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Treatment for Intracorneal Hematoma by Anterior Chamber Gas Tamponade Combined With Keratocentesis

Hiroshi Toshida, M.D., Ph.D., Yusuke Hayashi, M.D., and Kohei Ichikawa, M.D.

Purpose: To report a new surgical method for intracorneal hematoma removal using combination of keratocentesis and gas tamponade in the anterior chamber.

Methods: We reviewed the clinical course and outcomes of surgical intervention.

Results: An 82-year-old woman visited our department because of a sudden decline in visual acuity (20/800 on the Snellen chart) in her left eye. We observed neovascularization from the superior corneal limbus and a hematoma near the Descemet membrane, deep in the stroma of the corneal center. Filtered air was injected into the anterior chamber, keratocentesis was performed at four locations from the corneal epithelium through the stroma, and the hematoma was removed from the puncture sites. The corneal hematoma disappeared, and the best-corrected visual acuity reached 20/20 at postoperative month 4.

Discussion: Combination of keratocentesis and gas tamponade in the anterior chamber is a simple and effective method for removing intracorneal hematomas.

Key Words: Intracorneal hematoma—Keratocentesis—Gas tamponade—Anterior segment optical coherence tomography.

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Intracorneal hematoma, in which red blood cells are encapsulated within the corneal stroma, is an uncommon condition that occurs in association with corneal vascularization. The main causes of intracorneal hematoma are associated with intraocular surgeries, such as canaloplasty, trabeculectomy, and cataract surgeries,[1–5] although these are rare cases. Other causes include ocular trauma, inflammatory corneal diseases with stromal vascularization,[6–8] and spontaneous or intracorneal hematoma.[9,10] A wide range of treatment options for intracorneal hematoma are available, including conservative natural absorption,[2,10] pharmacotherapy with treatments such as antibiotic drugs,[8] and tissue plasminogen activator.[3] In addition, the surgical procedures are as follows: paracentesis,[5,9] intentional break of the Descemet membrane,[1,4] and gas injection into the anterior chamber.[1,3] Herein, we report a case in which gas tamponade in the anterior chamber combined with keratocentesis was effective during intracorneal hematoma removal.

CASE REPORT

This study was approved by the Institutional Review Board of the Juntendo University Shizuoka Hospital (No. 824), and all procedures performed in this study were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration. The authors certify that they obtained an appropriate written consent form.

An 82-year-old woman visited our hospital with sudden decline in visual acuity in her left eye. Her medical history included hypertension and cataract surgery in her left eye. The patient's family history was unremarkable. In the initial medical assessment, corrected visual acuity was 20/200 in the right eye and 20/800 in the left eye. Initial ocular findings included a mature cataract in the right eye and an implanted intraocular lens after cataract surgery in the left eye. We observed neovascularization in the deep corneal layer from the upper corneal limbus, and a circular intracorneal hematoma in the central part of the deep corneal stroma (Fig. 1A,B). The hematoma also lay in the pupil area. Anterior segment optical coherence tomography (OCT) (CASIA 2, Tomey Corporation, Aichi, Japan) revealed a hematoma under the Descemet membrane in the central part of the cornea, with a disk-shaped high-intensity area in the center (Fig. 1D). The density of corneal endothelial cells was 2,506 cells per square millimeter in the right eye and was unmeasurable in the left eye. Although the examination for posterior pole was disturbed by intracorneal hematoma, peripheral retina seemed to be normal under mydriasis. No significant changes were observed in the electroretinograms obtained during mydriasis. Because the intracorneal hematoma affected the pupil area and caused vision loss, removal was planned. Three days after the first visit, corneal neovascular ablation with an anterior chamber gas tamponade combined with keratocentesis was performed. Topical or oral medication was not initiated before surgery. The steps of the surgical procedure were as follows: (1) vascular ablation of the upper corneal limbus was performed (Fig. 2A); (2) filtered room air was injected into the anterior chamber with a 32-G needle to increase and maintain the intraocular

From the Department of Ophthalmology, Juntendo University Shizuoka Hospital, Shizuoka, Japan.

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Address correspondence to Hiroshi Toshida, MD, PhD, Department of Ophthalmology, Juntendo University Shizuoka Hospital, Izunokuni, Shizuoka, 410-2295, Japan; e-mail: toshida@juntendo.ac.jp

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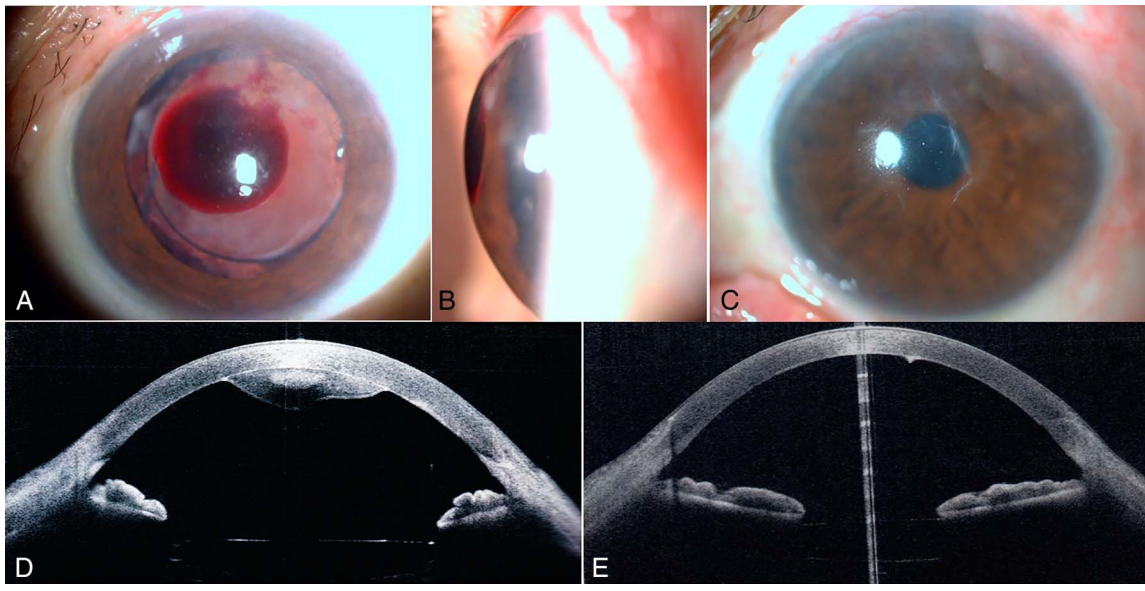

FIG. 1. Ocular finding of the intracorneal hematoma under the Descemet membrane. (A) Intracorneal hematoma covering the pupillary area on the first visit to our hospital. (B) Ocular image of the same eye taken from the temporal side. (C) At 4 months after the surgery, the pupillary area became transparent, although few corneal stroma opacites remained between the layers. (D) Anterior segment OCT showing intracorneal hematoma under the Descemet membrane at the first visit. (E) Image of the anterior segment OCT 4 months after the surgery. No intracorneal hematoma was observed 4 months after the treatment. OCT, optical coherence tomography.

pressure for the removal of the intracorneal blood, referring to the procedure in Descemet membrane endothelial keratoplasty (DSAEK) when accumulated fluid between the donor and host was removed (Fig. 2B); (3) four keratocentesis was performed with a 24-G V lance needle from the corneal epithelium to the stroma (Fig. 2C); (4) the hematoma was displaced between the layers and removed through the puncture sites by scraping the cornea with a spatula (Fig. 2D), and a balanced saline solution was injected into the anterior chamber to replace filtered air; and (5) a soft contact lens (SCL) (Air Optix Ex Aqua, Alcon Co Ltd, Geneva, Switzerland) was worn for bandage purpose after conjunctival injection of dexamethasone (see **Video 1**, **Supplemental**

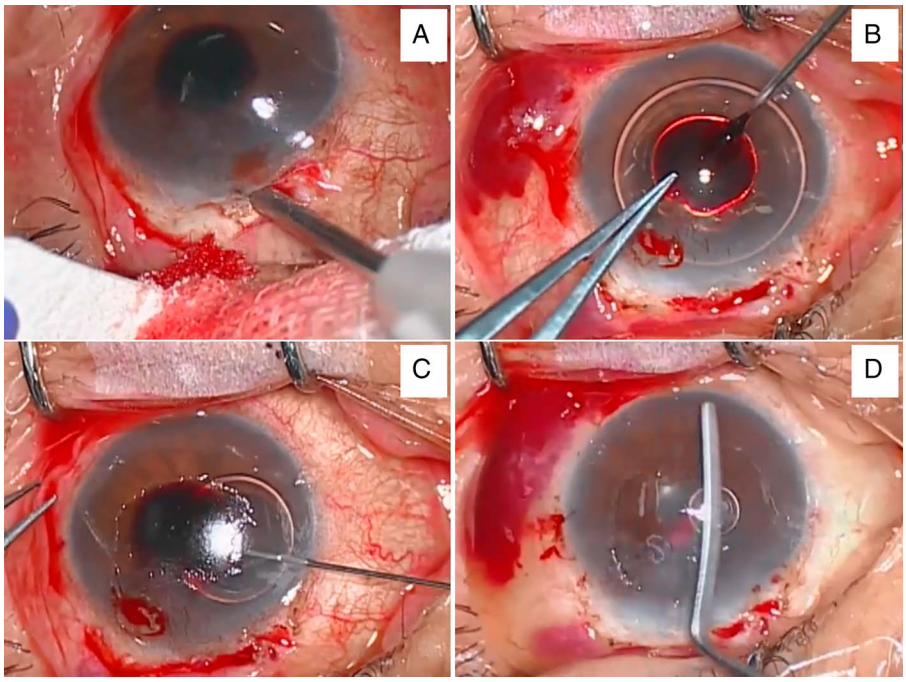

FIG. 2. Surgical methods for anterior chamber gas tamponade combined with keratocentesis. (A) Cauterization of vessels in the superior corneal limbus. (B) Injection of filtered gas into the anterior chamber with a 32-G needle. (C) Keratocentesis with a 24-G V lance needle from the corneal epithelium to the stroma. (D) Scraping the cornea with a spatula to remove the hematoma between the layers by means of puncture.

Digital Content 1, http://links.lww.com/ICL/A248). After these procedures, a small part of the coagulated hematoma remained in the superior area of the cornea, but we assumed that this was at high-intensity area that had been seen on anterior segment OCT. On the day after the surgery, the ocular pressure was normal, and 0.1% betamethasone eye drops (Rinderon, Shionogi and Co, Ltd, Osaka, Japan) and 0.5% moxifloxacin eye drops (Vigamox, Basel. Switzerland) were initiated by instillation four times a day. The corrected visual acuity was 20/100, the SCL was removed on postoperative day 7. The administration of moxifloxacin eye drops was discontinued. Four months after the operation, a few corneal stroma opacities remained between the layers (Fig. 1C,E), and the density of corneal endothelial cells in the left eye was measurable (913 cells/mm^2). Betamethasone eye drops were then discontinued. Best-corrected visual acuity was 20/20 at postoperative month 4, and it has been maintained for 5 years since the operation.

DISCUSSION

Most intracorneal hematomas are reported to result from rupture of new blood vessels in the cornea or complications of ocular surgeries.[1–8] Although no information was available from the patient's previous physician, we hypothesized that the corneal neovascularization in this patient was caused by the invasion of vessels into the cornea from the wound area after cataract surgery because corneal neovascularization was confirmed to originate from the scar on the superior limbus. Possible treatments for intracorneal hematoma include (1) making an incision in the Descemet membrane from the endothelial side and washing the anterior chamber[1,4] and (2) injecting gas or viscoelastic into the anterior chamber.[1,3,5,9] The disadvantage of the former method is that the corneal endothelium is extensively invaded because an incision is made on the endothelial side. In our patient, we decided to remove the hematoma using gas tamponade in the anterior chamber followed by corneal puncture, referring procedure in DSAEK to remove accumulated fluid between the donor and host.

The advantages of this approach are that an anterior chamber operation is not required, minimizing damage to corneal endothelial cells, intraocular pressure control is easier to maintain, and no corneal conjunctival incision or suturing is required. This procedure appeared to be simple, safe, and effective because few opacities remained in the pupil area of the cornea and a maximum corrected visual acuity of 20/20 was obtained as early as 4 months later.

An alternative treatment for intracorneal hematoma includes the administration of anti-inflammatory agents for inflammatory diseases and waiting for the hematoma to be absorbed naturally; however, the latter approach carries the risk of persistent opacity if the hematoma is organized.[2,10] Invasive methods include breaking the Descemet membrane[1] or irradiation of the Descemet membrane with an Nd:YAG laser,[4] which allows the hematoma to flow out. Furthermore, a report was published on corneal lamellar transplantation for the treatment purpose.[7] However, the gas tamponade approach is considered the least invasive and has a better prognosis; therefore, it should be attempted first.

After the operation, the cornea became transparent, and the density of the corneal endothelial cells was measured. The density was lower than that of the fellow eye. Because the density of corneal endothelial cells before the intracorneal hematoma was unknown, it is unclear whether the hematoma itself triggered a decline in density, for example, by distorting the back of the cornea. Other possible causes include intraoperative and postoperative complications of previous cataract surgery, prolonged postoperative inflammation, presence of inflammation because of other causes that can promote the development of corneal neovascularization, and effects of the surgical procedure. However, surgery is considered relatively unlikely because it does not include manipulation of the endothelial side of the cornea.

In conclusion, this procedure, which uses anterior chamber gas tamponade followed by corneal puncture to treat intracorneal hematoma, seems to be relatively simple and effective.

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