Commentary: Vitrectomy for stage 4 and 5 retinopathy of prematurity - Selecting the right approach to the vitreous cavity

Vitrectomy has been established as the standard of care for repair of tractional retinal detachments (TRDs) in stage 4 and 5 retinopathy of prematurity (ROP).[1] In comparison to scleral buckling, vitrectomy addresses the vitreous tractional forces more directly and has been shown to have better structural and refractive outcomes.[2] However, vitrectomy in an infant has its unique set of challenges.[3] The most critical decision is choosing the appropriate site of entry for gaining access to the vitreous cavity. Infant eyes are not just smaller adult eyes, they are different anatomically. The important anatomic considerations in these eyes are the poorly developed pars plana (PP), globular crystalline lens occupying a larger proportion of the eyeball, lower scleral rigidity, and limited working space due to the lens and the anteriorly lifted tractional retinal detachment. All these factors influence the choice of approach to the vitreous cavity in these eyes.

Conventional PP vitrectomy is generally not possible in premature infants undergoing ROP surgery. The PP undergoes its maximum growth between 26 and 35 weeks of gestation and even in term infants has a mean width of just 1.87 mm.[4] Placement of sclerotomies through the PP carries an increased risk of creating iatrogenic retinal tears. Hence, a pars plicata approach is preferred and a simple recommendation for distance of entry from the limbus has been suggested by Gan and Lam for these eyes.[3] Children under the age of 1 year are best approached through sclerotomies that are 1 mm behind the limbus with 1 mm being added to this distance per year, until the age of 4 years. The sclerotomies should be parallel to the visual axis to avoid damage to the crystalline lens.

Another consideration while entering into eyes with TRDs due to ROP is the quadrant of placement of the sclerotomies. Stage 4 ROP, especially stage 4B, may have the temporal retina being pulled up to the retrolental space. Conventional vitrectomy dictates placement of two of the three sclerotomies in the temporal half; however, doing so in stage 4B ROP cases run the risk of creating an iatrogenic retinal break [Fig. 1a]. Ho *et al*. described an ab-interno incision with a microvitreoretinal blade to release the anteriorly traction before placing the ports in such cases.[5] We have been routinely using an *"all-nasal"* approach for lens sparing vitrectomy in cases with stage 4B ROP. Using this approach, all the sclerotomies are placed in the nasal half and the surgeon sits on the nasal side of the eye being operated. The infusion cannula is placed between the ports for the vitreous cutter and endoilluminator [Fig. 1b]. This allows for the cannula to remain stable and the shallow nasal bridge of the infant keeps the tip of the cannula away from the crystalline lens.

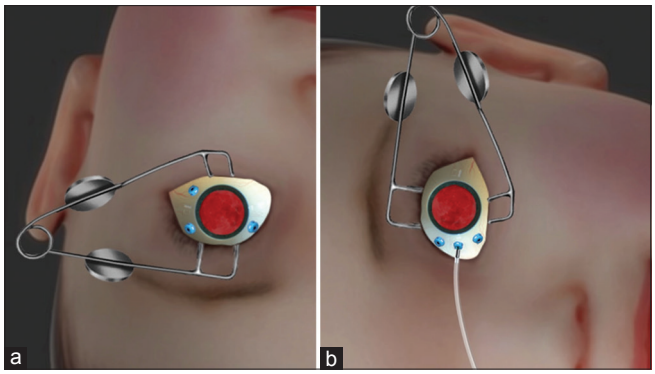

Figure 1: Approach to cases with stage 4B ROP (a) Conventional approach with cannulas placed in the inferotemporal, superotemporal, and superonasal quadrants. (b) "All-nasal" approach with the surgeon seated nasal to the eye being operated, showing the placement of the infusion cannula in the center and the other two ports on the sides

In eyes with stage 5 ROP, the extensive detachment of the retina obviates a more anterior approach which requires sacrificing the crystalline lens. Limbal sclerotomies with or without the use of iris hooks are commonly employed. This route of entry minimizes traction on the vitreous base and preserves the iris as well.[1,3] Iris root sclerotomies, passing through or just behind the iris root, placed 0.5 mm behind the limbus have been described for such cases.[6] The entry in this case is more horizontal than vertical and a lensectomy is performed in a majority of these eyes. A limbal-based approach has also been described for entering the vitreous cavity in such cases.[7] This approach avoids any chances of injury to the anterior retina. In the current study, the authors describe a hybrid clear corneal approach using 25 gauge instrumentation through 23 gauge incisions.[8] The authors recommend vertical incision through the cornea so as to limit corneal folds during instrument manipulation in the vitreous cavity. Although this improves the view during surgery, it may potentially reduce the self-sealing ability of the incisions. Both scleral and/or corneal incisions should be sutured in children, whenever in doubt.

As our understanding of ROP improves, techniques to approach TRDs also keep evolving. Although multiple variations in approaches to access the vitreous cavity in eyes of ROP babies have been described in literature, the anatomic and functional prognosis of surgeries for stage 4B and 5 ROP remains guarded.

Mohit Dogra, Simar Rajan Singh, Mangat Ram Dogra

Advanced Eye Centre, Department of Ophthalmology, Post Graduate Institute of Medical Education and Research (PGIMER), Chandigarh, India

Correspondence to: Dr. Mohit Dogra, Advanced Eye Centre, Post Graduate Institute of Medical Education and Research, Chandigarh - 160 012, India.
E-mail: mohit_dogra_29@hotmail.com

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