

Tube Shunts: Preventing Erosion

A report on some of the newly available options for covering a tube.

BY STEVEN R. SARKISIAN, JR, MD

As the popularity of tube shunts for the treatment of glaucoma continues to grow, so, too, do the options for materials with which to cover these devices. Historically, surgeons favored sclera or processed pericardium for patch grafts, with the latter currently more popular owing to its greater availability and ease of use. A recent shortage of Tutoplast processed pericardium (IOP Inc., Costa Mesa, CA), however, has prompted ophthalmologists to seek alternatives to avoid delaying patients' surgery. Pericardium is also available from New World Medical, Inc. (Rancho Cucamonga, CA). Investigators are exploring other materials for use as patch grafts to cover the tubes of drainage implants.

Another reason to use alternative materials is cosmesis, because many patients complain about seeing the white patch under their conjunctiva. I find this reaction to be more common among younger patients who do not have sufficient age-related ptosis to cover the patch completely and among patients with a wide palpebral fissure. An additional benefit of a clear graft is that it facilitates the lysis of a ligature suture around a nonvalved tube shunt. This article reviews the currently available alternatives to sclera and pericardium.

CORNEA

The clarity of donor corneal tissue gives it a cosmetic advantage over sclera and pericardium. In addition, corneal tissue may be more enduring than pericardium. Over time, most pericardial patch grafts may thin, thereby increasing the risk of the erosion of the tube. Although mechanical forces and poor positioning may have more to do with a tube's erosion, a thinned patch may contribute to the problem.

The two main disadvantages of corneal tissue are its availability and cost. Surgeons cannot keep a large supply of donor cornea on hand to accommodate a busy 2 months of surgery. Moreover, the facility fee for scleral reinforcement with a patch graft is fixed, and using a more expensive material only decreases the facility's bottom line. This may not be a major issue for surgeons who operate in a

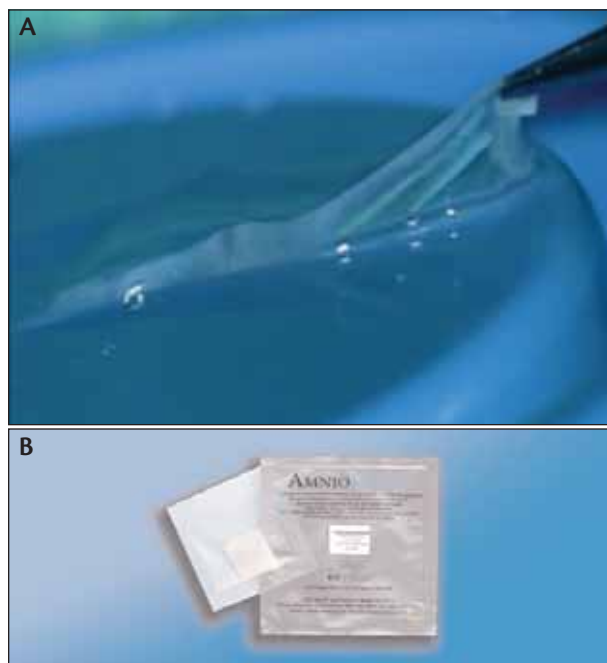


Figure 1. Amniograft-G (A) in its packaging (B).

hospital setting. For those who operate in an ambulatory surgery center, however, the added \$150 to \$200 per case for corneal tissue versus less expensive alternatives is usually prohibitive. A third drawback to donor cornea is that its use involves extra administrative time pre- and postoperatively. For example, the staff must coordinate getting corneal tissue in time for a case and must fill out the donor and recipient data forms.

AMNIOTIC MEMBRANE

A less expensive alternative to corneal tissue is amniotic membrane. Bio-tissue, Inc. (Miami, FL), developed amniotic membrane for the coverage of tube shunts. Unlike the thin membranes used for ocular surface reconstruction, Amniograft-G (Figure 1A) is approximately 300 to 400 μ m thick—almost 10 times the thick-



Figure 2. Anterior segment optical coherence tomography shows host-cell integration forming a 250-µm tectonic layer 1 month after the placement of amniotic membrane to cover the tube.

ness of standard amniotic membrane. Amniograft-G comes on a piece of paper, which is soaked in a preserving fluid inside a sterile plastic peel pack (Figure 1B).

I have used Amniograft-G as is but, more recently, have been folding it over to create a 600- to 800-µm patch. I use fibrin tissue glue to fixate all of my patch grafts to the sclera over the tube. The technique has been especially helpful with amniotic membrane, because it eliminates any manipulation of the graft that may occur during suturing. In the past year, I have used amniotic membrane to cover approximately 15 tubes with no cases of erosion to date. The cosmetic result is similar to that of corneal tissue.

A possible disadvantage is that amniotic membrane may dissolve over a short period of time. I have noted a persistent elevation in the area where the graft is placed, however, that is likely due to the host-cell migration of conjunctival cells that integrate into the graft. Anterior segment optical coherence tomography demonstrates the persistence of the membrane over time, but longer follow-up is needed (Figure 2). It is also possible that amniotic membrane exerts anti-inflammatory and anti-scarring actions.

The pricing of Amniograft-G is similar to that of pericardium. If its protective effect over the tube proves to be enduring, thick amniotic membrane may be an excellent alternative to corneal tissue in terms of cosmesis, cost, and biocompatibility.

PORCINE SUBMUCOSAL TISSUE

In addition to Tutoplast, IOP Inc. manufactures a new material for scleral reinforcement that can be used to cover a tube. Both products are packaged similarly, but KeraSys is porcine submucosal tissue. A significant advantage of this material is that there is an almost unlimited supply. In addition, it does not carry the same risk of disease transmission as corneal tissue. KeraSys is a thinner, more pliable version of the company's TarSys,

keraSysTM
Bioengineered Lamellar Patch Graft



Maximum durability

Minimum transmission risk

The Advantage is Clear



3184-B Airway Avenue
Costa Mesa, CA 92626 USA
(714) 549-1185

(800) 535-3545

www.iopinc.com

GLAUCOMA TODAY SUBMISSION GUIDELINES

If you would like to submit an article for publication in *Glaucoma Today*, first send a written inquiry with an outline of your proposed article. Email inquiries to Gillian McDermott, Editor-in-Chief, at gmcdermott@bmctoday.com.

Editorial Policies. All articles published in *Glaucoma Today* are reviewed by our Editor-in-Chief, who has sole discretion to accept, reject, or edit any article submitted for consideration. Articles are also read by a medical reviewer. All articles must be original in form and substance, and the author must warrant (1) that the article has not been published (and is not under consideration for publication) elsewhere and (2) that it does not contain material that infringes or violates any personal or intellectual property rights of others.

Format. We accept manuscripts in Microsoft Word for Macintosh and PC. Email copy to gmcdermott@bmctoday.com.

Deadlines. All assigned work must be submitted by no later than the first of the month, 2 months prior to publication.

Length. Unless otherwise agreed to by our Editor-in-Chief, articles should be approximately 1,200 words in length.

Author Information. Please include (1) the complete article title, (2) the authors' full names, academic degrees, and affiliations, (3) all relevant financial disclosures, and (4) a name and address for correspondence, including fax number, telephone number, and email address.

Artwork. Artwork may be submitted in digital or original form. Digital files may be sent in JPG, TIF, or EPS format; they should be approximately 300 dpi and 4 inches wide. If sending via email, JPGs are preferred. Original slides and photos are also acceptable. Please be sure to indicate the number and orientation of each image. If any artwork previously appeared elsewhere, it is the author's responsibility to obtain reprint permission from the original author and publisher.

References. The author is responsible for the accuracy of references. References should be typed at the end of the manuscript and listed in the order in which they appear in the text (not alphabetically). Unpublished data (papers submitted but not yet accepted for publication, personal communications) should be cited parenthetically in the text.

Questions? Contact Gillian McDermott, Editor-in-Chief, at (484) 581-1812; gmcdermott@bmctoday.com

You may address correspondence to *Glaucoma Today*, Bryn Mawr Communications LLC, 1008 Upper Gulph Road, Suite 200, Wayne, PA 19087.

SURGICAL PEARLS



Figure 3. KeraSys bioengineered lamellar patch graft.

which oculoplastic surgeons use for reconstructing the eyelid.

During the last shortage of pericardial tissue, I tried KeraSys. It is far more rigid than Tutoplast but becomes easier to manage after soaking. Because I use fibrin tissue glue, the material's rigidity was not a problem, but it might be more difficult to suture than pericardium. It is also unclear how this bioengineered lamellar patch graft will behave over time. The tissue is mildly opaque (Figure 3) but was not visible under the conjunctiva except for the raised edges of the graft. KeraSys therefore offers similar cosmetic advantages to cornea and amniotic membrane. During early follow-up, it also seems to be an enduring material. The raised edges of the graft were still visible in the eyes I treated even after several months, but the follow-up period had not yet reached 6 months at press time.

At present, IOP Inc. uses the same pricing for KeraSys and Tutoplast.

CONCLUSION

Most glaucoma surgeons have extensive experience with pericardium, which is likely the most commonly used patch graft to cover a tube. At times, however, its availability is limited, and this material offers suboptimal cosmesis. Donor cornea can be used even if the conjunctiva cannot be completely closed. Availability, administrative issues, possible disease transmission, and cost remain barriers to the regular use of corneal tissue as a patch graft over a tube shunt. Amniograft-G and KeraSys seem to be promising, but greater follow-up is needed to determine their long-term effectiveness for preventing the tube's erosion. □

Steven R. Sarkisian, Jr, MD, is a clinical assistant professor at The Dean A. McGee Eye Institute of the University of Oklahoma in Oklahoma City. He acknowledged no financial interest in the products or companies mentioned herein. Dr. Sarkisian may be reached at (405) 271-1093; steven-sarkisian@dmei.org.

