

Diabetic Vitrectomy: Less is More

Ahmed B. Sallam

Pak J Ophthalmol 2017, Vol. 33 No. 1

Tractional retinal detachment (TRD) that threatens or involves the macula, is the second most common indication for pars plana vitrectomy in diabetic eyes¹. The primary goals of vitreous surgery in tractional diabetic detachment include removal of vitreous hemorrhage, and the elimination of antero-posterior and tangential macular traction, thus stabilizing and increasing the vision. Removing all membranes is believed to reduce the frequency of postoperative re-bleeding, and the risk of epiretinal membranes/TRD recurrences. In proliferative diabetic retinopathy (PDR), fibrovascular tissue extends along the posterior hyaloid surface. This proliferation often causes changes in the vitreous gel that result in further traction on the retinal neovessels.

Diabetic TRD surgery is one of the most difficult surgery that the retina surgeon encounters for several reasons. First, the posterior hyaloid is usually not detached from the retina and often the adhesions between vitreous/epiretinal membranes and the underlying retina are vascular and significantly strong. Second, the ischemic nature of the diabetic retina makes it fragile and thin. Accordingly, employment of high suction to induce posterior vitreous detachment (PVD) (as conventionally used in macular hole or retinal detachment surgery) or peeling of membranes (as in idiopathic epiretinal membranes cases) are not advised due to high risk of retinal tears and bleeding. Finally, vitreoschisis, splitting of the posterior hyaloid layer, a consequence of anomalous PVD is present in a significant number of eyes with PDR related TRD³. This phenomenon could make the identification of the plane between the posterior hyaloid difficult and the retina and explains why we sometimes encounter what appears as 'layers of epiretinal membranes' in eyes with diabetic TRD intraoperatively. The correct surgical cleavage plane for dissection of epiretinal membranes is under the posterior leaflet of the split posterior hyaloid and

accessing this plane makes dissection easier, quicker and safer.

We routinely use intravitreal anti-VEGF preoperatively in diabetic TRD the membranes are completely fibrosed. Anti-VEGF decreases the risk of intraoperative bleeding as well as early postoperative hemorrhage². We are cautious about its risk of increasing fibrosis so we tend to administer the injection 3-4 hours only before the vitrectomy surgery.

We use 25g or 27g transconjunctival vitrectomy for most of our surgeries. For cases of diabetic vitreous hemorrhage and minimal or no diabetic membranes, we would start by inducing PVD (if not yet detached) over the optic disc using active suction with the vitreous cutter. We usually perform this step slowly and pay attention to whether abnormal vitreoretinal adhesions exist as employing suction on these areas may cause the retina to tear. If areas of PVD are present peripherally, these could be good areas to incise the hyaloid initially. In cases where the posterior hyaloid is difficult to separate from the retina with active suction, we find sharp dissection using a bent sharp needle or a retinal pick very helpful to penetrate the posterior hyaloid and elevate it off the retina. Removal of vitreous hemorrhage is usually straightforward when the posterior hyaloid is separated. In the absence of peripheral retinal detachment, we usually do not perform vitreous base shaving. We believe that this an unnecessary step that does not improve the visual result and is associated with increased surgery time as well as risk of creating retinal tears or touching the crystalline lens touch. The only exception is in eyes with inferior vitreous base hemorrhage where 'leaching' of blood from this area may cause early postoperative bleeding and cautious shaving of the vitreous base inferiorly could therefore be of benefit.

When undertaking TRD surgery, identification of the proper plane between the posterior hyaloid and the retina is crucial and greatly facilitates posterior hyaloid separation and membrane dissection. With this in mind, we usually start the dissection from the posterior pole and move outwards. Vitreoschisis, if present, usually does not exist over the posterior pole and hence it is good area to start dissection. After a very limited central vitrectomy mainly to clear the view from any vitreous hemorrhage, we stain the posterior hyaloid/epiretinal membranes with either trypan blue or ICG. We then use a vitreoretinal forceps to peel the hyaloid/epiretinal membrane off the optic nerve edge. While peeling of diabetic fibrovascular membranes in diabetic vitrectomy is generally not advisable due to strong attachment of retina and membranes, in our experience, peeling over the optic disc is safe and is unlikely to cause problems apart from some risk of bleeding from the avulsed vessels. Having exposed the 'correct' dissection plane that facilitates access to the fibrovascular epiretinal membranes, we would now use the vitreous cutter to remove the membranes, initially aiming for wide segmentation of membranes, and opening up spaces followed by further cutter-based techniques such as, cut back delamination and trimming of membranes down to epicenters. For membranes in eyes where the posterior hyaloid is totally plastered down to the retina and where membranes are adherent down to the retina, we would switch to bimanual surgery, using a horizontal curved scissor and forceps with the help of an additional chandelier light. As membrane dissection continues, the posterior hyaloid would then start to separate and core vitrectomy can be completed. As for ILM peeling, we peel the ILM only in eyes where the macula remains wrinkled after ERM removal and not routinely. Caution needs to be exercised when peeling ILM in eyes with marked diabetic macular edema so as not to roof macular cysts and cause a macular hole.

The best case scenario is to be able to finish the TRD surgery after one has completely separated the posterior hyaloid and removed all retinal membranes without iatrogenic retinal tears. Unfortunately this not possible to achieve in every case, at least in our hands. In our view the 'second best' is to remove central membranes (within and at the vascular arcades), trim the peripheral vitreous, leave peripheral membranes that are judged to be very adherent to underlying retina and still do not cause iatrogenic retinal tears. It takes a lot of experience to learn to resist the temptation of removing all epiretinal membranes and

in particular to be able to do this before creating iatrogenic tears. However, if during membrane dissection, retinal tears do occur, it is then important not to stop but rather continue to remove all traction around the tear (s) even if this results in creating further retinal tears. Causing retinal tears during dissection but successfully removing all traction around these tears and ending up with a gas tamponade is also a 'second best,' in our view. In the absence of retinal tears, we would perform laser photocoagulation while the eye is filled with saline. If retinal tears and rhegmatogenous detachment exist, we would then do the laser after air-fluid exchange or under perflurocarbon liquid (PFCL). In general, we prefer to do laser after air-fluid exchange unless retinal mobility was excessive and PFCL was needed to stabilize the retina during membrane dissection. The view under air could also be difficult in pseudophakic eyes with opened posterior capsule, and in these cases, we would also favor PFCL over air. We routinely apply laser up to the ora serrata in diabetic patients and also extend treatment to the pars plana at the entry sites to decrease the risk of entry site neovascularization, a cause for late postoperative bleeding.

Intraocular tamponade is usually not required in the absence of retinal tears. In cases where retinal tears exist, intraocular gas is usually preferred over silicone owing to superior tamponade effect and because silicone oil use in diabetic patients could trigger recurrent epiretinal membrane proliferation. However, we use silicone oil in cases that we end up with retinal tears that are associated with significant residual traction that could not be relieved and in complex cases that required retinectomies. Data from a UK large cohort national database study that comprised 510 diabetic vitrectomies with delamination/segmentation showed that approximately 60% of eyes required internal tamponade that included gas (mainly sulfurhexafluoride) in 63% of eyes, air in 18% and silicone oil in 19%⁴.

In conclusion, we believe that 'less is more' when undertaking diabetic TRD surgery. We would prefer to only remove the membranes over the macula and leave peripheral membranes and not to end up with lots of retinal tears that we failed to relieve traction around and have no alternative but to use silicone oil. In our view, gas tamponade is far superior to silicone oil in diabetic patients and the use of silicone oil in diabetic patients should be limited.

Authors Affiliations:

Ahmed B Sallam
MD PhD FRCOphth
Jones Eye Institute, University of Arkansas for Medical
Sciences, Arkansas, US.
Email: asallam@uams.edu

REFERENCES

1. **Jackson TL, Donachie PH, Sparrow JM, Johnston RL.** United Kingdom National Ophthalmology Database Study of Vitreoretinal Surgery: report 1; case mix, complications, and cataract. *Eye*, 2013; 27: 644-651.
2. **El-Sabagh HA et al.** Preoperative intravitreal bevacizumab use as an adjuvant to diabetic vitrectomy: histopathologic findings and clinical implications. *Ophthalmology*, 2011; 118: 636-641.
3. **Schwartz SD, Alexander R,** Hiscott P, Gregor ZJ. Recognition of vitreoschisis in proliferative diabetic retinopathy. A useful landmark in vitrectomy for diabetic traction retinal detachment. *Ophthalmology*, 1996; 103: 323-328.
4. **Jackson TL, Johnston RL, Donachie PH, Williamson TH, Sparrow JM, Steel DH.** The Royal College of Ophthalmologists' National Ophthalmology Database Study of Vitreoretinal Surgery: Report 6, Diabetic Vitrectomy. *JAMA Ophthalmol.* 2016; 134: 79-85.