Challenging complications of valve implantation

by

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PREDISPOSING FACTORS

It is important to consider the case mix for these devices on dealing with their complications

Most of the eyes receiving tube shunts have already had
-multiple previous operations including cataract extraction and trabeculectomy
-Subjected also to chronic use of medications
-Most of these eyes have advanced optic nerve damage
Intra-operative complications

A) Oversized anterior chamber entry incision: Which predisposes to leakage around the tube with creation of a limbal bleb (which predisposed to further hypotony. To prevent this problem, a 23 gauge needle is used to produce an adequate entry for the tube without leakage. However if leakage occurs, a phimosis stitch (10/0 nylon) can he used to close this too large entry incision.

B) Improper direction of entry incision: An anterior chamber entry incision must be parallel to the iris. When this incision is directed posteriorly, occlusion of the tube by the iris occurs. When directed anteriorly endothelial touch occur.

c) Scleral Perforation: May occur during suture fixation of the episcleral plate. Retinal cry-therapy must be done at the puncture site, while other steps of surgery is completed within the same quadrant.

d) Tube damage: The tube may be damaged if grasped with toothed forceps. Another implant should be used.

e) Obstructed tube: As manufacture fault that discover on priming of the implant so another spare implant of appropriate size should be available.

f) Hyphema: With incidence ranging from 10% to 20% usually from iris vessels usually mild and resolve spontaneously.
Early postoperative complications (< 2 weeks)

A) **Hypotony:** Hypotony & associated complications such as shallow anterior chamber, choroidal detachment & choroidal hemorrhage. This complication is less likely to occur with valved implants with incidence of (7-10%) in valved implants as AGV (15-20% in non valved)

B) **choroidal detachment:** occurred as a results of hypotony with incidence as hypotony usually serous and mild sometimes massive and hemorrhagic

**Choroidal detachment**

**Causes:** marked hypotony, prolonged hypotony specially with the use of antimetabolite
Venous changes, Inflammation
Choroidal detachment lead to increase hypotony by decrease aqueous production and possibly by increase uveoscleral out flow

**Management:** mild to moderate spontaneous resolution give systemic steroid and atropine and stop aqueous suppressant to the other eye
Massive; (KISSING) surgical drainage and AC reformation preferably by NA halourinate
**Hemorrhagic effusion:**
Unlike painless serous choroidal effusions, hemorrhagic choroidals generally have an abrupt onset with severe pain and marked reduction in visual acuity. When hemorrhagic choroidals are associated with high IOP, hyperosmotic agents and aqueous suppressants are recommended. The visual outcomes and overall prognosis are worse.

**Risk factors:** eye with reduced structural rigidity as prior vitrectomy ,advanced buphthalmos with thin sclera

**Prevention:** avoid large surface implants that create large bleb, healon injection in ant chamber

**Management:** drainage is more effective when clot liquefied typically after 7-10 days but if effusion is massive do drainage. Full thickness sclerostomy 3-4 mm posterior to limbus ideally over the meridian of highest effusion simultaneous ant .ch infusion with BS S

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**We have a case of**

**male** child 6th years old single eye ,
his Lt eye had **advanced recurrent buphthalmos** dated since birth operated

**4 times trabeculectomies** and one cataract operation were done at different ages,

**vision was 2/60 BCVA,**

**IOP was 38 mmHG with max tolerated medical topical ttt,**

**corneal diameter exceed 14 mm**

Planned for Ahmed glaucoma valve implantation 4 months ago

The surgery was classic with No intraoperative complications

In the 1st post-operative day, examination revealed: lost ant ch with high IOP, **US** was done that revealed a large hemorrhagc choroidal detachment with kissing choroids

Beside medical ttt drainage was done by vitreoretinal surgeon, during drainage

Large hemorrhagic fluid exit from sclerostomy, after operation choroid settled ( by US) but there were hyphema and vitreous HGE and the vision become pL
Hypotony maculopathy

occur after glaucoma implant surgery with a reported incidence of 1.3% to 18%. the risk increases with the use of antifibrosis agents.

characterized by a low IOP associated with fundus abnormalities, including chorioretinal folds, optic nerve head edema in the acute setting, and vascular tortuosity.

Risk Factors
Male gender
Myopia
Young Age
multiple glaucoma filtration Surgeries
Use of Antifibrosis agents (Mitomycin C >> 5-Fluorouracil)
Elevated Pre-Operative IOP
**Symptoms:** diminution of vision and or distorted vision

**On examination:**
- Intraocular pressure less than 6.5mm Hg
- Painless, decreased vision
- Hyperopic shift in refraction
- Characteristic fundus changes: chorioretinal folds, vascular tortuosity, and optic disc swelling

**Diagnosis**

**Implant tube erosion**
- Occur if the tube converge which are the scleral flap or graft and the conjunctiva and Tenon all are melt

**predispose factors:**
- anti-fibrotic use especially MMC
- pt with thin of sclera (as advanced buphthalmos )

This complication is often serious if not recognized early as this erosion gives the conjunctival microbes direct access to anterior ch around tube giving rise to late onset endophthalmitis

**Incidence:** 2-5%

**Management:** this require placement of donor graft over this site (sclera, facia lata, dura matter, pericardial patch)
Tube erosion

Too large tube touching the cornea
Tube erosion

Late endophthalmitis

It is rare complication (less than 1%). It occurs mostly following tube or plate erosion. The paediatric age group was five times higher than in adults. It require removal of the implant as it might serve as a reservoir for the infectious organism.

*Hemophilus influenzae* and *Streptococcus pneumoniae* mostly isolated from the culture sites in children. In adults, organisms causing AGV related endophthalmitis included *Streptococcus* species and *Pseudomonas aeruginosa*. 
Intra-vitreal antibiotics must be administered during the vitreous tap. Intra-vitreal dexamethasone may also beneficial. The intraocular antibiotic regimen should consisted of vancomycin and either an aminoglycoside or ceftazidime.

A female infant aged 9 mounthes presented by bilateral recurrent congenital glaucoma with advanced corneal opacity, corneal diameter 15 mm and had 2 trabeculectomies with MMC were done before, but IOP was still high bilaterally. AGV was done for each eye at 2 separate sessions, IOP was controlled for 2 months then the patient lost from the follow up for 4 months, after that pt came with marked redness and discharge. Examination under GA revealed erosion of the valve tube covering and hypopion the valve was removed and a fortified antibiotic eye drops, intra-cameral, intravitreal and subconjunctival antibiotic (vancomycin -moxifloxaclin ) was given immediately. Inflammation subsided but unfortunately eye become atrophic.
An encapsulated cyst (also called Tenon’s cyst) develops when Tenon’s capsule adheres to the episclera forming a high, domed, smooth, two-layered bleb. The encapsulated cyst is impermeable to aqueous, which results in persistent IOP elevation with excessive fibrosis. It is the commonest complication that lead to valve failure. The incidence range from 2.5% to 29% with various types of glaucoma being higher with younger age and with multiple surgeries in same quadrant of the eye, its incidence increase with longer follow up.

**Prevention:** effort had been made to delay the formation of this cysts and hence increased the survival of valves including the use of MMC (0.4mg/ml/3min) & AMM under the valve body with comparable results.

**The treatment options of encysted valves** include:
A-needling and 5FU usage but with limited success,
B- surgical excision of the cystic wall with application of mitomycin
C-valve removal and re-implantation in another site.
We conducted a study included 25 eyes with encysted AGV in Zagazig University (12 eyes) that were treated by surgical decapsulation and (13 eyes) were treated by removal of the valve and re-implantation in another quadrant of the eye.

<table>
<thead>
<tr>
<th>Item</th>
<th>Group (I) (no=12)</th>
<th>Group (II) (no=13)</th>
<th>Chi square</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean op. time (in min)</td>
<td>30 ±12</td>
<td>45 ± 13.5</td>
<td>7.13*</td>
<td>0.023*</td>
</tr>
<tr>
<td>Surgical success Complete</td>
<td>9 (75%)</td>
<td>10 (77 %)</td>
<td>0.71</td>
<td>0.66</td>
</tr>
<tr>
<td>Partial</td>
<td>2 (16.6%)</td>
<td>1 (7.6 %)</td>
<td>0.65</td>
<td>0.12</td>
</tr>
<tr>
<td>Failed</td>
<td>1 (8.3 %)</td>
<td>2 (15.4%)</td>
<td>0.63</td>
<td>0.15</td>
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The study revealed that both surgical techniques were effective in controlling IOP yet the decapsulation technique was simpler with shorter operation time and no chance for tube related complications. Valve re-implantation had longer operation time and more tube related complications but it is associated with less incidence of re-encapsulation.
Other complications

**Tube corneal Touch** occur by too long tube or anterior migration of the implant this is usually lead to progressive loss of endothelial cells, localized opacification, rarely corneal decomposition, treated by repositioning of the tube and body

**Cataract**; tube lens touch occurs with too posterior tube entry usually lead to localized lens opacities

**Implant calcification**: very rare complication require valve removal.

**Muscle imbalance**: muscle imbalance and diplopia It is usually transient however persistent diplopia occur due to:

- Large Implant size and height
- Large bleb size so it is more with encysted implant
- Post operative adhesions and scar formation
- Muscle ischemia especially with anti-fibrotic used
- Fat adherence syndrome

**Incidence** up to 15 %, more in implant that placed under EOM (Baervelted and Schocket) so it is less with AGV especially S3

**Prevention**: avoid placing the implant in inferior or nasal quadrant

**Management**: if mild use prisms

If there is encysted valve, decapsulation or implant removal and other smaller one in other quadrant implantation should be done

Strabismus muscle surgery if scaring is expected to be the cause
Even though these large number of complications that represent a real challenge facing the glaucoma specialists, sometimes these devices are the only treatment option for these difficult cases of glaucoma and the prevention and management of its complications become the golden target in front of us.