

Original Article

23-gauge vitrectomy and silicone oil tamponade with and without phacoemulsification in rhegmatogenous retinal detachment

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Abstract: The aim of this study is to assess clinical outcomes of 23-gauge vitrectomy and silicone oil (SO) tamponade combined with and without phacoemulsification (PE) in rhegmatogenous retinal detachment (RRD). The study included forty eyes of 40 patients that underwent 23-gauge vitrectomy and SO tamponade combined with and without PE. Twenty eyes of 20 cases, of whom underwent 23-gauge vitrectomy and SO tamponade combined with PE were allocated to the group 1. Likewise, 20 eyes of 20 cases that underwent 23-gauge vitrectomy and SO tamponade alone were allocated to the group 2. Best corrected visual acuity (BCVA) between two groups was compared. There was no significant difference in BCVA between the two groups during the 6 months ($P = 0.3$). Recurrent retinal detachments were observed in 2 cases (10%) in both groups. There was no statistically significant difference between two groups as a point of recurrent retinal detachments ($P = 1$). We have found higher rates of post-vitrectomy cataract progression (45%) in the eyes with RRD who underwent 23-gauge vitrectomy and SO tamponade. Combined vitrectomy and PE is safe and effective for the patients with RRD.

Keywords: Phacoemulsification, recurrent retinal detachment, silicone oil, vitrectomy

Introduction

Machemer and coworkers [1] have reported successful closed pars plana vitrectomy (PPV) and the first prototype of ocutome was a 14-gauge probe. 20-gauge vitrectomy was commonly applied in the period between the early 1980s. Small-gauge vitrectomy instruments were then developed and became widely available in 2004 [2]. Fujii et al. [3] developed the feasibility of 25-gauge transconjunctival sutureless pars plana vitrectomy (TSPPV) system. Eckardt [4] also developed 23-gauge instrumentation method for TSPPV in 2005. TSPPV depends on smaller diameter instruments and conjunctival displacement before making the transconjunctival sclerotomies. Thus, the conjunctiva covers the sclerotomy after surgery is completed. Silicone oil (SO) was first used in vitreoretinal surgery as an internal tamponade in 1962 [5]. For many years it is used in the treatment of complex retinal detachments. This approach is very useful if long-lasting internal tamponade effect is des-

ired [6]. However, if SO is left in the eye for a long time, some complications are inevitable [7]. Therefore, it should be removed just after complete retinal stability is achieved. The most important complication of intraocular SO is cataract formation [8]. When SO is left in the phakic eye longer than 3 months, posterior subcapsular cataract development is seen. This complication leads not only to the deterioration of the patients' vision, but also to the impairment of fundus visualization [9].

In this study, we have evaluated the surgical results of 23-gauge vitrectomy and SO tamponade combined with phacoemulsification (PE) and intraocular lens implantation and without PE in the management of rhegmatogenous retinal detachment (RRD).

Patients and methods

All of the study procedures were conducted in accordance with the Declaration of Helsinki, and informed consents were obtained from all

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Table 1. The demographic characteristics of cases with two various surgeries

	Group 1 (n, %)	Group 2 (n, %)	P Value
Males	12 (60%)	11 (55%)	0.7
Females	8 (40%)	9 (45%)	0.6
Average age (Years \pm Standard Deviation)	50.3 \pm 7.54	51.5 \pm 8.76	0.3
Mean follow up period (Years)	1.89	1.91	0.5

of the participants. The study was approved by Ankara Diskapi Training and Research Hospital Ethical Committee. All patients were Turkish Caucasians. This study included 40 eyes of 40 patients that underwent 23-gauge vitrectomy and SO tamponade combined with and without PE in SB Ankara Ulucanlar Eye Education and Research Hospital between January 2010 and December 2013. Patients with a history of prior vitreoretinal surgery and any corneal pathology were excluded from the study. Prior to surgical intervention a complete ophthalmologic examination was performed including best corrected visual acuity (BCVA), intraocular pressure (IOP) with applanation tonometry, slit-lamp biomicroscopy, and dilated fundus examination. Visual acuity was measured with the Snellen chart. Follow-up examinations were performed at 1st day, 1st, and 6th months after surgery.

Twenty eyes of 20 cases that underwent 23-gauge vitrectomy and SO tamponade combined with PE were allocated to the group 1, and 20 eyes of 20 cases that underwent 23-gauge vitrectomy and SO tamponade alone were allocated to the group 2. All cases were phakic and had RRD. Group 1 included 13 eyes with Grade B PVR and 7 eyes with Grade C PVR; Group 2 included 11 eyes with Grade B PVR and 9 eyes with Grade C PVR.

All surgeries were performed under local anesthesia by retrobulbar injection. The Dutch Ophthalmic Research Company (DORC, Zuidland, Holland) 23-gauge system was used in all cases. Trans-scleral cannulas were placed through the pars plana in the superonasal, superotemporal, and inferotemporal quadrants, per standard vitrectomy protocol. In the combined group, PE and intraocular lens implantation was performed before PPV through a 2.75 mm superior clear corneal incision. Hydrophilic acrylic IOL inserted to the capsular bag in all cases. A 10-0 nylon suture was applied to the corneal wound. Pars plana vitrec-

tomy was performed and posterior hyaloid membrane and vitreo-retinal membranes were removed either by peeling or by segmentation or delamination. Retinal photocoagulation was performed in

3 lines of grey-white burn around the retinal break via a laser. Air-fluid exchange was performed followed by air-silicone oil exchange in all cases. Intraocular antibiotics and corticosteroids were then injected.

All statistics in this study were analyzed using SPSS for Windows (SPSS Inc., Chicago, IL, USA). Preoperative numerical data of the first groups were compared with the Mann Whitney U test. In order to do the inferential analyses of three times studied between themselves it was used the Friedman test. This test was complemented by the Wilcoxon signed rank test to cases in which there were significant statistical difference pointed by the Friedman test. Bonferroni corrected, was used to perform pairwise comparisons (in the text, *p*-values are corrected). Visual acuity was measured with the Snellen chart, then converted to the logMAR chart and mean best-corrected visual acuities were calculated. Finally, LogMAR scores were converted back to snellen. The level of significance was set at < 0.05.

Results

There were 8 females (40%) and 12 males (60%) and the average age of patients was 50.3 \pm 7.54 years in group 1. There were 9 female (45%) and 11 male (55%) and the average age of patients was 51.5 \pm 8.76 years in group 2. Mean follow up period was 1.9 years (9-36 months). There was no difference regarding the age and gender of the patients in the two studied groups (**Table 1**). The demographic characteristics of cases are summarized in **Table 1**.

In the group 1, the mean preoperative LogMAR BCVA was 2.65 \pm 1.31. Mean overall postoperative BCVA was 1.92 \pm 1.06 on first day, 1.69 \pm 1.03 on first month, and 1.06 \pm 0.91 on sixth month. Statistically significant improvement in BCVA was also established at the 1st day, 1st

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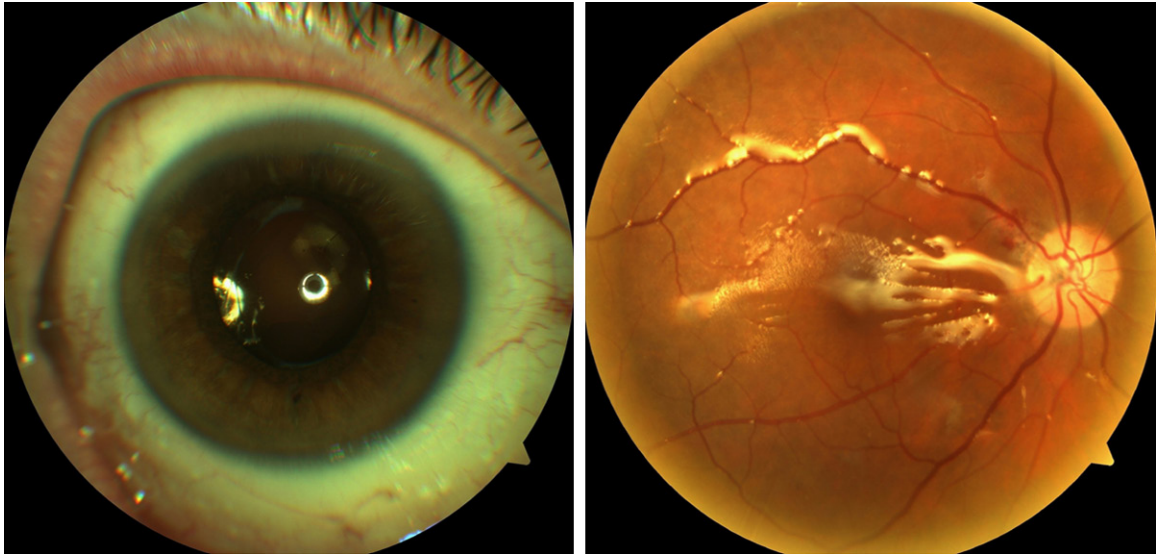


Figure 1. Anterior and posterior segment pictures of cases underwent 23-gauge vitrectomy and silicone oil tamponade combined with phacoemulsification.

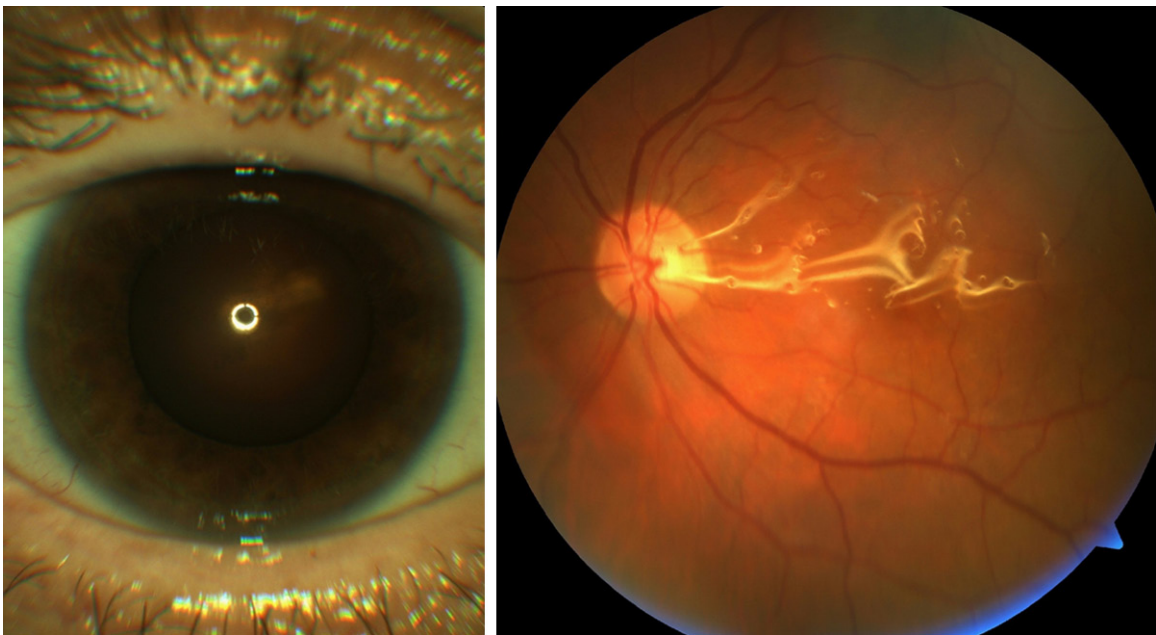


Figure 2. Anterior and posterior segment pictures of cases underwent 23-gauge vitrectomy and silicone oil tamponade alone.

month, and 6th month visits compared to the preoperative BCVA ($P < 0.05$). The mean overall preoperative IOP was (mean \pm SD) 12.2 ± 3.49 mmHg (range, 10-20 mmHg). Mean overall postoperative IOP was 12.3 ± 6.47 mmHg (range, 7-32 mmHg) at first day, 13.8 ± 6.22 mmHg (range, 11-23 mmHg) at first month, and 15.4 ± 5.48 mmHg (range, 10-19 mmHg) at sixth month. Postoperative complications

included transient elevated IOPs in 3 eyes (15%), SO bubble in anterior chamber in 2 eyes (10%), mild fibrinous reaction in the anterior chamber in 2 eyes (10%), and epiretinal membrane in 1 eye (5%). Recurrent retinal detachment and proliferative vitreoretinopathy developed in 2 patients (10%). Anterior and posterior segment pictures of a case underwent 23-gauge vitrectomy and silicone oil tampon-

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Table 2. Complications related with two various surgeries

Complications	Group 1 (n, %)	Group 2 (n, %)	P Value
Transient elevated IOP	3 (15%)	1 (5%)	0.29
Silicone oil bubble in anterior chamber	2 (10%)	1 (5%)	0.55
Mild fibrinous reaction in the anterior chamber	2 (10%)	-	0.15
Epiretinal membrane	1 (5%)	-	0.31
Recurrent retinal detachment	2 (10%)	1 (10%)	0.55
Cataract formation	-	9 (45%)	0.001
Transient hyphema	-	1 (5%)	0.31
Endophthalmitis	-	-	Not applicable

ade combined with phacoemulsification are shown in **Figure 1**.

In the group 2, the mean preoperative LogMAR BCVA was 2.46 ± 1.09 . Mean overall postoperative BCVA was 1.88 ± 1.02 on first day, 1.78 ± 0.94 on first month, and 1.08 ± 0.82 on sixth month. Statistically significant improvement in BCVA was established at the 1st day, 1st month, and 6th month visits compared to the preoperative BCVA ($P < 0.05$). The mean overall preoperative IOP was (mean \pm SD) 10.1 ± 4.19 mmHg (range, 9-21 mmHg). Mean overall postoperative IOP was 13.7 ± 7.28 mmHg (range, 8-29 mmHg) at first day, and 16.1 ± 4.38 mmHg (range, 10-20 mmHg) at sixth month. Intraoperative iatrogenic cataract formation was not observed in any of the eyes. Postoperative complications included cataract formation in 9 eyes (45%), transient elevated IOPs in 1 eye (5%), SO bubble in anterior chamber in 1 eye (5%), and transient hyphema in 1 eye (5%). Recurrent retinal detachment also developed in 2 patients (10%). Anterior and posterior segment pictures of a case underwent 23-gauge vitrectomy and silicone oil tamponade not combined with phacoemulsification are shown in **Figure 2**.

There were no cases of postoperative choroidal detachment. Through the follow-up visits, none of the 40 eyes developed endophthalmitis. The SO was completely removed from all of the eyes, with no significant residual oil in the anterior chamber or in the vitreous cavity seen in indirect ophthalmoscopy at the end of 6 months. Complications at the postoperative period are summarized in **Table 2**.

There was not a significant difference between the two groups regarding the change in BCVA on first day ($P = 0.81$), 1st month ($P = 0.62$) and

6th month ($P = 0.46$). No significant difference in re-detachment rate was also observed ($P = 1$).

Discussion

Modifications in the vitrectomy instruments have led to a decrease in size of the instruments and consequently in smaller incisions. Fujii et al [3] had firstly described the 25-gauge transconjunctival sutureless pars plana vitrectomy (TSPPV) and found it to be a safe surgical procedure in a variety of vitreoretinal pathologies. There are many advantages of TSPPV surgery including shorter surgical time, less conjunctival scarring, less surgery-induced astigmatism, improved postoperative comfort, decreased postoperative inflammation, and more rapid visual recovery [10]. SO is the most commonly used tamponade for the management of complex retinal detachments. Postoperative anterior segment complications have been reported after SO injection, such as cataract, glaucoma, and keratopathy, even after successful reattachment of the retina [11].

The development of cataract complication following vitreoretinal surgery is resulted from accidental mechanical injury to the lens or from the untoward physiologic effects of infusion solutions or intraocular tamponades [12]. Three different mechanisms have been hypothesized for the cataract formation, i.e. lens opacities caused by abnormal cell arrangement altered cell structure and lens opacities or altered membrane function of the lens epithelial cells. Vitreoretinal procedures may also accelerate the development of nuclear sclerotic cataract, probably as a consequence of the greater vulnerability of the aged lens to chemical and mechanical trauma [13]. In the present

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study, during the follow-up period, 9 eyes (45%) in group 2 had progression of cataracts.

Cataract surgery may be combined with PPV to improve the operative view and/or enhance post-operative visual rehabilitation and subsequent treatment. The combined approach is likely to be cheaper and of less inconvenience to the patient than sequential surgery, and has been suggested to be safe and equally effective [14]. The potential advantages of PE over alternative methods include retention of the lens capsule to facilitate intraocular lens insertion, maintenance of a clear cornea and a watertight eye [15]. The advantages of combined procedures include minimizes surgical trauma, reduces the risk of complications and allows for faster visual rehabilitation, while improving visualization and maximizing surgical access to the anterior retina; disadvantages might include increased technical difficulty and increased postoperative inflammation and IOL-related complications [16].

Scharwey et al. [17] described 38 eyes, all of which underwent clear corneal PE and vitrectomy with IOL placement at the end of the procedure. The authors commented that both visual outcome and complications were dependent upon the underlying vitreoretinal pathology and were not related to the combined procedure technique. Our results disclosed that good functional visual acuity at the postoperative period in two groups. Visual results in our study are very much what we would expect from a series of vitreoretinal procedures of this nature.

Elevated IOP was the more frequent anterior segment complications of combined surgery, with an incidence ranging from 4.4 to 23.8% [18]. This was similar to the results in our study, in which we reported that the incidence of transient elevated IOP after combined surgery was 15%, but returned to normal values following administration of anti-glaucomatic drugs (Brimonidine BID) within 1 week after surgery. Transient elevated IOPs was observed in 1 eye (5%) in group 2.

Treumer analysis revealed fibrinous exudation in the anterior chamber to be significantly more frequent after combined surgery particularly in cases of PDR [19]. Two patients (10%) in our series had small fibrinous reaction in the anterior chamber; by topical steroids appear to be

effective in bringing it under good control soon after the surgery. Although there is an increase in inflammation following combined surgery. Factors predisposing to fibrin reaction include multiple surgical procedures, such as retinocryopexy, excessive endolaser photocoagulation, large retinotomy, diabetes, and internal tamponade [18]. The fibrinous reaction in the anterior chamber was not observed in group 2.

SO may pass through the zonules into the anterior chamber may result in keraopathy and glaucoma [12]. This situation could be observed in pseudophakic eyes than phakic eyes. In our study, SO bubble detected in anterior chamber in 2 eyes (10%) underwent combined surgery, but in 1 eye (5%) with underwent vitrectomy surgery alone.

There are several limitations in our present study. Firstly, the number of patient in study was small with only limited to 20 patients in each group. Secondly, this is a retrospective study.

The results of the present study show that visual acuity outcomes are similar in both groups. Preoperative and postoperative complications are not excessively distinct in both groups, and the differences may be attributed to the technique used in each case. Transient elevated IOP and mild fibrinous exudation in the anterior chamber was the more frequent in combined surgery. Progression and formation of cataract after vitrectomy surgery was seen mostly (45%) in combined surgery. Combined vitrectomy and PE is safe and effective for patients with RRD. There was no significant difference in the final visual acuity and in re-detachment rate.

Disclosure of conflict of interest

None.

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