

Fibrin Glue and Glaucoma Surgery

A review of technique and pearls for success.

BY MALIK Y. KAHOOK, MD, AND ROBERT J. NOECKER, MD, MBA

Fibrin glues have been widely used as surgical adjuncts to help minimize bleeding and to seal wounds, thus reducing the need for sutures or staples. Successful applications for fibrin glues have been reported predominately in the field of gastroenterology, although their use in ophthalmology is increasing.¹⁻⁹ The most widely used of these adhesives, Tisseel glue (Baxter AG, Vienna, Austria), has been shown to be effective in pterygium surgery, postvitrectomy conjunctival closure, and glaucoma filtration surgery.⁹⁻¹¹

This article shares our experience with Tisseel in glaucoma surgery and discusses possible future applications for the technique.

WHAT IS TISSEEL GLUE?

Tisseel is packaged as two independent components that must be mixed at the time of surgery (Figure 1). The kit contains freeze-dried powders and diluents, including sealant proteins and a setting solution. The sealant proteins include human fibrinogen, plasminogen, fibronectin, and factor XIII in a bovine aprotinin solution. The setting solution includes human thrombin and calcium chloride. Mixing the thrombin solution with the sealant protein converts the fibrinogen to fibrin while the factor XIII component cross-links the fibrin. The fibrin and fibronectin cross-link to surrounding collagen, leading to tissue-to-tissue binding.

TECHNIQUE

When using Tisseel in ophthalmic surgery, it is essential to mix the two components properly at the time of



Figure 1. Pictured in bottles from left to right, the four ingredients that make up the fibrin glue mixture are sealer protein concentrate, fibrinolysis inhibitor solution, thrombin, and calcium chloride solution.

application. They may be combined in one of two ways. We routinely apply each component to the targeted tissues independently and either allow them to mix passively or simply combine them using a blunt instrument (ie, a cannula or spatula). Alternatively, one may use the Duploject syringe that comes with the Tisseel package. This apparatus combines the individual components of the glue in the cannula used for application, and the syringe then allows surgeons to inject the glue in one step. We recommend exercising caution if mixing Tisseel in this manner. We have found that the cannula can become occluded, allowing the passage of only one component or of an unequal ratio of the components. The product delivered has not congealed appropriately and has been of less assistance in collagen cross-linking. To avoid problems, surgeons should visually confirm that the glue has a gelatinous rather than fluid appearance.

The majority of our experience with Tisseel is during the implantation of various glaucoma drainage devices.¹² The procedure does not differ from a traditional implantation until the suturing of the plate and the threading of the sili-

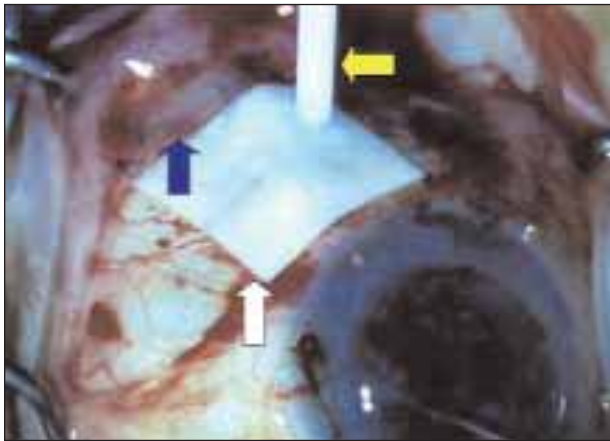


Figure 2. The surgeon applies Tisseel glue on top of the Tutoplast graft (IOP Inc., Costa Mesa, CA) (white arrow) using the Duploject system (yellow arrow). The glue has a jelly-like consistency (blue arrow) when all of its components have been mixed correctly.

cone tube into the anterior chamber. The next step involves judiciously applying Tisseel on the scleral bed while ensuring that the fibrin glue has spread evenly (eg, no focal clumping). We then place processed pericardium or a scleral/corneal patch graft over the silicone tube and apply Tisseel over the graft tissue (Figure 2). Next, we bring the conjunctiva forward and apply additional Tisseel if necessary. Using toothless forceps, we hold the margins of the conjunctiva in place for approximately 30 seconds. Any excess glue that emerges from the edges of the wound may be cut off and removed from the surgical field.

OUTCOMES

In a recent report, we compared the use of Tisseel glue versus traditional sutures in the implantation of a Baerveldt device (Advanced Medical Optics, Inc., Santa Ana, CA).¹² The mean (SD) age of the patients in the suture group was 56.6 (±10.5) years versus 54.7 (±8.6) years in the Tisseel group ($P=.56$). The IOP was equivalent between the groups, including preoperatively and at all postoperative time points. The need for postoperative glaucoma drops and the rate of complications were similar between the groups. The average time of surgery for the Tisseel group was 15.00 (±3.11) minutes compared to 25.93 (±4.04) minutes for the suture group ($P<.001$). We estimated that the reduced OR time per case as well as the difference in cost between Tisseel (\$100 per 1 mL) and sutures (approximately \$10 per pack) resulted in an overall savings of almost \$400 for the Tisseel group. We also noted less conjunctival inflammation in the Tisseel group ($P=.002$) using a standard scale. Subjectively, we found patients in the Tisseel group to be

more comfortable postoperatively, although we did not study this aspect quantitatively. We concluded that the use of Tisseel glue appeared to be a safe and viable alternative to the use of some sutures in glaucoma drainage device surgery and resulted in less OR time as well as decreased conjunctival inflammation compared with the traditional technique.

Certainly, there are drawbacks to this approach (see *The Pros and Cons of Using Tisseel Glue in Place of a Suture for Glaucoma Surgery*). Patients who have previously undergone conjunctival manipulating surgery that resulted in significant conjunctival fibrosis may be poor candidates for surgery with Tisseel. The conjunctiva should be freely mobile in order to decrease the chance that tissue will retract postoperatively and leaks will occur.

Furthermore, it is important to note that other uses of Tisseel in glaucoma surgery have been less successful. For example, the results of administering this adhesive for hypotony and leaking blebs have generally been disappointing.⁹ This is largely because fibrin glue lasts for only 7 to 10 days underneath the conjunctiva, possibly an inadequate amount of time for significant healing to occur. In addition, the transmission of infection may be possible, owing to the nature of Tisseel, although we are aware of no such reports since the glue’s introduction in 1974.

Nonetheless, we are continuing to expand our use of Tisseel for glaucoma surgery. Most notably, we are finding that applying fibrin glue during trabeculectomy surgery appears to effectively decrease leaks and may act as a barrier to early fibrosis between the scleral bed and the surrounding Tenon’s capsule and conjunctival tissues. Studies are underway to better quantify our subjective observations.

CONCLUSION

We believe Tisseel fibrin glue represents a viable alternative to the use of sutures in glaucoma surgery. Our report on its use during the implantation of a glaucoma drainage device illustrates the technique’s safety as well as its time-saving benefits. We caution surgeons who try

THE PROS AND CONS OF USING TISSEEL GLUE IN PLACE OF A SUTURE FOR GLAUCOMA SURGERY	
PROS	CONS
Decreased surgical time	Increased cost of materials
Decreased conjunctival inflammation	Lower tensile strength than a suture
Provides hemostasis	Requires additional training of OR staff
Seals leaks during early postoperative phase	Present at surgical site for a relatively short time

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SURGICAL PEARLS

this technique, however, to follow some simple guidelines prior to performing their first procedure. They must be familiar with the injection device and know that their OR staff has been trained properly in mixing the components. They should be careful to inject the fibrin glue to ensure that the two components are mixing to create a jelly-like substance. If the glue appears to flow more like water, it is not mixed correctly.

This procedure is not for every patient. It requires mobile conjunctiva to limit postoperative retraction, which can overcome the tensile strength of the glue.

With proper preparation and diligent operative technique, Tisseel fibrin glue may become an important part of the surgical armamentarium, and the number of its applications may well increase as more ophthalmologists gain experience with adhesive agents. Interested surgeons may wish to attend one of the courses centered around the use of fibrin glue in ocular surgery at this year's AAO Annual Meeting. □

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