SURGICAL MANAGEMENT OF TRAUMATIC GLAUCOMA

A stepwise approach.

BY OMOLOLA O. IDOWU, MBCHB, MRCS(ED), AND CARLA I. BOURNE, MD

Glaucoma management after ocular trauma is challenging. A thorough history and detailed examination are required for accurate diagnosis and appropriate intervention. When medical therapy fails, surgery often becomes necessary. The choice of procedure is dictated by the nature and timing of injury, conjunctival health, the presence of inflammation, concomitant ocular morbidities, and any preexisting history of glaucoma. In this article, Drs. Idowu and Bourne discuss a stepwise approach to the surgical management of traumatic glaucoma. In addition to reviewing traditional glaucoma surgeries, they explore the role of microinvasive glaucoma surgery (MIGS) in traumatic glaucoma.

—Sarwat Salim, MD, section editor

Glaucoma secondary to trauma can be multifactorial and may occur after blunt or lacerating trauma, chemical exposure, electromagnetic radiation, or surgery. IOP elevation may occur acutely or chronically. Some eyes that are predisposed to glaucoma may initially present with low IOP after an ocular injury. This is usually seen in the setting of inflammation or a cyclodialysis cleft. The IOP gradually increases as a result of the treatment of underlying inflammation, normal healing processes, or direct damage to the trabecular meshwork. Typically, the IOP rises because of reduced aqueous outflow facility through a damaged trabecular meshwork.[1]

Surgical intervention is indicated when medical management or observation has failed and optic nerve damage is imminent. The nature of the injury, associated ocular and nonocular conditions, and the degree of IOP elevation determine the timing and nature of surgical repair. Occasionally, conditions may limit a full slit-lamp examination, making ultrasonography and radiology necessary to reveal the full extent of injury. It is important for clinicians to maintain a high index of suspicion for occult causes of elevated IOP (eg, a retrobulbar hematoma needing a canthotomy or neurosurgical intervention for a carotid-cavernous fistula causing elevated episcleral venous pressure).

Fortunately, recent advances have expanded the surgical options for glaucoma subspecialists.

TRADITIONAL INCISIONAL GLAUCOMA SURGERY

Trabeculectomy

Standard trabeculectomy and surgery with the Ex-Press Glaucoma Filtration Device (Alcon) require an intact conjunctiva. The presence of increased inflammation after trauma may predispose the eye to scarring and early bleb failure despite the use of antimetabolites. Trabeculectomy has improved outcomes when the initial injury is remote and the eye is quiet, such as in angle-recession glaucoma. Conversely, the procedure is relatively contraindicated in cases of chemical injury or eyes with damaged conjunctiva.[2-7]

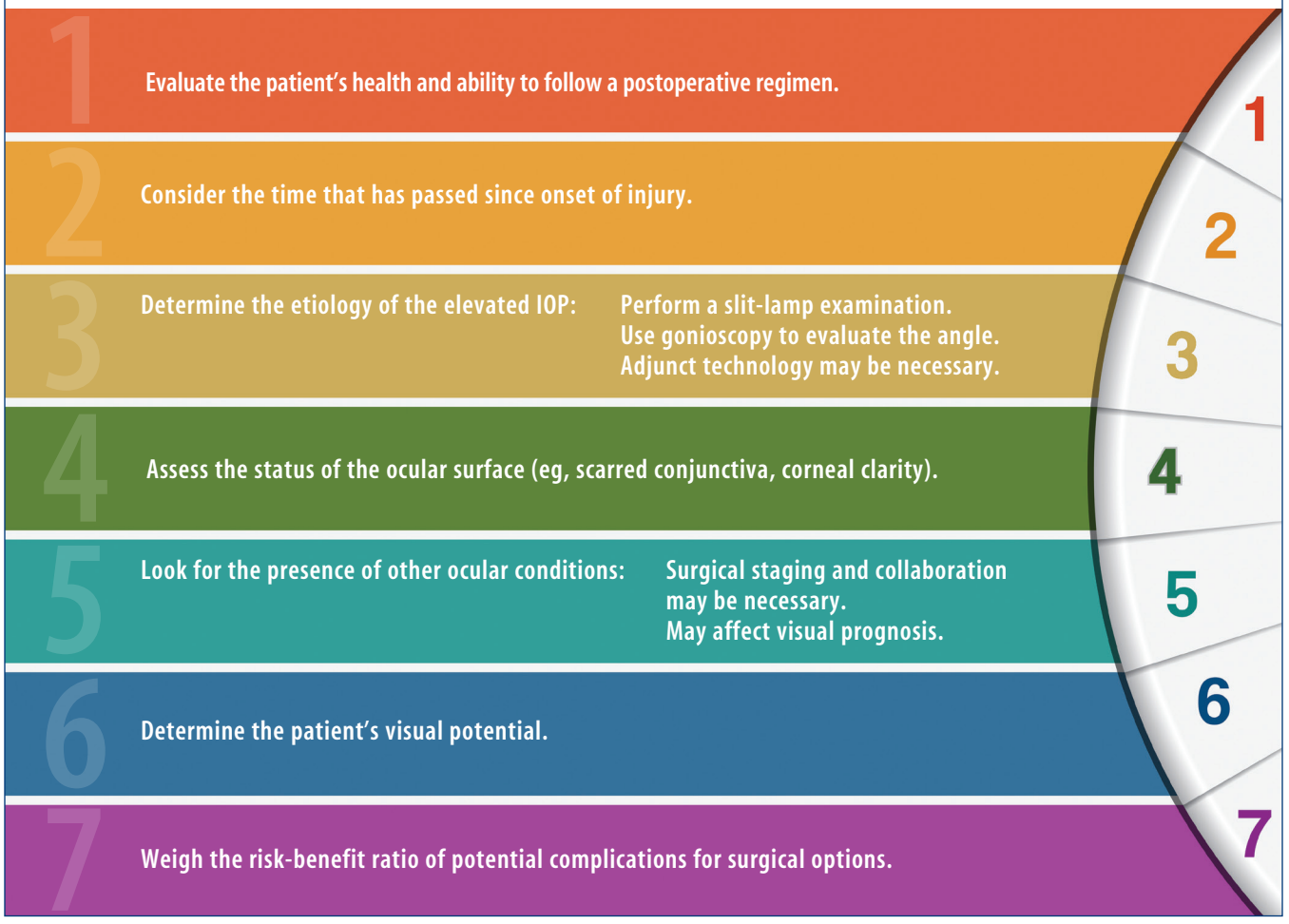
Glaucoma Drainage Devices

The success of glaucoma drainage devices is influenced by conjunctival health and the presence of inflammation in the eye. These implants can be inserted into the anterior chamber, sulcus, or pars plana. If the amount of conjunctiva at the site of surgery is insufficient, conjunctival autografts from the same or contralateral eye or amniotic membrane grafts can be used. This versatility makes glaucoma drainage devices a valuable option for the management of patients with traumatic glaucoma.[2,6-11]

MICROINVASIVE GLAUCOMA SURGERY

MIGS reduces IOP by improving the flow of aqueous humor through Schlemm canal and adjacent collector channels or by shunting aqueous directly from the anterior chamber into the subconjunctival or suprachoroidal space. MIGS procedures are most useful when angle anatomy is preserved and the cornea is clear, allowing the identification of anatomical landmarks. Most of the MIGS devices approved by the FDA are indicated for primary open-angle glaucoma or chronic angle-closure glaucoma, but clinicians have expanded their use to the surgical management of other forms of the disease. There have been reports of successful IOP reduction

STEPS FOR DECIDING HOW TO APPROACH TRAUMATIC GLAUCOMA



in traumatic glaucoma with the iStent Trabecular Micro-Bypass Stent (Glaukos), ab interno trabeculotomy using the Trabectome (NeoMedix), and gonioscopy-assisted transluminal trabeculotomy.[12-14]

These ab interno procedures/devices bypass the trabecular meshwork, allowing aqueous to directly access Schlemm canal. The number of traumatic glaucoma cases remains small in these reports, and larger studies with longer follow-up are necessary to elucidate the efficacy of these newer procedures in this setting. The CyPass Micro-Stent (Alcon) and Xen Glaucoma Treatment System (Allergan) recently received FDA approval, but their efficacy in traumatic glaucoma has not been established. Several ab interno and ab externo supraciliary devices are under investigation to control IOP. They may be subject to scarring of surrounding tissues, however, and may be less optimal in the setting of preexisting conjunctival scarring. These MIGS procedures may also require the application of antimetabolites, as is typical with trabeculectomy.

TRADITIONAL LASERS

Lasers can be used in the management of traumatic glaucoma to improve trabecular outflow and to decrease aqueous production.[10,15-20]

Laser iridotomy restores the flow of aqueous humor from the posterior to anterior chamber if pupillary block develops due to posterior synechiae. A clear cornea is required for visualization of anterior chamber structures. Laser iridotomy does not improve outflow through the trabecular meshwork.

Laser trabeculoplasty risks IOP spikes by inducing further scarring of the angle structures in the setting of compromised trabecular function and, thus, is relatively contraindicated in the setting of traumatic glaucoma.

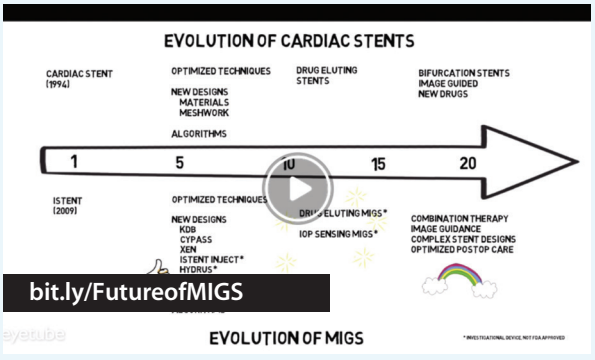
Transscleral diode cyclophotocoagulation reduces aqueous humor production and is useful when incisional surgery cannot be performed because of corneal/conjunctival status or a poor visual prognosis. There is an increased risk of hypotony after trauma, and it is important to titrate therapy to avoid side effects.

CONTEMPORARY LASERS

Recent options for ciliary ablative procedures are associated with lower rates of hypotony than traditional transscleral photocoagulation.[20] Further studies are needed,

WATCH IT NOW

Devesh K. Varma, MD, forecasts the future of microinvasive glaucoma surgery. Dr. Varma reviews devices in development and conceptual applications that may be available in the future, including drug-eluting stents, IOP-responsive devices, and personalized 3-D printed devices.



however, to determine these interventions' long-term outcomes and potential role in traumatic glaucoma.

Endoscopic cyclophotocoagulation is especially useful when visualization is poor because of corneal scarring. The procedure uses a laser with a light source, aiming beam, and video monitor (E2 Microprobe Laser and Endoscopy System; BVI).[21]

Micropulse laser treatment (MicroPulse P3 Glaucoma Device and Cyclo G6 Glaucoma Laser System; Iridex) uses less laser energy than traditional continuous-wave transscleral diode cyclophotocoagulation and thus induces minimal inflammation.[20] Many surgeons are using this procedure in the setting of a good visual prognosis.[22]

Ultrasound ciliary plasty, currently awaiting FDA approval, involves the application of high-intensity focused ultrasound cyclocoagulation delivered by a circular, miniaturized transducer placed on the eye (EyeOp1; EyeTechCare). In one report, this procedure provided controlled targeting of the ciliary body, and the circular geometry of the device allowed precise, constant, and reproducible positioning.[23]

SUMMARY

New choices bring new challenges, and ophthalmologists will have to weigh the lower-risk profile of MIGS procedures against the proven efficacy of traditional surgery. A systematic approach to the treatment of traumatic glaucoma assists decision making (see *Steps for Deciding How to Approach Traumatic Glaucoma*). ■

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