Almost all cataract surgical procedures rely on phacoemulsification, which requires favorable lens visibility. Visibility can be negatively affected by various ocular pathologies including dense vitreous hemorrhage. When the microscope light source reflects off the ocular fundus, the lens is transilluminated. In the presence of dense vitreous hemorrhage, light cannot adequately reach the fundus, and no red reflex is created. In these patients, vitrectomy and cataract surgery may be performed simultaneously (phacovitrectomy) but cataract surgery complications, such as nucleus drop or corneal damage, may lead to problems during vitrectomy.

Several surgical techniques have been used to alleviate the problem of poor lens visibility.1,2 Jang et al1 fixed a chandelier illuminator on the sclera, turned off the microscope light source, and visualized the lens by illuminating the vitreous cavity. Furino et al2 improved anterior lens capsule visibility by staining it with triamcinolone acetonide. Although both techniques were effective, both had limitations. Vitreous chamber illumination reduces the visibility of the cornea and iris because of the need to turn off the microscope light. Staining the anterior lens capsule with triamcinolone acetonide allows for better anterior chamber visualization but the lenticular nucleus and cortex remain difficult to see.

Here, we present a novel surgical technique, to our knowledge, in which triamcinolone acetonide is injected into the vitreous cavity before vitrectomy. In the absence of a red reflex, cataract surgery is performed using the white reflex created by the light from the microscope reflecting off triamcinolone acetonide crystals in the vitreous. This allows the cornea, anterior chamber, iris, lens nucleus, lens cortex, and posterior chamber to be easily viewed, potentially improving the safety of cataract surgery in these patients.

This surgical technique was reviewed and approved by the Fujita Health University institutional review board. This study adhered to the Declaration of Helsinki tenets, and all patients provided written informed consent. A total of 23 patients with poor lens visibility due to dense vitreous hemorrhage were included. All patients required vitrectomy and cataract surgery independent of the study. No exclusion criteria were applied.

Surgical Technique

Retrobulbar anesthesia was administered.3 Following observation of the lens and confirmation that no red reflex from the ocular fundus was present (Figure, A), a port in the sclera was created (25-gauge trocar) for the vitrectomy, and the vitreous body was resected, without infusion, over a few seconds. C, The conventional triamcinolone solution (2-4 mg in 0.1-0.2 mL) was injected into the scleral port. D, A continuous curvilinear capsulorhexis was performed under good lens visibility. E, Phacoemulsification of the lens was performed safely under good visibility of lens structures.

Figure. Images of the Surgical Procedure

A, Poor lens visibility due to vitreous hemorrhage. B, A scleral port was created using a 25-gauge trocar. The vitreous body was then resected, without infusion, over a few seconds. C, The conventional triamcinolone solution (2-4 mg in 0.1-0.2 mL) was injected into the scleral port. D, A continuous curvilinear capsulorhexis was performed under good lens visibility. E, Phacoemulsification of the lens was performed safely under good visibility of lens structures.
sected over a few seconds using a vitreous cutter, without infusing the vitreous cavity (Figure, B). A one-time dose of triamcinolone acetonide (2-4 mg in 0.1-0.2 mL) was injected through the scleral port (Figure, C), which turned the posterior surface of the lens white. Additionally, triamcinolone acetonide crystals reflected the light from the microscope, resulting in illumination of the vitreous chamber and an improved view of the lens and anterior chamber.

A corneal incision was then made, and a viscoelastic material (OPELEAD; Senju Pharmaceutical Co Ltd) was injected into the anterior chamber. Given the good visibility of the lens, a continuous curvilinear capsulorhexus was easily made (Figure, D). Once visibility was sufficient, phacoemulsification and cortical aspiration were simultaneously and safely performed (Figure, E). After completion of cataract removal, vitrectomy and other necessary procedures (eg, membrane peeling) were performed. All visible crystals were removed from the vitreous cavity during vitrectomy, leaving negligible amounts of triamcinolone acetonide in the eye after surgery.

Outcomes
Lens visibility allowed cataract surgery to be performed; no complication occurred. The triamcinolone acetonide injected into the vitreous body did not impede vitrectomy and, to our knowledge, all triamcinolone acetonide crystals were removed during vitrectomy. No marked increases in intraocular pressure (IOP) or serious reductions in corneal endothelial cell counts were observed in any eye.

The IOP dropped by 1.25±4.3 mm Hg postoperatively 1 month after surgery (P = .20; paired t test). In early postoperative days, transient IOP increases by more than 10 mm Hg that required medication were observed in 7 eyes but IOP was normal without medication 1 month after surgery and no patient started treatment for glaucoma. The mean (SD) loss of corneal endothelial cell counts was 214 (224) and percentage cell loss was 8.0% (9.3%) 1 month later.

In the 23 patients, visibility of the anterior lens capsule, lens nucleus, lens cortex, and posterior lens capsule was good, and no serious complications occurred.

Comparison With Other Methods
As stated previously, techniques for cataract surgery in patients with dense vitreous hemorrhage have included the use of chandelier illumination and triamcinolone acetonide staining of the anterior chamber. The disadvantages of these techniques include difficulty in visualizing the cornea and iris with a chandelier and limited lens nucleus and cortex visibility with anterior chamber staining.

In addition to having potential visibility advantages over other techniques, our method has potential cost and preparation advantages. Chandelier lighting is expensive, although it is not required in eyes that have only vitreous hemorrhage. Additionally, triamcinolone acetonide injected into the anterior chamber requires micronization, which can be a troublesome process. With our surgical method, the conventional triamcinolone acetonide preparation for vitrectomy, which is generally available in many facilities, can be used. Our technique also potentially simplifies the surgical preparation and reduces cost because it does not require the use of specialized instruments or solution preparations.

The limitation of this comparison is that we have not performed randomized comparison and formal cost analysis among these 3 techniques. This aspect will require further studies.

Technique Limitations
Our technique does not allow adjustment of IOP once the triamcinolone acetonide has been injected. A large-volume injection results in an increased vitreous cavity pressure, which makes cataract surgery more difficult to perform; small injection volume results in an insufficient white reflex, which reduces lens visibility. The balance between normal IOP and sufficient visibility can be attained by removing vitreous from the scleral port when IOP is too high and adding triamcinolone acetonide through the port when visibility is too low. Based on our experiences from the 23 cases reported here, this technique can be used to overcome these problems.

Summary
Here, we report a technique for performing phacoemulsification during phacovitrectomy in patients with dense vitreous hemorrhage that obscures lens visibility. By injecting triamcinolone acetonide into the vitreous cavity, the lens can be transilluminated by the microscope light source, similar to conventional cataract surgery. Our results suggest that this technique may improve lens visibility, thereby increasing the chances of a safe surgical outcome.

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ARTICLE INFORMATION
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