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Study of Anatomical and Visual Outcomes after Macular Hole Surgery

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Abstract: *Macular hole management is one of the most challenging clinical retinal disorders in Ophthalmology with varying percentages of anatomical and visual success rates. We herewith report our clinical experience of managing idiopathic and nonidiopathic types of macular holes through this article with comparable success rates.*

Key words: *Macular hole, vitrectomy, OCT*

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I. Introduction

A full thickness macular hole (FTMH) is defined as a defect of all layers of retinal tissue, from the internal limiting membrane (ILM) through segments of the photoreceptor layer, involving the anatomic**al** fovea.[1]

Its pathogenesis can be idiopathic or result from myopia, trauma, or other causes (i.e non-idiopathic)[1,2].

Macular hole surgery was first initiated by **Kelly and Wendel** (1991).[3-5] Since then the surgery have passed through numerous modification**s** and excellent anatomical (90-100%) and functional (70%-96%) results in all types of macular holes **by vitrectomy**.[6]

Conventional surgery involves pars plana vitrectomy and ILM peeling which would eliminate the forces of secondary vitreoretinal traction. Replacement of intraocular volume with internal gas tamponade provides a smooth template for glial cell migration which would optimize reapproximation of the edges of the macular hole[3]

Most studies indicate that better anatomical and functional outcomes can be achieved after ILM peeling.[6-13] Furthermore, ILM peeling may prevent reopening of the macular hole.[11]

In the present study, an effort was made to compare outcomes in idiopathic and non-idiopathic macular hole in **terms** of anatomic**al** and functional outcomes.

II. Meterial & Method

This was a retrospective, comapartive pre-post operative study done at Upgraded Department of Ophthalmology, JLN Medical College, Ajmer, Rajasthan in India.

Two groups were made; one Idiopathic (idiopathic origin) and other Non-idiopathic group (include traumatic, myopic tractional-ERM and other macular holes). Each group contained 25 eyes of stage 2 to 4 macular hole.

Statistical Analysis- Qualitative data was summarized in the form of proportion. Quantitative data was summarized in the form of mean and standard deviation. The difference in pre and postoperative mean value was analyzed using paired t test. The level of significance for all statistical analysis was kept 95%.

Ophthalmological examination included best corrected visual acuity (BCVA), slit lamp biomicroscopy, indirect ophthalmoscopy, optical coherance tomography(OCT, TOPCON). Surgical procedure included 23 G pars plana vitrectomy, Brilliant Blue-G satined ILM peeling , 20% SF6 gas tamponade and postoperatively face-down positioning for 2 days.

III. Resuts

The mean age of idiopathic MH patients was 53.92 ± 5.57(SD) years. Out of these 14 (56%) patient were females and 11(44%) were males.

Whereas, the mean age of non-idiopathic MH patients was 38.80 ± 12.39(SD)years. Out of these 9 (36%) patients were female and 16 (64%) were male.

Idiopathic group patients showed symptoms of short duration 5.2 ±1.62 (SD) while non-idiopathic group were of long duration 7.39 ± 3.2(SD)

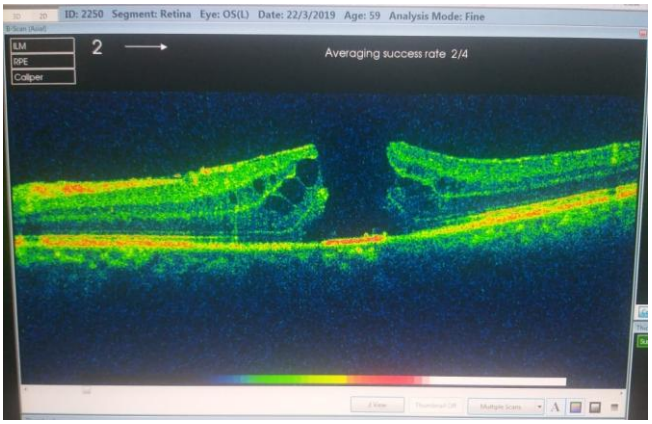


Figure 1: OCT picture of a case of full thickness macular hole

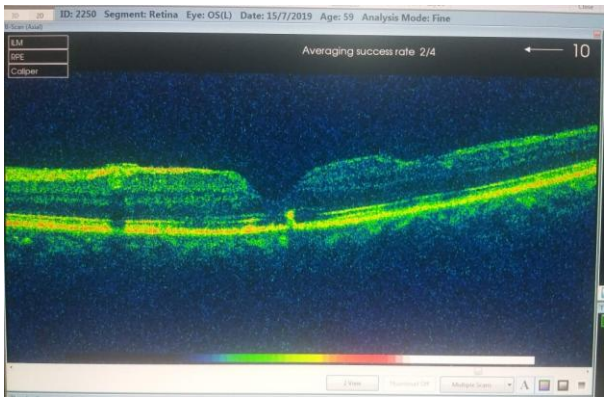
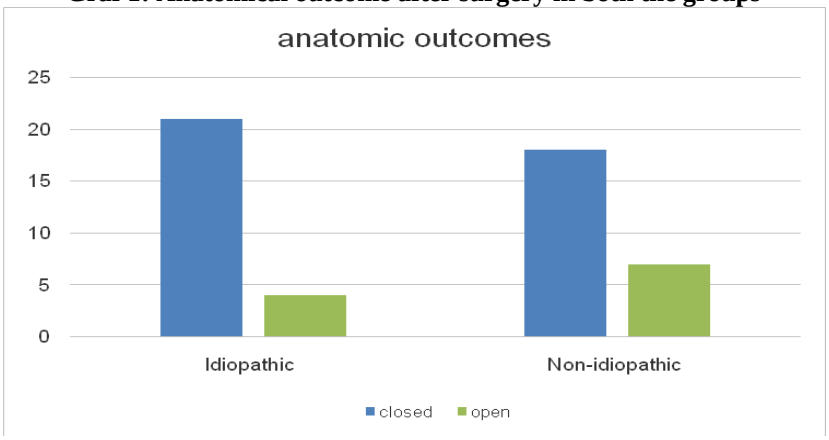


Figure 2: OCT picture of same patient after vitrectomy showing closure of macular hole

Table 1: Distribution of patients as per stages of macular hole in both groups

Stage	Idiopathic	Non-idiopathic
2	10	14
3	7	4
4	8	9
Total	25	25

Graf 1: Anatomical outcome after surgery in both the groups



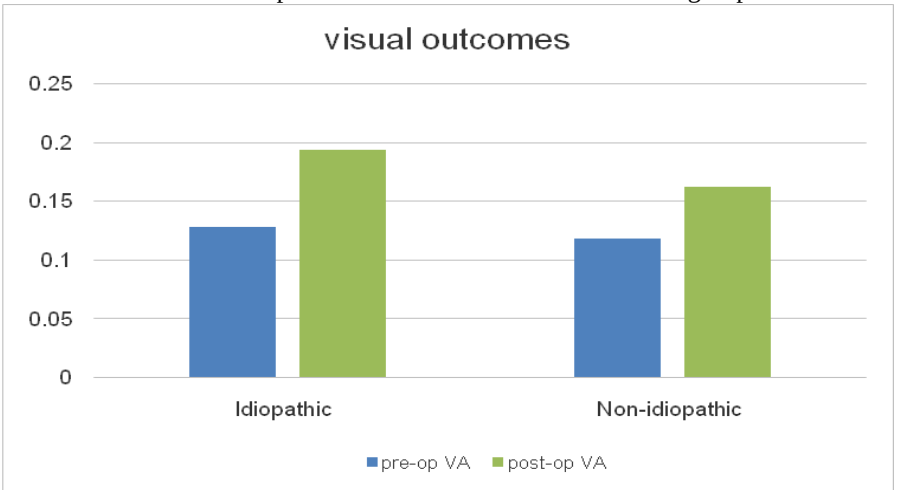
Anatomical hole closure rate was good in both groups; 80% in idiopathic and 72% in non-idiopathic group and was not statistically significant (p=0.51) when compared both the groups.

Table 2: Final visual outcomes after surgery in both the groups

	Idiopathic	Non-idiopathic	
Pre-op VA	0.128±0.05	0.119±0.06	P=0.52
Post-op VA	0.193±0.07	0.157±0.06	P=0.0366
	P=0.0004	P=0.0188	

Improvement in mean BCVA at 2 month postoperative period in both group (idiopathic and non-idiopathic) was statistically significant (p= **0.000,** p=0.0188 respectively) when analysed by student t-test.

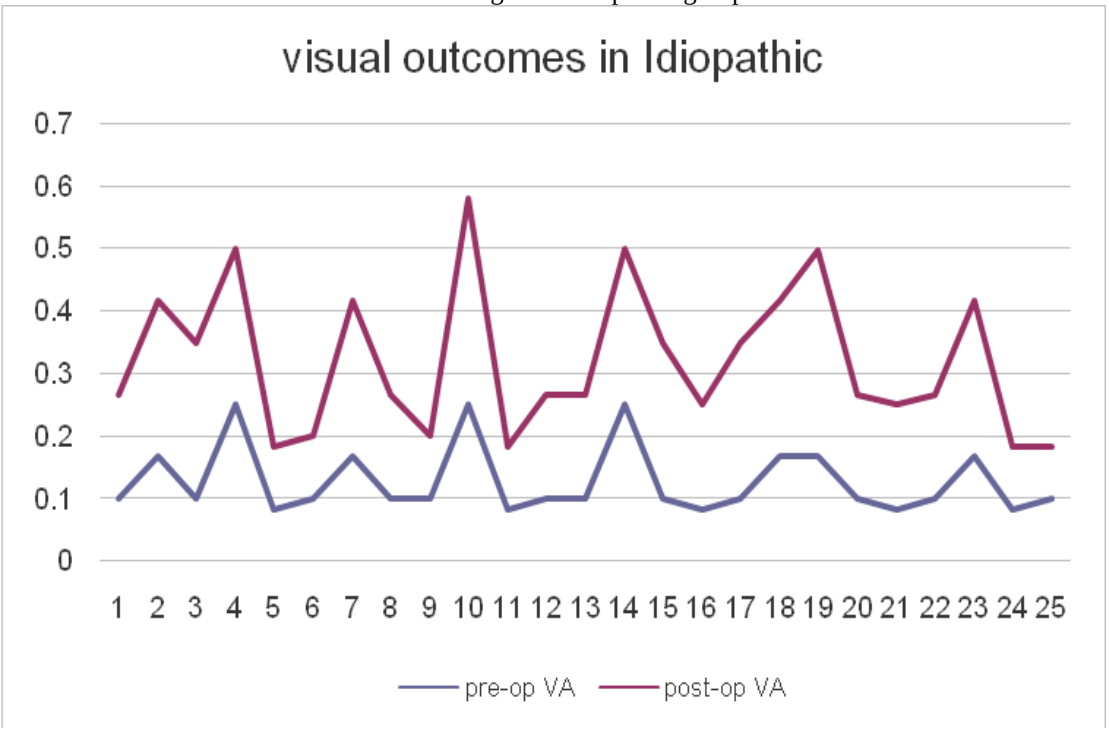
Graf 2: Comparision of visual outcome in both the groups



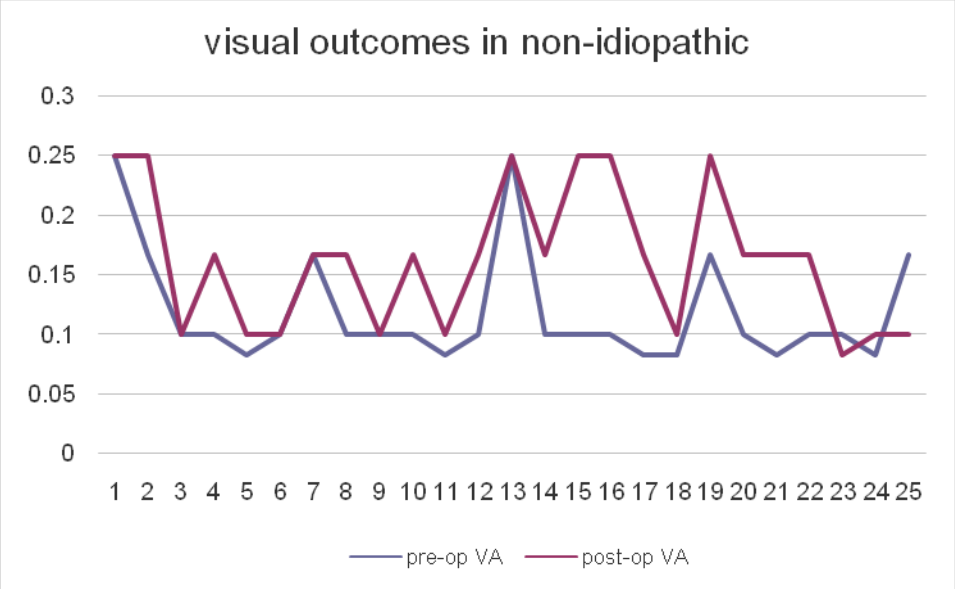
Mean BCVA at preoperative period in both groups was not statistically significant (p= 0.52) but postoperatively, it was found statistically significant (p= 0.036) in both the groups (student t-test).

Moreover, postoperatively, final visual outcome was seen more in Idiopathic group. This more visual gain postoperatively in idiopathic group possibly could be depended on their slight better preoperative vision.

Graf 3: Trend of visual gain in idiopathic group in decimels



Graf 4: Trend of visual gain in non idiopathic group in decimels



IV. Discussion

Many clinicopathologic studies reported by DJ Gass et al[2] and the remarkable success following vitreous surgery was demonstrated by Kelly & Wendell, highlighting the role of vitreoretinal traction in the pathophysiology of macular holes.[4,5]

The mean age of idiopathic MH patients was 53.92 ± 5.57 years. Out of these 14 (56%) patients were female and 11(44%) were male. Idiopathic macular hole is more prevalent in middle aged women, the similar finding was seen in our study which had also been supported by others.[15,16]

The mean age of non-idiopathic MH patients was 38.80 ± 12.39 years. Out of these 9 (36%) patients were female and 16 (64%) were male. Non-idiopathic (traumatic, myopic, tractional or other) macular hole is more prevalent in young age men.[17,18]

Following macular hole surgery, the anatomical closure rate was 80% in idiopathic and 72% in non-idiopathic group with no significant differences between them.

These findings are in accordance with Kelly and Wendell et al (1993)[5] who showed 73% closure rate, Kwok et al (2003)[9] and Krohn J et al (2005)[18] who reported 87.5% closure rate. Whereas, Kim et al (2008)[14] reported 90% closure rate, Christensen UC et al (2009)[12] 95% closure rate, and Da Mata AP et al (2004)[7] upto 98% closure rates of idiopathic macular hole. Nearly same results like ours were reported in non-idiopathic macular hole by Aman F et al [19] who in 1999 reported 70% closure rate. Whereas, Kuhn et al in 2001[20] reported 100%, Chown DR et al in 1999[21] reported 94%, and Jonson RN et al in 2001[17] reported 96% closure rate in traumatic macular hole. Similarly Qu J et al (2012)[22] reported 100%, and Wu TT et al (2018)[23] 85.7% closure rate in myopic macular holes.

The improvement in visual acuity at 2 months was found to be statistically significant in both group (**p= 0.00**). These findings are consistent with *Kelly and Wendell* (1993)[5], *Kwok et al* (2003)[9]], *Da Mata AP et al* (2004)[7], *Christensen UC et al* (2009)[12] in idiopathic macular holes and Aman F et al (1999)[19], Kuhn et al (2001)[20], Chown DR et al (1999)[21], Jonson RN et al (2001)[17], Qu J et al (2012)[22], and Wu TT et al (2018)[23] in non-idiopathic macular holes.

Mean BCVA at preoperative period in both groups was not statistically significant (p= 0.52 by student t-test) but postoperatively in both groups was statistically significant (p= 0.036 by student t-test). Moreover, postoperatively, final visual outcomes is seen slight more in Idiopathic group. Even after complete surgical success, functional recovery was not complete in any of the group. This can be better explained to some extent by OCT as type of macular hole, its pathology, disruptions to the retinal pigment epithelium, photoreceptor IS/OS status, choriocapillary complex and Ellipsoid zone external limiting membrane.[24-26]

It was also found that the most favorable outcomes for visual recovery were associated with better initial visual acuity, as has been reported in previous studies.[24-26]

The complications observed in our series were similar in nature to those observed in previously published studies (i.e., cataract and raised IOP).

V. Conclusion

The following conclusion can be drawn from the present study; Anatomical hole closure rate was good in both, in idiopathic and in non-idiopathic group, so, anatomical success not depends on etiology.
Even after successful hole closure, visual acuity does not return to normal level in any type of MH.
Better visual recovery noted in Idiopathic macular hole as compare to Non-Idiopathic hole.

OCT is a very useful noninvasive investigating tool, in diagnosis and typing of macular hole, ***aiding mode of surgical intervention ILM peel or inverted ILM peel*** *and also in predicting the anatomical and visual outcome after macular hole surgery.*

OCT also may help in explaining to some extent in the poor visual gain even after surgical success ie; Macular bed changes with duration (RPE-Choriocapillaris complex and ellipsoid zone), External limiting membrane changes, IS/OS junction etc.

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