Journal of Animal and Veterinary Advances 12 (4): 447-451, 2013
ISSN: 1680-5593

23-Gauge Vitrectomy for Recurrent Retinal Detachment in Silicone Oil-Filled Eyes

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Abstract: To evaluate anatomical and visual outcomes of 23-gauge vitrectomy for recurrent retinal detachment in silicone oil-filled eyes with silicone oil *in situ*. The records of nineteen patients who undergone reoperation with 23-gauge vitrectomy for recurrent retinal detachment in silicone oil-filled eyes were retrospectively reviewed. During the surgeries, three 23-gauge cannulas were placed and the inferotemporal cannula was connected to automated silicone oil pump, the surgery steps were similar to conventional vitrectomy with subretinal fluid drainage, empiretinal membrane pleading, relaxing retinotomy and endophotocoagulation. In all, fifteen of the cases had retinal breaks in the inferior quadrants; recurrent retinal detachment was due to Proliferative Vitreoretinopathy (PVR) in four other cases. The retina was attached at the last follow-up vist in eighteen of the nineteen eyes. Simplified 23-gauge vitrectomy with silicone oil *in situ* for recurrent retinal detachment in silicone oil-filled eyes is a simplified and useful method.

Key words: 23-gauge vitrectomy, recurrent detachment, silicone oil-filled, empirical membrane pleading, inferotemporal cannula

INTRODUCTION

The role of silicone oil as a tamponade agent for complex rehegmatogeous retinal detachment is well established (Morphis *et al*., 2012; Federman and Schubert, 1988; Yeo *et al*., 1987; McCuen *et al*., 1985). The risk of redatchment in these complex cases is relatively high. Recurrent detachment may still occur secondary to reproliferation that could be either focal or diffuse, leaking inferior retinal break with or without Proliferative Vitreretinopathy (PVR) or intrinsic retinal contraction (Wickham *et al*., 2011; Goezinne *et al*., 2007; Nawrocki and Starska, 2002; Sharma *et al*., 2002). Conventional treatment involves removal of preexisiting silicone oil followed by vitreortinal manipulations and reinjection of silicone or just scleral buckling without revision of vitrectomy (Acar *et al*., 2011; Sharma *et al*., 2002; Nawrocki and Starska, 2002).

Over the last few years, advances in technology and instrumentation, modifications in surgical technique of small-gauge pars plana vitrectomy have promoted an expansion of surgical indications, mor complicated cases such as diabetic traction retinal detachment eyes with fibrovascular proliferation, complex retinal detachment and giant retinal tear can be performed using small gauge instrument (Romano *et al*., 2011; Eckart, 2005; Charles, 2011; Oshima *et al*., 2009; Shah *et al*., 2008; Fine *et al*., 2007).

In this retrospectively study, researchers investigated the anatomic and functional results of 23-gauge vitrectomy for recurrent inferior retinal detachment in silicone oil-filled eyes without removing the per existing silicone oil.

MATERIALS AND METHODS

The records of nineteen consecutive patients (nineteen eyes) who underwent reoperations on silicone oil-filled eyes were reviewed. The patients characteristics were presented in Table 1. All patients were treated by the same surgeon at Renmin Hospital of Wuhan University (Wuhan, China) between January 2008 and December 2011. Patients were selected based on the preoperative assessment which predicted that reattachment may be obtained without scleral buckle. All cases presented with inferior rehegmatogeous retinal detachment with or without macular involvement and localized posterior or anterior vitreoretinal proliferation. All patients had previously been treated with pars plana vitrectomy and 5700-centipoise silicone oil (Oxane 5700; Bausch and Lomb).

All patients had clinical examinations by slitlamp bio microscopy, indirect funds ophthalmology and three-mirror lens examination for location of retinal breaks and condition of vitreortinal proliferation. Information obtained by reviewing the medical records of each

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Table 1: Clinical data of the 19 cases in this study

Case	Age	Sex	Indication	Previous operations	Duration (weeks)	Lens status	Location of RB and PVR	BCVA		Follow-up (months)
								Preop	Postop	
1	36	M	GRT with PVR	PPV, SO	5	Phakic	Retinal break at 4:30, posterior PVR	10/200	20/200	6
2	32	F	GRT without PVR	PPV, SO	8	Phakic	Retinal break at 6:30, ERM around the break	20/200	30/200	8
3	46	F	ARN with RRD	PPV, SO	4	Phakic	Two retinal breaks at 6:00 and 7:00, ERM posterior PVR	CF	10/200	10
4	43	M	ARN with RRD	PPV, SO	3	Phakic	Retinal break at 5:30, ERM around the break	20/200	20/200	7
5	35	M	IOFB with RRD	PPV, SO	2	Phakic	Retinal break at 7:00, without PVR	30/200	10/100	10
6	72	F	Macular hole with RD	PPV, SO	6	Pseudophakic	Retinal break at 7:30, macular hole open, without PVR	CF	10/200	9
7	60	F	VH+BRVO+RRD	PPV, SO	2	Phakic	Retinal break at 5:00, without PVR	20/200	30/200	9
8	78	M	RRD with dropped nucleas	PPV, SO	3	Aphakic	Two retinal breaks at 5:00 and 7:00, without PVR	20/200	20/100	12
9	37	M	Endophthalmitis	PPV, SO	6	Aphakic	Retinal break at 5:30, ERM, posterior PVR	HM	4/200	13
10	61	M	Chronic RD with PVR	PPV, SB, SO	12	Aphakic	Retinal break at 6:00, ERM, posterior PVR	CF	10/200	21
11	57	F	RRD without PVR	PPV, SO	2	Phakic	Retinal break at 7:00, without PVR	20/50	20/50	11
12	51	M	RRD without PVR	PPV, SO	3	Phakic	Retinal break at 5:30, without PVR	20/50	30/50	8
13	63	F	Primary RD with PVR	PPV, SB, SO	2	Phakic	Without retinal break, ERM posterior PVR	20/200	20/100	18
14	56	M	Primary RD with PVR	PPV, SB, SO	2	Phakic	Retinal break at 6:00, ERM around break	10/200	20/250	19
15	24	F	Recurrent RD with PVR	PPV, SB, SO	5	Phakic	Without retinal break, postevior PVR	CF	5/200	22
16	52	M	Recurrent RD with PVR	PPV, SB, SO	7	Phakic	Without retinal break, postevior PVR	CF	10/200	21
17	29	M	Recurrent RD with PVR	PPV, SB, SO	4	Phakic	Retinal break at 7:00 postevior PVR	4/200	10/200	17
18	19	M	Recurrent RD with PVR	PPV, SB, SO	3	Phakic	Retinal hole at 6:00 postevior PVR	5/200	10/200	18
19	36	F	Recurrent RD with PVR	PPV, SB, SO	7	Phakic	Without retinal break posterior and anterior PVR	LP	LP	25

ARN = Acute Retianl Necrosis syndrome; BCVA = Best-Corrected Visual Acuity; BRVO = Branch Retinal Vein Occulusion; CF = Counting Finger; ERM = Epiretinal Membrane; F = Female; HM = Hand Movement; IOFB = Intraocular Foreign Body; LP = Light Perception; M = Male; PPV = Pars Plana Vitrectomy; PVR = Proleferative Vireoretinopathy; RRD = Rhegmatogenous Retinal Detachment; SB = Scleral Buckle; SO = Silicone Oil tamponade; VH = Vitreous Hemorrhage

patients included age, gender, ocular history, duration of RD, preoperative Best Corrected Visual Acuity (BCVA), postoperative BCVA, Intro Ulnar Pressure (IOP) and clinical features of the retinal detachment which included type and distribution of all retinal breaks, area of detachment, grade of PVR.

In all cases, surgery was performed by a single surgeon under retrobulbar anesthesia. The 23-gauge cannulas were placed using two-step technique (Inoue *et al*., 2007) at inferotemporal, superotemporal and superonasal region 3.5 mm posterior to the limbus. The conjunctiva was displaced using forceps, taking care not to tear it, the blade was inserted at a 30 angel and the entry was made perpendicular to the sclera. The inferotemporal cannula was connected to automated silicone oil pump integrated into the ACCURUS vitrectomy machine (Alcon Laboratories, Inc., USA). Surgeon can momentarily adjust intraocular pressure with automated silicon oil pump by controlling a foot pedal. Subretinal fluid was drained via accessible retinal break with vitreous cutter aspiration and retinal traction was released by epiretinal membrane pleading or inferior circumference retinal relaxing retinotomy using pics, forceps or scissors under a non contact wide-angle viewing system combined with an image inverter (BIOM, Oculas, Munich, Germany). Endophotocoagulation around the break margins or in the area of suspected breaks was then executed after the retinal became flattened. The intraocular pressure was elevated to about 25 mmHg by adding silicone oil with the inferotemporal infusion cannula at the end of operation for more adequately filling vitreous cavity and then the three cannulas were removed, the conjunctiva was replaced over the sclerotomies with a cotton tip applicator.

RESULTS

All cases in this series had completed retinal reattachment in the earlier Pars Plana Vitrectomy (PPV) with silicone oil tamponade. The patients' characteristics

were presented in Table 1. Most of recurrent retinal detachment involving the inferior periphery retinal had developed in 2-6 weeks after the earlier operation and often had 1-2 retinal breaks in the inferior retinal with proliferative epiretinal membrane. Five eyes had undergone a failed primary scleral buckling procedure before the surgery with silicone oil tamponade. Three eyes had undergone scleral buckling during previous vitreous surgery with silicone oil tamponade. No buckling was considered for eleven eyes because of the edge of giant retinal tear was either at the equator or posterior to the equator or there wasn't PVR. Two eyes of RRD without PVR had undergone vitreous surgery with silicone oil tamponade because there were more than four retinal breaks in inferior and superior quadrants. Age and sex distribution of the patients, indications for primary vitrectomy, location of the breaks and the condition of the Proliferative Vitreoretinopathy (PVR) are shown in Table 1. Recurrent retinal detachment was due to open inferior retinal breaks with or without PVR in fifteen eyes, another four eyes because of localized posterior or anterior proliferative vitreoretinaopathy.

The retina was completely attached and could be observed easily in early postoperative period in eighteen eyes expect for one with anterior chamber hyphema and vitreous hemorrhage. Seventeen eyes remained attached during the entire follow-up period which ranged from 3-21 months, two eyes redetached in 4-12 weeks due to the intrinsic retinal contraction and underwent vitreoretinal surgery and the retina remained attachment during the follow period. In the immediate postoperative period only one eye was observed with a fibrin response. None of the cases had increased IOP or hypotony.

DISCUSSION

With advances in surgical techniques and equipment of vitrectomy, the indication of PPV for treatment of RRD has been gradually expanded. Especially for complicated RD with PVR and inferior breaks, PPV and silicone oil tamponade can largely increase success rate of reattachment and improve visual function. However, the rate of recurrence of retinal detachment in silicone oil-filled eyes varies from 21.4-77% (Federman and Schubert, 1988; Yeo *et al*., 1987; McCuen *et al*., 1985). Retinal detachment affects inferior quadrants of the retina in silicone oil-filled eyes as a result of the displacement by the buoyant silicone oil bubble. Inferior retinal detachment has a poor prognosis in primary and recurrent cases (Quintyn *et al*., 2005; Gastaud and Freton, 2007; Abu El-Asrar *et al*., 2009).

The most common causes of failure and recurrence in silicone oil-filled eyes are reproliferation that could be either focal or diffuse, leaking peripheral inferior retinal breaks which could be primary breaks reopened because of scarcity of silicone oil tamponade or new breaks caused by traction of the epiretinal membrane and intrinsic retinal contraction. In this series, fifteen eyes had found retinal breaks of those eyes, ten had epiretinal membrane and posterior PVR, five eyes had not found PVR or epiretinal membrane. The another four redetachment eyes had not found retinal breaks in preoperative or intropeative. In this study, recurrent retinal detachment occurring within the first several weeks of surgery is probably due to scarcity of silicone oil tamponade, undiscovered retinal breaks in previous surgery and persistent retinal traction not adequately relieved while late retinal redetachment is more likely due to reproliferation. Preventive measures include carefully searching retinal breaks in preoperative and intraoperative, meticulous removal of epiretinal membranes to relieve retinal traction, assiduous vitreous base dissection when anterior PVR is present, adequate tamponade vitreous cavity with silicone oil and pharmacological inhibition of reproliferation.

In silicone oil-filled eyes with inferior rhegmatogenous retinal detachment with or without macular involvement and localized posterior vitreoretinal proliferation, instead of conventional treatment involving removal of preexisting silicone oil followed by vitreoretinal manipulations and reinjection of silicone oil or just scleral buckling without revision of vitrectomy (Acar *et al*., 2011; Sharma *et al*., 2002; Nawrocki and Starska, 2002), retina reattachment may be achieved using simplified 23-gauge vitrectomy technique without removal of silicone oil. There are several reports of the pars plana vitrectomy without scleral buckle for the repair of retinal detachment with inferior breaks and proliferative vitreoretinopathy which revealed supplementary scleral buckle did not significantly increase the primary success rate (Sheng *et al*., 2012; Mehta *et al*., 2011; Kinori *et al*., 2011; Boscia *et al*., 2008). There are also simplified procedures which have been advocated for limited proliferation in silicone oil-filled eyes (Kertes and Peyman, 1997; Yang *et al*., 2006). In the present study, all eyes underwent reoperation with silicone oil *in situ*. Various steps were combined in the reoperations: three 23-gauge biplanar sclerotomies with displacement of the conjunctiva were created, the inferotemporal infusion line was connected to automated silicone pump instead of Balanced Salt Solution (BSS) bottle, retinal was released by epiretinal membrane peeling or inferior circumferential relaxing retinotomy using pics, forceps or scissors retinal fluid was drained and endophotocoagulation was executed. This approach was successful in seventeen of nineteen patients after only one operation, two failed

because of retina hemorrhage and anterior PVR continually developing, the retina was reattached after vitreoretinal surgery increasing the anatomical success rate.

The simplified 23-gauge vitrectomy system utilized in this study have several advantages. Because automated silicone oil pump integrated into modern vitrectomy system is controlled by the surgeon with a foot pedal, the surgeon can momemtarily adjust intraocular pressure during the operation. Proper intraocular pressure elevation can decrease the risk of retinal bleeding especially when the epiretinal membrane was peeled and with the silicone oil *in situ*, these epiretinal membranes which were held in place can be held and removed with intraocular forceps with great ease. Meanwhile for the automated silicone oil infusion instead of BSS infusion, emergence of the aqueous interface trapped between the silicone oil globule and the detached retinal which may interfere some vitreoretinal surgical maneuvers can be eliminated during the operation procedure. By increasing the intraocular pressure properly, researchers can aspirate the subretinal fluid and the fluid over the disk region with a soft-tipped cannula more easily and can fill the vitreous cavity adequately. The part of the retina which was attached preoperatively stayed attached throughout the process, so increasing the likelihood of at least maintaining the preoperative visual acuity in the treated eye. It also can avoid suprachoroidal silicone oil injection which is rare but devasting complication because 23-gauge infusion cannula still stay the vitreous cavity and can be observed during the operation. The operation time is considerably reduced because of without silicone oil removal, air-fluid exchange, oil-air exchange and the transconjunctival sutureless 23-gauge cannula incision. More important the 23-gauge minimally traumatizing surgery results in less postoperative inflammation, less corneal astigmatism, greater postoperative comfort, faster recovery time and fewer postoperative medications.

In the study, in the immediate postoperative period, a fibrin response was not observed in eighteen eyes, only one eye was observed with anterior chamber hemorrhage and vitreous hemorrhage, the less inflammation and more reattachment rate compared with those reported by Sharma *et al.* (2002) may be due to the 23-gauge minimal traumata and the limited focal PVR in the patients. The conjunctiva scar and severe tissue adhesion caused by previous surgery don't interfere the 23-gauge surgery procedure. The limitation of this method is in treating cases with significant and widespread proliferating tissue or cases with tented retina and large breaks with possible subretinal silicone oil.

CONCLUSION

In this small series, the results seemed to support the concept that with proper preoperative fundus assessment, simplified 23-gauge vitrectomy without removal of silicone oil may be a simplified, effective and economic method to teat recurrent inferior retinal detachment without extensive proliferation in silicone oil-filled eyes.

REFERENCES

Abu El-Asrar, A.M., H.F. Al-Kwikbi and D. Kangave, 2009. Prognostic factors after primary vitrectomy and perfluorocarbon liquids for bullous rhegmatogenous retinal detachment. Eur. J. Ophthalmol., 19: 107-117.

Acar, M.A., N. Unlu, D. Hazirolan, M.N. Demir, G.O. Uney and F. Ornek, 2011. Conventional surgery for complicated retinal detachment in silicone oil-filled eyes. Eur. J. Ophthalmol., 21: 290-295.

Boscia, F., C. Furino, N. Recchimurzo, G. Besozzi, G. Sborgia and C. Sborgia, 2008. Oxane HD vs silicone oil and scleral buckle in retinal detachment with proliferative vitreoretinopathy and inferior retinal breaks. Graefes Arch. Clin. Exp. Ophthalmol., 246: 943-948.

Charles, M., 2011. Closed system and expanded instrumentation improves MIVS outcomes. Retina Today. http://bmctoday.net/retinatoday/2011/08/advertorial/article.asp?f=closed-system-and-expanded-instrumentation-improves-mivs-outcomes.

Eckart, C., 2005. Transconjunctival sutureless 23-gauge vitrectomy. Retina, 25: 208-211.

Federman, J.L. and H.D. Schubert, 1988. Complications associated with the use of silicone oil in 150 eyes after retina-vitreous surgery. Ophthalmology, 95: 870-876.

Fine, H.F., R. Iranmanesh, D. Iturralde and R.F. Spaide, 2007. Outcomes of 77 consecutive cases of 23-gauge transconjunctival vitrectomy surgery for posterior segment disease. Ophthalmology, 114: 1197-1200.

Gastaud, P. and A. Freton, 2007. Inferior retinal detachment with silicone oil tamponade. J. Fr. Ophtalmol., 30: 852-860.

Goezinne, F., E.C. La Heij, T.T. Berendschot, A.T.A. Liem and F. Hendrikse, 2007. Risk factors for redetachment and worse visual outcome after silicone oil removal in eyes with complicated retinal detachment. Eur. J. Ophthalmol., 17: 627-637.

Inoue, M., K. Shinoda, H. Shinoda, R. Kawamura, K. Suzuki and S. Ishida, 2007. Two-step oblique incision during 25-gauge vitrectomy reduces incidence of postoperative hypotony. Clin. Exp. Ophthalmol., 35: 693-696.

Kertes, P.J. and G.A. Peyman, 1997. Drainage of Subretinal fluid under silicone oil. Can. J. Ophthalmol., 32: 445-446.

Kinori, M., E. Moisseiev, N. Shoshany, I.D. Fabian and A. Skaat *et al*., 2011. Comparison of pars plana vitrectomy with and without scleral buckle for the repair of primary rhegmatogenous retinal detachment. Am. J. Ophthalmol., 152: 291-297.

McCuen, B.W., M.B. Landers and R. Machemer, 1985. The use of silicone oil following failed vitrectomy for retinal detachment with advanced proliferative vitreoretinopathy. Ophthalmology, 92: 1029-1034.

Mehta, S., K.J. Blinder, G.K. Shah and M.G. Grand, 2011. Pars plana vitrectomy versus combined pars plana vitrectomy and scleral buckle for primary repair of rhegmatogenous retinal detachment. Can. J. Ophthalmol., 46: 237-241.

Morphis, G., C. Irigoyen, A. Eleuteri, T. Stappler, I. Pearce and H. Heimann, 2012. Retrospective review of 50 eyes with long-term silicone oil tamponade for more than 12 months. Graefes Arch. Clin. Exp. Ophthalmol., 250: 645-652.

Nawrocki, J. and D. Starska, 2002. Use of retinotomy for retinal redetachment in the silicone oil filled eye. Klin Oczna, 104: 30-32.

Oshima, Y., C. Shima, T. Wakabayashi, S. Kusaka, F. Shiraga, M. Ohji and Y. Tano, 2009. Microincision vitrectomy surgery and intravitreal bevacizumab as a surgical adjunct to treat diabetic traction retinal detachment. Ophthalmology, 116: 927-938.

Quintyn, J.C., C. Ponchel, J. Fillaux, C. Arnaud, V. Pagot-Mathis and A. Mathis, 2005. Retinal detachment by inferior tear: A poor prog-nosis? J. Fr. Ophtalmol., 28: 953-957.

Romano, M.R., M. Angi, X. Valldeperas, C. Costagliola and P. Vinciguerra, 2011. Twenty-three-gauge pars plana vitrectomy, Densiron-68 and 360° endolaser versus combined 20-gauge pars plana vitrectomy, scleral buckle and SF6 for pseudophakic retinal detachment with inferior retinal breaks. Retina, 31: 686-691.

Shah, C.P., A.C. Ho, C.D. Regillo, M.S. Fineman, J.F. Vander and G.C. Brown, 2008. Short-term outcomes of 25-gauge vitrectomy with silicone oil for repair of compli-cated retinal detachment. Retina, 28: 723-728.

Sharma, T., L. Gopal, M.P. Shanmugam, P.S. Behind, R. Agrawal, S.S. Badrinath and T.K. Samanta, 2002. Management of recurrent retinal detachment in silicone oil-filled eyes. Retina, 22: 153-157.

Sheng, Y., W. Sun, B. Mo, Y.J. Yu, Y.S. Gu and W. Liu, 2012. Non-buckled vitrectomy for retinal detachment with inferior breaks and proliferative vitreoretinophathy. Int. J. Ophthalmol., 5: 591-595.

Wickham, L., G.O. Ho-Yen, C. Bunce, D. Wong and D.G. Charteris, 2011. Surgical failure following primary retinal detachment surgery by vitrectomy: Risk factors and functional outcomes. Br. J. Ophthalmol., 95: 1234-1238.

Yang, C.M., Y.T. Hsieh, C.H. Yang and K.R. Liu, 2006. Irrigation-free vitreoretinal surgery for recurrent retinal detachment in silicone oil-filled eyes. Eye, 20: 1379-1382.

Yeo, J.H., B.M. Glaser and R.G. Michels, 1987. Silicone oil in the treatment of complicated retinal detachments. Ophthalmology, 94: 1109-1113.