



How make a successful glaucoma valve surgery in the neovascular glaucoma

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Eye & ENT Hospital of Fudan University

- The largest EENT hospital in China
- Established in 1952, located in Shanghai
- Dept. of Ophthalmology ranks top-three in China



Refractory Glaucoma

- New vascular glaucoma (NVG)
- Iris corneal endothelial(ICE) syndrome
- Uveitis-associated glaucoma
- Congenital and adolescent glaucoma
- Glaucoma with multiple failed filtration surgeries
- Malignant glaucoma
- Traumatic glaucoma (especially chemical injuries)
- Glaucoma secondary to ocular surgeries (vitrectomy with silicone oil emulsification, penetrating keratoplasty)
- ...



Neovascular Glaucoma(NVG)

- **Characterized** by fine arborizing blood vessels on the surface of iris and TM, accompanied by a fibrous membrane→

the fibrovascular membrane

which contraction results in PAS

- **Refractory to treatment:**

Filtering surgery with MMC : 11-33%

lower rate of successful control of IOP

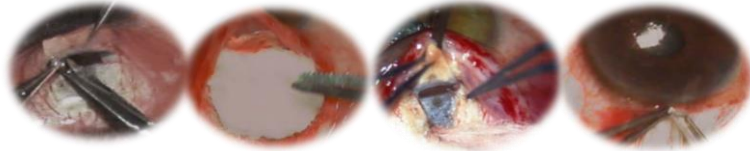
Anterior segment neovascularization

Prognosis for NVG is very poor

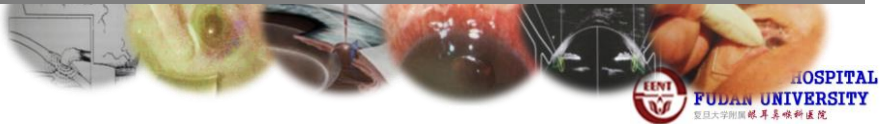


Surgical choices of refractory glaucoma

- Filtration surgery diverting the outflow of aqueous humor (extraocular drainage surgeries)



Prefer to perform the filtering surgery (with artificial drainage device) at first



Glaucoma Valve Implant

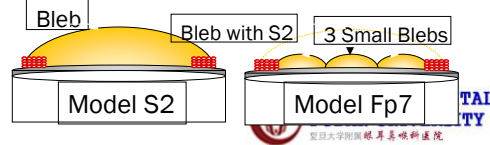
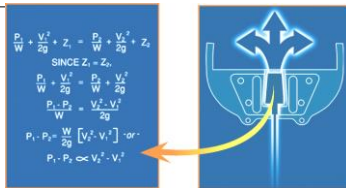
Registered and available in China:
Ahmed glaucoma valve (FP7/8)



- The theoretical basis was the fluid dynamics theory proved by Bernoulli equation.
- The special design of trapezoidal cavity inside the valve body forms the Venturi effect. (Venturi-Flo)
- Effectively reducing the internal resistance of the valve system, which is conducive to the drainage of AH.

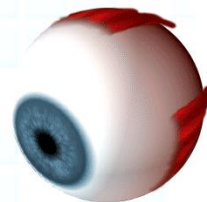
Features of the Improvement:

- Utility of three filtration pores
- Increased effective area of drainage
- Help limiting the height of filtering bleb, forming the fibrous “dike dam”
- Reducing the incidence of encapsulated cystic filtering bleb



How lowering IOP with Ahmed glaucoma valve

- **Anterior chamber catheter/tube**
Drainage of aqueous to the periphery of drain plate at around 10-20mm post the limbus.;
To prevent encroachment of neovascular membrane.
- **Posterior implantation drainage plate**
Filtration sac、reservoir of aqueous humor;
Absorption through the cyst wall to capillary and lymph duct.
- **Level of IOP**
Valve control、filtration area.
The thinner cyst wall, the larger cyst surface area, and the lower IOP



TAL TY

Ahmed glaucoma valve implantation to treat NVG

The results of 63 consecutive cases (33 male, 30 female) of NVG treated with Ahmed glaucoma valve from Eye & ENT Hospital.

- Age averaged at 48.6 years
- Average preoperative IOP: 53.6 ± 14.5 mmHg
- Vision acuity: NLP~0.1 (LP 11eyes, NLP 12eyes)
- Primary diseases

RVO 26 cases, DR 16 cases, Periretinal phlebitis (Eales' disease) 15 cases, Severe ocular traumas 4 cases, others 2 cases



The definition of IOP Control

The definition standard as:

$$6\text{mmHg} \leq \text{IOP} \leq 21\text{mmHg}$$

- Complete success----- without medications
- Qualified success---- with topical medications, without additional surgery or complications
- Improvement----- relief of painful symptoms

(for end-stage glaucoma)



Therapeutic effect in NVG with Ahmed glaucoma valve

7d post-op IOP 8~28mmHg (average 14.2mmHg);
86% complete suc., 14% qualified suc.;

No neovascular membrane was found within the drainage tube in the anterior chamber.

1yr post-op 61% complete suc., 15% qualified suc., 21% impro.;
The totally success rate 76%.

2yr post-op 60% complete suc., 13% qualified suc, 17% impro.
The totally success rate 73%
IOP 10~21mmHg (avg 17.6mmHg)


5 failed cases: 1 case eyeball atrophy, 4 cases needed re-operation



The main complications of Ahmed glaucoma valve surgery

- **Shallow/flat anterior chamber** 14%
(above level II, often accompanied by choroidal detachment)
- **Blockage of the tube tip in the anterior chamber** 13%
(by blood clot, iris tissue, exudate, etc.)
- **Hyphema** 8%
(blood vessels damaged, errhysis caused by low IOP)
- **Forward movement of implant** 3%
(poor fixation, rejection reaction?)







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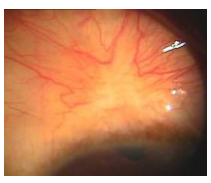
The key points:

How to take measures for effective establishment and maintenance of filtration pathway !





Influence factors of effective filtration channel

- **Surgical wound healing**
Involving operative skills,
operative complications and the management
- **Inflammatory stimulation**
 - **Pre-operation factors** such as stimulation caused by primary ocular diseases or medicines
 - **Post-operation factors** such as inflammatory response,



The first two factors can be man-made controlled through paying attention to during peri-operative period.



Perioperative medication for refractory glaucoma

- **Pre-operative anti-glaucoma medications**
Medications lowering IOP by reducing the production of aqueous humor are recommended
- **Anti-inflammatory meds pre- & post- operation**
It should be emphasized especially for those eyes (such as NVG, trauma, uveitis, etc.) with inflammation
→ Topical glucocorticoid drops mainly
- **Anti-metabolic drugs during and after operation**
Reducing fibroblast proliferation and inhibit scarring tissue formation; MMC and 5-FU are commonly used.

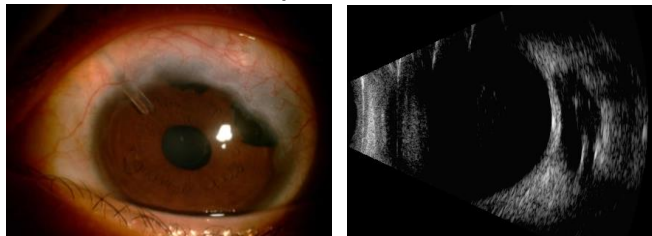


The prerequisites of success glaucoma valve surgery

It depends on

The AH could flow out of the AC smoothly

The outflowed AH can spread and be absorbed smoothly



Need:

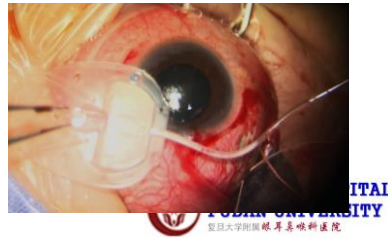
relatively deep and "clean" anterior chamber



What We Have Learned...

To avoid shallow anterior chamber:

- Inject viscoelastic agents to maintain anterior chamber. Do not make pressure on the eye ball after anterior chamber puncture or insert tube.
- Low IOP (excessive filtration) in early postoperative stage(1-2 weeks).
 - Moderate aperture of anterior chamber puncture
 - Control of valve ?
 - Avoid unnecessary pressure on the involved eye.



Special reminders during & post surgery with valve

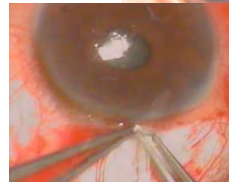
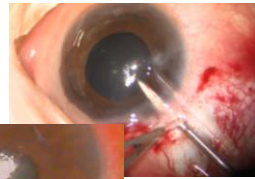
- **During the surgery** **DO NOT added pressure to the surgical eye** after completing the sclera tunnel to anterior chamber, especially with the anterior chamber tube inserted! (Because any additional pressure will open the valve and cause excessive drainage, resulting in shallow anterior chamber/anterior chamber disappearance, iris incarceration, etc..)
- **At the end of surgery** **DO NOT use compression bandage!** (The same reason as above)
- **Post the surgery** Do not estimate IOP by finger tension; avoid sneezing, constipation, or exerting force as far as possible ; wear protective eye mask two weeks especially when sleeping to **avoid oppressing the eye!**



What we have learned...

To avoid hyphema:

- Carefully select a site for tube insert: with less PAS and less neovascular vessels in angle.
- Inject some viscoelastic agents into anterior chamber.
- Avoid touching of iris during anterior chamber puncture and while inserting the tube.
- Avoid sudden lowering of IOP.
- Inject anti-VEGF pre-operation if possible.



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What We Have Learned...

To avoid obstruction of tube:

- Just avoid shallow anterior chamber and hyphema.

To avoid other complications:

- Device movement or protrusion of tube
- Fixed tightly drainage plate on sclera and made moderate scleral tunnel.
- Eye motility restriction or diplopia post-op
- Not oppress extraocular muscles by drainage plate.
- Bulbous keratopathy
- Proper location of tube in anterior chamber.

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Interesting Phenomena

Complete regression of neovascular vessels have found in 47% of IOP controlled surgical eyes.

- ? May have an improvement of intraocular blood and oxygen supply?
- Drained-out of pathological aqueous humor together with intraocular neovascular growth factors
- Disturbed the survival condition of intraocular neovascular vessels

Need further investigation



Video Procedures for Ahmed valve implantation

Thanks for your attention!

Careful to do every operation
Save every eye

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