

These are specially devised plates with tubes which conduct aqueous from the anterior chamber to the subtenon lake created at the equator. Aqueous drainage devices are important tools in the management of refractory glaucomas.

### Seton(Latin word - bristle)

Seton is a non- hollow linear shaft that prevents wound apposition facilitating bulk flow by surface tension.

Sources of Seton: Silk, Horse hair, gold, Tantalum wire, platinum, gelatin, Silicon, PMMA.

### Shunt

Shunt is a passive tubular structure incapable of influencing either antegrade or retrograde flow.

### Valves

Designed to allow unidirectional flow.

### Principle

Principle behind the function of the aqueous drainage devices is that it provides an alternate pathway for drainage and absorption of aqueous. Aqueous is shunted to a subscleral lake created behind the equator where the plate is fixed and aqueous collected there is absorbed in to systemic circulation by diffusion and through the scleral veins.

### Basic fundamentals of drainage implants

All modern implants are made of non reactive synthetic material to which fibroblasts adhere poorly. Device establishes a potential space around which drained aqueous is pooled and gets absorbed. The bleb is placed away from the anterior limbus and this reduces inflammation and thinning of the bleb. Plates have large surface area and hence promote the formation of filtering bleb posteriorly near the equator.

Newer implants use translimbal aqueous drainage from anterior limbus to posterior subtenon reservoir. There is increased surface area under the Tenon's causing increased absorption of aqueous and reduction in IOP. There is also a reduced possibility of conjunctival erosion.

### Indications

1. Refractory neovascular glaucomas
2. Aphakic & pseudophakic glaucomas
3. In children with JRA and uveitic glaucomas
4. Post traumatic glaucomas
5. Glaucomas following Vitreoretinal surgeries and PKP

6. Refractory glaucomas after failed AG surgery with or without antimetabolite
7. Post inflammatory glaucomas
8. ICE syndrome.

### Types of Aqueous drainage devices

- A. Non valved implants
- B. Valved implants
- C. Implants for non penetrating deep sclerectomy.

### Non valved implants

1. Molteno
2. Bareveldt
3. Schocket
4. White pump shunt
5. Express miniature glaucoma shunt
6. istent from glaucos
7. Deep light gold micro shunt from SOLX (suprachoroidal shunt)

### Valved implants

1. Krupin Denver
2. Joseph
3. American glaucoma valve
4. Optimed implant
5. Ahmed implant
6. Keiki Mehta valve

### Parts of the valve

- A. Connecting tube
- B. Reservoir plate
- C. Membrane valve- Present at the junction of tube and the plate

Advantages of the valved implants are that they are pressure dependent. Start shunting of fluid only when the IOP goes above the preset level. Normally the pressure is kept at 9-10 mmHg and hence the risk of hypotony is reduced.

### Implants for non penetrating deep sclerectomy

Absorbable implants

1. Aquaflow- Collagen implant
2. SK gel 3.5 & 4.5 implant- Reticulated Sodium Hyaluronate
3. Healon GV

### Non Absorbable implants

1. TFLUX implant. T- shaped implant made of polymagma.
2. TBAR- Made of surgical grade Stainless steel
3. MERMOUD X- Essentially a PMMA implant.
4. Mehta hema wedge

These implants have been used in the intra scleral space to

prevent inevitable fibrosis in late stages and thereby good results are achieved.

**Procedure**

All procedures are done under peribulbar anaesthesia Conjunctival peritomy is done and tenon’s tissue is separated at the site of reservoir plate to be placed. Partial thickness scleral flap is taken to place the tube. The tube can also be placed through the scleral tunnel created by 18G needle. First reservoir plate is sutured in place then connecting tube is interiorized into the anterior chamber through the scleral flap/tunnel created. Tube placed inside should be bevel up and should be near the root of the iris to avoid corneal erosion.

**Complications**

1) Intraoperative:

- Oversized anterior chamber incision- managed by closing the wound with sutures.
- Improper direction of entry insertion- managed by redirecting the new incision.
- Scleral perforation- managed by applying retinal cryo at the perforation site.

2) Post Operative complications:

- Valve malfunction- priming should be done
- Flat chamber & Hypotony
  - a. By overfiltration- valved device , temporary occlusion of tube lumen with stent, injection of dense Viscoelastic agents.
  - b. Hypotony due to aqueous leakage around the shunt. Ensure the entry site is watertight around the shunt.
  - c. Flat chamber with shunt cornea touch- Early reformation of anterior chamber and correction of overdrainage by using shunt occlusion technique.
  - d. Flat chamber due to serous choroidal detachment and supra choroidal haemorrhage- Conservative management.
- Shunt occlusion & increased IOP: avoid by beveling the shunt away from uveal tissue or vitreous. Iridectomy at the site of tube ostium has been recommended to prevent iris plugging the tube ostium.
- Shunt Cornea Touch: Avoid making the anterior chamber insertion parallel with the iris plane.
- Shunt Exposure Or Erosion: Repair shunt exposure by removing any protruding sutures and secure the tube tightly.
- Plate Migration- Surgical Revision: Avoid by securing the plate tightly to sclera with non absorbable sutures. Plate migration towards the limbus requires repositioning of the

plate in te equatorial subconjunctival space. Plate migration away from the limbus may require tube extender.

- Endophthalmitis: In the late postoperative period exposure of the tube seems to be a major risk factor for these infections. Surgical revision with a patch graft in all cases is indicated to prevent this potentially devastating complication.
- Inflammation-Corticosteroids
- Diplopia-Prisms , removal of the implant

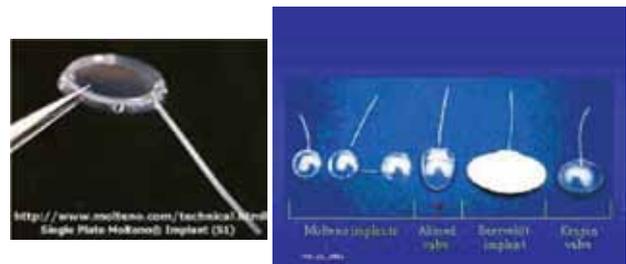
A study was conducted in RIOGOH- Chennai wherein Mehta valve implantation was done in 30 eyes of 29 patients during the two year study period between September 2006 & October 2008. The Male to Female ratio was 2:1 and the mean age was 10-64 years. The mean preop IOP was 37.4mmHg.

GLAUCOMA DIAGNOSIS	NO. OF PATIENTS
Neovascular Glaucoma	22
Post traumatic Glaucoma.	2
Post PKP Glaucoma	1
Failed Trabeculectomy	2
Post inflammatory Glaucoma	3

In the immediate post operative period IOP was recorded by non- contact tonometry. 22 patients had post operative IOP well within the desired range 3 patients had minimal hyphaema in the immediate post operative period & the IOP was not recordable immediately but 1 week later the IOP was within the desired range. All cases were done without patch graft and tube was secured in the intrascleral tunnel.

In terms of IOP control Mehta implant was found to be good in refractory glaucomas and the fall in IOP was sustained over the period of follow up. Nevertheless longer follow up is necessary to examine the long term course of the success rate.

**Molteno Valve**

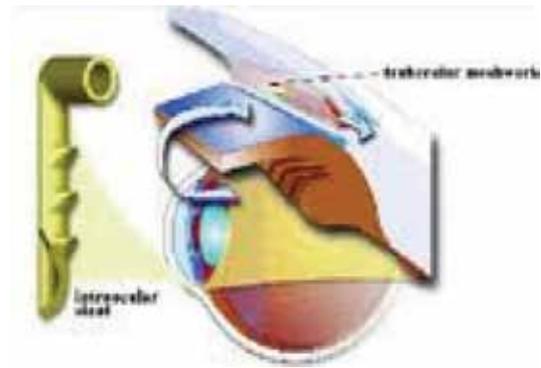




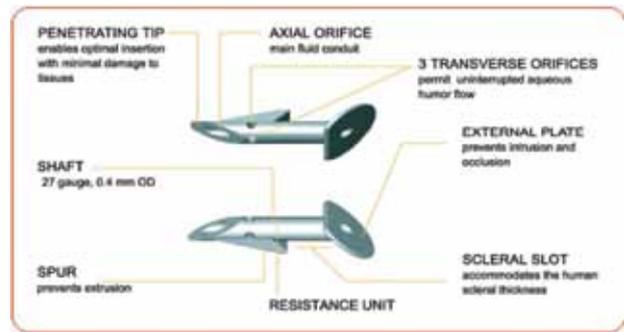
Ahmed Valve



Keiki Mehta Valve



iSTENT



Express Shunt

## References

1. Text book of Glaucoma, M. Bruce Shields, M.D. 4th edition
2. The Glaucomas, Clinical Science, Robert Ritch, Theodore Krupin, M. Bruce Shields 2nd edition, Vol.2.
3. Becker-Shaffer's Diagnostic and therapy of the Glaucomas, Robert. L. Stamper, M.D., Marc F. Liberman M.D., Michael V. Drake, M.d., 7th edition
4. Atlas of Glaucoma, Neil T choplin, Diane C Chandy
5. Soft Section Glaucoma filtration surgery - a new technique Mehta K R, Ind J Ophthalmol. 1986;34:200
6. Wolff's Anatomy Of the eye & Orbit , 8th Edition, Anthony T. Bron, Ramesh C. Tirupathi, Brenda J. Tripathi.

## Internet References:

7. Keiki Mehta BP valve Glaucoma shunt-Surgiwear
8. Surgical procedure of Ahmed Glaucoma Valve
9. Clinical update- Glaucoma today- Glaukos i stent
10. Ocular Surgery news US edition Feb 2006- Express shunt, Solx deep light gold micro shunt, Bifurcatable trabecular shunt