

Timely vitrectomy without intraocular lens removal for acute endophthalmitis after cataract surgery

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Abstract

• **AIM:** To investigate the clinical features, causative organisms and effects of timely vitrectomy and silicone oil tamponade without intraocular lens (IOL) removal in the treatment of acute-onset endophthalmitis after cataract surgery (APCE).

• **METHODS:** We retrospectively analyzed the clinical features and microbiological factors in 10 eyes of 10 patients with APCE at Tianjin Medical University General Hospital from January 2010 to December 2018. Data on the clinical features, causative organisms, visual acuity, intraocular pressure (IOP) and complications were collected. The mean follow-up period was 25.5mo.

• **RESULTS:** The mean age of the patients was 71.4y. The mean time between cataract surgery and the onset of endophthalmitis was 2.0d. Preoperative visual acuity ranged from no light perception to hand motion. After vitrectomy, the visual acuity increased in nine eyes (90%), and was unchanged in one eye (10%). A significant difference was observed between the mean preoperative (36.3±7.1 mm Hg) and postoperative IOP (14.9±4.3 mm Hg, $P<0.05$). *Staphylococcus epidermidis* was isolated in 5 eyes, *S. aureus* in 2 eyes, and *Enterococcus* in 1 eye. Postoperative complications mainly included fibrin exudates in the anterior chamber at the early stages in all eyes and temporary IOP elevation in one eye. No retinal detachment or ocular atrophy was observed during the follow-up period.

• **CONCLUSION:** Under systemic antibiotic treatment and timely diagnosis, vitrectomy and silicone oil tamponade without IOL removal is a safe and effective method for APCE.

• **KEYWORDS:** vitrectomy; silicone oil; endophthalmitis; cataract; intraocular lens

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INTRODUCTION

Although postoperative endophthalmitis is rare with an incidence of 0.02%-0.33%^[1], it is one of the most serious complications after cataract surgery^[2]. If this condition is not treated in a timely manner, it may result in visual loss and even ocular atrophy. The incidence of endophthalmitis following phacoemulsification and intraocular lens (IOL) implantation is estimated to be between 0.012% and 1.3% since 2000^[3], and acute-onset post-cataract endophthalmitis (APCE) occurred in 0.04% cataract surgeries performed in the United States between 2013 and 2017^[4]. Risk factors include anterior vitrectomy, cataract surgery combined with other ophthalmic surgery, younger age, intraoperative posterior capsule rupture, non-use of antibiotics, and non-use of behind-the-lens washout^[5-6].

Previous treatment methods included vitrectomy, IOL removal, and local and systemic use of antibiotics^[1,7]; however, IOL removal decreases uncorrected visual acuity, leaving patients dissatisfied with the outcome, and likely leading to postoperative medical dissension. In most reports on the treatment of post-cataract endophthalmitis, the visual acuity of only half of the cases reached 20/40^[8-9]. To date, there are few reports on the effect of vitrectomy on postoperative pseudophakic endophthalmitis without IOL removal. Therefore, the clinical features, causative organisms, and effects of vitrectomy and silicone oil tamponade without IOL removal in the treatment of APCE are reported here using a small case series.

Table 1 Demographics and outcomes of vitrectomy for APCE in 10 patients

Case No.	Sex	Age (y)	Onset of APCE (d)	VA		IOP (mm Hg)		Complications	Silicone oil		Microorganisms cultures	Follow-up (mo)
				Preop.	Postop.	Preop.	Postop.		Intraop.	Postop.		
1	Male	74	3	LP	20/40	56	17	Exudates in AC	Filling	Removal	<i>Staphylococcus aureus</i>	20
2	Male	67	1	HM	20/25	35	20	Exudates in AC, temporary IOP elevation	Filling	Removal	<i>Staphylococcus epidermidis</i>	26
3	Female	84	3	NLP	NLP	35	10		Exudates in AC	Filling	Unremoval	<i>Enterococcus</i>
4	Male	72	1	LP	20/250	35	18	Exudates in AC	Filling	Removal	<i>Staphylococcus epidermidis</i>	20
5	Male	68	2	LP	20/60	36	19	Exudates in AC	Filling	Removal	Negative	30
6	Female	69	2	LP	20/100	35	18	Exudates in AC	Filling	Removal	<i>Staphylococcus epidermidis</i>	53
7	Male	70	2	HM	20/200	35	17	Exudates in AC	Filling	Removal	<i>Staphylococcus epidermidis</i>	19
8	Male	63	3	LP	20/60	32	9	Exudates in AC	Filling	Removal	Negative	27
9	Male	71	2	LP	20/50	33	10	Exudates in AC	Filling	Removal	<i>Staphylococcus aureus</i>	24
10	Female	76	3	LP	20/100	31	11	Exudates in AC	Filling	Removal	<i>Staphylococcus epidermidis</i>	20

APCE: Acute-onset endophthalmitis after cataract surgery; VA: Visual acuity; IOP: Intraocular pressure; AC: Anterior chamber; LP: Light perception; HM: Hand moving; NLP: No light perception.

SUBJECTS AND METHODS

Ethical Approval The examination and treatment of the patients were approved by the Ethics Committee of the Tianjin Medical University General Hospital and informed consent forms were obtained from all patients.

Patients This study involved a series of clinical characteristics and microbial factors in 10 eyes of 10 patients treated for APCE between January 2010 and December 2018 at Tianjin Medical University General Hospital. Post-cataract endophthalmitis is classified as APCE if it occurs within six weeks postoperatively, and chronic if it occurs after this period^[3]. The diagnosis of APCE was the appearance of ocular pain, sudden vision decrease, conjunctival congestion and edema, corneal edema, hypopyon, and vitreous opacification after cataract surgery, regardless of whether the culture of intraocular fluid was ultimately positive^[10-11]. Cases in which cataract surgery was combined with other eye surgeries were excluded. The posterior capsule had minor rupture during cataract surgery in 2 eyes, and was intact in 8 eyes. All patients received systemic antibiotics and vitrectomy combined with silicone oil tamponade, and the IOL was maintained in each eye.

The treatment indications for vitrectomy without IOL removal on APCE are as follows: 1) No abnormal changes in the implanted IOL, such as dissolution, reduced transparency, and deformation; 2) Patients with better corrected vision (>20/40) after cataract surgery before the occurrence of endophthalmitis; 3) Absence of zonular dialysis or severe rupture of the posterior capsule (>1/4 quadrant) during cataract surgery; 4) Patients without severe systemic diseases.

Surgical Procedures All surgeries were performed under retrobulbar anesthesia (2.0% lidocaine) by the same surgeon (Yan H). An initial undiluted anterior chamber specimen was

obtained for organism culture before irrigation/aspiration. The capsular bag was separated from the IOL with the use of viscoelastics. Then the anterior chamber and capsular bag were irrigated/aspirated completely and repeatedly. An initial undiluted vitreous specimen was also obtained for microbiological culture before vitrectomy. The posterior vitreous detachment from the optic disc was performed and infected vitreous was completely removed during vitrectomy. After vitrectomy, the anterior chamber and capsular bag were reirrigated/aspirated again if the anterior segment was not clear. Finally, the silicone oil was filled.

Postoperative Management and Follow-up Routine topical cycloplegics (1.0% atropine sulfate) and topical corticosteroids (1.0% tobramycin dexamethasone) were administered 3 times per day for 7.0d after surgery. Systemic corticosteroids were administered orally with prednisolone at 30 mg once a day for 7.0d. Intravenous infusion of ofloxacin 100 mg twice a day for 7.0d and ofloxacin eye drops 3 times per day were then administered for 2.0wk. The routine follow-up was performed 1, 3, 5d, 1, 2, 4, 12wk, 6 and 12mo postoperatively.

Statistical Analysis The Wilcoxon signed-rank test was used to assess the change in pre- and post-surgical IOP.

RESULTS

Demographics The mean age of all patients was 71.4y (range, 63-84y; Table 1). Five patients had a history of diabetic mellitus. All patients had symptoms of acute ocular pain and a sudden decrease of vision after cataract surgery. All patients had hypopyon, edema cornea, hyperemic and edema conjunctiva. The mean time between cataract surgery and the onset of endophthalmitis was 2d with a range from 1 to 3d. The mean follow-up period was 25.5mo with a range from 16 to 53mo.

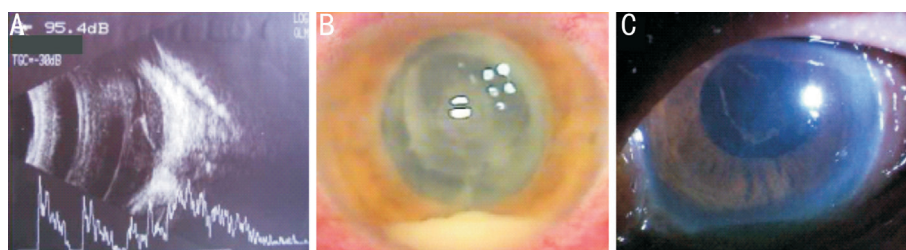


Figure 1 A case of acute-onset endophthalmitis after cataract surgery A: The dense vitreous opacity observed by ocular B-scan pre-vitrectomy; B: Hypopyon was observed pre-vitrectomy; C: Hypopyon completely disappeared 7d after vitrectomy.

Causative Organisms The microorganisms of the aqueous humor and vitreous were *Staphylococcus epidermidis* in 5 eyes (50%), *Staphylococcus aureus* in 2 eyes (20%), and *Enterococcus* in 1 eye (10%). Two eyes had negative cultures.

Visual Acuity The pre-vitrectomy uncorrected visual acuity ranged from no light perception to hand motion and post-vitrectomy from no light perception to 20/25 at the last follow-up (Table 1). After vitrectomy, the visual acuity increased in 9 eyes (90%), and unchanged in 1 eye (10%).

Intraocular Pressure The mean pre-vitrectomy IOP was 36.3 mm Hg, with a range from 31 to 56 mm Hg. The mean post-vitrectomy IOP was 14.9 mm Hg with a range from 9.0 to 20 mm Hg ($P < 0.05$).

Other Postoperative Outcomes and Complications After vitrectomy, the symptoms of ocular pain progressively disappeared in all eyes. Corneal transparency was recovered, and hypopyon was not visible. The IOL was transparent in all eyes. Retinas remained completely attached in all eyes (10/10, 100%) after vitrectomy. Silicone oil was removed in 9 eyes within 3.0-6.0mo postoperatively, and the retina remained attached in 9 eyes. The silicone oil was not removed in 1 eye that had no light perception because of serious retinal and vessel impairment. Figure 1 shows a case of APCE and final treatment result.

DISCUSSION

APCE is a serious complication^[12-13]. It is different from anterior segment toxic reaction syndrome (TASS) in clinical and laboratory examinations^[13-14]. If patients are not treated in a timely manner, the prognosis is poor^[12-13]. Post-vitrectomy retinal detachment and management of IOL are still controversial in the treatment of APCE^[15-16]. Vitrectomy for endophthalmitis has several advantages for patients, such as removing the infected organism, toxins and the infected vitreous that can cause subsequent retinal detachment^[17]. Previous studies have shown that vitrectomy with silicone oil tamponade is preferable for post-surgery endophthalmitis^[18-21]. Complete and early clearance of purulence and toxins is the most critical procedure for endophthalmitis, which will promptly halt and reverse potentially devastating damage to the eyes. Complete and early vitrectomy was the initial treatment of choice and recommended by recent studies compared with

the tap-and-inject process in the Endophthalmitis Vitrectomy Study (EVS), with 79% of eyes achieving $\geq 20/40$ visual acuity in a recent study compared to 53% in the EVS, especially for those whose initial visual acuity was light perception only^[18-21]. Various factors have been described that influence the prognosis of APCE, such as microorganism virulence and treatment^[22-23]. In our study, the APCE was diagnosed within 2.0d after cataract surgery and was immediately treated by vitrectomy. The higher culture-positive rate was obtained included *S. epidermidis* in 5 eyes, *Staphylococcus aureus* in 2 eyes (20%), and *Enterococcus* in 1 eye. The visual acuity increased in 9 eyes (90%) postoperatively, and one-half of the patients had a final vision of 20/60 or better. No retinal detachment or ocular atrophy was observed during the follow-up period. These results indicate that vitrectomy combined with silicone oil tamponade without IOL removal is effective and timely for APCE in our case series.

Previous methods of treating APCE include vitrectomy combined with IOL removal and irrigation/aspiration of the anterior chamber^[7]. The purpose of these manipulations was to remove the bacteria easily and completely from the anterior chamber and capsular bag. Hayashi *et al*^[24] reported that in some cases with delayed-onset post-cataract endophthalmitis, and IOL removal was required to eliminate the bacteria that adhered to the tip of the IOL haptic. Dave *et al*^[25] concluded that IOL explantation could be necessary in the management of delayed-onset post-cataract endophthalmitis, while explantation of IOL is not a standard recommendation in the management of APCE. In our study, complete irrigation/aspiration of the anterior chamber and capsular bag was conducted intraoperatively, and there was no remaining inflammation in the anterior segment at the final follow-up. Therefore, we got the same effects though the IOL was not removed.

In addition, treating APCE with IOL removal may have some shortcomings, including a decrease of uncorrected visual acuity, retinal detachment and requirement of a secondary IOL implantation^[22]. In the present study, vitrectomy without IOL removal can also successfully eradicate the endophthalmitis, increase uncorrected visual acuity with a low rate of postoperative complications and reoperation, and reduce unnecessary medical dissension.

However, IOL removal or not in the treatment of APCE is still controversial, and we suggest that this management should be considered according to the different situations of different cases.

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