

# Role of Ex-Press Glaucoma Shunt Implant in Glaucoma Filtering Surgery.

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## ABSTRACT

Glaucoma filtration surgery is a challenge for any glaucoma surgeon, because of its variable results and numerous complications. The Ex-PRESS glaucoma shunt, when used along with trabeculectomy gives a controlled drainage of aqueous and hence most of the complications due to over filtration like hypotony, choroidal detachment could be avoided. Tissue erosion and migration of device were initially noted, but later became rare due to modifications in techniques, like use under a sclera flap. The Ex-PRESS glaucoma shunt implant is a promising device in glaucoma filtration surgery, if used judiciously.

**Key words:** Ex-PRESS glaucoma shunt, Trabeculectomy, Glaucoma filtration surgery.

## INTRODUCTION

The Ex-PRESS glaucoma shunt, made from medical grade implantable stainless steel, 2.4-3 millimeters long and 400  $\mu\text{m}$  in diameter [Figure 1,2] is MRI compatible and biocompatible device. It was designed with the intention of offering an accurate, repeatable, and safe alternative to trabeculectomy. Similar to trabeculectomy, the shunt reduces intraocular pressure (IOP) by diverting aqueous humor from the anterior chamber to the sub-conjunctival space in order to form a filtration bleb.

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Mitomycin C (MMC) use during the procedure is recommended to prevent scarring. The device's unique flow-modulating design and the scleral flap under which it is implanted, controls postoperative aqueous flow. Filtering surgery with the Ex-PRESS mini-shunt is a safe and standardized procedure compared to classic trabeculectomy.<sup>[1,2]</sup>

Originally the Ex-PRESS manufacturer (Optonol Ltd., a Swiss-Israeli company) recommended placing the device directly under the conjunctiva, but due to excessive hypotony, exposure, and other adverse effects, this technique has been abandoned.<sup>[3]</sup>

Dahan and Carmichael first recommended implanting the Ex-PRESS shunt under a 5  $\times$  5 mm partial thickness scleral flap, similar to a standard limbus-based guarded trabeculectomy.<sup>[4]</sup> Placing the Ex-PRESS under a half thickness scleral flap provides resistance to aqueous flow and prevents erosion. No iridectomy is required. Since 2003, Optonol, Ltd. has recommended all users of the device to only implant the device guarded under a scleral flap.

**Table 1:** Models and Features of ExPRESS Shunt

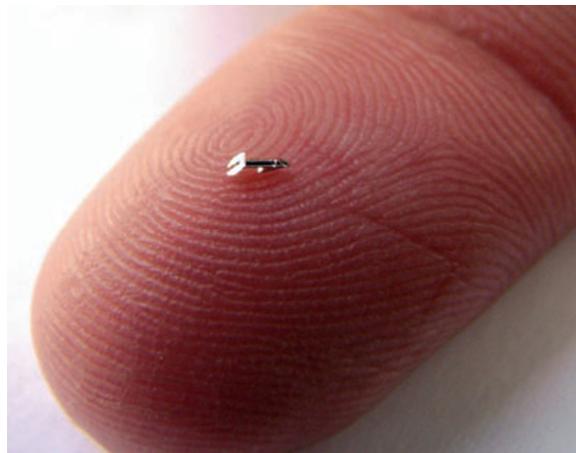
| Characteristics                       | Ex-PRESS™ R-50<br>Beveled tip for easy insertion                                    | Ex-PRESS™ X-50, X-200<br>Used for excessive flow                                     | Ex-PRESS™ P-50, P-200<br>Beveled tip for easy insertion. Vertical split back plate for posterior flow |
|---------------------------------------|---|--|---|
|                                       |  |  |                  |
| External body shape                   | Round   | Square   | Round   |
| Device length (mm)                    | 2.96  | 2.42   | 2.64  |
| Internal lumen size ( $\mu\text{m}$ ) | 50  | 50, 200  | 50, 200   |
| Tip shape                             | Pointed   | Square & Short   | Pointed   |
| Back plate shape                      | Uniform   | Lateral Channel  | Vertical Split  |
| Pre-incision needle gauge             | 27g   | 23-25g   | 25g   |

**Ex-PRESS Indications<sup>[5]</sup>**

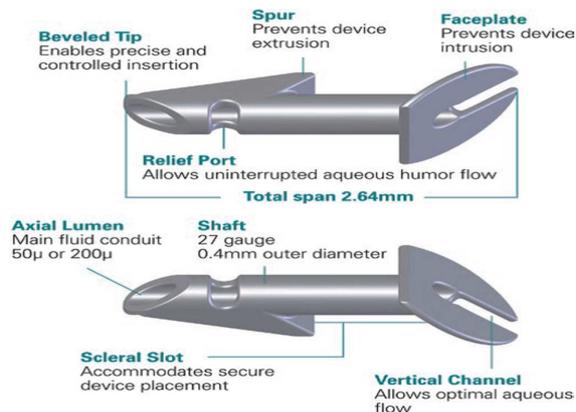
1. Open Angle Glaucoma refractory to medical and laser treatment
2. Open Angle Glaucoma when a filtration procedure has failed
3. With combined glaucoma and cataract procedure
4. Aphakic glaucoma
5. Sturge-Weber syndrome

**Ex-PRESS Contraindications**

1. Narrow Angle Glaucoma
2. Congenital or juvenile glaucoma
3. Aniridia and anterior segment dysgenesis syndromes
4. Neovascular glaucoma
5. Microphthalmia



**Figure 1:** Express shunt



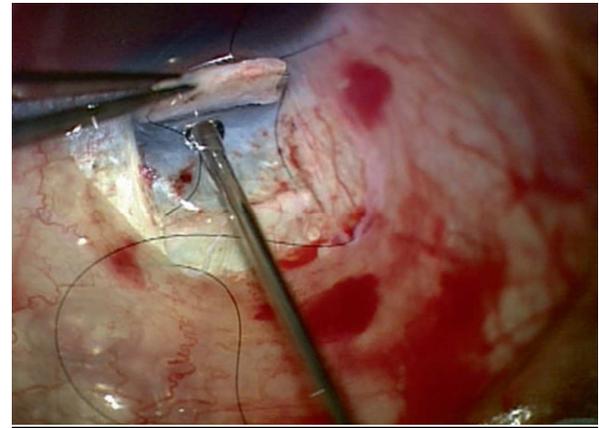
**Figure 2:** Parts of the device

**Surgical Technique [Figure 3-6]**

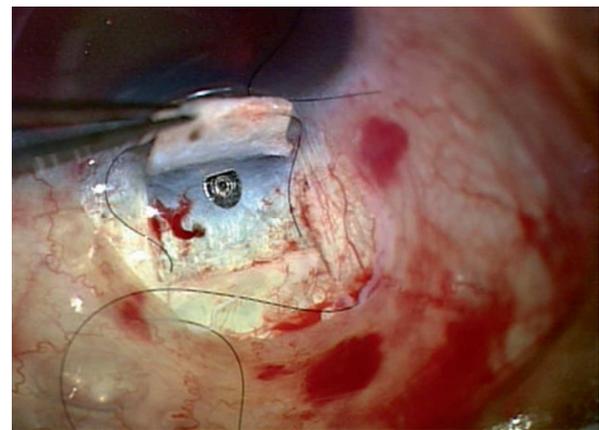
**Step 1:** A standard fornix or limbal-based conjunctival incision is performed to gain exposure to the scleral bed adjacent to the limbus. Gentle cautery is performed in this area.

**Step 2:** A scleral flap is created in a similar manner performed with a standard trabeculectomy. Care is

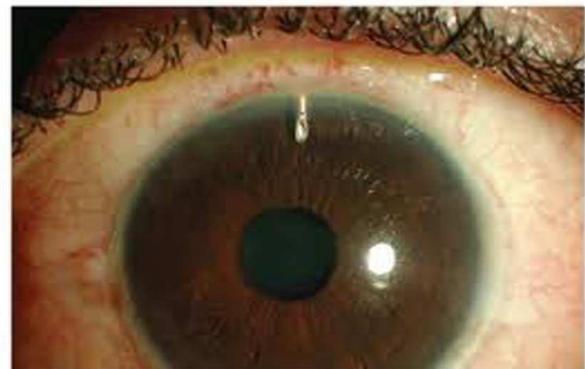
taken to dissect the flap up to clear cornea. Anti-fibrotic agents can be applied either before or after the creation of the scleral flap in the usual manner based on the surgeon's preference.



**Figure 3:** The shunt is inserted in a previously made opening.



**Figure 4:** The Ex-PRESS external plate should lie flush with the scawith either a 27- or 25-gauge needle (depending on model).



**Figure 5:** Express Shunt in situ

**Step 3:** A temporal paracentesis is created through the cornea. The scleral flap is lifted and care is taken

to identify the center of the “blue line” adjacent to clear cornea which corresponds to the location of the trabecular meshwork. A 26 gauge needle is inserted into the anterior chamber through the center of the “blue line” at an angle parallel to the iris plane. The needle is removed. There must not be any lateral movement of the needle as this will cause aqueous to flow around the implant.

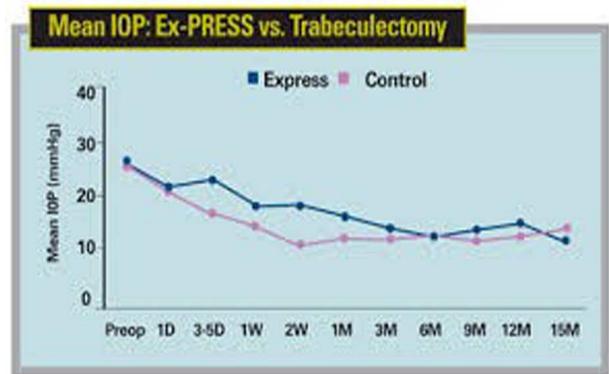
**Step 4:** The Ex-Press shunt is preloaded on an injector. The shunt is then placed in the anterior chamber through the ostium created with the needle. The angle of entry with the shunt is the same as the angle used to make the ostium. The shunt is inserted all the way into the wound making the plate flush with the scleral bed. In a similar fashion as a standard punctal plug inserter, the injector has an area on the shaft that is then depressed which retracts the metal rod in the lumen of the shunt. This allows the injector to be free from the lumen of the shunt.

**Step 5:** The scleral flap is then sutured in place using a 10-0 nylon suture with a spatulated needle. One to three sutures are typically required depending on the flow which can be tested by inflating the anterior chamber with balanced salt solution with a 27 or 30 gauge canula through the temporal paracentesis.

**Step 6:** The conjunctiva is then meticulously closed with the surgeon's suture of choice. (8-0/9-0 polyglactin suture in a running or interrupted fashion). A fluorescein strip is used to make certain the wound is water tight.

### COMPLICATIONS

Complications typically seen with a trabeculectomy can also be observed following implantation of the Ex-PRESS implant. Immediate postoperative hypotony, shallow or flat anterior chamber, hyphema, and choroidal detachments do occur, although to a lesser extent because of the small 50 µm drainage orifice. The usual directive on how to avoid these complications in other filtration procedures is also applicable to filtration surgery with the Ex-PRESS. In terms of toxicity of the material, no adverse reports have been published to this date and the shunt is MRI compatible.<sup>[6]</sup> Moreover, interpretation of MRI scans of the orbit and brain are not affected by EX-PRESS shunt artifacts. There have been rare reports of erosion when inserted directly under the conjunctiva, and therefore have the implant extrude after direct trauma and the shunt when improperly placed can dislocate into the anterior chamber.<sup>[7]</sup> On occasion, the implant will need to be safely removed.



**Figure 6:** Comparison of mean IOP.

### CONCLUSION

Glaucoma surgery is constantly evolving. The perfect glaucoma procedure has yet to be invented. However, the desire to minimize complications while maximizing outcomes continues to move surgical technology forward. Prospective randomized studies comparing Ex-PRESS implantation with standard trabeculectomy and other drainage implants are warranted to define the optimal treatment modality for complicated glaucoma.

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**How to cite this article:** Cheriyath D, Swadique M. Role of Ex-Press Glaucoma Shunt Implant in Glaucoma Filtering Surgery. Ann. Int. Med. Den. Res. 2015;1(3):126-28.

**Source of Support:** Nil, **Conflict of Interest:** None declared