Pars plana implantation of glaucoma drainage devices - The way to succeed in refractory glaucoma

Glaucoma drainage devices (GDDs) have been used extensively to manage refractory glaucoma, especially in patients with previously failed partial-thickness filtering procedures or with a low chance of success. These devices create an alternate pathway for the aqueous outflow from the anterior chamber to an equatorial plate (surrounded by a bleb) through a long tube.[1]

In a conventional procedure, the GDD is inserted in the anterior chamber. However, many serious complications have been reported following the anterior chamber placement of the tube. Many studies have shown progressive endothelial loss over the first 2 years after surgery with maximum endothelial loss in the quadrant of GDD implantation. The mechanism of corneal endothelial compromise is unknown and likely multifactorial. Multiple hypotheses proposed include jet flow around the tube, tube corneal touch, tube uveal touch, foreign body reaction, pre-existing endothelial damage, intraocular pressure rise and change in the aqueous humor composition.[1,2]

Pars plana insertion of GDD into the vitreous cavity was first described in 1991.[3] In cases of corneal endothelial compromise, vascularized or obliterated angle due to peripheral anterior synechiae, and small eye with inadequate anterior chamber depth, placement of the tube in the anterior chamber is highly challenging. In these situations, pars plana tube placement is the preferred approach.[3] Moreover, pars plana tubes are appropriate for patients with neovascular glaucoma and in whom transpupillary laser is contraindicated and require a vitrectomy in addition to glaucoma surgery. Even for cases in which transpupillary retinal photocoagulation is possible, and the risk factors for failure of trabeculectomy are high due to active neovascularization, the use of a pars plana implant may be more appropriate.[4] Numerous studies have produced clinical data on the use of pars plana GDD implantation in various types of intractable glaucoma.[1,5,6] However, pars plana insertion of GDD tubes has complications too, including vitreous incarceration of the tube, vitreous hemorrhage and retinal detachment.[5] With the help of modern vitrectomy machines and high-level trained vitreoretinal surgeons, a complete peripheral vitrectomy can negate these complications.

The most common GDDs in use worldwide are the Ahmed glaucoma valve, which cost around INR 16,000, and the Baerveldt glaucoma implant, which is not available in India. The Aurolab aqueous drainage implant (AADI) is a low-cost (around INR 3,500) non-valved glaucoma drainage device modeled on the Baerveldt implant. It was introduced in 2013 by Aurolab, the manufacturing division of Aravind Eye Hospital, Madurai, India, and has shown promising results.[7] Most studies on the AADI describe the implant placement in the anterior chamber.[7,8] Recent studies have shown promising outcomes with pars plana placement of the tube.[1]

Different techniques and modifications have been used by surgeons to facilitate safe and appropriate pars plana implantation of GDD. A fornix-based or a limbal-based peritomy may be used for implant insertion though the former gives better exposure with less tissue damage. The patency of the tube should be checked by irrigating the tube through the 30-gauge needle or cannula using a sterile balanced salt solution. A complete vitrectomy with base dissection should be ensured using triamcinolone acetate to prevent traction and tube occlusion by the vitreous. After trimming the tube, it should be inserted under direct visualization with an adequate length such that it is easily visualized through the pupillary area in the vitreous cavity. A donor scleral or corneal patch graft is being used conventionally to cover the tube, which prevents tube exposure-related complications. A novel approach of fashioning a long partial-thickness scleral tunnel with a crescent blade starting from pars plana going posterior beyond the spiral of tillaux, instead of a patch graft, has been described.[9] Creating a partial-thickness scleral tunnel is cost-effective. However, though the authors commented that it saves donor tissue, it is always the cornea that cannot be utilized for any other purpose, and the sclera, which usually goes waste, is the one used. Another vital aspect of using autogenous tissue is the lack of cosmetic problems, especially in the inferior placed valves where the sclera may be too prominent, and some patients may complain of a whitish appearance which seems rather unsightly at times. The presence of original tissue near the limbus as described here overcomes this significant cosmetic blemish and has been used by us for many years.[6]

Every glaucoma surgeon must acquire the skill to perform pars plana GDD implantation combining a technique either in the form of a partial-thickness scleral tunnel or donor scleral patch graft to avoid tube erosion and migration. A critical aspect of the procedure is the availability of a vitreoretinal associate for performing a complete vitrectomy along with a regular posterior segment examination. A complete vitrectomy with adequate shaving of the vitreous base can negate tube occlusion and vitreous traction complications. In this regard, we want to reiterate that if the space in the anterior chamber is adequate and there are no clear hurdles, then the tube implant in the anterior chamber should be the first option for the reason that the posterior chamber implant is indeed a more complicated surgery. Thus, this procedure should be limited for situations where the anterior chamber implant is likely to create long-term corneal decompensation or where putting the anterior chamber implant is not feasible.

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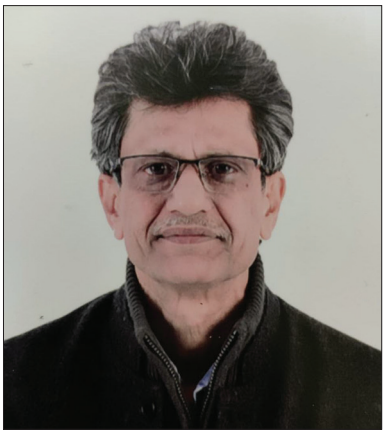

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