EX-PRESS®
Glaucoma Filtration Device:
A More Standardized Surgical Experience
Advancing Glaucoma Surgery, One Innovation at a Time

THE EX-PRESS® GLAUCOMA FILTRATION DEVICE (Alcon Laboratories, Fort Worth, TX) represents a major advancement in glaucoma surgery. Introduced as an alternative to trabeculectomy, it provides a more standardized, minimally invasive procedure that achieves significant reductions in intraocular pressure (IOP). In clinical studies, implantation of the EX-PRESS® device resulted in the successful reduction of IOP and lower complication rates than trabeculectomy. This biocompatible, non-valved, miniature device is made of medical-grade stainless steel, and testing has indicated that it is MRI safe up to 3 Tesla. MRI of the head is permitted, however not recommended, in the first two weeks post-implantation. During EX-PRESS® filtration device surgery, the device is placed under a partial-thickness scleral flap to direct aqueous flow from the anterior chamber to the subconjunctival space, leading to the formation of a filtration bleb. The EX-PRESS® filtration device procedure is minimally invasive and does not require the sclerectomy or iridectomy performed with standard trabeculectomy. The device is pre-loaded onto an inserter for more control and efficient implantation (Figure 1). It also includes several structural features to enhance safety and efficacy (Figure 2). The consistent internal lumen diameter of the device provides an important standardization of the procedure by reducing the variability in the aqueous outflow opening.

The lower rate of complications reported with the EX-PRESS® device may be partly attributable to its design. The small 50-micron lumen, for example, is thought to limit aqueous flow, theoretically lowering the risk of hypotony. In a retrospective comparative series of 100 eyes, early postoperative hypotony was observed in 32% of patients who underwent trabeculectomy, versus 4% of those who underwent EX-PRESS® device surgery. In a separate study of 153 eyes (76 that underwent EX-PRESS® device surgery, 77 that underwent trabeculectomy), the incidence of postoperative hypotony was 16% with trabeculectomy, versus 4% with EX-PRESS® device surgery.

Recently, Sugiyama and associates evaluated the outcomes of EX-PRESS® device surgery and trabeculectomy in Japanese eyes for at least 1 year postoperatively. They reported higher rates of early postoperative hypotony among patients who underwent trabeculectomy compared to EX-PRESS® device surgery, concluding the small, 50-micron lumen may have contributed to the difference. Additionally, the EX-PRESS® device group experienced narrower IOP variations on the first postoperative day, more stable visual acuity from 1 week to 3 months, and fewer cases of laser suture lysis, as well as fewer administrations of IOP-lowering eye drops. Moreover, progression of visual field defect was observed in one-third of the patients in the trabeculectomy group, versus none in the EX-PRESS® device group. Evaluating the 1-year postoperative results from a prospective, randomized trial of glaucoma patients undergoing EX-PRESS® device surgery or trabeculectomy, de Jong observed similar complication rates between the two groups. However, the EX-PRESS® device group had significantly higher success rates, higher responder rates, and greater IOP control.

Longer-term studies have also shown promising results. Patients from the de Jong study were followed for up to an additional four years; from year 1 to 3, the EX-PRESS® device exerted better control of IOP than trabeculectomy; over the total five-year study period, patients in the EX-PRESS® device group required fewer IOP-lowering medications and fewer surgical interventions than those in the trabeculectomy group. Overall, the EX-PRESS® device patients had significantly higher success rates. In a comparative consecutive case series of 345 eyes, EX-PRESS® device surgery was found to have a 94.8% success rate as a standalone surgery 3 years postoperatively, as well as a 95.6% success rate when combined with phacoemulsification. With both the standalone and combined procedures, significant reductions in IOP were observed, as well as significant decreases in the number of needed IOP-lowering medications.

In this supplement, three ophthalmologists discuss their experiences with the EX-PRESS® device and share pearls and considerations for first-time users.

![EX-PRESS® Glaucoma Filtration Device](Image courtesy of Alcon.

**FIGURE 1.** The EX-PRESS® device is pre-loaded onto an inserter to facilitate implantation for right- or left-handed surgeons. Once positioned in the eye, the device can be released from the inserter using only one finger. Image courtesy of Alcon.

**FIGURE 2.** PS0 model of the EX-PRESS® Glaucoma Filtration Device. Image courtesy of Alcon.

### References

See back page for important safety information.
Introduction

SINCE I BEGAN using the EX-PRESS® Glaucoma Filtration Device (Alcon Laboratories, Fort Worth, TX) several years ago, a number of refinements have been made, both to the device and to the technique, to allow for more successful implementation and fewer complications. I currently use the P50 model and have been very happy with the results. One of the aspects I like most is that the EX-PRESS® device allows for a more standardized surgery — I am able to achieve a more consistent, predictable result while providing my patients with the added benefit of a fast visual recovery.

EX-PRESS® Device vs. Trabeculectomy

SINCE THE 1960s, trabeculectomy has been the gold standard in glaucoma surgery. However, standardizing this procedure from patient to patient is difficult due to a tremendous amount of variability, including variation in flap size and thickness, the amount of ocular tissue removed, and the different closures for the trabeculectomy flap. All of these factors contribute to differences in technique between surgeons. Although surgery with the EX-PRESS® device does not eliminate all these variables, many of them are now standardized to make the whole process a bit more reliable.

This allows for a more consistent, repeatable surgery — I create the flap the same way, and do the closure the same way, for each patient. Additionally, the 50-micron lumen in the EX-PRESS® device establishes a standardized size for the outflow ostium so that this remains a “constant” from surgery to surgery. The flow aspect is what is so difficult to standardize with traditional trabeculectomy surgery, giving the EX-PRESS® device an advantage. I have also observed less variability in anterior chamber depth with the EX-PRESS® device procedure compared to a trabeculectomy, since, with a trabeculectomy, the chamber often flattens or collapses after the block is removed, prior to the closure of the scleral flap. This differs from my experiences with the EX-PRESS® device, in which the anterior chamber usually remains formed throughout the procedure, decreasing the potential for complications. EX-PRESS® device surgery also eliminates the need for an iridectomy, which could possibly increase inflammation and cause bleeding.

Patient Selection

AS WITH ANY surgical procedure, appropriate patient selection is extremely important. The EX-PRESS® device can be used safely and effectively in eyes with prior scarring; however, there must be at least two clock hours of healthy conjunctiva with mobile posterior conjunctiva in order to establish a low diffuse bleb. If the entire conjunctiva is scarred everywhere, the likelihood of having a successful result is significantly reduced. The EX-PRESS® device is indicated for lowering IOP in glaucoma patients for whom medical and conventional surgical treatments have failed. I often perform the EX-PRESS® device procedure on patients with failed trabeculectomy, because I do not want to repeat the same surgery that was already unsuccessful (Figure 1). Using the EX-PRESS® device allows me to establish a nasal or temporal bleb with a small amount of conjunctiva, avoid the original scar, and lower the IOP without the use of a...
larger tube (Figure 2). Moreover, I can always place a silicone glaucoma drainage device later if needed.

Other patients who would make appropriate candidates for this procedure include people with deep anterior chambers, or those who have had cataract surgery (pseudophakia) and have healthy superior conjunctiva. Many surgeons prefer the EX-PRESS® device as a primary glaucoma procedure following failed medical therapy in trabeculoplasty. These patients are ideal since the chambers are deep, and the superior conjunctiva untouched.

I would avoid performing the EX-PRESS® device procedure on patients with neovascular glaucoma, uveitis, chronic angle closure, or superior peripheral anterior synechiae, where the iris is attached to the wound superiorly. It is more difficult to insert the device into the eyes of these patients without encountering complications.

The Procedure

PREPARING THE PATIENT

PRIOR TO SURGERY, the patient receives Betadine and TetraVisc to anesthetize the eye and is then prepped and draped in the operating room. I begin the procedure by making a paracentesis with a sharp point blade, followed by 0.1 cc of intraocular 1% non-preserved lidocaine. I then use a 30-gauge needle on the same syringe of 1% non-preserved lidocaine to elevate the superior conjunctiva; this acts as a reservoir for the anesthetic agent so that the patient is completely pain-free. We termed this “Blitz anesthesia” years ago and find no need to deliver a peribulbar block.

CREATING THE FLAPS

A CONJUNCTIVAL fornix-based flap is made (although a limbal-based flap is also just fine) using Wescott’s scissors and smooth forceps at the surgical limbus to provide an adequate space for the procedure. I apply light cautery and then an antimetabolite on three or four 10-mm Weck-Cel® sponges cut from the spongy insert within the plastic drain. The sponges are then placed under the conjunctiva and Tenon’s capsule for 1.5 minutes; then the area is irrigated copiously with balanced salt solution. The drain is then changed so that the antimetabolite is disposed of according to proper regulations.

The scleral flap is made with a 67 blade, followed by a 57 blade, to create a 3 x 4 mm or 3 x 3 mm flap that is half thickness into clear cornea (Figure 3). It is critical that the flap is large enough to cover the inserted EX-PRESS® device completely so that no part of the device is exposed postoperatively. I then pre-place two 10-0 nylon sutures on either side of the scleral flap to accomplish two things: First, this tends to avoid inducing additional astigmatism, since the sutures are placed in a pressurized eye; and secondly, it allows the flap to be closed immediately if needed.

INSERTING THE DEVICE

BEFORE CREATING AN entry point in the anterior chamber for the EX-PRESS® device, I make sure the chamber is formed to an IOP of about 20 mm Hg with balanced salt solution through the paracentesis. This will allow the device to pass through the entry point easily, clear the cornea, and avoid hypotony. Once the IOP is confirmed, a 25-gauge needle is used to create the anterior chamber entry point. I place the needle exactly at the grey line where the cornea meets the sclera (Figure 4).

See back page for important safety information.
It is most critical to keep the needle exactly parallel to the iris. This ensures that the device will not nosedive into the iris or pass through the cornea. Once I’ve created the entry point, I remove the needle and insert the EX-PRESS® device. Keeping my hand parallel to the iris, I rotate the device counter-clockwise so that it is on its side (Figure 5). I introduce it into the entry point, and gently, steadily move the instrument forward until I feel a “pop” sensation. I rotate the device back into an upright position and press the release mechanism, which releases the device immediately. If the device is positioned correctly, it will be flush with the sclera in the mid-anterior chamber (Figure 5).

Once the EX-PRESS® device is inserted, there is an immediate egress of aqueous out through the back of the device. The pre-placed 10-0 nylon flap sutures are then closed with a slipknot. Ultimately, I want to make sure there is a posterior flow out through the back of the wound so that a diffuse bleb will form and microcysts will become apparent early on within the conjunctiva. At this point in the surgery, I like to have more control over the flow, so I add either one or two releasable sutures (Figure 6, Figure 7). Certainly lasketable sutures work just as well. If the preoperative IOP is very high, we want to have tighter control of aqueous egress in the postoperative period, so the flap sutures will be tighter. If the IOP is low — for example, in normal-tension glaucoma, where the starting pressure is 18 mm Hg, and the goal is an IOP of 10 mm Hg — the flow through the posterior edge of the flap can be more aggressive; therefore, the releasable sutures need not be as tight, and/or they can be removed the first postoperative day. Usually, I remove the releasable sutures within 3 weeks.

When closing the conjunctiva and Tenon’s capsule, it is imperative that the closure be watertight. I place one suture temporally and one nasally, making the temporal suture a modified purse string so that the wound implodes on itself and does not leak. I use a mattress suture on the opposing side as counter-traction to additionally assure that the cord length of the conjunctival closure is as small as possible and as tight against the limbus as possible. I cut the ends of the releasable sutures just at the edge of the conjunctival closure so that I can just see the edges. All sutures are removed at 3 weeks at the slit lamp. Finally, using the pre-placed paracentesis, the bleb is blown up with balanced salt solution, and a Weck-Cel® sponge is applied to the wound to assure that it is watertight.

REPOSITIONING THE DEVICE

AN ADDED ADVANTAGE of the EX-PRESS® device procedure is that it can be redone if the device is not positioned correctly — although this rarely occurs, the surgeon could remove an improperly positioned EX-PRESS® device by abutting a sharp point blade right next to the pre-placed opening, thereby making it wider. This will allow for the removal of the device so that it can be placed back onto the inserter and re-inserted in the correct position in another entry site, often under the same flap. This is certainly much easier than trying to rectify a problematic trabeculectomy in which the surgeon has removed too much tissue.

Although the EX-PRESS® device procedure in the literature has been associated with fewer postoperative complications than standard trabeculectomy4-7 there are still risks. Shallow or flat chambers can still present if the flap is not tied tightly enough. Although fewer in number, the complications of trabeculectomy can still occur, and the surgeon must be able to recognize and deal with these
rare but serious events. Also, as with a trabeculectomy, some patients who undergo the EX-PRESS® device procedure may experience scarring due to adhesions between the episclera and the conjunctiva and Tenon's capsule, which can impair the outcome of the surgery. Unfortunately, scarring of the bleb is the main issue in why this device can fail.

Conclusion
I REGULARLY PERFORM a wide variety of different glaucoma surgeries and choose the procedure based on the individual circumstances of each patient. In the patients I have selected for the EX-PRESS® device procedure, this device has yielded very positive results, promoting a consistent, repeatable surgery with less tissue manipulation, fewer complications, and a fast rehabilitation. Should the procedure fail, a larger tube device can always be done in the future.

WHY I LIKE THE EX-PRESS® DEVICE
—Marlene Moster, MD

- Lowers IOP
- No iridectomy required
- Creates a low diffuse posterior bleb (Figure 8)
- Quicker visual recovery
- Relatively fast learning curve

MAXIMIZE SURGICAL OUTCOMES WITH THE EX-PRESS® DEVICE

- Correct placement is key
- Keep anterior chamber formed prior to insertion
- Conjunctival closure must be watertight
- Cut permanent or releasable sutures appropriately to titrate flow in first 3-week post-op period

PATIENT SELECTION
- Pseudophakic patients with healthy superior conjunctiva
- Patients with deep anterior chambers
- Patients with failed trabeculectomies
- Avoid patients with chronic angle closure, neovascular glaucoma, uveitis, or superior peripheral anterior synechiae

EX-PRESS® Increased Precision with a Mini-Glaucoma Filtration Device

Introduction
MY IMPRESSION OF the EX-PRESS® Glaucoma Filtration Device (Alcon Laboratories, Fort Worth, TX) has evolved significantly as a minimally invasive surgical option for glaucoma. I was trained on the original model, which received FDA clearance in 2002, and was very apprehensive about using it. At that time, the device was placed under the conjunctiva without a scleral flap, which I felt promoted hypotony. Despite completing the certifying course, I never used it in this fashion in a patient. However, several adjustments followed, including a major shift in surgical strategy: The device is now placed underneath a partial-thickness scleral flap to minimize adverse events postoperatively.1 The device itself has also been modified for better results.3 When I learned about the new scleral

REFERENCES

FIGURE 1.
Implantation of the EX-PRESS® device. A 25-gauge needle tract provides a minimally invasive entry point into the anterior chamber. Photo courtesy of Thomas W. Samuelson, MD.

FIGURE 8.
EX-PRESS® device bleb 4 years after implantation. Photo courtesy of Marlene Moster, MD.
flap approach a few years ago, I decided to try the EX-PRESS® device again. I have been using it with increasing frequency ever since.

**Small Adjustments, Big Difference**

The EX-PRESS® device procedure brings a certain degree of consistency that makes it an attractive surgical option. Intraoperatively, many of the standard components of glaucoma filtration surgery still apply, including meticulous scleral flap dissection — while the EX-PRESS® device ensures that every eye will have a uniformly sized lumen for aqueous flow, a competent scleral flap is still essential to help control the flow.

Indeed, proper scleral flap construction may be the most important step to master with EX-PRESS® device surgery. Similar to trabeculectomy, complications can arise if the flap is an inadequate size or thickness. One must also be cautious not to make the dissection too deep, especially in the region of device implantation, because this could significantly impact the outcomes of the surgery. I typically make the flap about two-thirds thickness and about 3.5 mm x 3.5 mm. Additional care is taken to assure that the flap extends adequately posterior to cover the ostium of the device, because the aqueous is delivered more posteriorly with the EX-PRESS® device. We want to direct aqueous back into the subconjunctival space so that it doesn’t collect at the limbus. A properly made scleral flap allows us to accomplish this.

Once the flap is created, I usually pre-place two flap sutures to control the aqueous flow. Then, I make an entry point in the anterior chamber for the device. (I use the P30 model.) This minimally invasive entry point — a 25-gauge needle tract — represents another favorable aspect of EX-PRESS® device surgery. A 26-gauge needle would also suffice here; however, needles smaller than that are not recommended, as the surgeon will encounter much more resistance when trying to implant the device (Figure 1).

Once the device is in place (Figure 2), the pre-placed flap sutures are tied to adjust flow (Figure 3). I generally use two sutures, but will not hesitate to add more if needed to control flow and to avoid the risk of hypotony. I prefer to control the flow in this manner, because it is easier to increase flow postoperatively by cutting or releasing sutures than it is to try to slow the flow down.

The conjunctival closure is very similar to that performed in a trabeculectomy. A fornix-based flap is typically used, and the incision is closed at the limbus (Figure 4).

The learning curve for the EX-PRESS® device is relatively short, but it is like all microsurgery — a nuanced procedure, and it is important to learn from your first few cases and develop a systematic, standardized approach. This device lends itself to that.

**A More Standardized Surgery**

I LIKE USING the EX-PRESS® device because it standardizes a key step in the surgery, the sclerostomy. As a result, surgeons have a much better idea of what to expect each time they implant the device. I also appreciate the consistency that I observe postoperatively. For example, I have a better idea of what response to expect with suture lysis.

With a trabeculectomy, these factors are less predictable. There are times when I can use a Kelly punch — I punch out the sclerostomy, and the anterior chamber stays formed, the iris stays in the correct place, and no bleeding occurs from the cut edges of the scleral tissue. However, there are also plenty of times when I perform a trabeculectomy and just the opposite occurs — the iris prolapses from the anterior chamber, and the cut ends of the sclera/ peripheral cornea bleed. Sometimes, with a punch sclerostomy, aqueous from the anterior...
chamber evacuates, and the chamber shallows considerably. Virtually every time I use a Kelly punch, I have to release my traction suture while I do the punch.

Using the EX-PRESS® device eliminates all of these issues — the iris has no opportunity to prolapse; no bleeding occurs from cut edges of Schlemm’s canal, the sclera, or the edges of the iris (from an iridectomy). Plus, there is no chance that the ciliary processes will be dragged into the iridectomy incision and cause bleeding. The EX-PRESS® device procedure takes away a lot of the individual variability that is so common in glaucoma surgery.

If we can standardize an important step such as the sclerostomy, I believe this goes a long way toward advancing the field. I have found that my appreciation for this standardization has only grown the more I use this device.

**Less ‘Open Eye’ Experience**

THE EX-PRESS® device procedure also involves less open eye experience than a trabeculectomy — “open eye” referring to that period of time during an operation when the IOP is essentially zero, and the eye is more vulnerable to anterior chamber shallowing/flattening, or to suprachoroidal events, such as hemorrhages, effusions, or iris prolapse. Many times when I am performing an EX-PRESS® device filtration procedure, I do not have to release my traction suture. Often, the paracentesis is not made until the end of surgery, when the sutures are all closed, and I am simply testing the aqueous flow from beneath the scleral flap. The anterior chamber generally doesn’t shallow at all, throughout the entire operation. There are clear benefits to this, with less overall potential disruption of the normal intraocular milieu — when an anterior chamber shallows, we anticipate that the vitreous face may shift slightly, for example. With these issues in mind, limiting the amount of sustained open eye experience is favorable, and the EX-PRESS® device affords us this ability.

**Earlier Suture Removal**

ALTHOUGH THE EX-PRESS® device lends some resistance to outflow, I do not depend on the device exclusively for flow regulation. Rather, additional input from the scleral flap and conjunctiva-Tenon’s complex contribute to exert the right amount of flow resistance. Once the scleral flap has begun to seal within a week or so of healing, and the conjunctiva has begun to contract, I can release the flap sutures a little earlier than I might otherwise feel comfortable doing after a standard trabeculectomy.

This is especially noteworthy because it can be frustrating for patients when they return for their 1-week postoperative checkup, the IOP is a little too high, but it is too early to cut a suture to increase the flow — so they must come back again a few days later. With the EX-PRESS® device, the window during which the flap sutures can be released is a bit more flexible, and this can save patients postoperative visits.

**Patient Selection**

BECAUSE THERE IS no one-size-fits-all surgical option, the EX-PRESS® device procedure is one of many types of glaucoma surgeries I perform depending on the needs of the patient. I have performed fewer trabeculectomies over the last few years in favor of earlier tube shunt surgery, cataract surgery alone, or canaloplasty. However, with my appreciation for some of the advantages the EX-PRESS® device brings, my transscleral filtration procedures have increased in number significantly in the past year, somewhat reversing a trend in the last decade to reduce my use of bleb-forming procedures. Trabeculectomy and the EX-PRESS® device procedure have similar indications. For example, I like to use the EX-PRESS® device in patients with high myopia who require trabeculectomy, because with these individuals, one wants to do everything possible to avoid hypotony. The EX-PRESS® device procedure is also especially useful for patients who may have a greater risk of vitreous prolapse; we do not want to perform an iridectomy and allow for the possibility that vitreous could come in anteriorly. Almost anyone who is a candidate for trabeculectomy is, for the most part, a candidate for the EX-PRESS® device. I just view the EX-PRESS® device procedure as a desirable alternative to trabeculectomy in most cases, when medical and conventional surgical treatments have failed.

**Conclusion**

ALTHOUGH I AM very comfortable performing standard trabeculectomies, this does not mean that I cannot benefit from or appreciate improvements. Many surgeons will say that they don’t need help performing a sclerostomy — and they don’t. But if we can do it more safely, and in a more standardized fashion, I don’t see how that couldn’t be an advantage. I am hopeful that this only represents the beginning, and that we develop additional standardizing steps in what has traditionally been a very “non-standardized” procedure.

The EX-PRESS® device represents a notable innovation in the advancement of glaucoma surgery. As with all glaucoma procedures, it requires meticulous attention to detail. However, this minimally invasive surgery also allows for greater surgical control; and its predictability, standardization, and elegance make it an attractive addition to our armamentarium.

**References**


**See back page for important safety information.**
Introduction
OPHTHALMOLOGISTS ARE CONTINUALLY looking for ways to improve surgical outcomes. The EX-PRESS® Glaucoma Filtration Device (Alcon Laboratories, Inc., Fort Worth, TX) is reported to be associated with fewer surgical interventions, a lower rate of complications, and a faster visual recovery.1-3 I have been using the EX-PRESS® device for about 5 years, and I have found that a few simple measures can go a long way toward optimizing the results of this surgery. In this segment, I highlight pearls and considerations for surgeons who are new to the EX-PRESS® device procedure, including those performing this surgery for the first time.

Seeing the Difference
COMPARED WITH TRABECULECTOMY, the frequency of anterior chamber shallowing and hypotony appears to be lower with the EX-PRESS® device procedure.1,4 This may be at least partly attributable to the fact that certain aspects of EX-PRESS® device surgery promote stability: The entry incision for the device is a small, 25-gauge opening and is self-sealing, which helps to maintain the anterior chamber during the procedure. The 50-micron lumen of the EX-PRESS® device, meanwhile, provides a standardized opening for aqueous flow; but it also provides some flow resistance, which appears to add further stability to the anterior chamber in the early postoperative period. Also, EX-PRESS® device surgery does not require the removal of a large block of ocular tissue, and because an iridectomy isn’t part of the equation, iridectomy-associated bleeding, inflammation, pigment release, and potential for vitreous prolapse don’t apply. These advantages make EX-PRESS® device surgery an appealing choice for qualified patients, with the added benefit that it requires fewer steps than a trabeculectomy.

It is important to remember that the EX-PRESS® device procedure still involves a subconjunctival external filter, and that there is still a risk of hypotony, bleb-related issues, and other complications; although the reported rate of postoperative complications with EX-PRESS® device surgery is lower than with trabeculectomy.1,2,4

First-Time EX-PRESS® Device Users: What to Expect
SURGEONS ACCUSTOMED TO performing trabeculectomies will find some notable similarities with the EX-PRESS® device procedure — the conjunctival and scleral dissections are similar, and the scleral and conjunctival suturing is fairly direct and consistent — making the transition to EX-PRESS® device surgery pretty straightforward. Scleral flap design is a key factor in any filtering procedure, so for someone who has not performed trabeculectomies previously, understanding limbal anatomy will be an important prerequisite for using the EX-PRESS® device. Useful anatomical landmarks can help guide the surgeon to determine the proper positioning of the flap, as well as the proper entry point for the device. These landmarks are discussed below. Experience with blebs is also important.

Selecting the Right Patients
IN GENERAL, ANY open-angle glaucoma patient who has failed medical and surgical
therapies and requires a filtering procedure and pressure target in the low teens or single digits is a candidate for the EX-PRESS® device procedure. I would avoid this surgery on patients with angle closure, as there is likely insufficient space for the placement of the device. Eyes with narrow angles also need to be carefully considered for the same reason. Additionally, I avoid performing EX-PRESS® device surgery on patients for whom trabeculectomy techniques (and, therefore, the EX-PRESS® device procedure) would likely fail. This includes individuals with neovascular glaucoma, active uveitis, or eyes that have undergone conjunctival surgery and exhibit excessive limbal scarring. For these patients, other options (tube shunts, for example) are typically considered.

Pearls for Using the EX-PRESS® Glaucoma Filtration Device

MY EX-PRESS® device patients receive topical anesthesia with subconjunctival lidocaine, if needed, after the conjunctival flap is raised. In cases where wound-healing modulations are used, I typically use the same agents indicated for trabeculectomy.

PEARLS FOR DISSECTING THE FLAPS

- A corneal traction suture can be useful for rotating the eye downward if patient cooperation is suboptimal.
- I usually create a fornix-based conjunctival flap, but with an added modification: I leave a small stump of conjunctiva at the limbus, which is used when the conjunctiva is sutured closed at the end of the surgery to obtain a watertight closure.
- I mentioned earlier the importance of landmarks to help guide the surgeon during this procedure: The scleral spur is a white, glistening band that borders the limbal blue zone. The limbal blue zone is a grey-blue zone that transitions to clear cornea. Ultimately, we will want to insert the device at the scleral spur, posterior to the edge of the limbal blue zone (Figure 1).
- Prior to scleral flap dissection, the entry point for the device is determined. The flap dimensions are then pre-planned around this point. As a result, when the device is finally inserted, we already know that the flap will adequately cover it (Figure 2).
- When measuring the flap dimensions, I generally leave a space of about 1-1.5 mm on either side of the implant, 1 mm posteriorly, and 0.5 mm anteriorly to produce a flap size of approximately 4 mm x 3 mm (Figure 2).
- I intentionally leave a 0.5 mm gap between the apex of the flap and the anterior aspect of the implant to help prevent compression of the implant by the flap (Figure 2).

For surgeons who are new to this procedure, using a caliper to measure the scleral flap dimensions is recommended.

- Once all dimensions of the scleral flap are measured out, the flap is dissected. It is dissected past the scleral spur and into the blue zone of the peripheral cornea (Figure 3).
- A thick scleral flap helps to provide good control of the aqueous flow and will help guard against hypotony. I generally make a half-thickness flap.

See back page for important safety information.
PEARLS FOR CREATING THE ENTRY POINT FOR THE DEVICE

- The entry point should be made at the scleral spur, posterior to the edge of the limbal blue zone (Figure 3). Entering at the scleral spur ensures that the device is placed properly in the anterior chamber, away from the cornea and iris.
- A 25-gauge needle or MVR blade is used to create an anterior chamber entry point for the device. Inserting it parallel with the iris is crucial so that it does not point up toward the cornea or down toward the iris (Figure 4).

PEARLS FOR INSERTING THE DEVICE

- Before attempting to insert the device through this newly created opening, I position the EX-PRESS® delivery system in my hand so that my first finger is already on the injector trigger, making it easy to release the EX-PRESS® device into place once it is correctly positioned in the eye.
- I rotate the device 90 degrees on its side, insert it into the anterior chamber opening, and then turn it back to its final upright position once the device is fully inserted (indicated by a “pop” sensation) (Figure 5).
- If the device is inserted correctly, its tip will be in the anterior chamber, and the end plate of the device will be flush with the scleral bed (Figure 5).
- I then inject balanced salt solution through a paracentesis to check the aqueous flow. Sometimes, not surprisingly, some aqueous may flow around the device, because it has been placed through a stretched pilot hole.

PEARLS FOR SUTURING

- When placing sutures intraoperatively, I use slipknots so that the tension can be titrated up or down, depending on the amount of flow that occurs as balanced salt solution is injected into the side port.
- When the scleral flap is sutured down at the end of the procedure, I typically use two or three sutures; the goal is to provide enough resistance to ensure that the aqueous flow will be able to maintain the IOP at a target level of at least the mid-teens. I expect there to be a slight trickle of aqueous around the scleral flap indicating adequate suture tension.
- The conjunctival flap is sutured back using 10-0 Vicryl sutures with a running horizontal mattress technique, allowing for a watertight closure (Figure 6).
- Postoperatively, if the sutures have been placed with adequate tension, the IOP should ideally be in the mid-teens on the first day.
- As the IOP increases over time during bleb healing, suture lysis may be performed
as needed. I usually prefer to wait at least a week before lysing the sutures, allowing an enhancement of the bleb to be formed postoperatively as needed.

**The Bottom Line**

A KEY POINT with any filtering procedure is ensuring that once everything is in place, the eye is stable. The EX-PRESS® device procedure promotes this stability. Several facets of the surgery — the small opening used for the device, the ability to maintain a more stable anterior chamber, avoiding an iridectomy — all contribute to a more peaceful procedure. Postoperative instability and variability appear to be reduced with this procedure as well.

**References**


**Disclosures**

Dr. Moster is a lecturer and consultant for Alcon, Allergan, IOP, BD, Merck, Genentech, tissue Tech, and Science.

Dr. Samuelson is a consultant for Alcon, AcaMems, Allergan, Abbott Medical Optics, AqueSys, EndoOptiks, Glaukos, Ivantis, Merck, Ocular Surgery News, QLT, Santen Inc., and SLACK, Inc.

Dr. Ahmed is a consultant for and receives research/grant support from Alcon, Abbott Medical Optics (AMO), Allergan, AqueSys, Carl Zeiss Meditec, Ivantis, Science, Pfizer, and Transcend Medical. He is also a consultant for Clarity Medical Systems, EndoOptiks, Eyelight, and Glaukos and is a speaker for Alcon, AMO, Allergan, Carl Zeiss Meditec, Clarity Medical Systems, science, Merck Frosst, New World Medical, and Pfizer.

**FIGURE 6.**

Suturing of the conjunctival flap (can be sutured to limbal conjunctiva or cornea). Photo courtesy of Iqbal “Ike” K. Ahmed, MD, FRCS.

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**EX-PRESS® Glaucoma Filtration Device Brief Statement**

**CAUTION:**

Federal (USA) law restricts this device to sale by, or on the order of, a physician.

**INDICATION:**

The EX-PRESS® Glaucoma Filtration Device is intended to reduce intraocular pressure in glaucoma patients where medical and conventional surgical treatments have failed.

**GUIDANCE REGARDING THE SELECTION OF THE APPROPRIATE VERSION:**

Prior clinical studies were not designed to compare between the various versions of the EX-PRESS® Glaucoma Filtration Device. The selection of the appropriate version is according to the doctor’s discretion.

**CONTRAINDICATIONS:**

The use of this device is contraindicated if one or more of the following conditions exist:

- Presence of ocular disease such as uveitis, ocular infection, severe dry eye, severe blepharitis.
- Pre-existing ocular or systemic pathology that, in the opinion of the surgeon, is likely to cause postoperative complications following implantation of the device.
- Patients diagnosed with angle closure glaucoma.

**WARNINGS/PRECAUTIONS:**

- The surgeon should be familiar with the instructions for use.
- The integrity of the package should be examined prior to use and the device should not be used if the package is damaged and sterility is compromised.
- This device is for single use only.
- MRI of the head is permitted, however not recommended, in the first two weeks post implantation.

**ATTENTION:**

Reference the Directions for Use labeling for a complete listing of indications, warnings, precautions, complications and adverse events.