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Vitrectomy with Internal Limiting Membrane Repositioning and Autologous Blood for Macular Hole Retinal Detachment in Highly Myopic Eyes

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Purpose: To investigate the surgical results of macular hole retinal detachment (MHRD) repaired using vitrectomy combined with inverted internal limiting membrane repositioning (ILMR) and autologous blood clot (ABC) in highly myopic eyes.

Design: Retrospective, interventional case series.

Participants: Twenty-seven cases of MHRD.

Methods: Twenty-seven cases of highly myopic eyes with MHRD in 27 patients who underwent a vitrectomy combined with ILMR and ABC and were followed up over 6 months were reviewed. The anatomic outcomes of MHRD were evaluated by fundus examinations and optical coherence tomography. The preoperative and postoperative best-corrected visual acuities (BCVAs) were compared as the functional outcome.

Main Outcome Measures: Retinal reattachment, macular hole (MH) closure, and BCVA before and after surgery.

Results: In total, women accounted for 85% (23/27) of the MHRD patients. The mean age was 59.1±10.6 years. The mean axial length was 29.37±1.92 mm. Type 1 MHRD was present in 9 eyes, and type 2 MHRD was present in 18 eyes. After a single surgery, the retina was attached and the hole was closed in 26 eyes (96%), and 100% retinal attachment was achieved by another vitrectomy for rhegmatogenous retinal detachment that occurred 3 months after the initial surgery. A parafoveal unclosed hole was found in 1 eye (4%) during the follow-up period, and the patient did not undergo further treatment. Three eyes with a closed hole showed persistent subretinal fluid (SRF) after gas absorption. In 2 of these cases, the fluid absorbed completely during the follow-up period, but 1 eye exhibited persistent SRF, which was resolved progressively during the 12 months of follow-up. The surgery significantly improved the BCVAs {from 1.8±0.7 logarithm of the minimum angle of resolution units to 1.3±0.7 logarithm of the minimum angle of resolution units ($P = 0.001$)} at 3 and 6 months and at the last visit after surgery. Seven patients underwent cataract surgery during the follow-up period.

Conclusions: A vitrectomy combined with ILMR and ABC is effective for closing MHs and reattaching the retina and significantly improves the postoperative BCVA in MHRD patients. *Ophthalmology 2015;■:1–10 © 2015 by the American Academy of Ophthalmology.*

Supplemental video is available at www.aaojournal.org.

Macular hole (MH) retinal detachment (MHRD) is one of the most vision-threatening complications associated with highly myopic eyes, and it is highly prevalent in east Asia.[1,2] The mechanisms of MHRD may be related to the tangential traction from the epimacular structure and the inverse traction from the posterior staphyloma. Choroidal and retinal pigment epithelium atrophy also may result in weakened retinal adherence to the posterior pole.[3–5] According to the pathologic mechanisms, several surgical methods have been introduced to treat MHRD. They include intraocular gas tamponade, pars plana vitrectomy, macular buckling, and combination approaches. Among them, vitrectomy and gas–fluid exchange with internal limiting membrane (ILM) removal followed by face-down positioning was most popular for the treatment of MHRD.[6–19] The retinal reattachment rate ranged from 40% to 90% after vitrectomy and gas–fluid exchange, but the hole closure rate was lower; the hole could remain open even if the retina was attached.[14–16,20] In addition to the unsatisfying anatomic results of MHRD, remaining in a face-down position for 1 to 2 weeks after vitrectomy and gas–fluid exchange is an unpleasant experience for the patient during

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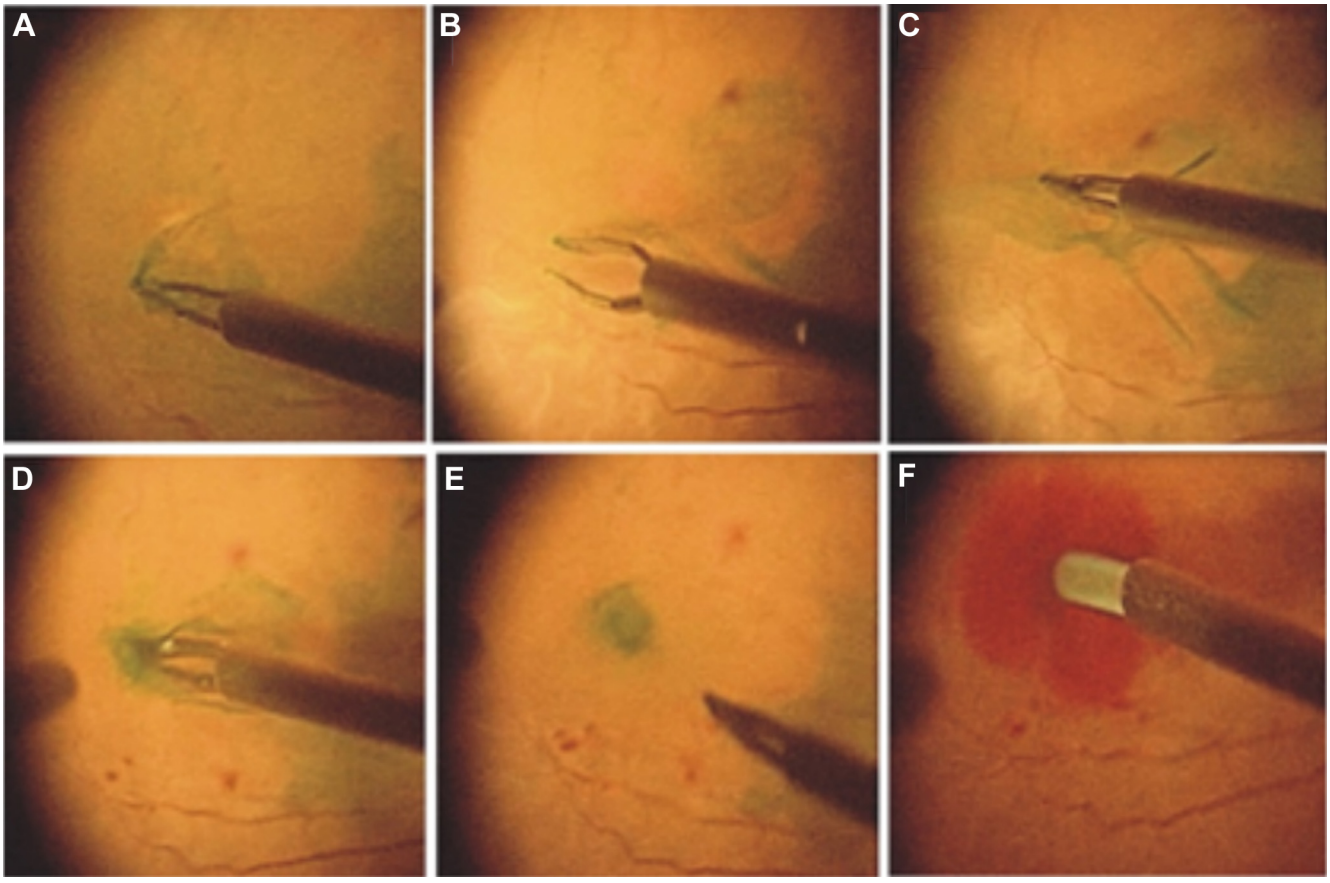

Figure 1. The surgical procedure of macular hole retinal detachment repaired by a vitrectomy combined with inverted internal limiting membrane (ILM) repositioning and autologous blood clot in highly myopic eyes. **A**, **B**, After a vitrectomy, ILM lifting was assisted by staining with indocyanine green without intentional drainage of the subretinal fluid. The lifted ILM was not detached completely from the retina and remained attached to the edge of the macular hole. **C**, **D**, Then, the lifted ILM was inverted and placed into the macular hole. **E**, The inverted ILM was used to fill the macular hole. **F**, Then, fresh blood from the patient was injected gently to cover the macula and seal the macular hole.

recovery. Although silicone oil was introduced in the initial surgery to avoid the need for face-down positioning,[21] it is necessary to remove the silicone oil afterward, and long-term retinal toxicity cannot be ignored.[18,22,23] Increasing the successful rate of retinal attachment and hole closure and decreasing the duration that patients are in a prone position are the main goals of MHRD repair.

Recently, an inverted ILM flap was used to close large idiopathic MHs in a small case series of MHs in highly myopic eyes with or without retinal detachment (RD).[24,25] In addition, blood from the patient long has been applied in vitreoretinal surgeries, and blood components long have been used to improve the hole closure rate for MH.[26–29] The purpose of this study was to determine the efficacy of a modified combination therapy, that is, a vitrectomy with inverted ILM repositioning (ILMR) combined with autologous blood clot (ABC) and gas tamponade in a prone position for 1 day, to treat MHRD in highly myopic eyes.

Methods

A retrospective, consecutive chart review of all patients with MHRD who underwent a vitrectomy with ILMR combined with ABC and gas tamponade by a single surgeon (C.-C.L.) at Chang Gung Memorial Hospital was conducted. The institutional review board of Chang Gung Memorial Hospital, Taoyuan, Taiwan, approved this retrospective study. This study included only the patients with MHRD in a highly myopic eye ($\geq$6 diopters or axial length $\geq$26.5 mm). Patients with a history of RD or proliferative vitreoretinopathy, any kind of retinal surgery, diabetic retinopathy, vitreous hemorrhage, retinal vascular occlusion, uveitis, trauma, optic atrophy, ocular tumors, glaucoma, corneal opacity, or incomplete chart records were excluded. The patient's age, gender, ocular history, initial best-corrected visual acuity (BCVA), preoperative and postoperative clinical manifestations, subtypes of MHRD, optical coherence tomography (OCT) results, and final BCVA were collected. The classifications of MHRD were based on the extension of RD as described previously.[17] Briefly, a classification of type 1 indicated RD within the macula, type 2 indicated RD beyond the macula, and type 3 indicated total RD. Optical coherence tomography was performed before and after surgery in all eyes using a commercially available spectral-domain OCT device (Spectralis HRA OCT; Heidelberg Engineering, Heidelberg, Germany) with macular volume scan acquisition protocol to detect any defect in the macular area. The BCVA in Snellen value was converted to the logarithm of the minimum angle of resolution for analysis purposes. If the BCVA was counting fingers or hand movements, it was assigned as the equivalent Snellen acuity of 20/2000 or 20/20000, respectively, based on a previous publication.[30]