

Effect of lens status on intraocular pressure in siliconized eyes

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Purpose: To evaluate the effect of lens status on intraocular pressure (IOP) in siliconized eyes and also on the emulsification of silicone oil.

Patients and methods: A total of 31 eyes of 31 patients with retinal detachment were operated on with pars plana vitrectomy and silicone oil injection: 16 phakic (Group A) and 15 pseudophakic (Group B). During the 6-month follow-up period, IOP was measured: 1 day postoperative, then at 1 week, 1 month, 2 months, 3 months, and 6 months postoperative. At the end of the follow-up period, gonioscopy was carried out to check emulsified silicone at the anterior chamber angle and also the presence of emulsified silicone on the back of the cornea when the patient was lying down.

Results: There was no significant difference between both groups until the first week (P value = 0.15). Starting from the first month, the difference was statistically significant, with mean IOPs in Groups A and B of 14.9 mmHg and 18.2 mmHg, respectively, up to the sixth month (P value = 0.002), with a mean IOP in Groups A and B of 14.4 mmHg and 19.4 mmHg, respectively. Emulsified silicone was clinically stated in twelve cases (80%) in Group B and in three cases (19%) in Group A.

Conclusion: There is a higher incidence of increased IOP and emulsification of silicone oil in pseudophakic eyes than in phakic eyes.

Keywords: vitrectomy, siliconized eyes, emulsification, lens status

Introduction

The use of silicone oil in conjunction with advanced vitreous surgical techniques can successfully treat complicated retinal detachment (RD),¹⁻⁴ including proliferative vitreoretinopathy (PVR), giant retinal tears, and severe trauma cases.^{5,6}

Silicone oil is still the best-tolerated substance that is well accepted and biologically well tolerated in the clinical management of complicated conditions. Although it is well recognized that aphakic patients may develop pupil block glaucoma after vitrectomy and silicone oil injection,^{7,8} this condition is not well recognized in phakic patients.^{9,10}

Furthermore, hypotony is especially common after posterior segment retinal reattachment surgery for PVR. Chronic hypotony was found in 58 (24.1%) of 241 eyes in a silicone study¹¹ and in 41 (17.5%) of 234 eyes in the Vitreon study.¹² There are likely multiple, complex reasons for this finding, but one potential contributory factor may be the presence of a native or prosthetic intraocular lens. The lens and lens diaphragm can serve as potential physical impediments to the complete dissection of anterior tractional membranes and the vitreous base.

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The aim of this study was to assess the influence of postoperative lens status on the intraocular pressure (IOP) changes in eyes treated with silicone oil in the management of complicated RD.

Patients and methods

We performed a prospective, comparative study, which was carried out during the period from March 2010 to April 2011. This study included 31 eyes (16 phakic and 15 pseudophakic) of 31 patients: 18 males and 13 females. These 31 eyes underwent pars plana vitrectomy for repair of RD resulting from PVR, with silicone oil 1000 cSt as endotamponade. This study was carried out at Kasr El Eini University Hospital, Cairo, Egypt. The mean age was 42 ± 0.6 years (range 20–63 years).

Informed consent was obtained from all patients after they received a detailed description of the surgical procedure. Exclusion criteria included severe systemic disease, pregnancy, any pre-existing ocular inflammatory disease, glaucoma, or recurrent cases of RD.

The following preoperative and postoperative parameters were noticed: etiology of RD, refractive status, pre-existing glaucoma, lens status, presence of emulsified silicone in the anterior chamber, emulsification of silicone, and rubeosis iridis.

Additionally, all the study patients received full preoperative and postoperative examinations 1 day after surgery and then at 1-week, 1-month, 2-month, 3-month, and 6-month follow-ups. These examinations included IOP measurement using Goldmann applanation tonometer, slit-lamp examination, dilated ophthalmologic examination, and best-corrected visual acuity using a Snellen chart.

At the end of the follow-up period, gonioscopy was carried out to check emulsified silicone at the anterior chamber angle and also the presence of emulsified silicone on the back of the cornea when the patient was lying down during the operative procedure under the operating microscope.

Fundus photography was done preoperatively and at the end of the follow-up period, to ascertain the C/D ratio. The presence of ocular hypertension was defined as postoperatively elevated IOP greater than 25 mmHg.

All surgeries were performed under general anesthesia. The surgical procedure included a standard three-port pars plana vitrectomy using the ACCURUS® system (Alcon Laboratories, Inc, Hünenberg, Switzerland) for vitrectomy. During vitrectomy, the vitreous base was thoroughly removed. Epiretinal membrane dissection and relaxing retinotomies were performed, when necessary. The retinal periphery was inspected for retinal breaks, and any break found was treated

with endolaser photocoagulation. A fluid–air exchange procedure was then performed. At the end of the surgical procedure, silicone oil was injected using an automatic device. The silicone used was of 1000 cSt viscosity at 25°C, with a specific gravity of 0.965 g/cm³, and interfacial tension against water at 25°C of 35.5 mN/m.

At the end of surgery, the eye appeared clinically completely filled by the substance. Suture of the sclerotomies followed. In all cases, the surgery was not combined with scleral buckle placement, and no intraoperative complications occurred.

Postoperative follow-up examinations were scheduled, as mentioned previously, and all the data collected were used for statistical analysis.

Statistical analysis was carried out using SPSS for Windows (v 17.0; SPSS, Inc, Chicago, IL), and *P* values of less than 0.05 were considered statistically significant.

Results

Thirty-one eyes of 31 patients with RD were operated on with pars plana vitrectomy and silicone oil injection: 16 phakic (Group A) and 15 pseudophakic (Group B).

The average patient age at time of surgery was 42 ± 0.6 years (range 20–63 years). The postoperative follow-up period was 6 months. No intraoperative complications were encountered during the operative procedure.

During the 6-month follow-up period, IOP was measured on the first day postoperative then at 1 week, 1 month, 2 months, 3 months, and 6 months postoperative.

Group A had rhegmatogenous RD, with 12 cases with PVR graded as C2 with Machemer classification and four cases graded as C3.¹³

Group B had pseudophakic RD, with three cases graded as C2 and twelve cases graded as C3 by Machemer classification.

Postoperative follow-up included a full clinical examination. Cases of recurrent RD were excluded from the study.

Comparing the results of IOP pressure measurement showed that there was no statistically significant difference between Group A (mean IOP = 14.8 mmHg) and Group B (mean IOP = 16 mmHg) in the first day postoperative (*P* value = 0.1).

Comparing IOP measurements at the first week postoperative was also of no statistically significant difference: Group A mean IOP = 15 mmHg, Group B mean IOP = 16.2 mmHg (*P* value = 0.15), as seen in Table 1.

Starting from the first month to the sixth month, the difference was statistically significant between the two groups, as shown in Table 2.

Table 1 Mean intraocular pressure (IOP) measurements of both groups during the first day and first week postoperative

	Mean IOP Group A	Mean IOP Group B	P value
First day postoperative	14.8 mmHg	16 mmHg	0.1
First week postoperative	15 mmHg	16.2 mmHg	0.15

Figure 1 also shows the mean IOP measurements of both groups during the first, second, third, and sixth months postoperative.

Regarding C/D ratio, there was no change of more than 0.1 in three cases (20%) in Group B. In Group A there was no change in C/D ratio throughout the follow-up period.

Emulsified silicone was found on the back of the cornea when the patient was lying down or by gonioscopy in twelve cases in Group B (80%), whereas in Group A, emulsified silicone was detected in only three cases (19%).

During silicone evacuation in Group A, eleven cases (68.7%) had a clinically significant cataract that needed extraction.

Discussion

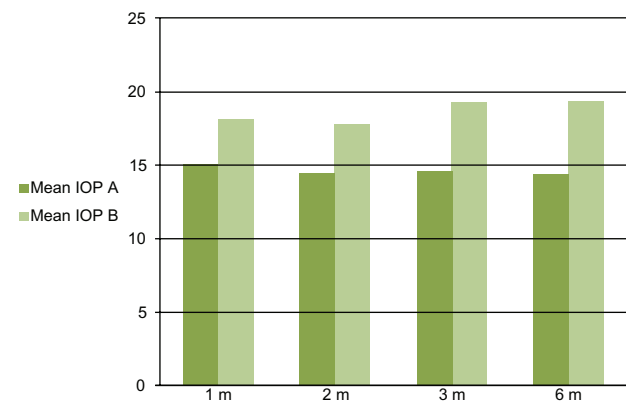
Silicone oil is an effective intraocular tamponade. It is often placed in the vitreoretinal cavity as an aid in the repair of PVR, proliferative diabetic retinopathy, recurrent RD, giant retinal tears, macular holes, viral retinitis, and traumatic retinal injuries.¹⁴

However, the use of silicone oil as endotamponade may be associated with an increased incidence of elevated IOP. The cause of raised IOP following the use of endotamponade in the surgical treatment of complicated RD may be multifactorial, including inflammation, previous vitreoretinal procedures, and overfilling.¹⁵ Clinically significant increased IOP could represent a complication following vitreoretinal procedures, which can lead to the development of secondary glaucoma.^{16,17}

In a study performed by Henderer et al,¹⁸ it was reported that 21% (80 out of 383 eyes) of patients treated with

Table 2 Mean intraocular pressure (IOP) measurements of both groups during the first, second, third, and sixth month postoperative

	Mean IOP Group A	Mean IOP Group B	P value
First month	14.9 mmHg	18.2 mmHg	0.02
Second month	14.4 mmHg	17.8 mmHg	0.008
Third month	14.6 mmHg	19.3 mmHg	0.003
Sixth month	14.4 mmHg	19.4 mmHg	0.002

**Figure 1** Mean intraocular pressure (IOP) measurements of both groups during the first, second, third, and sixth month postoperative.

silicone oil for complex RD had an elevated IOP (greater than 25 mmHg) at the 12-month follow-up.

In our study, a mild increase in IOP was noticed. This increase was more pronounced in Group B (pseudophakic RD group) than in Group A (phakic RD group), of which the difference which was not statistically significant on the first day and after the first week postoperative ($P = 0.1$ and $P = 0.15$, respectively) but became statistically significant during the first, second, third, and sixth month postoperative ($P = 0.02$, $P = 0.008$, $P = 0.003$, and $P = 0.002$, respectively).

Emulsification of silicone oil to some degree has been reported to occur in 56%–100% of cases over a period of months to years.^{19,20} Multiple factors may contribute to silicone oil emulsification, including the use of low-viscosity silicone oils, residual fluid in the vitreous cavity, and hemorrhage or leakage of other blood constituents from the breakdown of the blood–aqueous barrier after surgery. Even the oil/aqueous movement generated by high-speed vitrectomy handpieces results in shearing force in silicone oil emulsification.^{21,22}

In our study, emulsified silicone was found in twelve cases (80%) in Group B, whereas in Group A, only three cases were detected (19%).

The increased incidence of silicone emulsification in Group B, and also the higher IOP measurements postoperatively in comparison with Group A, may be related to the fact that when the silicone oil emulsifies, it may induce a chronic reaction.

The macrophages react toward the tamponade emulsion as if it were a foreign body, as already reported by Hiscott et al²³ in 2001, for F6H8, and thus they are able to promote, theoretically, an IOP increase. However, no explanation could be given to relate the increased incidence of emulsification in

cases of pseudophakic pars plana vitrectomy more than the phakic, and a larger number of cases are required in further studies to prove this relationship.

Also, there was a higher incidence of cataract progression in phakic patients of Group A (68.7%) who needed cataract extraction during silicone oil removal. This was described by another study, which described a higher incidence of progressive, clinically significant cataract following vitrectomy.²⁴

Conclusion

This study illustrates the possible influence of lens status on IOP outcomes in eyes that underwent successful repair of RD by pars plana vitrectomy and silicone oil tamponading. Higher IOP measurements were detected in pseudophakic patients; thus, ophthalmologists should be aware that incidence of glaucoma may occur in pseudophakic patients more than in phakic patients after vitrectomy and silicone oil injection.

Disclosure

The authors indicate no financial conflict of interest in this work.

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