Glaucoma Surgical Decision Tree
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**What is the best option?**

- SLT
- Tube
- Trab
- LPI
- Cataract
- Ex-Pres
- Cat/Trab

**Considerations**
- Type of glaucoma
- Severity of disease
- Current IOP
- Goal IOP
- Previous surgery
- Patient risk factors
- Surgical risk factors

**Surgical Options**
- Selective laser trabeculoplasty
- Laser peripheral iridotomy
- Cataract extraction
- Trabeculectomy
- Trabeculectomy with Ex-Press shunt
- Cataract extraction and trabeculectomy
- Glaucoma tube implant

Glaucoma accounts for about 12% of blindness worldwide
- Treatment should be aimed at treating IOP in the short-term, while keeping an eye on the long-term
- Often more than one surgical option may be appropriate
  - Minimally invasive treatments initially allow for more future options if needed

Selective Laser Trabeculoplasty
Selective Laser Trabeculoplasty

- Quick
- Easy
- Convenient
- Topical anesthesia
- Safe (no endophthalmitis, hemorrhage, RD)

SLT Benefits

- Improves patient compliance
- Can eliminate or decrease ocular side effects
- Cost-effective compared to brand name topical medications
- Has been shown to decrease IOP fluctuation

SLT Indications

- Ocular hypertension with open angles
- Open angle glaucoma
  - Pigmentary glaucoma
  - Pseudoexfoliation glaucoma
- IOP elevation after intraocular injection
- Can be used as first-line therapy or to lessen need for additional topical medications

SLT Contraindications

- Active uveitis
- After recent ocular trauma
- Active iris neovascularization
- Insufficient open angle
- Inability to visualize angle

Principles of SLT

- Cell stimulation by biophotoactivation triggers cytokine response
- Cytokines recruit macrophages
- Macrophages help clear cellular debris
- Biological response improves outflow facility
- Fluid is allowed to flow freely through the TM without thermal-related tissue damage

Differences in Cellular Response

- ALT
  - High thermal absorption
- SLT
  - Only pigmented cells are affected
  - Thermal transfer indicated in red
  - SLT shows only melanin containing cells with thermal absorption
The effect of selective photothermolysis can be seen.
This process successfully limits heat transfer to surrounding architecture.

SLT Efficacy
- Average IOP reduction of 20-30%
- Success rate of >80%
- As effective as a prostaglandin
- Onset of effect 1 day to 6 weeks
- Can wear off over time
- Repeatable

SLT risks
- IOP spike
- Poor or short-lived IOP reduction
- Low grade inflammation
- Ocular discomfort

Case #1
- 25yo Caucasian male
- Moderate myopia -5.00 sph
- Krukenberg spindle and transillumination defects
- Wide open angles with 3+ pigmentation
- Ta 28 OU with pachs 550/555
- C:D 0.3 OU
- Normal HVF and OCT

Case #2
- 72yo African-American female
- Meds: none (but side effects to PG, AA)
- Medical history of COPD
- Ta 20 OD, pachs 505 OD
- C:D 0.65 OD with inferior notch
- OCT NFL inferior thinning
- HVF early superior nasal defect

Case #3
- 75yo Caucasian male
- Pseudophakic OS
- Meds: AA and BB OS
- Ta 18 OS, pachs 560 OS
- C:D 0.85 OS
- OCT thin superior NFL
- HVF moderate inferior arcuate
Laser Peripheral Iridotomy

LPI Indications
- Occludable angle
- Acute angle closure
- Fellow eye of acute angle closure
- Subacute and chronic angle closure
- Malignant glaucoma

Goals for LPI
- In patients with risk for occlusion, LPI can lower risk for acute ACG
- In patients with acute ACG, aim is break attack and to prevent another attack of acute ACG or progression to chronic ACG
- In patients with chronic ACG, IOP may remain the same or be lowered after LPI depending on the extent of PAS
- Fellow eye in a patient with acute ACG or chronic ACG has a 50% chance of developing acute ACG

Argon Laser PI
- Good for dark colored irides
- More shots
- Longer procedure
- Safer for eyes at higher risk for bleeding due to coagulative effect

Nd:YAG Laser PI
- Quicker
- Not dependent on iris color
- Better for corneal edema or haziness
- More bleeding
- Risk of lens trauma
Nd:YAG Laser PI

Laser PI Technique

- Laser at 1:00 or 11:00 positions
- Pre-op pilocarpine (pulls iris centrally)
- Slight upgaze
- Avoid visible iris vessels

Combined Argon/Nd:YAG LPI

- Easier to achieve successful LPI in inflamed eyes
- Less bleeding
- Argon laser first to coagulate and cauterize iris
- Follow with Nd:YAG laser to penetrate iris

LPI Complications

- Closure of iridotomy site
- Post-op IOP spike
- Intraocular inflammation
- Iris bleeding and hyphema
- Focal cataract
- Posterior synechiae
- Visual symptoms
  - Blurred vision, halos, glare, and diplopia

Case #4

- 44yo Asian female
- +3.25 sph OU
- Gonio open to Schwalbe’s line
- Ta 13/14, pachs 540 OU
- C:D 0.25 OU
- OCT and HVF normal

Case #5

- 65yo Caucasian female
- +2.25 sph OU
- Va 20/25 OU
- 1+NS
- Gonio open to anterior TM OU
- Ta 22 OU, pachs 580 OU
- C:D 0.50 OU (had been 0.35 OU 5yrs ago)
- OCT and HVF normal
Cataract Extraction

- Cataract and glaucoma are common comorbidities
- Earlier studies suggested only small IOP reduction of 2-4mmHg
- Newer studies show a greater sustained reduction on IOP
  - Higher starting IOPs show greatest effect

- Best is used in patients with mild-moderate glaucoma
- Patients with pseudoexfoliation often show good improvement in IOP
  - Recommend cataract surgery sooner rather than later
  - Be careful of early post-op IOP spike

Case #6

- 77yo Hispanic male
- +3.50 sph OD
- Va 20/60 OD
- 2+NS OD
- Gonio open to Schwalbe’s line
- Ta 25 OD, pachs 555 OD
- C:D 0.40 OD
- OCT and HVF normal

Case #7

- 82yo African-American male
- Meds: PG
- -1.25 sph OS
- Va 20/60 OS
- 2+NS/1+CS OS
- Gonio open to SS
- Ta 20 OS
- C:D 0.70 OS
- OCT thin inferior NFL
- HVF moderate superior arcuate
Trabeculectomy

- Remains the most common incisional glaucoma procedure performed today
- Partial-thickness scleral flap with block excision of limbal tissue to expose angle structures
- Aqueous humor exits anterior chamber through or around scleral flap forming bleb

Trabeculectomy Indications

- Open angle glaucoma
- Closed angle glaucoma
- Childhood glaucoma

Trabeculectomy Contraindications

- Cases likely to respond to less invasive treatments
- Eyes with previous failed trabeculectomy
- Eyes with severely scarred conjunctiva
- Neovascular glaucoma
- Uveitic glaucoma

Trabeculectomy

- Able to lower IOP to very low levels
- Use of anti-metabolites to suppress scar formation and preserve the patency of filtering fistula
- Intensive post-op care to evaluate bleb appearance, IOP, and anterior chamber status

Creation of Sclerotomy
Creation of Peripheral Iridectomy

Complications

- Intraoperative
- Early post-operative
- Late post-operative

Intraoperative Complications

- Conjunctival buttonhole or tear
- Subconjunctival hemorrhage
- Scleral flap buttonhole, loss, or disinsertion
- Premature entry into the anterior chamber
- Crystalline lens injury
- Hyphema
- Imperforate sclerostomy
- Vitreous loss
- Intraoperative choroidal effusion/suprachoroidal hemorrhage
- Imperforate peripheral iridectomy
- Endh Hortent sector iridectomy
- Cyclodialysis/iridodialysis
- Intraoperative aqueous misdirection syndrome

Early Post-Operative Complications

- Filtering bleb complications including the following:
  - Wound leak or dehiscence
  - Early bleb leak
  - Early bleb failure
  - Encapsulated bleb (Tenon cyst)
  - Hypotony
  - Choroidal effusion/suprachoroidal hemorrhage
  - Shallow or flat anterior chamber
  - Over- or underfiltration
  - Aqueous misdirection syndrome
  - Infection
  - Pupillary block (due to an imperforate peripheral iridectomy)
  - Loss of central visual acuity (snuff out or wipe out)
  - Corneal or ciliary body toxicity due to the antifibrotic agent

Late Post-Operative Complications

- Blebitis and bleb-related endophthalmitis
- Late bleb failure
- Late bleb leak
- Hypotony
- Cataract formation or progression
- Cystic bleb
- Bleb dyesthesias (symptomatic bleb)
- Overhanging bleb

Case #8

- 67yo African-American male
- Meds: PG, AA, BB, CAI
- Va 20/30 OD
- 1+NS OD
- Ta 32, pachs 590
- C:D 0.90 OD
- OCT thin superior and inferior
- HVF dense superior and inferior arcuate
Ex-PRESS Mini Glaucoma Shunt

- FDA approved miniature unvalved implant
- Designed to be a simpler substitute to trabeculectomy
- 400 micron stainless steel tube
  - MRI compatible
- Less than 3mm long
- Reduces IOP by diverting aqueous from anterior chamber to a subconjunctival bleb

Ex-PRESS Shunt Features

- The resistance mechanism consists of an intrinsic fixed part in the device’s design, which restricts the flow through a reduction/constriction of the lumen
- The resistance unit is not a valve and does not have any moving parts.

The Flow Modulating Unit
Ex-PRESS Surgical Procedure

- No tissue removal
- No sclerostomy or iridectomy
- Quicker procedure than trabeculectomy
- Less inflammation and quicker vision recovery
- Less risk of vitreous exposure and cataract formation
- Placement under scleral flap
  - Provides more resistance to aqueous outflow, leading to less incidence of hypotony
  - Reduces risk of device extrusion
**Ex-PRESS Mini Glaucoma Shunt**

- 63yo Hispanic female
- Meds: PG and BB
- s/p SLT six months ago
- Va 20/25
- Trace NS
- Ta 22, pachs 510
- C:D 0.75
- OCT thin superior NFL
- HVF moderate superior and inferior arcuate

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**Combined Cataract Extraction and Trabeculectomy**

- Used in one of two scenarios
  - Controlled moderate to advanced glaucoma with visually significant cataract
  - Uncontrolled moderate to advanced glaucoma on maximal medical therapy and cataract

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**Glaucoma Tube Implant**

- Create an alternate aqueous pathway from AC by channeling aqueous out of the eye through a tube to a subconjunctival bleb
- Tube is usually connected to an equatorial plate under the conjunctiva
- Being used more frequently in the treatment of glaucoma that is not responding to medications and trabeculectomy operations.

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**Case #9**

- 63yo Hispanic female
- Meds: PG and BB
- s/p SLT six months ago
- Va 20/25
- Trace NS
- Ta 22, pachs 510
- C:D 0.75
- OCT thin superior NFL
- HVF moderate superior and inferior arcuate

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**Case #10**

- 75yo Caucasian male
- Va 20/100
- Meds: PG and AA
- 2+NS/CS
- Ta 15, pachs 570
- C:D 0.75
- OCT thin superior NFL
- HVF moderate inferior arcuate
Glaucoma Tube Implant

- Extremely useful in managing refractory cases of glaucoma
  - Neovascular glaucoma
  - Uveitic glaucoma
  - Congenital or juvenile glaucoma
  - Failed filtering surgery or extensive scarring

Tube vs. Trab

- Many newer studies looking into efficacy of GDI instead of trabeculectomy in non-refractory glaucoma cases
  - Equivalent IOP reduction with less post-operative complications
  - However, limited potential for performing trabeculectomy after GDI

Ahmed Valve Implant

Glaucoma Tube Implant Complications

- Hypotony
- Hypertensive phase
- Tube obstruction or retraction
- Tube or end-plate exposure
- Diplopia
- Suprachoroidal hemorrhage
- Endophthalmitis

Case #11

- 58yo Caucasian female
- Proliferative diabetic retinopathy, s/p Avastin
- Meds: AA, BB, topical and oral CAI
- Va 20/400
- Rubeosis irides
- 1+NS
- Ta 44, pachs 556
- C:D 0.40
Case #12
- 65yo Hispanic male
- H/o trabeculectomy
- Meds: PG, BB, AA
- Va 20/80
- Pseudophakic
- Ta 28, pachs 535
- C:D 0.85
- OCT thin sup. and inf. NFL
- HVF dense sup. and inf. arcuate

Conclusion
- Once glaucoma diagnosis is made, decision needs to be made on medical or surgical therapy
- Some surgical interventions can be used as first-line therapy
- Careful consideration of type of glaucoma, goal IOP, patient and surgical risks to choose best procedure

Conclusion
- Provide necessary treatment to achieve short-term goals, but allow for future options if needed
- Choose the most minimally invasive procedure to accomplish goals

Thank You!