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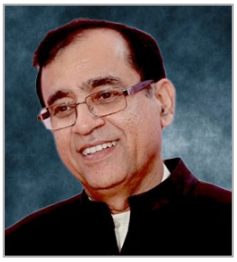

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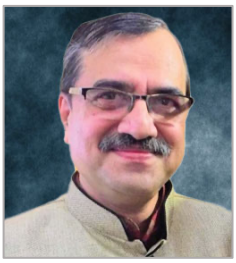

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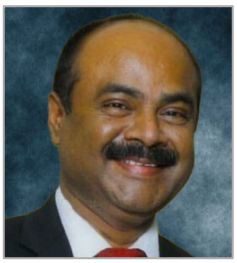

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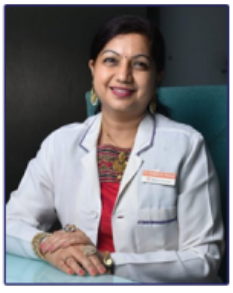

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EDITORIAL ADDRESS

Dear Members of the esteemed AIOS,

Greetings from your Editor proceedings Dr Krishna Prasad Kudlu,

A warm hug of gratitude to all of you for giving me an opportunity to serve in the respectable and responsible capacity of Editor Proceedings. In the past 6 years, I have been working in the position of Member , Scientific committee and tried to fulfil it to the best of my abilities. There has been an overall approval of the job done and I would like to continue the good work in a better manner in my new profile.

My predecessor Dr Arup Chakrabarti has done tremendous work in the two terms that he held office and I thank him for the foundation laid to build on. Most of the scientific contents of the AIOS annual meetings are available to AIOS members at the very user friendly, easy to navigate http://proceedings.aios.org/. You can access these from anywhere in the world and improve your knowledge and scientific acumen. These priceless pearls are now at your fingertips, whatever your need be. A post graduate wanting to make a presentation, a teacher wanting to teach his pupils or a consultant wanting to make clinical decisions, AIOS ON Demand is your place top go.

We have had a successful AIOC 2023 at KOCHI and the proceedings of the same has been be brought to you after being curated and well archived. the scientific sessions which were well received, will all be there for you to access, if you missed any. It is was an arduous task , but be rest assured you will enjoy the content in it .

Each of you will receive daily mailers which will contain heaps of knowledge for you to pick and choose . The You Tube Channel for the Editor Proceedings will also be ripe with information from the conference. Please enjoy the content and be forever hooked to the motto of “Live To Learn and Grow”.

We have a very dynamic President , DR Harbansh Lal at the Helm and hope to see AIOS making great strides in his term as the captain. My Job needs all the help from the Hon Secretary which I know I will be getting, from the most knowledgeable and legendary Dr Santosh Honavar. Our enthusiastic and hard working scientific committee chairman , Dr Namrata Sharma has been delivering wonderful scientific session feasts at every AIOS conference. These ultimate scientific contents will be handed over to editor proceedings where knowledge will be delivered to AIOS members continuously through various channels.

We as a team hope to make this portal of information more beneficial to all members in my term and hope to receive all cooperation from you.

Yours sincerely

Dr. Krishna Prasad Kudlu

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This paper was judged as the BEST PAPER of Cataract & Refractive Surgery Session

DR. ARVIND KUMAR MORYA M17612

Eye Surgeon Jodhpur,
Rajasthan

A RANDOMIZED TRIAL BETWEEN MORYA'S TECHNIQUE OF NUCLEUS HYDROEXPRESSION VS VISCOEXPRESSION IN MSICS

PURPOSE

The purpose of this study was to compare and analyze the endothelial cell loss during manual small-incision cataract surgery (MSICS) using the viscoelastic-assisted nucleus removal versus basal salt solution plus Morya's technique of nucleus hydroexpression. Methods: This was a prospective randomized trial of 204 patients who underwent MSICS using viscoelastic-assisted nucleus removal (Group 1- OVD) versus basal salt solution plus technique (Group 2- BSS) at a tertiary eye care hospital in North India from January 2018 to 2021. Of these 204 patients, 103 (50.5%) and 101 (49.5%) were allocated to Group 1 and 2, respectively. The parameters assessed were detailed history, demographics, and anterior and posterior segment details. Visual acuity, intraocular pressure (IOP), keratometry, pachymetry, and endothelial cell density were evaluated preoperatively and postoperatively on day 1 and 30.

RESULTS

The mean age of the patients was 64.5 ± 8.2 years (range 48–82 years). There were 129 (63.2%) males and 75 (36.8%) females. The mean LogMAR visual acuity for both groups on day 1 (Group 1- 0.3 ± 0.1, Group 2- 0.5 ± 0.2) and day 30 (Group 1- 0.1 ±

0.2, Group 2- 0.1 ± 0.1) was statistically significant (P < 0.001), and the mean IOP value showed a statistically significant value (P < 0.009) on day 1 in Group 2 (15.0 ± 2.4 mmHg) and on day 30 (P < 0.001) in both the groups (Group 1- 13.6 ± 1.8 mmHg, Group 2- 13.5 ± 2 mmHg). The horizontal and vertical k values also showed a statistically significant difference on day 1 and day 30 (P < 0.001). The mean percentage change of central corneal thickness (CCT) in Group 1 was 17.7% and in Group 2 was 17.4% on day 1, and it was 1.1% on day 30 in both the groups, which was statistically significant (P < 0.001) compared to preoperative values. The percentage change in endothelial cell density on day 1 was 9% in Group 1 and 4.6% in Group 2, which was statistically significant (P < 0.001). On day 30, it was 9.7% and 4.8%, respectively, which was statistically significant (P < 0.001). Conclusion: Our study highlights statistically significant endothelial cell loss with viscoelastic-assisted nuclear delivery compared to BSS-assisted nuclear delivery using Morya's technique during MSICS in a short follow-up of 1 month. The CCT values showed a slight increase, and the keratometry and IOP were unaffected compared to the preoperative parameters in both the groups.

Key words: Morya's technique of nucleus hydroexpresion, Balanced salt solution, endothelial cell count, manual small-incision cataract surgery (MSICS), nucleus extraction, viscoelastic

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Age-related cataract is the major cause of vision loss in developing countries and across the globe.[1] It accounts for approximately 50% of blindness worldwide. Cataract surgery is the most common ophthalmic procedure performed nowadays.[2] Continued research, advances in surgical techniques, development and modification of instruments, and

newer pharmacological advancements have revolutionized cataract surgical management.[3] The surgery has evolved from extracapsular cataract extraction (ECCE) to manual small-incision cataract surgery (MSICS) and phacoemulsification.[4] Phacoemulsification became popular in early 1990, and MSICS took a stride forward in early 2000. The recent innovations are femtosecond laser-assisted cataract surgery and robotic cataract surgery.[5] Every surgical procedure has a nominal complication rate, and the goal and challenge for ophthalmic surgeons are to minimize the complication rate.[6,7] Elective cataract surgery is associated with some endothelial cell loss, which is well proven in the literature. This is of particular concern as endothelial cells cannot regenerate, and cellular decline below an acceptable limit of 1000 cells/mm2 can lead to corneal decompensation.[8] Earlier studies have reported 16%–67% of endothelial cell loss during phacoemulsification, and this majorly happens when bursts of ultrasonic energy are used to emulsify the nucleus.[9] The plane of phacoemulsification also governs the degree of trauma to the endothelium.[10] MSICS is also associated with endothelial cell loss, and the reported incidence is 4%–17% in various studies.[11] Less viscoelastic cover to the endothelium, nucleus prolapse, nucleus delivery, and continued jet of irrigation and aspiration are the significant factors causing endothelial cell loss during MSICS.[11] Nayak and Jain,[12] in their analysis, compared the endothelial cell loss during

phacoemulsification using continuous anterior chamber (AC) infusion versus the endothelial cell loss on using an ophthalmic viscosurgical device and found that there is not much difference in endothelial cell loss during the two techniques. Gogate et al.[13] studied endothelial cell loss in 200 patients using phacoemulsification and small-incision cataract surgery (SICS). They concluded that there was no clinically or statistically significant difference in endothelial cell loss or visual acuity (VA) between the two techniques. Still, there was a small difference in the astigmatic shift. Many studies have been performed on a similar concept, but as per the best of literature review, none has compared endothelial cell loss during different steps of MSICS. Considering this as our research question, we, in this randomized controlled trial, compared the endothelial cell loss during MSICS by using viscoelastic-assisted nucleus removal versus continuous basal salt solution plus nucleus removal.

METHODS

This was a prospective randomized controlled trial conducted at a tertiary eye care hospital in North India from January 2018 to 2021. A total of 204 patients were randomized into two groups by the computer-generated binary randomization method. The study adhered to the tenets of the Declaration of Helsinki, and institutional review board approval was obtained from the institutional ethics committee of the hospital. Informed consent was obtained from all the study participants. The inclusion criteria were patients aged between 40 and 80 years, with nuclear sclerosis from grades 1 to 5 with or without pseudoexfoliation, controlled diabetes mellitus (DM), hypertension (HTN), and intraocular pressure (IOP). The exclusion criteria were subluxated, dislocated nucleus, hard mature cataract, any other preexisting ocular pathology, previous ocular surgery including refractive surgery, corneal pachymetry greater than 630 □m, preoperative endothelial cell count less than 1500 cells/mm^2, pupillary dilatation less than 6 mm, AC depth less than 2.5

mm, and systemic comorbidities apart from controlled glaucoma and HTN. A detailed history was obtained from all the patients, and all patients underwent a thorough slit-lamp anterior segment examination, dilated fundus examination, Snellen's best-corrected VA, IOP by noncontact tonometry, A-scan (Axis II, Quantel Medical, Rue Newton, France) using immersion technique, keratometry (Nidek KM 500, Washington Drive Fermont, CA 94539, USA), central corneal thickness (CCT), and noncontact specular endothelial cell count (SP-2000P; Topcon, 111 Bauer Drive Oakland NJ 07436, USA). The grading of nuclear sclerosis was done in accordance with Emery and Little nuclear hardness classification. The IOL power was calculated using Sanders, Redlaff, Kraff (SRK-T) formula for all patients. The patients were divided into two groups by the computer-generated binary randomization method as follows:

Group 1 (Ophthalmic Viscosurgical Devices, $n = 103$): The patients underwent cataract surgery by MSICS technique, and nucleus removal was performed by using BSS (BSS plus) (Alcon Laboratories, Inc, Fort Worth, Texas, 76134, USA) [Fig. 1].

Group 2 (basal salt solution [BSS], $n = 101$, Morya's technique of nucleus hydroexpression): The patients underwent cataract surgery by MSICS technique, and nucleus removal was performed by using BSS (BSS plus) (Alcon Surgical, USA) [Fig. 1].

Postoperatively, in both the groups, the VA, IOP, central corneal pachymetry, and endothelial cell count were assessed on days 1 and 30. All the surgeries were performed by a single surgeon (AKM) who was informed about the patient group by the assisting mid-level ophthalmic personnel (MLOP) on the operation table before starting the surgery. All the doctors who performed the postoperative examination were masked about the patient group.

SURGICAL TECHNIQUE

Preop 0.5% moxifloxacin eye drop was instilled 6 h for 3 days before surgery in the eye to be operated. Topical tropicamide 0.8% and phenylephrine 5% eye drops were used preoperatively for pupillary dilatation. All surgeries were performed under peribulbar anesthesia using 4 ml 2% lignocaine mixed with 150 IU of hyaluronidase. The MSICS technique was used for cataract surgery and IOL implantation. After superior conjunctival peritomy from 10-1 o clock, cauterization of conjunctival vessels was performed to get a smooth scleral bed for scleral incision. This was followed by a 7-mm horizontal scleral incision with a blade, triplanar sclerocorneal tunnel formation, and a crescent with approximately 1 mm corneal entry. Next, a side port incision was made with a 15° side port at 8 o clock to facilitate side port steps. Through the side port, diluted adrenaline, 0.06% trypan blue, and viscoelastic were injected in sequence to stain the anterior capsule and form the AC. This was followed by an AC entry with a 3.2-mm keratome. Further, after viscoelastic injection, 7–8 mm continuous curvilinear capsulorhexis (CCC) was performed with a bent 26-G needle or Utrata's forceps, and hydrodissection was performed with a 5-ml syringe attached to a 30-G cannula. Nucleus prolapse in the AC was performed with hydrodissection or using a sinskey hook. In Group 1, the nucleus delivery was facilitated by using 2% HPMC (2% Occugel, Ophtechnics Ltd). In Group B, nucleus delivery was done by using BSS plus (Intasol Plus 500 ml Intravenous (IV) fluid; Intas Pharmaceuticals Ltd, India), Morya's technique of nucleus hydroexpression. It is done by a especially designed Beveled up Morya's Hydrocannula - attached to continuous BSS – Plus solution is inserted behind the Nucleus under direct visualization and through sideways motion Nucleus is engaged in the sclero-corneal tunnel and counter pressure at the posterior – lip leads to it's removal

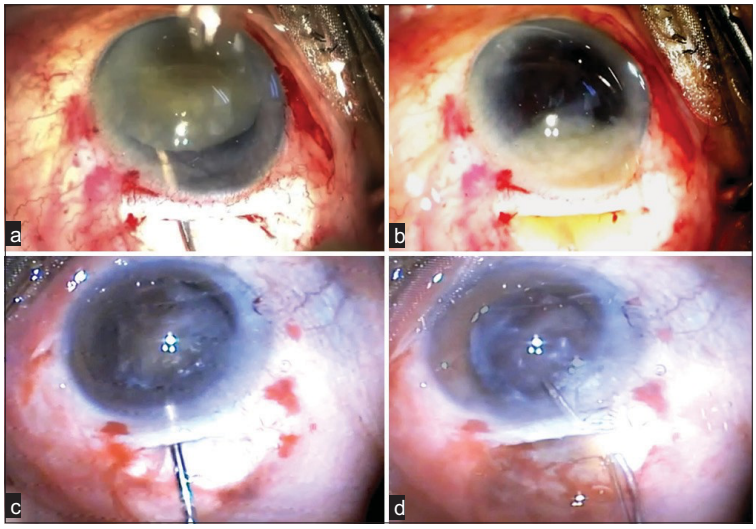


Figure 1: (a, b) Digital image depicting nucleus removal with the help of basal salt solution plus during manual small-incision cataract surgery. (c, d) Digital image depicting nucleus removal with the help of viscoelastic during manual small-incision cataract surgery

Cortical aspiration was done with the help of a bimanual irrigation and aspiration Simcoe cannula attached to a 5-ml syringe. Lastly, rigid single-piece PMMA IOL implantation was performed under viscoelastic cover. After IOL implantation, the viscoelastic was thoroughly washed with BSS, and AC reformation was done through side port hydration. The tunnel was covered with conjunctiva, and cautery was performed to close the tunnel. In the end, intracameral 0.1 ml moxifloxacin was injected. Postoperatively, all patients were started on 0.5% moxifloxacin eye drops four times, 0.5% Carboxymethylcellulose (CMC) three times, and 0.05% difluprednate six times in tapering doses for 6 weeks. The pachymeter readings were taken when the cell borders appeared well defined on the monitor. The endothelial cell density was

assessed by manually counting 70 cells after freezing the screen. A total of three readings were taken, and the mean was taken into account [Fig. 1 and Video 1].[14]

STATISTICAL ANALYSES

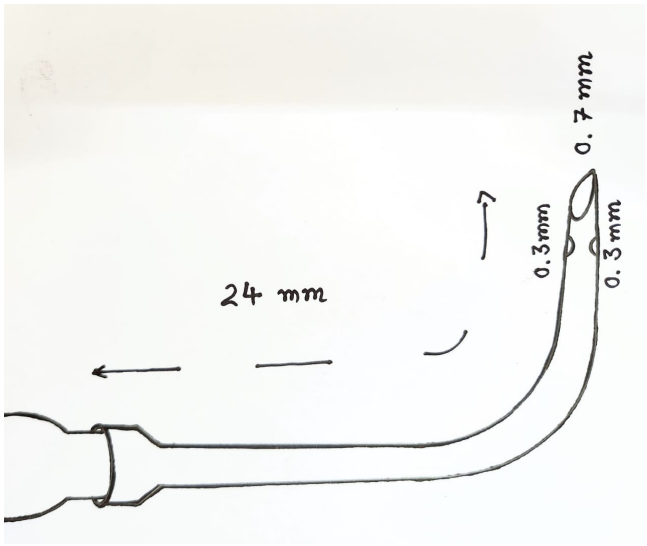
Descriptive statistics were presented with frequency and percentage for categorical parameters. Mean and standard deviations (SDs) were used for continuous parametric data, while median and interquartile ranges (IQRs) were used for nonparametric data. The normality of the data was checked using the Shapiro–Wilk test. Student's *t*-test/Mann–Whitney U test was used to determine the significant difference in continuous factors between the two techniques. Wilcoxon signed rank test was used to determine the difference between pre- and postoperative values. Chi-square/Fisher's exact test was used to find the association between the factors and techniques. *P* value < 0.05 was considered as statistically significant. All statistical analyses were carried out using STATA 17.0 (StataCorp LLC, College Station, TX, USA).

RESULTS

The mean ± SD age was 64.5 ± 8.2 years, and the range was 48– 82 years. A total of 129 patients (63.2%) were male, and 75 (36.8%) were female. The mean ± SD IOP was 15.2 ± 4.1 mmHg, ranging from 10 to 38 mmHg for the patients in Group 1, and for the patients in Group 2, it was 14.9 ± 3.4 mmHg and ranged from 10 to 30 mmHg. There was no significant difference in various preoperative parameters in the two groups, except the axial length and uncorrected distant VA, which showed a significant *P* values of 0.027 and 0.006, respectively [Table 1]. The preoperative to postoperative percentage change in VA in both the groups was approximately 40% and the *P* value was significant ($P < 0.001$) [Table 2]. The percentage change in IOP from preoperative to postoperative day 1 and day 30 in Group 1 was 0.7% and 8.7%, respectively, and in Group 2 was 2.7% and 7.5%, respectively. The *P* value of change in IOP was significant

in Group 2 on day 1 (*P*-0.009) and day 30 ($P < 0.001$); but in Group 2, it was significant on day 30 ($P < 0.001$) [Table 3]. The preoperative mean ± SD (□m) CCT was 470.4 ± 12.2 in group 1 and 470.9 ± 17.7 in Group 2. On postoperative day 1 and day 30, the mean ± SD (□m) CCT in Group 1 was 553.8 ± 24.1 and 475.4 ± 12.4, respectively, and in Group 2 was 552.8 ± 27.2 and 476.1 ± 1.9, respectively. The percentage change

DESIGN OF MORYA'S HYDROCANNULA



on postoperative day 1 was 17.7% in Group 1 and 17.4% in Group 2 and at 1 month was 1.1% in the groups [Table 4a]. The preoperative mean ± SD (□m) horizontal k value was 43.3 ± 1.8 in Group 1 and 43.5 ± 1.7 in Group 2. The postoperative day 1 and day 30 mean ± SD (□m) horizontal k values were 42.8 ± 1.9 and 42.9 ± 1.8, respectively, in Group 1 and 43.2 ± 1.8 and 43.1 ± 1.7, respectively, in Group 2. The percentage change of horizontal k value on postoperative day 1 was 1.2% in Group 1 and 0.7% in Group 2, and at 1 month, it was 0.9% in both groups [Table 4b]. The preoperative mean ± SD (□m) vertical k value was 43.2 ± 1.5 in Group 1 and 43.1 ± 1.7 in Group 2. The postoperative day 1 and day 30 mean ± SD (□m) vertical k values were 43.7 ± 1.6 and 43.0 ± 1.5, respectively, in Group 1 and 43.2 ± 1.7 and 43.6 ±

1.6, respectively, in Group 2. The percentage change on postoperative day 1 was 1.2% in Group 1 and 0.2% in Group 2;

at 1 month, it was 0.5% and 1.2% in Group 1 and Group 2, respectively. The *P* value was significant on postoperative day 1 and day 30 ($P < 0.001$) [Fig. 2a and Table 5a]. The preoperative mean ± SD (□m) endothelial cell density value was 2307.2 ± 215.1 in Group 1 and 2491.1 ± 203.5 in Group 2. The postoperative day 1 and day 30 mean ± SD (□m) endothelial cell density values in Group 1 were 2099.2 ± 210.9 and 2083.8 ± 228.9, respectively, and in Group 2 were 2376.7 ± 191.3 and 2371.8 ± 190.8, respectively. The percentage change on postoperative day 1 was 9% in Group 1 and 4.6% in Group 2; at 1 month, it was 9.7% and 4.8% in Group 1 and Group 2, respectively. When the two groups were compared, the *P* value was significant on postoperative day 1 and day 30 ($P < 0.001$) [Fig. 2b and Table 5b].

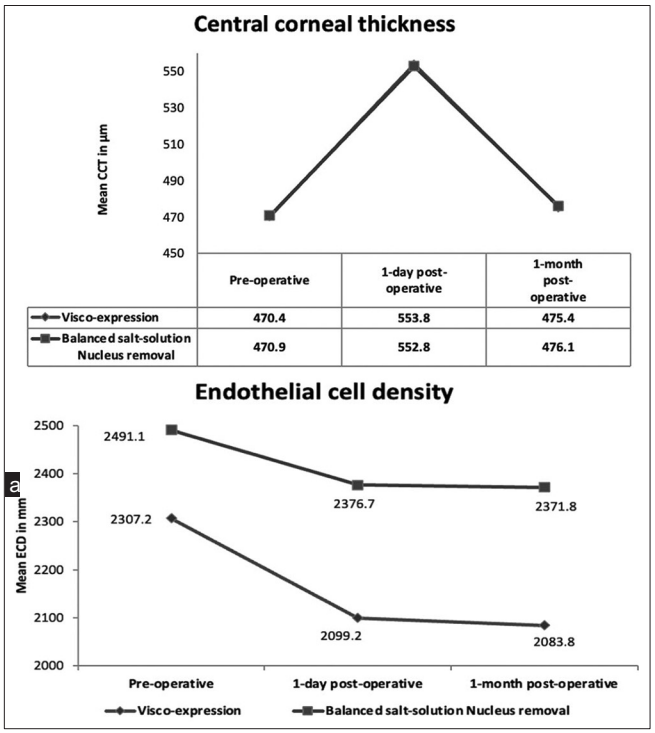


Figure 2: (a) Digital line graph depicting the changes in central corneal

thickness on day 1 and day 30 postoperatively compared to preoperative values during the two techniques of nucleus removal while performing manual small-incision cataract surgery. (b) Digital line graph depicting the changes in endothelial cell density on day 1 and day 30 postoperatively compared to preoperative values during the two techniques of nucleus removal while performing manual small-incision cataract surgery

Table 1: Demographic data and clinical parameters of Group 1 and Group 2

Parameters	**Group**		**Overall**	***P***
	Group 1 (*n*=103) (OVD)	**Group 2 (*n*=101) Morya's technique (BSS plus)**	**(*n*=204)**	
Cataract grading				
Nuclear sclerosis 1	1 (1.0)	2 (2.0)	3 (1.5)	0.335
Nuclear sclerosis 2	50 (48.5)	44 (43.6)	94 (46.1)	1
Nuclear sclerosis 3	37 (35.9)	30 (29.7)	67 (32.8)	
Nuclear sclerosis 4	12 (11.6)	17 (16.8)	29 (14.2)	
Nuclear sclerosis 5	3 (2.9)	8 (7.9)	11 (5.4)	
Pseudoex foliation				
Absent	96 (93.2)	93 (92.1)	189	0.758
Present	7 (6.8)	8 (7.9)	(92.6)	1
			15 (7.4)	
Diabetic mellitus				
No	79 (76.7)	88 (87.1)	167	0.053
Yes	24 (23.3)	13 (12.9)	(81.9)	1
			37 (18.1)	
Hypertension				
No				

Yes	84 (81.6)	89 (88.1)	173 (84.8)	0.1921
	19 (18.4)	12 (11.9)	31 (15.2)	
Anterior chamber depth Mean±SD Min.-Max.	3.1±0.6 2.1-4.1	3.1±0.6 2.1-4.1	3.1±0.6 2.1-4.1	0.5882
Axial length Mean±SD Min.-Max.	23.3±1.9 20.6-32.8	22.8±1.0 20.6-25.4	23.0±1.6 20.6-32.8	0.0272
Uncorrected distant visual acuity LogMAR median (Snellen's VA) IQR	0.6 (6/24) 0.3-0.78	0.78 (6/36) 0.48-1	0.6 (6/24) 0.48-0.78	0.0062
Fundus No abnormalit	25 (24.3)	29 (28.7)	54 (26.5)	0.5981
Media-hazy	12 (11.6)	18 (17.8)	30 (14.7)	
Foveal reflex-dull	15 (14.6)	14 (13.9)	29 (14.2)	
Hazy view	8 (7.8)	11 (10.9)	19 (9.3)	
Tessellated fundus	10 (9.7)	8 (7.9)	18 (8.8)	
Pathological myopia	6 (5.8)	6 (5.9)	12 (5.9)	
Drusen along vessel	2 (1.9)	2 (2.0)	4 (2.0)	
Vitreous degeneration	2 (1.9)	2 (2.0)	4 (2.0)	

BSS=Basal salt solution, IQR=Interquartile range, SD=Standard deviation, VA=Visual acuity. 1- Chi-square test/Fisher's exact test; 2- Student's *t*-test/ Mann-Whitney U test

Table 2: Preoperative, postoperative day 1 and day 30 changes in visual acuity in Group 1 and Group 2

Visual acuity	Preoperative		Postoperative			
			1 day		1 month	
	Group 1 (OVD)	Group 2 (BSS plus Morya's technique)	Group 1 (OVD)	Group 2 (BSS plus, Morya's technique)	Group 1 (OVD)	Group 2 (BSS plus, Morya's technique)
Mean±SD (LogMAR)	0.5±0.2	0.8±0.4	0.3±0.1	0.5±0.2	0.1±0.2	0.1±0.1
Mean difference (LogMAR)	-	-	0.3	0.4	0.5	0.6
SD (LogMAR)	-	-	0.2	0.3	0.2	0.4
% of change	-	-	40.0%	37.5%	80%	87.5%
*P**	-	-	**<0.001**	**<0.001**	**<0.001**	**<0.001**
*P***	-	-	**<0.001**			**<0.001**

LogMAR=Logarithm of the Minimum Angle of Resolution, BSS=basal salt solution, SD=standard deviation. *Wilcoxon signed rank test to compare the paired observation within the group. **Mann-Whitney U test to compare the day 1 and 1 month postoperative changes between Group 1 and Group 2. Boldface indicates statistical significance

DISCUSSION

The endothelial cell monolayer is vital as it is responsible for maintaining a dehydrated state of the cornea through the Na+/K+-ATPase pump and active bicarbonate gradient, thus maintaining corneal transparency.[15] The endothelial cell loss during cataract surgery is of significant concern for any operating surgeon.[16] The average endothelial cell density in

Table 3: Preoperative, postoperative day 1 and day 30 changes in IOP in Group 1 and Group 2

IOP	Preoperative		Postoperative			
			1 day		1 month	
	Group 1 (OVD)	Group 2 (BSS plus, Morva's technique)	Group 1 (OVD)	Group 2 (BSS plus, Morva's technique)	Group 1 (OVD)	Group 2 (BSS plus Morva's technique)
Mean±SD (mmHg)	14.9±2.7	14.6±2.7	15.0±2.3	15.0±2.4	13.6±1.8	13.5±2.0
Mean difference (mmHg)	-	-	1.3	1.6	1.8	1.3
SD (difference)	-	-	0.6	1.0	1.2	1.1
% of change	-	-	0.7%	2.7%	8.7%	7.5%
*P**	-	-	0.341	**0.009**	**<0.001**	**<0.001**
*P***	-	-	0.893		0.594	

BSS=basal salt solution, IOP=intraocular pressure, SD=standard deviation. *Wilcoxon signed rank test to compare the paired observation within the group.

****Mann-Whitney U test to compare the day 1 and day 30 postoperative values between Group 1 and Group 2. Boldface indicates statistical significance**

BSS=basal salt solution, SD=standard deviation. *Wilcoxon signed rank test to compare the paired observation within the group. **Mann-Whitney U test to **compare the day 1 and 1 month postoperative values between Group 1 and Group 2. Boldface indicates statistical significance**

Table 4a: Preoperative, postoperative day 1 and day 30 changes in horizontal keratometry value (k) in Group 1 and Group 2

Horizontal keratometry	Preoperative		Postoperative			
			Day 1		1 month	
	Group 1 (OVD)	Group 2 (BSS plus)	Group 1 (OVD)	Group 2 (BSS plus)	Group 1 (OVD)	Group 2 (BSS plus)
Mean±SD (D)	43.3±1.8	43.5±1.7	42.8±1.9	43.2±1.8	42.9±1.8	43.1±1.7
Mean difference (D)	-	-	0.6	0.6	0.4	0.5
SD (difference)	-	-	0.2	0.4	0.2	0.4
% of change	-	-	1.2%	0.7%	0.9%	0.9%
*P**	-	-	**<0.001**	**<0.001**	**<0.001**	**<0.001**
*P***	-	-	0.148		0.449	

BSS=basal salt solution, SD=standard deviation. *Wilcoxon signed rank test to compare the paired observation within the group. **Mann-Whitney U test to compare the day 1 and 1 month postoperative values between Group 1 and Group 2. Boldface indicates statistical significance

Table 4b: Preoperative, postoperative day 1 and day 30 changes in vertical keratometry value (k) in Group 1 and Group 2

Vertical keratometry	Preoperative		Postoperative			
			1 day		1 month	
	Group 1 (OVD)	Group 2 (BSS plus)	Group 1 (OVD)	Group 2 (BSS plus)	Group 1 (OVD)	Group 2 (BSS plus)
Mean±SD (D)	43.2±1.5	43.1±1.7	43.7±1.6	43.2±1.7	43.0±1.5	43.6±1.6
Mean difference (D)	-	-	0.5	0.4	0.3	0.5
SD (difference)	-	-	0.04	0.1	0.5	0.3
% of change	-	-	1.2%	0.2%	0.5%	1.2%
*P**	-	-	**<0.001**	**<0.001**	**<0.001**	**<0.001**
*P***	-	-	0.072		0.006	

BSS=basal salt solution, SD=standard deviation. *Wilcoxon signed rank test to compare the paired observation within the group. **Mann-Whitney U test to compare the day 1 and 1 month postoperative values between Group 1 and Group 2. Boldface indicates statistical significance

the Indian population is approximately 2527 ± 337 cells/mm2.[17] During surgery, iatrogenic trauma to the endothelium may result in pseudophakic bullous keratopathy and may cause a gross reduction in VA.[18] The other disadvantage is that once lost, endothelial cells do not replicate in vivo.[10] The various factors which are known to cause a reduction in endothelial cell count are senile degeneration of cornea, small pupillary diameter, advanced cataract grade, large nuclear size, air bubbles, a greater volume of irrigation during irrigation and aspiration (I/A), longer duration of surgery, nucleus rubbing the endothelium, less or no viscoelastic cover to the endothelium, free-floating lens fragments in the AC, and higher ultrasound energy during phacoemulsification.[19] In this randomized trial, we kept most of the comparative parameters in two groups nearly similar to reduce any potential bias. Although higher grades of cataract are implicated to cause more endothelial cell loss, we excluded hard mature cataracts. We had only

a few patients with nuclear sclerosis grade 5 in the two groups. Maggon et al.,[20] in their analysis, concluded that phacoemulsification in eyes with small pupillary diameter (<5 mm) results in more endothelial cell loss, compared to eyes with more than 5 mm pupillary diameter.

Table 5a: Preoperative, postoperative day 1 and day 30 changes in CCT in Group 1 and Group 2

CCT	Preoperative		Postoperative			
			1 day		1 month	
	Group 1 (OVD)	Group 2 (BSS plus)	Group 1 (OVD)	Group 2 (BSS plus)	Group 1 (OVD)	Group 2 (BSS plus)
Mean±SD (μm)	470.4±12.2	470.9±17.7	553.8±24.1	552.8±27.2	475.4±12.4	476.1±17.9
Mean difference (μm)	-	-	83.5	81.9	5.0	5.1
SD (difference)	-	-	22.2	26.2	1.2	1.4
% of change	-	-	17.7%	17.4%	1.1%	1.1%
*P**	-	-	**<0.001**	**<0.001**	**<0.001**	**<0.001**
*P***	-	-	0.735		0.801	

BSS=basal salt solution, CCT=central corneal thickness, SD=standard deviation. *Wilcoxon signed rank test to compare the paired observation within the group.

**Mann-Whitney U test to compare the day 1 and 1 month postoperative values between Group 1 and Group 2. Boldface indicates statistical significance

Table 5b: Preoperative, postoperative day 1 and day 30 changes in ECD in Group 1 and Group 2

ECD	Preoperative		Postoperative			
			1 day		1 month	
	Group 1 (OVD)	Group 2 (BSS plus Morya's technique)	Group 1 (OVD)	Group 2 (BSS plus Morya's technique)	Group 1 (OVD)	Group 2 (BSS plus) Morya's technique)
Mean±SD (μm)	2307.2±215.1	2491.1±203.5	2099.2±210.9	2376.7±191.3	2083.8±228.9	2371.8±190.8
Mean difference (μm)	-	-	208.0	114.4	223.4	124.9
SD (difference)	-	-	51.6	41.6	86.0	47.2
% of change	-	-	9.0%	4.6%	9.7%	4.8%
*P**	-	-	**<0.001**	**<0.001**	**<0.001**	**<0.001**
*P***	-	-	**<0.001**		**<0.001**	

BSS=basal salt solution, ECD=endothelial cell density, SD=standard deviation. *Wilcoxon signed rank test to compare the paired observation within the group. **Mann-Whitney U test to compare the day 1 and 1 month postoperative values between Group 1 and Group 2. Boldface indicates statistical significance

Similarly, Perez *et al*.[21] also documented that the smaller the pupillary size, the more the endothelial cell loss.

Most of the previous studies have focused on endothelial cell loss in various steps during phacoemulsification or compared endothelial cell loss during phacoemulsification with SICS.[13,16] We studied the endothelial cell loss during nucleus removal using two techniques in MSICS, which is less well explored. The technique of viscoexpression of the nucleus during MSICS is well studied and documented, and in Group 2, we used Morya's technique of nucleus hydroexpression with BSS plus as it has been known to cause less postoperative corneal edema after intraocular surgery.

In the current study, we had 101 patients in Group 1 and 103 patients in Group 2, which was comparatively higher than in previous studies to get better insights about endothelial cell loss post-MSICS. The patient population and demographics were compared in the two groups, and also, age, nuclear grade, and systemic parameters were comparable with previous studies. The mean postoperative VA values were 0.1 ± 0.2 and 0.1 ± 0.1 in Group 1 and 2, respectively, which were comparable with a *P* value of < 0.001. This shows that VA is not affected much by different cataract surgery techniques. Similarly, the IOP in the two groups was also nearly similar at the end of 1 month, with values of 13.6 ± 1.8 and 13.5 ± 2 mmHg in Group 1 and Group 2, respectively, and the *P* value (<0.001) was significant compared to preoperative values. This signifies that there was no to minimal corneal edema postoperatively in the two groups, which could impact the IOP. We also assessed the impact of two techniques on keratometry values in our study. The horizontal K values at the end of 1 month were 42.9 ± 1.8 and 43.1 ± 1.7 in Group 1 and Group 2, respectively, which were nearly similar to the preoperative values. The vertical K values at the end of 1 month in Group 1 was 43.0 ± 1.5 and 43.6 ± 1.6 and was nearly identical to preoperative values. This shows that modification of any step of MSICS does not affect the keratometry values. The CCT at 1 month was slightly higher

compared to the preoperative values, and there was no significant difference between the two groups. This is in accordance with the results of Nayak and Jain.[12] They also showed that the CCT returned close to preoperative values at the end of 1 month in both the groups, and there were no significant differences between groups. Similarly, in the analysis by Maggon *et al.*,[20] the CCT values in Group A (523.44 ± 20.31), Group B (512.56 ± 35.65), and Group C (515.78 ± 19.9) at the end of 1 month were nearly similar to the preoperative values (515.98 ± 19.99, 506.9 ± 35.15, and 513.54 ± 19.77, respectively). Ganekal and Nagarajappa,[22] in their study, also showed that CCT values are unaffected at 6 weeks from baseline with a value of 574.04 ± 21.29 versus 574.04

± 23.96 in Group 1 and 559.76 ± 32.05 versus 560.76 ± 33.68 in Group 2. We found an endothelial cell loss of 9.7% and 4.8% at 1 month in Group 1 and Group 2, respectively, with a *P* value of 0.001, which was significant. Nayak and Jain[12] reported an endothelial cell loss of 7.38% and 7.47% at 1 month in Groups A and B, respectively, during phacoemulsification using OVD in Group A and BSS plus in Group B. This proves that OVD may not be necessary, and the endothelial cell protection

can be better with BSS plus in experienced hands. Similarly, Jagani *et al.*[23] reported a mean endothelial cell loss (cells/mm^2) of 307.80 (12.33%), 397.79 (15.93%), and 421.69 (16.89%) at

1 week, 6 weeks, and 3 months postoperatively, respectively, in Group A undergoing phacoemulsification and 270.86 (10.63%), 385.22 (15.12%), and 413.68 (16.24%) at 1 week, 6 weeks, and 3 months postoperatively, respectively, in Group B undergoing MSICS. There was no clinical and statistically significant difference (*P* >0.05) between the two groups. In our analysis, the endothelial cells were comparatively lesser, probably due to single surgeon's expertise and the technique of nucleus delivery. Still, large-scale studies are needed to get better insights.

The major limitation of our study was the follow-up period was 1 month. The other morphological endothelial parameters, like the coefficient of variation and SD, were not compared. The strengths of our study were the prospective nature of the study, large sample size, and computer-based randomization to avoid selection bias. A study from the USA reported that the rate of endothelial cell decreases with time.[24] In contrast, a short-term follow-up usually highlights a more significant endothelial loss, as reported in the literature. Hence short-term follow-up is enough to denote the long-term consequences. A short-term follow-up will also prevent loss to follow-up of patients. A recent article reported acute shortage of OVD in the European market, and it is likely to affect the whole world due to scarcity of raw materials. Hence, we have to look for alternatives of OVD and also minimize its usage in various steps of surgery.[25] As per our knowledge, this is the first large-scale analysis highlighting the pachymetric and endothelial cell changes during nucleus removal by two different techniques of MSICS.

CONCLUSION

Our study highlights statistically significant endothelial cell loss with viscoelastic-assisted nuclear delivery compared to Morya's technique of nucleus hydroexpression with BSS-assisted nuclear delivery during MSICS in a short follow-up of 1 month which maintains at a follow -up of 6 months in those patients who reported in the OPD. The CCT values showed a slight increase, and the keratometry and IO*P* values were unaffected compared to preoperative parameters in both the groups.

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This paper was judged as the BEST PAPER of Cataract & Refractive Surgery Session II Session

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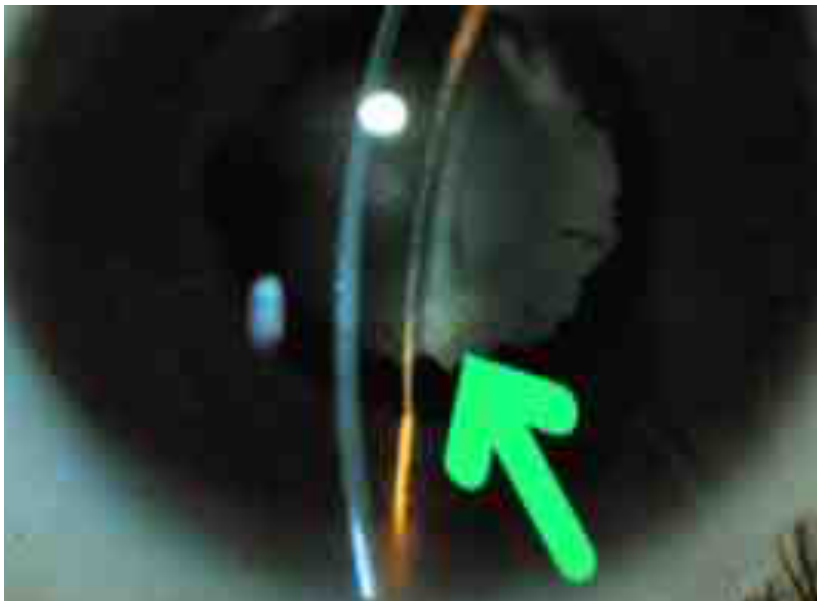
Swaraashi netralaya

Mumbai

SUTURELESS COMBINED VITRECTOMY WITH CATARACT SURGERY FOR UVEITIS CATARACT



INTRODUCTION

There is currently no approved treatment for non-infectious posterior uveitis, a sight-threatening disease. Cataract is a commonly encountered complication of chronic uveitis, with an incidence varying from 57-78%. 50% incidence of CME in uveitis patients after phacoemulsification Diamond and Kaplan in 1978 .

Leuenberger and Freyler. In these patients, the visual outcome of cataract extraction can be unpredictable and can lead to a higher rate of postoperative

inflammation, macular oedema and posterior capsular opacification (PCO) than in patients without uveitis

OPTIONS AVAILABLE

CATARACT EXTRACTION

Phacoemulsification cataract extraction and posterior chamber lens implantation in patients with uveitis. Estafanous MF, Lowder CY, Meisler DM, Chauhan R Am J Ophthalmol. 2001 May;131(5):620-5 Posterior capsule opacification occurred in 24 eyes (62%), 12 of which required Nd:YAG capsulotomy (31%). Other postoperative complications included recurrence of uveitis (41%), cystoid macular edema (33%), epiretinal membrane formation (15%), and posterior synechiae (8%)

CATARACT EXTRACTION WITH IVTA

2 .Safety and efficacy of intraoperative intravitreal injection of triamcinolone acetonide injection after phacoemulsification in cases of uveitic cataract Dada T, Dhawan M, Garg S, Nair S, Mandal S. J Cataract Refract Surg. 2007 Sep;33(9):1613-8 Four patients in the triamcinolone acetonide group and 5 in the steroid group had recurrence of uveitis; One patient in the triamcinolone acetonide group and 3 in the steroid group had cystoid macular edema postoperatively

CATARACT EXTRACTION WITH VITRECTOMY

1.Combined pars plana vitrectomy and phacoemulsification to restore visual acuity in patients with chronic uveitis. Androudi S, Ahmed M, Fiore Ti, Brazitikos P, Foster CS.* J Cataract Refract Surg 2005;31:472– 478.

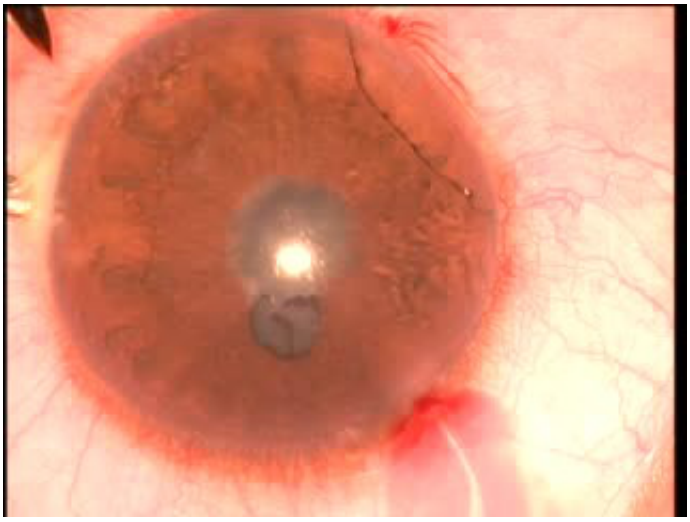
2. Sutureless combined 25-gauge vitrectomy, phacoemulsification, and posterior chamber intraocular lens implantation for management of uveitic cataract associated with posterior segment disease Soheilian M, Mirdehghan SA, Peyman GA Retina. 2008 Jul-Aug;28(7):941-64.

CATARACT EXTRACTION AND VITRECTOMY ON A LATER DATE.

Because the presence of inflamed viterous in close contact with posterior capsule of lens the chance of posterior capsular opacification and cyclitic membrane formation is higher with this approach , cataract extraction in uveitic patients . Surv of Ophthalmology .1990 :35 :120-144. Hooper P L, Rao N.A.

PURPOSE

TO REPORT VISUAL OUTCOME AND COMPLICATION RATES ASSSOCIATED WITH ONE STAGE SURGERY FOR MANAGEMENT OF UVEITIS CATARACT ASSOCIATED WITH POSTERIOR SEGMENT AND VITREOUS OPACIFICATION ON B SCAN.



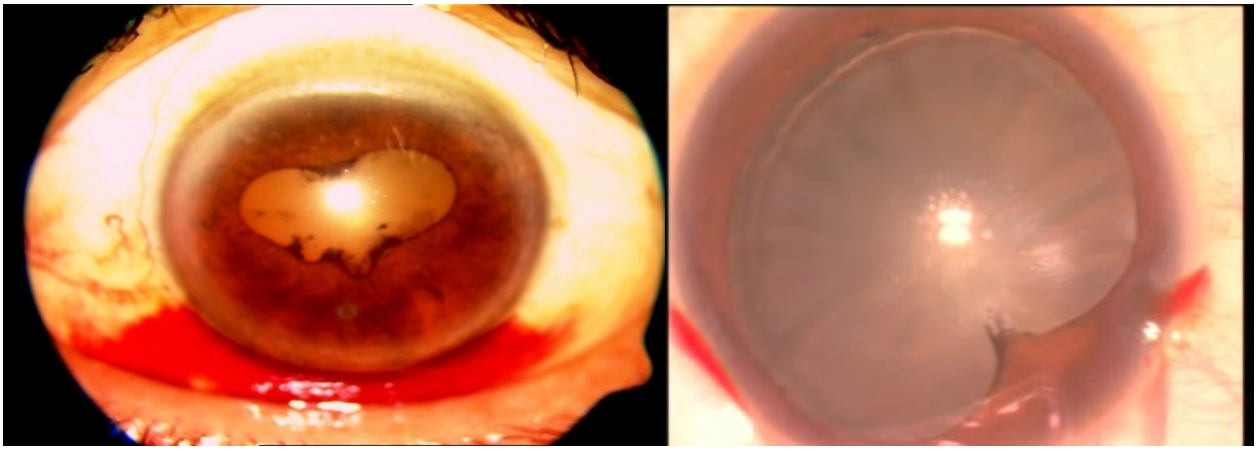
MATERIALS AND METHODS

A prospective randomized interventional case series of 12eyes of 9 patients with uveitic cataracts and vitreous opacification on ultrasound B scan

Sept 2021 to Sept 2022.

Vision ranged from PLPR to CF 4 ft .

well-controlled preoperatively or was in remission for 3 months



Vision.

intraocular tension .

slitlamp biomicroscopy

ultrasound A and B scan .

Systemic and lab investigations.

Preoperative supplementary inflammatory therapy of topical prednisolone acetate 1% eye drops, four times a day, starting two days before the day of surgery Postoperatively oral corticosteroids are given at a dose of 1 mg/kg/day initially and are tapered off over a period of four to six weeks.

LAB INVESTIGATIONS

Medical history of clinical evaluation

Lab investigation Routine studies included HB, blood urea, electrolytes, creatinine, LFT, RBS, ESR, Fluorescent treponemal antibody absorption test,

VDRL test, serum angiotensin converting enzyme and chest x-ray.

Tests like HLA,B27, antinuclear factor, antineutrophiliccytopasmic antibody measurements were done when indicated

RESULTS:

Mean duration of uveitis before surgery was 56 ± 44.17 months. The mean follow-up was 18.4 ± 14.7 months. Mean age 37 years.

There were 5 females and 4 males

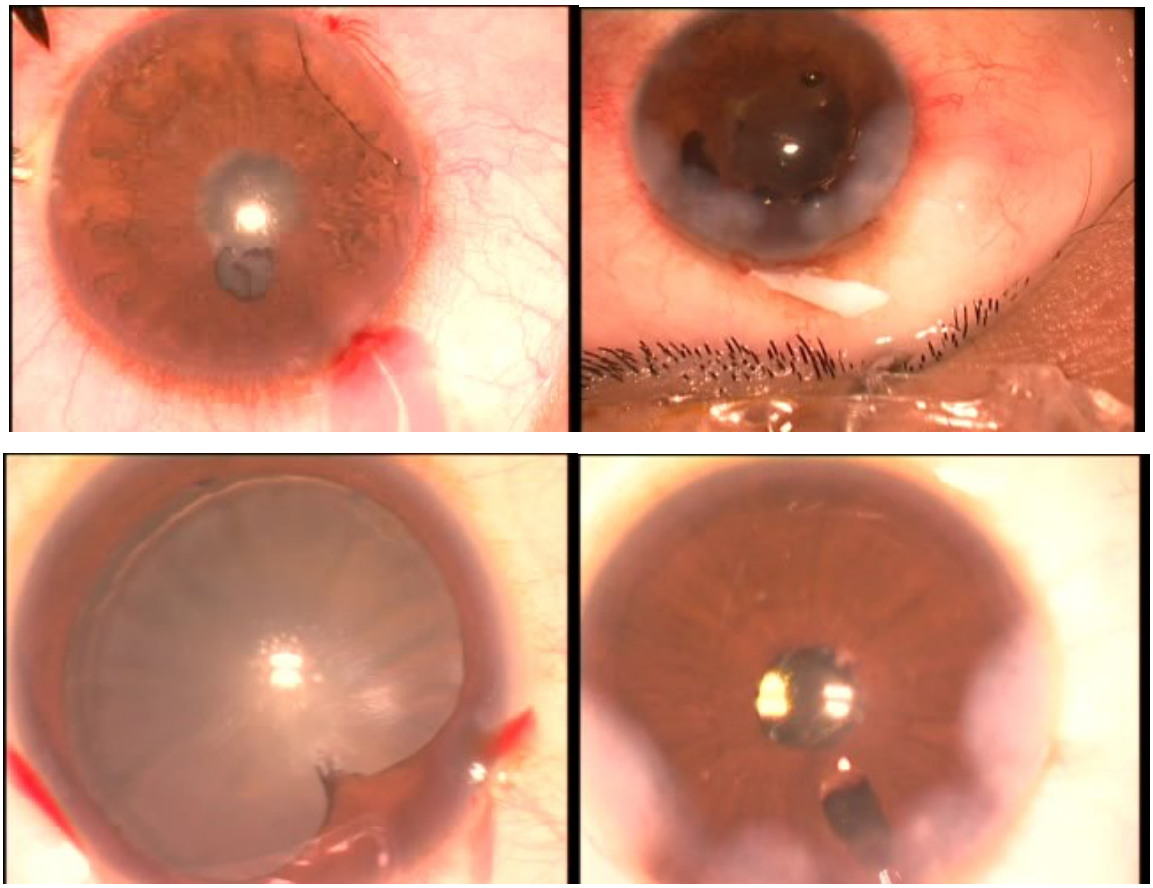
Minimum follow up of six month

6 eyes achieved a BCVA of 20/100 or better

6 eye achieved a BCVA of 20/40 or better

Early compication noticed were transient corneal oedema (10 eyes),mild fibrin reaction (3 eyes). Persistent CME noted in 2 eyes.

PREOP- POSTOP IMAGES



CONCLUSIONS

Clear corneal Phacoemulsification with posterior chamber intraocular lens implantation and 23 g sutureless pars plana vitrectomy (MIVS) was effective and restores vision in most cases.

This paper was judged as the BEST PAPER of Community / Social Ophthalmology I Session

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THE EYE AND TICK BORNE DISEASES -A STUDY FROM SOUTH INDIA

ABSTRACT

Purpose - Globally ticks are the important arthropod vectors for transmission of numerous infectious agents and are responsible for causing human and animal diseases. Tick bite is responsible for many disease in India. As ocular complaints usually force the patient to seek medical advice, it is important to be aware of the ophthalmic & systemic manifestations of tick borne diseases which will detailed in this paper.

Methods - we conducted a prospective analysis of all the cases that presented to us with tick bite during the monsoon season in south India. Detailed ocular evaluation including slit lamp , IOP and fundus evaluation was done & followed up at frequent interval to monitor the systemic manifestation. A liaison with local physician was created to refer and follow up all included patients.

Results - A total of 23 eyes of 23 patients which presented with tick bite in and around eyes from june -august 2022 were included in the study. All the removed ticks were sent for microbiological analysis and species identification .Course of the disease, ocular complications, incidence of systemic manifestations ,visual outcome, and investigations are discussed. Serological investigations were sent as per physician orders and frequent follow ups and documentation was done. A total

of 7 patients developed systemic manifestations which were treated immediately as per physician consultation and hence major morbidity was avoided. Four eyes developed retinal manifestations which were managed successfully.

Conclusion - Awareness regarding the ocular& systemic manifestations of tick-borne diseases and need for careful ocular examination and frequent follow ups during the latent period and prompt referral to physician on suspicion of systemic disease is crucial. Systematic fundus examination should be made a part of the routine evaluation of any patient who presents with tick bite and later fever and/or skin rash living in or returning from a specific endemic area.Doxycycline along with oral corticosteroids was effective in treating the systemic condition.

INTRODUCTION

Ticks act as ectoparasitic vectors which can cause a range of life threatening diseases such as lyme disease, tuluremia, Crimean-Congo hemorrhagic fever (CCHF), a potentially fatal tickborne disease, tick borne encephalitis ,Kyasanur forest disease[KFD],ricketssia ,Q fever etc.(1) Ocular manifestation include eyelid nodule , blepharitis, lid ulceration, uveitis , keratitis , vasculitis , neuroretinitis etc. (2,3)

Although majority of the cases are reported from European and American countries, its is not uncommon in India, but being underreported. The disease is being is easily overlooked due to lack of awareness among clinicians regarding the specific ocular signs and symptoms, diagnostic tests and epidemiological affinities. Increased incidence in the recent years can be contributed to widespread deforestation, urbanisations and climatic changes. Hence there is increased need for creating awareness among ophthalmologists regarding specific ocular and systemic manifestations of the tick-borne diseases. We report a case series of 23 cases of tick infestations of the eye during the rainy seasons from southern India and will

also briefly summarise the systemic and ophthalmic manifestations endemic to tropical countries.

METHODS

This is a retrospective case series study conducted at a tertiary care hospital at kerala state of south India during the monsoon season between the months of June-august 2022 and 2023 kerala state has an abundance of vegetations and forest region provides favourable conditions for the survival of several tick species we analysed all the cases that presented to us with history of tick bite during the monsoon seasons in south India. Detailed ocular evaluation including slit lamp examination ,intraocular pressure (IOP) and fundus evaluation was done & followed up at frequent interval to monitor the systemic manifestations. A liaison with local physician and microbiologist was created to refer , treat and follow up all included patients

Primary outcome was to analyse the ocular manifestation following a tick bite and secondary outcome measures included the incidence of systemic manifestations and effectiveness of prophylactic systemic antibiotic treatment in preventing systemic and ocular complications. Analysis was done using the statistical software Stata (version 10, Stata Inc, USA) with statistical significance set at $p<0.05$.

RESULTS

All 23 patients included in the study were residents of Kerala state, located at the southern part of India. All patients reported during the monsoon season between the months of June-august 2022 and 2023 which confirms that tick borne diseases had a high propensity during monsoon season.(The fact that all patients reported during the monsoon season between June and August of 2022 and 2023 confirms that tick-borne infections were more common during this time.)

All patients presented with complaints of severe eyepain and lid edema of 3-7 days duration. Unilateral involvement was seen in all the cases. Mean age of patients was

47years (range 3–70 years).There was a slightly male preponderance in our study, as they travel more and are engaged in agricultural work. The baseline characteristics of study population is detailed in table 1. Mean period of presentation to our OPD after tick bite was 4.9/1.3 days(range 3-7 days. Tick was present in situ in 13 eyes and of these live tick was isolated in 10 cases. On examination, best corrected visual acuity (BCVA) ranged from 20/20 to 20/100. Ocular examination revealed lid edema with lid erythema , periorbital edema and erythema , mechanical ptosis due to edema in majority of the cases(figure 1). Severe eye pain and pain during eye movements was the most common symptoms among all the cases. Ocular signs and their frequency in our study population is listed in table 2. The most common sign in our study group was eyelid edema. Five eyes developed non granulomatous anterior uveitis and the mean period for development of uveitis post tick bite was 11/ 2.3 days(figure 2).One patient who presented with a severe non granulomatous anterior uveitis and raised intraocular pressure had a concealed conjunctival nodule in the lower lid with a dead tick in situ. Two cases that presented with preseptal cellulitis had associated uncontrolled diabetic status.

A total of four cases presented to us with retinal findings. Two patients presented with disc edema and haemorrhages and complained of defective vision. There was no evidence of any hard exudates at macula. First patient presented 8 days after the history of tick bite and the second patient after 10 days. Both the patients gave the history of removing the tick from the eyelids by themselves by using fingers alone and had not consulted anywhere else. On presentation to us there was still a residual lid edema and eye pain accentuated by ocular movements. Both the cases revealed mild anterior uveitis and a h/o myalgia and mild fever two days prior to onset of defective vision. The visual acuity was dropped to 20/60 in first case and 20/100 in second case after maximum correction. The patients were send to physician consultation and both of them were started on tab doxycycline along

with rifampycin and also low dose steroids(omnacortil 40 mg OD) for 4 week and steroids were tapered weekly. One case of an elderly man who presented with severe anterior uveitis, vitritis and macular edema had residual parts of tick head recovered from the eyelid nodule with surrounding ulceration.

Seven patients reported associated fever post tick bite and the mean period of the development of fever was 7 days. None of the patients gave history of skin rash or joint pain. Prophylactic antibiotic was started in 16 eyes(tab doxycycline100mg B for 2 weeks). Five cases which presented later with uveitis and four cases with retinal involvement were not prescribed antibiotic at the first place and were started on antibiotics later by ophthalmologist.

Live tick was present in-situ and removed with angled blunt forceps from the eyes in ten cases. The best method removal from our experience is by using a blunt medium tipped angled forceps with minimal manipulation under slit lamp microscope. One should be very careful to remove the entire body parts of the tick under direct visualisation, any residual dead parts release enzymes which can lead to severe local inflammation and uveitis. All the removed tick parts were immediately sent to microbiologist for species identification. The identified species and their manifestations are listed in table 3.The most prevalent species was an Ixodid family member and was linked to many local reactions near the lid.. An intriguing finding from the identification of species was that fever invariably developed following a dog tick (Dermacentor species) bite.

DISCUSSION

Ticks are bloodsucking ectoparasites that infest mammals, reptiles and birds. Hyalomma Anatolicum and Haemaphysalis spinigera are the two important species of ticks present in India, causing the fatal tick-borne viral diseases of Crimean–Congo hemorrhagic fever (CCHF) and Kyasanur forest disease (KFD), respectively.Less common are Imported tick born spotted fever, Lyme disease,

Omsk Hemorrhagic Fever (OHF), Tick borne encephalitis (TBE). They carry vectors of an array of pathogens, including bacteria, spirochetes, rickettsiae, protozoa, viruses, nematodes, and toxins. Their life cycle comprise of three stages: larvae, nymph, and adult stages. The development of ticks depends on a series of moults, especially in the nymph developmental stage. Each blood meal helps them move onto the next stage of their life cycle. A single bite can also transmit multiple pathogens, a phenomenon that has led to various atypical presentations of some classic tick-borne diseases.(4) There are two classes of ticks: hard ticks (family Ixodidae) and soft ticks (family Argasidae). Hard ticks are more common , difficult to remove and more likely to transmit disease. Soft ticks usually take smaller, quicker blood meals at shorter intervals, and can transmit pathogens much more quickly (within a minute of biting) than hard ticks (hours or days). To reduce the potential complications, complete removal of the organism is critical.(5)

Ticks frequently enroots the meibomian gland orifice and mimics the appearance of haemangioma, nevus, or epidermal cyst The preferential localization of the tick to the eyelid margin may be due to various reasons viz warm and moist environment , the easy access to pores, better camouflage due to eyelashes.(6)

The tick often embeds its piercing element called as hypostome, which consists of hooks or reverse barbs, into the skin of the host to provide a firm anchorage. A small number of ticks also secrete a cementing ingredient to aid in strong adhesion.(7) Ixodes ticks also secrete anticoagulant, immunosuppressive, and anti-inflammatory substances into the area of the tick bite to obtain a blood from host. The same substances also help any freeloading pathogens along with establishing a foothold in the host. (5,8)

Human and animal studies have demonstrated that the risk of disease transmission and infection increases after the first 24 hours of tick infestation and is especially high after 48 hours. It is advisable to remove the tick completely and remove any residual pieces in order to prevent infections spread by ticks. Using chemicals to

remove the tick is not advised as it may cause it to salivate, which could increase the vector's ability to spread. Instead, non-toothed angle forceps or en bloc excision with a frill of surrounding tissue are the recommended methods.(9,10)

Lyme disease is a human zoonotic infection caused by Borrelia spirochete. Three species are known to cause Lyme disease: B. burgdorferi, B. garinii, and B. afzelii. It is transmitted through tick bite and is a treatable multisystem disease that presents in three stages of severity. The first stage lasts between 1 and 4 weeks, duly followed by the second stage lasting 1–4 months. The third stage can last from months to years. The first stage has only mild conjunctivitis , flu like symptoms along with lymphadenopathy and presence of erythema migrans. Second stage develops fever . ocular manifestations and can have with cardiac arrythmias, bells palsy etc. third stage has neurological manifestations. Skin manifestations(erythema migrans) are the earliest to occur and is present if 70-80% of patients, and diagnosing these lesions, followed by appropriate treatment, can prevent fatal complications of the disease, which are mainly neurological.

Keratitis, is characteristic of the 2nd and 3rd stages and can present as interstitial or ulcerative keratitis with peripheral neovascularization. Anterior uveitis is infrequent. Intermediate uveitis is the most common of the uveitis and is associated with pars planitis. Posterior uveitis signs mostly include chorioretinal involvement. Macular edema and retinal vasculitis are the most frequent retinal findings. In the case of optic neuritis, there will be concurrent other cranial nerve palsies. Papillitis as the sole ocular sign in Lyme disease has also been reported from the UK.

Only 25% of patients can actually recall a tick bite. That is why the history and physical are of utmost importance in diagnosing Lyme disease. Despite the pathognomonic rash of erythema migrans, the diagnosis of Lyme disease still remains relatively elusive at times. Laboratory diagnosis is established by molecular methods. IgM and IgG antibodies become detectable by

immunofluorescence study or ELISA after the 5th day.(11) Serology testing is often negative in the first few weeks of the disease, and thus, negative values must be taken in context with the clinical picture. If the clinical picture matches and erythema migrans is present, serological investigations are neither required nor recommended.(4)

Majority of the patients in our study has been started with systemic antibiotics as our place is endemic for Lyme disease, explain the lower incidence of systemic manifestations(7/23) and posterior segment findings(4/23) in our study group. Considering the potential fatal complication following a tick bite it is advisable to start all patients with prophylactic antibiotics at the first visit . These antibiotics usually include doxycycline for adults and children older than eight, and amoxicillin or cefuroxime for adults, younger children, pregnant or breastfeeding women. A 14–21-day course of antibiotics is usually recommended, but some studies suggest that courses lasting 10–14 days are equally effective.(12)

CONCLUSION

In conclusion, consider the possibility of a tick bite in any patient presenting with a history of eyelid swelling, redness, irritation, or pain, whether or not flu-like symptoms are present. This is especially important in endemic countries like India. Ticks removal should be immediate and complete and should be followed by a antimicrobial prophylaxis. Patients should be warned about potential systemic symptoms of other tick borne diseases and asked to review immediately and should be kept under close observation. Systematic fundus examination should be part of the routine evaluation of any patient who presents with fever and/or skin rash living in or returning from a specific endemic area.

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LEGENDS

Figure 1- Clinical photographs of patients with tick bite causing lid edema and erythema

Figure 2- Figure 2-Slit lamp image of a patient with acute anterior uveitis post tick bite

TABLE 1-Baseline characteristics of the study population

TABLE 2- Ocular manifestations and their frequency in our study population

Table 3- Identified species and their ocular manifestations in the study group

This Paper Was Judged As The BEST PAPER Community / Social Ophthalmology II Session

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COMPARISON OF PSYCHOSOCIAL AND EMOTIONAL IMPACT OF CHILDHOOD STRABISMUS IN PARENT VS PATIENT!

ABSTRACT

Aim-Squint affects visual, psychosocial and emotional behaviour of children. There is a perception difference between children and their parents about the squint. Through this study we have assessed and compared the effects of strabismus on psychosocial & emotional health of patients and their parents.

METHODS

91 patients & parents with mean age of 8-15 years were included in the study. They were subjected to modified Adult Strabismus 20 questionnaire. The first 10 questions are on psychosocial aspect and next 10 on functional aspects.

Results- Scores were significantly lower for strabismus subjects as compared to their parents($P<0.001$).

CONCLUSION

There is a significant lack of awareness among parents about the effects of strabismus on their children. Study stresses on need for further strabismus awareness activities.

KEY WORDS - squint, parent, patient, modified adult strabismus questionnaire, psychosocial, emotional

INTRODUCTION

Strabismus which is a common childhood ocular disability has a prevalence of 3 to 5% among children.[1,2] The functional effects of strabismus include diplopia, asthenopia, decreased vision, poor development of binocular single vision, stereopsis, and cosmetic blemish. Besides these functional effects, both children and their parents may develop variable psychosocial impact of strabismus. Satterfield et al[3] found that patients with strabismus felt a negative impact on their lives and reported difficulty with self-image, interpersonal relationships, and school performance. The parents of such children are faced with an enormous decision of planning the course of management based on differing views in the social environment.

Yet in a pilot study conducted by the chief author (yet to be published), we found 56.45% of strabismic children had their first consultation after a mean of one year after the development of strabismus. Furthermore 68.89% of children who were advised strabismus treatment initiated their treatment after a mean of 4 months after advice. This data definitely indicated despite a significant strabismus in children, there is a delay in diagnosis and treatment from parental side.

Through this study we compared the perceptional difference between parents and patients (children) about the impact of strabismus on psychosocial and functional health. This further lead us to evaluate the various barriers faced by parents regarding strabismus in their child.

METHODS

This was a prospective study conducted in the Outpatient Department of Ophthalmology at a tertiary eye care center where 191 patients of 7-16 years with strabismus and their parents were included in the study. Ethical clearance for the study was obtained from the Institutional Ethical Review Board. Written informed consent from all parents participating in the study was taken.

Any co-existing ocular pathology causing vision loss or disfigurement, patients with neurological disorders & physical disabilities, children with poor comprehension of the questionnaire or inability or unwillingness to give informed consent were excluded from the study.

Patients and parents were subjected to paediatric adaptation of Adult Strabismus-20 questionnaire (Fig-1). The first 10 questions were about psychosocial impact of strabismus and next 10 questions assessed functional impact of strabismus. The answers were in the format of Yes/No.

The comparison of the variables which were quantitative and not normally distributed in nature were analysed using Mann-Whitney Test (for two groups) and variables which were quantitative and normally distributed in nature were analysed using Independent t-test (for two groups).

RESULTS

The age of the patients was between 7 years to 16 years. A total of 191 parents were interviewed through the modified adult strabismus-20 questionnaire. 31.67% children had esotropia,61.67% had exotropia and rest 6% had vertical strabismus.

On comparison of psychosocial subscale, we noticed 100 percent agreement between parents and patients only with 7^{th} question where the squint was addressed as a cosmetic stigma. In all the rest questions there was a significant difference between parents and patient's response, less parents perceiving the psychosocial impact of strabismus in children, $p<0.001$. (Fig-2)

In contrast on comparison of functional subscale between parents and patient, there was a significant number of questions where both parents and parents' response coincided significantly, $p<0.001$. parents and patients agreed that strabismus does affect the child's reading and writing speed resulting in negative

exam results. Parents even complained of impaired sports activity of child due to strabismus, (Fig 3).

The belief that squint could be a good luck charm (34%0, fear of surgery (29%) and misinformation propagated on social media (23%) were major barriers which prevented parents from accessing treatment at the right time.

DISCUSSION

The study was carried out to assess the difference in perception of functional and emotional impact of strabismus between parents and patients with strabismus. In majority of the cases, strabismus is a treatable condition that requires identification and treatment at early age. However, whether the treatment is given in a timely manner depends on parents' knowledge and attitude. Lack of knowledge and information among parents adversely affects the age of presentation and management of strabismus.

Multiple studies by Singh et al (2012)[4], Khokar et al (2003)[5], Cacodkar et al (2002)[6] have studied knowledge, attitude and practices among parents towards children with strabismus and have concluded lack of knowledge about strabismus in parents resulting in delayed process of identification and treatment.

20 years down the lane, our study still proves that there is a huge gap in perception of impact of strabismus between patients and parents. Though 76.56% parents had knowledge about functional impacts of strabismus as well as about the management aspect, only 36.25% parents knew aboutb psychosocial impact of strabismus. Social media and beliefs are still a major barrier for seeking strabismus treatment resulting in intractable amblyopia in children.

CONCLUSION

The success of strabismus treatment happens only if early diagnosis and treatment is possible. This is only possible with better awareness about strabismus among parents. Lack of knowledge and myths and beliefs delays the entire process of

identification and treatment of strabismus. Hence awareness sessions and health education is very important to increase the awareness and change myths about strabismus; thus making early diagnosis and successful treatment possible. Early diagnosis and treatment will also help prevent psychosocial problems and behavioural disorders among children affected with strabismus and improve academic performance and also prevent the development of amblyopia.

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FIG 1- Modified Adult Strabismus questionnaire- 20

	PSYCHOSOCIAL		FUNCTIONAL
1	I FEEL UNCOMFORTABLE WHEN PEOPLE NOTICE MY EYES	11	I COVER/CLOSE ONE EYES TO SEE BETTER
2	PEOPLE DON'T GIVE ME OPPORTUNITY BECAUSE OF MY EYES.	12	MY READING/ WRITING SPEED IS AFFECTED BECAUSE OF MY EYES
3	I FEEL INFERIOR TO OTHERS BECAUSE OF MY EYES.	13	I FEEL STRESSED DURING EXAMS BECAUSE OF MY EYES
4	I HAVE A SMALL SOCIAL CIRCLE DUE TO SQUINT.	14	SQUINT HINDERS MY CONCENTRATION
5	I FEEL SELF CONSCIOUS/ ANXIOUS ABOUT MY EYES IN PUBLIC GATHERING	15	I HAVE TUFF PLAY TIME DUE TO MY SQUINT
6	I FEEL UNCOMFORTABLE WHEN PEOPLE ASK ABOUT MY EYES	16	IT AFFECTS MY SCHOLASTIC PERFORMANCE
7	MY SQUINT IS A COSMETIC STIGMA	17	MY VISION IS COMPARITIVELY LESS THAN THAT OF MY FRIENDS
8	MY TEACHERS TREAT ME DIFFERENTLY DUE TO SQUINT	18	I HAVE PAIN/BURNING IN EYES DUE TO SQUINT
9	MY PARENTS TREAT ME DIFFERENTLY DUE TO SQUINR	19	I HAVE OCCASIONAL HEADACHE DUE TO SQUINT
10	MY FRIENDS TREAT ME DIFFERENTLY DUE TO SQUINT	20	I HAVE OCCASIONAL DOUBLE VISION DUE TO SQUINT

Fig 2- Comparison of psychosocial impact of strabismus between parents and patients

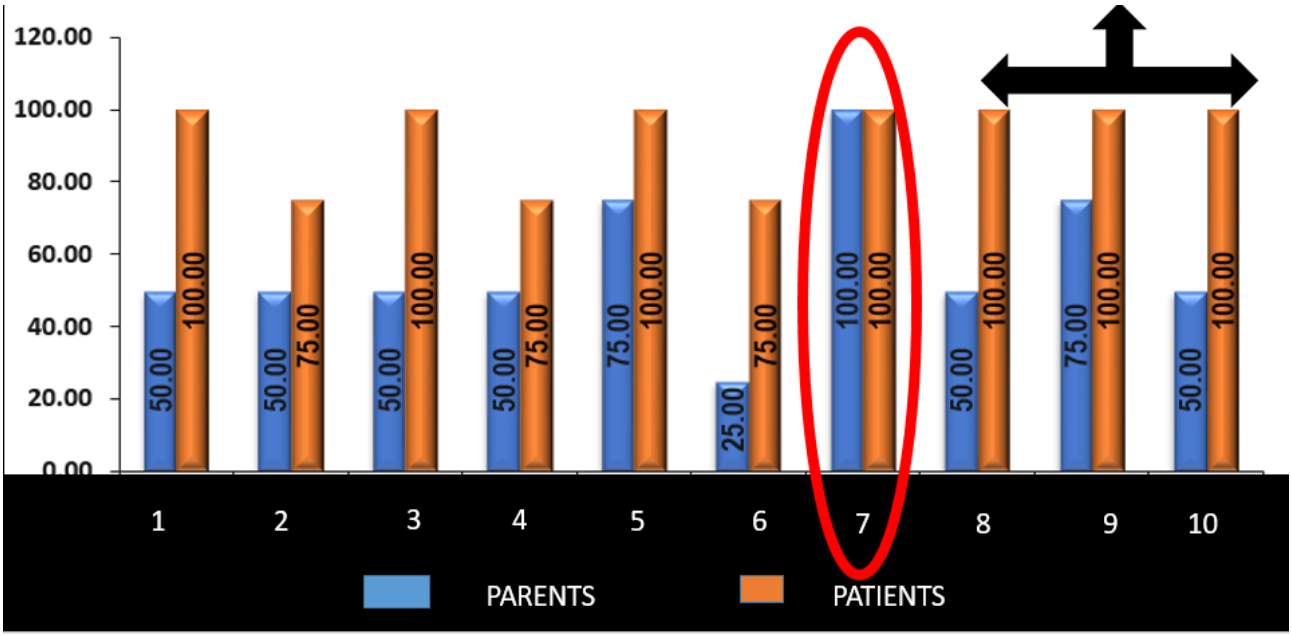
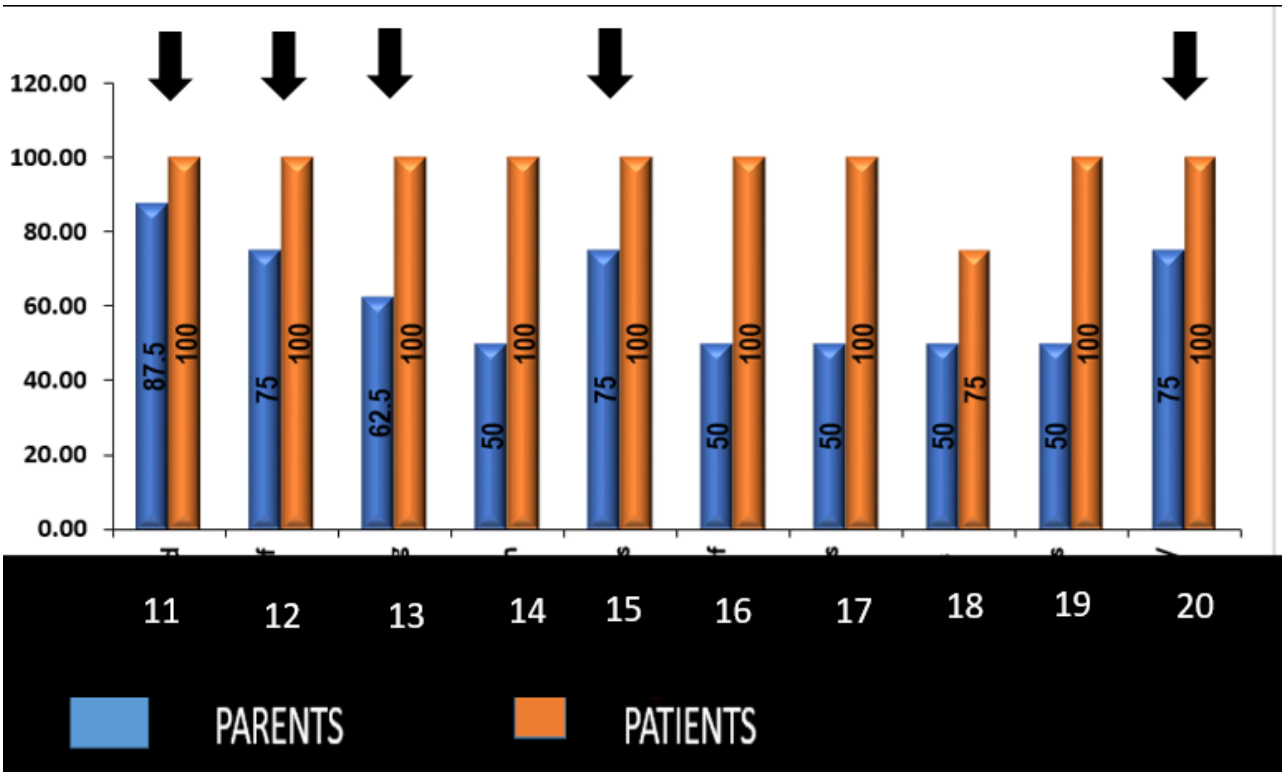


Fig 3- Comparison of functional impact of strabismus between parents and patients



This paper was judged as the BEST PAPER of Comprehensive Ophthalmology Session

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CENTRAL RETINAL ARTERY OCCLUSION IN YOUNG ADULTS AT HIGH ALTITUDE: THIN AIR, HIGH STAKES

ABSTRACT

We present five cases of young security personnel who were posted at high altitude for a duration of at least six months and presented with a sudden decrease of vision in one eye. The diagnosis of central retinal artery occlusion was made in all patients. Fundus fluorescein angiography and optical coherence tomography of the macula supported the diagnosis. None of these cases had any pre-existing comorbidities. Erythrocytosis was noticed in all patients, and two of them had hyperhomocysteinemia. Four out of five patients showed either middle cerebral artery or internal carotid artery thrombosis on computed tomography angiography. The patients were managed by a team of ophthalmologist, haematologist, vascular surgeon, and neurologist. In cases of incomplete internal carotid artery occlusion, patients were managed surgically. However, in the case of complete internal carotid artery occlusion, management was conservative with anti-platelet drugs. This case series highlights high altitude-associated erythrocytosis and hyperhomocysteinemia as important risk factors for central retinal artery occlusion in young individuals stationed at high altitude.

INTRODUCTION

Central retinal artery occlusion (CRAO) is a rare ophthalmic emergency characterized by acute, painless, and often irreversible vision loss due to occlusion of the central retinal artery or its branches (Hayreh., 2009). While CRAO is more commonly seen in elderly individuals with underlying cardiovascular risk factors such as hypertension, hyperlipidemia, and diabetes, it can rarely be seen in young individuals, particularly those posted at high altitude (HA) (Rudkin AK et al., 2009). We report five cases of CRAO in young security personnel who were lowlanders and were posted in HA, having no co-morbidities. Our study will provide further insight into the relationship between HA, increased hematocrit levels, and the risk of thrombosis of the common carotid artery (CCA) or internal carotid artery (ICA) leading to CRAO in young individuals.

CASE REPORT

CASE 1

A 37-year-old male stationed at 14,000 feet for a year presented with sudden loss of vision in right eye. The best corrected visual acuity (BCVA) in the right eye was perception of light positive and the left eye had a BCVA of 20/20. Anterior segment of the right eye revealed a relative afferent pupillary defect, and the posterior segment showed a cherry red spot at the fovea along with sclerosed arteries. Fundus fluorescein angiography was consistent with CRAO in the right eye. Computed tomography angiography showed complete occlusion of the distal one-third of the right CCA and the entire right ICA. Cardiology and hematological workup were normal except for increased hematocrit and hemoglobin (Hb) (Table 1).

CASE 2

A 39-year-old male stationed at 15,500 feet for six months developed an ischemic stroke in left middle cerebral artery territory and a sudden loss of vision in the left eye. BCVA was 20/20 in the right eye, and left eye had a vision of hand movement close to the face. Ocular examination in the right eye revealed superior quadrantopia on the confrontation test, which was confirmed on the visual field. The left eye revealed a relative afferent pupillary defect and a cherry red spot at the fovea. Computed tomography angiography showed complete occlusion of the left ICA. 2D echo and hematological workup were normal except for increased hematocrit and Hb (Table 1).

CASE

A 34-year-old male stationed at 15,000 feet for a year presented with sudden loss of vision in the right eye. BCVA of the right eye was perception of light positive, and the left eye was 20/20. The patient had a history of amaurosis fugax a day prior. The right eye revealed relative afferent pupillary defect, and a cherry red spot at the fovea. Fundus fluorescein angiography and optical coherence tomography of the right macula confirmed CRAO in the right eye. Computed tomography angiography showed complete occlusion of the distal one third of the right ICA. Cardiology and hematological workup were normal except for increased hematocrit, Hb, and serum homocysteine (Table 1).

CASE 4

A 33-year-old male stationed at 18,200 feet for 11 months presented with sudden loss of vision in the right eye. BCVA of the right eye was perception of light positive, and the left eye was 20/20. The right eye revealed relative afferent pupillary defect and cherry red spot at the fovea (Fig. 1A). Computed tomography angiography showed approximately 80% blockage of the right ICA due to calcified plaque (Fig.

1B). Cardiology and hematological workup were normal except for increased hematocrit, Hb, and serum homocysteine (Table 1).

CASE 5

A 32-year-old male stationed at 16,000 feet for 20 months, presented with sudden loss of vision in the right eye. BCVA in the right eye was perception of light positive, and the left eye was 20/20. The right eye revealed relative afferent pupillary defect and a cherry red spot at the fovea. Fundus fluorescein angiography was consistent with CRAO. Computed tomography angiography showed bilateral normal ICA, CCA, and orbital arteries. Cardiology and hematological workup were normal except for increased hematocrit and Hb (Table 1).

All patients underwent complete hematological work up viz hemogram, serum erythropoietin level, anticardiolipin and antiβ2GPI antibodies, paroxysmal nocturnal hemoglobinuria assay by flow cytometry, serum homocysteine levels, JAK2 V617 F and JAK exon 12 mutation, lipid profile, 2D echocardiography and carotid doppler. Patients with positive carotid doppler studies were further evaluated by computed tomography angiography. The ophthalmologist treated all five cases with ocular massage and paracentesis. Cases 1, 2, and 3 had complete ICA occlusion and were therefore started on dual antiplatelet agents (oral aspirin 75mg + oral clopidogrel 75mg). Case 4 underwent endarterectomy as the right ICA showed 80% occlusion. Case 5 was managed with oral aspirin. Presently, all patients are under follow-up and having BCVA of hand movement close to face or less and are on antiplatelet drugs.

DISCUSSION

Our study highlights five cases of young security personnel who developed CRAO while stationed in HA. Four of the five cases had associated CCA/ICA obstruction. Persistent erythrocytosis was noted in all patients and hyperhomocysteinemia was noticed in two of these patients (Table 1). In contrast to our case series, where

acquired hypercoagulable state was seen in all patients, a study done among 53 Indian Army soldiers having pulmonary embolism revealed a hereditary thrombophilic condition in 9 out of 53 patients, and 44 cases were idiopathic (V Dutta et al., 2018). A prospective longitudinal study of thrombotic events at HA in 960 healthy lowland sojourners noted a prothrombotic state with suppressed naturally occurring anticoagulants, dampened fibrinolysis, endothelial activation, platelet activation and raised proinflammatory markers in index cases (V Nair et al., 2022).

We speculate that artery to artery embolism must have obstructed the central retinal artery in our first four cases and led to CRAO. The exact mechanism by which CCA/ICA thrombosis occur in young people stationed at HA is unknown. However, hypoxia-induced erythropoietic drive results in erythrocytosis and an increase in Hb and hematocrit at HA (Azad P et al., 2018). Thus, increased hematocrit levels along with chronic hypoxia are thought to cause changes in blood flow dynamics, which could lead to endothelial damage and platelet activation leading to CCA/ICA thrombosis (Bärtsch P et al., 2007). Other factors, such as dehydration, cold exposure, and physical exertion may also contribute to thrombosis development in this population. There is no evidence to support an association between inherited thrombophilia and arterial thrombosis in adults. Hence, testing for heritable thrombophilia is not recommended in patients with arterial thrombosis. However, testing for antiphospholipid antibodies, myeloproliferative neoplasm and paroxysmal nocturnal hemoglobinuria should be considered in patients with arterial thrombosis in the absence of other vascular risk factors or significant atherosclerosis, especially in younger patients as this may have a significant impact on management (Deepa A et al., 2022).

While CRAO can occur at any altitude, it is more common in elderly people with underlying comorbidities such as hyperlipidemia, hypertension, and diabetes. In contrast, the cases highlighted in our study are young lowlanders who were posted

in HA. They didn't have any prior comorbidities and four out of five were non-smokers. Acquired HA associated erythrocytosis, and hyperhomocysteinemia were identified as important risk factors which led to acquired hypercoagulable state which probably led to CCA/ICA occlusion. In the elderly, atherosclerotic plaque commonly causes obstruction at the level of the carotid bulb; however, in young people, this obstruction can occur anywhere involving a segment of the ICA or CCA. Also, an interesting study by Sukun et al showed that people who reside at HA (more than 5 years) have a significantly lower rate of carotid stenosis, and lower atherogenic lipid profile values, which indicate a protective effect of HA on atherosclerosis (Sukun A et al., 2022). However, there is scarcity of literature on HA effects on carotid stenosis among young individuals who are lowlanders.

When lowlanders acclimatize to HA, their cerebral vessels, particularly the Middle Cerebral Artery, undergo significant dilation, which may return to sea-level diameter within 1 to 3 weeks. A study found substantial expansion at peak altitudes, promptly countered by oxygen introduction (Wilson et al., 2011). In light of Poiseuille's Law, accurate blood flow measurements necessitate accounting for arterial diameter variations. Concurrently, retinal arterioles and venules adapt, with the latter showing more pronounced dilation due to reduced oxygen (Willmann G., et al). However, this response, though initially beneficial, becomes fraught with risks as high altitude-induced polycythemia increases blood viscosity. Combined with potential vasoconstriction or endothelial dysfunction, the risk of CRAO, characterized by sudden vision loss, intensifies, illustrating the intricate vascular adaptations and their repercussions in lowlanders at high altitudes.

There is a scarcity of literature on CRAO in HA and on literature search only three cases have been reported. The first case involved CRAO caused by intraocular gas expansion at HA (Fang IM et al., 2002). The second case involved bilateral optic nerve head drusens that manifested as CRAO in HA (Newsom RS et al., 1995). The third and most recent case revealed ICA thrombosis and increased hematocrit as

cause of CRAO in young security personnel stationed at HA. Given the limited available literature, further research is needed to better understand the mechanisms and risk factors associated with CRAO in HA.

CONCLUSION

In conclusion, this study provides further insight into the pathophysiology of CRAO in young individuals stationed at HA. Specifically, the study highlights, HA associated erythrocytosis and hyperhomocysteinemia as probable risk factors for thrombosis of CCA/ICA which led to CRAO in HA. Role of HA, polycythemia, hypoxia and various procoagulant factors needs evaluation in well planned randomized controlled trials. The findings may aid healthcare professionals in better understanding the underlying mechanisms of CRAO in these individuals, allowing them to make more informed decisions regarding timely screening so as prevent this devastating complication.

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AUTHORS CONTRIBUTIONS

Article draft and background research by VR, revision of the article by PK, article design and concept by SB, expert guidance regarding high altitude by DKJ and SKM, expert guidance regarding radiological findings by SB, expert guidance regarding medical and surgical intervention by VKS and VAA.

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Case	**Age (years)**	**Altitude (feet)**	**Reported To ophthalmologist (days)**	**Duration of stay in HA (months)**	**Smoking**	**Hb[a](g/dl)**	**Hematocrit Normal (41%-50%)**	**Hematological work up[b]**	**CT Angiography[c]**
1	37	14,200	2	12	No	19.0	60	Normal	Complete occlusion of the distal one-third of the right CCA[d] and the entire right ICA[e]
2	39	15,500	4	6	Yes	18.6	58	Normal	Complete occlusion of the left ICA
3	34	15,000	1	12	No	19.2	62	34µmol/l	Complete occlusion of the distal 1/3rd of the right ICA
4	33	18,200	2	11	No	18.6	58	36 µmol/l	80% blockage of the right ICA
5	32	16,000	2	20	No	18.4	56	Normal	Normal

[a]Hemoglobin

[b]Hematological work up showed increased serum homocysteine in case 3 and 4. (Normal range of serum homocysteine: 5-15 µmol/l)

[c]Contrast enhanced computed tomography angiography of brain, neck and orbit.

[d]Common Carotid Artery

[e]Internal Carotid Artery

This paper was judged as the BEST PAPER of Cornea - I Session

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CENTRAL TOXIC KERATOPATHY AFTER COLLAGEN CROSS-LINKING: A CASE SERIES

PURPOSE:

The aim of this study was to report a case series of central toxic keratopathy (CTK) after collagen cross-linking (CXL) in keratoconus.

Methods: This is a retrospective case series between January 2020 and September 2021. In this period, CXL was performed for progressive keratoconus in 964 eyes. CXL was performed using the epithelium-off accelerated protocol in all patients with a ribofla- vin soak time of 20 minutes and a UVA light exposure of 9 mW for 10 minutes using the Avedro KXL (Glaukos Inc, Aliso Viejo, CA) cross-linking system.

RESULTS:

Twelve of 964 eyes (1.2%) developed CTK within 1 week of CXL. All patients presented with well-circumscribed, central disciform haze that was broader in the anterior stroma and narrower in the posterior stroma. We noted initial flattening in keratometry up to 3 months post-CXL in these patients, which gradually steepened over 12 months, but did not reach preoperative levels. We also noted exuberant flattening in pachymetry in the first 3 months, which improved over 12 months. There was a statistically significant decrease in pachymetry in patients

who developed CTK at 3 and 12 months postoperatively when compared to patients who under- went CXL but did not develop CTK.

CONCLUSIONS:

Several reports of CTK postrefractive surgery have been described previously. However, the association of CXL in the development of CTK has not been described previously. Here, we elucidated the clinical features of CTK after CXL and how it differs from corneal scarring or haze that occurs post-CXL.

KEY WORDS: central toxic keratopathy, collagen cross-linking, keratoconus

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Collagen cross-linking (CXL) with riboflavin and ultraviolet-A (UVA) is a corneal tissue-strengthening

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Technique by using riboflavin as a photosensitizer and UVA to increase the formation of intrafibrillar and interfibrillar covalent bonds by photosensitized oxidation.[1] CXL effec- tively halts the progression of keratoconus over the years with a reduction in corneal curvature. The reported complications in literature post-CXL include haze, diffuse lamellar keratitis, microbial keratitis, reactivation of herpetic keratitis, and corneal scarring.[1,2]

Central toxic keratopathy (CTK) is a rare, acute, noninflammatory condition associated with excimer laser ablation surgery, most commonly LASIK but also after PRK or PTK.[3,4] One case of CTK has been reported post- PRK, followed by CXL.[5] The proposed contributing factors for the development of CTK are photoactivation of povidone- iodine by the excimer laser, laser-induced keratocyte apopto- sis of

corneal matrix, intraoperative exposure to meibomian gland secretions, marking pen ink, talc from latex surgical gloves, or postsurgical debris from the microkeratome blade.[4,6]

There is no direct correlation between CXL and the development of CTK in the literature. This is the first case series of CTK post-CXL being reported. Its management depends on whether it is progressive or stationary and whether it affects the corrected distance visual acuity.

PATIENTS AND METHODS

During the period of study from January 2020 to September 2021, 964 CXL procedures were performed for progressive keratoconus at our institute. CXL was performed per the epithelium-off accelerated protocol in all patients with a riboflavin soak time of 20 minutes and a UVA light exposure of 9 mW for 10 minutes using the Avedro KXL (Glaukos Inc, Aliso Viejo, CA) cross-linking system. After the procedure, a bandage contact lens was applied in all patients for 1 week, which was removed at the 1-week visit. Post-CXL, all patients were prescribed topical loteprednol etabonate 0.1% eye drops (L Pred; Allergan Inc, Irvine, CA) in tapering doses over a month, moxifloxacin 0.5% eye drops (Vigamox; Alcon, Fort Worth, TX) for a week, and carboxymethylcellulose 0.5% eye drops (Optive; Allergan, Irvine, CA) for 3 months. All study protocols were adhered to the Declaration of Helsinki, and approval was obtained from the institute's institutional review board for a retrospective analysis of the data. A retrospective chart review was conducted. Preoperative and postoperative data including uncorrected distance visual acuity and corrected distance visual acuity, manifest refraction with spherical equivalent

TABLE 1. Details of Patients Who Developed CTK Post-CXL

Sr. No.	Age (yr)	Sex	Preoperative SE (Diopters)	Preoperative BDVA (LogMAR)	Time of Onset (d)	1 wk Post-CXL—UDVA (LogMAR)	Last Follow-Up SE (Diopters)	Last Follow-Up—BDVA (LogMAR)	Follow-Up Period (mo)
1	25	M	−1	0.1	7	0.6	−1	0.1	1
2	30	M	−3.5	0.3	7	0.7	−2.25	0.3	24
3	16	M	−3	0.5	7	0.4	−2	0.2	26
4	11	F	−5.25	0.6	5	1.2	−5.5	0.8	10
5	28	M	0.5	0.5	3	0.9	0	0.3	4
6	16	F	0	0.1	7	0.3	0	0	15
7	23	F	−5.375	0.1	7	0.7	−3.25	0.3	16
8	21	F	−15.25	0.5	7	1.2	−13	0.2	59
9	23	F	−10.5	0.7	7	1.2	−10.5	0.4	12
10	18	M	−4.5	0.5	7	0.3	−1	0.1	11
11	32	F	−3	0.2	7	0.6	−2.5	0.4	12
12	23	M	−1	0.1	5	0.6	−1.5	0	28

UDVA, uncorrected distance visual acuity.

(SE), and corneal tomography with Pentacam (Oculus, Wetzlar, Germany) were collected and analyzed.

Data were recorded and analyzed using Microsoft Excel. Postoperative data at the 3- and 12-month follow-up visits were collected for analysis. In the analysis of visual acuity, Snellen visual acuity was converted to the logarithm of the minimum angle of resolution (logMAR). Descriptive statistics analysis, such as mean and standard deviation, was used for continuous data. The postoperative results of the CXL with CTK group were compared with the CXL without CTK group by using the t test. A P value of ,0.05 was considered as statistically significant.

RESULTS

Between January 2020 and September 2021, 964 patients underwent CXL for progressive keratoconus. Of these, 12 patients (1.2%) were noted to have developed CTK. Their ages ranged between 16 and 32 years, and 50% of the patients were women and 50% were men, suggesting no gender predilection. All patients who developed CTK presented within a week to the clinic post-CXL (Table 1). All patients had a characteristic feature of disciform-shaped central corneal haze with the most significant area of haze anteriorly and reducing in the posterior stroma with well-demarcated borders (Fig. 1). None of the patients developed any haze in the peripheral cornea. The density of the haze varied from patient to

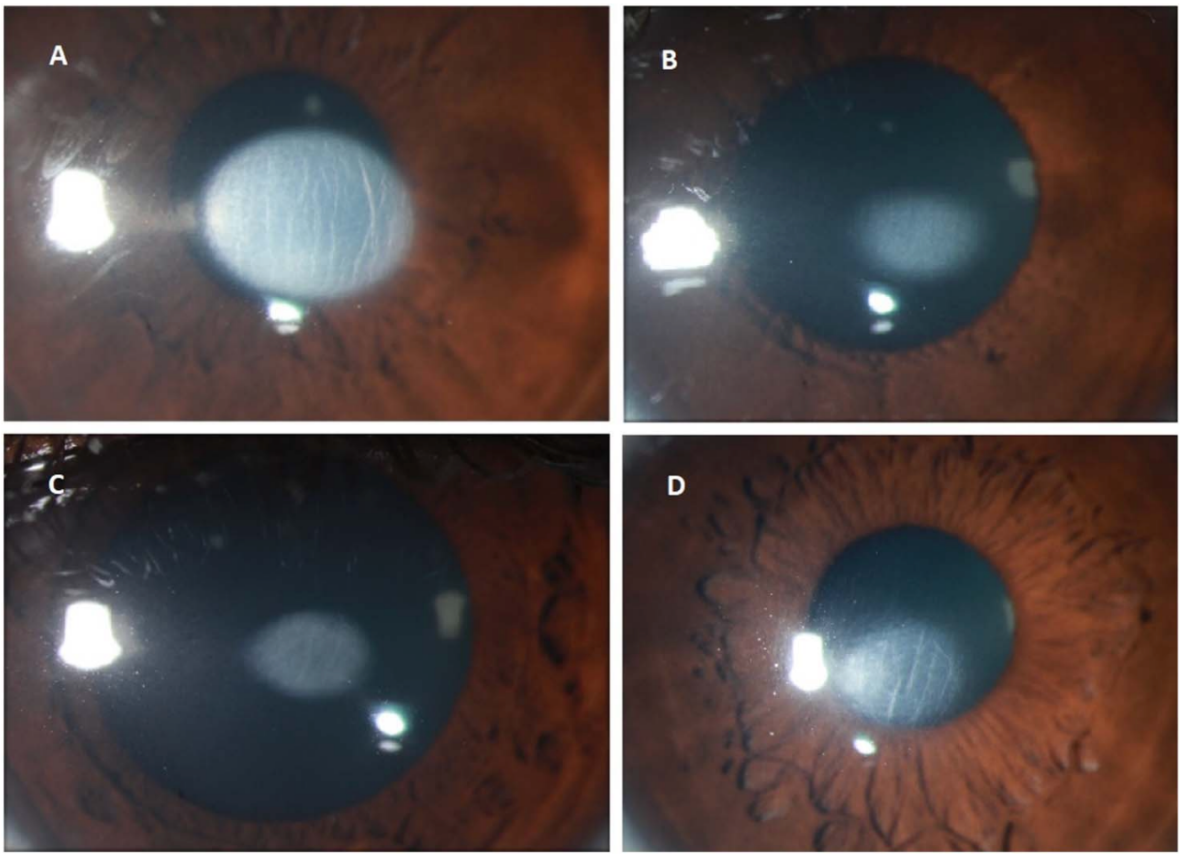


FIGURE 1. Slit-lamp photographs of 4 patients (A, B, C, D) showing a central, disciform area of haze with distinct borders and varying density. (The full color version of this figure is available at www.corneajrnl.com.)

patient. Striae at the level of the Bowman membrane that has been described in the clinical features of CTK were noted. There was no epithelial defect, stromal edema, or cellularity. Anterior segment optical coherence tomogra- phy showed stromal thinning in the area of haze and a characteristic inverse dome-shaped configuration (Fig. 2). Flattening of the cornea in the area of haze was noted in all patients. Confocal microscopy performed through this central haze in few of our patients in the acute phase of the disease showed loss of keratocytes without any inflammatory cells (Fig. 3), suggesting that this CTK haze was noninflammatory. All patients were managed conservatively without changing the postopera- tive medications. The haze gradually decreased with time without additional intervention in all our patients (Fig. 4). The mean preoperative SE was 24.54 6 5D

with BCVA of 0.35 6 0.22 logMAR, whereas the mean SE at last follow-up was 23.83 6 4.52D with BDVA improving to 0.27 6 0.21 logMAR (Table 1). We noted initial flattening in keratometry (K1, K2, Kmean, and Kmax) up to 3 months post-CXL in these patients, which gradually steepened over 12 months, but did not reach preoperative levels (Fig. 5A). We also noted exuberant flattening in the thinnest pachymetry and pachymetry at apex in the first 3 months, which improved over 12 months, but the cornea stayed significantly thinner compared with preoperative levels (Fig. 5B).

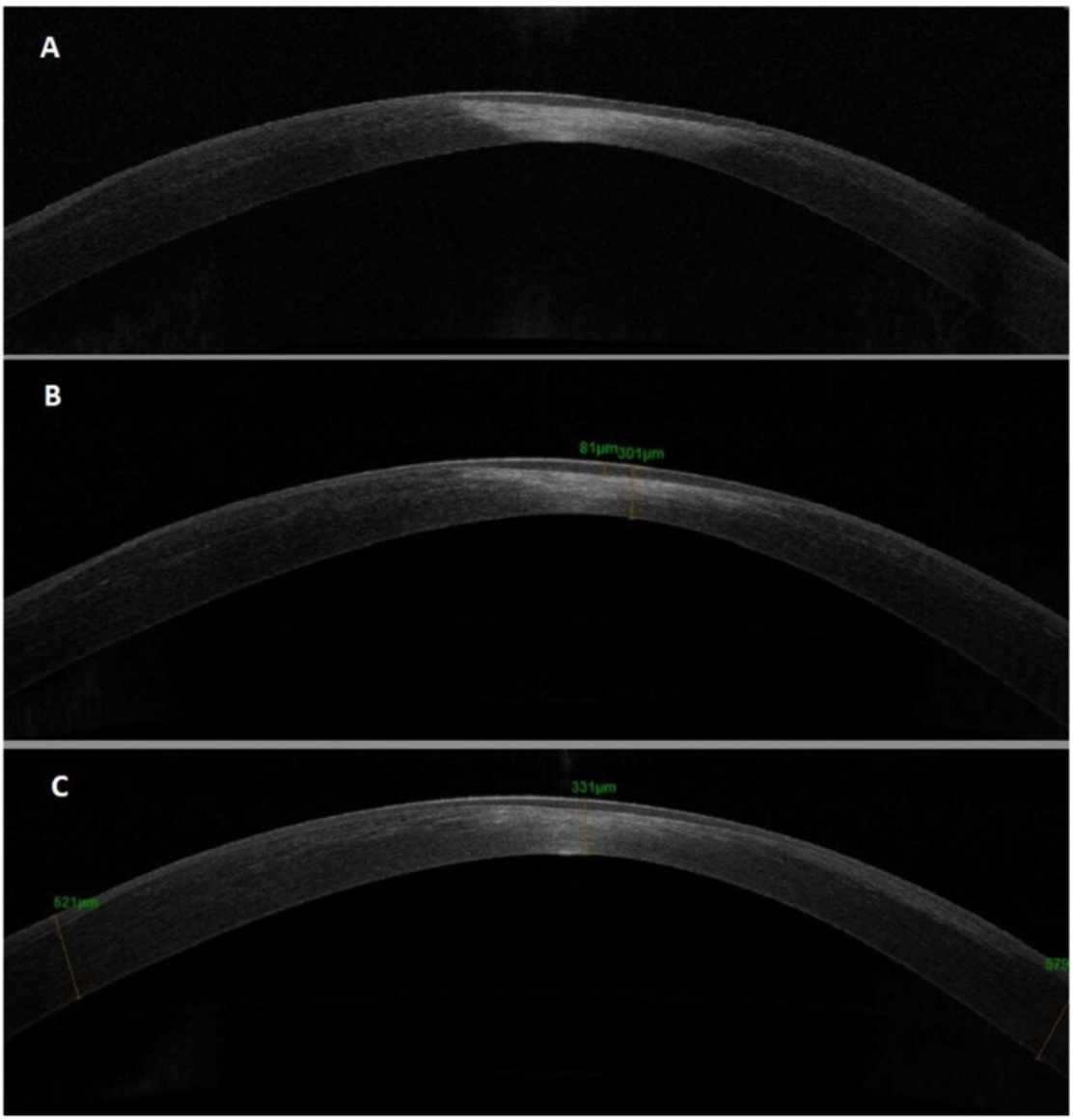
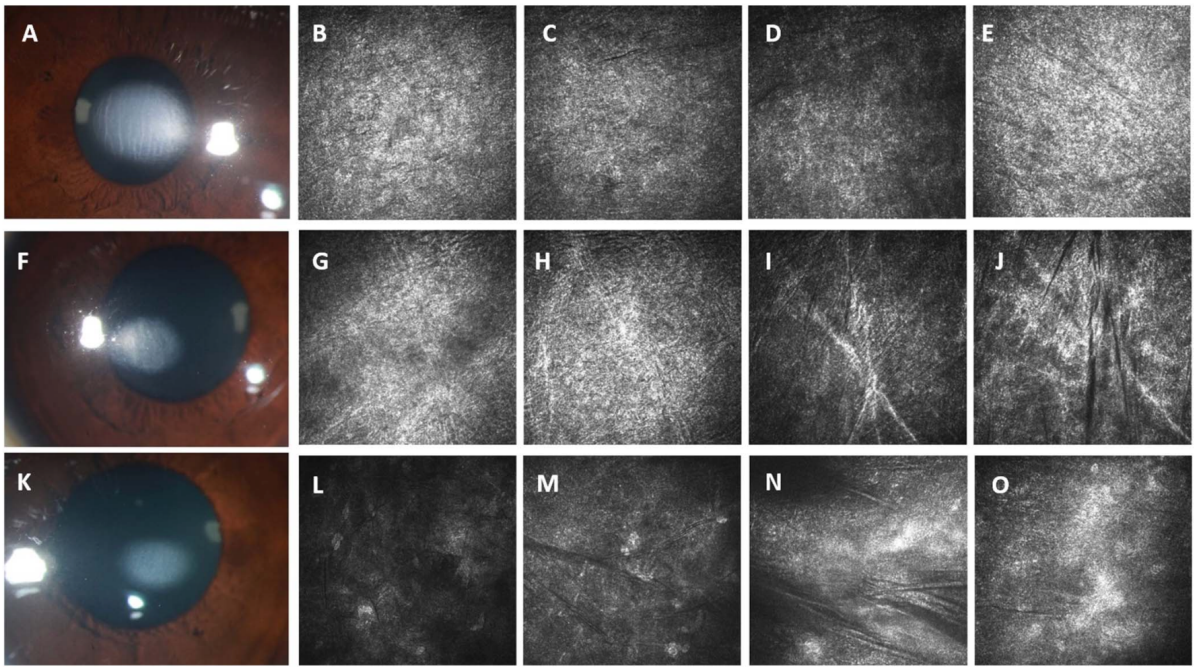


FIGURE 2. AS-OCT (A) 1 week post-CXL showing a typical inverted dome-

shaped configuration of haze and thinning in the region of haze. B, 1 month post-CXL showing a decrease in haze (C) 3 months post-CXL showing a further reduction in haze and recovery in corneal thickness. AS-OCT, anterior seg- ment optical coherence tomography. (The full color version of this figure is available at www.corneajrnl.com.)



On comparing our cohort of patients with a group of patients with similar preoperative keratometry and

FIGURE 3. Slit-lamp photographs of 3 patients (A, F, K) taken in the acute phase (2–3 months post-CXL) along with corresponding confocal microscopy images at depths of 75 mm (B, G, L), 150 mm (C, H, M), 200 mm (D, I, N), and 250 mm (E, J, O) showing loss of keratocytes and absence of inflammatory cells. (The full color version of this figure is available at www.corneajrnl.com.)

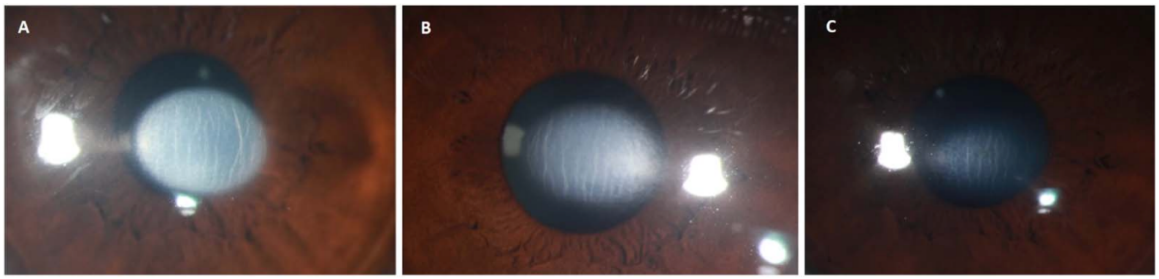
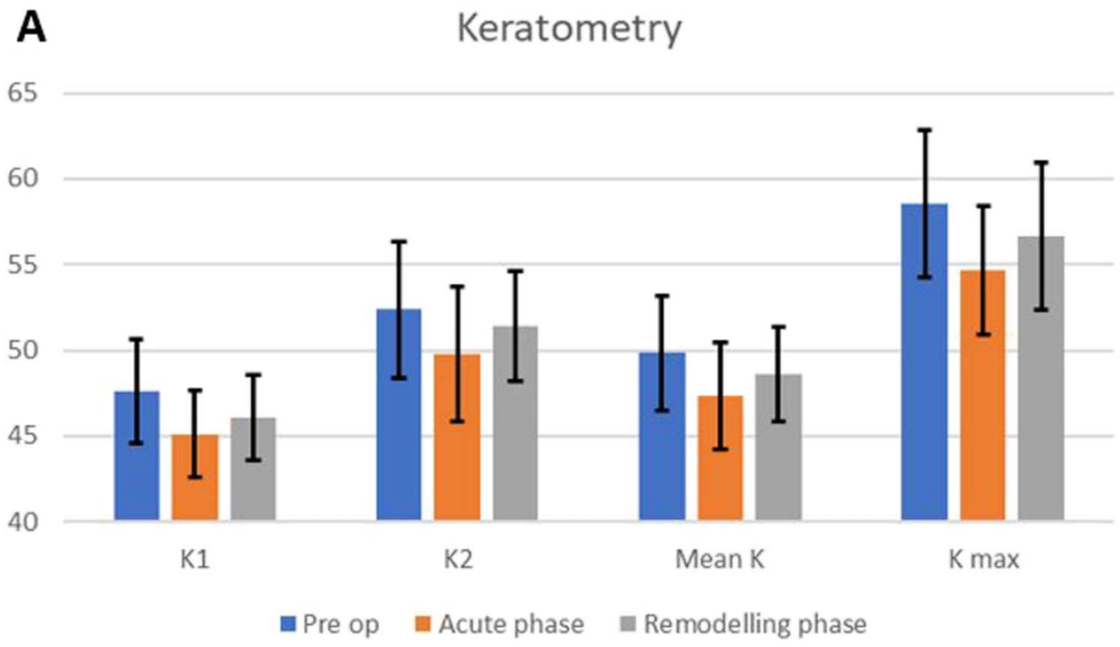


FIGURE 4. Slit-lamp photographs showing a progressive decrease in the haze with conservative management: (A) before CXL, (B) 1 week post-CXL, and (C) 1 month post-CXL. (The full color version of this figure is available at www.corneajrnl.com.)

pachymetry who underwent CXL but did not develop CTK (Table 2), we noticed that there was a statistically significant decrease in pachymetry in the CXL with CTK group at 3 and 12 months postoperatively compared with the CXL without CTK group. We also noted a decrease in keratometry in the CXL with CTK group compared with the CXL without CTK group at 3 months postoperatively, but this was not statisti- cally significant (Fig. 6).

FIGURE 5. Graph depicting (A) the change in keratometry (in diopters) in K1, K2, Kmean, and Kmax com- paring before CXL, in the acute phase after CTK (2–3 months), and in the remodeling phase (9–12 months). B, Change in corneal thickness (in microns) in the thin- nest location and apex of cornea comparing before CXL, in the acute phase after CTK (2–3 months), and in the remodeling phase (9–12 months). (The full color version of this figure is available at www. corneajrnl.com.)


A
Keratometry
65
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55
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45
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K1
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Mean K
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Pre op
Acute phase
Remodelling phase

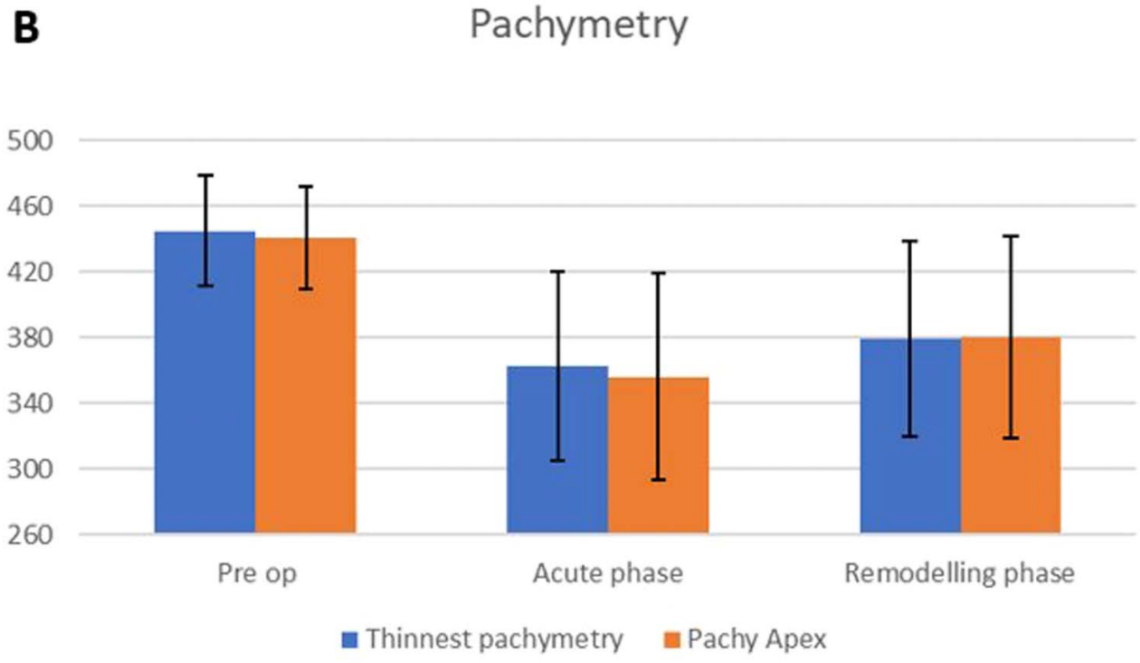
B
Pachymetry
500
460
420
380
340
300
260
Pre op
Acute phase
Remodelling phase
Thinnest pachymetry
Pachy Apex

TABLE 2. Comparison of Keratometry and Pachymetry Results Between CXL Without CTK and CXL With CTK Groups

	Preoperative			3 Mo Post-CXL			12 Mo Post-CXL		
	CXL Without CTK	CXL With CTK	*P*	CXL Without CTK	CXL With CTK	*P*	CXL Without CTK	CXL With CTK	*P*
K1	47.67 ± 3.63 D	47.60 ± 3.06 D	0.482	47.28 ± 3.74 D	45.12 ± 2.54 D	0.103	46.78 ± 2.93 D	46.09 ± 2.49 D	0.289
K2	52.09 ± 3.16 D	52.36 ± 3.99 D	0.431	51.55 ± 3.54 D	49.81 ± 3.93 D	0.151	50.93 ± 3.10 D	51.41 ± 3.21 D	0.365
Mean K	49.76 ± 3.24 D	49.85 ± 3.33 D	0.474	49.31 ± 3.49 D	47.33 ± 3.14 D	0.098	48.76 ± 2.84 D	48.60 ± 2.73 D	0.450
K max	58.54 ± 4.11 D	58.54 ± 4.30 D	0.500	58.33 ± 4.34 D	54.69 ± 3.76 D	0.055	57.38 ± 4.86 D	56.64 ± 4.25 D	0.362
Pachy (thinnest)	458.08 ± 43.40 µ	440.70 ± 33.94 µ	0.158	435.17 ± 45.44 µ	362.44 ± 57.88 µ	0.002	432.33 ± 53.81 µ	379.33 ± 59.45 µ	0.023
Pachy (apex)	465.58 ± 46.25 µ	440.60 ± 31.40 µ	0.081	440 ± 44.66 µ	355.89 ± 62.72 µ	0.001	438.92 ± 53.59 µ	380.11 ± 61.54 µ	0.05

DISCUSSION

This may be the first documented case series of patients who developed CTK after the CXL accelerated protocol. The etiology of CTK is still poorly understood, and several inciting factors have been put forward in the literature on postrefractive surgery cases. In our series, the only identifi- able risk factor for CTK was administering a 5% povidone- iodine drop in the conjunctival cul-de-sac preoperatively. However, it was washed away thoroughly before starting the procedure. Powder-free gloves were used, and the speculum and spatula used for epithelial removal were the only sterilized instruments that touched the eye intraoperatively. Isotonic riboflavin was used to soak the cornea, and UVA exposure was for 10 minutes with a total energy delivery of 5.4 J/cm^2. Traditionally described haze post-CXL appears as a dust-like change in the corneal stroma with a midstromal demarcation line.[7] Corneal haze seems to be associated with the depth of CXL in the stroma and the amount of keratocyte loss.[2] Cases of deep stromal scarring post-CXL have been reported, which usually present much later postoperatively. However, early onset haze limited to the central visual axis has not been documented previously. CTK after laser refractive surgery usually starts within 3 to 9 days[4] as a focal, dense, well-demarcated whitish opacity without inflamma- tion. The absence of an overlying epithelial defect and lack of inflammation distinguish it from infection. It is associated

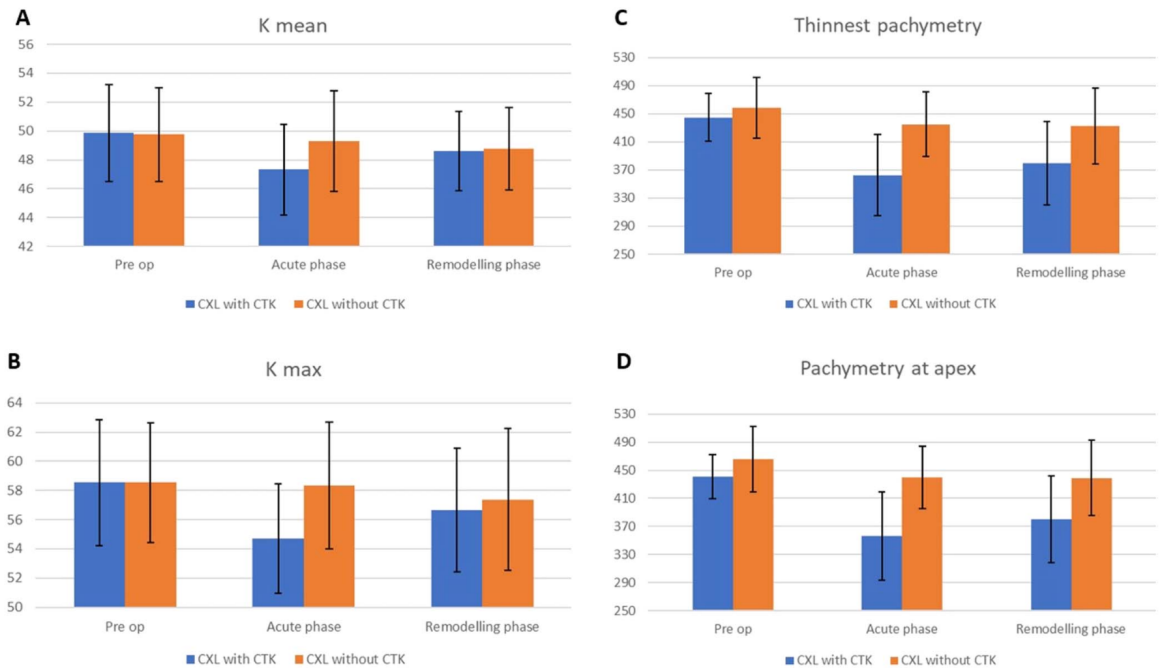

FIGURE 6. Graph depicting the comparsion between the CXL with CTK group and the CXL without CTK group in (A) Kmean, (B) Kmax, (C) thinnest pachymetry, and (D) pachymetry at apex before CXL, in the acute phase (2–3 months) and in the remodeling phase (9–12 months). (The full color version of this figure is available at www.corneajrnl.com.)

with a significant hyperopic shift and eventually clears within 12 to 18 months.[8] The etiology has been hypothesized to be either keratocyte apoptosis or enzymatic degradation of the central stromal matrix resulting in tissue loss resulting in central corneal collapse and thinning.[4] Davey et al[5] described a case of CTK post-transPRK (followed by CXL) with a dense central corneal opacity with surrounding diffuse superficial stromal haze. A significant hyperopic shift was associated with anterior stromal thinning in the center. Noor et al[9] reported 3 cases that showed continuous flattening after CXL, even after 12 years of follow-up. By contrast, in our cases of CTK post-CXL, we observed initial flattening followed by regularization of the cornea. We also found a statistically significant difference in thinning when compar- ing cases of CTK with those in which CTK did not develop. Sikder et al[8]

conducted a tomographic analysis of a bilateral case of CTK (post-LASIK) and found that the hyperopia that occurs in this disease is related to changes in anterior corneal curvature, as well as the thinning of the anterior stroma, which is more in the first week postoperatively. One limitation of our findings is the unavailability of epithelial maps, which would help in differentiating between stromal remodeling and compensatory epithelial hypertrophy.

The characteristic features of CTK differentiating it from haze noted after CXL include early onset (usually within 1 week), central location with distinct borders, absent demarcation line, and central thinning with a hyperopic shift. By contrast, post-CXL haze is usually present later (around 4–6 weeks) and is diffuse with indistinct borders and a midstromal demarcation line. CTK is generally managed conservatively. The role of topical steroids is controversial

because this is a noninflammatory condition, and steroids may cause worsening by inhibiting keratocytes and fibroblasts from rebuilding the cellular matrix leading to aggravated stromal loss.[6]

Although CTK postrefractive surgery is a known entity, its occurrence post-CXL is a rare phenomenon that has never been reported. This is a self-limiting condition that resolves over time with conservative management. We report 12 cases with characteristic features resembling CTK postrefractive surgery which is distinctly different from the post-CXL haze.

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This paper was judged as the BEST PAPER of Cornea - II Session

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REAL TIME INTRAOPERATIVE OPTICAL COHERENCE TOMOGRAPHY (IOCT) GUIDED STROMAL FLUID DRAINAGE IN CORNEAL HYDROPS FOR EARLY RESOLUTION OF CORNEAL EDEMA

ABSTRACT

AIM

To describe a novel technique of real time intraoperative optical coherence tomography (iOCT) guided stromal fluid drainage in corneal hydrops for rapid resolution of corneal edema.

METHOD

Six eyes of keratoconus with acute corneal hydrops with multiple stromal fluid clefts underwent this procedure. The surgical technique comprised of iOCT-guided localization of the stromal fluid clefts followed by multiple venting incisions into the stromal fluid clefts with micro-vitreoretinal blade with simultaneous air tamponade in anterior chamber. Corneal massage with merocel sponge further aided in draining fluid through the incision site. Time taken for resolution of corneal edema, requirement for repeat procedure and any complication arising out of this procedure was noted.

RESULTS

Five patients (six eyes) with acute corneal hydrops underwent this procedure. All but one case had some associations such as vernal keratoconjunctivitis (n=2), fundal coloboma (n=1) and Downs syndrome (n=1). The median duration of hydrops before undergoing the procedure was 21± 8.8 days. The median corneal thickness on presentation, at the highest point of corneal edema was 1625± 390 microns. The median resolution time was 17.5± 8.4 days. None of the cases required a repeat procedure. No intra-operative or post-operative complication was noted in any case.

CONCLUSION

iOCT guided drainage of stromal fluid pockets is a safe and effective technique for early resolution of corneal edema in cases of corneal hydrops with severe corneal edema and large fluid clefts. Real time monitoring with iOCT allows for fluid clefts location, instrument depth judgment and complete drainage of fluid clefts.

INTRODUCTION

Management of acute corneal hydrops can be difficult especially if it is associated with collection of multiple stromal fluid pockets in addition to a tear in Descemet membrane (DM). [1–3] Although most cases of corneal hydrops resolve spontaneously without any intervention over a period of 2-4 months, surgical intervention may be needed in some cases.[4] Such circumstances include include cases where early visual rehabilitation is needed, where medical management fails, and to prevent complications such as corneal neo-vascularization especially in corneas with multiple cystic clefts and severe corneal edema.[5–8]

The most commonly performed intervention is intracameral gas/air injection. However, in severe cases with multiple stromal clefts and large areas of DM detachment, these procedures are often not successful and repeat procedures may be required. In addition, elevated intra ocular pressure (IOP), pupillary block

glaucoma and intrastromal migration of gas can complicate these procedures. .[1,9] Lastly, the corneal edema may take a long time to resolve putting the patients eye at risk of corneal neovascularization and poor survival of penetrating corneal grafts that may have to be performed after complete healing.

The basic problem underlying delayed resolution in corneal hydrops is the accumulation of excessive fluid within the intra-stromal spaces or clefts, which require considerable time to egress. To overcome this problem Vajpayee et al described a technique wherein anterior segment optical coherence tomography (ASOCT) was used during pre-operative evaluation of the cases for precise localization of the stromal fluid cleft and these images were used intra-operatively as a guide to select the appropriate site for surgical drainage of stromal fluid clefts.[6] The drainage of intrastromal fluid pockets was done using a Micro-vitreoretinal (MVR) blade. The major drawback of this technique is that the depth of MVR entry was entirely dependent upon the surgeon's subjective assessment. This can lead to inadequate drainage of the stromal pockets, multiple attempts to drain the cleft resulting in multiple entry points and sometimes inadvertent entry into the anterior chamber resulting in formation of corneal fistula. Herein we describe a technique of "iOCT guided intrastromal fluid drainage for corneal hydrops" with the advantage of real time intraoperative OCT monitoring of the fluid pockets, depth of draining incisions and completeness of stromal fluid drainage.

MATERIAL AND METHODS

Five patients of keratoconus with corneal hydrops with multiple stromal fluid clefts underwent this procedure. All cases received medical management for 2-4 weeks without significant improvement before the intervention. Approval was obtained from the Institutional review board of All India Institute of Medical

Sciences, New Delhi, India and the study conformed to the tenets of Declaration of Helsinki.

SURGICAL TECHNIQUE

The surgery was performed under peribulbar anesthesia. Intraoperative OCT (OPMI Lumera 700 and RESCAN 700, Carl Zeiss, Meditec, Germany) was done using the RESCAN 700 [microscope integrated OCT system with a heads-up display system, external video display panel and a foot pedal control of the OCT scanner, based on the Lumera 700 (Carl Zeiss Meditec) platform]. Anterior segment imaging was achieved with the help of the standard microscope viewing system that included a 9 mm × 9 mm volumetric cube scan and raster scans (2 line and 5 line) at zero degree orientation. The size of the cube was modified depending upon the need. Small cube size 4mm x 4 mm was used initially to screen the entire cornea, by moving the cube with the foot pedal control, to look for presence of stromal fluid pockets. (Figure 1a) An MVR entry was made at the limbus and air was injected into the anterior chamber to prevent further ingress of fluid into the corneal stroma. (Figure 1b-c) Subsequently, two to five venting incisions were made in the cornea at 10˚-30° angulation to the corneal plane with real time monitoring of the fluid pockets using iOCT. (Figure 1d) The venting incisions were created, using a 20-gauge MVR blade avoiding the visual axis as far as possible. In addition, the fluid pockets that were in direct contact with anterior chamber were avoided while creating the venting incisions in order to avoid corneal fistula formation. Successful vents into the stromal fluid pocket were evidenced by egress of fluid as well as real time monitoring of the MVR knife depth on iOCT. (Figure 1d) In addition, external pressure was applied over the edematous cornea with the help of merocel sponge to aid in aqueous drainage. (Figure 1e) Merocel sponges worked both by mechanical pressure as well as capillary action in egress of fluid. This maneuver was repeated several times to ensure complete egress of fluid, which was

confirmed on iOCT, while maintaining complete fill of anterior chamber with air. (Figure 1f) Following this, the air from anterior chamber was released partially leaving behind the anterior chamber 2/3rd filled with air. At the end of the procedure, topical moxifloxacin 0.5% was put and eye was patched. Postoperatively, topical antibiotic, corticosteroid, cycloplegic, antiglaucoma and hypertonic saline were prescribed for 4 weeks.

RESULTS

iOCT guided hydrops drainage was performed in six eyes of five patients. The details of the patients have been described in Table-1.

Table 1: Baseline characteristics of all cases of corneal hydrops

Case	Age/Sex	Diagnosis	Association	Eye	Visual acuity	Duration of Hydrops	Corneal thickness at presentation (µm)	Height of detachment at presentation
1	18/F	Keratoconus	IFC	Right	1/60	30	980	-
2	21/M	Keratoconus	None	Left	FCCF	42	1650	1200
3	18/M	Keratoconus	VKC	Left	1/60	21	1600	-
4	30/M	Keratoconus	Downs Syndrome	Right	PL	3	1880	-

5	5/M	Keratoconus	VKC	Right	FCCF	21	2200	-
6	5/M	Keratoconus	VKC	Left	FCCF	10	930	-

FOOTNOTES

F= Female; M=Male; IFC= irido-fundal coloboma; FCCF= Counting finger close to face; VKC= Vernal Keratoconjunctivitis

All cases had bilateral keratoconus with acute corneal hydrops. One patient had bilateral hydrops, although the two eyes got involved at different point of time. The age ranged between 5 to 21 years. The study included four male and one female patient. The primary diagnosis was bilateral keratoconus for all cases. All but one case had some associations such as vernal keratoconjunctivitis (n=2), fundal coloboma (n=1) and Downs syndrome (n=1). The median duration of hydrops before undergoing the procedure was 21± 8.8 days. The median corneal thickness on presentation, at the highest point of corneal edema was 1625± 390 microns.

The median resolution time was 17.5± 8.4 days (range 7 to 28 days). No intra-operative complication was noted in any case. Descemet membrane was attached on day one in five eyes while one case had a delayed reattachment.(Table-2)

Table 2 : Outcome of all cases following iOCT guided stromal fluid drainage

Case No	Corneal thickness (in microns)					IOP Pod 1	Time to resolution	Complications	Final outcome	BCVA
	Pod 1	Pod 7	Pod 14	Pod 28	Pod 60					
1	-	321	321	321	-	14	7	Nil	Paracentral 3x5 mm scar	HMCF
2	1280	-	-	564	422	16	14	Nil	Central 4x4 mm scar	1/60

3	-	-	913	355	-	16	28	Nil	Paracentral 4x4 mm scar	6/60
4	1700	1400	900	599	-	14	21	Nil	Corneal scar 8x8 mm	1/60
5	1700	1200	800	542	-	14	21	Increased symptoms and edema at 6 week which resolved with medical management	Corneal 4x5 mm scar	3/60
6	-	515	410	-	-	12	7	Nil	Para central corneal scar 3x3 mm	6/36

FOOTNOTES

Pod 1- post-op day1; IOP- Intra ocular pressure; BCVA- best corrected visual acuity; HMCF- hand movement close to face

No postoperative rise in IOP occurred in any case. In addition, none of the cases required a repeat air injection. One of the case developed increased photophobia and watering with increased corneal edema, precipitated by vigorous eye rubbing, at six week post-op that resolved with medical management.

DISCUSSION

iOCT is an extremely useful tool for both anterior and posterior segment surgeries and its use has been validated by two multi-centric trials that is DISCOVER study (RESCAN 700) and PIONEER study (Bioptigen).[10,11] It provides detailed information about graft thickness, orientation and opposition to host bed during lamellar keratoplasty as well as helps in surgical manipulations (e.g., manual sweeping, increased air infusion pressure) and visualization of instrument-tissue interaction in Descemet stripping automated endothelial keratoplasty, Deep anterior lamellar keratoplasty and Descemet membrane endothelial keratoplasty.[10] In addition, during phacoemulsification, it has been found useful for visualization of capsulorrhexis, hydrodissection, groove depth, and intraocular

lens placement. [10,11] We utilized this technique to identify the stromal fluid pockets in our case and to drain the fluid pockets under real time monitoring of iOCT.

Management of corneal hydrops with conventional techniques is difficult when it is associated with multiple intrastromal fluid clefts. Conventional treatment modalities require a prolonged time for recovery, hence not recommended. Corneal edema persisting for a long duration can lead to complications such as infection, corneal fistula/perforation, and corneal neovascularisation.[12–14] Intracameral injection of air or gas (C3F8/SF6), in addition to prolonged edema can be complicated by elevation of IOP, pupillary block glaucoma and intrastromal migration of air.[1,9] Decompression sutures have been proposed to deal with such cases however they carry the risk of suture-related complications, and a second procedure for suture removal.[15] Keratoplasty can be performed in such cases, however the survival of graft is compromised due to underlying inflammation in presence of corneal hydrops. Vajpayee et al. have described the technique of intrastromal fluid drainage with air tamponade in acute corneal hydrops guided by pre-operative ASOCT image of the cornea.[6] This technique was extremely useful in cases of corneal hydrops with large DM detachment. Corneal edema resolved in all cases over 2–3 weeks without any need for repeat air injection. Draining the edematous fluid significantly reduces the burden of collected edematous fluid to be drained by the host endothelium. This allows for early resolution of corneal edema as highlighted by the results of our study.

Our technique is similar to that of Vajpayee et al, the major difference being the use of iOCT guided drainage of fluid pockets. Continuous intra-operative monitoring allows for complete drainage of stromal fluid pockets along with an increased margin of safety. The instrument depth can be monitored and a direct entry into anterior chamber can be avoided. In addition, by moving the OCT cube or raster

lines all around the edematous cornea, all pockets can be identified and drained completely.

The result of this study highlights the usefulness of this technique in acute corneal hydrops. This technique utilizes air tamponade instead of gas injection (sulphur hexafluoride/ perflouropropane) avoiding the risk of secondary glaucoma and the theoretical risk of endothelial cell damage with gas injection. Complete drainage of all the fluid pockets ensured by scanning the entire edematous cornea intraoperatively, can lead to early resolution of corneal edema as well as visual rehabilitation. Shorter duration of corneal edema avoids complications such as corneal neovascularization and therefore improves the future chance of graft survival. One important advantage of this technique, in contrast to that described by Vajpayee at al, is the real-time monitoring of the clefts in multiple frames allowing for identification of any unsuspected communication between the cleft and anterior chamber. This decreases the risk of an inadvertent drainage of any fluid cleft communicating with the anterior chamber thereby avoiding complications such as intraocular infection and fistula formation. The importance of this advantage was realized while performing the procedure in one of our case where large fluid pockets communicating with anterior chamber were noted. In order to avoid the complications mentioned above, drainage of these fluid clefts was avoided, which resulted in delayed recovery in one of our case.

The limitation of this technique is increased risk of infection at the punctured wounds as they might not be self sealing in these abnormal corneas. When the fluid clefts involve the visual axis, the puncture wounds can lead to corneal scarring. However, hydrops as such results in corneal scar following resolution of corneal edema and the scarring due to puncture wounds is unlikely to add on to the visual loss by the hydrops scar. Moreover, iOCT is expensive equipment that may not be available to all ophthalmologists and pre-operative ASOCT picture may be

sufficient for successful drainage of most cases as evident from the results of study by Vajpayee et al. However, when available, iOCT is an extremely useful tool.

Thus, to conclude, iOCT guided intrastromal fluid drainage in cases of acute hydrops can result in early resolution of corneal edema avoiding its long-term sequelae. Though not an absolute necessity when available, it increases the margin of safety and ensures complete drainage of fluid clefts. The technique needs to be validated by a study with a larger sample size but considering the rarity of this condition despite of the small sample size the result of this study cannot be overlooked. We recommend this technique in cases of corneal hydrops with multiple intrastromal fluid clefts and severe corneal edema not responding to medical management.

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FIGURE LEGENDS

Figure 1: iOCT guided stromal fluid drainage for corneal hydrops: a- iOCT guided stromal fluid cleft localization; b-MVR entry at limbus for air injection into anterior chamber; c- Air injection into anterior chamber; d- Venting incision into the stromal fluid cleft at precise depth under direct visualization of iOCT; e- Massage of cornea with merocel sponge to aid egress of fluid from the punctured sites; f- Complete drainage of stromal fluid cleft ensured by collapse of clefts seen in iOCT.

TABLE LEGENDS

Table 1: Baseline characteristics of all cases of corneal hydrops

Table 2: Outcome of all cases following iOCT guided stromal fluid drainage

This paper was judged as the BEST PAPER Diabetic Retinopathy & Medical Retina Session

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CENTRAL RETINAL LAYER THICKNESS IN PATIENTS WITH PROLIFERATIVE DIABETIC RETINOPATHY TREATED WITH INTRAVITREAL RANIBIZUMAB VS RANIBIZUMAB PLUS PAN RETINAL PHOTOCOAGULATION

STUDY DESIGN : Prospective Observational Study

PURPOSE : To compare central retinal thickness (CRT) between eyes with proliferative diabetic retinopathy (PDR) patients treated with Intravitreal Ranibizumab and Ranibizumab with PRP

METHODS : 30 patients presented with Proliferative Diabetic Retinopathy were divided into two groups. Group A had 15 eyes who underwent Intravitreal Ranibizumab and Group B had 15 eyes who underwent Intravitreal Ranibizumab with Panretinal photocoagulation (PRP). Visual acuity and Central retinal thickness (CRT) were measured at baseline, 1 month and 2months and analyzed using Independent sample T test.

RESULTS: Significant difference is observed between two groups in Visual acuity ($p<0.05$) and Central Retinal thickness ($p<0.05$).

CONCLUSION: Treatment with Intravitreal Ranibizumab along with PRP showed better visual acuity but did not show much change regarding CRT when compared with Ranibizumab alone.

CLINICAL IMPLICATION: PRP should be considered as an option for PDR patients along with Intravitreal Ranibizumab for better results in visual acuity.

INTRODUCTION:

Diabetic retinopathy (DR) is a common complication of type 2 diabetes (T2DM) and is the leading cause of blindness in the working population in the world. In India the estimated national prevalence of diabetic retinopathy ranges from 12·5 - 21.7 % and vision threatening diabetic retinopathy (VTDR) is 4·0% (3·4–4·8), with no significant differences between urban and rural residence for diabetic retinopathy. [1,2]

Retinal ischemia predisposes to angiogenesis ie. Proliferative diabetic retinopathy (PDR) which is largely mediated by VEGF (Vascular endothelial growth factor).[3]

Pan retinal photocoagulation (PRP) offers a promising early intervention in which around 60% of PDR patients experience neovascularization regression within three months of PRP.[4] However, the need for additional laser treatments and, in some cases (4.5%), vitrectomy highlights the limitations of PRP.[5] PRP, often reported as painful, can potentially lead to peripheral vision loss and even increase the risk of macular edema.[6]

Anti-VEGF Intravitreal therapies radically changed the outcome of DR, due to combined anti-angiogenic and anti-edematous activities. In eyes with PDR, intravitreal ranibizumab (RBZ) resulted in less PDR-worsening compared to PRP, especially in eyes not required to receive ranibizumab for center involving diabetic macular edema (CI-DME).[7]

Filho et al in their study on high-risk PDR eyes, showed that adjunctive IVR to PRP demonstrated a significantly larger reduction in foveal leakage area (FLA) at 48 weeks (about 11 months), potentially mitigating the modest visual acuity decline and macular thickening observed with PRP alone.[8] Figueira et al in their study showed Combining RBZ with PRP achieved better regression of abnormal blood

vessels (NV) in high-risk proliferative diabetic retinopathy (HR-PDR) patients over a year compared to PRP alone.[9]

Our study aims to compare central retinal thickness (CRT) between eyes with proliferative diabetic retinopathy treated with intravitreal Ranibizumab and intravitreal Ranibizumab with (PRP).

MATERIALS AND METHODS

A Prospective Observational Study was conducted in Ophthalmology OPD in a tertiary care centre. The study was reviewed by the Institutional Research Ethics Committee and informed consent was obtained from all participants before data collection. The tenets of Declaration of Helsinki were followed during the conduct of this study. Consecutive patients with PDR coming to OPD were grouped into two study groups- Group 1 included 15 patients undergoing intravitreal Ranibizumab and 15 patients undergoing intravitreal Ranibizumab along with PRP.

METHODOLOGY

Patients were included if they had Proliferative Diabetic Retinopathy defined as per EDTRS guidelines as follows : (i) Presence of neovascularization at the disc (NVD) greater than EDTRS standard photograph 10A, (ii) Presence of NVD associated with vitreous or pre retinal haemorrhage or (iii) Neovascularization elsewhere (NVE) with more than a half disc area associated with vitreous or pre retinal haemorrhage. Exclusion criteria included the following : (i) Patients with significant media opacity, (ii) History of prior laser treatment or vitrectomy in the study eye, (iii) patients with Tractional retinal detachment, (iv) Patients with histories of ophthalmic disease other than DR and cataract, (v) Patients with Intraocular surgery except for cataract extraction, (vi) Patients with external ocular infections (conjunctivitis, keratitis, or significant blepharitis), (vii) any condition affecting documentation.

At baseline, all the patients underwent detailed ophthalmic examination including best corrected visual acuity (BCVA) in LogMAR format, IOP by Goldmann Applanation Tonometer (GAT), dilated fundus examination with direct ophthalmoscope or +90D or indirect ophthalmoscope in case of media haziness after pupillary dilatation with 1% tropicamide eye drops. A single masked certified examiner graded – Diabetic Retinopathy severity using EDTRS protocol. Other basic blood investigations including RBS and HbA1c were performed.

PROCEDURE

All the patients were divided into two groups – both the group patients received Intravitreal ranibizumab of 0.5mg in 0.05ml at baseline , 4 weeks and 8 weeks and in addition Group 2 patients received standard PRP treatment delivered as per routine clinical practice targeting non-perfusion areas. PRP was performed by a single retinal specialist with NIDEK GREEN LASER of 532nm frequency in two sessions with an interval of 15 days between the two sessions. Shots were delivered with a pulse duration of 0.2s for a total of 1200-2000 burns.

Thereafter all these patients were followed up regularly for complete detailed ophthalmic examination including BCVA , dilated fundus examination and SD-OCT at baseline, 4 weeks and 8 weeks.

OCT PARAMETERS

Spectral Domain OCT (SD-OCT) was performed using retinal thickness map analysis to display numeric averages of measurements for each of the nine EDTRS sub fields to measure the thickness of the retinal layer.

The subfoveal and parafoveal areas were analyzed.

The central retinal thickness (CRT) was measured.

STATISTICAL ANALYSIS:

The statistical data analysis was performed using Windows Microsoft excel 2010 software and SPSS 20.0 version. P values of 0.05 or less were considered to indicate a significant difference.

OBSERVATION AND RESULTS:

The mean age of the sample is 63.20 ± 6.14 years and 63.80 ± 5.34 years in group A and B respectively (P value < 0.05). 33.33% were females in group 1 and 66.66% were males while 46.66% were females in group 2 and 53.33% were males. The mean visual acuity at baseline is 0.85 ± 0.10 and 0.98 ± 0.14 in group A and B respectively while the mean visual acuity after 1 month is 0.56 ± 0.15 and 0.53 ± 0.14 respectively (P value < 0.05) and after 2 months is 0.34 ± 0.07 and 0.26 ± 0.07 respectively (P<0.05). The mean central retinal thickness at baseline is 258.33 ± 20.33 and 267.40 ± 29.40 in group A and B respectively (P value < 0.05) while the mean central retinal thickness after 1 month in both groups is 228.00 ± 14.83 and 247.26 ± 21.04 respectively (P value < 0.05) and after 2 months is 217.26 ± 10.49 and 228.00 ± 15.69 respectively (P<0.05).

Table 1 shows demographic details of the group 1 and group 2

VISUAL ACUITY	GROUP A	GROUP B	P VALUE
Baseline	0.85 ± 0.10	0.98 ± 0.14	<0.05
1 month	0.56 ± 0.15	0.53 ± 0.14	<0.05
2 months	0.34 ± 0.07	0.26 ± 0.07	<0.05

CRT	GROUP A	GROUP B	P VALUE
Baseline	258.33 ± 20.33	267.40 ± 29.40	<0.05
1 month	228.00 ± 14.83	247.26 ± 21.04	<0.05
2 months	217.26 ± 10.49	228.00 ± 15.69	<0.05

Figure 1 shows evolution of BCVA in both the groups at baseline, 1 month and 2 months

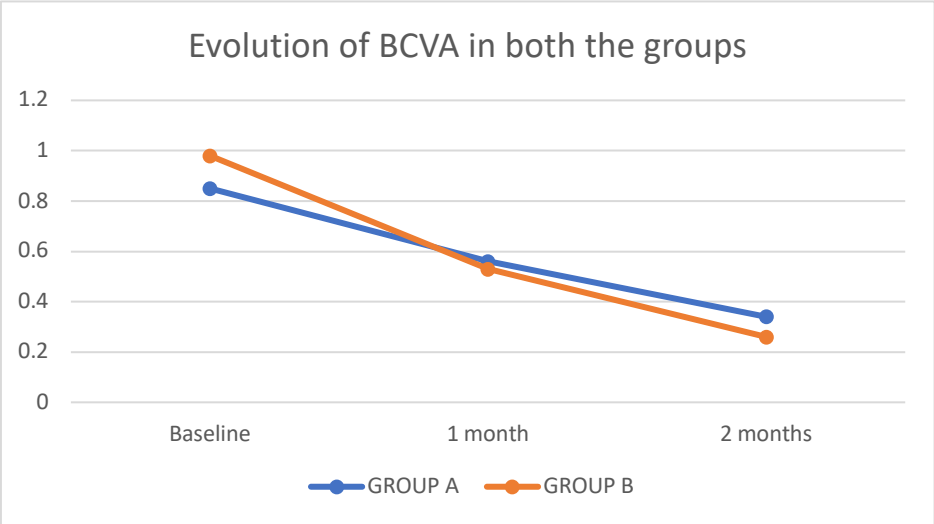


Figure 2 shows evolution of Central retinal thickness (CRT) in both the groups at baseline, 1 month and 2 months

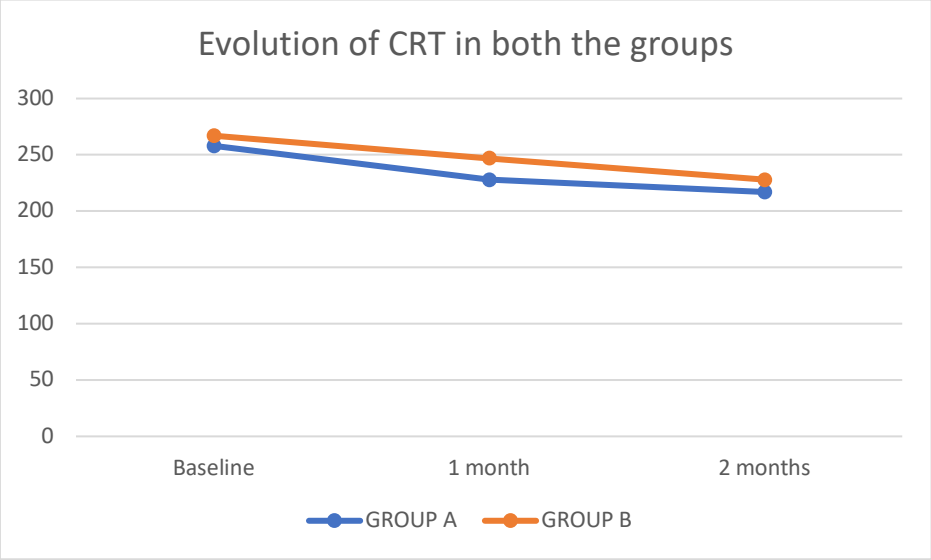
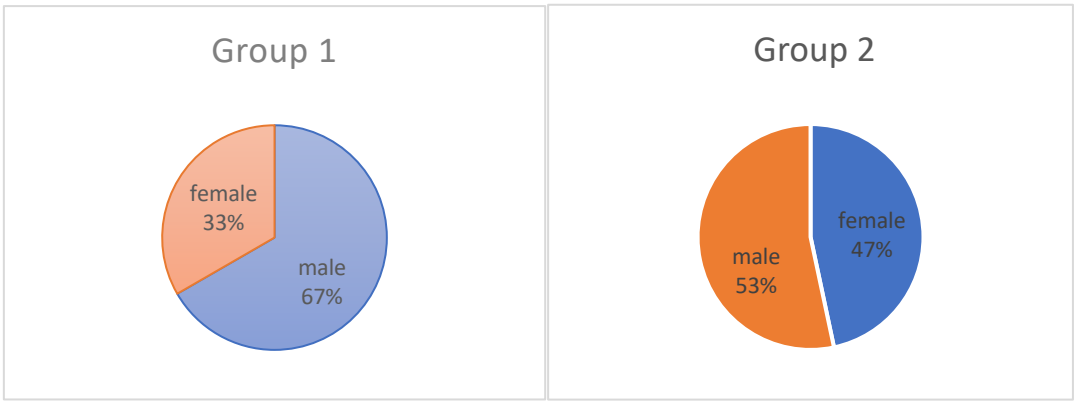


Figure 3 shows the sex distribution between the two groups



DISCUSSION:

AUTHOR, YEAR OF STUDY	PLACE OF STUDY	TITLE	STUDY DEMOGRAPHICS	CONCLUSION
Present study	Alluri Sitarama Raju Academy of Medical Sciences	Central Retinal Thickness changes in PDR treated with Intravitreal Ranibizumab vs Ranibizumab +PRP	30 patients	Intravitreal Ranibizumab along with PRP was associated with a larger reduction in central retinal thickness at 1 month when compared with Intravitreal Ranibizumab alone in patients with PDR
José A R Filho 1, André Messias, Felipe P P Almeida, 2011	School of Medicine of Ribeirão Preto, Brazil	Panretinal photocoagulation (PRP) versus PRP plus intravitreal ranibizumab for high-risk proliferative diabetic retinopathy	40 patients	Intravitreal ranibizumab after PRP was associated with a larger reduction in FLA at week 48 compared with PRP alone in eyes with high-risk PDR, and the adjunctive use of IVR appears to protect against the modest visual acuity loss and macular swelling observed in eyes treated with PRP alone.
João Figueira 1, Emily Fletcher 2, Pascale Massin 2018	European Vision Institute Clinical Research Network	Ranibizumab Plus Panretinal Photocoagulation versus Panretinal Photocoagulation Alone for High-Risk Proliferative Diabetic Retinopathy (PROTEUS STUDY)	87 patients	Intravitreal Ranibizumab along with PRP was more effective than PRP monotherapy for NV regression in high risk PDR participants over 12 months

When compared to intravitreal ranibizumab alone, our study revealed a significant reduction in central retinal thickness at one month in patients with proliferative diabetic retinopathy treated with the combination of panretinal photocoagulation and intravitreal ranibizumab, but not much of a reduction at two months. When in comparison with intravitreal ranibizumab alone, there are improved results regarding the improvement of visual acuity when intravitreal ranibizumab is combined with PRP.

With 40 patients as a sample, the Filho et al. study demonstrated that intravitreal ranibizumab following PRP was linked to a greater reduction in FLA at week 48 compared with PRP alone in eyes with highrisk PDR. Additionally, the adjunctive

use of IVR appears to protect against the mild macular swelling and visual acuity loss seen in eyes treated with PRP alone.

Including 87 patients as a sample, the trial by Figueira et al. demonstrated that intravitreal ranibizumab plus PRP was superior to PRP monotherapy for the 12-month treatment of neovascularization regression in high-risk PDR participants.

With a sample of 47 patients, Chatziralli at all determined that intravitreal ranibizumab, either by itself or in conjunction with PRP, may be utilised to treat PDR and coexistent DME. Even though there was no difference in BCVA and CRT at the 24-month follow-up between the two groups, the combination group presented greater regression of neovascularization with less injections.

CONCLUSION:

The current study demonstrates a substantial reduction in central retinal thickness after one month when comparing PDR patients treated with intravitreal ranibizumab plus PRP to those treated with intravitreal ranibizumab alone. However, after two months, not much has changed. Because of the regression of neovascularization with PRP after two months, intravitreal ranibizumab with PRP produced better results in terms of visual acuity than intravitreal ranibizumab alone.

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This paper was judged as the BEST PAPER External Eye & Ocular Surface Disease – I Session

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DRY EYE AND MEIBOMIAN GLAND DYSFUNCTION IN PATIENTS OF ALLERGIC CONJUNCTIVITIS IN A COASTAL AREA.

ABSTRACT

Allergic conjunctivitis and dry eye disease are the two most common ocular surface diseases affecting the quality of life and work productivity. Allergic conjunctivitis can be classified into perennial or seasonal allergic conjunctivitis. Vernal Keratoconjunctivitis can also be included under this broad spectrum of allergic disorders.

This is an observational, cross-sectional study which included 32 patients of allergic conjunctivitis having the chief complains of itching and redness, conducted over a period of 2 months in a coastal area during the District Residency Programme.

PURPOSE: To study the association of dry eye and meibomian gland dysfunction in patients of allergic conjunctivitis.

METHODS: The patients were evaluated on the basis of OSDI scores, Schirmer test, TBUT and slit lamp evaluation for meibomian gland dysfunction.

RESULTS: Out of 32 patients, 10 patients had mild and 4 had moderate dry eye disease. 11 patients had associated meibomian gland dysfunction.

CLINICAL IMPLICATION The patients of allergic conjunctivitis should also be evaluated and treated for dry eye and the associated meibomian gland dysfunction to reduce the discomfort and improve the quality of life.

KEYWORDS- Dry eye, Meibomian Gland Dysfunction, Seasonal Allergic Conjunctivitis, Perennial Allergic Conjunctivitis, Vernal Keratoconjunctivitis

INTRODUCTION- Allergic Conjunctivitis and Dry eye disease are highly variable and two most common ocular surface inflammatory disorders. These disorders have been regarded as the epidemics of the 21st century affecting the quality of life. [1] Results of quality of life studies have shown that the impact of moderate to severe dry eye is similar to that of moderate to severe angina.[2]

The Tear Film Ocular Surface Society (TFOS) Dry Eye Workshop (DEWS II) defined DED in 2015 as : " Dry eye is a multifactorial disease of the ocular surface characterized by a loss of homeostasis of the tear film, and accompanied by ocular symptoms, in which tear film instability and hyperosmolarity, ocular surface inflammation and damage, and neurosensory abnormalities play etiological roles" Dry eye hinders the removal of allergenic antigens on the ocular surface which exacerbates allergic conjunctivitis.[3] Similarly, allergic conjunctivitis has been shown to disrupt the tear film stability, contributing to worse outcomes in patients with dry eye.[4] These negative interactions between the two diseases necessitate bidirectional diagnosis and management to prevent chronic damage to the ocular surface.

AIMS AND OBJECTIVES-

1. To study the prevalence of dry eye in clinically diagnosed patients of allergic conjunctivitis.
2. To study the prevalence of meibomian gland dysfunction in patients of allergic conjunctivitis.

MATERIALS AND METHODS-

An Observational, cross-sectional study was conducted in the Department of Ophthalmology of a tertiary care centre from June, 2023-July 2023.

32 patients having the chief complains of itchiness and redness in the eyes were included in the study after taking proper, written, informed consent. In paediatric patients, consent was taken from the parents/guardian.

INCLUSION CRITERIA- Clinically diagnosed cases of allergic conjunctivitis, having the chief complains of itching and redness, aged between 7 and 60 years.

EXCLUSION CRITERIA-

i. Patients on any topical medication.
ii. History of contact lens wear
iii. History of refractive surgery or ocular surgery.
iv. History of ocular trauma
v. Any corneal pathology.
vi. Systemic diseases like Diabetes mellitus, collagen vascular disease, hypertension
vii. Patients on medications like immunosuppressants, Isotretinoin.

A detailed history was taken from the patients about their demographic characteristics, onset and duration of ocular symptoms in order to classify them into perennial allergic conjunctivitis, seasonal allergic conjunctivitis or vernal keratoconjunctivitis. The diagnosis of dry eye disease in these patients was then done on the basis of the Ocular Surface Disease Index (OSDI) questionnaire, TFBUT and Schirmer's Test.

The total OSDI Score ranges from 0-100. A score of ≤12 is classified as normal, 13-22 as mild, 23-32 as moderate, ≥33 as severe Dry eye disease. For Schirmer's test a value of <10mm was considered abnormal and for TFBUT, a value of <10s was considered abnormal.

A detailed Slit lamp Evaluation was done to assess for Meibomian Gland Dysfunction and then they were classified into Grade 1, Grade 2 and Grade 3 Meibomian Gland Dysfunction according to the Classification by the International Workshop on Meibomian Gland Dysfunction.[5]

STATISTICAL ANALYSIS- The data was expressed as mean ±SD and percentage. Fischer's exact test or chi-square test was used to analyse the significance of the difference between the frequency distribution of the data. P value <0.05 was considered statistically significant. SPSS for windows and Microsoft Excel were used to perform the statistical analysis.

RESULTS:

Of the total 32 patients, Perennial Allergic Conjunctivitis was found in 9 patients-28.12% (4 males and 5 females), Seasonal Allergic Conjunctivitis was found in 17 patients 53.12%(4 males and 13 females) and Vernal Keratoconjunctivitis was in 6 patients-18.75% (4 males and 2 females).

18 Patients (56.25%) had normal OSDI score (≤12), 10 Patients (31.25%) had mild Dry eye (13-22) and 4 patients (12.5%) had moderate dry eye (23-32).

Mean OSDI score in perennial allergic conjunctivitis patients was 20.33±7.22, in the Seasonal Allergic Conjunctivitis patients was 12.29±4.84 and in VKC patients it was 12.50±5.32. Mean OSDI Score was found to be significantly higher in patients of perennial allergic conjunctivitis($p<0.001$).

According to TFBUT, 8 patients (25%) had dry eye, having a TFBUT of less than 10s. This included 4 patients of perennial allergic conjunctivitis (50%), 3 patients of Seasonal allergic conjunctivitis (37.50%) and 1 patient of VKC(12.5%).

According to Schirmer 1 test, 10 patients had dry eyes having a value of less than 10mm in 5min(31.25%). Out of which, 5 patients were of perennial allergic conjunctivitis (50%), 4 were of seasonal allergic conjunctivitis (40%), 1 patient of VKC (10%).

Out of the 32 patients of allergic conjunctivitis, 11 patients had associated meibomian gland dysfunction. (7 patients of perennial and 4 of seasonal allergic conjunctivitis). 4 patients had Grade 1, 5 had Grade 2 and 2 patients had Grade 3 Meibomian Gland Dysfunction. (According to the classification by the International Workshop on Meibomian Gland Dysfunction.)

OUTCOME: Allergic conjunctivitis was found to be more common in females. Seasonal allergic conjunctivitis was more common. Perennial allergic conjunctivitis has higher prevalence of dry eye, followed by seasonal allergic conjunctivitis and then VKC. In our study, out of 32 patients 10 had mild DED and 4 had moderate DED based on OSDI scores.

Meibomian gland dysfunction was significantly found in Perennial allergic conjunctivitis patients(77.78%), indicating its association with chronicity of the disease.

DISCUSSION:

TFOS DEWSII has identified AC as a probable risk factor for Dry eye disease. Similar findings are seen in other studies of Seasonal allergic conjunctivitis being the most common[6]. Mazumdar et al had similar inference of Perennial Allergic Conjunctivitis having higher prevalence of dry eye. Prevalence of dry eye in our study differed from other studies, decrease in prevalence could be due to climatic variations, as our region had high humidity. Our study had a small sample size, it was a longitudinal study, duration of the study was small, and meibography was not done. These are some of the limitations of the study.

CONCLUSION: Ocular allergy contributes to tear film hyperosmolarity, ocular surface inflammation, and damage, all of which are key mechanisms in the vicious cycle of dry eye disease. Meibomian gland dysfunction is a major long term complication of Allergic conjunctivitis. The inflammation response and continuous mechanical stress induced by chronic eye rubbing in Allergic conjunctivitis are

presumed to be associated with the onset of Meibomian gland dysfunction. Therefore, allergic conjunctivitis patients need to be screened for Dry eye disease even after the resolution of symptoms and associated Meibomian gland dysfunction needs to be treated in order to improve their quality of life.

Fig-1: Male:Female ratio of Allergic Conjunctivitis

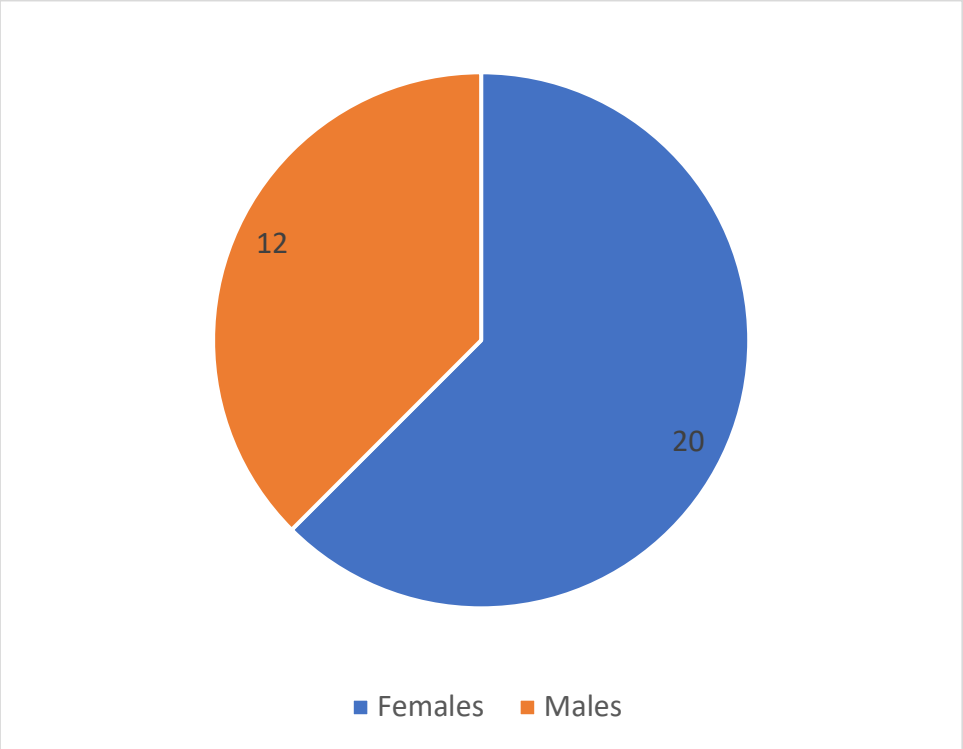


Fig-2: Male: Female ratio of Perennial, Seasonal Allergic Conjunctivitis and VKC

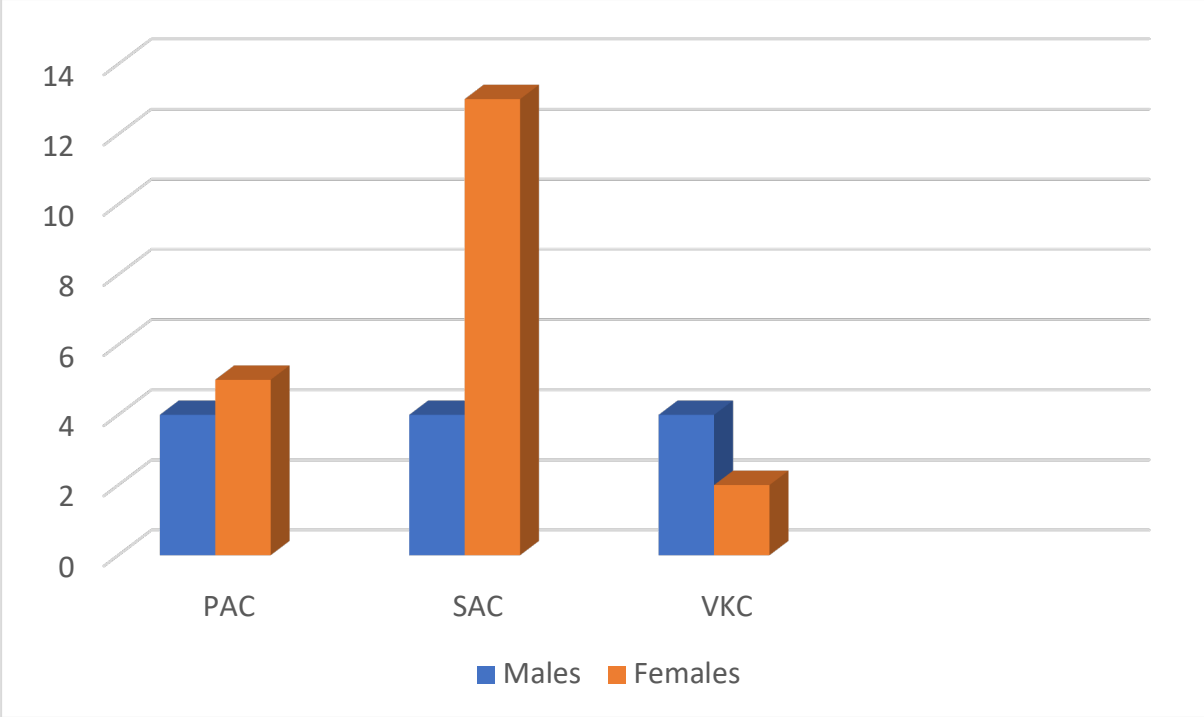


Fig-3: Classification of DED based on OSDI Scores

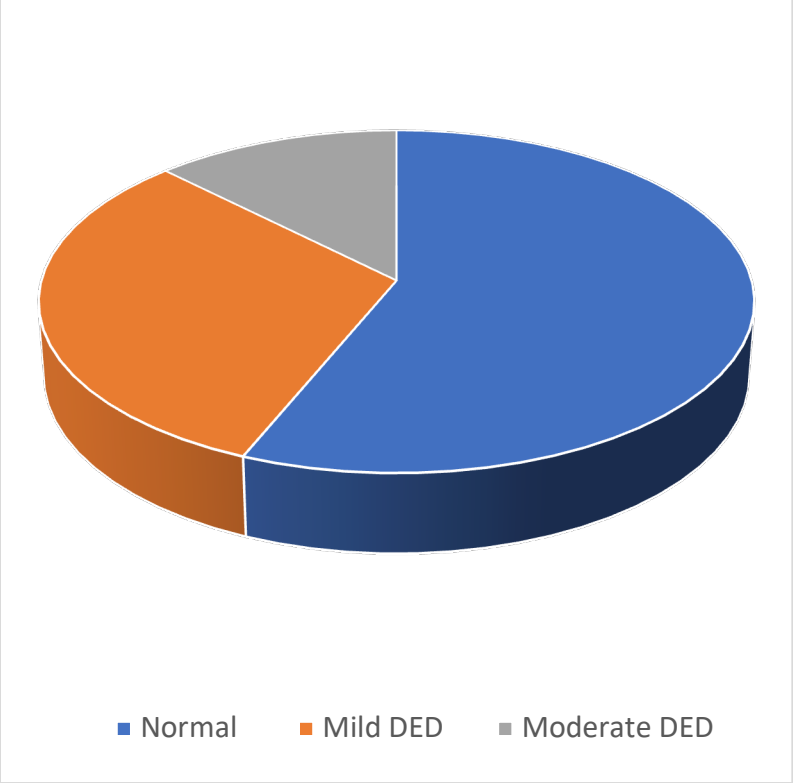


Fig-4: Mean OSDI Scores in Perennial, Seasonal Allergic Conjunctivitis and VKC

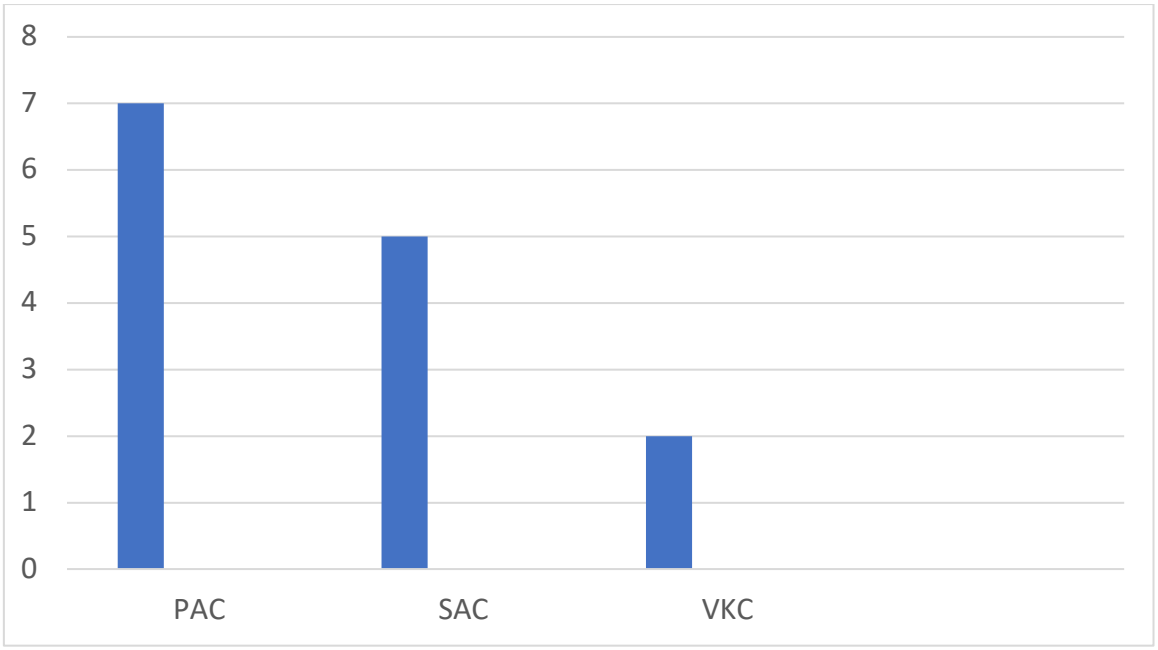


Fig-5: TFBUT<10s in different subsets of Allergic Conjunctivitis.

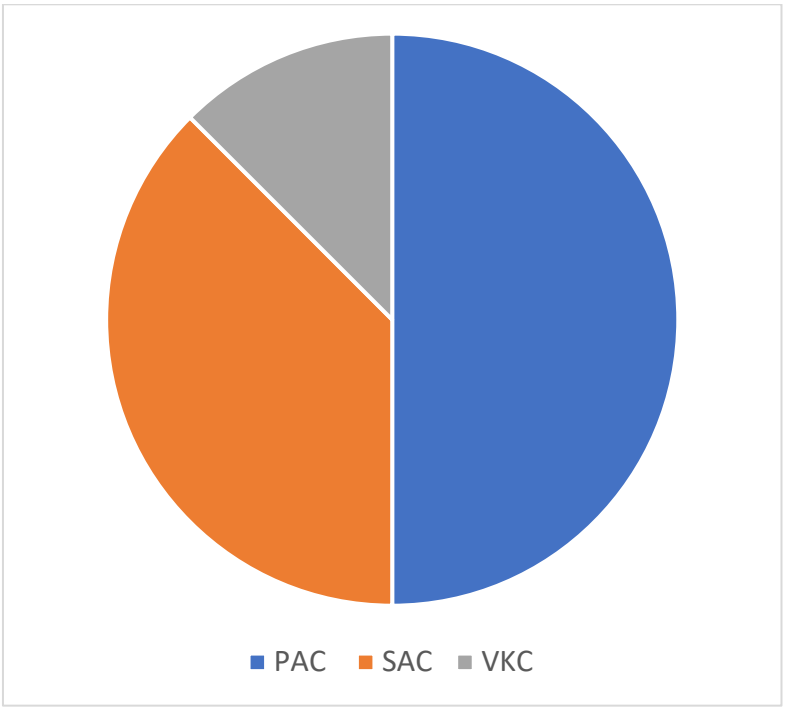
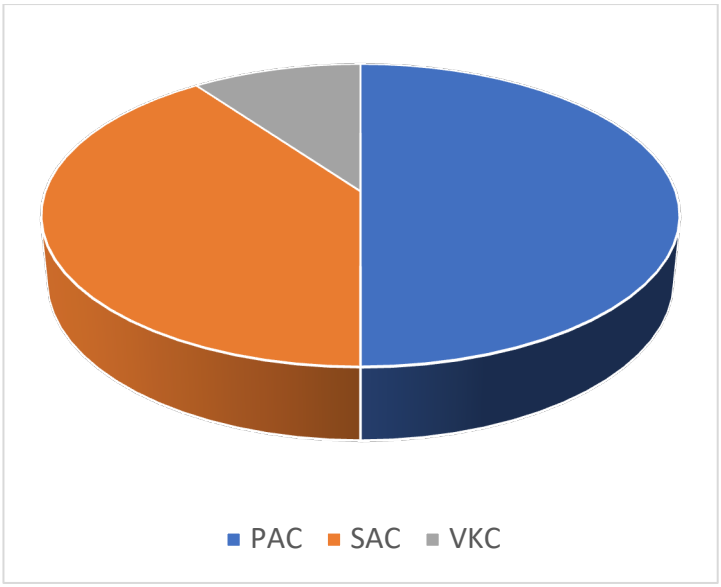
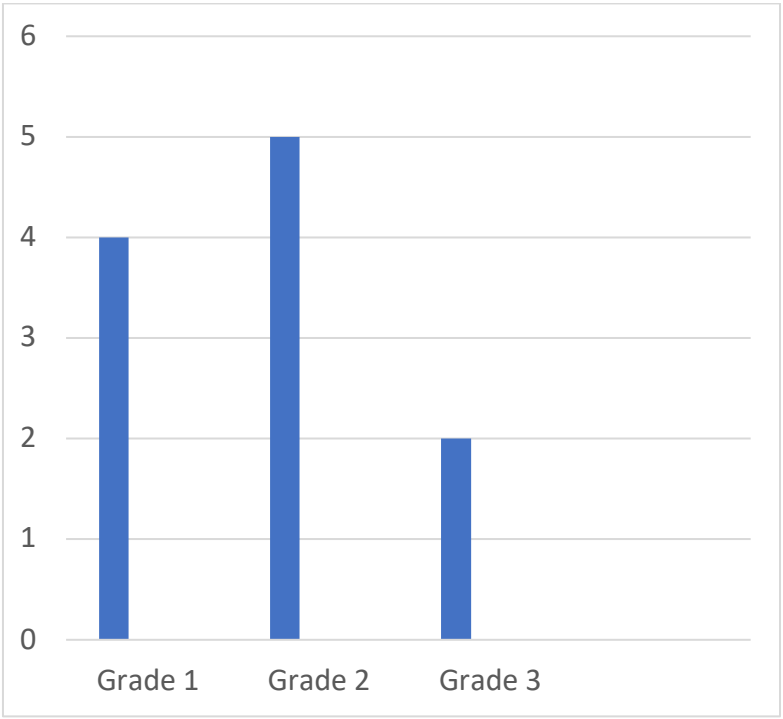


Fig-6: Schirmer-1 less than 10mm in different subsets of Allergic



Conjunctivitis

Fig- 7: Grading of Meibomian Gland Dysfunction



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This paper was judged as the BEST PAPER Glaucoma – I Session

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AN INNOVATIVE, SELF BUILT, 3D, COST EFFECTIVE, SMART PHONE APPLICATIION FOR SIMULATIVE MIGS LEARNING

TITLE:

An Innovative, Self-Built, 3D, Cost Effective, Smart Phone App For Simulative MIGS Learning

ABSTRACT:

To improve ophthalmic concept learning and e-counselling, we have innovated a 3D with augmented reality (AR) application (Eye MG Holo) built on an advanced interactive 3D touch interface. Concepts of ophthalmology (circle of Willis, cavernous sinus, cranial nerves, visual pathway etc.) have lots of theoretical frameworks. Neophyte residents and patients may have to mentally visualise them during training and counselling respectively. Only a powerful cognitive tool like a 3D atlas, where users can choose their optimal frame, cross-section, and amount of zoom required to visualise various parts of the ophthalmic anatomy, can fill in their cognitive mental gaps. The MIGS simulator within the app provides a surgical simulation platform for young ophthalmologists to develop their practical skills. The majority of users have already been using their smartphones to surf the internet for studying as well as to understand the disease process. e-Ophthalmology is the order of the day; thus, carving an application with user-

friendly 3D augmented reality focused on the anatomy and pathophysiology of ophthalmology is the way forward.

KEYWORDS:

Eye MG Holo, 3D, Augmented reality, Ophthalmology

INTRODUCTION

In this era, medical education is gradually flourishing with advancements in the technology. Various innovative and interactive smartphone applications about ophthalmology, play essential roles in learning resources, counselling, and surgical simulations, for ophthalmologists. Nowadays, augmented reality (AR) technology is not a mere science-fiction concept but has stepped foot into a science-based reality. Currently, AR-based applications are more helpful in knowing human anatomy via three dimensions. The use of an e-ophthalmology platform with AR will pave the pathway for a new-age gameful pedagogy and better comprehensive counselling. In this paper, we have reported on one such novel innovative augmented reality application along with touch-interference facilities named “Eye MG Holo” to aid in pedagogy and counselling.

THE INITIATION OF “EYE MG HOLO” TOUCH-INTERFERENCE APPLICATION

Modern technologies are more widely used in the healthcare industry for easy diagnosis of the disease and the e-counselling process. In this digitalization era, medical professionals and neophytes showing interest in using reality-based technology in their studies or practice. Recently, Ramesh et al. introduced AR technology in the Android platform for simplifying concept learning about complex anatomical and pathological structures of the eyeball. In the Android platform, the primary drawback of the AR application is the AR template, which needs to be

printed and kept on a table or surface before operating the application. Moreover, the touch-interference facility is not available.[1-5]

"Eye MG Holo" application is fully concentrated on providing a cutting-edge technology experience with augmented reality and touch-interference in ophthalmology and extends a gamified learning experience. There are multiple 3D models integrated into a single prototype view. Ophthalmologists and novices can view these 3D models in a very realistic way to learn about the complex anatomical and pathological structures of organs (brain, visual pathway, circle of Willis, venous system). It is more convenient for users to see the different angles of the model's structure through free rotation, dragging and zooming views, etc. Moreover, this application provides a brief explanation of the models using an AR camera. It is available in Microsoft HoleLens 2 and a similar application is available in iOS named as Eye MG Max app.

FEATURES OF THE NOVEL APPLICATION

3D view: For illustration purposes, anyone can view the whole 3D model in 360-degree angles using the "Hide and Show button". There are some customized angles available to split the model into different associated parts of the 3D models. These models help to know the eye structure along with the brain and its functionality with the animated actions. The transparency mode is available for observing the internal organ structures such as the brainstem, cerebral venous system, nucleus, visual pathway etc.

AR View: AR view is one of the advanced modules in this application. This section has an augmented reality camera mode (RGB Camera) and Light detection and ranging sensor (LiDAR). The LiDAR sensor senses the area around us and maps the real world to the virtual world. On switching the AR view, the AR camera asks for permission to activate the AR session. Once the AR session starts, there are some options given, to choose the 3D model. After choosing and establishing the 3D

models in the appropriate location, the ophthalmic models can be viewed in various zoom levels, and rotated as desired, for comprehensive learning.

ADDITIONAL HIGH-TECH FEATURES IN "EYE MG HOLO"

Virtual Dissection / Subtractive Learning: Virtual dissection is a touch-screen table, which provides 3D visualization of anatomy and pathology visualization structures, which will be helpful for easy understanding of the concept. It allows the presentation of focused classes with customized content and enhances the classroom experience of neophytes. The novices can visualize all the parts of a structure separately (Figure 1). It aids in virtual dissection and allows them to explore individually and learn individually. It also allows intuitive simulation of surgical procedures.

Direct Ophthalmoscopy Effect: Direct ophthalmoscopy is a friend of an ophthalmology postgraduate, helpful in diagnosing various retinal pathologies using a simple and cost-effective technique. This application has become a fruitful companion for postgraduates, especially during outreach programmes or camps. Learning this technique with proper and constant training is the key. For novice trainees, it takes some time to accurately identify the optic disc. Due to the lack of patients, lack of different types of pathologies or the mass crowd in high volume setups, required training does not take place. Another downside of the direct ophthalmoscopy technique is the difficulty in hand coordination using the non-dominant hand. We propose simulative learning for direct ophthalmoscopy at one's fingertip. In this application 'Eye MG Holo', we bring in the simulator for direct ophthalmoscopy, with the option to customize for any retinal pathologies, especially to train hand-eye coordination even using the non-dominant hand (Figure 2). This is an augmented reality module inside the application, wherein the user can select the desired eyeball model with any retinal pathology. The postgraduates have the accessibility at their fingertip in their free time and use

them to train themselves. The eyeball model used in the application uses real-time patient fundus images along with other real-time structures.

Surgical Simulation: Currently, 3D simulators are not available in a cost-effective manner for simulative learning. We have innovated a novel 3D simulator using eyeball models which are made using real-time patient images, and surgical tools with microscopic structures giving the ophthalmologist the real-time experience of performing a surgery. This surgical simulator is created in "Eye MG Holo" as an application and is customizable and portable. Hand-eye coordination with touch sensation available in this innovation helps in performing surgical and other medical procedures. This application helps reduce the trouble of carrying a highly stocked wet lab or highly occupying surgical simulators with all the machinery. 3D Surgical and medical simulative training in a cost-effective and accessible way pave the way for future innovations and refine the field of eye care (Figure 3).

PEDAGOGICAL AND COUNSELLING TRANSFORMATION

3D models used in the novel application provide real-time experience for understanding the anatomy, pathology and functionality of the ophthalmic structures. The experience of viewing through the Eye MG Holo is closer to visualizing the real structures when compared to studying with images. The 3D models simplify this issue by allowing the students to study the models/structures in all 360-degree views and angles so that those studying it with augmented reality can grasp it better. In this application, 3D models and their functionality are described with proper animations and flow of structure. It is much better when compared to studying with images that are only 2 dimensional where we can only see a single angle/view. These types of tools give real-time and practical knowledge compared with other study materials. It is helpful to make their examination easygoing with the technical experience.

FUTURISTIC ASPECTS

The target audiences for our application are primarily eye hospitals for counselling, students as supporting material, and residents for assisting in their practice. Moreover, we believe this application would be of huge help for areas of research. In terms of counselling, it would be easier to help patients understand their condition and would improve patient compliance. When the patients are shown a progressive improvement in their condition, they will be even more enthusiastic. For students, they wouldn't have to imagine the structures and they can rather see the structures right before their eyes and learn the complex anatomical structures. This would greatly improve their learning and limit cognitive gaps.

In the pursuit of cutting-edge advancements, we conducted a three-month cross-sectional study involving 30 glaucoma fellows to assess the effectiveness of wet-lab training (WLT) compared to our innovative surgical-simulator training (SST). A pivotal element in our approach is Eye MG Holo, our revolutionary surgical simulator system that harnesses the power of a holographic device (Microsoft HoloLens 2). Through on-road workshops and comprehensive feedback obtained via Google Forms, our paired t-test demonstrated significant satisfaction ($p<0.05$) with the Eye MG Holo surgical training. Residents consistently preferred Eye MG Holo, attributing improvements in hand-eye coordination, confidence, mistake reduction, accessibility, and safety. These findings underscore the superior efficacy of SST over traditional WLT. The integration of such pioneering training methodologies with emerging technologies aligns seamlessly with our vision to advance medical education and practice, presenting a holistic approach to ophthalmic training and patient care (Table 1).

CONCLUSION

The environment in which we practice ophthalmic medicine has undergone a profound transformation as a result of the COVID-19 pandemic. Innovative

methods to teach and learn e-ophthalmology are highly sought after as we adjust to what has become the new "norm" regarding social distance and interpersonal contact. We are confident that this innovative tool in 3D with AR application will significantly impact ophthalmology and its related professions. The introduction of new technologies and techniques in the field of ophthalmology will also improve the cognitive exposure of the neophytes and residents and improve intellectual capacity.

DECLARATION OF PATIENT CONSENT

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

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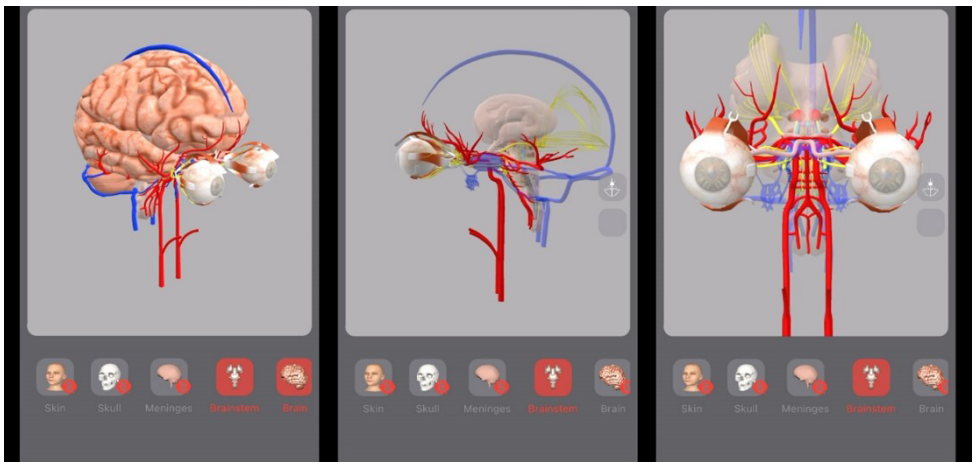

Figure 1: The image shows the separated images of a human brain with associated organs.

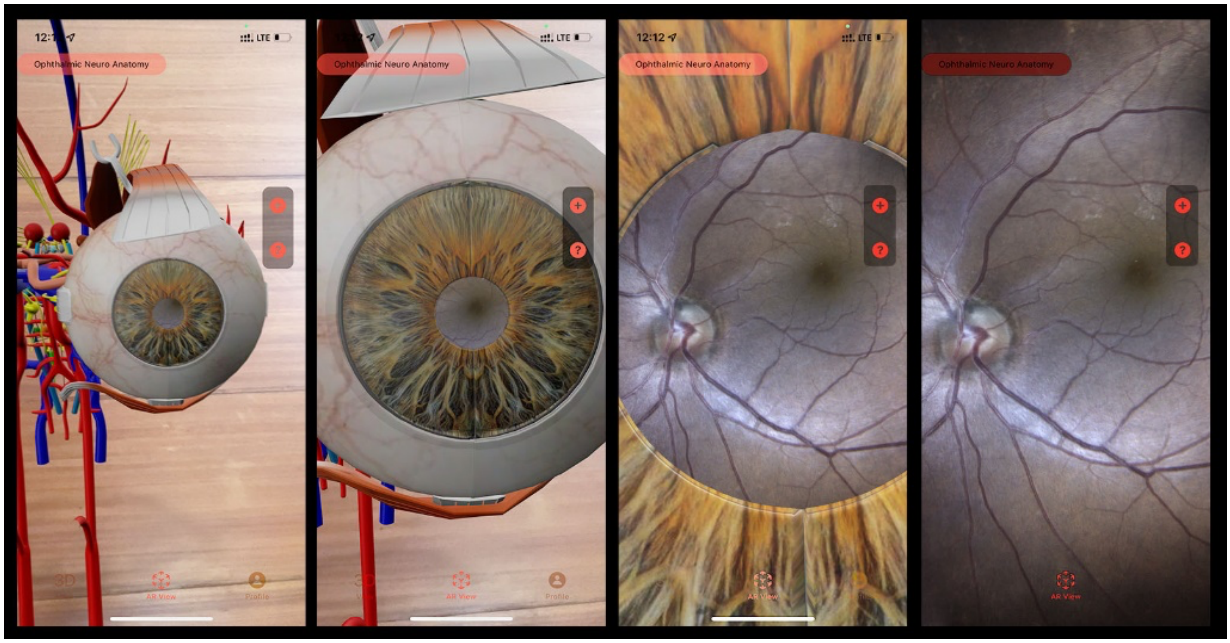

Figure 2: The image shows the direct ophthalmoscopy effect, performed by using the "Eye MG Holo" application.

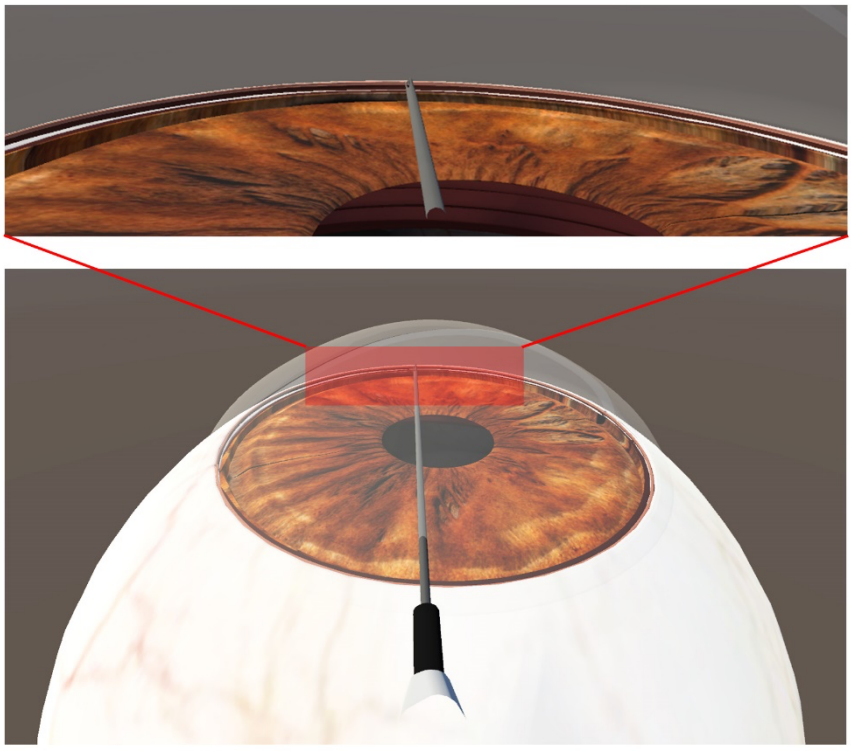

Figure 3: The image shows the surgical simulation experienced by the use of the "Eye MG Holo" application.

Purpose	To analyze whether wet-lab training (WLT) or our novel surgical-simulator training (SST) is better for glaucoma fellows to master the surgical technique.
Methodology	Demonstration and training done in various postgraduate institutes through on-road workshops. 30 glaucoma fellows participated Study period was 3 months (October to December, 2022) Cross-sectional study Comparative study Questionnaire through Google forms
Statistical Analysis	Feedback was categorized into two groups: satisfaction with Eye MG Holo surgical training and satisfaction without Eye MG Holo (Through Wet Lab). Satisfaction levels were classified as satisfied, neutral, or dissatisfied. Discrete satisfaction variables were converted to continuous variables. A paired t-test was used, and the p-value was significant ($p<0.05$).

Questionnaire Feedback on Simulator Surgical Training

Questionnaire	Excellent	Good	Okay	Bad	Poor
Did you feel adequately prepared for real surgical procedures after	6%	31%	38%	22%	3%

completing the simulator surgical training?					
Did the Simulator help you in hand-eye coordination?	100%	-	-	-	-
What was your rate of satisfaction level in the surgical simulator training?	-	100%	-	-	-
Did the simulator surgical training provide adequate visual feedback to help improve your surgical skills?	6%	50%	27%	14%	3%
Did the simulator surgical training provide adequate tactile (HAPTIC TOUCH) feedback to help improve your surgical skills?	-	50%	17%	33%	-
How much did the simulator surgical training increase your confidence in performing surgical procedures?	17%	63%	20%	-	-
Did the simulator surgical training reduce the likelihood of making mistakes during surgical procedures?	13%	33%	54%	-	-

What rating will you give (1 to 5) for the accessibility of the simulator? (From the perspective of ONE simulator in ONE hospital)	33%	50%	17%	-	-
How much did the simulator surgical training offer a safe environment for practicing surgical procedures without the risk of harming patients?	50%	33%	17%	-	-
Would you recommend simulator surgical training to other medical professionals seeking to improve their surgical skills?	100%	-	-	-	-
How do you rate the graphics and real structures used in the stimulator (1 to 5)?	80%	20%	-	-	-

Components of questionnaire	
3D realistic model	8%
Surgical planning and guidance	38%
Training and learning	32%
Safety and recommendation	12%
Graphics and Gamification feature	11%

Residents' Satisfaction Level - Surgical Training	Satisfied	Neutral	Dissatisfied
With Eye MG Holo	97.4%	2.3%	0.3%
Without Eye MG Holo	89.44%	4.42%	6.14%

Table 1: Comparative Evaluation of Wet-Lab Training (WLT) and Surgical-Simulator Training (SST) for Glaucoma Fellows: Feedback, Satisfaction Levels, and Residents' Satisfaction with Eye MG Holo Surgical Training.

This paper was judged as the BEST PAPER of Glaucoma – II Session

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VITAMIN D AND PRIMARY OPEN ANGLE GLAUCOMA: A NOVEL WAY TO OPTIMISE TREATMENT STRATEGIES IN GLAUCOMA

STUDY DESIGN: PROSPECTIVE OBSERVATIONAL

PURPOSE: TO PRESENT SERUM VIT D LEVELS IN MILD, MODERATE & SEVERE FORMS OF POAG ALONG WITH VISUAL FIELD CHANGES.

METHODS: 21 EYES OF 11 PATIENTS WERE EXAMINED THOROUGHLY. BASELINE IOP BY ATN WAS DONE.CCT AND HVF 24-2 AND 10-2 WERE ADVISED AS PER NECESSITY.GRADING OF POAG WAS DONE BASED ON HODAPP-PARRISH-ANDERSON CRITERIA INTO MILD (MD< -6DB), MODERATE (MD -6DB TO -12DB) AND SEVERE (MD >-20DB). SERUM VITAMIN D WERE MEASURED BY ELISA AND REPORTED IN ng/ml.

RESULTS: 6 FEMALES AND 5 MALES, WITH MEAN AGE OF 57YRS.THE MAX&MIN IOP WERE 40&12mmhg WITH MEAN OF 20.63mmhg.MIN&MAX CCT WERE 480 AND 591 WITH AVG OF 501.AVG SERUM VIT D LEVELS WERE 34.38 ng/ml(N:30-90) WITH RANGE OF 23.48-49.32ng/ml. THE MEAN DEVIATIONS IN HVF 24-2 WERE RANGING FROM -2.22db TO -32.8db. A SMALL NEGATIVE CORRELATION FACTOR (-0.115) EXISTS BETWEEN SERUM VITAMIN D AND AVERAGE OF MEAN DEVIATION OF BOTH EYES OF STUDY SUBJECTS.

CONCLUSION: SEVERAL STUDIES ESTABLISHED INVERSE RELATION BETWEEN VIT D&IOP THAT ARE NOT CONCLUSIVELY PROVED.THIS STUDY HIGHLIGHT NEED TO FURTHER RESEARCH CORRELATION BETWEEN VIT D AND GLAUCOMA.

TITLE: VITAMIN D AND PRIMARY OPEN ANGLE GLAUCOMA: A NOVEL WAY TO OPTIMISE TREATMENT STRATEGIES IN GLAUCOMA

INTRODUCTION: GLAUCOMA IS DEFINED AS AN ACQUIRED LOSS OF RETINAL GANGLION CELLS AND AXONS WITHIN THE OPTIC NERVE OR OPTIC NEUROPATHY THAT RESULTS IN A CHARACTERISTIC OPTIC NERVE HEAD APPEARANCE AND A CORRESPONDING PROGRESSIVE LOSS OF VISION. (1) GLAUCOMA IS THE SECOND LEADING CAUSE OF BLINDNESS GLOBALLY. IT PRESENTS GREATER PUBLIC HEALTH CHALLENGE BECAUSE THE BLINDNESS CAUSED BY IT IS IRREVERSIBLE.

IN 2020, THE NUMBER OF PEOPLE ESTIMATED WITH GLAUCOMA WAS 76 MILLION. THE ESTIMATED GLOBAL PREVALENCE OF GLAUCOMA BY 2040 IS 111.8 MILLION [(2)].IN INDIA, THE ESTIMATED NUMBER OF CASES OF GLAUCOMA IS 12 MILLION, AROUND ONE FIFTH OF THE GLOBAL BURDEN OF GLAUCOMA. IT WAS OBSERVED THAT MORE THAN 90% CASES OF GLAUCOMA WERE UNDIAGNOSED AND IDENTIFIED ONLY AT THE TIME OF SURVEY.

GLAUCOMAS ARE BROADLY DIVIDED INTO OPEN ANGLE AND CLOSED ANGLE GLAUCOMAS BASED ON PATHOPHYSIOLOGY. PRIMARY IS WHEN ONE CAUSE CANNOT BE PINPOINTED, SECONDARY GLAUCOMAS OCCUR AS A RESULT OF SOME OTHER OCULAR OR SYSTEMIC CONDITION. PRIMARY OPEN ANGLE GLAUCOMA (POAG) IS THE PREDOMINANT SUBTYPE OF GLAUCOMA. THE PREVALENCE OF PRIMARY OPEN ANGLE GLAUCOMA WAS HIGHEST IN AFRICA AND PRIMARY ANGLE CLOSURE GLAUCOMA WAS FOUND TO BE HIGHEST IN ASIA.

THE NUMBER OF POAG CASES IN ADULT POPULATION (40–80 YEARS OLD) WAS ESTIMATED 52.68 MILLION IN 2020 AND 79.76 MILLION IN 2040.

POAG IS A CHRONIC, SLOWLY PROGRESSIVE OPTIC NEUROPATHY WITH CHARACTERISTIC PETTERN OF OPTIC NERVE DAMAGE AND VISUAL FIELD LOSS[3] .SOME OF THE RISK FACTORS OF POAG ARE AGE, GENDER, RACE, SOCIOECONOMIC FACTORS, INTRAOCULAR PRESSURE, REFRACTIVE ERROR, CORNEAL THICKNESS, HEREDITARY AND SOME SYSTEMIC FACTORS [4]

VITAMIN D IS AN IMPORTANT SECOSTEROID HORMONE THAT PLAYS A ROLE IN THE SIGNALING PATHWAYS RELATED TO BONE AND MINERAL METABOLISM, CELLULAR PROLIFERATION, IMMUNE MODULATION, AND OXIDATIVE STRESS. VITAMIN D DEFICIENCY IS ASSOCIATED WITH NEURODEGENERATIVE EFFECTS ON THE CENTRAL NERVOUS SYSTEM. SEVERAL BIOLOGICAL EXPERIMENTS HAVE INDICATED THAT VITAMIN D REGULATES NEUROPROTECTIVE FUNCTIONS IN THE CENTRAL NERVOUS SYSTEM, INCLUDING THE OPTIC NERVE [5] MOREOVER, VITAMIN D STATUS CAN AFFECT CHRONIC METABOLIC DISEASES, INCLUDING DIABETES, HYPERTENSION, AND DYSLIPIDEMIA, WHICH ARE CONSIDERED IMPORTANT METABOLIC RISK FACTORS OF ELEVATED IOP AND REDUCED OCULAR BLOOD FLOW [6]

PURPOSE: TO PRESENT THE LEVELS OF SERUM VITAMIN D LEVELS IN MILD, MODERATE AND SEVERE FORMS OF PRIMARY OPEN ANGLE GLAUCOMA(POAG) ALONG WITH VISUAL FIELD CHANGES.

OBJECTIVES OF THE STUDY:

1) TO MEASURE SERUM VITAMIN D LEVELS IN PATIENTS DIAGNOSED AS PRIMARY OPEN ANGLE GLAUCOMA.
2) TO GRADE POAG INTO MILD, MODERATE AND SEVERE ACCORDING TO HODAPP-PARRISH-ANDERSON CRITERIA

MATERIALS AND METHODS:

STUDY DESIGN: PROSPECTIVE OBSERVATIONAL STUDY

STUDY DURATION: 5 MONTHS (MARCH 2023 TO JULY 2023)

PLACE OF STUDY: DEPARTMENT OF GLAUCOMA, SAROJINI DEVI EYE HOSPITAL, HYDERABAD.

ELIGIBILITY CRITERIA: PATIENTS DIAGNOSED AS PRIMARY OPEN ANGLE GLAUCOMA FOR THE FIRST TIME AND NOT ON ANY TREATMENT.

SAMPLE SIZE: 11 PATIENTS – 21 EYES

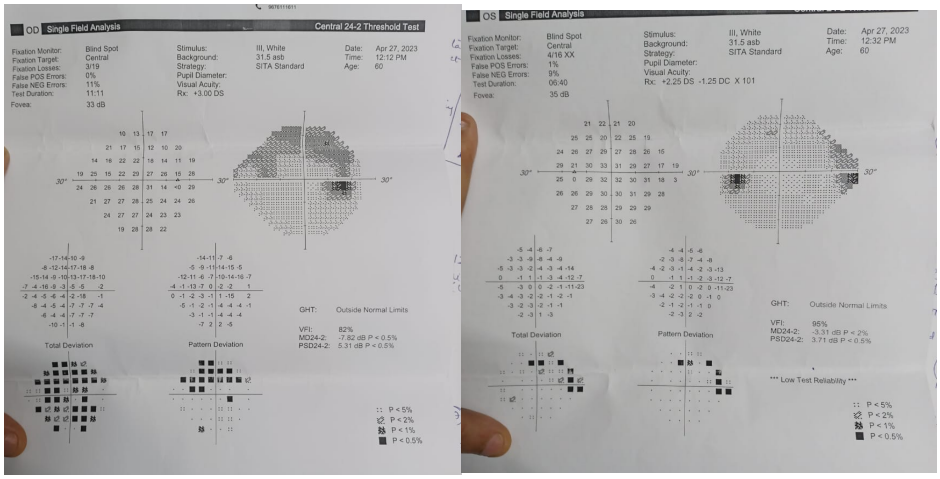
STUDY PROPER: 21 EYES OF 11 PATIENTS WERE EXAMINED THOROUGHLY IN GLAUCOMA OPD INCLUDING BEST CORRECTED VISUAL ACUITY, GONIOSCOPY AND OPTIC DISC EXAMINATION. BASELINE INTRAOCULAR PRESSURE(IOP) BY APPLANATION TONOMETRY WAS DONE. CENTRAL CORNEAL THICKNESS(CCT) AND HUMPREYS VISUAL FIELDS 24-2 AND 10-2 WERE ADVISED AS PER NECESSITY. GRADING OF POAG WAS DONE BASED ON HODAPP-PARRISH-ANDERSON CRITERIA INTO MILD (MD< -6DB), MODERATE (MD -6DB TO -12DB) AND SEVERE (MD >-20DB). SERUM VITAMIN D LEVELS WERE MEASURED BY ENZYME LINKED IMMUNOSORBENT ASSAY TECHNIQUE AND REPORTED IN ng/ml.

RESULTS: OUT OF 11 PATIENTS, 6 WERE FEMALES AND 5 WERE MALES (M=45.45%, F=54.54%) WITH MEAN AGE OF 57 YEARS. THE MAXIMUM AND MINIMUM IOP MEASURED WERE 40 AND 12mmhg (INTEROBSERVER VARIATION EXCLUDED) WITH MEAN OF 20.63mmhg. MINIMUM AND MAXIMUM CCT WERE 480 AND 591 WITH AVERAGE OF 501.7273. THE MEAN OF SERUM VITAMIN D LEVELS WERE 34.38 ng/ml (NORMAL VALUES 30-90ng/ml) WITH RANGE OF 23.48 TO 49.32 ng/ml.

MEAN DEVIATIONS OF STUDY SUBJECTS IN HVF 24-2

RIGHT EYE	LEFT EYE	AVERAGE
-3.54	-2.64	-3.09
-30.13	-21.91	-26.02
-2.29	-2.22	-2.255
-8.68	-26.54	-17.61
-9.38	-32.09	-20.735
-7.82	-3.31	-5.565
-10.5	-8.32	-9.41
-31.65	-32.8	-32.225
-20.2	-29	-24.6
-19.37	-21	-20.185
-13.25		-13.25

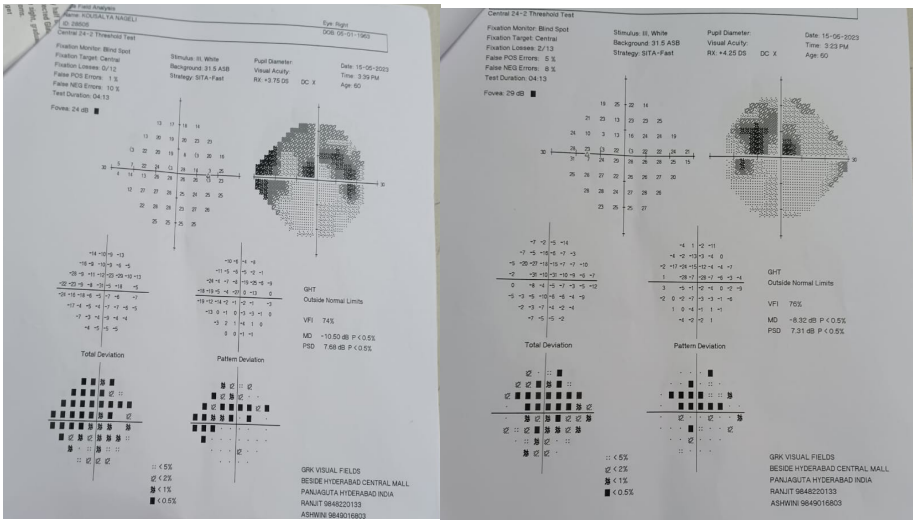
PATIENT 1:



RIGHT EYE: SUPERIOR ARCUATE DEFECT CONSISTENT WITH IR NOTCHING, MEAN DEVIATION:-7.82db (MODERATE)

LEFT EYE: MEAN DEVIATION OF -3.31db (MILD)

PATIENT 2:



RIGHT EYE: SUPERIOR VISUAL FIELD DEFECT CONSISTENT WITH IR LOSS, MEAN DEVIATION OF -10.50db (MODERATE)

LEFT EYE: MEAN DEVIATION OF -8.32db (MODERATE)

STATISTICALANALYSIS:

DATA ENTERED IN EXCEL AND COMPUTED FOR CORRELATION FACTOR.

CORRELATION FACTOR FOR SERUM VITAMIN D LEVELS AND AVERAGE OF MEAN DEVIATION IN VISUAL FIELDS YIELDED -0.115(-1<P<0)- A SMALL NEGATIVE CORRELATION EXISTS. THE CORRELATION FACTOR FOR SERUM VITAMIN D AND AGE YIELDED -0.227 (-1<P<0) – A SMALL NEGATIVE CORRELATION.

LIMITATIONS OF STUDY:

1) SMALL SAMPLE SIZE (P=3.51%, ADEQUATE SAMPLE SIZE = 51)

2)LACK OF CONTROL GROUP

3)ELIMINATION OF CONFOUNDERS(AGE, NUTRITIONAL STATUS, MENOPAUSE ETC.,)WERE NOT DONE

4)AQUEOUS VITAMIN D LEVELS HAVE MORE CORRELATION WITH SEVERITY OF GLAUCOMA THAN SERUM VITAMIN D LEVELS (7)

CONCLUSION: VITAMIN D IS AN IMPORTANT MOLECULE THAT ACTS BOTH ON INTRACELLULAR VITAMIN D RECEPTORS AND MODULATE GENE EXPRESSION

AND EXTRACELLULAR RECEPTORS AFFECTING SEVERAL SIGNALLING PATHWAYS OF CELLS INCLUDING IMMUNE MODULATION. IT IS BELIEVED TO AFFECT MULTIPLE STEPS IN PATHOPHYSIOLOGY OF GLAUCOMA STARTING FROM REGULATING THE DEPOSITION OF EXTRACELLULAR MATRIX PRODUCTION AT THE LEVEL OF TRABECULAR MESHWORK TO BALANCING THE NEUROTROPHIC FACTORS NECESSARY FOR MAINTAINING THE HEALTH OF GANGLION CELL AXONS.

THE MAIN CULPRIT WAS HOWEVER BELIEVED TO BE THE IMBALANCE OF THE IMMUNE CELLS CAUSING NEURODEGENERATIVE INJURY TO THE GANGLION CELL BODIES AND OPTIC NERVE AXONS. IT ALSO PLAYS AN IMPORTANT ROLE IN HEALTH OF VASCULATURE OF RETINA[6].

THE CONVENTIONAL TREATMENT TO POAG IS TARGETTED AGAINST CONTROL OF IOP. BUT ANY TREATMENT THAT COULD TARGET THE CORE PATHOLOGY AND CHANGE THE COURSE OF DISEASE IS ALWAYS GROUND BREAKING. SEVERAL STUDIES ESTABLISHED INVERSE RELATION BETWEEN VITAMIN D AND IOP WHICH WERE NOT CONCLUSIVELY PROVED. THIS STUDY HIGHLIGHTS THE NEED TO FURTHER RESEARCH THE CORRELATION BETWEEN VITAMIN D AND GLAUCOMA AND ITS ROLE IN CAUSATION OF DISEASE AND ITS USE AS A NOVEL TREATMENT STRATEGY IN GLAUCOMA.

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This paper was judged as the BEST PAPER of Lacrimal Session

DR. SRAWANI SARKAR, M.NO:S26367

OUTCOMES AND COMPLICATIONS IN EXTERNAL DACRYOCYSTORHINOSTOMY SURGERY PERFORMED BY RESIDENTS

ABSTRACT

INTRODUCTION

Dacryocystitis is caused by an obstruction in the nasolacrimal system with the resulting stagnation of tears. Dacryocystorhinostomy (DCR) is the gold standard procedure for treating acquired nasolacrimal duct obstruction. A significant number of cases are managed by the residents and external DCR surgeries are performed by them as a part of their training curriculum. In this study, we aimed to look at the complications and outcomes of external DCR surgeries performed by the residents.

METHOD

Data from all patients > 18 years age who had nasolacrimal duct blockage and underwent external DCR surgery performed by residents was collected prospectively.

The procedure involved anastomosis of the anterior lacrimal and nasal mucosal flaps whereas posterior mucosal flaps were excised.

RESULTS

Data from 136 patients were collected during the study period. The mean age of the study population was 45±10.66 years (range, 18 to 65 years). There 112 (82%) females and 24 (18%) males. The average operative time was 45.48±4.72 minutes (range, 30-90 minutes). The most common intraoperative complication was laceration of nasal mucosa in 32 (22%) followed by intraoperative haemorrhage in 20 (14.7%) patients. 6 months follow up, 122 (89.7%) patients reported relief from epiphora. Syringing of nasolacrimal duct confirmed patency in 125 (92%) patients, partially patent in 7 (5%) and non-patent in 4 (3%) of the patients.

CONCLUSION

External dacryocystorhinostomy with anterior flaps anastomosis performed by residents had similar success rate compared to other studies. However, operative time was longer and intra operative complications and post operative swelling and ecchymosis were more frequent. Frequency of Post operative epistaxis and infection were low and similar to other studies.

INTRODUCTION

Dacryocystorhinostomy (DCR) is a surgical procedure commonly performed to treat cases of persistent or severe dacryocystitisitis. This surgical intervention is aimed at relieving symptoms of epiphora (excessive tearing), mucopurulent discharge, and discomfort associated with dacryocystitis. Dacryocystorhinostomy has a high success rate in treating chronic dacryocystitis, providing patients with relief from unpleasant symptoms and improving their quality of life.

Dacryocystorhinostomy is a complex surgical procedure that requires precision and skill to effectively create a new tear drainage pathway. During the surgery, the ophthalmic surgeon carefully navigates through the lacrimal passage and creates a functional pathway from the canaliculi into the nose by creating an osteotomy and opening the nasolacrimal sac into the nose.

In addition to the clinical success of DCR surgery, there has been a growing interest in evaluating the outcomes and potential complications associated with resident participation in these surgeries. Understanding the role of residents in performing DCR surgeries under the supervision of experienced ophthalmic surgeons is crucial in guiding future training programs and ensuring the delivery of high-quality care to patients.

As the trend of resident involvement in DCR surgeries continues to evolve, ongoing research and evaluation of outcomes will further contribute to the advancement of surgical techniques and patient care in the field of ophthalmology.

Research has shown that while the involvement of residents may contribute to longer operative times[1-4] and potentially higher rates of certain complications, it also provides a valuable learning experience for residents and can lead to comparable overall outcomes when compared to surgeries performed solely by experienced surgeons.

METHOD

Data was collected prospectively from all patients who had nasolacrimal duct blockage and underwent external DCR surgery performed by residents during the period April 2022- March 2023. The inclusion criterias were: a) age ≥18 years b) history of watering or discharge; and c) nasolacrimal duct syringing revealing blockage. Exclusion criteria were: a) patients presenting with acute dacryocystitis; b) canalicular or common canalicular blockage; c) previous history of lacrimal surgery; d) trauma involving nasolacrimal draining system; e) lid abnormality such as ectropion entropion etc; f) nasal abnormalities like hypertrophied nasal polyp, gross septal deviation, nasal growth, atrophic rhinitis, etc.;

A detailed history along with local examination of eyes and lacrimal apparatus was done of all patients. Routine blood investigations were done. ENT consultation was taken for all patients prior to surgery to rule out any nasal pathology.

The procedure involved anastomosis of the anterior lacrimal and nasal mucosal flaps whereas posterior mucosal flaps were excised. Patients were followed up at 1 week, 1 month, 3 month and 6 months post operatively. Symptoms of watering and discharge were reviewed at each visit followed by syringing of nasolacrimal duct to check patency. Data was collected in excel sheet.

RESULTS:

Data from 136 patients were collected during the study period. The mean age of the study population was 45±10.66 years (range, 18 to 65 years). There 112 (82.4%) females and 24 (17.6%) males. The average operative time was 45.48±4.72 minutes (range, 30-90 minutes).

Table 1. Demography of study population

Sample Characteristics	No. of Patients and percentage n (%)
Total Number of Patients	136 (100%)
Age Groups (Years)	
18-30	7 (5.2%)
30-40	20 (14.7%)
40-50	49 (36%)
50-60	45 (33.1%)
60-70	15 (11%)

Sex	
Males	24 (17.6%)
Females	112 (82.4)

The most common intraoperative complication was laceration of nasal mucosa in 32 (22%) leading to flapless external DCR in 20 (14.7%) patients. In the other 12 (8.8%) patients, anterior flaps were sutured. The second complication was intraoperative haemorrhage in 20 (14.7%) patients which was managed by compressing with haemostatic retractors, packing with cotton swabs, and applying pressure for few minutes or suturing the bleeding vessel. On post operative day 1, 19 (14%) patients had periorbital edema with ecchymosis. 2 patients had epistaxis on post operative day 1 that resolved on the second post operative day. 1 patient developed hypertrophic scar at the incision site over 6 months follow up. Another patient developed infection at the site of surgery which was managed by systemic antibiotics.

Table 2. Intraoperative and postoperative complication

Outcomes Complications	**No. of Patients and percentage n (%)**
Intraoperative	
Haemorrhage	20 (14.7%)
Laceration of nasal mucosa Flapless With flap	32 (22%) 20 (14.7%) 12 (8.8%)
Postoperative	

Lid swelling and periorbital ecchymosis Post op day 1 1 week follow up- lid swelling and ecchymosis	19 (14%) 5 (3.6%)
Epistaxis	2 (1.4%)
Hypertrophic scar	3 (2.2%)
Post operative infection	1 (0.7%)

Over the course of 6 months follow up, 122 (89.7%) patients reported relief from epiphora. 12 (8.8%) patients complained of recurrence of watering after few weeks to months following surgery and 2(1.5%) patients reported mucopurulent discharge from the operated eye. Syringing of nasolacrimal duct confirmed patency in 125 (92%) patients, partially patent in 7 (5%) and non-patent in 4 (3%) of the patients.

Table 3. Symptomatic and objective outcome over 6 months follow up.

Characteristics	**No.of Patients and percentage n (%)**
Recurrence of Symptoms:	
No watering	122 (89.7%)
Watering	12 (8.8%)
Mucopurulent/purulent discharge	2 (1.5%)
Syringing of nasolacrimal duct:	
Patent	125 (92%)

Partially patent	7 (5%)
Non-patent	4 (3%)

DISCUSSION

Resident involvement in DCR surgeries serves as an essential component of surgical training in ophthalmology. The participation of residents under the supervision of experienced surgeons is crucial to develop their operative skills, decision-making abilities, and overall confidence in handling complex surgical procedures.

Successful outcome of DCR surgery was tested by irrigation for patency of nasolacrimal duct and symptomatic improvement in epiphora. Our study showed that the overall success rate of DCR surgeries performed by residents was comparable to other studies.[5-8] However, operative time was longer than previous studies[5,9] while similar to a study performed by Deka et al.[10] Intra operative haemorrhage and injury to nasal mucosa were more frequent compared to a study performed by Sharma et al.[5] Post op periorbital swelling and ecchymosis were present in 14% of the patients and were more frequent compared to a study reported by Sharma et al.[5] Occurrence of post operative infection, epistaxis and hypertrophic scar was low and similar to other studies.[5,11]

Nevertheless, these experiences are invaluable for resident education, and the overall outcomes can still be comparable to those surgeries performed by experienced surgeons alone.

Ensuring high-quality patient care is paramount. Research centered on resident-performed surgeries should investigate not only the educational benefits of the residents but also the impact on the quality of care delivered, including patient satisfaction and long-term success rates.

CONCLUSION:

External dacryocystorhinostomy with anterior flaps anastomosis performed by residents had similar success rate compared to other studies. However, operative time was longer and intra operative complications and post operative swelling and ecchymosis were more frequent. Frequency of Post operative epistaxis and infection were low and similar to other studies.

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EVALUATING BLEB MORPHOLOGY AMONG OPERATED JUVENILE OPEN ANGLE GLAUCOMA PATIENTS

PURPOSE:

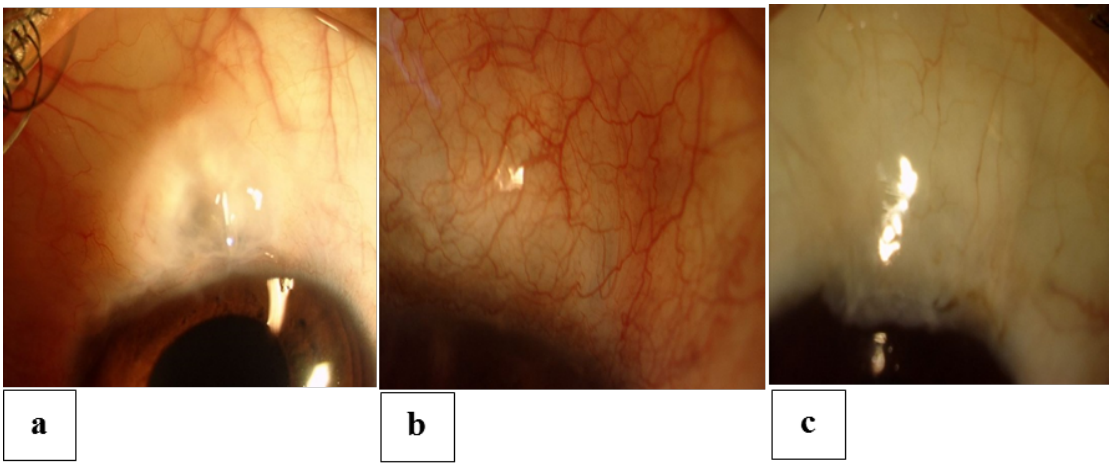
We studied bleb morphology, and whether preoperative and intraoperative factors affecting the bleb morphology among operated juvenile open angle glaucoma patients and IOP control.

METHODS:

A total of 142 JOAG operated patients at least 1 year ago among them 160 eyes are in retrospective arm and 20 eyes of 20 patients in prospective arm.

Inclusion Criteria: JOAG with age 10-40 yrs, IOP >22 mmHg in one or both eyes on more than two visits, open angle on gonioscopy, glaucomatous optic neuropathy with visual field loss.

Exclusion criteria: Patients with bleb photographs could not be done, steroid induced glaucoma, secondary glaucoma were excluded. Bleb photographs of JOAG patients were evaluated by masked observer using the same condition of magnification and illumination and graded using a simple classification system described by us as avascular bleb, fibrosed bleb, good diffuse bleb.



a= Avascular bleb

b= Fibrosed bleb

c= Good diffuse bleb

Figure 1

Evaluated preoperative factors like age at the time of surgery, gender, baseline IOP, duration of glaucoma medication and intraoperative factors like tenon's thickness, use of mitomycin-c, size of scleral flap, size of ostium, size of iridectomy and postop requirement of antiglaucoma medications.

Statistical analysis was carried out using SPSS version 23 (Chicago IL, USA). Pearson chi-square test used to test differences in categorical variables, independent 't' test and paired 't' test used to compare the continuous variables and compare the within group variables. ANOVA was used for comparing for different groups. A $p<0.05$ was considered statistically significant

RESULTS:

There were total 142 operated JOAG patients. Among them 160 eyes of 120 patients were in retrospective arm in which bleb photographs available for 109 eye. 20 eyes of 20 patients in prospective arm , bleb photographs available for all.

Mean age at time of surgery was 27.7 ± 10.03, gender ratio was M;F = 102:40, baseline IOP 37.9 ± 11.52, duration of glaucoma medication using(months) was 53.4 ± 83.80.

AGE DISTRIBUTION AT TIME OF SURGERY

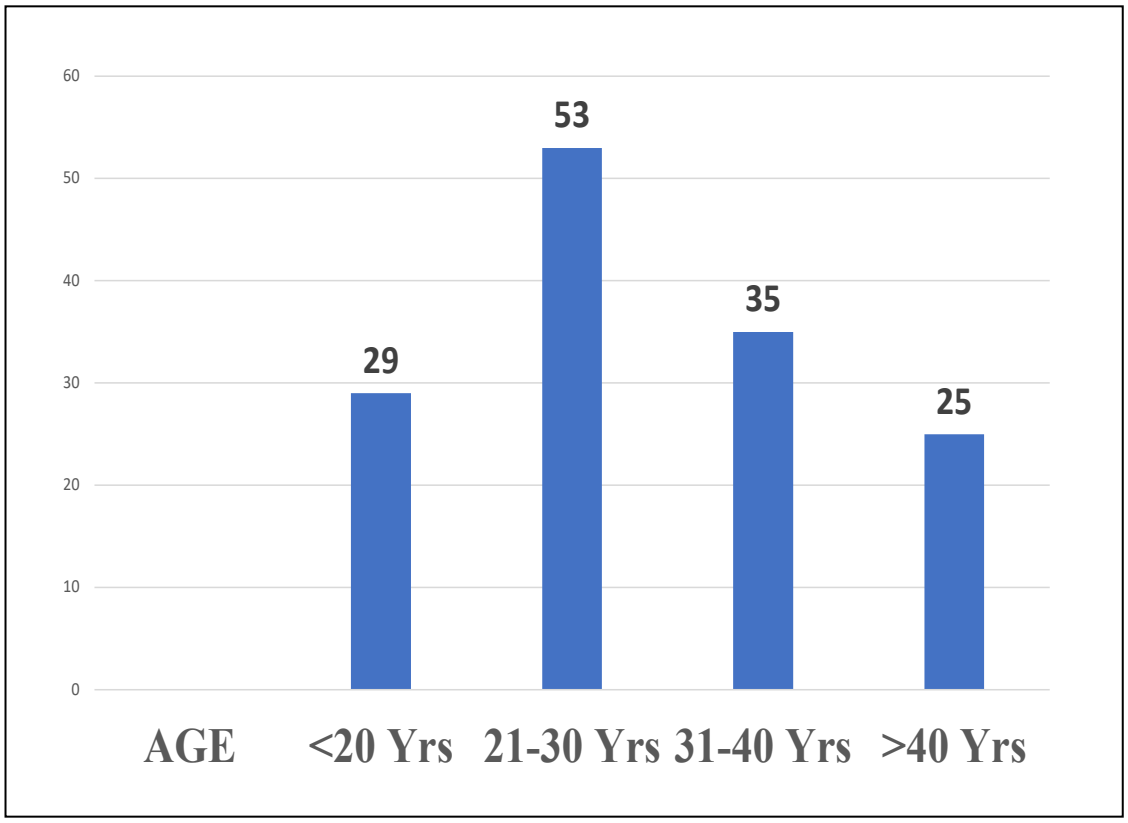


Figure 2

Most of our patients were operated during age between 21- 30 years of age (37%) followed by 31-40 years of age (24.6%)

BLEB TYPE AMONG JOAG PATIENTS

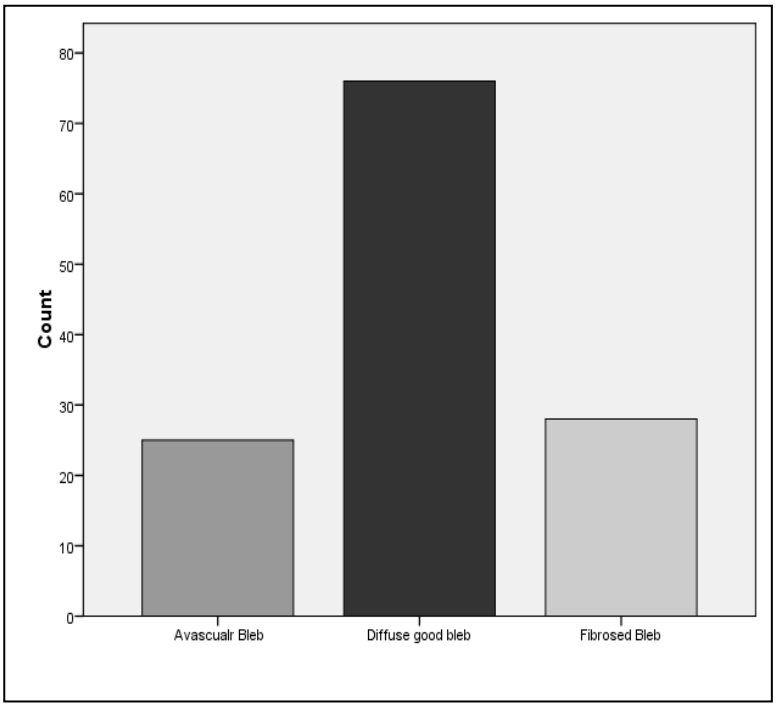


Figure 3

On evaluation over all type of bleb morphology was varied, though majority was achieved good diffuse bleb which was 76%, avascular bleb and fibrosed bleb approximately equal

TYPE OF BLEB AMONG MMC/NON MMC GROUP

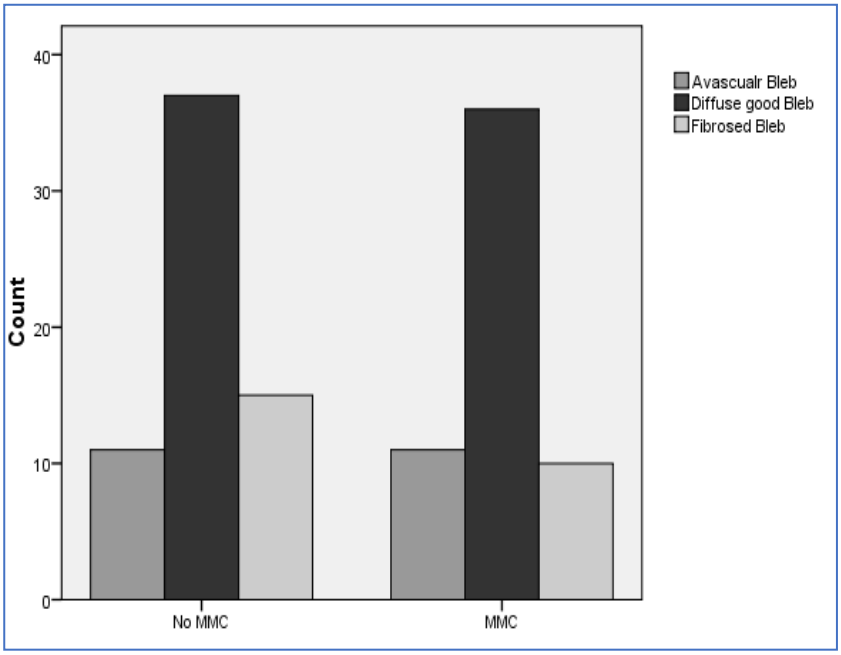


Figure 4

After using Mitomycin-C 0.2mg/ml subconjunctivally for 3 minutes , The type of bleb forming among the MMC group and non MMC group was more or less similar.

PRE OP FACTORS DETERMINING BLEB MORPHOLOGY

We evaluated preoperative factors like preoperative mean IOP in avascular blebs was 39.50 ± 12.58, in fibrosed blebs 36.80 ±14.01, good diffuse bleb was 37.91 ±10.32. Median duration of medication in months were in avascular bleb was 24 months, fibrosed bleb was 28 months and good diffuse bleb was 26 months. We found that preoperative factors did not affect the bleb morphology. Details are described in below table 1. P value was not significant

Table 1

Intraoperative factors determining bleb morphology

Preop factors	AVASCULAR BLEB (n = 25)	FIBROSED BLEB (n = 29)	GOOD DIFFUSE BLEB (n =75)	P Value
PREOP IOP Mean± SD (Range)	39.50 ± 12.58 (20-60)	36.80 ± 14.01 (16-72)	37.91 ± 10.32 (20-62)	0.738
DURATION OF MEDICATION (Months) Median (Range)	24(0.2-208)	28(1-528)	26(0.20-624)	0.78

On evaluation intraoperative factors like tenon's thickness, size of scleral flap, size of ostium, size of iridectomy were found not to affect the bleb morphology. The P value was not significant

INTRAOPERATIVE FACTORS	AVASCULAR BLEB (n= 25)	FIBROSED BLEB (n=29)	GOOD DIFFUSE BLEB (n=75)	P Value
TENON THICKNESS				
1) Thin	12	12	32	
2) Moderately thick	8	13	36	P=0.62
3) Thick	5	4	7	
SIZE OF SCLERAL FLAP				
WIDTH				
1) 1mm	3	2	3	
2) 2-4mm	21	24	67	P=0.99
3) 5mm	1	3	5	
LENGTH				
1) 2.5mm	3	4	7	
2) 3-5mm	13	14	47	P=0.75
3) 5mm	9	11	21	
SIZE OF OSTIUM				
1) SMALL(1mm)	6	10	26	
2) MEDIUM(2-4mm)	12	13	38	P=0.32
3) LARGE(5mm)	7	6	11	
SIZE OF IRIDECTOMY				
1) SMALL	10	12	32	
2) MEDIUM	9	12	35	P=0.49
3) LARGE	6	5	8	

Table 2

IOP PROFILE OVER 1 YEAR

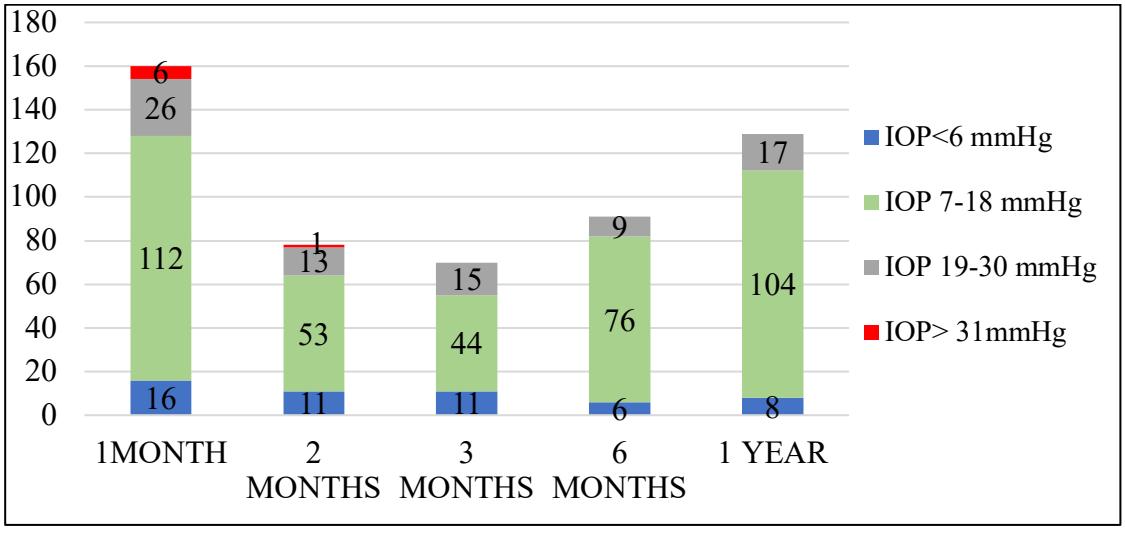


Figure 5

In our study on follow up of the operated juvenile open glaucoma patients over we found that most of the patients had IOP between 7-18mmHg without medication.

Over all need of medication at 1 year

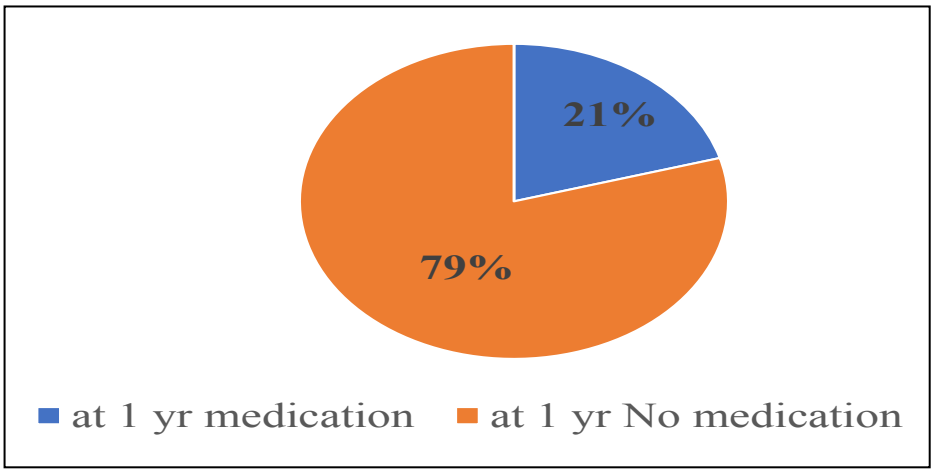


Figure 6

On evaluation at 1 year of follow up approximately 80% of patients does not require medication. Only 20% of patients required medication at 1 year.

Kaplan Meir survival curves

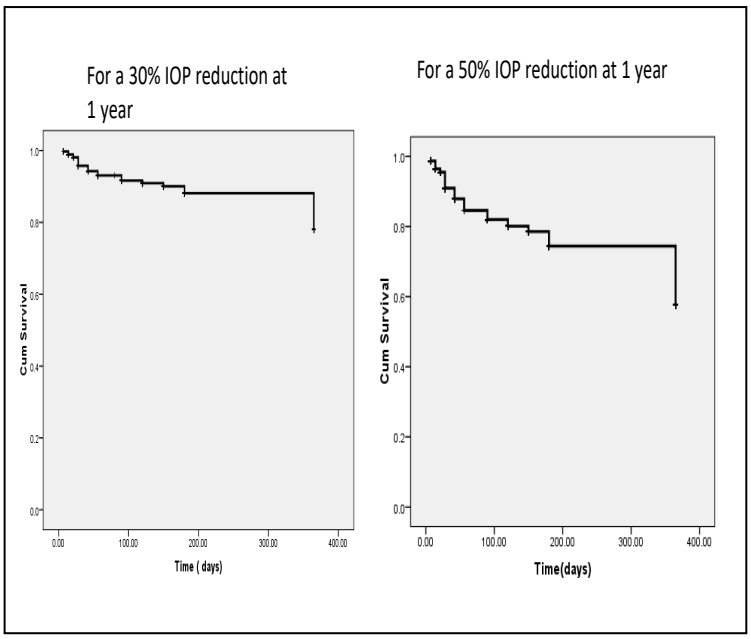


Figure 7

On evaluation we found that For 30% reduction of intraocular pressure at 1 year follow up was around 80% and for 50% reduction of intraocular pressure at 1 year was around 60%

ABSOLUTE SUCCESS

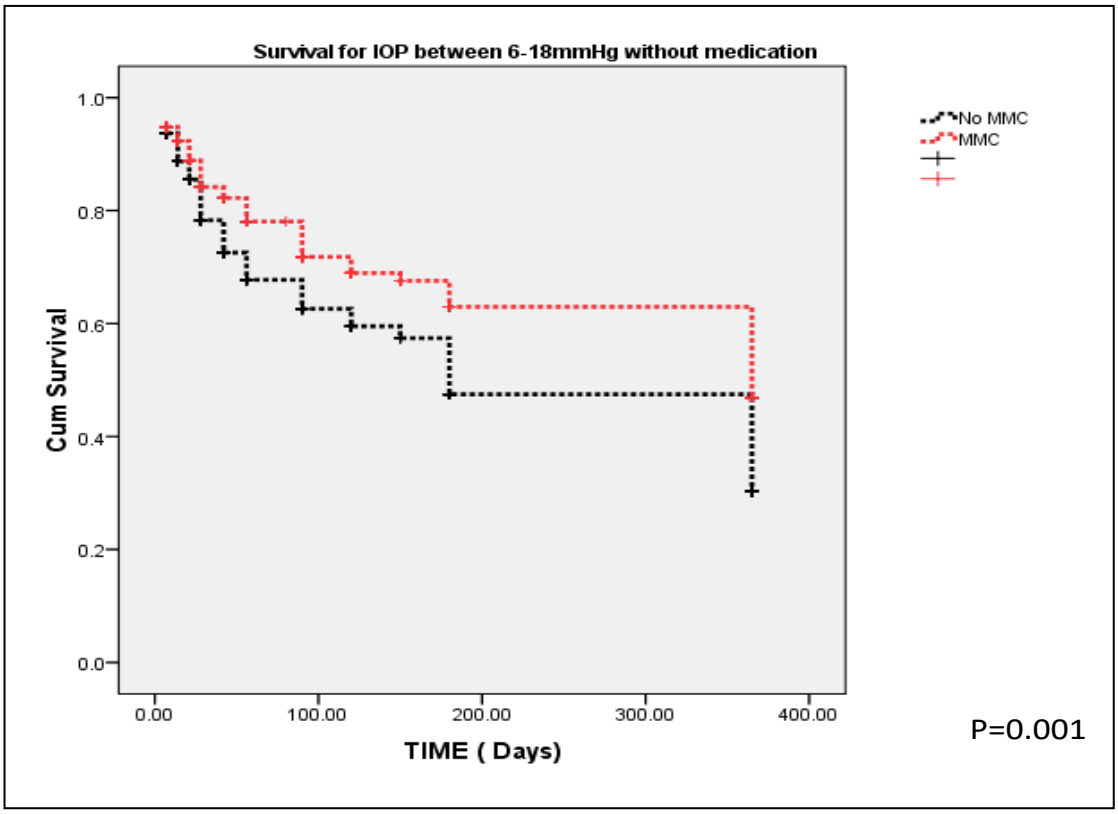


Figure 8

The absolute success rate defined as IOP between 6-18 mmHg without medication. Among the MMC group was around 50% and non MMC group was around 30% success rate which was significant(p=0.001)

DISCUSSION:

Classification of blebs has attempted to standardize various bleb forms and improve ability to monitor bleb filtration function utilizing a consistent assessment. Bleb classification has evolved from earliest Kronfield to the IBAGS. All

the classification systems are based on the perception of clinical features evaluated on slit lamp examination, and are therefore subjective. The features of predicting successful bleb were diffuse blebs, paucity of vessels, quiet surface area, elevated blebs and microcystic changes in conjunctiva. Factors portending failure of bleb included bleb injection, large rope like vessels, thickening of bleb wall, localisation of bleb wall with high domed blebs[1].

In our patients the mean age at the time of surgery was 27.7 years. Pathania et al had mean age of 24.1 ± 6.8 years found that younger age was significantly associated with failure of trabeculectomy[2]. Jacobi et al showed primary trabeculectomy in young patients may have a favorable outcome even without antimetabolite therapy[3]. JOAG is known to be more common among males. In our study we found the male preponderance among operated JOAG patients. Tsai et al also found male preponderance among operated JOAG patients. In contrast to our study[4.]. In our study we used low dose MMC 0.2mg/ml subconjunctivally for 3 minutes. Clinically antifibrotic agents like MMC reduce fibroblast proliferation in the subconjunctival space and tenon's capsule to prevent epi scleral fibrosis.

In our study we evaluated the effect of size of scleral flap on bleb morphology. among the 3 groups of avascular (n=25), fibrosed (n=29),and diffuse blebs (n=75), scleral flap size does not seem to affect the bleb morphology at 1 year. Tse KM et al objectively assessed the effect on the aqueous outflow rate of various geometries of the scleral flap and sclerostomy created in trabeculectomy. A square scleral flap increased the aqueous drainage by 36.26% compared with a triangular flap of equivalent flap area. Decreasing flap thickness beyond half-thickness caused an additional increase in aqueous outflow. However, clinically the flap should not be thinner than half the thickness of the sclera as this may result in hypotony.[5] ostium size and iridotomy was not affecting the bleb morphology.

LIMITTATIONS:

A large part of this study was a retrospective study and may have bias associated like male female bias, rural versus urban area bias. Male will come for follow up by their own, and female patient one need to bring for follow. Urban area patients better follow up than rural patients. The result of this study are of 12 months only, the differences in bleb morphology may be more apparent on longer follow up. Postoperative factors like timing of releasable sutures removed, bleb massage, use of postop steroids, presence and absence of bleb leak etc were not evaluated and could affect the bleb morphology. Patient compliance which may have reflected on the number of failures and those with qualified success to surgery.

CONCLUSIONS:

Bleb morphology among operated juvenile open angle glaucoma patients is varied, though majority of them achieved good diffuse bleb. Preoperative and intraoperative factors analysed in this study do not seem to affect the bleb morphology. At 1 year absolute success rate was higher with use of MMC than not using it.

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This paper was judged as the BEST PAPER of Mixed Bag II Session

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MANAGEMENT OF INFECTIVE SCLERITIS POST BUCKLING WITH SUBCONJUNCTIVAL ANTIBIOTICS

ABSTRACT

The reported incidence of buckle infection varies from 0.5% to 5.6%. We present two male patients aged 67 and 27, treated with subconjunctival antibiotics with good outcome. Both underwent scleral buckling for phakic retinal detachment (RD). Both developed infection and underwent buckle explant, before referring to us. Posterior segment examination revealed shallow inferior RD with macula off in older patient and attached retina in younger patient. Swabs were sent for microbiological work up. Both patients received subconjunctival (S/Conk) piperacillin+ tazobactam (2.25mg/ml) near the lesion on every alternate day. Culture was positive for staph aureus with vancomycin sensitivity for older patient. The patient was given S/Conk vancomycin (25mg/ml). In view of poor response, S/Conk linezolid (20mg/ml) was administered along with topical linezolid till the complete resolution. Other patient showed no culture growth and healed with subconjunctival (S/Conk) piperacillin+ tazobactam.

PURPOSE OF STUDY

To analyse the role of subconjunctival antibiotics in management of post buckling infective scleritis

MATERIALS AND METHODS

Retrospective analysis of 2 eyes of 2 patients to study efficacy of subconjunctival antibiotics in the treatment of post buckling infective scleritis

CASE 1

67year old Asian Indian male underwent Right eye scleral buckle for pseudophakic rhegmatogenous retinal detachment elsewhere. The patient developed buckle infection after 10 days and buckle explant done by primary surgeon and treated with intravenous antibiotics. The patient presented to our centre after 10 days with a visual acuity of counting figure of one metre. Anterior segment revealed a localised patch of scleral abscess (Fig1a). Posterior segment examination revealed shallow inferior retinal detachment with macula off He received 3 doses of subconjunctival Piperacillin+Tazobactum (2.25mg/ml). The swab was positive for *Staphylococcus aureus* sensitive to vancomycin. The treatment was changed and he received 3 doses of subconjuctival Vancomycin(25mg/ml) but there was poor response. Then he received 7 doses of subconjunctival Linezolid (2mg/ml) every alternat day with complete resolution of scleritis. (Fig 1 b)

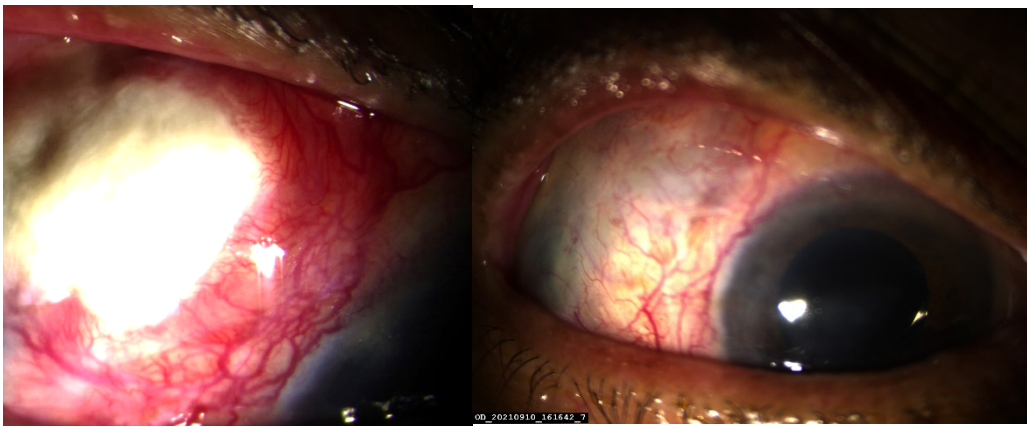

Figure 1 a show localises scleral abscess and Figure 1 b complete resolution after subconjunctival antibiotics,

CASE 2

27 years old, high myope, Asian Indian male underwent RE scleral buckle for rhegmatogenous retinal detachment elsewhere. He developed buckle infection after 5 days and buckle explant done by primary surgeon. On presentation the visual acuity was 6/60 and presence of localised scleral abscess (Fig 2a). Posterior segment showed attached retina. The swab did not show any growth. The patient was managed with alternate day subconjunctival Piperacillin+Tazobactum (2.25mg/ml) 12 doses with complete resolution of scleritis. (Fig 2b)

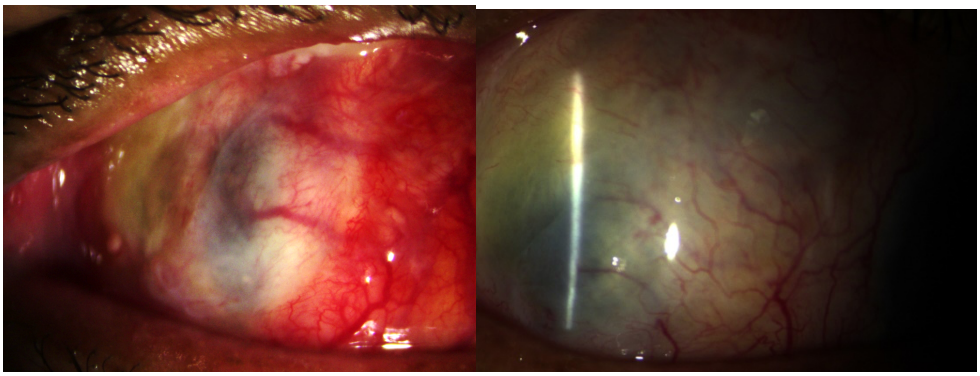

Fig 2a shows presence of localised scleral abscess and fig 2b shows complete resolution with some scleral thinning.

DISCUSSION

Scleral buckle (SB) is an established surgical treatment for retinal detachment Buckle related complications include refractive error, diplopia, infection, extrusion, intrusion. Buckle infection is one of the common causes for buckle removal with reported incidence varying from 0.5% to 5.6%. [1] The probable source of infection in such eyes is when organisms gain entry during surgery leading to biofilm formation on ends and surfaces of silicone implants and leads to drug resistance. The current treatment protocol - buckle explant along with topical and systemic antibiotics. However, there are some case reports which have reported effectiveness of subconjunctival antibiotics in treatment of infective scleritis.

Abdelmegid O *et al* in their case report on *Nocardia arthritidis* associated scleritis was successfully treated with subconjunctival vancomycin, gentamicin, and

ceftazidime. [2] Sykes SO *et al* in their case report of *Haemophilus influenzae* associated scleritis was treated with subconjunctival ceftazidime. [3] Timothy C Smith *et al* managed *Pseudomonas aeruginosa* associated infective scleritis with subconjunctival gentamycin. [4]

Subconjunctival antibiotics are an effective treatment modality which can be used in patients with post buckling infective scleritis. The advantages include increased concentration of antibiotics at the local site and rapid response, decreased risk of systemic side effects associated with antibiotic use and decreased systemic antibiotic resistance.

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This paper was judged as the BEST PAPER of Ocular Pathology Ocular Oncology & Tumors Session

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CORRELATION OF CLINICAL AND HISTOPATHOLOGICAL RISK FACTORS IN SECONDARY ENUCLEATION

INTRODUCTION: Retinoblastoma is most common primary intraocular malignancy of childhood.

Early diagnosis and multimodal treatment protocol has significantly reduced mortality in cases of retinoblastoma. There are certain clinical and histopathological high-risk factors which can actually predict the outcome and help in deciding the further management protocol. [3,10]

Identification of these high-risk factors can be done by clinical, radiological and histopathological evaluation. Clinical high-risk factors include proptosis, prephthisical changes, sterile orbital inflammation, orbital cellulitis, buphthalmos, corneal oedema, secondary glaucoma, AC seeds, pseudo-hypopyon, hyphema, neovascularisation of iris, ectropion uvea, cataract and ciliary body infiltration. Radiological high-risk factors include optic nerve involvement, choroidal infiltration and extraocular extension. Histopathological risk factors include infiltration of lamina cribrosa, retrolaminar optic nerve, massive (>3mm) choroid, sclera, extra scleral tissue, iris, ciliary body and anterior chamber. [3,10,11,12]

Post enucleation presence of these high-risk factors warrants a need for adjuvant treatment in form of chemotherapy +/- radiotherapy. Adjuvant treatment can

significantly reduce the incidence of distance metastasis, which is the most common cause of mortality in cases of retinoblastoma. [5,7]

SUBJECTS AND METHODS: In a retrospective consecutive case series of total 406 patients with secondary enucleation were identified. In these patients at baseline clinical evaluation presence of clinical high-risk factors such as proptosis, prephthisical changes, sterile orbital inflammation, orbital cellulitis, buphthalmos, corneal oedema, secondary glaucoma, AC seeds, pseudo-hypopyon, hyphema, neovascularisation of iris, ectropion uvea, cataract and ciliary body infiltration were identified. After MRI and cytology of bone marrow, cerebrospinal fluid to rule out distant metastasis, these patients were treated with 6 cycles of neoadjuvant chemotherapy including vincristine, etoposide and carboplatin along with focal therapy in form of transpupillary thermotherapy, cryotherapy and periocular topotecan injections. After completion of 6 cycles clinical response was re-evaluated and MRI was repeated. In cases with suboptimal response secondary enucleation was done and histopathological high- risk factors such as infiltration of lamina cribrosa, retrolaminar optic nerve, massive (>3mm) choroid, sclera, extra scleral tissue, iris, ciliary body and anterior chamber were identified. Those cases with histopathological high-risk factors received further adjuvant treatment in form of chemotherapy and cases with extraocular extension received external beam radiotherapy in addition to chemotherapy. (6,7) Outcomes were noted in form of morbidity and mortality.

RESULTS: Out of 406 cases that underwent secondary enucleation clinical high-risk factors (CRF) were present in 243 (60%) cases and in 163(40%) there was no CRF at baseline. Out of these 243 cases with CRF, AC seeds were seen in 22(9%), sterile orbital inflammation in 32(13%), secondary glaucoma in 39(16%) and NVI was present in 40(16%) cases. Histopathological high-risk factors were seen in total 122(30%) cases and 284 (70%) cases had no HRF. HRF was present in

91(37%) cases from total 243 cases who had baseline CRF, while only 31(19%) cases showed HRF from the total 163 cases which did not show any CRF on baseline. Out of 122 cases with HRF, there was infiltration of massive (>3mm) choroid in 56 (46%), retrolaminar optic nerve in 18 (15%), ciliary body in 26 (21%), Iris in 19 (16%), sclera in 10 (8%), extra scleral tissue in 13 (11%) cases.

So, 91 (37%) of CRF positive cases eventually had HRF on secondary enucleation but amongst all HRF positive cases baseline CRF was found in (76%) with p value <0.001. All HRF positive cases 122(30%) received adjuvant chemotherapy but only 10 (2%) required EBRT. Life salvage was found to be 98% (239) in CRF positive cases, 99% (162) in CRF negative cases, 96% (117) in HRF positive cases, 100% (284) in HRF negative cases and 99% (401) in overall cases.

DISCUSSION: Retinoblastoma is mostly a clinical diagnosis which is often supported by imaging modalities such as USG, CT scan and MRI. Clinical and radiological high-risk factors often alert the clinician and warrants a need for multimodal management protocol. But histopathology still remains most definitive diagnostic modality to ascertain high-risk factors, based on which further adjuvant management can be planned.

Previously published few studies have documented the correlation between clinical and histopathological high-risk factors. As per study by Shields et al of 289 eyes in 1993, clinical high-risk features included were exophytic growth pattern (p=0.002), tumor thickness > 15 mm (p=0.01), vitreous haemorrhage (p =0.05) and iris neovascularization (p=0.02). [11,12] In 2008, Chantada et al, studied 182 cases and reported glaucoma (P=0.025) and buphthalmos (P=0.00017) as clinical high-risk factors. [2] In another study by Gupta et al in 2009, the clinical features predictive of high-risk retinoblastoma included age >2 years (P = 0.01) and iris neovascularization (P = 0.007). [3] Kashyap et al in 2012 published age >2 years at presentation, duration of symptoms >3 months, hyphema, staphyloma, and orbital cellulitis as clinical high-risk factors. [9] In another study by Chawla et al in 2012 suggested that, neovascularization of iris, raised IOP, shallow anterior chamber,

and tumor volume correlated well with high-risk histopathology. [4] In a study on 403 eyes by Kaliki et al in 2015 concluded, clinical features predictive of high-risk retinoblastoma included prolonged duration of symptoms >6 months (p=0.008) and secondary glaucoma (p=0.021). [8] In our study we found AC seeds, sterile orbital inflammation, secondary glaucoma and iris neovascularisation as clinical high-risk factors which were correlated on histopathology (p=0.001).

For, histopathological high-risk factors previously published almost all studies suggested choroidal invasion as most common high-risk factor. Gupta et al in 2009 published that choroidal invasion was seen almost in 40% of cases in his study and all of them received adjuvant therapy after which life salvage rate was 96.4%. [3] In a study by Kashyap et al in 2012, Kaliki et al in 2015 and Brennan et al in 2016, choroidal invasion and optic nerve invasion were most frequently observed histopathological high-risk factors. [8,9] In a study by Kaliki et al and Brennan et al life salvage rate was 95% and 98.1% respectively. [8] As per Alkatan et al in 2020 optic nerve invasion was the most common histopathological high-risk factor with a life salvage 95.2%. [1] In our study choroidal invasion (46%) was the most common histopathological high-risk factor, all the patients with histopathological high-risk factors received adjuvant treatment following which life salvage rate was observed to be around 99%.

To conclude, clinical high-risk factors can predict histopathological high-risk factors. So, any retinoblastoma case should be examined with high index of clinical suspicion and MRI should be followed to look for radiological evidence of optic nerve, choroidal, extraocular or intracranial extension. All cases with histopathological high-risk factors should be aggressively treated with adjuvant therapy to reduce distance metastasis related mortality.

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This paper was judged as the BEST PAPER of Optics Refraction Contact Lens Session

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A STUDY OF BARRETT UNIVERSAL II (BU-II) VS SRK/T FORMULA TO CALCULATE IOL POWER USING IMMERSION ULTRASOUND BIOMETRY

PURPOSE:

To compare the refractive outcomes of SRK/T with the BU-II formula, which is a fourth-generation formula, by using immersion ultrasound biometry

STUDY DESIGN:

Cross-sectional analytical study

METHODS:

60 patients with age-related immature cataracts are randomized into two groups. All patients underwent a complete ocular examination including BCVA, IOP measurement, slit lamp examination and fundoscopy. Biometry IOL power calculations using A-scan ultrasound by immersion method were performed using the Barrett Universal II and the SRK/T formulas. Independent sample t-test was used to analyse the data.

RESULT:

There was a significant difference in postoperative obtained refractive error when IOL power was calculated using the Barrett Universal II formula ($p<0.05$).

CONCLUSION:

The Barrett Universal II formula provides a better predictability of IOL power calculation than the SRK/T formula.

CLINICAL IMPLICATION:

Clinically helpful for improving the refractive accuracy post-cataract surgery.

INTRODUCTION

Cataract surgery is considered a refractive procedure. So, estimating the intraocular lens (IOL) power accurately is crucial for cataract surgery refractive outcome. (1) One of the commonly used formulas, the Sanders, Retzlaff and Kraft/ Theoretical formula (SRK/T) formula that was introduced in 1990 is formulated as a combination of both regression and theoretical approach and is accurate, particularly in eyes with AL more than 27 mm.(2)

The Barrett Universal II (BU-II) formula, an updated version of the BU formula, was introduced in 2010 by Graham D Barrett and has shown promising results so far. (3, 4). Our study aimed to compare the predictive accuracy of refractive outcomes after cataract surgery using SRK/T and BU-II formulae.

MATERIALS AND METHODS

The study employed a cross-sectional analytical design, utilizing a sample size of 60 patients divided equally into two groups. Participants were randomly assigned to their respective groups through the use of random tables, ensuring unbiased selection. The study spanned a period of nine months, from October 2022 to July 2023, and was conducted within a tertiary hospital setting. Before commencing the research, informed consent was obtained from all participants, and the study protocol received institutional ethical clearance.

Patients above 50 years old and having an age-related, immature cataract confirmed by a LOCS III grading system were included in the study. Patients with

retinal or corneal pathologies like macular degeneration or corneal dystrophy, as well as the presence of traumatic, congenital, or complicated cataracts, glaucoma, squint (strabismus), and having significant corneal astigmatism exceeding 2.5 diopters according to keratometry measurements, were excluded from the study.

Patients were divided into two groups. Group S received IOLs calculated using the Sanders, Retzlaff and Kraft/Theoretical formula (SRK/T) formula. Group B, on the other hand, received IOLs calculated using the Barrett-universal-II (BU-II) formula. All patients underwent a comprehensive ocular examination, which included measurement of best corrected visual acuity (BCVA), intraocular pressure (IOP), slit lamp examination, and fundoscopy. Biometry and IOL power calculation were performed using A-scan ultrasound by immersion method (BIOMEDIX ECHORULE PRO) and Automated Refracto-Keratometer (TOPCON KR-800). The standard phacoemulsification procedure was performed on all patients using the CARL ZEISS VISALIS 100 PHACO MACHINE, with a 2.8mm incision and implantation of the Acryfold foldable intraocular lens (manufactured by Appasamy Ass., TN, India). A single surgeon performed the surgeries, and only uneventful surgeries were included in the study. The best corrected visual acuity was measured postoperatively at 6 weeks. The refractive error predicted versus obtained was tabulated, and both groups' outcomes were compared.

The study utilized Microsoft Excel 2019 for both data entry and analysis. To compare the average values between the two groups, an independent sample t-test was employed. Additionally, a Bland Altman plot was constructed to assess the level of agreement between two formulas used to calculate intraocular lens (IOL) power. Throughout the analysis, a p-value less than 0.05 was considered statistically significant.

RESULTS:

Among those 60 patients, 53% were female and 47% were male.

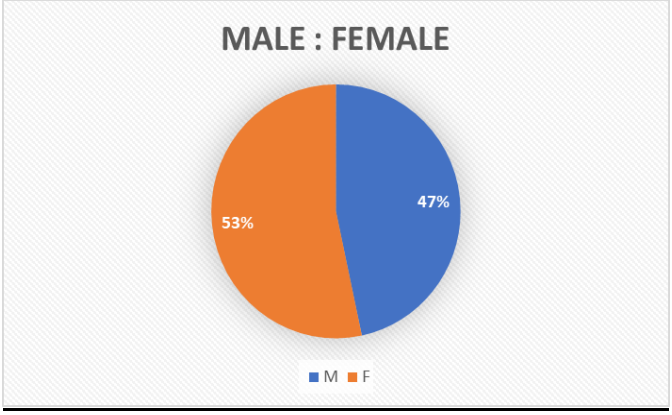


FIGURE :1 Sex Distribution

Table 1: Pre-operative demographics of the patients, including age, mean keratometry reading, and axial length

THE PRE OPERATIVE DEMOGRAPHICS	MEAN + SD Group S	MEAN + SD Group B
Age (years)	63.93 ± 0.97	63.70 ± 1.11
Mean keratometry reading (Diopters)	44.63 ± 0.28	43.60 ± 0.18
Axial length (mm)	22.44 ± 0.15	22.41 ± 0.12

The mean age of patients in Group S was 63.93 years old and in Group B was 63.70 years. The mean keratometry reading in Group S was 44.63 D and in Group B was 43.60 D, and the mean axial length was 22.44 mm in Group S & 22.41 mm in Group B. The standard deviations for all three measures were relatively small, indicating that there was not a lot of variability within the sample.

Table 2. Comparing Predicted error vs Obtained error in both the groups

	SRK/T	Barrett Universal II	P VALUE
PREDICTED ERROR (D)	0.14 ±0.01	0.13 ± 0.01	0.19
OBTAINED ERROR (D)	0.97 ± 0.11	0.65 ± 0.08	0.01

Groups S and B had mean predicted errors of 0.14D and 0.13D, respectively, with a p-value >0.05, indicating no significant difference. Groups S and B had mean obtained errors of 0.97D and 0.65D, respectively, with a p-value <0.01, indicating a significant difference

Table 3. Comparing Mean of Predicted error vs Obtained error in Group S

SRK/T	PREDICTED ERROR	OBTAINED ERROR	P VALUE
MEAN ± SD(D)	0.14 ± 0.01	0.97 ± 0.11	0.01
CONFIDENCE INTERVAL	0.12 ± 0.17	0.74 ± 1.20	

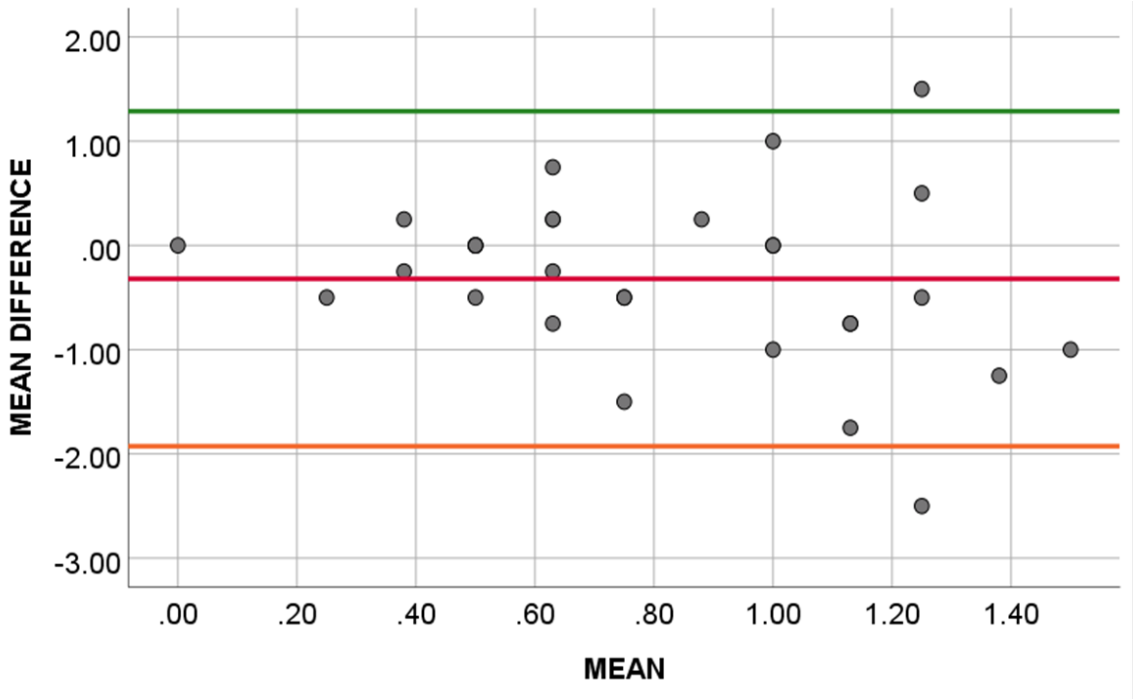
In group S the mean predicted error was 0.14 with the confidence interval 0.12 ± 0.17 & the mean obtained error was 0.97 with the confidence interval 0.74 ± 1.20, As the P value < 0.01 indicating that there is a significant difference between the two groups

Table 3. Comparing Predicted error vs Obtained error in Group B

Barrett Universal II	PREDICTED ERROR	OBTAINED ERROR	P VALUE
MEAN ± SD (D)	0.13 ± 0.01	0.65 ± 0.08	0.01
CONFIDENCE INTERVAL	0.10 - 0.16	0.48 - 0.83	

In group B the mean predicted error was 0.13D with a confidence interval of 0.10 - 0.16 & the mean obtained error was 0.65 D with a confidence interval of 0.48 - 0.83, As the P value < 0.01 indicating that there is a significant difference between the two groups

Fig 2. Bland Altman plot comparing both the formulae



BLAND-ALTMAN PLOT Shows the levels of agreement in both the groups is essentially equivalent

DISCUSSION

In this study despite a slightly higher mean age in Group S (63.93 years) compared to Group B (63.70 years), the overall measurements of keratometry and axial length showed high similarity between the groups, suggesting minimal variability within the sample. Both the mean predicted errors (0.14 D for group S, 0.13 D for group B) showed no significant difference ($p > 0.05$). However, the observed errors (0.97 D for group S, and 0.65 D for group B) were significantly different ($p < 0.01$).

Table 5: Comparing other similar studies

AUTHOR , YEAR OF STUDY	PLACE OF STUDY	TITLE	STUDY DEMOGRAPHICS	CONCLUSION
Present study	Alluri Sita Rama Raju Academy Of Medical Sciences , Eluru, Andhra Pradesh	A study of barrett – ii vs srk/t formula to calculate iol power using immersion ultrasound biometry	60 Patients	The Barrett Universal II formula provides a better predictability of IOL power calculation than the SRK/T formula

Demiana W. Aziz, Moataz H. Osman, Nihal A. Hassan, Nermeen M. Bahgat 2021	Cairo University Hospital , Egypt (Journal of the Egyptian Ophthalmological Society)	Evaluation of Barrett Universal II, SRK-T, and Haigis formulae for intraocular lens power calculation in myopes using optical biometry	34 patients	The study concluded that Barrett Universal II formula out performs both the SRK/T and Haigis formulas for highly myopic eyes
Kuthirummal, Nikhil; Vanathi, Murugesan; Mukhija, Ritika; Gupta, Noopur; Meel, Rachna; Saxena, Rohit; Tandon, Radhika	Dr Rajendra Prasad Centre for Ophthalmic Sciences, Delhi (Indian journal of ophthalmology)	Evaluation of Barrett Universal II formula for intraocular lens power calculation in Asian Indian population	244 patients	Barrett universal II performed as the most accurate formula in the prediction of post operative refraction over a wide range of Axial lengths

2020				
J skrzypecki et al. Poland 2020	Centre for Postgraduate Medical Education in Warsaw (Clinical Ophthalmology journal)	Immersion biometry for intraocular lens power calculation with Fourth-generation forumulas	50 patients	Fourth-generation formulas combined with immersion ultrasound produced similar results to 3rd generation formulas. However, the percentage of eyes within 1D of target refraction remains inferior to previously reported results for optical biometry measurements.

Ronald B Melles , Jack T Holladay , William J Chang (2018)	Redwood City Medical Center, Redwood City, California. (American Academy of Ophthalmology)	Accuracy of Intraocular Lens Calculation Formulas	Retrospective consecutive case series. 18501 eyes	Overall, the Barrett Universal II formula had the lowest prediction error for the 2 IOL models studied.

A study done by Demiana W. Aziz et al. compared Barrett Universal II, SRK-T, and Haigis formulas in 34 highly myopic patients using optical biometry. They concluded that Barrett Universal II outperformed both SRK/T and Haigis for this specific population.A larger study done by Kuthirummal et involving 244 patients compared Barrett Universal II with various other formulas across a wide range of axial lengths. They found that Barrett Universal II performed the most accurately, demonstrating its effectiveness in diverse scenarios. Our study compared the Barrett Universal II and SRK/T formulas in 60 patients using immersion ultrasound biometry. They found that the Barrett Universal II formula provided better predictability of IOL power.

While immersion ultrasound biometry was employed in this study, the BU-II formula for IOL power calculation more commonly utilizes optical biometry to assess ocular parameters which could be a main limitation of this study. Further studies comparing the refractive outcome fourth generation formulae using ultrasound and optical biometry are required.

In conclusion, the Barrett Universal II formula demonstrates superior predictability in IOL power calculation compared to the SRK/T formula. This improved accuracy translates to a clinically significant impact, potentially enhancing refractive outcomes and reducing the need for postoperative refractive

adjustments following cataract surgery. With its increased precision, the Barrett Universal II formula holds promise for optimizing visual outcomes and further advancing the field of cataract refractive surgery.

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This paper was judged as the BEST PAPER of Orbit & Oculoplasty Session

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EVALUATION OF COLLAGEN MATRIX IMPLANT IN OCULAR SURFACE RECONSTRUCTION FOR SYMBLEPHARON-PILOT STUDY

INTRODUCTION

Symblepharon is a partial/complete adhesion of the palpebral conjunctiva to the bulbar conjunctiva. Symblepharon release and mainly due to increased failure rates and recurrence of symblepharon even with use of intraoperative mitomycin C application paired with AMG/MMG. Use of antifibrotic agents has been tried with an aim to reduce recurrence but is associated with potential side effects like corneal melt and scleral necrosis. Collagen matrix is composed of biodegradable lyophilised type I atelocollagen and glycosaminoglycans which due to its porous structure results in random orientation of extracellular matrix and acts as a spacer, reducing scar formation. So it could be used to modify scar formation in symblepharon.

METHODS

Patients:-. This was a prospective interventional pilot study conducted at RP Centre of ophthalmic sciences, AIIMS, New Delhi from August 2021 to June 2023. This study was approved by Institute Ethics committee, AIIMS, New Delhi .The clinical data including demographic details, previous surgery, visual acuity (VA), outcome

of surgery, and complications were noted for all patients. All patients presenting to RPC, AIIMS, New Delhi with symblepharon secondary to chemical injury were evaluated for inclusion in the study. Patients with moderate to severe symblepharon willing to take part in the study with more than or equal to grade 2 symblepharon (3 and 4 grades of the length of symblepharon and b and c grades of the width of symblepharon)were included in the study.

Pre-op forniceal depth of both eye was noted. Lagopthalmnos and entropion if present was noted in all cases. Symblepharon was graded as per previously published grading as grade I, II, III and IV according to length and a,b,c according to width. Grading of symblepharon as proposed by Kheirkhah et al was used in our study. In our study moderate symblepharon was defined as grade 2b/2a with canthal involvement and severe symblepharon was defined as grade 3b/3a with canthal involvement or Grade 4.

SURGICAL TECHNIQUE

All surgeries were performed by a single surgeon. Standard steps of ocular surface reconstruction were followed. Collagen matrix implant (ologen) was placed on sclera more than 12 mm from limbus betwwn the 2 recti muscle with the help of pre-placed 6-0 vicryl sutures. Mucous membrane graft was harvested and mucous membrane graft and amniotic membrane graft was applied as discussed in previous studies.

A symblepharon ring will be placed and a suture tarsorrhaphy will be done in cases of severe symblepharon with 6-0 silk sutures using plastic pegs. After surgery, the tarsorrhaphy and anchoring sutures will be removed after 3 weeks. Symblepharon ring will be kept till 6-8 weeks post op or till the time of spontaneous extrusion which ever is shorter. All patients will receive topical antibiotics for 3 weeks and topical steroids in tapering doses for 3 months.

Post-op visits:- Postoperatively, patients will be seen on post day 1; 2 weeks; 2 months and 3 months and then as needed. Parameters like Visual acuity, extraocular movement, ocular surface congestion, eyelid closure, entropion will be evaluated at each visit. Ability to wear prosthesis and dry eye work up was done at 2 months, 3months, 6 months and 1 year follow up visit.

Outcome measures

A. Surgical success was defined as restoration of forniceal depth with at least a 30% depth correction. It was further categorised as:-

Excellent :- Restoration of 75%-100% of depth correction

Good :- Restoration of 60-75% of depth correction

Poor :- Restoration of 30-60% of depth correction

Recurrence- Decrease in the forniceal depth at 6 months by more than 2 mm of the 3 month value.

Surgical Failure- Depth correction was less than 30%,

Depth correction being defined as

Post-op forniceal depth at 3 months – Pre-op forniceal depth * 100

Normal Forniceal depth- Pre-op forniceal depth

Statistical analysis:- Data were coded and recorded in MS Excel spreadsheet program. SPSS v23 (IBM Corp.) was used for data analysis. Descriptive statistics were elaborated in the form of means/standard deviations and medians/IQRs for continuous variables, and frequencies and percentages for categorical variables. If data were found to be non-normally distributed, appropriate non-parametric tests in the form of Wilcoxon Test were used. Chi-squared test was used for group comparisons for categorical data. In case the expected frequency in the contingency tables was found to be <5 for >25% of the cells, Fisher's Exact test was used instead. Linear correlation between two continuous variables was explored using Pearson's correlation (if the data were normally distributed) and Spearman's

correlation (for non-normally distributed data). Statistical significance was kept at $p < 0.05$.

RESULTS

Serial No.	Age	Sex	Laterality	Upper / Lower lid	Grade of severity	Pre-op avg forniceal depth (mm)	Post-op avg forniceal depth(3 MO)	% depth correction	Outcome	Pre-op VA	Post-op VA
1.	29	M	R	UL,LL	SEVERE	0	13	86.7	Excellent	FCCF	5/60
2.	11	M	L	UL,LL	SEVERE	4	11	87.5	Excellent	PL+	PL+
3.	6	M	L	UL,LL	SEVERE	0	9	69.2	Good	NO PL	NO PL
4.	10	M	R	UL,LL	MODERATE	5	14	100.0	Excellent	6/36-6/18	6/18
5.	10	M	L	UL,LL	MODERATE	4	12	80.0	Excellent	2/60	2/60
6.	21	M	L	UL,LL	SEVERE	8	11	50.0	Poor	HMCF	6/24
7.	23	M	L	UL	MODERATE	2	12	80.0	Excellent	PL+	PL+
8.	31	M	R	UL	MODERATE	3	11	90.9	Excellent	PL+	PL+
9.	28	M	R	UL	MODERATE	6	12	85.7	Excellent	6/60-6/12	6/60-6/12
10.	10	M	L	UL,LL	MODERATE	12	17	83.3	Excellent	FCCF	FCCF

The study included 10 eyes of nine patients(9 Males) with average mean age of 17.90 years(Range 6-31 years). The cause of symblepharon was chemical injury sequelae in all patients due to limestone(n=8), acid (n=1) and cement (n=1). Both upper lid and lower lid was involved in 7 eyes(70%) and only upper lid involvement in 3 of the eyes. (30%). 4 eyes had moderate symblepharon (40%) while 6 eyes had severe symblepharon (60%). Mean duration between injury and surgery was 7.68 years (Range- 0.67-20 years) and the average number of previous surgeries the patients had undergone was 1.69 (range 0-5) and 80% of the patients had undergone previous surgeries in the form of symblepharon lysis

with amniotic membrane graft and mucous membrane graft. The average length of collagen matrix implant applied per quadrant of fornix was 5.8 mm.

After surgery patients were followed up for 12 months and The mean percent depth correction achieved in the upper lid was 78.32% and in lower lid was 74.47%. There was no recurrence of symblepharon at 6 months among the sample size. There was no failure among the sample size. The outcomes of moderate symblepharon were better than the severe symblepharon. The upper middle fornix achieved the best correction.

The mean Upper Middle forniceal depth increased from 4.40 mm (3.66) at the Pre-Operative timepoint to 12.20 mm(2.15) at the 3 Months timepoint, and then decreased to 11.40 mm(1.96) at the 6 month timepoint. This change was statistically significant (Wilcoxon Mann Whitney test, $p = 0.002$).

The overall change in Lower Middle forniceal depth over time was compared in the two groups using the Generalized Estimating Equations method. There was significant difference in the trend of Lower Middle forniceal depth over time between the two groups ($p < 0.001$).

The anatomical outcomes were excellent in 58% of the quadrant, good in 25% of the quadrants and poor in 17% of the quadrants. 2 patients also had significant improvement of visual acuity from FCCF, PR accurate to 5/60, PR accurate and HMCF, PR accurate to 6/24, PR accurate at 6 months follow up. The mean TBUT (s) increased from a minimum of 5.10 s at the Pre-Operative timepoint to a maximum of 9.10 s at the Post-Operative timepoint. This change was statistically significant (Wilcoxon Test: $V = 5.0$, $p = 0.043$). The mean NEI - Cornea decreased from a maximum of 9.20 at the Pre-Operative timepoint to a minimum of 5.60 at the Post-Operative timepoint. This change was statistically significant (Wilcoxon Test: $V = 54.0$, $p = 0.007$). The mean NEI - Conjunctiva decreased from a maximum of 9.60 at the Pre-Operative timepoint to a minimum of 6.20 at the Post-Operative timepoint. This change was statistically significant (Wilcoxon Test: $V = 28.0$, $p = 0.022$). 2

(20.0%) patients had improvement of ptosis but this was not statistically significant (McNemar's test: $\chi 2 = 2.000$, $p = 0.157$). 1 (10.0%) patients had improvement of entropion from grade 1 to zero. The overall change in Entropion was not statistically significant (Stuart-Maxwell test: $\chi 2 = 1.000$, $p = 0.607$).

COMPLICATION

There were no complications in the post-op period that could be attributed to the collagen matrix. 1 patient had orbital cellulitis in the post op period that was controlled with topical and systemic antibiotics. 2 patients had ptosis, 2 patients had ectropion of the lower lid in the post-op period for which further surgeries have been done. 3 patients had pyogenic granuloma near the medial fornix which was subsequently excised

DISCUSSION

Symblepharon is a partial or complete adhesion of the palpebral conjunctiva to the bulbar conjunctiva, Symblepharon release with ocular surface reconstruction has variable outcomes especially in cases of moderate to severe symblepharon even with multi-faceted approaches to treat , like symblepharon release with amniotic membrane graft and mucous membrane graft with mitomycin C application. Recurrence rate of symblepharon release with AMG + MMG with MMC was found to be 14.3% to 66.7% for moderate-severe symblepharon in various studies. Treatment of mild symblepharon with AMG showed a recurrence rate of 33.3% and treatment of symblepharon due to recurrent pterygium surgery treated with AMG with conjunctival autograft showed a recurrence rate of 53% and AMG with conjunctival limbal autograft showed a recurrence rate of 25%. Thus, there is no consensus regarding the treatment of symblepharon and most patients are subjected to multiple surgeries in view of recurrences and there is need for newer modalities for treatment of symblepharon in view of its high recurrence rates even with multiple surgeries.

The rationale for use of collagen matrix implant in the fornix was for it to act as a barrier for ingrowth of scar tissue from the fornix that causes recurrence. The basic principle by which it acts is because of its porous structure with pores measuring between 10-300 microns forms a dry form scaffold providing irregular seeding space for fibroblast preventing the formation of dense connective tissue. Furthermore, the collagen matrix implant acts as reservoir and helps in the mechanical separation of episcleral and conjunctival surfaces limiting the adhesions. The collagen matrix implant degrades in 90-180 days but its long term benefit is explained by the following mechanism. The myofibroblast proliferate inside the pores of the collagen matrix which following the degradation of the collagen matrix leaves behind a loose matrix that is randomly oriented collagen fibres (confirmed by polarised light micrography-Discontinuous birefringence) compared to the linear orientation of collagen fibres in scar tissue(Continuous birefringence in polarised light micrography). Also, the glycosaminoglycans (in the collagen matrix has been shown to inhibit wound contraction. The 2.6% dermatan sulphate present in the collagen matrix delays degradation of collagen and thus prevents wound contraction

Pathogenesis of symblepharon forms a vicious cycle with symblepharon leading to dry eye which further increases ocular inflammation and fibrosis. The causes of dry eye in symblepharon can be due to

Dry eye due to interruption of tear flow and spread.

Blockage of lacrimal gland ducts

Blink related microtrauma resulting from irregular tarsal surface

Cicatricial entropion/ misdirected lashes

Untoward exposure because of inadequate blinking and closure or limitation of Bell's phenomenon

Symblepharon at 12 'O' clock and 6 'O' clock position destabilises the tear film by disrupting the formation of adequate tear meniscus.

Dissection of adhesion between conjunctiva restores ocular motility and cures diplopia. This results in improved tear circulation and lubrication of eye surface with normal eye movements. A normal deep fornix is restored that results in

Sufficient tear reservoir contributing to the formation of tear meniscus

Friendly contact between lid margin and globe during blinking and closure

Free range of ocular motility

Visual acuity also is expected to improve because of decreased astigmatism due to traction release. The adjoining corneal adhesions are also removed which helps in the restoration of normal corneal clarity if intact palisades of vogt are present.

The symblepharon release with collagen implant thus works in manifold ways to restore the ocular surface and in our pilot study has shown to restore atleast 70% of the forniceal depth in all the quadrants with an average of 58% of excellent outcomes and no failures or no recurrences in the follow up period of 6 months with better results in severe symblepharon.

Therefore we can conclude that ocular surface reconstruction with collagen matrix implant is a viable alternative for moderate symblepharon but needs with excellent short term outcomes.

Long term outcomes need to be evaluated further in a larger sample size and cost benefit analysis with MMC should be done in further comparative studies

This paper was judged as the BEST PAPER of Pediatric Ophthalmology Session

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EFFECT OF LOW DOSE ATROPINE ON CHOROIDAL THICKNESS IN CHILDREN WITH MYOPIA PROGRESSION

ABSTRACT:

Purpose: To study the effect of low dose atropine (0.01%) on choroidal thickness in children with myopia progression and to compare the rate of myopia progression in cases (patients treated with low dose atropine0.01%) versus controls (patients treated with placebo eyedrop) in terms of changes in spherical equivalence, axial length, BCVA and choroidal thickness at presentation and subsequent follow ups. Study design: A prospective case control interventional study was conducted in the department of ophthalmology at a tertiary eye care centre in eastern India. Materials and methods: A total of 87 children aged 5-16 years with bilateral progressive myopia were recruited and randomly assigned into 2 groups. Spherical equivalence, axial length (AXL) and choroidal thickness (sub-foveal and at 1500 and 3000 microns nasal and temporal to fovea) were documented at baseline,1 month,3 months and 6 months.44 children in group A received treatment with once daily dosing of 0.01& atropine at bedtime, while 43 children in group B received a placebo eyedrop. Results: Children in group A showed a significant increase in overall choroidal thickness at 3 and 6 months (11+/-9.67) and (18+/-13.43) microns respectively, which showed a significant

correlation with decrease progression of myopia (in terms of spherical equivalence and axial length). Conclusion: Low dose atropine induced a significant choroidal thickening effect which was associated with slower progression of myopia in the treatment group.

KEY WORDS:

ChT = choroidal thickness, BCVA = best corrected

visual acuity, AXL = axial length, SE = spherical equivalent, IOP = intraocular pressure, OCT Optical coherence tomography, EDI-OCT: Enhanced depth imaging OCT, RPE: Retinal pigment epithelium,

INTRODUCTION:

There is an unprecedented global increase in the prevalence of myopia causing major public health problems.[1] It has been estimated that by 2050, almost 50% of the world population will suffer from myopia. [2,3] Control of myopia progression is of utmost importance because of concerns regarding significantly increased risks of pathological myopia and its aftermath. There are several optical and surgical modalities of myopia correction, but these measures have no role in halting myopia progression. Various methods to control myopia progression include progressive addition executive bifocal lenses, peripheral defocusing lenses, contact lenses, orthokeratology, multifocal soft contact lenses, increasing outdoor activities, and few pharmacological agents. [4,5,6] Topical atropine in myopia control dates back to history, with early studies by Bedrossian et al, Kelly et al, Gimbel et al and Yen et al. [7.8.9.10] Topical atropine delays myopia progression and axial elongation in a dose-dependent manner through non-accommodative mechanisms. Gong et al. opined that the efficacy of atropine is concentration independent (0.01% to 1% atropine have same efficacy), whereas the adverse effects are concentration dependent.[11] Atropine has been shown to increase choroidal thickness in children through modulation of dopamine release, by

binding to the muscarinic Ach receptors and this has been correlated with a reduction in axial elongation and thus myopia progression.[12] It has also been postulated that the up- and down-regulation of retinal and scleral muscarinic receptors have an influence on the scleral matrix. The scleral muscarinic receptors are known to modulate the function of scleral fibroblasts and interfere with the scleral remodelling that accompanies progressive myopia. [12,13] On the other hand, a non-muscarinic and a direct influence of atropine on the scleral fibroblasts is also evident. Atropine is said to be directly acting on sclera and might play a possible mechanism in inhibiting glycosaminoglycan production and, thus elongation and growth of eyeball. [13,14] Therefore, atropine functions at a relatively lower dose, through M1/M4 receptors in the retina. [14,15] The actual mechanism may include a combination of the abovementioned effects. The choroid is a highly vascular tissue that provides nutrition to the retina, regulates intraocular pressure (IOP), modulates ocular temperature, absorbs light absorption and regulates ocular growth. [16,17] Choroidal thickness (ChT) changes in response to retinal defocus, and this interaction is found to be linked to myopia and its progression. [17,18] Changes in choroidal thickness has been seen to occur in a number of chorio-retinal disorders like age related macular degeneration, polypoidal choroidal vasculopathy, central serous chorioretinopathy, diabetic retinopathy, posterior uveitis, inherited retinal diseases and glaucoma. [17,18,19] Enhanced depth Imaging OCT (EDI-OCT) allows improved visualization of the choroido-scleral junction and enables measurement of the choroidal thickness. Sub-foveal choroidal thickness is the distance between the outer border of the hyperreflective retinal pigment epithelium (RPE) and the inner edge of the hypo-reflective suprachoroidal space, measured by drawing a line vertical to a line tangential to the foveal contour. Sub-foveal choroidal thickness is influenced by age, gender, axial length, IOP and systolic blood pressure. [19,20]

MATERIALS AND METHODS:

This was a prospective single blind interventional case control study conducted at the department of ophthalmology in a tertiary eye care hospital. The study is in accordance to the principles of Declaration of Helsinki and was approved by the ethical committee. All the participants and their parents gave their informed consent before the study. 110 participants (55 cases and 55 controls) aged 5-16 years with bilateral progressive myopia were recruited out of which 44 cases and 43 controls included and the rest participants were excluded as per the exclusion criteria. We excluded patients who were allergic or hypersensitive to atropine, had a poor compliance to atropine use, patients with any systemic diseases, with astigmatism >2D, with uniocular progressive myopia, patients using other forms of anti-myopia therapies earlier (orthokeratology/any dose of atropine/pirenzepine), with any retinal pathology or other ocular morbidities and the patients who were lost to follow up at subsequent follow up visits. All the total 87 children were randomly assigned into 2 groups (Gr A: 44 children and Gr B: 43 children) and the participants were unaware of group assignment (single blind). 88 eyes of 44 children in group A received once daily dosing of 0.01% atropine at bedtime, while 86 eyes of 43 children in group B received once daily dosing of a placebo eyedrop at bedtime. The study participants underwent comprehensive ocular examination before carrying out the study, including best corrected visual acuity (BCVA), cycloplegic refraction using 1% atropine, axial length (AXL) measurements using IOL master 500, slit-lamp examination, dilated fundoscopy, and optical coherence tomography (OCT+HRA Spectralis -Heidelberg). All the participants were examined at the same time of day to minimize the influence of circadian fluctuations on choroidal thickness. Spherical equivalence was calculated as a sum of spherical power plus half of the cylindrical power. Sub-foveal choroidal thickness and choroidal thickness at 1500 and 3000 microns from the centre of fovea were documented in all the four quadrants (superior, inferior, nasal and temporal) at baseline,1 month,3 months and 6 months. All the participants were

followed up for a minimum duration of 6 months. All the measurements were done by a single observer to minimise inter-observer variability.

STATISTICAL ANALYSIS:

The presentation of the categorical variables was done in the form of number and percentage (%). On the other hand, the quantitative data with normal distribution were presented as the means ± SD and the data with non-normal distribution as median with 25th and 75th percentiles (interquartile range). The data normality was checked by using Shapiro-Wilk test. The cases in which the data was not normal, we used non parametric tests. The comparison of the variables which were quantitative and not normally distributed in nature were analysed using Mann-Whitney Test and variables which were quantitative and normally distributed in nature were analysed using independent t test. Paired t -test/Wilcoxon signed rank test was used for comparison across follow up. The comparison of the variables which were qualitative in nature were analysed using Fisher's exact test as at least one cell had an expected value of less than 5. The data entry was done in the Microsoft EXCEL spreadsheet and the final analysis was done with the use of Statistical Package for Social Sciences (SPSS) software, IBM manufacturer, Chicago, USA, ver 25.0. For statistical significance, p-value of less than 0.05 was considered statistically significant.

RESULTS:

The mean ages were comparable in cases and control groups (10.91+/-2.81 in cases and 10.93+/- 2.82 in controls). There was a slight female preponderance in both the case and control groups, but this was not significant. A significant reduction in mean spherical equivalence (0.5D and 0.88 D) and axial length (0.21 mm and 0.32 mm) were noted in the cases group as opposed to significant increase in the mean spherical equivalence (0.75 D and 0.87 D) and axial length (0.52 mm and 0.74 mm) in the control group at 3 and 6 months of follow up (table1 and 2

respectively). Low dose atropine (0.01%) significantly increased the sub-foveal choroidal thickness (3.05 microns and 5.02 microns) as well as choroidal thickness in all four quadrants in cases at 3 and 6 months of follow up respectively whereas sub-foveal choroidal thickness (2.51 and 6.09 microns) and choroidal thickness in all quadrants showed significant thinning in controls at 3 and 6 months follow ups (table 3). A significant improvement in BCVA was noted in cases (from 0.2 to 0 log MAR) as compared to a significant decrease in BCVA in controls (from 0 to 0.25 log MAR) at final follow up (table 4). None of the study participants had any adverse effects following atropine use.

DISCUSSION:

Atropine suppresses the pre-junctional M2 and M4 muscarinic receptors on cholinergic-nitrergic nerve terminals in the choroid and thus modulates a vasodilatory response in ocular blood vessels through the neural nitric oxide pathway. This in turn, influences choroidal thickness changes and ocular growth.[21] While higher concentrations of atropine lead to development of a "Rebound phenomenon" along with enhanced myopia progression in children 12 months after cessation of the therapy, lower concentrations of atropine are usually devoid of such effects. [22] In the ATOM 2 study, patients treated with 0.01% atropine had less rebound phenomenon and better response to treatment.[23] At five years follow up, these patients had less myopic progression in ATOM 2 study. [24,25] In a study by Gong et al, they found that after 3 months of using 0.01% atropine eye drops, only the sub-foveal ChT increased continuously during the 12 months follow-up.[26] The LAMP study, a double-blinded, randomized, placebo-controlled trial was conducted to evaluate the efficacy and safety of low concentration atropine 0.05%, 0.025%, and 0.01% daily. At 1 year follow up, the mean SE change was −0.27 (0.61) D, −0.46 (0.45) D, −0.59 (0.61) D, and −0.81 (0.53) D, respectively. The mean AXL change after 1 year was 0.20 (0.25) mm, 0.29 (0.20) mm, 0.36 (0.29) mm, and 0.41 (0.22) mm, respectively. LAMP study noted a

clear concentration-dependent response as 0.05% atropine was most effective for controlling myopia progression and axial elongation whereas 0.01% atropine caused 12 % reduction in axial length as compared to that of the placebo group, along with 27% reduction in mean myopia progression. The side effects were minimal and low doses of atropine were found to be well tolerated. [27] In a study by Ye et al, 0.01% atropine caused an initial increase in choroidal thickness at 3 months follow up, whereas it caused a decrease in ChT after 6 months of treatment.[28] In our study low dose atropine (0.01%) significantly retarded myopia progression by reducing axial length and spherical equivalence as well as increasing the choroidal thickness in children with myopia progression at 3 and 6 months follow up. Few studies including ours have shown significant increase in choroidal thickness and reduced axial elongation with low dose atropine use, thus causing retardation of myopic progression. None of the patients had any adverse effect related to the drug in the present study.

Limitations of our study: Our study has a fairly small sample size and lesser duration of follow up. We did not take into account the other risk factors for myopia progression like duration of near work and time spent on outdoor activities into consideration in our study. Measurement of pupil size, accommodation amplitude, CCT and ocular blood flow were not done in the study participants.

CONCLUSION:

Low dose atropine (0.01%) was found to be effective in retarding myopia progression in children aged 5-16 years by increasing the choroidal thickness, decreasing the axial elongation of eyeball and spherical equivalence as well as improving the BCVA with no significant adverse events. There is a need for further studies with larger sample size, longer duration of follow up and correlation of changes in choroidal thickness with CCT, pupil size and IOP. There is also a need for studying the rebound in myopia progression after cessation of the drug and its correlation with different concentrations of atropine.

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Table1: Comparison of changes in spherical equivalence in cases versus

controls at presentation and subsequent follow up visits

Spherical equivalent(D)	Cases(n=88)	Controls(n=86)	Total	P value
At presentation	-6.5(-9.125--3.212)	-6.75(-9.5--3.25)	-6.75(-9.625--3.25)	0.348 §
At 1 month	-6.5(-9.125--3.212)	--6.75(-9.5--3.25)	-6.5(-9.625--3.25)	0.348 §
At 3 months	-6(-8.625--3)	-7.5(-10.5--3.312)	-6.75(-10--3.25)	0.026 §
At 6 months	-5.62(-8--3)	-7.62(-11.0--3.5)	-6.88(-9.938--3.152)	0.002 §

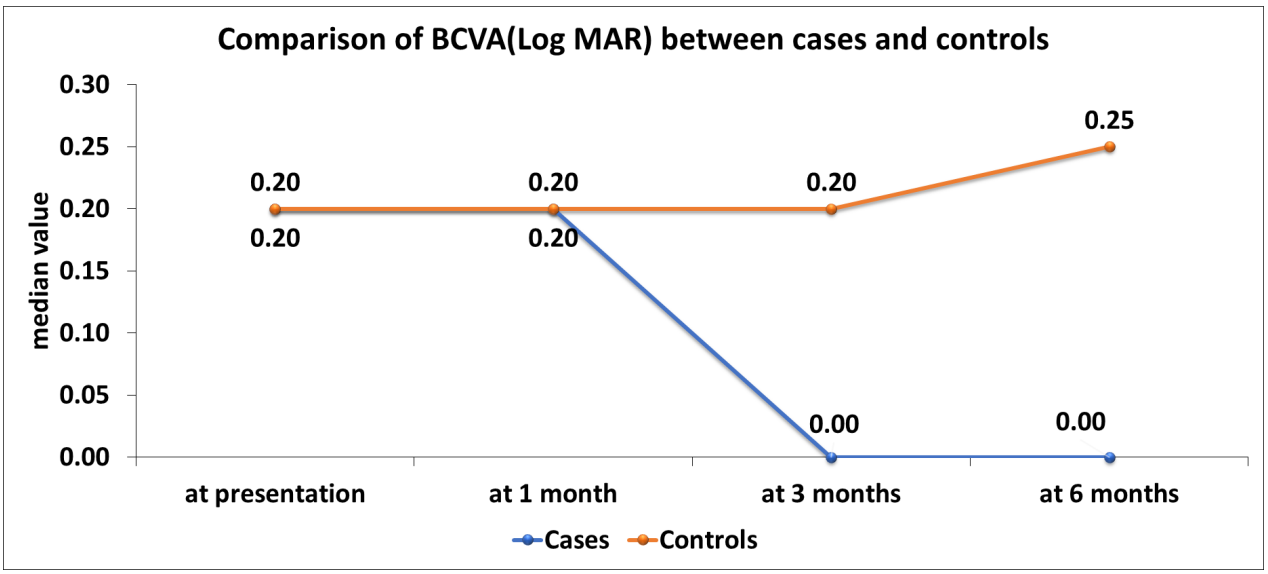
Table 2: Comparison of changes in axial lengths in cases versus controls at presentation and subsequent follow up visits

Axial length (mm)	Cases (n=88)	Controls (n=86)	Total	P- value
At presentation	**25.83 ± 1.76**	**25.87 ± 1.78**	25.96 ± 1.79	0.333‡
At 1 month	25.83 ± 1.76	25.87 ± 1.78	25.96 ± 1.79	0.333‡
At 3 months	25.62 ± 1.75	26.39± 1.89	25.91 ± 1.83	**0.036‡**
At 6 months	**25.51 ± 1.75**	**26.61 ± 1.89**	25.85 ± 1.84	**0.013‡**

Table 3: Comparison of sub-foveal choroidal thickness between cases and controls at presentation and subsequent follow ups

Sub-foveal choroidal thickness(microns)	Cases(n=88)	Controls(n=86)	Total	P - value
At presentation	**295.36 ± 37.63**	**295.27 ± 36.18**	292.84 ± 36.9	0.364‡
At 1 month	**296.25 ± 38.56**	**295.27 ± 36.18**	294.81 ± 37.57	0.115‡
At 3 months	**298.35 ± 37.53**	**292.76 ± 35.56**	292.58 ± 37.61	**0.018‡**
At 6 months	**300.38 ± 38.13**	**288.16 ± 34.04**	290.06 ± 37.52	**0.0002‡**

Table 4: Comparison of trend of BCVA (Log MAR) between cases and controls at presentation and follow ups



This paper was judged as the BEST PAPER of Squint Session

DR.ISHA GUPTA, M.NO:I20770

OUTCOMES OF VARIOUS SURGICAL APPROACHES TO STRABISMUS IN CONGENITAL FIBROSIS OF EXTRA OCULAR MUSCLES

INTRODUCTION

Congenital fibrosis of the extraocular muscles (CFEOM) refers to a subset of congenital cranial dysinnervation disorders (CCDDs). It is characterized by hereditary nonprogressive restrictive ophthalmoplegia, with or without blepharoptosis[i].CCDDs are primarily due to neurogenic disturbances of brain stem or cranial nerve development, causing secondary muscle fibrosis. Surgical intervention for CFEOM is challenging and technically difficult. Patients with indications for surgery, or their guardians, should be informed of the uncertainty of the surgical outcome and the need to undergo multiple procedures to obtain relatively satisfactory cosmetic outcomes[ii]. Stepwise strabismus correction should precede ptosis correction to avoid complication of exposure keratopathy as there is absence of Bell's phenomenon. The outcomes of surgical management of strabismus are an enigma. This interventional prospective study aims to evaluate and hence form a consensus of surgical approach to CFEOM by studying outcome of series of patients. The present study tried to focus on surgical management of phenotype appearance rather than looking at genetic classification.

PATIENTS AND METHODS

A Combined retrospective and prospective study was done between 2021 and 2023. Total of nine cases of CFEOM were recruited in the study and recession procedures were performed as per needs of case in one/two stage.

INCLUSION CRITERIA

i. Ptosis and hypotropia since birth
ii. Positive forced duction test (FDT).
iii. Unilateral and bilateral cases

EXCLUSION CRITERIA

iv. FDT negative
v. Previous ptosis surgery
vi. Acquired ptosis / MGJW ptosis
vii. Any other ocular surface disease/ orbital anomaly/orbital trauma

All patients underwent full ophthalmologic assessment. Neuroimaging was also done in case of associated neurological anomaly. Patients and/or parents were informed about the nature of CFEOM and differential diagnosis like myopathy. They were informed about the performance of FDT before surgery under general anesthesia (GA). They were informed that surgery on extraocular muscles would be performed only in case of positive FDT. They were informed about the stepwise approach treating squint first. If FDT was positive, the affected muscle was weakened using large recessions, hangback procedures, release and periosteal fixation of the muscles in one or two steps. The patients were resassesed at 2 weeks, 6 weeks and 12 weeks postoperatively.

STATISTICAL ANALYSIS

Data were analyzed with the Statistical Package for the Social Sciences (SPSS) version 16 (IBM Corporation, Armonk, NY). Data are presented as mean, SD. Paired sample t-test and $p< 0.05$ was considered significant.

RESULTS

Patient ages ranged from 7 to 15 years old with a mean age of 12.3 years. Six patients were male and three were female. All patients had had ocular deviation since birth. No strabismus or ptosis correction surgeries had been done before presentation. All patients had inferior rectus restrictive myopathy, severe ptosis with poor levator function and chin-up position. Lagophthalmos was present in 7/9 (77.7%) of the patients preoperatively. Mild to moderate visual impairment was found in 8/9 patients (88.8%) secondary to ptosis and error of refraction. Based on clinical signs and patterns of inheritance, all patients were diagnosed as CFEOM. Eight patient has exotropia and only one had esotropia as primary horizontal deviation. Minimum recession of the inferior rectus was 7 mm. two staged procedure was required in two patients. Mean postoperative angle of hypotropia was 13.7 PD with a high statistically significant difference from the preoperative angle. Mean residual exotropia was 18.1 PD which was statistically significant in eight cases. Mean postoperative MRD was 1.3 ± 0.8 mm. Ptosis improved in five of nine patients (55%). 3 patients improved with crutch glasses, while only one patient underwent frontalis sling surgery. Abnormal head posture improved with improvement in ptosis , with only one case manifesting newly acquired head tilt after surgery. Hangback recession gave a higher mean improvement than simple recessions (mean residual exotropia = 13.4 PD, hypotropia = 12.3PD).

DISCUSSION

The CFEOM spectrum includes unilateral as well as bilateral cases, and one muscle (IR) as well as more than one muscle affection. All the patients who presented to

us had bilateral disease. The hallmark of CFEOM is reduced movement of the eye away from the direction of action of the affected muscle, confirmed by FDT[iii]. The strict inclusion and exclusion criteria of our study helped us to diagnose CFEOM based on clinical assessment (phenotypical) rather than on genetic assessment (genotypical)[iv]. Strength of our study was a larger sample size in our population. Although we had a more conservative approach as compared to other studies wherein large recessions of more than 12 mm was taken as minimum[v]. Our conservative approach is supported by Taylor and Gregson, who stated that very large recessions may be ineffective in CFEOM with very unpredictable outcomes[iii]. Average improvement in our study(For bilateral CFEOM) was 16.4 pD of horizontal alignment and 18.9 pD of Vertical alignment (hypotropia) which was less than that in meta-analysis study conducted by Van Swol JM et al [vi]. Abnormal Head posture was minimal post-operatively in 55.55% cases. Maximal correction of the hypotropia angle resulted in improvement of lid position in 66% of the operated patients without need for further eyelid surgery. Crutch glasses had to be given in three patients to clear the visual axis.

The surgical approach should be tailored based on the variable clinical presentations of CFEOM, even within a family. There should be an alternative plan to cope with different forced duction test results and possible anatomic variations. The likelihood of stepwise rectus muscle surgery, to avoid anterior segment ischemia, should be considered.

CONCLUSION

Every case of CFEOM requires a bespoke approach with main aim to improve quality of life. This being a rare but hereditary disease, multiple family members will need surgical treatment. Overcorrection on table can give long term stable results. Surgeon should not shy away from maximal weakening procedure. Titrate using Forced duction test after every surgical step. Improving hypotropia is the

main objective as it secondarily improves ptosis and abnormal head posture. Patients should always be counselled for unpredictable results and multiple surgeries.

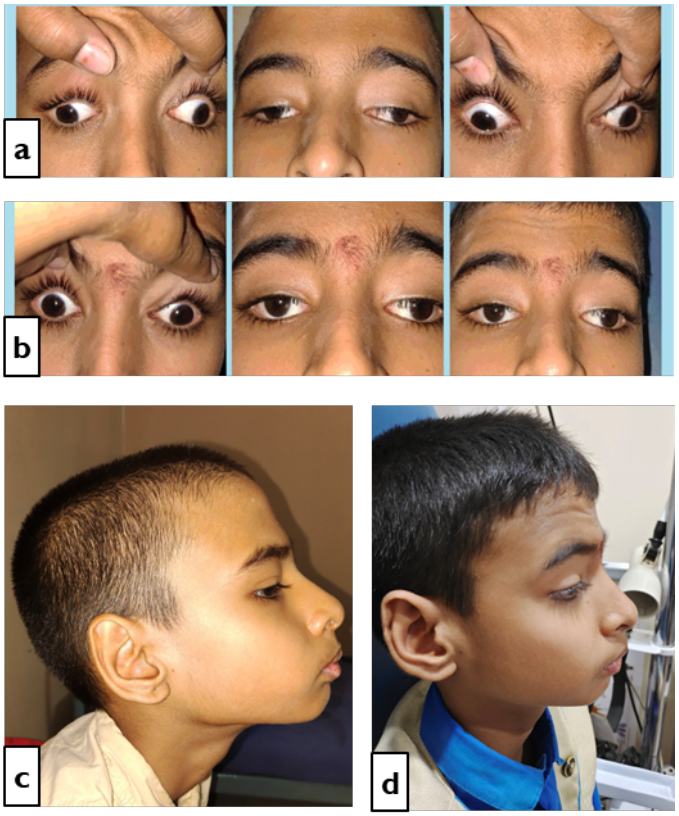


Figure 1 – a. Pre-operative gaze limitation and ptosis; b. post-operative gaze limitation and ptosis; c. pre-operative chin up AHP; d. post-operative minimal AHP

Table 1 – Surgical outcomes

Case	Pre-operative deviation	Surgical plan	Post operative residual deviation	Ptosis correction and Abnormal head posture
1	OU exotropia 40 pD + OU hypotropia 30 pD	OU LR recession 9 mm + OU IR Recession 8 mm	OU exotropia 20 pD + hypotropia 11 pD	Visual axis clear with minimal chin up AHP
2	OU exotropia 25 pD + OU Hypotropia 35 pD	OU IR recession hangback 10 mm	OU exotropia 25 pD + OU hypotropia 15 pD	Crutch glasses given to clear Visual axis , maintained moderate chin up AHP
3	OU exotropia 60 pD + OU hypotropia 28 pD	Stage 1 – OU LR hangback 12 mm Stage 2 – OU IR recession 7 mm	OU exotropia 25 PD + OU hypotropia 10 pD	Frontalis sling surgery with undercorrection to clear visual axis
4	OU exotropia 50 pD + OU hypotropia 25 pD	OU LR recession hangback 11 mm+ OU IR recession 7 mm	OU exotropia 18 pD + Hypotropia RE 10 pD LE 14 pD	Visual axis clear with minimal chin up AHP
5	OU exotropia 45 pD + OU hypotropia 25 pD	OU LR hangback 11 mm + OU IR Recession 8 mm	OU exotropia 20 pD + hypotropia 10 pD	Visual axis clear with minimal chin up AHP
6	OU exotropia 40 pD + OU hypotropia 24 pD	OU LR hangback 14 mm + OU IR Recession 8 mm	OU exotropia 15 pd + OU hypotropia 15 pD	Crutch glasses given to clear Visual axis , maintained moderate chin up AHP
7	OU esotropia 35 pD + OU hypotropia 35 pD	Stage 1 – OU MR recession 7 mm Stage 2 – OU IR recession 6 mm + RE periosteal fixation of LR	OU esotropia 12 pd + OU hypotropia 11 pD	Visual axis clear with minimal head tilt to right AHP
8	OU exotropia 40 pD + OU hypotropia 35 pD	OU LR recession 9 mm + OU IR hangback 12 mm	OU exotropia 12 pd + OU hypotropia 12 pD	Visual axis clear with minimal chin up AHP
9	OU exotropia 40 pD + OU hypotropia 30 pD	OU LR hangback 12 mm + OU IR hangback 10 mm	OU exotropia 15 pd + OU hypotropia 11 pD	Crutch glasses given to clear Visual axis , maintained moderate chin up AHP

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This paper was judged as the BEST PAPER of Trauma – I Session

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COMPARATIVE STUDY OF VISUAL OUTCOMES IN ENDOPHTHALMITIS WITH TRAUMATIC AND NON-TRAUMATIC ETIOLOGIES

INTRODUCTION:

Infectious endophthalmitis is a serious and uncommon condition that can lead to vision impairment, demanding immediate attention. The purpose of this study is to examine and compare the epidemiological, clinical, and microbiological characteristics of patients with infectious endophthalmitis, particularly focusing on the distinctions between traumatic and non-traumatic causes. The research took place at a Tertiary Eye Care Center located in rural tribal regions in western India.

METHODS:

A retrospective analysis was conducted using electronic medical records of patients diagnosed with endophthalmitis between January 2008 and December 2022. The treatment protocol involved the administration of the initial intravitreal injection and/or 23 g pars plana vitrectomy. All patients adhered to a specific follow-up format and schedule. Data were exported to an Excel sheet and analysed using SPSS-22, with no financial disclosures. The analysis encompassed descriptive and cross-tabulation functions.

RESULTS:

Among the 200 patients included in the study, 89 (45.5%) were diagnosed with non-traumatic postoperative (PO) endophthalmitis, while 111 (55.5%) had posttraumatic (PT) endophthalmitis. Males constituted the majority in both groups. The PT group consisted of notably younger individuals compared to the non-traumatic PO group.

At the time of presentation, the majority (94.2%) of patients had a best-corrected visual acuity (BCVA) of less than 1/60. The treatment outcomes varied depending on the aetiology, with 46 (23%) eyes experiencing an improvement to a BCVA of 6/60, and 29 (14.5%) eyes achieving a BCVA greater than 6/24.Additionally, 22 patients (11%) had no perception of light, and no significant variation in visual outcome (p=0.278) was observed between different etiologies.

CONCLUSION:

Infectious endophthalmitis is an infrequent yet severe condition that can lead to vision loss. The timely and aggressive implementation of treatment is associated with a considerable improvement in vision. However, this study did not find any noteworthy impact of the aetiology on treatment outcomes. Early diagnosis and appropriate management remain crucial for achieving favorable visual prognosis in cases of infectious endophthalmitis.

INTRODUCTION:

Endophthalmitis resulting from open globe ocular injury tends to have a poorer visual prognosis compared to postsurgical endophthalmitis (1-3). The discrepancy in final visual acuities between these groups can be attributed to various factors, including the virulence of the infecting organisms, the severity of associated ocular trauma, promptness of diagnosis, and the appropriateness of therapeutic interventions. The use of intravitreal antibiotics and vitrectomy has shown promising results in improving the outcomes of experimental and clinical

endophthalmitis in specific cases. To identify the factors influencing the prognosis of traumatic versus postoperative (PO) endophthalmitis (Figure-1), we conducted a retrospective review of 50 cases of exogenous endophthalmitis (3-6) (Figure-2).

METHODS:

The Institutional Review Board (IRB) of XXX approved this study and waived the need for informed consent. The study adhered to the principles of the Declaration of Helsinki. We conducted a retrospective review of all endophthalmitis cases diagnosed and managed between January 2008 and December 2020, with a minimum follow-up duration of 30 days.

The study encompassed cases of exogenous endophthalmitis presented at XXXX from January 2008 to December 2022. The criteria for clinical exogenous endophthalmitis included a history of traumatic or surgical ocular injury, clinical symptoms such as ocular pain, decreased visual acuity, conjunctival chemosis and hyperemia, and anterior chamber or intravitreal inflammation.(Figure 1,2)

In accordance with the EVS guidelines, our institution added vitrectomy and intravitreal antibiotics to the treatment regimen for selected cases. Typically, these included eyes with poor visual acuity (perception or no perception, hand motions worse than 7) and advanced vitreous inflammation indicative of infection. Intravitreal administration of vancomycin and ceftazidime was common. Additionally, B-scan ultrasonography was routinely performed to monitor endophthalmitis and aid in potential vitrectomy planning. Painful and totally blind eyes underwent primary enucleation/evisceration. We defined "success" as a visual acuity of ≥3/60.

RESULTS:

The study cohort comprised 200 eyes, with 111 (55.5%) cases occurring after trauma and 89 (45.5%) after ocular surgery. Among the participants, 122 (61%) were male, and 78 (35.6%) were female, with a median age of 45.00 years (range:

1–84). Overall, 46 (23%) patients achieved successful final visual acuities, defined as a visual acuity of ≥6/60, while 29 (14.5%) achieved >6/24.

When analysing the visual outcome, a significant difference was observed between pre- and post-treatment (p=0.000).

However, when comparing the visual outcomes between traumatic and non-traumatic causes, no significant difference was found (p=0.278, Table 2). The overall success rate for exogenous endophthalmitis cases in this study was 23%, with 17.13% for posttraumatic (PT) and 30.3% for postoperative (PO) cases.

All other variables were studied and compared between both etiologies. The most notable finding was that surgical treatment yielded a better outcome in non-traumatic cases. Additionally, pediatric cases were minimal in the non-traumatic category, while pediatric eyes had a poor outcome in the traumatic category (Table-1).

DISCUSSION:

In this study, we conducted a retrospective review of 200 consecutive cases of exogenous endophthalmitis from 2008 to 2022. The cases treated with endophthalmitis vitrectomy showed better visual outcomes compared to those treated with medical treatment alone in non traumatic group.

Based on the EVS guidelines, vitrectomy and intravitreal antibiotics (IOAB) administration were considered reasonable therapeutic options for selected cases with severe vitreous involvement, regardless of the aetiology. The overall success rate in cases of exogenous endophthalmitis treated after 1977 was found to be 27.2%, which aligns with recently reported case series (2, 7).

The success rates in treating posttraumatic (PT) endophthalmitis varied widely, ranging from 17% to 83% in our series. Our study observed a success rate of 17.1% in 111 cases of PT endophthalmitis (1, 8-12) and 33% in 84 cases of PT endophthalmitis treated with vitrectomy and IOABs. The visual outcome in PT endophthalmitis may be influenced by several prognostic factors, including the severity of the initial trauma, the time

interval between trauma and treatment, and the virulence of the infecting organisms. These factors likely account for the wide range of visual outcomes reported in various series. On the other hand, the success rates in cases of postoperative (PO) endophthalmitis showed only slight variations in recently reported series (2, 4, 7). These patients typically underwent primary anterior segment operations and were closely monitored during the PO period. In our study, the success rate for cases of PO endophthalmitis treated with vitrectomy and IOABs was 32.1%. No significant difference was observed between patients with PO and PT endophthalmitis (Tables 1 and 2).

The lower visual outcomes observed in previous studies could be attributed to comorbidities (1), which were also observed in our study. Apart from the direct and delayed effects of ocular trauma, the poorer visual prognosis in the PT group might be due to these patients delaying treatment seeking compared to those with PO endophthalmitis. Moreover, PT infections could be caused by multiple organisms, as noted by Rowsey et al. (7), who observed a higher occurrence of mixed infections in PT cases compared to PO endophthalmitis cases. Some studies also suggest that the combination of organisms might result in more significant visual loss than a single species (13-16).

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Table-1 Comparative study of Traumatic and non traumatic infections endophthalmitis

VARIABLE	NON TRAUMATIC		POST TRAUMATIC		TOTAL	
	NO	%	NO	%	NO	%
DEMOGRAPHY						
NO	89	45.5	111	55.5	200	100
AGE MEDIAN	60	---	25	---	45	--
FEMALE	35	39.3	37	33.3	78	39
MALE	54	60.7	74	67.4	122	61
PEDIATRIC	4	4.5	46	41.4	50	25
INTERVAL EVENT AND PRESENTATION(MEDIAN)	7	--	5	--	6	--
INTERVAL EVENT AND INTERVENTION (MEDIAN)	4	--	9	---	7	--
TREATMENT						

MEDICAL TREATMENT	40	44.9	27	24.3	66	33
NUMBER OF INJECTIONS(MEAN)	1.46	--	1.13	--	1.28	
NUMBER OF SURGERIES(MEAN)	0.56	--	0.95	--	1.08	
SURGICAL TREATMENT	49	55.1	84	75.7	134	67
DESTRUCTIVE PROCEDURE	3	3.4	3	2.7		
PRE TREATMENT VISION						
NOPL	3	3.4	17	15.9	20	10
PLPR-HM	66	74.2	77	69.4	143	71.5
FCNF-3/60	14	15.7	13	11.7	27	13.5
>6/60	6	6.7	4	3.6	10	5
POST TREATMENT VISION						
NOPL	9	10.1	13	11.7	22	11
PLPR-HM	34	38.2	48	43.2	41	52
FCNF-3/60	12	13.5	21	18.9	33	16.5
>6/60	27	30.3	19	17.1	46	23
LF	7	7.9	10	9	17	8.5
COMPARATIVE STUDY OF OTHER VARIABLES-P VALUE						
PRE TREATMENT VISION	0.112		0.000		0.000	
TRAUMATIC VS NON TRAUMATIC	---		---		0.315	
NUMBER OF INJECTIONS	0.132		0.945		0.993	
MEDICAL VS SURGICAL INTERVENTION	0.02		0.365		0.091	
PEDIATRIC VS ADULT	0.801		0.005		0.001	

VISOUAL OUTCOME VS AGE	0.326	0.075	0.002
NOPL	0.660	0.059	0.660
TYPE OF INJURY	---	0.328	--
OBJECT OF INJURY	---	0.236	--
PREVIOUS SURGERY	0.002	--	--

TABLE-2COMPARATIVE STUDY OF VISUAL OUTCOME IN TRAUMATIC AND NON TRAUMATIC CATEGORIES

VISION CATEGORY	CAEGORIES		TOTAL
	TRAUMATIC	NON TRAUMATIC	
1/60	3	5	8
2/60	3	1	4
3/60	3	3	6
6/12	5	4	9
6/18	5	2	7
6/24	2	5	7
6/36	5	6	11
6/60	2	5	7
6/9	2	6	8
FCNF	11	4	15
HM	21	15	36
LF	1	3	4
NOPL	18	10	28
PLPR	30	20	50
TOTAL	111	89	200

P=0.31

This paper was judged as the BEST PAPER of Trauma – I Session

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USG BASED STUDY OF OCULAR TRAUMA IN A TERTIARY CENTRE IN NORTH EAST INDIA

INTRODUCTION:

The World Health Organization has estimated that blindness resulting from ocular trauma affects approximately 1.6 million people worldwide annually and the prevalence of ocular trauma is 2 - 6%, among which 97% results from blunt trauma.[1]

In ocular traumas associated with facial injuries, the incidence of visual loss and blindness may be as high as 10.8% and it was noted that 84% of patients with head injuries have ocular injuries.[2]

Examination of the globe is difficult after a trauma. The presence of periorbital soft tissue swelling and other injuries pose difficulties during the examination along with factors like poor patient cooperation. In such a predicament, B scan ultrasonography is an imaging technique which can be utilised. It is non-invasive, user friendly, reliable and reproducible.

Conventional ultrasonography uses a probe that oscillates between 7.5-12 megahertz. It employs a unidirectional amplitude modulated A-scan which was first reported in 1956 by Mundt and Hughes, thereafter the two-dimensional brightness scan i.e. the B-scan was introduced in ophthalmic practice by Baum and

Greenwood in the year 1958. The two scans, A-scan and B-scan complement each other and are frequently used together. It is useful in detecting the presence of intra ocular foreign body and it can outline the soft tissue abnormalities of the eye in the presence of media opacities. In the presence of open globe injuries, B-scan should ideally be done after the primary repair, however if performed before the repair, it should be done with caution to minimize additional trauma to the eye and the probe should be sterilized or placed in sterile rubber sleeves. Using the immersion or water bath technique, anterior segment abnormalities like shallow anterior chamber, gross angle recession, ciliary body detachment and presence of foreign body can also be detected.[3]

METHODOLOGY:

It is a hospital based, retrospective, observational study. Electronic medical records of all patients who presented to the emergency clinic with ocular trauma and underwent ultrasonographic examination of the eye from 1st January 2020 to 31st December 2020 were reviewed. Details of the trauma including date and time of injury, time of presentation, eye involvement, mode of injury, type of injury and B-scan findings were noted, along with the demographic details like age and sex of the patients. In fresh open globe injuries, B-scan examination was doneafter the primary repair. The inclusion criteria were patients with ocular trauma in which posterior segment evaluation with indirect ophthalmoscope was not possible due to hazy media, ocular trauma with clear media in suspected intraocular foreign body cases, all patients who provided their consent for the study. The exclusion criteria was infective keratitis secondary to trauma.

RESULTS:

A total of 275 eyes of 269 patients were studied. Patients were aged between 9 months and 82 years (mean : 25.16±19.06 years). Children (age group 1-12 years)

were found to be most susceptible to ocular trauma (36.80%), followed by middle aged adults (23.04%).

AGE (years)	NUMBER (%)
<1 year	1 (0.37%)
1-12 years	99 (36.80%)
13-17 years	15 (5.57%)
18-30 years	60 (22.30%)
31-50 years	62 (23.04%)
>50 years	32 (11.89%)

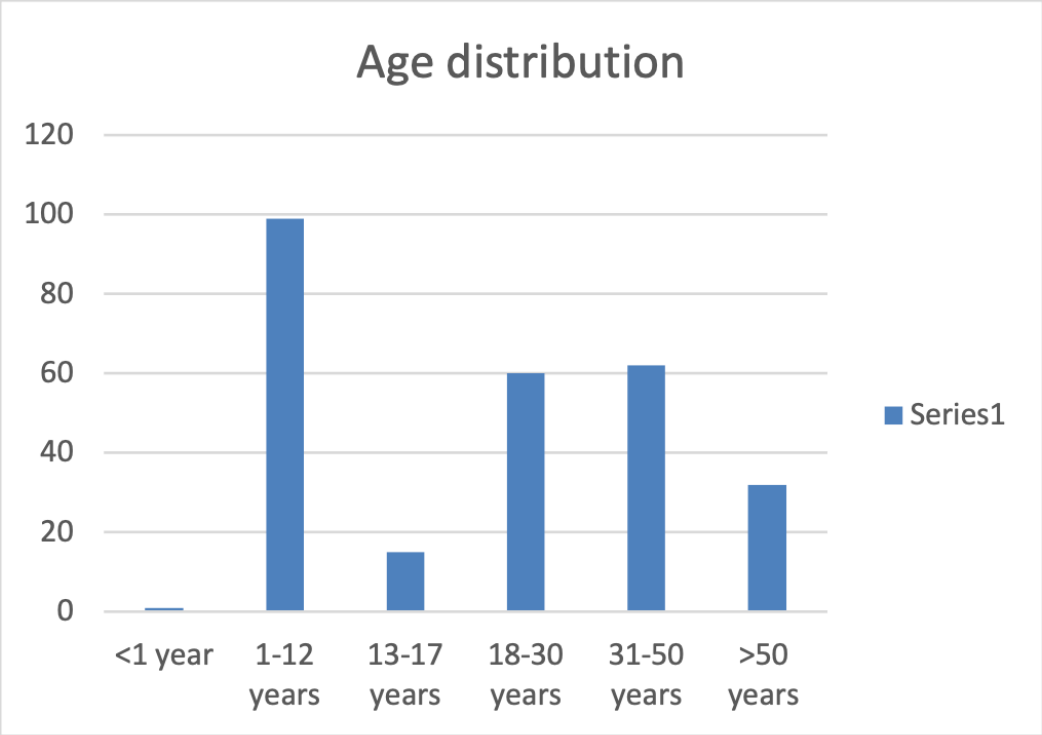

Table 1 and Figure 1 - Age distribution of the study population.

Out of the 269 patients, 79.55% (n=214) were males and 20.44% (n=55) were females, sex ratio was 3.9:1.

The most common source of injury was a non-metallic object, which accounted for injury in 48.32% (n=130) of patients, among which injury with a wooden stick was the most common (n=62), other rare entities included bird beak injury, injury from confetti, goat horn injury and injuries sustained from stationaries like pens, pencils and plastic folders. Metallic objects accounted for 23.79% (n=64) of all injuries, second most common after non-metallic objects. Firecracker and physical assault contributed to equal number of cases, which was 3.34% (n=9) followed by injury during road traffic accidents which was 2.60% (n=7). Blast injury included explosion of explosive materials or mobile battery and it contributed to 1.85% (n=5) of all injuries. Injury from chemical spillage accounted for 0.74% (n=2).

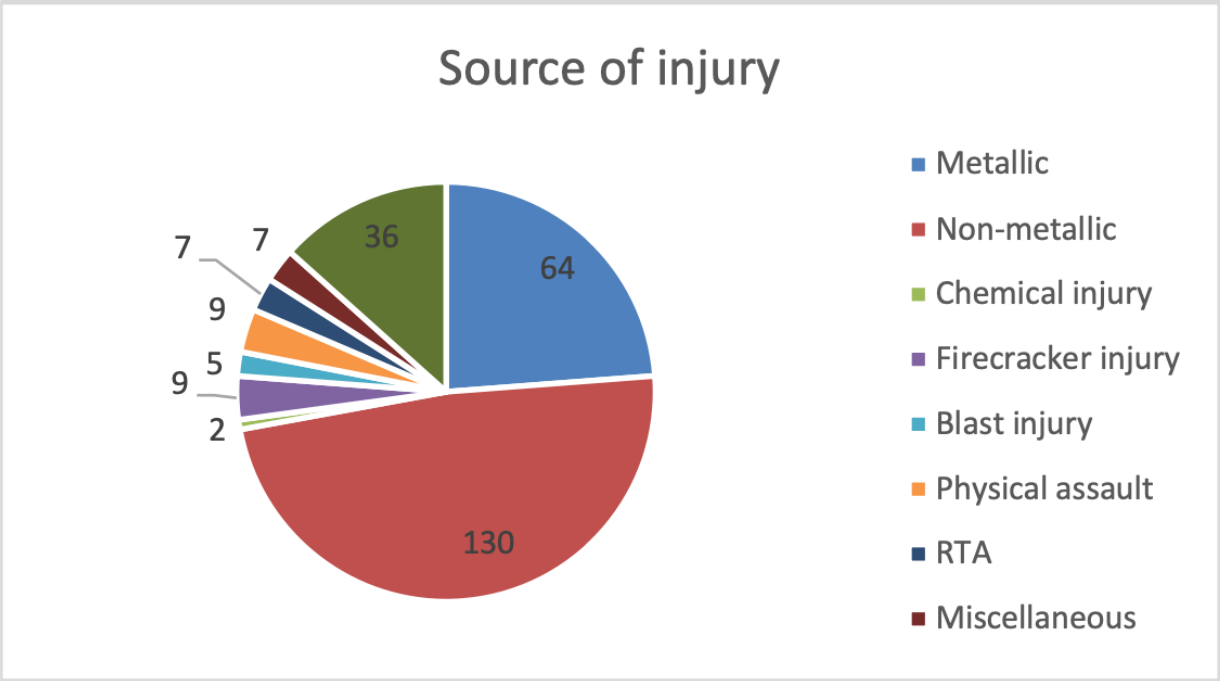

Figure 2 - Distribution of patients based on source of injury

In our study, we found that single eye involvement was more common 97.76% (n=263), whereas bilateral involvement was seen in only 2.23% (n=6) of patients. Blast injury contributed to one third of the bilateral cases, others were due to chemical spillage, road traffic accident, physical assault and bamboo stick injury. Among the unilateral cases, right eye was more commonly involved 58.55% (n=154) whereas left eye was involved in 41.44% (n=109).

Most patients presented between 3-7 days (n=58) 21.56%, whereas only 0.7% (n=2) presented in the first 1 hour of sustaining trauma.

TIME OF PRESENTATION	NUMBER (%)
Within 1 hour	2 (0.74%)
Within 24 hours	30 (11.15%)
1-2 days	52 (19.33%)
3-7 days	58 (21.56%)
8-15 days	27 (10.03%)
16-30 days	36 (13.38%)
>1month	50 (18.58%)
>1 year	14 (5.20%)

Table 2 - Distribution of patients based on time of presentation

The most common type of injury was open globe 57.81% (n=159) and closed globe accounted for 42.18% (n=116).

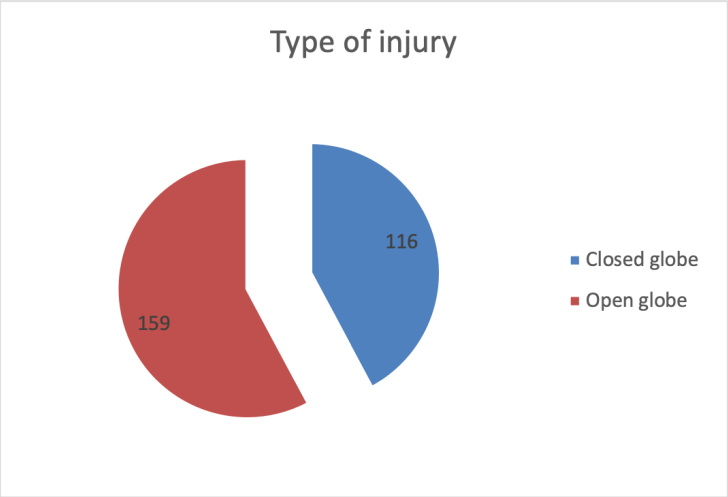

Figure 3 - Type of injury

Visual acuity at the time of presentation was recorded in 82.54% of eyes. A visual acuity of 1/60 to light perception was recorded in 70.04% of eyes (n=159), followed by no light perception in 14.97% (n=34) eyes. The severity of visual impairment was classified according to the International Statistical Classification of Diseases.

BCVA AT PRESENTATION	NUMBER (%)
≥6/12	7 (3.08%)
6/18 - 6/60	12 (5.28%)
6/60-3/60	3 (1.32%)
3/60-1/60	12 (5.28%)
1/60 - light perception	159 (70.04%)
No light perception	34 (14.97%)

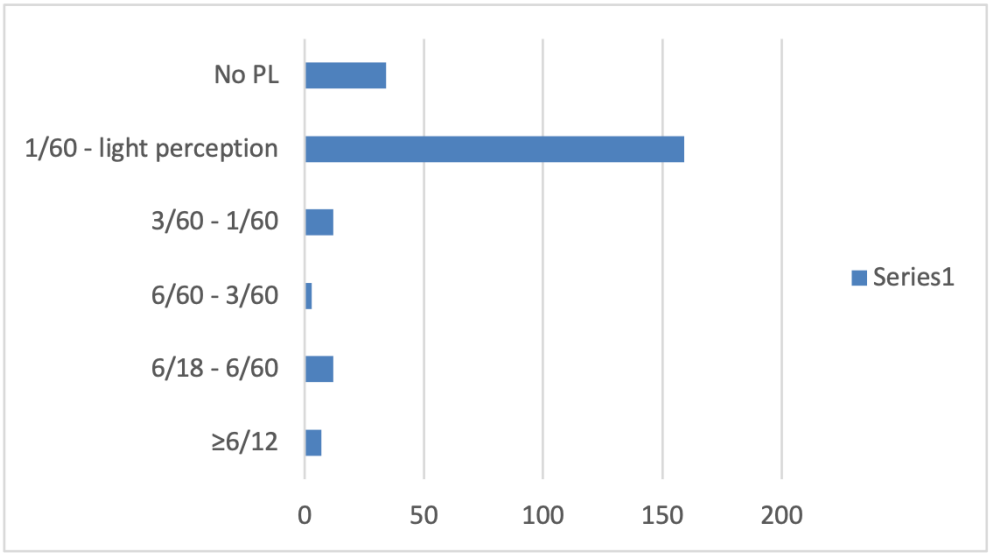

Table 3 and Figure 4 - Distribution of patients based on visual acuity at presentation

Ultrasonography finding	Number (%)
Normal study	76 (27.63%)
Lens injury	42 (15.27%)
Vitreous haemorrhage	37 (13.45%)
Retinal detachment	67 (24.36%)
Choroidal detachment	3 (1.09%)
ONH avulsion	1 (0.36%)
IOFB	9 (3.27%)
Endophthalmitis	14 (5.09%)
Panophthalmitis	8 (2.90%)
Phthisis bulbi	17 (6.18%)
Hematoma in orbit	1 (0.36%)

Ultrasonography performed on the 275 eyes, showed a normal study in most cases 27.63% (n=76), followed by retinal detachment (Figure 6) in 24.36% (n=67). Lens injury (Figure 7) was seen in 15.27 % (n=42) and vitreous haemorrhage (Figure 8) in 13.45 % (n=37). 6.18% (n=17) of eyes had phthisical changes (Figure 9) on B-scan and endophthalmitis (Figure 10) and panophthalmitis (Figure 11) were seen in 5.09% (n=14) and 2.90% (n=8) of eyes respectively. Intraocular foreign body (Figure 12) was found in 3.27% (n=9) of cases. Choroidal detachment (Figure 13) was seen in 1.09% (n=3) of cases and optic nerve avulsion was seen in one case 0.36%. Orbital B-scan performed in one case showed the presence of hematoma in superior muscle complex (Figure 14).

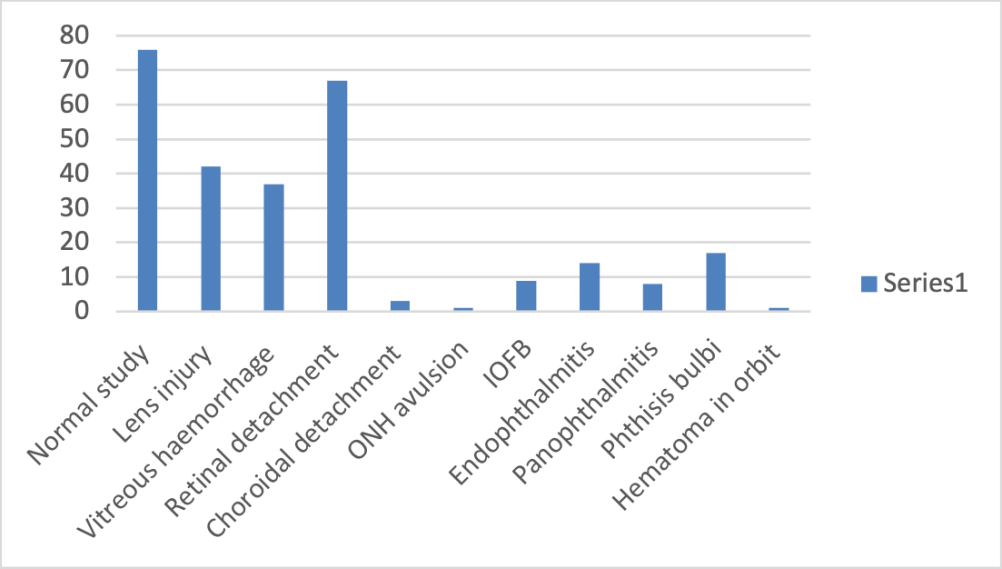

Table 4 and Figure 5 - Ultrasonographic findings of patients with ocular trauma

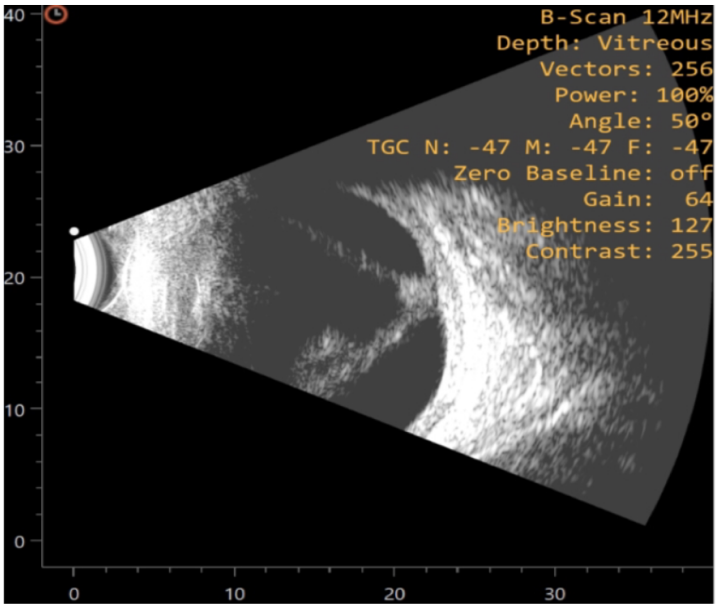

Figure 6 – Total retinal detachment
showing attachment at optic disc

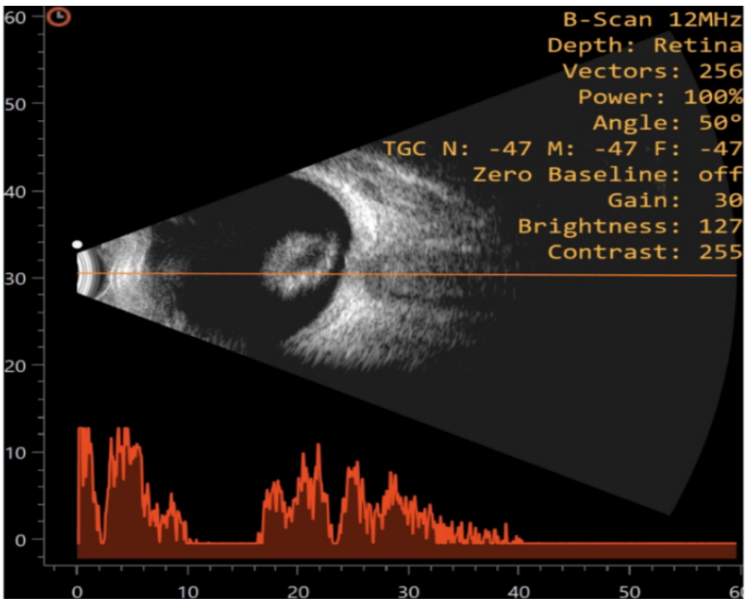

Figure 7 - Posteriorly dislocated lens

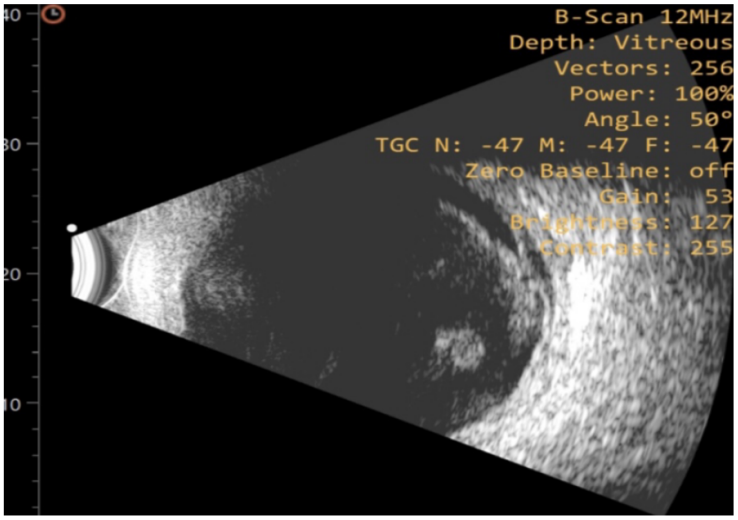

Figure 8 - Vitreous haemorrhage with inferior layering and a focal Tractional retinal detachment

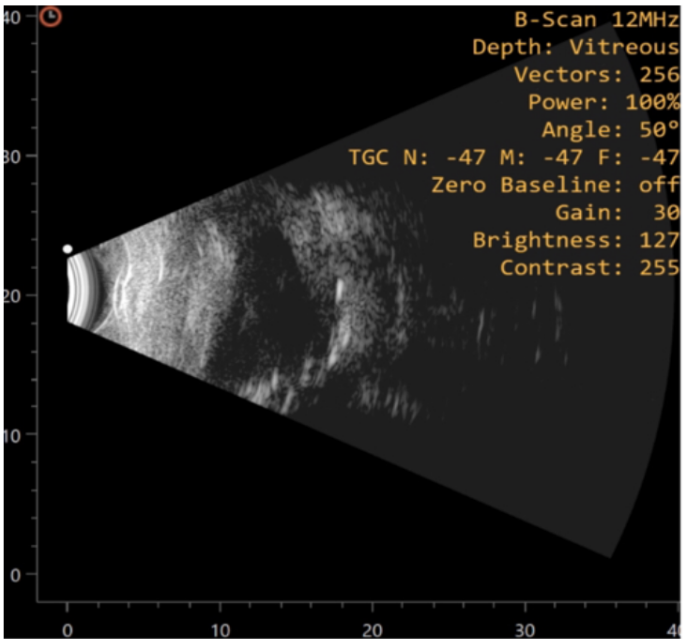

Figure 9 - Phthisis bulbi showing calcification of ocular coats

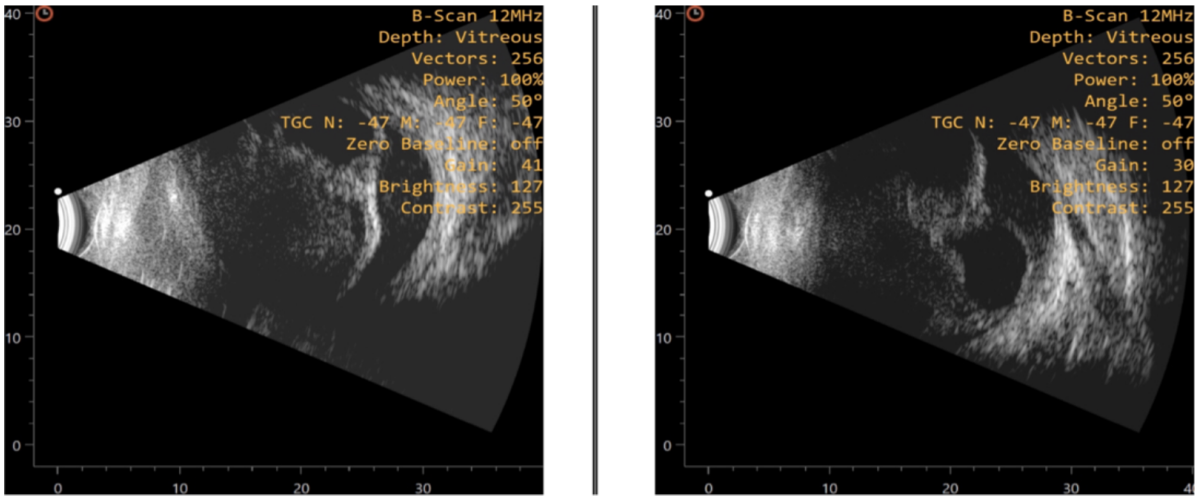

Figure 10 - Plenty of echoes giving a cobweb appearance in vitreous cavity suggestive of traumatic endophthalmitis

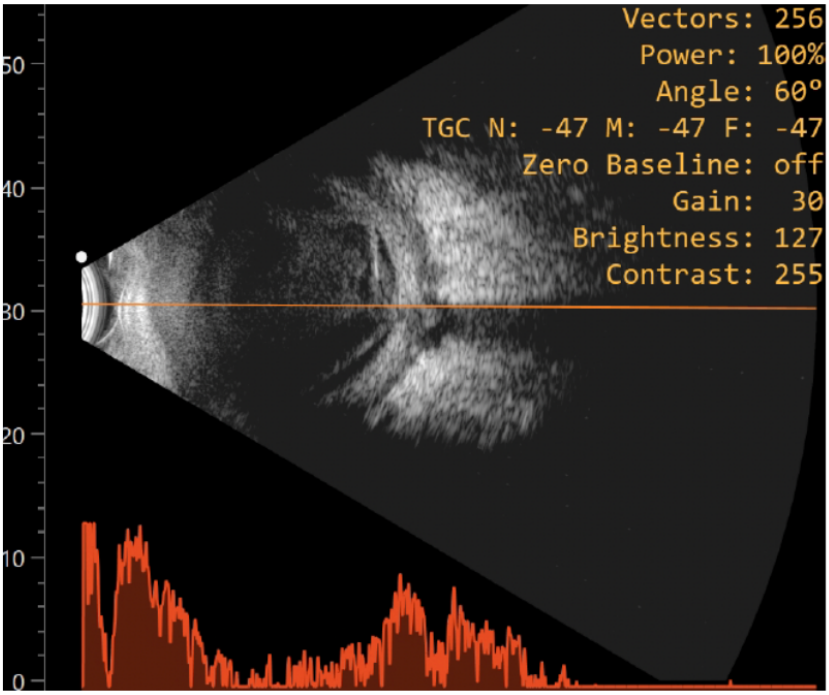

Figure 11 - Panophthalmitis showing typical T-sign

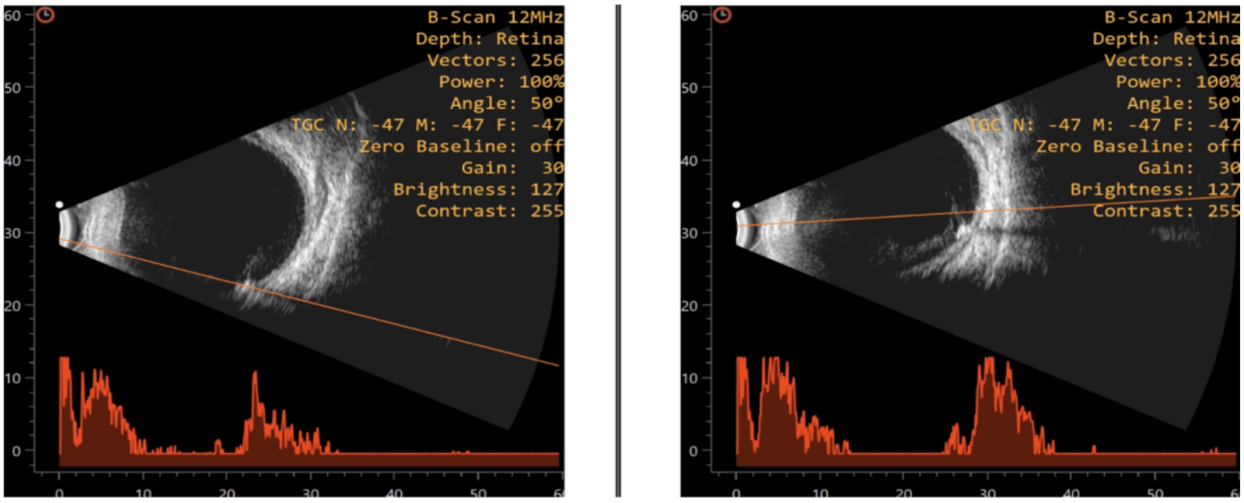

Figure 12 - A high reflective Intraocular foreign body in vitreous cavity with back shadowing

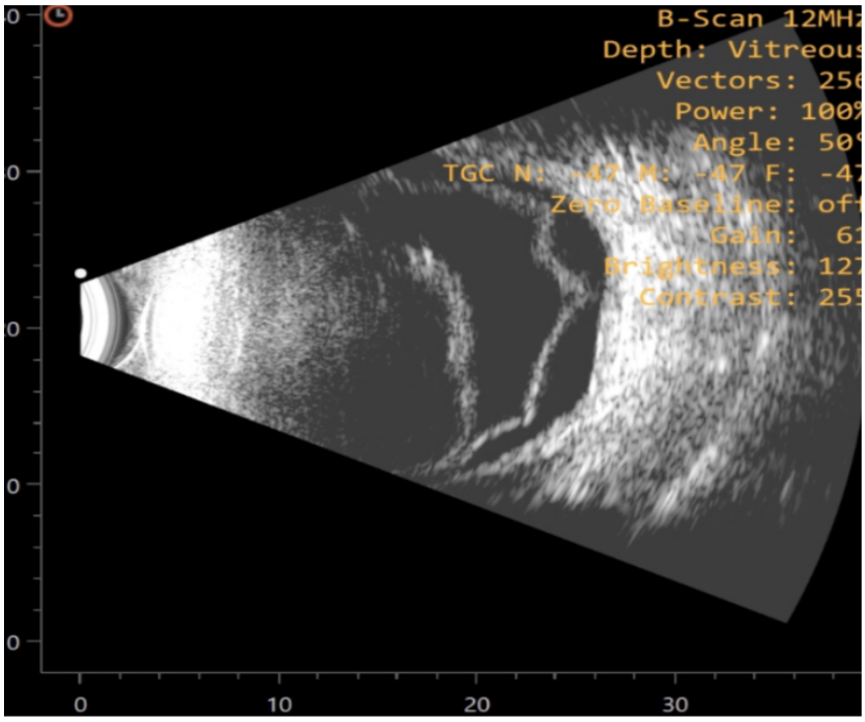

Figure 13 : 360 degree dome shaped choroidal detachment

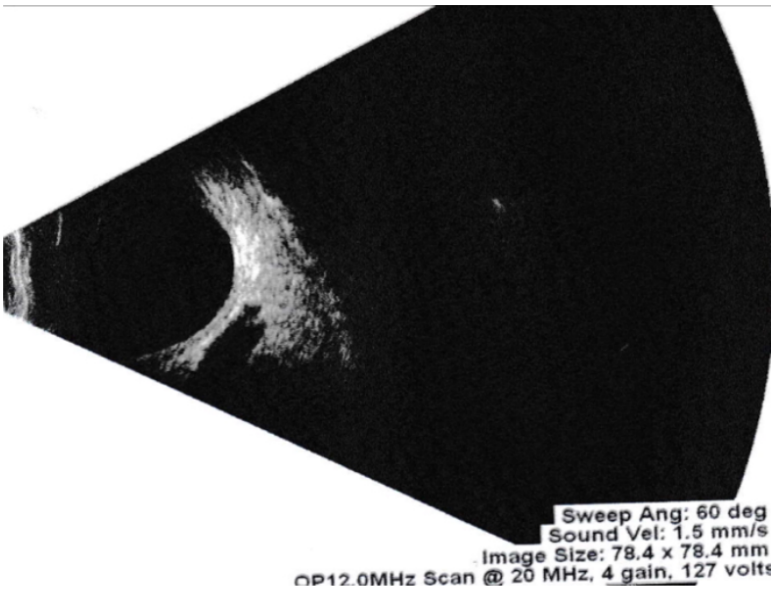

Figure 14 - Orbital hematoma in superior muscle complex

DISCUSSION:

The mean age of patients in our study was 25.16±19.06 years. Children (age group 1-12 years) were found to be most susceptible to ocular trauma (36.80%) which was comparable to other studies, [4][5][6] followed by middle aged adults. Males had a higher preponderance of ocular trauma. The M:F sex ratio in our study was 3.9:1. It is marginally higher than studies conducted in other centers of India.[4][6]

The most common source of injury was a non-metallic object, which accounted for injury in 48.32% (n=130) of patients, among which injury with a wooden stick injuries were accounted for 89.3% of all eye injuries which was similar to other studies where the most common source was wooden object (24.9%) followed by metallic objects (20.9%).[4]

In our study the B-scan ultrasonographic examination revealed a normal posterior segment in most patients. The second most common finding was retinal detachment which was seen in 24.36% of patients. A study conducted in central India by Srivastava et al also reported similar findings.[7] Other findings that were documented are lens injury, vitreous haemorrhage, phthisis bulbi, endophthalmitis, IOFB, panophthalmitis, choroidal detachment, ONH avulsion and hematoma in orbit.

CONCLUSION :

Ultrasonography is an important tool in assessing the posterior segment after ocular trauma. It is a non-contact procedure, the probe can be easily placed over the closed eyelids of a traumatized eye making the procedure tolerable for the patients while providing accurate and reliable diagnostic aid. In our study we have also shown that the ultrasound database can be utilized to estimate the incidence of ocular trauma in society.

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This paper was judged as the BEST PAPER of Trauma II

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ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY TO DIAGNOSE OCCULT SCLERAL TEAR AND INTRAOCULAR FOREIGN BODY – NOVEL NON INVASIVE TECHNIQUE

SUMMARY

We present a case of 55-year-old male who presented with diminutionof vision in right eye since 1 week.The patient did not give history of any apparent ocular or head injury. Best corrected visual acuity (BCVA) was hand movements in right eye and 20/20 in left eye. Slit lamp examination of right eye showed a depigmented lesion with small subconjunctival hemorrhage temporally at 9 clock hours, cataractous lens with anterior chamber reaction and a fibrinous membrane at pupil. Right eye fundus showed vitreous hemorrhage. Ultrasound B scan showed total retinal detachment with choroidal detachment. Left eye ocular examination was unremarkable.Intraocular pressure was 03 mmHg and 12 mmHg in the right eye and left eye, respectively.Anterior segment optical coherence tomography through the lesion showed a full thickness scleral defect with vitreous incarceration with intact overlying conjunctiva. Ultrasound biomicroscopy (UBM) confirmed the scleral defect.

BACKGROUND

Ocular trauma is a significant cause of visual disability. The prevalence of ocular trauma in India was reported to be around 2.4%.(1) The prevalence of visual impairement following ocular trauma is around 2%. (2) Children account for between 20% and 50% of all ocular injuries.(3)The diagnosis of open globe injury is usually evident in patients who present with corneal lacerations, uveal prolapse or a frank collapsed anterior chamber.However, there are instances where the diagnosis is not obvious and the physician must make a clinical judgement whether to explore the globe to exclude the diagnosis.There are many clinical predictors to diagnose occlut scleral tears , however none of them is confirmatory. Here we present a case where AS OCT, a non invasive modality helped in confirming the diagnosis of occult scleral tear.

CASE DESCRIPTION

Case 1:

A 55-year-old male presented with right eye diminution of vision for the past 1 week.There was no history of ocular trauma. On examination, his best corrected visual acuity(BCVA) was hand movementsin right eye and 20/20 in left eye. Right eye slit lamp biomicroscopy showed a small subconjunctival hemorrhage(SCH) temporally, anterior chamber reaction, posterior synechiae with irregular pupil, cataractous lens withpigments on anterior lens capsule.Fundus examination of right eye showed vitreous hemorrhage. Left eye ocular examination was unremarkable. Intraocular pressurewas 3 and 12mmHg in the right and left eye respectively. Ultrasound B scan showed total retinal detachmentwith associated choroidal detachment.

In view of subconjunctival hemorrhage, hypotony, irregular pupil, presence of VH in association with RD and CD, an occult scleral tear was suspected.On detailed examination, a small round depigmented lesion adjacent to SCH was

noted 4 mm from the limbus at 9 clock hours.An anterior segment optical coherence tomography (AS-OCT) through the suspected area showed a full thickness scleral defect with vitreous incarceration with intact overlying conjunctiva (Fig). Ultrasound biomicroscopy (UBM) confirmed the scleral defectwith vitreous incarceration. (Fig 2b).The patient was advised surgical intervention, however, the patient was lost to follow up.

Case 2:

A 20 year old man presented to us with diminution of vision in left eye since 2 days following injury with fire cracker. His BCVA was 20/20 in right eye and perception of light (PL) in left eye. Anterior segment examination of right eye was unremarkable while the left eye showed lid edema, small superior conjunctival defect at 11CH, hyphema, and cataractous lens with no view to retina. IOP using Goldmann applanation tonometer was 12 mm Hg and 17 mm Hg in the right eye and left eye respectively. Right eye fundus was within normal limitis.

B scan of left eye showed medium organized vitreous opacities with retrobulbar hemorhage and a foreign body superior to disc which gave a clue that there must be an entry wound. AS OCT through the suspicious area superiorly confirmed full thickness scleral tear. The patient underwent left eye wound exploration with scleral tear repair and intraocular antibiotics. CT scan of orbit showed hyperintense focus in posterior vitreous of 4x2mm suggestive of foreign body.Later the patient underwent vitreoretinal surgery with intraocular foreign body removal.

Case 3:

A 28 – year –old male presented with right eye dimunition of vision along with redness since 1 day following injury with iron wire. BCVA in right eye and left eye was 20/50 and 20/20 respectively. Anterior segment of right eye showed

limbal tear from 7 to 9'0 clock with iris prolapse, shallow anterior chamber with hyphema while left eye was unremarkable. B scan of right eye showed echo free vitreous cavity with retina on. The patient underwent right eye corneal tear repair with intracameral antibiotics. Subsequently the vision improved to 20/20. However there was temporal vitreous hemorrhage. On careful indirect ophthalmoscopic examination, there was shiny substance noted at 9 CH. AS OCT at 9'0 clock showed hyperreflective lesion suggestive of intraocular foreign body (IOFB) and UBM confirmed the diagnosis.The patient was advised IOFB removal, however the patient was lost to follow up.

INVESTIGATIONS

B scan ultrasonography of the right eye showed total retinal detachment(RD) with choroidal detachment(CD) all around(Fig 1c and 1d).Left eye ocular examination was unremarkable.Intraocular pressure(IOP) using Goldmann applanation tonometer was 3mm Hg and 12mm Hg in the right eye and left eye respectively.

Based on these findings of VH,RD with CD and low IOP in right eye,there was a high suspicion of occult scleral tear in right eye. On careful examination, a depigmented lesion with small SCH was noted 4 mm from limbus at 9CH suggestive of an entry wound. Anterior segment OCT(AS OCT) through the lesion showed a full thickness scleral defect with vitreous incarceration with intact overlying conjunctiva (Fig 2a). UBM confirmed the diagnosis of scleral tear (Fig 2b).

Similarly in the second patient, B scan of left eye showed medium organized vitreous opacities with retrobulbar hemorhage and a foreign body superior to disc which gave a clue that there must be an entry wound. AS OCT through the suspicious area superiorly confirmed full thickness scleral tear.

In the third patient, though the BCVA was 20/20, there was temporal VH with shiny substance at 9 CH. AS OCT at 9 CH confirmed IOFB.

TREATMENT

All the three patients were advised surgery. Although the first and third patient were lost to follow up, the second patient underwent vitreoretinal surgery and intraocular foreign body was removed.

DISCUSSION

The diagnosis of open globe injury is evident clinically if presents with uveal prolapse, collapsed AC and low IOP(4). However it is very difficult to make a diagnosis of scleral tear especially if the patient doesnot give history of trauma and there is no evident uveal prolapse.There are many predictors to suggest occult scleral tear.These include BCVA of PL+ or less, SCH, conjunctival chemosis, afferent pupillary defect, low IOP, limitation of ocular movements and associated intraocular damage such as cataract, VH, RD(5,6,7). However, there is no single factor or combination of factors that could absolutely determine the status of globe related to possible rupture .Surgical exploration remains the definitive diagnostic modality to exclude globe rupture. But this being an invasive procedure, subjects the patient to risks involved in general anaesthesia especially in children and to the costs of surgical procedureOur case had few clinical predictors of occult scleral tear which include BCVA of HM+, Low IOP,VH along with RD and CD. However, there was no conjunctival chemosis and SCH was very small and the patient also did not give any history of trauma even on repeated questioning.

Close differential for first and second case would be a closed globe injury causing RD with CD and VH and IOFB. Scleral tear could have been easily missed in such cases.

AS OCT is an important noninvasive diagnostic modality which can be used to diagnose occult scleral tears.AS OCT is being used for various corneal and anterior segment diseases (8).However its use to detect occult scleral tear has not been reported before.In our case, AS OCT gave a confirmatory diagnosis of scleral tear which could have been easily missed(Fig 2). In case of suscpicion of occult scleral tear with associated signs predictive of scleral tear, AS OCT can be an important non invasive diagnostic modality to confirm the occult scleral tear and increase the predictive value in diagnosing scleral tear.

However, the limitation of AS OCT is that , it cannot diagnose occult scleral tears which are posterior. Missing occult scleral tear can increase the chances of pthisis if left untreated. Hence it becomes the responsibility of treating ophthalmologist to identify these tears and AS OCT along with UBM would be one of the important non invasive diagnostic modality to confirm the diagnosis

LEARNING POINTS/TAKE HOME MESSAGES

Diagnosing occult scleral tear is very important in order to prevent development of pthisis if left untreated.

Though surgical exploration remains the confirmatory diagnosis, AS OCT can be an important non invasive diagnostic modality to confirm the diagnosis of occult scleral tear.

In any suspicious cases of occult scleral tear, other than the reported predictors of globe rupture like BCVA of PL+ or less, SCH with conjunctival chemosis,low IOP with RD and CD, AS OCT in those suspicious areas can confirm the scleral tear.

Using AS OCT to diagnose scleral tear, rate of surgical exploration can be decreased to a significant level.

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This paper was judged as the BEST PAPER of UVEA Session

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PATTERN AND PROFILE OF PEDIATRIC UVEITIS IN TERTIARY EYE CARE HOSPITAL IN POST-COVID ERA

ABSTRACT

Paediatric uveitis is a rare but potentially serious condition that can lead to vision loss if not promptly diagnosed and managed. Present study aims to provide a comprehensive overview of paediatric uveitis among paediatric population in India, including its epidemiology, etiology, pathogenesis, clinical presentation, diagnosis, and management. METHOD: A retrospective study was done on 99 new cases (114 eyes) of age less than 16 years seen by 1 uvea specialist in post COVID 2 years and was classified according to the anatomical site of ocular involvement and the most probable etiological factor based on clinical manifestations and results of specific laboratory investigations. RESULT: A total 99 (11.61%) paediatric uveitis cases were seen among the 852 uveitic cases in post COVID 2 years.Male:female ratio was 1.25:1. Anterior uveitis (66.7%) was commonest followed by intermediate uveitis (15.2%), posterior uveitis (12.1%) and panuveitis (6.1%).Most common cause of non infectious cases were idiopathic (48.5%), followed by JIA (12.1%), and trauma (9.1%). Infectious etiology was proven in 22.2% cases with tuberculosis (10.1% cases) as the most common infectious etiology. Immunosuppression was needed in 9 patients and cataract surgery was done in 8 cases.

INTRODUCTION

Uveitis refers to inflammation of the uvea, which is composed of the iris, ciliary body, and choroid[vii]. Paediatric uveitis is a rare but potentially serious condition that can lead to vision loss if not promptly diagnosed and managed. The incidence of paediatric uveitis varies widely, depending on the population studied and the definition of uveitis used. In general, it is estimated to occur in 5-10% of all uveitis cases and in up to 25% of uveitis cases in children[viii,ix]. Uveitis, can have a significant impact on visual function and quality of life, particularly in children. The incidence of paediatric uveitis varies widely depending on the population studied and the definition of uveitis used.

ETIOLOGY AND PATHOGENESIS

Paediatric uveitis can be caused by a wide range of etiologies, including infectious and non-infectious causes. Infectious causes include bacterial, viral, and fungal infections, while non-infectious causes include autoimmune diseases, systemic diseases, and idiopathic uveitis[x,xi]. The exact pathogenesis of paediatric uveitis is not fully understood, but it is thought to involve a complex interplay between genetic, environmental, and immunological factors[xii].

CLINICAL PRESENTATION

The clinical presentation of paediatric uveitis can vary widely depending on the underlying etiology, but it typically includes symptoms such as redness, pain, photophobia, and blurred vision[vii,viii,xiii]. Children may also experience floaters, decreased visual acuity, and a decrease in the field of vision[vii,xiii]. The clinical signs of uveitis include anterior chamber cells and flare, vitreous cells, and retinal and choroidal inflammation[xiv].

DIAGNOSIS

The diagnosis of paediatric uveitis requires a thorough clinical examination, including a detailed medical history, a comprehensive eye examination, and laboratory tests to identify the underlying aetiology. The clinical examination should include an assessment of visual acuity, intraocular pressure, and the presence of anterior and posterior segment inflammation. Laboratory tests may include blood tests, imaging studies, and intraocular fluid analysis. The treatment of paediatric uveitis depends on the underlying aetiology and the severity of the inflammation. The goals of treatment are to control inflammation, prevent complications, and preserve visual function. Treatment options include topical and systemic corticosteroids, immunomodulatory agents, biologic agents, and surgery. The management of paediatric uveitis depends on the underlying aetiology and the severity of the inflammation. The goals of treatment are to control inflammation, prevent complications, and preserve visual function. Treatment options include topical and systemic corticosteroids, immunomodulatory agents, biologic agents, and surgery. However, the use of these treatments can be limited by their potential side effects, particularly in children.

MATERIAL AND METHODS

Records of uveitis patients attending the centre from 1st January 2021 to 31st December 2022 were reviewed retrospectively. The study was conducted as per the principles of the Declaration of Helsinki. Ethical approval was obtained

Clinical records were evaluated in detail concerning the presenting complaints and detailed ocular and systemic history, best corrected visual acuity (BCVA), intraocular pressure (IOP), slit lamp examination of the anterior segment and dilated fundus examination with the help of +20 D indirect ophthalmoscopy. If fundus evaluation was not possible due to dense media opacity, ultrasonography B-scan done in these cases will be reviewed. Fundus fluorescein angiography (FFA) and optical coherence tomography (OCT) if done to help in diagnosing a case will

also be evaluated. Uveitis diagnosis was based on the standardisation of uveitic nomenclature (SUN) classification.

Systemic Investigations: Complete blood count, erythrocytic sedimentation rate, blood sugar, blood pressure, Monteux test, ELISA for TORCH infection, rheumatoid factor, anti-nuclear antibody, human leucocyte antigen B27, B51, serum angiotensin-converting enzyme, serum calcium, serum phosphorus, liver function test, X-ray chest, X-ray spine as per the requirement.

INCLUSION CRITERIA:

The patient's parent giving wilful written consent.

All eyes with the diagnosis of uveitis.

Patient below the age of sixteen years

Exclusion criteria:

The patient's parent refused written consent

Patient above the age of sixteen years

Patients presenting with:

1- Secondary uveitis cases
2- Primary optic nerve disease.
3- Retinal Vasculitis
4- Masquerade syndrome
5- Exogenous endophthalmitis

RESULTS

Table 1: Distribution of Demographic parameters (N=99)

SN	Parameter		
1	Mean Age ±SD (Range) years	12.24±3.63 (3-16) years	
2	Gender	No.	%
	Female	44	44.4
	Male	55	55.6

The mean age of the patients was 12.24±3.63 years and the age ranged between 3 & 16 years. The majority of the patients were Males (55.6%).

Table 2:

SN	Parameter	No.	%
1	Type of Uveitis		
	Anterior	66	66.7
	Intermediate	15	15.2
	Post	12	12.1
	Pan	6	6.1
2	Aetiology		
	Not Specific	48	48.5
	Ankylosing Spondylitis	3	3.0
	Jia	12	12.1
	Kerato Uveitis	3	3.0
	Sarcoidosis	2	2.0
	Tb	10	10.1
	Toxocara	3	3.0
	Toxoplasma	6	6.1
	Traumatic	9	9.1

	Viral Uveitis	3	3.0
3	Affected Eye		
	Left	36	36.4
	Right	48	48.5
	Bilateral	15	15.2
4	Vision PreTT		
	≤20/60	39	39.4
	>20/60-<20/120	27	27.3
	≥20/120-≤20/200	24	24.2
	>20/200	9	9.1
5	Vision Post-TT		
	20/20	54	54.5
	>20/20-≤20/60	36	36.4
	>20/60-<20/120	6	6.1
	≥20/120-≤20/200	0	0
	>20/200	3	3.0

Anterior uveitis was the most prevalent type of uveitis (66.7%) among the patients, followed by Intermediate uveitis (15.2%) and Post Uveitis (12.1%). The least common form was Pan Uveitis (6.1%).

Among various etiologies of uveitis presented by the patients, the most common was Not Specific (48.5%), followed by JIA (12.1%) and TB (10.1%), while the least common causes were Sarcoids (2.0%), followed by Kerato Uveitis, Ankylosing Spondylitis and Viral Uveitis (3.0%, each).

In the majority of the patients, unilateral uveitis was reported (n=84; 84.9%), among them, the Right eye was affected in 48 and the Left eye was affected in 36.

Table 3: Association of clinical parameters with the type of Uveitis

SN	Parameter	Anterior Uveitis		Intermediate Uveitis		Post		Pan		Statistics
1	Age	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
		12.27	3.77	13.73	2.34	11.25	3.33	10.17	4.40	F=1.843 p=0.145
		No.	%	No.	%	No.	%	No.	%	
2	Gender									
	Female	22	33.3	9	60.0	9	75.0	4	66.7	χ^2=10.508
	Male	44	66.7	6	40.0	3	25.0	2	33.3	p=0.015
3	Affected Eye									
	Left	18	27.3	9	60.0	3	50.0	6	50.0	χ^2=18.641
	Right	39	59.1	3	20.0	0	0.0	6	50.0	p=0.005
	Bilateral	9	13.6	3	20.0	3	50.0	0	0.0	

Though, no statistically significant association was found for Uveitis type with the age of the patients, a significant association of Male gender and Anterior Uveitis was found. Similarly, a statistically significant association was found between Anterior Uveitis and the incidence of Uveitis in the Right eye.

Table 4: Association of type of Uveitis with Etiology

SN	Aetiology	AU		IU		Pan		Post	
		No	%	No	%	No	%	No	%
1	Not Specific	36	54.5	12	80.0	0	0.0	0	0.0
2	ANKYLOSING SPONDYLITIS	3	4.5	0	0.0	0	0.0	0	0.0
3	JIA	12	18.2	0	0.0	0	0.0	0	0.0
4	KERATO UVEITIS	3	4.5	0	0.0	0	0.0	0	0.0
5	SARCOIDOSIS	0	0.0	2	13.3	0	0.0	0	0.0
6	TB	0	0.0	1	6.7	3	50.0	6	50.0
7	TOXOCARA	0	0.0	0	0.0	3	50.0	0	0.0
8	TOXOPLASMA	0	0.0	0	0.0	0	0.0	6	50.0
9	TRAUMATIC	9	13.6	0	0.0	0	0.0	0	0.0
10	VIRAL UVEITIS	3	4.5	0	0.0	0	0.0	0	0.0
χ^2=163.710; p<0.001									

The majority of the patients presenting with Anterior and Intermediate Uveitis had Non-specific aetiology (54.5% and 80.0% respectively), while TB was reported to be the cause of uveitis among half of the patients with Pan Uveitis and Post Uveitis (50.0% each). On comparing statistically, a significant association was found in the cause of Uveitis with the type of uveitis.

Table 5: Visual Acuity and change in visual acuity at different intervals of the affected eye

SN		Pre-op		Post-op		Mean Diff.	% Chg	t-test	'p'
		Mean	SD	Mean	SD				
1	AU	0.51	0.31	0.16	0.23	-0.35	68.62	13.571	<0.001
2	IU	0.44	0.12	0.47	0.99	-0.39	88.64	13.100	<0.001
3	Pan	0.85	0.17	0.23	0.46	-0.63	74.12	11.611	<0.001
4	Post	1.25	0.12	0.78	0.57	0.47	37.6	2.214	0.078

On comparing the Visual Acuity changes pre-and post-surgery, a significant change in visual acuity was reported in Anterior, Intermediate and Pan Uveitis, while in Pan uveitis, the Visual Acuity decreased at the post-op interval, however, the difference was not significant.

DISCUSSION

Paediatric uveitis is a rare but potentially serious condition that can lead to vision loss if not promptly diagnosed and managed. The incidence of paediatric uveitis varies widely depending on the population studied and the definition of uveitis used. Paediatric uveitis can be caused by a wide range of etiologies, including infectious and non-infectious causes. The exact pathogenesis of paediatric uveitis is not fully understood, but it is thought to involve a complex interplay between genetic, environmental, and immunological factors. The clinical presentation of paediatric uveitis can vary widely depending on the underlying aetiology and typically includes symptoms such as redness, pain, photophobia, and blurred vision. The diagnosis of paediatric uveitis requires a thorough clinical examination, including a detailed medical history, a comprehensive eye examination, and laboratory tests to identify the underlying aetiology. The management of paediatric uveitis depends on the underlying aetiology and the severity of the inflammation

and may include topical and systemic corticosteroids, immunomodulatory agents, biologic agents, and surgery.

Surgery may be required in cases of complicated uveitis, such as cataract formation, glaucoma, or vitreous opacities. However, surgery carries its risks, particularly in children, including the risk of infection, bleeding, and retinal detachment.

The current treatment options for paediatric uveitis are effective in controlling inflammation and preserving visual function. However, they are associated with significant side effects, particularly in children. Long-term use of corticosteroids can lead to cataract formation, increased intraocular pressure, and growth retardation. Immunomodulatory agents can be associated with significant side effects, including hepatotoxicity, bone marrow suppression, and increased risk of infection. Biologic agents are expensive and may increase the risk of infection. Surgery carries its risks, particularly in children.

The management of paediatric uveitis remains challenging, and there is a need for new treatment options that are effective in controlling inflammation while minimizing side effects. Future directions for research include the development of novel immunomodulatory agents that are safer and more effective than current treatments, the development of targeted therapies that are specific to the underlying aetiology of uveitis, and the development of non-invasive imaging techniques that can monitor disease activity and guide treatment decisions.

Paediatric uveitis is a rare but potentially serious condition that can lead to vision loss if left untreated. The diagnosis and management of paediatric uveitis require a multidisciplinary approach involving pediatric ophthalmologists, rheumatologists, and infectious disease specialists. The current treatment options for paediatric uveitis are effective in controlling inflammation and preserving visual function, but they are associated with significant side effects, particularly in children. Future directions for research include the development of novel

immunomodulatory agents that are safer and more effective than current treatments, the development of targeted therapies that are specific to the underlying aetiology of uveitis, and the development of non-invasive imaging techniques that can monitor disease activity and guide treatment decisions.

In conclusion, paediatric uveitis is a rare but potentially serious condition that requires early diagnosis and prompt treatment to prevent vision loss. The pathogenesis of paediatric uveitis is not fully understood, and the diagnosis and management require a multidisciplinary approach. The current treatment options for paediatric uveitis are effective but associated with significant side effects, particularly in children. Future research is needed to develop new treatment options that are safer and more effective and to improve our understanding of the pathogenesis of paediatric uveitis. By advancing our knowledge and treatment options for paediatric uveitis, we can improve outcomes for children with this challenging condition.

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This paper was judged as the BEST PAPER of Vitreo Retinal Diseases – I Session

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MULTIMODAL IMAGING CHARACTERISTICS AND TREATMENT OUTCOMES OF RETINAL CAPILLARY MACROANEURYSMS

INTRODUCTION:

Aneurysms are acquired, focal dilatation of a retinal vasculature that can involve any part of the retinal circulatory system although the arterioles and the capillaries are the commonly involved elements. They are said to occur as a result of focal ischemia of the blood vessel wall bringing about increased vessel permeability and intimal collagen remodelling or due to hemodynamic overload.[1,2] They are usually seen in association with diabetes mellitus, hypertension, or veno-occlusive disease, but can also be idiopathic.[2–5] Retinal capillary macroaneurysms (RCM) arise typically range from 125 to 200 microns in size, usually solitary, associated with surrounding intraretinal lipid deposition or hemorrhage.[2] Identification of these macroaneurysms is important because they can lead to focal rupture of the blood–retinal barrier causing chronic retinal edema.[3,6,7]

Materials and methods:

This was a retrospective chart review study of cases of RCM diagnosed clinically aided by various multimodality investigations. Eleven eyes of ten patients were included in this study, and was conducted at the Department of Ophthalmology of

Jawaharlal Institute of Postgraduate Medical Education and Research Hospital between January 2022 and March 2023.

Age, gender and presence of associated clinical comorbidities were noted. Fundus photographs were done with a widefield fundus camera (Clarus 700, Zeiss). Macular cube OCT scan were done using Cirrus 5000, Zeiss to quantify the macular edema and associated retinal changes like cystoid spaces, neurosensory detachment, hyper reflective dots, schisis etc. High definition 21-line raster scan was done with placement of OCT scans over the RCMs to recognise their characterisitics. Using the built-in calipers, the largest diameter of MAs in the transverse (xy) plane was measured. Fundus fluorescein angiography was done to identify the dye characteristics of the lesions and identify associated retinal pathologies. Macroaneurysms were identified on the basis of clinical features, color photographs, and fluorescein angiographic criteria as red saccular or fusiform structure measuring 125 um or larger in size on OCT. The number, location, type of macroaneurysms, presence of associated retinal hemorrhages, retinal thickening, hard exudate ring or clusters and retinal vascular pathologies such as diabetic retinopathy and diabetic macular edema were noted. Response to various treatment modalities were also noted.

RESULTS:

Ten eyes of nine patients were included in the study out of which six were males (75%) and three were females (25%). Patient characteristics are shown in the table. The mean age was 62.2 years (range: 45-3years). The presenting visual acuity ranged from 6/6 to 6/60. Seven patients had diabetes mellitus and two patients had systemic hypertension. Eight patients had unilateral involvement while one had bilateral involvement. Associated coexisting retinal pathologies identified were diabetic retinopathy in 70 % cases of which four eyes had proliferative diabetic retinopathy with macular edema, three eyes had moderate

non-proliferative diabetic retinopathy and branch retinal vein occlusion in two eyes.

The retinal capillary aneurysmal lesions were uniformly oval in shape with size ranging from 206um to 432um (average size of 306um) with an extent spanning from the retinal nerve fibre layer to the outer retinal layers. The macroaneurysms were associated with a relatively higher rate of surrounding intraretinal lipids in rings or clusters (60%), or hemorrhages (50%) or retinal thickening (40%). In eyes with multiple aneurysms, most of the additional aneurysms were located peripherally associated individually with surrounding hard exudates and hemorrhages. All the aneurysms had hyperreflective wall with non-homogenous variably reflective contents and back-shadowing on OCT. The clinical characteristics of the aneurysmal lesions are summarised in the table below:

Cases	Size of the aneurysm(μm)	Location	Surrounding retina	Associated retinal pathology	RCM as a cause of macular edema
1	210	Peripapillary	Retinal thickening	Nil	Yes
2	330	Temporal perifoveal	Retinal hemorrhages, thickening, hard exudates	PDR + DME	Yes
3	352	Along PM bundle	Retinal hemorrhages, thickening, hard exudates	PDR + DME	Yes
4	280	Superior to disc	Retinal hemorrhages	Moderate NPDR + DME	No
5	336	Nasal quadrant	Retinal hemorrhages	Moderate NPDR + DME	No

6	310	Nasal to disc	Retinal hemorrhages, thickening, hard exudates	Moderate NPDR + DME	No
7	452, 269, 418 (3 RCM lesions)	Temporal	Hard exudate ring, sclerosed vessels, collaterals	IT BRVO	No
8	286, 206 (2 RCM lesions)	Nasal to disc	Hard exudate ring	Early PDR + DME	No
9	265	Temporal to optic disc	Hard exudate ring	IT BRVO	Yes
10	270	Temporal	Hard exudate ring	PDR + DME	Yes

On fluorescein angiography, the commonly observed pattern was hyperfluorescence with minimal leak in 8 eyes (80%), hyperfluorescence with no leak in an eye and hypofluorescence was noted in one eye. The presence of capillary non-perfusion areas at or adjacent to the lesion along with collaterals, microaneurysms, and haemorrhage causing blocked fluorescence were also noted. Four eyes were advised observation of the lesions since the RCMs were away from the macula or were not contributing to macular edema. One eye received anti-VEGF treatment with poor response. Focal laser in this patient led to resolution of macular edema and regression of the lesion. One eye received intravitreal triamcinolone acetonide which led to decrease in macular edema but perilesional edema and the lesion itself persisted. Focal laser of the RCM in this case led to

complete regression of the lesion. 4 patients received direct focal laser therapy which led to complete resolution of macular edema.

DISCUSSION:

Retinal capillary macroaneurysms (RCMs) are abnormal dilations of small blood vessels, specifically capillaries, within the retina. These macroaneurysms are characterized by localized bulges or outpouchings in the retinal capillaries, which may result from weakened vessel walls. RCMAs are typically associated with various ocular conditions, such as hypertensive retinopathy, diabetes mellitus, and other vascular disorders. Spaide was the first to coin the term Retinal capillary macroaneurysms for large, solitary, persistent lesions which showed an incomplete response to anti-VEGF therapy. This series by Spaide documented the growth of these lesions over time. Hence, RCMS may appropriately considered as a continuum of microaneurysms.[2]

The occurrence of microaneurysms is a common feature of many common retinal vascular diseases like diabetic retinopathy, chronic branch and central retinal vein occlusions, retinal vasculitis and in diseases causing retinal ischemia. The occurrence of macroaneurysms is seen less frequently. They can be arterial, venous or of capillary origin.[1] Arterial macroaneurysms are frequently seen in elderly hypertensive patients and are most often solitary.[8] The occurrence of venous and capillary macroaneurysms is rare. They are often seen in patients with chronic retinal vein occlusions.[1,9] They are typically seen adjacent to areas of severe retinal ischemia. An insufficient number of retinal collaterals has been considered an important factor in the development of these macroaneurysms.[9] Six of our patients had diabetic retinopathy, two had branch retinal vein occlusion and one had diabetes but no evidence of diabetic retinopathy. All the lesions in our patients were within the posterior retina. Out of these, six eyes had lesions in the macular area and were cause of macular edema in five eyes.

The diagnosis of RCMs is a challenge. Clinical examination often gives only a clue and they are best diagnosed on OCT and ICG angiography.[5,10] Fundus fluorescein angiography in most cases shows a bright hyperfluorescence with or without leak. OCT helps to understand the location, size, extent, inner contents, and surrounding changes like cystoid edema and retinal thickening which suggest activity. OCT is also the best modality to monitor response to treatment and to know the course of the RCM itself.

RCMs can be either innocuous or lead to complications, including retinal hemorrhages and fluid leakage into the surrounding retinal tissue.[2,3,6,7] This can result in macular edema leading to vision impairment. In cases of lesions away from the macular area or are not showing activity, observation can be advocated. For lesions causing macular edema, treatment is needed. Intravitreal anti-VEGFs have been used but often show poor response to treatment.[2,11] One of our patients received anti-VEGF Bevacizumab with no response. Intravitreal steroids can also be used which can decrease the macular edema but often do not lead to regression of lesion. Focal laser offers best treatment for these lesions.[6,7,10–12] It leads to complete regression of the lesion as well as associated retinal changes and resolution of macular edema. This also reduces the burden of repeated injections.

CONCLUSION:

RCMs may be a continuum of microaneurysms. They are best detected on OCT followed by ICG angiography. They may be exudative or non-exudative. Exudative lesions can be a cause of chronic macular edema. Intravitreal (steroids/anti-VEGFS) can be reserved for lesions close to fovea and multiple injections may be needed. Selective focal laser leads to regression of lesion and associated macular edema and decreases the burden of intravitreal injections.

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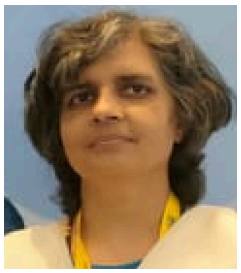

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FIBRIN GLUE FOR CLOSING RETINAL BREAKS IN COMPLEX RETINAL DETACHMENTS (RD) WITH SILICON OIL IN-SITU

CONCEPT

Fibrin glue has been used in systemic surgery for hemostasis, tissue sealing, & suture support. It has been used in ocular surgery to seal corneal perforations, leaks, for scleral fixation of IOLs & sealing sclerotomies that leak.

FIBRIN GLUE FOR RETINAL INDICATIONS

Glue-assisted retinopexy for simple rhegmatogenous retinal detachments (CDs) (GuARD) was described by Mudit Tyagi, Sayan Basu et al to seal retinal breaks and obviate the need for oil/ gas tamponade. However, it has not been reported in the management of complex RDs with silicon oil injection.

We first used fibrin glue in September 2022 to close an open retinal break in an eye with failed combined tractional rhegmatogenous RD secondary to Proliferative Diabetic Retinopathy (PDR). The eye had silicon oil in-situ from the primary surgery. An open break superior to macula was the cause of surgical failure. During resurgery, after adequate membrane peeling around the retinal break & sub-retinal fluid (SRF) aspiration the break continued to remain open & was not amenable to endolaser. Fibrin glue was instilled to seal the break on table and silicon oil was retained.

Postoperatively, retina was completely reattached by the end of 1st week. Reviewed a year later there was no inflammation, IOP rise, fibrosis, traction or oil emulsification.

Fibrin glue was subsequently used with success in 2 other eyes with PDR-RD where laser for retinal breaks was not feasible due to overlying retinal bleed & retinal edema.

It was then used in a case of PDR-RD where the retinal break was very close to foveal centre making strong laser an unsafe proposition.

The indication was then extended to non-PDR complex RDs where laser was not feasible: 2 eyes with failed macular hole RD where ILM peeling had already been done in the primary surgery but hole was open; fibrin glue was instilled was over the macular hole with rapid retinal reattachment.

However, a word of caution when used to seal macular holes: the glue migrates subretinally through the macular hole and can cause RPE atrophy which can adversely affect visual outcome as we were able to document in one case.

Hence its use in this indication can be restricted to only where ILM peeling is unsuccessful reducing the chances of surgical success.

Glue was no longer visualised as early as 3 days to 4 weeks after surgery.

No adverse effect was noted when fibrin glue was used with silicon oil in-situ: no case of inflammation, IOP rise or early silicon oil emulsification in the 18 months follow up. Further, the need for postoperative prone positioning was significantly reduced as the break was already closed on the table and closure was not dependant on oil tamponade.

CONCLUSION:

Fibrin glue can be a useful adjunct in the management of complex RD when laser for retinal breaks is not possible due to bleed, edema, proximity of retinal break to macular centre or macular hole RD.

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