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## Original Article

# Vitrectomy with Fovea Sparing Internal Limiting Membrane Peeling versus Total Internal Limiting Membrane Peeling for Myopic Traction Maculopathy

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## ABSTRACT

**Background:** Myopic traction maculopathy [MTM] complicating high myopia is a spectrum of diseases involving damage of the macula resulting from traction leading to inner or outer retinoschisis, macular detachment, lamellar macular hole, full-thickness macular hole [FTMH] or even retinal detachment.

**Aim of the work:** To compare the role of vitrectomy with total internal limiting membrane peeling [TILMP] versus fovea sparing internal limiting membrane peeling [FSILMP] for MTM.

**Patients and Methods:** The study was conducted on eighteen eyes with MTM. Preoperatively, best corrected visual acuity [BCVA] converted into logMAR and optical coherence tomography [OCT] were done. Nine patients were surgically treated with total ILM peeling and nine patients were surgically treated with fovea sparing ILM peeling. Six months postoperatively, the patients were examined for BCVA in logMAR. Also, OCT was done 6 months postoperatively.

**Results:** The difference between the two groups was no significant statistically according to their BCVA preoperatively and postoperatively with a p-value >0.05 NS, while there was a statistically significant reduction BCVA postoperatively compared to preoperative in TILMP Group and FSILMP group with p-value <0.05 S with more significant results in FSILMP group. One case developed a FTMH postoperatively in FSILMP group.

**Conclusion:** Both techniques of vitrectomy with TILMP and FSILMP provided good anatomical and visual results in the surgical treatment of MTM with relatively better results in FSILMP group.

**Keywords:** Myopic traction maculopathy; Foveoschisis; Vitrectomy; ILM peeling; Fovea sparing

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\* Main subject and any subcategories have been classified according to the research topic

## INTRODUCTION

Myopia is categorized into pathological and non-pathological. Pathological one is diagnosed with an axial length more than 26.00 mm or refractive error of more than minus 6.00 diopters [1].

Myopic traction maculopathy [MTM] complicating high myopia is a spectrum of diseases involving damage of the macula resulting from traction leading to inner or outer retinoschisis, macular detachment, lamellar macular hole, full thickness macular hole [FTMH] or even retinal detachment [2].

The surgical treatment of MTM is somewhat complicated. Schepens, Okamura and Brockhurst firstly described macular buckling for the management of myopic macular hole retinal detachment [3].

The idea of buckling is to antagonize the posterior scleral bulging, which is present in high myopic patients with posterior staphyloma, the main risk factor for myopic traction maculopathy [4].

Vitrectomy with ILM peeling is now the major tool for the treatment of MTM the idea of which is to release the inner retinal surface traction [5].

ILM peeling in MTM has a risk of macular hole formation during peeling with an incidence of about 5.1 to 28.6% [6].

The fovea sparing ILM [FSILMP] peeling technique was described first time with Shimada *et al.* in which the ILM peeling was done from the macula leaving the ILM over the fovea, this technique may have the value of preventing macular hole formation [7].

## AIM OF THE WORK

Probably, the FSLIMP technique allows the anatomical preservation of the integrity of the retina, especially in the highly myopic patient, where the retina is of reduced thickness. Thus, a comparison between vitrectomy with total ILM peeling [TILMP] and vitrectomy with fovea sparing ILM peeling [FSILMP] was evaluated.

## PATIENTS AND METHODS

A prospective cohort study conducted at Ophthalmology Department, Al-Azhar University Hospital, Egypt, in the period from January 2019 until April 2021 and involved eighteen patients with MTM.

Eyes with previous vitreoretinal surgery, retinal detachment due to myopic macular hole or another retinal break, uncontrolled glaucoma, dense cataract and other ocular lesions like choroidal neovascularization that could

cause a decrease in vision were excluded from the study.

## Ethical considerations:

All participants enrolled in the research were given written consent. The approval of the research was achieved from Al-Azhar Faculty of Medicine Research Ethics Committee [REC].

## Methods

The study was conducted on eighteen eyes of eighteen patients. All eyes have high myopia [long axial length more than 26.00 mm or refractive error more than -6.00 diopters] with their OCT showing the presence of MTM, they were categorized into 2 groups: group one involved nine eyes who were surgically treated with vitrectomy with total ILM peeling [TILMP Group], and group two involved nine patients who were surgically treated with fovea sparing ILM peeling [FSILMP Group].

Preoperatively, all participants had undergone ophthalmic assessment involving BCVA converted to logMAR, anterior segment examination and fundus examination. OCT was performed to assess the degree of MTM including inner or outer retinoschisis, macular detachment, lamellar macular hole and full-thickness macular hole [FTMH]. All surgeries were done by the same surgeon.

Postoperatively, the patients were examined after 6 months assessing BCVA in logMAR. OCT was done 6 months postoperatively assessing disappearance of retinoschisis and if there was a postoperative FTMH development.

## Vitrectomy technique:

A standard 23 gauge vitrectomy was done for all eyes, starting with the insertion of three trocars, after that core vitrectomy was done then vitreous staining with triamcinolone acetonide followed by posterior vitreous detachment induction, then restaining with triamcinolone acetonide to detect if vitreoschisis was present then air fluid exchange then ILM staining using Brilliant Blue G then ILM peeling reaching the vascular arcades, In the first group, TILMP was done while in the second group, FSILMP was done peel ILM all over the macula sparing the fovea then complete shaving, then air fluid exchange leaving the patient on air then removing the trocars with massaging on sclerotomies.

**Statistical analysis:** Recorded data analysis was done with the use of the statistical package for social sciences, version 23.0 [SPSS Inc., Chicago, Illinois, USA]. Quantitative data were presented as mean± standard deviation [SD]. Qualitative data were presented as percentage and frequency. Data were explored for normality using Kolmogorov–Smirnov and Shapiro-Wilk Test. Independent-samples t-test was used to compare two means, while paired

sample *t*-test was applied to compare pre- and post-operative values. Percentage change% was utilized to calculate percentage of improvement after intervention. It equals the difference between second reading – first reading/ first reading x 100. Mean Difference was made to calculate the mean improvement after intervention. It equals the difference between 2nd reading - 1st reading. Probability [P-value] was considered significant when P-value  $\leq 0.05$ .

## RESULTS

A total of 18 eyes of 18 patients with MTM were involved. In TILMP group, five eyes belonged to females [55.6%], while in FSILMP group seven eyes belonged to females [77.8]. The age in TILMP group ranged from has a mean of  $65.89 \pm 8.19$ , while in FSILMP group the mean age was  $63.78 \pm 6.18$ . Six eyes in TILMP group were right [66.7%], and 4 [33.3%] left while in FSILMP group four eyes were right [44.4%] and five eyes were left [55.6%]. There was no significant difference between both groups according to their demographic data

regarding sex, age and laterality [Table 1]. The two groups showed no statistically significant difference according to their logMAR BCVA preoperatively [ $1.39 \pm 0.16$  and  $1.40 \pm 0.09$  relatively] and postoperatively [ $1.23 \pm 0.11$  and  $1.17 \pm 0.16$  relatively] with a p-value  $> 0.05$ , while there was statistically significant reduction in BCVA in logMAR postoperatively compared to preoperatively in TILMP Group and FSILMP group with a p-value  $< 0.05$  S with more significant results in FSILMP group [Table 2].

There was no statistically significant difference between both groups according to their anatomical improvement represented in retinoschisis disappearance [Table 3]. There was no statistically significant difference between groups according to their complications represented in the development of a postoperative macular hole, in TILMP group there was only a one case who developed a lamellar macular hole, while in FSILMP group there were no cases developed a macular hole [Table 3].

**Table [1]:** Demographic data in both groups

Demographic data		TILMP Group [n=9]	FSILMP Group [n=9]	Test value	p-value
Age [years]	Mean $\pm$ SD	65.89 $\pm$ 8.19	63.78 $\pm$ 6.18	0.617	0.546
Sex	Female	5 [55.6%]	7 [77.8%]	FE	0.611
	Male	4 [44.4%]	2 [22.2%]		
Laterality	OD	6 [66.7%]	4 [44.4%]	FE	0.637
	OS	3 [33.3%]	5 [55.6%]		

**Table [2]:** Comparison between groups according to their BCVA in logMAR

B.C.V.A in logMAR		TILMP Group [n=9]	FSILMP Group [n=9]	Independent Sample t test	p-value
Pre-operative	Mean $\pm$ SD	1.39 $\pm$ 0.16	1.40 $\pm$ 0.09	-0.182	0.858
	Range	1.1–1.6	1.3–1.5		
Post-operative	Mean $\pm$ SD	1.23 $\pm$ 0.11	1.17 $\pm$ 0.16	0.927	0.368
	Range	1–1.4	0.9–1.4		
<b>Paired Sample t-test</b>					
Difference	Mean $\pm$ SD	-0.16 $\pm$ 0.21	-0.23 $\pm$ 0.17	0.865	0.400
	Range	-0.5–0.2	-0.6–0		
Change%	Mean $\pm$ SD	-10.17 $\pm$ 15.07	-16.44 $\pm$ 11.70	0.987	0.338
	Range	-33.3–18.2	-40–0		
<b>P value</b>		<b>0.046*</b>	<b>0.004*</b>		

**Table [3]:** Comparison between groups according to their anatomical improvement and complications

	TILMP Group [n=9]	FSILMP Group [n=9]	Test value	p-value
Anatomical Improvement	8 [88.9%]	9 [100%]	0.999	0.318
Complications [macular hole]	1 [11.1%]	0 [0%]	0.999	0.318

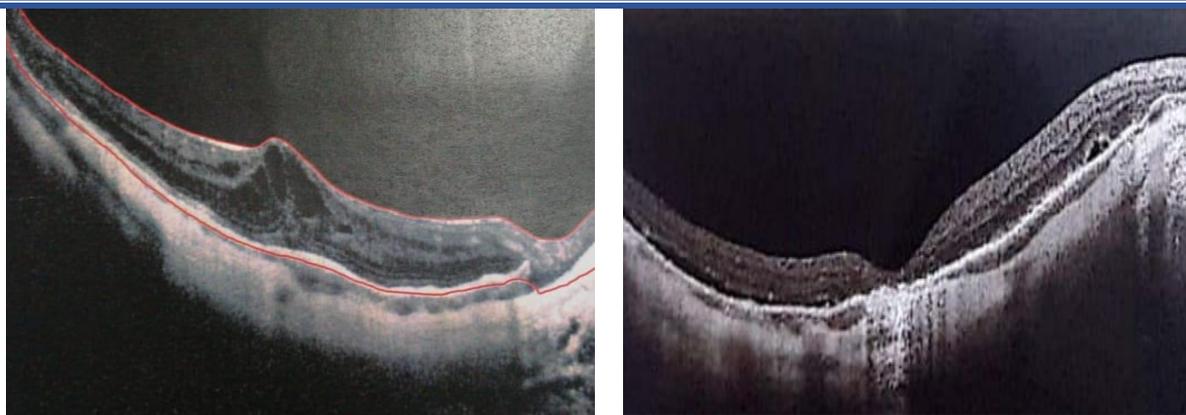


Figure [1]: Case 1: Preoperative and postoperative OCT images of the right eye of a 61 years old male case of MTM surgically treated with TILMP. Preoperatively the image showed an inner and outer retinoschisis that resolved postoperatively in the second image with a small pocket of extrafoveal neurosensory detachment and foveal thinning

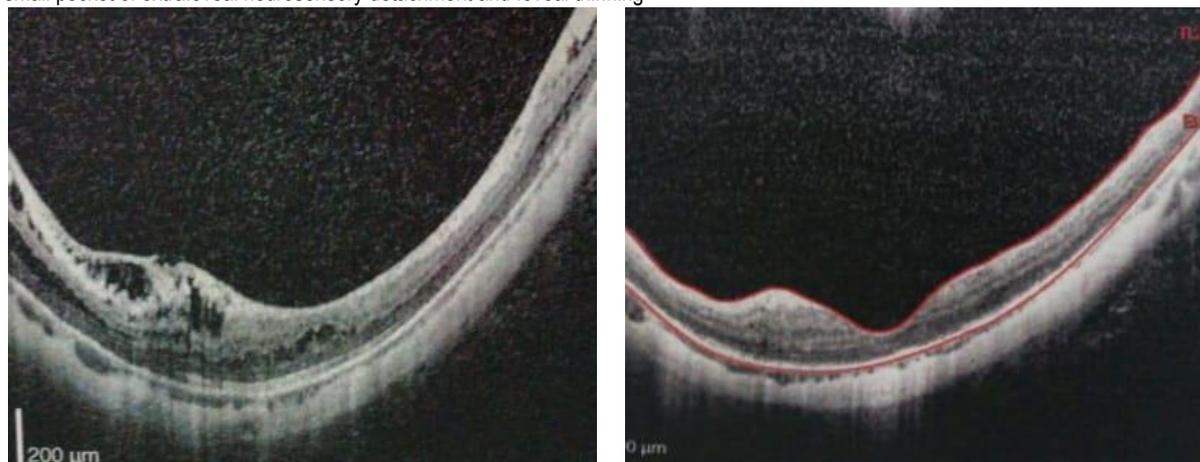


Figure [2]: Case 2: Preoperative and postoperative OCT images of the right eye of 59 years old female case of MTM surgically treated with FSILMP. Preoperatively the image showed an inner and outer retinoschisis that resolved completely postoperatively in the second image with a normal foveal contour

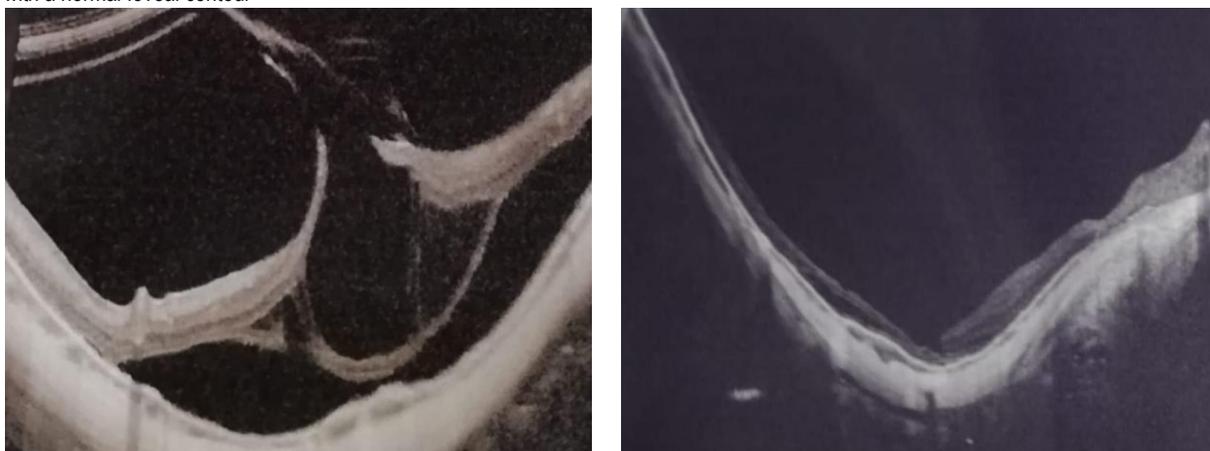


Figure [3]: Case 3: Preoperative and postoperative OCT images of the right eye of 64 years old female case of MTM surgically treated with TILMP. Preoperatively the image showed outer retinoschisis with. Postoperatively, the retinoschisis mostly disappeared with a lamellar macular hole

## DISCUSSION

Multiple studies showed that after vitrectomy with complete peeling of ILM for myopic foveoschisis, FTMHs were developed post-surgery leading to worsening of visual acuity [8].

The development of macular holes after vitrectomy may be due to damage of foveal Muller cell cone during ILMP over the fovea [9].

In this study, 18 eyes with MTM were enrolled and planned for vitrectomy. They were divided into two groups; first group included nine eyes that were surgically treated with vitrectomy with total ILM peeling while second group

included nine eyes that were surgically treated with vitrectomy with fovea sparing ILM peeling.

A lamellar macular hole developed postoperatively in only one case in TILMP group, whereas no cases developed a macular hole [MH] in FSILMP group. So, FSILMP was valuable in preventing MH development although the difference between both groups was statistically insignificant.

Shimada *et al.* [7] firstly evaluated FSILMP for treatment of MTM and reported the effectiveness of this technique in improving postoperative visual acuity and decreasing the incidence of postoperative macular holes. However, the technique of FSILMP carries the risk of recurrence from proliferation of the remnants of glial cells leaven around the center of the fovea [10]. In this study, there were no recurrences in FSILMP group during the 6 months period of follow up.

Visual acuity assessment in this study showed that the two groups have no statistically significant difference regarding their BCVA in logMAR preoperatively and postoperatively, while there was a statistically significant decrease in BCVA in log MAR postoperatively compared to preoperatively in both TILMP Group and FSILMP group with more significant results in FSILMP group. So, the visual acuity was improved postoperatively in FSILMP more than that in TILMP group, but this difference was statistically insignificant. The difference between both groups in the postoperative BCVA may be explained by the development of a macular hole in TILMP group.

In a retrospective study of eyes with myopia traction maculopathy [MTM], Iwasaki *et al.* [11] concluded that FSILMP has significantly better visual gain than TILMP. This study was conducted on 22 eyes divided into two groups each included 11 eyes. Three eyes developed a FTMH postoperatively in TILMP group, while no eyes developed FTMH in FSILMP group. However, the limitation to this research was the small sample size to obtain more optimal results.

**Conclusion:** Both techniques of vitrectomy with total ILM peeling and fovea-sparing ILM peeling provided good anatomical and visual results in the surgical treatment of myopic traction maculopathy. However, the visual outcomes were relatively better in FSILMP group; also, the incidence of postoperative complications in the form of macular hole was relatively less in FSILMP group.

#### Financial and Non-financial Relationships and Activities of Interest

None

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