

Outcome of Silicone Oil Removal in Eyes Undergoing 3-Port Parsplana Vitrectomy

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Purpose: The present study was designed to evaluate the outcome of silicone oil removal in eyes, which underwent vitreoretinal surgery using silicone oil as internal tamponade.

Material and Method: A total of 50 patients who underwent 3-port parsplana vitrectomy with silicone oil used as an internal tamponade were enlisted in the month of March 2005 and April 2005 and were followed for the period of twelve months till March 2006. All the patients were selected by a convenience type of non-probability purposive sampling.

Results: Out of 50 patients, at the end of study period 31 achieved anatomical success that is the completely flat retina, 16 of these eyes achieved functional outcome, which was defined as attainment of VA \geq 5/200. 19 eyes suffered retinal redetachment, out of which in 8 eyes retinal redetachment occurred in 1st week and in rest subsequently.

Conclusion: Retinal detachment after silicone oil removal is common. A fewer than half the detachments occur within the first week.

Retinal surgery has progressed from external tamponade via buckling and indentation to the concept of removing human vitreous and replacing it with an inert substance which act as an internal tamponade to keep two layers of retina apposed, thus attempting to close tears and relieving traction.

Instrumentation for pars plana vitrectomy were developed by Machemer¹ who, after the clinical experimental work of D. Kasner, in 1960 proved that an eye could function without vitreous. Injection of silicon oil after vitrectomy was tried first by Haut^{2,3} in 1976, though Cibis^{4,5} introduced silicon oil in retinal surgery and J. Scott^{6,7} refined its use. Current vitrectomy techniques and use of silicon oil tamponade to treat complicated retinal detachments have led to improvement in the success rate of retinal detachment surgery. The rate of recurrence of retinal detachment in eyes treated with silicon oil tamponade varies from 21.4%^{8,9} to 77%¹¹⁻¹³. In our study we have

tried to assess the complications arising from the removal of silicone oil.

MATERIALS AND METHODS

Fifty eyes of fifty patients, who underwent silicone oil removal after successful 3 port parsplana vitrectomy with silicone oil tamponade for various indications (Table 1), in Liaquat National Hospital, were included in this observational prospective study. All the patients selected for this research were enrolled in this study after their consent, during March 2005 and April 2005, and were followed up for 12 months. The patients were enlisted for silicone oil removal either because of completely flat retina for at least 8 weeks or because of the development of complications associated with silicone oil retention. A detailed proforma was filled containing both their medical and ocular examination.

All eyes underwent complete preoperative ocular examination and assessment of best-corrected visual

acuity. Preoperative data regarding age, sex, eye involved, details of first surgery i.e. parsplana vitrectomy, band encircling, membrane peeling, use of heavy liquids and silicone oil injection (1000 cS) were recorded. Visual acuity, lens status, adequacy of endolaser photocoagulation was reviewed.

One consultant performed all the surgeries. Silicone oil was removed by oil-fluid exchange. When oil was removed by e ports plana technique, it needed oil air exchange. Removal of lens by phaco and lensectomy were carried out followed by implanting intraocular lens in phakic and aphakic eyes. The need for more endolaser photocoagulation and cryotherapy were assessed on the operating table. Ports were closed and conjunctiva sutured afterwards. Patients were examined on first postoperative day, 1 week, and then 4 weekly intervals as in prescribed proforma till the end of study period. At the end of the study the data was compiled and evaluated statistically.

Anatomical success was defined as a completely flat retina that remains attached till the last follow-up. Retinal redetachment due to focal or diffuse peripheral leaking breaks due to ongoing proliferative vitreoretinopathy or intrinsic contraction of retina within twelve months of removal of silicone oil was considered a failure.

Functional outcome was studied as the recovery of ambulatory visual acuity of $\geq 5/200$ at the last follow-up. Refractive changes occurring after removal of silicone oil from phakic, aphakic and pseudophakic eyes were documented.

RESULTS

50 eyes of fifty patients attending the out patient department of ophthalmology LNH were included in this prospective study. Of these 37 were male, 13 female and 3 were below 18 years. The average age of patient was 43 years (range 8-72 years). In 10 patients visual acuity in fellow eye was count fingers. Silicone oil was successfully removed from the eyes of 50 patients. The mean duration of intraocular silicone oil tamponade ranged from 2 months to 18 months.

Out of these patients who primarily underwent 3 port parsplana vitrectomy with silicone oil, 25 eyes had PVR, 7 eyes had giant retinal tear, 12 eyes had advanced diabetic eye disease, 3 had eye trauma and 3 eyes with other diagnosis included two with uveitis and one with Eale's disease.

INDICATIONS

Flat retina for at least 8 weeks is the most common indication and was present in 15 patients. In these patients no complication of silicone oil was found. There was absence of traction and active proliferation. The mean intraocular pressure in these patients was 17 mm of Hg. The mean preoperative visual acuity was 6/48, (Table 2).

Persistently high intraocular pressure of 25 mm of Hg or more was the major indication of oil removal and was present in 20 patients. Average baseline IOP was found to be 42mm of Hg (range 30-55mm of Hg). In these patients persistently high IOP was not controlled by standard IOP lowering drugs. Out of these patients two had developed relative afferent pupillary defect.

Emulsification of silicone oil occurred in 10 eyes. Silicone oil presented in anterior chamber as inverse hypopyon in 2 patients. The mean duration of silicone oil tamponade in these eyes was 6 months.

Keratopathy occurred in 13 eyes in the form of persistent epithelial defects, stromal edema, and corneal opacity. Out of which 8 were pseudophakic and 5 were aphakic. Two patients developed band keratopathy and also needed chelation.

Cataract developed in 4 eyes. It was of nuclear type and hindered the proper visualization of fundus along with decreasing the visual acuity and needed removal.

OUTCOME OF SILICONE OIL REMOVAL

Main objective of the study was to determine the outcome of intravitreal silicone oil removal. In this regard the main complication we encountered in our study population was re-detachment which occurred in eyes after removal of silicone oil. In the immediate post operative period (within first week), a fibrin response was seen in 2 eyes, vitreous hemorrhage was observed in two eyes and phthisis bulbi in 4 eyes, (Table 3).

ANATOMICAL OUTCOME

Retina remained attached in 42 (84%) eyes during the first week after the removal of the silicone oil. However redetachment occurred in 11 eyes (22%) with macula off in 4 eyes within the first month of the follow-up. Of these 19 (38%) eyes in which redetachment occurred, 7 underwent further operations.

Table 1: Silicone oil used indication group

Described Indication	No. of patients	Male	Female
All diagnosis	50	37	13
PVR, all cases	25		
PVR, uncomplicated	20	18	02
Complicated	05	04	01
Giant tear	07	05	02
Diabetic retinopathy all cases	12		05
DR, with detachment	10	05	02
Without detachment	02		02
Trauma	03	03	00
Miscellaneous	03	01	02

Table 2: Removal of silicone oil in the indicated group

Complications	No. of patients n(%)
Raised IOP	15 (30)
Oil emulsification	10 (20)
Cataract formation	4 (8)
Band keratopathy	2 (4)

Table 3: Success rate after surgery

Success achieved	No. of patients n (%)
Anatomical success	31 (62)
Visual success	14 (45)

FUNCTIONAL SUCCESS

Of the 31 (62%) eyes with successful silicone oil removal and in which retina was stable till the last follow-up, 15 eyes had final visual acuity of < 6/60. Two had optic atrophy due to intractable glaucoma, and rest had corneal complications. Eleven eyes had final visual acuity between 6/60 and 6/18, and 3 had final visual acuity between 6/12 and 6/9.

REFRACTIVE OUTCOME

Mean difference in refraction after silicone oil tamponade in phakic eyes was +6.00 D sph (+2.00 D sph to +8.00 D sph). Mean refraction change in aphakic eyes with silicone oil was -5.50Dsph (-3.50 D sph to -7.00 D sph). Removal of silicone oil changed the refraction in aphakic eyes towards hypermetropia, mean +6.00Dsph.

DISCUSSION

Silicone oil is used as a long-term internal tamponading agent in complicated retinal detachment surgeries. Unlike intraocular gas, silicone oil is a liquid polymer with no expansile property, and it is not absorbed. It is immiscible in water and perfluorocarbon liquid and creates a readily visible meniscus during intraoperative use. Although silicone oil's viscosity is greater than that of gas, its buoyancy and surface tension are far less than that of intraocular gas, and therefore it exerts less retinal tamponade.

Our concept for the use of silicone oil have evolved and changed with growing clinical experience and results of experimental studies. Various preoperative variables that were analyzed for correlation with anatomical failure included indications of primary silicone oil use, history of trauma, number of previous surgeries, causes of failure, type of PVR, visual acuity, extent of retinal detachment. Vitrectomy with silicone oil removal is also a preferred choice when dealing with retinal detachments occurring because of penetrating traumas especially for breaks which are too posterior to be adequately covered by an explant.

Regarding the data given in the literature, the rate of vitreoretinal complications after silicone oil removal, even in cases with a clinically stable appearing retinal situation, is rather high in severe proliferative vitreoretinopathy (PVR) and lower in most advanced cases of severe proliferative diabetic retinopathy requiring silicone oil tamponade. Silicone oil removal has to be considered a procedure of ill defined risks, especially if silicone oil is really used as a last therapeutic resort in most severe cases of complicated retinal detachment. The benefits of silicone oil removal are better in those cases in which there is minimal PVR. Exact criteria for the timing and safe removal of silicone oil in these complex vitreoretinal disorders still needs to be defined.

The most authoritative study of silicone oil for PVR is by the Silicone Study Group, which published

its results in 1992⁸. In the primary surgery group they found no significant difference between perfluoropropane gas and silicone oil in achieving visual acuity better than or equal to 5/200 (1.5/60). They also achieved macular attachment in 73% of the patients treated with perfluoropropane versus 64% in-group 1 and 61% in-group 2 for silicone oil. It was stated that a longer tamponade of perfluoropropane was the reason for the higher success rate with C3F8.

The use of silicone oil in PVR has stimulated the development of some newer approaches. Federman and Eagle⁹ reported a 360 posterior retinotomy in a series of 18 patients. Visual acuity of 20/400 or better was achieved in 22% of the patients. In all instances the patients had at least two previous pars plana vitrectomies. The cases represented non-dissectable membranes, intraretinal fibrosis, incarcerated retina, or malpositioned choioretinal scars preventing reattachment by ordinary techniques.

Out of the 50 silicone oil filled eyes that underwent silicone oil removal, 31 eyes had completely flat retina after a follow-up period of 12 months. Of these eyes 16 achieved functional success (defined as attainment of visual acuity of $\geq 5/200$). The long term complication in this study was the presence of raised IOP in about 30% of patients and only two patients developed band keratopathy which is in contrast to the Silicone Study in which glaucoma was observed in 8% of cases¹⁰ and band keratopathy was observed in 25% of patients¹¹. The results of our study show that even if the indication is established very carefully, silicone oil removal results in a relatively high rate of complications of redetachment of the retina.

In conclusion retinal detachment after silicone oil removal is common. A fewer than half the detachments occur within the first week and majority within the first month. Re-detachment is more common after surgery for PVR than for PDR.

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REFERENCE

1. **Machemer R.** Massive peri-retinal proliferation. A logical approach to therapy. *Trans Am Ophthalmol Soc.* 1977; 75: 556.
2. **Haut J, Ullern M, Boulard ML, et al.** Utilisation du silicone intra oculaire apres vitrectomie comme traitement des retractions massive du vitre. *Bull Soc Ophthalmol Fr.* 1978; 361-5.
3. **Haut J, Ullrn M, Chatellier PH, et al.** Resultats de 200 cas d'injection intra oculaire de silicone associee a la vitrectomie. *Bull Mem Soc Fr Ophthalmol.* 1979; 180-4.
4. **Cibis P A, Okun E, Canaan S.** The use of liquid silicone in the retinal detachment surgery. *Arch Ophthalmol.* 1964; 590-2.
5. **Cibis PA.** Vitreous transfer and silicone injection. *Trans Am Acad Ophthalmol.* 1964; 983-7.
6. **Scott JD.** The treatment of massive vitreous retraction by separation of pre-retinal membrane using liquid Silicone. *Mod Probl Ophthalmol Karger Basal.* 1975; 285.
7. **Scott JD.** A rational for the use of liquid silicone. *Trans Ophthalmol Soc UK.* 1977; 235.
8. **Silicone Study Group:** Vitrectomy with silicone oil or perfluoropropane gas in eyes with severe proliferative vitreoretinopathy: Results of a randomized clinical trail: Report 2 *Arch Ophthalmol.* 1992; 110: 780.
9. **Federman JL, Eagle RC:** Extensive periretinal retinectomy combined with posterior 360-degree retinotomy for retinal reattachment in advanced proliferative vitreoretinopathy cases. *Ophthalmology.* 1990; 97: 1305.
10. **Barr CC, Lai MY, Lean JS:** Postoperative intraocular pressure abnormalities in the Silicon Study: Silicon Study Report 4 *Arch Ophthalmology.* 1993; 100:1629.
11. **Abrams GW, Azen SP, Barr CC.** The incidence of corneal abnormalities in the Silicone Study: Silicone Study Report 7 *Arch Ophthalmology.* 1995; 113: 764.
12. **Yeo JH, Glaser BM, Michels RG.** Silicon oil in the treatment of complicated retinal detachments: *Ophthalmology.* 1987; 94: 1109.
13. **Cox MS, Trese MT, Murphy PL.** Silicon oil for advanced proliferative vitreoretinopathy: *Ophthalmology.* 1986; 93: 646.