

Intraocular lens implantation and vitrectomy using 0.025% povidone-iodine in irrigation solution for bleb-related endophthalmitis

Yorihisa Kitagawa¹, Hiroyuki Shimada¹, Hiroyuki Nakashizuka¹, Takayuki Hattori¹, Yoshio Yamazaki²

¹Department of Ophthalmology, School of Medicine, Nihon University, Chiyodaku, Tokyo 101-8309, Japan

²Department of Ophthalmology, Tokai University Tokyo Hospital, Shibuyaku, Tokyo 151-0053, Japan

Correspondence to: Hiroyuki Shimada. Department of Ophthalmology, Nihon University Hospital, 1-6 Surugadai, Kanda, Chiyodaku, Tokyo 101-8309, Japan. sshimada@olive.ocn.ne.jp

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Dear Editor,

We report the results of using Balanced Salt Solution (BSS) Plus containing 0.025% povidone-iodine, a microbicidal and safe solution^[1-2], in combined intraocular lens (IOL) implantation and vitrectomy in two cases of bleb-related endophthalmitis. In both cases, hypopyon and a purulent bleb were observed, but fundus could not be observed due to anterior chamber fibrin. Both cases were diagnosed as stage III bleb-related endophthalmitis and emergency surgery was conducted.

In glaucoma, filtering surgery is widely performed. However, bleb-related infection develops after filtering surgery with adjunctive mitomycin C at a mean of 6.9±5.8y after surgery, and the 5-year incidence was 2.2%±0.5%, which is higher than that of infection after cataract surgery^[3]. Bleb-related infection is classified into 3 stages: stage I is blebitis; stage II is anterior chamber endophthalmitis; stage IIIa is mild vitreous endophthalmitis; and stage IIIb is advanced vitreous endophthalmitis^[4]. For treatment, repeat intravitreal injections of antibiotics for stage IIIa and immediate vitreous surgery for stage IIIb are recommended. When bleb-related endophthalmitis of stage IIIa occurs in a phakic eye, the eye

becomes non-mydratic due to fibrin deposition in the pupil region. Since intravitreal antibiotics injection and follow-up are difficult in the non-mydratic eye, one treatment option is to perform simultaneous cataract surgery and vitrectomy for stage III bleb-related endophthalmitis. When bleb-related endophthalmitis occurs in a phakic eye, some ophthalmologists perform lensectomy^[5]. The rationale is to remove bacteria and biofilm attached to the lens^[6], aiming to prevent recurrence of endophthalmitis. If secondary IOL insertion is not performed, the quality of vision (QOV) will be markedly reduced. If an IOL is inserted at the time of simultaneous vitrectomy and cataract surgery, it is possible to avoid a drop in QOV.

Vancomycin and ceftazidime are used as first-line treatment for endophthalmitis because they have low resistance potential and are effective against 99% of bacteria encountered clinically. However, intraocular vancomycin has been reported to be associated with hemorrhagic occlusive retinal vasculitis, with 22% risk of no light perception^[7]. We need to consider alternatives to vancomycin. Povidone-iodine has a wider spectrum of antimicrobial activity than antibiotics, and anti-biofilm activity is also recognized^[8]. We reported that 0.025% povidone-iodine in BSS Plus used as irrigation solution in vitrectomy was markedly bactericidal after 15s of exposure, and that vitrectomy using the above irrigation solution followed by postoperative antibiotics resolved endophthalmitis in 3 eyes with endogenous endophthalmitis and 9 eyes with postoperative endophthalmitis (3 eyes after cataract surgery, 4 eyes after vitrectomy, and 2 eyes after intravitreal injection)^[1-2]. The present report describes the results of performing IOL implantation simultaneously with vitrectomy and BSS Plus containing povidone-iodine in two cases of bleb-related endophthalmitis. We obtained approval of the Ethical Committee of Surugadai Hospital of Nihon University, the written informed consent from patients, and this study is in accordance with the tenets of the Declaration of Helsinki.

Case 1 A 71 year-old male presented with bleb-related endophthalmitis. The patient was diagnosed with bilateral open angle glaucoma in 1996. He was prescribed eye drop treatment, but intraocular pressure increased and visual disturbance in

the right eye occurred. Filtering surgery was performed using mitomycin C in 2006. However, glaucomatous optic atrophy progressed and visual acuity became 20/600. On March 3, 2018, right ocular pain and vision loss appeared, and stage IIIa or IIIb bleb-related endophthalmitis was diagnosed in another hospital. He was prescribed topical antibiotics every 1h. He visited our hospital on March 5. Visual acuity was hand movement; intraocular pressure was 13 mm Hg; and corneal endothelial cell density was not measurable. Hypopyon and a purulent bleb were observed, but there was no bleb leakage (Figure 1A). In the anterior chamber, fibrin caused mydriatic defect, and the fundus was unclear. We performed emergency simultaneous phacoemulsification and vitrectomy. Just before the start of surgery, a 0.025% povidone-iodine in BSS Plus was freshly prepared by adding 1.25 mL of 10% povidone-iodine to 500 mL of BSS Plus, and this solution was used as irrigation solution during surgery. Initially, while stopping the irrigation solution, anterior chamber fluid and vitreous humor samples were collected, then an iris retractor was placed and fibrin in the pupil area was removed. Next, with irrigation solution flowing, we conducted phacoemulsification through a superior corneal incision, and performed vitrectomy with a 25-gauge vitrectomy system. Intraoperative examination revealed vitreous turbidity, blot hemorrhage, and scattered retinal vasculitis in the posterior fundus. Stage IIIb bleb-related endophthalmitis was diagnosed. After the turbid vitreous body was excised, an IOL was inserted because improvement in visual acuity was expected. The posterior lens capsule was resected to 4 mm diameter. The infected bleb was excised and the filtering bleb was reconstructed. After closing the three scleral wounds with absorbable sutures, 1 mg/0.1 mL of vancomycin and 2 mg/0.1 mL of ceftazidime were injected intravitreally. Post-surgical management included intravenous infusion of imipenem hydrate/cilastatin sodium 0.5 g 4 times daily for 5d. No bacteria were detected from the anterior chamber fluid and vitreous humor samples. At 3mo after surgery, visual acuity was 20/300; intraocular pressure was 8 mm Hg; and corneal endothelial cell density was 1300 cells/mm². The visual improvement was presumably attributed to cure of endophthalmitis and cataract surgery. There was no anterior chamber inflammation or conjunctival hyperemia (Figure 1B, 1C). A healthy filtering bleb was observed. In fundus examination, glaucomatous optic atrophy and several retinal hemorrhages were observed (Figure 2A-2C). Fluorescein angiography showed fluorescence leakage from the foveal capillary network. On optical coherence tomography, the outer retinal layer was preserved, but the inner retinal layer was thinned. No recurrence and no adverse events were observed during follow-up of 7mo.

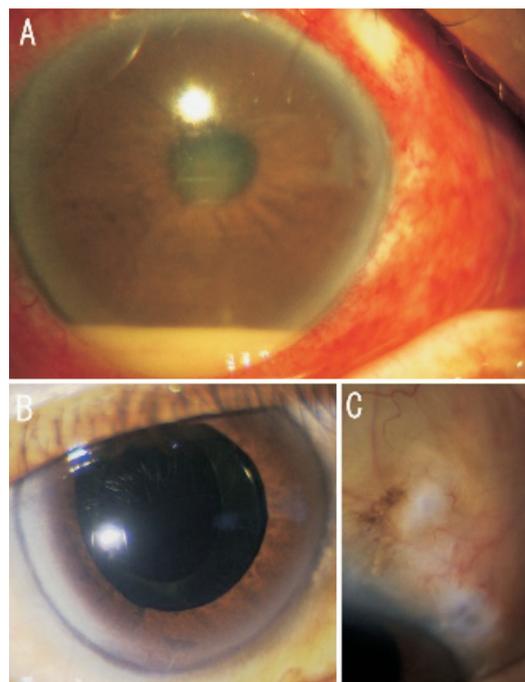


Figure 1 Anterior segmental findings before and after surgery: case 1 A: Hypopyon and a purulent bleb were observed, but there was no bleb leakage. Fibrin caused mydriatic defect. B: Three months after surgery, there was no anterior chamber inflammation or conjunctival hyperemia; C: Healthy filtering bleb was observed.

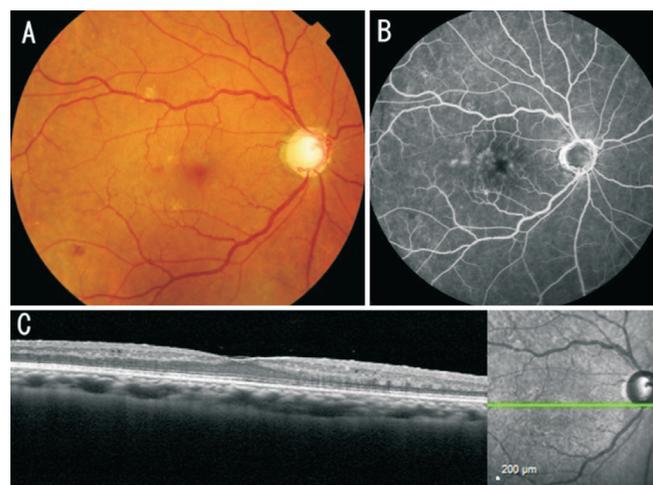


Figure 2 Fundus findings at 3mo after surgery: case 1 A: In fundus examination, glaucomatous optic atrophy and several retinal hemorrhages were observed; B: Fluorescein angiography showed fluorescence leakage from the foveal capillary network; C: Optical coherence tomography showed that the outer retinal layer was preserved, but the inner retinal layer was thinned.

Case 2 A 65 year-old female presented with bleb-related endophthalmitis. She was diagnosed with bilateral open angle glaucoma in 2007. Despite eye drop treatment, intraocular pressure increased and visual disturbance in the right eye occurred. Filtering surgery was performed using mitomycin C in 2017. However, glaucomatous optic atrophy progressed and visual acuity became 20/600. On July 9, 2018, right eye pain

and vision loss appeared, and stage IIIa or IIIb bleb-related endophthalmitis was diagnosed in another hospital. She visited our hospital on July 9. Visual acuity was finger counting; intraocular pressure was 20 mm Hg; and corneal endothelial cell density was 1700 cells/mm². Hypopyon and bleb leakage from the thin purulent bleb were observed (Figure 3A, 3B). In the anterior chamber, fibrin caused mydriatic defect, and the fundus was unclear. We performed emergency simultaneous phacoemulsification and vitrectomy by the procedures described in case 1. Intraoperative examination revealed mild vitreous inflammation together with vasculitis and retinal hemorrhage in the peripheral area. Stage IIIa bleb-related endophthalmitis was diagnosed. After the turbid vitreous body was excised, an IOL was inserted because improvement in visual acuity was expected. The infected bleb was excised and the filtering bleb was reconstructed. Wound closure and postoperative management were as described in Case 1. *Streptococcus pneumoniae* was detected from the anterior chamber fluid sample. At 3mo after surgery, visual acuity was 20/600; intraocular pressure was 14 mm Hg; and corneal endothelial cell density was 1407 cells/mm². There was no anterior chamber inflammation or conjunctival hyperemia, and a healthy filtering bleb was observed (Figure 3C). In fundus examination, glaucomatous optic atrophy was observed (Figure 3D). On optical coherence tomography, the outer retinal layer was preserved, but the inner retinal layer was thinned. No recurrence and adverse events were found during follow-up of 3mo.

The visual outcome of bleb-associated endophthalmitis is poor compared with endophthalmitis after cataract surgery^[9-11]. A possible reason is that visual acuity had already declined due to glaucoma before endophthalmitis developed. In our two cases, glaucomatous optic atrophy was present, so that there was little improvement in visual acuity even with IOL insertion. However, we consider that inserting an IOL could maintain and improve QOV. Our search of literature found no article reporting treatment of bleb-related endophthalmitis in phakic eyes by IOL implantation and vitrectomy.

Povidone-iodine is known to have wide-spectrum microbicidal activities against not only antibiotic susceptible bacteria but also multidrug-resistant bacteria^[12], *Candida* species^[13], viruses and *Acanthamoeba*^[14]. Its anti-biofilm activity is especially useful for intraocular infections in which biofilm formation has been documented^[6]. Furthermore, we have demonstrated that 0.025% povidone-iodine in BSS Plus used as irrigation solution in vitrectomy exhibits rapid bactericidal action^[1-2]. For use in vitrectomy, we recommend to prepare a 0.025% povidone-iodine just before starting vitrectomy, because the solution decolorizes from 15min after preparation and is accompanied by reduced bactericidal effect^[1-2]. We use BSS

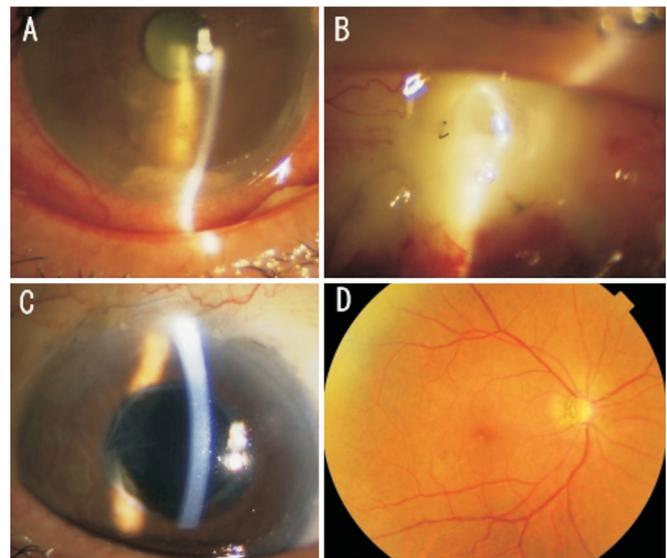


Figure 3 Anterior segmental findings before and after surgery: case 2 A: At presentation, hypopyon and fibrin caused mydriatic defect; B: At presentation, there was bleb leakage from a thin purulent bleb; C: Three months after surgery, there was no anterior chamber inflammation or conjunctival hyperemia. Healthy filtering bleb was observed. D: Three months after surgery, glaucomatous optic atrophy was observed in the fundus.

Plus as the irrigation solution because oxigluthathione, which is one of the ingredients, has beneficial effects of protecting the integrity and barrier function of corneal endothelial cells^[1-2]. The antimicrobial and anti-biofilm activities together with corneal protective effect of BSS Plus containing 0.025% povidone-iodine used as irrigation solution in our cases probably contributed to the treatment success.

Two cases of bleb-related endophthalmitis in phakic eyes were successfully treated by combined IOL implantation and vitrectomy using 0.025% povidone-iodine irrigation fluid that has wide spectrum antimicrobial and anti-biofilm activities. No ocular adverse events and no recurrence of endophthalmitis were observed in both cases. Implantation of IOL in eyes treated for bleb-related endophthalmitis may be useful from the viewpoint of maintaining QOV. It is necessary to investigate a large number of cases to examine whether or not recurrence of endophthalmitis can be prevented by this method.

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