An Introduction to Angle Based Glaucoma Surgery

Malik Y. Kahook, MD
The Slater Family Endowed Chair in Ophthalmology
Professor of Ophthalmology
Vice Chair, Clinical and Translational Research
University of Colorado School of Medicine
Aurora, CO
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- Ivantis: O
- Zeiss: P
- FDA C
How often do you perform ab interno angle based glaucoma surgery?

A. Never
B. Weekly
C. Monthly
D. Rarely
Most resistance to aqueous outflow is at the level of the:

A. Collector Channels
B. Juxtacanalicular TM
C. Aqueous veins
D. Sclera
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Is Earlier Surgical Intervention the Future of Glaucoma Therapy?
The TVT Mentality

- Tubes are worse than Trabs (More meds)

- Trabs are worse than Tubes (More failure)

- Have you ever considered that many of our trials are geared towards identifying which intervention is less harmful? Perhaps it is time for a change?
Evolution of Surgical Glaucoma

What is MIGS*:

- Ab-interno approach that is minimally traumatic
- At least modest efficacy that is sustained
- Extremely high safety profile
- Rapid recovery with minimal impact on quality of life

*Defined by Dr. Ike Ahmed
Evolution of Surgical Glaucoma

MIGS Device Implant:

- Trabecular Bypass Devices:
  - Treatment of mild to moderate glaucoma concomitant with cataract extraction

- Suprachoroidal:
  - Treatment of mild to moderate glaucoma concomitant with cataract extraction

- Filtration Devices:
  - Full thickness bypass from anterior chamber to sub-Tenon’s space. Closer to traditional filtration surgery profile
Adding Angle Surgery to Your Practice
Outline

- Patient selection
- Day of Surgery
  - Pre-operative (consent and drops)
  - Intra-operative (positioning, gonioscopy, other)
  - Post-operative (instructions)
- Follow Up Pearls
Patient selection

- Ab interno is not just for mild disease

- Mild to moderate
  - Main goal to decrease meds?
    - Goniotomy or ECP
  - Decrease meds and IOP?
    - Goniotomy or Combo (Goniotomy+ECP)

- Moderate to Severe
  - Goniotomy
  - Angle closure patients
  - Combined in-flow out-flow (ICE, PEAK)
Pre-operative

- When combined with CE
  - Consent should always include “+/-” statement
  - Discuss recovery may be a bit different compared to CE
  - Dilation and preoperative drops as usual
  - Discuss positioning prior to the case (turning head)

- Standalone
  - Antibiotic + Pilocarpine 1% q5m x 3
  - As above
Intra-operative

- Use miotic in first few cases to enhance view
- Routine cases and cooperative patients
- Consider peribulbar anesthetic
- Hydrate the wounds well
- Leave IOP at ~25mmHg at the end of the case
Differences between Standalone CE and Angle Surgery

- Elbows
  - At sides for vs outstretched

- Cornea
  - Incisions vs Surface

- Hands
  - Bimanual vs Intra/Extra

- Operative Space
  - Above/below iris vs 1mm angle space

http://glaucomatoday.com/2016/10/gonioscopy-is-essential-for-migs/
Intra-operative

Positioning:

Phaco
- Elbows at sides
- Back straight
- Coaxial light

MIGS
- Arm straight
- Back straight
- Inc. distance

http://glaucomatoday.com/2016/10/gonioscopy-is-essential-for-migs/
Intra-operative

- **Gonioscopy:**
  - Place viscoelastic on the lens rather than on the eye
  - Rest hand on forehead or zygoma
  - Don’t use lens to direct the eye
  - Zoom in

http://glaucomatoday.com/2016/10/gonioscopy-is-essential-for-migs/
Wound Construction

- Avoid limbal vasculature, because blood will obscure angle viewing.

- In standalone ab interno cases, corneal incisions that are 2 mm or smaller is usually sufficient. However, it is best to use a 2.0-2.4mm incision when first starting out.

- While temporal incisions are commonly used to access the nasal angle, supra or infra-nasal incisions can be made to access other parts of the angle if needed.
Putting it all together
Fluid Wave
Post-operative

- Treat similar to cataract patients

- Antibiotic/Steroid/NSAID +/- Pilocarpine 1% when combined with CE

- Antibiotic/Steroid +/- Pilocarpine 1% with standalone

- See back post op day one
Follow Up Pearls

- Steroid response is not uncommon after ab interno procedures
- Stop all meds when IOP < 15mmHg
- Keep 1-2 meds as needed depending on nerve status and IOP
- Restart meds one by one as needed
Steroid response elevation in IOP is rare after angle based surgery

- True
- False
Steroid response elevation in IOP is rare after angle based surgery

- True
- False
The Case for Goniotomy
The Ramp is Critical:

- Placing the TM on stretch allows for a more precise cut.

- Attempts at incising the tissue on both sides of the TM without elevating and stretching the tissue failed in the past.

- As the KDB moves forward, the TM is elevated and cutting occurs above the plane of where the TM usually rests.
KDB CLINICAL DATA
29% IOP reduction in IOP at month 12 with baseline IOP below 18mmHg
Glaucoma Medications over time with 95% CI for Combined Phaco+KDB Cohort

Reduction of at least one medication in 74% of treated eyes
KDB Surgical Technique
TM Removal Post KDB

Courtesy of Dr. Leonard Seibold
Trabecular Meshwork Analysis

KDB allows for harvesting TM strips for study purposes if desired
Tissue Collection and Treatment Post GATT Procedure

- Incisional angle procedures have been associated with tissue overgrowth leading to increased IOP.

- Drs. Grover and Fellman were able to collect this tissue from a patient post GATT.

- Analysis took place by Drs. Ammar and Kahook and revealed fibrosis with basement membrane deposition.

- KDB can assist with tissue collection for studies and enhanced diagnostic capabilities.
We still have much to learn
Removal of iStent with TM Harvest
Initial Histology

- Fibrotic Tissue
- Normal Pigment
- Low TM cell number with fibrosis
Harvested TM Tissue
I’m Ready to Start Angle Surgery. Which One?
Where are we today?

- Glaucoma is becoming a field where our past best patient experiences are now becoming the expectation.

- Patients want a safe option that provides IOP lowering with added bonus of decreasing medications.

- Surgeons want predictable procedures that are safe and effective and economically sound to continue to serve patients.
Patient Case:

- 65 year old with POAG and Goal IOP of 15 RE (current IOP 18) and visually significant cataract
- No Prior glaucoma surgery and currently on a PGA
- Visual field shows early nasal step that is progressing slowly

What is your best surgical option?
What is on the Menu?

- Choices might lead to confusion
- Deeper dive will allow us to make informed choices
- “There are many choices but a poor understanding of where things fit due to a lack of data”
- The above statement is no longer true as we are in the era of EBM across multiple devices

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<thead>
<tr>
<th>Conventional Outflow</th>
<th>Unconventional Outflow</th>
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<tr>
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<td>CyPASS</td>
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<th>Full Thickness Outflow</th>
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<td>XEN</td>
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How do I choose today and future steps?

Unconventional

Conventional

Inflow

Full Thickness
Outflow: Conventional Pathway

- This is my first choice in mild to severe glaucoma: safe, most physiologic, small footprint

- All devices have a role and we are learning how to personalize the care (long term data)

- Personalized Approach:
  - All: Mild glaucoma with cataract where decrease in meds trumps IOP lowering (safe)
  - Goniotomy: Mild to severe with/without CE when IOP & meds are both targeted

Where are we headed?
- Accessing several CC
- Combo procedures
- Combine with medications
- In office procedure
Outflow: Unconventional Pathway

- Suprachoroidal Implant labeled for mild/moderate glaucoma with CE

- Why is it not my first choice?
  - Can be unpredictable (refractive surprise/IOP)
  - AE profile (Hypotony/Pain/ECL)

- Where does it fit in my algorithm?
  - Instead of a second tube
  - Extensive conjunctival scarring

Where are we headed?
- New Materials
- Different designs
- Combine with medications
- Modify expectations (advanced glaucoma?)
Outflow: Full Thickness

- What is on the menu?
  - XEN/Trab/ExPRESS/GDD

- Why is it not my first choice?
  - Avoiding a bleb is still a major goal
  - Needling rate is significant (~40%)
  - Treating glaucoma with surgery earlier

- Where does it fit in my algorithm?
  - XEN: elderly Caucasians with physical or social situations that are compelling
  - Traditional Trab or ExPRESS are still my go-to procedures in this category

Where are we headed?
- Back to ab exetrno
- Innfocus MicroShunt (Santen)
- Different designs (ease of use)
- Anti-scarring strategies
Inflow: ECP

- Expectation is 20-25% IOP lowering backed by long term data
- CE+ECP clearly better than CE alone
- Two incision treatment is superior
- Easily combined with outflow procedures
- “Go to” when Conjunctiva is compromised

Where are we headed?
- Smaller probes with better view
- Combo studies with outflow
- Technology advancements will lead to decreased costs

Patient Case:

- 65 year old with POAG and Goal IOP of 15 RE (current IOP 18) and visually significant cataract
- No Prior glaucoma surgery and currently on a PGA
- Visual field shows early nasal step that is progressing slowly

What is your best surgical option?
- Goniotomy is my procedure of choice in this scenario.
- Safe, effective and exposes several CCs without leaving a device behind
Patient Case:

- 65 year old with POAG and Goal IOP of 15 RE (current IOP 18) and visually significant cataract
- Prior glaucoma drainage device and currently on MTM
- Visual field shows nasal step progressing rapidly

What is your best surgical option?
- 360 ECP (+/-Outflow procedure) is my procedure of choice in this scenario
Patient Case:

- 65 year old with POAG and **Goal IOP of 10 RE** (current IOP 14) and visually significant cataract
- **No Prior glaucoma surgery** and currently on MTMT
- Visual field shows nasal step with **steady progression**

What is your best surgical option?
- Traditional **Trabeculectomy** is still my go to in these cases
- This is one area that has not changed significantly over the years (**Innfocus**?)
Which glaucoma surgery is most likely to succeed when targeting an IOP level of 10-12mmHg?

A. Goniotomy
B. TM bypass devices
C. XEN (short tubes)
D. Trabeculectomy
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We are headed towards a more nuanced approach

• More choices will further our ability to personalize care similar to tailoring IOLs or glaucoma medication choices
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• Head to head data to further inform decision making
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• Educational outreach will enhance surgeon comfort
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- Learning more about combining inflow-outflow and drug delivery with devices to maximize outcomes
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• Fight for reimbursement will intensify
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- Learning more about combining inflow-outflow and drug delivery with devices to maximize outcomes
- Fight for reimbursement will intensify
- Robust office based IOP-lowering procedures are the next target
Options
Thank You