

Supplement to

March/April 2019

GT

Glaucoma Today



This educational supplement is sponsored by
Allergan Global Medical Affairs.

XEN NEEDLING CASE EXAMPLES

Arsham Sheybani, MD

Dan Lindfield, BM, FRCOphth

Analisa Arosemena, MD

Carla Bourne, MD

Manjool Shah, MD

Investigating Real-World Successes and Failures

PARTICIPANTS



ARSHAM SHEYBANI, MD, COMODERATOR

- Assistant Professor, Department of Ophthalmology and Visual Science, Washington University School of Medicine, St. Louis, Missouri
- sheybaniar@wustl.edu
- Financial disclosure: Consultant (Allergan)



DAN LINDFIELD, BM, FRCOPHTH, COMODERATOR

- Royal Surrey County Hospital, Guildford, England
- danlindfield@nhs.net
- Financial disclosure: Advisory board (Allergan); Speaker (Alcon, Allergan, EndoOptiks, THEA)



ANALISA AROSEMENA, MD

- Aran Eye Associates, Miami, Florida
- aarosemena@araneye.com
- Financial disclosure: Consultant (Allergan)



CARLA BOURNE, MD

- Orlando Veterans Affairs Hospital, Orlando, Florida
- Assistant Professor of Ophthalmology at the University of Central Florida, College of Medicine, Orlando, Florida
- cbournemd@gmail.com
- Financial disclosure: Speaker (Allergan)



MANJOOL SHAH, MD

- Kellogg Eye Center, University of Michigan, Ann Arbor, Michigan
- manjool@med.umich.edu
- Financial disclosure: Consultant (Allergan); Speaker (Allergan)

The increasing incidence of glaucoma worldwide has been met with a growing number of earlier and safer treatment options, including the XEN Gel Stent (Allergan). The XEN Gel Stent seeks to provide an option that achieves similar outcomes to a trabeculectomy but with greater predictability and fewer complications.^{1,2} Needling is an option that can potentially enhance the outcomes of XEN by freeing restrictions to aqueous outflow that are caused by fibrosis.

We recently published a paper together with other colleagues on recommendations for the management of elevated IOP due to bleb fibrosis.³ In the paper we discussed evaluation, timing, and techniques for needling XEN Gel Stent blebs. We determined that needling should be considered when the stent can be clearly visualized under the conjunctiva, and that reducing conjunctival inflammation, avoiding subconjunctival hemorrhage, and using additional antimetabolites increases the chance of success. We have also found that if adequate flow of aqueous cannot be reestablished at the end of the needling, it may be useful to amputate the distal end of the stent. If needling is unsuccessful, consider performing YAG laser on the internal portion of the implant. We have asked some colleagues to share cases of needling following XEN Gel Stent implantation to help users better understand real-world use of this alternative.

—Arsham Sheybani, MD, and Dan Lindfield, BM, FRCOPHTH

XEN NEEDLING | CASE EXAMPLES

SUCCESSFUL NEEDLING CASES

CASE 1: MANJOOL SHAH, MD

A 62-year-old monocular African-American woman presented with a history of severe open-angle glaucoma (OAG) in her left eye. Patient history includes a trabeculectomy with mitomycin C (MMC) in the right eye, after which the patient lost fixation in the eye and manifested significant inflammation. XEN with MMC was performed in the left eye with no complications. At the 1-month postoperative follow-up the left eye had 3 to 4+ diffuse conjunctival injection and the IOP had increased to 32 mm Hg with a flat bleb. A sub-Tenon triamcinolone acetate (Kenalog-40, Bristol-Myers Squibb Co.) injection was given in the inferotemporal quadrant to try and quiet the eye, but the bleb remained scarred.

At postoperative week 6 needling was performed with 0.2 mg/mL x 0.1 mL of MMC, teasing off the fibrotic sock that had formed around the distal end of the implant. Fifteen minutes after the procedure, the IOP was reduced to 15 mm Hg, and the eye has remained at 11 mm Hg using two classes of medication for 6 months.

CASE DISCUSSION

Arsham Sheybani, MD: When the conjunctiva is hyperinjected, that is an indication that the patient has inflammation and the stent may fail. In cases with hyperinjection early, you may want to consider adding corticosteroids or antimetabolite, either MMC or 5-fluorouracil (5-FU).

Dan Lindfield, BM, FRCOphth: Excess inflammation and fibrosis after trabeculectomy predicts that a similar response may occur after XEN. Increased frequency and duration of topical steroid therapy may help reduce fibrotic drive and is often best given preventatively rather than reactively. Consideration could also be given to using a prophylactic depot steroid during the procedure or in the early postoperative period. However, this case illustrates that if flow can be achieved by needling after an inflammatory response has settled, then good outcomes are still possible.

CASE 2: DAN LINDFIELD, BM, FRCOPHTH

A 68-year-old woman presented with cataracts and an IOP of 25 mm Hg on two agents. She underwent combined phacoemulsification and XEN implantation without complications. At weeks 1, 3, 6, and 12 her IOP remained satisfactory within the range of 11 to 14 mm Hg, without any topical hypotensive medication. At week 20 her IOP rose to 20 mm Hg and needling was performed at the slit lamp. She had a thick Tenon and healthy conjunctiva with localized flow (cystic/encapsulated). This was physically dissected with the needling procedure, and diffuse flow was achieved. Immediately after needling her IOP lowered to 10 mm Hg; an injection with 50 mg/mL of 5-FU was given and dexamethasone was prescribed for 4 weeks. Her IOP has remained in the range of 12 to 14 mm Hg without medication for the last 3 months (see *Slit Lamp XEN Needling*).

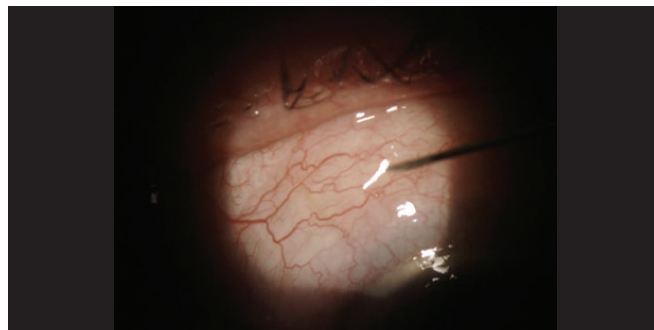
CASE DISCUSSION

Dr. Sheybani: The notable point with this needling is that it occurred at week 20 following XEN Gel Stent implantation. There is a wide time range in which needling can be performed successfully.

Dr. Lindfield: Lenzhofer and colleagues⁴ showed that the majority of needling occurs in the first year following implantation (72%), but 28% of patients required their first needling in the second year or later, so vigilance is important.

WATCH IT NOW

Slit Lamp XEN Needling



→ EYETU.BE/DYTAG

CASE 3: ANALISA AROSEMENA, MD

An 83-year-old Hispanic male presented with moderate OAG. He had an IOP of 13 mm Hg on three IOP lowering medications. He underwent combined phacoemulsification and XEN Gel Stent implantation with 0.4 mcg x 0.1 cc of MMC and an injection of subconjunctival 0.1 cc Kenalog-40 inferiorly to minimize patient burden with postoperative regimen. On postoperative day 1 his IOP was 9 mm Hg, which increased to 13 mm Hg at week 1. His IOP continued to rise and at postoperative month 1 his IOP was 22 mm Hg with a flat bleb morphology with poor conjunctival movement (Figure 1). Needling was performed at this time with good bleb formation; the IOP came down to 10 mm Hg (Figure 2). Despite the presence of a subconjunctival hemorrhage at the time of needling, the procedure turned out successful with an IOP of 13 mm Hg with no topical medications 5 months after needling (Figure 3).



Figure 1. At postoperative month 1 the patient's IOP was 22 mm Hg with a flat bleb morphology.

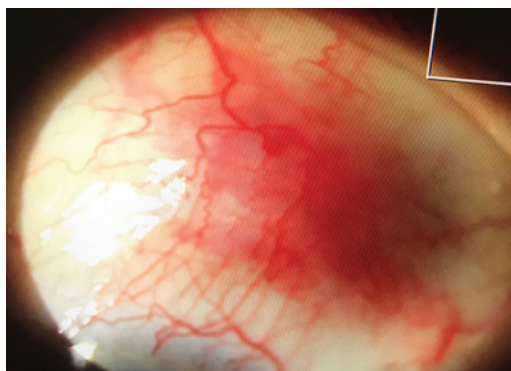


Figure 2. Needling was performed with good bleb formation; the IOP came down to 10 mm Hg.

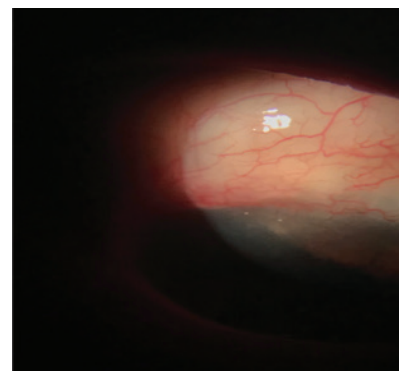


Figure 3. Five months after needling.

CASE DISCUSSION

Dr. Sheybani: This case shows that subconjunctival hemorrhage can occur during needling. One way to avoid subconjunctival hemorrhage is to stay more anterior to the sclera and away from the scleral vessels.

Dr. Lindfield: Postoperative steroid regimens vary around the world. Early inflammation appears to be a risk for early fibrosis and application every 2 hours for the first 2 weeks is becoming increasingly common. The important message here is to act quickly once fibrosis starts. This case was needled as soon as flow impairment was detected, and a good outcome was achieved.

CASE 4: CARLA BOURNE, MD

A 72-year-old African-American man presented with an IOP of 21 mm Hg on maximum medications (latanoprost, dorzolamide-timolol, brimonidine, and acetazolamide) in his left eye. The patient underwent cataract surgery with the XEN Gel Stent implant using MMC in a routine procedure. The XEN had good intraoperative positioning; however, there was some subconjunctival hemorrhage in the stent area.

On postoperative day 1 his IOP was 18 mm Hg. There was good stent visualization and a low diffuse bleb with subconjunctival hemorrhage. At postoperative week 1 his IOP was 12 mm Hg with a low diffuse bleb, and the subconjunctival hemorrhage was mostly resolved; however, +2 vascularity had developed in the surrounding conjunctiva. Needling was performed, and 5-FU was injected. The patient was prescribed difluprednate ophthalmic solution (Durezol, Novartis) and trimethoprim polymyxin B sulfate ophthalmic solution (Polytrim, Allergan) four times a day for 5 days.

At week 3 his postoperative IOP was 16 mm Hg. Vascularity had decreased but due to the increase in IOP, residual vascularity, and previous presence of hemorrhage, a second needling and

5-FU injection was performed. His medication regimen remained the same. At 5 weeks his postoperative IOP decreased to 13 mm Hg with a low diffuse bleb; vascularity had further decreased. The patient was instructed to continue Durezol four times a day for 2 weeks then start to slowly taper off Durezol each week. At 5 months his postoperative IOP was 15 mm Hg with no medication.

Some surgeons prefer a “watch and wait” approach to see how things would settle as the subconjunctival hemorrhage resolved. However, I opted for a more aggressive approach given the IOP and vascularity of the surrounding conjunctiva.

CASE DISCUSSION

Dr. Sheybani: My experience coincides with this advice. Intervening early when signs of fibrosis are identified seems to improve long-term success of the XEN Gel Stent.

Dr. Lindfield: This is another example of a proactive approach. African-American race, preoperative use of four drug agents, and on-table hemorrhage are all risk factors for early fibrosis.

CASE 5: ARSHAM SHEYBANI, MD

A 78-year-old white man taking oral blood thinners presented with advanced primary OAG. His IOP was 26 mm Hg on three classes of medications prior to undergoing XEN with 20 mcg of MMC. Three months later his postoperative IOP was 29 mm Hg with no medication. Needling was performed with a 27-gauge needle, and 40 mcg of MMC was administered. His IOP immediately dropped to 19 mm Hg with a bleb present and subconjunctival hemorrhage. After needling, his week 1 IOP was 15 mm Hg, his month 1 IOP was 18 mm Hg, and his month 3 IOP was 16 mm Hg on latanoprost (Figure 4).

CASE DISCUSSION

Dr. Sheybani: A patient taking blood thinners has increased potential for subconjunctival hemorrhage. In these cases, I use phenylephrine at the time of needling. If a large subconjunctival hemorrhage does occur, you may consider stopping the needling and applying pressure, then bringing the patient back 1 to 2 weeks later to attempt the needling again.

Dr. Lindfield: Blood is nature's superglue. It contains all the factors required for fibrosis. Needling with MMC may be superior to 5-FU and therefore useful in such cases where hemorrhage persists. However, caution should be used as repeated application and long-term conjunctival response are not fully understood.

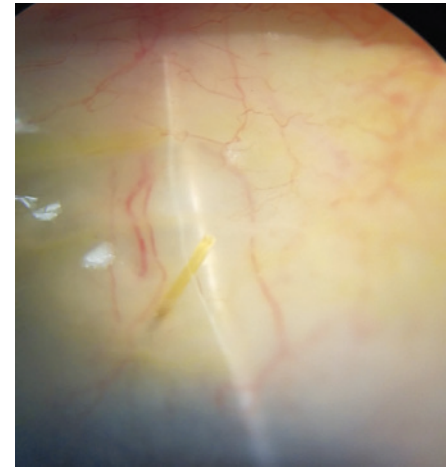


Figure 4. Bleb restored after needling. Thin conjunctiva over the implant given 60 mcg total of MMC.

FAILED NEEDLING CASES

CASE 1: MANJOOL SHAH, MD

A 74-year-old patient presented with atypical, unilateral OAG. The patient had an IOP of 34 mm Hg on four classes of medication plus acetazolamide (Diamox, Duramed Pharmaceuticals), severe ocular surface disease, and a dense cataract. Preoperatively, the patient was placed on Diamox to reduce the number of topical glaucoma medications; I added topical steroids to reduce inflammation in the ocular surface. The patient then underwent uncomplicated cataract extraction combined with XEN. MMC (0.4 mg/mL x 0.1 mL) was used at the time of surgery.

In the early postoperative period, there was a low diffuse bleb. However, the patient also manifested 2 to 3+ conjunctival injection despite administering prednisolone acetate once every 2 hours. At week 4 the bleb had begun to contract with evidence of straightened conjunctival vessels suggesting fibrosis. As IOP had elevated to 28 mm Hg, needling was performed using 0.2 mg/mL x 0.1 mL of MMC. The needle was successfully passed under and over the implant. At day 1 the postoperative IOP was 12 mm Hg, but by 1 week the IOP had risen to

23 mm Hg. Digital compression was instituted to help break up the fibrosis, but it was unsuccessful. The patient elected to remain on maximum topical medications rather than undergo another needling procedure or a bleb revision. IOP remains at 16 mm Hg on four topical medications.

CASE DISCUSSION

Dr. Sheybani: Poor ocular surface is a risk factor for failing any filtration surgery; attempts to reduce ocular surface inflammation prior to XEN implantation may not be sufficient in severe cases. However, before XEN is considered a failure, needling should be attempted if the stent is visible and appears to be in a good position.

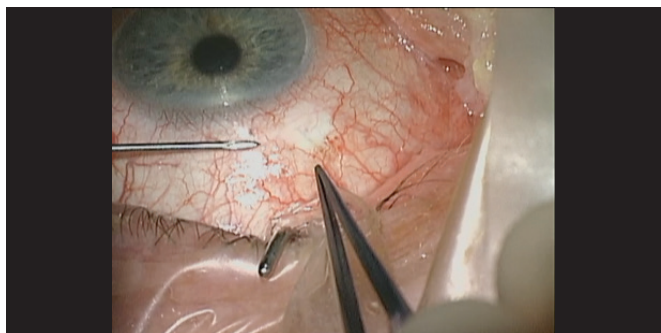
Dr. Lindfield: Dr. Shah tried everything here; preoperative eyedrop vacation, preoperative steroid preparation, high-dose MMC, and postoperative steroid every 2 hours. Open revision with scleral bed clearance may have brought a better outcome.

CASE 2: DAN LINDFIELD, BM, FRCOPHTH

A 46-year-old myopic patient (-14.00) presented with an IOP of 24 mm Hg on three agents and underwent combined phacoemulsification and XEN Gel Stent implantation. On day 1 the patient had a postoperative IOP of 4 mm Hg. I find early hypotony to be more common in myopic patients. At week 1 the IOP was 11 mm Hg, and at week 3 the IOP was 13 mm Hg. The bleb appeared to be good, but it was very limbal. In hindsight, most of the flow was peri-stent rather than intraluminal. By week 6 the postoperative IOP was 24 mm Hg, and I could not reduce it with digital ocular compression.

▶ WATCH IT NOW ◀

Myopic Patient Encounters Failed Needling



▶ EYETU.BE/YSXEG

Due to the long axial length, it was difficult to achieve the 1-2-3 positioning recommended with the stent. The length in the anterior chamber was good, but the stent was short in the subconjunctival portion due to the longer intrascleral length of the patient's globe. Needling was attempted, but aqueous flow could not be achieved due to the stent being completely stuck down. The patient had to progress to a trabeculectomy, which functioned well (see *Myopic Patient Encounters Failed Needling*).

Myopic eyes often have early hypotony due to a floppy sclera. Early sclera channel leak means little aqueous drains via the stent lumen causing the distal tip to dry up. If you cannot get flow early, I find that good long-term results are harder to achieve.

CASE DISCUSSION

Dr. Sheybani: We have learned through experience that a shorter scleral track probably results in a stent that is closer to the episclera or within Tenon tissue. If the stent is short in the subconjunctival space, it is likely to end up more inside of Tenon and risks failure.

Dr. Lindfield: When the distal XEN tip is closer to the limbus, it may be caught up in Tenon insertion and drain less freely. Large myopic eyes appear to have an increased risk of early hypotony and shorter subconjunctival portion.

CASE 3: ANALISA AROSEMENA, MD

An 85-year-old African-American woman presented with severe OAG and an IOP of 20 mm Hg on four agents. She underwent XEN Gel Stent implantation without complications and received 0.4 mcg of 0.1 cc MCC placed in the same quadrant as the stent and a subconjunctival injection of 0.1 cc of Kenalog-40. At day 1 her postoperative IOP was 7 mm Hg and 8 mm Hg at 1 month without medications. At 2 months her postoperative IOP spiked to 19 mm Hg while still using prednisolone. The patient started bimatoprost ophthalmic solution (Lumigan, Allergan) and returned at 3 months with a postoperative IOP of 19 mm Hg and flat bleb morphology with no movement of the implant or conjunctiva over the implant. Needling was performed without complications, and her IOP immediately lowered to 7 mm Hg. One month following needling her IOP increased to 22 mm Hg, and medical therapy was reinstated.

At 2 months following the needling her IOP was 20 mm Hg on maximum IOP-lowering medications.

A trabeculectomy was performed at the same time as an open XEN revision, in which the conjunctiva was opened, all of the fibrous tissue over the device was removed, and then the conjunctiva was closed with a water-tight closure. The patient now has a stable IOP at 13 mm Hg with one medication and is doing well.

CASE DISCUSSION

Dr. Sheybani: When needling fails, another option is a revision by opening the conjunctiva. A positive attribute of the XEN Gel Stent is that it is possible to follow it with a trabeculectomy in the same area when necessary.

Dr. Lindfield: In my opinion, adding IOP-lowering medications to a failing bleb often results in further fibrosis (it dries up). Early needling is often advisable rather than adding medication.

CASE 4: CARLA BOURNE, MD

A 78-year-old Hispanic man presented with a cataract and mild OAG in his left eye complicated by quiescent herpes zoster. His IOP averaged around 18 mm Hg on four topical medications. His second eye (fellow eye with successful XEN) surgery was planned in effort to decrease medication burden since he was originally on maximum medications including orals.

The patient underwent successful XEN placement in the left eye. At day 1 his postoperative IOP was IOP 27 mm Hg despite good stent position and visualization possibly due to viscoelastic retention. His IOP was reduced to 20 mm Hg with digital pressure, and increased elevation of bleb was observed.

At week 1 postoperative the eye was quiet and without inflammation, but the IOP was still high at 21 mm Hg. Due to the lack of response to digital pressure and decreased stent visibility despite good positioning with minimal vascularity, there was concern for fibrosis and/or sub-Tenon stent location. Needling was performed to liberate the stent from any fibrosis, and 0.1 mcg of 5-FU was injected. The patient was instructed to continue corticosteroid and began gentle digital massage.

At week 1 his postoperative IOP was higher than optimal at 18 mm Hg; he was unresponsive to massage, and there was thickening over the stent. A second needling was performed, and an injection of 5-FU was given. Resistance was noted during needling indicating fibrosis, which tends to occur if the stent has sub-Tenon placement. Corticosteroids were continued and tapered slowly.

At his 3-month appointment, the IOP increased to 40 mm Hg.

The bleb over the XEN was very thick, low, and quiet. A third needling was performed where significant bands of fibrosis were encountered. The needling failed to produce bleb elevation or a major decrease in IOP. Medications were restarted, and the patient was advised that additional surgery may be needed.

The initial location of the XEN placement may be a better indicator of success, but this location is not always obvious, even intraoperatively. In this case the stent was mobile, and there was tenting of the conjunctiva during placement. Did the past history of herpes zoster play a role despite being quiescent? Was there some patient noncompliance? This case serves as a reminder of the unpredictability of glaucoma.

CASE DISCUSSION

Dr. Sheybani: I think that what Dr. Bourne has said is true. Sometimes we just do not know why a stent or subsequent needling fails.

Dr. Lindfield: The ease of on-table bleb priming is an indication of subconjunctival resistance. If the bleb does not prime freely then first ensure all viscoelastic is removed then perform a primary (on-table) needling. The operation is not finished until flow is established. A day 1 IOP greater than 12 is a poor prognostic indicator but means the XEN emerged in a high-resistance area or is blocked with viscoelastic or blood. It is too early for this to be fibrosis or inflammation.

CASE 5: ARSHAM SHEYBANI, MD

A 52-year-old African-American man presented with severe primary OAG (POAG) and an IOP of 20 mm Hg on four classes of medication with poor compliance. The patient underwent implantation of the XEN Gel Stent with the use of 60 mcg of MMC; the stent was slightly curled following placement. At month 2 his postoperative IOP was 22 mm Hg without medication. The bleb was flat, and the XEN was scarred and slightly more curled.

Needling was performed with a 27-gauge needle using 20 mcg MMC, but the IOP did not come down, and the XEN Gel Stent could not be straightened. Four classes of medication were restarted, and at month 4 his postoperative IOP was 17 mm Hg (see *Failed Needling After XEN in a Case of POAG*).

CASE DISCUSSION

Dr. Sheybani: If the XEN Gel Stent is curled at implantation, this likely indicates excessive intratissue connections. Today, if the stent curls during placement, I will perform needling on the table. This is a very controlled situation, does not take too much extra time, and seems to help with the outcomes.

Dr. Lindfield: If the subconjunctival portion of XEN looks curled in the early postoperative period ("early curly") it means there are strands of Tenon at the tip. I personally free these on the table with a primary needling procedure as it is often much harder to do this later on.

▶ WATCH IT NOW ◀

Failed Needling After XEN in a Case of POAG



▶ EYETU.BE/MBDEJ

CONCLUSION

Needling following a XEN Gel Stent is a perfect example of medicine as more of an art form than an exact science. Each surgeon will have their own protocol and technique. However, it is helpful to be reminded of points of consensus among a variety of surgeons with extensive experience. The recently published paper by Dr. Sheybani and colleagues³ complements these real-world examples to help every surgeon find their own best protocol. See *Tips for Needling* for more helpful information. ■

1. Mansouri K, Guidotti J, Rao HL, et al. Prospective evaluation of standalone XEN gel implant and combined phacoemulsification-XEN gel implant surgery 1-year results. *J Glaucoma*. 2017;27:140-147.
2. Schlenker MB, Gulamhusein H, Conrad-Hengerer I, et al. Efficacy, safety and risk factors for failure of standalone ab interno gelatin microstent implantation versus standalone trabeculectomy. *Ophthalmology*. 2017;124(11):1579-1588.
3. Vera V, Sheybani AR, Lindfield D, et al. Recommendations for the management of elevated IOP due to bleb fibrosis after XEN gel stent implantation. *Clinical Ophthalmology*. 2019. Accepted for publication.
4. Lenzhofer M, Kersten-Gomez I, Sheybani A, et al. Four-year results of minimally invasive transscleral glaucoma gel stent implantation in a prospective multicenter study. *Clin Exp Ophthalmol*. 2018. Epub ahead of print.

TIPS FOR NEEDLING

- Ensure the XEN Gel Stent (Allergan) is released from Tenon. The distal end must be free and mobile with a low, diffuse bleb.
- It may be useful to amputate the distal end of the stent. If needling is unsuccessful, consider performing YAG laser on the internal portion of the implant.
- Avoid needling if the Gel Stent is not plainly visible under the conjunctiva and consider revision with open conjunctiva.
- The majority of needling occurs in the first year following implantation, but there is a wide time range in which it can be performed successfully.
- Antimetabolites are very effective, and repeated applications should be considered; exercise caution as the long-term conjunctival response is not fully understood.
- Avoid bleeding for better visibility and to minimize wound healing response.
- Be proactive—control inflammation and act quickly once fibrosis starts!