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ORIGINAL ARTICLE

VISUAL OUTCOME AND POST OPERATIVE COMPLICATIONS AFTER SILICONE OIL REMOVAL IN PSEUDOPHAKIC VITRECTOMIZED PATIENTS

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ABSTRACT

OBJECTIVE: To assess visual outcome and post-operative complications after silicone oil removal in pseudophakic vitrectomized patients.

METHODS: This interventional case series study was conducted at Department of Ophthalmology, Medical Teaching Institution Lady Reading Hospital, Peshawar, Pakistan from February 2019 to January 2020. A total of 32 eyes of 32 patients were enrolled in the study after fulfilling inclusion and exclusion criteria using non-random consecutive sampling technique. All patients had pars plana vitrectomy with silicone oil done 6 months ago and were pseudophakic. Silicone oil removal was carried out in all patients and visual outcome and surgical complications assessed on 1st and 14th post-operative day. Final examination was done after six months. Statistical analysis was done by using Statistical Package for Social Sciences (version 21) by applying paired sample t-test.

RESULTS: Amongst 32 patients, 20 (62.5%) were male and 12 (37.5%) were female. Age of the patients ranged from 16 to 60 years with a mean age of 35±13.97 years. Pre operatively mean best corrected visual acuity (BCVA) was 1.45±0.52 Log Mar. On the last post-operative follow up after six months mean BCVA was 1.21±0.55 Log Mar. Visual acuity improved in 24 (75%), remained stable in 3 (9.4%) and worsening in visual acuity was seen in five (15.6%) cases. Visual improvement was statistically significant (p-value 0.001) using paired t-test. Most common complications were retinal detachment (n=4: 12.5%), secondary glaucoma (n=4: 12.5%) and epi-retinal membrane (n=2; 6.3%).

CONCLUSION: Vision improves in majority of pseudophakic patients after silicone oil removal.

KEYWORDS: Silicone Oil (MeSH); Visual outcome (Non-MeSH); Retinal Detachment (MeSH); Rhegmatogenous retinal detachment (Non-MeSH); Visual Acuity (MeSH); Postoperative Complications (MeSH); Secondary glaucoma (Non-MeSH); Glaucoma (MeSH); Glaucoma, Open-Angle (MeSH)

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INTRODUCTION

Rhegmatogenous retinal detachment (RRD) is often complicated by proliferative vitreoretinopathy (PVR) which makes the retina stiffer and more difficult to manage and usually it requires a long-acting endotamponade in the form of silicone oil, to prevent recurrent retinal detachment.[1]

Pars plana vitrectomy is often combined with internal tamponade so as to seal the breaks and prevent its re-opening in the immediate post-operative period till chorioretinal adhesions take on. Internal tamponade used frequently include air, gas [sulfurhexafluoride (SF6) & perfluoropropane (C3F8)], silicone oil, densiron.[1,2] Mostly long acting tamponade is required in rhegmatogenous retinal detachments (RRD) with high grade proliferative vitreoretinopathy (PVR).[1,2] PVR occurs in large proportion of RRD cases, ranging from 26.9 to 52.9 %.[3] The use of silicone oil as tamponading agent was described by Cibis et al.[4] Ever since then, numerous studies have shown the benefits and improved outcomes with the use of silicone oil in complex retinal detachment cases.[5,6]

The silicone oil use as an endotamponade has been for a long time now with clearly evident advantages and yet certain disadvantages too. It is preferred as a long acting tamponade especially in cases of trauma, Intraocular foreign body (IOFB), high grade PVR, recurrent RD, patient who have posture related problems, one eyed cases and those travelling abroad. Silicone oil has high surface tension which allows its use as an effective endotamponading agent in such cases. The Silicone Study showed superior outcomes in terms of vision and anatomy restoration with silicone oil as compared to SF6 gas at 1 year in PVR cases.[7] The Silicone Study Group in its report clearly favored the use of silicone oil over SF6 gas in terms of better visual acuity, and few postoperative complications.[7] Silicone oil although being inert, is still a foreign body to the eye and it has to be removed before it poses different threats to the eye in the form of keratopathy, glaucoma, emulsification, and cataract.[8] A long-term follow-up report of the silicon study group demonstrated no significant visual and anatomic difference between silicone oil, C3F8 and SF6.[9] Its removal needs a second intervention which is again not risk free. That are why different authors recommend removal of silicone oil as soon as strong chorioretinal adhesions develop.[10,11] Complications encountered in silicone oil removal include retinal re-detachment, intraocular pressure rise, inflammation, hypotony, cataract and corneal decompensation.[11]

Similarly, European Vitreoretinal Society (EVRS) Retinal Detachment Study showed

no difference between silicone oil and gas in complicated retinal detachment cases.[12]

All other studies are conducted on silicone oil removal in phakic, aphakic patients. In order to generate local evidence, we conducted this study in pseudophakic patients. In this study we have evaluated visual acuity changes and post-operative complications encountered after silicone oil removal who underwent 20 gauge pars plana vitrectomy (PPV) with silicone oil for complex RRD.

METHODS

This was an interventional case series study in which a total of 32 eyes of 32 patients were included who had undergone pars plana vitrectomy with silicone oil 6 months ago and were pseudophakic. Using OpenEpi calculator and taking a complication of 2.1%[12] with 95% confidence interval the sample size came out 32. Silicone oil removal was done and visual outcome and surgical complications assessed. The study was carried out at Lady Reading Hospital Peshawar from February 2019 to January 2020. Patients were admitted from outpatient department on consecutive basis. All patients were examined by consultant vitreoretinal surgeons and baseline examination was carried out including best corrected visual acuity (BCVA), intraocular pressure (IOP), anterior and posterior segment evaluation. Only those cases were included which were pseudophakic, had undergone PPV 6 months ago for RRD, had retina flat on clinic examination. Those patients which were aphakic, phakic, PPV duration of less than 6 months, persistently detached retina on clinical examination, PPV done for other vitreoretinal disorders like diabetic tractional retinal detachment and vitreous hemorrhage were excluded from the study. Written informed Consent was obtained from each patient and prognosis explained. Ethical approval of study was taken from ethical committee of institution. Silicone oil removal was done by a vitreoretinal resident with 3 port PPV technique. Oil removal was done with both active and passive suction using 5 cc syringe and flute needle respectively. Fluid air exchange was performed and retina was examined directly under EIBOS. PPV ports were sutured with 7/0 vicryl and air was left in vitreous cavity. After the procedure patients were given a single day stay. Snellen's acuity was converted to LogMar acuity. Statistical analysis was performed using SPSS version 21. Data were summarized as percentages, means, tables and graphs. Statistical significance was checked for different variables using paired sample T test and value of $P < 0.005$ was considered significant.

Visual acuity was termed improved if patient shows improvement on Snellen's chart from baseline at the final follow up, stable if no change in the BCVA preoperatively and postoperatively and rated as worsened if patient showed a decrease BCVA on Snellen's chart at final follow up in comparison to baseline BCVA.

RESULTS

Amongst 32 patients, 20 (62.5%) were male and 12 (37.5%) were female. Age of the patients ranged from 16 to 60 years with a mean age of 35±13.97 years.

Pre-operatively mean BCVA was 1.45±0.52 Log Mar. On the last post-operative follow up after six months mean BCVA was 1.21±0.55 Log Mar. Pre- and post-operative paired difference of BCVA was significant (p=.001) on paired sample t-test (Table I).

Visual acuity improved in 24 (75%) and remained stable in 3 (9.4%). Most common complications were retinal detachment (n=4: 12.5%) and secondary glaucoma (n=4: 12.5%) [Table II].

DISCUSSION

Silicone oil removal is not complication free. The timings and severity of these complications depends on a number of factors e.g., status of PVR, age of patient, size and extent of retinectomies, use of laser or cryo, any intraocular foreign body (IOFB), post-operative inflammation, duration of silicone oil in the eye, viscosity of silicone oil used. The timing of silicone oil removal has been debated a lot. Some authors favor early removal before silicone oil manifest its complications.[13] While others have shown that prolonged retention of silicone oil in eyes doesn't pose additional risks.[14] The appropriate timing to remove silicone oil is still controversial and most of the authorities suggest early removal between 3 to 6 months in cases of attached retina as compared to late removal which poses more risks of complications.[13,14] In our study silicone oil removal was done after six months. Visual acuity improved in majority of our subjects from baseline to final follow up in 75% eyes and worsened in 15.6% cases, whereas remaining 9.4% eyes maintained same vision in post-operative period.

However, vision improvement was statistically significant in our series (p value 0.001). Significant visual improvement (p value <0.001) was also noted by Bassat IB following silicon oil removal.[15] Hu SQ reported 73.6% (p value 0.001) had improvement in BCVA following oil removal in their study.[16] Silicone study report 6 reported that following removal of silicone oil visual acuity improved in the majority of eyes.[17] On the contrary, vision may drop following silicone oil removal due to retinal detachment, optic neuropathy, glaucoma, hypotony, keratopathy, vitreous hemorrhage.[11] Visual acuity of 20/200 was achieved following silicone oil removal in 70% eyes.[18] Multiple factors play their part in better visual outcome like short duration of tamponade, few past interventions, smaller retinectomy, better preoperative vision, timely silicone oil removal.[18] Improvement in vision occurs due to several reasons like improvement in refraction following oil removal, slow recovery of attached retina with improved oxygen and nutrient supply, possible silicone oil toxicity with improved retinal physiology after oil removal.

Increase intraocular pressure after vitrectomy with silicone oil may be due to pupillary block, post-operative inflammation, pre-existing glaucoma, silicone oil bubble in the anterior chamber, emulsification. Sometimes the raise pressure may continue to be higher after silicone oil removal due to chronic inflammation, post op steroid use, infitration of trabecular meshwork plugging by oil and synechial angle closure. In our cases 12.5% (n=4) developed secondary glaucoma mostly due to trabecular meshwork problems which responded to topical treatment in 3 cases while I required augmented trabeculectomy. Rates of hypotony ranged from 3.5–20 % after silicone oil removal in different studies.[11] In our cases, one eye (3.1%) developed hypotony, while one eye (3.1%) ended up in phthisis.

Retinal redetachment has been reported in silicone oil removal cases and it varies from 8.8–25 %.[15,19] In our study retinal detachment was found in 12.5%. Redetachment rates were same if silicone oil removal was done by 2 port or 3 port techniques in a study done by Tan HS et al.[20] We removed oil using 3 port technique. Redetachment rates are

TABLE I: STATISTICAL SIGNIFICANCE OF PRE-OPERATIVE AND FINAL-POST OPERATIVE BEST CORRECTED VISUAL ACUITY

Parameter	Pre-operative (Mean±SD)	Post-operative (Mean±SD)	Paired T test			P-value
			Pre- and Post-Operative Paired difference	95% Confidence Interval of the Difference		
				Lower Limit	Upper Limit	
Best corrected visual acuity (measured in Log mar)	1.45±0.52	1.21±0.55	0.24	0.109	0.383	0.001

TABLE II: COMPLICATIONS AFTER SILICONE OIL REMOVAL

Variables		Frequency (n=32)	Percentages
Complications	No complications	19	59.4%
	Retinal detachment	4	12.5%
	Secondary Glaucoma	4	12.5%
	Epi-retinal membrane	2	6.3%
	Phthisis	1	3.1%
	Hypotony	1	3.1%
	Vitreous bleeds	1	3.1%
Visual Acuity Changes	Improved	24	75%
	Stable	3	9.4%
	Worse	5	15.6%

affected by other factors like status of PVR at the time of PPV, vitreous base shaving, type of endo tamponade, extent of laser retinopexy, retinotomies failed retinal surgeries in the past, myopia, aphakic status, the surgeon factor, the patient's vision before to silicone oil removal.[21-23] Nagpal MP and coauthors suggest application of 360° prophylactic laser retinopexy 1 to 3 months before removal of silicone oil to prevent detachment.[24] The retina usually gets redetached after silicone oil removal as a result of formation of new retinal breaks due to traction especially in the areas where inadequate laser is done. In our cases retinopexy was augmented where needed at the time of surgery. Other than that, preexisting retinal breaks that were missed initially and not effectively treated are a cause of redetachment. These types of breaks usually open up after silicone oil removal. PVR is one the most important cause of re-detachment and it may be triggered by silicone oil removal or due to rapid progression of a preexisting PVR process. In our cases preexisting PVR progression was a common cause of re-detachment. In our study we did not establish relation between timing of silicone oil removal and its correlation with risk of retinal redetachment.[21,23] Re-detachment cases in our series were subjected to PPV again with silicone oil by a vitreoretinal consultant.

CONCLUSION

Removal of silicone oil improves visual acuity in pseudophakic patients. Several factors may impact the ultimate outcome. Limitations of our study are lack of multivariate analysis to determine factors involved in deciding better outcome, relatively small sample size, relatively short follow up.

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

AA: Concept and study design, acquisition of data, drafting the manuscript, approval of the final version to be published

ZUD: Analysis and interpretation of data, drafting the manuscript, critical review approval of the final version to be published

TS: Acquisition, analysis and interpretation of data, drafting the manuscript, critical review, approval of the final version to be published

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

CONFLICT OF INTEREST

Authors declared no conflict of interest

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DATA SHARING STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request