To drop or to chop – options of medical and surgical management of glaucoma

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Disclosure

- None

J Caprioli; A Visual Field Index for Calculation of Glaucoma Rate of Progression

To chop or to drop

- This debate has gone on for long time
- What should occur first?
  - Drop
  - Chop

Medications first advantages

- Drugs are safer than surgery-
  - Less complications
  - Less discomfort
- Drug effects can reversed or is short acting
- Less expensive in the short run
- Multiple drugs can be combined to achieve successful reduction in IOP
- Better quality of life when compared to surgery first (Lichter et al., Ophthalmology 2001)

Medications first disadvantages

- May be more expensive in the long run
- Multiple drugs
  - Compliance, adherence and persistence issues
- Chronic drug uses and its effect on future surgical outcomes?
  - Preservatives effect?
  - Inflammation leading to failure of future procedures*
  - Increased chances of cataract formation

*Broadway DC et al., Adverse effects of topical antiglaucoma medications: II Arch Ophthalmal 1994
Surgery first - advantages
- If successful and large drop in IOP may be obtained
- No issues related to patient compliance, adherence and persistence
- Good in situations where obtaining continuous supply of medications is a problem
- May be cheaper long term

Surgery first - disadvantages
- Outcomes may be variable
- Long term may lose efficacy
- May still require additional topical medications
- Complications may be dire
- Comfort and quality of life may be lower
- Chances of cataract formation is greater than topical medications
- Age- young vs. older individuals

Race and management options
- Race – white versus individuals with greater pigment
- Individuals with greater pigment- greater risk of post-operative scarring*
  - Medications – first choice

*Broadway DC et al., Racial differences in the results of glaucoma filtration surgery: are racial differences in conjunctival cell profile important? BJO 1994

Age and management options
- Younger individuals
  - Accelerated wound healing systems
  - Thick fleshy periocular tissues heals rapidly
  - Thus older individuals better suited for surgical options

Overall mostly it is medications first!

When is surgery indicated?
Current practice patterns

- Unacceptable high pressures will inevitably destroy optic nerve tissue
- Safe levels of IOP by any means warranted
  - If these don’t work or not sufficient
  - drugs like – prostaglandins
  - reduction in inflow – beta blockers
- Maximal medical therapy
  - Consider surgery

Maximal tolerated medical therapy

- Conventional/Trabecular
  - Carbonic Anhydrase Inhibitors (CAIs)
  - Prostaglandin derivatives:
    - Bimatoprost
    - Latanoprost
  - α2-Agonists:
    - Apraclonidine
    - Brimonidine
- Nonconventional/Uveoscleral
  - Prostaglandin derivatives:
    - Travoprost
  - α2-Agonists:
    - Apraclonidine
    - Brimonidine

And how exactly do I use them?

- Stage of disease
  - Visual field status
- Stage of nerve damage
  - Rim tissue remaining
- Type of glaucoma
  - POAG – medical first makes sense
  - Secondary glaucoma
  - Congenital glaucoma
  - Complete angle closure – treated differently
- Adherence, compliance, persistence issues
- Effect of medications and future outcomes of surgery

Do we really have the luxury to use them all?

Target pressure

- A theoretical value below which visual field and ONH appear stable (not deteriorating).
- Calculated from highest recorded IOP.
- Conventionally 20-30% decrease in IOP.
- 40% or more if severe glaucoma
**Target pressure calculation**

- **Target Pressure** = Maximum IOP - Max IOP% - Z

Max IOP% can be approximately 20% or 30% of max IOP value.

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**Is this defect a sign of "early glaucoma"**

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**Criteria for glaucomatous damage**

- GHT outside normal limits in at least two occasions
- A cluster of three or more **non-edge** points (pattern deviation plot) all of which are depressed at a p<5% and one of which is depressed at a p<1% on two occasions (respecting horizontal meridian)
- PSD < 5% of normal individuals
- This criterion was written for 30-2, if 24-2 field is analyzed edge points are included.

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**Why is staging important?**

- Treatment issues
- Management issues
- Prognosis
- Research

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**Staging of disease**

**Staging based on MD**

- Better than -6 dB – Mild
- Worse than -6.0 dB but better than -12 dB – Moderate
- Worse than -12.0 dB – Severe
Progression

Guided progression Analysis
- Can be used with SITA standard and Fast but not SWAP.
- Full threshold tests can still be used for baseline
- Corrects for cataract and media effects
- Flags change
- MD plotted over time and regression analysis done to quantify dB change over a year
- Verifies reliability "low test reliability" "excessive false positive"

Guided progression Analysis cont...3
- Baseline:
- First two tests (automatic) are needed and average to make the baseline
- If you don’t want to use the first two tests you can manually chose other tests
  - For example: Learning curve, poor test taker
  - Ocular intervention like, High IOP which was treated during first test

Guided progression Analysis cont...4
- 30-2 and 24-2 can be used. If 24-2 is the follow-up fields then all field reports are used as 24-2 (extra points of 30-2 is not used)

GPA cont ...5
- Example of additional information with your single field printout

GPA cont -6
- Symbols used
  - Open triangle p<5%
  - Half filled p<5% two occasions
  - Solid triangle p<5% three occasions
  - X out of range
- Possible progression – three or more points show change at least two consecutive tests
- Likely progression – three or more points show change in at least three consecutive tests
**Visual Field Index**

- Percentage of normal age adjusted field
- Greater the number more normal
- Trend over time is given with a probability values as well

**Summary**

<table>
<thead>
<tr>
<th>Medications</th>
<th>Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early glaucoma</td>
<td>Moderate to advanced glaucoma</td>
</tr>
<tr>
<td>Compliant patient</td>
<td>Chances of serious loss of vision</td>
</tr>
<tr>
<td>Target IOP achieved</td>
<td>Unable to take medications- various reasons</td>
</tr>
<tr>
<td>Works with life style/physical ability</td>
<td>Unable to achieve and maintain target IOP</td>
</tr>
<tr>
<td>Not too many medications (ocular)</td>
<td></td>
</tr>
</tbody>
</table>

**Laser Therapy**

- Enhances aqueous outflow
- How does it cause increase outflow
- Exact mechanism unknown
  - Mechanical theory
    - Mechanical tightening of trabecular meshwork
    - Opens adjacent untreated spaces
  - Laser induced cellular changes
    - Macrophages migrate to the location
    - Clears trabecular debris

**Argon Laser Trabeculoplasty- (ALT) theory**

- Enhances aqueous outflow
- How does it cause increase outflow
- Exact mechanism unknown
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    - Mechanical tightening of trabecular meshwork
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  - Laser induced cellular changes
    - Macrophages migrate to the location
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Argon Laser Trabeculoplasty - indications

- Open angle
- Require decrease in IOP
- Both POAG and secondary like pseudoexfoliation or pigmentary
- Poor candidates
  - Angle recession, uveitic glaucoma, aphakia, high IOP (35 or greater), high episcleral venous pressure
  - Very young individuals
  - Previous 360 degree ALT

Summary of Argon Laser Trabeculoplasty

- Laser burns to trabecular meshwork
- Enhances aqueous flow and thus lowers IOP
- Usually an adjunct therapy
- Treatment benefit seen 4-6 weeks
- 180 degrees at a time, 360 can be done
- Retreatment not effective

Selective Laser Trabeculoplasty (SLT)

- Selectively targets melanin pigment of TM
- More safe compared to ALT (because lower power)
- Equally effective as ALT
- Can be repeated if first attempt is not effective

Mechanisms of action SLT

- 5-8 fold increase in monocytes and macrophages in TM
  - after treatment with SLT
- Hypothesis
  - Injury via laser causes releasing of chemoattractant
  - This in turn recruits monocytes that are transformed into macrophages
  - Macrophages clear pigment granules and exit via Schlemm’s canal

ALT versus SLT

- SLT preferred
- Unlike ALT, SLT does not scar
- Autopsy specimens – confirm no coagulative damage after SLT
- SLT can be repeated

Peripheral iridotomy

**ANGLE CLOSURE GLAUCOMA**

### Indications
- Acute primary angle closure
  - One to two days after attack
  - Once eye is settled and edema is cleared
- Fellow eye of acute primary angle closure
  - 50% chance of angle closure
- Chronic angle closure
- Narrow or occludable angle

### Contraindications
- Significant edema
  - Unable to visualize iris
- Thick iris
  - Dilated pupil, bunched up iris
- High risk of complications
  - Significant inflammation

### Laser iridoplasty
- Procedure to open an appositionally closed angle
- Series of laser burns
  - Low power
  - Large spot
  - Longer duration
  - Extreme peripheral iris
- This causes tightening of peripheral iris creates a space between anterior iris surface and trabecular meshwork

### Trabeculectomy
- Creates a fistula that allows aqueous from anterior chamber to subtenons space
- Fistula guarded by scleral flap
- The bell should not be fully vascularized neither completely avascular
- Mytomycin C (alkylating agent) or other antimetabolites (example 5-fluorouracil) prevents scarring and failure
Glaucoma implants

- Indications
  - Uncontrolled glaucoma
  - Poor candidates for trabeculectomy
    - Neovascular glaucoma,
    - Penetrating keratoplasty or retinal detachments with glaucoma
    - ICE syndromes traumatic glaucoma, previously failed trabeculectomy

Case 1 LW

- 50 YO BF
- Vn 20/40- and LP OS
- No improvement with PH
- Slitlamp
- OD cortical cataract
- OS Total traumatic cataract
- IOP 23 OD 28 OS
- Gonioscopy – Open angle CBB all quadrants OU
  - TM pigmentation even 360 degree grade 2

VF 24-2

Pachymetry

Scan quality - acceptable
Inferior and superior average thickness decreased
Overall decrease in rim tissue as well
• Rx Travatan Z qhs
• RTC 1 month

• 1 month later – IOP OU 26 mmHg
• Non compliant - discussed importance of IOP lowering
• RTC 1 month

• 1 month later IOP OU 26 mmHg - reported non compliance due to family visit
• Educated and RTC 1 month

2/1/2012

Case 2 GH

• 2009
• Painful eye OS intermittent 1 year, nothing helps
• Vn OD 20/40
• OS NLP
• Slitlamp
  • OD NS 2+
  • OS corneal edema, iris neo
• IOP OD 24 mmHg, OS 61-74 mmHg

• Visit 4
• Reported compliant to medications
• IOP
  • OD 15 mmg (11 mmHg lower than highest)
  • OS 16 mmHg (12 mmHg lower than highest)

• RTC 3-6 months
• IOP recheck, VF 24-2
• Discussion - compliance important, rechecks important, Laser an option in non-compliant patients.

Tx
• In office Iopidine, tomolol, acetazolamide 250 mg 2 tabs
  • Side line point 500 mg STAT and then BID
• IOP lowered to 53 mmHg OS

  • CD OD 0.75 H/V 0.85
  • Macula soft drusen OD
  • OS no view

• Plan- Px referred
• OD Xalatan qhs, timolol BID
• OS Timolol BID and report to ophthalmologist for further management.

• 2 years later...

2011

• No new complaints. Stopped all medications 2 years
  • Not sure why?
• OD 20/70 OS NLP (no pain)
• Slit lamp
• OD
• OS
• Nuclear sclerosis
• Corneal edema, Iris neo
• Cortical cataract
• PSC
• IOP 18 mmHg OD
- Fundus evaluation
- Clinically significant diabetic macular edema
- Diabetic retinopathy
- HTN retinopathy

2009 vs 2011

- CD 0.75 H 0.85 V CD 0.85 V and H

Re-educated on importance of medications.
- Start Travatan Z qhs
- Due to non-compliance and monocular – referred for surgical consult
- Surgeons opinion was to opt for laser as first choice and trabeculectomy if laser treatment not successful.