Original Article

Effectiveness of Silicone Oil Tamponade with Pars Plana Vitrectomy in Isolated Cases of Vitreous Hemorrhage with Advanced Diabetic Retinopathy

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ABSTRACT

Purpose: To assess the effectiveness and safety of silicone oil as tamponade in vitrectomy performed for isolated cases of vitreous hemorrhage in patients with advanced diabetic retinopathy.

Study Design: Quasi experimental.

Place and Duration of Study: Al-Ibrahim Eye Hospital, Karachi from October 2022 to March 2023.

Methods: Forty two cases of advanced diabetic retinopathy (either sex), with developing vitreous hemorrhage (active bleeding) were enrolled through convenient sampling. Demographic characteristics and pre-operative examination of eyes including Best corrected visual acuity (BCVA), intraocular pressure (IOP), indirect ophthalmoscopy, gonioscopy and ultrasonography (in cases where fundus was not visible) were performed. All the patients underwent pars plana vitrectomy (PPV) and pan retinal photocoagulation (PRP). Silicone oil was used as tamponade. Post-operative follow up was at first week after surgery and repeated at 3rd month and 6th month. Effect of silicon oil tamponade on re-bleeding after surgery was specifically observed. Anatomical outcome and side effects were also noted during the study period.

Results: Out of 42 cases, re-bleed occurred in 2 cases (4.76 %). However, IOP was raised in 3cases (7.1%) and cataract formed in 2 cases (4.76%). No other side effect was observed throughout the study period.

Conclusion: Use of silicone oil as tamponade effectively decreases re-bleeding in patients of advanced diabetic retinopathy after vitrectomy. However, few complications such as increased intraocular pressure and cataract can occur that are manageable both medically and surgically.

Key Words: Silicone oil, vitreous hemorrhage, advanced diabetic retinopathy, vitrectomy.

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INTRODUCTION

Diabetic retinopathy (DR)can be a sight threatening complication of Diabetes Mellitus if blood sugar levels are uncontrolled.[1] Proliferative diabetic retinopathy (PDR) is the advanced stage of diabetic retinopathy, caused by neovascularization at retina and optic disc due to hypoxia, microangiopathy and capillary

occlusion.[2,3] These blood vessels are fragile and bleed readily, leading to vitreous hemorrhage. Vitreous hemorrhage, a late complication of proliferative DR, can cause loss of vision due to tractional retinal detachment and fibrovascular proliferation.[3] Vitreous surgery may be obligatory for treatment of PDR such as non-clearing vitreous hemorrhage or tractional retinal detachment.[4] There are frequent cases of re-bleed reported after vitrectomy.[2]

Silicone oil (SO) is used as tamponade after vitrectomy for severe PDR. It accelerates retinal reattachment by giving prolonged intraocular tamponade.[5] Silicone oil may prevent growth of new blood vessels in eyes by discontinuing the movement of angiogenic substances.[6]Hypothetically, chances of re-bleed can be decreased by its use.

SO is regarded as a useful tamponade due to its physical properties of transparency, chemical inertness and high interfacial tension with water.[7]

Although, some researchers have mentioned obvious advantages of silicone oil after vitrectomy in encouraging retinal stabilization and regression of new blood vessels at iris.[8,9] Others are in disagreement to this.[10]

A well reported effect of silicone oil as tamponade on postoperative complications specifically re-bleeding in cases of vitrectomy for advanced diabetic retinopathy is lacking in literature. This study was designed to evaluate the efficacy and safety of using silicon oil in preventing re-bleed after vitrectomy in cases of isolated vitreous hemorrhage with advanced diabetic retinopathy. Anatomical and functional outcome of affected eyes as well as other side effects such as retinal re-detachment, silicone oil residue, cataract and glaucoma were also observed.

METHODS

This quasi experimental study was conducted at Al-Ibrahim Eye Hospital, Karachi for 6 months duration from October 2022 to March 2023 after taking permission from institutional review board (IRB no: REC/IPIO/2023/065). The study strictly followed the guidelines laid down by World Medical Association and Declaration of Helsinki for human based researches. Diagnosed cases of advanced diabetic retinopathy (either sex), developing vitreous hemorrhage (active bleeding) were enrolled for the study. Informed consent was acquired from all patients. Sampling was done using convenient sampling. Sample size was calculated by online sample size calculatorhttps://www.calculator.net/sample-size-calculator.html. (Confidence interval: 95%, Margin of errors: 5, Population proportion: 50%, population size: 48 cases). Patients with advanced diabetic retinopathy with other complications, hypertensive retinopathy and other retinal diseases were excluded.

Demographic characteristics of patients including age, sex, area of residence, duration and type of diabetes and side of eye (right/left) were noted. Pre-operative examinations of both eyes included BCVA, IOP measurement, indirect ophthalmoscopy, gonioscopy and ultrasonography (in patients where fundus could not be seen). BCVA was measured by Snellen chart. IOP was checked by Goldmann Applanation tonometer. All the patients underwent PPV and laser treatment. Silicon oil was used as tamponade in cases. Post-operative eye examinations of affected eyes were performed in first week after surgery and repeated at 3rd month and 6th month. Effect of silicon oil tamponade on vitreous hemorrhage (active bleeding) was specifically observed. Patients were also observed for any side effects of silicon oil tamponade throughout the study period. Data was entered on MS excel and analyzed using SPSS 23.

Quantitative data was presented as mean ± standard deviation and ranges when their distribution was parametric. Qualitative data was given as numbers and percentages. Normality was detected using Shapiro-Wilk test. Pre and post-operative comparison of readings was done using paired t-test. Follow-up of readings was done by repeated measures ANOVA. BCVA on Snellen chart was converted to logarithm of minimum angle of resolution (logMAR) scale for statistical analysis. P-value was considered significant at <0.05. The confidence interval was set at 95% and the margin of error at 5%.

RESULTS

A total of 43 patients of advanced diabetic retinopathy with active vitreous hemorrhage were included. Single eye was involved in all cases. Right eye was affected in 19 (44.18%) patients whereas left eye was affected in 24 (55.81%) patients. One patient lost to follow-up, hence excluded from the study. Demographic characteristics area shown in Table 1.

Out of 42 cases, re-bleeding occurred in two cases at 3rd and 6th month. On gonioscopy, no new vessels

were found in retina pre-operatively. On postoperative examination, new vessels were developed in 2 patients in first week and in 1 patient at 3rd month after surgery. Pre-operative BCVA was limited to hand movement only. It improved in all patients (Table 2).

IOP was raised in 3 cases (7.1%).Re-bleeding occurred in 2 cases (4.76%) out of 42, in one patient at 3rd month and in another at 6th month. No other complication was observed throughout the study period.

Table 1: *Demographic characteristics of patients (N=42).*

Age (Years)	**Range (Mean ± SD)**	**45-76 (62.3 ± 0.04)**
Gender	Male	31 (73.8%)
	Female	11 (26.19%)
Type of Diabetes	Type I	4 (9.52%)
	Type II	38 (90.47%)
Duration of Diabetes (Years)	**Range (Mean ± SD)**	**10-23 (17.43 ± 0.03)**
Residence	Karachi	37(88.09%)
	Outsiders	5(11.90%)

Table 2: *Pre and Post-operative comparison of affected eyes.*

Ocular Examination	**Pre-operative Findings**	**Post-operative Findings**		
	Before vitrectomy and PRP	**First week**	**3rd month**	**6th month**
BCVA: Mean ± S.D	1.82 ± 0.04	1.32±0.01*	0.842 ± 0.32*	0.613 ± 0.04*
IOP(mmHg) Mean ± S.D	14 ± 1.06	17 ± 1.23*	18 ± 1.04*	18 ± 0.32*
Indirect Ophthalmoscopy	Vitreous hemorrhage	Silicon oil in vitreous cavity, Retina flat, no vitreous hemorrhage	Same findings	Samefindings
Gonioscopy	No new vessels	New vessels in 2 cases	New vessels in 3 cases	Same findings
Ultrasonography	Vitreous hemorrhage	Clear	Clear	Clear
Re-bleeding	Active in all cases	None	Recurred in 1 case	recurred in 1 case
Anatomical outcome	Retina flat	Same finding	Same finding	Same finding
Any other complication	-	-	-	Cataract in 2 cases

BCVA(Best corrected visual acuity); IOP (Intraocular pressure);PRP (Pan retinal photocoagulation) *****P<0.05

DISCUSSION

Silicone oil is frequently used as intraocular tamponade in vitreoretinal surgeries.[11] It confines the spread of proliferative cells and biochemical intermediaries through the vitreous cavity by occupying the space and also shows hemostatic effect.[12,13]

In our study, re-bleeding occurred in two cases of PDR after vitrectomy with silicone oil used as tamponade. Various other studies reported similar results and supported our findings. In a retrospective study patients who underwent PPV with SO for PDR, it was found that anatomical attachment was attained in 17 (74%) out of 23 cases. Whereas, the final anatomical attachment at last visit was achieved in 20 (87%) patients. Results of this study encouraged the use of silicone oil in severely diseased eyes with PDR.[14] Another study of 15 patients of proliferative diabetic retinopathy with Vitreous hemorrhage showed anatomical attachment of retina in 10 cases. Four patients developed re-bleeding after SO removal, one patient developed neovascular glaucoma, 7 patients developed cataract and one patient developed emulsification of silicone oil. This study also supported the use of SO after vitrectomy in cases of vitreous hemorrhage with fewer side effects.[15]

However, Selma etal reported that tamponade was not necessarily needed in vitreous hemorrhage caused by diabetic retinopathy. They argued not to use SO if no tear was found and anatomical success could be achieved without its use.[16]Similarly, according to Divya etal, using SO as tamponade in vitreous haemorrhage with PDR was not beneficial without retinal breaks.[17]Silicone oil tamponade is associated with several side effects such as cataract, keratopathy, anterior chamber oil emulsification, and glaucoma.[18,19]

In our study, IOP was raised in few cases which is reported in literature as well.[20] Various pathologic mechanisms are involved for increase in IOP. Rise in IOP can occur as an early postoperative ocular hypertension or as a late onset glaucoma. Early rise in IOP could be due to exacerbation of pre-existing undetected glaucoma,[21]inflammation triggered by surgery and tamponade,[22,23]steroids given after surgery,[24] the migration of SO into the anterior chamber resulting into pupillary block or enormous penetration of trabecular meshwork.[25]

Limitation of this study is small sample size without comparison with control. Follow up was limited to six months only.

CONCLUSION

Use of silicone oil as tamponade effectively decreases re-bleeding in patients of advanced diabetic retinopathy after vitrectomy. However, few complications such as raised IOP and cataract can occur which can be effectively managed.

Conflict of Interest: Authors declared no conflict of interest.

Ethical Approval: The study was approved by the Institutional review board/Ethical review board **(REC/IPIO/2023/065).**

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Authors' Designation and Contribution

Kaleem Ullah Shaikh; Consultant Ophthalmologist: *Concepts, Design, Literature Search, Data Acquisition, Data Analysis, Manuscript Preparation, Manuscript Editing, Manuscript Review.*

Umar Kazi; Consultant Ophthalmologist: *Concepts, Manuscript Review.*

Nasir Memon; Consultant Ophthalmologist: *Literature Search, Data Analysis, Statistical Analysis, Manuscript Review.*

Ali Zia; Consultant Ophthalmologist: *Literature Search, Manuscript Preparation, Manuscript Review.*

Zunair Aziz; Consultant Ophthalmologist: *Literature Search, Manuscript Preparation, Manuscript Review.*