Vol. 18, No.1

Jan-March 2020

THE TRUSTED JOURNAL OF OPHTHALMIC SCIENCES

Affiliated to Peshawar Medical College,
Rawalpindi Medical University & Riphah International University

Established 1998

ISSN 1993-2863
ISBN 978-967-7690-00-8

Quarterly

International Ophthalmology Update

Chief Editor: Prof. Dr. M. Yasin Khan Durrani

Approved and Indexed by:
Pakistan Medical & Dental Council
EBSCO, ABC Certified

A Quarterly Publication of
Ophthalmic Newsnet
from Islamabad

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Editorial Office:
Published quarterly by Ophthalmic Newsnet from 267-A, St: 53, F-10/4, Islamabad
Phone: 051-2222922 Ext. 1255
Fax: 051-2291935
Mob: 0333-5158885
E-mail ophthalmologyupdate@gmail.com
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Website: www.ophthalmologyupdate.com

Registration: (I) 3405/2/(63) under Press and Publication Ordinance '98, Govt. of Pakistan.

(2) Registered with the International Standard Book Agency, Department of National Libraries, Govt. of Pakistan.

Vide No. 978-969-7690-00-8

Approved and Indexed by:
Pakistan Medical & Dental Council
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Printed at Pan Graphics (Pvt) Ltd., Islamabad.

CONTENTS

وَ قُلْ رَّبِّ زِدْنِیْ عِلْمًا (پارہ ۱۶، سورۃ طٰہٰ، آیت ۱۱۴)

اور آپ دعا کیجئے! اے میرے رب! میرے علم میں اضافہ فرمایئے

Editorial

Managing Glaucoma in Uveitis
(Current Concepts)

Glaucoma is the most common and devastating complication of Uveitis having multi-factorial patho-physiology and occurring in 20% of the patients especially in the youngster age group. Since it is a baffling painful inflammatory condition with raised intra- ocular pressure and blurred vision, it requires a very careful and accurate diagnosis of the underlying etiology. In fact, it needs a multi-disciplinary approach to its management. To recapitulate, here is a brief account of various etiologies and management of Uveitic Glaucoma in various forms.

Anatomically speaking Anterior Uveitis is the most common condition in 40% of the cases with idiopathic etiology. Other prominent causes could be Auto-immune disorders and Infective conditions. Mostly the mechanism involved, is a disruption of blood aqueous barrier due to the presence of inflammatory cells in the anterior chamber, trabecular meshwork, cytokine release, protein debris, post-synichae (iris bombe) and presence of fibrin resulting in angle closure which disturbs the out-flow equilibrium of the aqueous. Even the corticosteroids which are the mainstay of the treatment of uveitis, can exacerbate Glaucoma in 1/3rd of the patients, by the increased out-flow resistance and suppression of phagocytic activity leading to deposition of Glycosamino glycans, decrease in prostaglandin synthesis, cataractuous changes and local immuno-suppression.

The management needs a multi-disciplinary approach by an ophthalmologist, rheumatologist and a general physician to find the underlying etiology and correct approach to the appropriate treatment.

Intra-ocular inflammation is commonly controlled through topical and systemic corticosteroids and in refractory cases through non-steroidal anti-inflammatory (NSAID) drugs which are not particularly helpful as they may exacerbate hypertension in certain patients.

Other drugs used popularly are through topical and systemic means are Beta-blockers, and carbonic anhydrase inhibitors. Alpha 2 adrenergic agonists (are used in combination with beta blockers). Prostaglandin analogues and cholinergic agents are also used through breaking the blood aqueous barrier. In certain cases, cycloplegics are helpful to relieve the discomfort and prevent post-synechiae. In non-infective and refractory cases of uveitis, immune-modulatory drugs are significantly helpful in controlling the long term uveitis. Anti-metabolites like methotraxate, azothiprine and T-cell inhibitors like cyclosporine, tacrolimus are also used, but these cases may fail to control uveitis up to 40% of cases. In acute cases of Uveitic Glaucoma, hyper-osmotic agent like mannitol is used but care must be taken for Hyperglycemia, pulmonary edema and electrolytic imbalance.

However, indolent cases (1/3rd) are subjected to various surgical procedures where management to control IOP by medication fails, from 60-90 % success. Trabeculectomy with anti-metabolic agents like Mitimycin-C or 5 Fluorouracil is widely used with 80-90% success. Yag laser peripheral irridotomy is indicated in Iris Bombe. Cyclo-ablation is normally practiced in resistant cases but be avoided for complication like Pthisis Bulbi at a later stage. Other procedures like laser trabeculoplasty with Argon Laser may be considered

Tube Shunts with Ahmed Glaucoma Valve (AGV) is favored for unidirectional valve mechanism which prevents ocular hypotony. If the IOP persists over six weeks, Baerveldt tube is useful for long term control around 50-70 %success rate. Micro-invasive glaucoma surgery

(MIGS) like canaloplasty is becoming popular for increasing trabecular outflow by removing a part of trabecular meshwork in well controlled uveitis.

Current Research:

Rho Kinase inhibitors like Ripasudil, inhibits actin cytoskeleton resulting in morphological changes in trabecular meshwork and endothelial cells of Schlemms' canal to improve the outflow facility, may be of value. The compound is still being investigated.

Neuro-protective agents like Brimonidine, available in Pakistan as 0.2% eye drops is the drug of choice in producing less visual field progression in open angle glaucoma, may cause higher occurrence of side effects in some cases.

Cannabis or Marijuana may lower IOP. The US National Eye Institute supported its studies from 1978-84, when administered orally, I.V. or by smoking, but not topically applied to the eye. But the American Academy of Ophthalmology stated that cannabis is not more effective. However American Glaucoma Society discredited its use as legitimate treatment in view of its short duration of action and side effects that limits the daily life activities.

Biologics, a new class of treatment with Alpha TNF (anti-tissue necrotizing factor) like Enbrel injections (Etanercept) available in Pakistan, used on long term basis, has shown significant success in resistant cases of uveitits but a regular consultation is essential with the rheumatologist to monitor the side effects up to 80% of cases.

In **Summary,** In our country where health facilities are meager and not available to 70% of the population especially in remote and un-approachable like snow-clad areas, Glaucoma remains undiagnosed for a longer period due to lack of awareness, education and transport facility. Moreover, the anti-glaucoma drugs are not easily available in their areas, resulting in irreversible damage to the eyes

The ophthalmologists, medical professionals, other stake holders and Glaucoma societies should remain vigilant for the intricate problems related to glaucoma and uveitis. They should work out strategies on the following lines:

1. Create awareness amongst the population through education, seminars, lectures and meetings about the severity of the disease.
2. They should form teams to visit regularly the remote areas, as well as the Tehsil, District Headquarter Hospitals, Sub-unit Hospitals and dispensaries to examine these patients especially the senior citizens. The Societies should acquire funds through donations for the provision of gadgets as well as essential drugs in the remote areas.
3. They should widely publish literature, books and pamphlets and distribute them in un-approachable areas.
4. Free surgical interference be available in the near hospitals by ophthalmologists.
5. Our Ophthalmologists should be directed to visit remote areas around their vicinity on regular basis and it should be a part of their official duty.
6. They may like to see cases with other ocular ailments like cataract or serious disorders and help them to avail the medical facilities in tertiary hospital through ambulances.

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1. Sharma SM et al. Br J Ophthalmol. Published online March 12, 2019.
2. Ceballos EM et al. J Glaucoma. 2002;11(3):189-196.
3. Ceballos EM et al. Ophthalmology. 2002;109(12):2256–2260.
4. Papadaki TG et al. Am J Ophthalmol. 2007;144(1):62-69.
5. Ceballos EM et al. Ophthalmology. 2002;109(12):2256-2260.
6. Muñoz-Negrete FJ et al. Biomed Res Int. 2015;2015:742792.
7. Shimizu A et al. Clin Ophthalmol. 2014;26(8):2383-2389.
8. Kalin-Hajdu E et al. Can J Ophthalmol. 2014;49(5):414-419.

Fatima Iqbal

ORIGINAL ARTICLE

Effect of Photopic and Mesopic Light Conditions on Stereo-acuity & Pupil diameter in Myopes, Hyperopes and Emmetropes

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ABSTRACT

Purpose: To compare stereo-acuity in emmetropia and ametropia in photopic and mesopic light condition.

Methodology: In this comparative cross-sectional study, we will assess the change in stereo-acuity under the photopic and mesopic light condition of emmetropes and ametropes with their respective glasses in the duration of 6 months from November 2018 to May 2019. This study will include 60 females by non-probability convenience sampling with age range of 18-25 years at The University of Faisalabad and Madina Teaching Hospital in Faisalabad. Stereoacuity will be tested with TNO at a test distance of 40cm and PD with millimeter ruler in both light conditions.

Results: The mean difference of stereoacuity under photopic condition in myopics was 84 ± 45.236, hyperopes it was 93 ± 30.625and in emmetropes it was 66 ± 18.468. The mean difference of stereo-acuity under photopic condition in myopes was 906 ± 724.957, hyperopes it was 1305 ± 765.627 and in emmetropes it was 603 ± 606.119. There is significant relationship between the stereo-acuity and pupil diameter in ametropes &emmetropes under mesopic and photopic conditions (p=0.01)

Conclusion: The result of this study will help emmetropic and ametropic persons to have better outcomes and stereo acuity under different light conditions.

Keywords: Mesopic, Photopic, Pupil diameter, Stereoacuity

INTRODUCTION.

Through variation in pupil size, the iris act as an automatic regulator of the amount of light getting into the eye it controls the depth of focus of the optical system and it minimizes the degree of chromatic and spherical aberrations. The normal pupillary aperture in adults changes from two to four mm in diameter in high luminance and four to eight mm in the low luminance.

Whenever light comes it induces change in pupil size that leads to photochemical activity which takes several minutes. Then perceptual field's size also alter i.e. pupil size gets small in response to high luminance and vice versa. Cone perception stabilizes in response to extensive changes in spectral composition of stimulus then compensatory components will drops the changes that brings about by head and eye movements. As impulse farther travels visual observation arise at the same moment but following a time lag. Then modification of visual organ because of the reflex reactions of the brain center for radiation occurs. Memory and attention mechanisms that are part

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Received: Sep'2019 *Accepted: Nov'2019*

Note: Ms. Fatima Iqbal has the singular honor, being Global Ambassador TFos, Associate Editor of the J Inside Optometry & Member World Council of Optometry

of physiological modification mechanism will decide the final position and response to human visual perception.

The activity of photoreceptors i.e. rods and cones outcomes in the three familiar ranges of vision at low luminance level only rods are active and contribute to scotopic vision ; at high luminance levels only cones are active that contribute to photopic vision and at intermediate luminance level both rods and cones function together that contributes to mesopic vision. Mesopic vision is also known as purkinje shift because of the change that occurs between photopic and scotopic vision. The mesopic vision ranges from 10-3 cd/m2 to 3 cd/m2 and luminance level for photopic vision is $\geq$3cd/m2.

The impacts of rods and cones cooperation in visual potential andpresentation are specifically appropriate to numerous world related situations, including transportation (i.e., aviation, maritime, rail, and road) and medicine. Complicated nature of rods and cones contributes in intermediate light levels imply there is right now no acknowledged efficiency function for mesopic luminous. Stereopsis is defined as the ability of the eyes to observe the depth perception which is established on the disparity of the images made by the both eyes at same time.

Threshold stereo-acuity refers to the minimum degree of binocular disparity that can give depth perception of stereopsis. The reason of disturbance of normal binocular fusion are amblyopia, anisometropia or aniseikonia reduce stereoacuity and may have an impact on the development of visual-motor action and spatial resolution.

TNO is based on random dot stimulus along with red or green pair of glasses to separate the image presented to each eye. There are no monocular clues and target is not outlined by monocularly visible contours.TNO is the most dissociative of the stereo test used and it has the smallest stimulus elements.

METHODS:

Informed consent of the patient was obtained after formulation of the entire procedure that the patient had undergone during the study. The study was only conducted after we made sure that the patient has completely understood the whole procedure that has been formulated and is willing to be a part of the study. As our study involves 120 eyes of 60 individuals of only females were recruited through non probability convenient sampling in a time duration of 6 months from November 2018 to May 2019 at the University of Faisalabad and Madina Teaching Hospital all subjects were treated in harmony with the declaration of Helsinki that is 'Health of my patient should be the first consideration and no harmful act should be done with them'. After taking complete personal history, ocular history, systemic history and past surgical history, all subjects received the following examination in the succeeding order.

Firstly, pen torch examination was done to rule out exclusion criteria then for further brief examination slit lamp was used. The patient was comfortably seated in front of the slit-lamp with his forehead against the head-rest belt and chins on chin-rest and was instructed to look at the fixation target. Using diffuse illumination at an angle of 45 degrees, complete anterior segment examination of the eyes was done in order to rule at any ocular diseases that have been mentioned in exclusion criteria of the study. Then dark adaptation was given for 15 minutes in totally dark room after dark adaptation blind folds were removed from the patient's eyes and mesopic condition was applied by study lamp having a 0.5 watt CFL bulb then the visual status of the eye was checked by a LogMAR Chart at a 4 meters comfortable distance in order to check the VA in relation to mesopic and photopic lightening condition, and then we finally proceeded towards measuring stereopsis

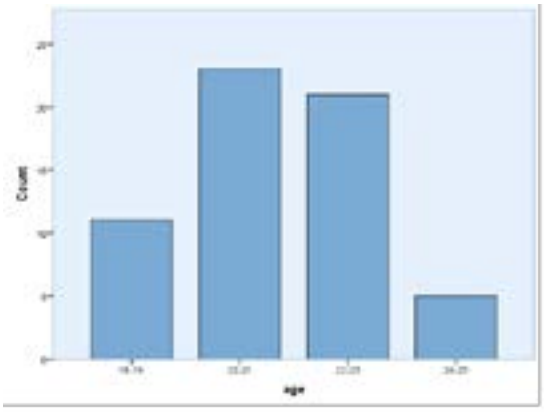
with the help of TNO test at a distance of 40 cm was performed and PD was measured using mm scale ruler after doing this whole procedure in mesopic condition we repeated this whole procedure in photopic light condition with the help of study lamp having 25 watts CFL bulb in place of 0.5 watts. Then noted the readings and compared the results under these two lighting conditions.

RESULTS

The study included 120 eyes of 60 female subjects. Subjects of 18-30 years of age group were included in this study.

Figure: 1 Mean of age:

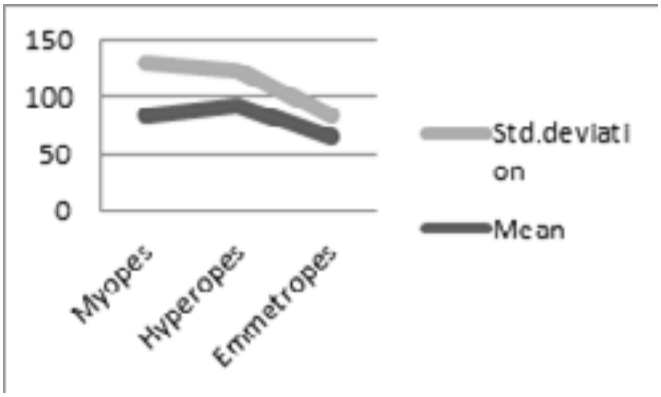
Following bar graph shows distribution of 60 female subjects according to age with 11% participants from age group 18-19, 23% participants from the age 20-21, 21% participants from age group 22-23 and 5% from the age group 24-25.



Graph showing the percentage of female subjects involved in this study.

Figure 2: Mean of stereoacuity in myopes ,hyperopes and emmetropes under photopic condition:

The mean difference of stereoacuity under photopic condition in myopes was 84 ± 45.236, hyperopes it was 93± 30.625and in emmetropes it was 66 ± 18.468 (Table 4.1). ANOVA were used to check the stereoacuity in different lightening conditions in hyperopes, myopes and emmetropes. Graph shows a change in stereoacuity in myopes, hyperopes and emmetropes. Result shows a significant change in stereopsis in three different refractive states and less mean optimization value shows good stereopsis.

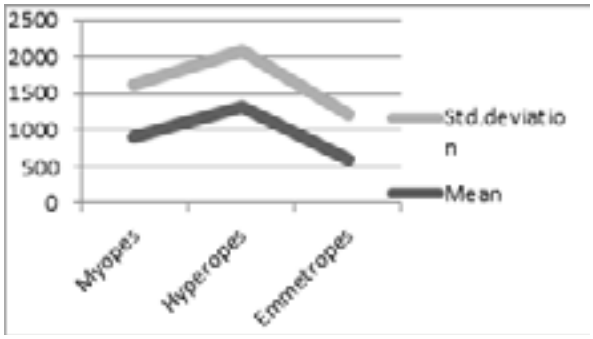


Line graph shows the comparison of stereoacuity on three different refractive states i.e. myopes and hyperopes with their full refractive correction and emmetropes along with mean values and standard deviations. Comparison of mean values of stereoacuity in photopic condition obtained by applying ANOVA analysis, shows that p value is less than 0.05 which means that there is significant difference between stereo-acuity of myopes , hyperopes and emmetropes under photopic condition .

Figure: 3 Mean of stereo-acuity in ametropes and emmetropes under mesopic condition:

The mean difference of stereo-acuity under photopic condition in myopes was 906 ± 724.957, hyperopes it was 1305 ± 765.627 and in emmetropes it was 603 ± 606.119(Table 4.3). ANOVA were used to check the stereoacuity in different lightening conditions in hyperopes, myopes and emmetropes. Graph shows a change in stereo-acuity in myopes, hyperopes and emmetropes. Result shows a significant change in stereopsis in three different refractive states and less mean optimization value indicates good stereopsis

Graph 4.3

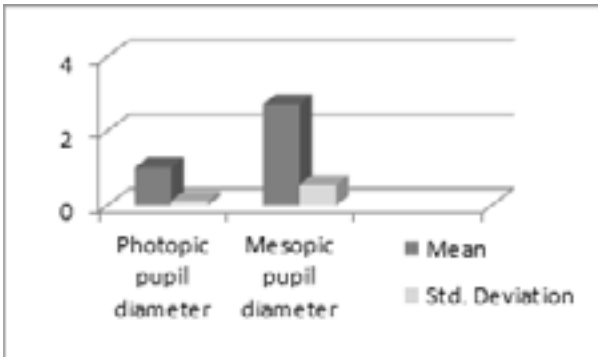


Line graph shows the comparison of stereoacuity on three different refractive states i.e. myopes and hyperopes with their full refractive correction and emmetropes along with mean values and standard deviations.

Comparison of mean values of stereoacuity in mesopic condition obtained by applying ANOVA analysis , shows that p value is less than 0.05 which means that there is significant difference between stereo-acuity of myopes , hyperopes and emmetropes under mesopic condition.

Figure 4: Mean value of pupil diameter in mesopic and photopic condition

The pupil diameter of both eyes was measured in photopic and mesopic light conditions. The mean difference of photopic is less than mesopic due to the constriction of pupil 1.02 ± .129 contrary to mesopic condition in which pupil dilates 2.72 ± .555(Table 4.3). ANOVA were used to determine pupil diameter changes under varying lightening conditions in hyperopes, myopes and emmetropes. Following graph shows a significant change in pupil diameter in photopic and mesopic condition.



The bar graph shows mean values and standard deviation of pupil diameter in mesopic and photopic condition. First bar (dark grey) shows mean optimization value of pupil diameter in photopic condition and second bar shows mean optimization value of pupil diameter in mesopic condition. First bar (light grey) shows standard deviation of pupil diameter in photopic condition and second bar shows standard deviation value of pupil diameter in mesopic condition. Comparison of mean values of pupil diameter in mesopic and photopic conditions obtained by applying ANOVA analysis, shows that p value is less than 0.05 which shows that there is significant difference between pupil diameter in photopic and mesopic condition.

DISCUSSION

Assessment of stereo-acuity is essential for tasks which required fine detail like needle threading, ball catching, and pouring liquids. In professional task, the stereopsis is used in binocular microscope. Occupational demand of distance in airplane pilots and surgeon required fine resolution stereoacuity.The following test are used for assessment of stereoacuity i.e. Lang test, Frisby test, and Titmus test or TNO etc. TNO is built on random dot stimulus along with red or green pair of spectacles to separate the image shown to both eyes. There are no monocular hints and object is not bordered by monocularly noticeable shapes .TNO is the most important stereo test used and it takes the smallest stimulus elements.

The range of stereo-acuity of first three plates accounts for 1980 sec of arc, plate 4 is used to test suppression to access ocular dominance, plate 5,6,7 are quantitative plates used for more exact determination of stereoacuity 480 to 15 sec of arc. Charman calculated the mesopic vision ranges from 10^{-3} cd/m² to 3 cd/m² and luminance level for photopic vision is >3 cd/m².

A study shows that the size of pupil increased with decreases in light vice versa. The mean size of pupil was 550 lux at 3.5 mm, 350 lux at 4.2 mm, 150 lux at 5.2 mm, 40 lux at 5.03 mm and two lux at 5.4 mm. Refractive error (E&M) has no further effect on the reflex light of the pupil. As in our study there is significant relationship between PD and different light conditions.

Guillon et al, in 2014 considered that luminance was the supreme important factor with PD increasing with reduced luminance, all associations. PD fluctuations demonstrated by well-known age, luminance (light) , finest or best corrected sphere refraction (BCSR), and RE as important factors secretarial for just over 70% of the normal changes in PD. Guillon et al published in 2016 a study on the relation of pupil size with age, refractive status and luminance. The hyperopic subjects showed a small pupil diameter while myopic and emmetropic shows large pupil diameter at low luminance level. So both age and refractive status affect pupil size. Similarly in our study there is no influence of refractive error on PD but significant relationship between PD and light conditions.

Binda et al in 2013 observed that because light changes, the pupil constrict and pupil dilates with light level increase or decrease. Hessler et al in 2013 observed that the traditional spectacle correction for photopic light conditions and a sphero-cylindrical advanced mesopic scene remedy were tried for about fourteen days each. Compared to photopic light conditions visual acuity was observed to be physiologically decreased in mesopic conditions by 0.2 logMARunits. Like in our study we access visual acuity with glasses in both lightening conditions we found significant relationship between them but visual acuity is not our variable.

Colette in 2017 observed mesopic visual acuity decreased significantly with increasing myopia, even when the acuity were adjusted for spectacle removal (p=0.003). With increased myopia acuity reduced in low photopic light level but not considerably. Compared to emmetropes, myopes with optical correction show a considerable decrease in mesopic acuity. Like in our study there is significant reduction in mesopic vision in increasing myopia.

Chanchal et al in 2015 concluded that the simple myopia of >3D, Astigmatism and anisometropia of >1 D are associated with reduced stereopsis, however with the use corrective lenses there is improvement in stereopsis. As compared to our study stereoacuity is still decreased in corrected myopes in mesopic light condition but improved in photopic light.

Livingstone concluded that stereoacuity is finest in photopic light conditions (photopic vision) and is condensed in mesopic light condition (mesopic vision) and scotopic light conditions (scotopic vision).

CONCLUSION:

The research reported in our thesis is revealed that in photopic and mesopic light conditions there is a significant change in stereopsis in myopes , hyperopes and emmetropes and pupil diameter. Mean value of hyperopes in photopic light condition is high as compared to myopes and emmetropes which shows there is less stereoacuity in hyperopes in photopic light condition. In mesopic light condition there is a notable change in stereoacuity in the three refractive states. Emmetropes shows less mean optimization value and standard deviation as compared to other two refractive states but it is less than normal values of stereoacuity in mesopic light condition. There is remarkable change in stereoacuity in hyperopes. The difference is significant statistically.

We found that there is a change in pupil diameter in both light conditions (bright and dim).

There is more pupil diameter in mesopic light condition due to dilation of pupil in dim light. We concluded that photopic and mesopic light condition is more important in doing refraction clinically. Eye care professionals better be aware of the effects of light on pupil diameter and stereoacuity and visual acuity in daily life tasks.

RECOMMENDATIONS:

1. Mesopic and photopic pupil diameter are recommended for refractive surgeries.
2. Stereopsis is important in different fields e.g. Aviation, Rail and medicine.
3. Pupil diameter is essential for orthokeratology procedures and treatment and contact lens wearer.
4. Pupil diameter measurement plays vital role in refraction.
5. Pupil diameter effects readings in various instruments like IOL Master etc.
6. In patients who are hypersensitive to cycloplegic, pupil can be dilated through luminance level of 0.5 Watts.
7. Hyperopes need more lighting for doing near tasks.

REFERENCES:

1. Arson W. An Investigation of the Difference in Stereoacuity between Crossed and Uncrossed Disparities Using Frisby and TNO Tests.*OVS*:1990;67(3):157-161.doi:10.1097/00006324-199003000-00002.
2. Artal P, Benito A and Tabernero J. The human eye is an example of robust optical design. *JOV*: 2006;6(1):1.doi:10.1167/6.1.1.
3. Binda P, Pereverzeva M and Murray S. Pupil constrictions to photographs of the sun. *JOV*: 2013;13(6):8-8.doi:10.1167/13.6.8.
4. Chen Z, Niu, L, Xue, F, Qu X, Zhou, Z, Xingtao Zhou X and Chu R. Impact of Pupil Diameter on Axial Growth in Orthokeratology. *OVS*: 2012;89(11):1636-1640.doi: 10.1097/OPX.0b013e31826c1831.
5. ColettaN , Walker L and WD F. Reading speed during a mesopic visual acuity task. *JOV*: 2017;17(10): 603. doi:10.1167/17.10.630.
6. Doi T, Tanabe S and Fujita I. Matching and correlation computations in stereoscopic depth perception. *JOV*: 2011;11(3): 1-1. doi. 10.1167/11.3.1.
7. FlitcroftD..Emmetropisation and the aetiology of refractive errors. *Eye*: 2014;28(2): 169-179. doi: 10.1038/eye.2013.276.
8. Gantz L and BedellH.. Variation of Stereothreshold with Random-Dot Stereogram Density. *OVS*: 2011;88(9):1066-1071. doi: 10.1097/OPX.0b013e3182217487.
9. Guillon M, Dumbleton K, Theodoratos P, Gobbe M, Wooley C and Moody K. The Effects of Age, Refractive Status, and Luminance on Pupil Size. *OVS*: 2016;93**(**9), 1093-1100. doi: 10.1097/OPX.0000000000000893.
10. Mashigea, PK., and Munsamya, JA.,2016. Diplopia. South African Family Practice,58(1): 12-17. [online].[Accesed on 24 February 2019] Mathôt, S. (2018). 1
11. 1. Pupillometry: Psychology, Physiology, and Function. J Cogn.: 1(1). [online] Available at: doi: 10.5334/joc.18 [Accessed on 13 Februay 2019].
12. Mathur, A., Gehrmann, J. and Atchison, D. (2014). Influences of Luminance and Accommodation Stimuli on Pupil Size and Pupil Center Location. IOVS: 55(4):2166. [online] Available at: doi: 10.1167/iovs.13-13492 [Accessed on 1 January 2019].
13. Metsing, I., Jacobs, W. and Hansraj, R. 2018. A review of vision screening methods for children. AVEH, 77(1).[online]Available at:doi: 10.4102/aveh.v77i1.446.[Accessed on 11 February,2019]
14. Miller, N., 1996_'The Pupil: Embryology,Anatomy,Innervation, and Reflex Movements of the Iris'_Walsh and Hoyt's Clinical Neuro-Ophthalmology.Fourth Edition.2(4),400.[Accessed on 18 January 2018]
15. Mrugacz, M., Gajecka, M., Mrukwa-Kominek, E. and Witkowska, K. ,2018. Myopia: Risk Factors, Disease Mechanisms, Diagnostic Modalities, and Therapeutic Options. J Ophthalmol: 2018: 1-2. [online] Available at: https://doi.org/10.1155/2018/7942379 [Accessed on 22 February 2019]
16. Mueller, C. and Lloyd, V. (1948). Stereoscopic Acuity for Various Levels of Illumination. Proceedings of the National Academy of Sciences:34(5):223-227. Available at:doi: 10.1073/pnas.34.5.223 [Accessed 5 Feb. 2019].
17. Nordqvist, C. (2017). Astigmatism: Causes, types, symptoms, and treatments, Medical News Today,[online]. Available at: <https://www.medicalnewstoday.com/articles/158810.php> [Accessed 5 Mar. 2019] Oliva, M.andAnikin, A., 2018. P
18. upil dilation reflects the time course of emotion recognition in human vocalizations. Scientific Reports: 8(1). [online] Available at: doi:10.1038/s41598-018-23265-x [Accessed on 20 February 2019].
19. Orr, J., Seidel, D., Day, M. and Gray, L. (2015). Is Pupil Diameter Influenced by Refractive Error?. OVS: 92(7): 834-840. [online] Available at: doi: 10.1097/OPX.0000000000000627. [Accessed on 25 March 2019]
20. Park, J. and McAnany, J., 2015. Effect of stimulus size and luminance on the rod-, cone-, and melanopsin-mediated pupillary light reflex. JOV:15(3):13. [online] Available at: doi: 10.1167/15.3.13 [Accessed 8 February 2019].

Shoukat Bilal

ORIGINAL ARTICLE

To Evaluate Visual Outcome in Children Undergoing Surgery after Penetrating Anterior Segment Trauma.

Shoukat Bilal MBBS[1], Faisal Rashid M.Phil(Optomet)[2], Muhammad Siddique FCPS[3], Muhammad Nabeel Khalid MBBS[4], Prof. Salah ud Din Arbi FCPS[5], Zulfiqar Ali FCPS[6]
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ABSTRACT
Objective: To evaluate the visual outcome in children undergoing surgery after penetrating anterior segment ocular trauma.
Methodology: This was a descriptive type cross sectional study conducted at Ophthalmology Department of Sheikh Zayed Medical College/Hospital; Rahim Yar Khan from January 2018 to June 2019. 96 cases of either gender with age range of 3 to 18 years with penetrating anterior segment injuries were included by using non probability consecutive sampling technique. An informed consent was taken from parents of all participants. Pre-operative visual acuity was checked and slit lamp bio-microscopy was done for wound assessment. Trauma was categorized into following types based on location of wound as seen on slit lamp examination; Type1: Isolated cornealinvolvement, Type2: Corneal involvement along with scleral involvement up to 3mm posterior to limbus and Type3: Isolated sclera involvement. The injury was repaired as soon as possible and was followed at 2 and then 4 weeks follow, final outcome was checked by visual acuity and was labeled as good or bad. Data was entered in structured proforma and was analyzed by using SPSS version 20.0 software.
Results: In this study there were total 96 cases out of which were 51 (53.13%) males and 45 (46.88%) females with mean age of 9.23±3.79 years. The maximum cases had type II injury affecting 48 (50%) of cases. Good outcome was seen in 47 (48.96%) of cases after surgical intervention of which 26 (50.98%) were males as compared to 21 (46.67%) females. The outcome was better in age group 10-18 years, observed in 22 (55%) of cases. There was no significant difference in terms of type of injury, with highest number seen in type I where it was seen in 13 (54.17%) of cases in its respective group followed by type II where it was 50%. There were significant results seen in terms of type of injury where good outcome was seen in pencil injuries revealed in 20 (57.14%) cases as compared to needle or glass where it was seen in none of the cases with p= 0.04.
Conclusion; Penetrating anterior segment injuries are common in Ophthalmic emergencies and good outcome is seen in almost half of the cases. There are significantly better results in pencil injuries as compared to needle or glass injury.
Key words; Ocular trauma, anterior segment injury, visual acuity.

INTRODUCTION

Open globe injury is one of the main causes of severe visual loss in children and adults[1]. It is estimated that eye injuries cause approximately 1.6 million people to become blind in the whole world. 2.3 million are bilaterally involved and 19 million are with unilateral visual loss[2]. This is the commonest cause of unilateral blindness today[2], ocular trauma in children; studies show its prevalence to be 8% to 14% of total injuries in children[3,] The prevalence of visual outcome in open globe injury group is 38.4%-63%[12]. Causes of penetrating and perforating eye injuries are sharp and pointed instruments like needles, sticks, pencils, knives, arrows, pens, glass, high velocity flying objects and house hold items. In penetrating injuries, object has only entry wound.

Penetrating anterior segment injuries are common in Ophthalmic emergencies and good outcome is seen in almost half of the cases. There are significantly better results in pencil injuries as compared to needle or glass injury.

The perforating injuries have entry and exit wounds. Among children, the biggest danger is at play and also lack of parental supervision. Infants

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Received: July'2019 *Accepted: Oct'2019*

and children less than 3 years of age suffer less trauma due to close parental supervision[5]. Males suffer more frequently than females due to their aggressive behavior and having more liberty to go out[6]. Penetrating eye injuries in children have a great impact of long term morbidity and so is matter of major socio-economic importance. Delayed diagnosis is a problem in pediatric population because children may not recognize or verbalize the history of trauma or ensuing complications[7]. Likewise visual rehabilitation is not an easy job in children as surgical repair is technically difficult in children when compared with adults.

Several local[1,4] and international[2,3,6,7-11] investigators have studied the causes, risk factors and pattern of open globe injuries in children. Visual outcome after such injuries has been less emphasized in these studies and our study aims to evaluate the visual outcome after open globe injury specifically affecting anterior segment of eye in children. This study was also a strive to create awareness in parents/ guardians regarding the preventive measures and possible visual loss as the result of these injuries.

METHODOLOGY

This was a descriptive type cross sectional study conducted at Ophthalmology Department of Sheikh Zayed Medical College/Hospital; Rahim Yar Khan from January 2018 to June 2019. 96 cases of either gender with age range of 3 to 18 years with penetrating anterior segment injuries were included by using non probability consecutive sampling technique. An informed consent was taken from parents of all participants. After recording the demographic data, a detailed history was taken from patients/parents regarding nature of object, time elapsed since injury and action at time of impact.Pre- operative visual acuity was wound assessment through X-ray orbit to rule out intraocular foreign body. Eye was operated as early as possible under G/A. Corneal wounds were repaired. In case of lens injury, lens matter was aspirated and IOL was implanted. In case of vitreous prolapsed vitrectomy was done by automated vitrectomy cutter. Anterior segment foreign body was removed if present. Patient were examined at regular follow up of 2 and 4weeks. Final visual acuity was taken at 4 weeks. Trauma was categorized into following types based on location of wound as seen on slit lamp examination; Type1: Isolated cornealinvolvement, Type2: Corneal involvement along with scleral involvement up to 3mm posterior tolimbus and Type3: Isolated sclera involvement. Data was entered in structured proforma and was analyzed by using SPSS version 20.0 software. Chi-square test was applied on post stratification of each of the effect modifiers separately. A p value ≤ 0.05 for any factor will imply that it has a significant effect on visual outcome.

RESULTS

In this study there were total 96 cases out of which were 51 (53.13%) males and 45 (46.88%) females. The mean age was 9.23±3.79 years. There were 56 (58.33%) cases in age group 3 to 9 years. The maximum cases had type II injury affecting 48 (50%) of cases. Fifty-four (56.25%) cases took more than 3 days to intervention. Stick injury was the most common object seen in 55 (57.29%) cases followed by pencil injury in 35 (36.46%) cases.

Good outcome was seen in 47 (48.96%) of cases after surgical intervention out of which 26 (50.98%) males as compared to 21 (46.67%) females. The outcome was better in age group 10-18 years, observed in 22 (55%) of cases. There was no significant difference in terms of type of injury, with highest number seen in type I where it was seen in 13 (54.17%) of cases in its respective group followed by type II where it was 50% p value= 0.67. There were significant results seen in terms of type of injury where good outcome was seen in pencil injuries revealed in 20 (57.14%) cases as compared to needle

FIGURE NO 1 Nature of object for injury

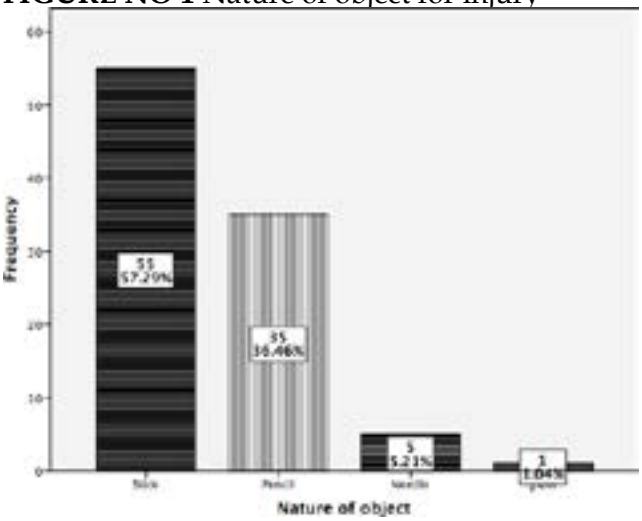

FIGURE NO 2 Visual outcome

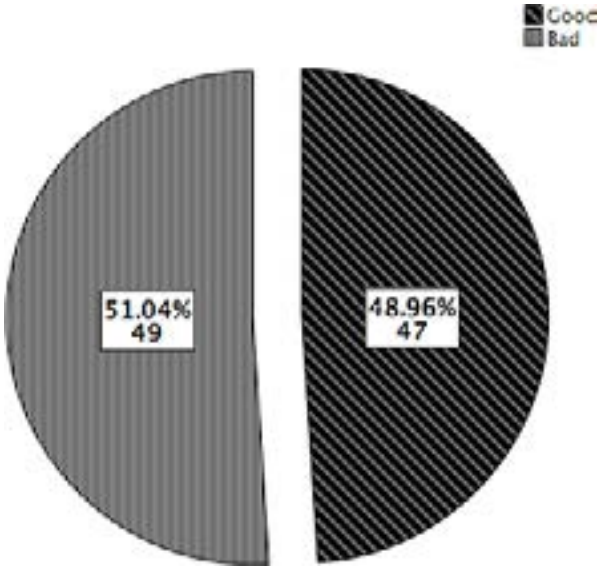

TABLE NO. 01: Outcome with respect to gender

GENDER	OUTCOME		Total
	Yes	No	
Male	26 (50.98%)	25 (48.02%)	51 (100%)
Female	21 (46.67%)	24 (53.33%)	45 (100%)
Total	**47 (48.96%)**	**49 (51.04%)**	**96 (100%)**

TABLE NO. 02 Outcome with respect to age groups

AGE GROUPS	OUTCOME		Total
	Yes	No	
3-9	25 (44.64%)	31 (55.36%)	56 (100%)
10-18	22 (55%)	18 (45%)	40 (100%)
Total	**47 (48.96%)**	**49 (51.04%)**	**96 (100%)**

TABLE NO. 03: Outcome with respect to type of injury

TYPE OF INJURY	OUTCOME		Total
	Yes	No	
I	13 (54.17%)	11 (45.83%)	24 (100%)
II	24 (50%)	24 (50%)	48 (100%)
III	10 (41.66%)	14 (58.33%)	24 (100%)
Total	**47 (48.96%)**	**49 (51.04%)**	**96 (100%)**

TABLE NO. 04: Outcome with respect to nature of object for injury

Nature of object	OUTCOME		Total
	Yes	No	
Stick	27 (49.09%)	28 (50.91%)	55 (100%)
Pencil	20 (57.14%)	15 (42.86%)	35 (100%)
Needle	0 (0%)	5 (100%)	5 (100%)
Glass	0 (0%)	1 (100%)	1 (100%)
Total	**47 (48.96%)**	**49 (51.04%)**	**96 (100%)**

Chi square p= 0.04

DISCUSSION

Ocular trauma is one of the leading causes of ocular morbidity in children and young adults. Success rate of anterior segment trauma in adults and especially in children is a great challenge in the field of ophthalmology. Counseling of the trauma victim and his family is one of the important components in the management of open globe injury. The management of penetrating ocular injuries has changed with the advent of new modalities and improved technology. A close follow up of the patient with globe injury before and after surgical intervention is needed to improve the visual outcome. Numerous studies have been done to find out the visual outcome after penetrating globe injuries. Based on available studies, the factors likely to predict outcome after open globe injury are mechanism or type of injury, preoperative visual acuity (VA), time lag between injury and surgery, relative afferent pupillary defect (RAPD), size and location of the wound. International classification of ocular trauma is based on some of the variables affecting the final visual outcome. Apart from above mentioned variables, other factors that can predict vision outcome are hyphema, lens damage, vitreous hemorrhage, uveal or retinal tissue prolapse, retinal detachment and number of surgeries.

In this study there were total 96 cases out of which 51 (53.13%) were males and 45 (46.87%) females. This was consistent with the studies done in the past from Pakistan and other countries. The reason of higher number of such injury in males can be explained by multiple factors. As males are more social and active in outdoor activities including sports, they have higher chances to get the injury by sharp objects and glasses.

Stick injury was the most common affecting 55 (57.29%) cases followed by pencil injury seen in 35 (36.46%). This was consistent with a study conducted at Sir Ganga Ram Hospital, Lahore where the pencil was the most common type causing this injury.[12] While in another study at AL Ibrahim Hospital Karachi, they found the sticks to be the most common one as in our study. Jinnah Hospital Lahore, however found other sharp objects like metal pieces as the most common one. The similar results from the local studies also reveal the similar pattern of injuries and the prevalence of common risk factors.[13]

In this study, maximum cases 48 (50%) had type II injury. It was followed by the type I lacerating injury and the type III injury was seen in the least number. These results were consistent in studies conduction in Lahore and Peshawar.[12] In the present study after penetrating anterior chamber injury, the good outcome was seen in 47 (48.96%) out of 96 cases after surgical intervention. These results were similar to the studies done in the past. In a study done by Zia S et al on 33 cases of anterior chamber injury, the good outcome was seen in 15 (45%) cases.[14] In another study done by Greven et al this outcome was seen in 55% of cases.[13] Even higher results were observed by the study done by Moisseiev et al where they observed this in 67% ofcases.[16]

There was no significant difference in terms of good outcome with respect to gender where it was seen in 26 (50.98%) males as compared to 21 (46.67%) females and also with age groups. This was also observed in previous studies as well, where the outcome was more or less the same in both gender and different age groups, however the cut off values used by the other studies were not the same like this study due to difference in inclusion criteria.[17-18]

There was no significant difference in terms of outcome with respect to type of injury, with highest number seen in type I where it was seen in 13 (54.17%) cases in its respective group followed by type II where it was in 50% of the cases with p value of 0.67. These results were similar to study conducted by Thevi T et al that also reported that the best results were seen in terms of visual acuity in cases with type I injury with corneal lacerations. They also did not find any significant difference in different types of injuries with good outcome in type I injury was seen in 90% of the case.[19] In another study done by Ram J et al and he compared the penetrating and blunt injuries to look for their outcome. It was seen that the good outcome with penetrating anterior chamber injury was seen in 57.6% of cases irrespective of its type and that of blunt injury was seen in 71.4% of cases. But he did not find any significant difference in neither of these two groups and nor for the type of penetrating eye injuries; however the highest number of cases with good outcome were seen in type I and II injury and higher complication rate in type III injury.[20]

There was no significant difference in terms of time to intervention. In a study conducted by Beby F et al revealed that the cases that presented later after the injury had poor outcome; although they did not use the same cut off values like our study. According to them 15 (20%) of the cases that presented later than 24 hours of the injury had relatively poor outcome than early reporting; however this difference in their study was also not statistically significant. [21]

In another study by Narang S et al the cases that presented within 24 hours, then the good outcome was seen in 18 out of 33 cases, and those with 24 to 72 hours, the good outcome was in 11 out of 13 and worst was seen with cases that presented even after 72 hours where it was seen in only 7 out of 20 cases.[22] The bad outcome in very early and very delayed surgery can be explained by the fact that in earlier presentation their might be severe injury that led to bad outcome or it might be due to infective injury and early intervention led to lower number of cases with good outcome. Similar can be explained in cases with late presentation, where the bad outcome can be explained by the fact that these were either complicated cases or there were referred from other centers and led to late intervention and poor outcome.

Repair of wound edges is complicated by tissue loss as some tissue becomes devitalized making it difficult to restore the normal corneal contour, hence high degrees of irregular astigmatism. Most literature report that the optimal time for repair is within twenty-four hours of injury, which is very difficult to achieve in our setting.

There were significant results seen in terms of object involved in eye injury where good outcome was seen in pencil injuries revealed in 20 (57.14%) cases as compared to needle or glass where it was seen in none of the cases with p= 0.04. This was also proved by the study conducted by Narang S et al that also revealed almost similar results to the present study. in their study good outcome was seen in 60% of the cases with pencil. Injuries and around65% with wooden injuries; as compared to the other objects, however they did not particularly assessed the glass and needle injuries.[22]

In a study by Rahman *et al*, they found statistically significant better visual outcome in cases suffering from sharp injuries in contrast to blunt injuries (P = 0.004).[23] The poor outcome in cases that had injury due to stick can be explained as the vegetative material leading to injury has more chances of infections and led to poorer outcome; however this was not found in present study. The reason might be comparatively earlier reporting, early administration of antibiotic or better eye care.

There were few limitations of the study, first this study did not reveal any type of the complication developed during the course of the treatment, which was major component in the various study. However, there were many strengthening points as well. As this study extensively elaborated different confounding variables like age, gender, duration, type and object of injuries which is not as much studied in the previous studies.

CONCLUSION

Penetrating anterior segment injuries are common in ophthalmic emergencies and good outcome is seen in almost half of the cases. There are significantly better results in pencil injuries as compared to needle or glass injury.

REFERENCES

1. Babar TF, Jan S, Gull. Pattern of pediatric ocular trauma in Hayatabad Medical Complex, Peshawar. Pak J Med Res.2006; 45(1):6-9.
2. Negrel AD,ThyleforsB.Theglobalimpactof eye injuries. OphthalmicEpidemiol.1998; 5:143-69.
3. Takvam JA, MidelfartA.Survey of eye injuries in Norwegianchildren.Acta Ophthalmol.1993; 71:500-5.

4. Bukhari S, Mahar P S, Qidwai U, Bhutto IA, Memon A S.Ocular trauma in children. Pak J Ophthalmol.2011; 27:4.
5. MontanesCB,CuveaMC.Eyeinjuriesinchildhood. AnnEspPediatrics.1998; 48:625-30.
6. Nelson LB, Wilson TW, Jeffers JB.Eye injuries in childhood: demography, etiology and prevention. Pediatrics.1998; 84:438-41.
7. Narang S, Gupta V, Simalandhi P, Gupta A, Raj S, DograMR. Paediatric open globe injuries. Visual outcome and risk factors for endophthalmitis. Indian J Ophthalmol.2004; 52(1):29-34.
8. Okeigbemen VW, Kayoma D. Visual outcome of childhood ocular injuries in a tertiary hospital in Benin city.Asian J Med. Sci.2013; 5 (5):105-07.
9. El-Mekawey HE. Ocular trauma visual outcomes during the 2011 Egyptian revolution. Med J Cairo Univ.2011; 79 (1):407-13.
10. Hossain A, Hussain E, Ferdausi N, Sen U, Islam Z. Prognostic value of ocular trauascorein evaluating visual outcome of pediatric (4-16 years) open globe injuries. Asia Pac J Ophthamol.2014; 3(4):226-9.
11. Acar U, Tok OY, Acar DE, Burcu A, Ornek F. A new ocular trauma score in pediatric penetrating eye injuries. Eye.2011;25:370-4
12. *Arfat MY, Butt HM. Visual outcome after anterior segment trauma of the eye. Pak J Ophthalmol 2010, Vol. 26 No.2:74-8.*
13. *Qazi ZA. Corneal endothelium tissue that demand respect editorial. Pak J Ophthalmol. 2003; 19:1.*
14. Zia S, Khan QA, Iqbal Y, Niazi FK. Visual outcome of cataract surgery in cases of penetrating ocular trauma. Gomal J Med Sci 2014;12:56-9.
15. Greven CM, Collins AS, Slusher MM, Grey Weav- er R. Visual results, prognostic indicators, and posterior segment findings following surgery for cataract/lens subluxation-dislocation secondary to ocular contusion injuries. Retina 2002; 22:575-80.
16. Moisseiev J, Segev F, Harizman N, Arazi T, Roten-streichY,AssiaEI.Primarycataractextractionandintraocularlens implantation in penetrating ocular trauma. Ophthalmol 2001;108:1099-03.
17. Chang HC, Chien KH, Lu DW. Open globe injury in a tertiary hospital in Northern Taiwan: A 10-year review. J Med Sci2016; 36:131-6.
18. Pieramici DJ, Au Eong KG, Sternberg P Jr., Marsh MJ. The prognostic significance of a system for classifying mechanical injuries of the eye (globe) in open-globe injuries. J Trauma2003; 54:750-4.
19. Thevi T, Mimiwati Z, Reddy SC. Visual outcome in open globe injuries. Nepal J Ophthalmol. 2012Jul-Dec;4(2):263-70.
20. Ram J, Verma N, Gupta N, Chaudhary M. Effect of penetrating and blunt ocular trauma on the out- come of traumatic cataract in children in northern India. J Trauma Acute Care Surg 2012;73:726-30.
21. Beby F, Roche O, Kodjikian L, Abaas F, Kouassi N, Burillon , etal. Penetrating ocular injuries in children; visual outcome and prognostic factors. Acta Ophthalmo Sacand.2006; 2005:266-7.
22. Narang S, Gupta V, Simalandhi P, Gupta A, Raj S, Dogra MR. Paediatric open globe injuries. Visual outcome and risk factors for endophthalmitis. Indian J Ophthalmol2004; 52:29-34.
23. Rahman I, Maino A, Devadason D, Leatherbarrow B. Open globe injuries: Factors predictive of poor outcome. Eye (Lond)2006; 20:1336-41.

ORIGINAL ARTICLE

Nabeel Khalid

Success of Inferior Oblique Myectomy in Inferior Oblique Over-action

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ABSTRACT

Objectives: To determine the frequency of success of inferior oblique myectomy in inferior oblique overaction.

Methodology: This was a descriptive type cross sectional study conducted at Ophthalmology Department of Sheikh Zayed Medical College/Hospital; Rahim Yar Khan from June 2016 to December 2018. A total of 150 patients with inferior oblique overaction, 20-50 years of age of both genders were selected by non-probability convenient sampling technique. An informed consent was taken from all participants. Data was entered in structured proforma and was analyzed by using SPSS version 20.0 software. Strabismus assessment of patients was done by an optometrist before and after the procedure. Myectomy was performed in each patient by consultant Ophthalmologist and success was noted as yes or no at the end of 3 months follow up.

Results: Out of 150 patients, 83 (55.33%) were males and 67 (44.67%) were females with male to female ratio of 1.2:1. Mean age was 36.89 ± 8.06 years. Success was seen in 142 (94.67%) patients while remaining 08 (5.33%) had shown no success.

Conclusion: This study concludedthat inferior oblique myectomy is a procedure of choice in patients having inferior oblique overaction.

Keywords: inferior oblique overaction, myectomy, success.

INTRODUCTION

Primary Inferior Oblique over action (PIOOA) is usually associated with horizontal strabismus such as congenital esotropia or intermittent exotropia. Isolated PIOOA can occur without associated horizontal strabismus.[1] Although PIOOA is bilateral in most of the cases but it is usually asymmetrical. Since the inferior oblique muscle is an elevator, abductor and extortor (the primary action of inferior oblique being extortion), these elements are exaggerated in direct proportion to over action.[2]Inferior oblique overaction may be primary or secondary. Primary can be idiopathic while secondary may be due to congenital IV nerve palsy. Primary inferior oblique overaction most commonly presents after 1 year of age and is associated with congenital esotropia. In addition to congenital esotropia, primary inferior oblique muscle overaction may be associated with exotropia or occur as an isolated inferior obliqueoveraction without other strabismus.[1]

The success of inferior oblique myectomy in inferior oblique over-action is very high, this technique should be opted in routine practice more effectively with better success in order to reduce the morbidity rate

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Clinical signs of primary inferior oblique overaction may be associated with elevation, adduction and extortion of the eyeball. Hypertropia is linked with symmetry of over-action. extortion does not appear in patients with younger age due to sensory learning to combat the situation. Bilateral IOO produces a right hypertropia in left gaze,

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Received: July'2019 *Accepted. Nov'2019*

left hypertropia in right gaze, and minimum or no vertical strabismus in primary position.[3]

Inferior oblique over-action should be surgically addressed if significant inferior oblique overaction is associated with horizontal strabismus. Significantly change in the horizontal deviation inprimary position is not affected by weakening procedures of oblique muscles. Surgery is more useful in IOO is +2 or more except in bilateral cases where surgery can be considered with IOO of +1. Surgery is indicated in Amblyopic Eye if significant amblyopia is present.[4]

The surgical intervention of inferior oblique overaction is dependent on either changing the vector of mechanical function of the muscle by moving the insertionsite or weakening the inferior oblique muscle by diminishing the muscle tension. Techniques such as myectomy and recession act by decreasing the inferior oblique muscle tone. Inferior oblique recession with anteriorization diminishes muscle tension and changes the functional insertion. Anteriorizing the inferior oblique muscle insertion anterior to the eyeball's equator changes the inferior oblique muscle from an elevator to more of a depressor. The more the inferior oblique muscle is anteriorized the more it becomes a depressor. Severe inferior oblique overaction is treated with a full anteriorization to the insertion, whereas mild overaction is managed with less of an anteriorization.[5]

The weakening procedures of IO muscle is in practice since White and Brown reported IO disinsertion in the 1930s. Currently, myectomy of the IO and IO recession are the most widely used procedures to treat IOOA.[6,7]Anterior transposition of IO is another procedure for correcting IOOA. This procedure is efficient for treatment of IOOA with co-existing dissociated vertical deviation (DVD).[8,9]

In a prospective comparison of anterior transposition and myectomy which was performed by Min et al on 20 children with bilateral 3+ IOOA, the anterior transposition group was more successful (85%) than myectomy group (25%).[10]Soltan Sanjari et al[11] reported on a retrospective study of the treatment for inferior oblique overaction (IOOA) performed over a 10-year period on 122 eyes utilizing three different surgical techniques to weaken the inferior oblique muscle. They performed disinsertion on 12 eyes, myectomy on 91 eyes, and anterior transposition of the inferior oblique on 19 eyes. They judged success to be a result of better than +1 IOOA postoperatively, finding that all three procedures had similar success rates not statistically different assessed by this metric at 91.7%, 97.8% and 89.5% respectively in the disinsertion, myectomy and anterior transposition groups.

Since there was controversy on the success of inferior oblique myectomy in the previous available literature, it was decided to evaluate the success of inferior oblique myectomy in inferior oblique overaction in local population. This study would not only provide the local statistics but also help to resolve the controversy regarding success of myectomy in inferior oblique overaction. An if it's success rate would be found high, then this would encourage ophthalmologists to adopt this procedure routinely in managing these particular patients more effectively with better success in order to reduce the morbidity of our population.

METHODOLOGY

This was a descriptive type cross sectional study conducted at Ophthalmology Department of Sheikh Zayed Medical College/Hospital; Rahim Yar Khan from June 2016 to December 2018 after approval from the ethical review committee. A total of 150 patients with inferior oblique overaction, 20-50 years of age of both genders were selected by non-probability convenient sampling technique. Patients having previous history of surgery, secondary Inferior Oblique overaction and trauma were excluded from study. An informed consent was taken from all participants. Strabismus assessment of patients was done by an optometrist before and after the procedure. Myectomy was performed in each patient by consultant and success was noted as yes or no at the end of 3 months follow up.

Data was entered in structured proforma and was analyzed by using SPSS version 20.0 software. Effect modifiers like age, gender, duration of disease and diabetes mellitus were stratified and chi square was applied to see their effect on success. P-value ≤0.05 was taken as significant.

RESULTS

Out of 150 patients, 83 (55.33%) were males and 67 (44.67%) were females with male to female ratio of 1.2:1. Mean age was 36.89 ± 8.06 years. Success was seen in 142 (94.67%) patients while remaining

08 (5.33%) had shown no success.

Table- I: Distribution of patients according to Age (n=150).

Age (in years)	No. of Patients	%age
20-30	31	20.67
31-40	64	42.67
41-50	55	36.67
Total	**150**	**100.0**

Table I shows that out of 150 patients, 31 (20.67%) were between age 20-30 years, 64 (42.67%) were between 31-40 years while 55 (36.67%) were between 41-50 years.

Figure I: Gender Distribution

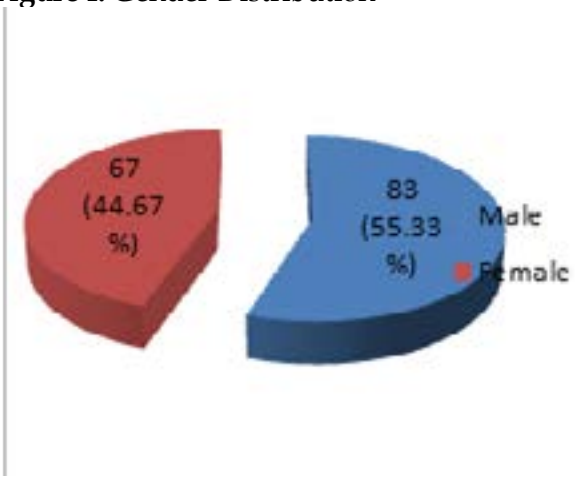

Figure I shows that out of 150 patients, 83 (55.33%) were males while 67(44.67%) were females.

FigureII: Distribution of patients according to Success (n=150)

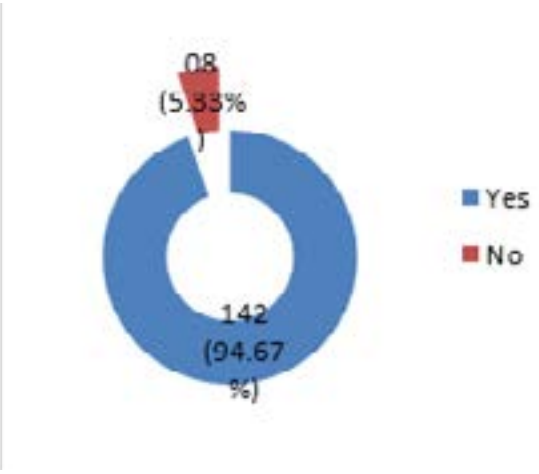

Figure II shows that out of 150 patients, 142 (94.67%) had successful surgical results while 8 (5.33%) had unsuccessful results.

DISCUSSION

Inferior oblique weakening procedures are frequently applied as surgical options if secondary IO overaction is prominent without the evidence of SO tendon laxity or significant SO weakness.[12-14,15-19]Multiple studies have been carried out to find out the effects of IO myectomy in eliminating the anomalous head postures as well as reducing the vertical deviation.[13,17,19-20]Toosi and von Noorden reported that IO myectomy was a surgery of choice for IO over-action due to SOP.[17]Helveston and associates also described that IO myectomy had low complications such as an iatrogenic Brown syndrome and great efficacies to treat the symptoms from SOP as an initial procedure.[13] In addition, Shipman and Burke reported that IO myectomy resulted in the greatest reduction of hypertropia in the primary position up to 15 prism diopters (PD) or more with better predictable long term outcome compared to IO recession.[18]Ghazawy and associates identified that IO myectomy improved SO under-action irrespective of the accordance of primary or secondary IO overaction.[20] Hence, uncombined IO myectomy has been commonly preferred as the initial procedure, especially in SOP patients with over-action of the ipsilateral IO and preoperative hyper-deviation of 10 to 15 prism diopter (PD) or more.[17-19]

Age range in this study was from 20 to 50 years with mean age of 36.89 ± 8.06 years. Majority of the patients 64 (42.67%) were between 31 to 40 years of age. Out of 150 patients, 83 (55.33%) were males and 67 (44.67%) were females with male to female ratio of 1.2:1.Success was seen in 142 (94.67%) patients while remaining 08 (5.33%) had shown no success. Ghazawy et al investigated the efficacy of myectomy versus anterior transposition in a retrospective study. They showed that both procedures are effective in treatment of IOOA but myectomy is superior to anterior transposition for under-action of superior oblique muscle.[20]

The success rate in anterior transposition group (85%) was much higher than myectomy group (25%) in a prospective study conducted by Min et al on 20 children with bilateral 3+ IOOA.

myectomy [10]Soltan Sanjari et al[11] reported on a retrospective study of the treatment for inferior oblique overaction (IOOA) performed over a 10-year period on 122 eyes utilizing three different surgical techniques to weaken the inferior oblique muscle. They performed disinsertion on 12 eyes, myectomy on 91 eyes, and anterior transposition of the inferior oblique on 19 eyes. They judged success to be a result of better than + 1 IOOA post-operatively, finding that all three procedures had similar success rates not statistically different assessed by this metric at 91.7%, 97.8% and 89.5% respectively in the disinsertion, myectomy and anterior transposition groups.In another study conducted in both genders and all age groups,inferior oblique overaction was much more successful surgical option.[17] They recommendedinferior oblique myectomy as a primary treatment for superior oblique palsy.[17]

In another study, they compared the efficacy of inferior oblique myectomywith recession procedures.[19] They showed that the patients of inferior oblique myectomy had less postoperative hypertropia (p<0.001) compared to the patients who underwent recession procedure. Thepatients who underwent the myectomy had higher success rate as far as residual hypertropia is concerned (p=0.056). But they also pointed out thatthe difference in success between the two procedures was more pronounced (p=0.005) when patients had small to moderate hypertropia before surgery and thisstatistical difference was lost when patients had large hypertropia before surgery.[19]Soyugelen et al[21] evaluated the outcomes of IO myectomies in a total of 28 patients, 18 unilateral and 10 asymmetric. Themean follow-up duration was 15 months; the mean pre-andpostoperative IOOA severity was 2.88±0.75 and 0.16±0.38, respectively. The asymmetric cases had pre- and postoperative IOO A severity of 4.40±0.69 and 2.00±0.94, respectively. In a study by Rajaviet al[22] including 82 eyes of 50 patients,eyes randomly underwent myectomy (42 eyes) or recession (40eyes). They were unable to detect a statistically significantdifference in the outcomes of the two procedures.In another study[23], twenty-seven eyes of 27 patients that underwent inferior oblique myectomy surgery for superior oblique palsy were included. The study included 12 male patients and 15 femalepatients. The mean age of the patients was 15.62±13.31 years (range, 2-59 years) and the mean follow-up time was17±11.28 months (range, 6-60 months). Unilateral/ipsilateral myectomy was performed in all cases. The patients' mean preoperative IOOA grade was2.55±0.75. In the early postoperative period the mean IOOAgrade was 0.14±0.36, and this difference was statisticallysignificant (p<0.01). Postoperative IOOA severity remained stable throughout follow-up for most of the patients; however,2 patients' IOO A grade increased from 0 to 1 in the finalfollow-up and 2 other patients' IOOA grade decreased from 1 to 0. Cumulatively, there was no statistically significantdifference in IOOA severity between the early and latepostoperative periods (p>0.05).Fifteen of the 27 patients (55.5%) had abnormal headposition (AHP) preoperatively.

After surgery, AHP was corrected in 12 of those 15 patients (80%).[24]On the whole, it is concluded that success of inferior oblique myectomy in inferior oblique overaction is very high and should be opted in our routine practice guidelines for these particular patients. It is pertinent to note that most of the studies have been conducted in children but this study aimed to include adult population to see the effects of IO myectomy in IO over-action.

CONCLUSION

This study concluded that the success of inferior oblique myectomy in inferior oblique over-action is very high. So, it is recommended that this technique should be opted in routine practice guidelines for managing these particular patients more effectively with better success in order to reduce the morbidity rate

REFERENCES

1. Asim AA, Hashmani S, Jamil MA, Zaheer CM. Graded recession for primary inferior oblique over action. Pak J Ophthalmol. 2012;28(3):122-6.
2. Bhatta S, Auger G, Ung T, Burke J. Underacting inferior oblique muscle following myectomy or recession for unilateral inferior oblique overaction. J PediatrOphthalmol Strabismus. 2012;49:43–8.
3. Demer JL, OhSY, ClarkRA, PoukensV. Evidence for a pulley of the inferior oblique muscle. Invest Ophthalmol Vis Sci. 2003;44(9):3856–65.
4. Kushner BJ . Multiple mechanisms of extraocular muscle "overaction." Arch Ophthalmol. 2006;124(5):680–8.
5. Stager DR . Costenbader Lecture. Anatomy and surgery of the inferior oblique muscle: recent findings. J AAPOS. 2001;5(4):203–8.
6. Rajavi Z, Molazadeh A, Ramezani A, Yaseri M. A randomized clinical trial comparing myectomy and recession in the management of inferior oblique muscle overaction. J PediatrOphthalmol Strabismus 2011;48:375-80.

7. Kelkar J, Kanade A, Agashe S, Kelkar A, Khandekar R. Outcome of asymmetric primary inferior oblique muscle overaction managed by bilateral myectomy and tucking of proximal muscle end: a cohort study. Middle East Afr J Ophthalmol. 2015;22:457-61.
8. Rishikeshi N, Gogate P, Bosco AJ. Comparison of outcome of inferior oblique weaknening procedures, myectomy and anterior transposition, from Western India. J ClinOphthalmol. 2015;3:123-5.
9. Silbert D, Matta N. Commentary on the outcomes of inferior oblique muscle weakening in inferior oblique muscle overaction. J Ophthalmic Vis Res. 2014;9:289-90.
10. SoltanSanjari M, Shahraki K, Nekoozadeh S, Tabatabaee SM, Shahraki K, AbriAghdam K. Surgical treatments in inferior oblique muscle overaction. J Ophthalmic Vis Res. 2014;9:291-5.
11. Min BM, Park JH, Kim SY, Lee SB. Comparison of inferior oblique muscle weakening by anterior transposition or myectomy: a prospective study of 20 cases. Br J Ophthalmol. 1999;83:206–8.
12. Knapp P, Moore S. Diagnosis and surgical options in superior oblique surgery. IntOphthalmolClin. 1976;16(3):137–149.
13. Helveston EM, Mora J, Lipsky S, Plager D, Ellis F, Sprunger D, et al. Surgical treatment of superior oblique palsy. Trans Am Ophthalmol Soc. 1996; 94:315.
14. Knapp P. First Annual Richard G. Scobee Memorial Lecture. Diagnosis and surgical treatment of hypertropia. Am Orthopt J. 1971;21:29–37.
15. Scott WE, Kraft SP. Classification and surgical treatment of superior oblique palsies: I. Unilateral superior oblique palsies. Trans New Orleans AcadOphthalmol. 1986; 34:15–38.
16. Ellis FD, Helveston EM. Superior oblique palsy: diagnosis and classification. IntOphthalmolClin. 1976;16(3):127–35.
17. Toosi SH, von Noorden GK. Effect of isolated inferior oblique muscle myectomy in the management of superior oblique muscle palsy. Am J Ophthalmol. 1979;88(3 Pt 2):602–8.
18. Shipman T, Burke J. Unilateral inferior oblique muscle myectomy and recession in the treatment of inferior oblique muscle overaction: a longitudinal study. Eye (Lond). 2003;17(9):1013–8.
19. Bahl RS, Marcotty A, Rychwalski PJ, Traboulsi EI. Comparison of inferior oblique myectomy to recession for the treatment of superior oblique palsy. Br J Ophthalmol. 2013;97(2):184–8.
20. Ghazawy S, Reddy AR, Kipioti A, McShane P, Arora S, Bradbury JA. Myectomy versus anterior transposition for inferior oblique overaction. J AAPOS. 2007;11(6):601–5.
21. Soyugelen G, Demirel S, Onursever N, Sarac Oİ, Ceran BB, Can İ. Tektaraflıalt oblikmiyektomisonuclarımız. MN Oftalmoloji. 2010;17:166-70.
22. Rajavi Z, Molazadeh A, Ramezani A, Yaseri M. A randomized clinical trialcomparing myectomy and recession in the management of inferior obliquemuscle overaction. J PediatrOphthalmol Strabismus. 2011;48:375-80.
23. Yumusak E, Yolcu U, Küçükevcilioglu M, Diner O, Mutlu FM. Outcomes of unilateral inferior oblique myectomysurgery in inferior oblique overaction due to superioroblique palsy. Turk J Ophthalmol 2016;46:21-4.

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ORIGINAL ARTICLE

Problems in the Management of Retinoblastoma

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ABSTRACT

Objective: To find the problems in the management of Retinoblastoma patients at Ophthalmology Department Jinnah Postgraduate Medical Centre.

Methods: The study was conducted after approval from ethics review committee of JPMC. Medical records were reviewed retrospectively from January 2017 to January 2019.Patients were included in study after detailed history and examination. Studies done prior to starting treatment included ocular ultrasonography, examination under anesthesia (EUA), computed tomography (CT) or a magnetic resonance imaging (MRI).

Research: The ages at first presentation and the symptoms were acquired from clinical history. Gender, laterality of involvement and family history was noted. The data collection for this analysis included age at presentation, sex, family history of RB, clinical presentation, treatment administered, treatment compliance and outcome duration of survival.

Conclusion: Low socioeconomic status, unawareness of disease, lack of knowledge are the main problems which delays in early diagnosis and prompt treatment retinoblastoma patients in most of the developing countries.

INTRODUCTION

Retinoblastoma, is the common intraocular malignancy with estimated prevalence of 1 in 18000 children under the age of 5 years.[1]Its incidence is 1:15,000-1:20,000 in live births worlwide.[2] Mutation of the *RB1* gene, the first described tumor-suppressor gene is responsible for its initiation. Loss of both allele of RB1 initiates development of retinoblastoma.[3] Mostly the tumor has more incident in developing countries of Latin America, Africa and Asia, it has poor prognosis due to late presentation and extra-ocular extension[4].

Leucokoria is the common presentation of retinoblastoma, other less common presentations are orbital cellulitis , glaucoma, strabismus and hyphema[5]. Extra - ocular extension of retinoblastoma through sclera and optic nerve, ranging from 6.3 to 7.6% is more common in underdeveloped and developing countries as compared to developed countries, one of the major factor of mortality and poor prognosis is orbital spread[6]. The poor prognostic factors are late presentation, delay in treatment, poorly differentiated tumors with extra-ocular spread, high cost of treatment and lack of resources[7].

Low socio-economic status, unawareness of disease, lack of knowledge are the main problems which delays early diagnosis and prompt treatment of retinoblastoma patients in most of the developing countries.

In a study conducted at the All India Institute of Medical Sciences, the median age of presentation of retinoblastoma patients was 2.5 years (median age for unilateral retinoblastoma was 3 years and for bilateral retinoblastoma was 2 years).

Sixty-nine percent of the cases were unilateral and 30.5% were bilateral, with a male to female ratio of 1.6:1.[8]Clinical Diagnosis of retinoblastoma usually requires complete fundus examination with indirect ophthalmoscope under general anesthesia, confirmed with investigation like B scan, ultrasonography, CT scan and MRI of the orbit[9]. Retinoblastoma is classified according to Reese–Ellsworth and the International Classification of Retinoblastoma (ICRB) systems, latter

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Received: Sept'2019 *Accepted: Oct'2019*

being most advanced and current method. ICRB divides retinoblastoma into five categories; class A is the least advanced and E is the most advanced type.

Focal therapies such as laser ablation and cryotherapy can be used for retinoblastoma with classes A and B, whereas more advanced cases (ICRB class C, D, or E) are preferentially treated with systemic chemotherapy or intra-arterial chemotherapy (IAC) over EBR or plaque brachytherapy because of their adverse effects. Enucleation and exenteration of the eye is performed when there is a potential risk of extra-ocular extension, especially in class E eyes, neglected or untreated cases for longer time or when all prior treatments have failed.[10]

The aim of treatment is to prevent blindness, preserve cosmoses and increase life expectancy which poses great challenges because of delayed presentation in developing countries. According to study conducted in Indonesia, about 20% of the children with extra-ocular extension die because their parents refused for invasive treatment. A community awareness program is needed for early diagnosis and treatment of retinoblastoma.

METHODS

This retrospective descriptive study was carried out at Ophthalmology department of Jinnah postgraduate medical center from January 2017 to January 2019 after taken approval from ethical review committee. Informed consent had been signed from parents. This study includes patients that were diagnosed as retinoblastoma according to patient medical records came and treated at ophthalmology department JPMC.The collected data were age, gender, affected eye, prior symptoms ,diagnosis ,treatment and additional treatment like chemotherapy. All patients under went detailed examination which includes anterior segment and fundus examination with indirect ophthalmoscopy and scleral indentation under general anesthesia. Studies done prior to starting treatment included ocular ultrasonography, examination under anesthesia, computed tomography (CT), magnetic resonance imaging (MRI), patient was then categorized according to international classification of Retinoblastoma and then treatment was offered to all patients after letting know the risk factor of treatment to parents. Descriptive statistics i.e. mean ± standard deviation for quantitative values like age and frequencies along with percentages for qualitative variables (gender, laterality of eyes) were used to describe the data.

RESULTS

A total of 35 patients of retinoblastoma were included in study from January 2017 till January 2019 that came to department of ophthalmology Jinnah postgraduate medical center. There were more males (19) than females who were 16 in number.

Table 1.shows that male are affected more that is 19 (54.28%) than females that are 16 (45.71%)

Gender	No: of patients	%
Male	19	54.28%
Female	16	45.71%

Table 1: distribution of retinoblastoma according to sex

Retinoblastoma can be unilateral or bilateral but it can be trilateral. Trilateral retinoblastoma (TRB) is a syndrome consisting of unilateral or bilateral hereditary retinoblastoma (RB) associated with an intracranial neuroblastic tumor (pineo-blastoma).

Table 2.showing retinoblastoma most frequently present in one eye (unilateral) in 32 child (91%) than in both eye (bilateral) in 3 child (8.5%).

Affected eye	Number	%
unilateral	32	91%
Bilateral	03	8.5%

Table 2: distribution of retinoblastoma according to lateralization.

Most common presentation of retinoblastoma is leukocoria, second most common is strabismus but it can also present as proptosis, orbital cellulites, glaucoma, hyphema.

Table 3.showing patient with retinoblastoma commonly present with leukocoria in 17 children and orbital mass (protrusion) that is in 12 children.

Symptoms	Frequency	%
Leukocoria	17	48.5%
Orbital mass(protusion)	12	34.2%
Orbital cellulitis	04	11.4%
Hyphema	01	2.8%
Strabismus	01	2.8%

Table 3: distribution of retinoblastoma based on symptoms

There are different treatment modalities based on the stage of the disease but mostly patient came with advance stage or orbital invasion so the ratio of enucleation and exenteration is more common treatment modality.

Table 4.showing that the most common treatment for retinoblastoma patients was enucleation combined with chemotherapy in 14 patients (40%). This study showed most common symptom was leucokoria (48.5%). The results also obtained by Soebagyo et al in their study in East Java, Indonesia where protrusion was the most symptom (61.36%). This result is different with the result of other study in the countries of Southeast Asia region, where leukocoria was the most symptom 66.78%. It shows that the patients generally came in advanced stage or orbital involvement. Late diagnoses could be due to other problems such as, poor affordability and accessibility to available medical facilities.

Enucleation	09	25%
Enucleation chemotherapy	14	40%
Exenteration	04	11.4%
Exentration+chemotherapy	07	20%
Radiotherapy	01	2.8%
Refused treatment	02	5.7%

Table 4: Distribution of treatment of retinoblastoma patients

Problems that most commonly occurs in treatment of patient with retinoblastoma in developing countries is low socioeconomic status that is 29 (82%) patients, other problem is unawareness of disease knowledge among parents of children that is 04 (11.4%) which delays the treatment and that leads to intra-orbital involvement.

Low socioeconomic	29	82%
Un awareness	04	11.4
Fear	02	5.7%

Table 5: Distribution of retinoblastoma patients based on delayed in seeking treatment.

DISCUSSION

Retinoblastoma is the common intraocular malignancy of childhood. In past years survival rate of retinoblastoma has improved in developed countries from <5% to as high as 99% while in some developing countries survival rate remains as low as 0-5%.[12]There is no predilection of gender and race but in this study retinoblastoma is more common in males that is 19 (54.28%) boys than females are 16 (45.71%) but in one study carried at Almouassat University Hospital(AUH) in Damascus ,Syria where male to female ratio is 1.6:1.[13]there is more male predominance, which is similar to the gender distribution shown in reports from Mexico [10] (52.4%), Mali [16] (54.5%), Egypt [17] (60.25), and Jordan [18] (70.0%)[14]. In different studies it is found that there is more unilateral involvement of retinoblastoma than bilateral like in study at south western China, retinoblastoma occurred unilaterally in 203 (80.2%) patients, and bilaterally in 50 (19.8%) patients, so as in this study unilateral cases reported were 32(91%) and bilateral 03 (8.5%).[15] Genetic and epidemiological analysis of the disease has uncovered two distinct classes of retinoblastoma. Sporadic retinoblastoma is generally unilateral, and is diagnosed at age of about two years. Familial retinoblastoma is generally diagnosed at an earlier age, at 11 months, and is typically bilateral and/or multifocal. These observations have been incorporated into a 'two hit' mutational inactivation hypothesis of the origin of retinoblastoma, so according to this study it indicates that sporadic mutation influence more in occurrence of Retinoblastoma in children rather than familial.[16]

Clinical presentation of retinoblastoma depends on the stage of disease and with symmetrical or asymmetrical lesions. The tumor may present as white pupillary reflex (leucokoria, most common form of presentation) which appears as whitish retinal mass with variable blood vessels and may present calcifications.

We received majority of patients with leucokoria that is 17 (48.5%) and 12(34.2%) with orbital mass (protrusion). It presents as endophytic form in which tumor extends into vitreous or exophytic mass associated with retinal detachment or mixed form with vitreous involvement and retinal detachment.[17]There are different tools of diagnosis for retinoblastoma, among which B-scan ultrasonography is most common and valuable tool in precise evaluation of disease showing characteristic intraocular mass with calcification with good sensitivity and specificity.[18]

Other modalities such as fluorescein angiography, autofluorescence (AF), computed to-

mography (CT), magnetic resonance imaging (MRI), and optical coherence tomography (OCT) provide additional information. Computerized tomography (CT) images of orbit, 1 mm can detect extra-ocular extension and confirm intraocular calcification. Magnetic Resonance Imaging (MRI) provides superior soft tissue details. The tumor characteristically appears hyper-intense in T1-weighted image (WI) and hypo-intense in T2-WI, whereas calcification remains markedly hypo-intense. It is considered more valuable compared to CT in detecting optic nerve invasion and intracranial extension. In addition, it also helps in screening and detecting midline lesions associated with trilateral RB-pineoblastoma.[19]

The management of retinoblastoma is complex and includes surgical and conservative techniques.[20]It has evolved from enucleation and external beam radiation therapy (EBRT) to other globe-salvaging therapies, including chemo reduction with focal consolidation and, more recently, super selective intra-arterial chemotherapy. The art of retinoblastoma treatment rests on the ocular oncologist's clinical examination and assessment of relevant imaging to formulate an appropriate treatment plan with the child's well-being and family's wishes in mind.[21]Currently available treatment for retinoblastoma includes chemo reduction in which Various drugs are used for intravenous, intra-arterial, subconjunctival, or intra-vitreal chemotherapy depending on the team (most commonly carboplatin, vincristine, etoposide, topotecan, melphalan). Chemo reduction followed by local therapy is still widely used by many teams with recognized efficacy and accept- able systemic toxicity.

External beam radiotherapy (EBRT) is now more rarely used due to the risk of local complications and the major risk of sarcoma in the irradiated field.[22] Enucleation and exenteration is preserved for advance stage of disease and intra-orbital involvement. Combination between enucleation and chemotherapy was the most common therapy performed found in this study, done in 14 patients (40%). This is appropriate with the patient's main complaint when they first present with whitish pupillary reflex (leucokria). Surgery procedure followed by chemotherapy are the treatments that had been done. The reasons why the patients were delayed in seeking for treatment were financial problem in 29 patients (82%%) and unawareness of disease that is 04 (11.4%). Low socioeconomic status and low education level was the reason for patients in delayed searching for the help. In one study it is shown that 5-year observed survival for retinoblastoma in children 0 to 14 years of age is 94%. This means on average, 94% of children diagnosed with retinoblastoma are expected to live at least 5 years after their diagnosis.[23]

After treatment, the status of vision that is left in the affected eye is highly variable, depending on the size and location of the tumor and whether tumor is intraocular or intraorbital.[24] In this study of Dutch retinoblastoma patients with long-term and complete follow-up, the overall risk of any second malignancies among hereditary retinoblastoma survivors was 20-fold higher than that in the general population while non-hereditary retinoblastoma survivors did not have a statistically significantly elevated risk of second malignancy as compared with the general population, so long term follow ups required after treatment in Retinoblastoma patients.[25]

CONCLUSION

There were total of 35 patients out of which males are 19 (54.28%) and females are 16 (45.17%). lateralization of affected eye is mostly observed with whitish pupillary reflex (leucokoria) and is common symptom that patient may present. Other is orbital mass (protrusion). Low socioeconomic status, unawareness of disease, lack of knowledge are the main problems which delays in early diagnosis and prompt treatment of retinoblastoma patients in most of the developing countries.

REFERENCES.

1. Rahman A. (2014) Dilemma in Management of Retinoblastoma. J Community Med Health Educ 4:323. doi: 10.4172/2161-0711.1000323
2. Fabian ID e. The management of retinoblastoma. - PubMed - NCBI [Internet]. Ncbi.nlm.nih.gov. 2019 [cited 18 February 2019]. Available from: https://www.ncbi.nlm.nih.gov/pubmed/29321667
3. Dimara H, Kimani K, Dimba E, Gronsdahl P, White A, Chan H, et al.Retinoblastoma.TheLancet.March 12,2012;volume 379,P1436-1446.
4. .Rodrigues KE ,LatorreMdo R ,de Camargo B, Delayed diagnosis in retinoblastoma. J Pediatr (Rio J). 2004; 80 (in Portuguese).: 511-516.
5. Chintagumpala M, Chevez-Barrios P, Paysse E, Plon E, Hurwitz R.Retinoblastoma:overview of current Mangemenet.The Oncologist july 17,2007; vol. 12 no. 10 1237-1246.
6. Ali M, Honavar S, Reddy V. Orbital retinoblastoma: Present status and future challenges – A review. Saudi Journal of Ophthalmology. 2011;25(2):159-167.
7. V Essuman L. Presentation of Retinoblastoma at a Paediatric Eye Clinic in Ghana [Internet]. PubMed Central (PMC). 2019 [cited 18 February 2019]. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2956311/.
8. . Bakhshi S, Meel R, Radhakrishnan V. Current therapy and recent advances in the management of retinoblastoma. Indian Journal of Medical and Paediatric Oncology. 2012;33(2):80.

9. Pandey A. Retinoblastoma: An overview. Saudi Journal of Ophthalmology. 2014;28(4):310-315.
10. Schefler AC and Kim RS. Recent advancements in the management of retinoblastoma and uveal melanoma [version 1; referees: 2 approved]. F1000Research 2018, 7(F1000 Faculty Rev):476 (https://doi.org/10.12688/f1000research.11941.1)
11. Rahman A (2014) Dilemma in Management of Retinoblastoma. J Community Med Health Educ 4:323. doi: 10.4172/2161-0711.1000323.
12. Singh G, Daniels A. Disparities in Retinoblastoma Presentation, Treatment, and Outcomes in Developed and Less-Developed Countries. Seminars in Ophthalmology. 2016;31(4):310-316.
13. Murad, R, Zaid, K, Zaid k, Al Daoud, J, Al Hasan A. Epidemiological Characteristics of Retinoblastoma in Children Attending Almouassat University Hospital, Damascus, Syria, 2012-2016.Asian Pac J Cancer Prev. 2017;18(2):421–424.
14. Singh U.[a] tochD.[a] · KaurS.[a] · DograM.R.[a] · BansalD.[b] · KapoorR.[c] Retinoblastoma: A Sixteen-Year Review of the Presentation, Treatment, and Outcome from a Tertiary Care Institute in Northern India.OculOncolPathol 2018;4:23-32.
15. Gao J, Zeng J, Guo B, He W, Chen J, Lu F et al. Clinical presentation and treatment outcome of retinoblastoma in children of South Western China. Medicine. 2016;95(42):e5204
16. Goodrich DW,LeeWH.The molecular genetic of Retinoblastoma. Cancer Surv. 1990;9(3):529-54.
17. Nathalie Cassoux, LiviaLumbroso, Christine Levy-Gabriel, Isabelle Aerts, François Doz, Laurence Desjardins. (2017) Retinoblastoma: Update on Current Management. Asia-Pac J Ophthalmol6:3, pages 290-295.
18. Moulin AP, Gaillard MC, Balmer A, Munier FL. Ultrasound biomicroscopy evaluation of anterior extension in retinoblastoma: A clinicopathological study. Br J Ophthalmol 2012;96:337-40.
19. P Manjandavida F, Chahar S. art of retinoblastoma managment. Kjophthal.7 june 2018;vol 30 ,p17-27.
20. Shields CL, Mashayekhi A, Demirci H, Meadows AT, Shields JA. Practical Approach to Management of Retinoblastoma. Arch Ophthalmol. 2004;122(5):729–735. doi:10.1001/archopht.122.5.729.
21. Houston SK, Berrocal AM, Murray TG. The future of diagnostic imaging in retinoblastoma. J AAPOS 2011;15:125-6.
22. Cassoux N[1,2], Lumbroso L[1], Levy-Gabriel C[1], Aerts I[3], Doz F[2,3], Desjardins L[1].Retinoblastoma:update on current management. Asia Pac J Ophthalmol (Phila). 2017 May-Jun;6(3):290-295.
23. www.cancer.ca. (2019). Survival statistics for retinoblastoma - Canadian Cancer Society. [online] Available at: http://www.cancer.ca/en/cancer-information/cancer-type/retinoblastoma/prognosis-and-survival/survival-statistics/?region=qc [Accessed 5 Apr. 2019]
24. Cleveland Clinic. (2019). Retinoblastoma Outlook / Prognosis | Cleveland Clinic. [online] Available at: https://my.clevelandclinic.org/health/diseases/10706-retinoblastoma/outlook--prognosis [Accessed 5 Apr. 2019].
25. Moll, A., Imhof, S., de Boer, M., Ringens, P. and van Leeuwen, F. (2019). Risk of Second Malignancies in Survivors of Retinoblastoma: More Than 40 Years of Follow-up.Journal of the National Cancer Institute.2008;100(24):1771–1779.

Fatima Iqbal

ORIGINAL ARTICLE

Estimation of Lens Thickness (LT) in Pre Presbyopia Using Coherence Inter-ferometry Based IOL Master 700

(A Comparison with Presbyopia)

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ABSTRACT

Purpose: To estimate lens thickness in pre-presbyopes compared with presbyopes by using Partial Coherence Interferometry based IOL Master 700 (Ziess) and comparing it with presbyopes.

Methodology: In this comparative cross-sectional study, thickness of crystalline lens was compared between two groups' i.e pre-presbyopia (25 - 35 years) and presbyopia (45 - 55 years) in the duration of six months from October 2018 to April 2019. This study included 100 patients of selected age groups from a non-probability convenient sampling of either gender at Javed Eye Center in Pakistan. Lens thickness was measured by using Partial Coherence Interferometry based IOL Master 700 (Ziess) and near visual acuity was assessed by using near chart at a standard distance of 40 cm(s).

Results: A significant relation was formulated between the ages of the patient; changes in lens thickness with respect to age, near visual acuity and near add prescribed using the Regression formula at the level of 5% of confidence interval and a significance value of $p < 0.01$. Comparative analysis was done using SPSS version 20.

Conclusion: The results of this study helped in early detection of presbyopia which was in turn useful in detaining the progression of presbyopia. In order to delay the onset of presbyopia, various exercises, minerals and vitamins are prescribed. We were also able to assess crystalline lens thickness using Partial Coherence Interferometry based IOL Master 700 which gave us the estimation of accommodative amplitude of lens thus providing with an estimate of onset and progression of presbyopia.

Keywords: Crystalline Lens thickness, Interferometry, IOL Master 700, Pre-presbyopia, Presbyopia.

INTRODUCTION

Lens thickness has many implications for visual functions. Crystalline lens is composed of thin, long, transparent fibers that are dynamically packed. Thickness varies between two regions of lens as it is thicker equatorially and thin centrally (lens continues to grow throughout life). As presbyopia occurs due to increasing age, lens thickness increases with age and cause near vision problems[1].

The primary function of crystalline lens is to increase vergence of light that passes through cornea and enters the pupil. In emmetropic eye, vergence of light increased by refractive power of lens so that the light focus on retina. Crystalline lens also serves the function of accommodation whereas the contraction of cilliary muscles increases the optical power of the lens[2]. Constant lens optical and physical properties require preservation of these two optical functions. With advancing age crystalline lens undergoes various evident changes which results in a gradual but complete loss of accommodation roughly midway through human life span.

To assess the crystalline lens thickness using Partial Coherence Interferometry based IOL Master 700 which gives the estimation of accommodative amplitude of lens thus providing estimation of onset and progression of presbyopia.

Presbyopia, a natural age-related condition, is the result of gradual decrease in accommodative amplitude, from about 15 diopters (D) in early childhood to 1 D before the age of 60 years. An irreversible, normal physiologic condition that affects all primates, it impairs the ability to see

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Received: July'2019 Accepted: Nov'2019

clearly at near thus affecting quality of vision and perhaps quality of life[3]. If presbyopia is uncorrected, a significant functional visual disability is likely to develop as an individual is unable to perform near tasks effortlessly at a required working distance without experiencing visual symptoms.

Presbyopia is often confused with farsightedness, but the two are different. Presbyopia happens when the natural lens in the eye gets less flexible[4]. Presbyopia can occur at an earlier or later stage, depending on the person. If presbyopia occurs at the age of 45, then a person aged between 35 and 45 years would be in the "pre-presbyopia" stage and after the age of 45 would be in the burgeoning presbyopia stage, known as an "emerging presbyopes".

Diminution of amplitude of accommodation may result inadequate range of clear vision for the patients commonly performed tasks[4]. Incipient presbyopia is the earliest stage of presbyopia at which the clinical symptoms begin to document the near vision effect of the condition. Gradual declining of accommodative amplitude with age and enhanced visual demands in patients results in increased level of difficulties that clinical findings confirm as functional presbyopia[5]. The age is fairly variable for which presbyopia becomes symptomatic. Due to continuous gradual loss of accommodation, the functional progresses into apparent absolute presbyopia[6]. The amplitude of accommodation begins to decline at an earlier age than expected for the patients usual near vision tasks due to nutritional, environmental, drug-induced or disease-related causes[7].

METHODOLOGY:

In Comparative cross-sectional study, we compared the thickness of crystalline lens between two age groups of pre-presbyopia (25 - 35 years) and presbyopia (45 - 55 years) in the duration of six months from October 2018 to April 2019. This study included 100 patients of selected age groups from a non-probability convenient sampling of either gender at Javed Eye Center in Faisalabad. Informed consent of the patient was obtained after formulation of the entire procedure that the patient had undergone during the study.

The study was only conducted after we made sure that the patient has completely understood the whole procedure that has been formulated and is willing to be a part of the study. As our study involves 200 eyes of 100 individuals of both the genders. All subjects were treated in accordance with the declaration of Helsinki. After taking complete personal history, all subjects received the following examination in the succeeding order.

Complete assessment of the eyes was done in order to rule at any ocular diseases. Then the visual status of the eye was checked using a Near N-notation Chart at a comfortable near working distance (W D) of the patient in order to categorize whether the patient falls in the category of pre-Presbyopia (23 – 35) or Presbyopia (36 – 55). The near add of the patient is also checked as it is also one of the variable of our study. We finally proceeded towards measuring the principal component of our study, LT with PCI based IOL Master 700.

Eye comfort observed by the individual was asked as a qualitative entity when measuring lens thickness (LT) with partial coherence interferometry (PCI) based IOL Master 700 (Ziess). After the completion of data collection procedure comparative analysis of changes in HCL thickness in relation with near visual acuity. Regression Analysis was performed using SPSS version 20. The measurements were obtained binocularly from each subject and expressed as mean standard deviation and then the data entered into the Statistical Package for Social Sciences (SPSS) version 20. The test was considered significant if $p \leq 0.05$.

RESULTS:

The study included 200 eyes of 100 subjects with age group of 25-35 years (pre-presbyopic) and 36-55 years (presbyopic). Fifty-seven (57%) subjects were male and forty-three (43%) were females. On the basis of age patients were equally distributed in pre-presbyopes and presbyopes; with 50 patients in each group (figure 1)

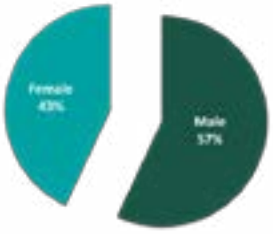

Figure 1: Gender distribution

Figure 2: LT is dependent variable among different age groups here age is is an independent variable and the mean of LT in right eye with respect to age is 3.028+0.025µm. There is a significant increase in LT of right eye with increase in age. With an increase of 1 year in age, there is an increase of LT by 0.025 µm.

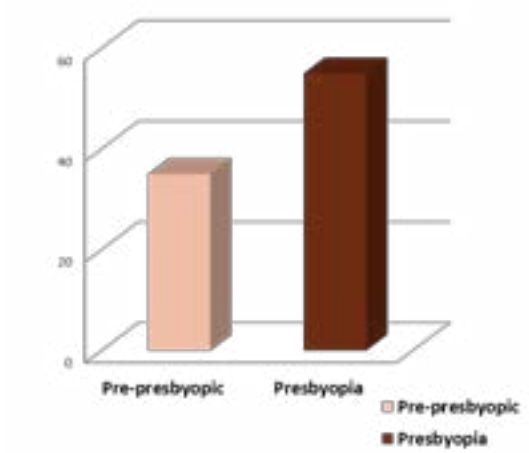

Figure 2: Age distribution

LT = 3.028+0.025Age

Figure 3: Mean value of LT of right eye in pre-presbyopia is 3.8076 and standard deviation of 0.32686 and N=50. In presbyopic patients mean value of right LT is 4.297 and a standard deviation of 0.25926 and N=50.LT is dependent variable among different age groups whereas age is an independent variable and the mean of LT in left eye with respect to age is 2.949+0.028µm. There is significant increase in the LT of left eye with increase in age. With an increase of 1 year in age, there is an increase in LT by 0.028 µm.

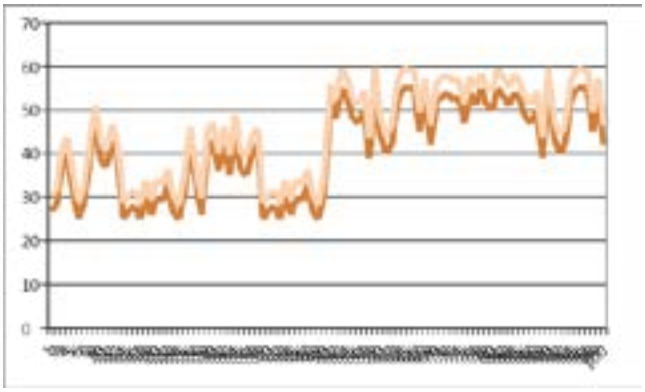

Figure 3: Lens thickness of right eye in pre-presbyopes and presbyopes

Figure 4: Mean value of LT of right eye in pre-presbyopia is 3.8076 and standard deviation of 0.32686 and N=50. In presbyopic patients mean value of right LT is 4.297 and a standard deviation of 0.25926 and N=50.

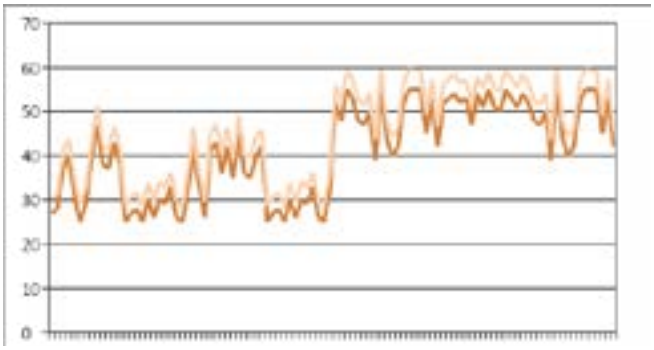

Figure 4: Lens thickness of left eye in pre-presbyopes and presbyopes

Figure 5: LT in presbyopes is greater than pre-presbyopes and LT of left eye is slightly greater than right eye. The mean of LT increment of right eye is 0.25µm and of left eye is 0.28µm. Regression analysis shows significant association.

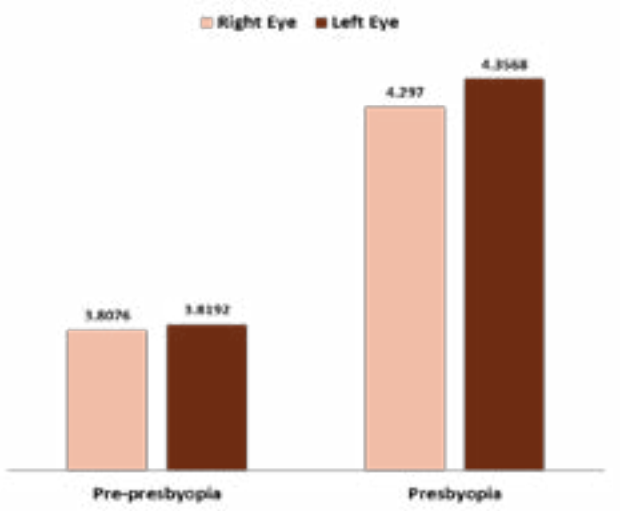

Figure no 5: Comparison of lens thickness of both eyes in pre-presbyopes and presbyopes

DISCUSSION:

Presbyopia is an age-related long-sight condition which occurs due to changes in LT with advancing age. Since LT has direct relation with age; with an increase in age there is an increase in the LT. PCI based IOL Master 700 was used to[7] measure LT in pre-presbyopes and presbyopes as per the inclusion and exclusion criteria of the study and near visual acuity was accessed by using near chart at a standard distance of 40 cm and the near add was prescribed accordingly[8]. The main objective of this research study was to estimate and compare LT in two different age groups; pre-presbyopes (25-35 years) and presbyopes (36-

55 years) and prescribe various exercises and vitamins/minerals accordingly for delaying the onset of presbyopia[9].

In 2008, Rosenfield in a study was conducted on the measurement of CL thickness using A-scan ultrasound from infancy to adulthood. Three age groups were considered in this study ranging from three months to the age of 35 years[10]. Mean HCL thickness at the age of three months was 3.91± 0.16 mm. At the age of 10 years, there was progressive thinning of crystalline lens by about 50 μm per year to the minimum thickness of 3.42 ± 0.16 mm. Between the age of 10 to 15 years, the lens differed by about 10 μm per year. The LT differed is about 20 μm at 35 years of age per year. This study concludes that increase in cell layer thickness is likely offset by a stretching of the lens from growth of the globe[11].

In 2009, a study was conducted by Schachar RA evaluated the validation of OCT based human crystalline lens (HCL) thickness measurement in children. Forty-seven normal children were measured with Visante anterior segment OCT and A-scan ultrasonography (Humphery 820). Cycloplegic drugs were used in one eye and five readings were taken by A-scan ultrasonography and three readings were taken by OCT. The Visante OCT is a non-contact instrument which was comparatively simple to use and provided valid HCL thickness measurement with excellent repeatability[12]

Zeng and colleagues in 2019 elaborated comparison of LT measurement using the anterior segment OCT and A-scan ultrasonography. Two age groups considered were between 18-40 years and ≥ 50 years of age. Lens thickness was measured with internal manual caliper tools in AS-OCT. The LT values measured by AS-OCT were significantly greater than A-scan. They concluded that AS-OCT can be used to measure Lens thickness in most eyes with clear or opacified lenses. It appears to be an alternative mean of measuring Lens thickness particularly with non-contact method[13].

In 2013, HCL thickness was measured by Abraham in the accommodating eye using AS-OCT. Sixty-six participants were included in the study ranging from 18 to 75 years of age. Images were taken during stimulation of accommodation. Lens thickness measurements in unaccommodated state for all participants were - 0.0001 mm with 95% limits of agreements from -0.051 to 0.051 mm over the range of accommodative demand[14]. The 95% limits of agreement were widest for the 18-29 years old age group ranging from -0.034 to 0.043 mm for a 2 D accommodative demand to -0.120 to 0.171 mm for a 5 D demand and narrowest for the 60-75 years old age group ranging from -0.023 to 0.017 mm for a 3 D demand to -0.033 to 0.033 mm for a 4 D demand[20]. Their data demonstrates similar repeatability compared with a previous study in children under cycloplegic. Repeatability does not deteriorate significantly with increasing accommodating effort and was shown to improve with increasing age[15]. The ability to detect small changes in LT with good repeatability indicates the suitability of the Visante AS-OCT when studying changes in LT both with age and under accommodative conditions[16].

In 2016 Akman et al, evaluation and comparison of the new swept source OCT based IOL Master 700 was carried out with IOL Master 500. The purpose of this study was to compare the measurement and failure rates obtained with the swept source OCT based IOL Master 700[17]. They measured AL, AC depth and corneal power and compared these vales with IOL Master 500[19]. They concluded that IOL Master 700 was more efficient in obtaining biometric measurements in eyes with posterior capsular dense nuclear cataract[18].

CONCLUSION:

We concluded that lens thickness increases with age when human crystalline lens is measured by using Partial Coherence Interferometry based IOL Master 700. The result reported in our thesis revealed the early detection of presbyopia by measuring human crystalline lens thickness in two age groups namely pre-presbyopes (25-35 years) and presbyopes (36-55 years). Therefore, it was noted that lens thickness in presbyopic patients is larger as compared to pre-presbyopic patients. There is no profound variation between right eye and left eye. Hence, the results of our study go in favor of the hypothesis that human crystalline lens thickness increases with age. We also concluded that if there is an increase of 0.21 μm in lens thickness then there will be an increase of 0.50 D in near add.

This study also helped us in determining whether the cornea or human crystalline lens is responsible for a specific refractive error which further aided us in grading the patient as presbyopic

and non-presbyopic. Moreover, we can prescribe various exercises and vitamins/minerals in order to detain the onset and progression of presbyopia and further studies can be conducted in order to prove their reliability.

Recommendations:

Results of this study are beneficial for eye care professionals to prefer IOL Master 700 for the measurement of lens thickness in pre-presbyopia and presbyopia.

1. Measurement of Lens thickness should be done in all age groups to verify the whether the refractive error is corneal or lenticular.
2. Our study is reproducible in a way that further studies can be conducted on prescribing near add in relation with the lens thickness.

Age	Lens thickness	Near add
36-40	3.79 – 3.99	+0.75 - +1.00
41-44	4.00 – 4.20	+1.25 - +1.50
45-48	4.21 – 4.41	+1.75 - +2.00
49-52	4.42 – 4.62	+2.25- +2.50
53-56	4.63 – 4.83	+2.50
57-60	4.84 – 5.04	+2.50 or >

0. A cohort study must be conducted in order to determine the effect of various exercises (in a certain order such as: warm-up before exercises, distant object focusing, arm's length focusing, warm-down exercises) and vitamins/minerals prescribed for delaying the onset and progression of presbyopia.
0. Refractive ocular surgeries can be planned according to lenticular astigmatism.
0. Pre and post measurements of lens thickness in laser surgeries should be taken in order to evaluate lenticular changes.

REFERENCES:

1. Abraham LM , Kuriakose T, Sivanaandam V, Venkatesan N, Thomas R and Muliyil J. AA and its Relation to Refractive Errors. *IjO*. 2005;53(1):105-108. Doi: 10.4103/0301-4738.16173.
2. Abraham NG, Srinivasan K and Thomas J. Normative data for near point of convergence, AACOM and phoria. *Oman J Ophthalmol*. 2015; 8(1):14-18. Doi: 10.4103/0974-620X.149856.
3. Akman A, Asena L and Gűngőr SG. Evaluation and comparison of the new swept source OCT-based IOL Master 700 with the IOL Master 500. *British Journal of Ophthalmology*. 2016;100(9):1201-1205.
4. Blystone PA. Relationship between age and presbyopic addition using a sample of 3,645 examinations from a single private practice. *Journal of the American Optometric Association*. 1999; 70(1):505-508.
5. Breinin GM and Chin NB. AACOM, convergence and aging. *Doc Ophthalmol*. 1973; 34(1):109-121.
6. Bullimore MA, Slade S, Yoo P and Otani T. An Evaluation of the IOL Master 700. *Eye Contact Lens*. 2019;45(2):117-123. Doi: 10.1097/ICL.0000000000000552.
7. Calder-Gallie J. The anisometropic presbyope. British Journal of Physiological Optics. 1961;18(1):174-180.
8. Coates WR. AA in South Africa. *British Journal of Physiological Optics*. 1995;12(1):76-81.
9. Crofts M.A, Glasser A and Kaufman PL. accommodation and Presbyopia. *International Ophthalmology Clinics*. 2001;41(2):33-46. Doi: 10.1097/00004397-200104000-00005.
10. Daum KM. Accomodative dysfunction. Documenta Ophthalmologica. 1983;55(1):177-198.
11. Duane A. Normal values of the AACOM at all ages. The *Journal of the American Medical Association.* 2018;59(1):1010-2003.
12. Dubbel M, Van der Heijde GL, Weeber HA and Vrensen GF. Changes in the internal structure of the human CL with age and AACOM. *Vision Res*. 2003; 43(22):2363-2375.
13. Dubbelman M, Van der Heijde GL and Weeber HA. Change in the shape of aging human CL with accommodation. *Vision Res*. 2005;45(1):117-132.
14. Emery P. Metabolic changes in malnutrition. *Eye*. 2005;19(1):1029-1034. Doi: 10.1038/sj.eye.6701959.
15. Glasser A. Presbyopia and aging in the CL. *Journal of Vision*. 2003;3(12):22. Doi: 10.1167/3.12.22.
16. Rosenfield, M. (1997). ACCOM. In: Zadnik K. The ocular examination, measurements and findings. Philadelphia. 97(1):114-205.
17. Schachar, R.A. (1992). Cause and treatment of Pb with a method for increasing the AA. Ann Ophthalmol. 24(1):445-452.
18. Schachar, R.A. (2006). The mechanism of ACCOM and Pb. Int Ophthalmol Clin. 46(1):39-61.
19. Shum, P.J., Ko, L.S., Ng, C.L. and Lin, S.L. A Biometric Study of Ocular Changes During Accomodation. American Journal of Ophthalmology. 115(1):76-81. Doi: 10.1016/S0002-9394(14)71480-1.
20. Stanila, A. and Popa, D. (2001). Physiology in ACCOM and Pb, clinical and surgical approach. Ophthalmologia. 51(1):8-11.

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