

Curved Scissors Delamination

This technique complements cutter delamination in diabetic traction retinal detachment surgery.

BY STEVE CHARLES, MD, FACS, FICS

Many design and manufacturing advances in recent years have enabled safe use of the vitreous cutter for the removal and segmentation of epiretinal membranes (ERM) in diabetic traction retinal detachment (TRD). Specifically, higher cutting rates, ie, at least 5000 cuts per minute (cpm), as well as smaller diameters produce port-based flow limiting, which reduces pulsatile vitreo-retinal traction. Port-based flow limiting, a term that I coined, more importantly limits surge and iatrogenic retinal breaks after sudden elastic deformation of dense ERM through the port. In addition, new manufacturing methods allow the port to be closer to the tip, improving access to ERMs in TRD cases. Smaller diameter cutters, 25-gauge and 23-gauge, also facilitate lateral access. The Constellation Vision System (Alcon Laboratories Inc.) has a very small, fast responding, and continuously emptying aspiration chamber that is controlled by 2 proportional vacuum valves and 1 proportional pressure valve. These valves are coupled to a distributed processor system with a real-time operating system that enables 25 ms response time to a proportional foot-pedal command by the surgeon. Precise aspiration control is essential when one is working near the retina, particularly when removing dense ERM.

Despite these advantages in vitreous cutter technology, scissors are still necessary for ERM removal in difficult TRD cases. This article reviews a number of techniques for managing ERM in diabetic TRD.

CUTTER TECHNIQUES

Three distinctly different techniques are used in managing ERMs in diabetic TRD cases. Cutter segmentation is accomplished by placing the cutter under regions of ERM not in contact with the retina, which bridge the gap between zones of adherent ERM. This technique is effective for less difficult cases but does not accomplish

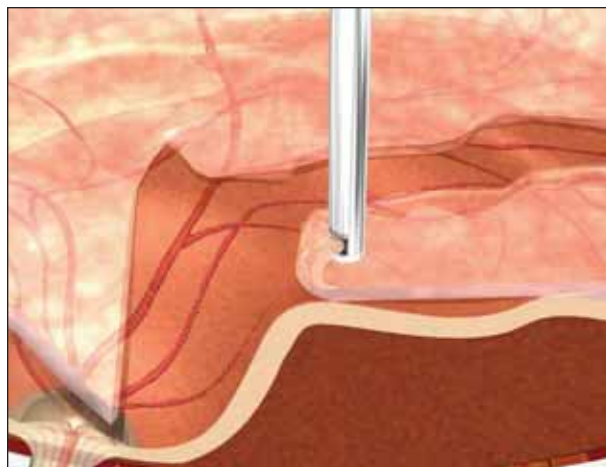


Figure 1. Foldback delamination is used for flexible ERM. ERM between port and retina reduces the likelihood of iatrogenic retinal breaks.

removal of the zones of adherent ERM.

Cutter delamination, in contrast to segmentation, allows removal of ERM rather than sectioning ERM. There are 2 types of cutter delamination. *Foldback delamination* is performed by placing the cutter on the anterior surface of the ERM just behind the leading edge. Trans-orifice pressure (ΔP) causes flexible, typically thinner, ERM to fold back into the port, hence the term foldback delamination coined by the author. This method is safer than conformal cutter delamination but cannot be used unless the ERM is flexible (Figure 1).

Conformal cutter delamination, a term also developed by the author, is utilized for rigid, typically thicker, ERM than cannot fold back into the port (Figure 2). Conformal means that the angle of attack is constantly altered by rotating the cutter along the long axis to cause rotation of the port away from the retina while

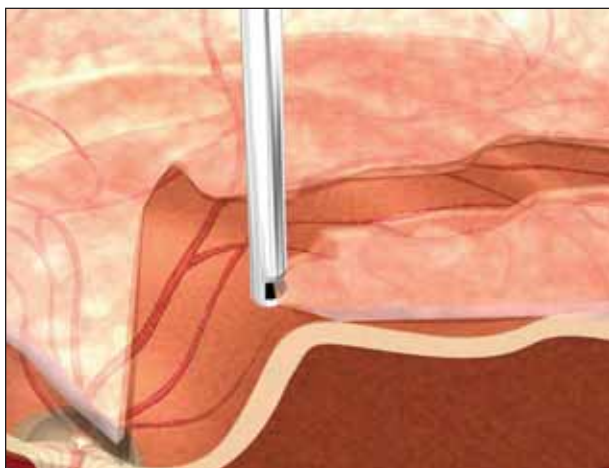


Figure 2. Conformal cutter delamination is used for dense ERM that cannot foldback into the port. The angle of attack must be adjusted to reduce the chances of retina entering the port.

maintaining apposition of the cutter port to ERM. Conformal also refers to the need to alter the angle of attack while traversing areas of more convex or concave retina, upslope or downslope, controlling probe access to the surface.

THE ROLE OF PEELING

In my opinion, spatulas, picks and forceps membrane peeling have virtually no role in diabetic TRD cases because of high ERM adherence, which creates greater risk of iatrogenic retinal breaks than scissors delamination. Peeling should be limited to low-adherence scenarios such as proliferative vitreoretinopathy and macular surgery.

SCISSORS SEGMENTATION AND DELAMINATION

I developed *scissors segmentation* more than 3 decades ago; segmentation simply means to section the ERM between so-called epicenters, zones of tight adherence. Segmentation does not remove the epicenters, which are often small TRDs. Bleeding from the sectioned edges of ERM often forms a fibrin substrate along which glial cells proliferate soon after surgery. Chronic TRD is another consequence of residual epicenters after segmentation; chronic elevation leads to atrophic retinal holes and late rhegmatogenous detachments.

I developed *scissors delamination* 2 years after segmentation to address the residual tissue remaining after segmentation. In brief, delamination means to remove ERM by shearing while segmentation means to section

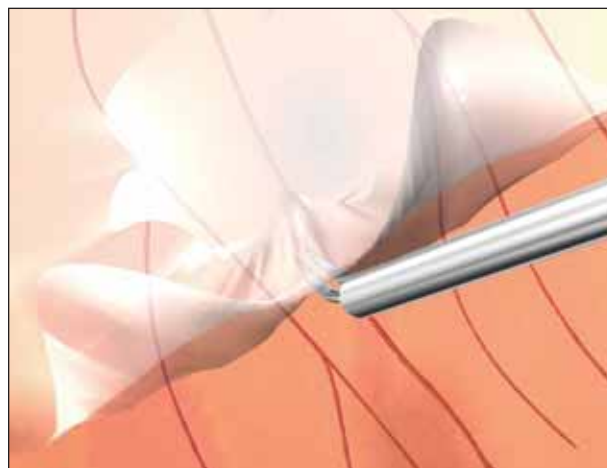


Figure 3. Scissors delamination is performed with the scissors almost closed by cutting near the tips while moving the scissors from side to side to identify and shear attachment points.

the ERM (Figure 3). Initially, vertical scissors were used for segmentation; so-called horizontal scissors (actually 135° scissors) are used for delamination. Curved scissors, such as the Grieshaber DSP 25-gauge scissors (Alcon Laboratories Inc.), are better for both segmentation and delamination because the retinal surface is concave; the curve reduces the chances of impaling the tips in retina. There is no longer any rationale for either vertical or horizontal scissors. In addition, because blade thickness is far less than blade width, 1 curved scissors blade can be introduced under the ERM in the potential space between ERM and retina to allow access segmentation to be performed without lifting the ERM and tearing the retina (Figure 4). Simply rotating the scissors after access segmentation so that both blades are under the ERM to begin delamination eliminates tool exchange and reduces the number of tools required.

Inside-out delamination (Figure 5) is preferred over the *outside-in* approach described in the original paper on en bloc dissection because central retina is stronger than the retina just outside the arcades. In addition, the view is better centrally, the retina is redundant centrally, and the dissection plane is more obvious after access segmentation. Scissors should be used almost closed, cutting just at the tips of the blades. Scissors should not be inserted under ERM and opened to spread, or inserted wide open and then closed. Both of these approaches tear retina at the discrete attachment points.

EN BLOC

En bloc is a highly inappropriate term for ERM dissection; it should be reserved for cancer surgery, in which

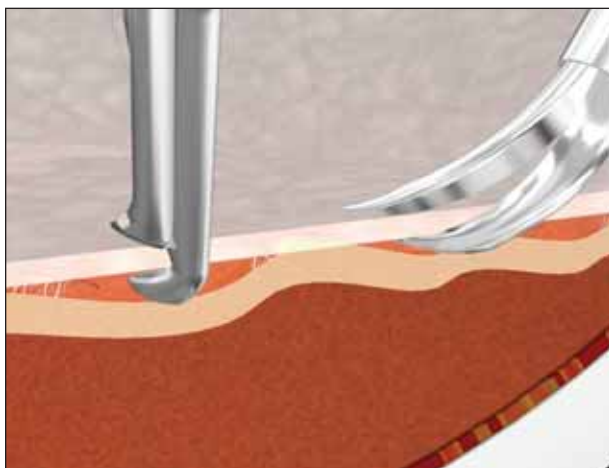


Figure 4. Curved scissors require less space between ERM and retina because blade thickness is less than blade width; curved scissors conform to the retinal contour and are less likely to cause retinal breaks than vertical or horizontal scissors.

the goal is avoiding dissemination of cancer cells. There is simply no rationale to remove all the ERM in 1 piece; in fact, this approach creates remote, unobserved traction during dissection. Segmenting the ERM into smaller regions before delamination provides better control and produces fewer retinal breaks.

SURGICAL ALGORITHM

Many surgeons believe that there is a linear algorithm for vitrectomy: core vitrectomy first, then posterior vitreous detachment (PVD) induction if PVD is not present. This algorithm, however, is not applicable to diabetic TRD cases. First there is no *core* vitreous; the posterior vitreous cortex is contiguous with the peripheral margin of all ERM and extends in a single, multilayer sheet between all zones of adherence to the retina, although it may be fenestrated over the macula. Second, PVD creation is seldom necessary, and, if the posterior vitreous cortex is not separated from the retina, no attempt should be made to apply traction. A safer approach is to delaminate ERM from the optic nerve head, then delaminate outward along the arcades with the scissors or cutter until outside the arcades. At this juncture, continuity with the posterior vitreous cortex will be obvious, and it can be removed without traction. In short, the emphasis should be placed on inside-out delamination, not PVD creation.

BIMANUAL SURGERY

Bimanual surgery is a misleading term; surgeons have always used both hands. The key issue is whether the endoilluminator is held in 1 hand and the cutter, scissors, forceps, or pics are held in the other hand—or if instru-

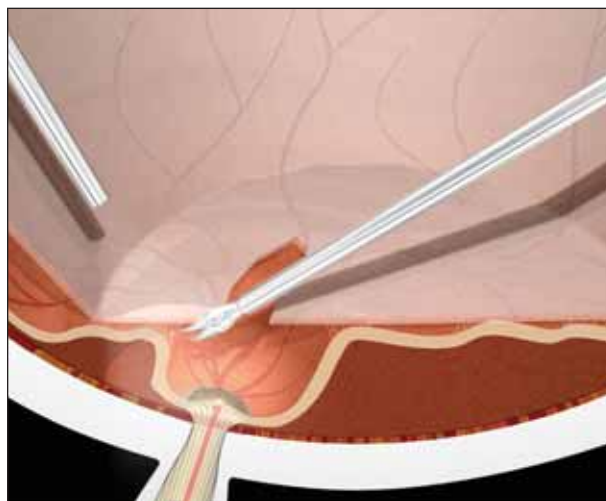


Figure 5. Inside-out delamination performed in a patient without a PVD, demonstrating continuity between the posterior vitreous cortex and outer margin of the ERM plate.

[For diabetic TRD cases] the emphasis should be placed on inside-out delamination, not PVD creation.

ments are in both hands. Scissors produce a push-out force as they close, and forceps in the other hand can be used to offset this force: ie, forceps stabilization of ERM. Using a pic in 1 hand and cutter in the other is less desirable because of obligatory traction with pics. Scissors are preferable to the vitreous cutter in difficult cases. Chandelier illumination is necessary for so-called bimanual surgery. The Alcon chandelier is ideal because it is compatible with safe scleral wound construction, conjunctival displacement, and vitrectomy at the sclerotomy site.

VISCODISSECTION

Viscodissection creates hydraulic force on the retina that can tear the retina and cause viscoelastic to enter the subretinal space; retina is approximately 1/100 the tensile strength of ERM and the vascular adherence points. In addition, the visco cannulas are too large for 25-gauge surgery and cannot be sufficiently curved to traverse the ports. Viscoelastics add cost to the surgery and are also difficult to remove.

LASER HEMOSTASIS

Laser hemostasis was developed by the author to avoid the collateral damage caused by bipolar diathermy. I have

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noted the development of late, large, atrophic holes without traction at sites of diathermy for bleeders during TRD surgery. The diathermy on the Constellation Vision System is higher frequency than the Accurus (Alcon Laboratories Inc.), and this confines the effect to a smaller area thereby causing less collateral damage. Laser energy (532 nm, green) is absorbed mostly in the blood column with minimal damage in surrounding retina. The laser probe is usually available because of the need for panretinal photocoagulation, obviating the need for the diathermy probe.

SUMMARY

Despite tremendous advances in cutters and fluidics, scissors are still needed in difficult diabetic TRD cases. Curved scissors have made both vertical and horizontal scissors obsolete. Delamination is preferred over peeling, and segmentation should largely be used for access. Laser hemostasis has advantages over diathermy. A rational approach to the wide variety of tools and techniques not only improves outcomes, but it also saves time and cost. ■

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1. In what percentage of diabetic TRD cases so you use scissors?

- ☐ 100%
- ☐ 75-99%
- ☐ 50-74%
- ☐ 25-59%
- ☐ 1-24%
- ☐ 0%

2. For diabetic TRD cases, do you use vertical, horizontal, or curved scissors?

- ☐ vertical
- ☐ horizontal
- ☐ curved