

To Evaluate the Surgical Outcome of Epiretinal Membrane- Retrospective Study

Mahat Pawan^{1*}, Bajimaya Sanyam², Thapa Raba², Sharma Sanjita², Joshi
Purushottam¹, Paudyal Govinda²

¹Vitreoretina Surgeon, Mechi Eye Hospital, Jhapa, Nepal. ²Vitreoretina Surgeons, Tilganga Institute of Ophthalmology, Kathmandu, Nepal. *Corresponding Author's Email: pawanmahat11@gmail.com

ABSTRACT

The epiretinal membrane (ERM) is a common vitreoretinal intersurface disorder in elderly individuals. The objective of the study was to evaluate the outcome of vitreoretinal surgery in patients with epiretinal membrane. We retrospectively reviewed the medical records of thirteen eyes of 12 patients with ERM with mean age group of 63 ± 6.07 (53 – 73) years who underwent vitreoretinal surgery in Tilganga Institute of Ophthalmology and completed at least 3 month postoperative follow up from April 2018 to March 2019. The patients' pre- and post-operative best corrected visual acuity, slit-lamp examination findings, and optical coherence tomography (OCT) images were evaluated. Three cases were pseudophakic. Out of 10 phakic eyes, 7 had combined surgery and 3 had consecutive surgery (Pars Plana Vitrectomy followed by cataract surgery). The median baseline best corrected visual acuity in Log MAR was 0.7 (0.6-1.00) which improved to 0.30 (0.25-0.60) in 3 month follow up which was statistically significant ($p=0.04$). OCT parameters showed decrease in mean CMT from $411.15 \pm 94.52 \mu\text{m}$ to $318.61 \pm 118.87 \mu\text{m}$ ($p=0.002$). One eye developed inferior retinal detachment at 6 weeks follow up, two eyes had postoperative IOP $>30\text{mmHg}$ which was managed with topical anti-glaucoma medication and two had persistent cystoid macular edema. Pars plana vitrectomy with membrane peeling is safe and effective in restoring visual acuity in patients with ERM. Though the study population was small with short duration of follow up, results are encouraging, so need further prospective large multi-centered study to determine the effectiveness of ERM surgery.

Key words: Central macular thickness, Epiretinal membrane, Visual acuity, Vitreoretinal surgery.

INTRODUCTION

The epiretinal membrane (ERM) is a common vitreoretinal intersurface disorder, presented with semi translucent fibro cellular membrane found on the inner surface of internal limiting membrane (ILM) at the macula (1). The overall prevalence of ERM was 7–11.8%, with a 5-year incidence of 5.3% (2). The prevalence of epiretinal membrane among elderly population in Bhaktapur retina study was 3.66% done by Thapa et al (3). Victor Koh in his Singapore Indian Eye Study showed age-standardized prevalence of ERM to be 7.6% (4). The potential risk factors for the development of ERM includes race, ethnicity, sex, smoking, diabetes, arteriolar narrowing, hypercholesterolemia and age (5,6). The most

consistent risk factor for development of ERM being increasing age. The age distribution shows a peak between the ages of 70 and 79 (11.6%), with ERMs being uncommon before the age of 60 (1.9%) (7).

The clinical presentation of an ERM may varies from completely asymptomatic, diagnosed on routine examination, to metamorphopsia, photopsia, decreased visual acuity (VA), and loss of central vision (1,8).

Based on etiology, ERM can be classified as either idiopathic or secondary. Ocular conditions such as uveitis, trauma, retinal detachment, or retinal vascular diseases can cause secondary ERM formation (9, 10). However, exact pathogenesis of idiopathic ERM not known.

This is an Open Access article distributed under the terms of the Creative Commons Attribution CC BY license (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted reuse, distribution, and reproduction in any medium, provided the original work is properly cited.

(Received 20th February 2022; Accepted 07th March 2022; Published 10th April 2022)

Possible mechanism in these cases may be due to internal limiting membrane disruption during posterior vitreous detachment which allows cells to migrate to the inner surface of the retina or anomalous PVD resulting in vitreoschisis and vitreoretinal traction (9). Vitreoretinal traction induces the production of cytokines, such as basic fibroblast growth factor and nerve growth factor that stimulate the residual vitreous cells to proliferate. Moreover, residual vitreous cells may promote the migration of cells or projection of cell processes through an otherwise intact ILM (9).

The pars plana vitrectomy with membrane peeling has become a well-established surgical procedure for removal of epiretinal membranes with favorable results (8, 11). Primary indication of surgical intervention is worsening visual acuity and metamorphopsia (10). The improvements in surgical techniques and instruments have resulted in better visual outcome along with reduction in complications, expanding indications of ERM surgery. So far no studies have been done in this region showing outcome of ERM surgery. The aim of the study is to evaluate the visual outcome of ERM surgery among Nepalese population who had undergone surgical intervention at Tilganga Institute of Ophthalmology.

METHODS

This retrospective observational study was conducted following approval of Institutional review committee of Tilganga Institute of Ophthalmology, Kathmandu, Nepal on 28th May 2020 (Ref: 12/2020). The study was conducted in accordance with the Declaration of Helsinki.

The medical records of all the consecutive patients who underwent vitreoretinal surgery in Tilganga Institute of Ophthalmology for idiopathic epiretinal membrane from 1st April 2018 to 31st March 2019 and had completed at least 3 month postoperative follow up were retrospectively reviewed. Tilganga Institute of Ophthalmology is a tertiary eye care center located in capital city of Nepal. This institute is one of the referral centers from all over the country. ERM associated with uveitis or trauma or simultaneous retinal detachment, glaucoma, age-related macular degeneration, and myopia of more than 6 diopters, patients with less than 3 month follow

up, ocular surgery apart from cataract surgery were excluded from the study.

Information on demographics, preoperative and postoperative visual acuity (Snellen), intraocular pressure, surgical details, intraoperative and postoperative complications were retrieved and recorded. Optical coherence tomography (OCT) scans (Carl Zeiss Cirrus HD) were reviewed for retinal thickness, presence of cystoid macular edema, and ERM recurrence when available.

Standard 23G, three port transconjunctival pars plana vitrectomy (PPV) was performed. Standard phacoemulsification surgery with intraocular lens implantation was done in cases with significant cataract along with PPV. All surgeries were done using a 23-gauge Constellation R vision system (Alcon; Fort Worth, Texas). During PPV, cut and flow rates were adjusted according to the patient's condition during core vitrectomy and removal of the vitreous base and hyaloid. Following core vitrectomy, posterior hyaloid was removed with aid of 0.1 mL (4 mg) triamcinolone acetonide (Kenacort-A; 40 mg/ mL; Bristol-Myers Squibb, Princeton, NJ, USA), and vitreous base removed. The ILM was stained with use of indo-cyanine green dye and ERM along with ILM peeled from the area between the major vascular arcades with help of Eckardt end gripping microforceps.

Functional success was evaluated based on improvement in BCVA (logMAR) pre- and postoperative. Evaluation of anatomic success was based on pre- and postoperative OCT measurements of central macular thickness (CMT).

STATISTICAL ANALYSIS

The data was collected and entered in Microsoft excel and checked for validity and coded. It was then converted into SPSS 11.5 for further statistical analysis. Data was checked for normal distribution by Kolmogorov-Smirnov test. Descriptive analysis was done by calculating frequency and percentage (for categorical data), while mean and standard deviations were calculated for continuous data.

Wilcoxon nonparametric test was used to compare changes in BCVA and paired t test was used to compare the changes in central macular thickness following ERM surgery at 3 month

postoperative follow up from baseline. A *P* value less than 0.05 was considered statistically significant.

RESULTS

The thirteen eyes of 12 patients who underwent ERM surgery with or without phacoemulsification surgery at Tilganga Institute of Ophthalmology

were enrolled in the study. There were 3 males and 9 females with mean age of 63 ± 6.07 (53 – 73) years. Out of ten phakic eyes, 7 eyes undergone combined surgery (PPV with phacoemulsification and intraocular lens implantation) and 3 eyes had consecutive surgery (PPV followed by phacoemulsification with intraocular lens implantation).

Table 1: Demographic and clinical profile of the study group

Variables	Values (mean $\pm$ SD or N (%))
Age (years)	63 $\pm$ 6.06
Gender	Male = 3 (23%) Female = 10 (77%)
Systemic Disease	
Diabetes Mellitus	2 (17%)
Hypertension	5 (42%)
Dyslipidemia	1 (8%)
OCT based morphological classification of ERM [#]	
ERM with CMO	3 (23%)
ERM with macular edema	4 (31%)
ERM with lamellar hole	2 (15%)
ERM with VMT	4 (31%)
Baseline BCVA logMAR	0.7 (0.6 - 1.00)
Baseline CMT	411.15 $\pm$ 94.52
Baseline mean macular volume	11.96 $\pm$ 1.54
Eye Operated*	
Right Eye	54%
Left Eye	46%
Operative procedure	
PPV only	3 eyes (23%)
Combined (PPV and phacoemulsification)	7 eyes (54%)
Consecutive Surgery (PPV followed by Phacoemulsification)	3 eyes (23%)
Postoperative Complication	
Rise in IOP	2 eyes (15%)
Retinal detachment	1eye (8%)
Cataract progression	3 eyes (23%)
CMO	2 eyes (15%)

[#] OCT guided classification of epiretinal membrane according to Vasileios et al (12)

*One patient had undergone both eyes ERM surgery

The median baseline BCVA in LogMAR was 0.7 (0.6-1.00) which improved to 0.30 (0.25-0.60) in 3 month follow up which was statistically significant (*p*-0.04). Seven eyes achieved final VA 20/40 or more at 3 month following ERM surgery, one patient had VA < 20/200. The mean gain of VA > 2 lines was seen in 9 eyes, 1 eye had one line improvement, 2 eyes had no change and one had poor visual outcome. No change in VA was

attributed to persistent cystoid macular edema and one had poor vision due to retinal detachment developed at 6 weeks follow up (Table 2). There was significant decrement in CMT from $411.15 \pm 94.52 \mu\text{m}$ to $318.61 \pm 118.87 \mu\text{m}$ (*p* -0.002) in 3 months follow up. The decrement in CMT was statistically significant (*p*-0.001) (Table 2)

Table 2: Comparison of BCVA and CMT at Baseline and 3 months after treatment

Variables	Baseline	3 months after treatment	p value
BCVA	0.7 (0.6-1.00)	0.30 (0.25-0.60)	0.04 ^{a*}
CMT	411.15 ± 94.52	318.61±118.87	0.00 ^{b*}

a=Wilcoxon Signed Rank test; b= Paired t-test; *p value <0.05 is considered to be statistically significant

COMPLICATIONS

There were two eyes with postoperative rise in IOP (>30mmHg) which was managed with anti-glaucoma medication. One eye developed postoperative uveitis at 2 weeks follows up which was managed with topical steroid. The same eye developed inferior retinal detachment with PVR grade C at 6 weeks follows up which subsequently undergone pars plana vitrectomy with endolaser and silicone oil injection. On follow up, retina was attached with visual acuity of 3/60. In 3 eyes, there was progression of cataract during follow up which subsequently underwent phacoemulsification with intraocular lens implantation. There were two cases with persistent macular edema in postoperative period.

DISCUSSION

ERM is a common vitreoretinal intersurface abnormality commonly affecting elderly population. Studies have shown that the incidence of ERM increases with advancing age.(7, 13,14) In our study, the mean age group of the study population was 63± 6.06 years which was comparable to the studies done by Schechet et al (15) and Akincioglu et al (16) (67.95 ± 10.42 and 69±8.2 years respectively).

Symptomatic ERM are treated with vitrectomy with membrane peeling. With advancement in surgical techniques and instrument, various studies reported favorable outcome with ERM surgery. The result of this study also showed improvement in visual acuity following ERM surgery. The median gain of visual acuity was 0.4 LogMAR from baseline which was comparable to the study done by Dawson et al (17) and Akincioglu et al (16) (median gain of 0.3 LogMAR and mean 0.3Log MAR respectively). Pournaras et al (18) had shown improvement in

BCVA following ERM surgery with or without ILM peeling (0.32 ±0.39 from baseline 0.58 ± 0.40 LogMAR and 0.37 ± 0.42 from 0.48 ± 0.22 LogMAR respectively). Similarly, Elad Moisseiev had shown mean change of visual acuity 0.23 LogMAR unit in elderly patients undergoing ERM surgery (11).

Anatomical success of this study was evaluated in terms of reduction in CMT on OCT imaging. There was significant reduction in central macular thickness in 3 month follow up. The mean decrease in CMT was 93 µm in 3 month period which was comparable to the study done by Schechet et al (15) (87µm) but slightly more than a study done by Akincioglu (16) (57µm in 3 month). Similarly, studies done by Chuang (19) have shown significant decrement in CMT (166µm) in patient who had undergone ERM surgery along with ILM peeling. This decrement was greater than the finding from our study which may be due to short follow up period in this study. The postoperative complications in this series were retinal detachment (8%), CMO (15%), Cataract progression (23%) and postoperative rise in IOP (15%). In most of the cases the complications were managed or resolved. There was no any case of endophthalmitis. Complications rate were comparable to other previously published studies who underwent PPV with membrane peeling, RD in 1% to 4.8% (8, 11, 20, 21) CMO in 1% to 7% (8, 11), cataract progression in 25% to 50% (8, 17) and rise in IOP in 5% to 10% (8, 11, 17).

LIMITATION

Major limitation of this study is retrospective nature with small study population. Other limitation is variable time between operation date and follow up for individual patient. Visual acuity improvement was sole measures for success surgery. Metamorphopsia was not taken into

account which may be major symptoms in patients with ERM causing disability. Even with improvement in VA following ERM surgery, patients may have metamorphopsia. The follow up period was short, recurrence of ERM could not be determined.

CONCLUSION

This study has shown significant improvement in visual acuity and decrease in central macular thickness following ERM surgery with membrane peeling in symptomatic patients. We suggest that regular monitoring of patients with epiretinal membranes may be useful to detect early deterioration in vision and believe that it is important to include some form of functional visual assessment in surgical planning and case selection.

ACKNOWLEDGEMENT

I am thankful to IRC-TIO committee and Prof. Dr. Suman S. Thapa for granting approval of the study and kind support during study. I am also thankful to Dr Sarita Sitaula and Dr Saurav Man Singh Shrestha for their help in writing manuscript. I would like to thank Dr Apeksha Niraula for helping out me in Statistics.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interests regarding the study or this article.

REFERENCES

1. Shao-Chong BU, Roel Kuijer, Xiao-Rong Li, Johanna M. M. Hooymans, Leonoor I. Los. Idiopathic epiretinal membrane. *Retina*. 2014; 34 (12):2317-2335.
2. Fraser-Bell S, Guzowski M, Rochtchina E, Wang JJ, Mitchell P. Five-year cumulative incidence and progression of epiretinal membranes: the Blue Mountains Eye Study. *Ophthalmology*. 2003; 110:34-40.
3. Thapa R, Khanal S, Tan HS, Thapa SS, van Rens GHMB. Prevalence, Pattern and Risk Factors of Retinal Diseases among an Elderly Population in Nepal: The Bhaktapur Retina Study. *Clin Ophthalmol*. 2020; 14:2109-2118.
4. Koh V, Cheung CY, Wong WL, Cheung CM, Wang JJ, Mitchell P, Younan C, Saw SM, Wong TY. Prevalence and risk factors of epiretinal membrane in Asian Indians. *Invest Ophthalmol Vis Sci*. 2012; 53(2):1018-22.
5. Ning Cheung, Shu-Pei Tan, Shu Yen Lee, Gemmy Chui Ming Cheung, Gavin Tan, Neelam Kumar, Ching-Yu Cheng, Tien Yin Wong. Prevalence and risk factors for epiretinal membrane: the Singapore Epidemiology of Eye Disease study. *Br J Ophthalmol*. 2017; 101: 371-376.
6. Kawasaki R, Wang JJ, Mitchell P, Aung T, Saw SM, Wong TY; Singapore Malay Eye Study Group. Racial difference in the prevalence of epiretinal membrane between Caucasians and Asians. *Br J Ophthalmol*. 2008; 92: 1320-1324.
7. Mitchell P, Smith W, Chey T, Wang JJ, Chang A. Prevalence and associations of epiretinal membranes: The Blue Mountains Eye Study, Australia. *Ophthalmology*. 1997; 104:1033-40.
8. James G Wong, Nitin Sachdev, Paul E Beaumont, Andrew A Chang. Visual outcomes following vitrectomy and peeling of epiretinal membrane. *Clinical and Experimental Ophthalmology*. 2005; 33 : 373-378
9. Malav Joshi, Shivi Agrawal, and John Byron Christoforidis. *Inflammatory Mechanisms of Idiopathic Epiretinal Membrane Formation*. Hindawi Publishing Corporation *Mediators of Inflammation*. Volume 2013, Article ID 192582, 6 pages <http://dx.doi.org/10.1155/2013/192582>
10. Maiko Inoue and Kazuaki Kadonosono. *Macular Diseases: Epiretinal Membrane: Management of Specific Diseases*. Oh H, Oshima Y (eds): *Microincision Vitrectomy Surgery. Emerging Techniques and Technology*. Dev Ophthalmol. Basel, Karger, 2014; 54 : 159-163.
11. Elad Moisseiev, Zvi Davidovitch, Michael Kinori, Anat Loewenstein, Joseph Moisseiev, and Adiel Barak. Vitrectomy for Idiopathic Epiretinal Membrane in Elderly Patients: Surgical Outcomes and Visual Prognosis. *Current Eye Research*. 2012; 37(1): 50-54.
12. Vasileios Konidaris, Sofia Androudi, Alexandros Alexandridis, Anna Dastiridou, Periklis Brazitikos. Optical coherence tomography-guided classification of epiretinal membranes. *Int Ophthalmol*. July 2014; 35 (4).
13. McCarty DJ, Mukesh BN, Chikani V, Wang JJ, Mitchell P, Taylor HR, McCarty CA. Prevalence and associations of epiretinal membranes in the visual impairment project. *Am J Ophthalmol*. 2005; 140:288-294.
14. Mester V, Kuhn F, Mester L. Epiretinal membranes: current management concepts. *Expert Rev Ophthalmol*. 2007; 2: 131-141.
15. Schechet SA, DeVience E, Thompson J.T. The Effect of Internal Limiting Membrane Peeling on Idiopathic Epiretinal Membrane, With a Review of the Literature. *Retina*. 2017; 37(5): 873-880.
16. Akincioglu D, Ozge G, Kucukcilioglu M, Erdurman FC, Durukan AH. Surgical Outcomes of Idiopathic Epiretinal Membrane: The Gülhane Experience. *Turk J Ophthalmol*. 2018; 48:75-80.
17. SR Dawson, M Shunmugam and TH Williamson. Visual acuity outcomes following surgery for idiopathic epiretinal membrane: an analysis of data from 2001 to 2011. *Eye*. 2014; 28: 219-224.

18. Pournaras CJ, Ahmed Emarah, and Ioannis K. Petropoulos. Idiopathic Macular Epiretinal Membrane Surgery and ILM Peeling: Anatomical and Functional Outcomes. *Seminars in Ophthalmology*. 2011; 26(2): 42-46.
19. Chuang LH, Nan-Kai Wang, Yen-Po Chen, Yih-Shiou Hwang, Kuan-Jen Chen, Ling Yeung, Wei-Chi Wu, Tun-Lu Chen, Chi-Chun Lai. Comparison of visual outcomes after epiretinal membrane surgery. *Taiwan Journal of Ophthalmology*. 2012; 2:56-59.
20. A. Feldman, J. Zerbib, A. Glacet-Bernard, P. Haymann, G. Soubran. Clinical evaluation of the use of infracyanine green staining for internal limiting membrane peeling in epimacular membrane surgery. *European Journal of Ophthalmology*. 2008; 18 (6): 972-979.
21. M. Dimitri Bouwens, Floris de Jong, Paul Mulder, Jan C. van Meurs. Results of macular pucker surgery: 1- and 5-year follow-up. *Graefes Arch Clin Exp Ophthalmol*. 2008; 246:1693-1697.