Internal Limiting Membrane Transposition for Persistent Macular Holes Using Double Layers of Viscoelastic

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In this article, the authors present a beautiful video showing a modified technique for autologous inner limiting membrane (ILM) transposition to close a persistent macular hole (MH) using a double layer of viscoelastic material.

When performing autologous ILM transposition, the process of securing the ILM free flap (as opposed to an ILM hinged flap) to the MH can be challenging. The free flap can often destabilize and float away. Although several techniques utilizing viscoelastics or perfluorocarbon liquids have been reported, these typically require the ILM free flap to be embedded within the MH for stability. This often induces gliosis, which can hinder the recovery of the outer retinal layers and be detrimental to recovery of visual acuity. Therefore, it would be preferable to "cover" the MH, similar to how a hinged ILM flap would sit above the MH, as opposed to "stuffing" it with ILM like previous techniques. This video presents just such a technique, and subfoveal gliosis of the MH was not observed on the postoperative optical coherence tomography.

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Furthermore, the use of a dispersive, rather than cohesive, viscoelastic material is key to the success of this technique. Dispersive viscoelastics have low molecular weights and short-chained sodium hyaluronate, allowing it to evenly and flatly distribute along the surface of the retina when applied. This property allows it to maintain and spread the free flap evenly over the MH. Covering the free flap with a second layer of viscoelastic material minimizes the chances for it to dislocate during the fluid-air exchange.

Further studies are needed to determine the success rate of this procedure and the visual prognosis over a longer follow-up period.

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ABSTRACT: Internal limiting membrane (ILM) grafting provides a useful option for repair of large and refractory macular holes that fail to close following prior ILM removal. However, current ILM graft techniques are associated with several challenges that may result in failure, most notably the difficulty in maintaining the graft in situ. In this video, the authors describe their modified technique for ILM grafting using a double layer of viscoelastic for stabilization in situ during the procedure. Four of five eyes managed with this technique demonstrated type 1 closure, and all eyes demonstrated improvement in visual acuity.

Closure of macular holes (MHs) that persist following unsuccessful pars plana vitrectomy (PPV) with internal limiting membrane (ILM) peeling represents a therapeutic challenge. Several factors may contribute to failure of primary repair, including the tendency of refractory holes to be large and long-standing, as well as the persistence of postoperative tangential surface traction by residual ILM or epiretinal membranes (ERMs) around the margin of the hole.[1,2]

Recently, several approaches have been proposed to overcome the challenge of persistent MHs, including grafting autologous ILM. Once translocated, ILM grafts act as a physical barrier that prevents fluid en-

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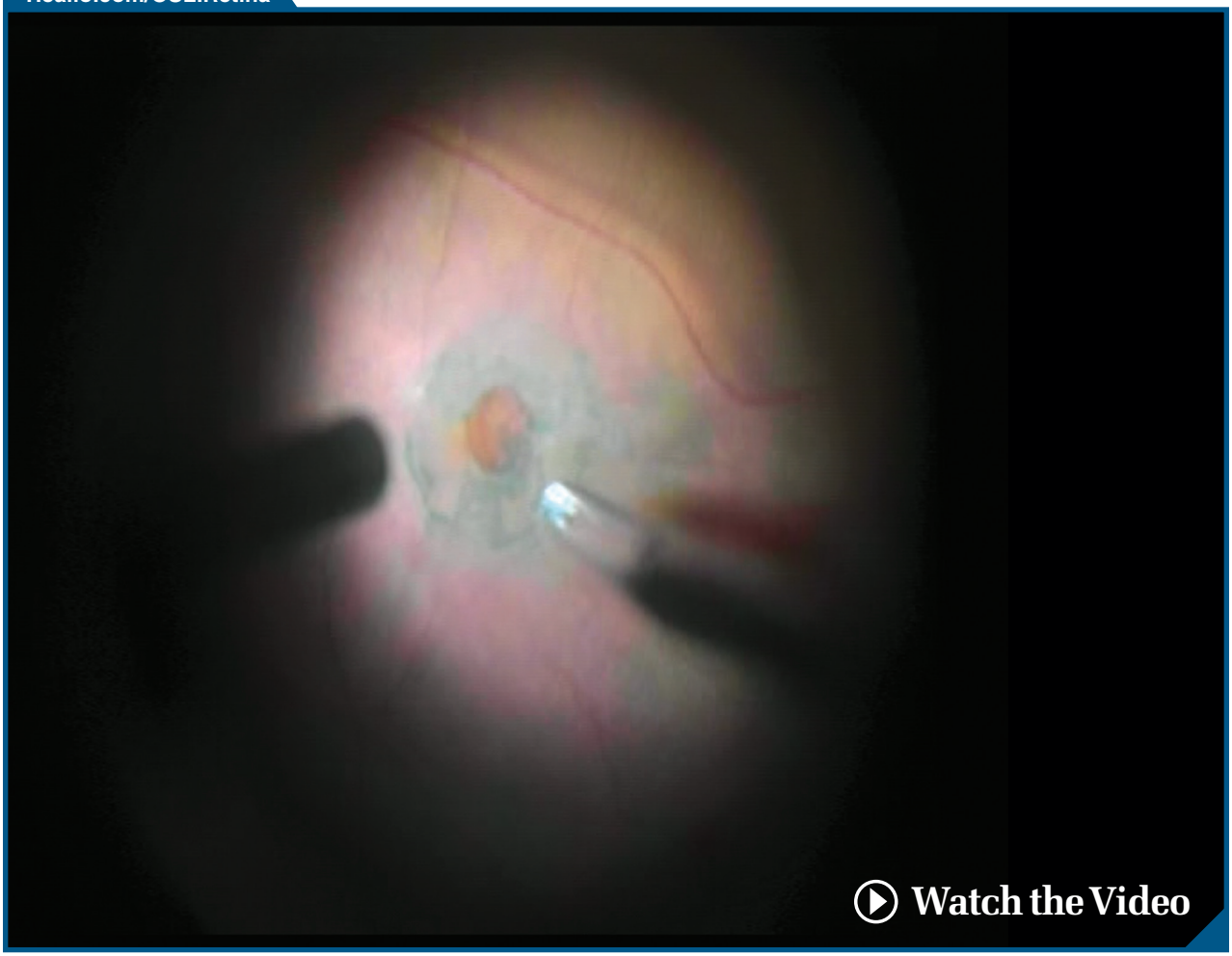

Figure. Extramacular internal limiting membrane free flap is peeled and placed over the macular hole within the viscoelastic to aid in positioning.

try into the MH while also potentially providing a scaffold that promotes retinal proliferation and healing. Prior studies have shown this approach to be associated with favorable results in eyes with persistent MHs.[3-5] However, the ILM graft technique is associated with several surgical challenges. Extramacular ILM is usually thin and difficult to harvest. In addition, the ILM graft usually sticks to the ILM forceps and is difficult to release onto the surface of the retina over the hole. In contrast to an ILM flap that is hinged at the edge of the hole, which is possible only in eyes without prior ILM peeling, the free graft is liable to float away from intraocular currents and during air-fluid exchange. Unstable grafts often require repeated repositioning, which leads to increased surgical manipulation and operative time. Tucking the ILM graft beneath the edge of the MH is sometimes attempted to help to stabilize it inside the hole and minimize the risk of graft dislocation.[3-5] However, this technique may be associated with risk of mechanical trauma to the RPE. In addition, the presence of ILM inside the hole may act as a barrier hindering retinal layers from closing the hole.

In this video, we describe our technique of using double layers of viscoelastic (Viscoat; Alcon, Fort Worth, TX) to increase ILM graft stability during PPV. We initially inject indocyanine green to identify any residual ILM around the hole and to stain extramacular ILM. Afterwards, an ILM graft is harvested from an extramacular location. We intend to peel an area greater than the hole size and, prior to fully harvesting the graft, it is left hinged to the retina so that it does not float away with intraocular currents. The MH is prepared by injecting a layer of viscoelas-

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tic over the surface of the retina around the hole. The graft is then completely peeled from the retina and placed on top of the hole. The viscoelastic facilitates adherence and spreading of the ILM graft flat into the retinal surface over the MH. Another layer of viscoelastic is injected on top of the graft for stabilization. This layer of viscoelastic helps to secure the graft in place through the remaining part of the procedure. Air-fluid exchange is performed while tilting the eye nasally to allow complete drying of the macula.

Five eyes with persistent MHs were managed using this technique, the median size of which was 301 µm. Type 1 closure was achieved in four of five MHs.[6] The remaining MH showed reduction in size but did not completely close. Visual acuity improved in all five cases. A similar technique of ILM grafting using double layers of viscoelastic was recently described by Iwakawa et al. in a case of refractory MH secondary to ruptured retinal artery macroaneurysm.[7] Our results are comparable to prior studies that utilized free ILM grafting with MH closure rates ranging between 80% to 100% for refractory or very large MHs.[3-5] In conclusion, using double layers of viscoelastic facilitates covering and stabilizing the ILM over the MH while reducing the risk of mechanical RPE damage, saving surgical time and potentially promoting anatomical closure.

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