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Original Research

THE TIME INTERVAL POST-VITRECTOMY CATARACTS : A COMPARISON BETWEEN SILICONE OIL AND BALANCED SALT SOLUTION AS VITREOUS SUBSTITUTES

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ABSTRACT

Introduction: To investigate the comparison of time interval of cataracts following vitrectomy using silicone oil (SO) and balanced salt solution (BSS), and the differences between time interval of cataracts following vitrectomy using different SO viscosities.

Methods: This is a retrospective cohort study involving 94 medical records of phakic patients who had undergone vitrectomy in a tertiaryhospital from October2018 to December2022. Data on diagnosis before vitrectomy, type of vitreous substitutes, viscosity of SO, lens opacity at 3, 6, and 12 months, and time interval for post-vitrectomy cataracts were described and then analyzedusing a univariate test, followedby a comparative bivariate test using the chi-square test.

Result: Post-vitrectomy cataracts occurred in 90.4% of patients with SO tamponade, significantly higher than 52.4%with BSS ($p < 0.001$). In patients with SO, the incidence of post-vitrectomy cataracts was most common at 12 months (41%), followed by 6 months (21%), >12 months (21%), and 3 months (17%). In the BSS group,cataracts were mostlyobserved at 3 months (36%)and 6 months (36%). Cataractincidence was similar between low- and high-viscosity SO (90.9% vs. 89.1%, $p = 0.735$)

Conclusion: Post-vitrectomy cataract formation occurs more frequently in eyes treatedwith SO tamponade compared to BSS, with the highest incidence observed around the 12th month after vitrectomy. However, no statistically significant difference in the incidence of cataract has been observed among different SO viscosities

Keywords: Post-vitrectomy Cataracts, Silicone Oil, Balanced Salt Solution

Introduction

Cataracts are the most common complications associated with vitrectomy, with a 60-98% incidence in patients with a history of previous vitrectomy. These nuclear-sclerotic cataracts may develop clinically significant within the next 2 years.[1,2] The exact pathogenesis of the formation or acceleration of post-vitrectomy cataracts is not yet understood; several studies have argued that light toxicity, oxidation processes in the lens, length of surgery, use of intraocular gas, age, diabetes status, complex vitrectomy, and use of vitreous substitutes materials influence the formation of cataracts.[2] Materials for vitreous substitutes are those used during vitrectomy, which share similar shapes and functions to the vitreous. The currently available vitreous substitutes materials can be classified into 2 main categories, namely gas-based (air, expansive gas, etc.) and liquid-based (balanced salt solution [BSS], perfluorocarbon liquid, silicone oil [SO], polymeric hydrogels, etc.[3–5] Silicone oil is a tamponade agent that used to anatomically reattach the retina. The silicone oil used in the field of ophthalmology is polydimethylsiloxane. Silicone oil has several types of viscosity, the ones used currently have low viscosity with a viscosity of 1,000–1,500 centistokes (cSt) and high viscosity with a viscosity of 5,000–5,500 cSt. In several studies, the incidence of cataracts is believed to be related to the duration of SO in the eye. The incidence of cataracts in patients with SO during the first 3 months is 6% and increases to 85% in the 6th month.[6–8] In a previous study, patients after vitrectomy using vitreous gas substitutes had 68% post-vitrectomy cataract complications within 12 months and patients usingBSS had a smaller post-cataract percentage, which was 30%.

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Although there has been research on the incidence of post-vitrectomy cataracts for BSS and the incidence of post-vitrectomy cataracts for SO, There are currently no studies comparing the incidence of post-vitrectomy cataract between SO and BSS. This maybe advantage in this study, as the authors attempted to determine the difference in the incidence of post-vitrectomy cataracts in patients with SO tamponade and those with BSS.[9,10]

Methods

This is an observational analytical study using a retrospective cohort method. This study was carried out with data obtained from the Vitreo-Retina Division of the Eye Clinic at Dr. Saiful Anwar Hospital, Malang, (RSSA) from October 2018 to December 2022. This study, vitrectomy was performed by a single operator and received ethical clearance from the Medical Research Ethics Team, Faculty of Medicine, UniversitasBrawijaya number 400/266/K.3/302/2023. The inclusion criteria are patients with a previous vitrectomy history at RSSA, either with SO or BSS, and visiting the Eye Clinic from October 2018 to December2022. The incomplete data, cataracts before the vitrectomy, intraocular infection or inflammation, pseudoexfoliation syndrome, eye trauma, or eye surgery other than the vitrectomy were excluded.

The collected data include patient demographic such as gender, age, diagnosis prior to vitrectomy, type of vitreous substitutes material, the viscosity of silicon oil used, lens opacity at 3, 6, and 12 months, and the time interval for cataractdevelopment. In this study, post-vitrectomy cataract was defined as the presence of lens opacity developing after a previous history of vitrectomy. The interval to cataract development was measured from the date of vitrectomy to the first documented evidence of lens opacity, as recorded in the patient's medical records.

All of this data was presented as a description of the research subjects, which subsequently underwent statistical analysis.The analysisused was a univariate test, then a comparative bivariate test was carried out using chi-square. [b1] [cd2] The study aimed to understand the impact of vitrectomy on cataracts.

Result

The total number of samples that metthe inclusion criteria was 94. The demographic characteristics and clinical profiles of the research samples are presented in Table 1 below.

Table 1.Respondent Characteristics (N= 94)

Characteristics	
Sex, f (%)	
Male	49 (52.1%)
Female	45 (47.9%)
Age, mean ± sd	54.68 ± 11.67
Tamponade	
BSS	21 (22.3%)
SO	73 (77.7%)
High Viscosity	18 (24,7%)
Low Viscosity	55 (75,3%)
indications for vitrectomy, f (%)	
RRD	66 (70.2%)
Vitreous Opacity	5 (5.3%)
DR complications	23 (24.5%)
History of DM	25 (26.6%)

The study reveals that post-vitrectomy cataract most commonly occurs in men with an average age of 54.68 ± 11.67.

Table 2. A T-Test of the Post-Vitrectomy Time Interval between Silicone Oil and Balanced Salt Solution

Interval Time	Tamponade		P value
	Balanced Salt Solution (n=21)	Silicone Oil (n=73)	
Non Cataract	10 (47.6%)	7 (9.6%)	<0.001
Cataract			
3rd Month	4 (19.0%)	11 (15.1%)	
6th Month	4 (19.0%)	14 (19.2%)	
12th Month	1 (4.8%)	27 (37.0%)	
> 12th Month	2 (9.5%)	14 (19.2%)	

Statistically significant at p-value <0.05

It found that 81.9% of patients had post-vitrectomy cataract. In 18.1% who did not have cataracts, 58.8% using BSS as vitreous substitutes material. In SO group post-vitrectomy cataracts occurred in 90.4% patients. Patients who received SO vitreous substitutes material and developed post-vitrectomy cataract predominantly experienced these cataracts at the 12-month follow-up. In contrast, post vitrectomy cataracts associated with BSS were mostly found at the 3-month and 6-month intervals.

The test results indicated a significant difference in the time interval for the incidenceof post-vitrectomy cataracts between SO and BSS with a p-value of <0.001. These findings suggest that patients treated with silicone oil experience post-vitrectomy cataracts more frequently.

Table 3. T-Test of the Post-Vitrectomy Time Interval between Low-Viscosity Silicone Oil and High-Viscosity Silicone Oil

Interval Time	Silicone oil		P Value
	Low Viscosity (n=55)	High Viscosity (n=18)	
Non cataract	5 (9.1%)	2 (11.1%)	0.735
Cataract			
3rd Month	6 (10.9%)	5 (27.8%)	
6th Month	12 (21.8%)	2 (11.1%)	
12th Month	23 (41.8%)	4 (22.2%)	
> 12 Month	9 (16.4%)	5 (27.8%)	

Statistically significant at p-value <0.05

The study found that 90.9% of patients with low-viscosity SO developed post-vitrectomy cataracts, with the majority experiencing them by the 12-month mark. Additionally, 88.9% of the 18 patients with high-viscosity SO also developed cataracts.

The analysis test results indicate a p-value of 0.735. Therefore, no statistically significant difference was observed in the time interval to post-vitrectomy cataract development between low- and high-viscosity SO.

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Table 4. The Relationship between Indications for Vitrectomy and the Time Interval of Cataract after Vitrectomy

Time Interval	Vitrectomy indication			
	RRD (n=66)	Vitreous Opacity (n=5)	DR complications (n=23)	P value
Non Cataract	7 (10.6%)	4 (80.0%)	6 (26.1%)	0.001
Cataract				
3rd Month	11 (16.7%)	1 (20.0%)	3 (13.0%)	
6th Month	10 (15.2%)	0 (0%)	8 (34.8%)	
12th Month	25 (37.9%)	0 (0%)	3 (13.0%)	
> 12 Month	13 (19.7%)	0 (0%)	3 (13.0%)	

The p-value of the Mann-Whitney of Indication for Vitrectomy: RRD – Vitreous Opacification (p = 0.001), RRD – DR Complication (p = 0.037), Vitreous Opacification – DR Complication (p = 0.018)

Of the 94 patients, 77% of post-vitrectomy cataracts were caused by RRD, with the highest incidence observed at 12 months, accounting for 42.3%.

The test results indicate a significant relationship between the indications for vitrectomy and the time interval following the procedure (p = 0.001). Each group of indications for vitrectomy shows significant differences in the time interval (p < 0.05).

Table 5. The Relationship between History of DM and the Time Interval after Vitrectomy

Time Interval	History of DM		P value
	NO(n=69)	Yes(n=25)	
Non cataract	10 (14.5%)	7 (28.0%)	0.079
Cataract			
3rd Month	12 (17.4%)	3 (12.0%)	
6th Month	10 (14.5%)	8 (32.0%)	
12th Month	24 (34.8%)	4 (16.0%)	
> 12th Month	13 (18.8%)	3 (12.0%)	

Statistically significant at p-value <0.05

The test results show that statistically there is no relationship between history of DM and time interval after vitrectomy (p = 0.079).

Discussion

The majority of patients in this study were male, comprising 52.1% of the sample. This finding aligns with research conducted by Elyashiv et al. in 2021,which was a retrospective study involving patients undergoing vitrectomy, where 55% of the participants were men. Similarly, studies by Feng et al. and Abu-Yaghi et al. also reported a higher prevalence of male patients. An analysis of vitrectomy procedures based on sex indicates that men are more likelyto undergo vitrectomy than women, which can be attributed to the higher incidence of retinal detachment due to trauma in males. Research suggests that diabetic retinopathy (DR) is generally more prevalent in men; however, this trend may vary depending on other systemic factors.[8,9,11]

Findings indicate that post-vitrectomy cataracts predominantly occur in individuals aged 41 to 65 years, with an averageage of 54.68 ± 11.67. The incidence of post-vitrectomy cataracts in this age group is also associated with the prevalence of vitrectomy itself. A study by Wubben et al. reported that as individuals age, they are more likely to exhibit retinal abnormalities that necessitate vitrectomy, such as RRD,DR, and macular holes. Individuals over 65 years of age are less frequently identified in this context, as most patients in this age group have typically undergone cataract surgery prior to experiencing these complications.[11,12]

Overall, the findings of the present study represent a demographic characteristics of patients with post-vitrectomy cataract and should be interpreted within the context of the study population rather than as evidence of an increased risk associated with sex or age. SO is a long-term tamponade used in complex RRD patients, with an average success rate of 70%. It restoresretina anatomical position, while BSS is a vitreous substitutes material that doesn't have a tamponade effect, making it unsuitable for cases requiring a sealing agent.[13]

The study found that most of post-vitrectomy cataract developed in patient with SO as their vitreous substitutes material with most experiencing them at the 12th month interval. Research conducted by Citirik et al. found that 100% of 10 patients who received SO experienced cataracts after being followedup for 3 years. Another study by Liu et al. revealed that the average duration of post-vitrectomy cataract with SO was 4.85 ± 1.85 months [14,15]

According to the theory,almost all lenses that come into contact with SO will eventually develop cataracts, this is due to a disturbance in the metabolic exchange in the posterior lens capsule. Another hypothesis states that SO can increase the permeability of the lens capsule by changing its molecular charge, thus facilitating the entry of SO into the lens cell.[16] BSS is a vitreous substitute that closely resembles the natural vitreoushumour, which has an osmolality of 300 to 305 mOsm. Its ionic concentration aligns with the metabolic processes occurring in the retina, which is believed to be a reason why patients receiving BSS are less likely to develop cataracts. [13]

The incidence of post-vitrectomy cataracts can be associated with the duration of vitrectomy where the possibility of oxygen levels present behind the lens during vitrectomy can prolong oxygen exposure with the posterior lens. A previous theory stated that damage to lens proteins caused by increased oxygen levels behind the lens can increase the clouding of the lens. This is further supported by the notion that oxygen levels can also influence the acceleration of post-vitrectomy cataractswhere low oxygen levels can also reduce the incidence of post-vitrectomy cataracts.[17] In this study, there is no statistically significant difference in the time interval for cataracts to occur post-vitrectomy for both low-viscosity and high-viscosity SO.

A similar study carried out by Abu-Yaghi et al. on patients with SO as their vitreous substitutes materialshowed that, out of 85 patients—43 patients with low-viscosity SO and 42 with high-viscosity SO—they did not find significant differences in the complications that appeared in the two groups.[8]

Based on a systemicreview conducted by Valentin-bravo et al in 2022, so far there have only been 2 studies evaluating the difference in the incidence of post-vitrectomy cataracts when compared between low-viscosity SO and high-viscosity SO. However, there is no significant difference in the two groups. A study by Hernandez et al suggests a theory in which reduced viscosity in the vitreous may lead to faster molecular transport within the vitreous cavity. This decreasein viscosity allows rapid and uniform distribution of oxygen within the vitreous cavity, thereby influencing the oxygen gradient in the vitreous and lens. The oxygen concentration in the lens then increases. This can cause oxidative damage to the lens and lead to post-vitrectomy cataracts.[16,18]

SO is generally used for patients with complex RRD. Even though SO is divided into low and high viscosities, the surface tension produced is almost the same, as is the specific weight. Previous researchonly explained that SO with a higher viscosity has a tendency to have lower emulsification properties. The indication for determining the viscosity itselfdepends on the operator: the underlying consideration for the operator is that SO with a low viscosity is easier to inject,and SO with a high viscosity is believed to fill the vitreous cavity better than one with a low viscosity.[19,20]

The indication for vitrectomy makes a significant difference in the incidence of post-vitrectomy cataracts. Research conducted by Okonkwo et al on patients who had undergone vitrectomy revealed that there were 3 major indications for vitrectomy, the highest being RRD at 62%, followed by DR at 10%, and trauma at 6%. Blodi et al stated in their theory that the incidence of post-vitrectomy cataracts is more relatedto the complexity of the eye condition than the patient's age. The development of post-vitrectomy cataracts may be influenced by the underlying disease. Patients with this condition often undergo a longer vitrectomy and a longer post-operative period; conversely, patients with epiretinal membranes or choroidal new vessel membranes may have a lower risk of post-vitrectomy cataracts because they require relatively short surgery and generally do not cause inflammation. In RRD and DR, the duration of surgery tends to be longer becausethe procedures performed are more complex compared to vitreous opacification due to other causes. In a study by Liao et al, older patients with vitreous hemorrhage were the main indication for.[21–24]

The analysis showed no statistically significant association between a history of diabetes mellitus (DM) and the time interval to post-vitrectomy cataract development. This finding differs from that reported by Borislav et al. in the Netherlands, who found that cataracts developed more rapidly in patients without a history of DM than in those with a history of DM. One possible explanation proposed in previous literature is that diabetes may increase glucose levels in the aqueous humor, which could potentially influence lens metabolism and delay cataract.[25]

A study conducted by Holekampe et al and Markatia et al suggested that a history of DM maybe a protective factor for post-vitrectomy cataracts, as the incidence of cataract surgery is lower in patients with a history of DM. Chronic DM also causes tissue perfusion and hypo-oxygenation. Evidence supporting this hypothesis comes from a recent study in which the eyes of patients with diabetes undergoing vitrectomy surgery due to complications of diabetic retinopathy were found to have significantly lower oxygen levels in the vitreous fluid than non-DM eyes.[26–28] In their retrospective study, Faramawi et al assessed the average time for cataract surgery in post-vitrectomy patients, which found that patients withoutDM had a faster averagetime for cataract surgery compared to patients with DM. One possible explanation is that reduced oxygen levels within the vitreous cavity may decrease oxidative damage to the lens. However, this proposed mechanism was not directly evaluated in the present study [28,29]

Previous studies have reported post-vitrectomy cataract following the use of either SO or BSS. However, to the best of our knowledge, no previous study has compared cataract development between these two vitreous substitutes. This study has several limitations due to its retrospective nature, which may introduce selection bias. Factors such as the duration of vitrectomy and surgical difficulty may also have influenced the results. Additionally, imbalances in the data across variables may have affected the statistical analysis.

Conclusion

Post-vitrectomy cataract was more frequently observed in eyes receiving SO than in those receiving BSS, with the incidence peaking approximately 12 months after surgery. However, no statistically significant difference in the rate of cataract development was observed between different SO viscosities.

Reference

1. Holekamp NM, Shui YB, Beebe D. Lower Intraocular Oxygen Tension in Diabetic Patients: Possible Contribution to Decreased Incidenceof Nuclear Sclerotic Cataract. Am J Ophthalmol. 2006 Jun;141(6):1027–32.
2. Do D V, Gichuhi S, Vedula SS, Hawkins BS. Surgery for post-vitrectomy cataract. Cochrane Database of Systematic Reviews. 2013 Dec 19;
3. Su X, Tan MJ, Li Z, Wong M, Rajamani L, Lingam G, et al. Recent Progress in Using Biomaterials as Vitreous Substitutes. Biomacromolecules. 2015 Oct 12;16(10):3093–102.
4. Kleinberg TT, Tzekov RT, Stein L, Ravi N, Kaushal S. Vitreous Substitutes: A Comprehensive Review.Vol. 56, Survey of Ophthalmology. 2011. p. 300–23.
5. Schulz A, Szurman P. Vitreous Substitutes as Drug Release Systems. Vol. 11, Translational Vision Science and Technology. Association for Research in Vision and Ophthalmology Inc.; 2022.
6. Lee KH, Chung YR, Yeo S, Lee K. Is gas/air tamponade essential for eyes with small peripheral retinal breaks without detachment during vitrectomy? BMC Ophthalmol. 2022 Dec 1;22(1).

7. Vaziri K, Schwartz SG, Kishor KS, Flynn HW. Tamponade in the surgical management of retinal detachment. Vol. 10, Clinical Ophthalmology. Dove Medical Press Ltd; 2016. p. 471–6.
8. Abu-Yaghi NE, Abu Gharbieh YA, Al-Amer AM, Alryalat SAS,Nawaiseh MB, DarweeshMJ, et al. Characteristics, fates and complications of long-term silicone oil tamponade after pars plana vitrectomy. BMC Ophthalmol. 2020 Aug 17;20(1).
9. Feng H, Aadelman RA. Cataract formation following vitreoretinal procedures. Clinical Ophthalmology. 2014 Sep 23;8:1957–65.
10. Hsuan JD, Brown NA, Bron AJ, Patel CK, Rosen PH. Posterior subcapsular and nuclear cataract after vitrectomy. Vol. 27, J Cataract Refract Surg. 2001.
11. Elyashiv S, Levin MF, Zloto O, Neimark E, Najjar R, Moisseiev J, et al. Epidemiology of pars plana vitrectomy in the elderly: A retrospective 10-year survey of 592 cases. Clin Interv Aging. 2021;16:1007–12.
12. Wubben TJ, Talwar N, Blachley TS, Gardner TW, Johnson MW, Lee PP, et al. Rates of vitrectomy among enrollees in a United States Managed Care Network, 2001-2012. Ophthalmology. 2016 Mar 1;123(3):590–8.
13. Yadav I, Purohit SD, Singh H, Bhushan S, Yadav MK, Velpandian T, et al.Vitreous substitutes: An overview of the properties, importance, and development. Vol. 109, Journal of Biomedical Materials Research - Part B Applied Biomaterials. John Wiley and Sons Inc; 2021. p. 1156–76.
14. Citirik M, Sargon MF, Has S, Bilgin S. Alterations of the anterior lens capsule in vitrectomized eyes with silicone oil tamponade. Ophthalmic Surgery Lasers and Imaging. 2012 Sep;43(5):388–94.
15. Liu R, Li Q. Changes in ocular biometric measurements after vitrectomy with silicone oil tamponade for rhegmatogenous retinal detachment repair. BMC Ophthalmol. 2020 Sep 2;20(1).
16. Hernandez-Bogantes E, Abdala-Figuerola A, Olivo-Payne A, Quiros F, Wu L. Cataract Following Pars Plana Vitrectomy: A Review. Vol. 36, Seminars in Ophthalmology. Taylor and Francis Ltd.; 2021. p. 824–31.
17. Yee KMP, Tan S, Lesnik Oberstein SY, Filas B, Nguyen JH, Nguyen-Cuu J, et al. Incidence of Cataract Surgery after Vitrectomy for Vitreous Opacities. Ophthalmol Retina. 2017 Apr 1;1(2):154–7.
18. Valentín-Bravo FJ, García-Onrubia L, Andrés-Iglesias C, Valentín-Bravo E, Martín-Vallejo J, Pastor JC, et al. Complications associated with the use of silicone oil in vitreoretinal surgery: A systemic review and meta-analysis. Vol. 100, Acta Ophthalmologica. John Wiley and Sons Inc; 2022. p. e864–80.
19. Zafar S, Munira S, Mahmood SA, Amin S, Iqbal Z. Comparison of 1000-centistoke versus 5000-centistoke siliconeoil in complex retinal detachment surgery. Journal of the College of Physicians and Surgeons Pakistan . 2016;26(1):36–40.
20. Rahman A, Hussain M, Fayaz M, Hassan M, Bhatti MN, Qazi AM. Comparison of Raised IOP after Pars Plana Vitrectomy (Ppv) Using 1000 cSt and 5000 cSt Silicone Oil in Rhegmatogenous Retinal Detachment. Vol. 27, Original Article Pak J Ophthalmol. 2011
21. Okonkwo ON, Lewis K, Hassan AO, Gyasi ME, Oluyadi B, Ogunro A, et al. Indications and outcomes of vitrectomy surgeryin a series of 1000 black Africaneyes. BMJ Open Ophthalmol. 2019 May 1;4(1).
22. BlodiBA, Paluska SA. Cataract after vitrectomy in young patients. Ophthalmology. 1997;104(7):1092–5.
23. KeyalK, Liao X, Liu G, Yang S, Wang F. Post-vitrectomy CataractAcceleration in Phakic Eyes: A Review. Discov Med. 2017 Dec;24(134):305–211.
24. Liao M, Wang X, Yu J, Meng X, Liu Y, Dong X, et al. Characteristics and outcomes of vitrectomy for proliferative diabetic retinopathy in young versus senior patients. BMC Ophthalmol. 2020 Dec 1;20(1).
25. Cataract after silicone oil implantation. Vol. 83, Documenta Ophthalmologica. 1993.
26. Holekamp NM, Bai F, Shui YB, Almony A, Beebe DC. Ischemic diabeticretinopathy may protectagainst nuclear sclerotic cataract. Am J Ophthalmol. 2010;150(4).
27. Holekamp NM, Shui YB, Beebe DC. Vitrectomy surgeryincreases oxygen exposure to the lens: A possible mechanism for nuclear cataract formation. Am J Ophthalmol. 2005;139(2):302–10.
28. Markatia Z, Hudson J, Leung EH, Sajjad A, Gibbons A. The Postvitrectomy Cataract. Int Ophthalmol Clin. 2022;62(3):79–91.
29. Faramawi MF, Delhey LM, Chancellor JR, Sallam AB. The Influence of Diabetes Status on the Rate of Cataract Surgery Following Pars Plana Vitrectomy. Ophthalmol Retina. 2020 May 1;4(5):486–93.