FILTERING SURGERIES IN GLAUCOMA

Presented by Dr. Nutan S PG student at NSCB MCH on 25-4-04 at Hotel Krishna - conference room.
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Definition of glaucoma

It is defined as a disturbance of the structural or functional integrity of the optic nerve that can usually be arrested or diminished by adequate lowering of
lOP.

Or

It is a chronic, progressive optic Neuropathy caused by group of ocular conditions that leads to damage to the optic nerve with loss of visual function.

Indications for filtering surgery

1. Documented visual field and optic nerve damage, despite maximum tolerated medication and laser therapy, that threatens the patients vision.

2. Anticipated progressive damage or intolerably high lOP, medication failure because of ineffectiveness, intolerance, poor compliance or complications.

3. lOP high enough to place the future health of optic nerve at significant risk.

4. Dysfunctional ocular tissue (corneal edema or bullous keratopathy, pulsating central retinal artery)

5. Combined with cataract procedure

Glaucoma surgery is directed at modifying aqueous dynamics in some way that will prevent or reduce lOP elevation.

It can be divided into two categories

The procedure to eliminate a block to the flow of aqueous.
The procedure to reduce the production of aqueous humor.
The former procedure is preferable.

Classification of aqueous flow block.

(I) internal flow block - block flow of aqueous in the eye.
A) Ciliary block glaucoma
B) Pupillary block.
(II)Out flow block
A. Trabecular block glaucoma.
1. Trabecular covering
2. Trabecular impermeability
B. Limbal block

External filtration Surgery

AIM - To create a new drainage pathway that allow aqueous to pass from the anterior chamber into sub conjunctival space.

Two basic types of External filtration procedures -
I. Penetrating
-Full thickness
-Guarded
2. Nonpenetrating

Penetrating Filtering Surgeries

Guarded Filtering Procedures also known as protected, sub scleral and partial thickness filtering surgery. Filtering sclerostomy is protected by partially closing it with scleral flap.

Full Thickness Procedure - There is no guard over the external surface of the sclerostomy.

Non Penetrating Filtering Surgeries

IOP lowering is achieved without entering into anterior chamber by deroofing of Schlemm's canal

Common procedure in both penetrating and non penetrating glaucomas surgery

Conjunctival flap:
Two types- Limbus based preferable
- Fornix based

Limbus based conjunctival flap.
Advantages: Water tight closure.
Post operative suture cutting or pharmacological inhibition of wound healing is anticipated.

Disadvantage- Excessive tissue handling may lead to post operative wound leak.
Poor surgical site exposure.

Fornix based:
Advantage - Easier exposure of the surgical site
- Reduced Handling of the conjunctival flap.

Disadvantage-May leak, in post operative days.
- Fail to retain aqueous so that bleb flattens.

Guarded Filtering Procedure- Trabeculectomy :

Most commonly used procedure, filtration occurs via sub conjunctival space. Reduced incidence of

hypotony and flat anterior chamber.

Theory of mechanism:
External filteration occusr primarily through or around the partial thickness scleral flap.

Indications
Open angle glaucoma
Close angle glaucoma
Intractable glaucoma - Aphakic, Inflammatory, Traumatic

Technique
Site: Superiorly and slight Nasally
Cauterization to reduce bleeding
Scleral flap (Triangular/rectangular) of 1/3 to 1/2, scleral thickness of 5x5 mm hingled at limbus dissected until 1mm of bluish self-sealing paracentasis at temporal horizontal anterior chamber is entered under the flap gray zone is exposed.
A block of 1-1.5 mm antero posteriorly by 3-4 mm wide is removed just anterior to scleral spur A peripheral iridectomy is made
Scleral flap is reapproximated with 9-0, 10-0 nylon suture
Conjunctival flap is also approximated
Results :- Pressure level of 21 mmHg or lower with or without medication are achieved in about 80%-90% of cases.

Earlier Full Thickness Procedures

It involves creation of a direct opening though the full thickness of limbal tissue. The fistula may be created by a variety of techniques.

Sclerectomy
The full thickness scleral tissue to be excised is always the limbal tissue.

Trephination:
The fistula is created with a small trephine placed just behind the corneolimbal junction.
Disadvantage
Misplacement of the trephine, button holing of the flap, Injury to the lens or ciliary body, Large Opening
Hypotony
Flat AC
Incarceration of intraocular tissues

Thermal sclerostomy (Scheie procedure)
A filtering technique in which a limbal fistula was created by entering the anterior chamber angle with an electrocautery to retract the wound edges, there by creating the fistula.

Iridenclesis
In this procedure a wedge of iris is incarcerated into the limbal incision in an effort to maintains a patent channel for aqueous out flow.

Complications Of Filtering Surgeries:

Intra operative complications:

Tearing and button holing of conjunctival flap.
Haemorrhage
Episcleral bleeding particularly in patients on long term anti glaucoma mediation. Inadvertent cutting of the ciliary body may cause brisk
bleeding. Choroidal or expulsive Hemorrhage result from sudden reduction in the lOP.
Choroidal effusion
Other intra operative complication:
Vitreous Loss
Lens injury
Stripping of descemet's membrane.
Scleral flap may be in advertently torn from its limbal hinge

Early post operative complications:

The lOP that is too low (hypotony) or too high.

Hypotony and flat anterior chamber

The causes may be
Conjunctival defect:- hole or leak at wound edge
Excessive filtration:- Trabeculectomy .offer one advantage over full thickness filtering procedure, since the protective scleral flap minimizes excessive
filtration.
Serous choroidal detachment:- It prolongs the hypotony by reducing aqueous production and possibly by increasing uveo scleral out flow.

Elevated Intra ocular pressure and flat anterior chamber.
It suggest one of three mechanisms.
a) malignant (ciliary block) glaucoma.
b) An incomplete iridectomy with pupillary block.
c) Delayed supra choroidal haemorrhage.

Elevated IOP and deep ant. Chamber:
It Indicate inadequate filtration due to
Obstruction of the fistula by iris, ciliary processes, lens or vitreous
An absent or poorly filtering bleb (following surgery 4 types of bleb may be seen. Type I & II is indicative of good filtration).

Other early post operative complications.
Uveitis and hyphema
Dellen
Ocular decompression retinopathy
Loss of central vision

Late post operative complications
Late failure of filtration
A leaking filtering bleb
Endophalmitis Blebitis.
Cataracts

Hypotony and Ciliochoroidal detachment
Corneal changes due to early postoperative iridocorneal touch
Sympathetic opthalmitis.
Hypotony maculopathy

Role of Antimetabolites in glaucoma filtering surgeries

Two drugs are mainly used - 5- florouracil and Mitomycin C

Indications
1.High risk factor
. Neovascular glaucoma.
. Previous failed trabeculectomy or artificial filtration devices.
. Certain secondary glaucomas (e.g. inflammatory, post-traumatic angle recession and iridocorneal endothelial syndrome). Chronic cicatrizing
conjunctival inflammation.
2. Intermediate risk factor
. Patients on topical anti glaucoma medication (particularly sympathomimetics) for over 3 years.
. Previous conjunctival surgery.
. Combined procedure for glaucoma and cataract.
3.Low risk factor
. Black patients.
. Patients under the age of 40 years.

5-Florouracil

It inhibits fibroblastic proliferation and thus reduces scar formation during the 1st 14 days and improve the success rate of filtering surgery.

Route & dosage:

1. Intra operatively -Surgical sponge soaked in 25-50 mg/ml ofthe drug, applied to the surgical site for 5 min.

2. Subconjunctival injections of 5 mg of 5-FU in 0.5 ml of Normal saline.

Complications:-

Early:-Comeal erosion.Corneal ulceration
-Conjunctival wound and suture track leaks
Late: -Endophthalmitis
-Hypotony maculopathy
-Malignant glaucoma
-Late blebs leaks.

Mitomycin-C:

It is an antineoplastic - antibiotic agent used as an agent to decrease scleral wound healing after Trabeculectomy
Dosage & route: Mitomyin c 0.5 mg/ml applied directly over the episclearal for 5 min using 1-2 mm soaked wick cell sponge. The area should be irrigated copiously with balanced salt solution.
2 - Subconjunctivally.

Complications:
It is less likely to cause the postoperative complication that are typically association with 5 FU
Similar to those seen with 5FU treatment
Thin avascular blels are common.
Seton Operations
These are synthetic devices used in glaucoma surgery to maintain patent drainage fistula.

Indications
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Uncontrolled glaucoma.
Secondary glaucoma - routine trabeculectomy with or without antimetabolites is unsuccessful i.e. neovascular glaucoma.
Congenital glaucoma with failed conventional surgeries. Severe conjunctival scarring.

Molteno Implants:

An acrylic plate connected with tube is used.

Shocket Procedure:

Shunting of aqueous via tube to an encircling band.

Krupin Denver valve:-

A tube with valve of silicon and supramid which has unidirectional flow and requires a pressure of 11-14 mm Hg to initiate flow.

Ahmed valve:

It restricts flow below about 7 mm Hg

Baerveldt implants -

It is Modified design feature of molteno and other devices by using always (up to 500 mm2) implant made of flexible material.

Complications
I. Excessive drainage
2. Corneal decompensation
3. Erosion of the tubes & plates
4. Cataract formation
5. Drainage failure
6. Diplopia
7. Bleb encapsulation
8. Late endophthalmitis

Non Penetrating Glaucoma Surgery

Main principle
Enhance natural outflow channel rather than to create new drainage site. Advantage
Less Postoperative hypotony

Three types
I. Ab externo trabeculectomy
II.Deep sclerectomy
III. Viscocanalostomy

(I) Deep sclerectomy
Steps
Superficial scleral flap 5x5 mm dissected (300 microns)
Flap dissected 1-1.5 mm into clear cornea
Deep scleral flap 4x4 mm dissected Reaching and ant partschlem's canal Schlemm's canal is unroffed
Sclerocorneal dissection prolonged ant into 1-1.5 mm
Sclerocorneal tissue removed
Superficial scleral flap sutured with 10-0
Filtration at the level of TDM
Resistance to outflow

(II) Ab externo trabeculectomy
Tissue excised are:- Deep scleral tissue, Schlemm's canal. Advantage - slow decrease in IOP during postoperative period.

(III) Viscocanalostomy
Steps
Resection of deep flap with unroofing of schlemm's canal
Superficial flap tightly closed
High viscosity Na hyaluronate injected underneath the flap to create reservoir Visco opens 2 surgically created ostia ofschlemm's canal

Mechanism Of Filtration
Sub conj bleb Intra
scleral bleb
Uveoscleral outflow
Schlemm's canal

Advantages: Reduced Hypotony
Reduced Flat AC
Reduced Choroidal detachment
Reduced Induced cataract