Management of Complex Tractional Retinal Detachments in Proliferative Diabetic Retinopathy

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Fibrovascular proliferations and tractional retinal detachment in patients with proliferative diabetic vitrectomy pose unique challenges in management. Surgical outcomes have improved with the availability of modern instrumentation and pharmacotherapy. The availability of anti-VEGF agents, small gauge instruments, bimanual techniques and intraoperative optical coherence tomography have reduced the overall risk of complications and improved the visual outcomes.

Abstract

Keywords: proliferative diabetic retinopathy, tractional retinal detachment, radial segmentation, bimanual surgery

Introduction

Tractional retinal detachment is a common cause of vision loss in patients with proliferative diabetic retinopathy. Various techniques to manage membranes in diabetic vitrectomy include segmentation, delamination and en bloc vitrectomy. We discuss use of modern instrumentation and surgical manoeuvres which help in surgically managing cases of complex tractional retinal detachments in patients with proliferative diabetic retinopathy.

Surgical technique

The presence of thick fibrovascular proliferation which is tightly adherent to the underlying retina over broad areas and absence of a complete posterior vitreous detachment are major challenges in diabetic surgeries. These factors prevent the surgeon from finding a good plane of cleavage between the abnormal fibrovascular tissue and the underlying retina. The highly vascular membranes also bleed during dissection which hampers visibility and sometimes leads to creation of secondary membranes during the surgery itself which would need to be additionally tackled. Small gauge vitrectomy with new cutters having the cutting port closer to the distal end has enhanced the surgeons capability of handling fibrovascular membranes closely adherent to the retina. The basic principle involved in such surgeries is to first get a separation of the posterior hyaloid from the underlying retina as far as possible. The possibility of vitreoschisis in such cases also exists. Thus, one must be sure that the last layer of hyaloid has been removed as far as possible. We, prefer to break the connections (360 degrees all around) of this last layer of hyaloid from the underlying fibrovascular proliferation rather than doing an en bloc dissection. This helps in direct access to the fibrovascular tissue and prevents peripheral traction while dissecting the posterior tissue. Sometimes, residual connections of the peripheral posterior hyaloid to the posterior tissue may not be clearly visible initially. However, during the course of the surgery as one finds the correct surgical plane, these might become evident and can then be cut with the vitrector. Certain other surgical steps which facilitate such surgeries are -

1. Pre-operative use of anti-VEGF
The use of anti-VEGF agents before diabetic vitrectomy has been shown to decrease the duration of surgery, formation of fewer breaks, with lesser incidence of intra-operative bleeding. We generally inject anti-VEGF agents 3-4 days prior to the surgery.

2. Momentary mode
This is a special mode of vitreous cutting in the Constellation system (Alcon surgicals). It allows footpedal-controlled linear vacuum and side pedal-controlled cutting at low cut rate as and when required. This function allows for using the cutter as scissors. This helps completion of surgery without introducing multiple instruments. The drag caused by the cutter is also less than that due to a mechanical scissors. However, it may not suffice in complicated large membranes.

3. Bimanual surgery
A true bimanual surgery allows instruments for manipulation of membranes in both hands. We prefer to use a single 25G chandelier (xenon illumination) in the inferonasal quadrant or the superior 12’o clock position. Use of two chandeliers (29G), one at 6’o clock and the other at 12’o clock has also been described. Additionally surgeons also use illuminated intravitreal instruments. Holding and lifting the edge of tightly adherent membranes with forceps with one hand enables finding a tiny gap beneath them through which a curved scissors can be introduced to cut peg like connections between this fibrovascular tissue and retina. Sometimes, only a blunt dissection with the scissors in this plane helps to further open up the gap between these membranes and the retina.

4. Radial segmentation
Normally membranes are delaminated from outside inwards (periphery to posterior pole) or from inside out (disc/posterior pole to periphery). However if large thick membranes are present they cause difficulty in identifying the underlying plane of separation and traction on large membranes can cause peripheral traction and formation of inadvertent breaks. Thus it is recommended to first segment these into smaller pieces. We describe a technique

1. Pre-operative use of anti-VEGF

2. Momentary mode

3. Bimanual surgery

4. Radial segmentation
of cutting the membrane radially (radial segmentation) from the peripheral perimeter towards the posterior pole. Since the attachment over the macula is usually weaker, radial segmentation can be safely done right over the macular area also. This helps in splitting them into smaller pieces which can be further delaminated or left after dissecting further into small fragments. (Figure 1)

4. Hybrid 23/25G surgery
In this technique one port is of 23G, while the other two are 25G. The larger port can be used for instruments which may require a lot of manipulation. This allows for easier manipulation of finer instruments like forceps without the instruments bending. We generally use this in cases where the fibrovascular proliferation extends much beyond the arcades and also nasally. We found that when a lot of bending of the instruments is required to handle tissue away from the posterior pole the 23G forceps is easier to manipulated espit being held in the non-dominant left hand.

5. Bimanual cautery of bleeders
Intraoperative bleeding from neovascular fronds is a commonly encountered problem in diabetic vitrectomy. Loss of intraocular pressure during exchange of instruments further increases bleed causing loss of media clarity and difficulty in precise identification of the bleeders. Use of chandelier assisted bimanual technique helps to identify and cauterize the bleeders under direct visualisation. This also decreases the operative time and complications associated with repeated instrument exchange.

6. Use of Intra-operative optical coherence tomodraphy (OCT)
The use of intraoperative OCT provides clinically relevant information that may impact surgical management like the presence of epiretinal membranes, macular edema, posterior hyaloid traction and retinal detachment. Another important utility of intraoperative OCT is to ruleout presence of any inadvertent full thickness breaks. (Figure 2)

7. Stop overzealous dissection
The main aim in diabetic vitrectomy is to free the macular area of traction. In case of densely adherent membranes, limited segmentation to free the macular area suffices in most of the cases. Overzealous dissection increases the risk of iatrogenic breaks.

Figure 1: Radial segmentation of the broadly attached membrane

Figure 2: Intraoperative OCT to ruleout inadvertent full thickness iatrogenic break

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