

Succeeding With the Pars Plana Glaucoma Implant

Indications for and surgical advice on this shunt's placement.

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The use of tube shunts to control difficult glaucomas is increasing as new techniques for improving early surgical success become widespread. One technique now accepted involves placing the shunt into the pars plana instead of the anterior chamber. This article reviews the indications for pars plana shunt placement and shares tips for success with this technique.

INDICATIONS

Pars plana shunts are indicated in several settings. First, the devices are appropriate for eyes that have undergone (or are expected to need) corneal transplantation and in which a trabeculectomy will likely fail. Anterior chamber shunts are associated with a higher risk of graft failure. By placing a pars plana implant, however, it is possible to keep the tube away from the cornea in an eye that may have conjunctival scarring or chronic inflammation.

Additionally, pars plana shunts are appropriate for patients who require a vitrectomy in addition to glaucoma surgery—for example, someone who has neovascular glaucoma and in whom transpupillary laser is contraindicated. In such a case, the surgeon may perform vitrectomy with an endolaser and then implant a pars plana shunt. Even for cases in which transpupillary retinal photocoagulation is possible and the risk factors for failure of trabeculectomy are high (ie, the presence of active neovascularization), the use of a pars plana shunt may be more appropriate. Other settings in which shunts are typically valuable and a vitrectomy is otherwise indicated include chronic uveitis, neovascular glaucoma, previous failed filtering surgery, or cases of conjunctival scarring. All of these may benefit from a pars plana approach.

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COMPARISON WITH OTHER MODALITIES

Implants Versus Medication

Generally, surgery is not indicated unless medications have failed or are likely to fail. In cases in which patients are on multiple medications and require surgical intervention for other reasons (ie, cataract extraction), however, the placement of a pars plana shunt may be combined with the other surgical procedure.

Implants Versus Trabeculectomy

For the most part, surgeons perform trabeculectomy before considering a shunt of any type. A previous failed trabeculectomy is not a prerequisite for performing shunting procedures, however. The primary issues in deciding which procedure to perform are the likelihood that the trabeculectomy will be successful and whether the patient requires very low IOPs. A trabeculectomy usually achieves a lower IOP than does a shunt of any type. Pars plana shunts usually lower IOP similarly to anterior chamber shunts; generally, they achieve a target of approximately 18 mm Hg without additional therapy. In a patient with a difficult secondary glaucoma and an IOP in the 40s or 50s, lowering the pressure to 18 mm Hg is often adequate, and a shunt procedure may be expected to achieve this reduction. If a patient requires a much lower IOP and a trabeculectomy will likely be successful,

then placing a shunt is not the procedure of choice. Trabeculectomy is often unsuccessful when combined with other surgery (except cataract extraction); a shunt is more appropriate for a patient who has a vitreous hemorrhage or who is scheduled to undergo corneal transplantation, for example.

Implants Versus Cyclophotocoagulation

Surgeons tend to reserve cyclophotocoagulation as a last resort, because it poses a higher risk of vision loss due to macular edema than does surgery. Additionally, cyclophotocoagulation causes a greater degree of pain. It is generally safer to err on the side of increasing outflow instead of decreasing inflow. Lastly, laser treatment is irreversible, whereas shunts can be restricted, adjusted, or removed if chronic hypotony occurs.

THE VARIOUS IMPLANTS

Any of the implants may be placed in the pars plana, but the presence of an elbow eases insertion. One shunt (the Baerveldt Pars Plana glaucoma implant; Pfizer Inc., New York, NY) is specifically designed for pars plana placement, and New World Medical, Inc. (Rancho Cucamongo, CA), offers an elbow as an add-on to any of its anterior chamber shunts. The three major factors to consider when deciding between shunts are (1) the surface area of each device, (2) the ease of implantation, and (3) the presence or absence of a valve.

The surface area of an implant is directly related to the final IOP achieved, and various studies¹ have found that surface areas of up to 350 mm² lower IOP further than smaller implants. Therefore, up to a point, larger is better. The Baerveldt implant's availability in a 350-mm size and the single-quadrant surgery for its placement are two reasons that the device is frequently the choice of glaucoma specialists. Because the implant does not offer any sort of flow restriction, however, surgical technique must be modified to restrict flow. The Baerveldt Pars Plana glaucoma implant is identical to the 350-mm anterior chamber device except that it has an integrated elbow for implantation via a preplaced sclerostomy (generally, the one used for vitrectomy).

The Molteno Implant (Molteno Ophthalmic Limited, Dunedin, New Zealand) is equally effective, but achieving adequate surface area requires a double plate and surgery in two quadrants. Like the Baerveldt Pars Plana glaucoma implant, the Molteno Implant does not contain a valve or any other sort of mechanism for regulating early postoperative IOP. The most common method of occluding these shunts is tubal ligation with either a VICRYL suture (Ethicon Inc., Somerville, NJ), which will dissolve on its own, or a nylon suture, which

the surgeon may laser. The second method involves an obturator (3–0 or 5–0 PROLENE [Ethicon Inc.]), which internally occludes the tube. The obturator may be combined with an external ligature of either nylon or VICRYL, and it may be removed at the slit lamp approximately 4 to 6 weeks postoperatively, after encapsulation of the plate has occurred. Although it averts early postoperative hypotony, unfortunately, encapsulation may not happen before leakage around the tube seals. For that reason, early, high IOPs may occur. Venting slits created in the tube itself with a suture needle and located anterior to the obturator may help mitigate the problem.

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The Baerveldt Pars Plana and Molteno implants are widely used, and the majority of patients who receive them have high IOPs during the early postoperative period. By contrast, the Ahmed Glaucoma Valve (New World Medical, Inc.) features a valve designed to regulate early postoperative IOP. Hypotony can still occur shortly after surgery, and low pressure may result in suprachoroidal hemorrhage. Additionally, postoperative hypotony in a uveitic eye, for example, can cause aqueous production to cease and the valve to close. Occasionally, the valve fuses shut, necessitating removal of the device.

A properly functioning Ahmed Glaucoma Valve is often effective at IOP control, but its surface area is probably too small to produce adequate long-term IOP control, although two-plate devices are now available. The single-plate valve is useful in patients who do not need a large surface area (in uveitic glaucoma, the hypoproduction of aqueous is a problem).

IMPLANTING THE BAERVELDT PARS PLANA DEVICE

Because I normally use the Baerveldt Pars Plana glaucoma implant, this section focuses on the implantation of this device. The first step is to decide where to place the implant. I generally prefer the superotemporal quadrant for its easy accessibility and long distance from the optic nerve. Occasionally, however, another location is preferable. For instance, it is desirable to avoid incising a preexisting bleb. In such cases, the incision may be creat-

ed around the bleb rather than at the limbus. If there is insufficient conjunctiva in this quadrant due to scarring, an inferior temporal approach is appropriate.

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Next, the surgeon creates a conjunctival peritomy that is large enough, when the quadrant is opened, to allow visualization of the anterior edges of the lateral and superior rectus muscles. As much conjunctiva as possible should be preserved. The surgeon opens the quadrant with a curved Stevens scissors.

Unlike with an anterior chamber device, it is important to measure 11 mm posterior to the limbus and mark the locations for suturing the implant. The surgeon should clean the adhesions between the muscles and sclera with a muscle hook and free sufficient space beneath each muscle for plate insertion. I prefer to suture the implant with 5-0 MERSILENE (Ethicon Inc.) on a spatulated needle. The surgeon must ensure that the needle is flat both during insertion into the sclera and when pulled out of the sclera, or the suture will not hold. This step is the most dangerous part of the surgery; scleral perforation has been reported.² Next, the surgeon marks the site for the pars plana vitrectomy at the location where the tube should enter the vitreous cavity.

At this point, I turn the case over to a retinal specialist who performs the vitrectomy. The vitrectomy does not need to be total, but no vitreous should rise to the insertion site, no matter how fluid is directed in the eye. The elbow of the shunt makes the shaving of the pars plana unnecessary, unlike when a non-elbowed shunt is placed in the pars plana.

Once the vitrectomy is complete, it is important to verify both with and without irrigation that no remnants of vitreous will come up near the sclerostomy site. Next, the glaucoma surgeon inserts the Hoffman elbow through the sclerostomy and sews it down with two 8-0 nylon sutures. It is at this point when the surgeon should perform total occlusion of the tube. Generally, I pass a 3-0 PROLENE suture into the tube up to 2 mm posterior to the elbow. This suture will act as a stent and may be removed 4 to 6 weeks postoperatively. An 8-0 nylon suture wrapped three times is used to ligate the tube around the obturator suture. If there is no flow

around the elbow upon insertion into the sclerostomy, fenestrating the tube three times with the needle from the 8-0 nylon will provide a measure of early postoperative IOP control until the obturator is removed. Although exposure of the elbow is rarely a problem, I cover the elbow with a scleral patch graft. I have yet to encounter erosion of the device through the graft. Preferably, the closure of the conjunctiva is watertight, but that may not be possible.

The postoperative course with a pars plana implant is similar to that for any anterior chamber tube shunt. The total occlusion of the tube causes many patients to have high IOPs during the early postoperative period. Unfortunately, the surgeon cannot predict intraoperatively how long IOPs will remain in a tolerable range before the removal of the obturator. The fenestrations are somewhat unpredictable, as is leakage around the tube. Hypotony is not common.

Frequently, I must manage high pressure with medications (including oral carbonic anhydrase inhibitors, if necessary) for 4 to 6 weeks until I can remove the obturator. The greatest difficulty of the postoperative course is waiting out this period of high IOP. Pulling the obturator too soon will result in hypotony and frequent suprachoroidal hemorrhage.

ADVANTAGES OF THE PARS PLANA APPROACH

Vitreous is more likely to occlude a shunt placed in the pars plana compared with one placed in the anterior chamber, but the latter location increases the risk of occlusion with the iris. In addition, a pars plana implant will not touch the cornea, and retraction of the shunt from the pars plana does not occur. Accurate positioning is less important with a pars plana device compared with an anterior chamber implant. In general, I perform fewer revisions of pars plana versus anterior chamber shunts.

For all of these reasons, I favor a pars plana implant for any patient requiring a vitrectomy. □

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