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The outcome of vitrectomy with internal limiting membrane peeling for chronic macular hole at Biratnagar eye hospital: A tertiary eye care center in Nepal

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ABSTRACT

Background: A macular hole is a full-thickness defect of retinal tissue involving the anatomic fovea, thereby affecting central visual acuity. Pars plana vitrectomy and gas tamponade is a recognised modality of treatment for macular hole.Larger holes are more likely to remain open after repair and late reopening after an initially closed macular hole is seen in macular holes larger than 400 μm. **Aims and Objective:** To evaluate the anatomical and functional outcome of pars plana vitrectomy with internal limiting membrane peeling for chronic stage 3 macular hole. **Materials and Methods:** Records of 15 patients with stage 3 chronic macular holes operated from 1st January 2013 to 30th June 2013 and completed 1 year of follow up were retrospectively evaluated and included in the study. Preoperative best distance corrected visual acuity (BCVA), preoperative macular hole size, final BCVA and macular hole status at 1 year follow up were recorded. Macular hole closure and visual improvement was calculated. Correlation of macular hole closure and visual improvement with various macular hole parameter was estimated. **Results:** Eleven (73.3%) macular holes closed at 1 year follow-up. Mean BCVA improved from 1.2 ± 0.27 to 0.89 ± 0.36 logarithm of minimum angle of resolution at 1 year ($p < 0.001$). Visual improvement was seen in only eight (53.3%) eyes. Both macular hole closure and visual improvement showed no correlation with minimum linear diameter, base diameter and hole height. **Conclusion:** Chronic stage 3 macular hole can be closed successfully in majority of patients with fairly good visual improvement. Macular hole parameters of stage 3 holes may not have any correlation with the anatomical and visual outcome.

Key words: Macular hole, Vitrectomy, ILM peeling, OCT parameters, Nepal

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INTRODUCTION

A macular hole (MH) is a full-thickness defect of retinal tissue involving the anatomic fovea, thereby affecting central visual acuity.[1] It was first described in late 1800s by Knapp and later by Noyes.[2] Gass has suggested that macular holes are the result of a dehiscence of the retina at the macula, due to tangential tractional forces on the macula by the prefoveal vitreous cortex and epiretinal membranes.[2]

Reported prevalence of macular hole in Nepal is 0.2%.[3] Variable data is available from different parts of the world with its prevalence ranging from 0.09% to 0.2%.[3-5]

Surgical treatment has been an accepted technique since Kelly and Wendel first reported the benefit of pars plana vitrectomy and gas tamponade in inducing closure of macular hole, flattening of the neurosensory rim and improvement in visual acuity.[6] Since then there has been several modification in the surgical technique.

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Internal limiting membrane (ILM) peeling has been shown to increase the success rate in large macular hole.[7] Michalewska and his colleagues reported an inverted ILM flap technique with improved anatomical and functional outcomes.[8] Ocriplasmin, a truncated form of the human serine protease plasmin is now being used for nonsurgical treatment option for MH.[9] The Enzymatic Vitreolysis with Ocriplasmin for Vitreomacular Traction and Macular Holes study reported a nonsurgical macular hole closure rate of 40.6%.[9] The success of these surgeries is still a matter of debate for chronic stage 3 macular holes.

The postoperative closure rate for stage 3 MH ranged from 56% to 100%.[7,10-12] Larger holes (mean diameter of 1205 microns) were more likely to remain open after repair and late reopening after an initially closed macular hole was seen only in macular holes larger than 400 μm.[10,11] This study aims to evaluate the anatomical and functional outcome of vitrectomy in chronic stage 3 macular hole at a tertiary eye care centre in Nepal, which may help guide the decision to repair chronic macular hole.

MATERIALS AND METHODS

Retrospective interventional case series was conducted in the Vitreoretina department of Biratnagar eye hospital. Records of all patients with stage 3 chronic macular holes operated from 1st January 2013 to 30th June 2013 and completed 1 year of follow up were included in the study. The study adheres to tenets of Declaration of Helsinki and informed consent was obtained from all the patients prior to surgery.

Chronic macular hole was defined as duration of complain more than 1 year.[11] Stage 3 macular hole was defined as minimum linear diameter (MLD) more than 400 μm without posterior vitreous detachment from optic disc and macula.[1,10] MH size was measured with time domain optical coherence tomography (Zeiss stratus OCT). All patients had undergone 3 port 23 gauge pars plana vitrectomy (PPV) with internal limiting membrane (ILM) peeling and perflouropropane (C3F8) gas tamponade. All patients had been advised face-down positioning in the post-operative period for 10 days. Patients with corneal opacity, coexisting history of diabetes mellitus, venous occlusive disease and traumatic macular hole were excluded.

Age and gender of the patients were recorded. Preoperative best distance corrected visual acuity (BCVA), preoperative macular hole size, final BCVA and macular hole status at 1 year follow up were recorded. Macular hole was considered closed if there was no foveal neurosensory retinal defect,[13] confirmed by OCT. Gain of two or more lines of Snellen's visual acuity was considered as visual improvement. Any complications in the postoperative period like retinal detachment, cystoids macular edema and late reopening of macular hole were recorded.

Statistical analysis: Data were entered in an Excel spreadsheet (Microsoft Corp.) and analyzed using SPSS software (version 16.1, SPSS, Inc.). Continuous variables were expressed as the Mean ± Standard deviation (SD) and categorical variables were expressed as individual counts. The Snellen's visual acuity was converted into logarithm of the minimum angle of resolution (logMAR) units for analysis. Differences were considered statistically significant when the p value was less than 0.05. Correlation of macular hole closure and visual improvement with various macular hole parameters (minimum linear diameter, base diameter and hole height) was estimated using spearman's rank test.

RESULTS

Fifteen patients were included in the study. Mean age of the patients was 65.3 ± 9.0 years (range= 50-89 years) and male:female ratio was 7:8. Seven left eyes and 8 right eyes were operated. Mean macular hole size parameters of the patients is given in Table 1.

Eleven (73.3%) macular holes closed at 1 year follow-up. Mean preoperative and 1 year postoperative logMAR BCVA was 1.2 ± 0.27 and 0.89 ± 0.36 respectively (Figure 1). There was a significant improvement in BCVA at 1 year

Table 1: Macular hole parameters and its correlation with hole closure and visual improvement

MH parameters	Mean (SD) (μm)	Macular hole closure		Visual improvement	
		Rho	p value	Rho	p value
MLD	667 (134)	0.139	0.62	0.12	0.66
Base diameter	1126 (350)	−0.371	0.17	0.24	0.38
Hole height	698 (113)	−0.310	0.26	0.35	0.20

MLD: Minimum linear diameter, SD: Standard deviation

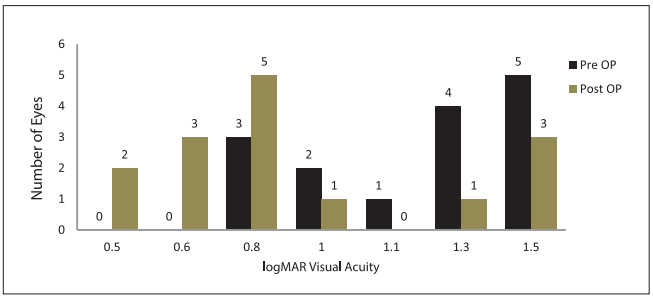

Figure 1: Pre-operative (Pre OP) and final best corrected visual acuity at 1 year (Post OP) for stage 3 macular hole

($p<0.001$). Visual improvement was seen in only 8 (53%) eyes. None of the eyes showed a decrease in visual acuity. Both macular hole closure and visual improvement showed no correlation with MLD, base diameter and hole height (Table 1). None of the patients showed complications like retinal detachment, cystoids macular edema and late reopening of macular hole.

DISCUSSION

The management of macular hole has evolved from an untreatable condition to a microsurgical procedure with a good success rate.[1] During this course, there have been several modifications in the surgical technique and adjunctive treatments.[1]

In various studies, macular hole closure rate ranged from 56% to 100%.[7,10-12] In this study the hole closure rate was only 73.3% which was similar to that reported by Thapa et al.[14] Similarly Shukla and colleagues reported a hole closure rate of 81% for chronic macular holes.[11] As only stage 3 macular holes were included in our study, MLD ranged from 436 to 910 μm. Ip and associates obtained an anatomical closure rate of 56% when the MH was larger than 400 μm, whereas this percentage increased to 92% for MH smaller than 400 μm.[10] For holes > 400 μm, success rate has been found to be significantly higher with face-down posturing than sitting posture after surgery (95.1% versus 79.5%).[15] The low rates of hole closure in our study may be attributed to poor compliance with post-operative head posturing or large hole size.

Visual improvement was seen in only 53% eyes in our study. Various authors have reported variable functional outcome for various stages of macular hole. In a study by Thapa and colleagues, this value was reported to be 45% only.[14] 73% & 77% of eyes had an improvement in visual acuity in studies by Shukla et al and Scott et al respectively.[11,16] Kang HK and associates reported visual improvement in 62.5% of stage 2 and 50% stage 3 or 4 holes which was similar to that in our study.[17] Several macular hole parameters have been studied for their value in predicting anatomical and visual outcomes. Base diameter, macular hole inner opening and minimum linear diameter has been found to be predictor of anatomical and functional success in macular hole surgery; base diameter holding the strongest association.[18,19] However, both macular hole closure and visual improvement showed no correlation with minimum linear diameter, base diameter and hole height in our study. This may be due to the fact that only stage 3 MH were included in our study and thus hole size larger than 400 μm did not show correlation with anatomical and functional success.

Shukla et al reported that holes of greater than 3.4 years duration were associated with a greater incidence of remaining open.[11] The low rates of hole closure in our study may be attributed to long duration of the disease, poor compliance with post-operative head posturing or large macular hole size. However the exact reason could not be explained. The limitation of the study is the small sample size, retrospective nature and a short follow-up.

Chronic stage 3 macular hole can be closed successfully in majority of patients with fairly good visual improvement. Macular hole parameters of stage 3 holes may not have any correlation with the anatomical and visual outcome.

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Authors Contribution:
LA - Concept and design of study, review literature, manuscript preparation and revision; **NA -** Review of literature, manuscript preparation and revision; **PK -** Concept and design of study, critical revision of manuscript; **AA -** Concept of study, review of literature.

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