

When Should We Perform Incisional Glaucoma Surgery?

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Abstract

Deciding when to perform glaucoma surgery can be challenging despite evidence in the literature supporting its safety and efficacy. In addition to clinical examination, visual field testing, and optic nerve imaging, other patient factors such as age, family history, and ocular comorbidities influence the decision-making process and are especially helpful in patients with borderline intraocular pressure and/or equivocal progression. The potential for a complicated postoperative course and lack of immediate visual benefit makes glaucoma surgery less straightforward than other ophthalmic procedures. The decision to operate is ultimately based on a discussion between each individual patient and the glaucoma surgeon, with careful consideration of disease severity, risk for progression, and quality of life.

Keywords

Glaucoma, glaucoma drainage implants, glaucoma surgery, intraocular pressure, trabeculectomy

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The decision to perform incisional glaucoma surgery is not an easy one. Surgery has traditionally been reserved for patients who are progressing or are deemed likely to progress despite maximally tolerated medical and/or laser therapy. It is at this point that the risk for continuing to observe outweighs the risks for performing surgery. There are numerous factors to be considered before consenting a patient for surgery but we think the most essential part of this process is to remember that each patient is unique. One cannot look at a simple set of parameters and decide to operate if one value is outside of the normal range. The decision is far more complex.

Risk–Benefit Analysis

Glaucoma tends to be a slowly progressive disease that can be monitored over time via changes in optic nerve appearance, visual fields (VFs), and optic nerve imaging. The conventional approach is to attempt medical therapy or laser trabeculectomy prior to surgery to minimize risk to the patient. The efficacy of antiglaucoma medications may be limited in certain patients by local and systemic side effects.

Despite a multitude of data to support the safety and effectiveness of traditional glaucoma surgery, including trabeculectomy and glaucoma drainage device (GDD) implantation, these procedures are associated with the potential for adverse effects. Postoperative complications following trabeculectomy with antimetabolite use include shallow or flat anterior chamber, hypotony, choroidal effusions, bleb encapsulation,

bleb leak, and blebitis/endophthalmitis. Complications relating more specifically to GDD implantation include tube obstruction, tube erosion, and motility disturbances.^{1,2}

What Factors Influence My Decision-making Process?

The intraocular pressure (IOP) should first be evaluated and one must try to determine if the patient is progressing or likely to progress at this IOP. When the IOP is at a level that is clearly too high, 30–50 mmHg, then the decision is straightforward. However, when the IOP is in the 20–30 mmHg range or even lower, the decision is not so straightforward and other measures need to be evaluated to make a proper decision.

We next evaluate the VFs and see if there is clear progression on testing. Apparent progression necessitates confirmation with repeat VFs, as substantiated by the Collaborative Normal Tension Glaucoma Study.³ Chauhan et al. recommend a minimum of six VFs over 2 years to confirm progression.⁴

We will often compare disc photographs and structural testing of the optic nerve to see if there has been progressive damage. This is more helpful in cases of preperimetric glaucoma and elevated IOP. When a patient has advanced disease, we find VF testing to be more helpful in judging progression.

Another important factor to consider is previous ocular surgery. If a patient has had a particularly suboptimal outcome or serious complication in the opposite eye, there may be more hesitation on the part of both the physician and the patient to go to the operating room. Though this should not ultimately preclude further surgery, medications such as miotic agents or oral carbonic anhydrase inhibitors may be initiated prior to surgical treatment.

The age of the patient plays a role in my decision-making as well. We have a lower threshold for surgical intervention in younger patients with advanced disease. On the flip side, for patients who are older and not healthy, we may elect to defer surgery if we feel that there is a chance they will not lose functional vision in their lifetime.

Family history is an established risk factor for glaucoma.⁵ We always inquire about first-degree relatives with this condition and specifically ask about blindness in the family. Again, this does not outweigh other factors such as IOP and VF loss, but we may be more inclined to recommend surgery if a borderline patient has a mother or father blind from glaucoma.

Special Situations

There are certain unique situations that come about that alter our decision-making process. Ocular surface disease (OSD) is a common comorbidity in patients with glaucoma and warrants special consideration in the decision to perform glaucoma surgery. A high prevalence of OSD has been reported among patients with glaucoma, and the severity of symptoms has been positively correlated to the number of topical antiglaucoma medications.^{6,7} Symptoms of OSD may be minimized by using preservative-free preparations and aggressive lubrication when possible, but some patients continue to experience disabling discomfort and conjunctival hyperemia despite these conservative measures. Though surgery can be challenging in this patient population and may present its own concerns, it is often a better option than chronic red, irritated eyes and a suboptimal IOP.

Another unique and challenging circumstance is that of patients with multiple ocular comorbidities who require combined surgical procedures. Patients with preexisting glaucoma or those at high risk for developing elevated IOP following cornea or retina surgery may benefit from GDD implantation in either a single or two-stage procedure. For example, patients undergoing Boston type 1 keratoprosthesis (KPro) implantation are at risk for the development of glaucoma or progression of preexisting glaucoma, and later placement of a GDD may be complicated by conjunctival scarring or altered anterior segment anatomy following KPro. Studies have shown that combined GDD and KPro surgery may result in improved perioperative IOP control.^{8,9}

Eyes with retinal detachment have a higher incidence of glaucoma than the general population, and patients requiring retinal detachment repair may benefit from combined surgery. Scarring of the conjunctiva and rectus muscles following scleral buckling can make future tube shunt placement technically challenging. Lima et al. reported successful IOP control in patients undergoing simultaneous scleral buckle and Baerveldt glaucoma implant surgery.¹⁰

Other important factors to consider include compliance with medications and office visits, as well as the ability to afford medications. Patients

with a history of noncompliance may be poor candidates for any type of therapy. Laser trabeculoplasty may be preferred over surgery in such situations. When medication and/or laser therapy fail to control IOP and surgery is the next best option, the likelihood that a patient will adhere to his or her postoperative visit schedule as well as medication regimen must be carefully assessed before proceeding to the operating room. Arranging for homecare services or confirming family support may help with compliance after surgery and in turn optimize surgical outcomes.

Why Is It So Difficult to Make the Decision to Go to Surgery?

Glaucoma surgery is not as straightforward as many other procedures. Even when surgery goes well, the postoperative period can be fraught with complications and patient complaints. As such, multiple preoperative visits are needed to establish a good rapport with the patient so that the following issues can be addressed:

1. Patients do not see better and often see worse after surgery (except if a combined procedure is performed). Transient vision loss is common after filtering surgery, and visual recovery may take up to 2 years.¹¹ Glaucoma surgeons must be sure that patients understand these risks prior to pursuing surgery.
2. Patients are often uncomfortable after surgery. Their eyes are red and irritated, sometimes for weeks, and they frequently continue to need many drops.
3. Patients do NOT always see or understand the need for surgery, given the slow, asymptomatic loss of vision that is typical for glaucoma. Patients understand the need for surgery when their retina is detached or cornea has failed.
4. The risks for surgery. A select few are listed here: hypotony, suprachoroidal hemorrhage, blebitis, endophthalmitis, diplopia, tube erosion, and corneal decompensation. Many are vision-threatening complications that often necessitate trips back to the operating room.

Despite all of these factors, surgery is often necessary to prevent progressive visual loss and blindness. And, as studies have indicated, good outcomes without serious complications are the result for many patients.

Wilson et al. conducted the first prospective, randomized trial comparing GDD with trabeculectomy. A total of 123 patients were randomized to receive an Ahmed glaucoma valve or trabeculectomy as a primary surgical procedure for glaucoma. With an average follow-up of 31 months, the mean IOPs and adjunctive medications were similar in the two groups. No statistically significant differences between groups were found in visual acuity, VF, and short- or long-term complications. The cumulative probabilities of success were similar between both procedures at final follow-up (68.1 % trabeculectomy group versus 69.8 % Ahmed group).¹²

The Tube Versus Trabeculectomy (TVT) Study was a multicenter randomized clinical trial that evaluated the safety and efficacy of the 350 mm² Baerveldt glaucoma implant to trabeculectomy with mitomycin-C in patients who had undergone previous cataract extraction with intraocular lens implantation and/or failed filtering surgery. Tube shunt surgery had a higher success rate than trabeculectomy throughout 5 years of follow-up (70.2 % tube group versus 53.1 % trabeculectomy group). No significant differences in IOP and glaucoma medical therapy were observed between

the two procedures at 5 years. Early postoperative complications were more frequently seen after trabeculectomy compared with tube shunt placement, although most were transient and self-limited. The rates of late postoperative complications, serious complications, and vision loss were similar with both procedures.¹²

Two ongoing randomized clinical trials are comparing the safety and efficacy of the Ahmed glaucoma valve implant (model FP7) and Baerveldt glaucoma implant (model 101–350) and both have shown good results with each device.^{13,14}

Seeing That We Achieve Good Outcomes, Should We Be Operating Earlier?

Doctors, as well as patients, are often reluctant to go to the operating room early during the course of treatment despite the results of landmark studies such as the Collaborative Initial Glaucoma Treatment Study (CIGTS) and Moorfields Primary Treatment Trial (PTT), which have challenged the traditional therapeutic approach.

In the PTT, patients who underwent trabeculectomy had a mean IOP of 14.5 mmHg at 5 years compared with 18.5 mmHg for those patients treated with either medication or laser therapy. In addition, there was a higher rate of success for the surgical group that was sustained throughout the 5 years of follow-up.¹⁵

The CIGTS study found that lowering IOP with initial filtering surgery is as effective as medical therapy for slowing progression of VF loss. In fact, patients with more advanced VF loss actually did better with initial surgery compared with those who were initially treated with medication.¹⁶ Surgically treated patients likely benefit from less diurnal IOP fluctuation, lower peak pressures, and a lower mean IOP. Neither the PTT nor CIGTS found any significant difference in the mean loss of visual acuity between the medical treatment and surgery groups.

A survey of the members of the American Glaucoma Society was performed to see how practice patterns have been affected by eight

landmark glaucoma studies. Of note, those surveyed were asked to answer whether they agree or disagree with the following statement: "I am more likely to perform surgery as initial treatment for patients with moderate to severe glaucoma." Only 20 % of those surveyed agreed with this statement despite the results of the CIGTS study, indicating that although there is good evidence to operate early, most elect to start with a more conservative approach.¹⁷

What About Minimally Invasive (Microinvasive) Glaucoma Surgery?

Minimally invasive, or microinvasive, glaucoma surgery (MIGS) has emerged as a new class of procedures with the potential to decrease IOP, with less associated risk than traditional incisional glaucoma surgery.¹⁸ The efficacy of the MIGS procedures available today is limited compared with that of incisional surgery, but its favorable safety profile may lead surgeons to intervene earlier on patients with mild to moderate glaucoma. Many MIGS procedures employ an *ab interno* approach and as such can be performed concurrent with clear corneal cataract surgery. As MIGS undergoes further development and refinement, it may help delay or supplant more invasive surgery in a subset of glaucoma patients.

In summary, we recommend asking four questions when deciding when to perform incisional glaucoma surgery:

1. Is the patient progressing or likely to progress at the current IOP?
2. What is the rate of progression?
3. How old is the patient, and will he or she lose useful vision in his or her lifetime?
4. Do the potential benefits of surgery outweigh the risks?

Until we develop the ideal glaucoma surgery—one that provides maximal IOP reduction with minimal complication and failure rates—the decision of when to perform incisional glaucoma surgery will rely on the experience of the surgeon, and a combination of objective and subjective factors unique to each patient. ■

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