

Transscleral Surgery

Seeing the sclera as a gateway rather than an obstacle.

BY JOHN W. KITCHENS, MD

I never thought much about the sclera during my residency. To me, it was just an obstacle between me and the anterior or posterior chambers. It was only during my fellowship, when I was introduced to the concept of scleral tunnels as an alternative to sutures for holding a scleral buckle in place, that I began to value the sclera. Since that time, I have practiced and learned a number of techniques that use the sclera as a gateway, rather than an obstacle, to the subretinal and suprachoroidal spaces.

SCLERAL TUNNELS

Scleral tunnel creation is not a new technique. Scleral tunnels have been around in some form since the advent of buckling itself. I learned the technique during fellowship at Bascom Palmer Eye Institute, where a number of faculty members used tunnels. It was a fun, effective, and fast way to place a buckle.

The key to creating a scleral tunnel is having the proper instrumentation and selecting the right buckle to place. First, it is essential to have a Castroviejo scleral dissector (E2990; Bausch + Lomb/Storz, St. Louis, MO). This instrument is shaped like a miniature crescent blade, but the difference is that the tip of the blade is sharp and the sides are somewhat dull. This allows the surgeon to wiggle the blade side-to-side without transecting the scleral tunnel anteriorly or posteriorly. Second, proper buckle selection is essential. Only moderately sized buckles can be placed in this fashion. A type 240 band is easily placed through a smaller tunnel. I typically use a type 41 band, which gives a broader buckle and allows the placement of a segmental element (such as a biconvex tire type 287WG [WG for wide groove]) that can be held in place by a single 5-0 nylon suture per quadrant. Although a type 42 band can be used, the tunnel must be a fair amount larger to accommodate it.

The advantages of using tunnels are that there is less hardware on the eye and no suture spaghetti and that buckle placement is faster. The disadvantage is the risk of perforating the eye wall. Keys to lessening this risk include avoiding the placement of tunnels in areas of ectatic sclera and creating tunnels that are less than 70% of scleral thickness.

It takes practice, and the novice should not be sur-



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prised if the first few attempts result in transected tunnels, thin tunnels, or tunnels that break when the buckle is placed. The learning curve is about 10 to 15 tunnels, and one should err on the side of making the tunnels too shallow at first.

Following are the steps to create a scleral tunnel:

1. Use a No. 64 blade to create two parallel anterior-posterior partial thickness (50% to 70% thickness) incisions of the sclera, 3 mm from each other and 2.5 to 4 mm in length (2.5 mm for a type 240 band, 4 mm for a type 41 band).
2. Use a Castroviejo scleral dissector to engage the sclera at the edge of one incision with the tip angled slightly toward the eye. The tip is then wiggled gently back and forth to advance the blade 1 mm into the sclera. At this point, with the sclera engaged and the tunnel started, the tip is angled slightly away from the eye and the wiggle motion is continued until the full tunnel has been created.
3. Make sure the buckle has been cut with a beveled edge, as this will assist with sliding the buckle through the tunnel. Direct the leading edge of the buckle toward the eye until the edge of the tunnel is engaged, then redirect the buckle more parallel to the eye wall. When the edge of the band appears on the other side of the tunnel, grasp it with a second set of nontoothed forceps (Nugent Utility Forceps, Bausch + Lomb/Storz) and pull the buckle through the tunnel. Pulling it through works much better than pushing it through.

GUARDED NEEDLE DRAINAGE

Needle drainage of subretinal fluid, first described by Steve Charles,¹ is a rewarding way to drain fluid in a controlled manner under direct visualization.

I was fortunate to train under some great scleral buckle surgeons during my residency, fellowship, and early years with Retina Associates of Kentucky. Few procedures are more satisfying than reattaching a patient's retina

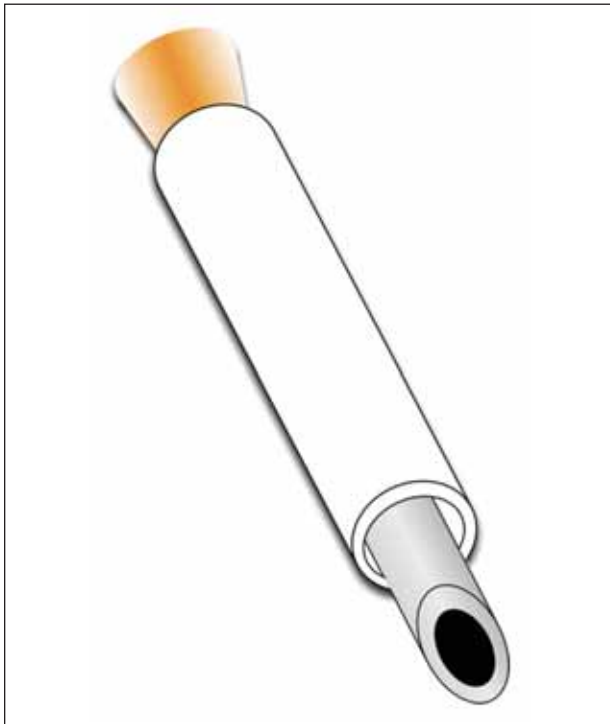


Figure 1. Needle with sleeve guard.

completely with the use of a buckle. It makes one feel like an old-world craftsman who could fashion a beautiful piece of furniture from a tree stump found in the woods. But one thing that did not appeal to me during buckling procedures in these early years was drainage of subretinal fluid using a traditional scleral cutdown. Perhaps this was because, in a few cases, the eye bled with the perforation of the choroid or because I could not see what was going on inside the eye during the drain. For whatever reason, I did not like this aspect of buckling until I discovered needle drainage of subretinal fluid.

One downside of the needle drainage technique is its learning curve. It takes time to become familiar with visualizing the needle in the subretinal space. In fact, even after 30 cases, there were still instances when I would think I had visualized the needle in the proper position, only to find that it was elsewhere. Another downside is that it requires an attentive assistant to help with the drainage. Finally, it is hard to teach this technique to fellows in training. I have tried trimming the needle to a shorter length, but this invariably dulls the needle edge and is not effective.

I struggled to find a safer way to do needle drainage. While doing a case with one of our talented fellows, it struck me to limit the advancement of the needle by using a guard—a guarded needle drainage technique. It did not take long to find the perfect guard, as it was right on the

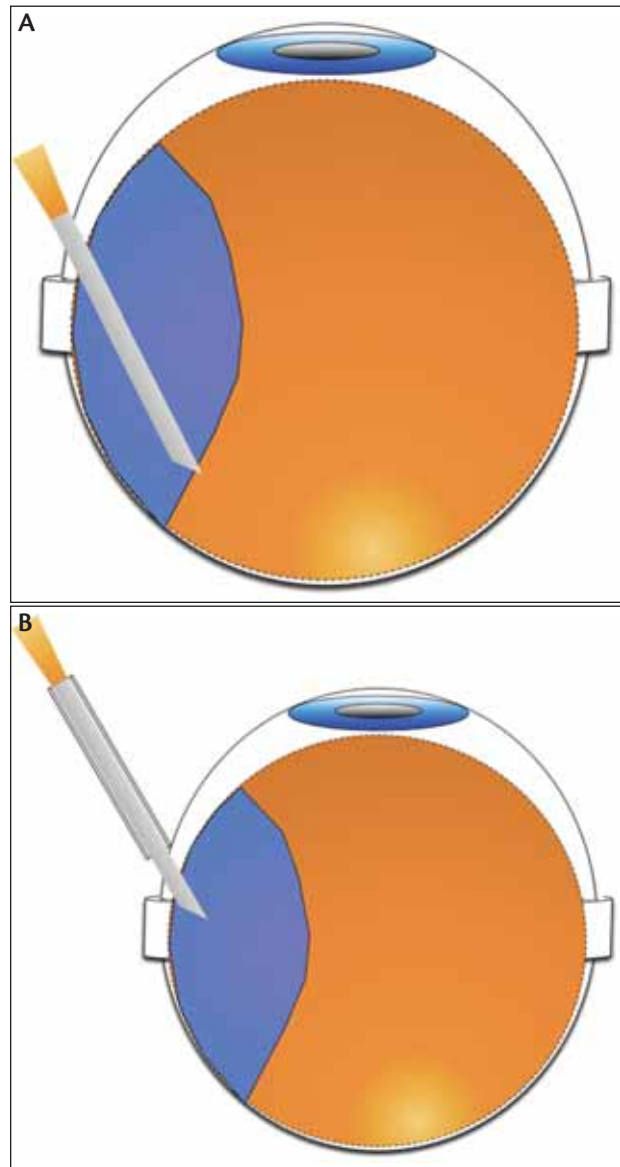


Figure 2. Unguarded needle allows over-penetration (A). Guarded needle prevents over-penetration (B).

table in front of us: the buckle sleeve. By placing the sleeve over the needle, we could control the amount of penetration of the needle into the eye (Figures 1 and 2). This guarded needle technique has the additional advantage that it can allow the surgeon to depress the eye wall during drainage with the sleeve to encourage egress of subretinal fluid.

Following are the steps for performing the guarded needle drainage technique:

1. Place and tighten the buckle.
2. Place a tractional 2-0 silk suture 180° away from the drainage site around the buckle. The assistant will pull on

this suture later in the procedure to increase the intraocular pressure (IOP) and encourage the drainage of subretinal fluid.

3. Attach a 26-, 27-, or 30-gauge needle (3/8 or 5/8 in) to a 1 or 3 cc syringe with the plunger removed.

4. Slide a type 270 sleeve over the needle. (Precut sleeves do not work, as they are too short.) Trim the sleeve so that approximately 3 to 4 mm of the needle tip is visible.

5. Place the needle tip with the bevel away from the retina on the anterior edge of the buckle. Avoid areas of vortex veins and stay 1 to 2 clock hours away from retinal breaks.

6. Use the indirect ophthalmoscope to visualize the needle prior to insertion into the subretinal space by gently depressing the needle against the eye wall.

7. Slide the needle into the subretinal space, directing it posteriorly to avoid inadvertent penetration of the retina. If the retina is engaged, the potential break should fall on the buckle due to the placement of the needle on the anterior edge of the buckle.

8. Have the assistant gently pull on the tractional suture to increase the IOP and encourage the fluid to drain through the open-ended syringe.

25-GAUGE DRAINAGE OF HEMORRHAGIC CHOROIDALS

This technique was developed out of necessity in the care of a monocular patient who had developed hemorrhagic choroidal detachments 1 week after trabeculectomy surgery. We attempted to manage the patient conservatively with oral prednisone, but after about a month his visual acuity remained light perception with appositional choroidals despite an IOP in the high teens. The glaucoma surgeon was concerned about his filtering bleb, which was not working well.

We decided to use a 25-gauge cannula (Alcon Laboratories, Inc., Fort Worth, TX) in a novel way to assist with drainage of the liquefied hemorrhage. This turned out to be a very effective technique that reduced operative time and prevented compromise to the conjunctiva. (The technique earned a Rhett Buckler video award at the 2008 meeting of the American Society of Retina Specialists.)

The technique was aided by several factors. First, the choroidals had adequate time to liquefy. Second, the older generation of Alcon cannulas were made of polyamide, not metal, and could be trimmed to 2 mm length in an attempt to prevent iatrogenic damage to the retinal pigment epithelium (RPE) and retina as the detachments settled. Third, there was space to place both infusion and a chandelier light through the pars plana, although more anterior than normal. Finally, surgeon and patient were both very lucky.

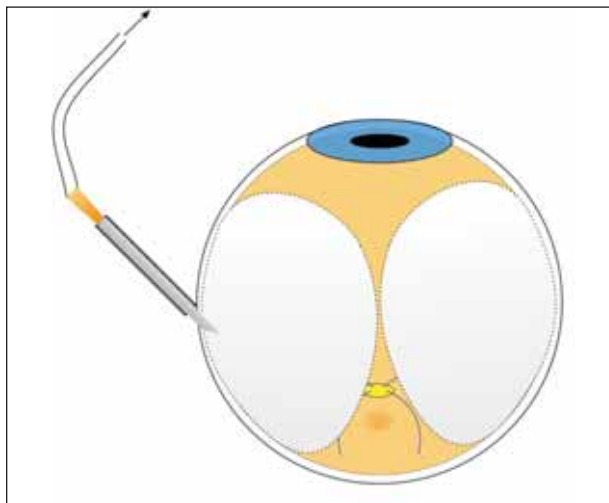


Figure 3. Use of a guarded needle attached to aspiration to provide controlled drainage of choroidal detachment.

Many choroidals, even hemorrhagic choroidals, will improve given time. Do not attempt this technique for patients who are demonstrating improvement in their condition or in patients with shallow or minimal choroidals.

Following is the technique for drainage of choroidal hemorrhages using modified 25-gauge instrumentation:

1. Place infusion either in the anterior chamber or preferably in the posterior chamber if space allows. Be sure to visualize the infusion to ensure it is not in the suprachoroidal space. Consider placing a chandelier or using an illuminated infusion line, as this can help visualize the drainage of the choroidal.

2. Remove the polyamide cannula and trim it to 2 mm. Replace it onto the trocar. Do not try this with the newer metal cannulas, as they cannot be cut easily.

3. Again visualize the infusion line to ensure it is in the proper position. Turn on the infusion.

4. Measure 8 mm to 10 mm posterior to the limbus in the area of highest choroidal detachment and away from the filtering bleb if one is present.

5. Advance the cannula-trocar using a very shallow entry angle parallel to the limbus.

6. Say a short prayer, and then remove the trocar.

7. Watch for the return of the red reflex. If the hemorrhage is very liquefied or the choroidal is serous in nature, it will drain rapidly, so be ready to remove the cannula.

8. Remove the cannula. It is not uncommon to get a surge of suprachoroidal blood when pulling out the cannula.

CONTROLLED DRAINAGE OF SEROUS CHOROIDALS

This technique, controlled drainage of serous

choroidals using active aspiration and a guarded needle (CDSCUAAGN for short!) was born from the second and third techniques described above. It seemed that the use of a 25-gauge cannula was less than ideal for serous choroidals, as the drainage occurred too rapidly and in an uncontrolled manner. A transscleral needle technique would provide more resistance to outflow and allow the use of a smaller incision. The downside to using an unguarded needle would be the risk of over-penetration and iatrogenic damage to the RPE and retina as the detachments settled. The innovation of the guarded needle technique solved this problem. In an attempt to create a more controlled environment for drainage, the needle was attached to aspiration to allow total control of the drainage (Figure 3).

The first patient in which this technique was used had undergone placement of an ExPress shunt (Alcon Laboratories, Inc.) with associated overfiltration. When the patient presented he had appositional serous choroidals that had been present for a couple of weeks. In surgery we first addressed the overfiltering flap with additional sutures. After this we used a guarded needle (a 26-gauge 3/8 inch needle with a type 270 sleeve guard) attached to the aspiration of the Accurus machine (Alcon Laboratories, Inc.). We placed an infusion line carefully through the anterior pars plana.

The control allowed by this method was impressive. We could start and stop the drainage at any point. In the associated video (see sidebar for EyeTube link) one can see that the drainage is stopped and the BIOM (Oculus, Lynnwood, WA) is then refocused to allow a better view before resuming the drain.

The patient did well with no recurrence of the choroidals and a return to his baseline vision.

The technique is performed as follows:

1. Set up the guarded needle as described previously. Attach the needle to the aspiration tubing.
2. Place an infusion line and ensure that it is in the proper location. Chandelier illumination is also helpful for this technique.

3. Turn on the infusion.
4. Advance the guarded needle 8 to 10 mm posterior to the limbus in the area of the highest choroidal detachment. Make a shallow entry parallel to the iris plane.
5. Move your posterior viewing system (BIOM, etc.) into position.
6. Engage aspiration slowly and watch the choroidals drain.

CONCLUSION

It is hoped that these techniques will allow you to better care for patients with challenging problems (choroidal detachments, hemorrhagic choroidal detachments) or to expand your buckling repertoire a bit further. In addition, I hope these help you enjoy engaging with the sclera more and finding it to be a gateway rather than an obstacle. ■

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1. Charles ST. Controlled drainage of subretinal and choroidal fluid. *Retina*. 1985;5(4):233-234.