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Original Article

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A Comparative Study of Macular Thickness after Uneventful Phacoemulsification and Small Incision Cataract Surgery Using Spectral Domain Optical Coherence Tomography (OCT) at Tertiary Care Centre in South Gujarat

Nishtha P Patel[1], Priti R Kapadiya[2], Trupti A Bhesaniya[3]

Abstract

Introduction: Cataract contributes to 62.6% overall ocular morbidity and is the main reason of avoidable blindness worldwide. Amongst the complications that follow cataract extraction, CME can occur inspite of utmost care. Optical coherence tomography (OCT) is a non-contact, non-invasive and quantitative imaging modality for assessing macular pathologies like CME. This study assessed the changes in macular thickness after an uneventful SICS and Phacoemulsification surgery. ***Study Design:*** The study was conducted amongst 100 consenting patients who underwent cataract extraction either via SICS or phacoemulsification. They were divided into two groups based on the same. Patients in whom pre-op OCT could be performed, those without any retinal/macular pathology and those had an uneventful cataract surgery were included in the study. Patients with existing macular pathologies, traumatic/pediatric cataract, eventful surgery with intra op use of drugs that could affect the macular thickness were excluded. Patients were examined pre-op and post op at 1 and 3 months. ***Observations and Results***: The changes in mean CMT noted postoperatively at one month and at third month from preoperative mean CMT were statistically significant in both the study groups; however the intergroup difference was not statistically significant. ***Conclusion*:** There is subclinical increase in macular thickness at 1 month postoperative period which resolves by 3 month postoperative period in both the groups (phacoemulsification and SICS) after uneventful cataract surgery. Increase in subclinical macular thickness has no effect on BCVA.

Keywords: SICS; Phaco; OCT; CME**.**

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Introduction

Cataract contributes to 62.6% overall ocular morbidity[1] and is the main reason of avoidable blindness worldwide.[2] Meticulous pre-operative, intra-operative and post-operative care can avoid most of the blinding complications such as cystoid macular edema (CME), secondary glaucomatous optic atrophy, retinal detachment, endopthalmitis, and expulsivehaemorrhage.[3]

Amongst these problems CME may occur inspite of utmost care where the inflammatory process appears to be the main causal factor for the edema. There is a formation of the fluid-filled cystoid spaces between the outer plexiform and inner nuclear layers of the retina, resulting from disruption of the blood-retinal barrier.[4] Even though the specific etiology is not fully understood, major risk factors remain surgical complications such as operative loss of vitreous, posterior capsular rent, previous retinal diseases, diabetes, uveitis and use of the

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prostaglandin drops.[5] These triggering agents cause diffusion of prostaglandin and other inflammatory mediators into vitreous cavity which induces a cascade of inflammatory events with subsequent rupture of blood retinal barrier and CME in some patients.[6]

CME can occur as early as 15 days to 9 months.[7] In most instances macular edema is transient and vision recovers rapidly as the process subsides. Subclinical increase in macular thickness is observed postoperatively due to inflammatory insult of the surgery releasing prostaglandins.[8] However, in significant number of patients the morbidity persists for a much longer period. It presents as a significant reduction in visual acuity.

Phacoemulsification is the preferred surgical technique worldwide. Small incision cataract surgery (SICS) is gaining popularity in the developing world where bulk surgeries are performed as it is less expensive, faster and less technology dependent compared to phacoemulsification and has all the advantages of a closed chamber surgery. The main disadvantage of SICS is that it causes more disruption of the blood retinal barrier as compared to phacoemulsification due to large incision size and more iris manipulation.[9,10]

The present study is an attempt to study the changes in macular thickness after an uneventful SICS and Phacoemulsification surgery which will highlight changes in macular thickness according to type of surgery done in relation to various variables.

Aims & Objectives

- To assess macular thickness after uneventful phacoemulsification cataract surgery.
- To assess macular thickness after uneventful SICS cataract surgery.
- To compare macular thickness changes in relation to type of surgery at variable postoperative period.

Materials and Methodology

The comparative prospective study was conducted on 100 patients who underwent uneventful cataract surgery in a tertiary care government hospital in South Gujarat. These patients were examined and investigated thoroughly as per the protocol. Written informed consent for the study was taken prior to enrolment.

All patients who underwent cataract surgery by consultant ophthalmic surgeons performing both SICS and phacoemulsification were taken as study participants.

The patients were divided into two groups as per the surgery performed.

Group 1 Participants operated by phacoemulsification.

Group 2 Participants operated by SICS.

Criteria to put patients under each group depended on the patient's consent for the type of surgery, choice of intraocular lens, affordability when free foldable IOLs were not available in the Government setup and type of cataract.

Inclusion criteria

- Cataract allowing pre-operative OCT to be performed.
- Patients without any retinal or macular pathology.
- Patients who underwent uneventful cataract surgery.

Exclusion criteria

- Patients having any coexisting ocular comorbidities that could affect macular thickness such as ARMD, glaucoma, Diabetic macular edema, Uveitis, Vascular causes (BRVO, CRVO) etc.
- Traumatic cataract, pediatric cataract, eventful cataract surgery, macular scar, macular hole.
- Dense cataract which does not allow OCT.
- Intraoperative use of drugs such as epinephrine, pilocarpine that could affect macular thickness.

Methodology: All patients having cataracts who fulfilled the inclusion criteria were taken in study. Informed written consent was taken from the patient and purpose of the study was explained to the patient after thorough history taken. Patient characteristics such as age, sex, duration of cataract were noted. History of any systemic illness noted. A complete anterior and posterior ocular examination was done for all patients to rule out any other ocular comorbidity.

Pre-operative data collection done as following: Determination of best corrected visual acuity by

illuminated Snellen's chart for 6 meter distance and near vision measured with Roman's near vision chart. Anterior segment examination using slit lamp examination. Dilated anterior segment evaluation for cataract gradation. Dilated Posterior segment examination using direct and indirect ophthalmoscope (Heine), Slit lamp biomicroscopy of the fundus using + 78D lens (Volk). Measurement of intraocular pressure (IOP) by applanation tonometry using Goldmannapplanationtonometre. IOl power calculation using manual keratometry by Bausch and Lomb keratometer and axial length by Appasamy A scan biometry; Baseline macular thickness by spectral domain optical coherence tomography using Topcon's 3D OCT-1 maestro. The 3D macula protocol was used on OCT for macular thickness measurements. It consists of a raster-scan composed of 256×256 (vertical × horizontal) axial scans covering an area of 6×6 mm in the macular region. It reconstructs a false-color topographic image displayed with numeric averages of thickness measurements for each of the 9 map regions within a 6×6 mm area centered on the fovea, as defined by the ETDRS [15]. According to ETDRS map, macula is divided into 9 regions with 3 concentric rings measuring 1 mm (innermost ring), 3 mm (inner ring) and 6 mm in diameter (outer ring) centered on the fovea. The innermost 1 mm ring is the fovea while the 3 mm inner ring and 6 mm outer ring are further divided into four equal regions.Central macular thickness > 250 µm is conidered significant for macular edema.

All patients who participated in the study underwent uneventful cataract surgery by either phacoemulsification or SICS. Balanced salt solution irrigating fluid used in all patients. Patients underwent Phacoemulsification using a 2.8 mm superior or temporal clear corneal incision by stop and chop technique. A foldable intraocular lens was inserted in the capsular bag at the end of surgery. Patients underwent manual small incision cataract surgery using a 6.0 mm superior scleral tunnel incision. A 6.0 mm PMMA single piece rigid intraocular lens was implanted in the bag at the end of surgery.

Post-operative examination at 1 month and 3 months: Determination of best corrected visual acuity by illuminated Snellen's chart for 6 meter distance and near vision measured with Roman's near vision chart. Anterior segment examination using slit lamp examination. Posterior segment examination using direct and indirect ophthalmoscope, 78D. Spectral domain optical coherence tomography.

Statistical Analysis: Data collected and put in excel sheet and were analyzed using SPSS 16.0 software. For the descriptive analysis, the mean, standard deviation, and percentage were used. The t test and Anova test applied for the univariate analysis. A p value <0.05 was considered be statistically significant

Results: In the present study preoperative OCT was done in 100 patients. Out of which 72 patients came for post-operative OCT at one month, later on 8 patients lost for follow up OCT at three months. So for purpose of analysis we have observed 64 patients who underwent uneventful cataract surgery; whose all OCT reports were available. Group 1 includes 31 patients who underwent phacoemulsification and group 2 includes 33 patients who underwent small incision cataract surgery (SICS).

In our study, the mean age of the 31 patients who underwent the phacoemulsification procedure was 57.45 years while the mean age of 33 patients who underwent the SICS procedure was 59.69 years.

In the phacoemulsification group, male (14): female (17) ratio was 1:1.2 while in the SICS group, male (14): females (19) ratio was 1:1.35.

There was variable increase in macular thickness at 1 month postoperative period irrespective of duration of surgery. The difference between increase in macular thickness and duration of surgery was statistically not significant (p value 0.25).

Table 1: Comparison of the preoperative and the postoperative mean central macular thickness (CMT).

Central macular thickness (CMT)	Pre-operative	Post-operative 1 month	Post-operative 3 month	Anova test P value
Minimum	152	157	153	0.0005
Maximum	220	527	232	
Mean	176.07	199.53	177.64	
SD	17.37	59.53	18.73	

There was subclinical increase in CMT at 1 month postoperative period which resolved by 3 month postoperative period, difference being statistically significant (p = 0.0005).

Table 2: Comparison of preoperative and postoperative mean central macular thickness (CMT) according to type of surgery.

Central Macular Thickness (CMT).	Pre-operative	Post-operative 1 month	Post-operative 3 month	P value

Phacoemul-sification	175.87±17.75	201.03±64.1	177.51±20.37	0.02
SICS	176.27±17.29	198.12±55.78	177.75±17.36	0.021

We found increase in subclinical macular thickness at postoperative 1 month and which resolved by 3 month postoperatively which was statistically significant (p value 0.02) in both the groups.

Comparison of CMT at 1 month and 3 month postoperative period between group 1 and group 2 is statistically not significant (t test p value 0.44 and 0.37 respectively).

There were two patients with clinical CME, one in group 1 (phacoemulsification) and other in group 2 (SICS). Clinical CME was observed at post-operative 1 month and resolved by 3 month post-operative after treatment with posterior subtenon injection of triamcinolone.

Table 3: Postoperative BCVA at 1 month and 3 month.

Postoperative BCVA	No of Patients 1 Month (Nos./ Percentage)	No of Patients 3 Month (Nos./ Percentage)
6/36(0.16)	2 (3.1%)	0
6/12 (0.5)	3 (4.68%)	0
6/9 (0.63)	39 (60.9%)	25 (39%)
6/6 (1.0)	20 (31.2%)	39 (60.9%)
Total	64 (100%)	64 (100%)
Mean	0.72±0.21 (decimal) (0.2 LogMAR)	0.85±0.18 (decimal) (0.05 LogMAR)

A statistically significant difference was observed between 1 month and 3 month BCVA (p value 0.0002).

Table 4: Postoperative BCVA according to type of surgery

Post-operative BCVA	No of Patients 1 Month (Nos./Percentage)		No of Patients 3 Month (Nos./Percentage)	
	Phaco	SICS	Phaco	SICS
Jun-36	1(1.56%)	1(1.56%)	0	0
06-Dec	1(1.56%)	2(3.12%)	0	0
06-Sep	17(26.57%)	22(34.37%)	10(15.62%)	15(23.43%)
06-Jun	12(18.75%)	8(12.5%)	21(32.81%)	18(28.12%)
Total	31(48.43%)	33(51.56%)	31(48.43%)	33(51.56%)
Mean	0.75(0.1 LogMAR	0.69(0.2 LogMAR)	0.88(0.05 LogMAR)	0.83(0.1 LogMAR)

Comparison of BCVA at 1 month postoperative period between group 1 and group 2 is statistically not significant (p value 0.39). Comparison of BCVA at 3 month postoperative period between group 1 and group 2 is statistically not significant (p value 0.31).

This is because, uncomplicated SICS surgery has comparable visual outcome to phacoemulsification.

Subclinical increase in macular thickness at postoperative 1 month has no effect on BCVA. Moderate visual impairment seen in 2 cases which were diagnosed as having CME at postoperative one month and treated with subtenon injection triamcinolone acetonide which resolved by postoperative 3 months.

In present study, the mean AMT(Average macular thickness) was 257.21. Post-operatively at 1 month, the mean AMT was 267.85. Post-operatively at 3 month, the mean AMT was 263.7. There is increase in AMT at postoperative 1 month from preoperative AMT and the difference was statistically significant (p value 0.003).

Table 5: Comparison of preoperative and postoperative AMT according to type of surgery.

AMT	Pre-operative	Post-operative 1 month	Post-operative 3 month	ANOVA test P value
Phacoemul-sification(31)	261.18±12.66	269.42±19.70	266.14±11.34	0.009
SICS (33)	253.48±17.26	266.38±12.47	261.88±13.4	0.001

There is increase in AMT from preoperative at 1 month postoperative in both the groups (phacoemulsification and SICS) which gradually resolves by 3 months postoperative and difference is statistically significant.

Comparison of AMT at 1 month and 3 month postoperative period between group 1 and group 2 is statistically not significant (p value 0.12 and 0.36 respectively).

Discussions

In our study, the mean age of the 31 patients who underwent the phacoemulsification procedure was 57.45 years while the mean age of 33 patients who underwent the SICS procedure was 59.69 years.

In Dr. Pragati Garg et al.[11] 2019 study, mean age of the 180 patients who underwent the phacoemulsification and SICS surgery was 58.11±12.16 years with maximum numbers of patients found between 55-65 years of age group which is comparable to our study.

In our study, 64 patients who underwent cataract surgery, the mean pre-operative CMT noted was 176.07 µ. Post-operatively, at the first month review, the mean CMT was 199.53 µ; while at the

third month review, the mean CMT was 177.64 μ;

There was subclinical increase in CMT at 1 month postoperative period which resolved by 3 month postoperative period, difference being statistically significant (p = 0.0005).

In Md. Kamal Hassan et al.[12] 2018 study, the mean pre-operative macular thickness was 198.67±27.42 μ, at 45 days the mean macular thickness was 221.32±28 .05μ and at 90 days it was 201.32±28.98 μ. This difference was significant statistically.

In our study we found increase in subclinical macular thickness at postoperative 1 month and which resolved by 3 month postoperatively which was statistically significant (p value 0.02) in both the groups phacoemulsification and SICS.

Comparison of CMT at 1 month and 3 month postoperative period between group 1 and group 2 is statistically not significant (t test p value 0.44 and 0.37 respectively).

There were two patients with clinical CME, one in group 1 (phacoemulsification) and other in group 2 (SICS). Clinical CME was observed at post-operative 1 month and resolved by 3 month post-operative after treatment with posterior subtenon injection of triamcinolone.

In Charu Chaudhary et al.[13] 2014 studyobserved that an increase in foveal thickness was detected from the first postoperative day with a peak at 1 week, which was maintained until 1 month and then decreasing to almost the preoperative values at 3 month postoperatively in both the groups. Comparison between group I and group II revealed that foveal thickness of group I was higher than group II at all the post-operative visits, which was not statistically significant at any of the visit. There were two patients with clinical CME in group I and one patient in group II. Thickness and cystoid spaces gradually decreased at 1 month and reached to normal values by 3 months postoperatively in all the patients.

In Md. Kamal Hassan et al.[12] 2018 study observed a higher value of macular thickness in SICS group on 45th day follow up as compared to PHACO group. Macular thickness difference between PHACO and SICS found to be highest on 45th day of follow up with statistical significant (p = 0.001).The values resolved to near normal during the final follow up at 180th day with a value of 194.74±29.05 in SICS and 190.26±26.58 in PHACO group.

In our study, the mean post-operative best corrected visual acuity at 1 month was 0.72±0.21 (decimal) (approximately 6/9, 0.2 logMAR) and at 3 month was 0.85±0.18 (decimal) (approximately 6/6, 0.05 logMAR). A statistically significant difference was observed between 1 month and 3 month BCVA (p value 0.0002). (Moderate visual impairment seen in 2 cases which were diagnosed as having CME at postoperative one month and treated with subtenon injection triamcinolone acetonide which resolved by postoperative 3 months)

In Supriya Dhar et al.[14] 2019 study, best corrected visual acuity (BCVA) at four, eight, and twelve weeks after uncomplicated cataract surgery was 0.1 logMAR, 0.05 logMAR and 0.01 logMAR respectively. A statistically significant difference was observed between BCVA at day (28 v/s 56) and (28 v/s 84) respectively. However, there was no significant difference between BCVA at day (56 v/s 84).

In Dr. Pragati Garg et al.[11] 2019 study, the mean post-operative best corrected visual acuity at 1 month was 0.28 logMAR and post-operative best corrected visual acuity at 3 month was 0.15 logMAR.

In the present study, 31 patients who underwent PHACO, the mean postoperative best corrected visual acuity at one month was 0.75 decimal (approximately 6/9, 0.1 LogMAR) and at the third month was 0.88 decimal (approximately 6/6, 0.05 LogMAR). While in the 33 patients who underwent SICS, the mean postoperative visual acuity at one month was 0.69 decimal (approximately 6/9, 0.2 LogMAR) and at the third month was 0.83 decimal (approximately 6/6, 0.1 LogMAR). A statistically significant difference was observed between 1 month and 3 month BCVA in both the groups; phacoemulsification (p value 0.0009) and SICS (p value 0.003).

Comparison of BCVA at 1 month postoperative period between group 1 and group 2 is statistically not significant (p value 0.39). Comparison of BCVA at 3 month postoperative period between group 1 and group 2 is statistically not significant (p value 0.31).

This is because, uncomplicated SICS surgery has comparable visual outcome to phacoemulsification.

In Charu Chaudhary et al.[13] 2014 study, observed that the mean postoperative best corrected visual acuity at post-operative day one, 1 and 3 months in group 1 SICS was 0.04, 0.00, and 0.05 logMAR respectively. Similar results were found in group II phaco at day one, 1 and 3 months was 0.10, 0.03, 0.03 logMAR respectively which was statistically not significant.

In Dr. Pragati Garg et al.[11] 2019 study, observed that the mean postoperative best corrected visual acuity of PHACO at one month was 0.30±0.26 logMAR and at the third month was 0.17±0.24 logMAR. While in SICS at one month was 0.26±0.22 logMAR and at the third month was 0.13±0.20 logMAR which was statistically not significant.

In our study, the mean AMT was 257.21. Post-operatively at 1 month, the mean AMT was 267.85. Post-operatively at 3 month, the mean AMT was 263.7. There is increase in AMT at postoperative 1 month from preoperative AMT and the difference was statistically significant (p value 0.003).

In study of Dr. Pragati Garg et al.[11] 2019 observed that the percentage change in average macular thickness between the first postoperative day and fourth week postoperatively and also between 1st postoperative day and twelve week postoperatively, was statistically significant with p-value <0.001 and P= 0.010 respectively.

However patients who participated in the study were not compliant for frequent follow up of OCT. Study results emphasize the need to investigate further with a larger sample size and longer duration of follow up necessary for further analysis of change in postoperative macular thickness in uneventful cataract surgery.

Conclusion

There is subclinical increase in macular thickness at 1 month postoperative period which resolves by 3 month postoperative period in both the groups (phacoemulsification and SICS) after uneventful cataract surgery.

However increase in subclinical macular thickness has no effect on BCVA.

Clinically pseudophakic cystoid macular edema is seen in 2 patients (3%) in our study which suggests that in uneventful cataract surgery there are less chances of development of cystoid macular edema.

Variables like age, sex, duration of surgery, type of surgery has not been proved statistically significant difference in our study.

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Original Article

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Comparison of Endothelial Cell Density in Psedoexfoliation Syndrome and Pseudoexfoliation Glaucoma

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Abstract

Purpose: Evaluation of endothelial cell density (ECD) in patients of pseudoexfoliation (PEX) syndrome with glaucoma (PEXG) and without glaucoma using specular microscopy. ***Material and methods:*** The study included 142 patients (236 eyes). In this group of patient we identified 166 eyes with PEX syndrome (80 with glaucoma, 86 without glaucoma) and 70 eyes without PEX syndrome. ECD was measured in each eye by specular microscopy. ***Results:*** ECD in eyes with PEX syndrome without glaucoma (2286 ± 348 cells/mm²) and in eyes with PEXG (2237 ± 353 cells/mm²) was lower than in the control group (2513 ± 265 cells/mm²) ($P < 0.001$). ***Conclusion:*** This research shows that in eyes with PEX syndrome, both with and without glaucoma, ECD was statistically significantly lower than in the control group.

Keywords: Psedoexfoliation syndrome; Pseudoexfoliation glaucoma; Endothelial cell density; Specular microscope.

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Introduction

Pseudoexfoliation (PEX) syndrome is an age-related systemic disorder with strong genetic predisposition.[1-3] It is characterized by formation and deposition of abnormal extracellular grey white dandruff like material in tissues most commonly in anterior chamber of the eye.[4] The material is classically found on the corneal endothelium, anterior lens surface, iris, trabecular meshwork, zonules and ciliary body.[2,5,6] This can lead to many pathological conditions of the eye like corneal endothelial decompensation, secondary open angle glaucoma, zonular weakness resulting in phacodonesis, lens dislocation, capsule rupture and vitreous release during cataract surgery and poor pupillary dilation.[7]

The corneal endothelium is made up of single layer of hexagonal cells without regeneration ability. Its function is to maintain the hydration of the cornea. The normal density in adults is approximately 2500 cells/mm² and it is reduced by 0.6% per year. When the density is reduced to approximately 800 cells/mm², it can lead corneal decompensation causing corneal edema.[8]

This study was aimed to asses corneal endothelial cell density in patients of PEX syndrome with and without glaucoma using specular microscope.

Material and Methods

Total 236 eyes of 142 patients were examined for PEX syndrome who came to the Department of Ophthalmology, S. N. Medical College & HSK

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Hospital, Bagalkot. This prospective study was done during the period of 1.5 years from November 2019 to April 2021. Patients with history of previous ocular surgery, glaucoma without PEX syndrome, history of ocular trauma and corneal pathology were excluded from the present study.

The study was approved by the ethical committee in accordance with ethical standards laid down in 1964 Declaration of Helsinki. Informed consent forms were signed by all the patients included in this study.

Sample size Estimation

Sample size estimation was done using Open EPi Software Version 2.3.1.

At 95% confidence level, and 80% power of the study α(two-tailed) = 0.050 and at 95% confidence level. β= 0.200 and 80% of power of the study Where Zα=standard table value for 95% CI=1.96

Z1-β=Standard table value for 80% Power=0.84 Based on previous study,etal, Mean CCT in PEX Group=529.7±30.3

Mean CCT in PEXG Group=508.2±32.6

Sample size is calculated using the formula, $n=2(Z\alpha+Z1-\beta)^2\sigma^2/d^2$

Sample size estimated is 44 which is rounded off to 50 patients in PEX and 50 in PEXG group.

The patients were divided into three groups: group PEX, which included 48 patients of PEX syndrome without glaucoma (86 eyes—47 corneas in 27 men and 39 corneas in 21 women), group PEXG, which included 43 patients with PEXG (80 eyes—42 corneas in 23 men and 38 corneas in 20 women), and group CNT, which included 51 patients without coexisting PEX syndrome (70 eyes- 41 corneas in 29 men and 29 corneas in 22 women).

PEX syndrome patients were diagnosed on the basis of sign seen during slit lamp biomicroscope examination. Patients with cup:disc ratio >0.5, intraocular pressure >21mm Hg and visual field defects were included in PEXG group excluding previous diagnosis and treatment of PEXG glaucoma.

All patients underwent complete eye examination which included visual acuity evaluation for distance and near vision using Snellen's chart, IOP measurement using Goldmann applanation tonometry, anterior segment examination using slit lamp biomicroscope, visual field analysis using Octopus perimetry and fundus examination using volk 90 D aspheric lens. B-scan was done in the patients with severe media opacity.

ECD was assessed in all patients using specular microscopy Topcon SP-3000 P in automatic mode. For getting accurate measurement of ECD, 60 adjacent cells were selected manually of a 0.5×0.25 mm section of endothelial surface. Three readings were taken in each eye and average ECD value were taken for further calculations.

Fig. 1: Specular photomicrograph from Topcon SP-3000P specular microscope. CD: cell density.

Plan for statistical analysis of the study

Statistical analysis will be done using SPSS software 19.0. Data obtained will be tabulated in the Excel sheet and will be analysed. Quantitative data will be expressed as mean ± standard deviation and nonparametric data will be expressed as median and min-max values. Percentages are used for representing qualitative data. Chi-square test for proportions in qualitative data. Student t test for quantitative data will be used Other appropriate statistical tests will be applied. P<0.05will be considered statistically significant.

Result

In this study as shown (table 1), PEX group consists of 48 patients out of which 27 were male and 21 were female (figure 2), the mean age was 72.37±6.12. PEXG group consists of 43 patients out of which 23 were male and 20 were female (figure 3) with mean age of 75.64±7.45. CNT group consists of 51 patients out of which 29 were male and 22 were female (figure 4) with mean age of 73.52±6.98.

Table 1: Patients demographics

Groups	Number of patients		Age, Y (Mean ± SD)
		M-27	M-73.48 ± 5.58
PEX	48		72.37± 6.12
		F-21	F-71.23 ± 6.42
		M-23	M-76.32 ± 6.72
PEXG	43		75.64 ± 7.45
		F-20	F-74.87 ± 8.25
		M-29	M-71.65 ± 6.59
CNT	51		73.52 ± 6.98
		F-22	F-76.36 ± 7.38

CNT: control group; PEX: pseudoexfoliation syndrome group; PEXG: pseudoexfoliation glaucoma group; F: female; M: male.

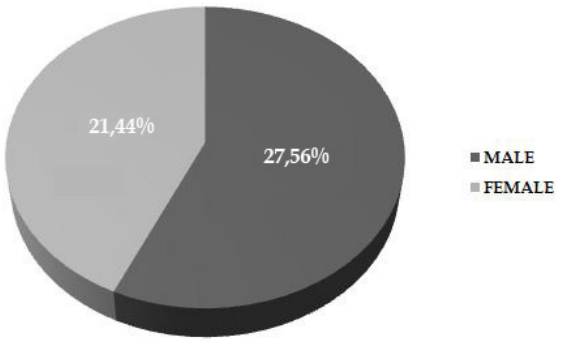

Fig. 2: PEX (pseudoexfoliation group).

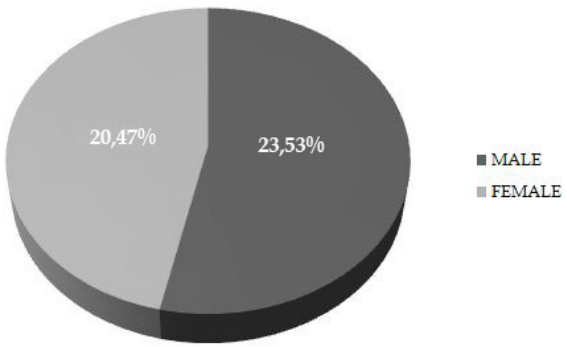

Fig. 3: PEXG (pseudoexfoliation glaucoma group).

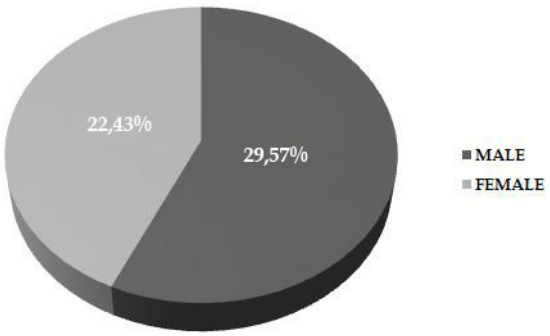

Fig. 4: CNT (control group).

In PEX group (Figure 5), ECD (2286 ± 348 cells/mm²) was low as compare to CNT group (2513 ± 265 cells/mm²) with statistical significance at P = 0.0009. In PEXG group, ECD (2237 ± 353 cells/mm²) was low as compare to CNT group with statistical significance at P = 0.000006. The difference between group PEX and PEXG was not statistically significant with P = 0.72 (table 2).

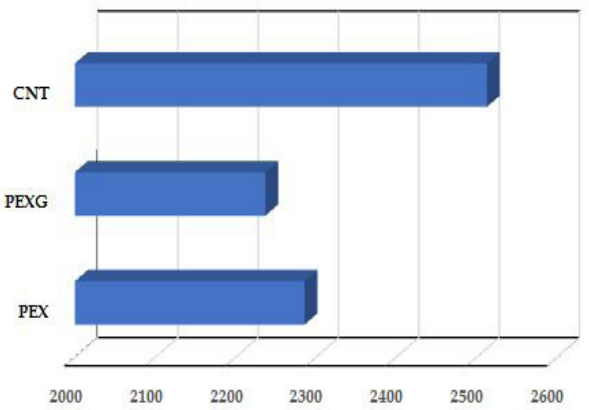

Fig. 5: Evaluation of cell density (ECD) in groups of patients with pseudoexfoliation syndrome (PEX), pseudoxfoliation glaucoma (PEXG) and control group(CNT).

Table 2: Summary of results.

Groups	ECD (cells/mm²)	p
PEX versus CNT	2286 ± 348 versus 2513 ± 265	0.0009
PEXG versus CNT	2237 ± 353 versus 2513 ± 265	0.000006
PEX versus PEXG	2286 ± 348 versus 2237 ± 353	0.72

CNT: control group; PEX: pseudoexfoliation syndrome group; PEXG: pseudoexfoliation glaucoma group; ECD: endothelial cell density.

Discussion

Specular microscopy was used in this study to compare ECD in patients with PEX syndrome, with PEXG and in CNT group. Results demonstrated that PEXG group showed the lowest cell density of endothelium (2237 ± 353 cells/ mm²). PEX group without glaucoma showed endothelial cell density slightly higher than PEXG group (2286 ± 348 cells/mm²). Highest endothelial cell density was seen in CNT group (2513 ± 265 cells/mm²).

Research done by Inoue et.al, Seitz et. al and Wang et.al shows that ECD of PEX group without glaucoma was lower than that of CNT group which is similar to present study.[9,10,11] (Table 3). Wali et. al studied ECD in PEX group without glaucoma and PEXG group whose results were similar to present study.[12]

Table 3: Result summary of research comparing endothelial cell density (ECD) of patient with PEX syndrome to the ECD of people without PEX syndrome and PEX to PEXG.

Authors	ECD PEX versus ECD CNT (cells/ mm²)	p	ECD PEX versus ECD PEXG (cells/mm²)	p
Inoue et.al[9]	2336 ±383 versus 2632 ± 327	0.003	2337 ± 407 versus 2332± 336	0.98
Seitz et.al[10]	2052 ± 264 versus 2372 ± 276	<0.001	2214 ± 251 versus 2014 ± 254	0.08
Wang et.al[11]	2298 ± 239 versus 2652 ± 18	0.026	2505 ± 284 versus 2186 ± 2	0.278

Present study shows that PEX syndrome with and without glaucoma significantly reduces ECD. Pseudoexfoliation material is responsible for the reduction of ECD which settles on endothelium and later on penetrates into descemets membrane causing breakage of connection between endothelial cells resulting in accelerated apoptosis. Other factors responsible for decrease in ECD were anterior chamber hypoxia, raised level of TGF-α1 and endothelial fibroblast changes.[3,13] Occurrence of glaucoma further accelerates the damage of endothelial cells. When ECD reduced to <800 cells/ mm² it causes corneal decompensation leading to corneal oedema resulting in loss of translucency.[14] Patients having ECD <2000 cells/mm² are considered to be high risk patients.[15] ECD loss after intraocular surgery fluctuates between 6% and 19% one year from the date of procedure.[8,16,17,18] To reduce this loss dispersive and adaptive viscoelastic substance should be used to maintain proper anterior chamber depth and to prevent instrument contact with endothelium.

Limitations of the present study:

- The severity of PEX was not accessed.
- Morphological analysis of corneal endothelial cells was not performed.
- Central corneal thickness was not compared in different groups.

Conclusion

ECD in PEX syndrome with and without glaucoma was statistically significantly lower than control group which may increase the risk of corneal decompensation after intraocular surgery. Difference of ECD in PEX and PEXG group was statistically insignificant.

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Conflicts of interest: There are no conflicts of interest.

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Case Report

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Isolated Medial Rectus Palsy: Two Case Reports

J Lakshmi Sindhura[1], L R Murthy[2], G Harika[3], K Navatha[4]

Abstract

Isolated medial rectus palsy in an otherwise healthy person is a very rare entity. It can be due to viral infections, orbital myositis, orbital cysticercosis or due to small fine infarcts in midbrain involving lateral subnuclei of the midbrain.These are the two case reports,one otherwise young adult female presented with sudden onset of blurring vision with diplopia,abnormal head posture and pain with deviation of left eye and other a congenital case of 3 year female child patient with deviation of left eye and abnormal head posture.Typical or atypical inter nuclear ophthalmoplegia should be ruled out after thorough clinical evaluation before making a diagnosis of isolated medial rectus palsy.Isolated medial rectus palsy in an young patient may be masking a systemic disorder and needs to be evaluated thoughrily.

Keywords: Isolated medial rectus palsy; Mid-brain infarct; Medial longitudinal fasciculus; Internuclear ophthalmoplegia; Ocular tilt reaction.

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Introduction

Any kind of extra-ocular muscle palsy can be a sign of serious neurological illness which can be commonly associated with systemic illness like Hypertension, Diabetes mellitus, hypercholesterolemia and cardiac illness etc.[1,2]

Isolated medial rectus muscle palsy is all the more rare entity in an otherwise healthy young adult and needs detailed evaluation and systemic investigation to elicit the cause.Very few cases of isolated medial rectus muscle palsy have been reported to the best of our knowledge[1,3-6]. Most of the cases reported either had other signs of third nerve palsy or neurological signs suggestive of central nervous system pathology. We report two cases,one a case of healthy adult female who presented with acute and sudden onset of blurred vision, diplopia,pain,deviation of left eye and abnormal head posture and the other as a congenital case of a 3 year old female child with deviation of left eye and abnormal head posture from birth. Thourough clinical evaluation and systemic investigation undertaken in both the cases. Our cases are unique in terms of presenting symptoms, absence of systemic neurological signs and documented neuroimaging like MRI.

Case report 1

A 24 year old otherwise healthy female presented in OPD with complaints of sudden blurring vision in left eye, diplopia, deviation of left eye, pain, headache and abnormal head posture since 5 days. She experienced the same after waking up in the morning 5 days ago. It was associated with double vision in right lateral gaze and abnormal head posture with face turn to the right side and mild head tilt to the left side. She also complained of episodic headache and pain in and around

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the left eye mild to moderate grade, since 5 days that was intermittent. No history of fever,trauma, convulsions and no other systemic complaints. Both eyes visual acuity 6/6 and near vision N5 and colour vision normal. Ocular movements show restriction of adduction in left eye on dextroversion (Fig. 1, Fig. 2 & Fig. 3).

Krimsky's and Hirschberg's corneal reflex test shows 15 degrees Exotropia in left eye. Ocular motility shows restriction of adduction on dextroversion. Ocular motility in rest of cardinal positions appears to be full and painless. There were no saccades of left eye on adduction. There appears to be no abducting nystagmus in right eye. Forced duction test was negative in left eye. Diplopia charting and Hess screening show left medial rectus palsy.Anterior segment and pupils of BE, are normal. Fundus of both eyes was normal with optic disc normal and no evidence of papilloedema. Rest of cranial nerves normal and no other systemic neurological deficits. Patient was referred to the Neurophysician and he opines as partial 3rd nerve palsy left eye. Routine Haemotological examinations like Hb%, TLC, DLC, PLT, HS CRP, ESR, RBS, VDRL, HIV, HCV, HBS Ag, Mantoux test and chest X- ray with in normal limits. MRI showed small foci of diffusion restriction and FLAIR weighted hyperintensities in the mid brain in the median and paramedian region anterior to aqueduct[7].

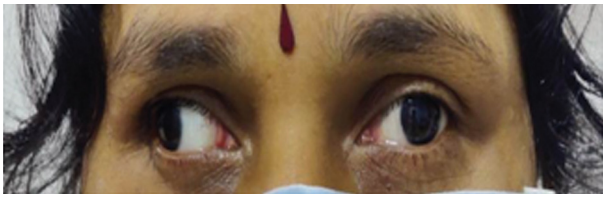

Fig 1: Dextroversion.

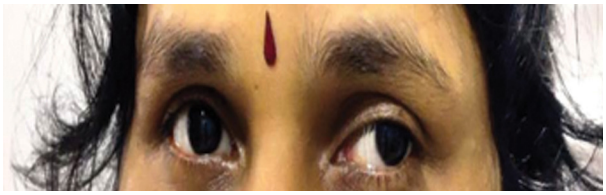

Fig 2: Primary Position.

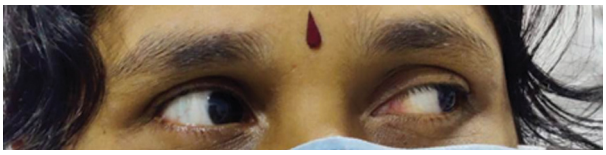

Fig 3: Laevoversion.

Basing on the above findings a diagnosis of acute isolated medial rectus palsy was made in left eye. It may be due to fine localized infarcts at the level of medial rectus nucleus of 3rd nerve nucleus complex or it can be due to a typical internuclear ophthalmoplegia due to fine infarcts involving medial longitudinal fasciculus region (MLF). MLF infarcts are more common as its blood supply show watershed zones unlike in medial rectus nucleus region.

Patient was put on antiplatelet therapy of acetyl salicylic acid 75 mg per day, Calcium and vitamin–D supplements and other supportive therapy. 3 weeks later there was partial recovery of adduction in left eye.

Case report 2

A female child of 3 years was brought to our OPD with a history of deviation of left eye and abnormal head posture with head tilt since birth. History of consanguineous marriage in parents present. First two children died due to congenital cardiac problems. The child is otherwise normal with normal milestones of development. Full term normal delivery. No history of fever, birth trauma or any systemic problem. Paediatric examination shows no other systemic problem. On examination constant head posture with face turn to right side and head tilt to left side. Ocular movements show limitation of left eye on dextroversion and abducting nystagmus in right eye. Absence of convergence in left eye. Hirschberg's test and Krimsky's prism test shows 20 degrees Exotropia in left eye. Visual acuity both eyes not cooperative. Anterior segment examination with in normal limits.pupils normal in size reacting to light. Fundus examination is normal with normal optic disc. Routine blood examination and chest X-ray with in normal limits. MRI shows no abnormality.

Patient was put on supportive therapy. The condition remains the same after 2 months when patient came for review. There may be subtle developmental anomaly of medial longitudinal fasciculus or medial rectus sub nucleus which refuses to improve.

Discussion

Extra ocular muscle palsy can be a sign of serious neurological desease which may be associated with systemic illness like hypertension, diabetes mellitus, hypercholesterolemia and cardiac illness etc.

Isolated medial rectus palsy in an otherwise healthy young adult needs detailed evaluation and systemic investigation to find out the cause. Very few cases of isolated medial rectus palsy have been reported

so far. Morya et all[8], reported the presumed cause to be due to small fine infarctions involving medial rectus sub nucleus of 3rd nerve in the mid-brain. The 3rd nerve nucleus is supplied by paramedian branches from basilar artery and proximal branches from posterior cerebral arteries with no watershed zones between neighbouring subnuclei where as medial longitudinal fasciculus responsible for internuclear ophthalmoplegia (INO) is supplied by end arteries from basilar artery, the latter being more prone for ischaemia,being end arteries. MLF is lying just ventro-lateral to medial rectus sub nucleus of 3rd cranial nerve and can be affected anywhere till rostral interstitial nucleus of Cajal[9]. The two frequently encountered aspects of INO, absent or weak convergence and accompanying ocular tilt reaction (OTR). or skew deviation due to involvement of otolithic pathways can be missed or over looked[9,10]. The patient with OTR may neither report vertical diplopia nor conjugate tortion and head tilt adopted maybe subtle and easily missed. An isolated/non isolated unilateral INO is prone to be misdiagnosed as isolated nuclear medial rectus palsy and such a diagnosis can be made after far more common INO has been ruled out by appropriate evaluation for convergence and OTR. Ischemic INO may not be MRI positive and may resolve spontaneously in one or two months.

Conclusion

INO should be thoroughly evaluated for and ruled out before making a diagnosis of isolated medial rectus palsy by appropriate testing for convergence, OTR and abduction nystagmus in the other eye.

MLF is more prone for ischemic damage than medial rectus subnucleus.

Ischemic INO may not be MRI positive and may resolve spontaneously and hence can be put on antiplatlet therapy and other supportive therapy only, instead of more problematic steroid therapy.

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