Original article

Comparison of diagnostic and surgical features of silicone oil filled eyes epiretinal membrane with idiopathic epiretinal membranes

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ABSTRACT

Background: Epiretinal membranes are avascular, fibrocellular membranes which develop on the inner most layer of the retina. These membranes can be idiopathic or secondary to the silicone oil injection after pars plana vitrectomy in patients with rhegmatogenous retinal detachment. When symptomatic, such membranes can cause decreased vision, visual distortion and sometimes diplopia. The purpose of this study was to compare the idiopathic epiretinal membranes versus silicone oil filled eyes epiretinal membranes in terms of their diagnostic and surgical features.

Patients and methods: The study was conducted at the Department of Ophthalmology, Services Hospital Lahore where 13 eyes with idiopathic epiretinal membranes (ERMs) and 13 eyes with silicone oil filled eyes epiretinal membranes (SOERMs) were evaluated from August 2017 to April 2019. The main diagnostic outcome was the preoperative Optical Coherence Tomographic (OCT) findings and main surgical outcome was peroperative time required for removal of epiretinal membranes.

Results: Mean central retinal thickness of patients with SOERMs on OCT was 530.30µm, which was recorded one day before surgery. It was greater as compared to the central retinal thickness in patients with idiopathic ERMs which was 391.92 µm. The mean time required for the removal of SOERMs was 466.38 seconds. It was longer as compared to the time required to remove idiopathic ERMs which was 385.69 seconds.

Conclusion: The SOERMs are relatively difficult to remove due to increased thickness and more adherent nature as compared to idiopathic ERMs which were single layer and relatively easy to remove.

Keywords:

Epiretinal membrane; Silicone oil; Optical coherence tomography; Rhegmatogenous retinal detachment

INTRODUCTION

Epiretinal membranes are the membranous proliferations over macula.[1] These membranes are significant because these can cause macular distortion and edema hence need surgical removal.[2] These membranes can develop in normal eyes or under various conditions such as in those with retinal detachment, posterior uveitis, following vein occlusion and after various surgical procedures such as cryotherapy and buckling , laser retinal photocoagulation, pars plana vitrectomy with tamponade of silicone oil and cataract surgeries.[3] The membranes which develop in normal eyes are considered idiopathic and these usually develop after 50 years of age.[4] According to the previous clinical studies, the prevalence of such membranes ranges from 7 % to 12 %.[5] These membranes are composed of glial cells, myofibroblastic tissues, retinal epithelial cells and part of the cortical vitreous.[3] Now a days, silicone oil is widely being used as an internal tamponade in various retinal surgeries and is kept into the eye for certain period of time.[6,7] The complications related to the silicone oil include emulsification, band keratopathy, cataract, secondary glaucoma and epiretinal membrane formation.[8-10] Such epiretinal membranes can cause significant reduction in visual acuity. Since the use of silicone oil as internal tamponade, there has been discussion between the potential toxicity and its benefits and the timings of removal of silicone oil.[11,12] Epiretinal membranes can cause significant visual distortion in siliconised oil filled eyes even after the removal of oil.[13] Tanaka and colleagues explained the clinicopathological features of epiretinal membranes in siliconised eye.[10] however no such study has been conducted in this region. This study compares the characteristics of such epiretinal membranes versus idiopathic epiretinal

Conflict of interest: The authors declared no conflict of interest exist.

Citation: Jameel F, Ihsan KM, Siddiq S, Waheed K, Butt IH, Iqbal RN. Comparison of diagnostic and surgical features of silicone oil filled eyes epiretinal membrane with idiopathic epiretinal membranes.J Fatima Jinnah Medical Univ. 2019; 13(4): 155-158.

DOI: https://doi.org/10.37018/jfjmu.652

membranes in terms of their preoperative OCT findings and peroperative surgical time required to remove such membranes behavior.

PATIENTS AND METHODS

After taking clearance from ethical committee Institutional Review Board of Services Hospital Lahore, study was conducted at Department of Ophthalmology, Services Hospital Lahore from August 2017 till April 2019. Thirteen patients having epiretinal membrane secondary to pars plana vitrectomy with silicone oil injection in the past, were recruited as group A. Thirteen patients with idiopathic epiretinal membrane were enrolled as group B. OCT for macular thickness study was performed to confirm the epiretinal membranes. Patients having epiretinal membranes due to uveitis or diabetic retinopathy were excluded. The features of both groups were compared. Detailed preoperative examination was performed. Preoperative and 2 weeks postoperative best corrected visual acuity of all the patients in both groups was recorded using Snellen's chart which was converted to the logarithm for analysis. The OCT of both groups was performed 1 day before surgery and thickness of epiretinal membranes over fovea centralis and central retinal thickness (CRT) were measured and reviewed. All surgeries were performed by the same surgeon. Brilliant Blue dye was used to stain the membranes in both groups. In group A, first silicone oil was removed then the epiretinal membrane and internal limiting membrane were removed. While in group B epiretinal membrane and internal limiting membrane were removed. The time required to remove epiretinal membrane and internal limiting membrane was recorded in seconds, from touching of the membranes to complete removal of the membranes. Patients were followed on day first and at end of first week after surgery. Main outcome variables included preoperative OCT findings and the time required to remove epiretinal membranes and internal limiting membranes. Data was analyzed using SPSS 20.

RESULTS

The demographic of the patients, operative time to remove the membranes and change in the best corrected visual acuity are discussed in Tables 1 and 2.

Table 1. Group A

Serial No.	Age	Sex	Eye	Pre op BCVA Log MAR	Post op BCVA Log MAR	Duration of Silicone Oil (months)	CRT (µ)	Time to remove membranes (seconds)
1	45	F	R	.80	.50	3	512	480
2	53	M	R	.60	.50	3	485	100
3	54	M	L	1.0	.60	5	680	540
4	65	M	R	.60	.60	3	424	240
5	60	F	R	.50	.15	3	358	300
6	58	F	L	1.0	1.0	7	720	600
7	47	M	L	.60	.15	4	469	420
8	63	M	L	.50	.30	3	413	360
9	72	M	R	1.0	.60	6	613	720
10	49	F	L	.50	.15	4	517	600
11	50	M	R	1.0	1.0	10	648	780
12	50	F	R	.60	.30	3	415	240
13	54	M	R	.67	.30	4	640	660

Table 2.Group B

Serial No.	Age	Sex	Eye	Pre op BCVA Log MAR	Post op BCVA Log MAR	CRT (µ)	Time to remove membranes (seconds)
1	63	F	L	.60	.15	436	210
2	52	F	L	.30	.50	310	720
3	63	M	R	.80	.15	340	660
4	52	M	L	.30	0.0	307	620
5	59	F	R	.80	.15	417	240
6	57	M	R	1.0	.30	537	240
7	54	F	R	.60	0.0	498	300
8	45	M	R	.60	.50	417	300
9	59	M	L	.60	.50	439	360
10	64	F	R	.50	.50	320	420
11	54	M	L	1.0	.60	345	390
12	56	F	R	.50	.60	309	300
13	57	M	L	1.0	.10	420	300

Mean age of patients was 55.38 year in the study group and 56.53 years in the control group (Table 3). Majority of the cases in both groups were male. Mean CRT in group A was 580.80 µm and in group B was 391.92 µm (Table 4). There was significant difference between the both groups which was also statistically significant (p 0.002). Mean operative time in group A was 466.38 seconds and in group B was 385.69 seconds which was statistically insignificant (p 0.29).

Few complications were encountered in group A. Two patients developed bleeding per operatively during the removal of membranes and 1 patient later developed retinal detachment after the removal of silicone oil from the eye. However in group B no such complications were encountered.

No statistically significant difference was noted among the gender distribution, age, eye involved and pre and post-operative Best Corrective Visual Acuity (BCVA) in both groups. Mean pre-operative BCVA was .72 in Group A and .64 in Group B (p= 0.99). Mean post-operative BCVA was .47 in Group A and .32 in Group B (p= 0.14)

DISCUSSION

Epiretinal membranes in silicone oil filled eyes have different pathophysiology as compared to idiopathic epiretinal membranes.[14] Wickham and colleagues described that intense inflammatory response was involved in formation of epiretinal membranes in silicone oil filled eyes as compare to idiopathic membranes.[14] In present study the OCT findings of patients with silicone oil epiretinal membranes have shown increased thickness at the fovea as compared to the idiopathic epiretinal membranes. The mean CRT in the group A was 530.30 µm while in the group B was 390.91 µm. According to Tanaka and coauthors, increased thickness of SO ERM is because of the double layer nature which were confirmed histopathologically. These bilayered membranes were composed of sponge like layer on the vitreous side and glial cell/ extra cellular matrix on the retinal side.[10] There are few studies that have shown the OCT findings of patients who were injected silicone oil as tamponade.[15-17] One previous study identified intra retinal cystic spaces after silicone oil injection in a patient who underwent macular hole surgery of internal limiting membrane peeling.[18] In another study hyper reflective areas were identified intraretinal, subretinal and beneath the epiretinal membranes in patients who were injected silicone oil as tamponade. Those hyper reflective areas were identified as emulsified oil.[15]

The idiopathic epiretinal membranes are composed of usually four types of cells which are retinal pigment epithelial cells, myofibroblasts cells, fibrous astrocytes and fibrocytes in variable proportions and the extra cellular matrix in idiopathic ERM is primarily collagen.[19,20] The SO ERM are different from idiopathic membranes as 10 % of these membranes are having new vessels whereas the idiopathic membranes are completely avascular.[21] Results of this study are consistent with the findings of previous studies.[10,19-21] The increased thickness at the fovea is because of the additional sponge layer in silicone oil ERM. Because of this double nature of the SO ERM, the time required to remove such membranes are longer than idiopathic ERMs. As previous studies have supported the fact that this sponge layer may induce the inflammation at retinal fovea so Silicone oil should be removed before development of such membranes. However, in current study, authors could not find out the exact duration of development of membranes in SO ERM. The surgical time required in removing SO ERM was greater than idiopathic ERM. The mean time to remove SOERMS was 466.38 seconds which was greater than time required to remove idiopathic ERM which was 385.69 seconds. It was difficult to remove SO ERM because of the fragile and more adherent nature of the membranes. The vitreous side of the membranes was fragile and removed easily when grasped with forceps while the retinal side part of the membranes was firmly adherent to the retina and the corresponding macular part was also fragile because of inflammation. However the removal of idiopathic ERM was easier and less time taking. In a previous study, the mean time required for the removal of SOERM was 131 seconds which was more as compared to the removal of idiopathic ERM which was 74 seconds.[10]

However, since this study was single centered and less number of patients were involved, we also recommend further studies with larger number of patients for more elaborative conclusion.

CONCLUSION

Central retinal thickness was greater in SOERMs than idiopathic ERMs. Time required to remove SOERMs was greater than idiopathic ERMs. This is recommended that preoperative OCT is necessary to identify ERMs. SOERMs should be removed with more

care than the idiopathic ERMs because the retina is fragile and layers are double in SOERMs. Silicone oil may be removed before development of epiretinal membranes.

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