

Internal Limiting Membrane Peeling to Prevent Post-vitrectomy Epiretinal Membrane Development in Retinal Detachment



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- **PURPOSE:** To determine the efficacy of internal limiting membrane (ILM) peeling during vitrectomy for rhegmatogenous retinal detachment (RRD) regarding post-vitrectomy epiretinal membrane (ERM) development and visual outcomes.
- **DESIGN:** Retrospective, interventional, comparative case series.
- **METHODS:** SETTING: Institutional. STUDY POPULATION: One hundred and two consecutive eyes with RRD treated with vitrectomy and followed for at least 6 months. ILM was peeled without using dye such as indocyanine green (ICG). OBSERVATIONAL PROCEDURES: Patients were divided into 2 groups based on postoperative ERM development: Group 1, 81 eyes without ERM formation; Group 2, 21 eyes with ERM development. Patients also were divided into 2 subgroups: those with and without ILM peeling (58 and 44 eyes, respectively). Statistical analyses were performed between the 2 groups with/without ERM formation and between the 2 subgroups with/without ILM peeling for 5 preoperative factors including foveal involvement of the RRD, 4 intraoperative factors including ILM peeling, baseline best-corrected visual acuity (BCVA), and final BCVA. MAIN OUTCOME MEASURES: An association of ILM peeling with ERM prevention and the influence of ILM peeling on visual outcomes.
- **RESULTS:** ILM peeling was significantly ($P < .001$) associated with ERM prevention. There was no significant difference in the final BCVA between subgroups with and without ILM peeling.
- **CONCLUSIONS:** ILM peeling without ICG staining during the initial vitrectomy for RRDs may prevent

postoperative ERM formation with favorable visual outcomes. (*Am J Ophthalmol* 2016;171:1–10. © 2016 Elsevier Inc. All rights reserved.)

INTERNAL LIMITING MEMBRANE (ILM) PEELING OFTEN IS performed during vitrectomy for macular diseases such as macular holes (MHs), macular edema owing to diabetic retinopathy and retinal vein occlusion, and epiretinal membranes (ERMs).^{1,2} ILM peeling has been reported to decrease the recurrence rate of ERMs after surgical removal of an idiopathic ERM.^{3,4} Some reports also have suggested that ILM peeling might prevent ERM formation after vitrectomy for complicated rhegmatogenous retinal detachments (RRDs) with silicone oil tamponade⁵ and RRDs accompanied by proliferative vitreoretinopathy (PVR)⁶ or diabetic retinopathy.⁷

RRDs occasionally are complicated by ERMs, which might lead to substantial postoperative visual impairment. The incidence of ERM formation after vitrectomy for RRDs has been reported to range from 4.4% to 12.8%.^{8–14} Some investigators have suggested that the risk factors for ERM development after repair of RRDs include macular-on RRDs,¹¹ multiple or large retinal breaks,¹² equatorial rather than anterior breaks,¹⁰ and a longer duration of macular detachment.¹⁰ Recently, Rao and associates¹⁵ and Nam and Kim¹⁶ have suggested the efficacy of ILM peeling during vitrectomy for RRDs to prevent postoperative ERM formation.

The current study determined the efficacy and visual outcomes of ILM peeling in relation to ERM formation in cases with RRDs treated with vitrectomy and also assessed the effect of various factors on postoperative ERM development. ILM peeling was performed without using indocyanine green (ICG) or Brilliant Blue G (BBG), to avoid their influence on the outcomes for the purpose of this study.

METHODS

- **STUDY DESIGN:** This study was a retrospective, institutional, interventional, comparative case series of consecutive eyes with RRDs treated with vitrectomy at the National Hospital Organization, Tokyo Medical Center, between

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Manuscript received Mar 24, 2016, and in revised form Aug 8, 2016. Accepted for publication Aug 9, 2016.

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TABLE 1. Characteristics and Visual Outcomes of Cases With and Without Epiretinal Membrane Formation

Characteristics, Mean ± SD	Total (102 Eyes)	Group 1: Cases Without ERM Formation (81 Eyes)	Group 2: Cases With ERM Formation (21 Eyes)	P Value ^a (Group 1 vs Group 2)
Baseline characteristics				
Age at the initial vitrectomy (y)	58.4 ± 11.4	59.2 ± 11.8	55.0 ± 9.3	.076
Refraction at baseline (diopters)	-3.57 ± 4.06	-3.62 ± 4.14	-3.37 ± 3.83	.878
Duration between RRD onset and the initial vitrectomy (d)	8.2 ± 15.9	7.6 ± 9.9	10.5 ± 29.5	.162
Follow-up period (d)	860.2 ± 668.9	743.8 ± 599.0	1309.3 ± 746.6	.001*
Visual outcomes (logMAR)				
BCVA at baseline	0.52 ± 0.78	0.54 ± 0.79	0.48 ± 0.75	.635
Final BCVA	0.058 ± 0.24	0.065 ± 0.25	0.033 ± 0.17	.755

BCVA = best-corrected visual acuity; ERM = epiretinal membrane; logMAR = logarithm of minimum angle of resolution; RRD = rhegmatogenous retinal detachment.

Statistical significance (*) was defined as $P < .05$.

^aMann-Whitney U test (between Group 1 and Group 2).

April 1, 2006 and August 31, 2015. The study protocol adhered to the tenets of the Declaration of Helsinki and the Institutional Review Board of the National Hospital Organization, Tokyo Medical Center, approved the study protocol (approval number: R14-111). All patients provided written informed consent for each surgical procedure.

The inclusion criteria were an initial vitrectomy to treat an RRD, a follow-up period of at least 6 months after the initial vitrectomy, and the availability of good-quality spectral-domain optical coherence tomography (SD OCT) images obtained at the follow-up visits to determine the presence of an ERM. The exclusion criteria were intraoperative use of ICG or BBG, development of PVR detected before the initial surgery, postoperative development of PVR that required additional surgery, RRDs associated with MHs, and coexisting ocular/macular diseases that could affect the postoperative visual acuity (VA).

• **PATIENTS AND OBSERVATIONS:** A detailed clinical history that included the onset of visual disturbances and history of ocular diseases was obtained at the initial visit to our clinic or at the visit at which an RRD was detected (baseline data). At each visit, the patients underwent a full ophthalmic examination including measurement of the decimal VA and slit-lamp and indirect ophthalmoscopy. SD OCT images were obtained postoperatively with at least 1 of 2 devices: the Cirrus HD-OCT system (Carl Zeiss Meditec, Dublin, California, USA) and the DRI OCT-1 (Topcon Corporation, Tokyo, Japan). The analysis mode of the 3-dimensional mapping (macular cube protocol) or 5-line raster protocol was applied for the SD OCT scans.

One of the 3 retina specialists (K.A., K.W., K.F.) performed all surgeries while the patients were anesthetized locally by retrobulbar injection of 2% lidocaine. Standardized microincision vitrectomy (23 gauge or 25 gauge) was

performed using a wide viewing system (OFFISS; Topcon Corporation) in 99 cases; the conventional 20 gauge system was used in 3 cases. After core vitrectomy, a posterior vitreous detachment (PVD) was created if one had not developed already, and the vitreous traction to the retinal tears or degenerations was released. The peripheral vitreous body was shaved as intensively as possible, facilitated by scleral indentation. Triamcinolone acetonide (TA) was injected into the vitreous cavity in 79 cases to visualize any residual vitreous cortex or vitreous traction. The ILM was peeled at the surgeon's discretion; this procedure has generally been employed in most cases since each surgeon started adopting it (K.A.: April 2011; K.W.: January 2013; K.F.: March 2014). The ILM was peeled with TA assistance¹⁷ or without any dye or TA staining. Tamponade with air, sulfur hexafluoride, or perfluoropropane was applied in all eyes, with the exception of 1 eye that was filled with silicone oil, which was removed 3 months after injection.

Full ophthalmic examinations were performed postoperatively at each visit in accordance with the baseline examinations. ERM formation was defined as the appearance of an ERM that was confirmed by the presence of a highly reflective line on the inner macular surface on SD OCT scans.

• **STATISTICAL ANALYSES AND MAIN OUTCOME MEASURES:** The decimal VA was converted to the logarithm of the minimum angle of resolution (logMAR) for statistical analyses. Hand motions VA was converted to 2.28 logMAR according to previous investigations.^{18,19}

The main outcome measures included the factors most affecting the postoperative ERM development, the preventive effect of ILM peeling on ERM development, and visual outcomes. To evaluate the effects of various factors on ERM development, the patients were divided into 1 of 2

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