·Clinical Research·

Episcleral macular buckling for posterior retinal detachment in silicone oil filled eyes associated with myopic macular hole

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Abstract

• **AIM: To evaluate anatomical and visual outcomes of episcleral macular buckling (EMB) for posterior retinal detachment in silicone oil filled eyes associated with myopic macular hole.**

• **METHODS: Five cases of EMB for initial failure of retinal reattachment after internal limiting membrane (ILM) peeling and silicone oil tamponade caused by myopic macular hole were retrospectively reviewed. A silicone sponge sutured directly across the macular region was performed on the silicone oil filled eyes. Silicone oil was removed no sooner than 1 month post-EMB. The duration of follow-up time after removal of silicone oil was more than 3 months.**

• **RESULTS: Retinas of five eyes were all reattached at the last follow-up. The postoperative vision ranged from counting fingers to 0.08.**

• **CONCLUSION: Anatomical results improved after EBM for posterior retinal detachment in silicone oil filled eyes associated with myopic macular hole, which was not evident for visual outcome.**

• **KEYWORDS:** episcleral macular buckling; myopia; macular hole; retinal detachment; silicone oil tamponade

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INTRODUCTION

Retinal detachment (RD) caused by macular hole is one of the most serious complications in highly myopic eyes, which is especially common among Asians [1-3]. Before pars plana vitrectomy (PPV) was introduced to retinal practice, episcleral macular buckling (EMB) with cryotherapy, laser photocoagulation, drainage of subretinal fluid and intraocular gas injection was the method of choice to treat RD due to macular hole. EMB provides good anatomic results, requires no sophisticated instruments, and also decreases the risk of intraocular complications such as endophthalmitis [3-5]. However, disadvantages include difficulties in placement of buckling material over the macula, destruction of photoreceptors and neurons around the macular hole, potential damage of nerves and vessels in the posterior pole, and limited effectiveness in eyes with proliferative vitreoretinopathy [4-7].

Today's most popular treatment for RD due to macular hole is PPV with several additional procedures such as intraocular gas tamponade, silicone oil tamponade, and internal limiting membrane (ILM) peeling [1, 2, 8-15]. The initial reattachment rates range from 63% to 91% after PPV with gas tamponade [2, 8-10] and range from 91% to 100% after PPV with silicone oil tamponade [1,11,12]. ILM peeling is helpful in improving the retinal reattachment rates [10,13-15]. Though the retinal reattachment rates are high, there are still a few failed cases in clinical practice. In this study, we report our recent experiences and results of EMB for posterior retinal detachment in silicone oil filled eyes associated with myopic macular hole.

SUBJECTS AND METHODS

The medical records of patients with RD caused by myopic macular hole who underwent EMB after initial failure of PPV with ILM peeling and silicone oil tamponade between August 2008 and December 2010 were retrospectively reviewed. The inclusion criteria were as follows: RD caused by a full-thickness macular hole in highly myopic eyes, initial failure of retinal reattachment after PPV with ILM peeling and silicone oil (5 700-centistokes) tamponade, myopia of at least 9.0 negative diopters, and no history of pre-existing ocular diseases or ocular surgery except for cataract surgery.

Table 1 Characteristics of five cases

No.	Sex	Age	Refractive error (D)	BCVA		Complication in EMB	Reattachment of retina	Anatomical MH closure	Follow-up (mo)
				Pre-op	Post-op				
1	M	49	-10.5	0.06	0.05	No	Yes	No	28
2	F	66	-13	CF	CF	No	Yes	No	27
3	M	71	-15.5	HM	CF	Hyphema	Yes	Yes	13
4	F	60	-9	CF	0.06	No	Yes	Yes	9
5	F	65	-10	0.02	0.08	No	Yes	No	10

F: female; M: male; BCVA: best corrected visual acuity; HM: hand motion; CF: counting fingers; EMB: episcleral macular buckling; MH: macular hole.

Figure 1 Pictures of the right eye in a 71-year-old patient postoperatively, after removal of silicone oil A: Fundus photograph shows myopic chorioretinal atrophy without retinal detachment. B: Ultrasonographic B-scan shows high echo of silicone sponge. C: Optical coherence tomography shows retinal reattachment and anatomical macular hole closure.

The following examinations were performed preoperatively and postoperatively: measurement of best-corrected visual acuity (BCVA) using the Snellen chart, noncontact tonometry, B-scan ultrasonography, slit-lamp examination of the anterior and posterior segment, and peripheral retinal examination by indirect ophthalmoscopy. Fast macular thickness map images were taken using optical coherence tomography (OCT) (OCT 3 000; Carl Zeiss, Dublin, California, USA) to confirm whether the macular hole had been closed after retinal reattachment. All surgeries and follow up care for all patients were performed by the same senior author.

Each highly myopic eye with RD caused by macular hole received conventional 20-gauge three-port PPV as the primary surgery. Triamcinolone acetonide was used intraoperatively to facilitate visualization of the vitreous and ensure completely posterior vitreous detachment. The ILM around the macular hole within the major temporal vascular arcades was peeled off with vitreous forceps. All patients with silicone oil tamponade were instructed to maintain a face-down position for at least 2 weeks. If the posterior retina did not attach after silicone oil tamponade within one month, EMB was performed after confirmation with an OCT scan.

The surgical procedure for EMB was as follows. The perilimbal conjunctiva was incised and traction sutures were placed in the superior, lateral and inferior rectus muscle tendons. If necessary, the lateral rectus muscle was temporarily detached from its insertion to obtain sufficient surgical area. In order to decrease the intraocular pressure and expose the posterior pole to facilitate exoplant placement, a 10mL syringe was used to remove about 0.3-0.4mL of silicone oil through the pars plana in an area 3.5-4mm behind the limbus. Then, two needling sites for exoplant suturing, 7-8mm apart, were marked on the sclera at the posterior staphyloma, which were usually behind the inferior oblique muscle insertions. The buckling material was silicone sponge trimmed to approximately 6mm×5mm×2mm in size. The silicone sponge was sutured on the sclera by the preplaced sutures. Fundus was examined by indirect ophthalmoscopy to ensure the macular buckling effect. No laser or cryotherapy was performed over the macular region. Postoperatively, patients were instructed to maintain a face-down position for 2 weeks again. Silicone oil was removed at the patient's convenience at least 1 month post-EMB. Phacoemulsification on all phakic eyes with intraocular lens implantation were performed prior to silicone oil removal for patients were all elderly and expected to have cataract after the surgery. The duration of follow-up time after removal of silicone oil was more than 3 months.

RESULTS

The clinical characteristics of the five eyes fulfilling the inclusion criteria are shown in Table 1. There were 2 male and 3 female patients whose age ranged from 49 to 71 years (62.2 ±8.3 years, mean ±SD) and whose refractive error ranged from -9.0 to -15.5 diopters (-11.6±2.6 diopters). The preoperative vision ranged from hand motion to 0.06. The posterior retina was detached in five cases after the PPV with ILM removal and silicone oil tamponade.

The postoperative vision ranged from counting fingers to 0.08. The retina was reattached in all five cases at the last follow-up (Figure 1A). The anatomical macular holes closure was in two eyes and the foveal neurosensory retinal defect was in other three eyes. Postoperative B-scan ultrasonography (Figure 1B) and OCT (Figure 1C) showed

obvious convexity at the macular area. Hyphema occurred in one eye during the EMB surgery. This might be related to the low intraocular pressure after 0.4mL silicone oil removal or the injury of blood vessels. It was absorbed in five days with topical treatment. The intraocular pressure was normal post-operation and during follow-up period. There were no other serious complications, such as scleral laceration, injury to the optic nerve or macular scarring.

DISCUSSION

In recent years, PPV with ILM peeling and either gas or silicone oil tamponade has become the most commonly used treatment for RD caused by macular hole in highly myopic eyes. According to the results of many studies on the treatment of RD due to myopic macular hole, the retinal reattachment rates of PPV with silicone oil tamponade were higher than PPV with gas tamponade, though some additional procedures differed [1,2,8-12]. Most of previous studies had shown that removal of the ILM improved the initial reattachment rates, because it ensured the complete removal of any overlying epiretinal membranes and enhanced flexibility of the retina [10, 14].

In our practice, PPV with silicone oil tamponade was performed in eyes with myopic macular hole, which had extensive RD and marked chorioretinal atrophy in the macular area. The duration of silicone oil tamponade was longer than the duration of gas tamponade, which may lead to better retinal reattachment. Moreover, the speed of RD after failure of the initial surgery was relatively slow with silicone oil tamponade, which was facilitated to the second surgery [1]. There were a small part of eyes with posterior retina detached after ILM peeling and silicone oil tamponade. The initial failure can be attributed to relatively less of retina due to the longer ocular axial length, adsorption strength weakening of retinal pigment epithelium, loss of elasticity of the retina and the inward tractional force of posterior staphyloma and retinal vessels [2,7,16]. In order to make these eyes get rid of dependence with silicone oil tamponade, we performed EMB to deal with the remaining RD.

In the past, EMB was the traditional method to treat RD due to macular hole and some surgeons still use it today for its favorable results. Ando *et al* [6] and Ripandelli *et al* [17] compared the anatomical and visual outcomes after EMB and PPV for RD caused by myopic macular hole. Both studies showed a higher rate of retinal reattachment and a greater improvement in visual acuity after EMB than after PPV. However, since PPV was performed with lens extraction, gas tamponade and without ILM peeling, the results may have been influenced. Theodossiadis *et al* [3] reported the mean a follow-up time of 15 years for the macular buckling procedure in myopic macular hole with RD and posterior staphyloma, and showed the anatomical success rates after a single procedure and after the second operation were 88% and 100% respectively. The existing staphyloma cause the macular surface to be extremely concave, and the macular buckling procedure is able to change the macular surface to a convex shape, which may relieve the anteroposterior vitreoretinal traction and overcome the geometric imbalance between the neurosensory retina and the retinal pigment epithelium-choroid-sclera complex due to posterior staphyloma, hence facilitating adhesion between the tissues [3, 6].

Reports also showed EMB was useful in the initial failure of PPV surgery. Nishimura *et al* [1] reported EMB successfully treated two cases with myopic macular hole after failure of the initial surgery, but no operational details were described. Tanaka *et al* [7] showed three cases of postvitrectomy recurrent RD with myopic macular hole which had successful retinal reattachment with EMB. They inserted a tube for infusion of BSS Plus intraocular irrigating solution, in order to control intraocular pressure during the procedure, and 20% oxygen-diluted SF_6 as the tamponade at the end of the procedure. In our study, the retinas were all reattached in the five eyes which underwent EMB after initial failure of retinal reattachment after ILM peeling and silicone oil tamponade caused by myopic macular hole. However, visual acuity did not improve and anatomical macular holes only closed in two patients. This could be related to extensive and long term RD and marked atrophy of the retinal pigment epithelium/choriocapillaris complex in the macular area. The main difference between our EMB surgery and the procedure Tanaka *et al* [7] reported was that our procedures were performed on silicone oil filled eyes. On one hand, silicone oil filled eyes could help control the intraoperative intraocular pressure. About 0.3-0.4mL silicone oil was removed to decrease intraocular pressure to facilitate exposure of the posterior pole and exoplant placement. On the other hand, tensile strength of intraocular silicone oil was helpful in postoperative retinal reattachment. The silicone sponge was used as the buckling material in our surgery, which was common in scleral buckling. But direct suturing across the macular region was difficult to performed and more likely to cause the damage of tissues in the posterior pole. In many reports, a specially designed rectangular-shaped solid silicone plate was used in EMB that had a circular button at the posterior tip used for indenting the macular area which made the suturing easier [1, 6, 7, 18]. That was a nice a buckling material worth recommending for use in EMB surgery.

In summary, the results of our study suggest that EMB is an effective method for initial failure of retinal reattachment after ILM peeling and silicone oil tamponade caused by myopic macular hole. Unfortunately, the sample size in the

current study was not sufficient and the duration of follow-up examinations were not enough to record the continuous change of the macula. Further prospective studies involving a larger number of patients and long-term follow up will be required.

REFERENCES

1 Nishimura A, Kimura M, Saito Y, Sugiyama K. Efficacy of primary silicone oil tamponade for the treatment of retinal detachment caused by macular hole in high myopia. *Am J Ophthalmol* 2011;151(1):148-155

2 Nakanishi H, Kuriyama S, Saito I, Okada M, Kita M, Kurimoto Y, Kimura H, Takagi H, Yoshimura N. Prognostic factor analysis in pars plana vitrectomy for retinal detachment attributable to macular hole in high myopia: a multicenter study. *Am J Ophthalmol* 2008;146(2):198-204

3 Theodossiadis GP, Theodossiadis PG. The macular buckling procedure in the treatment of retinal detachment in highly myopic eyes with macular hole and posterior staphyloma: mean follow-up of 15 years. *Retina* 2005;25(3): 285-289

4 Feman SS, Helper RS, Straatsma BR. Rhegmatogenous retinal detachment due to macular hole. Management with cryotherapy and a Y-shaped sling. *Arch Ophthalmol* 1974;91(5):371-372

5 Siam A. Macular hole with central retinal detachment in high myopia with posterior staphyloma. *Br J Ophthalmol* 1969; 53(1):62-63

6 Ando F, Ohba N, Touura K, Hirose H. Anatomical and visual outcomes after episcleral macular buckling compared with those after pars plana vitrectomy for retinal detachment caused by macular hole in highly myopic eyes. *Retina* 2007;27(1):37-44

7 Tanaka T, Ando F, Usui M. Episcleral macular buckling by semirigid shaped-rod exoplant for recurrent retinal detachment with macular hole in highly myopic eyes. *Retina* 2005;25(2):147-151

8 Lam RF, Lai WW, Cheung BT, Yuen CY, Wong TH, Shanmugam MP, Lam DS. Pars plana vitrectomy and perfluoropropane (C3F8) tamponade for retinal detachment due to myopic macular hole: a prognostic factor analysis. *Am J Ophthalmol* 2006;142(6):938-944

9 Li X, Wang W, Tang S, Zhao J. Gas injection versus vitrectomy with gas for treating retinal detachment owing to macular hole in high myopes. *Ophthalmology* 2009;116(6):1182-1187

10 Kadonosono K, Yazama F, Itoh N, Uchio E, Nakamura S, Akura J, Sawada H, Ohno S. Treatment of retinal detachment resulting from myopic macular hole with internal limiting membrane removal. *Am J Ophthalmol* 2001;131(2):203-207

11 Wolfensberger TJ, Gonvers M. Long-term follow-up of retinal detachment due to macular hole in myopic eyes treated by temporary silicone oil tamponade and laser photocoagulation. *Ophthalmology* 1999; 106(9):1786-1791

12 Scholda C, Wirtitsch M, Biowski R, Stur M. Primary silicone oil tamponade without retinopexy in highly myopic eyes with central macular hole detachments. *Retina* 2005;25(2):141-146

13 Ichibe M, Yoshizawa T, Murakami K, Ohta M, Oya Y, Yamamoto S, Funaki S, Funaki H, Ozawa Y, Baba E, Abe H. Surgical management of retinal detachment associated with myopic macular hole: anatomic and functional status of the macula. *Am J Ophthalmol* 2003;136(2):277-284

14 Uemoto R, Yamamoto S, Tsukahara I, Takeuchi S. Efficacy of internal limiting membrane removal for retinal detachments resulting from a myopic macular hole. *Retina* 2004;24(4):560-566

15 Oie Y, Emi K, Takaoka G, Ikeda T. Effect of indocyanine green staining in peeling of internal limiting membrane for retinal detachment resulting from macular hole in myopic eyes. *Ophthalmology* 2007;114(2):303-306

16 Sayanagi K, Oshima Y, Ikuno Y, Tano Y. Presumed vascular traction-associated recurrence of retinal detachment in patients with myopic macular hole. *Ophthalmic Surg Lasers Imaging* 2009;40(1):60-64

17 Ripandelli G, Coppè AM, Fedeli R, Parisi V, D'Amico DJ, Stirpe M. Evaluation of primary surgical procedures for retinal detachment with macular hole in highly myopic eyes: a comparison [corrected] of vitrectomy versus posterior episcleral buckling surgery. *Ophthalmology* 2001;108(12): 2258-2264

18 Sasoh M, Yoshida S, Ito Y, Matsui K, Osawa S, Uji Y. Macular buckling for retinal detachment due to macular hole in highly myopic eyes with posterior staphyloma. *Retina* 2000;20(5):445-449