

Review

Improving the success of trabeculectomy

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Background

Taking back to the history of glaucoma surgery, Albrecht von Graefe was the first to use surgery to lower intraocular pressure in 1856. He discovered iridectomy was an effective surgical method for acute glaucoma treatment. On September 13 in 1857 he reported his findings at the first International Congress of Ophthalmology held in Brussels. His dissemination of the technique established iridectomy, as an important treatment still used today for angle closure glaucoma.

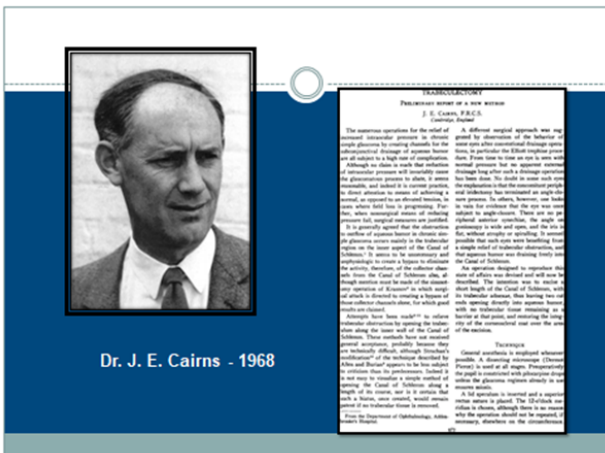
Two years later Dr. Louise De Wecker presented sclerotomy as a procedure for chronic glaucoma. He was the first to advocate the term "filtration" for the treatment of glaucoma which is still in use. Trabeculectomy introduced by Dr. J. E. Cairns was in use since the mid-1960s and is the most effective glaucoma surgery in terms of intraocular pressure reduction to date. Though it is considered as the gold standard surgical procedure for glaucoma, it requires a great deal of skill and there were enough complications and failures to make us find something even better.

trabeculectomy will be presented. First patient is a 52 year lady with primary open angle glaucoma who underwent trabeculectomy. Now after 4 years her intraocular pressure remains under control with no net VF progression.

Second patient is a 34 year old lady who underwent similar surgery, but who did not comply with the follow up. She came 4 months later with a high intraocular pressure with a vascularized, flat, non-functioning bleb. Her visual fields showed significant progressive loss of fields.

3rd patient was a 48 year old lady who was referred to us from another unit, following a standard trabeculectomy for further management. She had undergone a trabeculectomy for chronic angle closure glaucoma. When she presented to us her vision was counting fingers, cornea was hazy due to lenticular corneal touch and anterior chamber was flat. Bleb was flat and intraocular pressure was in late thirties. She was on maximum medical therapy.

The slit lamp appearance and the AS OCT showed a flat anterior chamber. She was in malignant glaucoma. She underwent a pars plana vitrectomy after which lens extraction as performed with insertion of PC IOL.



Dr. J. E. Cairns - 1968

The success of trabeculectomy depends not only on the surgery itself, even more importantly on the post-operative management.

Case presentations

In this presentation 3 case scenarios who had standard

Case 3

- 48 years Mrs. CN with PACG
- Referred for further management
- Following standard trabeculectomy
- Vision 3/60, Flat AC. Lenticular-corneal contact
- Flat bleb, patent PI, IOP-30mmHg

Later she underwent a penetrating keratoplasty as a secondary procedure. Vision improved to 6/60 without correction and pressure remained at late teens with a deep anterior chamber.

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Discussion

So 3 patients underwent standard trabeculectomy but they had drastically different outcomes. One had very good control of IOP with no net VF progression. Second patient had a scarred bleb with high intraocular pressures within the first year and the 3rd patient had serious sight threatening complications and had to undergo several subsequent surgeries to preserve the vision. Why do we get a variable outcome after trabeculectomy? How can we avoid these and improve the success of trabeculectomy.

Causes of failure

Causes of trabeculectomy failure are many. Scarring and over drainage are the most common reasons of failure. Others include bleeding which can vary from hyphaema to suprachoroidal haemorrhage. Wound leaks either due to poor wound closure or button holing can give rise to bleb failure. Wipe out, infection and aqueous misdirection are rare but possible. Tissue shortage is not an uncommon problem as most of these patients who are undergoing trabeculectomies have already been on prostaglandins. They do have tight orbits and giant fornix syndromes. Patient's cooperation is vital for the success of trab. Poor patient's compliance for follow up after surgery will lead to a failed trab. Counselling the patient prior to surgery regarding the importance of follow up after trab is extremely important for the success of trab.

Improving the success

How to overcome these problems and improve the success of trab? Improving the success starts prior to surgery. Selecting the optimum surgery for the individual patient is key to the success of surgery. Trab with mmc is indicated in patients with POAG, JOAG, NTGs. If it is aphakic glaucoma, traumatic glaucoma, neovascular glaucoma or in the presence of cicatricial disease, a tube will work better. When there is component of angle closure, trab combined with phacoemulsification or phaco alone will work better.

Selecting the optimum surgery

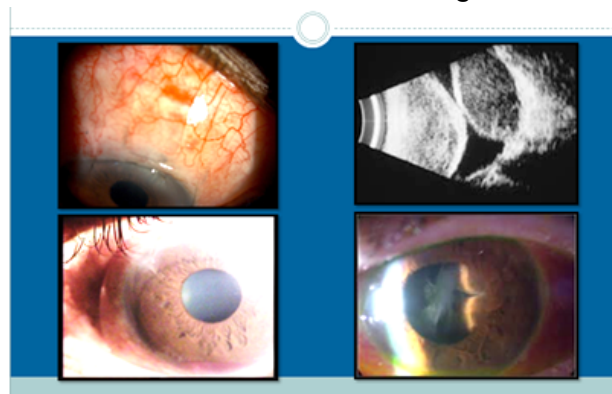
Trab +MMC	Tube	Cyclodiode	Phaco
POAG	Aphakia	Neovascular glaucoma	PACG
JOAG	Trauma	Severe OSD	APAC
NTG	Cicatricial disease	POAG	PXF
Uveitis	Neovascular Glaucoma		

Assessment of ocular status prior to surgery is important. One needs to know and grade the severity of glaucoma prior to surgery to plan further management. Conditions like red eyes, small eyes, floppy eyes and large eyes have their own consequences. Red eyes indicate that the ocular surface is not primed prior to surgery which can give rise to bleb failure and scarring. Small eyes like nanophthalmic eyes can give rise to suprachoroidal haemorrhage during decompression. Thin large, floppy myopic eyes can collapse during surgery. If we know the ocular status we can take certain precautions to prevent complications.

Control of infection and inflammation is extremely important to get a successful outcome. Infection is rare, but inflammation is extremely common because these patients are already on anti-glaucoma medication. Priming the ocular surface by using lubricants, anti-inflammatory medication and antibiotics prior to surgery is vital. Using topical NSAID at least 2 weeks prior to surgery is advisable.

Bleeding is a common problem after trabeculectomy. It can vary from a trivial subconjunctival haemorrhage to hyphema to kissing choroids. So how can we prevent bleeding? One needs to identify the high risk patients prior to surgery. Aphakic patients, post vitrectomised eyes and large eyes have a high risk of bleeding. If the patients are on anti-platelets, should be stopped prior to surgery. Uncontrolled blood pressure and pulmonary disease should also be controlled.

Prevention of bleeding



Hypotony following trabeculectomy is common in patients with large eyes, like myopes, patients with uveitis and patients with high scleral elasticity as in young patients. Particularly in these patients one needs to suture the scleral flap very tightly to prevent over drainage and ocular hypotony.

Wipe out is rare but possible. Minority of our patients do present to us with visual fields like this.

Wipe out

- Liaise closely with the anaesthetist
- Avoid hypotension on induction of GA
- Avoid dehydration
- Avoid tight orbit during LA
- Slow low volume injections

If the surgery is performed under anaesthesia, it is necessary to liaise closely with the anaesthetist. If done under local anaesthesia one needs to avoid a tight orbit. Best to use subtenon or topical in these patients.

Tissue shortage is a problem encountered quite frequently. Most of the patients, operated are already using PGs. Majority of these patients have a pre-orbitopathy with tissue shortage.

In handling the conjunctiva in these patients, one needs to be careful to prevent buttonholing and cheese wiring of these tight conjunctivae.

To prevent scarring, intra operative mitomycin (MMC) is used in all patients. These antimetabolites are also with complications, like cystic thin blebs. Intra-operative injection of MMC is convenient than sponge applied MMC. 0.1 mL of MMC:lidocaine which contains 20 µg of MMC, can be injected to the superior fornix. After instilling topical anesthesia, a snip peritomy is performed as limbal incision. A blunt 30-gauge cannula is introduced 7 to 8 mm from the limbus and MMC is injected posterior to the anticipated flap location.

Conjunctival entry is compressed with a surgical sponge to prevent any MMC from escaping. Solution can be further spread over a larger surface area using a surgical sponge.

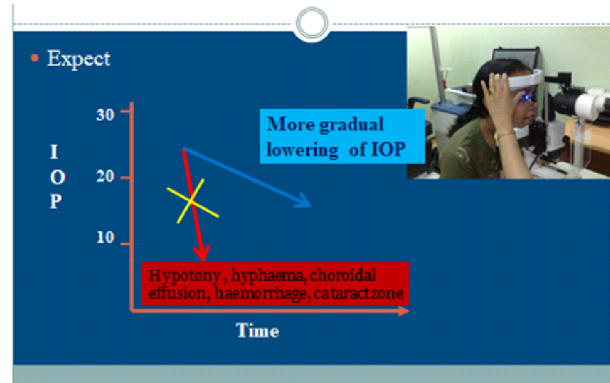
Aqueous miss-direction is rare, but it is possible with small eyes, particularly when the axial length is less than 22 mm such as in patients with nanophthalmos and patients with angle closure.

How to optimize the outcome of trabeculectomy?

After a trabeculectomy what is expected is a more gradual lowering of IOP and not a drastic drop of IOP

which will in turn lead to hypotony, hyphaema and choroidal effusion.

Optimising surgery



This can be achieved by using Moorfields safer surgery system, which was introduced by Sir Pen Chow. You can have your own modifications. In this presentation it is elaborated on the basic steps of the Moorfields safer surgery system.

Surgical technique

A large scleral flap not to cut the limbus to achieve a posterior flow is important. A large area posterior to the intended flap site should be treated with MMC using either sponge applicators or by injection. 8 o vicryl stay suture is applied. Fornix based conjunctival flap is dissected. Light quaternary is applied. 5 x 4 mm partial thickness scleral flap is created. 0.4% mmc is applied posterior to the flap over a large area. Single scleral punch sclerostomy is usually adequate. A single punch is 500 microns. Resistance to flow occurs only at 40 microns.

It is better to use an AC maintainer or inject viscoelastics to maintain a deep anterior chamber. So that, the lens iris diaphragm will not shift forward. Tight suturing of flap and slow release of aqueous will prevent most of the complications associated with ocular hypotony. Adjustable sutures can be used. It is your preference.

10 O nylon 4 interrupted tight sutures should be applied to the flap. Conjunctiva should be sutured in a water tight closure without creating button holes. Conjunctiva should not be under tension. Author is using interlocking suture to the conjunctiva at the limbus to prevent retraction. On table 1% atropine should be used in all patients.

Sutures can be manipulated post operatively using special non toothed suture forceps. Argon laser suture

lysis can be performed during the first 7-14 days post operatively. It is done under topical anaesthesia using the Hoskins lens. Laser settings include 50 micron spot size with a power of 200 to 300 mW. One needs to cut the suture at the junction between one third to two thirds.

Controlling the inflammation during the post op period is vital. Need to continue steroids for 3-6 months with the NSAIDS. Relieve pain is important as pain can trigger inflammation. Can consider bleb needling and advocate anti VEG F or 5 FU post operatively if you notice bleb vascularization.

These are the results of UK national survey of trabeculectomy compared to Moorfields safer surgery system. Green figures indicate the incidence of complications following Moorfields safer surgery system. It is clearly shown with this technique the complication rate is much lower.

Trabeculectomy Outcome UK National study vs MSSS

First 2 weeks	Incidence	First year	Incidence
Hypaema	24.6%	Reduced VA	18.8%
	5.0%	2 lines	2.3%
Shallow AC	23.9%	Cataract surgery	11.6%
	5.4%	Endophthalmitis	0.2%
Hypotony <5 mmHg	24.3%		0.05%
	4.3%		
Choroidal detachment	14.1%		
	3.0%		

In performing a trabeculectomy, patient's involvement is mandatory. Regular follow up and proper use of post-operative medication is vital for the success of trab. It is a time consuming team work based on trust.

Conclusion

Every surgeon even with the most meticulous attention to correct surgical technique will at some stage encounter at least some of the complications mentioned here. Active interventions to avoid complications are therefore common. Careful pre-op assessment, selecting the appropriate surgical procedure, better surgical technique and timely post op intervention will optimize the outcome following trabeculectomy.

These suggestions will improve your surgical results of this fundamental operation to prevent blindness from glaucoma.

Prevention is better than cure, 'first do no harm, to the patient'.

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