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Comparison of best corrected visual acuity following balanced salt solution or silicone oil injection in phakic and pseudophakic vitrectomized eyes

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Abstract

Background: To evaluate the effect of silicone oil (SO) on best-corrected visual acuity in phakic and pseudophakic vitrectomizied eyes.

Material and methods: This prospective comparative case-control study evaluated the best-corrected visual acuity (BCVA) in SO filled vitrectomizied eyes (case group 64 eyes) compared to the vitrectomizied eyes without SO injection (control group 46 eyes). The preoperative and postoperative BCVA evaluated by Snellen chart were compared between two groups. Exclusion criteria was consist of aphakia, any degree of anterior chamber inflammation, SO bubbles in anterior chamber and increased intraocular pressure in postoperative period.

Results: In the silicone oil group mean ±SD preoperative log MAR of BCVA was 1.76 ± 0.60 compared to 1.82 ± 0.52 in control group (P= 0.655), and mean postoperative log MAR of BCVA was 1.68 ± 0.56 compared to 1.55 ± 0.63 in control group (P = 0.23). There were no significant differences among groups.

Conclusion: SO in vitreous cavity of phakic and pseudophakic eyes could change vision in some of the patients. In this study, improvement of visual outcome occurred at the end of six months in both groups and SO per se has not been found to be an attributable factor for reduction of BCVA in patients.

Keywords: pars plana vitrectomy, silicone oil, BCVA

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Introduction

Jundishapur University of Medical Sciences, a referral center in south west of Iran. According to the injection of SO in vitreous cavity the patients divided into two groups. The eyes underwent vitrectomy with SO injection as case group and the eyes underwent vitrectomy without SO injection as control group. Standard postoperative examinations were performed at day one, one week, one month, three months, six months, and when clinically indicated.

Patients with a minimum age of 18 years candidate for pars plana deep vitrectomy due to vitreous hemorrhage, tractional or rhegmatogenous retinal detachment, or a combination of these situations were included.

Patients with a history of previous vitreoretinal intervention or subjects who underwent combined vitrectomy and cataract extraction were excluded. Exclusion criteria was also included aphakic eyes, clinically significant coexisting ocular pathology including glaucoma, inflammatory eye disease, any anterior segment and corneal disorders, and evidence of previous traumatic corneal injuries. Postoperative conditions that might reduce visual acuity such as evidence of SO in anterior chamber, high intraocular pressure and anterior chamber inflammation and also patients who didn't completed follow up period were excluded. Eyes requiring additional surgery e.g. cataract extraction, glaucoma surgery, penetrating keratoplasty, intravitreal gas injection, and SO removal within six postoperative months were also excluded.

Sequential sampling to reach the power of eighty percent for determining the number of cases was done.

Data collection

Demographic information, past medical and ocular history, initial BCVA, cornea and lens status, intraocular pressure, fundus

Silicone oil has been widely used as an internal tamponade for complicated retinal detachment surgery since it was first introduced in 1962 (1). It is common practice to remove SO after a period to reduce its well-known complications (2-4). Although the tolerance for intraocular SO is generally good, a number of side effects have been reported, including keratopathy, elevated intraocular pressure, ocular hypotony, emulsification, cataract formation, iritis and endophthalmitis (5). Numerous reports proposed some adverse effects of SO on the cornea (6-8).

Data obtained from enucleated, glaucomatous eyes suggest that silicone oil droplets can become impregnated within the neuroretina, pigment epithelium, optic nerve, and trabecular meshwork (9, 10).

Effect of SO on refractive and ocular biometric changes had been widely studied (11, 12) but comparative studies about the effect of SO on visual acuity is limited.

Compared with sulfur hexafluoride gas (SF6) as an intraocular tamponade for the management of retinal detachment, eyes treated with silicone oil were more likely to be successfully reattached, to achieve a better visual acuity, and to have fewer postoperative complications (13-15).

We evaluated the effect of intravitreal SO injection in phakic or pseudophakic vitrectomized eyes on BCVA until 6 months after surgery.

Material and methods

Study design and population

This study is a prospective, comparative case-control study of phakic or pseudophakic patients who underwent pars plana vitrectomy since May 2011 to June 2012 in Imam Khomeini hospital. All procedures were performed by two surgeon of the vitreoretinal faculty of the

consent was obtained from each patient before surgery**.** Ethical committee of Ahvaz Jundishapur University of Medical Science approved this study (ETH 252).

Results

One hundred and fifty six eyes were included in this study. In the course of study 46 eyes were excluded, due to need to SO removal in 26 eyes, anterior chamber inflammation in 4 eyes, progression of cataract leading to phacoemulsification surgery in 10 eyes and rise of intra ocular pressure in 6 eyes. 110 eyes of 99 patients completed the study after six months of follow up. For sixty four eyes vitrectomy with SO injection and for 46 eyes vitrectomy without SO injection were performed. Patient's demographics parameters in the two groups are summarized in Table 3.1. There were no statistically significant differences between measured parameters.

The most common preoperative clinical diagnoses and indications for vitrectomy in control group was long standing vitreous hemorrhage (21 eyes) versus combination of tractional, rhegmatogenous and/or vitreous hemorrhage in silicone oil group (24 eyes) (Figure 3.1). In all patients, the retina remained attached during six months follow up.

In the silicone oil group mean ± SD preoperative log MAR of best corrected visual acuity (BCVA) was 1.76 ± 0.60 compared to 1.82 ± 0.52 in control group (P = 0.655) , and mean postoperative log MAR of BCVA was 1.68 ± 0.56 compared to 1.55 ± 0.63 in control group (P = 0.23) (Table 3.2).

details, and indication of surgery were recorded. When needed to confirm the diagnosis ancillary tests such as echography and fluorescein angiography was performed. Preoperatively, 1 month and 6 months postoperatively BCVAs were evaluated by standard six meters Snellen chart at each examination. All measurements were done by a single observer.

All patients underwent pars plana vitrectomy. The procedure included a standard 20 gauge three-port pars plana vitrectomy using the Alcon Accurus system (Alcon Laboratories, Inc, Fort Worth, Texas). At the end of operation vitreous cavity was filled with SO 5000 (Siluron 5000, Fluoron GmbH, Ulm, Germany) (case group) or filled with gas or BSS+ (controlled group) according to their indications. Finally sclerotomies and conjunctiva were repaired. Postoperatively, the patient was asked to keep a face-down position.

Statistical analysis

To evaluate the validity of study repeated measurement test performed. For comparison of the mean age and sex differences between two groups, independent-samples t test and chi-square tests was performed respectively. Paired t-test and student t-test were used to comparison of preoperative and postoperative means of the BCVA between the two groups and in each group respectively. All tests of association were considered to be statistically significant if $P \leq 0.05$. Analysis was carried out using SPSS 19.0, (SPSS Inc, Chicago, Illinois).

Ethical consideration

After thorough explanation of the risks and benefits of surgery and silicone oil implantation when indicated, informed

Table 3.1. Patient's demographics parameters

	Group	
Parameter	Case	Control
Patients (n)	64	46
Mean age (y)	53.5 ± 11	57.5 ± 11
Sex (M/F)	29/35	18/28
Right/left eye	30/34	23/23
Phakic/pseudophakic	53/11	38/8
Diabetes Mellitus (%)	47 (73.4)	36 (78.3)
Hypertension (%)	26 (40.6)	17 (36.9)
Hyperlipidemia (%)	13 (20.3)	12 (26)
IHD (%)	18 (28.1)	11 (23.9)

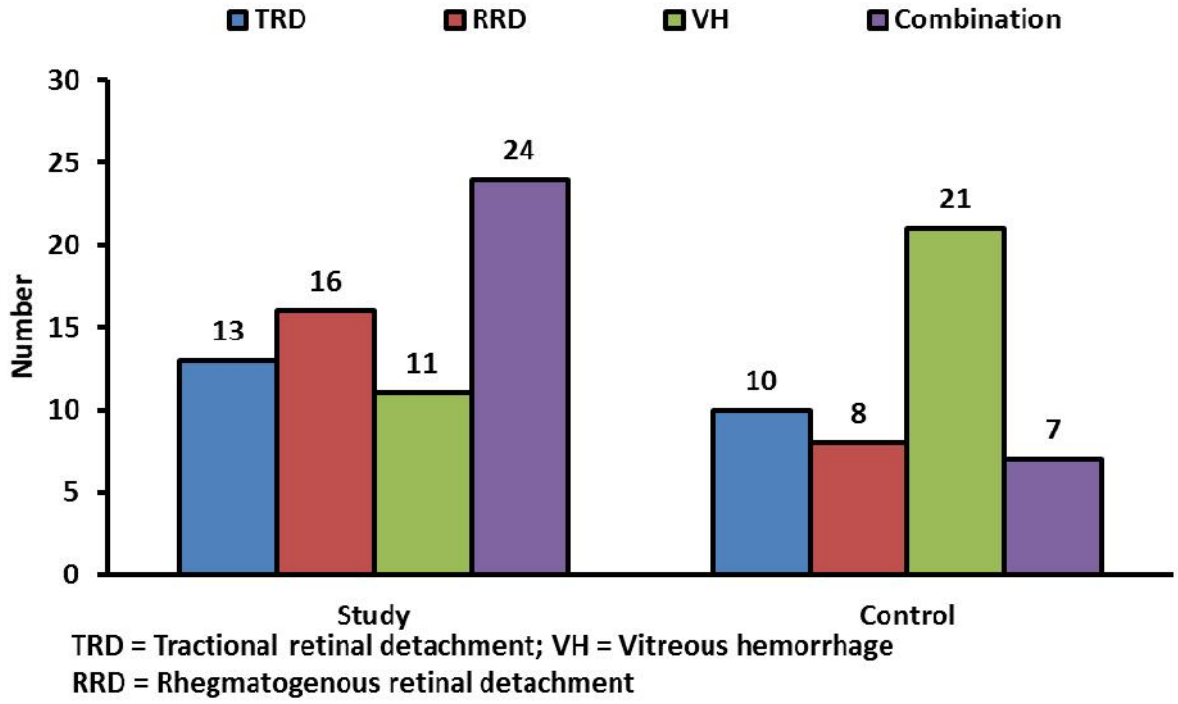

Figure 3.1. Indication of vitrectomy

Table 3.2. Overall BCVA measurements preoperative and postoperative.

	Mean Preoperative Mean ± SD			Mean postoperative 1 m Mean ± SD			Mean postoperative 6 ms Mean ± SD		
Parameter	Study	Control	*P* Value	Study	Control	*P* Value	Study	Control	*P* Value
BCVA	1.76 ± 0.60	1.82 ± 0.52	0.655	1.72 ± 0.58	1.66 ± 0.54	0.433	1.68 ± 0.56	1.55 ± 0.63	0.23

BCVA: Best-corrected visual acuity; 1 m: One months; 6 m: Six months

6 months after operation phakic and pseudophakic eyes in case and control groups were compared. There is a no significant difference in BCVA in each subdivided category as shown before (Table 3.3).

Table 3.3. Analysis of parameters based on lens status at 6 months

	Phakic			Pseudophakic		
Parameter	Case	Control	*P* Value	Case	Control	*P* Value
BCVA	1.77 ± 0.51	1.66 ± 0.54	0.681	1.26 ± 0.61	1.30 ± 0.65	0.902

BCVA: Best-corrected visual acuity

Discussion

Effect of SO on refractive and ocular biometric changes had been widely studied (11, 12) but comparative studies about the effect of SO on visual acuity is limited. It seems that SO in phakic and pseudophakic vitrectomized eyes had no significant effects on BCVA especially in first postoperative months. In this study, improvement of BCVA at the end of six months was occurred in both groups and this improvement was further in the control group. Although the differences was not statistically significant but it was noticeable. This marginal significance was possibly due to small numbers, and short follow ups but large randomized trials with evaluation of anatomical and structural status of macula are needed in future.

One explanation of better visual outcome in control group might be better preoperative condition of eye than the complicated situation in SO group that require further tamponade effect for conserving the globe.

Improvement of BCVA was reported significantly in Zenoni et al study on 50 eyes that underwent pars plana vitrectomy with SO injection in the treatment of complicated retinal detachment (16). Early removal of SO after reaching the tamponade effect might be the cause of significantly improvement of BCVA in their study in contrast to longer duration of retina and SO contact in ours.

Intravitreal SO in phakic and pseudophakic eyes could change the final visual outcome of patients. Loss of vision is a possible

complication after intravitreal SO injection. Loss of light perception in severe diabetic retinopathy could be due to retinal and optic nerve ischemia although vision improvement occurred in number of patients (17).

Vision loss may be masked by the fact that many eyes that receive silicone oil tamponade have severe retinal conditions with poor central vision at the time of oil placement (18). Moreover, silicone oil is believed to dissolve fat soluble elements from the retina, most notably lutein and zeaxanthin, both of which are widely thought to serve photo-protective roles (19, 20).

Gupta and colleges had shown vitrectomy alone could improve central vision in diabetic patients (21), although their study was retrospective but improvement in visual outcomes of SO filled eyes was also noticeable.

The overall improved results seen in our study could be multi-factorial: improved vitreoretinal surgical techniques and excluding the disturbing ocular and systemic co-morbidities that could affect the final visual outcomes.

In conclusion, vitrectomy with or without SO injection could improve BCVA in patients and SO in per se was not attribute to change in final visual outcome of patients. Therefore, further studies for detecting the possible contributing factors on BCVA in presence of intravitreal SO is recommended.

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