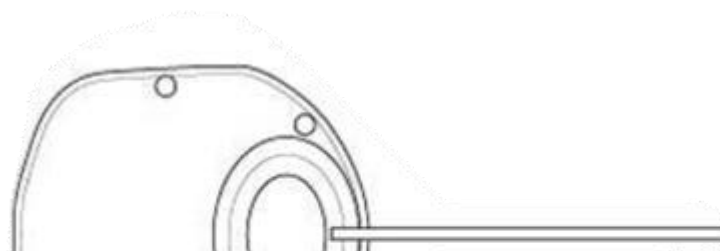




# Tube Revisions

Mary Qiu, MD



Tube Failures

Tube Complications

# Tube Failures

Tube Complications

## Reasons for Treatment Failure

	Overall Group (n = 253)	ABC Study		AVB Study		TVT Study
		Ahmed Group (n = 57)	Baerveldt Group (n = 47)	Ahmed Group (n = 78)	Baerveldt Group (n = 47)	Tube Group (n = 24)
Inadequate IOP reduction <sup>*</sup>	135 (53)	23 (40)	17 (36)	56 (72)	26 (55)	13 (54)
Reoperation for glaucoma	68 (27)	23 (40)	8 (17)	19 (24)	11 (23)	7 (29)
Persistent hypotony <sup>†</sup>	15 (6)	1 (2)	6 (13)	0	5 (11)	3 (13)
Loss of LP vision	25 (10)	7 (12)	12 (26)	2 (3)	3 (6)	1 (4)
Removal of implant	10 (4)	3 (5)	4 (9)	1 (1)	2 (4)	0

# What to do in eye with failed prior Ahmed?

- Ahmed capsule revision?
- Second inferonasal Ahmed?
- Second inferonasal Baerveldt?
- Same-quadrant Ahmed to Baerveldt exchange?
- CPC?

# What to do in eye with failed prior Ahmed?

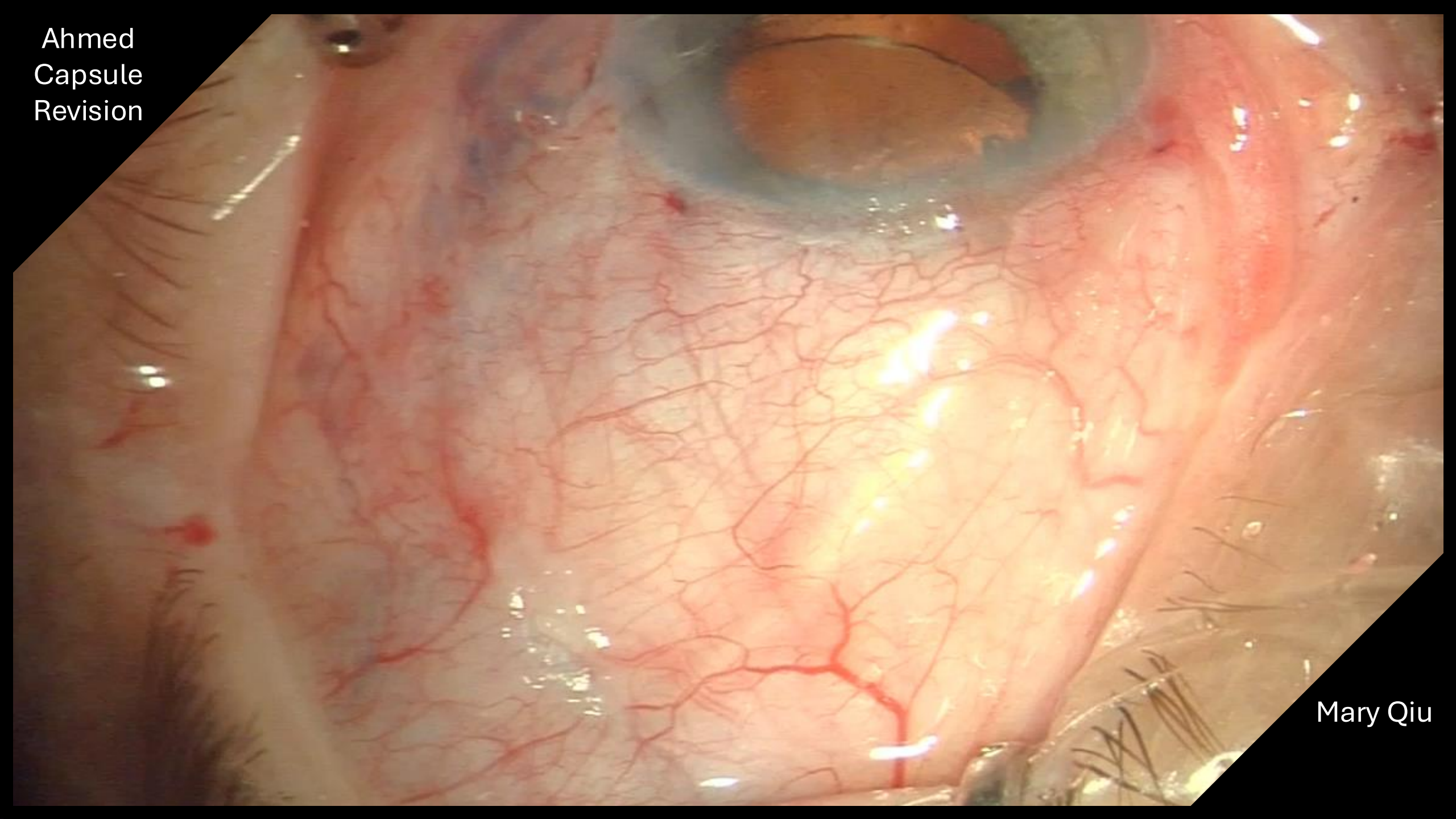
- Ahmed capsule revision?
- Second inferonasal Ahmed?
- Second inferonasal Baerveldt?
- Same-quadrant Ahmed to Baerveldt exchange?
- CPC?

# Case

- 61 year old monocular man with NVG s/p prior Ahmed in the AC.
- IOP 15 on 4 meds + Acetazolamide
- Angle open, no active NVI / NVA
- Visually significant cataract
- Phaco + goniotomy + Ahmed capsule revision

Ahmed  
Capsule  
Revision

Mary Qiu





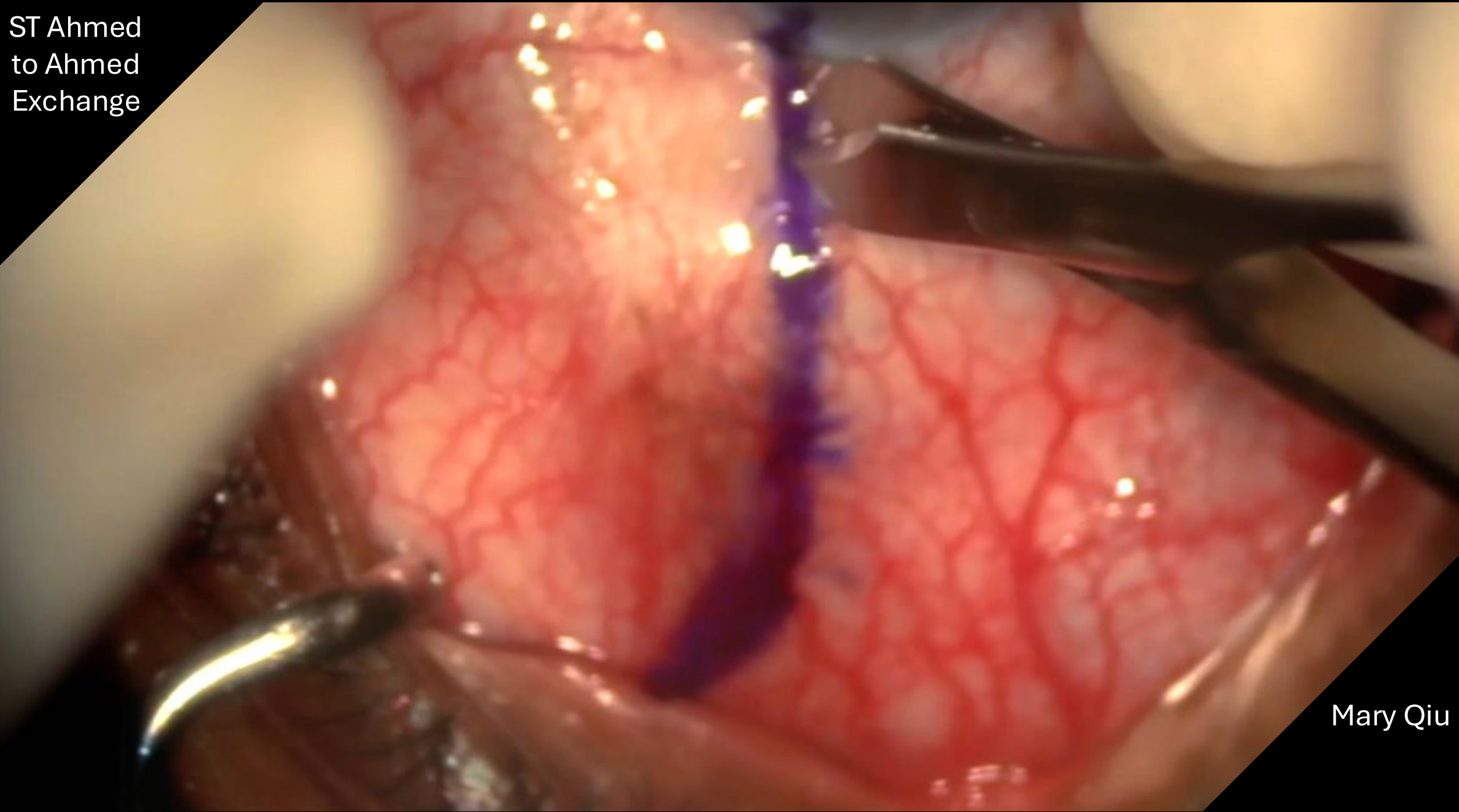
# Case

- Capsule revision worked until POM3
- Then he was LTFU til POM14
- The capsule revision failed

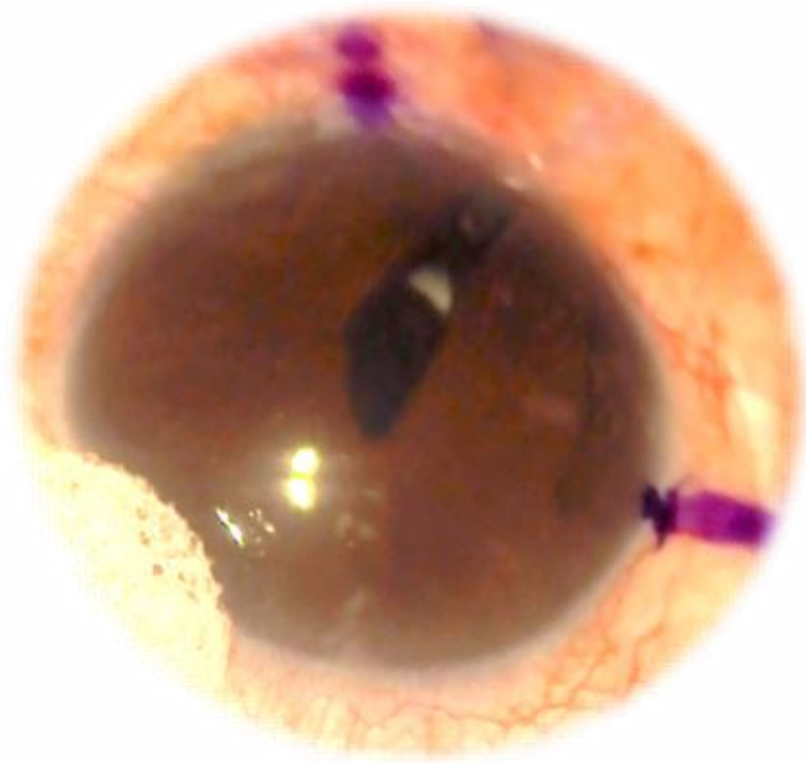
# Case

- 39 year old man with uveitic glaucoma
- s/p prior Ahmed in the AC, s/p prior phaco
- IOP 14 on 4 meds
- Angle mostly open, few inferior PAS
- Tube very short, chafing iris, pupil peaked toward tube
- Recalcitrant anterior uveitis and CME
- Reposition to sulcus + Ahmed capsule revision
  - > exchange for new Ahmed

ST Ahmed  
to Ahmed  
Exchange



Mary Qiu



# Case

- Capsule revision worked until POM12
- Then, the capsule revision started to fail
- He is back in the high teens on MMT at POY3
- Has not gotten additional IOP-lowering surgery yet

# What to do in eye with failed prior Ahmed?

- Ahmed capsule revision?
- Second inferonasal Ahmed?
- **Second inferonasal Baerveldt?**
- Same-quadrant Ahmed to Baerveldt exchange?
- CPC?



# Early Intraocular Pressure Control Via Capsule Revision of a Failed Valved Aqueous Shunt During Concurrent Placement of a Nonvalved Aqueous Shunt

Zhuangjun Si, MD,<sup>1</sup> Christos Theophanous, MD, MBA,<sup>2</sup> Saira Khanna, MD,<sup>1</sup> Mary Qiu, MD<sup>1</sup>

**Purpose:** To describe the novel strategy of performing a concurrent capsule revision of a failed pre-existing valved aqueous shunt with implantation of an additional nonvalved aqueous shunt for early postoperative intraocular pressure (IOP) control.

**Design:** Case report of a single patient.

**Results:** An 87-year-old man with severe primary open-angle glaucoma in both eyes presented to our clinic. His pseudophakic left eye had a failed superonasal trabeculectomy and an encapsulated superotemporal Ahmed FP7 (New World Medical) aqueous shunt in the anterior chamber. He had previously undergone micropulse cyclophotocoagulation 3 times and excisional goniotomy. Visual acuity in his left eye was 20/30, and IOP was 24 mmHg on 4 topical IOP-lowering medications. An inferonasal Baerveldt 350 (Advanced Medical Optics) aqueous shunt was placed with concurrent revision of the Ahmed capsule. A large block of capsule tissue was excised from the surface of the plate, and 20 mg of subtenon triamcinolone acetate (Kenalog, Bristol-Myers Squibb) was injected overlying the plate. His IOP ranged between 6 and 15 mmHg in the immediate postoperative period. There were no hypotony-associated complications at any time point. At postoperative month 18, his IOP was 10 mmHg on zero medications.

**Conclusions:** In patients with a failed valved aqueous shunt undergoing an additional nonvalved aqueous shunt, a concurrent capsule revision of the valved aqueous shunt can provide early IOP lowering before the nonvalved tube opens. *Ophthalmology Glaucoma* 2022;5:229-232 © 2021 by the American Academy of Ophthalmology



# What to do in eye with failed prior Ahmed?

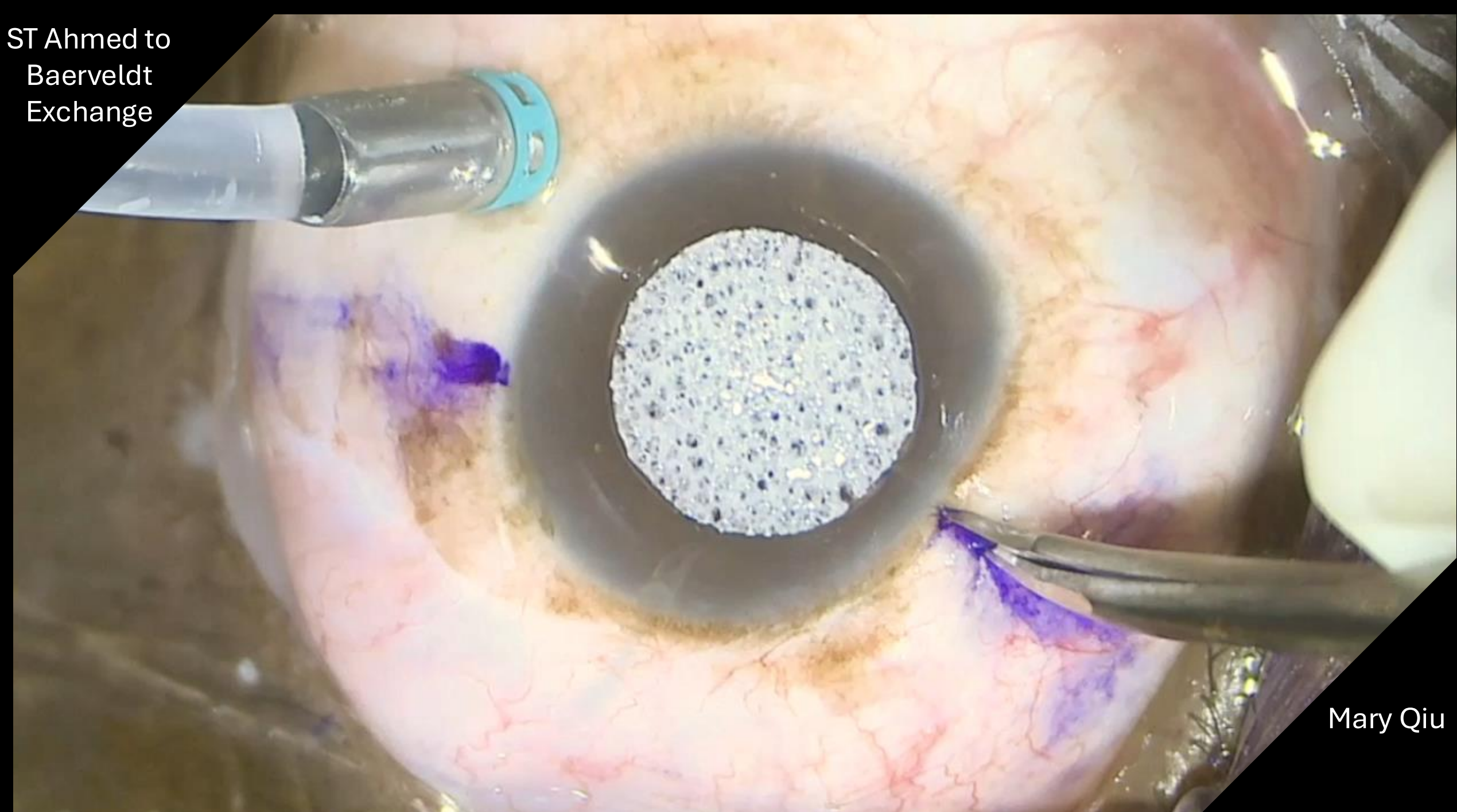
- Ahmed capsule revision?
- Second inferonasal Ahmed?
- Second inferonasal Baerveldt?
- Same-quadrant Ahmed to Baerveldt exchange?
- CPC?



# Case

- 51 year old monocular man with neovascular glaucoma
- s/p prior Ahmed in the AC, s/p prior phaco
- IOP 39 on 4 meds
- Angle 100% PAS
- Tube chafing iris, poor dilation
- Needs more fill-in PRP
- Prompt MP-CPC OS for “early IOP-lowering”
- Scheduled PPV + endo laser + AC Ahmed to Pars Plan Baerveldt exchange

ST Ahmed to  
Baerveldt  
Exchange



Mary Qiu

# Case

- POY2
- VA limited by macular ischemia
- IOP 10 on 0 meds
- Ripcord trimmed and left in place indefinitely
- PDR quiescent





## A Surgical Technique for Same-quadrant Ahmed-to-Baerveldt Exchange



In eyes with a preexisting Ahmed glaucoma valve (AGV, New World Medical) and persistently elevated intraocular pressure (IOP), there are several options for additional IOP lowering, including cyclodestruction to reduce aqueous production, angle-based procedures to enhance the conventional outflow pathway, and additional surgery to shunt fluid to the subconjunctival space. Within the category of aqueous shunts, a second aqueous shunt can be implanted in a different quadrant, or the preexisting AGV can be revised or exchanged for a nonvalved aqueous shunt in the same quadrant. The Baerveldt glaucoma implant-350 (BGI-350, Johnson and Johnson Surgical Vision) can be considered as a replacement for the preexisting AGV to provide further IOP reduction, as it has been shown to result in lower IOPs at 5 years compared with AGVs.<sup>1</sup>

There are advantages and disadvantages of implanting a second aqueous shunt in an eye with a preexisting AGV (Table 1).<sup>2-4</sup> Given the potential complications associated with multiple aqueous shunts, we propose a same-quadrant AGV-to-BGI-350 exchange as an alternative to implanting a second aqueous shunt in a different quadrant. Here, we describe and demonstrate our surgical technique for a patient who underwent a superotemporal same-quadrant AGV-to-BGI-350 exchange. The institutional review board at the University of Chicago states that approval was not required for this study since it is a case report of a single patient. This research adhered to the tenets of the Declaration of Helsinki. Informed consent was obtained from the participant.

The patient is a 51-year-old man with monocular pseudophakia with bilateral proliferative diabetic retinopathy and neovascular glaucoma with prior AGVs in both eyes. The operative eye also had a history of micropulse cyclophotocoagulation. Baseline visual acuity was 20/500, and IOP was 29 mmHg on 4 IOP lowering medications. He underwent a same-quadrant AGV-to-BGI-350 exchange with 3-0 polypropylene ripcord left in place indefinitely (Video S1, available at [www.ophtalmologyglaucoma.org](http://www.ophtalmologyglaucoma.org)). By postoperative month 16, visual acuity was "count fingers" (limited by retinal ischemia), and IOP was 10 mmHg on no IOP lowering medications.

The conjunctiva is opened at the limbus in the superotemporal quadrant, with radial relaxing incisions. Lidocaine is used to hydrate the Tenon's capsule and separate it from the conjunctiva and sclera. A 6-0 polyglactin scleral traction suture (large enough to prevent cheese wiring) is placed superiorly or temporally to rotate the eye. The previous patch graft and thin layer of translucent capsule around the tube are dissected. A paracentesis is made, and the anterior chamber (AC) is filled with viscoelastic. The tube is removed from the AC, and the tube track is sutured using 8-0 polyglactin suture. Another more posterior traction suture is placed in the superotemporal sclera to enhance exposure of the AGV. The AGV capsule is incised along the anterior edge of the plate, anchoring stalks growing through the fixation holes are severed,

and the entire AGV device is removed. Capsular tissue is harvested from the superficial side of the AGV and subsequently used as a patch graft, as previously described.<sup>2</sup> The tissue deep to the AGV is dissected, leaving bare sclera. Muscle hooks are used to isolate the superior and lateral rectus muscles, and the new BGI-350 is positioned under the muscles, as it would be in a primary BGI-350 surgery. The plate is affixed to the sclera with 8-0 silk suture, slightly posterior to the rectus muscle insertions. We prefer to use a 3-0 polypropylene ripcord suture, a 7-0 polyglactin ligature, and 3 fenestrations with the SE-160-8 spatulated needle for early IOP lowering before ligature dissolution. The new tube is trimmed and beveled for insertion. The previously harvested AGV capsular tissue is trimmed, shaped, and sutured, overlying the new tube entry site as an autologous patch graft. We prefer to use 7-0 or 8-0 polyglactin suture to secure the capsule autograft to the sclera, and if there is any concern about leakage from the prior sclerotomy site, wide mattress sutures are used. The ripcord is routed to the temporal and inferior subconjunctival space. The conjunctiva is closed; we prefer 7-0 surgical gut suture when there is no tension and 8-0 polyglactin on a blood vessel (BV) needle if there is tension. Balanced salt solution on a cannula is used to rinse the viscoelastic out of the AC. Intracameral and subconjunctival antibiotics, subconjunctival dexamethasone, and 125-mg intravenous (IV) methylprednisolone are administered. The eye is patched and shielded, IV acetazolamide may be administered per surgeon discretion, and the postoperative management is otherwise similar to primary BGI-350s. Frequent administration of topical prednisolone acetate or higher-potency steroids, such as difluprednate can be started postoperatively because there may be more postoperative inflammation from a more extensive surgery.

In eyes with preexisting AGVs requiring additional IOP lowering, we propose a same-quadrant AGV-to-BGI-350 exchange, which offers all the advantages of a nonvalved aqueous shunt, while potentially avoiding some of the risks and complications associated with implanting a second aqueous shunt (Table 1). Several key factors contribute to safely and successfully performing this surgical technique. Rather than a sub-Tenon's or retrobulbar block, general anesthesia should be considered for a same-quadrant device exchange because this procedure requires more time and manipulation than a primary aqueous shunt or second aqueous shunt in a different quadrant. We recommend allotting a total of 2 to 3 hours (more if there are trainees) and scheduling the device exchanges as the last surgery of the day. Additionally, a posterior scleral traction suture allows for improved rotation of the eye and visualization of the desired quadrant to aid in dissection and removal of the preexisting AGV. Given the uncontrolled IOP in the setting of a failed preexisting AGV, additional early IOP lowering strategies (such as fenestrations, wicks, goniotomy, or cyclodestruction) are needed until the new BGI-350 ligature dissolves. Because a same-quadrant device exchange may be associated with more postoperative inflammation than a primary BGI-350, it may be prudent to avoid cyclodestruction because the IOP may already be low from inflammation and ciliary shutdown.



# What to do in eye with failed prior BGI-250?

- Second inferonasal tube?
- Same-quadrant exchange to Baerveldt-350?
- CPC?

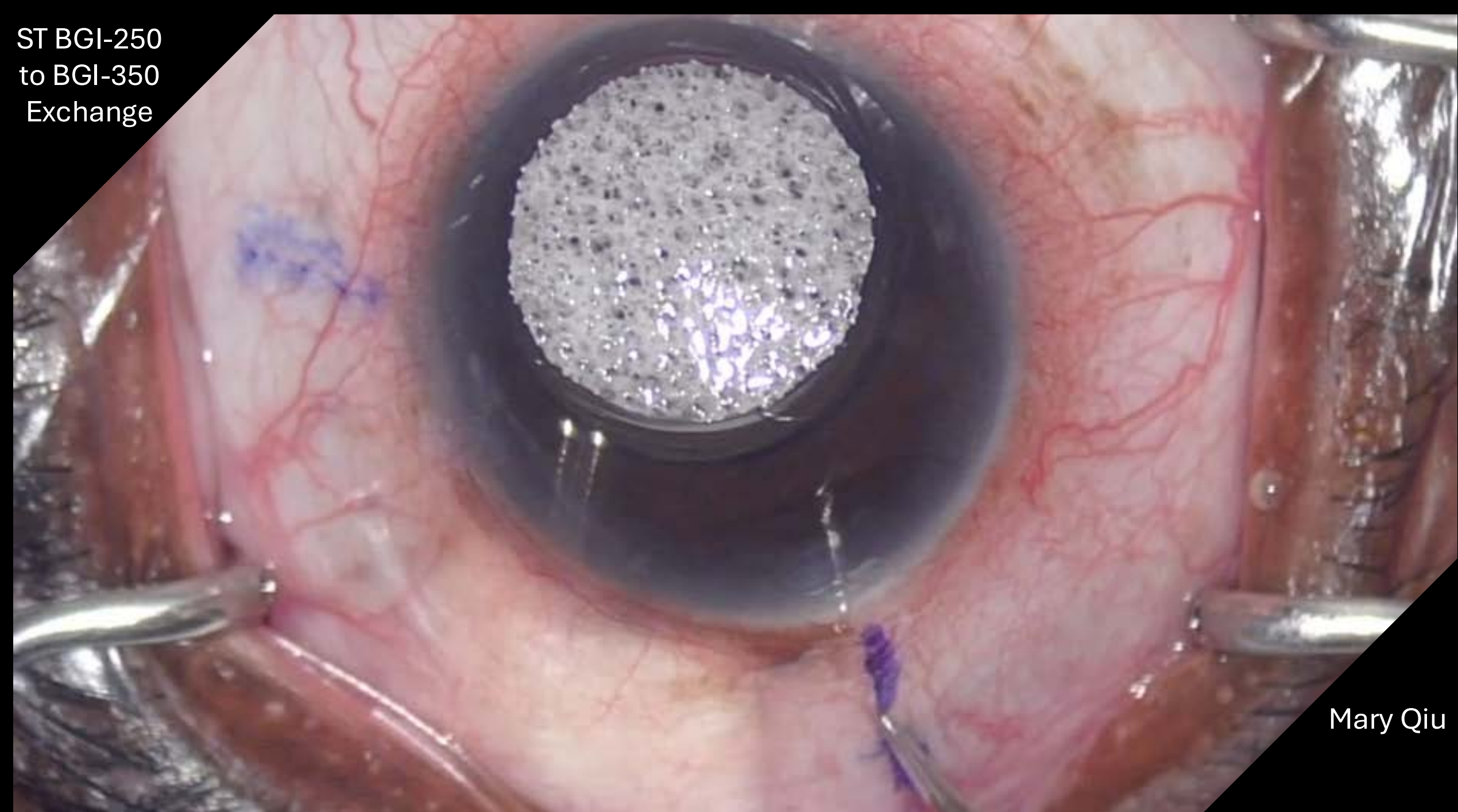
# What to do in eye with failed prior BGI-250?

- Second inferonasal tube?
- Same-quadrant exchange to Baerveldt-350?
- CPC?

# Case

- 71 year old woman with POAG OU
- s/p phaco iStent OU, s/p some kind of tube OD in AC
- s/p GATT OD + KDB + BGI 350 OS for IOP 30 OU on 3 meds + DMX
- IOP 26 OD and 13 OS on 3 meds OU
- OD Tube in AC
- Same-quadrant tube exchange for BGI 350 in sulcus

ST BGI-250  
to BGI-350  
Exchange



Mary Qiu



# Case

- POY2
- VA baseline
- IOP 14 on 3 meds





Contents lists available at ScienceDirect

## American Journal of Ophthalmology Case Reports

journal homepage: [www.ajocasereports.com/](http://www.ajocasereports.com/)



### Same-quadrant Baerveldt Glaucoma Implant-250 to Baerveldt Glaucoma Implant-350 exchange

Inae J. Kim, Jessie Wang, Mary Qiu\*

The University of Chicago Department of Ophthalmology and Visual Sciences, Chicago, IL, USA

#### ARTICLE INFO

##### Keywords:

Baerveldt-350  
Baerveldt-250  
Tube exchange  
Aqueous shunt  
Tube shunt  
Tube revision  
Autologous patch graft  
Capsule autograft

#### ABSTRACT

**Purpose:** In eyes with a prior failed aqueous shunt (or “tube”) requiring additional intraocular pressure (IOP) control, options include angle surgery, cyclodestruction, second tube, tube revision, or tube exchange. We present a case of a same-quadrant tube exchange of a Baerveldt-250 (BGI-250) to BGI-350.

**Observations:** The patient is a 71-year-old African American female with severe-stage primary open angle glaucoma of both eyes, and this case focuses on the right eye. This eye had prior cataract surgery with iStent, prior BGI-250 in the anterior chamber (AC), and prior iStent removal with gonioscopy assisted transluminal trabeculotomy (GATT). The visual acuity (VA) was 20/150, and the IOP was 26 mmHg on 3 IOP-lowering medications. The prior superotemporal BGI-250 had its “wings” on top of the superior and lateral rectus muscles and its tube tip in the AC. The implant was removed in its entirety including the superficial and deep layers of its capsule. The new BGI-350 was stented with a 3-0 polypropylene ripcord, ligated with a 7-0 polyglactin suture, and implanted with its wings under the rectus muscles and the tube tip in the sulcus. For early IOP-lowering prior to ligature dissolution, 2 needle stab fenestrations and an additional 7-0 polyglactin wick was used. The capsule from the prior BGI-250 was used as a patch graft for the new BGI-350. The ligature dissolved at postoperative week (POW) 6. By POW8, the IOP was 18 mmHg on 3 IOP-lowering medications and frequent topical steroid, the AC was quiet, and the ripcord was removed. A slow steroid taper finished at postoperative month (POM) 6. By POM 12, the VA was still at baseline 20/150, and the IOP was 14 mmHg on 3 IOP-lowering medications.

**Conclusions & importance:** Patients with a prior failed tube requiring additional IOP-lowering can undergo a same-quadrant tube exchange. BGI-350s may offer more IOP-lowering than BGI-250s, but the IOP-lowering achieved in this patient’s case could be attributable to differences in postoperative management in addition to endplate size; longer follow-up is needed. A tube exchange offers the opportunity to reposition the tube tip from the AC to the sulcus and to use the prior tube’s capsule as a patch graft for the new tube.



# What to do in eye with failed prior tube?

- Ahmed capsule revision?
- Second inferonasal Ahmed?
- Second inferonasal Baerveldt?
- Same-quadrant Ahmed to Baerveldt exchange?
- CPC?

# What to do in eye with failed prior tube?

- Ahmed capsule revision?
- Second inferonasal Ahmed?
- Second inferonasal Baerveldt?
- Same-quadrant Ahmed to Baerveldt exchange?
- CPC?

**More evidence  
is needed!**

# My Guiding Principles For Tube Failures

- 1<sup>st</sup> tube superotemporal, 2<sup>nd</sup> tube inferonasal
- Maximum 2 tubes per eye
- Ahmed capsule revisions don't work well long term
- Consider same-quadrant tube exchange before implanting 2<sup>nd</sup> tube
- I prefer to leave eyes pseudophakic with 1 ST BGI-350 in the sulcus
- General anesthesia for patient comfort
- Posterior scleral traction suture to enhance exposure
- Capsule from prior tube can be used as patch graft material

Tube Failures

**Tube Complications**

## Late Postoperative Complications<sup>a</sup> in the Tube Versus Trabeculectomy Study

	Tube Group <sup>b,c</sup> (n = 107)	Trabeculectomy Group <sup>b,c</sup> (n = 105)
Persistent corneal edema	17 (16)	9 (9)
Dysesthesia	1 (1)	8 (8)
Persistent diplopia	6 (6)	2 (2)
Encapsulated bleb	2 (2)	6 (6)
Bleb leak	0	6 (6)
Choroidal effusion	2 (2)	4 (4)
Cystoid macular edema	5 (5)	2 (2)
Hypotony maculopathy	1 (1)	5 (5)
Tube erosion	5 (5)	—
Endophthalmitis/blebitis	1 (1)	5 (5)
Chronic or recurrent iritis	2 (2)	1 (1)
Tube obstruction	3 (3)	—
Retinal detachment	1 (1)	1 (1)
Corneal ulcer	0	1 (1)
Shallow or flat anterior chamber	1(1)	0
Total number of patients with late postoperative complications <sup>d,e</sup>	36 (34)	38 (36)

## Late Postoperative Complications<sup>a</sup> in the Tube Versus Trabeculectomy Study

	Tube Group <sup>b,c</sup> (n = 107)	Trabeculectomy Group <sup>b,c</sup> (n = 105)
Persistent corneal edema	17 (16)	9 (9)
Dysesthesia	1 (1)	8 (8)
Persistent diplopia	6 (6)	2 (2)
Encapsulated bleb	2 (2)	6 (6)
Bleb leak	0	6 (6)
Choroidal effusion	2 (2)	4 (4)
Cystoid macular edema	5 (5)	2 (2)
Hypotony maculopathy	1 (1)	5 (5)
Tube erosion	5 (5)	—
Endophthalmitis/blebitis	1 (1)	5 (5)
Chronic or recurrent iritis	2 (2)	1 (1)
Tube obstruction	3 (3)	—
Retinal detachment	1 (1)	1 (1)
Corneal ulcer	0	1 (1)
Shallow or flat anterior chamber	1 (1)	0
Total number of patients with late postoperative complications <sup>d,e</sup>	36 (34)	38 (36)



# What to do in eye with tube erosion?

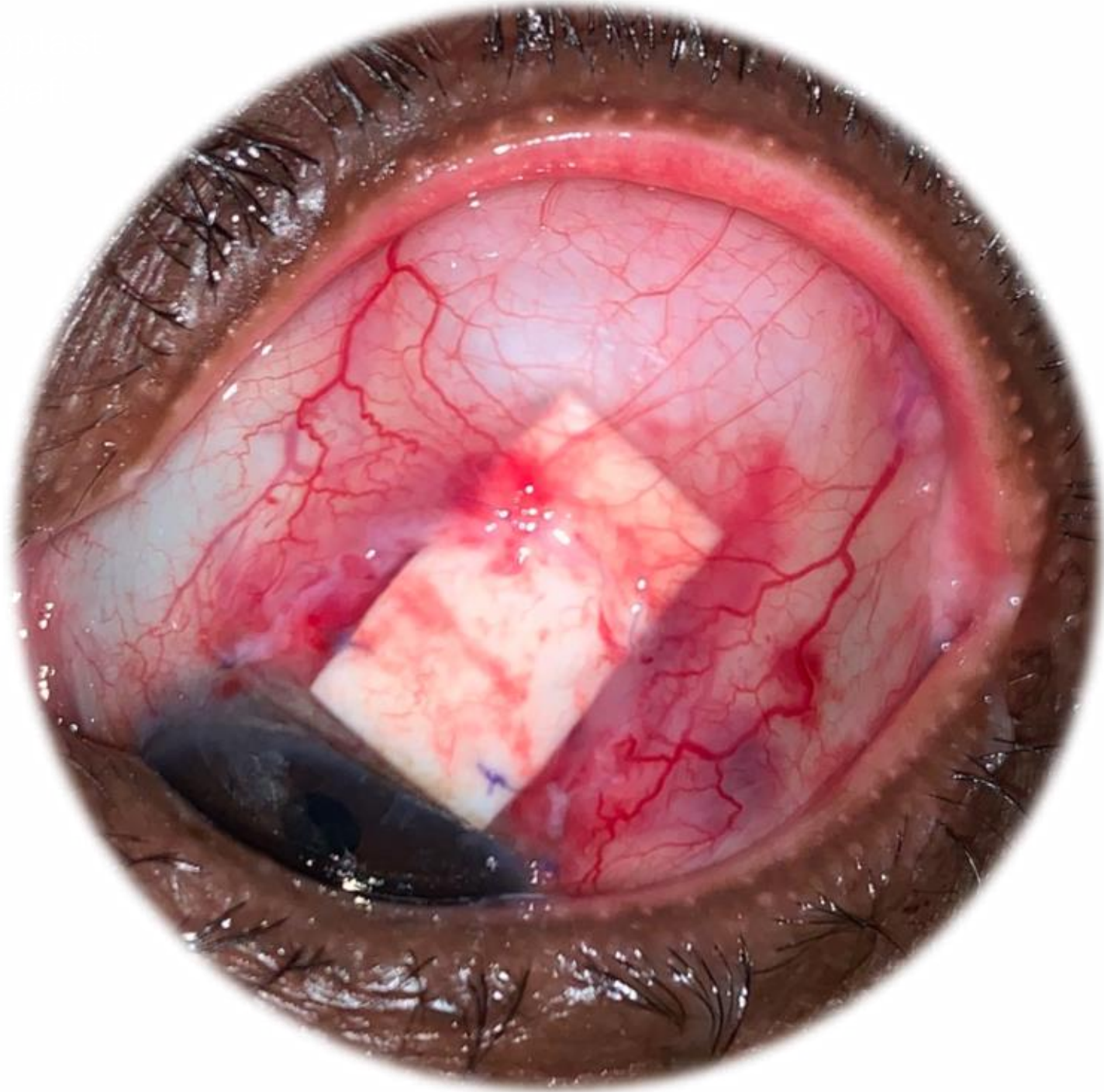
- Cover tube
- Reposition tube & cover tube
- Exchange tube & cover tube
- Remove tube & leave plate
- Remove tube & remove plate

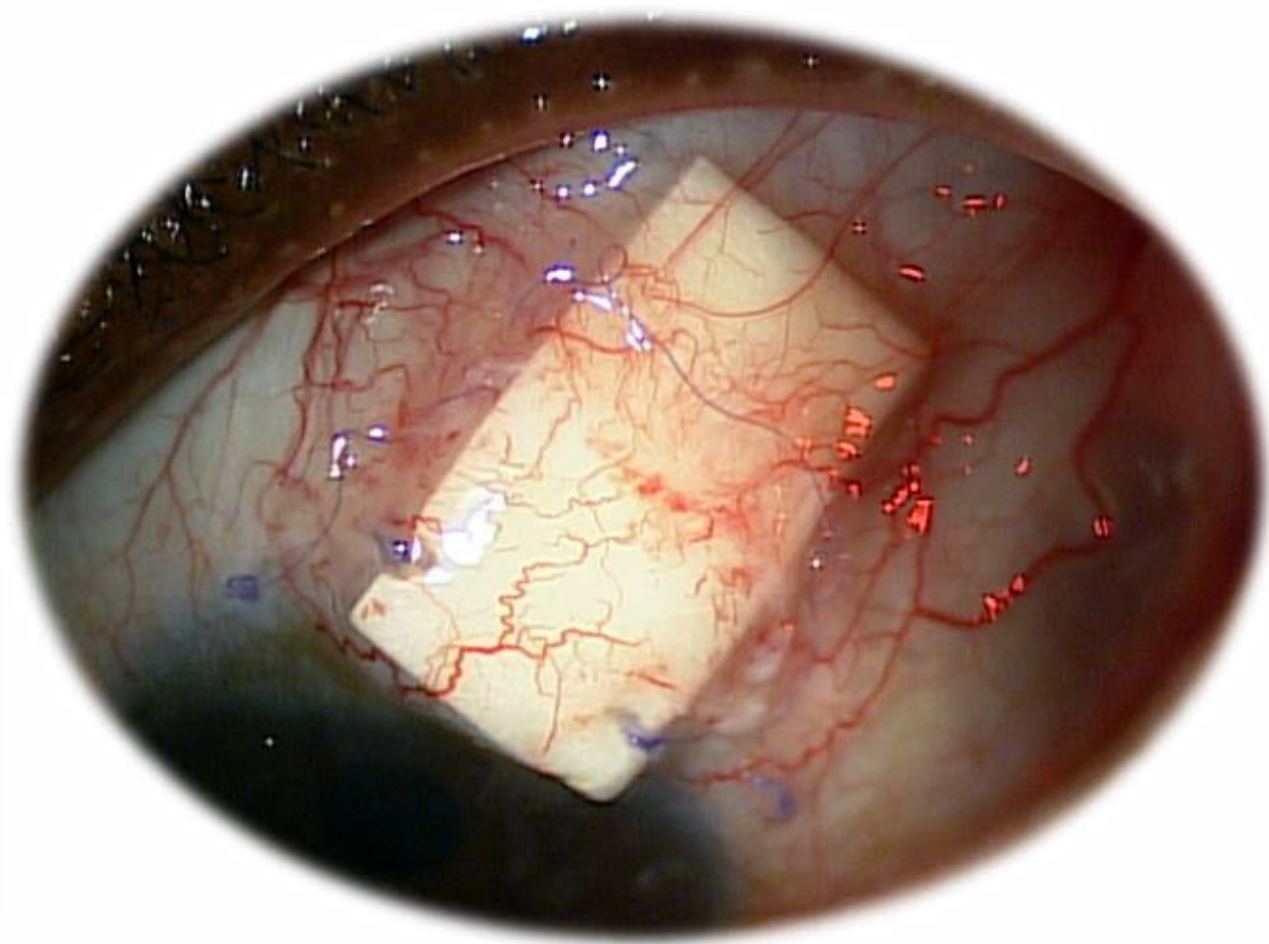
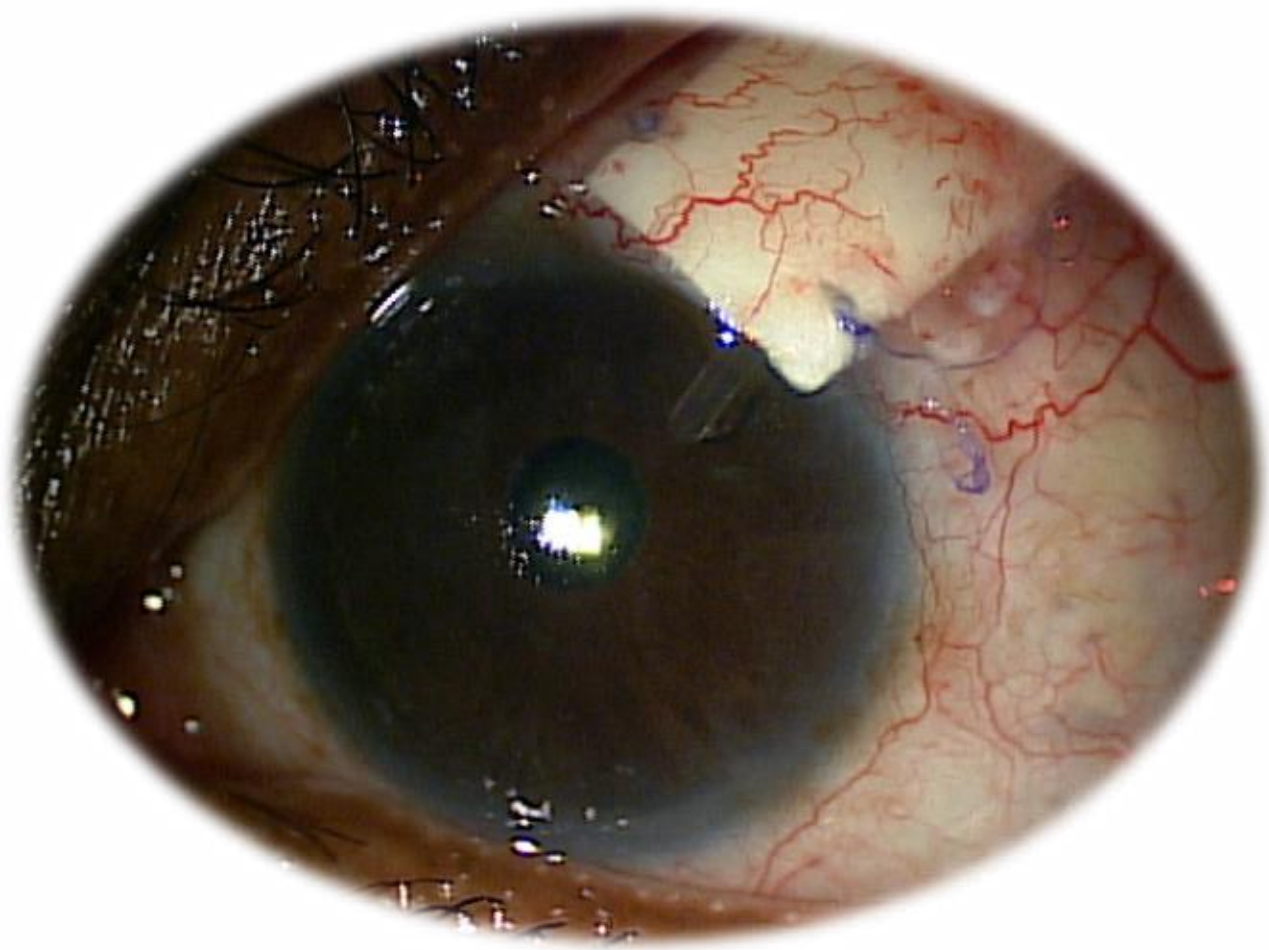
# What to do in eye with tube erosion?

- Cover tube
- Reposition tube & cover tube
- Exchange tube & cover tube
- Remove tube & leave plate
- Remove tube & remove plate

# Case

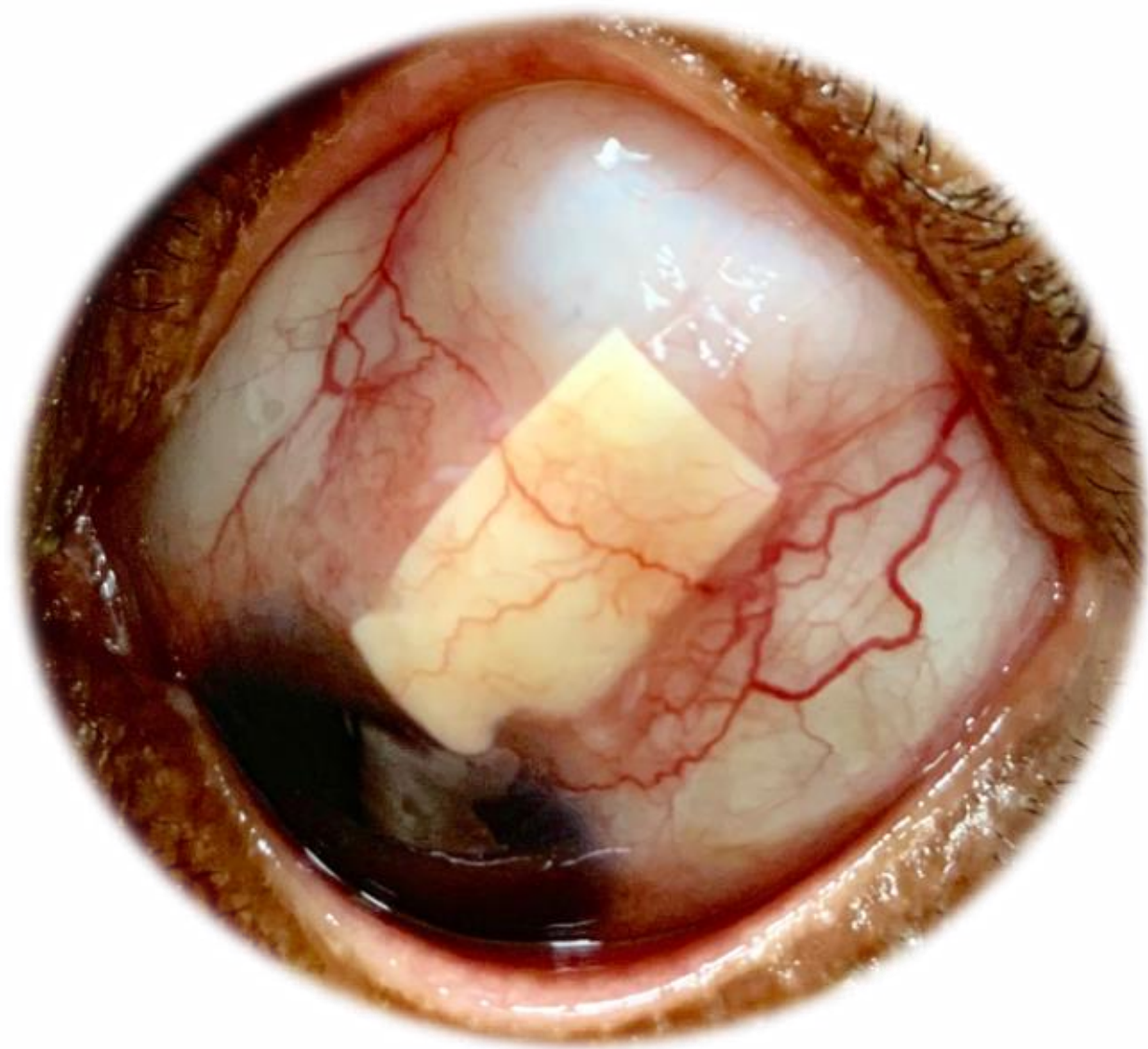
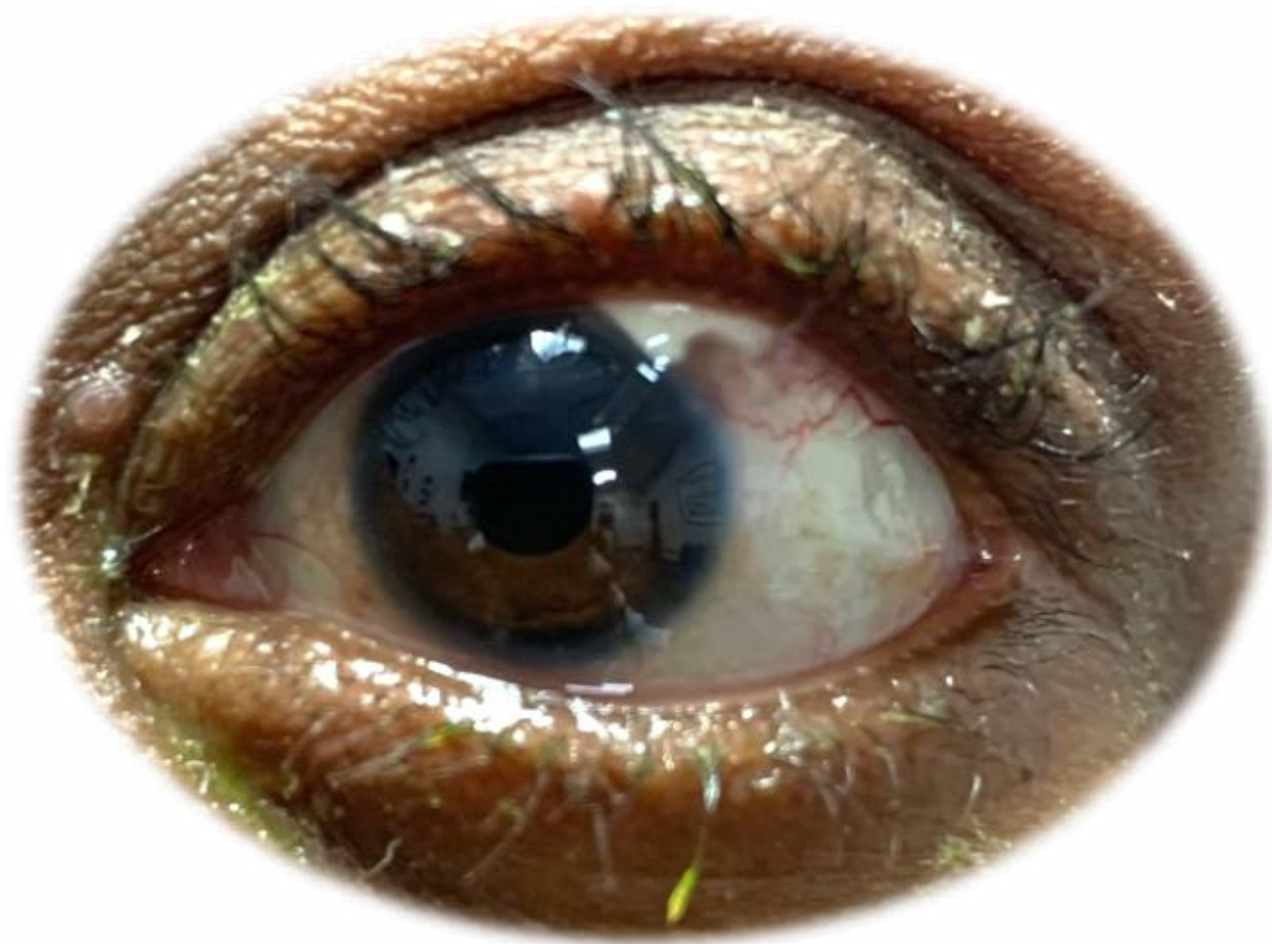
- 52 year old monocular man with neovascular glaucoma
- s/p phaco + Ahmed in AC 14 months ago
- IOP 16 on 4 meds
- Tube eroded, no infection
- Cover tube with tutoplast and conj autograft from NLP other eye



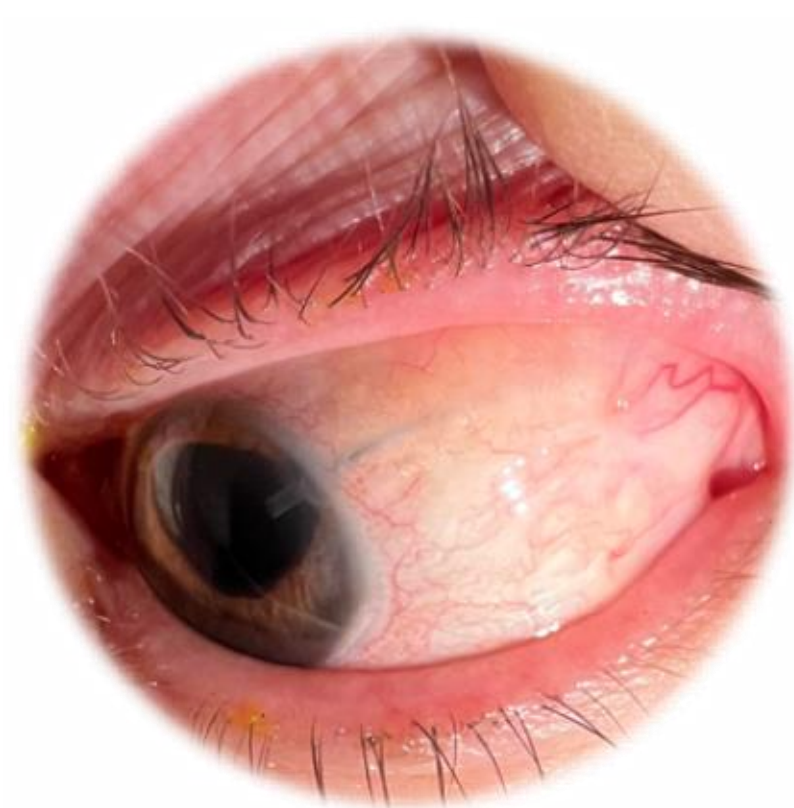
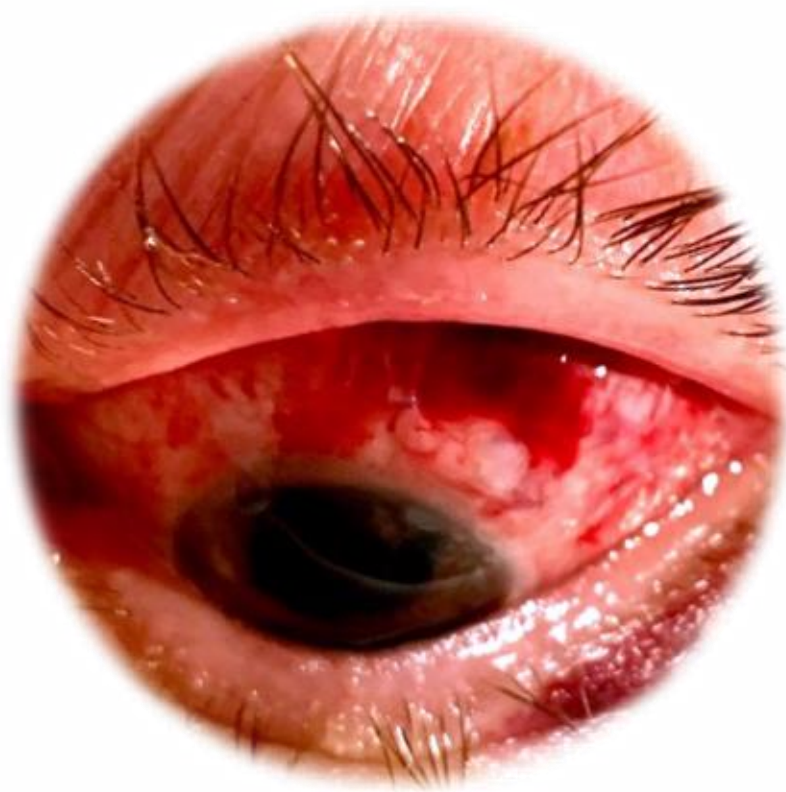
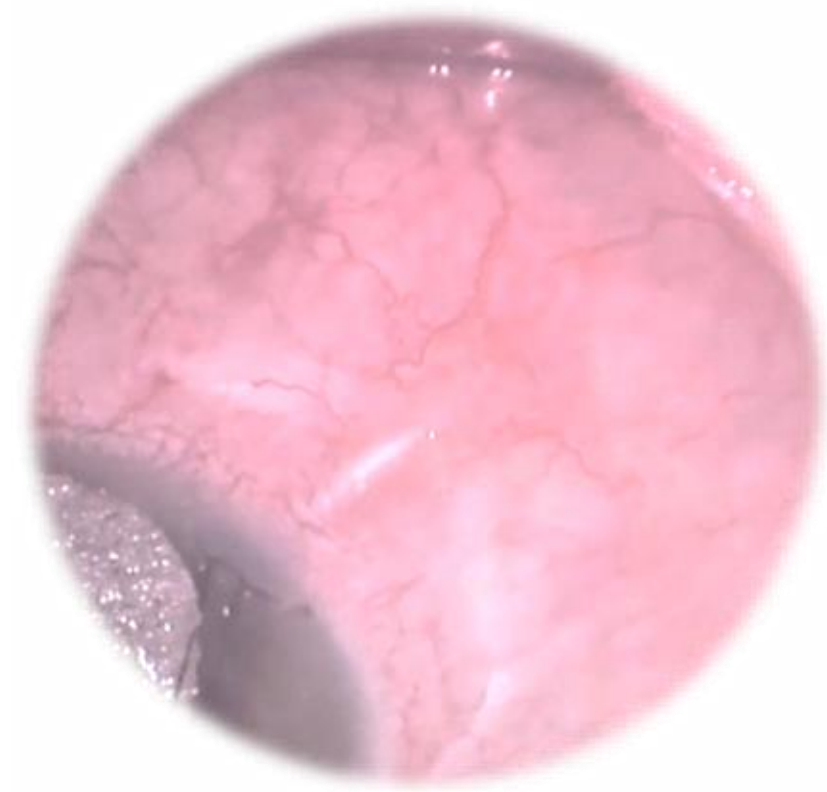














# What to do in eye with tube erosion?

- Cover tube
- Reposition tube & cover tube
- Exchange tube & cover tube
- Remove tube & leave plate
- Remove tube & remove plate

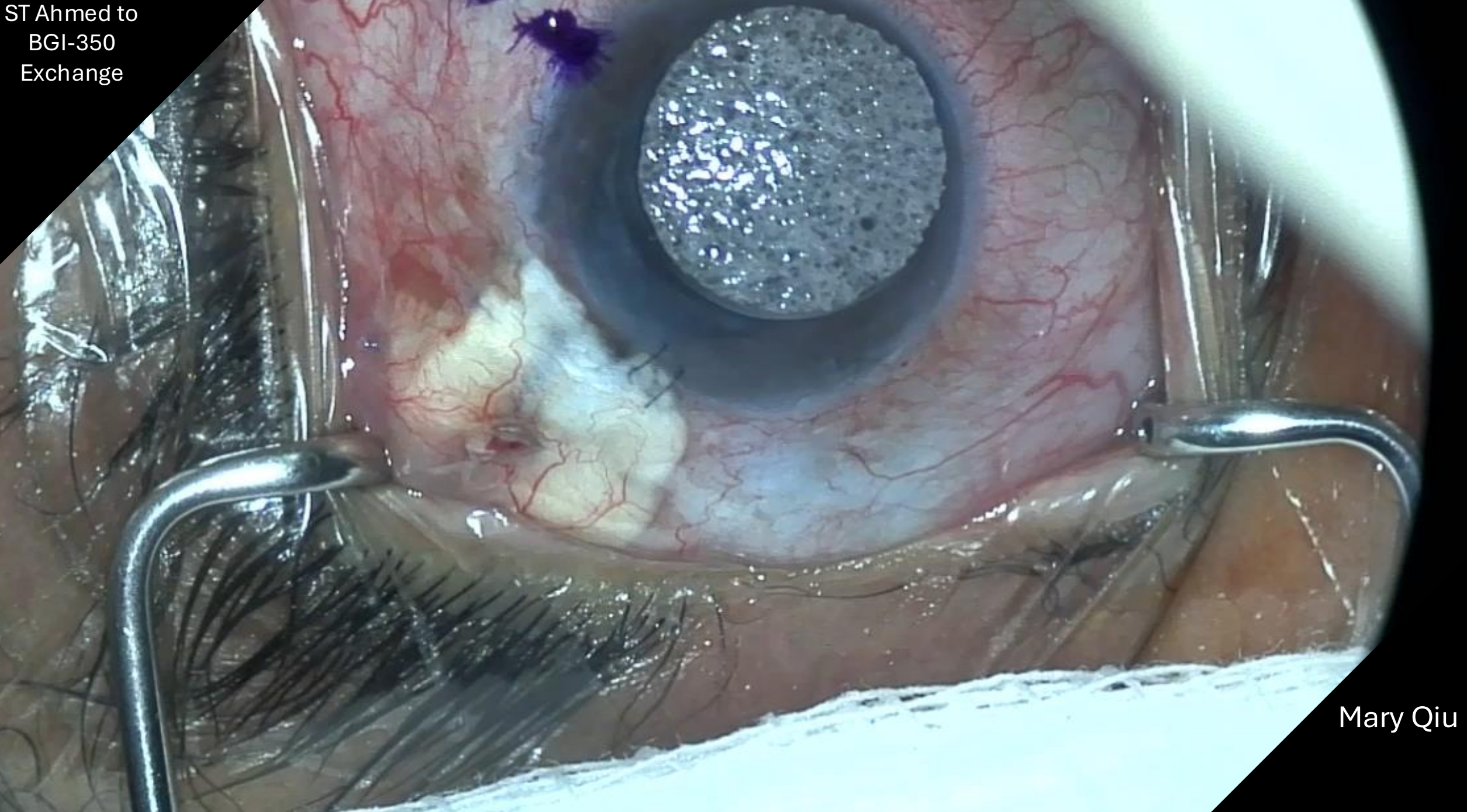
# What to do in eye with tube erosion?

- Cover tube
- Reposition tube & cover tube
- Exchange tube & cover tube
- Remove tube & leave plate
- Remove tube & remove plate

# Case

- 44 year old woman with uveitic glaucoma
  - s/p Ahmed in AC 11 years ago
  - s/p Phaco
  - s/p Tube revision / repositioning (?)
  - s/p DSEK
  - s/p Tube erosion repair with scleral patch graft -> DSEK failed
- 
- IOP 12 on 0 meds
  - Tube re eroded, no infection
  - Will need repeat DSEK
- 
- AC Ahmed to sulcus BGI 350 (plan to leave ripcord indefinitely)

ST Ahmed to  
BGI-350  
Exchange

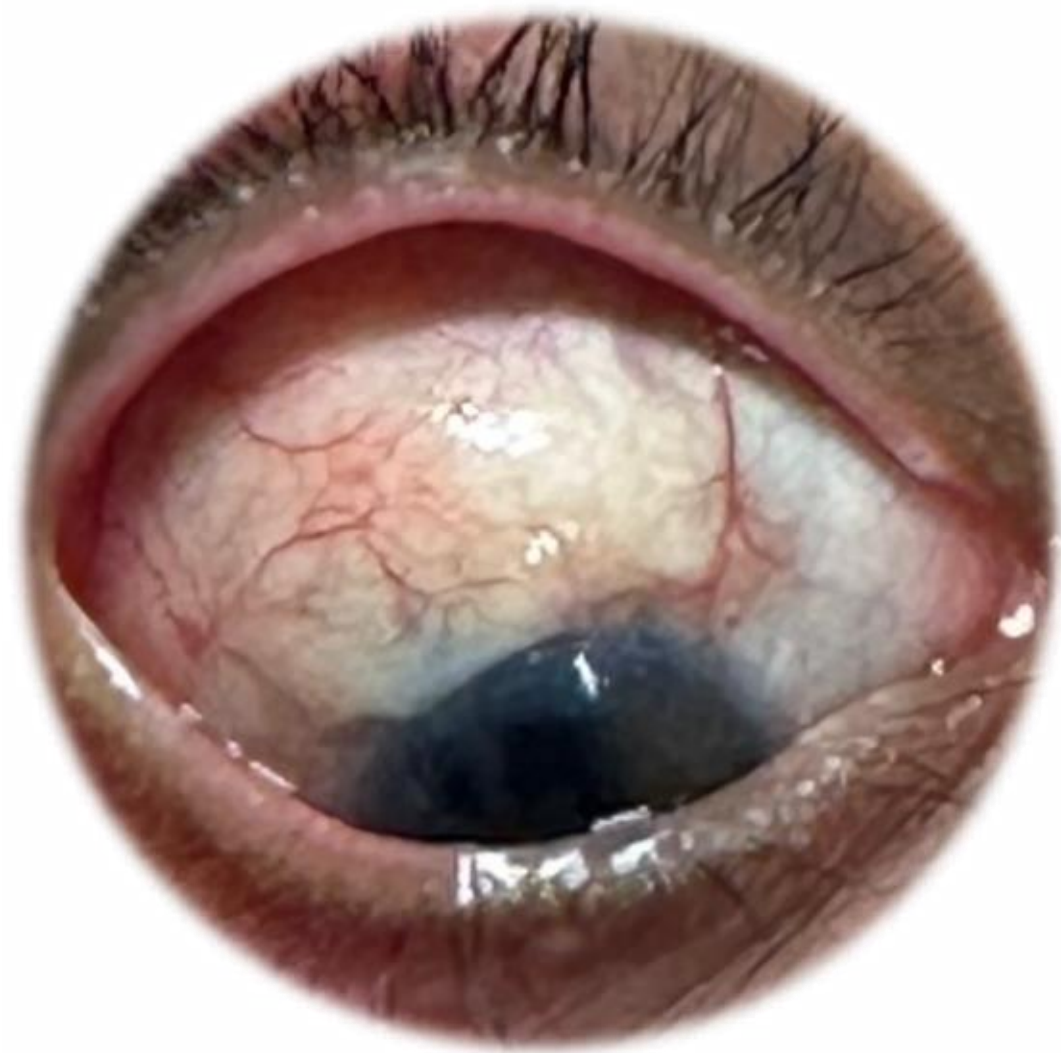
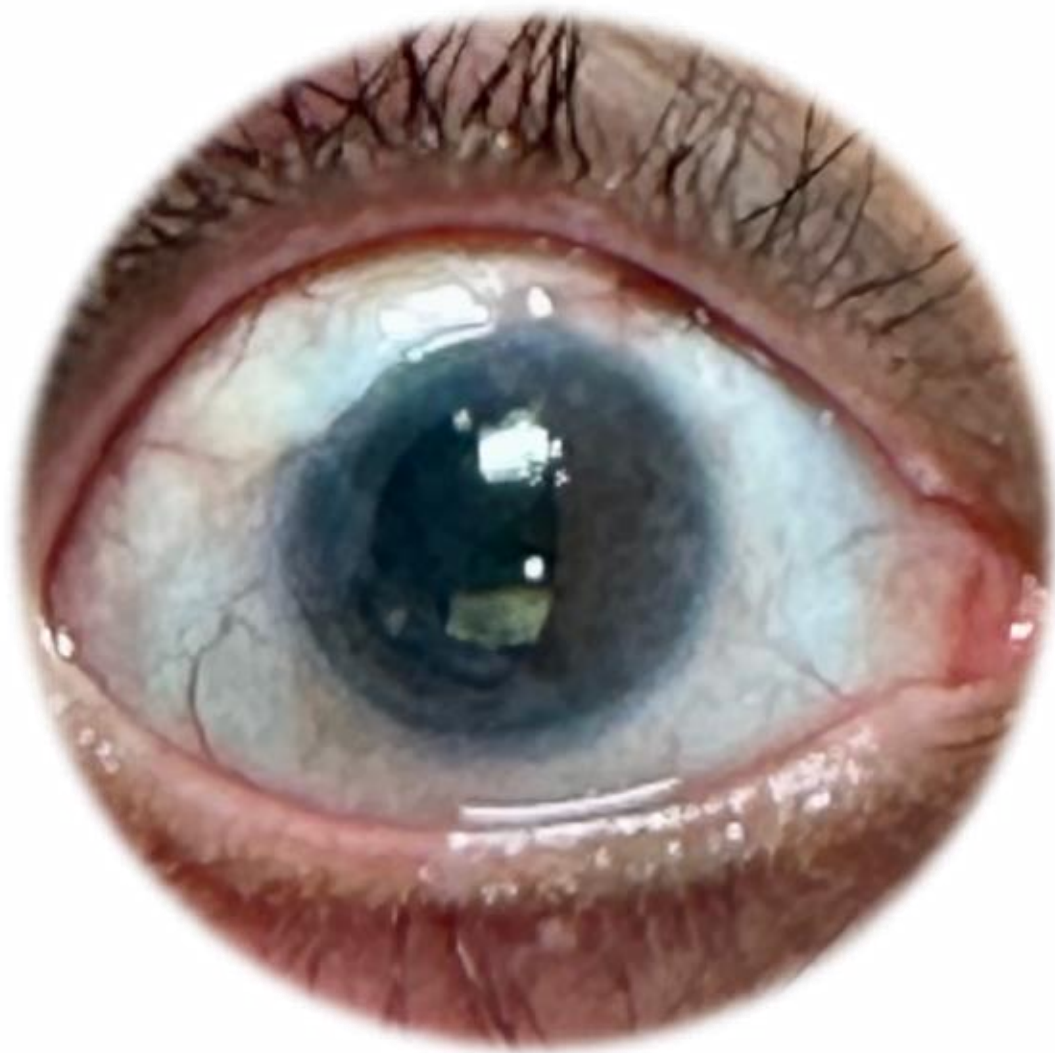


Mary Qiu

# Case

- POM12
- Got new DSEK, on Difluprednate BID
- VA 20/60 (from 20/1000)
- IOP 10 on 1 med
- Ripcord still in place









Contents lists available at ScienceDirect

## American Journal of Ophthalmology Case Reports

journal homepage: [www.ajocasereports.com/](http://www.ajocasereports.com/)



### Same-quadrant tube exchange and multiple-layer closure for recurrent tube erosion: Surgical technique description and preliminary results

Mikhayla Armstrong<sup>a</sup>, Jessie Wang<sup>a,c</sup>, Madhu Gorla<sup>b</sup>, Mary Qiu<sup>a,d,\*</sup>

<sup>a</sup> Department of Ophthalmology and Visual Science, University of Chicago Medical Center, Chicago, IL, USA

<sup>b</sup> Rush University Medical Center, Chicago Glaucoma Consultants, Chicago, IL, USA

<sup>c</sup> Duke Ophthalmology, Duke University School of Medicine, Durham, NC, USA

<sup>d</sup> Cole Eye Institute, Cleveland Clinic, Cleveland, OH, USA

#### ARTICLE INFO

##### Keywords:

Glaucoma  
Tube exchange  
Tube erosion  
Recurrent tube erosion  
Aqueous shunts

#### ABSTRACT

**Purpose:** This report describes a surgical approach involving a 5-layer closure performed for a patient with uveitic glaucoma who had an Ahmed Glaucoma Valve placed 12 years prior to presentation, then erosions which were revised 2 and 4 years ago. Additionally, the patient had a Descemet Stripping Endothelial Keratoplasty (DSEK) completed 4 years prior to presentation. The patient presented with a tube that was eroded and a DSEK that had failed.

**Observations:** We describe the process of same-quadrant tube exchange for a new Baerveldt Glaucoma Implant-350 with repositioning of the tube tip from the anterior chamber to the ciliary sulcus with a 5-layer closure with Tutoplast pericardial patch graft, capsule autograft harvested from the Ahmed capsule, Tenon's transposition from a different quadrant, Tenon's advancement from the same quadrant, and conjunctival advancement. By post-operative month 16, the patient had undergone a repeat DSEK and had an improved visual acuity and well-controlled intraocular pressure on one IOP-lowering medication.

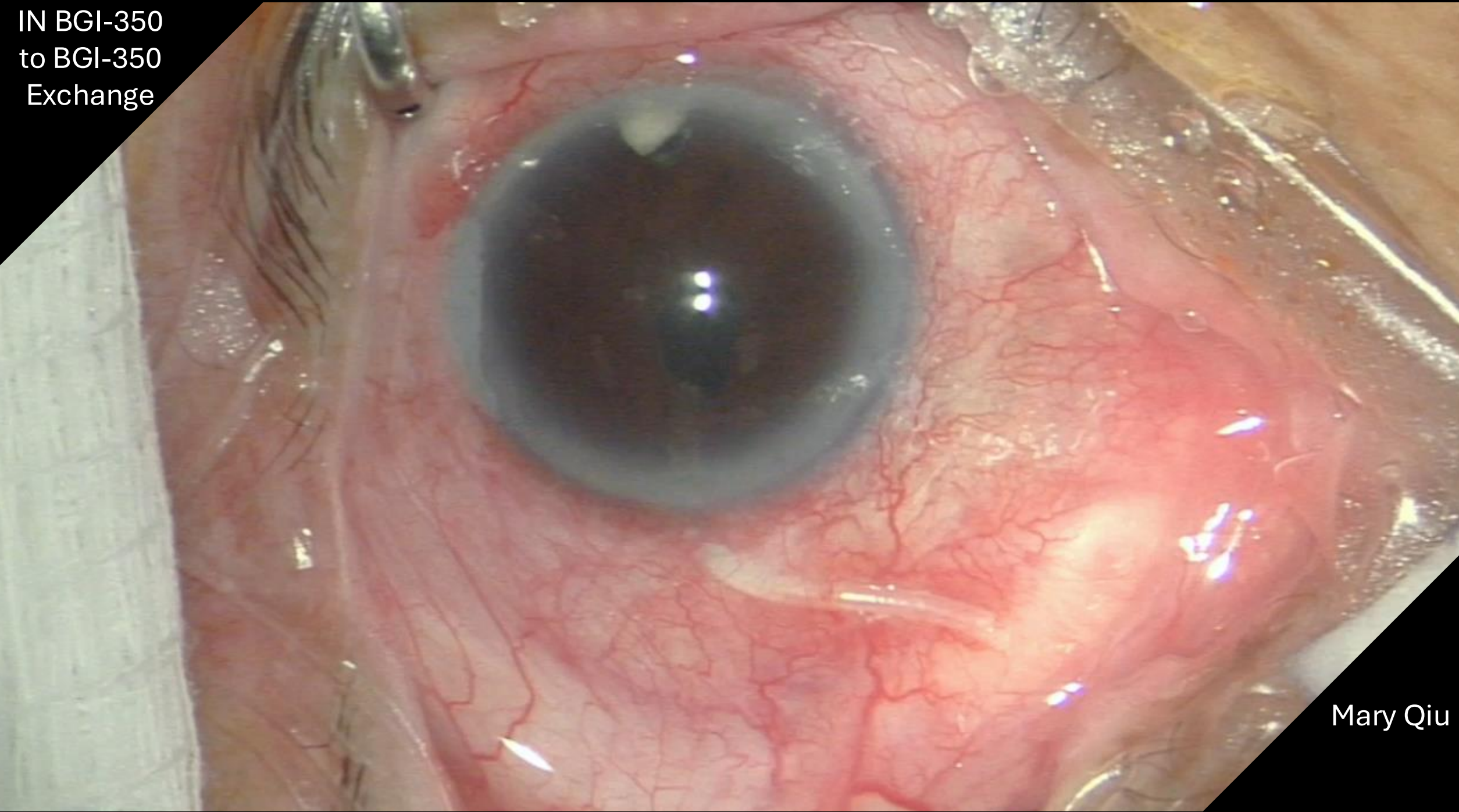
**Conclusions:** In complex tube revision surgeries with melted sclera, difficult closure under tension, and/or presence of significant tissue defect, pericardial patch graft, capsule autograft, tenon's transposition, tenon's advancement, or conjunctival advancement should be considered, as needed.



# Case

- 85 year old man with POAG OU
  - s/p Trab OU
  - s/p ST BGI 350 in AC OU 15 years ago
  - s/p IN BGI 350 in AC OD 2 years ago and subsequent CPC OD 1 year ago
  - s/p DSEK + tube repositioning OS earlier this year
- 
- OD IOP 15 on 3 meds + DMX
  - IN BGI 350 eroded, no infection
  - Plate is sitting too far forward which may have contributed to erosion
  - Tube tip chafing iris root, requiring chronic steroids which may have contributed to erosion
- 
- AC IN BGI 350 to sulcus IN BGI 350, with concurrent goniotomy

IN BGI-350  
to BGI-350  
Exchange

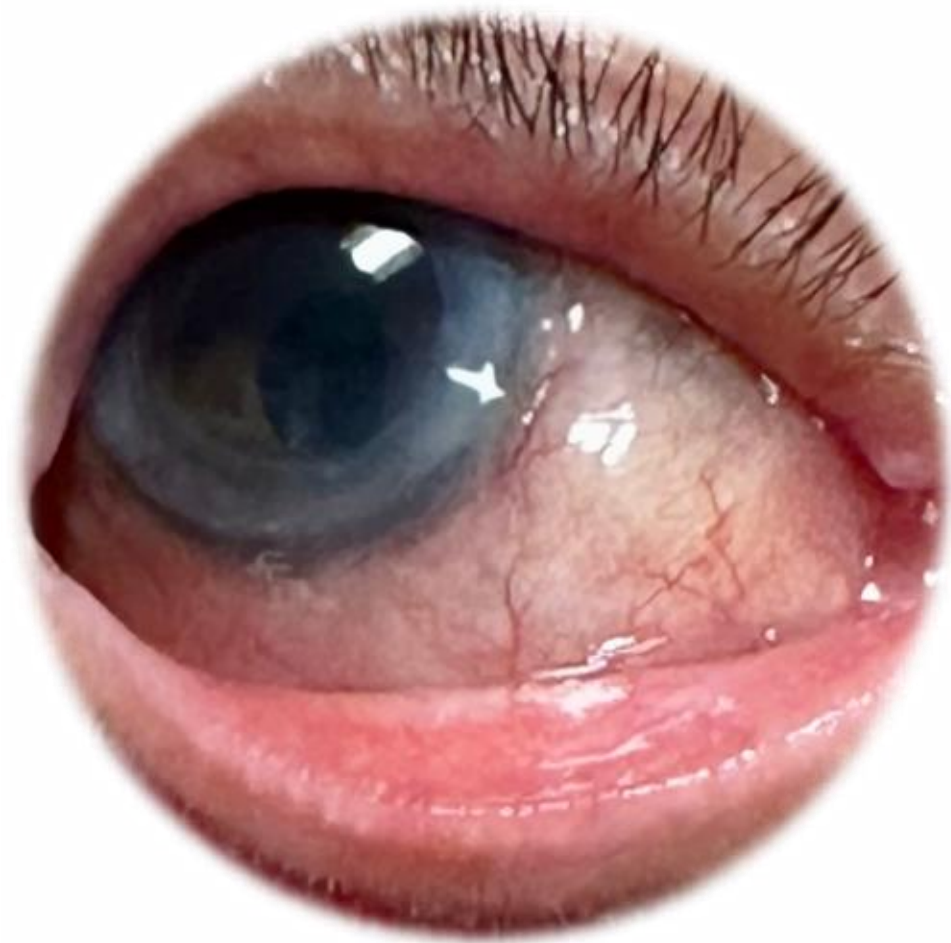
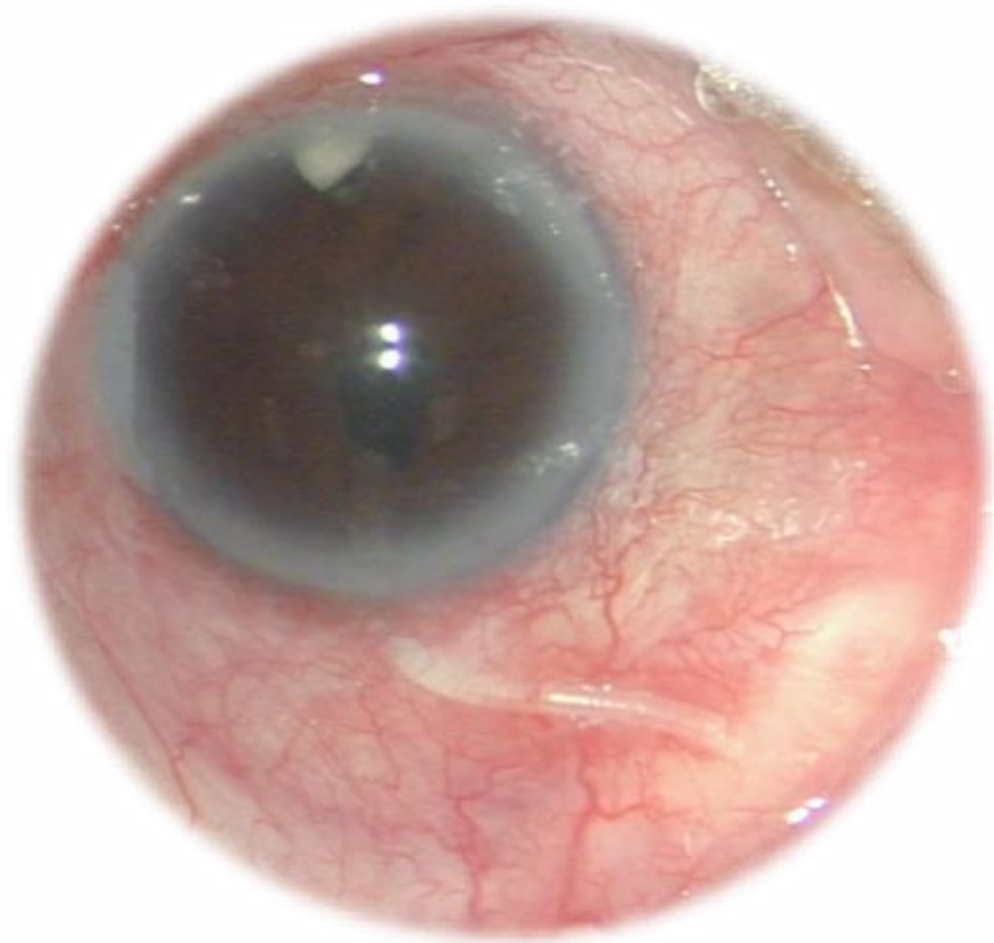


Mary Qiu

# Case

- POM30
- This eye got DSEK and repositioning of the ST tube to sulcus too
- IOP 7 on 3 meds, and pred once a day
- Ripcord left in place indefinitely, though could remove and stop some drops





# What to do in eye with tube erosion?

- Cover tube
- Reposition tube & cover tube
- Exchange tube & cover tube
- Remove tube & leave plate
- Remove tube & remove plate



# What to do in eye with tube erosion?

- Cover tube
- Reposition tube & cover tube
- Exchange tube & cover tube
- Remove tube & leave plate
- Remove tube & remove plate

# Case

- 91 year old monocular woman with POAG OU
- s/p phaco OU
- s/p BGI 350 in AC OU
- OS with tube erosion, endophthalmitis, tube was removed, NLP and phthisical
- OD IOP 10 on 2 meds
- ST BGI 350 eroded, AC cell, hypopyon, no vitritis
- Retina already injected intravit antibiotics
- Remove the tube + plate in its entirety, CPC later for IOP control

ST BGI-350  
Removal



Mary Qiu  
(U Chicago)

# Case

- POY1
- Got gentle CPC x 2 for IOP control
- VA at baseline 20/60
- IOP 10 on 1 med with no hypotony maculopathy







Contents lists available at [ScienceDirect](#)

## American Journal of Ophthalmology Case Reports

journal homepage: [www.ajocasereports.com/](http://www.ajocasereports.com/)



### Surgical techniques for Baerveldt glaucoma implant removal<sup>☆</sup>

Zaid Parekh<sup>a</sup>, Ian Patterson<sup>b</sup>, Mary Qiu<sup>b,\*</sup>

<sup>a</sup> The University of Chicago Pritzker School of Medicine, Chicago, IL, USA

<sup>b</sup> Department of Ophthalmology & Visual Sciences, University of Chicago, Chicago, IL, USA

#### ARTICLE INFO

##### Keywords:

Baerveldt glaucoma implant  
Ahmed glaucoma valve  
Glaucoma drainage device  
Aqueous shunt  
Tube shunt  
Glaucoma surgery  
Surgical technique

#### ABSTRACT

**Purpose:** To describe two surgical techniques for removing Baerveldt-350 Glaucoma Implants (BGI-350).

**Observations and plan:** A 91-year-old female with history of bilateral BGI-350s and prior history of tube associated endophthalmitis in the left eye requiring tube removal and resultant phthisis was referred for tube erosion and hypopyon in the right only-seeing eye, and we recommended tube removal. On exam, the left phthisical eye still had a BGI-350 plate attached under the lateral rectus muscle by one anchoring stalk, as it had not been fully removed previously, and the patient recalled severe pain during attempted tube removal in the left eye. We performed concurrent removal of both BGI-350s under general anesthesia. We describe a surgical technique for removing a BGI-350 when the conjunctiva does not need to be spared for future surgery. We also present a second case of BGI-350 removal with a different technique that aims to spare the conjunctiva for future surgery. **Conclusions and importance:** BGI-350s can develop complications requiring repositioning, revision, or removal. Improper removal of BGI-350s can lead to patient discomfort and future complications. We highlight two different techniques to remove a BGI-350, depending on whether the conjunctiva is intended to be spared for future surgery or not. With either technique, we advocate for general anesthesia and a posterior scleral traction suture to provide patient comfort and optimal exposure of the surgical field.

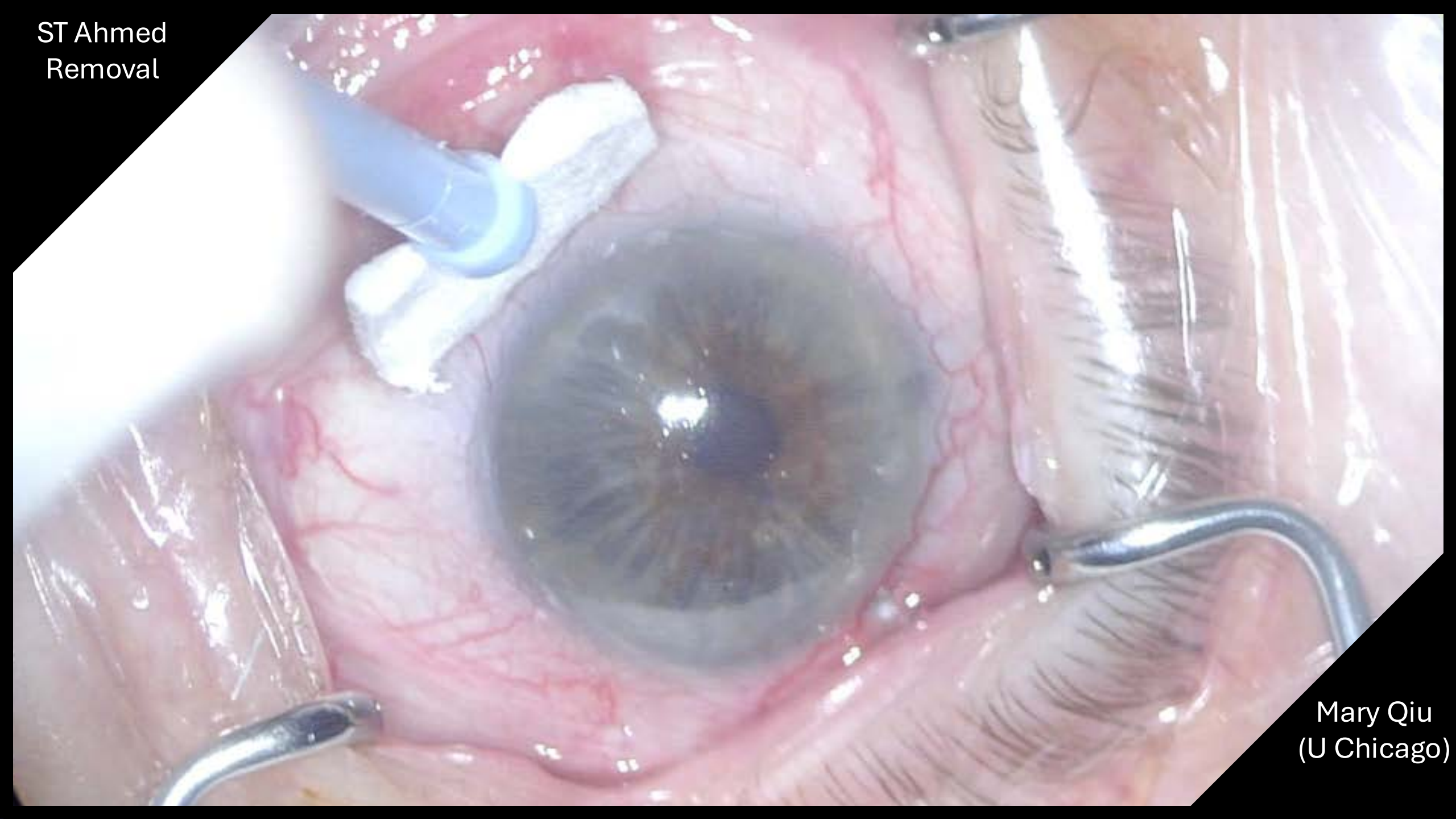




# Case

- 82 year old functionally monocular woman with uveitic glaucoma
- s/p phaco OU
- s/p trab OU
- s/p trab needling OD
- s/p Ahmed in AC OU 12 years ago
- s/p OD Tube erosion repair
- s/p OD Tube re-eroded, tube removed, plate left behind
- s/p OD Plate eroded too, plate removed too
  
- OS IOP 10 on 0 meds
- ST Ahmed eroded all the way from plate to entry site, no infection
  
- Remove the tube + plate in its entirety, +goniotomy for IOP control, future staged IN tube if needed

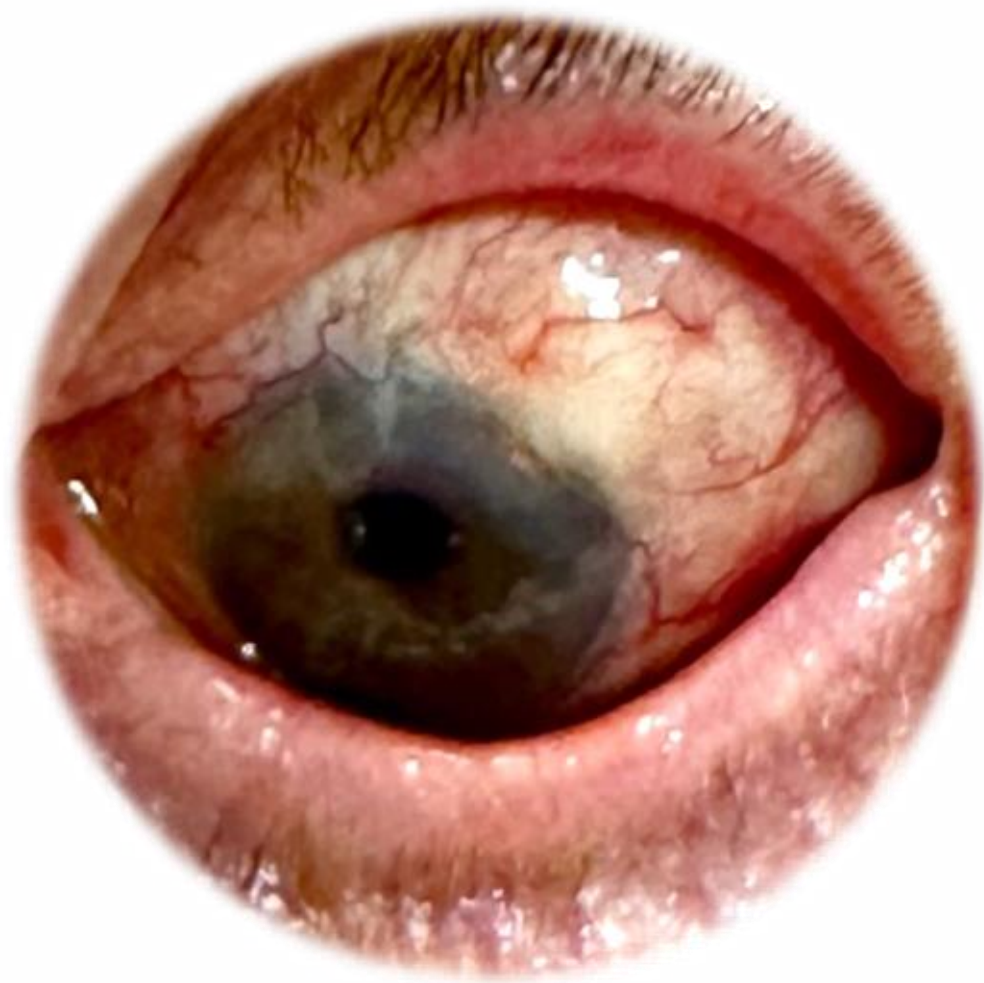
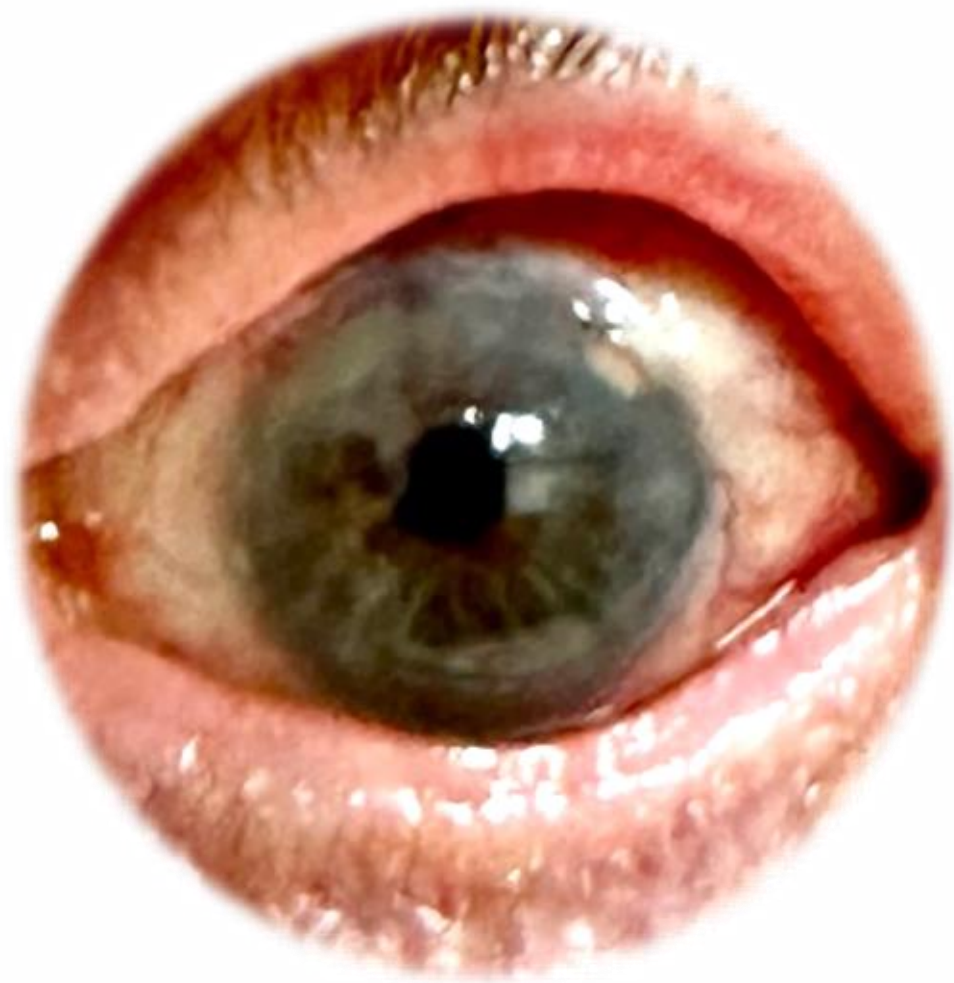
ST Ahmed  
Removal



Mary Qiu  
(U Chicago)

# Case

- POW7
- VA at baseline
- IOP 10 on 2 meds





P-GLA-022

### Glaucoma Tube Shunt Revision with Scleral "Turtle-Plast"

Sylvia U. Edoligawerie, PhD<sup>1</sup>, Peter Weber, MD<sup>2</sup>, Madhu Gorla, MD<sup>3</sup>, Giovanni Campagna, MD<sup>1</sup>, Arsham Shoyehani, MD<sup>1</sup>, Mary Qiu, MD<sup>1</sup>  
1. University of Chicago Medical Center, Chicago, IL, USA  
2. Chicago Glaucoma Consultants, Chicago, IL, USA  
3. Washington University in St. Louis, St. Louis, MO, USA

#### Purpose & Summary

In eyes requiring glaucoma tube repositioning, exchange, or removal, it may be challenging to achieve a watertight and astigmatically neutral closure of the prior sclerotomy track, especially if it is very short and anterior. We present two cases, demonstrating the surgical technique of cutting Tutoplast into a strategic geometric shape with a protruding tip to plug a corneoscleral fistula during tube revision surgery.

#### Case 1 Background

60-year-old woman with severe glaucoma & tube erosion in left eye  
Chronic topical steroid and Xalatan use  
Initial visual acuity (VA) = 20/400  
Visual field (VF) = no reading on only 20° drops. No AC cell, hyphema, or vitritis

#### Case 2 Background

68-year-old with secondary open-angle glaucoma  
underwent removal of a Baerveldt tube implant after tube erosion  
Plat = remove the eroded & perform endoglucomanometry in an attempt for VOP control

#### Case 1 Description

A. Altered FPV tube erosion from anterior chamber entry site to endothelium  
B. BION goniostomy  
C. Altered FPV tube, plate, and capsule removal  
D. Medion Pro refilling from entry  
E. Dry Tutoplast cut, shaped, inserted in tube entry site, hydrated, and sutured to achieve for a watertight seal  
F. A capsule autograft from the prior Altered's capsule was used to assist with the closure, and the conjunctiva and Tenon's were re-approximated to the limbus

#### Case 2 Description

G. Baerveldt tube erosion from anterior chamber entry site to endothelium, also with anterior plate erosion  
H. Baerveldt tube and plate removal  
I. Pre-hydrated Tutoplast cut to shape with a thin tip protruding  
J. Fistula was first widened with a side port blade  
K. Anterior corners of the Tutoplast were sutured to sclera so the tip could be inserted into the tube track  
L. Conjunctiva and Tenon's were advanced to the limbus, an anterior membrane graft was used to cover bare sclera

#### Conclusion: Pericardial "Turtle-plast" hydrated with balanced salt solution is efficacious for sealing corneoscleral fistula in tube shunt repair

"Turtle-Plast" technique advantages over direct suturing of the tube track:  
1. Turtle's head provides an astigmatically-neutral watertight seal of a short anterior fistula  
2. Watertight closure is challenging if the sclerotomy is short and anterior  
3. Tight sutures may induce significant astigmatism  
4. Body of the turtle can restore adjacent areas of scleral thinning

#### Acknowledgements

To: Keith Barker

Poster Board ID number: P-GLA-022

INTERNATIONAL  
OF OPHTHALMOLOGY

### Pentacam for the Occludable Angle Optimal

Authors: J.E. MOHAMED<sup>1</sup>, A.L. HUNT<sup>2</sup>, C.L. TORRES<sup>3</sup>, F.A. HERNANDEZ<sup>4</sup>  
1. Glaucoma International, Toronto, Canada  
2. Department of Ophthalmology, University of Toronto, Toronto, Canada  
3. Department of Ophthalmology, University of Toronto, Toronto, Canada  
4. Department of Ophthalmology, University of Toronto, Toronto, Canada

#### INTRODUCTION

Endothelial contact has been identified as a possible cause of endothelial disease. Endothelial (E) and angle (A) cells in the angle are in contact with the endothelium. The contact is thought to be important for the regulation of endothelial function. The contact is thought to be important for the regulation of endothelial function. The contact is thought to be important for the regulation of endothelial function.

#### AIM

To assess the impact of endothelial contact on the regulation of endothelial function. To assess the impact of endothelial contact on the regulation of endothelial function. To assess the impact of endothelial contact on the regulation of endothelial function.

#### CONCLUSIONS

The contact is thought to be important for the regulation of endothelial function. The contact is thought to be important for the regulation of endothelial function. The contact is thought to be important for the regulation of endothelial function.

# What to do in eye with tube erosion?

- Cover tube
- Reposition tube & cover tube
- Exchange tube & cover tube
- Remove tube & leave plate
- Remove tube & remove plate



# What to do in eye with tube erosion?

- Cover tube
- Reposition tube & cover tube
- Exchange tube & cover tube
- Remove tube & leave plate
- Remove tube & remove plate

**More evidence  
is needed!**

# My Guiding Principles For Tube Revisions

- I prefer to leave eyes pseudophakic with 1 ST BGI-350 in the sulcus
- General anesthesia for patient comfort
- Posterior scleral traction suture to enhance exposure
- When removing tube, I prefer not to leave the plate behind
- Tube fistulas can be plugged with dehydrated Tutoplast
- Pericardial Tutoplast is bigger than scleral Tutoplast
- Capsule from prior tube can be used as patch graft material
- Tenons can be separated from conjunctiva and transposed or advanced
- Circumferential relaxing incisions in Tenons' or conjunctiva help it stretch
- Conjunctival autograft can be taken from same or different eye



## Aqueous Shunt Revision with Autologous Capsular Patch Graft: Surgical Technique Description and Preliminary Results



Aqueous shunt surgeries commonly use patch grafts to prevent tube erosion.<sup>1</sup> Allografts include cornea, sclera, pericardium, fascia lata, dura mater, and amniotic membrane; autografts include lamellar scleral grafts, tenons, buccal mucosa, and tragal perichondrium; nonhuman grafts include porcine-derived tissues and synthetic materials.<sup>2</sup> A fibrous capsule forms around aqueous shunt plates, and aqueous drains into this reservoir and diffuses through the capsule wall to be absorbed by capillaries.<sup>3</sup> Excessive wound healing can result in an excessively thick capsule, and a fibrous stalk of tissue can obstruct the valve mechanism of Ahmed FP7s (New World Medical). An "Ahmed capsule revision" can be performed to improve aqueous outflow.<sup>4-5</sup> (Video 1, available at [www.ophtalmologyglaucoma.org](http://www.ophtalmologyglaucoma.org)). Excised Ahmed capsule tissue is typically discarded, and a histologic study of excised Ahmed capsules revealed an inner compressed collagen layer and an outer vascular layer.<sup>6</sup> A recent case series of 4 patients by Alvarez-Ascencio et al<sup>7</sup> describe using an excised Ahmed capsule as patch graft material for managing tube erosions.<sup>7</sup> In the current report, the author independently demonstrates techniques for harvesting autologous capsular patch graft material from valved and nonvalved aqueous shunts for use during tube revisions in a variety of clinical scenarios. This project adheres to the tenets of the Declaration of Helsinki, approval was obtained from the University of Chicago Institutional Review Board, and written consent was obtained from all patients.

Patient A is a 40-year-old man with uveitic glaucoma in the left eye. The left eye was pseudophakic with a superotemporal Ahmed FP7 in the anterior chamber (AC). The tube was chafing the iris root and exacerbating recalcitrant cystoid macular edema. The intraocular pressure (IOP) was controlled on 4 medications, and he elected for a tube exchange with the primary goal of repositioning the tube to the sulcus and a secondary goal of reducing the medication burden. To achieve both goals, the superotemporal Ahmed FP7 was removed, Ahmed capsular autograft tissue was harvested, a new Ahmed FP7 was affixed to the bare sclera in the same superotemporal quadrant with the tube in the superior sulcus, and the excised Ahmed capsule tissue was used as a patch graft for the new Ahmed FP7. By postoperative week 35, there was excellent cosmesis and no erosion (Fig 1A; Video 2, available at [www.ophtalmologyglaucoma.org](http://www.ophtalmologyglaucoma.org)).

Patient B is an 87-year-old man with bilateral primary open-angle glaucoma (POAG). The left eye was pseudophakic with a superior trabeculectomy, superotemporal Ahmed FP7 in the AC, micropulse cyclophotocoagulation 3 times, and goniotomy. The IOP was too high on 4 medications, and he elected for a second tube. A new inferonasal Baerveldt 350 in the AC was implanted, a capsule revision was performed on the superotemporal Ahmed

using the technique demonstrated in Video 1, and the excised Ahmed capsule tissue was used as a patch graft for the new Baerveldt 350. By postoperative week 60, there was excellent cosmesis and no erosion (Fig 1B).

Patient C is a 59-year-old phakic man with bilateral POAG. The right eye was phakic with a superotemporal Ahmed FP7 in the AC. The IOP was too high on 4 medications, and he elected for a second tube combined with cataract surgery. A new inferonasal Baerveldt 350 in the AC was implanted, a capsule revision was performed on the superotemporal Ahmed using the technique demonstrated in Video 1, and the excised Ahmed capsule tissue was used as a patch graft for the new Baerveldt 350. By postoperative week 14, there was excellent cosmesis and no erosion (Fig 1C).

Patient D is an 85-year-old man with bilateral POAG. The right eye was pseudophakic with a superior trabeculectomy, superotemporal Baerveldt 350 in the AC, inferonasal Baerveldt 350 in the AC, and micropulse cyclophotocoagulation. The inferonasal tube was chafing the iris root and causing recurrent anterior uveitis, and had become recurrently eroded (exacerbated by the suboptimal plate position 6 mm behind the limbus). The IOP was controlled on 3 medications, and he elected for a tube exchange with the primary goal of managing the erosion and secondary goal of repositioning the tube to the sulcus. To achieve both goals, the inferonasal Baerveldt 350 was removed, capsular autograft tissue was harvested while avoiding the rectus muscles, a new Baerveldt 350 was ligated and affixed to the bare sclera in the same inferonasal quadrant (9 mm behind the limbus) with the tube tip in the inferior sulcus, and the excised Baerveldt capsule tissue was used as a patch graft for the new Baerveldt 350. An autologous conjunctival free graft from the superonasal quadrant was used to close the inferonasal conjunctiva without tension. By postoperative week 23, there was excellent cosmesis and no erosion (Fig 1D; Video 3, available at [www.ophtalmologyglaucoma.org](http://www.ophtalmologyglaucoma.org)).

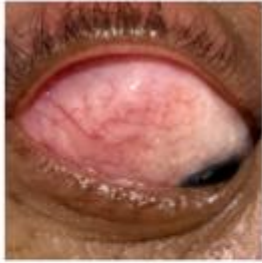
Patient E is a 73-year-old woman with bilateral POAG and secondary synechial angle closure in the right eye after multiple surgeries. The right eye was pseudophakic with a Descemet stripping endothelial keratoplasty (DSEK) for pseudophakic bullous keratopathy, superior trabeculectomy, inferotemporal Baerveldt 250 in the AC, ptosis, and lower lid ectropion repair. The IOP was controlled on zero medications, but the DSEK had failed and the cornea service recommended repeat DSEK with tube repositioning into the sulcus. Because the inferotemporal Baerveldt 250 was exacerbating lower lid ectropion and cosmetically unacceptable, the inferotemporal Baerveldt 250 was removed, capsular autograft tissue was harvested while avoiding the rectus muscles using the technique demonstrated in Video 3, a new Ahmed ClearPath 250 was ligated and implanted in the superotemporal quadrant with the tube tip in the superotemporal sulcus, and the excised Baerveldt capsule tissue was used as a patch graft for the new Ahmed ClearPath 250. By postoperative week 21, there was excellent cosmesis and no tube erosion (Fig 1E).

In conclusion, autologous capsular patch grafts can be harvested in patients with prior aqueous shunts for use during implant revision, replacement, placement of an additional implant, or any

# Capsule from prior tube can be used as patch graft!



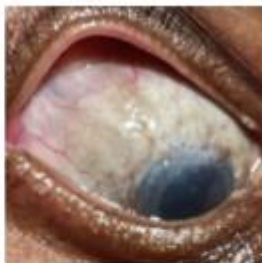
A: POW27



B: POW28



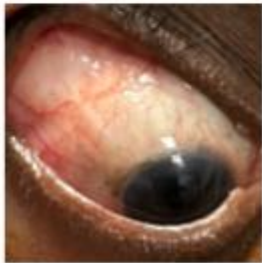
C: POW21



D: POW53



E: POW46



F: POW2



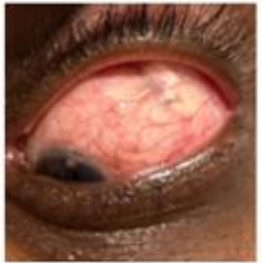
G: POW9



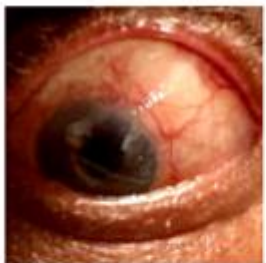
H: POW35



I: POW29



J: POW29



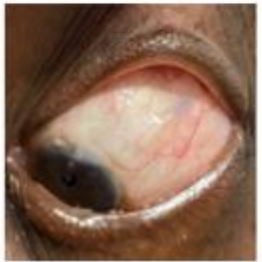
K: POW7



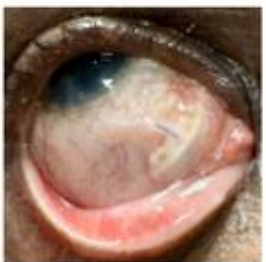
L: POW102



M: POW59



N: POW131



O: POW144



P: POW178





Mary Qiu

@maryqiumd · 118 subscribers · 18 videos

Hello and welcome to my YouTube channel! I'm a glaucoma and cataract surgeon. I did [more](#)

Customize channel

Manage videos

Home

Videos

Posts



Latest

Popular

Oldest



iTrack Advance GATT by PGY-2 Kevin Allan MD PhD with NGENUITY

26 views · 1 day ago



iTrack Advance Inferior Hemi-GATT

32 views · 7 days ago



Peritomy and Patches in Tube Shunt Surgery from American Glaucoma Society 2025

111 views · 2 months ago



Resident Performed GATT PGY 4

69 views · 3 months ago



GATT with iTrack Advance 3 ways

296 views · 5 months ago



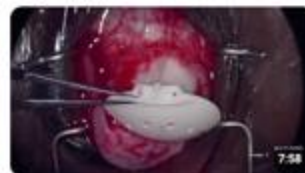
Ahmed ClearPath 250 with Guidewire-Assisted Tube Entry

191 views · 11 months ago



3 Techniques for Guidewire-Assisted Sulcus Tube

231 views · 1 year ago



Same-Quadrant Tube Exchange: Baerveldt-250 (AC) to Baerveldt-350 (sulcus)

88 views · 1 year ago



Same-Quadrant Baerveldt-350 (Anterior Chamber) to Ahmed FP7 (Sulcus) Exchange

58 views · 1 year ago



Baerveldt-350 Removal for Retained Plate

22 views · 1 year ago



Baerveldt-350 Removal for Tube Erosion with Infection

58 views · 1 year ago



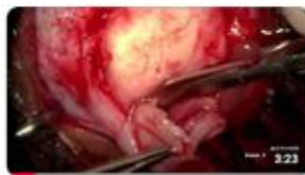
Same-Quadrant Tube Exchange: Ahmed (AC) to Baerveldt-350 (pars plana)

209 views · 2 years ago



Same-Quadrant Tube Exchange: Baerveldt-350 (AC) to Baerveldt-350 (sulcus) for...

50 views · 2 years ago



Same-Quadrant Tube Exchange: Ahmed (AC) to Ahmed (sulcus)

218 views · 2 years ago



Ahmed Capsule Revision

497 views · 2 years ago



Tube Repositioning (AC to Sulcus) + DSAEK

117 views · 2 years ago



# Thank You!



mary.qiu@gmail.com



www.youtube.com/@maryqiumd



@maryqiumd

