

Challenges of Insertion of Aqueous shunt in paediatric glaucoma

Ahmed Elkarmouty MD, FRCS
Moorfields Eye Hospital
London, UK

Classification

- **Primary Childhood Glaucoma**
 - A- Primary Congenital Glaucoma (PCG) 1: 10,000–18,000
 - B- Juvenile Open Angle Glaucoma (JOAG) (5-35 ys,)1 : 50,000.
- **Secondary Childhood Glaucoma**
 - A- Glaucoma associated with non-acquired ocular anomalies
 - B- Glaucoma associated with non- acquired systemic disease or syndrome
 - **C- Glaucoma associated with acquired condition**
 - **D- Glaucoma following Cataract surgery**

Glaucoma associated with non-acquired ocular anomalies

- Conditions with predominantly ocular anomalies **present at birth** which may or may not be associated with systemic signs
- Axenfeld Reiger anomaly
- Peters anomaly
- Ectropion Uvae
- Congenital iris hypoplasia
- Aniridia
- Oculodermal melanocytosis
- Posterior polymorphous dystrophy
- Microphthalmos
- Microcornea
- Ectopia Lentis (et pupillae)
- Persistent foetus vasculopathy

Glaucoma associated with non-acquired systemic disease or syndrome

predominantly associated with known syndrome, systemic anomalies **present at birth** which may be associated with ocular signs

- Down Syndrome
- Connective tissue disorder: Marfan syndrome, Weill-Marchesiani syndrome, Stickler syndrome
- Metabolic disorder : Homocystenuria, lowe syndrome, Mucopolysacchroidoses
- Phacomatoses: Neurofibromatoses, Sturge Weber, Klippel-Trenaunay- weber syndrome, Rubenstein Taybi
- Congenital Rubella

Glaucoma associated with acquired condition

Conditions which are not inherited or present at birth but which develop after birth

- Uveitis
- Trauma(Hyphema, angle recession, ectopia lentis)
- Steroid induced
- Tumors (benign/malignant, ocular/ orbital)
- Retinopathy of Prematurity

Surgical Rates in Glaucoma

Taylor RH et al. J AAPOS 1993

98% of PCG

50% of Aphakic glaucoma

80% Sturge-weber glaucoma

73% of ASD

67% of Aniridic glaucoma

71% of Juvenile onset glaucoma

Introduction

- Over last 2 decades more use of shunts in general encouraged to use more in paediatric glaucoma
- Tube shunt surgery had a higher success rate compared to trabeculectomy with MMC during 5 years of follow-up in the TVT Study.
- Additional glaucoma surgery was needed more frequently after trabeculectomy with MMC than tube shunt placement.

TVT study Budenz et al Am J Ophthalmol 2012

- “Aqueous shunt implantation offers a significantly greater chance of successful glaucoma control in the first 2 years of life, compared with trabeculectomy with MMC. However, the enhanced success with aqueous shunt devices is associated with a higher likelihood of postoperative complications requiring surgical revision, most commonly tube repositioning.” Jin et al AJO 2003

Difficulties and Challenges

- Decision (when, trab or tube)
- Valved or non valved
- Site (quadrant)
- Fixation
- Distance
- Entry site
- Length inside AC

Decision of Shunt vs Traby

- Age of the child (space to fit a tube- buy some time by diode) .
- Follow up visits for the Trabs
“Homework”(Releasables/LSL/Needling/
Injections).
- Other co morbidities “Cataract/ PKP soon??”
- Visits to theatre(General condition- busy lists).
- Rubbing of the eye is an issue.
- Trab results in your hand ??.



Valved or non valved

- Studies ABC/ AVB

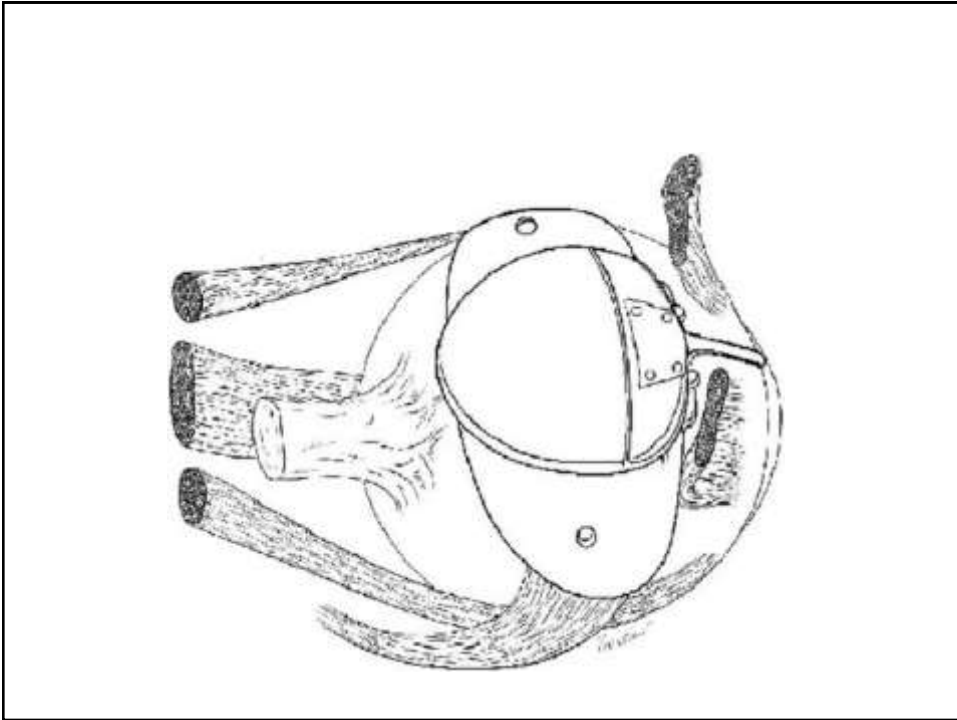
The BGI produced greater IOP reduction and a lower rate of glaucoma reoperation than the AGV, but the BGI was associated with twice as many failures because of safety issues.

- The BGI is effective and safe in the management of primary and secondary glaucoma. When angle surgery has proved to be unsuccessful or inappropriate in paediatric patients, a BGI is a good treatment option. One must be prepared to deal with the tube related problems. Waard et al BJO 2006
- UVEITIC GLAUCOMA(VKH/ JIA etc..)
- Availability/ Cost



Table 1 Glaucoma drainage devices evaluated

Device	Ahmed		Molteno	Boerveldt	
Model	S2	FP7	D1	BG 103 250	BG 101 350
Device image					
Surface area	184 mm ²	184 mm ²	133 mm ²	250 mm ²	350 mm ²
Side to side	13 mm	13 mm	13 mm	22 mm	32 mm
Front to back	16 mm	16 mm	13 mm	14 mm	15 mm
Implant profile	1.9 mm	0.9 mm	1.65 mm	0.84 mm	0.84 mm
Single quadrant insertion	Yes	Yes	Yes	Yes	Yes
Plate material	Rigid polypropylene	Smooth silicone	Rigid polypropylene	Smooth silicone	Smooth silicone
Drainage tube	Valved	Valved	Open	Open	Open
Fixation suture holes	Yes	Yes	Yes	Yes	Yes
Manufacturer	New World Medical, Inc	New World Medical, Inc.	Molteno Ophthalmic, Ltd	Advanced Medical Optics	Advanced Medical Optics



Site (quadrant)

- Preferable Suptemporal if no previous tube ?
- Inferonasal (exposure/ infection, less rubbing effect)
- May be superonasal (sup oblique in BVT)
- Not preferable inferotemporal (exposure)



Fixation

- Non absorbable suture 9/0 is my preference.
- Absorbable suture !!!! higher chance of migration.
- 10/ 0 not strong enough to hold the plate.
- Big needle small scleral bite (Buphthalmos).

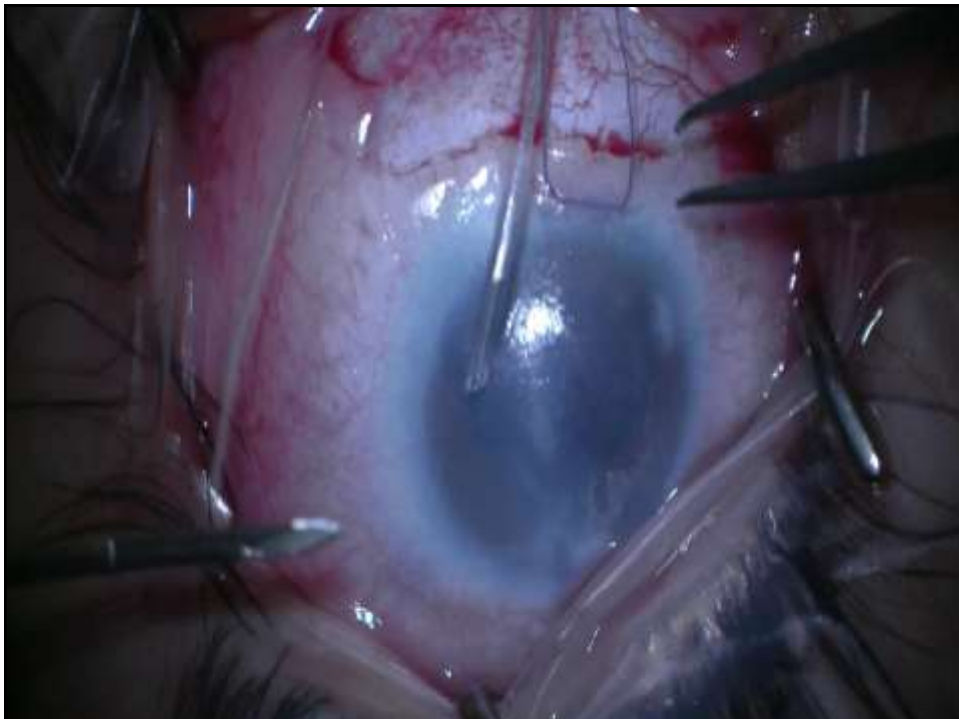
Distance

- Max distance average 10 mm
- "The maximum distance that a GDD can be placed posterior to the limbus, before encroachment around the optic nerve, varies between different devices and quadrants of placement. Taking a measurement of the exact distance of the plate from the limbus during GDD surgery is recommended." [Kahook et al Br J Ophthalmol. 2006](#)
- **Nanophthalmos (AXL x $3.14 \pi / 2$) – 6 mm-plate antero-posterior length 15 BVT& 16 Ahmed's)**



Entry site

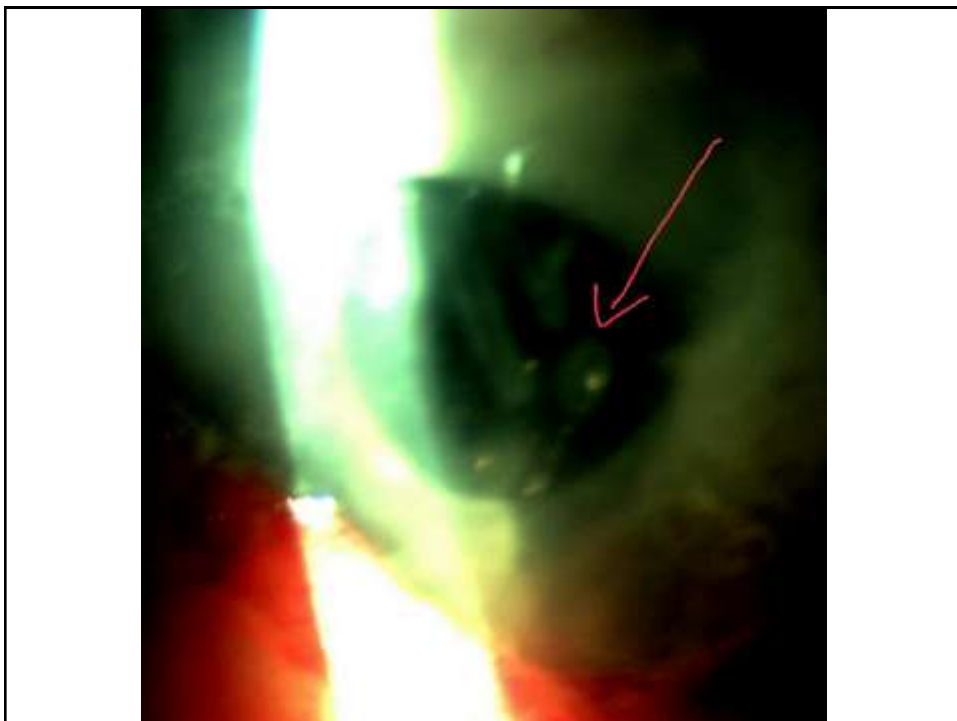
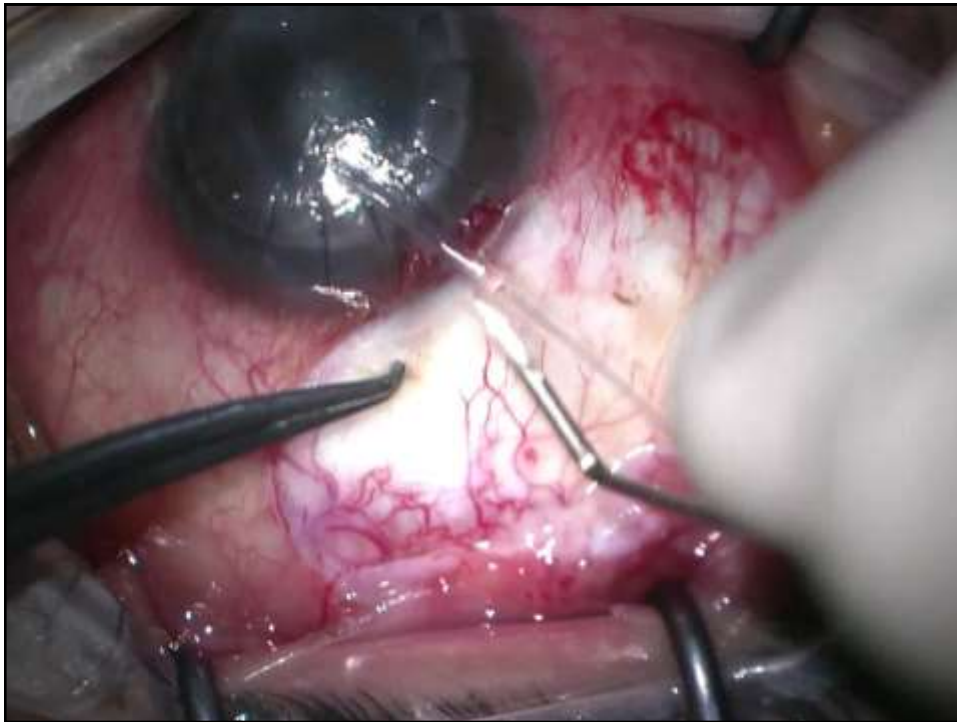
- Tube will stay there for the next 70 years.
- Ideally behind the iris if you can(future PKP)
- AC infusion (better to have false depth)
- Surgical limbus is distorted (Bupthalmos go more posterior)
- Lost AC (tricky if phakic).
- Closer or even touch iris rather close to cornea.





Length inside AC

- Ideally 1 mm but needs to be longer in paed
- Small eye will grow.
- Capsule retracts the tube.
- Long tube rubs against the cornea esp if low pressure with lots of eye rubbing

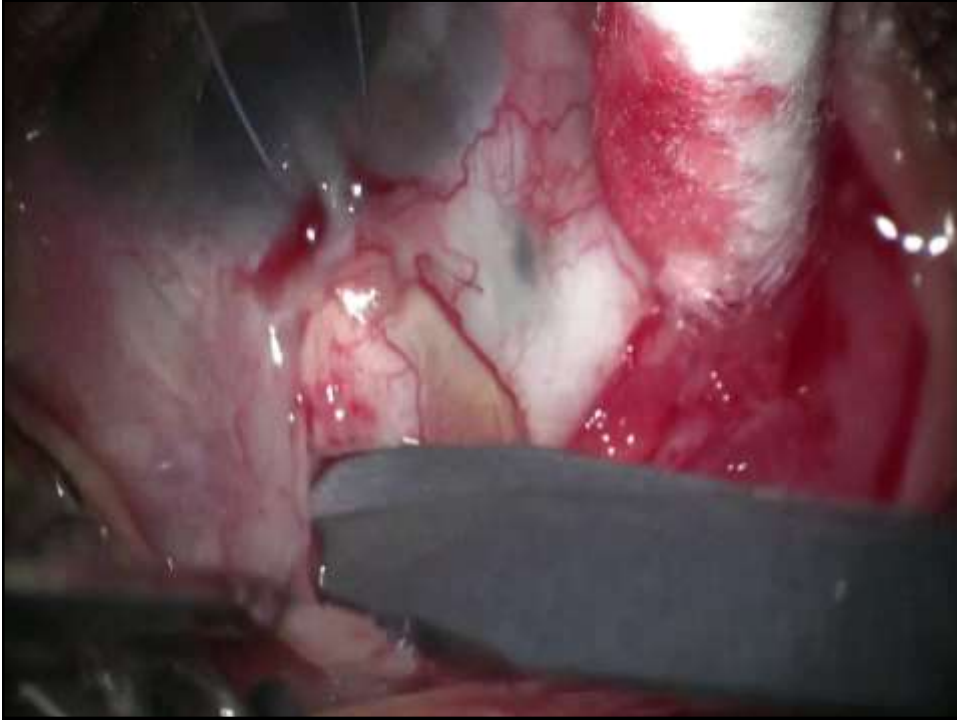


Cover of tube

- No patch available ??
- Tutoplast/ scleral part of graft remnant
- Glue or suture
- Exposed patch but covered tube?

Closure of the conjunctiva

- Scarred from previous surgery.
- Limbal mattress suture is important.
- 8/0 vicryl itchy more rubbing exposure of tube.
- 10/0 or 9/0 Nylon but needs extra visit to theatre.
- Glue ?? Not paed.



Closure of the cornea

- 2 sutures for each wound 10/0 Nylon.
- Gel or Air.
- **MUST BE REMOVED** to prevent infection.

Conclusion

- Paed glaucoma rare but important cause of visual impairment.
- Challenging to manage esp surgery.
- Tube vs Traby? whatever works in your hand better.
- Shunt is put as a part of long term plan not just pressure control.

Thank you

Email : ahmedelkarmouty@hotmail.com