Intraoperative Gonioscopy: A Key to Angle Surgery

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No financial conflicts of interest

10 Essential Steps of Perioperative Gonioscopy

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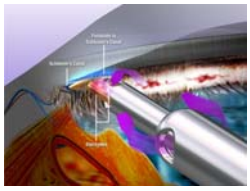
Angle Surgery limited to goniotomy

1936 – Goniotomy

70 years

2006 – FDA Approves Trabectome



Mandal A, Chakrabarti D. Evolution of Surgery for Congenital Glaucoma. Bengal Ophth J. 2012;10-19

What's the Big Deal?

MIGS PROCEDURES

- Trabectome
- iStent/iStent inject
- Hydrus
- Xen/InnFocus
- CyPass/iStent Supra
- Goniotomy/GATT
- KDB/ABiC/Visco 360
- **In Development …**

RATE LIMITING STEP

ANGLE VISUALIZATION WITH INTRAOPERATIVE GONIOSCOPY

Car Analogy

Manufacturers

- Ferrari
- Porsche
- BMW
- Mercedes
- Jaguar
- Audi
- **In Development …**

How Do I Drive It?

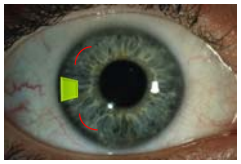
- Open door
- Adjust seat/rear view mirror
- Fasten Seatbelt
- Put key in ignition
- Automatic/Stick shift

Phaco vs. Angle Surgery

	PHACO	ANGLE SURGERY
Viewing	Full corneal access	Limited AC depth; increased work distance
Intraocular Surgery	Posterior to dilated iris sphincter	Anterior to iris plane; risk to cornea/iris in narrow space
Corneal Stimulation	Limited to keratome/side-port incisions	Stimulation sub-epithelial nerve endings entire surface
Instrument Handling	Bimanual intraocular	Simultaneous extra and intra-ocular manipulation; one handed surgery

Viewing

Phacoemulsification | **Angle Surgery**




Cataract Surgery: **Full access to the entire cornea**. Temporal keratome Incision. If needed,abandon main incision and create new incisions (forgiving/lots of reserve). **Angle Surgery**: **Limited access to the cornea**

Viewing

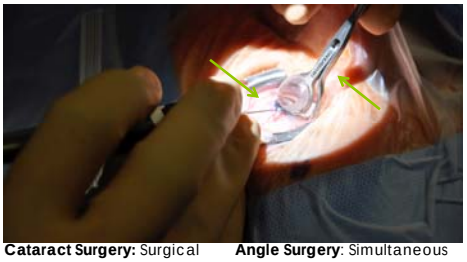
Anterior Chamber Depth: 2-3 mm; Trabecular Space: 0.7 mm

Corneal Stimulation

Subepithelial nerve endings throughout cornea: play role touch, pain, temperature

Phaco: Stimulation **limited** to Keratome/Side-port incisions
Angle Surgery: Maximal surface stimulation with lens

Instrument Handling



Cataract Surgery: Surgical plane **posterior** to iris; Simultaneous **bimanual intraocular** manipulation

Angle Surgery: Simultaneous **Extra/Intraocular** manipulation
One handed surgery
Surgical plane **anterior** to iris

Essential Perioperative Steps For Successful Angle Surgery

		STEPS	DESCRIPTOR
PRE-OP		1	Office Based Gonioscopy
		2	Angle Anatomy
		3	Anesthesia
INTRA-OP	EXTRA-OCULAR	4	Head/Microscope Rotation
		5	Goniolens Selection
		6	Hand Positioning
	INTRA-OCULAR	7	Corneal Incision
		8	Soft Shell Technique
		9	Goniolens Docking and Manipulation
POST-OP		10	Gonioscopy/Goniophotography

Step 1: Office Based Gonioscopy

PRE-OP


Intra-op gonioscopy is **NOT** a **substitute** for slit lamp based gonioscopy

Step 1: Office Based Gonioscopy

PRE-OP

- **Why?** For surgical planning
- www.gonioscopy.org [Dr. Alward]

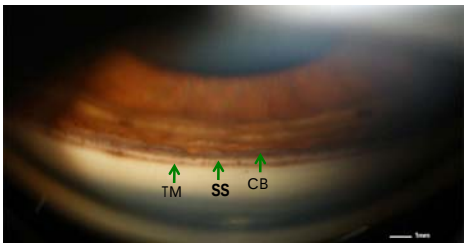
1. Gonioscopy documented < 50% charts reviewed of patients undergoing ocular medical therapy[1]
2. Medicare Claims Data: 50% open angle glaucoma patients undergoing surgery had a claim for Pre-Op gonioscopy[2]

Reflects **under utilzation** of office based gonioscopy

1. Quigley HA, Friedman DS, Hahn SR. . Ophthalmology. 2007;11:1599–1606.
2. Coleman AL, Yu F, Evans SJ. Use of gonioscopy in Medicare beneficiaries before glaucoma surgery. J Glaucoma 2006;15: 386–93.

Step 2: Angle Anatomy

PRE-OP



Scleral Spur: surgical landmark separates TM anteriorly from CB posteriorly

TM: Canal based surgery
CB: Suprachoroid based surgery

Step 3: Anesthesia

PRE-OP

Topical – involuntary movements (Saccade)
Peri-/Retrobulbar – Akinesia

Novice Surgeons: **Block**
Build surgical confidence
Avoid intraocular complications

Step 4: Corneal Incision

INTRA-OP

- Thornton **Fixation Ring**:

(1) Familiarity in **holding handle** of surgical goniolens. Use it in **all** cataract cases
(2) **Globe control**
(3) **Nasal rotation** provides **access** to peripheral cornea

Step 4: Corneal Incision

Eccentricity

INTRA-OP

With assistance of a fixation ring, rotate globe nasally and create incision just inside the limbus

Step 4: Corneal Incision

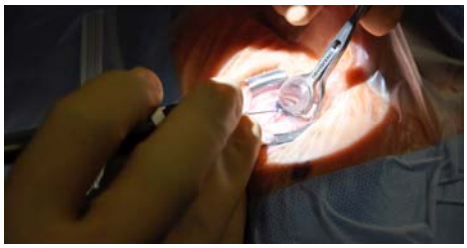
Eccentricity

INTRA-OP

Femtosecond Laser – Keratome incision **offset** from limbus
Potential for **interference** of surgical instruments with the overlying goniolens. Consider making incision **manually** and limiting the laser to capsulorrhexis and fragmentation.

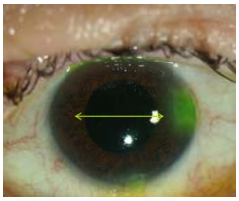
Step 4: Corneal Incision
Eccentricity

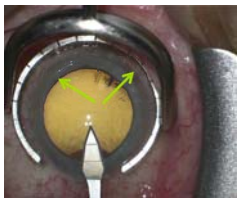
INTRA-OP



Step 4: Corneal Incision
Location

INTRA-OP

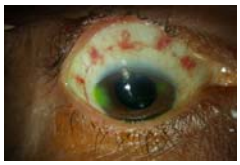




Create incision along **3 – 9 o'clock** plane
Gives **equidistant access** supero and inferonasal angle
Serves as an **anchor and pivot point** for surgical instruments during intra-op surgical manipulation

Step 4: Corneal Incision
Angle Surgery Timing: Pre or Post Phaco?

INTRA-OP

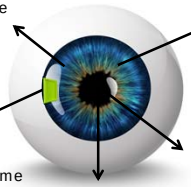


Pre-Phaco:
Pristine corneal clarity with unobstructed view of angle anatomy
Maintenance of ocular integrity
Small Keratome incision

Potential Post-Phaco Obstacles

IRIS
IFIS
Posterior Synechiae
Small pupil – need for Malyugin Ring

CORNEA
Diffuse edema
Prolonged Phaco Time
Fuch's Dystrophy
Femtosecond Suction Ring



TEMPORAL INCISION
Arcus Senilus
Edema around keratome incision
Stromal hydration of wound

LENS
Anterior chamber IOL
Complex Cataracts:
White
Brunescent
Pseudoexfoliation

VITREOUS
Anterior/Pars Plana Vitrectomy

Step 5: Soft Shell Technique

INTRA-OP

Arschinoff's soft shell technique:

- **Viscodispersive OVD** – coat and protect the corneal endothelium
- **Viscocohesive OVD -** A 2nd deeper layer creates and maintains space to safely introduce instruments in a confined trabecular space 0.7 mm

Arshinoff SA. Dispersive-cohesive viscoelastic soft shell technique. *J Cataract Refract Surg.* 1999;25:167-173.

Step 6: Head/Microscope Rotation

PRIMARY PHACO POSITION
Coaxial light perpendicular
Elbows straddling the flanks

Elbow non-dominant hand extends forward due to increased distance
8 inches in this case

ANGLE SURGERY POSITION

Step 6: Head/Microscope Rotation

INTRA-OP

Rotate Head **AWAY** Microscope **TOWARDS** surgeon **30 degrees**. Note the **INCREASED** working distance between the oculars and surgical field

Step 6: Head/Microscope Rotation

INTRA-OP

Endpoint: Align coaxial light **along iris plane** - **NOT** the corneal plane (oblique). Allows **direct** access of surgical instruments to the angle in the **SAME** plane. Adjust **illumination** & **magnification** to view angle

Step 6: Head/Microscope Rotation

INTRA-OP

Corneal Plane: Oblique approach to angle structures

Iris Plane: Direct approach to angle structures in the same plane

Fine Tuning: Instruct patient to **look nasally** to bring angle into view

Step 7: Goniolens Selection

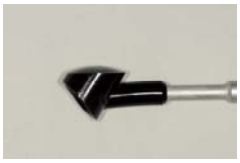
INTRA-OP

Modification of Swan Jacob (SJ) Lens. Lens **contiguous** with handle. Vary in **degree of corneal contact**, **field of view**, **magnification** and **handle length** (**See Hand-out: Table 2**)

Shareef S, Alward W, Crandall A, et al. Intraoperative gonioscopy: a key to successful angle surgery. *Exp Rev Ophthalmol*. 2014;9(6):515-527.

Step 7: Goniolens Selection

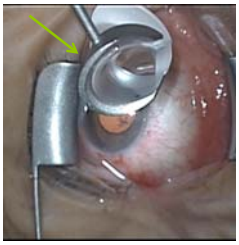
INTRA-OP



SJ lens modification with a plastic ridge to counter eye movement

Step 7: Goniolens Selection

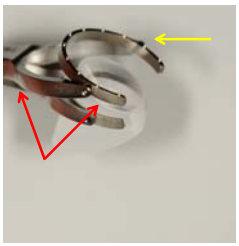
INTRA-OP

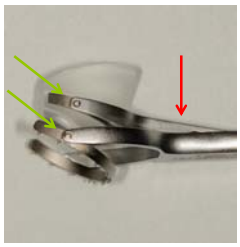


Hill Lens with **flange** (protruding metal rim) at base to counter eye movements for globe stabilization. Comes in right and left sided handles to be held by the non dominant hand

Step 7: Goniolens Selection

INTRA-OP





Vold Goniolens:
Handle **contiguous** with a cleat (Fixation) ring and **NOT** lens itself
Lens **originates** and is **suspended** by a **separate pendulum handle**
Multiple pivot points allow for **surgical adaptability**

Step 7: Goniolens Selection

INTRA-OP

Step 8: Hand Positioning

INTRA-OP

Step 8: Hand Positioning

INTRA-OP

Step 9: Docking of Goniolens

INTRA-OP

Options: Topical anesthetic drops; viscoelastic; lidocaine gel
2% Lidocaine Gel: (1) **Topical analgesic**; (2) **coupling medium**
Decrease sensation of tissue manipulation during surgery

Step 10: Goniophotography

POST-OP

Documentation purposes
Fosters a trusting doctor-patient relationship (**show and tell**)
Self assessment of surgical technique
Pre-op Counseling of potential surgical candidates

Step 10: Goniophotography

POST-OP

Step 10: Goniophotography

POST-OP

Getting Started – Summary Points

- **Office based gonioscopy** at slit lamp
- In **Minor O.R.**, practice gonioscopy
- Cataract Surgery:

1. **During surgery**:
   (i) Hold **fixation ring** to stabilize globe
   (ii) Rotate globe to create keratome incision
1. **After routine surgery**:
   (i) rotate head and microscope
   (ii) place goniolens to view angle structures

Recommend References

- www.gonioscopy.org
- www.anglesurgery.org
- **Basis for this course:**

✓ Shareef, S, Alward W, Crandall A, Vold S., Ahmed I. "Intra-operative Gonioscopy – A Key to Successful Angle Surgery". *Exp Rev Ophthalmol* 2014; 9(6):515-527