

## ORIGINAL ARTICLES

## OCULAR COMPLICATIONS OF SILICONE OIL

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## ABSTRACT

**Objective:** Silicone oil (SO) is an invaluable tool in the management of complex retinal detachments (RDs). Injection of silicone oil is associated with a variety of ocular complications specially when it is kept for a long time and its removal is endangering retinal re-detachment. The objective of this study was to determine the frequencies of different ocular complications associated with silicone oil injection in our setup.

**Study Design:** Case series.

**Place and Duration of Study:** This study was conducted at Vitreo-retina division of Al-Shifa Trust Eye Hospital, Rawalpindi from January 2014 to June 2014.

**Material and Methods:** A total of 30 patients were included in the study who underwent pars-planavitrectomy (PPV) with silicone oil injection for complex retinal detachments. The patients who had reached between 3 months & 6 months of their postoperative period and were presenting with some complications related to silicone oil injection were included in the study. Their records were reviewed and pre-operative data were collected regarding state of the eye preoperatively. Then the post-operative complications were noted. The descriptive and analytical statistics of different variables were measured using SPSS-17.0 software.

**Results:** Out of thirty patients included in our study 23 (76.7%) were male and 7 (23.3%) were female. The mean age was  $21.53 \pm 16.004$  years and range was 66 years. The mean pre-operative intra-ocular pressure (IOP) was  $14.0 \pm 2.150$  mmHg and range 8 mmHg and the mean post-operative IOP was  $24.93 \pm 13.889$  mmHg and range 45 mmHg ( $p=0.001$ ). The pre-operative PVR grade-C was absent in 12 (40%) patients and was present in 18 (60%) patients and post-operative PVR grade-C was absent in 24 (80%) patients and was present in 6 (20%) patients ( $p=0.004$ ; McNemar test). Band keratopathy was seen in 8 (26.7%) and corneal decompensation in 2 (6.7%) patients. Emulsification of silicone oil was seen in 14 (46.7%) patients. Rubeosis iridis was present in 2 (6.7%) patients.

**Conclusion:** Apart from other complications, raised intraocular pressure is a significant postoperative complication of eyes with silicone oil injection, so should be kept in mind because if not addressed properly it may lead to irreversible blindness in these cases.

**Keywords:** Band keratopathy, Intraocular pressure, Proliferative vitreo-retinopathy, Retinal detachment, Silicone oil.

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## INTRODUCTION

Silicone oil (SO) was first introduced as an internal tamponade agent in the early 1960s<sup>1</sup>. It has since grown into an invaluable tool to the retinal surgeon in managing complex rhegmatogenous retinal detachments, especially

those with severe Proliferative Vitreo-Retinopathy (PVR). Indications of silicone oil have been extended to include the treatment of giant retinal tears, viral retinitis, traumatic retinal detachments, proliferative diabetic retinopathy (PDR), complicated pediatric retinal detachments, macular hole surgeries, and endophthalmitis.

Silicone oil has got unique physical properties of specific gravity, buoyancy, surface tension and viscosity which make it suitable for

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use as intraocular tamponade<sup>2-5</sup>. Even then the use of silicone oil is not without complications. Important complications encountered include glaucoma<sup>6</sup>, chronic hypotony<sup>7</sup>, cataract formation<sup>8</sup>, migration into anterior segment causing damage to corneal endothelium and anterior chamber angle, emulsification<sup>9,10</sup> and keratopathy which may be in the form either band keratopathy, which is more commonly seen in the early stages, and bullous keratopathy in the late stages<sup>11</sup>. Contact between silicone oil and the corneal endothelium has been thought of as a major contributor to the development of keratopathy.

A lot has been mentioned about incidence and management of different complications in literature. The purpose of this study was to determine the frequencies of different ocular complications secondary to silicone oil injection in our setup.

## **MATERIAL AND METHODS**

This case series was conducted at Vitreo-retina division of Al-Shifa Trust Eye Hospital, Rawalpindi from January 2014 to June 2014. Purposive sampling technique was used and a total of 30 patients who underwent pars-planavitrectomy (PPV) with silicone oil injection for complex retinal detachments, had reached between 3 months & 6 months of their postoperative period and were presenting with some complications related to silicone oil injection were included in the study. The patients presenting with similar complications but silicone oil has been removed from their eyes were excluded from the study.

Their records were reviewed and pre-operative data were collected regarding state of the eye preoperatively. Vitreo-retinal surgery in the past and a definite history of blunt ocular trauma was documented. Pre-operative status of the crystalline lens, intraocular pressure (IOP) and any congenital anomalies were noted. Extent of retinal detachment was recorded as involving one quadrant, sub-total (2 to 3 quadrants) or total (4 quadrants) and associated proliferative vitreo-

retinopathy was classified according to the Machemer Classification of Proliferative Vitreoretinopathy, 1991<sup>12</sup>.

All the surgeries were performed by a single vitreo-retinal surgeon using the standard three port pars-plana vitrectomy technique and 5000-centistoke silicone oil was used in all cases. The post-operative data of intraocular pressure, proliferative vitreo-retinopathy, emulsification of silicone oil, band keratopathy and corneal de-compensation were recorded through detailed ocular examination using slit-lamp biomicroscopy with applanation tonometry and indirect ophthalmoscopy. Gonioscopic examination was performed where needed.

The descriptive and analytical statistics of different variables were measured using SPSS-17.0 software. Paired samples t-test was used for comparing numerical variables (Pre- and post-operative IOP) and McNemar test was used for comparing categorical variables (Pre- and post-operative PVR). *p*-value of <0.05 was taken as statistically significant.

## **RESULTS**

Out of thirty patients included in our study 23 (76.7%) were male and 7 (23.3%) were female. The mean age was 21.53 ± 16.004 years and range was 66 years (min 6yrs to max 72yrs). Sixteen (53.3%) patients were phakic, 8(26.7%) were pseudophakic and 6(20%) were aphakic. Ten (33.3%) patients had a history of previous vitreo-retinal surgery while 20(66.7%) patients had no history of such surgery. There was no definite history of blunt ocular trauma in 20(66.7%) patients while 10(33.3%) had a history of blunt ocular trauma to the eye. No congenital ocular anomaly was seen in 27(90%) patients but 3(10%) had a congenital ocular anomaly. Regarding the extent of preoperative retinal detachment, there was total RD in 16(53.3%), subtotal RD in 11 (36.2%) and one quadrant RD in 3(10%) patients.

The mean pre-operative IOP was 14 ± 2.150 mm Hg with a range of 8 mmHg (min 10 to max 18 mmHg) and the mean post-operative IOP was 24.93 ± 13.889 mm Hg with a range of 45 mmHg

(min 7 to max 52 mmHg)(95% CI, -15.657 to -6.210;  $t = -4.734$ ;  $p < 0.001$ , paired samples t-test).

The pre-operative PVR grade-C was absent in 12 (40%) patients and was present in 18 (60%) patients and post-operative PVR grade-C was absent in 24 (80%) patients and was present in 6 (20%) patients ( $p = 0.004$ ; McNemar test). Band keratopathy was seen in 8 (26.7%) and corneal decompensation in 2 (6.7%) patients. Emulsification of silicone oil was seen in 14 (46.7%) patients. Rubeosis iridis was present in 2 (6.7%) patients

## DISCUSSION

Silicone oil is an effective intraocular tamponade. It is often used in the repair of proliferative vitreo-retinopathy, proliferative diabetic retinopathy, viral retinitis, traumatic retinal injuries, recurrent RD, giant retinal tears and macular holes. 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 complicated RD surgeries may be multifactorial, including previous vitreo-retinal procedures, inflammation, and overfilling. Clinically significant increased IOP could represent a complication following vitreo-retinal procedures, which can lead to the development of secondary glaucoma. In a study performed by Riedel KG et al<sup>13</sup> it was reported that 21% (80 out of 383 eyes) of patients treated with silicone oil for complex RD had an elevated IOP (greater than 25 mmHg) at the 12-month follow-up. Local studies had also reported significant number of patients who had raised IOP (greater than 25 mmHg) at three months followup<sup>14,15</sup>.

In our study there is a statistically significant rise of post-operative IOP as compared to pre-operative IOP ( $p < 0.05$ ). In fact this is the most common and drastic complication of silicone oil injection and may lead to blindness if not addressed properly. There is also a statistically significant reduction of post-operative PVR-C (high grade PVR) as compared to pre-operative

PVR-C ( $p < 0.05$ ) which shows the effectiveness of silicone oil injection in reducing PVR and is the ultimate aim of silicone oil injection in these cases.

Some degree of emulsification of silicone oil has been reported to occur in 56%–100% of cases over a period of months to years<sup>16,17</sup>. Multiple factors may contribute to silicone oil emulsification, including the use of low-viscosity silicone oils<sup>18</sup>, 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 may result in shearing forces causing silicone oil emulsification<sup>19</sup>. In our study a significant number (46.7%) of patients developed emulsification of silicone oil.

Similarly corneal complications in the form of band keratopathy (26.7%) and corneal decompensation (6.7%) are also observed which is in accordance with other studies<sup>19</sup>. Rubeosis iridis (6.7%) was also seen with almost similar frequency as in other studies<sup>20</sup>.

## CONCLUSION

Apart from other complications raised intraocular pressure is a significant postoperative complication of eyes with silicone oil injection, so should be kept in mind because if not addressed properly it may lead to irreversible blindness in these cases.

## CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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