Interpolated Conjunctival Pedicle Flaps for the Treatment of Exposed Glaucoma Drainage Devices

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Objective: To describe an alternative method to repair exposed glaucoma drainage devices (GDDs) when conventional attempts have failed.

Methods: Four eyes, from 3 patients, with severe ocular surface disease were included in the study. All eyes had previously received a Baerveldt GDD for uncontrollable intraocular pressure and postoperatively had exposed GDDs. The conjunctival defects were unrepairable with a scleral patch or pericardium, conjunctival advancement, or a conjunctival patch graft. Two eyes had chemical burns, one eye had extensive scarring from multiple surgical procedures, and one patient had rheumatoid arthritis. Each patient provided informed consent, and was given the option of removing the GDD and undergoing diode cyclophotocoagulation or attempting to save the GDD by a conjunctival pedicle flap. An interpolated conjunctival pedicle flap was taken from the cul-de-sac (fornix). The conjunctiva and Tenon capsule were incised radially to the tube, rotated from the fornix at a 90° angle, and sutured to the remaining healthy conjunctiva to cover the exposed tube.

Results: Postoperatively, all eyes had vascularized flaps that showed viable tissue. All eyes retained the GDDs, and the intraocular pressure has been under control during follow-up (7, 13, 25, and 27 months).

Conclusion: Interpolated conjunctival pedicle flaps seem to be a viable alternative to repairing exposed GDDs when other methods are impractical or impossible.

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GLAUCOMA drainage devices (GDDs) are being increasingly used for the treatment of refractory glaucomas. The complications are well-known, and include hypotony, choroidal effusions, diplopia, corneal decompensation, and endophthalmitis. Tube erosion has also been described, and various methods have been described to repair the defects. Some methods include conjunctival advancement and a conjunctival patch graft. If these methods prove unsuccessful, the GDD may have to be removed from the eye. To our knowledge, we report a new technique to repair exposed GDDs when conventional attempts fail.

Four eyes, from 3 patients, that had previously received a Baerveldt GDD (350 mm²) were included in this prospective nonrandomized investigation. All eyes underwent successful GDD surgery, with improved intraocular pressure (IOP) control, and had exposure of the GDD tube. All eyes underwent repair of the exposure by somewhat conventional methods that failed. The report of the 4 eyes follows.

METHODS

The patients received a peribulbar block consisting of a 1:1 mixture of 0.75% bupivacaine hydrochloride and 2% lidocaine hydrochloride, without epinephrine. The eye was prepared with a povidone-iodine (Betadine) solution and draped in a sterile fashion. A 7-0 polyglactin 910 (Vicryl) suture (model J546; Ethicon, Inc, Somerville, NJ), with a spatulated needle (model TG140-8, Ethicon, Inc), was placed in the superior clear corneal area for use in infraduction of the globe. The area of the exposed drainage tube was inspected, and the epithelial edges were denuded and repositioned with sharp and/or blunt Westcott scissors. Remaining partial Tutoplast (processed human pericardium) (Innovative Ophthalmic Products, Inc, Costa Mesa, Calif) or scleral patch grafts were removed. After inspection of the fornix area, the potential flap was marked. Blunt Westcott scissors were used to incise the conjunctiva and undermine the Tenon capsule, leaving the base of the flap attached to its original vascular supply. The flap was then rotated into position over the exposed tube and sutured in place.
the exposed tube, assuring adequate coverage of the tube without straining the flap on its vascular supply (Figure 3). A new Tutoplast graft was placed over the tube and sewn into episcleral tissue with multiple 7-0 polyglactin 910 sutures. The interpolated flap was then sewn with 7-0 polyglactin 910 sutures to the fresh edges of the host conjunctiva (Figure 4). Antibiotic/corticosteroid ointment was placed on the eye, and the eye was patched until postoperative day 1. The patch was then removed, and all patients received 1% prednisolone acetate and ofloxacin (Ocuflox) 4 times daily.

REPORT OF CASES

CASE 1

An 82-year-old white man, with advanced primary open-angle glaucoma, age-related macular degeneration, and pseudophakia, was seen at our clinic with an uncontrolled IOP while taking maximally tolerated medications. He was essentially monocular because of glaucoma and age-related macular degeneration. He required a Baerveldt GDD with a scleral patch graft to the right eye on March 28, 2001, because of an IOP to 35 mm Hg. Postoperatively, he had a suprachoroidal hemorrhage, requiring drainage. By May 4, 2001, a conjunctival melt over the tube appeared. The patient underwent conjunctival advancement and received a new scleral patch graft. Exposure of the tube occurred again 7 weeks later. Furthermore, peripheral ulcerative keratitis occurred with a corneal melt. A rheumatology consultation was obtained, and a diagnosis of rheumatoid arthritis was made (rheumatoid factor 1920). The patient received high-dose oral prednisone. An interpolated conjunctival pedicle flap was placed on the right eye on July 3, 2001. The 7-month follow-up proved a controlled IOP, a properly working GDD, and a stable conjunctiva without leaks. The peripheral keratitis has stabilized with a combination of oral prednisone and methotrexate. Follow-up was limited secondary to the unrelated death of the patient, 12 months after surgery.

CASE 2

A 60-year-old white man reported an injury to his left eye at the age of 13 years. He required initial repair of his ruptured globe at the time of the injury. A retinal detachment required a scleral buckle to the left eye during his fifth decade of life. Strabismus surgery was then performed, followed by a cataract extraction (through a scleral tunnel) without an intraocular lens placement. He also underwent argon laser trabeculoplasty and a trabeculectomy for uncontrolled IOP. Because of a continued uncontrolled IOP, he was referred for further surgical management. He required a Baerveldt GDD with a scleral patch graft and vitrectomy for his left eye on April 18, 2001. A 7-0 polyglactin 910 ligature was placed around the tube, anterior to the plate. The conjunctiva was excessively scarred from previous surgical procedures; however, the GDD was placed over the scleral buckle in the superotemporal quadrant. The tube was covered with a donor...
scleral patch graft, and the conjunctiva adequately covered the patch and closed nicely at the limbus. Postoperatively, the eye did well and the tube opened appropriately at approximately 5½ weeks. The patient’s IOP decreased from 29 mm Hg while using 3 medicines preoperatively to 11 mm Hg while using 2 medicines 4 months postoperatively. Five months after surgery, the patient returned with pain in the left eye and an exposed GDD tube approximately 2 mm posterior to the limbus. The conjunctiva and scleral patch graft appeared eroded. The implant was revised with conjunctival advancement, and a Tutoplast (pericardium) graft was placed over the tube. Adequate conjunctival closure was achieved. Within 1 month after this surgery, the patient was seen again with pain and an exposed tube. The patient underwent surgery, and an interpolated conjunctival pedicle flap was placed to repair the exposed GDD tube. Thirteen months postoperatively, the eye has excellent IOP control (15 mm Hg while not taking medications), a well-covered tube, and a functioning GDD. The patient is pain free, and the cosmesis of the eye is quite acceptable.

CASES 3 AND 4

A 46-year-old white man had severe ocular acid burns to both eyes in 1973. He required multiple penetrating keratoplasties, cataract extractions with posterior chamber intraocular lens implants, and amniotic membrane transplantations in both eyes. He required a bilateral Baerveldt GDD with scleral patch grafts in both eyes. Because of excessive scarring, there was inadequate conjunctiva to cover the tubes. After the placement of bilateral interpolated conjunctival pedicle flaps, both eyes have retained the GDD and have had adequate IOP control 25 and 27 months postoperatively.

COMMENT

Vascularized conjunctival flaps are most commonly used in eyelid reconstructions, as the Hughes tarsoconjunctival flap procedure, and corneal stabilizations, as the Gunderson flap procedure. The function of such flaps is to bring vascularized autologous tissue to an ocular area lacking surface integrity and sufficient blood supply to regain surface tissue coverage. Interpolated flaps are taken from a nearby, but not immediately adjacent, donor site and transposed to the recipient defect. A pedicle of this flap must pass over or under the intervening tissue to be considered an interpolated flap. A pedicle conjunctival flap, by design, contains an umbilicated self-sufficient blood supply. This vascularized flap can be transferred to an adjacent area lacking surface coverage, integrity, and an underlying blood supply.

Tube erosions through the conjunctiva are infrequent but known complications of GDD surgery. Exposure of GDD tubes seems to be a risk factor for endophthalmitis; therefore, the erosions must be repaired promptly as long as infection is not present. Little information exists as to the best repair method for tube ex-
There seems to be no known incidence of tube exposure published. Tube exposure can be often repaired conservatively, especially if the defects are small; however, small numbers have been published on the repair of tube extrusion and erosion. Methods of repair include conjunctival advancement, a repeat scleral patch graft or Tutoplast graft, or even a conjunctival patch graft. Unfortunately, excessively scarred conjunctiva in these types of eyes can prevent good closure over the exposed tube. Added insults to the conjunctiva (such as chemical burns or disease processes such as rheumatoid arthritis) can be devastating to the integrity of the conjunctival surface and can make it impossible to cover defects associated with tube erosions. All 4 eyes described in this series underwent numerous operations, had extremely fragile conjunctiva, and had advanced optic nerve disease. Furthermore, these eyes had excessively scarred tissue, ischemia/vasculitis (as in case 1), and alkali burns, which presumably led to the dehiscence.

The decision to place the interpolated pedicle flap was considered a last effort to save the GDD. The only options left in each case were to remove the tube and to consider diode cyclophotocoagulation. All 4 eyes have regained functional use of the GDD and a stable IOP under control. The cosmetic appearance has proved excellent. To our knowledge, this is the first description of interpolated flaps used in glaucoma surgery. With continued follow-up and experience with other diagnostic challenges, we believe this procedure is a potential technique to use in various tube exposure problems.

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