Branch retinal vein occlusion (BRVO) is second only to diabetes as a cause of retinal vascular disease and is a major cause of visual morbidity in middle-aged to elderly individuals. Macular edema that is unresponsive to medical and laser treatment is the leading cause of severe visual loss in retinal vascular occlusion. A traditional therapy for chronic cystoid macular edema (CME) associated with BRVO is vitrectomy with hyaloid removal, based on the concept that vitreous traction on the macula promotes fluid accumulation. More recently, a valuable role of retinal internal limiting membrane (ILM) peeling in resolution of macular edema has been revealed as an alternative option for further investigation. This surgical procedure has previously been applied to etiologically different conditions, such as diabetic macular edema and chronic recalcitrant CME secondary to cataract surgery.

This article will provide a summary of the data that were published in our formal report of triamcinolone acetonide-assisted ILM peeling.

**OUR STUDY**

To evaluate the surgical effect in eyes with chronic CME related to BRVO, 38 eyes of 34 patients were included in our prospective study. All patients had a history of macular edema (visual acuity of <20/40) for at least 6 months, with an average duration of 10.1 months. Intraocular application of triamcinolone acetonide was used to assist with the surgery, for which we employed a 25-gauge vitrectomy system (Millennium Transconjunctival Sutureless Vitrectomy System [TSV25]; Bausch & Lomb, Rochester, NY).

**Surgical Technique**

The surgical technique used in this study was transconjunctival insertion of a cannula through a beveled trocar conjunctival/scleral incision of 0.5 mm (Figure 1). Following core vitrectomy, triamcinolone acetonide suspension was injected above the posterior pole, allowing clear visualization of the posterior hyaloid membrane. A 25-gauge vitreous cutter with suction on was then used for separating the hyaloid membrane from the optic nerve head and posterior retina. Following membrane separation, we performed subtotal vitrecomy. We then reinjected triamcinolone acetonide suspension, and after allowing settling to occur, we used a 27-gauge retrobulbar needle to make an ILM incision outside the papillomacular bundle. We peeled the ILM circumferentially around the area of
macular edema with 25-gauge microforceps.

ILM peeling characteristically results in a smooth vitreal surface and an irregular retinal surface, as seen in the transmission electron micrograph image in Figure 2.

POSTOPERATIVE ASSESSMENT

Assessment consisted of best-corrected visual acuity (BCVA), funduscopy, fluorescein angiography, and optical coherence tomography (OCT) before surgery and at 7 months postoperatively. Surgical specimens were also examined by electron microscopy to verify the nature of the triamcinolone acetonide-stained membrane peeled during surgery. Postoperatively, BCVA improved, and chronic CME was significantly absorbed ($P<.01$, Dunnett test) when compared to preoperative measurements. No eyes lost vision from baseline during the postoperative period. Foveal thickness, assessed by OCT, showed a significant negative linear correlation ($r=0.81$, $P<.01$; Spearman rank correlation) with BCVA 7 months after surgery, which implies an association

Figure 2. Transmission electron micrograph of peeled ILM demonstrating the characteristic smooth inner (vitreal) surface and the undulating or irregular outer (retinal) surface (original magnification, x6200).

Figure 3. Preoperative and postoperative fundus photography and OCT. (A) Color fundus photograph of the left eye of a 61-year-old man with marked intraretinal hemorrhage and macular edema secondary to an inferotemporal BRVO. Visual acuity was 20/300. (B) Preoperative optical coherence tomogram of the left eye exhibiting extensive macular edema with large cystic spaces in the foveal region. Foveal thickness was calculated to be 658 µm. (C) Color fundus photograph of the same eye 1 month after 25-gauge transconjunctival vitrectomy and triamcinolone acetonide-assisted ILM. Visual acuity is now 20/70. Note the marked resolution of intraretinal hemorrhage and macular edema, particularly in the foveal region. (D) 1-month postoperative optical coherence tomogram of the left eye exhibiting markedly decreased macular edema. Foveal thickness was calculated to be 295 µm.
between improvement of visual acuity and decreased macular edema. Furthermore, a good postoperative foveal contour appears to correlate with better visual outcome. In our study, we also found that functional change seemed to follow morphologic changes in chronic CME associated with BRVO after ILM peeling. One possible cause may be that the patients in our study had a long history of CME (mean, 8.5 months), which limited the quick resolution of retinal function damage.

CASE EXAMPLE
A 61-year-old male presented with marked intraretinal hemorrhage and macular edema secondary to an inferotemporal branch retinal vein occlusion in his left eye (Figure 3A). Visual acuity in the left eye was 20/300, and foveal thickness on OCT was 658 µm (Figure 3B). One month after 25-gauge transconjunctival vitrectomy and triamcinolone acetonide-assisted ILM peeling, we noted marked resolution of intraretinal hemorrhage and macular edema, particularly in the foveal region (Figure 3C). The patient’s visual acuity is currently 20/70, and OCT shows marked reduction in macular edema and reduction of foveal thickness to 295 µm (Figure 3D).

DISCUSSION
As stated, various surgical techniques and adjuvant therapies have been proposed to reduce macular edema and to improve visual results. The 25-gauge vitrectomy instrumentation was used when creating the conjunctival and scleral incisions, separating the hyaloid from the optic nerve head and posterior retina, and peeling the ILM around the macular edema. This operating system simplified the procedure, minimized surgically induced trauma, reduced the convalescence period, and caused less postoperative inflammation. That intraoperative or postoperative complications were observed might also indicate the contribution of this less invasive procedure. Further, ILM peeling with intravitreal injection of triamcinolone acetonide can be considered to be another feasible and safe procedure that provides superior anatomical and functional results for macular edema surgery. ILM peeling has been reported to provide an almost complete release of tangential traction and subsequent resolution of macular edema. However, removing the ILM can be very challenging because of the difficulty of visualization and consequent risk of incomplete peeling or retinal damage. In the current study, with the aid of triamcinolone acetonide, the ILM-peeled area could be distinguished as a plain face, in contrast with the unpeeled area in which white particles were stuck. Thus, visualization was greatly improved. Because triamcinolone acetonide cannot differentiate ILM from epiretinal membrane, an expert surgeon is needed. To characterize the peeled membrane after surgery, all surgical specimens were examined by electron microscopy, which demonstrated that the tissue adhered to by triamcinolone acetonide and removed during peeling was ILM. As an alternative to ICG, which has been reported to have potential toxicity, triamcinolone acetonide showed other properties. In all cases in the current study, triamcinolone acetonide was no longer observed at 1 week postoperatively, and no pathologic or functional changes were observed. The use of triamcinolone acetonide here was minimal, and there were no cases of elevated intraocular pressure or endophthalmitis. Although further study is needed to clarify the safety and visual outcome associated with this procedure, triamcinolone acetonide could be an aid to ILM peeling during macular edema surgery.

SUMMARY
In conclusion, our study demonstrated that 25-gauge vitrectomy with triamcinolone acetonide-assisted ILM peeling was generally effective in reducing macular edema and improving BCVA for chronic CME associated with BRVO for at least 7 months. Based on our results, we submit that further study of the efficacy of this surgical technique is warranted.

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