



## SECONDARY GLAUCOMA IN SILICONE FILLED EYES

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**ABSTRACT**

Silicone oil, a linear synthetic polymer is widely used in the management of retinal detachment(RD) following vitreoretinal surgeries. Although silicone oil is an important Endo tamponade, secondary glaucoma is one of the relatively common complications apart from cataract, inflammation, uveitis, emulsification etc. Acute and chronic elevation of intra-ocular pressure(IOP) occurs in minority of patients who undergo surgery with silicone oil for retinal detachment surgery. This can lead to damage of optic nerve producing decreased visual acuity with field defects. But most of the eyes can be treated with antiglaucoma medications. Those with persistent elevated IOP may be effectively managed with surgical treatment.

**KEYWORDS :** Silicone oil, intraocular pressure(IOP) , retinal detachment(RD)

**INTRODUCTION**

Silicone oil is the main choice as an Endo tamponade adjunct in retinal detachment surgeries for the past 5 decades. The silicone oil can lie in situ for longer duration to provide therapeutic effect. It has hydrophobic structure which provides stable interface between two phases. It provides occlusion of breaks and prevents the communication of fluid between the sub retinal and vitreous spaces, thus allowing the retina to attach to the underlying retinal pigment epithelium.<sup>1</sup> But its longer retention in the vitreous cavity can lead to raised intraocular pressure (IOP), cataract, secondary glaucoma, emulsification, inflammation, corneal decompensation (band keratopathy) and proliferation of fibrocellular membranes. Hence, most of the ophthalmologists aim to remove silicone oil from the vitreous cavity within few months.<sup>2</sup> Secondary glaucoma is a relatively one of the common complications after vitreoretinal surgery with silicone oil injection. Grey et al ranked glaucoma as a complication of silicone oil injection next to cataract.<sup>3</sup> The reported incidence of elevated intraocular pressure or glaucoma following silicone oil injection ranges from 2.2% to 56.0%.<sup>4,5</sup> The incidence of silicone oil induced glaucoma is found to be lower than previous reports, probably due to improvised surgical techniques and refined surgical materials. Hence, the present study was conducted to evaluate raised intraocular pressure in silicone oil filled eyes and also after oil removal for various causes and its management.

**MATERIALS AND METHODOLOGY**

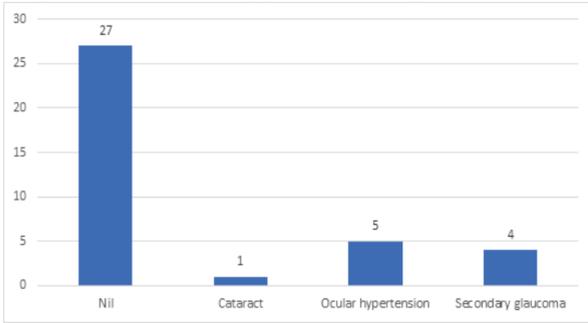
Prospective, interventional study was conducted between February 2021 to June 2022 in Glaucoma clinic of Minto Ophthalmic hospital, RIO Bangalore Medical College and Research Institute. Study was conducted after taking appropriate ethical clearance from the Institutional Ethical Committee of BMCRI. 40 eyes of 40 patients were included after meeting the inclusion criteria (written informed, either sex and age more than 18 years, patients with retinal detachment undergoing vitreo-retinal surgery with silicone oil injection, IOP < 21mmHg). Non-co-operative patients, known cases of glaucoma, media opacities, previous ocular surgeries and trauma were excluded. After obtaining informed consent, history and detailed ocular examination

was done. Best Corrected Visual Acuity test by Snellen's chart, slit-lamp biomicroscopic evaluation of anterior and posterior segment, intraocular pressure (IOP) using by goldmann's applanation tonometer, gonioscopy using zeiss 4-mirror gonioscope, stereoscopic fundus and optic disc examination using direct ophthalmoscope, +20D with indirect ophthalmoscope, +90D with slit lamp biomicroscope were done and data was collected. Patients underwent vitreoretinal surgery with silicone oil implantation under local anaesthesia with monitoring under anaesthetic care / general anaesthesia. Silicone oil (1500 cs) was injected. After the treatment, patients were followed up on post-operative day 1, day 15, day 30, day 60, day 90. Patients with raised IOP post silicone oil injection were subjected to detailed gonioscopy and categorized into closed/ occludable angle (occludable angle being considered as non-visualization of trabecular meshwork without indentation/ manipulation in atleast 180 degrees or more of the angle) and open angle. Patients with occludable angle were considered for laser peripheral iridotomy (LPI). Patients with open angle were managed medically with topical antiglaucoma such as aqueous suppressants or/and prostaglandin analogs or/and outflow enhancers . Patients were followed up with the scheduled follow ups. Patients in whom the intraocular pressure is uncontrolled after maximum medical therapy and non-compliance to medical management will be considered for surgical management. Surgical options being trabeculectomy, augmented trabeculectomy with antifibrotic agents or glaucoma drainage devices. Post-operatively patients will be followed up to a period of 3 months. In our study reduction of IOP by 20%-30% of baseline pressure with no further glaucomatous changes in the optic nerve head and stable visual fields was considered as successful outcome. The data was entered in MS EXCEL spreadsheet and analysis was done using Statistical Package for social Sciences (SPSS) version 22.

**RESULTS**

A total of 40 siliconized eyes were followed up in our study of which 22 males (55%) and 18 females (45%) patients with average age 57.43 ± 5.1 years Out of them 14 were myopics (35%), 8 hypermetropics (20%) and 18 emmetropics (45%). At

the end of 90 days, five (12.5%) had ocular hypertension (in the absence of glaucomatous disc changes and visual field changes), one (2.5%) had cataract and four (10%) were diagnosed with secondary glaucoma. (Graph 1)



**Graph 1: Distribution Of Study Population With Overall Complications Due To Silicone Oil Injection**

Out of these 9 cases with raised IOP it was observed that one (11.1%) patient had developed within 30days. One patient (11.1%) developed between 31- 60 days. Three (33.3%) patients developed between 60-90 days. Four (44.4%) patients had developed the increased IOP after 90 days.(Table 1)

**Table 1: Distribution Of Time Taken To Develop Increased Iop In Study Participants With Complications Secondary To Silicone Oil Injection**

Duration in days	N = 9	%
Upto 15 days	0	--
16 to 30 days	1	11.1%
31 to 60 days	1	11.1%
61 to 90 days	3	33.3%
>90 days	4	44.4%

Among those patients with complications, five (50%) with ocular hypertension were treated with antiglaucoma medications [E/D Brimonidine(0.2%) BD + E/D Brinzolamide (2%) BD or E/D Timolol (0.5%) BD], one(10%) with cataract was treated with SICS with PCIOL and four (40%) with secondary glaucoma were treated according to the cause for raised IOP. (Table 2)

**Table 2: Distribution Of Mode Of Management Of The Complications Among Study Participants**

Complications	Management	N = 10	%
Cataract	SICS with PCIOL	1	10
Raised IOP	E/D Brimonidine (0.2%) + E/D Brinzolamide (2%), E/D Timolol (0.5%)	5	50
Secondary glaucoma Inverse hypopyon	Inferior peripheral iridotomy	2	20
Secondary glaucoma Emulsified oil in angle	E/D Brimonidine (0.2%) + E/D Brinzolamide (2%) Silicone oil removal	1	10
Secondary glaucoma Emulsified oil in retina	Silicone oil removal	1	10

5 out of 9 raised IOP patients had the reduced IOP by 30 days, 1 by 60 days and 2 by 90 days. One patient still had >21mmHg even at 90 days. (Table 3)

**Table 3: Time Taken For Reduction In IOP After Treatment.**

Duration in days	N = 9
30 days	5
60 days	1
90 days	2
Still >21 mmHg	1

**DISCUSSION**

Age: 40 patients were included in our study with average age 57.43 ± 5.1 years. Similar results were noted by Issa R et al<sup>6</sup>

where the average age of the subjects was 47.2 ± 15 years.

Complications: Of all the 40 cases, overall incidence of complications were 10 (25%) patients out of which five (12.5%) had ocular hypertension, four patients (10%) had developed secondary glaucoma, one patient had cataract. The incidence of raised intra-ocular pressure was 22.5%. Pillai GS et al<sup>7</sup> found that the incidence of raised IOP among their patients was 24.25% and secondary glaucoma being the commonest complication with the pupillary block was one of the common causes for secondary glaucoma in their study. Several studies<sup>8,9,10</sup> have also observed that raised IOP followed by retinal detachment with silicone oil was the commonest complication. Nicoli M et al<sup>11</sup> also concluded that raised IOP is positively correlated with the silicone injection for retinal detachment. Al-Jazzaf et al<sup>12</sup> had found that 11% was the incidence of raised IOP among their study population. Whereas another study by Issa R et al<sup>6</sup> found that re-detachment (6.9%), hypotony (7.9%), ocular hypertension (12.9%), corneal decompensation (9.9%), CME (2%) and cataract progression (68%) were the complications after silicone oil injection.

Timeline of complications: On further analysis 10 patients with complications, out of the 10 patients, 1 developed complication between 16-31 days, 1 developed between 31 to 60 days, 4 (40%) had developed the complications between 61 to 90 days and 4 developed >90 days. Pillai GS et al<sup>7</sup> observed that the highest number of eyes had their peak by the first week (33%), followed closely 26.49% had their peak IOP by 1st month, 5.29% at third month as opposed to 9.93% at 6 months following surgery. It has been substantiated by another report by Nicoli et al<sup>11</sup>, who have observed raised IOP within 30 days of the silicone injection.

Mode of management: Based on the observed complications, SICS with PCIOL was the management of choice for the patient with cataract. Patients with intra ocular hypertension as well as those with secondary glaucoma due to emulsified oil in angle, topical brimonidine (0.2%) with brinzolamide (2%) BD, timolol (0.5%) BD were given. The two patients who had secondary glaucoma due to inverse hypopyon, were treated with inferior peripheral iridotomy and continued with antiglaucoma medications. One patient with emulsified oil in retina had to undergo silicone oil removal. Similar to our study, Al-Jazzaf et al<sup>12</sup> had reported 78% of their patients with raised IOP with treated with topical anti-glaucoma medicines only. Pillai GS et al<sup>7</sup> had documented none of the patients requiring the surgical management.

**Outcome Assessment**

We observed that there was a persistent reduction in the IOP at each follow up after starting the treatment. In our study, 5 out of 9 patients had shown reduction in IOP (<21 mmHg) by 30 days, 2 by 60 days, 1 by 90 days. One patient still had >21mmHg even after 90 days.

**CONCLUSION**

Vitrectomy with intra-ocular silicone oil tamponade is one of treatment of choice in cases with retinal detachment. Short term or long-term retention of the silicone oil can alter the metabolism and hence can lead to various complications. Patients can have no obvious symptoms with respect to IOP values making it difficult to predict secondary glaucoma. Knowing that secondary glaucoma is the commonest complication, with yet not understood mechanism for causing complications, follow up of these patients must be done thoroughly in order to prevent optic nerve damage and hence vision loss.

**Conflict Of Interest:** None declared

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