Call for Editorial Board Members

As you are well aware that we are a medical and health sciences publishers; publishing peer-reviewed journals and books since 2004.

We are always looking for dedicated editorial board members for our journals. If you completed your master degree and must have at least five years experience in teaching and having good publication records in journals and books.

If you are interested to be an editorial board member of the journal; please provide your complete resume and affiliation through e-mail (i.e. info@rfppl.co.in) or visit our website (i.e. www.rfppl.co.in) to register yourself online.

Call for Publication of Conference Papers/Abstracts

We publish pre-conference or post-conference papers and abstracts in our journals, and deliver hard copy and giving online access in a timely fashion to the authors.

For more information, please contact:

For more information, please contact:
A Lal
Publication–in-charge
Red Flower Publication Pvt. Ltd.
48/41-42, DSIDC, Pocket-II
Mayur Vihar Phase-I
Delhi – 110 091 (India)
Phone: 91-11-22754205, 45796900
E-mail: info@rfppl.co.in

Free Announcements of your Conferences/Workshops/CMEs

This privilege to all Indian and other countries conferences organizing committee members to publish free announcements of your conferences/ workshops. If you are interested, please send your matter in word formats and images or pictures in JPG/JPEG/Tiff formats through e-mail attachments to sales@rfppl.co.in.

Terms & Conditions to publish free announcements:

1. Only conference organizers are eligible up to one full black and white page, but not applicable for the front, inside front, inside back and back cover, however, these pages are paid.
2. Only five pages in every issue are available for free announcements for different conferences.
3. This announcement will come in the next coming issue and no priority will be given.
4. All legal disputes subject to Delhi jurisdiction only
5. The executive committee of the Red Flower Publication reserve the right to cancel, revise or modify terms and conditions any time without notice.

For more information, please contact:
A Lal
Publication–in-charge
Red Flower Publication Pvt. Ltd.
48/41-42, DSIDC, Pocket-II
Mayur Vihar Phase-I
Delhi – 110 091 (India)
Phone: 91-11-22754205, 45796900
E-mail: info@rfppl.co.in

Win Free Institutional Subscription!

Simply fill out this form and return scanned copy through e-mail or by post to us.

Name of the Institution_____
Name of the Principal/Chairman_____
Management (Trust/Society/Govt./Company)_____
Address 1_____
Address 2_____
Address 3_____
City_____
Country_____
PIN Code_____
Mobile_____
Email_____

We are regular subscriber of Red Flower Publication journals.

Year of first subscription_____

List of ordered journals (if you subscriberd more then 5 titles, please attach separate sheet)

Ordered through

Name of the Vendor	Subscription Year	Direct/subs Yr

Name of the journal for which you wish to be free winner

Terms & Conditions to win free institutional subscription

1. Only institutions can participate in this scheme
2. In group institutions only one institution would be winner
3. Only five institutions will be winner for each journal
4. An institution will be winner only for one journal
5. The free subscription will be valid for one year only (i.e. 1, Jan - 31, Dec)
6. This free subscription is not renewable, however can be renewed with payment
7. Any institution can again participate after five years
8. All legal disputes subject to Delhi jurisdiction only
9. This scheme will be available to participate throughout year, but draw will be held in last week of August every year
10. The executive committee of the Red Flower Publication reserve the right to cancel, revise or modify terms and conditions any time without notice.

I confirm and certify that the above information is true and correct to the best of my knowledge and belief.

Place: Signature with Seal
Date:

Revised Rates for 2020 (Institutional)					
Title of the Journal	**Frequency**	**India(INR) Print Only**	**India(INR) Online Only**	**Outside India(USD) Print Only**	**Outside India(USD) Online Only**
Community and Public Health Nursing	3	6000	5500	469	430
Indian Journal of Agriculture Business	2	6000	5500	469	430
Indian Journal of Anatomy	4	9000	8500	703	664
Indian Journal of Ancient Medicine and Yoga	4	8500	8000	664	625
Indian Journal of Anesthesia and Analgesia	6	8000	7500	625	586
Indian Journal of Biology	2	6000	5500	469	430
Indian Journal of Cancer Education and Research	2	9500	9000	742	703
Indian Journal of Communicable Diseases	2	9000	8500	703	664
Indian Journal of Dental Education	4	6000	5500	469	430
Indian Journal of Diabetes and Endocrinology	2	8500	8000	664	625
Indian Journal of Emergency Medicine	4	13000	12500	1016	977
Indian Journal of Forensic Medicine and Pathology	4	16500	16000	1289	1250
Indian Journal of Forensic Odontology	2	6000	5500	469	430
Indian Journal of Genetics and Molecular Research	2	7500	7000	586	547
Indian Journal of Law and Human Behavior	3	6500	6000	508	469
Indian Journal of Legal Medicine	2	9000	8500	703	664
Indian Journal of Library and Information Science	3	10000	9500	781	742
Indian Journal of Maternal-Fetal & Neonatal Medicine	2	10000	9500	781	742
Indian Journal of Medical and Health Sciences	2	7500	7000	586	547
Indian Journal of Obstetrics and Gynecology	4	10000	9500	781	742
Indian Journal of Pathology: Research and Practice	6	12500	12000	977	938
Indian Journal of Plant and Soil	2	7000	6500	547	508
Indian Journal of Preventive Medicine	2	7500	7000	586	547
Indian Journal of Research in Anthropology	2	13000	12500	1016	977
Indian Journal of Surgical Nursing	3	6000	5500	469	430
Indian Journal of Trauma and Emergency Pediatrics	4	10000	9500	781	742
Indian Journal of Waste Management	2	10000	9500	781	742
International Journal of Food, Nutrition & Dietetics	3	6000	5500	469	430
International Journal of Forensic Science	2	10500	10000	820	781
International Journal of Neurology and Neurosurgery	4	11000	10500	859	820
International Journal of Pediatric Nursing	3	6000	5500	469	430
International Journal of Political Science	2	6500	6000	508	469
International Journal of Practical Nursing	3	6000	5500	469	430
International Physiology	3	8000	7500	625	586
Journal of Animal Feed Science and Technology	2	8300	7800	648	609
Journal of Cardiovascular Medicine and Surgery	4	10500	10000	820	781
Journal of Emergency and Trauma Nursing	2	6000	5500	469	430
Journal of Food Additives and Contaminants	2	6000	5500	430	391
Journal of Food Technology and Engineering	2	5500	5000	430	391
Journal of Forensic Chemistry and Toxicology	2	10000	9500	781	742
Journal of Global Medical Education and Research	2	6400	5900	500	461
Journal of Global Public Health	2	12500	12000	977	938
Journal of Microbiology and Related Research	2	9000	8500	703	664
Journal of Nurse Midwifery and Maternal Health	3	6000	5500	469	430
Journal of Orthopedic Education	3	6000	5500	469	430
Journal of Pharmaceutical and Medicinal Chemistry	2	17000	16500	1328	1289
Journal of Plastic Surgery and Transplantation	2	8000	7500	625	575
Journal of Psychiatric Nursing	3	6000	5500	469	430
Journal of Radiology	2	8500	8000	664	625
Journal of Social Welfare and Management	4	8000	7500	625	586
New Indian Journal of Surgery	6	8500	7500	664	625
Ophthalmology and Allied Sciences	3	6500	6000	508	469
Pediatric Education and Research	4	8000	7500	625	586
Physiotherapy and Occupational Therapy Journal	4	9500	9000	742	703
RFP Gastroenterology International	2	6500	6000	508	469
RFP Indian Journal of Hospital Infection	2	13000	12500	1016	977
RFP Indian Journal of Medical Psychiatry	2	8500	8000	664	625
RFP Journal of Biochemistry and Biophysics	2	7500	7000	586	547
RFP Journal of Dermatology (Formerly Dermatology International)	2	6000	5500	469	430
RFP Journal of ENT and Allied Sciences (Formerly Otolaryngology International)	2	6000	5500	469	430
RFP Journal of Gerontology and Geriatric Nursing	2	6000	5500	469	430
RFP Journal of Hospital Administration	2	7500	7000	586	547
Urology, Nephrology and Andrology International	2	8000	7500	625	586

Terms of Supply:

1. Agency discount 12.5%. Issues will be sent directly to the end user, otherwise foreign rates will be charged.
2. All back volumes of all journals are available at current rates.
3. All journals are available free online with print order within the subscription period.
4. All legal disputes subject to Delhi jurisdiction.
5. Cancellations are not accepted orders once processed.
6. Demand draft/cheque should be issued in favour of "**Red Flower Publication Pvt. Ltd.**" payable at **Delhi.**
7. Full pre-payment is required. It can be done through online (http://rfppl.co.in/subscribe.php?mid=7).
8. No claims will be entertained if not reported within 6 months of the publishing date.
9. Orders and payments are to be sent to our office address as given below.
10. Postage & Handling is included in the subscription rates.
11. Subscription period is accepted on calendar year basis (i.e. Jan to Dec). However orders may be placed any time throughout the year.

Order from

Red Flower Publication Pvt. Ltd., 48/41-42, DSIDC, Pocket-II, Mayur Vihar Phase-I, Delhi - 110 091 (India)
Mobile: 8130750089, Phone: 91-11-45796900, 22754205, 22756995, E-mail: sales@rfppl.co.in, Website: www.rfppl.co.in

Ophthalmology and Allied Sciences

The views and opinions expressed are of the authors and not of the Ophthalmology and Allied Sciences. Ophthalmology and Allied Sciences does not guarantee directly or indirectly the quality or efficacy of any product or service featured in the the advertisement in the journal, which are purely commercial.

Corresponding address
Red Flower Publication Pvt. Ltd.
48/41-42, DSIDC, Pocket-II, Mayur Vihar, Phase-I
Delhi - 110 091 (India)
Tel: 91-11-22754205, 45796900, Fax: 91-11-22754205
E-mail: info@rfppl.co.in
Website: www.rfppl.co.in

Ophthalmology and Allied Sciences (OAS) (pISSN: 2454-7816, eISSN: 2455-8354) is a half yearly peer-reviewed journal for ophthalmologists and visual science specialists, with a broad international scope. The journal publishes original, peer-reviewed reports of research in ophthalmology, including basic science investigations and clinical studies. Topics include new diagnostic and surgical techniques, treatment methods, instrument updates, the latest drug findings, results of clinical trials, and research findings. In addition to original research papers, the journal presents review articles, editorial comments, an international calendar of events and book reviews.

Subscription Information

Institutional (1 year): INR6500/USD508

Payment methods

Bank draft / cashier s order / check / cheque / demand draft / money order should be in the name of **Red Flower Publication Pvt. Ltd.** payable at **Delhi.**

International Bank transfer / bank wire / electronic funds transfer / money remittance / money wire / telegraphic transfer / telex

1. **Complete Bank Account No.** 604320110000467
2. **Beneficiary Name (As per Bank Pass Book):** Red Flower Publication Pvt. Ltd.
3. **Address:** 41/48, DSIDC, Pocket-II, Mayur Vihar Phase-I, Delhi – 110 091(India)
4. **Bank & Branch Name:** Bank of India; Mayur Vihar
5. **Bank Address & Phone Number:** 13/14, Sri Balaji Shop,Pocket II, Mayur Vihar Phase- I, New Delhi - 110091 (India); Tel: 22750372, 22753401. **Email:** mayurvihar.newdelhi@bankofindia.co.in
6. **MICR Code:** 110013045
7. **Branch Code:** 6043
8. **IFSC Code:** BKID0006043 (used for RTGS and NEFT transactions)
9. **Swift Code:** BKIDINBBDOS
10. **Beneficiary Contact No. & E-mail ID:** 91-11-22754205, 45796900, E-mail: info@rfppl.co.in

Online You can now renew online using our RFPPL renewal website. Visit http://rfppl.co.in/subscribe.php?mid=7 and enter the required information and than you will be able to pay online.

Send all Orders to: **Red Flower Publication Pvt. Ltd.,** 48/41-42, DSIDC, Pocket-II, Mayur Vihar Phase-I, Delhi – 110 091 (India). Phone: 91-11-22754205, 45796900, Fax: 91-11-22754205, E-mail: sales@rfppl.co.in, Website: www.rfppl.co.in

Ophthalmology and Allied Sciences

Volume 5 Number 3
September – December 2019

Contents

Original Articles

Case Reports

Original Article

Ophthalmology and Allied Sciences
Volume 5 Number 3 / September – December 2019
DOI: http://dx.doi.org/10.21088/oas.2454.7816.5319.1

Comparision of Endothelial Cell Loss Between Phacoemulsification and Small Incision Cataract Surgery

Asritha Biradavolu[1], Dodla Manaswini[2], Shaik Gohar Firdous[3]

Abstract

Aim: To evaluate the effect of phacoemulsification and SICS on the endothelial cell count. *Introduction:* Cataract is an important and prevalent cause of blindness worldwide. Phacoemulsification and manual small incision cataract surgery are widely practiced today. Corneal transparency is maintained by a single layer of endothelial cells, which have the ability to pump out water from corneal stroma against an osmotic gradient. Some degree of corneal endothelial loss following surgery is expected. SICS requires a great deal of maneuvering and thus direct contact with the endothelium leads to cell loss. Cell loss in phacoemulsification is dependent on the anterior chamber depth, phaco energy and method used to emulsify the nucleus, and surgical skill. *Materials and Methods:* This is one-year observational follow-up study of 100 patients, who were divided into two groups. Group A had 50 patients who underwent phacoemulsification and Group B had 50 patients who underwent SICS. TOPCON specular microscope was used to record the endothelial cell count preoperatively, 7 days postoperatively, and 42 days postoperatively. *Results:* The mean endothelial cell loss at 1 week and 6 weeks after surgery was more in Group B (278 *cells/mm*^{2}; 400 *cells/mm*^{2}) compared to Group A (278 *cells/mm*^{2}; 400 *cells/mm*^{2}) respectively, but this difference was not statistically significant. $p > 0.05$. *Conclusion:* There was no statistically or clinically significant difference between phacoemulsification or SICS in terms of endothelial cell loss.

Keywords: Endothelial cell count, Phacoemulsification, SICS, Specular microscopy.

How to cite this article:
Asritha Biradavolu, Dodla Manaswini, Shaik Gohar Firdous. Comparision of Endothelial Cell Loss Between Phacoemulsification and Small Incision Cataract Surgery. Ophthalmol Allied Sci. 2019;5(3):257–262

Introduction

Cataract is an important and prevalent cause of blindness worldwide. It accounts for 50–80% of bilateral blindness in India. Cataract is an opacification of the crystalline lens that leads to significant visual impairment. The most common cause of cataract is aging and surgery is the only plan of treatment.

Author Affiliation: [1]Assistant Professor, [2,3]Post Graduate, Department of Ophthalmology, Narayana Medical College, Nellore, Andhra Pradesh 524003, India.

Corresponding Author: Shaik Gohar Firdous, Post Graduate, Department of Ophthalmology, Narayana Medical College, Nellore, Andhra Pradesh 524003, India.

E-mail: firdousshaik7@gmail.com

Received on 12.09.2019, **Accepted on** 12.11.2019

The evolution of cataract surgery started from couching and reached ECCE. Phacoemulsification is the most common surgical procedure practiced now-a-days. Manual Small Incision Cataract Surgery (SICS) is also practiced in developing countries because it is independent of advanced technology, universally acceptable, and more affordable than phacoemulsification. Both techniques achieved excellent visual outcomes with low complication rates.[1] Recently, Femtosecond laser-assisted cataract surgery is being practiced. Corneal endothelium can be adversely affected by cataract surgery.

Cornea plays an important role in visualization of an image. It is a powerful refractive medium and also a transparent medium for light rays to pass through. Corneal transparency is maintained by a single layer of endothelial cells, which have the ability

to pump out water from corneal stroma against an osmotic gradient. The endothelial cells cannot regenerate after injury; they repair by enlarging.[2] Mean endothelial cell count of adult cornea is *2000–2500 cells/mm*.[2] Endothelial Cell Count (ECC) decreases as the age advances. When ECC reaches *400–600/mm*^{2}, it is the point at which endothelial decompensation and loss of corneal clarity occurs.[3] Some degree of endothelial cell loss after any cataract surgery is inevitable and is acceptable. SICS is more damaging to the endothelium when compared to phacoemulsification because of the extensive manipulation in the anterior chamber during the surgery. Maneuvering is mechanical and performed within the capsular bag in the case of phacoemulsification, relatively far from the endothelium.

Phacoemulsification is performed in a limited space so a deeper anterior chamber has a protective effect on the corneal endothelium by decreasing intra-operative damage. Pre-operative anterior chamber assessment should be done to anticipate any intra-operative complications. Moreover, the divide-and-conquer method causes more endothelial damage than the phaco chop technique by using more phaco energy to chop and phacoemulsify the nucleus.[4]

Specular microscopy is the study of corneal layers under very high magnification. The endothelial cell shape, size, density, and distribution can be analyzed. Light source is placed at a *30° angle* to the cornea and the microscope at a *30° angle* on the other side of the cornea. The light beam passes through the cornea and it encounters a series of interfaces between the optically distinct layers. Some of the light is reflected back to the photomicroscope and forms an image of the endothelial surface. TOPCON SP-2000P gives highly repeatable and reproducible values for endothelial cell density and average endothelial cell size.[5]

Materials and Methods

This is an observational follow-up study of 100 patients conducted in Narayana Medical College and Hospital over the span of one year from *April 2018* to *April 2019*. Cases were divided into two groups, Group A had 50 patients who underwent phacoemulsification and Group B had 50 patients who underwent SICS. Study was done on the patients admitted for cataract surgery in department of ophthalmology. Consent was taken to include the patient in the study.

Inclusion criteria

1. Patients between the age group *45–90 years*;
2. Immature senile cataract Nuclear Sclerosis 1–3;
3. Cortical cataract;
4. Posterior subcapsular cataract;
5. Clear cornea.

Exclusion criteria

1. Mature cataract;
2. Hypermature cataract;
3. Nuclear sclerosis Grade 4;
4. Traumatic cataract;
5. Glaucoma;
6. Corneal surgeries;
7. Ocular trauma;
8. Uveitis;
9. Intraoperative complications during cataract surgery–premature entry, posterior capsule rupture;
10. Low pre-operative endothelial count <*1500 mm*^{2};
11. Post-operative complications–displaced PCIOLs, wound leak.

Pre-operative Evaluation

Patients' details were taken and routine pre-operative cataract evaluation and investigations were done. The decision of whether to perform SICS or Phacoemulsification was taken. Endothelial cell count was obtained one day prior to surgery using a TOPCON specular microscope. Following the surgery, endothelial cell count was recorded on the *7th (1 week) postop day* and *42nd postop day (6 weeks)*.

Surgical Procedure

All cases were performed under peribulbar anesthesia. Under aseptic conditions the eye which was to be operated was prepped withpovidone iodine and draped. Eyelids were retracted using wire speculum.

SICS

A superior rectus bridle suture was placed and a conjunctival peritomy done from *10–2 o'clock* position to exposed the sclera. Diathermy was used to cauterize the incisional area. Scleral incision was

made and a sclerocorneal tunnel upto *1–1.5 mm* into the clear cornea. Viscoelastic substance was injected and continuous curvilinear capsulorhexis followed by entry into the anterior chamber using a blade was performed. Hydrodissection and hydrodelineation of the nucleus was performed using a 26-gauge hydro cannula and the nucleus was prolapsed into the anterior chamber. An irrigating Vectis was passed under the nucleus and drawn into the tunnel. Remaining cortical matter was removed with Simcoe cannula and polymethyl methacrylate intraocular lens was placed. The anterior chamber was irrigated with irrigation fluid using a Simcoe cannula. The wound is self-healing. Subconjunctival steroid and antibiotic injection were given, the lids were closed, and dressing was applied.

Phacoemulsification

A superior rectus bridle suture was placed and a clear corneal incision of *3 mm* was made and entry performed with *3.2 mm* lancet microkeratome. A side port entry of *1 mm* size was made *45°* from the entry wound. Ocular viscoelastic substance was injected into the anterior chamber. Capsulorhexiswas performed with a cystotome in a viscoelastic substance filled anterior chamber. Hydrodissection and hydrodelineation of the nucleus was performed. Nucleus was prolapsed into the anterior chamber by the use of an intraocular lens dialer. VES was injected into the anterior chamber and emulsification done in a divide-and-conquer method. Vacuum settings of *70 mm Hg*, aspiration flow rate of *15–20 cc/min* and maximum power rate of 70% was used. Remaining cortical matter was removed with a Simcoe cannula and PMMC intraocular lens was placed. Anterior chamber was irrigated with irrigating fluid using a Simcoe cannula. Subconjunctival steroid and antibiotic injections were given and the eye was closed and dressing was done.

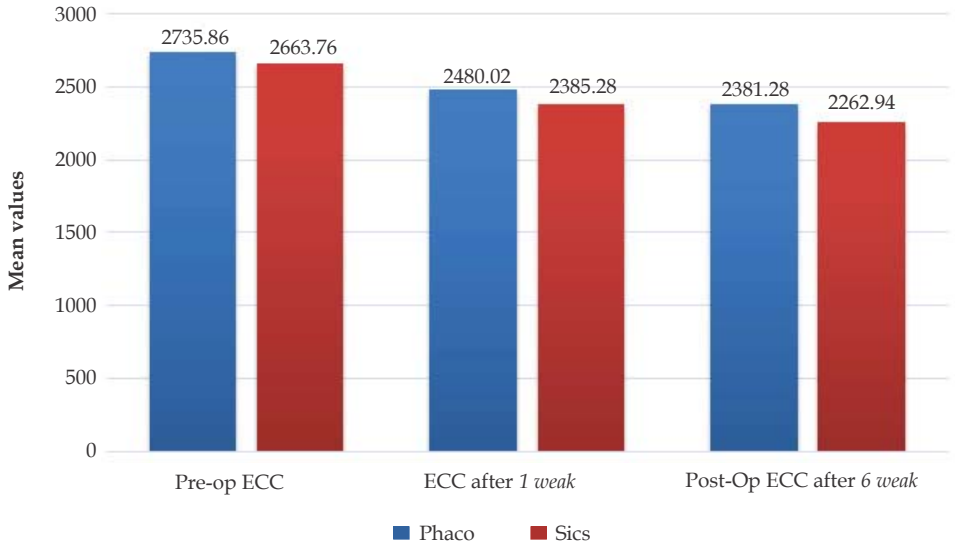
Results

The study was conducted on 100 individuals. Group A with 50 members who underwent phacoemulsification, Group B had 50 members who underwent small incision cataract surgery. Mean age of patients was *61.64 ± 6.8 years* and *61.42 ± 7 years* in Group A and B respectively. Group A had 42% males and 58% females, Group B had 44% males and 56% females. There is no statistical difference among 2 groups as per the age and sex.

The endothelial cell count in Group A was *2735.86 cells/mm²* pre-operatively (C1), *2480.02 cells/mm²* (C2) at *1 week* and *2381.28 cells/mm²* (C3) at *6 weeks* post-operative period. The endothelial cell count in Group B was *2663.76 cells/mm²* (C1) preoperatively, *2385.28 cells/mm²* (C2) at *1 week* and *2262.94 cells/mm²* (C3) at *6 weeks* post-operative period, **(Table 1) & (Graph 1)**.

Table 1: Endothelial Cell Count

	C1	C2	C3
Group A	2735.86	2480.02	2381.28
Group B	2663.76	2385.28	2262.94

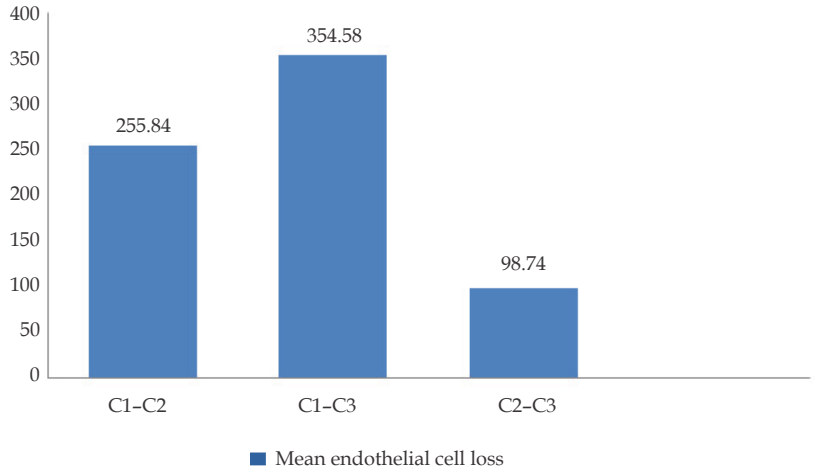


Graph 1: Endothelial cell count.

In the present study, in Group A; the mean endothelial loss *1 week* after surgery was *255.84 cells/mm²* (C1–C2) and *6 weeks* after surgery was *354.48 cells/mm²* (C1–C3), between *1 week* and *6 weeks* after surgery was *98.74 cells/mm²* (C2–C3). The mean cell loss was statistically significant ($p < 0.0001$), **(Table 2)** & **(Graph 2)**.

Table 2: Mean Endothelial Cell Loss–Group A

Mean endothelial cell loss	Cell loss (cells/mm²)	Standard deviation	*t* Value	*p* Value
(C1–C2)	255.84	52.012	34.781	<0.0001
(C1–C3)	354.58	64.915	38.624	<0.0001
(C2–C3)	98.74	40.981	17.037	<0.0001

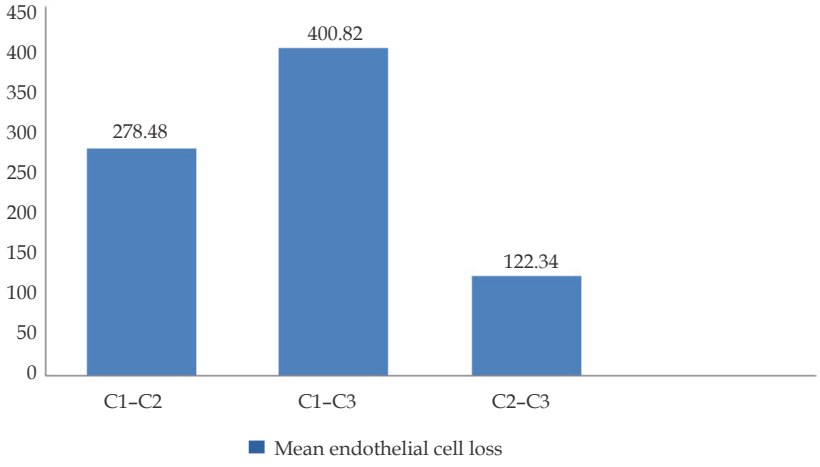


Graph 2: Endothelial cell loss in Group A

In Group B; the mean endothelial loss *1 week* after surgery was *278.48 cells/mm²* (C1–C2) and *6 weeks* after surgery was *400.82 cells/mm²* (C1–C3), between *1 week* and *6 weeks* after surgery was *122.34 cells/mm²* (C2–C3). The mean cell loss was statistically significant ($p < 0.0001$), **(Table 3)** & **(Graph 3)**.

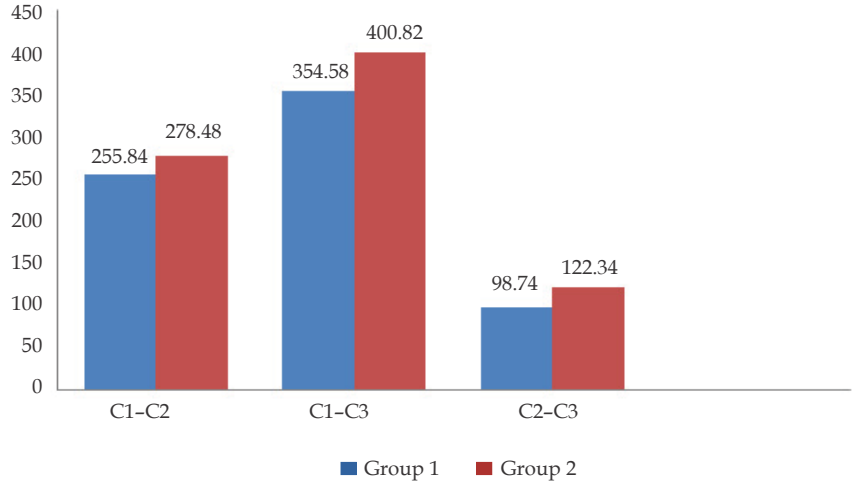
Table 3: Mean Endothelial Cell Loss-Group B

Mean endothelial cell loss	Cell loss	Standard deviation	*t* Value	*p* Value
(C1–C2)	278.48	63.507	31.007	<0.0001
(C1–C3)	400.82	75.962	37.311	<0.0001
(C2–C3)	122.34	34.514	25.065	<0.0001



Graph 3: Endothelial cell loss in Group B

The endothelial cell loss at *1 week* and *6 weeks* pos-toperative period is 9.4% and 13.14% in phacoemulsification and 10.6% and 15.3% in SICS respectively. The cell loss is more in SICS than in phacoemulsification, the difference being statistically insignificant (p >0.05).



Graph 4: Comparison with endothelial cell loss in Group A & B

Discussion

In our study, the mean endothelial cell loss in Group A and Group B was 9.4% and 10.6% at *1 week;* and 13.14% and 15.3% at *6 weeks*; and 4.06% and 5.25% between *1 week* to *6 weeks* respectively. The difference between the groups was statistically insignificant. There are several other studies that were consistent with ourresults.

The study conducted by Bourne and colleagues, comparing endothelial count in patients undergoing phacoemulsification and ECCE concluded there was an average of 10% reduction in cell count at *1 year* post-operatively. Difference of endothelial count between the two groups was not statistically significant.[6] In another study conducted by Dı´az-Valle *et al*. compared the endothelial damage between phacoemulsification, ECCE with continuous curvilinear capsulorhexis and ECCE with letter box capsulotomy. There was significant loss of endothelial cells in all the three groups and there was no statistical difference among the three groups.[7]

In the study conducted by Ravalico and colleagues, the endothelial cell loss between phacoemulsification and ECCE[8] was compared, no significant difference was found in the endothelial cell loss between the two Groups. In Gogate *et al*. study where endothelial cell loss in phacoemulsification and manual SICS was compared, concluded there was no significant difference in endothelial cell loss between the two Groups, the cell loss being 15.5% in phacoemulsification and 15.3% in SICS.[9] In another study conducted by George *et al*., where the endothelial cell loss was compared among conventional ECCE, manual SICS and phacoemulsification. Conclusions of the study are there is no statistically significant difference in the cell loss among three Groups at 6 weeks post-operative perioid.[10]

The study conducted by Jiang T *et al*., compared the effects of phacoemulsification and SICS in aged individuals. Conclusion of the study is there is no significant difference in endothelial cell loss between the two groups, with cell loss being 18.6% in phacoemulsification and 19% in SICS patients.[11]

The corneal endothelium is an important factor responsible for maintaining corneal transparency. It is an important factor in evaluating the safety of any intraocular surgery.[12] Whatever is the cataract surgery chosen, may lead to endothelial cell loss causing corneal edema and it recovers early in most of the cases. Such recovery depends on many factors such as surgical technique, OVD and irrigating fluid used. Regarding endothelial cell loss post-operatively, several studies conducted have given different results.

In the study conducted by Somil *et al*. compared the endothelial cell count in phacoemulsification and manual SICS. Phacoemulsification was divided into 2 Groups, one with temporal clear corneal incision and the other with superior incision. There was no statistical or clinical significance between

the two Groups. Among phacoemulsification cases, superior incision had less endothelial loss at *1 week* post-operative period and was statistically significant, but the difference was insignificant at *6 weeks* and *3 months* post-operative period.[13]

Our study has few shortcomings. We used irrigating vectis for manual SICS. Hydroxypropyl methylcellulose (HPMC) was used in all cases instead of endothelial protective viscoelastic agents like Viscoat and Healon. And moreover, stainless steel blades were used instead of diamond knives. Another drawback of the study is short term follow-up for only *6 weeks*.

Conclusion

Inspite of the advanced technology available in the management of cataract, it still remains the most important cause of blindness. In any cataract surgery, significant loss of endothelial cells appears to occur, and leads to reduced clarity in vision due to corneal decompensation, so we need to know the surgical procedure that has less endothelial loss and better visual acuity. In our study, there was no statistically or clinically significant difference between phacoemulsification or SICS in terms of endothelial cell loss. Manual SICS is the preferred surgery in developing countries because it is more economical than phacoemulsification.

Conflicts of interest: None

References

1. Phacoemulsification versus manual small-incision cataract surgery for white cataract Venkatesh, Rengaraj *et al*. Journal of Cataract & Refractive Surgery. 2006;36(11):1849–54.
2. Bamdad S., Bolkheir A., Sedaghat M. *et al*. Changes in corneal thickness and corneal endothelial cell density after phacoemulsification cataract surgery: A double-blind randomized trial. Electronic Physician. 2018;10(4):6616–23. doi:10.19082/6616).
3. Ventura ACS, Wälti R, Böhnke M. Corneal thickness and endothelial density before and after cataract surgery. British Journal of Ophthalmology. 2001;85:18–20.
4. Hwang HB, Lyu B, Yim HB, *et al*. Endothelial Cell Loss after Phacoemulsification according to Different Anterior Chamber Depths. J Ophthalmol. 2015;2015:210716. doi:10.1155/2015/210716.
5. Cheung SW & Cho P. Endothelial cells analysis with the TOPCON specular microscope SP-2000P and IMAGEnet system. Current Eye Research. 2000;21(4):788–98. doi:10.1076/ceyr.21.4.788.5548.
6. Bourne RRA, Minassian DC, Dart JKG, *et al*. Effect of cataract surgery on the corneal endothelium; modern phacoemulsification compared with extra capsular cataract surgery. Ophthalmology. 2004;111:679–85.
7. Dı´az-Valle D, Benı´tez del Castillo Sa´nchez JM, Castillo A, *et al*. Endothelial damage with cataract surgery techniques. J Cataract Refract Surg. 1998;24:951–55.
8. Ravalico G, Tognetto D, Palomba MA, *et al*. Corneal endothelialfunction after extracapsular cataract extraction andphacoemulsification. J Cataract Refract Surg. 1997;23:1000–1005.
9. Gogate P, Ambardekar P, Kulkarni S, *et al*. Comparison of endothelial cell loss after cataract surgery: Phacoemulsification versus manual small-incision cataract surgery: Six-week results of a randomized control trial. J Cataract Refract Surg. 2010;36:247–53.
10. George R, Rupauliha P, Sripriya AV, *et al*. Comparison of endothelial cell loss and surgically induced astigmatism following conventional extracapsular cataract surgery, manual small-incision surgery and phacoemulsification. Ophthalmic Epidemiol. 2005;12:293–97.
11. Jiang T, Jiang J, Zhou Y, *et al*. Cataract surgery in aged patients: phacoemulsification or small incision extracapsular cataract surgery. Int J Ophthalmol. 2011;4(5):513–8.
12. Ganekal S, Nagarajappa A. Comparison of morphological and functional endothelial cell changes after cataract surgery: Phacoemulsification versus manual small-incision cataract surgery. Middle East Afr J Ophthalmol. 2014;21:56–60.
13. Jagani SN, Lune AA, Magdum RM, *et al*. Comparison of endothelial cell loss by specular microscopybetween phacoemulsification and manual small-incision cataract surgery. Niger J Ophthalmol. 2015;23:54–9.

Original Article

Ophthalmology and Allied Sciences
Volume 5 Number 3 / September – December 2019
DOI: http://dx.doi.org/10.21088/oas.2454.7816.5319.2

Epidemiological Study of Primary Glaucoma in A Tertiary Care Centre in Ahmedabad

Hemaxi Desai[1], Sanjeev Prasad[2], Surohi Shah[3], Aarti Popat[4], Khushi Shah[5]

Abstract

Purpose: A hospital-based survey was conducted in GCS Medical College, Hospital and Research Centre, Ahmedabad, Gujarat, to study epidemiology of glaucoma. *Materials and Methods:* Detailed history, ocular examination was done in all patients diagnosed with glaucoma. Intra-ocular pressure was measured by Perkins applanation tonometer. Visual acuity was checked using Snellen's Chart. After dilating the pupil, the fundus was examined, glaucomatous changes in optic disc were noted diagrammatically. Visual field changes were noted from Humphrey perimetry. Gonioscopy was done by 4 mirror gonio lens to determine type of glaucoma. OCT was done for RNFL. *Results:* Total 1521 patients attending eye OPD of GCSMCH & RC were diagnosed and treated for glaucoma during the period of *three years* from *May 2015* to *April 2018* out of which only 161 patients were consistent throughout the study. Rest 1360 patients were lost to follow up. The maximum percentage of patients were between *45* and *60 years* of age. Mean base line intra-ocular pressure was *22 mm Hg* (SD = ± 0.20). Average cup-disc ratio was 0.6 (SD = ± 0.20). 111 patients (68.94%) were phakic and 50 patients (31.06%) were pseudophakic. POAG patients were 67 (41.61%), PACG patients were 52 (32.29%), PAC and PACS patients contributed to 22 (13.66%) and 20 (12.42%) respectively. 161 glaucoma patients who were primarily treated included 118 (73.29%) patients with medical treatment, 21 (13.04%) patients treated with laser and 14 (8.69%) patients managed surgically by trabeculectomy with mitomycin and 8 (4.96%) patients by cataract extraction following which the angles opened. During the course of our study, 106 number of patients required change of treatment out of which 75 (70.75%) patients were changed with medical line of treatment, 20 (18.87%) patients were changed to laser form of treatment and 11 patients (10.37%) were operated with trabeculectomy with mitomycin. *Conclusion:* Initiatives to increase public awareness and comprehensive eye examination by ophthalmologists are the key to reduce or eliminate undiagnosed glaucoma and also increase the compliance of the patients. The high non-compliance rate and high prevalance rate of change of treatment is also suggestive of requirement of close follow up and timely intervention to prevent blindness and morbidity related to glaucoma disease. The overall drop out rate was 89.41%. Also further study needs to be done for the reasons of high glaucoma drop out.

Keywords: Glaucoma; Intra-ocular pressure; Gonioscopy; Phakic; Pseudophakic.

How to cite this article:

Hemaxi Desai, Sanjeev Prasad, Surohi Shah, *et al*. Epidemiological Study of Primary Glaucoma in A Tertiary Care Centre in Ahmedabad. Ophthalmol Allied Sci. 2019;5(3):263–267

Author Affiliation: [1,3]Associate Professor, [4,5]2nd year Post-graduate Student, Dept. of Ophthalmology, GCS Medical College, Hospital & Research Centre, Ahmedabad, Gujarat 380025, India.[2]Assistant Professor, Dept. of Ophthalmology, Dr. N.D. Desai Faculty of Medical Science & Research Centre, Nadiad, Gujarat 387001, India.

Corresponding Author: Sanjeev Prasad, Assistant Professor, Dept. of Ophthalmology, Dr. N.D. Desai Faculty Of Medical Science & Research Centre, Chalali, Nadiad, Gujarat 387001, India.

E-mail: prasaddrsanjeev@gmail.com

Received on 13.08.2019, **Accepted on** 23.10.2019

Introduction

Glaucoma is a chronic slowly progressive optic neuropathy, characterized by optic disc and Retinal Nerve Fiber Layer (RNFL) changes along with raised Intra Ocular Pressure (IOP) and visual field defects. Glaucoma is the second leading cause of blindness in the world. About more than half of the glaucoma patients in our community remain undiagnosed, which is either due to late onset of symptoms or Ophthalmologists missing early diagnosis.[1] Some

are not properly counselled; either due to resource constraints or lack of manpower which leads to high dropout rate.[1] On the other side, nearly half of glaucoma patients using ocular hypotensive medication do not need the medication or are over treated.[2]

On the basis of the available data, there are approximately 11.2 million people aged ≥ *35 years* who are suffering from different types of glaucoma in India.[1] Primary open angle glaucoma is estimated to affect 6.48 million people, whereas primary angle closure glaucoma affects around 2.54 million people. However, different types of primary angle closure disease comprise about 27.6 million people. So, the study of prevalence, distribution and determinants of glaucoma in urban population ≥ *35 year* aged patients coming to a tertiary care hospital was done for a period of *three years* duration.

Materials and Methods

All patients visiting Ophthalmology OPD of a tertiary care hospital underwent assessment. History by personal interview was conducted regarding demographic profile, presence of any risk factor of glaucoma like family history, ocular trauma, eye surgery, any systemic illness and glaucoma treatment taken in the past. The visual acuity of each eye was noted using Snellen's vision chart. Anterior segment was examined both by torch light and slit lamp to note status of cornea, anterior chamber, pupillary reaction, lens. Intra-ocular pressure was measured with Perkins/Goldmann applanation tonometer. Gonioscopy was done using four mirror gonioscope with indentation. All the patients underwent dilated fundus evaluation by indirect ophthalmoscopy. Visual field was tested through Humphry's automated perimeter. All patients underwent Retinal Nerve Fiver Layer evaluation (RNFL) on Optical Coherence Tomography (OCT).

Patient having glaucomatous field defect, disc changes and IOP ≥ *22 mm* of *Hg* in the presence of an open angle on gonioscopy in either eye was defined as having Primary Open Angle Glaucoma (POAG). A person having glaucomatous field defect with disc changes, IOP ≥ *22 mm* of *Hg* with occludable angle in either eye was considered as Primary Angle Closure Glaucoma (PACG). Persons having optic disc changes but without field defect, were labeled as Glaucoma suspects. Persons having > *22 mm* of *Hg* with open angles but with no field defect or disc changes were considered as ocular hypertensive. A person having increased IOP, retinal/disc changes of glaucoma and evident ocular morbidity leading to glaucoma was considered as having secondary glaucoma.

Out of 1521 total patients diagnosed with glaucoma during the period from *April 2015* to *May 2018*, 161 patients of age ≥ *35 years*, diagnosed having primary open angle glaucoma and primary angle closure glaucoma, and those who remained in follow up for 3 consecutive years, were included in the study. Patients having congenital glaucoma, secondary glaucoma and ocular hypertension were excluded from the study. Also those who did not come for follow up were considered as drop out patients.

Data collection forms were used and the forms were computed using Statistical Package for Social Studies (SPSS-9) software for analysis. The outcome variable was glaucoma per person (Glaucoma could be in a single eye or both the eyes of a person but only one person was considered to be suffering from glaucoma). The dependent variables were gender, age group, and type of glaucoma.

Results

The proportion of patients having glaucoma in Ophthalmology OPD from *May 2015* to *April 2018* was 4.34%. During the course of *three years*, 161 glaucoma patients have been on regular treatment and follow up. The rest could not complete the defined follow up period. Number of phakic patients were 111 (68.94%) and pseudophakic were 50 (31.05%). Family history was found to be positive in 7 cases (5.34%). The number of male patients were 83 *i.e.*, 51.55 % and female patients were 78 *i.e.*, 48%, the difference was not statistically significant, ($p > 0.05$). The number of glaucoma patients in the age group wise is given in (**Table 1**). The maximum percentage of patients were between *46* and *60 years* of age, which was statistically significantly different from other age groups.

Table 1: Age distribution of Glaucoma patients

Age in years	No of pts	%	*p* - value
0–15	0	0	–
16–30	0	0	–
31–45	17	10.55	< 0.001
46–60	73	45.34	–
61–75	52	32.29	< 0.05
76–90	19	11.8	< 0.001

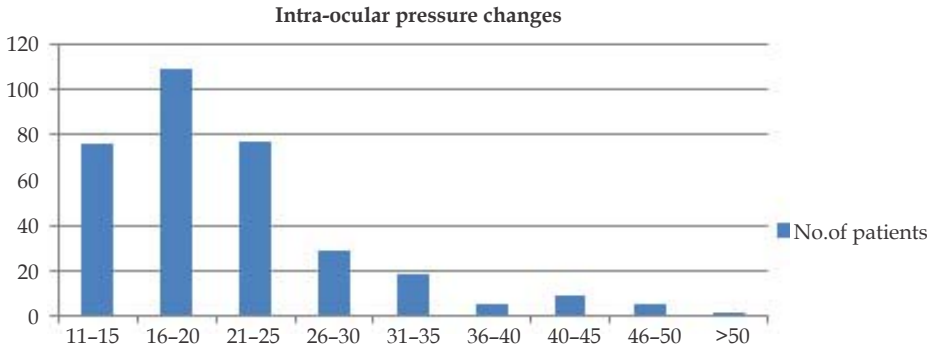
Table 2: Patients visiting the OPD with following symptoms

Symptom	No of Patients	% of Patients
Diminished vision	76	47.20 %
Pain	26	16.15 %
Headache	13	8.07 %
None	46	28.57 %

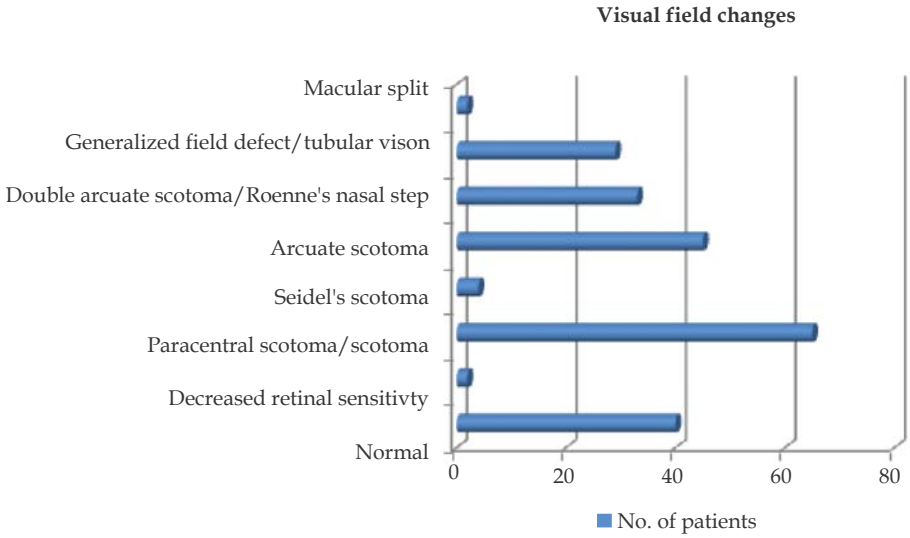
Diminished vision was the most common symptom found in the patients, (**Table 2**).

The average cup: disc ratio was 0.6 (SD +/-0.20).

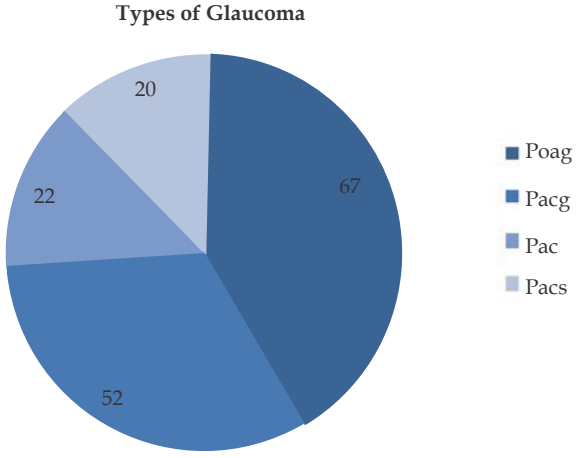
The baseline pressure was ≥ *22 mm* of *Hg* (SD ± 0.12, (**Graphs 1–3**).



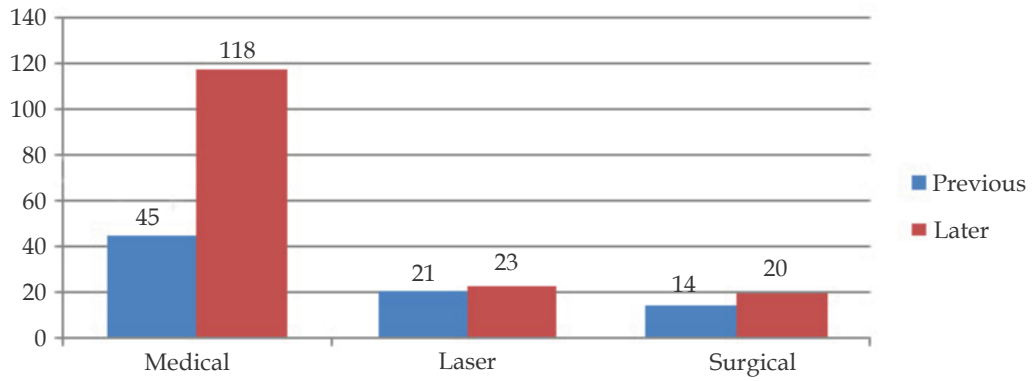
Graph 1: Patients with different initial Intra-ocular Pressure (IOP) changes in either eye are as follow



Graph 2: Paracentral scotoma was the most common type of field defect found in either eye



Graph 3: The patients suffering from different type of glaucoma are as follow



Graph 4: Change of treatment is done in 78 patients (48.45%)

Graph 4, clearly suggests that medical line of treatment is the mainstay modality for glaucoma patients, to either start with or if at all any change of treatment is needed. And in advanced cases of glaucoma surgical treatment is mandatory to reduce the morbidity.

Discussion

It is estimated that there are more than 60 millions cases of glaucoma worldwide and it will increase to 80 million by 2020.[3] Overall, glaucoma is the second major cause of blindness after cataract and refractive errors.[4] Overall prevalence of glaucoma in our study is 4.34%. Various studies in India have reported prevalence of Glaucoma ranging from 1%–6%.[13] Prevalence in male is 51.55% which is more than 48.44% in female. However, the Arvind comprehensive eye survey,[5] Frahmingham eye study[6] also showed a higher prevalence of glaucoma in male, whereas Beaverdam eye study[7] showed no gender difference.

There was higher prevalence of glaucoma in *45–55 years* age group, whereas several studies showed increased glaucoma prevalence with increasing age.[5] In Chennai Glaucoma Study,[8] patients over *70 years* are *five times* more likely to have POAG than those younger than *50 years*. The prevalence of POAG was found to be 41.61%, while PACG was found to be 32.29% in our study. PAC and PACS patients contribute to 13.66% and 12.42% respectively.

The mean CD Ratio was found to be 0.6 with a SD of 0.2. The average baseline pressure was *20–25 mm Hg*. Many studies showed that IOP fluctuated during the daytime for both healthy individuals and POAG patients, and fluctuation could influence the diagnostic and prognostic evaluation of the glaucomatous diseases.[9–12] Two of our patients progressed to glaucomatous optic atrophy leading to complete blindness.

Out of 161 glaucoma patients, 118 (73.29%) patients were on medical treatment, 21 (13.04%) patients were treated with laser and 14 (8.69%) patients were surgically managed by trabeculectomy with mitomycin-C and 8 (4.96%) patients by cataract extraction following which the angles opened.

During the course of our study, 106 number of patients required change of treatment, in 75 (70.75%) patients were changed with medical line of treatment, that is either the dose, type of drug or drug regime (one, two or three) whatever was the need at the hour of treatment was done, 11 patients (10.37%) were operated with AGS with mitomycin, 20 (18.87%) patients were changed to laser form of treatment during the course of treatment and follow up with us.

Conclusion

Initiatives to increase public awareness and comprehensive eye examination by ophthalmologists are the key to reduce or eliminate undiagnosed glaucoma and also increase the compliance of the patients. Also, more emphasis need to be made on all ophthalmologists to diagnose glaucoma patients at an early stage by using applanation tonometry or NCT for IOP measurement and the same for dilated examination with indirect ophthalmoscopy to pick up early disc changes. Morever, there should be proper counselling of these patients as they have to undergo battery of glaucoma tests and then treatment also is a lifelong issue. Also, nocturnal diurnal variation was noted in few patients during our study, so further emphasis on nocturnal diurnal variation test should be taken into consideration.

The higher drop out rate indicates that proper counseling is a must. We are therefore planning to start counseling sessions *twice a week* for these patients on a regular basis. Also, further study needs to be done for the reasons of high glaucoma drop out. The high non-compliance rate and high prevalance rate of change of treatment is also suggestive of requirement of close follow up and timely intervention to prevent blindness and morbidity related to glaucoma disease.

References

1. George R, Ve Vijaya L. Glaucoma in india: Estimated burden of disease. J Glaucoma. 2010;19:391–97.
2. Park's textbook of Preventive & Social Medicine. 23rd edition 2015.pp.60–61.
3. Quigley HA, Broman AT. The number of people with glaucoma worldwide in 2010 and 2020. Br J Ophthalmol. 2006;90:262–267.
4. Pascolini D, Mariotti SP. Global estimates of visual impairment. BrJ Ophthalmol. 2012;96:614–618.
5. Ramakrishnan R, Nirmalan PK, Krishnadas R, *et al*. Glaucoma in a rural population of southern India: The Aravind comprehensive eye survey. Ophthalmology. 2003;110:1484–490.
6. Kahn HA, Liebowitz HM, Ganley JP, *et al*. The Framingham Eye Study. Am J Epidemiol. 1977 Jul;17:(1)106–32.
7. Klein BEK, Klein R, Sponsel WE, *et al*. Prevalence of glaucoma: The Beaver Dam Eye Study. Ophthalmology. 1992;99:1499–504.
8. Vijaya L, George R, Baskaran M, *et al*. Prevalence of primary open angle glaucoma in an urban South Indian population and comparison with a rural population. Ophthalmology. 2008;115:648–54.
9. Romanet JP, Maurent-Palombi K, Noël C, *et al*. Nyctohemeral variations in intra-ocular pressure. J FrOphtalmol. 2004;27:2S19–26.
10. Shuba LM, Doan AP, Maley MK, *et al*. Diurnal fluctuation and concordance of intra-ocular pressure in glaucoma suspects and normal tension glaucoma patients. J Glaucoma. 2007;16(3):307–312.
11. Saccà SC, Rolando M, Marletta A, *et al*. Fluctuations of intra-ocular pressure during the day in open-angle glaucoma, normal-tension glaucoma and normal subjects. Ophthalmologica. 115:(2)212;1998–19.
12. Liu JH, Sit AJ, Weinreb RN. Variation of *24 hrs* intra-ocular pressure in healthy individuals: Right eye versus left eye. Ophthalmology. 2005;112(10):1670–675.
13. http://npcb.nic.in/writereaddata/mainlinkfile/File302.pdf.

STATEMENT ABOUT OWNERSHIP AND OTHER PARTICULARS
"Ophthalmology and Allied Sciences" (See Rule 8)

1. Place of Publication	:	Delhi
2. Periodicity of Publication	:	Tri-annual
3. Printer's Name	:	**Dinesh Kumar Kashyap**
Nationality	:	Indian
Address	:	3/259, Trilokpuri, Delhi-91
4. Publisher's Name	:	**Dinesh Kumar Kashyap**
Nationality	:	Indian
Address	:	3/259, Trilokpuri, Delhi-91
5 Editor's Name	:	**Dinesh Kumar Kashyap**
Nationality	:	Indian
Address	:	3/259, Trilokpuri, Delhi-91
6. Name & Address of Individuals	:	**Red Flower Publication Pvt. Ltd.**
who own the newspaper and particulars of	:	41/48, DSIDC, Pocket-II
shareholders holding more than one per cent of the total capital		Mayur Vihar, Phase-1, Delhi-91

I, **Dinesh Kumar Kashyap**, hereby declare that the particulars given above are true to the best of my knowledge and belief.

Sd/-
(Dinesh Kumar Kashyap)

Original Article

Ophthalmology and Allied Sciences
Volume 5 Number 3 / September – December 2019
DOI: http://dx.doi.org/10.21088/oas.2454.7816.5319.3

To Study the Changes in OCT Parameters and Visual Outcome in Wet ARMD Patients Pre-and Post-Ranibizumab Injection

Tamboli Kshitij S[1], Shanbhag Nita U[2], Jain Sanika A[3], Zarkar Jay N[4]

Abstract

Purpose: Our study assesses the impact of injection ranibizumab on patients with wet ARMD. We take into account OCT parameters pre- and post- administration of injection ranibizumab. We then correlate the effects of these parameters with visual outcome in these patients. *Methods:* This was a prospective study of 40 eyes of 40 patients in DY Patil Hospital, Nerul, Navi Mumbai over a period of 1 year. All patients were treated with monthly intravitreal ranibizumab injections (0.5 mg/0.05 ml) for 3 months. Changes in foveal photoreceptor layer integrity, choroidal neovascular membrane, diameter, thickness, central macular thickness, subretinal fluid assessment was done by spectral domain OCT at every visit and correlated with final visual outcom*e. Results:* It was observed that intravitreal injection ranibizumab has a significant effect on improvement in OCT parameters of these patients. Also, the patients who had significant improvement in OCT had improvement in visual acuity finally. *Conclusion:* Intravitreal ranibizumab is a good choice of treatment in wet ARMD patients. Improvements in OCT could be correlated with visual improvement in these patients.

Keywords: Age related macular degeneration; Choroidal neo-vascularization; Ranibizumab.

How to cite this article:
Tamboli Kshitij S, Shanbhag Nita U, Jain Sanika A, *et al*. To Study the Changes in OCT Parameters and Visual Outcome in Wet ARMD Patients Pre-and Post-Ranibizumab Injection. Ophthalmol Allied Sci. 2019;5(3):269–274

Introduction

Choroidal Neo-vascularization (CNV) pathogenesis is said to be due to promotion and inhibition of blood vessel growth by cytokines that cause release of VEGF which bind to endothelial cell receptors. Thus, proliferation and vascular leakage enhances growth of new vessel complex.

Author Affiliation: [1]Third Year Post Graduate Student (MS), [2]H.O.D, [3]Senior Registrar, [4]Second Year Resident, Department of Ophthalmology, D.Y. Patil School of Medicine and Hospital, Nerul, Navi Mumbai, Maharashtra 400706, India.

Corresponding Author: Tamboli Kshitij S, Third Year Post Graduate Student (MS), Department of Ophthalmology, D.Y. Patil School of Medicine and Hospital, Nerul, Navi Mumbai, Maharashtra 400706, India.

E-mail: tambolikshitij@gmail.com

Received on 29.09.2019, **Accepted on** 12.11.2019

Macular photocoagulation study classification classifies CNV as Classic CNV and Occult CNV. Classic CNV can be seen as well demarcated lesions, lacy pattern on fundus fluorescein angiography. Occult CNV is other type which is further classified into type 1 and type 2. Type 1 constitutes lesions with fibro vascular pigment epithelial detachment. Type 2 constitutes lesions late leakage of undetermined source. Lesions were also classified as (predominantly > 50%) classic or minimally classic (CNV < 50%). Ocular angiogenesis is a cause of severe worldwide visual loss and ocular morbidity.[1] However, the development of Anti-vascular Endothelial Growth Factor (anti-VEGF) has revolutionized the treatment of a plethora of ocular angiogenic disease processes.[2]

OCT provides important information on serous retinal detachments, hemorrhages and sub-retinal neo-vascular membranes that are

components of exudative macular degeneration and allows a more precise and detailed analysis of anatomic structures and neo-vascular membrane lesions subtypes. These capabilities facilitate an understanding of the differences between the classic membranes, occult membranes, Retinal Angiomatous Proliferation (RAP) and disciform scars in the natural course of the disease and assess the response to Anti-vascular Endothelial Growth Factor (VEGF) drugs.[3]

Believing that bevacizumab would not efficiently diffuse through the retina to reach the choroid, Genetech decided to generate a truncated alternative molecule. Ranibizumab (Lucentis) was determined effective by two pivotal trials: The MARINA (minimally classic/occult trial of the anti-VEGF Antibody Ranibizumab in the treatment of neo-vascular ARMD) and ANCHOR (anti-VEGF antibody for the treatment of predominantly classic choroidal neo-vascularization in ARMD) trials. Both of these trials were the first phase 3 trials to show improvement in visual outcomes for all forms of choroidal neo-vascularization and were given FDA approval in 2006.[4,5]

Our study focused on assessing the OCT parameters and measure the effect of intravitreal injection ranibizumab on these OCT parameters like foveal photoreceptor layer integrity, choroidal neo-vascular membrane, diameter, thickness, central macular thickness, subretinal fluid after the treatment and vision were been optimally achieved to target. Thus, to correlate the effects of visual parameters with these OCT findings.

Materials and Methods

Our study is a Prospective study with Sample size of 40 eyes of 40 patients. Study site was patients coming to retina clinic in DY Patil Hospital, Nerul, Navi Mumbai. Study duration was a period of 1 *year*. study began after approval from institutional ethics committee was taken. Well informed written consent was taken from all the participants. All patients were treated with monthly intra-vitreal ranibizumab injections (0.5 *mg*/0.05 *ml)* for 3 *months* by same surgeon. It was noticed that their interval of recurrence also reduced as we decided to treat and extend after 3 *months.*

Patients initial Best Corrected Visual Acuity (BCVA, by log MAR chart) was noted, dilated fundus examination, Fundus Fluorescein Angiography (FFA) was done, initial OCT (signal strength (> 5/10) by spectral domain was noted. BCVA at the end of 3 months and OCT at that time was then compared with the initial ones. Assessed the correlation of foveal microstructural changes with visual improvement in neo-vascular ARMD after treatment. Measurement of OCT parameters

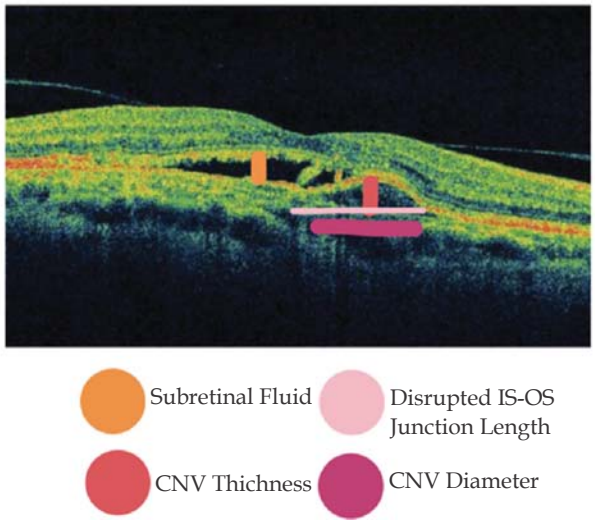


Fig.1: Illustration of measuring OCT parameters in a patient in our study

was done as shown in **(Fig. 1)**. CNV diameter, CNV thickness, IS-OS junction, sub-retinal fluid was assessed.

Inclusion criteria's were patients over 50 years of age, diagnosed with wet ARMD. Amongst those willing to participate to follow up. Exclusion criteria's were patients that had other retinal diseases, vitreous hemorrhage, Diabetic retinopathy, epiretinal membrane, myopic

degeneration, venous and arterial occlusion, optic neuropathy, uveitis, history of previous vitreo -retinal surgery, laser photocoagulation or photodynamic therapy.

In performing statistical analysis of data all values were presented as a mean ± standard deviation. Measurement values of the two Groups on SD-OCT images were compared using the Student's t-test. Bivariate relationships were analyzed using the Pearson correlation co-efficient. Then, multivariate analysis was performed with linear logistic regression over the dependent variable. Chi-square tests were used for comparison of discrete variables among groups. *p* values, < 0.05 were considered statistically significant. For evaluation of intergrader reliability, intraclass correlation co-efficient of variables (*e.g.*, disrupted IS/OS length, including CNV size) was assessed.

Results

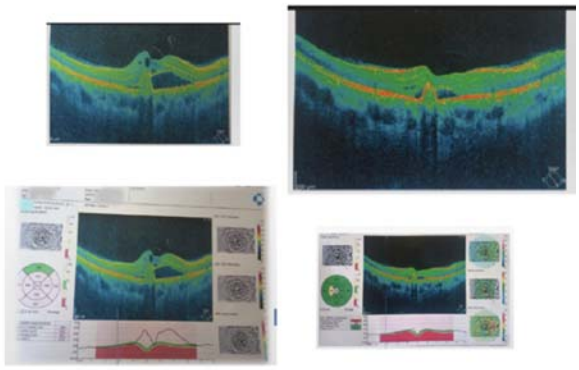
Total 40 eyes were studied, out of which 25 male and 15 females. Age range was from *51 years* to *81 years* (average, *62.07 ± 8.6 years*). Upon doing fundus fluorescein angiography 19 were classic CNVM, 18 were occult CNVM and 3 were unclassified.

The baseline mean BCVA (in log MAR) was 0.61 ± 0.24 while the change in BCVA after intervention was 0.34 ± 0.04, (**Table 1**). As other values of baseline and change in CNV central macular thickness, CNV thickness and diameter were analyzed along with sub-retinal fluid and its resolution and initial disrupted IS-OS junction and change in its length disruption (**Table 1**). Out of these findings, Change in BCVA, CNV thickness, change in sub-retinal fluid and change in disrupted IS/OS junction length were the parameters that found significant change after intervention in our study (**Table 1**).

Thus, Changes in oct parameters were measured

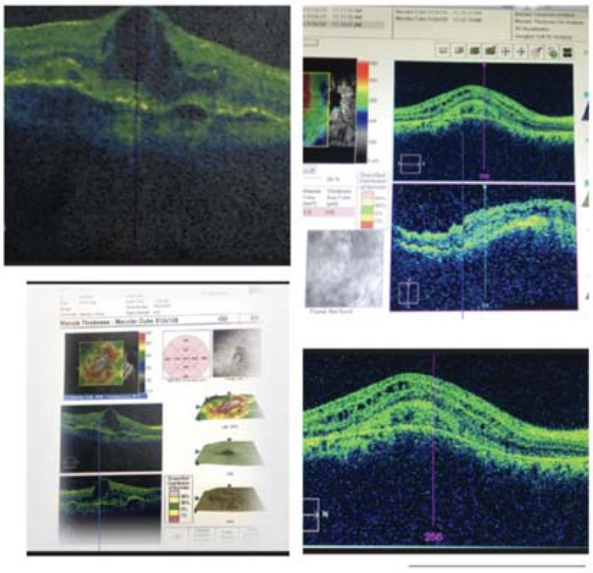
Table 1: Showing Oct findings and BCVA values before and after intervention. (adequate doses of injection Ranibizumab)

Pre injection parameters:					
Mean BCVA logMAR	**Central macular thickness**	**CNV thickness**	**CNV diameter**	**Subretinal fluid**	**Disrupted IS–OS length**
0.61 ± 0.24	390.12 ± 139.10	229.45 ± 142.14	2,256.41 ± 884.46	Present in 70% eyes	2327.40 ± 1070.85
Post injection parameters:					
Mean BCVA logMAR	**Central macular thickness**	**CNV thickness**	**CNV diameter**	**Subretinal fluid**	**Disrupted IS - OS length**
0.95 ± 0.20	514 ± 138.39	304 ± 138.78	2608 ± 842.62	Resolved in 6.8% of eyes	3345 ± 1001.90
Changes in parameters:					
Change in BCVA (logMAR)	**Change in Central macular thickness**	**Change in CNV thickness**	**Change in CNV diameter**	**Resolution of Subretinal fluid**	**Change in disrupted IS/OS length**
0.34 ± 0.04	124.12 ± 137.26	75.78 ± 46.62	352 ± 764.68	Present in 63% of eyes	1018.74 ± 976.40
p < 0.05 significant	Not significant	*p* < 0.05 significant	Not significant	significant	*p* < 0.05 significant



A B

Fig. 2A,B: Illustration showing oct changes in a patient in our study before and after the intervention



A B

Fig. 3A,B: Illustration showing oct changes in a patient in our study before and after the intervention

as shown in (**Fig. 1**), illustrates the actual cases in study that improved in oct parameters. (**Figs. 2–3**) are the Oct pictures of 2 cases in our study: Both of which, the part A of the Fig. shows the initial Oct, while part B shows the Oct after the intervention course of ranibizumab injections.

BCVA change was positively correlated with the change in disrupted IS/OS length ($r = 0.614, p = 0.05$). Consistent with the restoration of the disrupted IS/OS after IVR, the final BCVA improved. BCVA change was also positively correlated with the change in CNV thickness ($r = 0.652$, $p = 0.05$). Consistent with the decrease in CNV thickness after IVR, the final BCVA improved.

Discussion

In our study, oct parameters like CNV thickness, diameter, sub-retinal fluid and IS–OS junction receptor length were studied pre- and post-intravitreal injection ranibizumab. Visual acuity improvement after Intravitreal Ranibizumab is correlated significantly with the status of the photoreceptor IS/OS and CNV thickness on SD-OCT after intervention. Visual acuity was most improved when the disrupted IS/OS line was better restored, and CNV thickness was more decreased. However, central macular thickness and CNV diameter had no significant impact after intervention. Many clinical trials have achieved BCVA improvement after Intravitreal Ranibizumab in neo-vascular AMD. However, information on the microstructural changes correlated with visual improvement has so far been limited. Similar findings have been reported by a study done by Shin *et al*.[6] and Otani T *et al*.[7]

Frammeet *et al*.[8] reported on CNV structural changes before and after anti-VEGF monotherapy in 78 eyes with neo-vascular AMD. Quantitative measurement of stable CNV after resolved exudative change showed no significant difference in diameter but revealed a significant reduction in thickness. Similarly, Byun *et al.*[9] reported a positive response after intravitreal bevacizumab injection in 113 eyes with neo-vascular ARMD. Subretinal tissue thickness, which may reflect CNV thickness, was greater in the non-responder Group than in the responder Group. However, there was no significant difference in CNV diameter between Groups.

In 2006, the antibody fragment, ranibizumab, was approved for use in neo-vascular AMD by the FDA. The landmark ANCHOR and MARINA studies aimed to access the efficacy of ranibizumab in both classic and minimally classic/occult neo-vascular ARMD, respectively.[5] The EXCITE trial then directly compared monthly versus quarterly ranibizumab injections over *1 year.*[10]

HARBOR study [11] demonstrated that monthly

doses of *0.5 mg* ranibizumab produce the optimum visual results for patients with neo-vascular ARMD. The PrONTO (prospective optical coherence tomography imaging of patients with neo-vascular ARMD treated with intra-ocular ranibizumab) trial was a small, non-randomized, uncontrolled, open-label study which used OCT to vary ranibizumab dosing following a *3-month* loading phase.[12] The SUSTAIN (safety and efficacy of a flexible dosing regimen of ranibizumab in neo-vascular age-related macular degeneration) study was a larger, *1 year* single arm study which again involved ranibizumab dosing following a *3-month* loading phase.[13]

Some clinicians support a "treat and extend" regime, which involves treating monthly until the macula is dry and then incrementally increasing time between injections whilst the macular remains dry.[14,15] This seems to lead to stabilised visual acuity with a reduction in injections but has not been assessed with a prospective, randomised controlled trial.

Limitations of our study, were relatively small number of patients, OCT angiography technique as is not at our place so, wasn't used in this study, only intravitreal ranibizumab injection was used, no other intravitreal were compared.

In the future, therapeutic strategies should restore and maintain photoreceptor integrity and to decrease and stabilize CNV thickness during neo-vascular AMD treatment. Early detection by screening for the patients who come for visual distortion, cataract and glaucoma evaluation with OCT should be done. OCT should be made mandatory after age 50 in routine health check ups along with cataract. Awareness camps for prevention of blindness should include ARMD too.

Conclusion

It was observed that intravitreal injection ranibizumab has a significant effect on improvement in OCT parameters of these patients. Also, the patients who had significant changes in OCT parameters had improvement in visual acuity finally. Resolution of sub-retinal fluid was significantly noted in most of the patients who had the evidence of it before intravitreal injection. The results of the present study, showed that visual acuity improvement after intravitreal ranibizumab is correlated significantly with the status of the IS/OS junction integrity and CNV thickness on SD-OCT after completion of the loading phase. Visual acuity was most improved when the disrupted IS/OS line was better restored, and CNV thickness was more decreased. Foveal photoreceptor integrity and CNV thickness seen on SD-OCT are closely associated with visual improvement after intravitreal ranibizumab treatment in patients with neo-vascular AMD.

Many clinical trials including MARINA, ANCHOR, and PrONTO have achieved BCVA improvement after intravitreal ranibizumab in neo-vascular ARMD. However, information on the microstructural changes correlated with visual improvement has so far been limited.

References

1. Brad bowling. Aquired macular disorders; Kanski's Clinical ophthalmology, 8th edition. p. 607.
2. Tah Vikas. Anti-VEGF Therapy and the Retina: An Update; Hindawi Publishing Corporation Journal of Ophthalmology. 2015; Article ID 627674. Available from https://www.hindawi.com/journals/joph/2015/627674/#B13.
3. Garcia-Layana, Alfredo. Optical Coherence Tomography in Age-related Macular Degeneration, 2017 July. Available from http://www.amdbook.org/book/export/html/423.
4. PJ Rosenfeld, Brown DM, JS Heier. Ranibizumab for neo-vascular age-related macular degeneration. The New England Journal of Medicine. 2006;355(14):1419–31.
5. Brown DM, Kaiser PK, Michels M. Ranibizumab versus verteporfin for neo-vascular age-related macular degeneration. The New England Journal of Medicine. 2006;355(14):1432–44.
6. Shin. Microstructural change and vision in AMD retina, correlation of foveal microstructural changes with vision after anti-vascular endothelial growth factor therapy in age related macular degeneration; Retina. 2013;33:964–70.
7. Otani T. Correlation between visual acuity and foveal microstructural changes in diabetic macular edema. Retina. 2010 May;30(5):774–80.
8. Framme C, Panagakis G, Birngruber R. Effects on choroidal neo-vascularization after anti-VEGF upload using intravitreal ranibizumab, as determined by spectral domain-optical coherence tomography. Invest Ophthalmol Vis Sci. 2010;51:1671–76.
9. Byun YJ, Lee SJ, Koh HJ. Predictors of response after intravitreal bevacizumab injection for neo-vascular age-related macular degeneration. Jpn J Ophthalmol. 2010;54:571–577.
10. Schmidt-Erfurth U, Eldem B, Guymer R. Efficacy and safety of monthly *versus* quarterly ranibizumab

treatment in neo-vascular age-related macular degeneration: The EXCITE Study. Ophthalmology. 2011;118(5):831–839.

11. Busbee BG, Ho AC, Brown DM. Twelve-month efficacy and safety of *0.5 mg* or *2.0 mg* ranibizumab in patients with subfoveal neo-vascular age-related macular degeneration. Ophthalmology. 2013;120(5):1046–056.
12. Lalwani GA, Rosenfeld PJ, Fung AE. A variable-dosing regimen with intravitreal ranibizumab for neo-vascular age-related macular degeneration: Year 2 of the PrONTO Study. American Journal of Ophthalmology. 2009;148(1):43–58.
13. Holz FG, Amoaku W, Donate J. Safety and efficacy of a flexible dosing regimen of ranibizumab in neo-vascular age-related macular degeneration: The SUSTAIN study. Ophthalmology. 2011;118(4):663–71.
14. Engelbert M, Zweifel SA, and Freund KB. Long-term follow-up for type 1 (subretinal pigment epithelium) neo-vascularization using a modified 'treat and extend' dosing regimen of intravitreal anti-vascular endothelial growth factor therapy. Retina. 2010;30(9):1368–75.
15. Engelbert M, Zweifel SA, and Freund KB. Treat and extend' dosing of intravitreal anti-vascular endothelial growth factor therapy for type 3 neo-vascularization/retinal angiomatous proliferation. Retina. 2009;29(10):1424–31.

Original Article

Ophthalmology and Allied Sciences
Volume 5 Number 3 / September – December 2019
DOI: http://dx.doi.org/10.21088/oas.2454.7816.5319.4

Prevalence of Primary Open Angle Glaucoma among the Patients Attending the A Tertiary Care Hospital in Andhra Pradesh: A Cross Sectional Study

PL Sireesha Reddy[1], G Chandrasekhar[2]

Abstract

Background: Of the glaucoma types primary open angle glaucoma is the most common type. People of Asian origin are more likely to have glaucoma when compared to those of African or European origin. In the last *10* to *15 years* many population based studies have been conducted to understand the prevalence of glaucoma in the community. *Aims:* To understand the prevalence of primary open angle glaucoma among the patients attending our tertiary care center and correlation the disc cup ratio with the change in intra-ocular pressure. *Materials and Methods:* A cross sectional study was conducted in the department of ophthalmology in Narayana Medical College and Hospital, Nellore from the period of *2010* to *2012.* Detailed clinical history and evaluation was done for all the patients and noted in the case record form. Intra-ocular pressure was measured by Goldmann Applanation Tonometry. Gonioscopy was done by Goldmann Three-mirror gonioscope. *Statistical Analysis:* All the qualitative data was expressed in percentages and quantative data was expressed in mean and standard deviation. *Results and Conclusions:* The mean age of the sample was *52.15 ± 3.45 years* with male preponderance. The most common symptom was headache and diminished vision in the present study. The prevalence of the primary open angle glaucoma increased as the intra-ocular pressure increased. Disc cupping increased proportionately with increase in intra-ocular pressure, thus establishing progression of glaucoma with rise in IOP.

Keywords: POAG; Field defects; IOP; Disc: Cup ratio.

How to cite this article:
PL Sireesha Reddy, G Chandrasekhar. Prevalence of Primary Open Angle Glaucoma among the Patients Attending the A Tertiary Care Hospital in Andhra Pradesh: A Cross Sectional Study. Ophthalmol Allied Sci. 2019;5(3):275–278

Introduction

According to World Health Organisation statistics Glaucoma is the second leading cause of blindness across the world after cataracts.[1] Of the glaucoma types primary open angle glaucoma is the most common type. People of Asian origin are more likely to have glaucoma when compared to those of African or European origin. In the last *10* to *15 years* many population based studies have been conducted to understand the prevalence of glaucoma in the community.[2–6] Some of them specifically mentioned were Vellore Eye Survey, Andhra Pradesh Eye Disease Study, Aravind Comprehensive Eye Survey and Chennei Glaucoma Study.[7] Primary open angle glaucoma occurs which increase in intra-ocular pressure with gradual loss of vision. This in turn makes it hard to diagnose it at an early stage. With this background we conducted a study to understand the prevalence of primary open angle glaucoma among the patients attending our tertiary care

Author Affiliation: [1]Assistant Professor, [2]Professor, Department of Ophthalmology, Narayana Medical College, Nellore, Andhra Pradesh 524003, India.

Corresponding Author: G Chandrasekhar, Professor, Department of Ophthalmology, Narayana Medical College, Nellore, Andhra Pradesh 524003, India.

E-mail: drsireesha11@gmail.com

Received on 16.08.2019, **Accepted on** 23.10.2019

center and correlation the disc cup ratio with the change in intra-ocular pressure.

Materials and Methods

A cross sectional study was conducted in the department of ophthalmology in Narayana Medical College and Hospital, Nellore from the period of *2010* to *2012*. During the study period, 120 study subjects with primary angle glaucoma were included. Detailed clinical history and evaluation was done for all the patients and noted in the case record form. Intra-ocular pressure was measured by Goldmann Applanation Tonometry. Gonioscopy was done by Goldmann Three-mirror gonioscope. Disc evaluation was done by both direct ophthalmoscopy and slit lamp bio microscopy using 78D and 90D lenses.

Statistical Analysis

All the data was entered in Microsoft Excel and analysed using Epi info version 7.2. All the qualitative data was expressed in percentages and quantative data was expressed in mean and standard deviation.

Results

We included 120 study subjects in the present study, (**Table 1**).

Table 1: Demographic characteristics of the sample

Demographic characteristics	Frequency	Percentage
Age group		
< 40	3	2.5
40 to 50	22	18.3
50 to 60	41	34.16
60 to 70	39	32.5
> 70	15	12.5
Gender		
Male	62	51.6
Female	58	48.4

The mean age of the sample was *52.15 ± 3.45 years* with male preponderance,

Table 2: Clinical presentation of the study sample (*n* = 120)

Clinical presentation	Frequency	Percentage
Headache	92	76.67
Diminished vision	85	70.83
Other symptoms	3	2.5

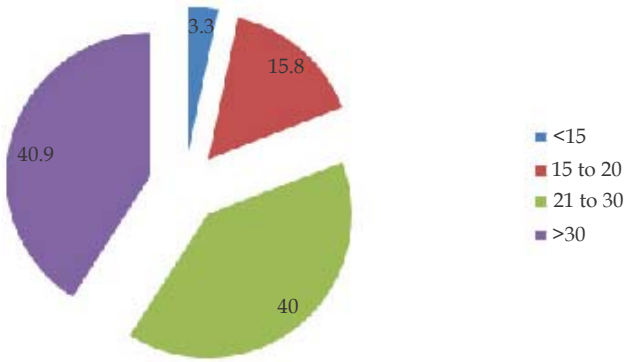


Chart 1: Prevalence of primary open angle glaucoma based on intra-ocular pressure

The most common symptom was headache and diminished vision in the present study, (**Chart 1**).

The prevalence of the primary open angle glaucoma increased as the intra-ocular pressure increased, (**Table 3**).

Table 3: Correlation of disc cupping with IOP

Intra ocular pressure	Cup: disc ratio
< 15	0.4
15 to 20	0.5
21 to 30	0.8
> 30	0.9

Disc cupping increased proportionately with increase in intra-ocular pressure, thus establishing progression of glaucoma with rise in IOP.

Discussion

Glaucoma is one the leading causes of gradual onset blindness across the world. According to a systemic review and meta-analysis done by Kapetanakis VK *et al*.[8] it was estimated that Globally 57.5 million people (95% CI 46.4 to 73.1 million) were affected by POAG in 2015, rising to 65.5 million (95% CI

52.8, 83.2 million) by 2020. We conducted a study to understand the prevalence of the primary open angle glaucoma in the patients attending department of ophthalmology in a tertiary care hospital in Andhra Pradesh.

We included 120 study subjects with glaucoma and found that the mean age of presentation was *52.15 ± 3.45 years* with male preponderance. Similar findings were reported by Shreekanth B *et al*.,[9] Mahesh Reddy M *et al*.,[10] Tidake, P *et al*.,[11] Agarwal S *et al*.,[12] Raychaudhari A *et al*.,[12] Jacob A *et al*.,[13] and Nangia V *et al*.[14] In Handan Eye study, using the *40-* to *49-year-old* Group As a reference population, the Odds Ratio (OR) increased from 3.4 (95% confidence interval [CI], 1.2–9.8) for the *50-* to *59-year-old* Group to 9.6 (95% CI, 3.2–28.6) for the *70 year* of age and older Group.[15] In a study conducted by Vijaya L *et al*.[16] subjects with POAG were significantly older ($p < 0.001$) than the overall study population (mean age, *59.9 ± 10.4 years* vs *53.8 ± 10.7 years*). The prevalence of POAG increased from 0.63% (95% CI, 0.44–0.83) in the age Group of *40* to *49 years* to 3.64% (95% CI, 1.16–6.12) in the age Group of > *80 years*.

The prevalence of the primary open angle glaucoma increased as the intra-ocular pressure increased. The mean IOP in a study conducted by Shreekanth B *et al*.[9] was 14.79 ± 3.60. Mahesh Reddy M *et al*.[10] studied the diabetic patients in their setup for prevalence of glaucoma and its types. The mean IOP of the patients with primary open angle glaucoma was *28.12 ± 3.99 mm hg*. A study conducted by Liang YB *et al*. among the Chinese adults (Handan Eye Study) revealed that older age, male gender and IOP are main predictors for primary open angle glaucoma. The OR was 1.5 (95% CI, 1.2–1.8) for every *5 mm Hg* of higher IOP.[15] In a study conducted by Vijaya L *et al*.[16] they found significant association between the older age and raised IOP with primary open angle glaucoma.

Disc cupping increased proportionately with increase in intra-ocular pressure, thus establishing progression of glaucoma with rise in IOP. In study conducted by Vijaya L *et al*.[16] The mean CCT in the normal study population was *505.9 ± 31.1* μm. The mean CCT in subjects with POAG (*502.8 ± 35.3 μ*m) was not different from the normal study Group ($p = 0.43$). Subjects with POAG with an IOP > *21 mm Hg* had slightly thicker CCT (*511.1 ± 26.7 μm*) in comparison with subjects with POAG with IOP < *21 mm Hg* (*500.2 ± 37.5μ*m). This difference, however, was not statistically significant ($p = 0.30$). A study conducted by Nangia V *et al*.[14] inferred that older, higher IOP and vertical cup: Disc ratio was important predictors of primary open angle glaucoma in their study.

Conclusion

The most common age Group was *50* to *60 years* to have primary open angle glaucoma and males were more likely to get it according to our study. Raised IOP had higher prevalence of the primary open angle glaucoma and disc changes are more frequently found with increase in the intra ocular pressure.

References

1. The Global Impact of Glaucoma. Bull World Heal Organ. 1994;72(3):323–26.
2. Leske MC. The epidemiology of open-angle glaucoma: A review. Am J Epidemiol. 1983;118(2):166–91.
3. Leydhecker W. A glaucoma survey in South India. Doc Ophthalmol. 1984;57(4):357–59.
4. Congdon N, Wang F, Tielsch JM. Issues in the epidemiology and population-based screening of primary angle-closure glaucoma. Surv Ophthalmol. 1992;36(6):411–23.
5. Bengtsson B. The prevalence of glaucoma. Br J Ophthalmol. 1981;65(1):46–49.
6. Hollows FC, Graham PA. Intra-ocular pressure, glaucoma, and glaucoma suspects in a defined population. Br J Ophthalmol. 1966;50(10):570–86.
7. George R, Ve RS, Vijaya L. Glaucoma in India: Estimated burden of disease. J Glaucoma. 2010;19(6):391–97.
8. Kapetanakis VV, Chan MPY, Foster PJ, *et al*. Global variations and time trends in the prevalence of Primary Open-angle Glaucoma (POAG): A systematic review and meta-analysis. Br J Opthalmol. 2016;100:86–93.
9. Sreekanth B. A Hospital based clinical study on Primary Open-Angle Glaucoma. Int J Sci Study. 2017;5(9):139–43.
10. Mahesh Reddy M, Malleswari M, Sai Rani K. Prevalence Of Primary Open-Angle Glaucoma in diabetic patients abstract: IOSR J Dent Med Sci. 2017;16(6):147–51.
11. Tidake P, Sharma S. Clinical profile and Management of Primary Open-angle Glaucoma patients above *40 Years*: A Rural Hospital-based Study. J Datta Meghe Inst Med Sci Univ. 2017;12:1–6.
12. Agarwal H, Gulati V, Sihota R. Visual field Assessment in Glaucoma: Comparative evaluation of manual Kinetic Goldmann Perimetry and

Automated Static Perimetry. Indian J Opthalmology. 2000;48(4):301–306.

13. Jacob A, Thomas R, Koshi SP, *et al*. Prevalence of Primary Glaucoma in an Urban South Indian population. Indian J Opthalmology. 1996;46(2):81–86.
14. Nangia V, Jonas JB, Matin A, *et al*. Prevalence and Associated Factors of Glaucoma in Rural Central India. The Central India Eye and Medical Study. PLoS One. 2013;8(9):1–10.
15. Liang YB, Friedman DS, Zhou Q, *et al*. Prevalence of primary open angle glaucoma in a Rural Adult Chinese Population: the Handan eye study. Invest Ophthalmol Vis Sci. 2011;52(11):8250–257.
16. Vijaya L, George R, Baskaran M, *et al*. Prevalence of Primary Open-angle Glaucoma in an Urban South Indian Population. Opthalmology. 2008;115(4): 648–55.

Original Article

Ophthalmology and Allied Sciences
Volume 5 Number 3 / September – December 2019
DOI: http://dx.doi.org/10.21088/oas.2454.7816.5319.5

Evaluation and Documentation of Ophthalmic Lesions in Children Having Homozygous Sickle Cell Disease

Kapadia Priti Rameshbhai[1], Patel Parth Atulkumar[2], Patel Shivani Dinesh Kumar[3]

Abstract

Background: Homozygous sickle cell disease is prevalent in tribal population of South Gujarat. *Aim:* To determine prevalence of different ocular manifestations in pediatric patients with homozygous sickle cell disease in South Gujarat. *Setting and Design:* Cross sectional study at tertiary level government hospital and primary health centers. *Methods:* 125 children with homozygous sickle cell disease, who fulfilled the criteria were enrolled, were enrolled in the study during a period from *December 2015* to *June 2017*. We collected data on demography, ocular history, hospitalization history and complete eye examination. We calculated systemic severity index. *Statistical analysis used:* We used SPSS version 20. *p* value ≤ 0.05 was considered to be statistically significant. *Results:* Majority of children were from age group *11–18 years* (68.8%) and belonged to schedule tribe with almost equal gender distribution; M: F = 1:1.08. Ocular abnormalities were observed in 43 (34.4%) patients. Anterior segment presentations were: Conjuctival sign-21 (16.8%), Iris atrophy-1 (0.8%). Posterior segment signs were: Retinal venous tortuosity-25 (20%), High cup: Disc ratio-3 (2.4%), Vitreous hemorrhage (Grade 4 Proliferative Central Retinopathy) -4 patients (3.2%), Salmon patch hemorrhage-2 (1.6%), Angioid streaks-2 (1.6%), Drusen-1 (0.8%), Central retinal artery occlusion-1 (0.8%). Ocular manifestations were found to be statistically significant in patients with systemic severity index between 0.8-1. Blindness was found in 4% cases. *Conclusion:* Mild ocular morbidities are found in children having homozygous sickle cell disease in most vulnerable communities of South Gujarat. Regular eye check-up is recommended in children having high systemic severity index for early diagnosis and treatment of potential blinding conditions.

Keywords: Homozygous sickle cell disease; Systemic severity index; Venous tortuosity; Conjuctival sickling sign; Vitreous hemorrhage.

How to cite this article:
Kapadia Priti Rameshbhai, Patel Parth Atulkumar, Patel Shivani Dineshkumar. Evaluation and Documentation of Ophthalmic Lesions in Children Having Homozygous Sickle Cell Disease. Ophthalmol Allied Sci. 2019;5(3):279–284

Introduction

Hemoglobinopathies are a group of genetic disorders of hemoglobin. They affect about 4.5% of the world population.[1] In India too, they have been considered responsible for the largest number of genetic disorders, contributing to imbalance in health profile.[2] It is estimated that incidence of major Hemoglobinopathies traits in Gujarat is about 12%.[3] Sickle Cell Disease (SCD) is one such severe hematological disorder. The prevalence of sickle cell in India varies between 1 and 44% because of consanguinity, caste issues and area endogamy.

Sickling disorders include: (1) heterozygous (HbAS) sickle cell trait (2) homozygous (HbSS) sickle cell disease (3) compound heterozygous states for HbS with hemoglobin C (HbSC), D (HbSD), E (HbSE) or other structural variants and (4) the combination of the sickle cell gene with different

Author Affiliation: [1]Professor and Head, [3]Assistant Professor, Department of Ophthalmology, Government Medical College, Surat, Gujarat 395001, India. [2]Consultant, Department of Ophthalmology, Lions Eye Hospital, Viramgam, Gujarat 382150. Inida.

Corresponding Author: Patel Shivani Dineshkumar, Assistant Professor, Department of Ophthalmology, Government Medical College, Surat, Gujarat 395001, India.

E-mail: shivupatel21@gmail.com

Received on 14.08.2019, **Accepted on** 23.10.2019

forms of thalassemia (HbSThal). Out the various genotypes which are known to cause SCD, the three predominate types identified in most populations are HbSS [often called Sickle Cell Anemia (SCA)], HbSC and HbS/-thalassemia.[5]

The polymerization of deoxygenated HbS results in premature destruction of red blood cells (hemolysis) and blockage of blood flow (vaso-occlusion). Micro-vascular occlusions is the most common cause of visual loss, especially those who suffered repeated episodes of vaso-occlusion are vulnerable to blindness. Sickle cell disease can affect every part of the eye.

According to Indian Council of Medical Research, sickle cell disease is most common in tribal populations. Gujarat has 89.12 lakhs tribal population (10–15% of the total tribal population of India). It is expected to have 70,000 Sickle Cell Disease patients and prevalence of Sickle Cell Trait (SCT) varies from 0 to 31.4% among different tribes.[6,7] Due to the high prevalence in some communities, the screening program is arranged by the government for control of sickle cell anemia in South Gujarat which has created disease awareness in the population. The improvement in the medical care of children with Sickle cell Disease has increased their survival.[8,9] This has raised the possibility of increased number of blind years in children surviving with sickle cell disease, if the potential blinding ophthalmic problems are not timely identified.

The knowledge about the magnitude of ocular manifestations in homozygous sickle cell disease patients of South Gujarat will be helpful to plan strategies for early diagnosis and intervention of blinding eye conditions in such debilitated patients.

Materials and Methods

The study was conducted in a tertiary care Government hospital and few primary health centers in South Gujarat. We took patient's assent and informed consent of their parents. The research was conducted in accordance to the tenets of Declaration of Helsinki. The study was approved by the Human Ethics Research Committee of our institute.

The present study is a cross sectional hospital and community based study of ocular manifestations in diagnosed cases of homozygous sickle cell disease in children. 125 children between *2* and *18 years* of age from *December 2015* to *June 2017* were recruited in the study. Pediatricians in our hospital were requested to send diagnosed cases of homozygous sickle cell disease patients to outdoor patient department of Ophthalmology for detailed ophthalmic examination. We also approached to health centers in South Gujarat where many cases of homozygous sickle cell disease are registered and who come for regular follow up. The Medical Officer of the peripheral health centers were requested to organize camps for registered cases of homozygous sickle cell disease patients for ophthalmic examination. When camp was organized, patients and their parents were explained about the disease and importance of eye examination in it. We excluded patients who had ocular comorbidities like developmental cataract, developmental glaucoma, retinopathy of prematurity; patients having other hemoglobinopathies like leukemia, thalassemia, etc.

We documented detailed ocular history, past history, family history and sibling history of the patients. History regarding hospitalization, purpose of hospitalization, duration and number of hospitalization till date was recorded.

Sickle cell disease is a systemic disease, the more severe the disease, higher are the chances of end organ damage one would expect including damage to ocular structures. To study this association, we calculated systemic severity index by dividing number of hospitalizations since birth, by age of the patient.[10]

We did detailed anterior and posterior segment examination of all patients. Visual acuity assessment was done by Snellen's chart. Anterior segment examination for conjuctival sickling sign, iris depigmentation or atrophy was done on slit lamp when patients were examined at a tertiary care center or on a torch light when patients were examined at peripheral health centers. We carried out indirect and direct ophthalmoscopy to identify lesions in posterior segment after dilating pupils with Tropicamide and Phenylephrine combination eyedrops. Patients with ocular manifestation were explained about their eye condition, the warning signs and further management depending on the severity of involvement.

Statistical analysis

Data entry was done and descriptive statistics was used to express values of parameters as mean and standard deviation. Analysis of result was done by MS Excel and Statistical Package for Social Scientists (SPSS) software version 20. Any *p* value less than or equal to 0.05 was considered to be statistically significant.

Results

Total 125 pediatric patients were recruited in the study. Nearly two third of them were above *11 years* of age; mean age being *11.96 years* (SD: 4). The gender distribution was nearly equal (M:F = 1.08). Ocular manifestations were found in only one third (34.4%) of the total cases. Posterior segment manifestations, either in isolation or in association with anterior segment changes, were found in majority of sickle cell cases who had ocular changes. Blindness was present in only 4% cases and there were no cases of low vision. (**Table 1**)

The major anterior segment manifestation was conjunctival sickling sign in 21 patients (16.8 %). Iris atrophy was present only in one patient (0.8 %). The major posterior segment finding was venous tortuosity (20%). The high cup disc ratio (2.4%) was not associated with raised IOP in any of the cases. The prevalence of Proliferative Sickle Cell Retinopathy (PSCR) in form of Vitreous hemorrhage (Stage 4 PSCR) was 3.2% in our study. Angiod streak and Salmon patch hemorrhage was found in 1.6% cases. (**Table 2**)

Table 1: Profile of cases examined

Parameter		Number of cases (%)	
Age-Sex Distribution			
Age group (*Years*)	Male	Female	Total (%)
2–5	8	5	13 (10.4)
6–10	15	11	26 (20.8)
11–18	42	44	86 (68.8)
	65 (52%)	60 (48%)	125 (100)
Ocular Manifestations			
Anterior segment		8 (6.4)	
Posterior segment		21 (16.8)	
Both		14 (11.2)	
Total cases with ocular manifestation		43 (34.4)	
Visual Acuity at time of examination			
Vision > 6/18		110 (88)	
Low vision Category 1 (< 6/18 to 6/60)		0	
Low vision Category 2 (< 6/60 to 3/60)		0	
Blindness Category 3 (< 3/60 to 1/60)		2 (1.6)	
Blindness Category 4 (< 1/60 to perception of light)		3 (2.4)	
Blindness Category 5 (No perception of light)		0	
Vision not assessed*		10 (8)	

*These kids were < *5 years* and were unco-operative for vision assessment with available charts. They gave finger counting positive at various distances

Table 2: Various Posterior segment manifestations (*n* = 35) in children with homozygous sickle cell disease

Posterior segment manifestations	Numbers	Percentages
Venous Tortuosity	25	20
Non-significant Cup: Disc Ratio	3	2.4
Vitreous hemorrhage	3	2.4
Salmon patch hemorrhage + Vitreous hemorrhage	1	0.8
Salmon patch hemorrhage + Central retinal artery occlusion	1	0.8
Angioid Streaks	1	0.8
Angioid Streaks + Drusen	1	0.8
Total	**35**	**28**

The causes for blindness in our study were Vitreous Hemorrhage (3.2%) and Central retinal artery occlusion (0.8%). In current study, all the patients enrolled belonged to schedule tribe. Gamit, Chaudhari Kotwadiya & Dhodia were the major tribes constituting about two third (72.8%)

Table 3: Distribution of ocular manifestations in different communities

Community	Number of patients of homozygous SCD examined (%)*	Number of patients of HbSS with ocular manifestations (%)*
Gamit	54 (43.2)	16 (37.2)
Chaudhari	18 (14.4)	5 (11.62)
Kotwadiya	11 (8.8)	3 (6.9)
Vasava	5 (4)	2 (4.6)
Dhodia	8 (6.4)	4 (9.3)
Nayka	2 (1.6)	1 (2.3)
Halpati	4 (3.2)	2 (4.6)
Valvi	1 (0.8)	1 (2.3)
Gavli	2 (1.6)	0
Ozariya	3 (2.4)	1 (2.3)
Bhanvar	4 (3.2)	3 (6.9)
Dikar	3 (2.4)	1 (2.3)
Shingada	2 (1.6)	0
Bhisana	2 (1.6)	1 (2.3)
Pawar	1 (0.8)	1 (2.3)
Mathur	1 (0.8)	0
Saidanve	1 (0.8)	0
Dipalde	1 (0.8)	1 (2.3)
Kokri	1 (0.8)	0
Chauhan	1 (0.8)	1 (2.3)
Total	125	43

*Column Percentages

of the total HbSS patient examined and 65% of the total cases with ocular manifestations. The number of cases with ocular morbidity was proportionate to the number of cases included in the study for all the major tribes. (**Table 3**)

Table 4: Univariate analysis of ocular manifestation with various variables in the patients

Factor	Ocular manifestation (n = 125)					
	Yes	No	Total	Odds Ratio	χ^2 Test	p value
Gender						
Male	24	41	65	1.2635	χ^2 = 0.382	0.5365
Female	19	41	60	0.7917		
Age groups						
2–5	2	11	13	0.3173	χ^2 =1.4794	0.1349
6–10	10	16	26	1.25	χ^2 = 0.24	0.6242
11–18	31	55	86	1.2682	χ^2 = 0.3311	0.5650
Systemic severity index*						
0–0.3	14	47	61	0.3625	χ^2 = 6.921	0.008521
0.4–0.7	17	32	49	1.0216	χ^2 = 0.00308	0.9557
0.8–1	8	1	9	18.09	χ^2 = 10.2906	0.0008
Above 1	4	2	6	4.052	χ^2 = 1.5998	0.1236

*Systemic severity index = number of hospitalization from birth/age of patient in *years*

Mean of systemic severity is 0.38 with range of 0–1.66. (SD = 0.31). The univariate analysis shows that only systemic severity has statistically significant association with ocular findings. When systemic severity is between 0.8–1, more ocular manifestations are found (p value -0.0008). (**Table 4**)

Discussion

In the present study, 70% of the patients with HbSS disease were above 11 years. This may be due to less awareness about the health problem in the community. Disease is diagnosed only when there

is a complication or observed in a routine checkup. Ocular manifestations were found in 34.4 % cases which are comparable to similar such study done in Nigeria.[11]

Conjuctival signs were the major anterior segment finding. It is considered as a pathognomonic sign for sickle cell disease.[12] However, in our study the rate is lower as compared to study done in past where 70% of SS disease patient had conjuctival sign. It was also reported that the frequency is higher for homozygous variety of patients as compared to sickle cell heterozygous variety or sickle thalassemia.[13] The reason of lower rate in our study could be the study population, whereby only pediatric patients were studied. It suggests that development of conjuctival finding may be related to the age of the patient. The major posterior segment finding was venous tortuosity similar to other studies.[14,15] Though 2.4% case had sickle disc sign none had glaucoma. The prevalence study reported it to be 12% in SS patient but none of HbSC or HbSthal patient had sickle disc sign.[13] There are documented case reports of sickle cell patient developing neovascular glaucoma.[16]

Proliferative Sickle Cell retinopathy prevalence of 3.2% in our study was contradictory to study in Nigerian children where no cases of Sickle cell retinopathy were reported.[11] Sickle Cell Retinopathy is also an age dependent process.[17] Earlier studies have reported lesser prevalence rate of PSCR in HbSS patient than HbSC patients in pediatric population similar to the findings in adults.[13,15,18–20]

The prevalence of angiod streak in our study was 0.8 % and was not associated with vision loss. It is studied that angiod streak in sickle cell patients are paripapillary and rarely affects vision.[21] In the natural course study, it was reported that majority of the patient with angiod streak were above *50 years* of age and no eye had clinical evidence of neo-vascularization.[13]

Majority of our patients had normal vision. Proliferative Sickle Cell retinopathy manifesting as vitreous hemorrhage was the major cause of blindness in our study. Another study in Jamaican population also reported vitreous hemorrhage as the most frequent cause of moderate and severe vision loss. PSCR contributes to vision loss by predisposing an eye due to vitreous hemorrhage, vitreous traction, retinal detachment and epiretinal membrane formation.[23] However, the natural course of PSCR is determined by the phenomenon of auto infarction or development of atrophic lesions which results in spontaneous regression of lesions as studied by various researchers.[24,25] The lower frequency of vision loss in Sickle Cell Disease patient, as in our study, can be attributed partly to this phenomenon occurring in about 20–60% cases.[26] The treatment of PSCR with laser has shown to reduce the incidence of vision loss.[27,28] This is of particular importance in pediatric population as it will reduce the number of blind years.

All patients in our study belonged to tribal castes. According to Indian Council of Medical Research, sickle cell disease is most common in tribal populations. There are study reports of higher prevalence of sickle cell trait in Gamit, Chaudhari and Vasava communities and prevalence of 0.03 % SCD in few sub castes of Gujarati Patel like Dhodia and Koli.[29] Because of consanguineous marriage, there is more chance of offspring's born with with SS disease. Our study shows similar findings of higher number of patients with SCD examined and also those with ocular manifestation belonging to Gamit and Chaudhary community followed by kotwadiya and Dhodia.

The univariate analysis showed that only systemic severity has statistically significant association with ocular findings. This is in contradiction to another study where age and not systemic severity of sickle cell disease, had significant association with ocular manifestations.[14] This may be because the researcher studied a population with homozygous sickle cell disease where nearly 50% cases were above *16 years*. We can say that in pediatric population, systemic severity can be used to predict ocular changes in SS patient.

Conclusion

Present study reveals a low prevalence of ocular morbidities in children having homozygous sickle cell disease in most vulnerable communities of South Gujarat. It emphasizes the need of regular eye check-up only in children having high systemic severity index for early diagnosis and treatment of potential blinding conditions. The disease requires monitoring of patient diagnosed with proliferative lesion to timely decide the therapeutic options as it has a variable course of progression.

Key Message

Ophthalmic referral is recommended to screen children with homozygous sickle cell disease for early detection of potential blinding conditions like proliferative sickle retinopathy.

References

1. Angastiniotis M, Modell B, Englezos P, *et al*. Prevention and control of hemoglobinopathies. Bull World Health Organ. 1995;73(3):375–86.
2. Balgir RS. Control and prevention of the genetic load of hemoglobinopathies in India. Natl Med J India. 1999;12(5):234–48.
3. Modell B, Petrou M. The problem of the hemoglobinopathies in India. Indian J Hematol, 1983.
4. Balgir RS. The genetic burden of hemoglobinopathies with special reference to community health in India and the challenges ahead. Indian J Hematol Blood Transfus, 2002.
5. Serjeant GR, Serjeant BE. Sickle Cell Disease, 3rd edition. Oxford Oxford Univ Press. 2001.
6. Bhatia HM, Rao VR. Genetic atlas of Indian tribes. Inst Immunohematology Publ. 1986.pp.263–73.
7. Gujarat, National Health & Family Welfare, DEPT. Sickle Cell Anemia Control Program, Gujarat. https://nrhm.gujarat.gov.in/sickle-cell.htm [Internet]. Available from: https://nhm.gujarat.gov.in/sickle-cell.htm [Accessed on November, 2019].
8. Vichinsky EP. Comprehensive care in sickle cell disease: Its impact on morbidity and mortality. Semin Hematol. 1991 Jul;28(3)220–26.
9. Vichinsky E, Hurst D, Earles A, *et al*. Newborn Screening for Sickle Cell Disease: Effect on Mortality. Pediatr. 1988 Jun;81(6):749-55
10. Osafo-Kwaako A, Kimani K, Llako D, *et al*. Ocular Manifestations of Sickle Cell Disease at the Korlebu Hospital, Accra, Ghana. Eur J Ophthalmol. Eur J Ophthalmol. 2011 Jul-Aug;21(4):484-9.
11. George I, Cookey SAH. Eye manifestation of children with homozygous sickle cell disease in Nigeria. J Med Med Sci [Internet]. 2012 May;3(5):302–305. Available from: http://www.interesjournals.org/JMMS [Accessed on November, 2019].
12. Paton D. Conjunctival sign of sickle cell disease. Further`observations. Arch Ophthalmol. 1962;68:627–32.
13. Clarkson JG. Sickle Cell Disease: A Prevalence and Natural History Study. Tr am Ophth. 1992;LXXXX:481–503.
14. Mumbi BW. [Unpublished] Ocular Manifestations of Sickle Cell Disease at the University Teaching Hospital, Lusaka, Zambia. 2014;6–7.
15. Oliveira DC de A, Villas-Bôas FS, Galvão-Castro B. Goncalves MS, do Nascimento VML. Sickle cell disease retinopathy: Characterization among pediatric and teenage patients from north-eastern Brazil. Rev Bras Hematol Hemoter. 2014;36(5): 340–44.
16. Bergren R, Brown GC. Neo-vascular glaucoma secondary to sickle-cell retinopathy. Am J Ophthalmol. 1992;113(6):718–719.
17. Leveziel N, Bastuji-Garin S, Lalloum F, *et al*. Clinical and laboratory factors associated with the severity of proliferative sickle cell retinopathy in patients with sickle cell hemoglobin C (SC) and homozygous sickle cell (SS) disease. Medicine (Baltimore). 2011 Nov;372:(6)90–78; [PubMed 22033449].
18. Gill HS, Lam WC. A screening strategy for the detection of sickle cell retinopathy in pediatric patients. Can J Ophthalmol. 2008 Apr;188:(2)43–91. [PubMed 18347621].
19. Condon GR, Serjeant PI. Ocular findings in homozygous sickle cell anemia in Jamaica. Am J OphthalmoI. 1972;73:533–43.
20. Condon GR, Serjeant PI. Ocular findings in hemoglobin SC disease in Jamaica. Am J Ophthalmo. 1972;74:921–31.
21. Hamilton AM, Pope FM, Condon PI, *et al*. Angioid streaks in Jamaican patients with homozygous sickle cell disease. Br J Ophthalmol. 1981;65(5):341–47.
22. Moriarty BJ, Acheson RW, Condon PI, *et al*. Patterns of visual loss in untreated sickle cell retinopathy. Eye. 1988;2(3):330–35.
23. Moriarty BJ, Acheson RW, Serjeant GR. Epiretinal membranes in sickle cell disease. Br J Ophthalmol. 1987;71(6):466–69.
24. Condon PI, Serjeant GR. Behavior of untreated proliferative sickle retinopathy. Br J Ophthalmol. 1980;64(6):404–11.
25. Nagpal KC, Patrianakos D, Asdourian GK, *et al*. Spontaneous Regression (Autoinfarction) of Proliferative Sickle Retinopathy. Am J Ophthalmol. 1975;80:885–92.
26. De Melo MB. An eye on sickle cell retinopathy. Rev Bra Hematol Hemoter, 2014;36(5): 319–321 [Internet]. Available from: http://dx.doi.org/10.1016/j.bjhh.2014.07.020 [Accessed on November, 2019].
27. Farber MD, Jampol LM, Fox P, *et al*. A randomized clinical trial of scatter photocoagulation of proliferative sickle cell retinopathy. Arch Ophthalmol. 1991 Mar;363:(3)109–67.
28. Rednam KR, Jampol LM GM. Scatter retinal photocoagulation for proliferative sickle cell retinopathy. Am J Ophthalmol. 1982 May;594:(5)93–99.
29. Patel PA, Naik R M, Shah M N, *et al*. Prevalence of Common Hemoglobinopathies in Gujarat: An analysis of a large population. Natl J Community Med. 2012;3(1):112–16.

Original Article

Ophthalmology and Allied Sciences
Volume 5 Number 3 / September – December 2019
DOI: http://dx.doi.org/10.21088/oas.2454.7816.5319.6

Study of Awareness Regarding Eye-donation among Medical Students of Akash Institute of Medical Sciences and Research Centre, Bengaluru

Vijay Kumar TS[1], Chethan KS[2]

Abstract

Introduction: A significant amount of visual disability and blindness is caused by corneal diseases. The cornea is the clear tissue covering the front of the eye. The vision is dramatically reduced or lost if the cornea becomes cloudy. This loss of vision is referred to as corneal blindness. Eye donation is an act of donating one's eyes after his/her death. It is an act of charity, purely for the benefit of society and is totally voluntary. The aim of the study is to assess awareness regarding eye donation among medical students of Akash Institute of Medical Sciences and Research Centre, Bangalore. *Materials and Methods:* This cross sectional descriptive study was conducted in department of Ophthalmology, Akash Institute of Medical Sciences and Research Centre, Bangalore. A total of 150 undergraduate MBBS *2nd year* students were assesses for their awareness on eye donation. *Results:* In this study, 45% students did not know that eyes should be enucleated within *6 hours* of death. Lack of awareness on eye donation was the major reason (47%) for not donating eyes. 70% students did not know the correct place and contact for eye donation. Majority of the students reported that Medical Personal as the major source of information (32%) on eye donation. 51% did not know that Cornea is the part which is to be used for eye donation. 71% students did not know that a near relative of the donor should give consent for eye donation. 77% students did not know that anybody can donate eyes. *Conclusion:* Medical students should be exposed to information about eye donation from *1st year* itself as they are the future Doctors. They should be trained to counsel and motivate the relatives of patients for eye donation. There is a need of an intervention in the academic activities to increase awareness in medical students regarding eye-donation.

Keywords: Corneal Blindness; Eye Donation; Knowledge; Medical Students.

How to cite this article:
Vijay Kumar TS, Chethan KS. Study of Awareness Regarding Eye-donation among Medical Students of Akash Institute of Medical Sciences and Research Centre, Bengaluru. Ophthalmol Allied Sci. 2019;5(3):285–289

Introduction

A significant amount of visual disability and blindness is caused by corneal diseases. The cornea is the clear tissue covering the front of the eye. It is a focusing element of the eye. The vision is dramatically reduced or lost if the cornea becomes cloudy. This loss of vision is referred to as Corneal blindness. It accounts for 5% of blindness in India. Approximately 18.7 million people are blind in India and 190,000 are blind from bilateral corneal disease. Every year, another 20,000 join the list.[1,2] Trachoma, corneal ulceration following xerophthalmia due to vitamin A deficiency, Ophthalmia neonatorum, use of harmful traditional medicines, onchocerciasis, leprosy and ocular trauma are the major causes of corneal blindness in the developing world. When the eye is affected only by corneal diseases, replacing with donor tissue will restore the vision. Corneal transplantation surgery, though not as common as cataract surgery, is performed at several eye hospitals in the country. Eye donation is

Author Affiliation: [1]Assistant Professor, [2]Junior Resident, Department of Ophthalmology, Akash Institute of Medical Sciences and Research Centre, Devanahalli, Bengaluru, Karnataka 562110, India.

Corresponding Author: Vijay Kumar TS, Assistant Professor, Department of Opthalmology, Akash Institute of Medical Sciences and Research Centre, Devanahalli, Bengaluru, Karnataka 562110, India

E-mail: vijayakitts@gmail.com

Received on 21.08.2019, **Accepted on** 23.10.2019

an act of donating one's eyes after his/her death. It is an act of charity, purely for the benefit of society and is totally voluntary.[3] The eye donation of the deceased can be authorized by the next of kith and kin even if the deceased did not pledge to donate his/her eyes before death. In eyes affected only by corneal diseases, replacement of cornea with donor tissue can improve the vision remarkably. These days corneal transplantation surgery is performed in many hospitals. Eye donation is an act done voluntarily by the patient. The next kith and kin of the patient can authorize the eye donation even if the patient has not pledged his eyes. Age or systemic illness such as Diabetes, Hypertension, Heart Disease and Kidney disease are not barriers for eye donations. The corneas of a person are unaffected even if they have undergone eye surgeries in the past and hence can be transplanted in others.[4–5]

The vision is drastically reduced or lost if the cornea becomes cloudy. The late Muthiah started the very first eye bank in India and he performed the first corneal transplant successfully in 1948.[6] The practice of keratoplasty has witnessed phenomenal advances owing to innovations in instrumentation, surgical techniques, and perioperative care, resulting in improved outcomes and cost effectiveness. Even after more than *60 years*, patients waiting for corneal transplants constitute a considerable backlog which is growing. The need, therefore, is to educate the masses about eye donation in an effort to increase the procurement of corneas. Till date, medical researchers and scientists are working on developing artificial cornea, but till that time, donating the eye would be the best gift ever for blind person suffering from corneal blindness. There are wide spread social awareness programs and activities conducted across the country to impart the knowledge regarding eye donation and its use to the visually impaired. Donated eyes can be used to restore vision in people suffering from corneal blindness. The front, clear and transparent tissue of the eye the cornea can be used to restore vision in a corneally blind person. The other portions of the eye are also used for research and training purposes to develop cures for other eye diseases. The main ease of corneal transplantation surgery is that no blood grouping and Rh typing is mandatory between the donors and recipient.[7]

Medical students are the future healthcare providers for the community. Well informed medical students can be expected to influence eye-donation rates. They can motivate people for the same during their postings in Community medicine. They can be actively involved as volunteers in eye donation campaigns and after proper training, they can act as counselors for eye donation. The aim of the study was to assess the awareness regarding eye donation among medical students of Akash Institute of Medical Sciences and Research Centre, Bangalore.

Objectives

(1) To test the knowledge about eye donation awareness as a special feature among medical students. (2) To try to fill lacunae in eye donation awareness program. (3) To assess the need to include eye donation content in syllabus.

Materials and Methods

This cross sectional descriptive study was conducted in Department of Ophthalmology, Akash Institute of Medical Sciences and Research Centre, Bengaluru. A total of 150 undergraduate MBBS *2nd year* students were assesses for their awareness on eye donation. A well-defined proforma was used to collect the details. Time period of *20 minutes* was given to each student for filling up of proforma. Prior introductory lecture was taken to the students and that the answers would not in any way affect their academics and their non-influential response was expected from them. The collected data was kept confidential. Verbal informed consent to be obtained from all the students. Pre-designed, pre-tested, semi-structured questionnaire developed for the purpose, containing questions about the awareness of eye donation, source of information, their reasons for donating and not donating eyes, trying to eliminate assumption of their answers to the questions and some basic information about corneal transplantation was recorded in the Proforma.

Results

About 49% of the students knew that the donated eye is used to replace the Cornea of the recipient eye. Majority (70%) of the students did not know the correct place for eye donation. 45 out of 150 students (30%) believed that eye donation causes delay in the funeral process which lead to reduced donation rates. Majority of the students (70%) knew that identity of donor will not be revealed to the patient. Majority of the students (54%) knew that the ideal time for eye donation is within *6 hours* of the death of the donor. Only 14% of students had history of Eye donation in their Families. Only 21% of students know that anybody can donate eyes &

Table 1: Awareness regarding Eye Donation

Awareness	Known (%)	Not known (%)
Donated eye is used to replace the Cornea	49	51
Knows contact place for eye donation	30	70
Eye donation causes delay in the funeral process	30	70
The donor details will not be revealed	70	30
Ideal time for donating eyes is within *6 hours* after death	54	46
History of Eye donation in their Families	14	86
Anybody can donate eye	21	79
Donor should not have any disease	47	53
Knew the meaning of Keratoplasty	64	36

47% students believed that donor should not have any disease. Majority of the students 64% knew the meaning of Keratoplasty as illustrated in (**Table 1, Charts 1 and 2**).

Major source of information among medical students was that through medical personnel (33%) and television and newspaper (33%) played an equivalent role. Only 9% of the information was

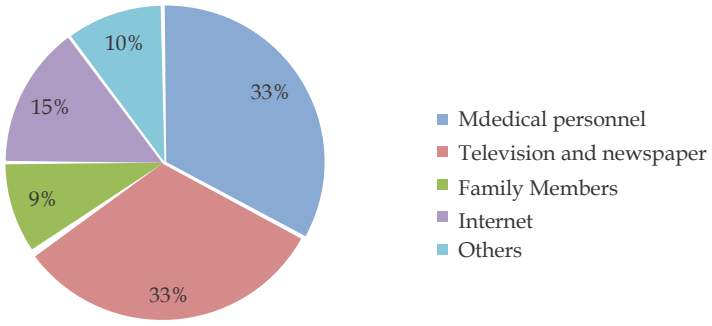


Chart 1: The profile on perception on the Eye Donation

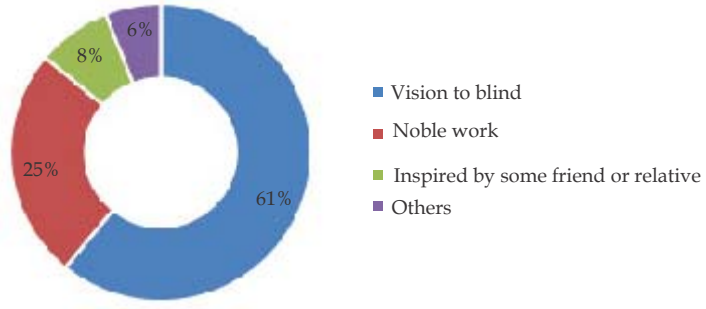


Chart 2: The sources of information about the Eye Donation

through family members and 15% came to know about eye donation through internet. Majority of the students (61%) considered eye donation as it can give vision to blind, whereas 25% believed it to be a noble work & only 8% were inspired by some friend or relative who had donated eyes which signifies the low level of motivation for eye donation.

Discussion

Medical students can play a huge role in eye donation programs as they are the future Doctors. If they have the right knowledge regarding eye donation, they can increase the number of eye donations. Though Mandatory consent for donation expressed before the death of the donor should form the basis for eye donation ideally, in case of unavailability of such consent, adult family members of the deceased can give consent. Newspapers, television, magazines and posters were important sources of information on eye donation. In our study, 150 medical students were surveyed about their awareness regarding eye donation. The knowledge that Cornea is the part of the eye which is used for transplantation was known to only 49% students in our study.

Medical students are the future Doctors and can play a huge role in eye donation programs. They can increase the number of eye donations if they have the right knowledge regarding eye donation. In our study, 150 medical students were surveyed about their awareness regarding eye donation. The knowledge that Cornea is the part of the eye which is used for transplantation was known to only 49% students in our study. Though medical students are from science stream during school, only 49% of them knew that cornea is the part of the eye used for corneal transplantation. This stresses on the fact that teaching about organ donation should start in school itself. In our study, 70% did not know the contact place for eye donation, similarly in the study by Sadana *et al.*,[8] 26% knew the contact place for eye donation. Our study shows that the major source of information among medical students was that through medical personnel (33%) and television and newspaper (33%) played an equivalent role. Only 10% of the information for eye donation was through family members and 15% came to know about donation through internet.

In the study by Gupta *et al.*,[2] television was the most common source of information on eye donation. Only 13% answered that medical teacher or doctor was the source of information. 14% students knew about eye donation from camps which they had attended which shows that students should be trained as volunteers of eye donation campaigns, which can increase their knowledge about eye donation.

In our study, the ideal time for eye donation is within six hours of death was known to only 54% of students. It was observed by Gupta *et al.*,[2] that the same was known to only 57% of students. Maximum knew that eye donation does not cause disfigurement of the donor. 27% answered that there is delay in funeral arrangements. In our study, only 27% students knew that only near relative can give consent for eye donation. In a similar study by Kumar *et al.*,[9] it was 18%. Our study shows that 64% knew that the donor or recipient family is not told who donated or received the cornea. In our study, only 20.89% of the students knew that anybody can donate eyes and about 48% students believed that donor should not have any disease. Only 4% knew a person who had donated eyes and only 1% knew a person who had undergone corneal transplantation. Our study shows that majority of the students (59%) considered eye donation as it can give vision to the blind, whereas 25% believed it to be a noble work and only 8% of the students were inspired by some friends or relatives who had donated eyes which signifies the low level of motivation for eye donation our findings suggests that there is a great need to educate students in medical profession about eye donation and the misconceptions regarding eye donation should be removed. This will enable them to become better future motivators for enhancing eye donation rates.

In our study, the lack of awareness was the major reason for not donating the eyes (40%) and 15% of the students were afraid of the invasive procedure for eye donation. 13% considered religion to be an obstacle in the donation and 14% of the students were superstitious regarding the eye donation. Similarly according to the study by Gupta *et al.*,[2] among medical students lack of awareness was cited as an important reason for people not donating their eye among 32.7% of students. Majority of the students (54%) knew that the ideal time for donation is within 6 hours of the death of the donor. Majority of the students 64% knew the meaning of keratoplasty. In our study, 37% students had average knowledge about the general aspects of eye donation whereas 49.3% had good knowledge about the same. 57.59% had good advanced awareness about eye donation. This study results were supported by Dandona R *et al.*,[10] and Priyadarshan B *et al.*[11]

Conclusion

Medical students of 2nd year MBBS were assessed for their awareness and attitude on eye donation

1. 70% did not know the correct place and contact for eye donation.
2. 46% students did not know that eyes should be enucleated within *6 hours* of death.
3. 71% did not know that a near relative of the donor should give consent for eye donation.
4. 77% students did not know the fact that anybody can donate eyes.
5. 50% of the students did not know that cornea is the part which is to be used after eye donation.
6. Majority of the students reported Medical personnel as the major source of information 32% on eye donation.
7. Lack of awareness on eye donation was the major reason (40%) for not donating eyes.

When Doctors play an active role in health education, they can improve the health in a community. Good knowledge and attitude of medical students are important in promoting eye

donations as they are the future potential Doctors. In many countries including India the decision to donate eyes ultimately lies with family members. If Doctors fail to approach family members about the possibility of eye donation to answer questions of concerns of family members after death of the donors, many potential eye donors can be missed. In our country with so many cases of corneal blindness, there is a strong need for developing effective means of procuring corneas. Medical students should be exposed to information about eye donation from *1st year* itself as they are the future Doctors. They should be trained to counsel and motivate the relatives of patients for eye donation. More information regarding organ donation is the need of the hour for Medical students.

Conflict of Interest: Nil.

Source of Funding: Nil.

References

1. Manjunath S Nekar, Nokare L, Sunil A Gokhale, *et al*. Awareness of eye donation among college students of Hubli City, Karnataka. IJBR. 2012;3(4):201–04.
2. Gupta A, Jain S, Jain T, *et al*. Awareness and perception regarding eye donation in students of a Nursing College in Bangalore. Indian J Community Med. 2009;34(2):122–25.
3. Dhaliwal U. Enhancing eye donation rates. Training students to be motivators. Indian J Ophthalmol. 2002;50:209–12.
4. Singh MM, Rahi M, Pagare D, *et al*. Medical students perception on eye donation in Delhi. Indian J Ophthalmol. 2007;55(1):49–52.
5. Singh M, Bharadwaj A, Ahluwalia SK, *et al*. Eye donation: Perception and promoting factors among medical students Indian J of Community Health. 2012;24(3):175–78.
6. Kannan KA. Eye donation movement in India. J Indian Med Assoc. 1999;97:318–19.
7. Krishniah S, Kovai V, Nutheti R, *et al*. Awareness of eye donation in the rural population of India. Indian Journal Ophthalmol. 2004;52:73–78.
8. Sadana A, Sushma M, Lekha KC, *et al*. Assessment of knowledge and attitude regarding eye donation among undergraduate medical students, Tripati Ijmps. 2014;4(9):16–24.
9. Kumar S, Shukla US, Agarwal P. Awareness and knowledge on eye donation among students at Bhopal. Natl J Community Med. 2012;3(4):685–89.
10. Dandona R, Dandona L, Naduvilath TJ, *et al*. Awareness of eye donation in the urban population in India. Aust NZ Ophthalmol. 1999;27:166–69.
11. Priyadarshan B, Srinivasan M, Padmavathi A, *et al*. Awareness of eye donation in an adult population of Southern India. A Pilot Study Indian J Ophthalmol. 2003;51:101–04.

Original Article

Ophthalmology and Allied Sciences
Volume 5 Number 3 / September – December 2019
DOI: http://dx.doi.org/10.21088/oas.2454.7816.5319.7

Study of Visual Outcome in Patients with Hypermature Cataract after Small Incision Cataract Surgery

Anupama Raju Taklikar[1], Pooja Rathod[2], Sheshank V Sajjanshetty[3]

Abstract

Purpose: To evaluate the visual outcome in patients with hypermature cataracts after small incision cataract surgery. *Materials and Methods:* This study was conducted in the Department of Ophthalmology, Navodaya Medical Hospital, Raichur, from *december 2017* to *may 2018*. In this study, evaluation of hundered patients with senile hypermature cataract after pre-operative assessment and investigations underwent small incision cataract surgery. Their surgical and post-operative complications were recorded. Their visual outcome was studied at post-operative *day 1*, *1 week* and *6th week*. Best corrected visual acuity was obtained at *6 weeks*. *Results:* Total of hundered patients with 42 male and 58 female had small incision cataract surgery. 8 of the eyes had surgery complicated by posterior capsule rupture, vitreous loss, zonular dialysis. On first post-operative day most common complication noted was striate keratitis (39%). Best corrected visual acuity at *6 weeks* was 6/18 in 58 (58%) patients. *Conclusion:* The intra-operative and post-operative complications rate is higher in hypermature cataracts. These complications can be reduced by early removal of cataract before it reaches the stage of hypermaturity. Small incision cataract surgery of hypermature cataract has good results after thorough pre-operative assessment and if performed with expertise.

Keywords: Capsulorrhexis**;** Hypermature cataract; Manual small incision cataract surgery

How to cite this article:
Anupama Raju Taklikar, Pooja Rathod, Sheshank V Sajjanshetty. Study of Visual Outcome in Patients with Hypermature Cataract after Small Incision Cataract Surgery. Ophthalmol Allied Sci. 2019;5(3):291–295

Introduction

In India, there are 12.5 million blind and it is estimated that 50% to 80%[1,2] of them are blind due to cataract. In addition to the backlog, an additional 3.8 million become blind each year due to cataract.[3] Most patients had advanced stages of cataract hypermature lenses. Majority of these patients are socio-economically backward and cannot afford procedures such as phacoemulsification.

Author Affiliation: [1]Professor and Head, [2,3]Post graduate student, Department of Ophthalmology, Navodaya Medical College, Raichur, Karnataka 584101, India.

Corresponding Author: Anupama Raju Taklikar, Professor and Head, Department of Ophthalmology, Navodaya Medical College, Raichur, Karnataka, 584101, India.

E-mail: dranusree67@gmail.com

Received on 12.01.2019, **Accepted on** 04.09.2019

Conventionally, in the last millenium Extra Capsular Cataract Extraction with Posterior Chamber Intra-ocular Lens Implantation (ECCE-PCIOL) was considered an effective means of restoring visual function and improving vision related quality of life in developing countries.

However, it has its own problems related to wound suturing with its associated complications and late visual rehabilitation.[4] Recent reports indicate that both Manual Small Incision Cataract Surgery (MSICS) and ECCE-PCIOL are safe and effective for treatment of cataract surgery, however, MSICS gives better uncorrected vision.[5]

In this context, MSICS is gaining popularity in developing countries as an inexpensive alternative to phacoemulsification.[6] Inspite of the fact that MSICS can be a cost-effective procedure, more research on the outcomes of MSICS is warranted.[7] This study reports the results of a prospective

observational study done to assess the safety and efficacy of MSICS in white cataracts.

Materials and Methods

This study included 100 eyes of 100 consecutive patients with white cataracts who had routine MSICS operated at Navodaya Medical Hospital and Research Centre, Raichur, from *december 2017–may 2018*.

Exclusion criteria were patients with traumatic cataract, complicated cataract, lens induced glaucoma, insufficient follow up cases. Institutional ethics committee clearance was obtained before the start of the study. All patients underwent detailed pre-operative ocular examination, including clinical history and systemic examination, measurment of visual acuity, Intra-ocular Pressure (IOP) by goldmann applanation tonometry.

Detailed slit lamp biomicroscopy under maximum mydriasis was performed.

A-scan and keratometry for IOL power calculation.

B-scan for posterior segment evaluation.

All observations and demographic data were carefully recorded using a protocol sheet.

Prophylactic antibiotics drops moxifloxacin 0.5% eye drops started one day before surgery. Patients were dilated with tropicamide and phenylephrine 0.5% eye drop and non-steroidal anti-inflammatory drops flurbiprofen sodium 0.03% was used *3 times* every *15 minutes* to maintain the dilatation.

Surgical Technique

All patients underwent small incision cataract surgery by experienced surgeon.

After peri-bulbar block with *5 ml* of with 2% lignocaine with adrenaline (1: 20,0000) with *150 units/ml* of hyaluronidase. Povidine-iodine 5% was instilled into the conjunctival sac. For SICS a fornix base conjunctival flap was made, scleral incision was made with bard parker knife with 15 no. blade temporally or supero-temporally and sclerocorneal tunnel was constructed with crescent. The anterior chamber was deepened using a viscoelastic and a CCC of *5–6 mm* was initiated and completed using a bent *26-gauge* needle mounted on a viscoelastic syringe.

In cases of hypermature cataract, a small trap door or nick was made in the anterior capsule through which the liquid cortex was emptied and the CCC was completed using a cystitome. If the CCC margin extended to the periphery, the capsulotomy was converted to canopener type. Hydroprocedures were done with a *24-gauge* hydrodissection cannula.

The nucleus was made to rotate freely by hydroprocedures. A sinskey hook was used to hook out one pole of the nucleus outside the capsular bag and the rest of the nucleus was wheeled out into the anterior chamber. After a good cover of viscoelastic, the prolapsed nucleus was extracted from the eye using an wirevectis technique. Rigid, single piece, biconvex, polymethyl meth acrylate posterior chamber intra-ocular lens (IOLs) with optic diameter of *5.25 mm* was implanted in bag. The integrity of the self-sealing scleral incision was ensured and the cut conjunctival flap was apposed using a forceps.

Intra-operative and post-operative complications

Post-operatively, patients were put on topical antibiotics and steroids tapered over *4–6 weeks* depending upon the post-operative inflammation. Patients were followed on the post-operative *day 1*, *day 7* and *day 14* and at weekly intervals for *6 weeks* to evaluate intra-ocular pressure spikes, presence of intra-ocular inflammation, decentration/tilt of intra-ocular lens and corneal odema. Post-operative uncorrected visual acuity was recorded every week and best corrected visual acuity was recorded at *6th week*.

Results

Of the 100 eyes operated, 55 had surgery in the right eye and 45 had surgery in the left eye. There were 42 males and 58 females in the study. The pre-operative vision for all patients were either FCF (finger counting close to face) or HM (hand movements) or PL (perception of light), (Table 1).

The age range was *50–80 years* with a mean age group of *62.78 years*.

Surgery was done on 22 morgagnian and 78 sclerotic type of hypermature cataract. 15 eyes had posterior synechia resulting in poor pupillary dilatation.

Capsulorrhexis tear was converted to can-opener type of capsulotomy in 10 cases (10%). All the ten cases had thick fibrotic anterior capsule so capsulorrhexis was difficult. In the rest of the 90 eyes, CCC was completed successfully.

Ninety two percent of these patients had

uneventful surgery while 8 (8%) of them developed some complications intra-operatively. 15 eyes had poor pupillary dilatation, 3 eyes had posterior capsular rupture with vitreous loss and 5 eyes had zonular dialysis and were rendered aphakic.

Table 1: Pre-op visual acuity

Visual acuity	Number of patients'*n*'(%)
Hand movements	41 (41%)
PL+ PR Accurate	53 (53%)
PL+ PR Inaccurate	06 (6%)
Total	**100 (100%)**

PL- Perception of Light; PR- Projection of Rays.

All patients underwent cataract surgery using SICS technique. Surgical complications are listed in (**Table 2**). 15 (15%) cases required sphincterotomy to facilitate capsulorrhexis and nucleus delivery. Zonular dialysis seen in 5 (5%) cases, posterior capsular tear with vitreous loss seen in 3 (3%) due to difficulty in surgical maneuvers, iris trauma occurred in 16 cases (16%).

Patients were followed on the post-operative *day 1*, *day 7*, *day 14* and at weekly intervals for *6 weeks* to evaluate intra-ocular pressure spikes, intra-ocular inflammation, decentration/tilt of intra-ocular lens and corneal odema. Post-operative hazy cornea (corneal odema) was seen in 39 (39%) cases. Anterior chamber reaction in 16 (16%) cases, irregular pupil seen in 15 (15%) cases (**Table 3**).

The IOP was measured both pre-operatively and post-operatively. We did not find any pressure spikes in any patient. Final visual acuity was recorded after *6 weeks* of surgery (**Table 4**). At the end of *6 weeks*, 8 (8%) patients showed persistent corneal edema probably due to corneal decompensation. However, pre- or post-operative specular microscopy and pachymetrywere not included in this study.

Table 2: Intra-op complications

Complications	Number of patients
Poorly dilating pupil	15
Difficulty in capsulorrhexis	10
Zonular dialysis	05
Posterior capsular rent with vitreous loss	03
Nucleus drop	00

Table3: Post-op complications

Complications	Number of patients'*n*'(%)
Corneal edema	39 (39%)
AC reaction	16 (16%)
Irregular pupil	15 (15%)

Ninety-two eyes had PCIOL in the bag and 8 eyes were rendered aphakic due to zonular dialysis and posterior capsular rent with vitreous loss. 58 (58%) cases had visual acuity between 6/6–/18, 19 (19%) cases had visual acuity between 6/24–6/36,15 (15%) cases had visual acuity of 6/60 and 8 (8%) cases had visual acuity of less than 6/60.

Table 4: Final visual acuity

Visual acuity	Number of patients'*n*'(%)
6/6–6/18	58 (58%)
6/24–6/36	19 (19%)
6/60	15 (15%)
< 6/60	08 (8%)
Total	**100 (100%)**

Disscusion

Cataract is the leading cause of blindness globally and prevalance of blindness among people aged *50 years* is 8.5%.[8,9] The annual incidence of cataract blindness is about *3.8 million*.

Hypermature cataracts constitute a significant volume of cataract surgical load in developing countries like India.[10] The most prevelant cause of blindness and low vision being an un-operated cataract.[11]

Currently, satisfactory results have been published with respect to phacoemulsification in white cataracts. In a developing nation like India, where cataract backlog is still a socio-economic problem, procedures like phacoemulsification remain an expensive modality of management, and majority of the population find it difficult to afford it.

MSICS promises to be a viable cost-effective alternative in this regard.[11,12] Certain eyes are at a higher risk of complication during cataract surgery. Operations on such 'high-risk' eyes are also more likely to yield a poor visual outcome (defined as best corrected vision less than 6/60 after surgery).

Learning to recognise when eyes are at greater risk, and acting accordingly, will help you to avoid complications. Even so, before the operation takes place, it is good practice to explain to such patients that a poor outcome is a possibility. This makes these patients' expectations more realistic and improves post-operative compliance and follow-up.

All those cataracts in which the CCC was converted to can-opener type were morgagnian in nature. The incomplete CCC encountered was

possibly due to increased intra-lenticular pressure. The challenge of performing CCC in white cataracts is well documented.[13]

This is because of lack of red reflex, poor contrast between the anterior capsule and the underlying cortex, high intra-lenticular pressure in morgagnian cataracts, leaking of lens matter from the anterior capsule puncture sites and the presence of capsular fibrosis.

Various methods have been described to tackle such situations effectively. Use of trypan blue is found to be safe and effective in performing a CCC.[14] In MSICS, it also helps in making the difficult step of nucleus prolapse through an intact capsulorrhexis safe and effortless, because the dye stained capsular rim is distinctly visible all throughout the surgery.

As a result, any compromise to the capsular bag during prolapse of nucleus can be detected easily and relaxing incisions can be made at any point of the process thereby saving the intra-capsular removal of nucleus.

In our study, out of 100 patients 39 cases had phacodonesis pre-operatively, 15 cases had posterior synechiae and 10 cases had thick fibrotic anterior capsule. In the present study, most frequent problem encountered was intra-operative poorly dilating pupil which was managed with sphincterotomy and viscomydriasis. Sphincterotomy and had the disadvantage of causing post-operative distorted pupil, which may even lead to the pupillary capture.

Intra-operative complications encountered were Zonular dialysis in 05 (5%) cases, posterior capsular tear with vitreous loss in 03 (3%) cases due to difficulty in surgical maneuvers, iris trauma occurred in 16 (16%) cases. Post-operative hazy cornea (corneal odema) was seen in 39 (39%) cases. Anterior chamber reaction in 16 (16%) cases, irregular pupil seen in 15 (15%) cases. After *6 weeks* 58 (58%) cases had visual acuity between 6/6–6/18, 19 (19%) cases had visual acuity between 6/24–6/36, 15 (15%) cases had visual acuity of 6/60 and 8 (8%) cases had visual acuity of less than 6/60. We did not encounter complications like decentered IOL, retained cortical matter, nucleus drop, postop hyphema as seen in other studies.

Similar results were obtained in a study conducted by erumshahid *et al*. were out of 50 cases corneal edema was noted in 30 cases (60%), anterior chamber reaction was noted in 4 cases (8%) and irregular pupil was noted in 3 cases (6%).[15] Final BCVA was > 6/18 in 58% cases in our study which is less compared to results of erumshahid, *et al*. in which BCVA was > 6/18 in 76% cases.

In a study, conducted by Alex A Ilechie on 1288 eyes with hypermature cataract who underwent cataract surgery Intra-operative complications encountered during surgery were; irido dialysis in 6 (0.5%) cases, posterior capsular tear with vitreous loss was seen in 6 cases (0.5%). Post-operative complications were corneal odema in 44 (3.4%) cases, anterior chamber reaction in 3 (0.5%) cases.[16]

Final BCVA was > 6/18 in 58% cases in our study which is more when compared to results of alex A, *et al*. in which BCVA was > 6/18 in 41.2% cases. The above two studies also encountered complications like hyphema, high IOP, dislocated IOL, retained lens matter, cystoid macular edema and early posterior capsular opacification which was not seen in our study.

Conclusion

We conclude from our study that chances of complications are higher in advanced cataracts and is a challenging scenario to operate upon, hence a thorough pre-operative assessment and case based management plan is required. Cataract patients should be advised to seek medical advise early to improve post-operative visual outcome.

References

1. Dandona L, Dandona R, Naduvilath T, *et al*. Is the current eyecare policy focus almost exclusively on cataract adequate to deal with blindness in India? The Lancet. 1998;74:341–43.
2. Jose R. National Programme for control of blindness. Indian J Community Health. 1997;3:5–9.
3. Minassian DC, Mehra V. 3.8 million blinded by cataract each year: Projections from the first epidemiological study of incidence of cataract blindness in India. Br J Ophthalmol. 1990;74:341–43.
4. Dada VK, Sindhu N. Management of cataract: A revolutionary change that occurred during last two decades. J Indian Med Association. 1999;97:313–37.
5. Gogate PM, Deshpande M, Wormald RP, *et al*. Extracapsular cataract surgery compared with manual small incision cataract surgery in community eyecare setting in Western India: A randomised controlled trial. Br J Ophthalmol. 2003;87:667–72.
6. Natchiar G and Dabral Kar T. Manual small incision suture less cataract surgery: An alternative

technique to instrumental phacoemulsification. Operative Techniques Cataract Refract Surg. 2000;3:161–70.

7. Muralikrishnan R, Venkatesh R, Prajna NV, *et al*. Economic Cost of Cataract Surgery Procedures in an Established Eye Care Centre in Southern India. Ophthalmic Epidemiol. 2004;11:369–80.
8. Foster A. Who will operate on Africa's 3 million curable blind people? Lancet. 1991;337:1267–69.
9. Yorston D. Ophthalmology review. Africa Health. March 2000.pp.25–26.
10. Chakrabarti A, Singh S. Phacoemulsification in eyes with white cataract. J Cataract Refract Surg. 2000;26:1041–047.
11. Gogate PM, Deshpande M, Wormald RP. Is manual small incision cataract surgery affordable in the developing countries? A cost comparison with extra-capsular cataract extraction. Br J Ophthalmol. 2003;87:843–6.
12. Muralikrishnan R, Venkatesh R, Manohar BB, *et al*. A comparison of the effectiveness and cost-effectiveness of three different methods of cataract extraction in relation to the magnitude of post-operative astigmatism. Asia Pacific J Ophthalmol. 2003;15:5–12.
13. Vasavada A, Singh R, Desai J. Phacoemulsification of white mature cataracts. J Cataract Refract Surg. 1998;24:270–77.
14. Kothari K, Jain SS, Shah NJ. Anterior capsular staining with Trypan blue for Capsulorhexis in mature and hypermature cataracts. A preliminary study. Indian J Ophthalmol. 2001;49:177–80.
15. Erum Shahid, Arshad Sheikh, Uzma Fasih. Complications of hypermature cataract and its visual outcome. Pak J Ophthalmol. 2011 Apr–Jun;27(2):58–62.
16. Alex A Ilechie, Boadi-Kusi BS, Ndudiri OV, *et al*. Evaluation of Post-Operative Visual Outcomes of Cataract Surgery in Ghana. International Journal of Health Research. 2012 March;5(1):35–42.

Revised Rates for 2020 (Institutional)					
Title of the Journal	**Frequency**	**India(INR) Print Only**	**India(INR) Online Only**	**Outside India(USD) Print Only**	**Outside India(USD) Online Only**
Community and Public Health Nursing	3	6000	5500	469	430
Indian Journal of Agriculture Business	2	6000	5500	469	430
Indian Journal of Anatomy	4	9000	8500	703	664
Indian Journal of Ancient Medicine and Yoga	4	8500	8000	664	625
Indian Journal of Anesthesia and Analgesia	6	8000	7500	625	586
Indian Journal of Biology	2	6000	5500	469	430
Indian Journal of Cancer Education and Research	2	9500	9000	742	703
Indian Journal of Communicable Diseases	2	9000	8500	703	664
Indian Journal of Dental Education	4	6000	5500	469	430
Indian Journal of Diabetes and Endocrinology	2	8500	8000	664	625
Indian Journal of Emergency Medicine	4	13000	12500	1016	977
Indian Journal of Forensic Medicine and Pathology	4	16500	16000	1289	1250
Indian Journal of Forensic Odontology	2	6000	5500	469	430
Indian Journal of Genetics and Molecular Research	2	7500	7000	586	547
Indian Journal of Law and Human Behavior	3	6500	6000	508	469
Indian Journal of Legal Medicine	2	9000	8500	703	664
Indian Journal of Library and Information Science	3	10000	9500	781	742
Indian Journal of Maternal-Fetal & Neonatal Medicine	2	10000	9500	781	742
Indian Journal of Medical and Health Sciences	2	7500	7000	586	547
Indian Journal of Obstetrics and Gynecology	4	10000	9500	781	742
Indian Journal of Pathology: Research and Practice	6	12500	12000	977	938
Indian Journal of Plant and Soil	2	7000	6500	547	508
Indian Journal of Preventive Medicine	2	7500	7000	586	547
Indian Journal of Research in Anthropology	2	13000	12500	1016	977
Indian Journal of Surgical Nursing	3	6000	5500	469	430
Indian Journal of Trauma and Emergency Pediatrics	4	10000	9500	781	742
Indian Journal of Waste Management	2	10000	9500	781	742
International Journal of Food, Nutrition & Dietetics	3	6000	5500	469	430
International Journal of Forensic Science	2	10500	10000	820	781
International Journal of Neurology and Neurosurgery	4	11000	10500	859	820
International Journal of Pediatric Nursing	3	6000	5500	469	430
International Journal of Political Science	2	6500	6000	508	469
International Journal of Practical Nursing	3	6000	5500	469	430
International Physiology	3	8000	7500	625	586
Journal of Animal Feed Science and Technology	2	8300	7800	648	609
Journal of Cardiovascular Medicine and Surgery	4	10500	10000	820	781
Journal of Emergency and Trauma Nursing	2	6000	5500	469	430
Journal of Food Additives and Contaminants	2	6000	5500	430	391
Journal of Food Technology and Engineering	2	5500	5000	430	391
Journal of Forensic Chemistry and Toxicology	2	10000	9500	781	742
Journal of Global Medical Education and Research	2	6400	5900	500	461
Journal of Global Public Health	2	12500	12000	977	938
Journal of Microbiology and Related Research	2	9000	8500	703	664
Journal of Nurse Midwifery and Maternal Health	3	6000	5500	469	430
Journal of Orthopedic Education	3	6000	5500	469	430
Journal of Pharmaceutical and Medicinal Chemistry	2	17000	16500	1328	1289
Journal of Plastic Surgery and Transplantation	2	8000	7500	625	575
Journal of Psychiatric Nursing	3	6000	5500	469	430
Journal of Radiology	2	8500	8000	664	625
Journal of Social Welfare and Management	4	8000	7500	625	586
New Indian Journal of Surgery	6	8500	7500	664	625
Ophthalmology and Allied Sciences	3	6500	6000	508	469
Pediatric Education and Research	4	8000	7500	625	586
Physiotherapy and Occupational Therapy Journal	4	9500	9000	742	703
RFP Gastroenterology International	2	6500	6000	508	469
RFP Indian Journal of Hospital Infection	2	13000	12500	1016	977
RFP Indian Journal of Medical Psychiatry	2	8500	8000	664	625
RFP Journal of Biochemistry and Biophysics	2	7500	7000	586	547
RFP Journal of Dermatology (Formerly Dermatology International)	2	6000	5500	469	430
RFP Journal of ENT and Allied Sciences (Formerly Otolaryngology International)	2	6000	5500	469	430
RFP Journal of Gerontology and Geriatric Nursing	2	6000	5500	469	430
RFP Journal of Hospital Administration	2	7500	7000	586	547
Urology, Nephrology and Andrology International	2	8000	7500	625	586

Terms of Supply:

1. Agency discount 12.5%. Issues will be sent directly to the end user, otherwise foreign rates will be charged.
2. All back volumes of all journals are available at current rates.
3. All journals are available free online with print order within the subscription period.
4. All legal disputes subject to Delhi jurisdiction.
5. Cancellations are not accepted orders once processed.
6. Demand draft/cheque should be issued in favour of "**Red Flower Publication Pvt. Ltd.**" payable at **Delhi.**
7. Full pre-payment is required. It can be done through online (http://rfppl.co.in/subscribe.php?mid=7).
8. No claims will be entertained if not reported within 6 months of the publishing date.
9. Orders and payments are to be sent to our office address as given below.
10. Postage & Handling is included in the subscription rates.
11. Subscription period is accepted on calendar year basis (i.e. Jan to Dec). However orders may be placed any time throughout the year.

Order from

Red Flower Publication Pvt. Ltd., 48/41-42, DSIDC, Pocket-II, Mayur Vihar Phase-I, Delhi - 110 091 (India)
Mobile: 8130750089, Phone: 91-11-45796900, 22754205, 22756995, E-mail: sales@rfppl.co.in, Website: www.rfppl.co.in

Original Article

Ophthalmology and Allied Sciences
Volume 5 Number 3 / September – December 2019
DOI: http://dx.doi.org/10.21088/oas.2454.7816.5319.8

Advantages of IOL Implantation in Ringer Lactate without Viscoelastics in Phacoemulsification

Nidhi O Singh[1], Trupti S Amrute[2], Roopa R Naik[3]

Abstract

Aim: To study advantages of Ringer's Lactate Solution (RL) instead of Hydroxypropyl Methylcellulose (HPMC) for Intra-ocular Lens (IOL) implantation in phacoemulsification. *Methods:* A prospective, randomized, interventional study was performed.100 patients of senile cataract were randomly divided in two groups; one in whom IOL was implanted in RL (ringer group) and one in which HPMC (visco group) was used. Results were evaluated on safety, efficacy, post-operative Intra-ocular pressure (IOP), reaction, endothelial cell count and surgical time. *Result:* Mean post-operative IOP at *6*, *24* and *48 hours* in ringer group was *16.02*, *13.46* and *12.44 mm Hg* respectively; and in visco group it was *22.24*, *17.32* and *13.84 mm Hg* respectively (p value < 0.0001; significant difference). Mean post-operative reaction at *24* and *48 hours* in ringer group was 1.48 and 0.72 respectively; and in visco group it was 1.56 and 1.08 respectively (p < 0.0001). Mean endothelial cell loss in visco group was 143.56 and in ringer group it was 210.68 (p = 0.055). Mean surgical time in visco group was *6.01 ± 0.93 mins* and in ringer group it was *5.08 ± 0.76 mins* (p < 0.0001). *Conclusion:* IOL implantation in bag under RL is safe, less time consuming, without significant extra loss of endothelial cells, controls spikes of IOP with less post-operative reaction.

Keywords: Ringer Lactate; Viscoelastics; Phacoemulsification; Intra-Ocular Pressure; Anterior Chamber Reaction; Endothelial Cell Count, Ringer's Lactate solution.

How to cite this article:
Nidhi O Singh, Trupti S Amrute, Roopa R Naik. Advantages of IOL Implantation in Ringer Lactate without Viscoelastics in Phacoemulsification. Ophthalmol Allied Sci. 2019;5(3):297–301

Introduction

Phacoemulsification has gone through many modifications and results have been recorded in terms of improvement in surgical and visual outcome.[1] Classically in a cataract surgery we implant Posterior Chamber Intra-ocular Lens (PCIOL) after putting viscoelastic substance (visco) in anterior chamber (AC) which inflates the capsular bag.[2] However, there are common issues with retained visco in cataract surgery like post-operative spikes of Intra-ocular Pressure (IOP), pseudo anterior uveitis, capsular bag distension syndrome, extra surgical time, and endothelial trauma due to washing out of visco.[3,4] To circumvent these problems we modified only one step of the surgery. We performed phacoemulsification using visco before cortical wash, and after cortical matter wash we implanted the PCIOL under a continuous irrigation of Ringer's lactate solution using irrigation cannula inserted from a side-port, which helped to maintain the anterior chamber and keep the capsular bag inflated. We investigated the possible advantages of using Ringer's lactate for foldable PCIOL implantation over visco including surgical efficiency, post-operative reaction, post-

Author Affiliation: [1]PG Student (Junior Resident), [2]PG Student (Junior Resident), [3]Professor and Head, Department of Ophthalmology, Dr. Vithalrao Vikhe Patil Foundation's Medical College & Hospital, Ahmednagar, Maharashtra 414111, India.

Corresponding Author: Trupti S Amrute, PG Student (Junior Resident), Department of Ophthalmology, Dr. Vithalrao Vikhe Patil Foundation's Medical College & Hospital, Ahmednagar, Maharashtra 414111, India.

E-mail: nidhisingh77899@gmail.com

Received on 15.10.2019, **Accepted on** 12.11.2019

operative IOP spike, endothelial cell count and surgical time.

Aims

- To study advantages of RL instead of HPMC for IOL implantation in phacoemulsification;
- To determine the difference in postop IOP between the two groups;
- To determine the difference in postop reaction between the two groups;
- To determine the difference in postop mean endothelial cell loss between the two groups;
- To determine the difference in the mean surgical time between the two groups.

Materials and Methods

Study Type

Prospective randomized interventional study.

Duration of Study

From *January 2019* to *February 2019*.

Sample Size

Hundred eyes of 100 patients with cataract who came to Ophthalmology OPD at our tertiary care hospital were selected for 95% confidence level by simple random sampling. Calculated from Open Epi, Version 3, Open source calculator--SSPropor.

Inclusion Criteria

- Patients with nuclear sclerosis grade 2–3;
- Patients willing to participate in the study;
- Patients who are able to read and understand Marathi/Hindi;
- Patients ready to give written informed consent.

Exclusion Criteria

Patients with:

- any previous ocular surgery;
- complicated cataract;
- mature and hyper mature cataract;
- glaucoma;
- corneal opacity/degeneration;
- and non-dilating pupil.

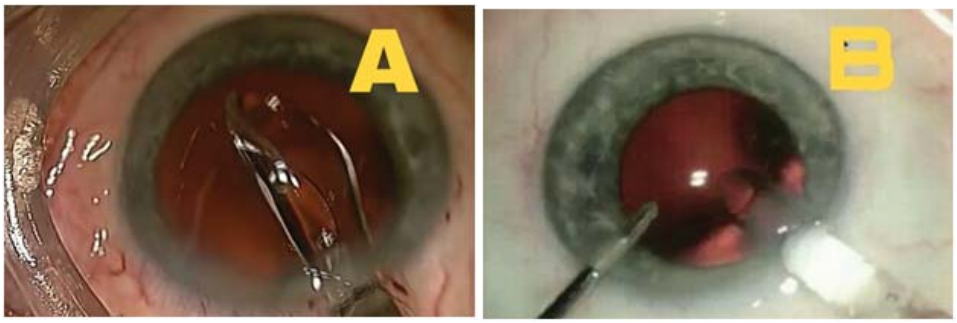
After selection of patients following pre-operative examinations were done:

- Slit lamp examination;
- Keratometry by Topcon auto kerato-refractometer KR-800;
- Axial length measurement using Tomey A scan biometer AL-100;
- IOP measurement by Goldmann's applanation tonometer;
- IOL power calculation using SRK-II formula;
- Endothelial cell count by specular microscope Topcon SP 3000 P model;
- Fundus examination by indirect ophthalmoscope;
- The patients were evaluated similarly after the surgery.

Patients were randomly divided into 2 groups; one in whom IOL was implanted in RL (ringer group) and other in which viscoelastic substance Hydroxypropyl methylcellulose (visco group) was used. All pts underwent phacoemulsification under peribulbar anesthesia by the same operating surgeon with similar surgical steps. Firstly *1.5 mm* size side ports were made at *10* and *2* O'clock positions at limbus and anterior capsule was stained with trypan blue dye under air bubble. The dye was washed and anterior chamber was filled with viscoelastic substance. A *5 mm* size anterior central continuous curvilinear capsulorhexis (CCC) was made, entry into anterior chamber with *2.8 mm* keratome was done. After hydro dissection nucleus was dialled and phacoemulsification was done by divide and conquer method. After thorough cortical matter wash with irrigation and aspiration cannulae, surgical steps were different in both the groups. In visco group anterior chamber was filled with viscoelastic substance and IOL was implanted, and after that the viscoelastic substance was aspirated from anterior chamber as well as from the bag, (**Fig. 1A**). In ringer group, after thorough cortical matter wash instead of viscoelastic substance we implanted the intra-ocular lens under a continuous irrigation of Ringer's lactate solution through a side-port which helped to maintain the anterior chamber and keep the capsular bag inflated **(Fig. 1B)**.

Outcome

The outcome was evaluated on safety (in terms of complications rate), efficacy (in terms of percentage of inbag-fixation of IOL - complete/partial), post-operative intra-ocular pressure (*8 hours*, *24 hours* and *48 hours*), post-operative anterior chamber cells,



Figs. 1A: IOL implanted after completely filling the anterior chamber with viscoelastic substance. **B:** IOL implanted under a continuous irrigation of Ringer's lactate solution through a side-port

endothelial cell count and surgical time **(Table 1)**. Data analysis was done by using SPSS statistical software version 17 with calculation of mean and standard deviation; student's *t*-test (paired) was utilized to look for statistical significance and odd's ratio was calculated.

Table 1: Different methods of measurement

Sr. No.	Variable	Method of measurement
1.	Intra-ocular pressure	Goldmann'sapplanation tonometer
2.	Post-op anterior chamber reaction	Slitlampbiomicrosope (Hogan *et al*. slit lamp grading)
3.	Endothelial cell count	Specular miscroscope
4.	Surgical time	Clock

Results

There were 50 (50%) patients in each group. The mean age of the patients in both the groups was comparable ($p = 0.10$).

Safety

There was no intra-operative complication in any group.

Position of IOL

Although the number of cases in which one haptic was in sulcus were more in ringer group, the difference between the groups was not statistically significant (odds ratio: 0.32; $p > 0.05$), (**Table 2**).

IOP Change

The mean IOP in visco group was *22.24 ± 8.42 mm Hg* at *6 hours* which normalized after that. In ringer group it was in normal range throughout. The difference was significant at *6 hours* and *24 hours* (p value < 0.0001). It was not significant at *48 hours* ($p = 0.11$), (**Graph 1**).

Table 2: Position of IOL

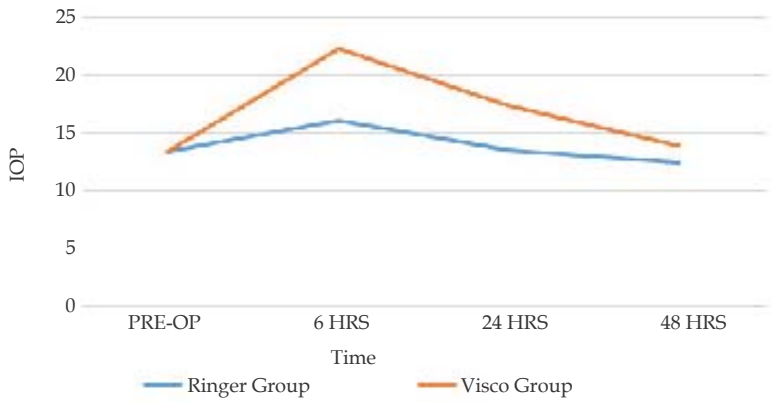
Group	Male/Female Ratio	Mean Patient's Age	IOL Position	
			Bag	Bag and Sulcus
Ringer Group	24/26	60.24 (SD ± 9.2)	47	3
Visco Group	34/16	64.2 (SD ± 7.3)	49	1

AC Reaction

The mean post-operative anterior chamber cells (Hogan *et al*. slit lamp grading) were more in visco group as compared to ringer group. The difference was significant (p value < 0.0001) at *24 hours* and *48 hours*.

Surgical Time

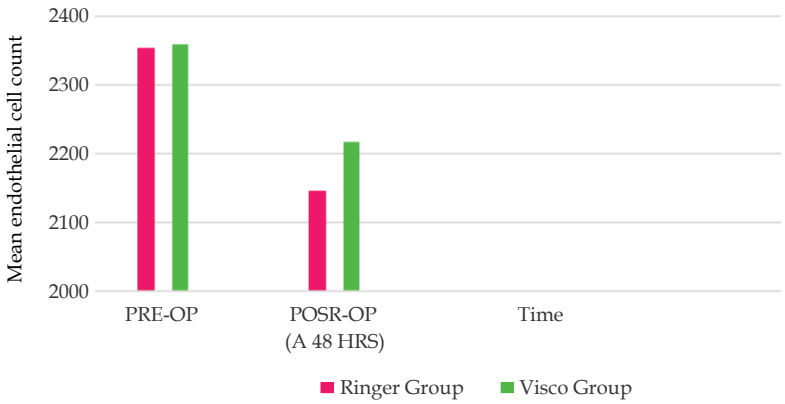
In ringer group the mean surgical time was *5.08 ± 0.76 mins* and in visco group it was *6.01 ± 0.93 mins*. The time difference between the groups was 11.8% and statistically significant (p value < 0.0001).



Graph 1: Changes in IOP

Mean Endothelial Cell Loss

The mean endothelial cell loss in visco group was 6.08% (143.56 cells) and in ringer group it was 8.9% (210.68 cells) at *48 hours*. Though the cell loss was more in ringer group, the difference was not statistically significant (*p* value = 0.055), (**Graph 2**).



Graph 2: Loss of mean endothelial cells

Discussion

Phacoemulsification is a popular technique of performing cataract surgery and various modifications have been described.[5] Thomas *et al*. have reported that implantation of IOL by Blumenthal technique is easy and safe.[6] In our study. there were no complications during IOL implantation in any group. In our study, IOP in visco group was high at *6 hours* and gradually became normal at *48 hours* but in ringer group there were lesser spikes of IOP. Shah *et al*. in their study reported maximum AC reaction on day one after cataract surgery using visco.[7] In our study, the number of AC cells on *day 1* was more than *day 2* in both groups, but cells in visco group were significantly more than that in ringer group. Tak *et al*. have reported that the average time of surgery was less in phaco during hydroimplantation of foldable IOL.[8] A similar outcome was noted in our study. Gogate *et al*. in their study reported 6.5% endothelial cell loss in phaco using visco.[9] Another study by Malik *et al*. has reported 5.5% endothelial cell loss in Blumenthal technique at three months. In our study, we observed an endothelial cell loss of 6.08% in visco group and 8.9% endothelial cell loss in ringer group At *48 hours*.

The weaknesses of our study were AC reaction calculation by slit lamp biomicroscope and absence of follow up data regarding endothelial cells and IOP. The results of several experimental corneal perfusion and clinical studies suggest that a more physiological solution (balanced salt solution Plus) may prove to be a better infusion solution for intra-ocular surgery than others presently being used such as RL.[10,11] The high cost of balanced salt

solution Plus limits its widespread acceptability and usage.[12] Despite the fact that RL lacks several essential constituents necessary for endothelial functioning and protection, it remains the most widely used irrigating fluid in our part of the world due to its low cost.[13]

Conclusion

We conclude that a small modification in one step of phacoemulsification can significantly control spikes of IOP with significantly lesser post-operative reaction. With some experience, implantation of IOL in the bag under a continuous irrigation of RL is safe, accurate and less time consuming method without any significant extra loss of endothelial cells.[14,15]

References

1. Oransky I. Charles Kelman. Obetuary. Lancet. 2004 Jul 134:(9429)364;16–10.
2. Hoffer KJ. Biometry of 7,500 cataractous eyes. Am J Ophthalmol. 1980;90: 360–68.
3. Arshinoff SA, Albiani DA, Taylor-Laporte J. Intra-ocular pressure after bilateral cataract surgery using Healon, Healon 5, and Healon GV. J Cataract Refract Surg. 2002;28:617–25.
4. Arshinoff SA, Wong E. Understanding, retaining, and removing dispersive and pseudodispersive ophthalmic viscosurgical devices. J Cataract Refract Surg. 2003;29:2318–23.
5. Malik KPS and Goel R. Nucleus management with Blumenthal technique: Anterior chamber maintainer. Indian J Ophthalmol. 2009;57(1):23–25.
6. Thomas R, Kuriakose T, George R. Towards achieving small-incision cataract surgery 99.8% of time. Indian J Ophthalmology. 2000;48:145–51.
7. Shah SM, Spalton DJ. Changes in anterior chamber flare and cells following cataract surgery. British J Ophthalmol. 1994;78:91–4.
8. Tak H. Hydroimplantation: Foldable intra-ocular lens implantation without an ophthalmic viscosurgical device. J Cataract Refract Surg. 2010;36(3):377–79.
9. Gogate P, Ambardekar P, Kulkurani S. Comparison of endothelial cell loss after cataract surgery: Phacoemulsification *versus* manual small-incision cataract surgery: Six-week results of a randomized control trial. J Cataract Refract surgery. 2010;36(2):247–53.
10. Vasavada V, Dixit NV. Comparison between Ringer's lactate and balanced salt solution on post-operative outcomes after phacoemulsification: A randomized clinical trial. Indian J Ophthalmol. 2009;57(3):191–5.
11. Yagoubi MI, Armitage WJ, Diamond J, *et al*. Effects of irrigation solutions on corneal endothelium function. Br J Ophthalmol. 1994;78:302–06.
12. Kiss B, Findl O, Menapace R, *et al*. Corneal endothelium cell protection with a dispersive viscoelastic material and an irrigating solution during phacoemulsification: Low-cost versus expensive combination. J Cataract Refract Surg. 2003:29:733–40.
13. Kramer KK, Thomassen T, Evaul J. Intra-ocular irrigating solutions: A clinical study of BSS plus and dextrose bicarbonate lactated Ringer's solution. Ann Ophthalmol. 1991;23:101–05.
14. Shimizu K, Kobayashi K, Takayama S, *et al*. Preloaded injector for intra-ocular lens implantation without the use of ophthalmic viscosurgical devices. J Cataract Refract Surg. 2008;34(7):1157–60.
15. Sharma PD, Madhavi MR. A comparative study of post-operative intra-ocular pressure changes in small incision *vs* conventional extra-capsular cataract surgery. Eye (London). 2010;24(4):608–12.

Ophthalmology and Allied Sciences

Library Recommendation Form

If you would like to recommend this journal to your library, simply complete the form given below and return it to us. Please type or print the information clearly. We will forward a sample copy to your library, along with this recommendation card.

Please send a sample copy to:

Name of Librarian

Name of Library

Address of Library

Recommended by:

Your Name/ Title

Department

Address

Dear Librarian,

I would like to recommend that your library subscribe to the Ophthalmology and Allied Sciences. I believe the major future uses of the journal for your library would provide:

1. Useful information for members of my specialty.
2. An excellent research aid.
3. An invaluable student resource.

I have a personal subscription and understand and appreciate the value an institutional subscription would mean to our staff.

Should the journal you're reading right now be a part of your University or institution's library? To have a free sample sent to your librarian, simply fill out and mail this today!

Stock Manager

Red Flower Publication Pvt. Ltd.

48/41-42, DSIDC, Pocket-II

Mayur Vihar Phase-I

Delhi - 110 091(India)

Phone: Phone: 91-11-45796900, 22754205, 22756995, Cell: +91-9821671871

E-mail: sales@rfppl.co.in

Original Article

Ophthalmology and Allied Sciences
Volume 5 Number 3 / September – December 2019
DOI: http://dx.doi.org/10.21088/oas.2454.7816.5319.9

Epidemiological and Pathological Analysis of Eyelid Tumour Treated in Tertiary Care Eye Hospital in Central India

Vikas Tantuway[1], Ambica Agrawal[2], Romila Singh[3]

Abstract

Aim: To analyze demography, clinical profile & histopathology of eyelid tumours treated in tertiary care Eye hospital in Central India. *Study Design:* Observational Study. *Methodology:* Retrospective analysis of 82 cases of lid tumour presented at tertiary Eye hospital from *April 11* to *14*. Cases analyzed for demography, location, marginal involvement, delay in presentation and histopathology. *Results:* There were 82 cases of lid tumour, 57 were benign and 25 malignant. Mean age of all cases *48.17 years*; for benign *43.98 years* & for malignant *57.72 years* ($p = 0.0023$). Male: Female ratio for benign 3.4:1 & for malignant 2.1:1. Commonest location of benign tumour upper lid lateral half (31.58%). Mean delay in presentation for benign tumour *44.32 months* (1–240 months) & malignancy *9.96 months* (*5–18 months*) ($p = 0.0125$). Lid Margin involvement was in 18 (31.58%) in benign & in 24 (96%) in malignancy ($p < 0.0001$). 48% of malignant tumours were sebaceous gland carcinoma (SGC). *Conclusion:* Long standing (> *1 year*) mass on upper lid laterally, probably is benign. Surgeon treating malignant tumour (Central India) should have high index of suspicion for SGC.

Keywords: Epidemiological; Pathological; Eyelid & Tumour**.**

How to cite this article:

Vikas Tantuway, Ambica Agrawal, Romila Singh. Epidemiological and Pathological Analysis of Eyelid Tumour Treated in Tertiary Care Eye Hospital in Central India. Ophthalmol Allied Sci. 2019;5(3):303–307

Introduction

The incidence of eyelid swellings appears to be increasing.[1-3] Complex reconstructive problems associated with the loss of an eyelid that a huge number of such cases are referred to plastic surgery facilities. Though, inadequate data are available, and hence the eyelid malignancies stay on largely un-characterized. Data of ocular adnexal malignancies within a particular geographical area have been revealed to give out as a reference for that particular area for future research & assist in guiding physicians & policy makers in planning resources for screening, treatment & prevention of malignancy of the eye & ocular adnexa.[4] Eyelid malignancies have a diverse pathology as well as Basal Cell Carcinoma (BCC), Squamous Cell Carcinoma (SCC), Malignant Melanoma (MM), Sebaceous Gland Carcinoma (SGC) & other rare tumours like hemangiopericytoma (HMP). The western & Asian data have substantial variations in case distribution & presentation. This study is an attempt to characterise these tumours in the Indian population.

Materials and Methods

The current study is a retrospective analysis of 82 cases of lid tumour presented at tertiary care eye hospital in central India. We integrated cases that

Author Affiliation: [1]Senior Resident, [2]PG Resident 3rd year, [3]PG Resident 2nd year, Department of Ophthalmology, Index Medical College Hospital and Research Centre, Indore, Madhya Pradesh 452001, India.

Corresponding Author: Vikas Tantuway, Senior Resident, Department of Ophthalmology, Department of Ophthalmology, Index Medical College Hospital and Research Centre, Indore, Madhya Pradesh 452001, India.

E-mail: varuny.indore09@gmail.com

Received on 11.09.2019, **Accepted on** 23.10.2019

reported to the study centre from *April 2011* to *April 2014*. The cases which are probable clinical diagnosis of eyelid mass were made & treated with wide local excision with a *05-10 mm* margin of normal tissue & an suitable combination of Split Skin Grafts (SSG), Tarso-conjunctival Flaps (TCF), Mustarde's Flaps (MF), Hughe's flap and Cutler-Beared procedure. The cases were analyzed for their age of presentation, sex distribution, tumour location, delay in seeking treatment, & variations with respect to the histopathological subtype.

Results

Comparision of Benign and Malignant Mass

Age

The mean age of presentation in our study was *48.17 years* (range *14–80 years*). In the present study, mean age of benign cases was *43.98 years* & of malignant *57.72 years* (p = 0.0023), (**Table 1**).

Sex

There was slight male preponderance as Male:Female ratio for benign 3.4:1 & for malignant 2.1:1 (**Table 1)**.

Tumour location

Commonest location of benign tumour upper lid lateral half (31.58%). Lid Margin involvement was in 18 (31.58%) in benign & in 24 (96%) in malignancy (p < 0.0001). (**Table 1**).

Delay in presentation

Mean delay in presentation for benign tumour *44.32 months* (*1–240 months*) & malignancy *9.96 months* (*5–18 months*) (p = 0.0125), (**Table 1**).

Distribution of Eyelid Benign and Malignant Mass

Pathology

SGC was the most common malignancy (48%) (**Table 2**). Sebaceous cyst is the commonest benign mass (19%), (**Table 3**).

Table 1: Comparision of Benign and Malignant Mass

Sr. No.	Charateristics	Benign	Malignant
1	No of Cases	57	25
2	Mean Age of presentation	43.98 Years	57.72 Years
3	Male	44	17
4	Female	13	8
5	Mean Delay in presentation	44.32 Months	9.96 Months
6	Location of Mass		
	Upper Lid medial half	12	2
	Upper Lid lateral half	18	4
	Whole Upper Lid	1	9
	Lower Lid medial half	13	1
	Lower Lid lateral half	10	2
	Whole Lower Lid	3	7
7	Marginal Involvement	18	24

Table 2: Distribution of Eyelid Malignancies

Sr. No.	Histopathological Type	No of Patients
1	Sebaceous gland carcinoma	12
2	Squamous cell carcinoma	5
3	Basal cell carcinoma	4
4	Non-hodgekins lymphoma	1
5	Plasmacytoma	1
6	Malignant melanoma	1

Table 3: Distribution of Eyelid Benign Mass

Sr. No	Histopathological Type	No of Patients
1	Angiomatous lesion	1
2	Benign eccrine acrospiroma	1

Sr. No	Histopathological Type	No of Patients
3	Cavernous hemangioma	1
4	Conjunctival papilloma	2
5	Dermal nevus	4
6	Dermoid cyst	6
7	Hemangioma orbit	1
8	Inclusion cyst	1
9	Junctional nevus	3
10	Keratin cyst	4
11	Lobular capillary hemangioma	3
12	Lymphatic reactive hyperplasia	1
13	Non-neoplastic canalicular cyst	1
14	Papiloma	2
15	Pigmented nevus	2
16	Pyogenic granuloma	3
17	Retention cyst	1
18	Schwanoma	1
19	Sebaceous cyst	11
20	Sebaceous gland adenoma	2
21	Sebaceous horn with sec inflammation	2
22	Seborrhic keratosis	2
23	Tarsal cyst	1
24	Trichilemmal cyst	1

Discussion

The most vital function of eyelids is considered to protect the eyeball. Even though their small surface area, they are along with the most sunlight-exposed area of skins. The thin skin of the eyelids is mainly sensitive to various irritants and UV & is thus prone to develop eyelid tumors. Approx 05 to 10 percent of all skin cancers occur on the eyelids. Eyelid tumours are usually in oculoplastic surgery practice, malignancies requiring resection by means of a wide margin often pose challenging reconstructive problems to the treating surgeon. Eyelid malignancies can be of diverse histological types. These malignancies, be likely to behave another way in terms of presentation, progression & reply to surgical resection. Treating eyelid malignancies as a single entity without accurate clinical & histological diagnosis is burdened with the danger of over simplification. The current study aims to characterise these eyelid tumours by encompassing *3 years* of data in an attempt to provide guidelines for evaluation of the tumours. Basal Cell Carcinoma is mainly recognised as the most widespread eyelid malignancy worldwide. Nevertheless, the relative incidence of BCC shows large regional variation. Data reported from the USA show that nearly 90% of eyelid malignancies are BCC.[5] Studies advocate that in Caucasians, BCC constitutes in relation to 80-90% of the malignant eyelid tumours. BCC was the most regular malignant tumour (86%), followed by SCC (07%) & sebaceous carcinoma (03%) in Switzerland.[6] BCC was the most common eyelid malignancy, excluding it accounted for only 65.1% of the cases in Taiwan.[7] Correspondingly, an incidence of 62.2% in another study done in Taiwan. In Thailand, BCC constitutes 64% of all eyelid tumours. The only exception to this trend of lower incidence of BCC in Asian countries. in Singapore, who have reported 84% incidence of BCC. BCC constituted 16% of all malignancies. This is lower than the frequency reported by other Asian countries & is significantly less than the data reported by the western studies,

Squamous Cell Carcinoma is uncommon among whites, accounting for 01-5.5% of all eyelid malignancies, which is far behind BCC & SCC.[8] In Asian countries, there is a improved occurrence of SGC. Chinese studies have reported an incidence of 7-24%. An incidence of 10-40% has been reported from Singapore, Thailand & Japan. In the current study, SGC constituted 48% of all malignancies. It remains to be seen whether this increased rate of SGC is due to increase in incidence of SGC per se or due to a relative decrease in the incidence of BCC. Large population based studies are required to establish the trend, although racial, genetic & geographical factors all seem to play a role.

In our study, the mean age of was *48.17 years* (range *14–80 years*) which correlates well with that reported in other studies from Asia. The median age at diagnosis in Singapore was reported to be *63 years* in males & *66 years* in females.[9] The mean age at diagnosis of eyelid cancers was *62.6 ± 14.1 years* in Taiwan. A rather earlier mean age of was [*52.4 years* (SD 21.8)] in Thailand. In the current study, the median age of presentation was *57.5 years* (range 35-75) for BCC, *58.1 years* (range 32–75) for sebaceous gland carcinoma, *64 years* (range 50–75) for squamous cell carcinoma. In Taiwan, the mean age was *61.8 years* (range 10-86) for BCC and *68.1 years* (range 48-91) for SGC. In the present study, there was male preponderance as 74.39% of the patients were males. Male:Female ratio for benign was 3.4:1 & for malignant 2.1:1. There seems to be large variations in the sex ratio as depicted by other studies. Women greatly outnumbered men in SGC (21 females, 09 males). Patients with eyelid tumours in their study were males. The sex distribution was equal for both sebaceous cell carcinoma and BCC, but males were relatively more often affected with SCC (60 %). It is possible that the variable sex incidence is due to the variations in the cohort of patients understudy.[10]

Commonest location of benign tumour upper lid lateral half (31.58%). Lid Margin involvement was in 18 (31.58%) in benign & in 24 (96%) in malignancy ($p < 0.0001$). The lower lid was also the most common site for tumour location for all histological subtypes except SGC. This result was the same as that of previous studies. The predominance of BCC in the lower eyelid has been shown in various studies. However, more SGC occurs in the upper eyelid due to greater number of meibomian glands in the upper lid. Mean duration of symptoms for all histological subtypes was 9.87 months (range *1–48 months*). Average duration of symptoms for BCC was *12.5 months*, while the duration was *11 months* for SGC and *6.2 months* for squamous cell carcinoma. This is probably due to a more rapid rate of growth of squamous cell carcinoma as opposed to SGC and BCC. It stems from the above discussion that the clinical symptoms of eyelid malignancies closely resemble each other. Higher rate of tumour growth points to a more aggressive malignancy like squamous cell carcinoma. SGC, however, presents a more confusing picture as its rate of growth and progression is intermediate between that of BCC and squamous cell carcinoma. BCC and SGC also behave differently in their response to treatment and post-operative course. Mortality from eyelid and medial canthal BCC ranges from 2 to 11%. On the other hand, SGC is conventionally considered between the most dangerous of all tumours of the ocular adnexa. Mortality from SGC has been estimated to be from 6 to 30% in a previous study. According to the literature, distant metastasis affects 14-25% of the cases & involves lymph node or hematogenous spread into liver, lungs, brain & bones. Thus, it is very important that exact diagnosis must be made as early as possible.[11]

Our preferred mode of lid reconstruction is a tarso-conjunctival flaps. It is evident that a greater free margin requires more complex reconstructive procedure. We recommend that SGC should be excised with a free margin of *10 mm*. Reconstructive procedure can be a matter of surgeon's choice, but in our experience, tarso-conjunctival flaps can be used for a satisfactory reconstruction. The present study shows, a greater incidence of squamous cell carcinoma & a relatively lower incidence of BCC in the Indian population though BCC is the most common histological type. We admit the fact that the study has the constraint of low long-term follow-up, which makes the computation of survival statistics difficult. However, a high occurrence rate of SGC is exclusively evident in India, requiring a high index of suspicion & aggressive treatment. Clinical features alone cannot be used effectively for diagnosis however, a higher rate of growth suggests a more aggressive variant. We recommend that all eyelid malignancies must be subjected to pre-operative histological diagnosis. BCC can be excised securely with a *5 mm* margin, although a *10 mm* margin for squamous cell carcinoma & *08-10 mm* margin for squamous cell carcinoma are recommended. Eyelid reconstruction can be done by an array of methods, nevertheless, we advise the use of tarso-conjunctival flaps.[12]

Conclusion

We advised that the surgeons treating eyelid malignancies in India should have a high index of suspicion for SGC. It is recommended that large population-based studies should be conducted to exactly quantify the incidence & prevalence of eyelid malignancies. Pre-operative histological confirmation of diagnosis & frozen section biopsy for healthy free margin in excision of malignancy is recommended.

References

1. Jou JR, Lai PC, Kao SC, *et al*. Malignant eyelid tumors in Taiwan. Eye. 2003;17:216–20.

2. Rathod A, Modini P, Kavitha T, *et al*. A clinic-pathological study of eyelid tumours & its management at a tertiary eye care centre of Southern India. MRIMS J Health Sci. 2015;3:54–58.
3. Gupta P, Gupta RC, Khan L. Profile of the eyelid malignancy in the Tertiary Health Care Centre in North India. J Cancer Res Ther. 2017 Jul–Sep;13(3):484–86.
4. Margo CE, Waltz K. Basal cell carcinoma (BCC) of the eyelid & peri-ocular skin. Surv Ophthalmol. 1993;38:169–92.
5. Rao NA, Hidayat AA, McLean IW, *et al*. Sebaceous carcinomas of ocular adnexa, clinicopathologic study of 104 cases, with five-year follow-up data. Hum Pathol. 1982;13:113–22.
6. Ramya BS, Dayananda SB. Tumour of the eyelid–A histo-pathological study of 86 cases in a tertiary hospital. Int J Sci Res Pub. 2014;4:1–5.
7. Weiner JM, Henderson PN, Roche J. Metastatic eyelid carcinoma. Am J Ophthalmol. 1986;101:252–54.
8. Kass LG, Hornblass A. Sebaceous carcinoma of the ocular adnexa. Surv Ophthalmol. 1989;33:477–90.
9. Levin GM. Sebaceous carcinoma of the eyelids. Ophthalmology. 2005 Dec;112(12):2242.
10. Khan JA, Doane JF, Grove AS. Sebaceous & meibomian carcinomas of the eyelid. Recognition, diagnosis, & management. Ophthalmic Plast Recontr Surg. 1991;7:61–66.
11. Hiroshi T, Hidetoshi Y. Clinico-pathological Analysis of Malignant Eyelid Tumor Cases at Yamagata Hospital, Statistical Comparison of Tumor Incidences in Japan & in Other Countries. Jpn J Ophthalmol. 2005 Sep-Oct;49(5):349-54.
12. Lee SB, Saw SM, Au Eong KG, *et al*. Incidence of eyelid cancers in Singapore from 1968 to 1995. Br J Ophthalmol. 1999;83:595–97.

Case Report

Ophthalmology and Allied Sciences
Volume 5 Number 3 / September – December 2019
DOI: http://dx.doi.org/10.21088/oas.2454.7816.5319.10

Diabetic Papillopathy in One Eyed Patient, an Incidental Diagnosis Based on Therapeutic Response

Sandhya R[1], Sumanth IM[2], Sai Monisha Jammula[3]

Abstract

A 52 years old one eyed male presented with history of blurring of in right eye since *7 days* which was rapidly progressing in onset and painless. Dilated fundoscopic examination of right eye showed pallid disc edema, venous dilation and a flame shaped superficial retinal hemorrhage in the peripapillary area with inferior altitudinal defect. Left eye was pthysical with no PL. On investigation patient was diagnosed to have diabetes mellitus with morbidly deranged metabolic status. This case was posed a diagnostic challenge as the clinical picture did not typically fit into the diagnosis of optic neuritis as the color vision was normal, RAPD could not be confirmed, disc showed pallid edema: AION was a differential diagnosis because of pallid edemaor the disc, peripapillary hemorrhage & altitudinal defect. The discovery of Diabetes mellitus on routine blood sugar estimation added Diabetic papillopathy to the list of differential diagnoses. However, it was the rapid therapeutic response with oral anti hypoglycemic agents in the form of improved vision & fileds that led to the incidental diagnosis of Diabetic papillopathy.

Keywords: Altitudinal defect; Anterior ischemic optic neuropathy Diabetic Papillopathy; Pallid edema, Pthysis, RAPD.

How to cite this article:
Sandhya R, Sumanth IM, Sai Monisha Jammula. Diabetic Papillopathy in One Eyed Patient, an Incidental Diagnosis Based on Therapeutic Response. Ophthalmol Allied Sci. 2019;5(3):309–312

Introduction

Diabetic papillopathy is believed to be a rare occurrence of diabetes mellitus seen in patients with both Type and Type 2 diabetes mellitus(T2DM). Its signs and symptoms often confound or overlap with non arteritic anterior ischemic optic neuropathy (NAION), as both these conditions are due ischemic process. While its been described that diabetic papillopathy as an asymptomatic, benign condition with no or minimal visual impact, which worsens with sudden glycemic control. Here we describe a case of diabetic papillopathy in newly diagnosed diabetes mellitus patients presented with moderate visual disturbance which resolved with good glycemic control , somewhat contrary to the described pattern in literature.

Case Report

A 52 year-old male presented to OPD with blurring of vision in right eye since *7 days* which was rapidly progressing in onset and painless. He noticed this while he tried reading & writing in the morning. There were no other ocular or systemic symptoms. He gave history of trauma to left eye with stick *40 years* back followed by complete loss of vision in left eye since then. No other details were forthcoming.

He was not a known smoker or alcoholic. General physical examination was essentially normal; Blood pressure *120/80 mm Hg*. Systemic examination of cardiovascular, respiratory,

Author Affiliation: [1]Professor, [2,3]Junior Resident, Department of Ophthalmology, Sri Devaraj Urs Medical College, Tamaka, Kolar, Karnataka 563101, India.

Corresponding Author: Sumanth I M, Junior Resident, Department of Ophthalmology, Sri Devaraj Urs Medical College, Tamaka, Kolar, Karnataka 563101, India.

E-mail: i.sumanthmohan@gmail.com

Received on 30.08.2019, **Accepted on** 23.10.2019

abdomen & nervous system systems were within normal. At presentation the BCVA of right eye was 6/18 (p), with no significant refractive error: color vision was normal. Slit lamp examination of anterior segment was normal, pupil was *3 mm*, round, reactive and well sustained. + 90 D examination showed no vitreous reaction, disc margin was blurred all around with *2 mm* elevation

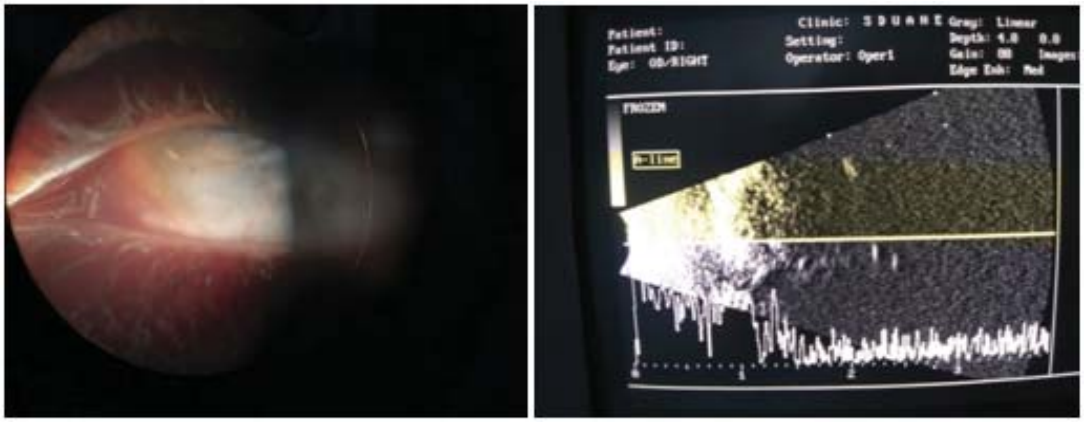


Fig. 1: Left eye of the patient with B scan

of optic disc. Vessels were arising from centre of the disc, there was venous dilation with A:V ratio 2:4. A single flame shaped superficial retinal hemorrhage was noted in the peripapillary area at *9'o clock* position. Macula appeared normal with dull foveal reflex. IOP was *12 mm Hg*. Gonioscopy showed open angles with Shaffer's grading 3 in all quadrants.

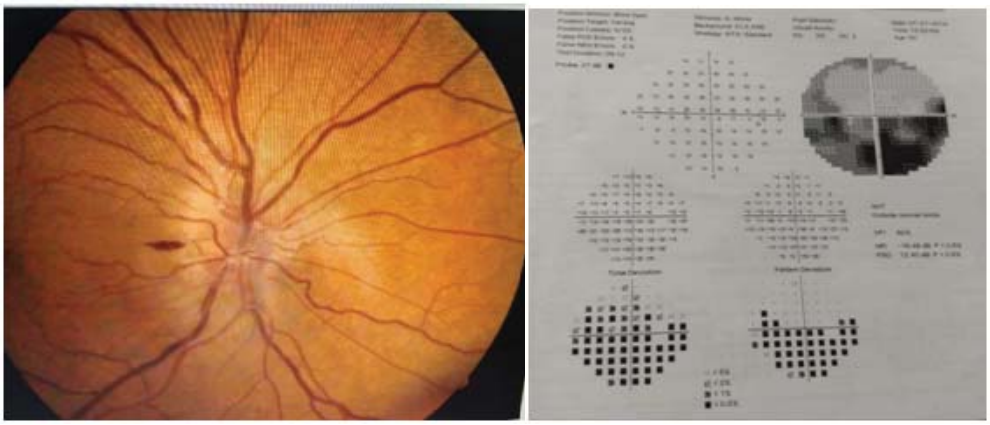


Fig. 2: Right eye fundus picture and fields on *day 1*

OCT showed disc edema extending to peripapillary area, there was no hyperemia. Macula & peripheral retina were normal & there were no other gross abnormalities. On examination left eye was pthysical with no PL negative. Axial length was *13 mm* with hyper intense lesions in the cavity suggestive of calcifications and sclerosed sclerochoroidal wall noted on USG B scan **(Fig. 1)**.

A working diagnosis of Disc Oedema Right eye was made & evaluated. Visual fileds by confrontation test showed constricted field infero-temporally and infero-nasally & HFA showed inferior altitudinal field defect.

On day two Metabolic work up revealed deranged glucose metabolism, with HbA1C value of 7.5%, fasting blood sugar *330 mg/dl* and post prandial *441 mg/dl*, ESR *10 mm/hr*. All other parameters were within the normal range. Neurological evaluation was repeated and was reported normal. CT scan was done to rule out any intracranial space occupying lesions & any other pathology **(Fig. 2)**.

Differential diagnosis of Optic neuritis, Non-

artritic–Anterior ischemic Optic Neuropathy, diabetic papillopathy were considered. Moderate painless visual disturbance, normal color vision & pale edema were not typical of Optic neuritis. Peripapillar hemorrhage, pale discedema, altitudinal filed defect were suggestive of anterior ischemic optic neuropathy: ESR was normal. Patient was started on oral hypoglycemic drugs in view of deranged sugar levels, also on oral multivitamin tablets and on topical NSAID eye drops. Steroids were not started due to the metabolic status of patient with consultation of physician.

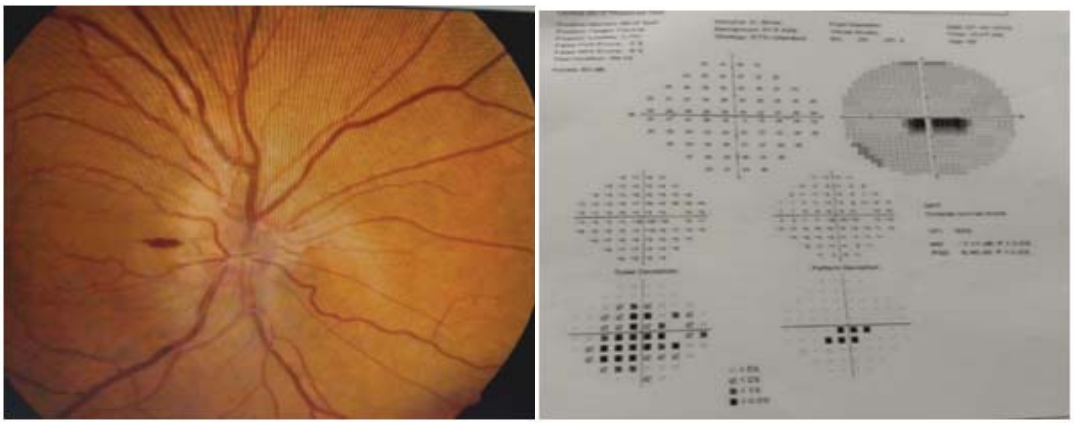


Fig. 3: Right eye fundus picture and fields on *day 5*

On day 3, fundus of the patient showed segmental disc pallor from *9 O' clock* to *12 O'clock* position, rest being the same.

On day 5 patient was symptomatically better. Visual acuity was 6/12. The fundus picture remained the same. Repeat HFA showed improvement in field of vision of the patient. It was decided to continue conservative management with emphasis on metabolic state of the patient **(Fig. 3)**.

At *two weeks* follow up, visual acuity had improved to 6/9, visual fields revealed just a small residual paracental scotoma and the patient had achieved stable glycemic control.

Discussion

Diabetic papillopathy is a rare diagnosis of exclusion. It was first described in 1971 and has been reported in patients with both type 1 and type 2 diabetes mellitus. It typically occurs bilaterally, has only mild to moderate effects on visual acuity and visual fields are typically restricted.[1,2] It may occur in the absence of diabetic retinopathy. The exact pathogenesis is unclear, but is believed to occur due to disruption of the peripapillary vasculature.[3] The degree of diabetic retinopathy in patients with diabetic papillopathy tends to be mild, and it is believed that diabetic papillopathy is a separate entity rather than an extension of diabetic retinopathy.[4] Current accepted criteria for the diagnosis of diabetic papillopathy include: Confirmed diagnosis of diabetes (type 1 or type 2), optic disc oedema, and absence of substantial optic nerve dysfunction, normal ICP and lack of nerve inflammation, infection, or infiltration.[5] In patients with diabetes who start intensive insulin treatment, incidence of diabetic papillopathy has been associated with failure to downregulate retinal blood flow and atrend toward increased retinal perfusion.[6]

Studies have also shown that cases having isolated peripapillarysubretinal hemorrhages may be due to crowded optic disc which can predispose to ischemic neuropathies.[7] Acute onset of blurring of vision in a middle aged one eyed patient with pale oedema and one peripapillary hemorrhage pointed towards an underlying ischemic pathology.

Patients with non-arteritic anterior ischemic optic neuropathy are typically older than *50 years* & predisposed those with crowded optic nerves. Typically the presentation is with sudden visual loss sometimes with mild, non-specific periocular pain which may sometimes continue to worsen for up to *30 days*,[8] Altitudinal field defects are usually present and clinically there may be no significant improvement invisual function.

Unilateral presentation of rapid visual disturbance with pallid edema, one NFL peri papillary hemorrhage & altitudinal filed defect in this one eyed patient were supporting the differential diagnosis of NA-AION. But in this case no clues such as small discs

could be obtained as the other eye was phthisical. The rapid recovery & absence of typical RAPD were non-conforming. Most patients with acquired optic neuropathy will have dyschromatopsia, which may be restriced only to the affected area corresponding to the sectorial optic nerve dysfunction. Sometimes the speed with which color plates are recognized may be the only difference in the affected eye.[9] Normal color vision at the day of presentation with a pallid disc edema was going against optic neuropathy. Optic neuritis is usually seen in women, mostly in their second, third and fourth decades of life, who present with subacute visual loss with (in over 90%) pain on eye movements.Only a 30% of patients with optic neuritis have visible optic nerve head oedema.[10] Less than 5% of patients have peripapillary hemorrhages. Here it was middle man with pallid disc edema which was painless and having peripapillary hemorrhage. Rapid therapeutic response to conservative management along with glycemic control confirmed the clinical suspicion of Atypical diabetic papillopathy: Albeit the absence of other features of diabetic retinopathy.[11]

Conclusion

Rapid onset of significant unilateral visual diminution in a young adult male is conventionally investigated on the lines of Optic neuritis. The challenges in this patient was, that he was one eyed; RAPD could not be assessed, the optic disc clues in the fellow eye such as crowded disc or small cup or other anomalies could not be assessed. The pallid edema was another distracter. Also, the choice of treatment options was critical for this one eyed patient. The routine metabolic work up was the key to the hitherto undiagnosed Diabetes mellitus. Despite Optic neuritis being the first differential diagnosis, steroid regimen was withheld as we considered metabolic control of diabetes the priority. However, the rapid therapeutic response with oral anti-hypoglycemic agents led to the revised diagnosis of Diabetic papillopathy. VEP and FFA at presentation and at serial follow up can give more clues to this clinical enigma.

References

1. Regillo CD, Brown GC, Savino PJ, *et al*. Diabetic Papillopathy: Patient characteristics and fundus findings. Arch Opthalmol. 1995;113:889–94.
2. Bayraktar Z, Alacali N, Bayraktar S. Diabetic papillopathy in type II diabetic patients. Retina 2002;22:752–58.
3. Kroll P, Wiegand W, Schimdt J. Vitreopapillary traction in proliferative diabetic vitreoretinopathy. Br J Opthalmol. 1999;83:261–64.
4. Regillo CD, Brown GC, Savino PJ Diabetic papillopathy: Patient characteristics and fundus findings. Arch Ophthalmol. 1995;113:889–95.
5. Arnold AC. Ischemic optic neuropathy. In: Miller NR, Newman NJ, Editors.Walsh and Hoyt's Clinical Neuro-Ophthalmology, 6th edition. Philadelphia: Lippincott Williams & Wilkins; 2005.pp.377–78.
6. Grunwald JE, Brucker AJ, Braunstein SN. Strict metabolic control and retinal blood flow in diabetes mellitus. Br J Ophthalmol. 1994;78:598–604.
7. Doro S, Lessell S. Cup-disc ratio and ischemic optic neuropathy. Arch Ophthalmol. 1985;103:1143–144.
8. Bayraktar Z, Alacali N, Bayraktar S. Diabetic papillopathy in type II diabetic patients. Retina. 2002;22:752–58.
9. Behbehani R. Clinical approach to optic neuropathies. Clin Ophthalmol. 2007;1(3):233–46.
10. The clinical profile of optic neuritis. Experience of the optic neuritis treatment trial. Optic Neuritis Study Group. Arch Ophthalmol. 1991;109:1673–678.
11. Margolin E. The swollen optic nerve: An approach to diagnosis and management. Practical Neurology. 2019;19:302–309.

Case Report

Ophthalmology and Allied Sciences
Volume 5 Number 3 / September – December 2019
DOI: http://dx.doi.org/10.21088/oas.2454.7816.5319.11

Non Arteritic Anterior Ischaemic Optic Neuropathy Secondary to Acute Primary Angle Closure: A Case Report

Salil Kumar[1], Aditi Dubey[2], Shubhangi Dubey[3], Prashant Borde[4]

Abstract

Purpose: To describe a case of non-arteritic anterior ischemic optic neuropathy (NA-AION) secondary to acute angle closure (AAC). *Case Report:* We present a case of *48 years* old female who presented with painful diminution of vision in the OS. After examination of the anterior segment she was diagnosed of having an acute attack of primary angle closure glaucoma. On fundus examination OD was within physiological limits, OS the disc was edematous and pale with superficial haemorrhage at disc margin. Medical management and laser peripheral iridotomy relieved pain but did not improve vision. The visual fields showed superior altitudional field defect. Patient was not a known case of diabetes mellitus or hypertension. The patient was diagnosed with NA-AION secondary to acute angle closure glaucoma. *Results:* A *48-year-old* woman presented with AAC with reduced visual acuity. Investigations revealed concurrent NA-AION with classical disc and visual field findings. *Conclusion:* NA-AION secondary to AAC is a rare clinical entity that can result in severe vision loss. Thus, it is important to look beyond the angle in cases of acute angle closure glaucoma.

Keywords: NA-AION; ACC.

How to cite this article:
Salil Kumar, Aditi Dubey, Shubhangi Dubey, *et al*. Non Arteritic Anterior Ischaemic Optic Neuropathy Secondary to Acute Primary Angle Closure: A Case Report. Ophthalmol Allied Sci. 2019;5(3):313–316

Introduction

The prevalence of acute angle closure (AAC) is 0.3 to 2.7 percent in patients older than 40.[1,2] The incidence of non-arteritic anterior ischemic optic neuropathy (NA-AION) is two to ten per 100,000 in the population older than 50.[3–5] NAION secondary to acute primary angle closure was first described by Sonty and Schwartz in 1981.[6] Patients present with typical AAC symptoms and signs, which include pain, headache, nausea and vomiting, conjunctival injection, corneal edema, elevated intraocular pressure (IOP), closed angles, and a shallow anterior chamber. NA-AION was present at the time of presentation for AAC in five of seven eyes and developed one week after AAC in two eyes.[5-9]

Author Affiliation: [1]Professor, Regional Institute of Ophthalmology, Bhopal, Madhya Pradesh 462001, India. [2]Assistant Professor [3]Resident, Department of Ophthalmology, Gandhi Medical College, Bhopal, Madhya Pradesh 462016, India. [4]Fellow, Sadguru Netra Chikitsalay, Chitrakoot, Madhya Pradesh 210204, India.

Corresponding Author: Aditi Dubey, Assistant Professor, Department of Ophthalmology, Gandhi Medical College, Bhopal, Madhya Pradesh 462016, India.

E-mail: aditi.dubey1585@gmail.com

Received on 07.10.2019, **Accepted on** 13.11.2019

Case History

Reporting a case of a *48 years* old female presented to the ophthalmology OPD with complains of marked diminution of vision, pain and redness in left eye associated with left sided headache for 8 days. She gave history of two similar episodes in the past one *year*.

On examination her visual acuity was *OD-6/6* and *OS-6/24*, not improving with pinhole. The anterior chamber was shallow in OD with a Von Herick (VH) grading 2. The pupil was central circular sluggishly reacting to light and the rest of the OD structure were found to have no abnormality. While in os the lids were edematous and non tender conjunctival congestion with corneal edema, shallow anterior chamber with a VH grading 2, pupil was mid

dilated not reacting to light. The intraocular pressure in the OD was *14.6 mm Hg* and in the OS was more than *49.5 mm Hg* by schiotz tonometer. On fundus examination, OD the disc was vertically oval with the cup to disc ratio of 0.4 with rest of fundus within normal limits. The left eye disc margins were blurred with pallor of neuroretinal rim, superficial hemorrhage superonasal to the disc, the cup to disc ratio was not appreciated and the arteries and veins were normal in thickness and caliber (**Fig. 1**).

Fig 1: Fundus Photograph at presentation

Gonioscopy was done after controlling the IOP medically and the angles were Grade 2–3 in all quadrants in OD and Grade 1 in 3 quadrants in OS by Shaffers system. Visual fields in the OS showed superior altitudinal field defects (**Fig. 2**). Visual evoked potential suggested a mixed optic neuropathy in the OS. On presentation the patient was given systemic hyperosmolar agent (iv mannitol stat) and oral carbonicanhydrase inhibitor (tab. Acetazolamide *250 mg* QID) with topical pilocarpine and beta blocker (timolol 0.5% BD) along with supportive medications. Once the acute attack subsided, a therapeutic Nd-YAG laser peripheral iridectomy was done in the OS and prophylactic in OD. Intraocular pressure was well controlled, but the visual acuity does not improve. Patient was given a trial of systemic steroid (inj. Methyl prednisolone *1 gm* for *3 days*), which resulted in improvement of visual acuity upto 6/12 unaided improving upto 6/9 with pinhole. The patient was followed up for a period of *6 months*,

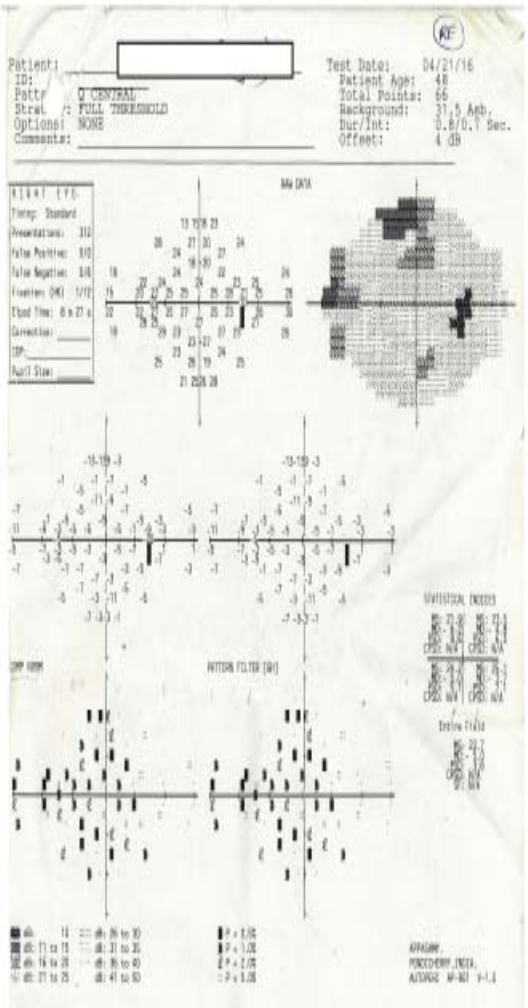


Fig 2A: Visual field charting

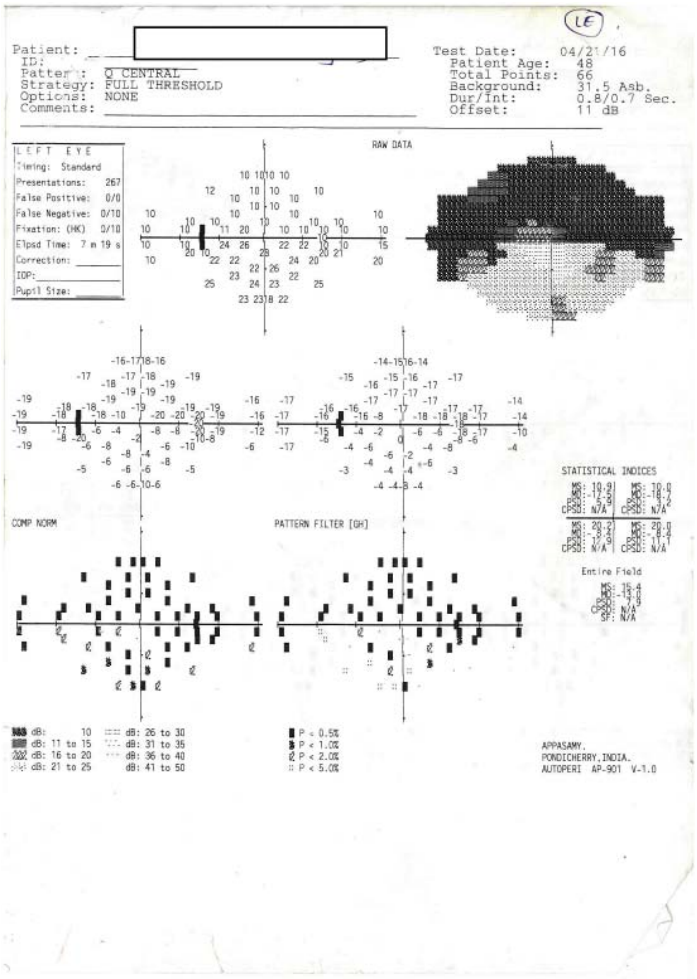


Fig. 2B: Visual field charting

the visual acuity and the intraocular pressure was maintained, but subsequent optic nerve head pallor was noted.

Discussion

NA-AION secondary to AAC is a rare clinical entity resulting in profound vision loss. Posterior ciliary artery and its branches are the principle blood supply of optic nerve head. NA-AION is due to ischemia of optic nerve head.[11, 17] Ratio of perfusion pressure and resistance to flow determines the blood flow to the optic nerve head.[12] Rheological properties of blood along with vascular autoregulation and integrity decides the resistance to flow.[12] Per-fusion pressure is the difference in mean arterial pressure (MAP) and IOP.[12] The MAP is reduced in cases of nocturnal hypotension or due to antihypertensive medication.[12] These are impaired in patients with hypertension, diabetes and atherosclerosis.[12] High IOP can precipitate episode of NA-AION by causing derangement in perfusion to optic nerve head. It has been reported in cases during high IOP in phacoemulsification leading to increased incidence of NA-AION after cataract surgery.[13–15] Elevated IOP has been identified as a causative factor for reduced perfusion to the optic nerve head in six cases (seven eyes).[14] It has been described that the cycle of NA-AION is due to ischemia of axons leading to axoplasmic stasis, which results in axoplasmic accumulation and swelling, compresses the capillaries, thus the vicious cycle ischemia sets in.[12]

Patients with AAC can also develop mild optic nerve edema that is not associated with NAAION.[18] Tsai *et al.* stated a statistically significant difference in the retinal nerve fiber layer thickness (RNFL) of the AAC eye and the contra-lateral eye measured by OCT, one week after the APAC event.[18] However, a statistically significant difference was not observed at the *4-* and *12-week* follow-ups.[18] These patients can be differentiated from NA-AION secondary to

AAC patients by the lack of subsequent optic nerve atrophy and preserved visual acuity and visual field.

NA-AION secondary to AAC is a rare but potentially blinding clinical entity. In addition to counseling patients about NA-AION risk factors (eg, evening antihypertensive medications and control of hypertension, diabetes, and dyslipidemia), patients must be counseled on the importance of performing an LPI in the contra-lateral eye. In AAC patients with an RAPD, a large amount of optic nerve edema, persistent decreased visual acuity, and a small cup-to-disc ratio in the contralateral eye should raise clinical suspicion for NA-AION.[19]

AAC glaucoma can per se present with some amount of disc edema secondary to angle closure. Cases with AAC and disc edema may have NA-AION. Thus all cases of AAC with disc edema need thorough examination and investigation in the lines of NA-AION. The visual acuity secondary to AAC is reversible after the proper management of acute attack, but visual loss secondary to NA-AION may not revert, if not diagnosed early and treated with steroids resulting in permanent vision loss. Thus, it is again stressed upon to diagnose case of acute angle closure with NA-AION, to prevent permanent vision loss and similar attack in the fellow eye. Also NA-AION can develop even days after the acute angle closure glaucoma attack so these cases require early follow up to diagnose and treat.

Key Message: AAC can be associated with NA-AION, thus fundus examination and prompt management is required to prevent permanent visual loss.

References

1. Sihota R. An Indian perspective on primary angle closure and glaucoma. Indian Journal of Ophthalmology. 2011:76–81.
2. Klein BE, Klein R, Sponsel WE, *et al*. Prevalence of glaucoma. The Beaver Dam Eye Study. Ophthalmology. 1992;99:1499–04.
3. Tielsch JM, Katz J, Singh K, *et al*. A population-based evaluation of glaucoma screening: the Baltimore Eye Survey. Am J Epidemiol. 1991;134:1102–10.
4. Hattenhauer MG, Leavitt JA, Hodge DO, *et al*. Incidence of nonarteritic anterior ischemic optic neuropathy. Am J Ophthalmol. 1997;123:103–7.
5. Johnson LN, Arnold AC. Incidence of nonarteritic and arteritic anterior ischemic optic neuropathy. Population-based study in the state of Missouri and Los Angeles County, California. J Neuroophthalmol. 1994;14:38–44
6. Sonty S, Schwartz B. Vascular accidents in acute angle closure glaucoma. Ophthalmology. 1981;88:225–8.
7. Yip LW, Yong VK, Hoh ST, *et al*. Optical coherence tomography of optic disc swelling in acute primary angle-closure glaucoma. Arch Ophthalmol. 2005;123:567–9.
8. Nahum Y, Newman H, Kurtz S, *et al*. Nonarteritic anterior ischemic optic neuropathy in a patient with primary acute angle-closure glaucoma. Can J Ophthalmol. 2008;43:723–4.
9. Slavin ML, Margulis M. Anterior ischemic optic neuropathy following acute angle-closure glaucoma. Arch Ophthalmol. 2001;119:1215.
10. Choudhari NS, George R, Kankaria V, *et al*. Anterior ischemic optic neuropathy precipitated by acute primary-angle closure. Indian J Ophthalmol. 2010;58:437–40.
11. Hayreh SS, Zimmerman MB. Non-arteritic anterior ischemic optic neuropathy: role of systemic corticosteroid therapy. Graefes Arch Clin Exp Ophthalmol. 2008;246:1029–46.
12. Hayreh SS. Management of ischemic optic neuropathies. Indian J Ophthalmol. 2011;59:123–36.
13. Hayreh SS. Ischemic optic neuropathy. Prog Retin Eye Res. 2009;28(1):34–62.
14. Lam B L, Jabaly H H, Al-Sheikh N. Risk of non-arteritic anterior ischaemic optic neuropathy (NAION) after cataract extraction in the fellow eye of patients with prior unilateral NAION. Br J Ophthalmol. 2007;91:585–7.
15. McCulley TJ, Lam BL, Feuer WJ. Incidence of nonarteritic anterior ischemic optic neuropathy associated with cataract extraction. Ophthalmology. 2001;108:1275–78.
16. Zhao Y, Li X, Tao A, *et al*. Intraocular pressure and calculated diastolic ocular perfusion pressure during three simulated steps of phacoemulsification in vivo. Invest Ophthalmol Vis Sci. 2009;50: 2927–31.
17. Hayreh SS, Zimmerman MB. Nonarteritic anterior ischemic optic neuropathy: natural history of visual outcome. Ophthalmology. 2008;115:298–05.
18. Tsai JC, Lin PW, Teng MC, *et al*. Longitudinal changes in retinal nerve fiber layer thickness after acute primary angle closure measured with optical coherence tomography. Invest Ophthalmol Vis Sci. 2007;48:1659–64.
19. Kuriyan AE, Lam Byron. Non arteritic anterior ischaemic optic neuropathy secondary to acute primary angle closure. Clinical ophthalmology. 2013;7:1233-38.

Subject Index

Author Index

Author Index

Manuscripts must be prepared in accordance with "Uniform requirements for Manuscripts submitted to Biomedical Journal" developed by international committee of medical Journal Editors

Types of Manuscripts and Limits

Original articles: Up to 3000 words excluding references and abstract and up to 10 references.

Review articles: Up to 2500 words excluding references and abstract and up to 10 references.

Case reports: Up to 1000 words excluding references and abstract and up to 10 references.

Online Submission of the Manuscripts

Articles can also be submitted online from http://rfppl.co.in/customer_index.php.

I) First Page File: Prepare the title page, covering letter, acknowledgement, etc. using a word processor program. All information which can reveal your identity should be here. use text/rtf/doc/PDF files. Do not zip the files.

2) Article file: The main text of the article, beginning from Abstract till References (including tables) should be in this file. Do not include any information (such as acknowledgement, your name in page headers, etc.) in this file. Use text/rtf/doc/PDF files. Do not zip the files. Limit the file size to 400 Kb. Do not incorporate images in the file. If file size is large, graphs can be submitted as images separately without incorporating them in the article file to reduce the size of the file.

3) Images: Submit good quality color images. Each image should be less than 100 Kb in size. Size of the image can be reduced by decreasing the actual height and width of the images (keep up to 400 pixels or 3 inches). All image formats (jpeg, tiff, gif, bmp, png, eps etc.) are acceptable; jpeg is most suitable.

Legends: Legends for the figures/images should be included at the end of the article file.

If the manuscript is submitted online, the contributors' form and copyright transfer form has to be submitted in original with the signatures of all the contributors within two weeks from submission. Hard copies of the images (3 sets), for articles submitted online, should be sent to the journal office at the time of submission of a revised manuscript. Editorial office: Red Flower Publication Pvt. Ltd., 48/41-42, DSIDC, Pocket-II, Mayur Vihar Phase-I, Delhi – 110 091, India, Phone: 91-11-22754205, 45796900, 22756995. E-mail: author@rfppl.co.in. Submission page: http://rfppl.co.in/article_submission_system.php?mid=5.

Preparation of the Manuscript

The text of observational and experimental articles should be divided into sections with the headings: Introduction, Methods, Results, Discussion, References, Tables, Figures, Figure legends, and Acknowledgment. Do not make subheadings in these sections.

Title Page

The title page should carry

1) Type of manuscript (e.g. Original article, Review article, Case Report)
2) The title of the article should be concise and informative;
3) Running title or short title not more than 50 characters;
4) The name by which each contributor is known (Last name, First name and initials of middle name), with his or her highest academic degree(s) and institutional affiliation;
5) The name of the department(s) and institution(s) to which the work should be attributed;
6) The name, address, phone numbers, facsimile numbers and e-mail address of the contributor responsible for correspondence about the manuscript; should be mentoined.
7) The total number of pages, total number of photographs and word counts separately for abstract and for the text (excluding the references and abstract);
8) Source(s) of support in the form of grants, equipment, drugs, or all of these;
9) Acknowledgement, if any; and
l0) If the manuscript was presented as part at a meeting, the organization, place, and exact date on which it was read.

Abstract Page

The second page should carry the full title of the manuscript and an abstract (of no more than 150 words for case reports, brief reports and 250 words for original articles). The abstract should be structured and state the Context (Background), Aims, Settings and Design, Methods and Materials, Statistical analysis used, Results and Conclusions. Below the abstract should provide 3 to 10 keywords.

Introduction

State the background of the study and purpose of the study and summarize the rationale for the study or observation.

Methods

The methods section should include only information that was available at the time the plan or protocol for the study was written such as study approach, design, type of sample, sample size, sampling technique, setting of the study, description of data collection tools and methods; all information obtained during the conduct of the study belongs in the Results section.

Reports of randomized clinical trials should be based on the CONSORT Statement (http:// www. consort-statement. org). When reporting experiments on human subjects, indicate whether the procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional or regional) and with the Helsinki Declaration of 1975, as revised in 2000 (available at http://www.wma. net/e/policy/l 7-c_e.html).

Results

Present your results in logical sequence in the text, tables, and illustrations, giving the main or most important findings first. Do not repeat in the text all the data in the tables or illustrations; emphasize or summarize only important observations. Extra or supplementary materials and technical details can be placed in an appendix where it will be accessible but will not interrupt the flow of the text; alternatively, it can be published only in the electronic version of the journal.

Discussion

Include summary of key findings (primary outcome measures, secondary outcome measures, results as they relate to a prior hypothesis); Strengths and limitations of the study (study question, study design, data collection, analysis and interpretation); Interpretation and implications in the context of the totality of evidence (is there a systematic review to refer to, if not, could one be reasonably done here and now?, What this study adds to the available evidence, effects on patient care and health policy, possible mechanisms)? Controversies raised by this study; and Future research directions (for this particular research collaboration, underlying mechanisms, clinical research). Do not repeat in detail data or other material given in the Introduction or the Results section.

References

List references in alphabetical order. Each listed reference should be cited in text (not in alphabetic order), and each text citation should be listed in the References section. Identify references in text, tables, and legends by Arabic numerals in square bracket (e.g. [10]). Please refer to ICMJE Guidelines (http://www.nlm.nih.gov/bsd/uniform_ requirements.html) for more examples.

Standard journal article

[1] Flink H, Tegelberg Å, Thörn M, Lagerlöf F. Effect of oral iron supplementation on unstimulated salivary flow rate: A randomized, double-blind, placebo-controlled trial. J Oral Pathol Med 2006; 35: 540–7.

[2] Twetman S, Axelsson S, Dahlgren H, Holm AK, Källestål C, Lagerlöf F, *et al*. Caries-preventive effect of fluoride toothpaste: A systematic review. Acta Odontol Scand 2003; 61: 347–55.

Article in supplement or special issue

[3] Fleischer W, Reimer K. Povidone-iodine antisepsis. State of the art. Dermatology 1997; 195 Suppl 2: 3–9.

Corporate (collective) author

[4] American Academy of Periodontology. Sonic and ultrasonic scalers in periodontics. J Periodontol 2000; 71: 1792–801.

Unpublished article

[5] Garoushi S, Lassila LV, Tezvergil A, Vallittu PK. Static and fatigue compression test for particulate filler composite resin with fiber-reinforced composite substructure. Dent Mater 2006.

Personal author(s)

[6] Hosmer D, Lemeshow S. Applied logistic regression, 2nd edn. New York: Wiley-Interscience; 2000.

Chapter in book

[7] Nauntofte B, Tenovuo J, Lagerlöf F. Secretion and composition of saliva. In: Fejerskov O,

Kidd EAM, editors. Dental caries: The disease and its clinical management. Oxford: Blackwell Munksgaard; 2003. pp 7–27.

No author given

[8] World Health Organization. Oral health surveys - basic methods, 4th edn. Geneva: World Health Organization; 1997.

Reference from electronic media

[9] National Statistics Online—Trends in suicide by method in England and Wales, 1979–2001. www.statistics.gov.uk/downloads/theme_health/HSQ20.pdf (accessed Jan 24, 2005): 7–18. Only verified references against the original documents should be cited. Authors are responsible for the accuracy and completeness of their references and for correct text citation. The number of reference should be kept limited to 20 in case of major communications and 10 for short communications.

More information about other reference types is available at www.nlm.nih.gov/bsd/uniform_requirements.html, but observes some minor deviations (no full stop after journal title, no issue or date after volume, etc.).

Tables

Tables should be self-explanatory and should not duplicate textual material.

Tables with more than 10 columns and 25 rows are not acceptable.

Table numbers should be in Arabic numerals, consecutively in the order of their first citation in the text and supply a brief title for each.

Explain in footnotes all non-standard abbreviations that are used in each table.

For footnotes use the following symbols, in this sequence: *, ¶, †, ‡‡,

Illustrations (Figures)

Graphics files are welcome if supplied as Tiff, EPS, or PowerPoint files of minimum 1200x1600 pixel size. The minimum line weight for line art is 0.5 point for optimal printing.

When possible, please place symbol legends below the figure instead of the side.

Original color figures can be printed in color at the editor's and publisher's discretion provided the author agrees to pay.

Type or print out legends (maximum 40 words, excluding the credit line) for illustrations using double spacing, with Arabic numerals corresponding to the illustrations.

Sending a revised manuscript

While submitting a revised manuscript, contributors are requested to include, along with single copy of the final revised manuscript, a photocopy of the revised manuscript with the changes underlined in red and copy of the comments with the point-to-point clarification to each comment. The manuscript number should be written on each of these documents. If the manuscript is submitted online, the contributors' form and copyright transfer form has to be submitted in original with the signatures of all the contributors within two weeks of submission. Hard copies of images should be sent to the office of the journal. There is no need to send printed manuscript for articles submitted online.

Reprints

Journal provides no free printed, reprints, however a author copy is sent to the main author and additional copies are available on payment (ask to the journal office).

Copyrights

The whole of the literary matter in the journal is copyright and cannot be reproduced without the written permission.

Declaration

A declaration should be submitted stating that the manuscript represents valid work and that neither this manuscript nor one with substantially similar content under the present authorship has been published or is being considered for publication elsewhere and the authorship of this article will not be contested by any one whose name(s) is/are not listed here, and that the order of authorship as placed in the manuscript is final and accepted by the co-authors. Declarations should be signed by all the authors in the order in which they are mentioned in the original manuscript. Matters appearing in the Journal are covered by copyright but no objection will be made to their reproduction provided permission is obtained from the Editor prior to publication and due acknowledgment of the source is made.

Approval of Ethics Committee

We need the Ethics committee approval letter from an Institutional ethical committee (IEC) or an institutional review board (IRB) to publish your Research article or author should submit a statement that the study does not require ethics approval along with evidence. The evidence could either be consent from patients is available and there are no ethics issues in the paper or a letter from an IRB stating that the study in question does not require ethics approval.

Abbreviations

Standard abbreviations should be used and be spelt out when first used in the text. Abbreviations should not be used in the title or abstract.

Checklist

- Manuscript Title
- Covering letter: Signed by all contributors
- Previous publication/ presentations mentioned, Source of funding mentioned
- Conflicts of interest disclosed

Authors

- Middle name initials provided.
- Author for correspondence, with e-mail address provided.
- Number of contributors restricted as per the instructions.
- Identity not revealed in paper except title page (e.g. name of the institute in Methods, citing previous study as 'our study')

Presentation and Format

- Double spacing
- Margins 2.5 cm from all four sides
- Title page contains all the desired information. Running title provided (not more than 50 characters)
- Abstract page contains the full title of the manuscript
- Abstract provided: Structured abstract provided for an original article.
- Keywords provided (three or more)
- Introduction of 75-100 words
- Headings in title case (not ALL CAPITALS). References cited in square brackets
- References according to the journal's instructions

Language and grammar

- Uniformly American English
- Abbreviations spelt out in full for the first time. Numerals from 1 to l0 spelt out
- Numerals at the beginning of the sentence spelt out

Tables and figures

- No repetition of data in tables and graphs and in text.
- Actual numbers from which graphs drawn, provided.
- Figures necessary and of good quality (color)
- Table and figure numbers in Arabic letters (not Roman).
- Labels pasted on back of the photographs (no names written)
- Figure legends provided (not more than 40 words)
- Patients' privacy maintained, (if not permission taken)
- Credit note for borrowed figures/tables provided
- Manuscript provided on a CDROM (with double spacing)

Submitting the Manuscript

- Is the journal editor's contact information current?
- Is the cover letter included with the manuscript? Does the letter:

1. Include the author's postal address, e-mail address, telephone number, and fax number for future correspondence?
2. State that the manuscript is original, not previously published, and not under concurrent consideration elsewhere?
3. Inform the journal editor of the existence of any similar published manuscripts written by the author?
4. Mention any supplemental material you are submitting for the online version of your article. Contributors' Form (to be modified as applicable and one signed copy attached with the manuscript)