Visual and Anatomical Outcomes Following Idiopathic Macular Epiretinal Membrane Surgery
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ABSTRACT
Objective: To assess the visual and anatomical outcomes following idiopathic macular epiretinal membrane (IERM) surgery.
Study Design: Case series.
Place and Duration of Study: Layton Rehmatulla Benevolent Trust (L.R.B.T), Free Base Eye Hospital, Karachi, from January 2015 to June 2016.
Methodology: Thirty eyes of thirty patients affected with idiopathic macular epiretinal membrane stage 2 were enrolled in this study. They subsequently underwent 23-gauge pars plana vitrectomy (PPV) with epiretinal membrane removal without internal limiting membrane peeling. The visual outcome was measured as improvement in best corrected visual acuity (BCVA) of at least two or more lines on ETDRS chart as compared to preoperative BCVA. The anatomical outcome was measured as decrease in foveal thickness on Spectral Domain-Optical Coherence Tomography (SD-OCT). Patients were followed for a period of 06 months.
Results: At the end of follow-ups, 23 (76%) eyes out of 30 gained 2 or more lines of vision. In 05 (16%) eyes, BCVA remained same and only 02 (6.6%) eyes showed worsening of vision. Mean preoperative foveal thickness was 392 ±20 µm, whereas mean postoperative thickness was 305 ±16 µm with an average decrease of 87 µm, in foveal thickness. Recurrence of ERM was found to be the most frequent complication.
Conclusion: IERM surgery is a safe procedure and beneficial in achieving significant visual acuity improvement and anatomical recovery in the majority of cases.


INTRODUCTION
Idiopathic epiretinal membrane (IERM) is one of the most common disorders presenting to a vitreoretinal specialist. The prevalence of ERM in the general population is estimated to be approximately 6 to 7%, increasing markedly with age. Specifically, according to epidemiologic studies, the prevalence of ERM formation is increasing from 2% under the age of 60 years to 12 to 20% beyond the age of 70, while it is bilateral in 10 to 30% of cases. ERM is a avascular, fibro cellular membranes that proliferate on the surface of the retina. The source of the cells producing these membranes has been the source of great debate. Earlier reports proposed that ERM could develop when glial cells (primarily fibrous astrocytes) from the inner layers of the neurosensory retina proliferated through breaks in the internal limiting membrane (ILM) produced after a posterior vitreous detachment (PVD). Recent reports states that incomplete PVD with residual attachment to vitreomacular interface caused fibrocellular proliferation between the inner surface of the retinal and posterior surface of the vitreous, resulting in ERM formation with increased vitreoretinal adhesion.

Clinically, significant ERM ranges from dense opaque tissues to fine transparent membranes. Proliferation and contraction of ERM can cause tangential traction with retinal changes like thickening of retinal layers, surface wrinkling, distortion of the blood vessels, and macular cystic changes. These changes can lead to decreased visual acuity and subjective visual symptoms such as central blurring, metamorphopsia, micropsia, macropsia, and monocular diplopia. These symptoms may interfere with binocular vision and constitute an important visual functional deficit in daily activities, therefore necessitating surgical intervention.

Optical coherence tomography (OCT) can elucidate the presence or absence of an ERM; and objectively measure other effects of the ERM on the retina, such as macular thickening, presence or absence of macular edema (e.g. cystoid macular edema), and any associated vitreous traction on the retina. It also allows the monitoring of the postoperative return of the normal retinal architecture as well as the presence of persistent traction or folds of the retina.

Surgical treatment of ERM is not an emergent procedure. Surgery is recommended if the blurred vision or the distortions are severe enough to interfere with
binocular vision or daily living. Three port pars plana vitrectomy with epiretinal membrane peeling has been found to be effective in removing ERM from the macula, improving the visual acuity and decreasing metamorphopsia.8
The purpose of this study was to evaluate the functional and anatomical outcomes of ERM removal.

METHODOLOGY
This study was carried out at the Layton Rahmatulla Benevolent Trust (L.R.B.T), Free Base Eye Hospital, Karachi, from January 2015 to June 2016. The study was approved by Hospital Ethical Review Committee and informed consent was taken from all the included patients. Thirty eyes of thirty patients older than 60 years of age and of either gender were enrolled in this study.
The inclusion criteria were IERM diagnosed on slit lamp biomicroscopy and documented by SD-OCT; visual acuity less than LogMAR 0.4; presence of metamorphopsia judged on the basis of subjective symptoms and tested with the Amsler grid chart; macular thickness >250um as measured by SD-OCT; minimum of six months postoperative follow-up and age 60 years or above. The exclusion criteria were other types of epiretinal membranes (like traumatic ERM, ERM associated with retinal tears, pseudohole type ERM); previous vitreoretinal surgery; corneal opacities; additional ocular comorbidity like glaucoma; and concomitant or previous retinal vascular diseases.
All vitreoretinal surgeries were performed by the same experienced surgeon (SFR), who used the technique of standard three-port pars plana vitrectomy. Standard 23-gauge instruments (ALCON-CONSTELLATION) were used. A core vitrectomy was performed, followed by posterior vitreous detachment, completion of vitrectomy, if it was not already present. ERM was elevated with end-gripping forcep and peeled in a circumferential manner with end-gripping forceps. Internal tamponade and posturing was not needed after surgery. Topical antibiotics and steroids were given for six weeks postoperatively.
Patients were followed on the first postoperative day and first postoperative week for early postoperative complications and then were followed after three and six months. Visual acuity was assessed using ETDRS charts and recorded as LogMAR unit. Final corrected visual acuity was assessed at the end of 6 months. Macular thickness was also recorded at one, three, and six months by using SD-OCT (HEIDELBERG OCT).
The statistical analysis of the data was done by the software Statistical Package for Social Sciences (SPSS) version 17. Mean and standard deviation were calculated for quantitative variable like age of the patients, and macular thickness. Median with interquartile ranges were computed for visual acuity due to nonparametric data. Kolmogorov smirnov test was used to check normality of data, only BCVA was not followed normality assumption. Frequency and percentage were calculated for gender and complications of IERM surgery. Paired T-test was run to compare difference between baseline and final data and Wilcoxon sign test for nonparametric data (BCVA). A p-value ≤ 0.05 was considered statistically significant.

RESULTS
A total of 30 eyes of 30 patients with idiopathic epiretinal membrane were included in this study. Out of 30 patients, 17 (56.6%) were females and 13 (43.3%) were males with an average age of 72 ±5 years (61 to 84 years). The right eye was affected in 12 (40%) cases and the left eye in 18 (60%) cases. All the eyes had received 23-guage PPV surgery with no preoperative and intraoperative complications.
In the follow-up period, 21 (70%) eyes showed cataract progression at an average time of 3 months after the PPV. All of them were treated surgically by phacoemulsification with implantation of posterior chamber intraocular lens.
At the end of the follow-up period, BCVA was improved in 23 patients (76.7%), stable in 5 patients (16.7%), and decreased in 2 patients (6.7%). Median (IQR) preoperative BCVA was logMAR 0.4 (.22), whereas median (IQR) postoperative BCVA was logMAR.185 (0.30) with significant p-value (0.001, Z=-3.321, Wilcoxon sign test).
Mean preoperative foveal thickness was 392 ±20 µm with disappearance of the foveal pit, whereas mean postoperative thickness was 305 ±16 µm (decrease in foveal thickness of 87 µm on average). The foveal pit reappeared in 17 (56.6%) eyes. There was a significant difference (p<0.001, t=31.974) in the reduction of central foveal thickness and improvement of visual acuity (Table I). In no case after the surgery did retinal thickness increase, comparing to that before the surgery.
Recurrence of ERM was found to be the most frequent complication that occurred in 4 (13.3%) patients. These recurrences did not affect vision and none of the patient underwent repeat PPV for this.
Regarding postoperative complications, retinal detachment occurred in one (3.3%) eye after one month of surgery because of an iatrogenic retinal tear formation. Patient underwent a repeat PPV with internal tamponade with no improvement in visual acuity. Cystoid macular edema also occurred in one (3.3%) eye because of incomplete PVD, causing persistent vitreomacular adhesion.
There were no severe complications such as postoperative endophthalmitis, inflammation, hypotony or vitreous hemorrhage.
Visual and anatomical outcomes following idiopathic macular epiretinal membrane surgery

DISCUSSION

IERM is a slowly progressive disease and can lead to significant visual impairment when located at the central retina.9 Surgery for macular pucker allows the recovery of approximately one-half of the visual acuity that had been lost. Complete recovery of vision is rare in patients with longstanding ERMs and retinal thickness; and the macular profile rarely returns to normal. Thus, early surgery is likely to decrease the risk of developing irreversible macular damage.10 Recent advances in vitreoretinal surgery have greatly improved the safety and efficacy of microsurgical intervention at the retinal surface level. Today, vitrectomy and membrane peels are considered the treatment of choice for most patients with ERMs that create significant visual symptoms.8

In this study, 30 phakic eyes of 30 patients who presented with clinically and visually significant ERM underwent 23-gauge pars plana vitrectomy for ERM removal. They were followed up to 6 months and at the end of follow-up, 23 (76.7%) eyes out of 30 gained 2 or more lines of vision. In 05 (16.7%) eyes, BCVA remained same and only 02 (6.7%) eyes showed worsening of vision. The study carried out by Dawson et al. in 2014 showed improvement of vision in 69.6% of cases, 15.2% of cases showed worsening, and 15.2% of cases showed no change in vision.8 Moisseiev et al. reported an improvement in 65.5% and worsening in 6.9% of patients.11 Another study conducted by Lehpamer showed improvement of visual symptoms in 73% of patients.12

In this study, the eyes with poorer preoperative BCVA of LogMAR 1.0 or worse, achieved maximum visual improvement of LogMAR 0.3 or more in the post-operative period. Literature review also reported that visual recovery is greater, if the preoperative visual acuity is lower. Dawson also reported that greatest improvements, in postoperative vision, were in those cases which had poorer preoperative vision.5

OCT measurement of postoperative macular thickness revealed a significant thickness decrease (87 µm on average) in this study and a significant linear relationship was found between the reduction of macular thickness and improvement of visual acuity. Konstantinidis reported that macular thickness decreased for an average of 131 µm at the end of follow-up period.13 Another study conducted by Ondrejkova also showed an average reduction of 140 µm in macular thickness post-operatively.14

Accelerated postoperative cataract formation was seen in 21 (70%) eyes after surgery. Ondrejkova reported that 76.9% of phakic eyes showed cataract progression after surgery.14 Cataract progression may confound the outcome and diminish the postoperative BCVA. The high prevalence of progressive nuclear sclerosis after vitrectomy has led some authors to suggest cataract extraction may be combined with PPV to maximise visual improvement;15 this was not addressed in this study.

In this study, recurrence of ERM was found to be the most frequent complication that occurred in 13.3% of patients in the follow-up period. The reason for these recurrences might be as ERM removal was not combined with internal limiting membrane (ILM) peeling. Kwok reported in his study that 17.6% of the cases, which underwent ERM removal without ILM peeling, showed recurrence of ERM.16

Removal of the ILM during ERM surgery remains controversial. Visual recovery after surgery can also be achieved without combining ILM peeling, as this may cause structural damage to the fovea. Chang reported that ERM removal, combined with ILM peeling, may reduce the incidence of later recurrence.17 On the other hand, Guigou et al. in a recent case report observed that ERM surgery, combined with ILM peeling, can cause functional and anatomical disorders.18 Lee and Kim in a comparative study found that thickening of the macula with loss of the normal foveal contour and mechanical damage to the fovea was more frequent in patients who underwent ERM and ILM peeling than in patients who underwent ERM peeling alone.19

In this study foveal contour reappeared again in 56.6% of the cases on postoperative OCT. Lee and Kim

| Table I: Preoperative and postoperative findings (BCVA and Foveal thickness. |
|----------------|----------------|----------------|----------------|
| Pre-BCVA (logMar) | Post-BCVA (logMar) | p-value |
| Median (IQR)=0.40 (.22) | Median (IQR)=.185 (.30) | 0.001, Z=-3.321 |
| Preop (Foveal thickness) | Postop (Foveal thickness) | p-value |
| Mean ±SD=392 ±20 | Mean ±SD=305±16 | P<0.001, t=31.974 |

Figure 1: Final best corrected visual acuity idiopathic epiretinal membrane surgery at 6th month.

Table I: Preoperative and postoperative findings (BCVA and Foveal thickness.
reported 84.2% of the eyes had a normal foveal contour in non-ILM peeling group.\textsuperscript{19}

In postoperative follow-ups, retinal detachment occurred in one eye (3.3%), after 5 months of surgery. Song reported an incidence of 2.2% of retinal detachment in his study. Another study carried out by Hass reported 1.6% of retinal detachment.\textsuperscript{20}

Mild cystoid macular edema occurred in one (3.3%) eye, on postoperative OCT. Another study conducted by Ondrejkova also showed cystoid macular edema in one (2.2%) eye.\textsuperscript{14}

\section*{CONCLUSION}

For most vitreoretinal surgeons, the surgical procedure for treating ERM is well established. Old age should not hinder surgery in patients who seek to improve their vision and quality of life. Although significant visual improvement and anatomical restoration was detected after IERM removal, full restoration of foveal thickness may not be achieved.

\section*{REFERENCES}


