The Role of Silicone Oil in Management of Postoperative Endophthalmitis.

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Abstract

Purpose: To evaluate the outcomes of vitrectomy with and without silicone oil injection for the treatment of infectious endophthalmitis after cataract surgery when the retina is severely affected.

Methods: This study is aretrospective review of an interventional case series and included 26 eyes of 26 patients who underwent 20-gauge vitrectomy for management of infectious endophthalmitis after cataract surgery. Patients were divided into two groups; group 1 in which vitrectomy was done without silicon oil and group 2 in which vitrectomy was done with silicon oil. All cases were followed for 6 months.

Results: In group 1 the mean logMAR visual acuity significantly improved from 2.71 ± 0.05 to 2.09 ± 0.82 (61.5 % improved, 9.5 % didn't change and 28.5 % worsened). In group 2 the mean logMAR visual acuity significantly improved from 2.70 ± 0.07 to 2.04 ± 0.75 (76.9 % improved, 15.3 % didn't change and 7.6 % worsened). Four cases (19 %) suffered from persistence of infection after vitrectomy and 3 cases (14.2 %) had postoperative retinal detachmentin group 1. These complications were not reported in any case of group 2.

Conclusion: Silicone oil may be an effective adjunctive to vitrectomy in management of postoperative endopthalmitis with sever retinal affection.

Keywords: Endophthalmitis,Silicone Oil.

Introduction

Postoperative endopthalmitis is one of the most devastating complications of cataract surgery. Despite of the great progress in the lines of treatment of this serious condition, the visual results are still poor and about 40% of cases sustain severe visualloss (corrected distance visual acuity of less than 20/200).[1]The incidence of endophthalmitis after cataract surgery varies according to the surgical technique, it has ranged from 0.04% to 0.13%.[2-3]This complication can end by evisceration as a last stage in management.[4]

Endophthalmitis Vitrectomy Study (EVS)results demonstrate that only patients in a subgroup ofinitial light perception-only vision or worse derive abenefit from immediate pars plana vitrectomy (PPV).[5]Immediate complete PPV is the goldstandard of treatment of refractory or fulminate acute postcataract surgery endophthalmitis.Similar to draining anabscess, vitrectomy debrides ocular contents of pus.[6]Vitrectomy is preferred for all patients who present with severe vision loss or rapidly worsening vision, or who are likely to have endophthalmitis caused by virulent bacteria such as streptococci.[7]

Retinal detachment was reported following endopthalmitis either treated by vitrectomy or by non-surgical methods (systemic, periocular, topical, and intravitreal antibiotics). The incidence was higher among patients managed by vitrectomy.[8]

Silicon oil has been used in the treatment strategy of endophthalmitis to prevent and manage retinal detachment following vitrectomy for endophthalmitis. It has been used either during the first vitrectomy in cases with extensive retinal affection or during the second vitrectomy in cases which developed retinal detachment after the first vitrectomy.[9]Control of infection is another reported benefit of silicon oil. Some surgeons have used silicon oil as a tamponade agent in cases with extensive retinal affection. Antibacterial properties of silicone oil had been reported in vitro, which support the idea of using it as a factor to control infection.[10] On the other hand, another study suggested that silicon oil tamponade is notnecessary until occurrence of retinal tear or detachment.[11]

The purpose of this study was to evaluate the outcomes of PPV with and without silicone oil injection for the treatment of infectious endophthalmitis after cataract surgery when the retina is severely affected.

Methods

In this study, we retrospectively reviewed a consecutive series of 26 eyes of 26 patients who underwent 20-gauge PPVfor management of infectious endophthalmitis after cataract surgeryat Sohag University Hospital during the period from October 2011 to March 2015. Patients were considered eligible for this study if vitrectomy was done as a primary line of treatment and sever retinal affectation was detected during surgery in the form of retinal necrosis, breaks and/or inflammatory epiretinal membranes. Cases with visual acuity of no light perception (NLP), retinal detachment and cases without visible retinal affection were excluded from the study.

A complete informed consent was obtained for all patients. Patient medical records were reviewed, and the collected data included preoperative data, surgical details and postoperative follow up data.

Preoperatively, the diagnosis of endopthalmitis was based on clinical picture: pain, loss of vision, lid edema, conjunctival chemosis and injection, corneal edema, anterior chamber flare, hypopyon, and vitreous opacification. B mode ultrasonography was done for all cases. All cases received intravitreal injection of ceftazidime 2 mg/0.1 and vancomycin 1 mg/0.1 immediately at the time of diagnosis and prepared for vitrectomy surgery.

According to the operative data, patients were divided into two groups; group 1 in which vitrectomy was done without silicon oiland group 2 in which vitrectomy was done with silicon oil.

All patients were subjected to three-port 20-gauge pars plana vitrectomy using the Megatron S4 phacoemulsifier and vitrectomy system (Geuder, Heidelberg, Germany). All cases were operated by two surgeons (MF & ME). Patients underwent general anesthesia or local monitored anesthesia care and received retrobulbar anesthesia. The periocular skin was prepared with 10% povidone iodine solution. The conjunctival sac was irrigated by 5% povidone iodine solution, and then irrigated by balanced salt solution (BSS). The eye was prepared and draped in a standard fashion, and a lid speculum was placed. The three 20-gauge cannulas were inserted 3.5 mm from the corneo-scleral limbus. The infusion catheter was connected to the inferotemporal cannula (which was the first to be inserted).

The procedure started by core vitrectomy, then peeling ofdense epiretinal membranes. Next, vitreous base shaving was performed by indentation with the help of the

assistant. Photocoagulation was applied surrounding all retinal breaks and areas of retinal necrosis.At the end of the procedure silicone oil wasinjected into the eye in cases of group 2. The intraocular lens was not removed in any case. Silicon oil removal was performed in group 2 after 2 to 4 months. Cases which developed RD after silicone oil removal were managed by revision vitrectomy, pealing of epiretinal membranes and reinjection of silicone oil.

Cases with follow-up period less than 6 m were excluded from the study. Patients were evaluated 1 day, 5 days, 1 month, 3 months and 6 months after surgery. At each follow-up, the following data were recorded: best-corrected visual acuity, IOP and findings of slit-lamp biomicroscopy of the anterior and posterior segments. Anatomical status and visual outcome were recorded in order to compare the results. The criteria for control of infection were improvement of vision and pain, no recurrence of hypopyon and decrease or absence of cells and flare in the anterior chamber and vitreous. Cases which develop retinal detachment after the first vitrectomy or after silicon oil removal were reported.

The main outcome measures were: the final best corrected visual acuity (BCVA) and anatomical condition of the retina.

Statistical analysis

Data was analyzed using STATA intercooled version 12.1. Quantitative data was represented as mean, standard deviation, median and range. Data was analyzed using student t-test to compare means of two groups and paired t-test compared pre and post results. Qualitative data was presented as number and percentage and compared using either Chi square test or fisher exact test. Graphs were produced by using Excel or STATA program. P value was considered significant if it was less than 0.05.

Results

Baseline and postoperative data obtained for both groups are summarized in table I and II.The mean ± standard deviation (SD) of age was 56.95 ± 15.75 and 53.69 ± 12.33 in group 1 and 2 respectively.

Visual Acuity

Snellen visual acuities were converted to a Logarithm of minimum angle of resolution (LogMAR) score for data analysis. This was performed by taking log10 of the reciprocal of Snellen fraction.Grover et al,estimated a decimal VA of 0.0025 for counting fingers (CF), 0.002 for hand motion (HM), 0.0016 for light perception (LP), and 0.0013 for no light perception (NLP).[12] By converting these values to logMAR score, we considered CF equal to 2.6, HM equal to 2.7, LP equal to 2.8 and No PL equal to 2.9.

The preoperative and postoperative visual acuities in both groups are summarized in table III. In group 1 the meanlogMAR visual acuity significantly improved from 2.71 ± 0.05 to 2.09 ± 0.82 (61.5 % improved, 9.5 % didn't change and 28.5 % worsened). In group 2 the mean logMAR visual acuity significantly improved from 2.70 ± 0.07 to 2.04 ± 0.75 (76.9 % improved, 15.3 % didn't change and 7.6 % worsened).

Complications

Four cases (19 %) suffered from persistence of infection after vitrectomy in group 1. On the other hand, all cases of group 2 showed complete control of infection after vitrectomy and silicon oil injection. Postoperative RD was reported in 3 cases (14.2 %) of group 1, and was not reported in any case of group 2. But, 2 cases of group 2 suffered from RD after silicon oil removal. These results are summarized in table IV.

Table I: Clinical characteristics of group 1 in which endopthalmitis was managed by vitrectomy without silicon oil (21 patients):

ID	Age	Preoperative VA	Postoperative VA (6m)	Postoperative persistent infection	Postoperative RD
1	32	2.7	1.5	No	No
2	71	2.7	2.9	No	Yes
3	54	2.8	2.6	No	No
4	63	2.7	1	No	No
5	67	2.7	2.9	Yes	No
6	58	2.8	1.3	No	No
7	48	2.8	2.9	Yes	No
8	63	2.7	2.6	No	No
9	73	2.7	2.6	No	No
10	68	2.6	0.8	No	No
11	52	2.7	1.3	No	No
12	62	2.7	2.7	Yes	No
13	69	2.7	2.9	No	Yes
14	43	2.8	1	No	No
15	62	2.7	1.5	No	No
16	6	2.7	2.9	No	Yes
17	63	2.7	2.6	No	No
18	52	2.6	0.8	No	No
19	70	2.7	2.9	Yes	No
20	49	2.8	2.7	No	No
21	71	2.7	1.5	No	No

Table II: Clinical characteristics of group 2 in which endopthalmitis was managed by vitrectomy with silicon oil (13 patients):

ID	Age	Preoperative VA	Postoperative VA (6m)	Postoperative persistent infection	Postoperative RD *
1	65	2.6	1	No	No
2	58	2.8	27	No	No
3	61	2.7	2.6	No	No
4	48	2.6	1.8	No	No
5	43	2.7	2.6	No	No
6	50	2.7	1	No	No
7	52	2.7	1.5	No	No
8	68	2.8	2.9	No	No
9	52	2.7	2.7	No	No
10	46	2.8	2.6	No	No
11	67	2.7	1.5	No	No
12	73	2.7	2.7	No	No
13	28	2.6	1	No	No

* Two cases of this group developed RD after silicone oil removal.

Table III: Preoperative and postoperative visual acuity results presented inLogMAR Mean ± SD (range)

	Group 1 (Vitrectomy without silicone oil)	**Group2** (Vitrectomy with silicone oil)	*P*-Value
Preoperative			
Mean ± SD	2.71 ± 0.06	2.70 ± 0.07	0.52
Median (Min-Max)	2.7 (2.6 to 2.8)	2.7(2.6 to 2.8)	
Postoperative (6m)			
Mean ± SD	2.09 ± 0.83	2.05 ± 0.76	0.88
Median (Min-Max)	2.6 (0.8 to 2.9)	2.6 (1 to 2.9)	
P-Value	0.02	0.006	
Status			
Improved	13 (61.90 %)	10 (76.92 %)	0.33
No Change	2 (9.52 %)	2 (15.38 %)	
Worsened	6 (28.57 %)	1 (7.69 %)	

LogMAR: logarithm of the minimum angle of resolution, SD: standard deviation.

Table IV: Post-operative complications in both groups.

	Group 1 (Vitrectomy without silicone oil)	**Group 2** (Vitrectomy with silicone oil)	*P*-Value
Postoperative persistent infection			
No	17 (80.95%)	13 (100%)	0.14
Yes	4 (19.05%)	0	
Postoperative RD			
No	18 (85.71%)	13 (100%) *	0.27
Yes	3 (14.29%)	0	

* Two cases of group 2 developed RD after silicone oil removal.

Discussion

In our study we tried to evaluate if there is a significant benefit from injecting silicon oil after vitrectomy for management of postoperative endophthalmitis.The visual acuity outcomes revealed statistically significant improvement in both groups and the significance was higher in group 2 (P=0.006 compared to P=0.02 in group 1). But, when we compared the postoperative visual acuity between the two groups, we did not get a statistically significant difference (*P*=0.88). These results may give the impression that vitrectomy is an efficient line of treatment for postoperative endopthalmitis regardless the use of silicon oil or not.

But, when we categorized the cases in each group into; improved VA, unchanged VA and worsened VA, we found that the number of cases with worsened VA in group 2 (i.e. with silicon oil) is much less than in group 1 (7.69 % and 28.57 % respectively). So, the use of silicon oil with vitrectomy to manage endopthalmitis may play a role in preventing visual deterioration.

Our results showed that the persistence of infection did not occur in any case when silicon oil is used (i.e group 2), while it affects about 19 % of the cases in group 1. Despite that there was no statistically significant difference (P=0.14), this can be explained by the

small sample size, because endopthalmitis is a rare complication and no large number of cases available. The complete control of infection in group 2 may be attributed to the antimicrobial effect of silicon oil and the limited space of fluid between the silicon bubble and the retina and ciliary body, which will make the infective organisms in more contact with the immune system (antibodies and inflammatory cells). Siqueira et al, reported the same results with complete control of infection in all cases with silicon oil injection.[13]Another study by Do et al, proved also that silicon oil increases the probability of controlling infection in cases with endogenous endopthalmitis.[14]

Another very serious complication after vitrectomy for endophthalmitis is retinal detachment (RD). Silicon oil is widely used as a tamponading agent in management of RD. Our study showed marked difference in the risk of postoperative RD after vitrectomy between the two groups, with no reported cases of RD when silicon oil is used. Nelsen et al, reported RD in 21 % of endophthalmitis cases treated by vitrectomy without silicon.[8] Our results proved that this risk can be markedly decreased if silicon oil is used. But, we reported that RD can occur in these cases after silicon oil removal, which requires carful pealing of epiretinal membranes and reinjection of silicon oil after laser photocoagulation of any breaks.The management of RD at this stage is much easier than during the acute inflammation stage because many authors reported that RD has a very poor prognosis if coexists with endopthalmitis.[15,16]

Limitation of the study

The study is retrospective with small number of cases which does not conclude statistically significant results. Future randomized comparative trials with large number of cases may overcome these limitations.

Conclusion

Silicone oil may be an effective adjunctive to vitrectomy in management of postoperative endopthalmitis with sever retinal affection. It provides better control of infection and effective prevention of early postoperative RD. The final mean visual outcomes may not be affected by the use of silicon oil, but there may be less incidence of worsening of vision.

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