consultation and face to face if necessary.

Royal College of Ophthalmology has set a few guidelines regarding restoration of full services and restarting of Cataract surgery in a phased manner. Though not certain, Phaco and

vitrectomy are considered aerosol-generating procedures, so donning of full PPE is advised.

Rules are still evolving, and practice may vary from Trust to Trust, Our Trust is preparing to start elective surgeries in another site which is not part of the hospital treating COVID-19 infection (Red zone). Care is being taken for the safety of the vulnerable ‘Black, Asian and minority ethnic group’ (BAME) hospital staff. We have all been tested for the proper kind of mask, like FFP3 and undergone individual risk assessment.

To begin with, Phaco surgery is being offered to low-risk patients who will have rapid and significant benefit from the surgery, who had previous uncomplicated Phaco done in one eye, those with post-surgical anisometropia or at risk of losing a driving license and those with very poor vision restricting mobility. Emphasis is on performing simultaneous bilateral surgery to reduce hospital time. RCO suggests a discussion of an added risk of Covid infection along with the risks and benefits of the procedure and reassurance of the protection we can offer. All these are best done via telephonic or video consultation before clinic visits to reduce exposure time. Patients can consent at the time of pre-assessment and Biometry. A COVID-19 test is to be performed 48 to 72 hours before surgery. The patient and family will have to self-isolate after viral negative test till the day of surgery, which could be a week or two.

New guidelines are still being formulated as I am writing this letter, as new challenges keep emerging. Though it seems like a Herculean task at the moment, it can be achieved, with a supportive team and more reliance on advanced technology. And this seems to be the beginning of the “New Normal”.....

P.S This article was written in May 2020 when we were struggling to cope with a strange new situation. It is end of October now and much water has flown down the bridge since then. We have a better understanding of the novel virus now. Our services are back to half the strength of pre Covid days, following the social distancing measures as before.

Our intravitreal injection clinics, with treat and extend policy have been a saviour for the vulnerable elderly age group who preferred injections to waiting in a crowded area for OCT and consultations. We are slowly catching up with the cataract surgery backlogs however more of our glaucoma patients are needing surgical interventions for deterioration of their conditions due to the cancellation of timely follow ups. Everyday is a new learning experience for us and there is hope at the end of the tunnel. [Coronavirus](#)

[COVID-19 Clinical Guidelines for ophthalmologists](#)

Stay safe.

Dr Jonalee Das, MS (GU), FRCS (Glasgow)
Northeast Lincoln shire NHS Trust, UK
Email: drjonalee@gmail.com

Received - Original: 26 May 2020

- Revised: 27 October 2020

Instruction for authors

Articles may be submitted at any time. It is mandatory to submit the following

1. ICMJE Form for Disclosure of Potential Conflicts of Interest
2. Authors' Declaration and Copyright Transfer form

Instructions for authors, Forms 1 and 2, above, are available at www.osa.ind.in/journal.htm.

Presently, all submissions may be made by email only at journal.osa@gmail.com.

Preparation of Manuscripts

Manuscripts must be prepared in accordance with "Uniform requirements for Manuscripts submitted to Biomedical Journals" developed by the International Committee of Medical Journal Editors (October 2008). The uniform requirements and specific requirement of Journal of Ophthalmological Society of Assam are summarized below. Authors are requested to check for the latest instructions the website of the journal (<http://www.osa.ind.in/journal.htm>).

Journal of Ophthalmological Society of Assam accepts manuscripts written in American English.

The Editorial Process

- A manuscript will be reviewed for publication subject to the Author's declaration
- The journal requires a corresponding author who will be responsible for all communication with the Journal related to the manuscript.
- All manuscripts received are duly acknowledged and given a Manuscript Number.
- On submission, all submitted manuscripts undergo a screening prior to a formal review. Manuscripts with insufficient originality, serious shortcomings, or outside the scope of JOSA may be rejected at this stage itself.
- Peer Review is undertaken by two or more subject expert reviewers. The contributor may suggest two or three qualified reviewers; such reviewers should not be affiliated with the same institutes as the author/co-authors. The selection of reviewers is at the sole discretion of the editorial board.
- The Journal follows a double-blind review process, wherein the identity of reviewers and authors are concealed from each other.
- The reviewers' comments (acceptance/ rejection/ amendments in manuscript) are conveyed to the corresponding author. The author is requested to submit a revised version of the manuscript incorporating a point by point response to reviewers' comments. This process may be repeated till reviewers and editors are satisfied with the manuscript.
- Manuscripts accepted for publication are copy edited.
- Page proofs are sent to the corresponding author. The corresponding author is advised to return the corrected proofs within 7 calendar days. It may not be possible to incorporate corrections received thereafter.
- All communication shall be by *email only* until further notice.
- The journal publishes articles online as 'Ahead of Print' on acceptance

Clinical Trial Registry

- Registration of clinical trials should conform to norms as updated by regulatory authorities in India from time to time. Kindly visit <http://www.edsco.nic.in>
- For studies conducted in India, registration is required at <http://www.ctri.in/>
- Guidelines on registration for PG thesis conducted in India is available at <http://ctri.nic.in/Clinicaltrials>

- Other acceptable trial registers are <http://www.actr.org.au/>; <http://www.clinicaltrials.gov/>; <http://isrctn.org/>; <http://www.trialregister.nl/trialreg/index.asp>, <http://www.umin.ac.jp/ctr>. Kindly consult editorial board, JOSA for any clarification
- For clinical trials that have begun enrollment of subjects before June 2008, retrospective registration with clinical trial registry is admissible.

Authorship Criteria

JOSA strongly recommends prospective authors to adhere to guidelines of the International Committee of Medical Journal Editors (<http://www.icmje.org>)

Authorship credit should be based only on substantial contributions to each of the three components mentioned below:

1. Concept and design of study or acquisition of data or analysis and interpretation of data;
2. Drafting the article or revising it critically for important intellectual content; and
3. Final approval of the version to be published.

The order of naming the Authors should be based on relative contributions towards the study and writing of the manuscript. Once submitted, the order cannot be changed without written consent of all the contributors. JOSA prescribes a maximum number of 6 (six) authors for manuscripts. If the number of authors exceeds six, a justification signed by all authors should be submitted.

Acknowledgement is permissible for members responsible for acquisition of funding, collection of data, technical support, and general supervision.

Contribution Details

Each contributor should have participated sufficiently in the work to take public responsibility for appropriate portions of the content of the manuscript. Contributors should mention the contributions made by each of them towards the manuscript. The nature of contribution could be: concept, design, definition of intellectual content, literature search, clinical studies, experimental studies, data acquisition, data analysis, statistical analysis, manuscript preparation, manuscript editing and manuscript review. At least one author should take responsibility for the whole work and he/she shall be designated as 'guarantor'.

Conflicts of Interest/ Competing Interests

All authors of must mandatorily submit the **conflict of interest form along with the main manuscript submission**, disclosing any and all possible conflicts of interest they may have with regard to the manuscript. The conflict of interest form is separate from the copyright transfer form

Submission of Manuscripts

All manuscripts must be submitted by email. Authors do not have to pay for submission, processing or publication of articles.

The manuscript should be submitted in the form of two separate files:

[1] Covering Letter/Title Page/First Page File

This file should provide

- The type of manuscript (Original Article, Review Article, Case Report/Short Case Series, Letter the Editor/Letter in Response, Guest Editorial, Research methodology, OSA Meeting Papers) title of the manuscript, running title, names of all authors/ contributors (with their highest academic degrees, designation and affiliations) and name(s) of department(s) and/ or institution(s) to which the work should be credited. All information which can reveal your identity should be here. Use files, preferably Microsoft Word files saved as .doc or .docx. Do not zip the files.
- The total number of pages, total number of photographs and word counts separately for abstract and for the text (excluding the references, tables and abstract), word counts for introduction + discussion in case of an original article.
- Source(s) of support in the form of grants, equipment, drugs, or all of these.
- Acknowledgement, if any. Acknowledgement should not be in the main article file.
- If the manuscript was presented previously, a full statement to that effect should be included with Subject title, place and date of presentation
- Registration number in case of a clinical trial
- Conflicts of Interest form
- Authors' declaration and copyright transfer form
- The name, address, e-mail, and telephone number of the corresponding author and Guarantor

[2] Article File:

- The file must not contain identity of the author(s), institution, or acknowledgements (Blinded)
- The main text of the article, beginning from Abstract, Key Words, Body of the Manuscript, References, Tables, Legend to Figures should be in this file in the specified sequence
- The pages should be numbered consecutively, beginning with the first page of the article file.
- Page headers/running title may include the title but not the authors' / institution identity.
- Use Microsoft Word .doc or .docx files.
- Do not zip the files.
- Limit the file size to 1 MB.

[3] The Authors' Declaration and Copyright Transfer Form has to be submitted in original with the signatures of all the contributors within two weeks of submission via email as a scanned image. It will not be possible to process the submission otherwise.

Copies of any Permission(s) of Copyright material

It is the responsibility of authors to obtain permissions for reproducing any copyrighted material. A copy of the permission obtained must accompany the manuscript. Kindly note that *Plagiarism is unethical and liable for punitive action.*

Types of Manuscripts

- Editable checklists for reporting guidelines can be found at www.equator-network.org
- The following table lists the type of articles accepted by JOSA

TYPE of ARTICLE	Abstract	Word Limit	Combined Maximum of Tables and Figures	Maximum References	Type of study	Checklist As per study Available on respective websites
ORIGINAL ARTICLES	Structured : Aim Methods, Results, Conclusion Maximum 250 words	3000 words	5	40	Randomized Controlled Trial (RCT), Prospective, Retrospective Observational / Interventional Study, Non-randomised Trial, Descriptive Data, Cost Analysis, Animal Studies	CONSORT, STROBE, RECORD, TREND, COREQ, SRQR, CHEERIES, STARD, REMARK, TRIPOD, CHEERS, ARRIVE, REFLECT
REVIEW ARTICLES	Unstructured maximum 250 words	5000 words	10	100	Review of Observational studies, Systematic review, Meta-analysis, Qualitative Data By editorial invitation only. All review articles are subject to peer review	MOOSE, ENTREQ, PRISMA
CASE REPORT and CASE SERIES	Unstructured maximum 100 words	900 words	Maximum 4 tables or figures	Maximum 10	Structure: Introduction, Case report and discussion. Must add to existing knowledge. Proper documentation required. Case series must contain 3-10 cases.	CARE
LETTERS TO THE EDITOR AND LETTERS IN RESPONSE	No abstract required	300 words	Maximum 2 tables or figures	Maximum 5	Should be either a response to a specific article published within the last 6 months, or introduction of a new issue. Letters in response are invited by Editorial board	Not applicable
GUEST EDITORIAL	No abstract required	1000 words	Maximum 4 tables or figures	Maximum 20	By invitation from Editorial board only	Not applicable
RESEARCH METHODOLOGY	Unstructured maximum 250 words	3000 words	Maximum 5 tables and 5 figures	Maximum 40	Scientific writing, statistics, legal, ethical aspects	Not applicable
OSA MEETING PAPERS	All papers that receive an award at an OSA meeting are required to be submitted to JOSA w.e.f. Golden Jubilee Conference 2017					As above

* Maximum word limit. Excluding title, abstract, tables and figures, legends and references.

Ethics

When human subjects are involved in India, authors are required to declare compliance with ICMR 'Ethical guidelines for biomedical research on human subjects (http://www.icmr.nic.in/ethical_guidelines.pdf) /Clearance from Ethics Committee/Institutional Review Board in accordance with the Helsinki Declaration of 1975, as revised in 2000. Patient's identity should not be revealed, especially in illustrative material. When reporting experiments on animals, indicate compliance with applicable regulatory requirements on use of laboratory animals.

References

JOSA recommends formats used by the National Library of Medicine (NLM) in *Index Medicus* (https://www.nlm.nih.gov/bsd/uniform_requirements.html). References should be *numbered* consecutively in the order in which they are first mentioned in the text (not in alphabetic order). *Identify references in text, tables, and legends by Arabic numerals in superscript with square bracket after the punctuation marks. References cited only in tables or figure legends should be numbered in accordance with the sequence established by the first identification in the text of the particular table or figure. Names of non-indexed journals should be mentioned in full. Avoid using abstracts, "personal communication", and "unpublished observations" as references.*

Tables

- Tables should be self-explanatory and should not duplicate textual material.
- **Each table should be limited to maximum of 5 columns and 20 rows.**
- Number tables, in Arabic numerals, consecutively in the order of their first citation in the text and supply a brief title for each.
- Explanatory notes, credit lines to be placed in footnotes.
- Explain in footnotes all non-standard abbreviations that are used in each table.
- For footnotes, symbols and their order should be: *, †, ‡, §, ||, ¶, **, ††, ‡‡
- Tables with their legends should be provided at the end of the text after the references in the manuscript file, not as separate file
- The table number should be cited at the relevant place in the text.

Illustrations/Figures/Images

- Upload images **as separate files in JPEG** only format. *Do not* inserted images in the body of the manuscript. Each file size should be within 2MB with minimum resolution of 300 dpi or 1800 x 1600 pixels. Rename file with - MANUSCRIPT NUMBER_FIGURE NUMBER, e.g., JOSA_2017_17_Fig 1
- Submit good quality color images as JPEG files less than 2 MB in size, 1600x1200 pixels, 5-6 inches.
- Graphs can be submitted as images separately without incorporating them in the article file.
- 1) Files should not be zipped.
- 2) Figures should be numbered consecutively according to the order in which they have been first cited in the text.
- 3) Labels, numbers, arrows, letters and symbols should be clear and of uniform size and good contrast. The lettering for figures should be large enough to be legible after reduction to fit the width of a printed column.
- 4) When graphs, scatter-grams or histograms are submitted the numerical data on which they are based should also be provided.
- 5) Legends for illustrations: word limit 50, excluding the credit line, using double spacing, and tagged with Arabic numerals. Place legends **after** the References Section / Tables in the article file.
- 6) The Journal reserves the right to edit illustrations.

Videos

- Video facility is not available presently. This section shall be updated in due course.

Protection of Patients' Rights to Privacy

Identifying information should not be included in written descriptions, photographs, scan reports, etc., and pedigrees. If the information is essential for scientific purposes, a written informed consent for publication must be obtained from the patient, or parent/ legal guardian of a minor, and copy of the consent should be submitted with the covering letter.

Sending a Revised Manuscript

The revised manuscript should be submitted by email quoting the manuscript number, incorporating point to point clarification to the reviewer's remarks, highlighting the changes in the article. The "First Page" or "Covering Letter" file may be omitted while submitting a revised version.

Reprints and Proofs

A complimentary copy is offered to all Authors and Co-Authors whose articles are published in JOSA. The Journal provides no free printed reprints. To purchase reprints, kindly contact the editorial office.

Publication Schedule

JOSA is in the process of bringing out semiannual issues.

Manuscript Submission, Processing and Publication Charges

The journal does not charge for submission and processing of the manuscripts. Black and white images are reproduced free of cost. However, color processing charges apply to images reproduced in color (Rs 4000 for 1-2 figures, Rs 6000 for 2-4 figures, Rs 8000 for 5-6 figures and so on). Charges may vary with reproduction size of the images and composites. The final decision is made by the Editorial Team. The Editor will inform the Author know about the exact charge / payment modalities at the time of provisional acceptance of the manuscript.

Copyrights

The entire contents of the Journal of Ophthalmological Society of Assam are protected under Indian and international copyrights. JOSA, however, grants to all users a free, irrevocable, worldwide, perpetual right of access to, and a license to copy, use, distribute, perform and display the work publicly and to make and distribute derivative works in any digital medium for any reasonable non-commercial purpose, subject to proper attribution of authorship and ownership of the rights. The journal also grants the right to make small numbers of printed copies for their personal non-commercial use under Creative Commons Attribution-Noncommercial-Share Alike 3.0 Unported License.

Checklist

- 2) Covering Letter/Title file
- 3) Author's Declaration and Copyright transfer form
- 4) Conflicts of interest disclosed
- 5) Article File
- 6) Images
- 7) Permissions: copyright material, borrowed figures/tables, patient's written consent

Presentation and Format

- Double spacing
- Margins 2.5 cm from all four sides
- Page numbers included at bottom
- Running title provided (not more than 50 characters)
- Abstract page contains the full title of the manuscript
- Key words provided (3-5)
- Manuscript title should be in Sentence case
- Remove 'Track Changes'

Language and Grammar

- Uniformly American English
- Write the full term for each abbreviation at its first use in the title, abstract, keywords and text separately unless it is a standard unit of measure.
- Numerals from 1 to 10 spelt out
- Numerals at the beginning of the sentence spelt out
- Check the manuscript for spelling, grammar and punctuation errors
- If a brand name is cited, also cite the manufacturer's name and city/state/country.
- Species names should be in italics

For ready to use templates authors may refer to www.jjo.in
For 'print-on-demand' kindly contact the editorial office.

© Journal of Ophthalmological Society of Assam| Published by Ophthalmological Society of Assam
Online (since 8December 2017)

Editorial and Ethics Policies of Journal of Ophthalmological Society of Assam conform to recommendation of the International Committee of Medical Journal Editors (<http://www.icmje.org>)

Authors' Declaration and Copyright Transfer form
(One signed copy to be submitted with the manuscript)

Manuscript Title: _____

Manuscript Number: _____

I/we certify that the manuscript represents valid work. I/we submit that I/we meet the criteria for authorship as established by the ICMJE, in terms of my/our sufficient participation in the intellectual content, conception and design of this work, or, the analysis and interpretation of the data, as well as the writing of the manuscript, to take public responsibility for it and have agreed to have my/our name listed as an Author/Co-author.

I/we declare that this manuscript under my/our authorship is being submitted to Journal of Ophthalmological Society of Assam alone at that point in time, and has not been published/already accepted for publication, nor is being considered for publication elsewhere

I/we certify that all the data collected during the study is presented in this manuscript and no data from the study has been or will be published separately.

I/we undertake that, if requested by JOSA, I/we will provide the primary data on which the manuscript is based, for examination by the editorial board or their assignees.

All financial interests, direct or indirect, for individual authors in connection with this paper have been disclosed in the cover letter. Sources of outside support of the project are declared in the cover letter.

I/We hereby transfer, assign, *all copyright ownership*, including any and all rights incidental thereto, exclusively to the JOSA, in the event that our work is published by the Journal. The Journal shall own the work, including 1) copyright; 2) the right to grant permission to republish the article in whole or in part, with or without fee; 3) the right to produce preprints or reprints and translate into languages other than English for sale or free distribution; and 4) the right to republish the work in a collection of articles in any other mechanical or electronic format.

I/we hereby authorise the corresponding author to communicate with JOSA, including incorporating due changes, and he/she will act as the guarantor for the manuscript on our behalf.

I/we understand that the article will be published under the terms of the latest Creative Commons Attribution-NonCommercial-ShareAlike License, unless the journal notifies the author otherwise in writing.

All individuals who have made substantial contributions to the manuscript, but who are not authors/co-authors, are duly acknowledged and have given me/us their written permission to be named. No contributor has been otherwise omitted.

Name	Signature with date	Nature of Contribution ¹
1.		
2.		
3.		
.....		

Guarantor²:

¹ Concept, design, intellectual content, literature search, data acquisition, data analysis, statistical analysis, manuscript preparation, manuscript editing and manuscript review

² One or more author takes public responsibility for the whole work and is designated as 'Guarantor'

Journal of Ophthalmological Society of Assam (JOSA)

Peer Review

All submissions shall be peer reviewed. The peer review process is designed to assure that JOSA publishes only original, accurate, and timely articles that contribute to knowledge in the Vision Sciences.

The Editor shall make a preliminary assessment on whether the manuscript meets the requirements of the journal and is worth sending out for thorough review.

If so, it is then assigned to three reviewers, presently by email only, that may include any member of the Editorial Board and/or other experts in relevant fields, as selected by the Editor-for review, preferably in a double blind process.

Reviewers are asked to assess submissions based on depth of original research, accuracy, appropriate documentation, readability, and suitability of content.

Reviewers shall make One of Four Recommendations:

1. Acceptance
2. Provisional Acceptance With Revision
3. Provisional Non-Acceptance
4. Rejection

For points 2, 3 and 4, reviewers are required to include comments explaining the recommendation.

Authors may expect to know the results of the manuscript peer review within four weeks from the date of submission.

Authors shall receive the reviewers' comments and be advised to revise their manuscripts in line with the reviewers' and/or editor's suggestions.

If the revised article is accepted for publication, the editor then determines the journal issue in which it will appear. All efforts are made publish an accepted article in the next issue of the journal.

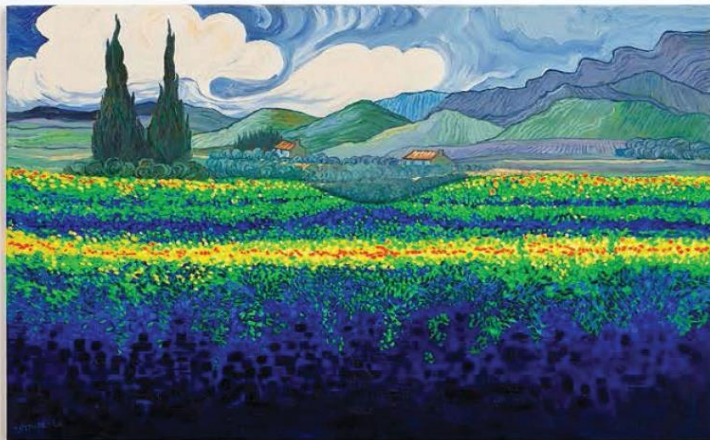
Call for reviewers:

Interested reviewers may contact the editorial office by email at journal.oe@gmail.com

Mandatory: at least two publications in peer reviewed indexed journal in the last 10 years

For patients with wet AMD¹

Their vision is a masterpiece



In two head-to-head trials vs aflibercept, Pagenax[®] 1,2 :

- Maintained a **majority of patients on a q12w** interval immediately after loading dose through Week 48^{1,2}
- Demonstrated **robust vision gains**^{1,2}
- Outperformed aflibercept with **superior fluid resolution**^{1,2†}
- Exhibited an overall well tolerated **safety profile**^{3,4}

Basic Succinct Statement PAGENAX[®]

PRESENTATION: Solution for injection. Each vial contains 27.6 mg of brolucizumab in 0.23 mL solution.

INDICATIONS: Pagenax is indicated for the treatment of neovascular (wet) age-related macular degeneration (AMD).

DOSAGE REGIMEN AND ADMINISTRATION:

Single-use vial for intravitreal use only. Each vial should only be used for the treatment of a single eye. Pagenax must be administered by a qualified physician. **Adults:** The recommended dose for Pagenax is 6 mg (0.05 mL) administered by intravitreal injection every 4 weeks (monthly) for the first three doses. Thereafter, Pagenax is administered every 12 weeks (3 months). The physician may individualize treatment intervals based on disease activity as assessed by visual acuity and/or anatomical parameters. The treatment interval could be as frequent as every 8 weeks (2 months).

Special populations: ● Renal impairment: No dose adjustment is required. ● Hepatic impairment: No dose adjustment is required. ● Geriatric patients: No dose adjustment is required. ● Pediatric patients: Safety and efficacy have not been established. **Contraindications:** ● Hypersensitivity to the active substance or to any of the excipients. ● Active or suspected ocular or periocular infection. ● Active intraocular inflammation.

WARNINGS AND PRECAUTIONS: ● Endophthalmitis, retinal detachment, retinal vasculitis and/or retinal vascular occlusion: Intraocular injections, including those with Pagenax, have been associated with endophthalmitis and retinal detachment. Proper aseptic injection techniques must always be used when administering Pagenax. Retinal vasculitis and/or retinal vascular occlusion, typically in the presence of intraocular inflammation, have been reported with the use of Pagenax. Patients should be instructed to report any symptoms suggestive of the above mentioned events without delay. ● Intraocular pressure increases: Transient increases in intraocular pressure have been seen within 30 minutes of injection, similar to those observed with intravitreal administration of other VEGF inhibitors. Sustained intraocular pressure increases have also been reported. Both intraocular pressure and perfusion of the optic nerve head must be monitored and managed appropriately. ● Driving and using machines: Patients may experience temporary visual disturbances after an intravitreal injection with Pagenax and the associated eye examination. Advise patients not to drive or use machinery until visual function has recovered sufficiently.

Pregnancy, lactation, females and males of reproductive potential

Pregnancy: The potential risk of use of Pagenax in pregnancy is unknown. However, based on the anti-VEGF mechanism of action, brolucizumab must be regarded as potentially teratogenic and embryo/fetotoxic. Therefore, Pagenax should not be used during pregnancy unless the expected benefits outweighs the potential risks to the fetus.

Lactation: Breast-feeding is not recommended during treatment and for at least one month after the last dose when stopping treatment with Pagenax.

Females and males of reproductive potential: Women of reproductive potential should use effective contraception (methods that result in less than 1% pregnancy rates) during treatment with Pagenax and for at least one month after the last dose when stopping treatment with Pagenax.

ADVERSE DRUG REACTIONS:

Common (1 to 10%): Visual acuity reduced, retinal haemorrhage, uveitis, iritis, vitreous detachment, retinal tear, cataracts, conjunctival haemorrhage, vitreous floaters, eye pain, intraocular pressure increase, conjunctivitis, retinal pigment epithelial tear, vision blurred, corneal abrasion, punctate keratitis, hypersensitivity.

Uncommon (<1%): Endophthalmitis, blindness, retinal artery occlusion, retinal detachment, conjunctival hyperaemia, lacrimation increased, abnormal sensation in eye, detachment of retinal pigment epithelium, vitritis, anterior chamber inflammation, iridocyclitis, anterior chamber flare, corneal oedema, vitreous haemorrhage.

Frequency not known: Retinal vasculitis, retinal vascular occlusion.

Interactions: No formal interaction studies have been performed.

Packs: One 0.23 ml vial, one filter needle

Before prescribing, please consult full prescribing information available from Novartis Healthcare Private Limited, Inspire BKC, Part of 601 & 701, Bandra Kurla Complex, Bandra (East), Mumbai - 400 051, Maharashtra, India. Tel +91 22 50243335/36, Fax +91 22 50243010.

To be sold by retail on the prescription of an Ophthalmologist only.

India BSS dated 6 Jul 2020 based on International BSS dtd 30 Apr 2020 effective from 23 Jul 2020.

AMD=age-related macular degeneration; q12w/q8w=treatment every 12/8 weeks; VA=visual acuity.

* In both studies, the primary efficacy endpoint was noninferiority in mean Best Corrected Visual Acuity (BCVA) to Week 48 as measured by the Early Treatment Diabetic Retinopathy Study (ETDRS). VA gains were achieved with 56% and 51% of patients treated with Pagenax on q12w at Week 48 in HAWK and HARRIER, respectively.¹

† Secondary endpoint in HAWK and HARRIER, confirmatory analysis in HAWK only (1-sided P values for superiority).^{1,3}

REVOLUTIONIZING EYECARE IN INDIA SINCE 1996

Dry Eyes Management

Refresh Tears[®]
(Carboxymethylcellulose Sodium 0.5%)

Refresh Liquigel[™]
(Carboxymethylcellulose sodium 1.0%)



optive[®]
(Carboxymethyl- Cellulose Sodium Eye Drops IPI)

Restasis[®]
(Cyclosporine Ophthalmic Emulsion) 0.05%

Glaucoma Care

LUMIGAN[®] 0.01%
(bimatoprost ophthalmic solution) 0.01%

GANfort[™]
(bimatoprost/timolol ophthalmic solution) 0.03%/0.5%



Combigan[™]
(brimonidine tartrate/timolol maleate ophthalmic solution) 0.2%/0.5%

Alphagan[®] Z
(Brimonidine Tartrate Ophthalmic Solution 0.1%)

For Pain and Inflammation Associated with Surgery

Amplinak[™]
Nepafenac Ophthalmic Suspension 0.1mg/ml



In Bacterial Conjunctivitis

ZYMAXID[™]
GATIFLOXACIN OPHTHALMIC SOLUTION 0.5%

For more information on products or prescribing information, please visit : <https://www.allergan.co.in/hi-in/home>

Allergan India Pvt. Ltd.

Level 6 & 7, Prestige Obelisk, No.3, Kasturba Rd. Ambedkar Veedhi, Bengaluru, Karnataka 560001,

Tel: +91-80-40707070 | Fax: +91-8040707007

In Moderate to Severe Dry Eyes*

Rx Soha Liquigel

Sodium Hyaluronate 0.18% w/v sterile eye drops

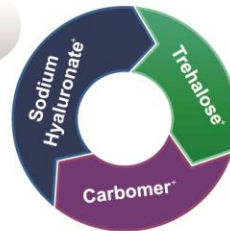
Natural Protection[#] that Lasts Long¹

Provides Lubrication, Bioprotection and Osmoprotection^{2S}

Faster efficacy than CMC formulation³

Statistically significant changes in TFBUT and Goblet Cell Density⁴

Preserved with SOC⁺



Available in
5ml & 10ml



*Approved by DCGI For the treatment sensation of ocular dryness, and other minor complaints of no pathological significance viz., burning & ocular fatigue induced for example by dust, smoke, dry atmosphere, air conditioning, extended computer screen use or contact lens wearer: # SH is a Natural component of Tear Film and Protects corneal epithelial cells. Park Y, Song JS, Choi CY, Yoon KC, Lee HK, Kim HS. A Randomized Multicenter Study Comparing 0.1%, 0.15%, and 0.3% Sodium Hyaluronate with 0.05% Cyclosporine in the Treatment of Dry Eye. J Ocul Pharmacol Ther. 2017;33(2):6672-1. Klemens Fondi, Piotr A. Wozniak, Doreen Schmidt, et al., "Effect of Hyaluronic Acid/Trehalose in Two Different Formulations on Signs and Symptoms in Patients with Moderate to Severe Dry Eye Disease," Journal of Ophthalmology, vol. 2018, Article ID 4691417, 7 pages, 2018. 2. Jones L, Downie LE, Korb D, Benitez-Del-Castillo JM, Dana R, Deng SX, Dong PN, Geerling G, Hida RY, Liu Y, Seo KY, Tauber J, Wakamatsu TH, Xu J, Wolfohn JS, Craig JP. TFOS DEWS II Management and Therapy Report. Ocul Surf. 2017 Jul;15(3):575-628. 3. Brignole F, Pisella PJ, Dupas B, Baeyens V, Baudouin C. Efficacy and safety of 0.18% sodium hyaluronate in patients with moderate dry eye syndrome and superficial keratitis. Graefes Arch Clin Exp Ophthalmol. 2005 Jun;243(6):531-8. Epub 2004 Dec 17. 4. Faiselli C, Giannaccare G, Fresina M, Versura P. Trehalose/hyaluronate eyedrop effects on ocular surface inflammatory markers and mucin expression in dry eye patients. Clin Ophthalmol. 2018;12:1293-1300. S: SH offers lubrications, trehalose offers Bioprotection and Osmoprotection SOC: Stabilised Oxchloro Complex CMC: Carboxy Methyl Cellulose + Prescribing Information of Soha Liquigel TFBUT - Tear Film Breakup Time

In Diabetic Retinopathy

Rx GLOeye*

Bilberry Extract 80 mg + Pine Bark Extract 25 mg

emPOWERs eyes

- Effectively halts progression of vision loss in diabetic retinopathy¹
- Helps in reducing retinal neo-vascularization in diabetic retinopathy²



Small tablet size easy to swallow

Ref: 1. Jain, Kaur S, Sachdev N. Brief Communication: French Maritime Pine Bark Extract (Pinus Pinaster) and Its Ophthalmic Use. J Clin Exp Ophthalmol. (2014) 5:353
2. Spadea L, Balestrazzi E. Treatment of vascular retinopathies with Pycnogenol. Phytother Res. 2001 May;15(3):219-23.



Thank you, Ophthalmology Fraternity

Your implicit trust has made us
Market Leaders.

Leadership comes with responsibilities well shouldered
and commitments honourably kept.

Doing business with integrity is what has been the
source of inspiration along the decades of this journey.

The journey continues and we forge ahead with
renewed affirmation of our commitment to you.



CataRhex 3



Faros



OS4

Mumbai
+91-22-4355 2727
E-mail : info@toshbromedicals.com

New Delhi
+91-11-4748 2727
E-mail : info@toshbromedicals.com

Chennai
+91 95001 20768
E-mail : info@toshbromedicals.com

Kolkata
+91-33-2422 0122 / 2422 5116
E-mail : info@toshbromedicals.com

Ahmedabad • Bangalore • Chandigarh • Guwahati • Jaipur • Kochi • Lucknow • Raipur

Web : www.toshbromedicals.com