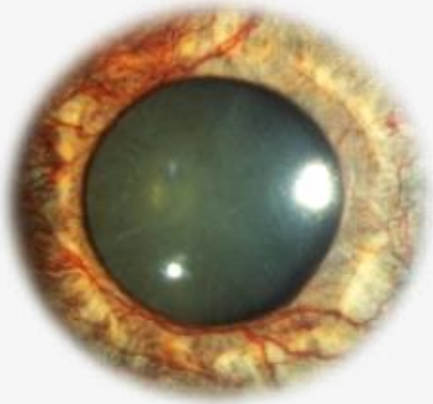

Angle Status in Neovascular Glaucoma

Mary Qiu, MD

Case A

- 57 year-old pseudophakic woman
- Presented to emergency room
- No eye history besides cataract surgery
- Worsening vision x 3 weeks
- Eye pain, nausea, vomiting x 2 days
- **NVG OS 2/2 CRVO**

- VA HM
- IOP 45 (came down to 34 with MMT)
- Active NVI & NVA, **50% PAS**
- Retina flat, no prior PRP

Case B

- 59 year-old phakic man
- Presented to outside eye clinic
- History CRVO 2 years ago, injections, PRP x 1
- Worsening vision x 1 month
- Dull ache x 1 month
- **NVG OS 2/2 CRVO**

- VA CF
- IOP 52 (did not come down with MMT)
- Active NVI & NVA, **100% PAS**
- Retina flat, prior light PRP, room for fill-in

Case A

- 57 year-old pseudophakic woman
- Presented to emergency room
- No eye history besides cataract surgery
- Worsening vision x 3 weeks
- Eye pain, nausea, vomiting x 2 days
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- VA CF
- IOP 52 (did not come down with MMT)
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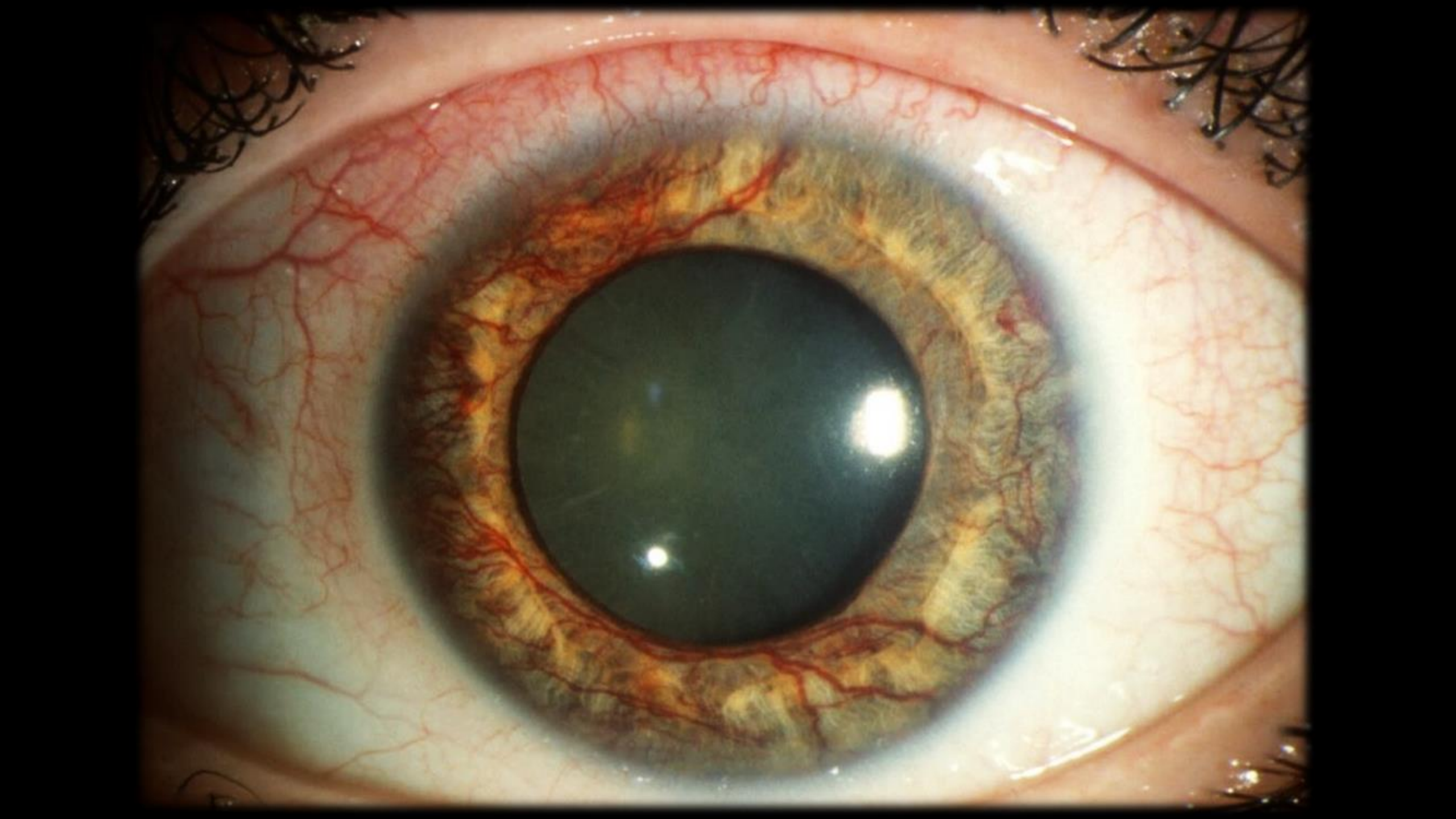

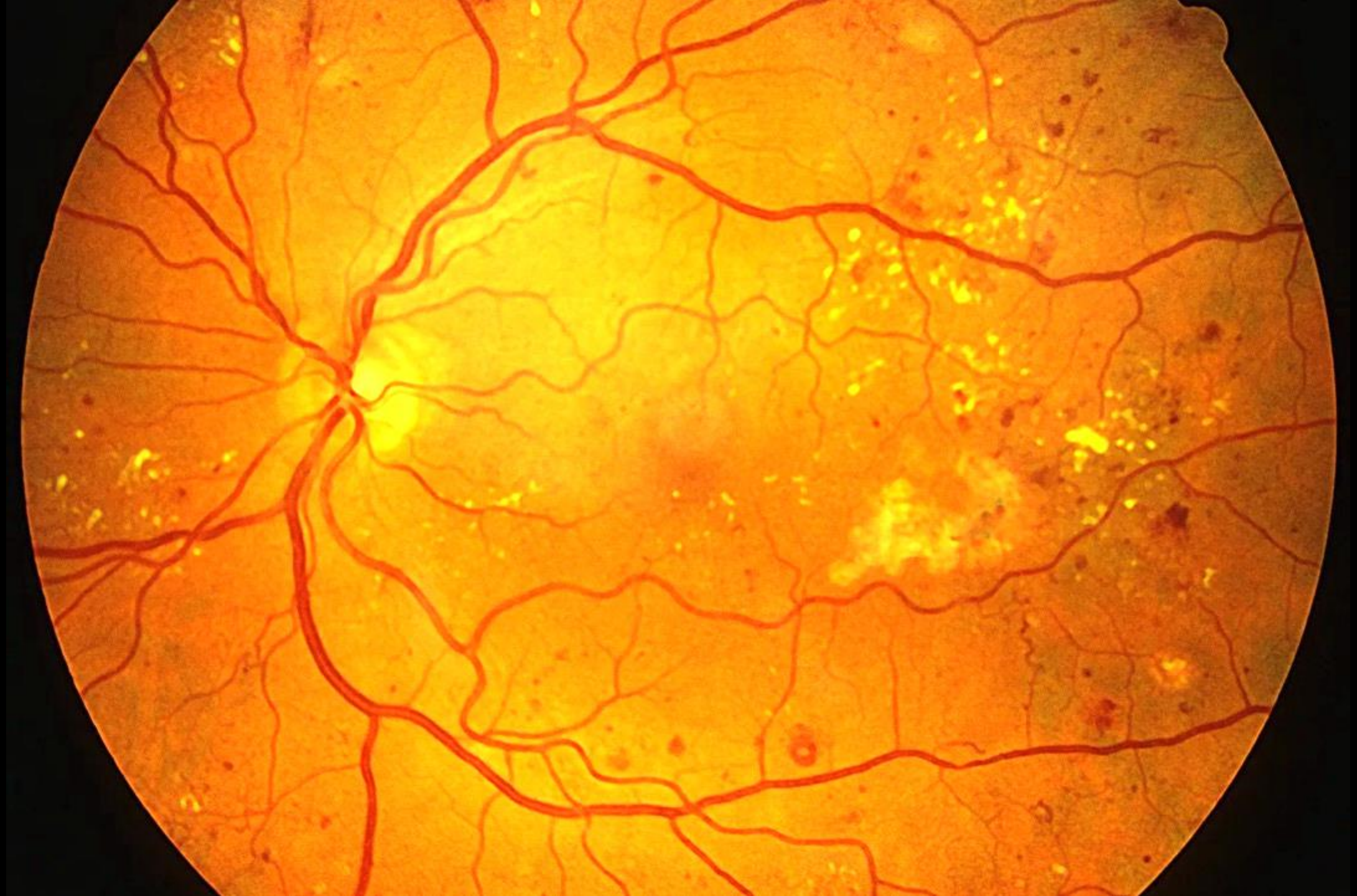

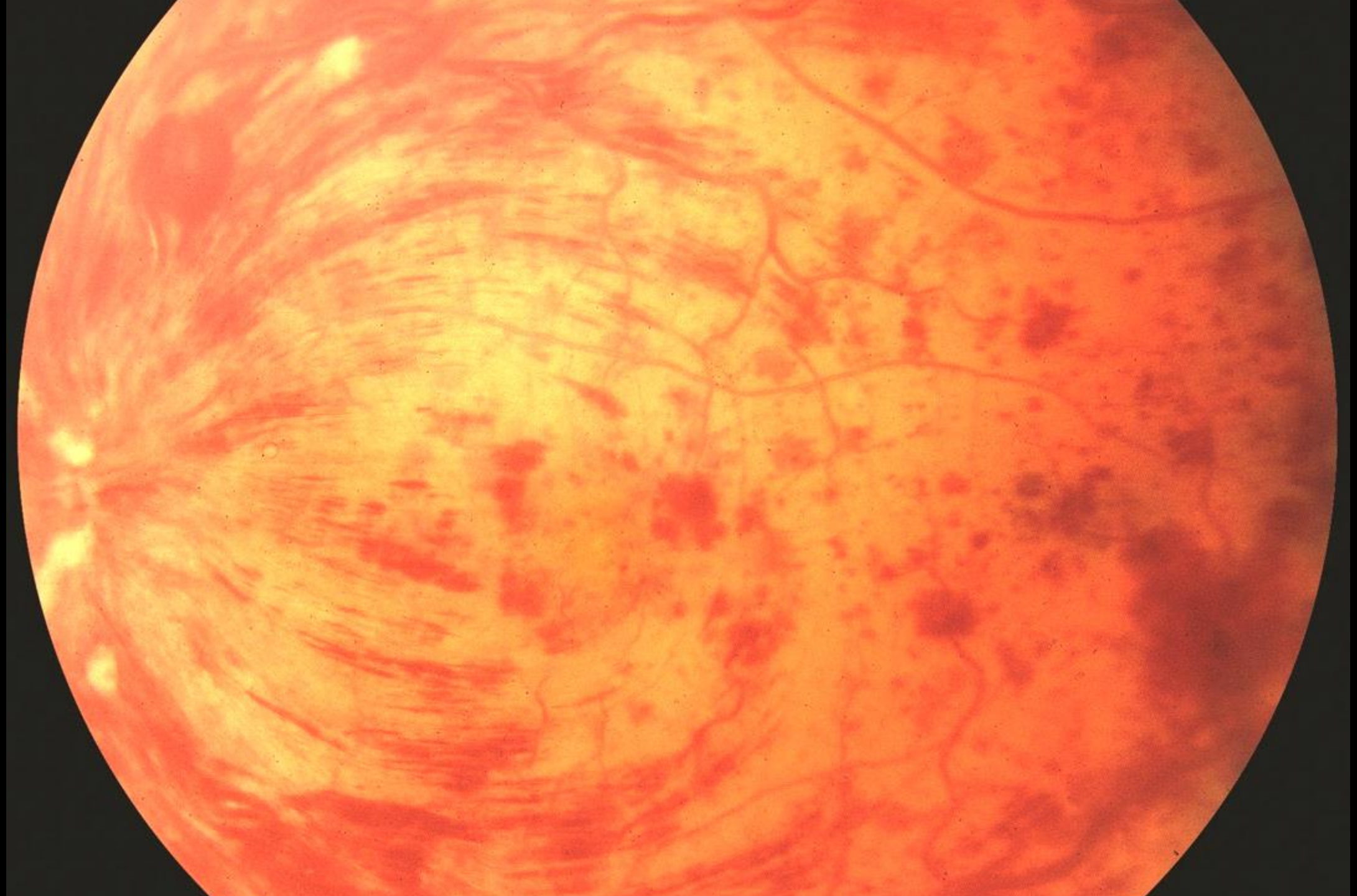

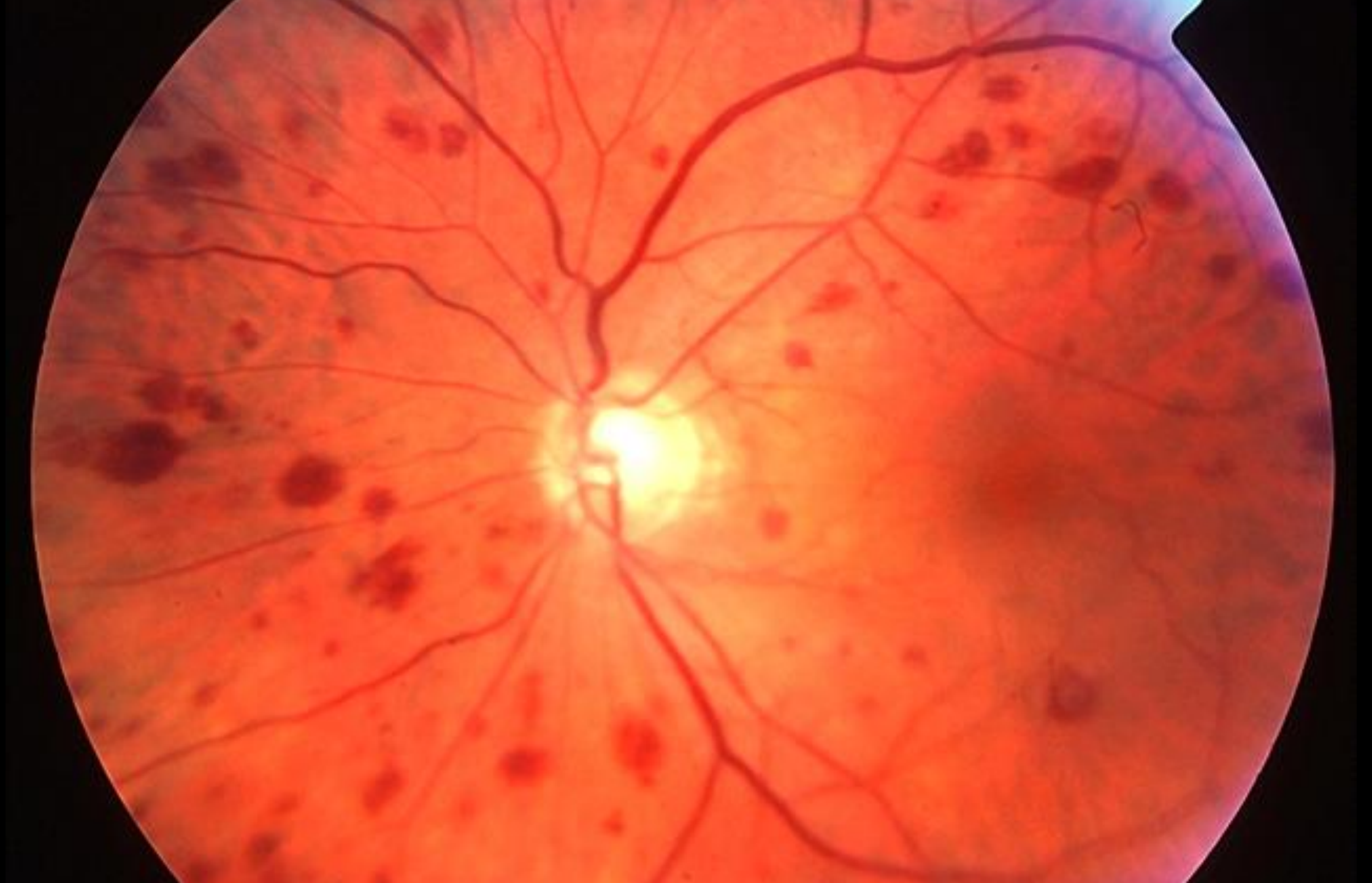

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Outcomes of Valved and Nonvalved Tube Shunts in Neovascular Glaucoma

Wesam Shamseldin Shalaby, MD,[1,2] Jonathan S. Myers, MD,[1] Reza Razeghinejad, MD,[1] L. Jay Katz, MD,[1] Michael Pro, MD,[1] Elizabeth Dale, MD,[1] Scott J. Fudemberg, MD,[1] Anand V. Mantravadi, MD,[1] Aakriti Garg Shukla, MD[1]

Purpose: To determine the outcomes of Ahmed glaucoma valve (AGV; New World Medical Inc) and Baerveldt glaucoma implant (BGI; Advanced Medical Optics) surgery in the setting of neovascular glaucoma (NVG).

Design: Single-center, retrospective study.

Participants: Consecutive patients who underwent AGV or BGI surgery for the treatment of NVG and had ≥6 months of follow-up.

Methods: Chart review of AGV and BGI surgical outcomes in patients with NVG.

Main Outcome Measures: Progression to no light perception (NLP) vision and 6-month surgical failure, which was defined as intraocular pressure (IOP) >21 mmHg with medications or <5 mmHg at 2 consecutive visits, or glaucoma reoperation.

Results: A total of 152 eyes (91 AGV, 61 BGI) were included with an average follow-up of 29.6 ± 25.8 months. Baseline demographics and clinical characteristics were comparable between groups. At month 6, failure was similar between AGV and BGI eyes (21.6% vs. 25.9%; $P = 0.552$), but glaucoma medication use was lower in BGI eyes ($P < 0.001$). At the final visit, 18.7% of AGV and 14.8% of BGI eyes progressed to NLP vision ($P = 0.530$), and medication use was lower in BGI eyes ($P < 0.0001$). Multivariate analysis identified lower preoperative visual acuity (VA) ($P = 0.001$), failure to receive panretinal photocoagulation within 2 weeks of surgery ($P = 0.003$), and bilaterality of the underlying ischemic retinal pathology ($P = 0.026$) as the strongest predictors of NLP outcome. Age, sex, race, NVG etiology, tube type, preoperative IOP, extent of synechial angle closure preoperatively, preoperative hyphema, IOP at the first NLP visit, and final IOP were not significant predictors of NLP vision.

Conclusions: Eyes with AGV and BGI had comparable outcomes in NVG, although fewer medications were required in BGI eyes to control IOP. Progression to NLP vision was associated with poor baseline VA, delayed retinal treatment, and bilaterality of the underlying ischemic retinal pathology. *Ophthalmology Glaucoma 2021;4:182-192* © *2020 by the American Academy of Ophthalmology*

Supplemental material available at www.ophthalmologyglaucoma.org.

A lot of NVG eyes end up NLP even with a tube

ORIGINAL RESEARCH

Sociodemographic and Economic Factors in Outcomes of Tube Shunts for Neovascular Glaucoma

Wesam S Shalaby[1], Amirmohsen Arbabi[2], Jonathan S Myers[3], Marlene R Moster[4], Reza Razeghinejad[5], L Jay Katz[6], Aakriti G Shukla[7]

Abstract

Importance: Few studies have analyzed associations between sociodemographic factors and neovascular glaucoma (NVG) outcomes.

Aim and background: To determine the potential impact of sociodemographic and economic factors on the NVG tube shunt surgery outcomes.

Design: Retrospective, single-center, comparative case series.

Participants: Consecutive patients who underwent tube shunt surgery for NVG and had ≥6 months of follow-up.

Materials and methods: Regional average adjusted gross income (AGI) was determined by cross-referencing self-reported residential zip codes with average AGI per zip code supplied by the Internal Revenue Service. Two groups were created: (1) lower-income: individuals from neighborhoods with the lowest 10% of AGI (near the United States poverty line), (2) higher-income: the remaining 90% of individuals.

Main outcome measures: Visual acuity (VA), intraocular pressure (IOP), and glaucoma medication number at 6 months and the most recent visit.

Results: The mean annual AGI in the higher-income group (130 patients) was $69,596 ± 39,700 and the lower-income group (16 patients) was $27,487 ± 1,600 ($p < 0.001$). Age, sex, distance to the clinic, language, and all baseline clinical variables (including VA and IOP) were comparable between groups. Lower-income was associated with non-white race (81.3 vs 52.3%; $p = 0.024$). At month 6, VA in the lower-income group [median: HM (20/70–NLP)] was worse than the higher-income group [median: CF (20/25–NLP)] (log MAR VA: 2.32 ± 0.8 vs 1.77 ± 1.1; $p = 0.02$); these trends persisted through the most recent visit ($p = 0.043$). Follow-up IOP and medications were similar between groups.

Conclusions and relevance: Lower-income may be associated with worse VA outcomes following NVG tube shunt surgery.

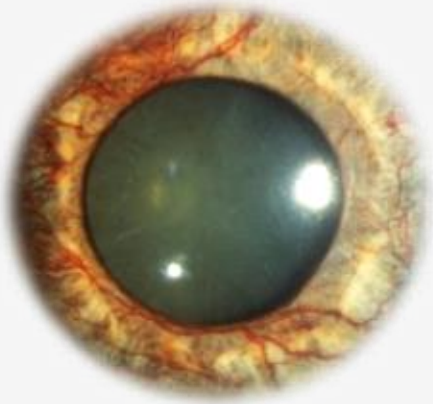
Keywords: Ahmed glaucoma valve, Baerveldt glaucoma implant, Glaucoma surgery, Income, Neovascular glaucoma, Race, Sociodemographic, Socioeconomic, Tube shunt.

Journal of Current Glaucoma Practice (2021): 10.5005/jp-journals-10078-1303

Lower income NVG patients end up with worse vision

Control the IOP!

Control the NV!



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"neovascular glaucoma"

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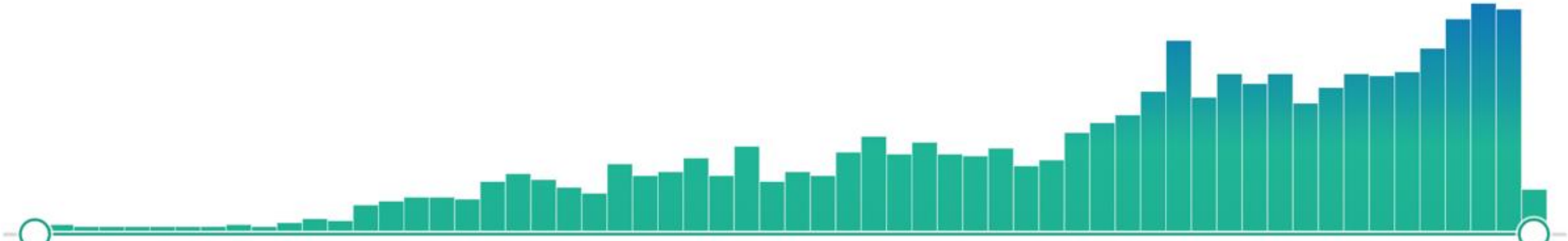
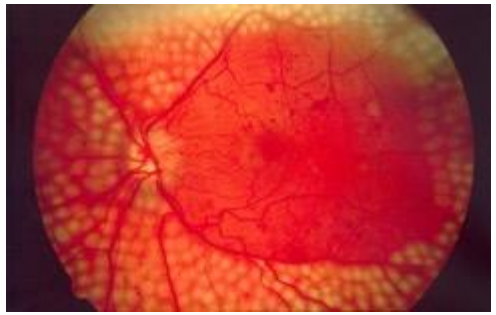
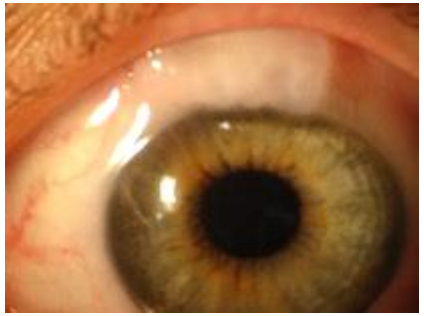
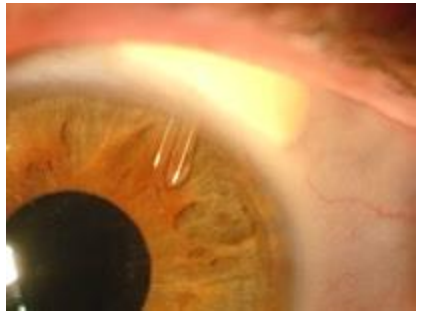
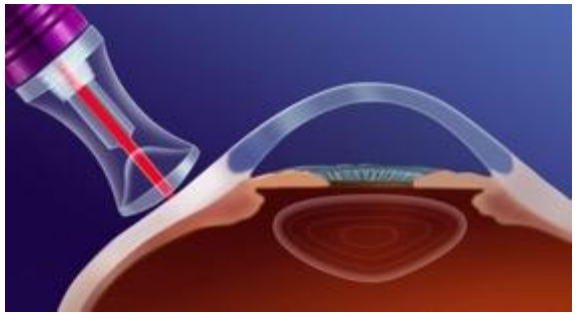
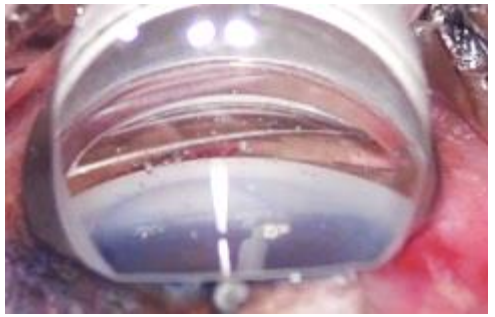


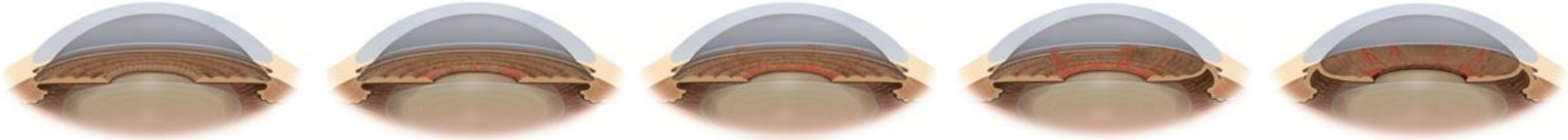




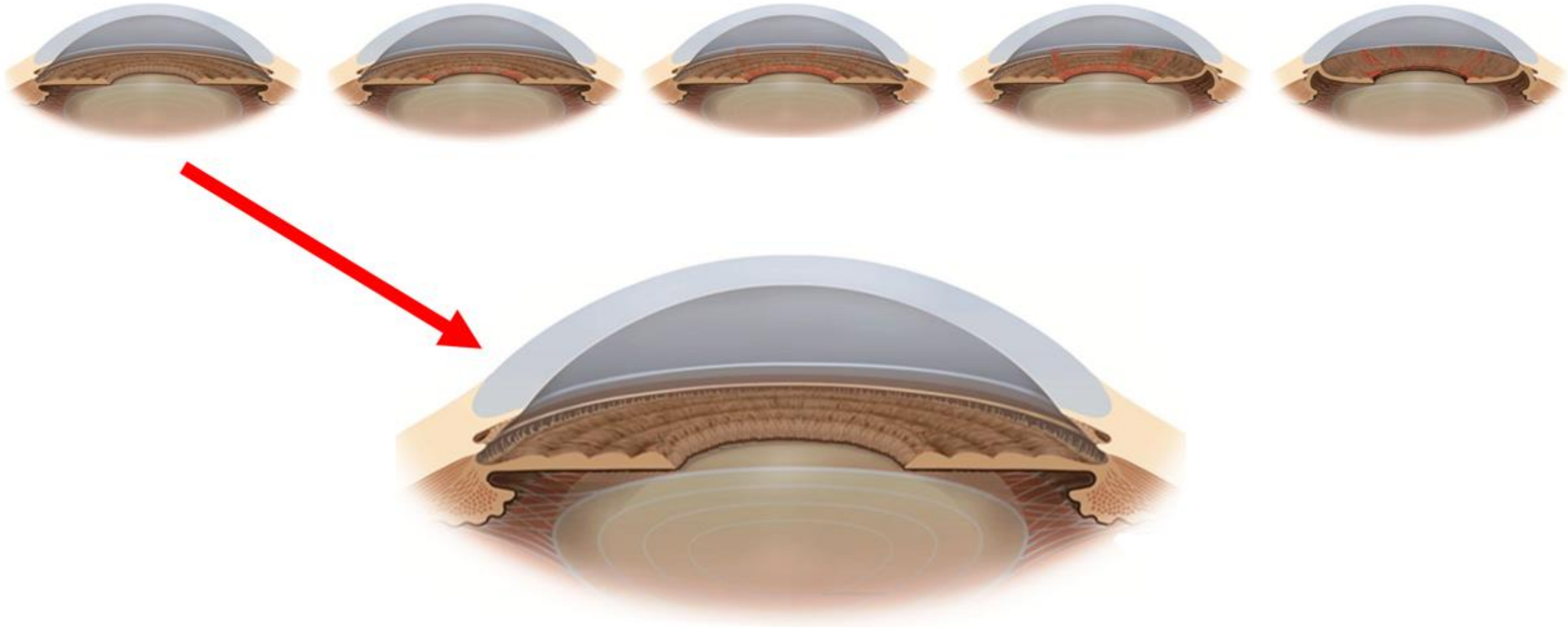






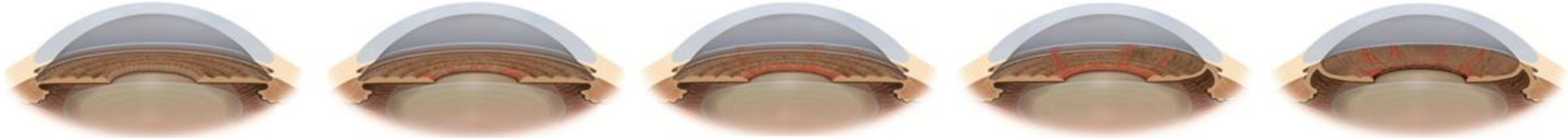


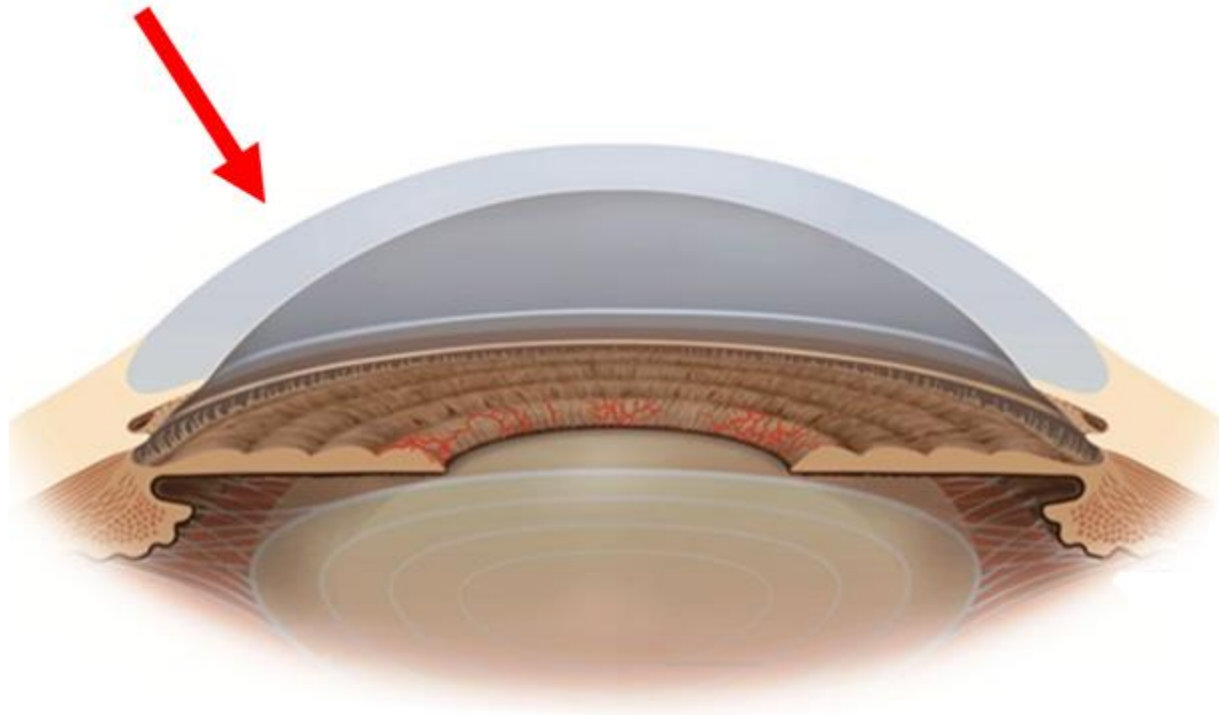
Stages of NVG



Pre-Rubeosis Stage

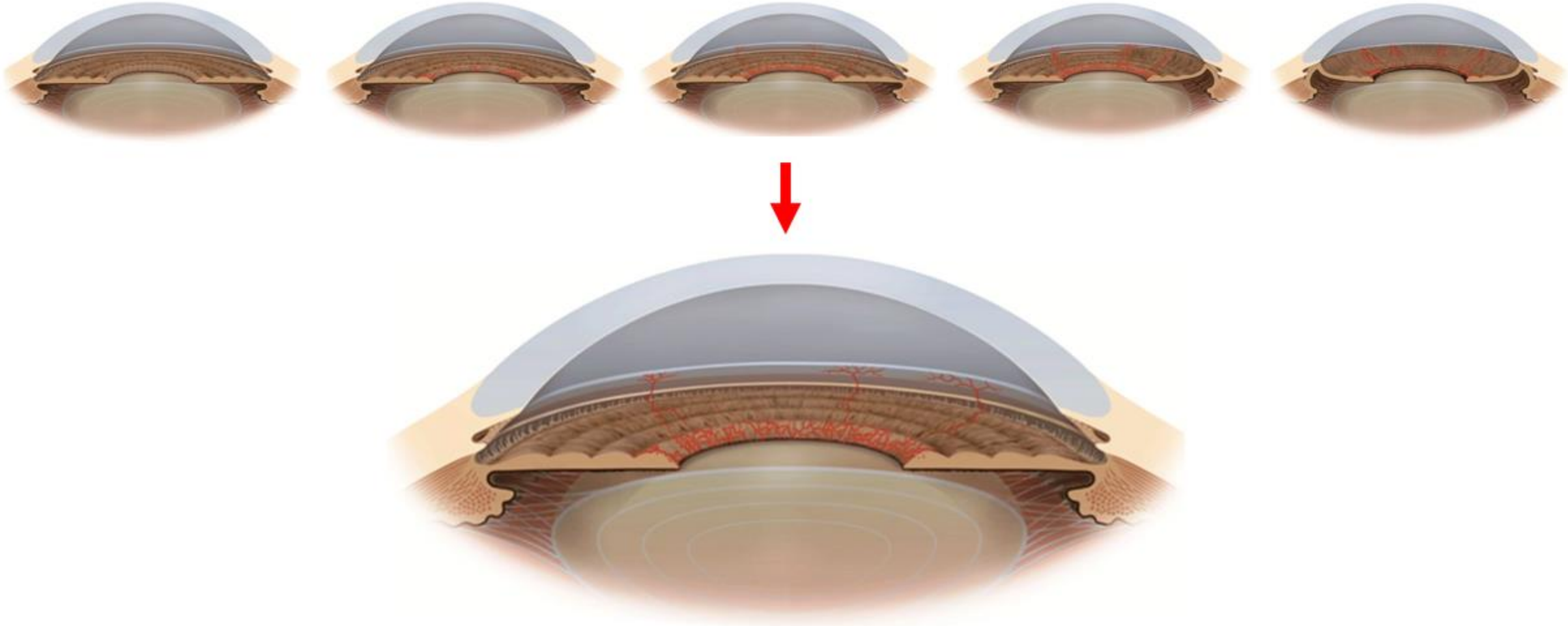
Rodrigues, et al. Int J Retina Vitreous. 2016





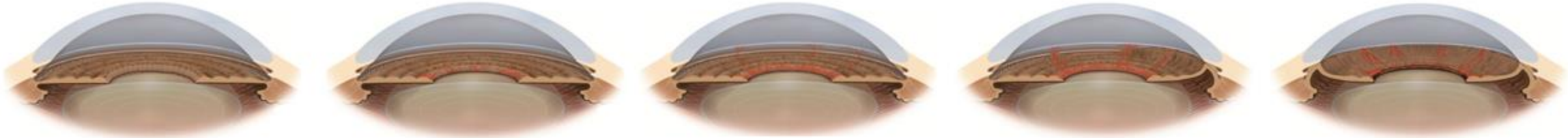
Rubeosis Stage

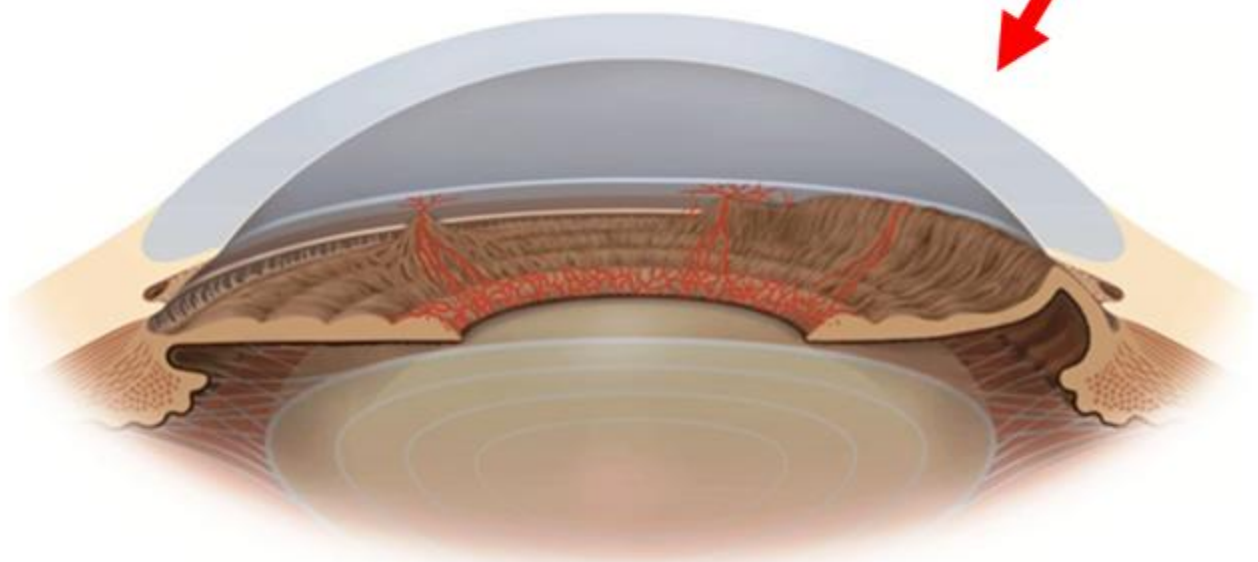
Rodrigues, et al. Int J Retina Vitreous. 2016



Open Angle Stage

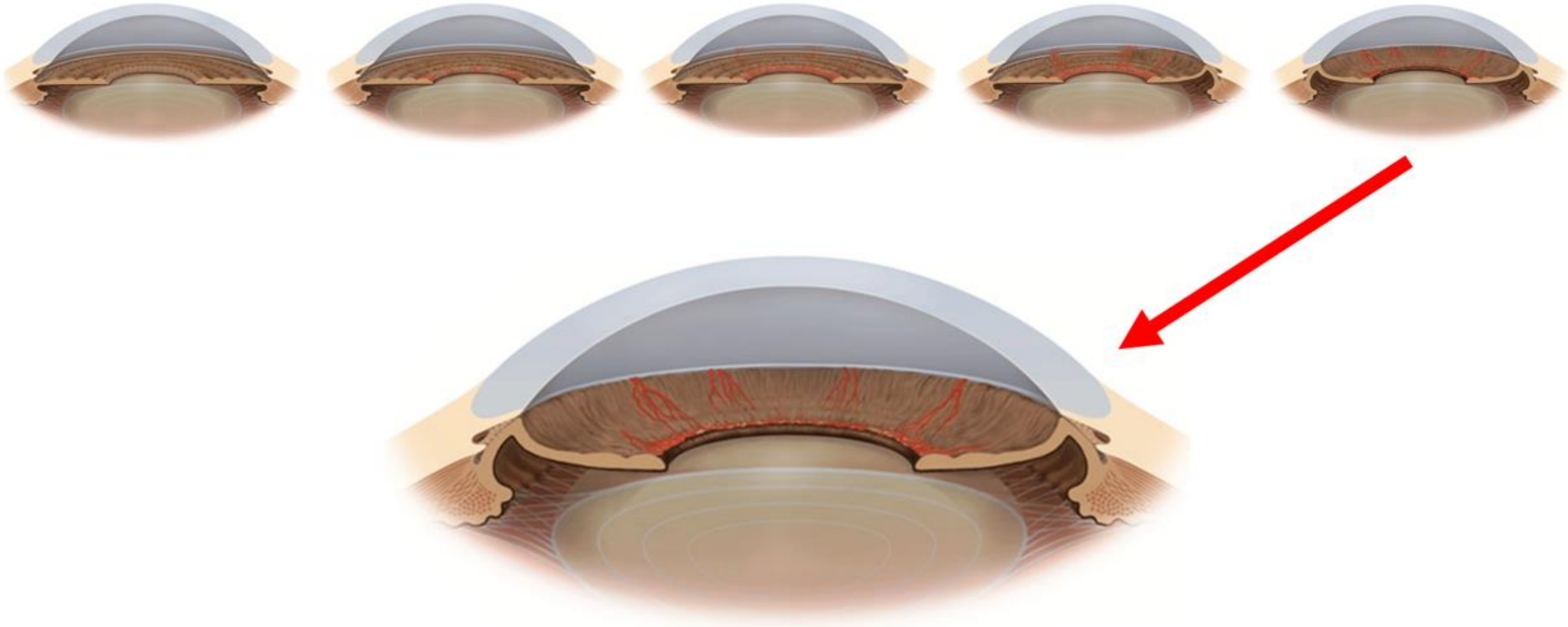
Rodrigues, et al. Int J Retina Vitreous. 2016





Partial Angle Closure Stage

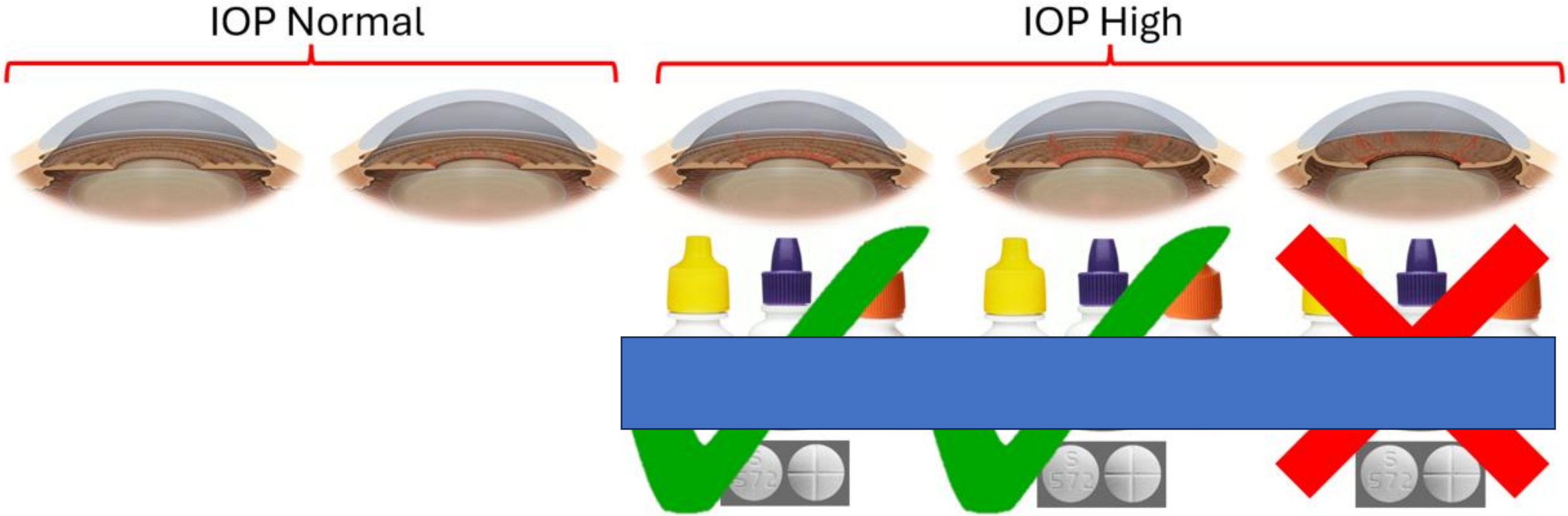
Rodrigues, et al. Int J Retina Vitreous. 2016



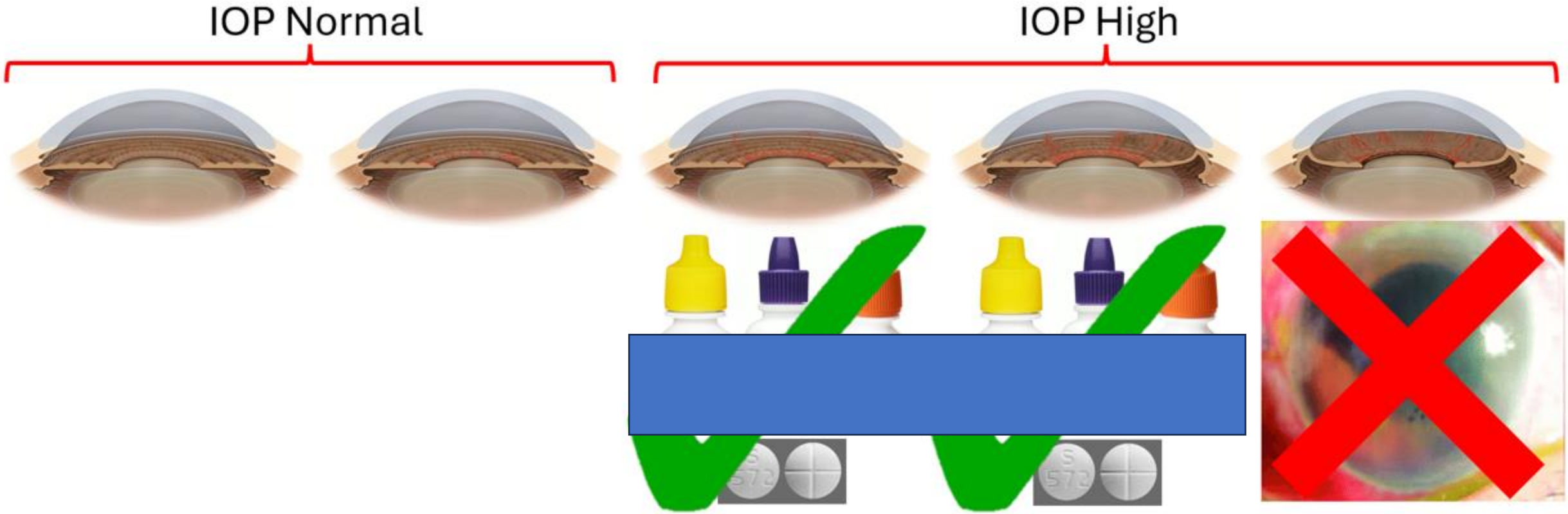
Total Angle Closure Stage

Rodrigues, et al. Int J Retina Vitreous. 2016

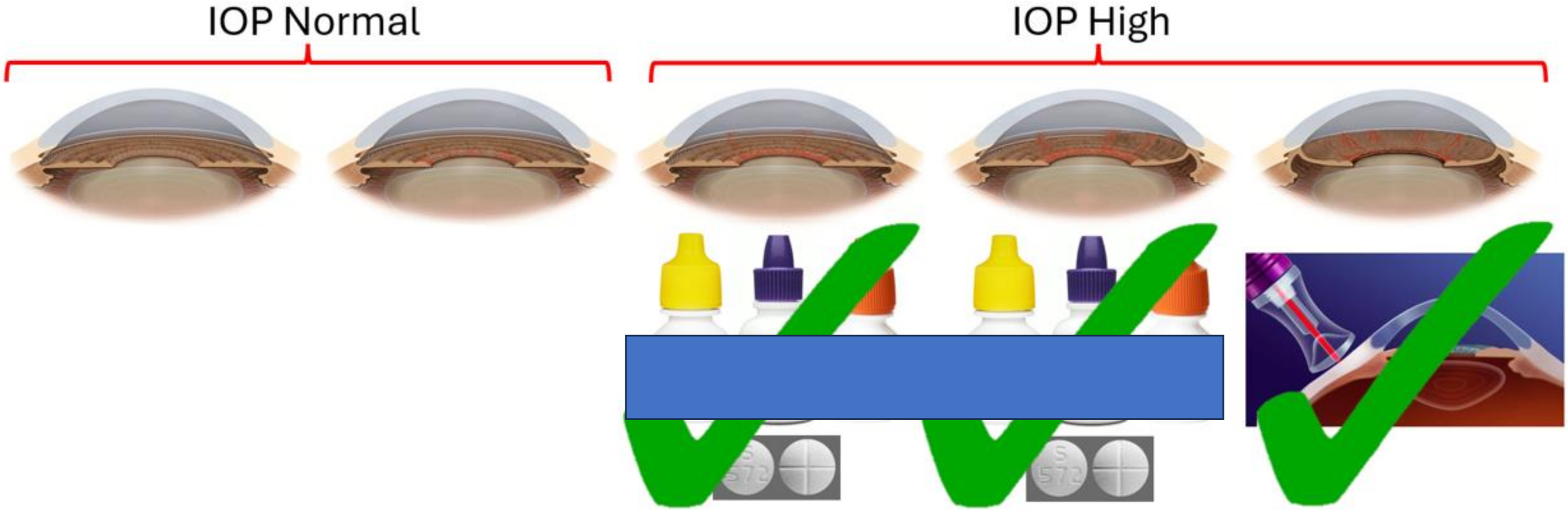
What can the glaucoma specialist do to control the IOP?



IOP-lowering medications can lower IOP
when angle is still somewhat open, but
IOP-lowering medications cannot lower IOP
when angle is mostly synechially closed

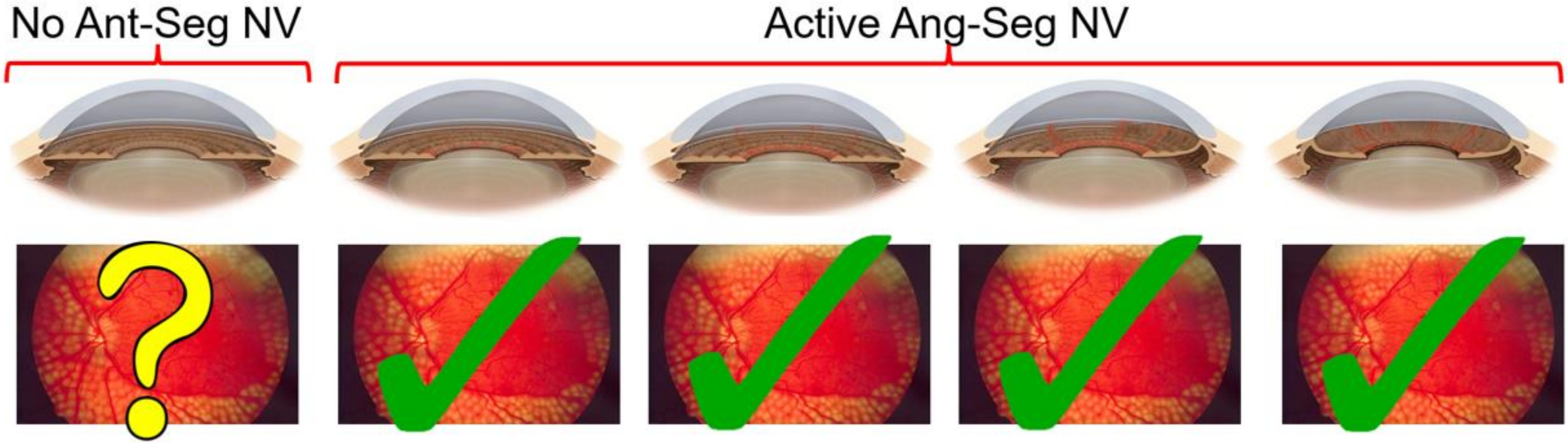


I do not put tubes in eyes with active anterior segment NV due to higher risk of bleeding-associated complications

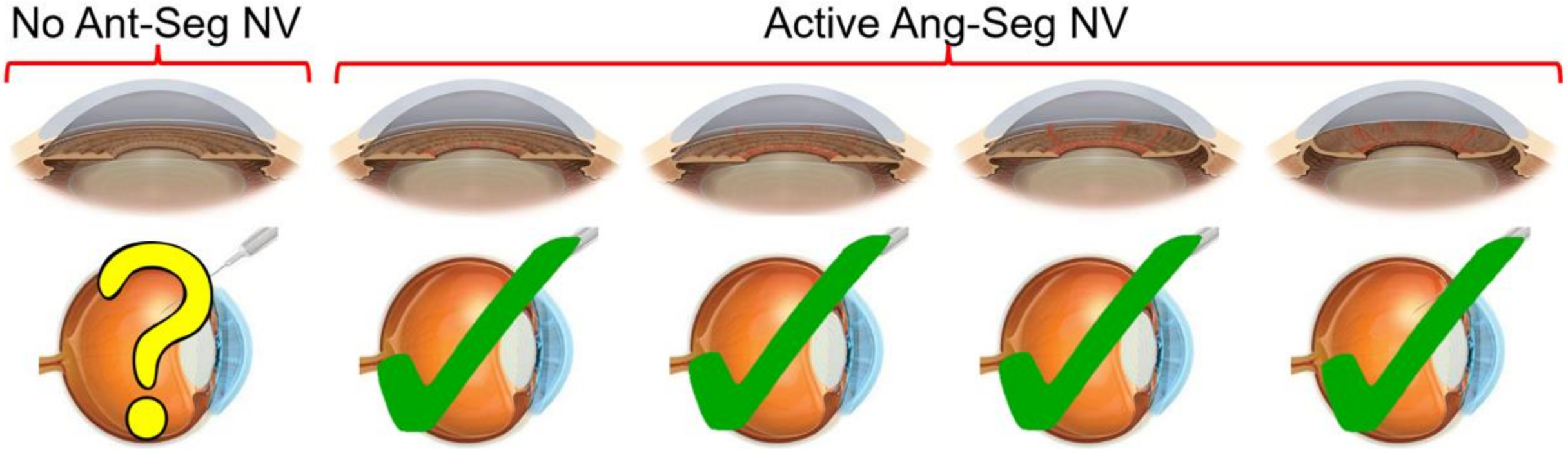


Prompt non-incisional CPC can safely lower IOP
if the angle is already mostly synechially closed
and there is active anterior segment NV

What can the retina specialist do to control the NV?

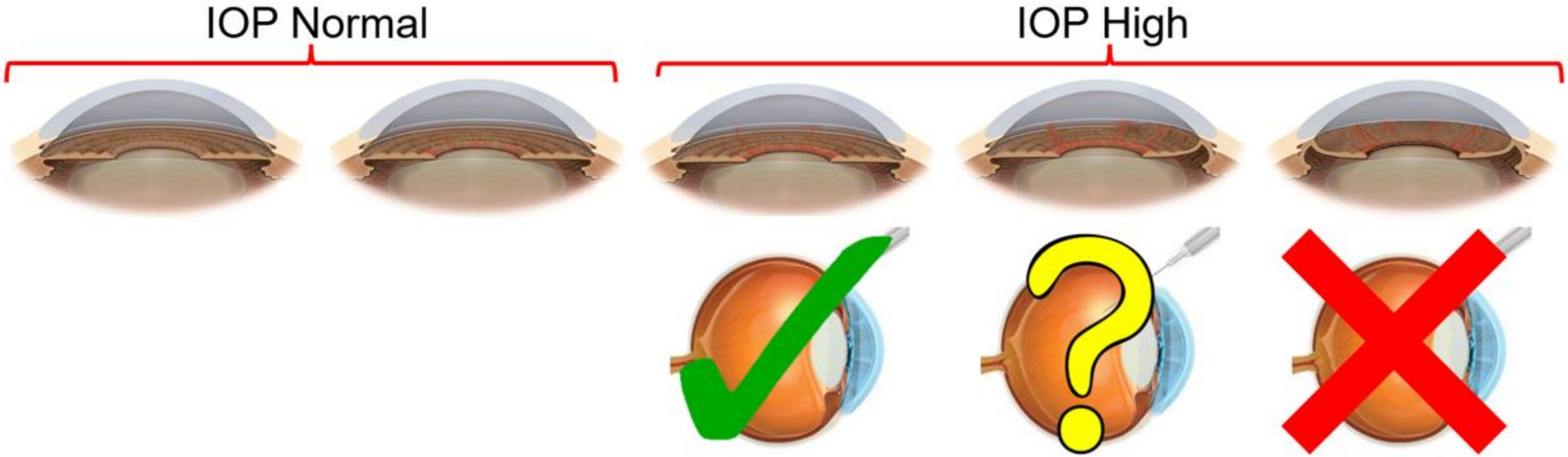


PRP prevents and/or ***GRADUALLY*** regresses NV;
do PRP if there is anterior segment NV,
or if there is posterior segment NV
in the absence of anterior segment NV



Anti-VEGF prevents and/or ***RAPIDLY*** regresses NV;
do anti-VEGF if there is anterior segment NV,
or macular edema with or without NV

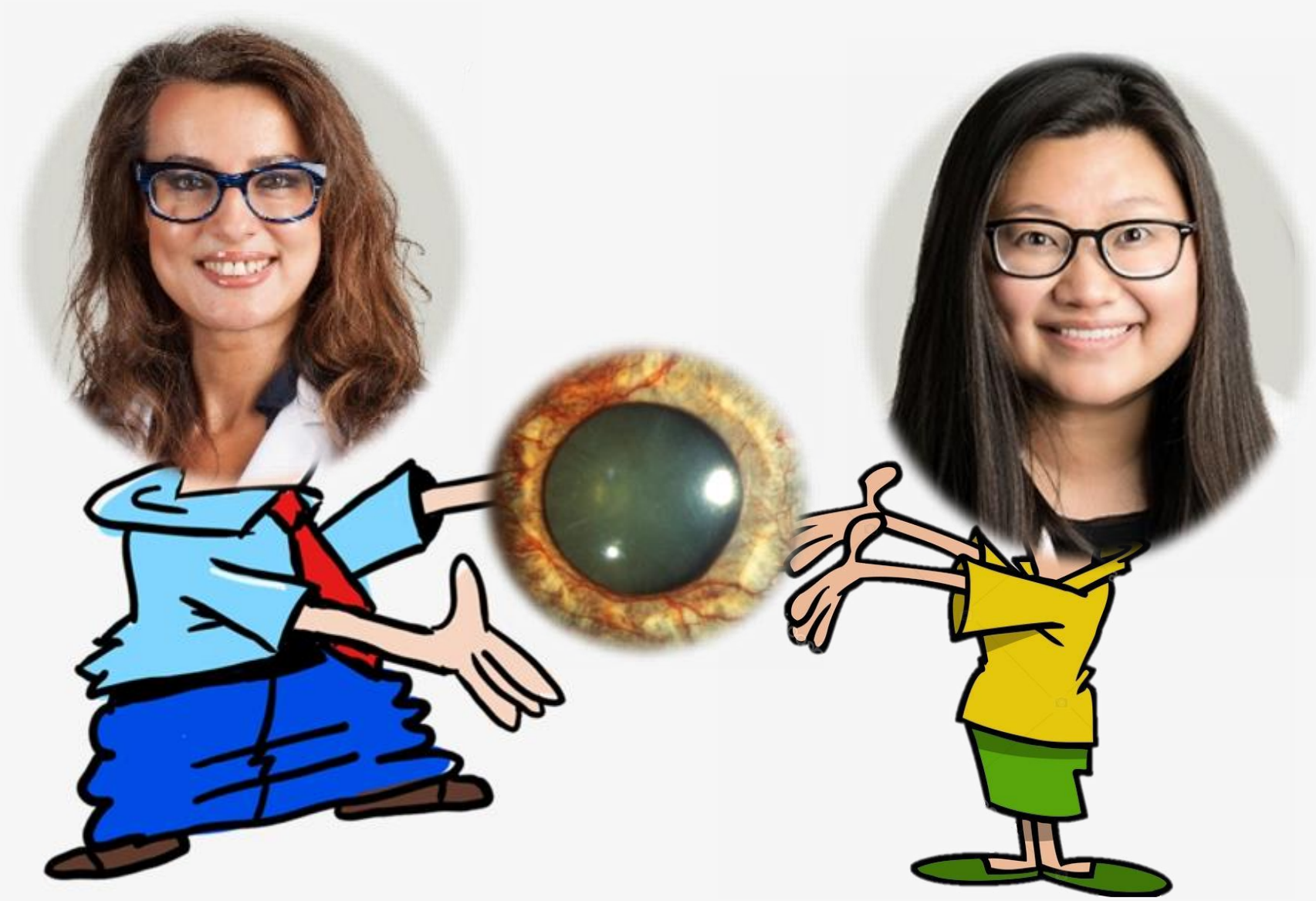
The effect of anti-VEGF on IOP depends on the angle status



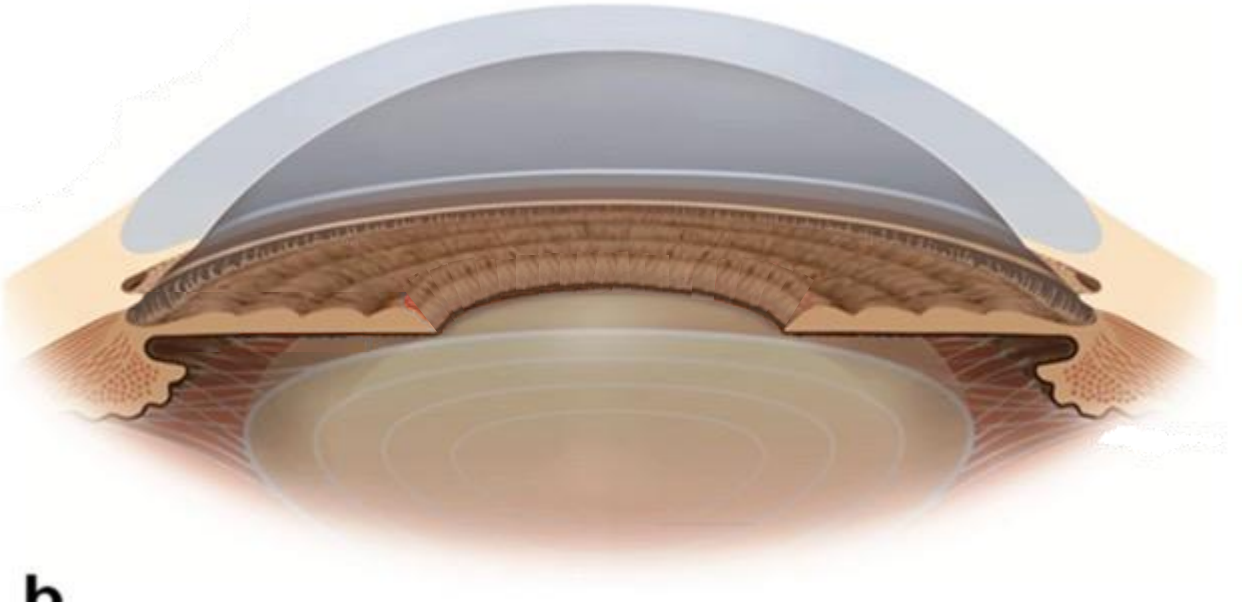
Anti-VEGF injection:
Lowers IOP if the angle is open,
Might lower IOP if the angle is partly open,
Does not lower IOP if the angle is completely closed

Dr. Dimitra Skondra
RETINA SPECIALIST

Dr. Mary Qiu
GLAUCOMA SPECIALIST



Pre-Rubeosis Stage



Anti-VEGF

For posterior segment NV and/or macular edema

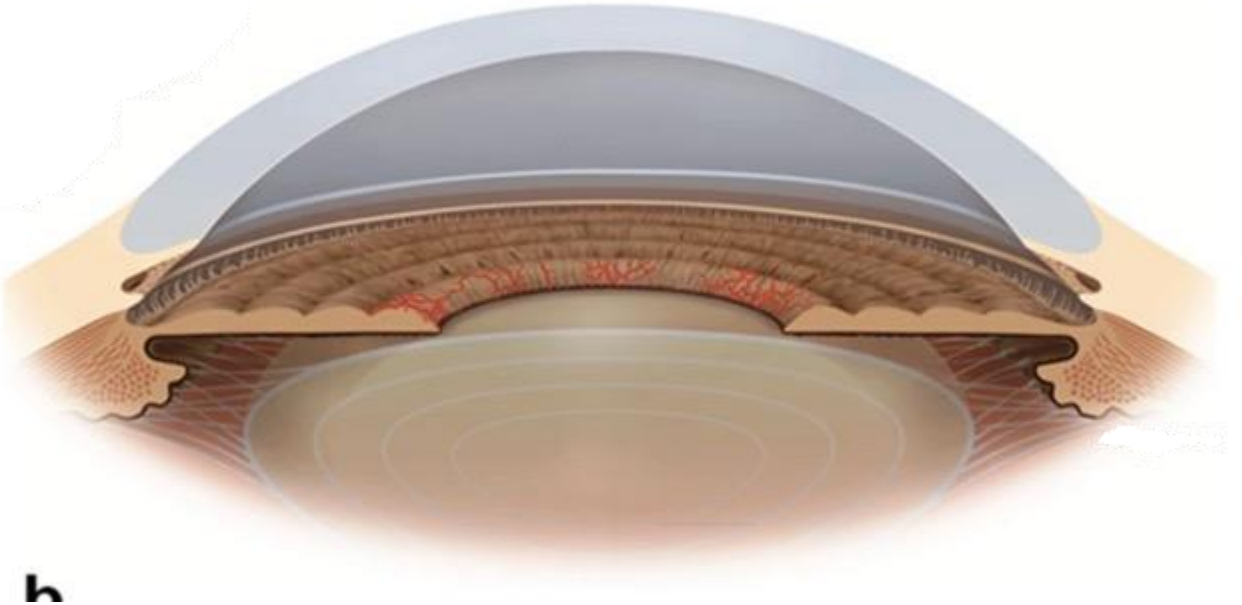
PRP

for posterior segment NV

N/A

IOP not high

Rubeosis Stage



Anti-VEGF

prompt regression of anterior segment NV, continue serial injections until PRP is complete

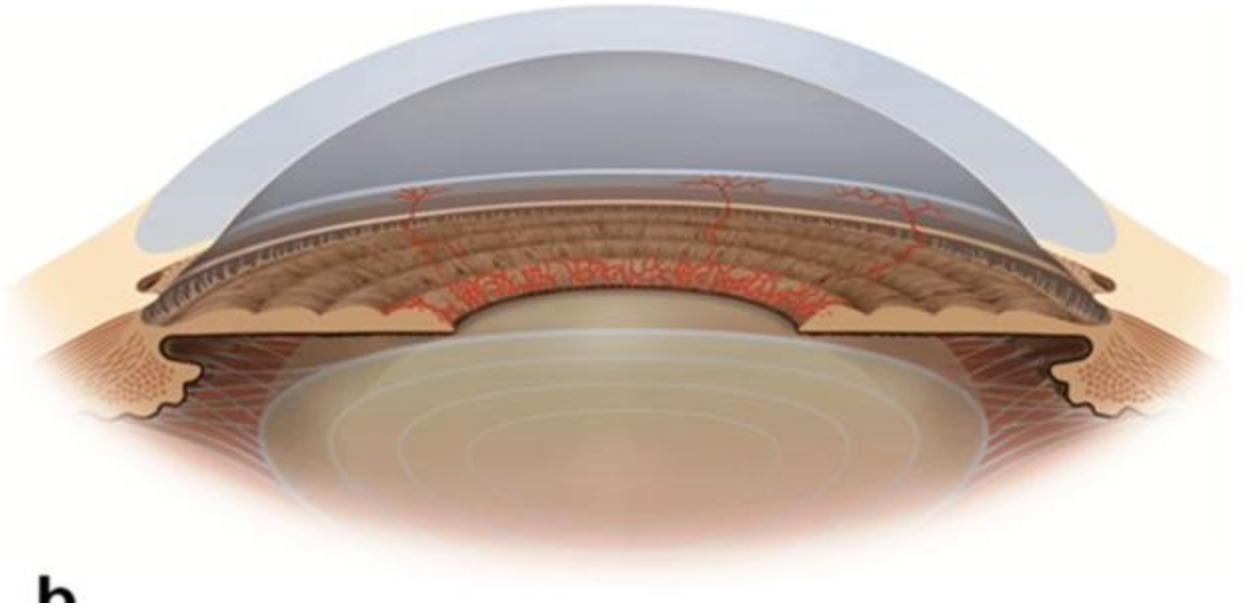
PRP

to suppress underlying neovascular drive

N/A

IOP not high

Open Angle Stage



Anti-VEGF

prompt regression of anterior segment NV, continue serial injections until PRP is complete

PRP

to suppress underlying neovascular drive

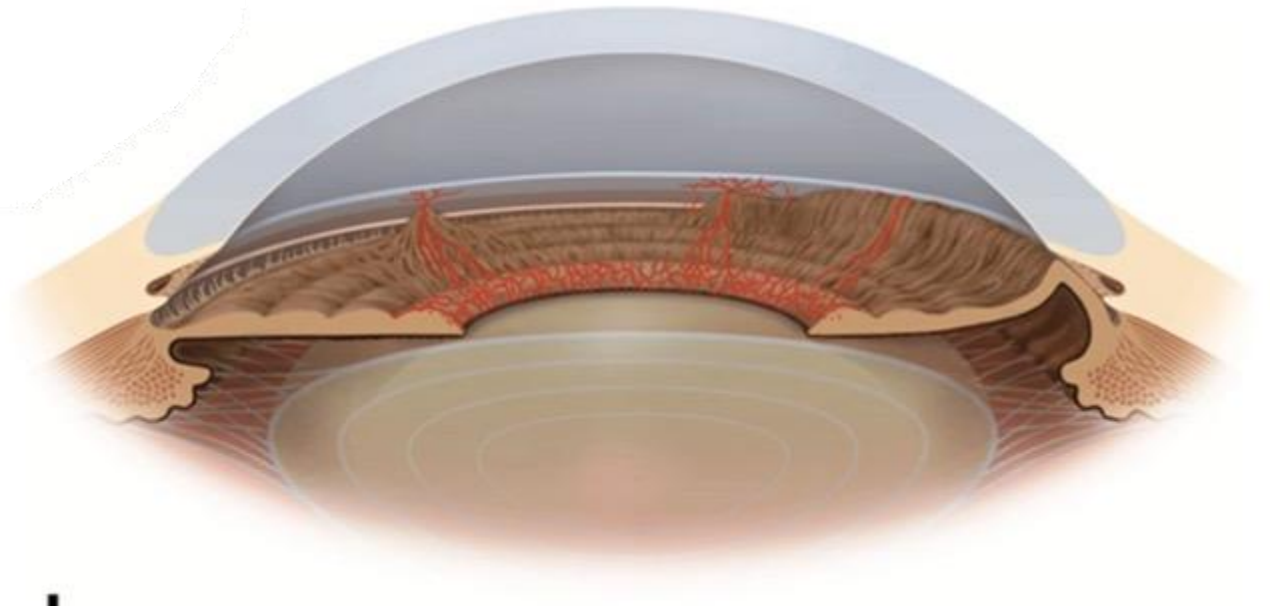
Max Meds

IOP should come down

Surgery

can likely be avoided

Partial Angle Closure Stage



Anti-VEGF

prompt regression of anterior segment NV, continue serial injections until PRP is complete

PRP

to suppress underlying neovascular drive

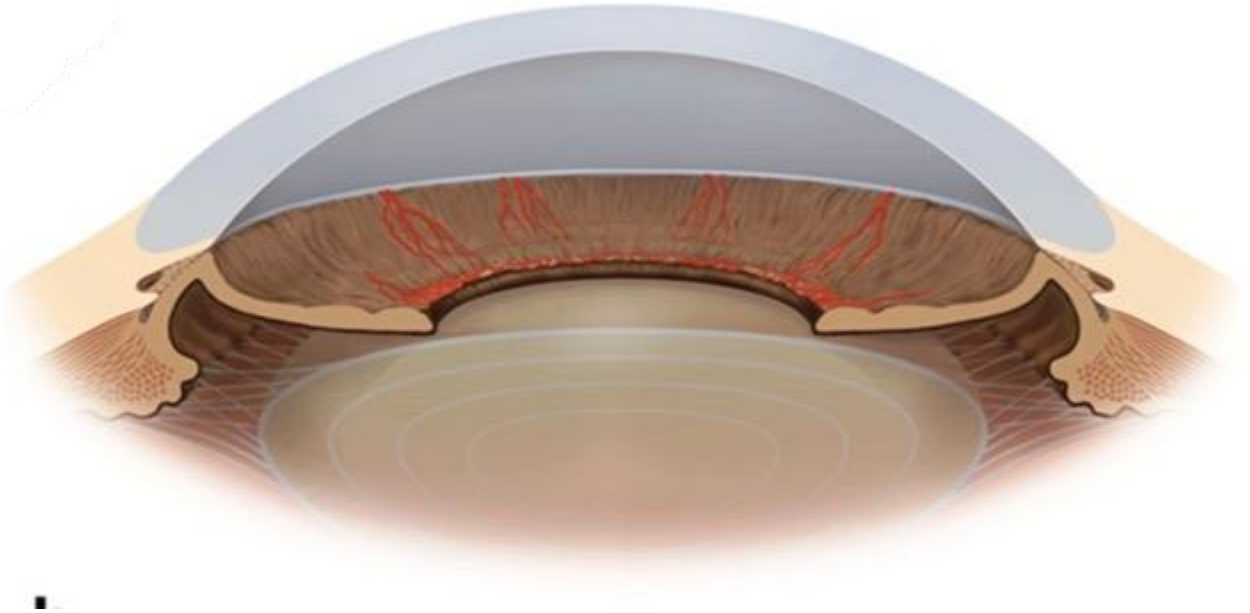
Max Meds

IOP might come down

Surgery

after ant-seg NV regresses, angle procedure if possible, phaco if possible, sulcus tube later if needed, CPC if visual potential poor

Total Angle Closure Stage



Anti-VEGF

prompt regression of anterior segment NV, continue serial injections until PRP is complete

PRP

to suppress underlying neovascular drive

Max Meds

IOP will not come down

Surgery

cannot wait until after ant-seg NV fully regresses, prompt CPC first, phaco + sulcus tube later

AT THE FOREFRONT

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Editorial

Improving Outcomes in Neovascular Glaucoma

Mary Qiu, MD - *Chicago, Illinois*
Aakriti Garg Shukla, MD - *Philadelphia, Pennsylvania*
Catherine Q. Sun, MD - *San Francisco, California*

A core obstacle to neovascular glaucoma (NVG) management and academic discussion is that it is a multidisciplinary problem where the etiology of anterior-segment neovascularization lies in the domain of retina specialists, while the resultant elevated intraocular pressure (IOP) lies in the domain of glaucoma specialists. Diagnosis of NVG is also often delayed, and patients may have already sustained permanent vision loss by the time of presentation. Furthermore, the patients at highest risk of developing NVG are often the most vulnerable in our medical system. To address the barriers to improved outcomes in NVG, multidisciplinary discussions in ophthalmology are needed around the following topics: (1) standardizing the definition and staging of NVG; (2) detecting anterior-segment neovascularization earlier; (3) increasing evidence-based research to improve outcomes; (4) determining the optimal multidisciplinary treatment approach; and (5) increasing patient adherence to treatment. We propose solutions to help address the barriers to improved outcomes.

The ophthalmology community should work synergistically across specialties and with patients to surmount barriers to optimal NVG care.

Standardizing the Definition and Staging of Neovascular Glaucoma

The commonly used definition of NVG is anterior-segment neovascularization (neovascularization of the iris [NVI] or neovascularization of the angle [NVA]) with elevated IOP with or without glaucomatous optic neuropathy. We believe elevated IOP and the presence of peripheral anterior synechiae should be used to classify NVG. The presence of glaucomatous optic neuropathy could be considered in the definition, but it can be difficult to assess during the acute presentation. Consensus panels are needed to define a new NVG classification system, which would help risk stratify patients, determine whether interventions should be tailored to disease stage, and prevent long-term sequelae.

Earlier Detection of Anterior-Segment Neovascularization

The diagnosis of NVG is often delayed because of an asymptomatic early disease course and presentation only when elevated IOP causes pain and decreased vision. A retrospective review found that 25% of eyes presenting with NVI/NVA and IOP < 21 mmHg progressed to NVG, with the majority progressing by 6 months.[1] As such, there is a window of opportunity for improved outcomes if these high-risk patients with normal IOP are identified earlier. Unfortunately, gonioscopy is not performed in all high-risk patients to detect early NVI/NVA. The findings of NVA or peripheral anterior synechiae may be challenging to detect for providers who do not frequently perform gonioscopy. In addition, undilated examination of the iris and angle may not be feasible for all ophthalmology clinic workflows. Early NVI/NVA detection could involve the aid of diagnostic tests such as anterior-segment photographs, iris or gonioscopic angiography,[2–4] and noninvasive anterior-segment OCT angiography (OCTA).[5,6] Although these diagnostic tests have been described in the literature, additional evaluation of their efficacy and utility is needed. One key question that needs to be addressed is the duration between subclinical presentation (NVI/NVA detected on angiography or OCTA) to clinical presentation of NVG.

Additional Evidence-Based Research Needed

Several key areas require further investigation, including choice of treatment for proliferative retinal conditions (anti-vascular endothelial growth factor [VEGF], panretinal photocoagulation [PRP], or both) before and after the development of NVG, as well as the choice of IOP-lowering procedure. The Diabetic Retinopathy Clinical Research Network Protocol S study reported no difference in development of NVG in patients with proliferative diabetic retinopathy (PDR), but it may not have been sufficiently powered to detect minor differences (0%–2%) in NVG incidence after PDR treatment.[7] A retrospective cohort study suggested that the long-lasting effect of PRP may lead to better outcomes than anti-VEGF alone for long-term prevention of anterior-segment neovascularization in patients with PDR at risk of loss to follow-up or rapid disease progression.[8] Likewise, updated guidelines are needed for patients with central retinal vein occlusion (CRVO) in the anti-VEGF era because the American Academy of Ophthalmology's (AAO) Preferred Practice Pattern (PPP) guidelines are largely based on evidence derived from studies conducted before the use of anti-VEGF.[9] With the increasing use of anti-VEGF for macular edema in CRVO, patients are at risk for developing NVG well beyond the historical 90-day time frame and need continual monitoring.[10] More work is needed to determine whether a combination of anti-VEGF and prophylactic PRP can prevent NVG in CRVO eyes and to elucidate the optimal frequency and duration of follow-up to detect early

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anterior-segment neovascularization in high-risk patients with CRVO.

Regarding the role of anti-VEGF and PRP after NVG has already developed, the AAO PPP for diabetic retinopathy recommends prompt PRP for high-risk PDR, which includes the presence of anterior-segment neovascularization,[11] and the AAO PPP for CRVO recommends PRP when NVI is present.[9] In a retrospective review of 217 treatment-naïve NVG eyes with light perception or better vision at presentation, receiving at least 1 anti-VEGF injection or PRP session within 1 week of presentation was associated with 20/200 or better vision at 6 months.[1] A few single-center comparative studies suggest that a combination of anti-VEGF and PRP should be given to patients with NVG likely due to the rapid onset of action after anti-VEGF injections compared with PRP.[12,13] As such, it has been proposed that a combination of anti-VEGF and early PRP within 4 weeks of anti-VEGF injection has a promising role for treating high-risk PDR without clinically significant macular edema.[14] Further multicenter prospective research is needed in this area.

Regarding the choice of IOP-lowering procedure after NVG has developed, there have been no published randomized controlled trials to date enrolling only NVG eyes, and data from small to medium-sized retrospective and prospective studies comparing surgical outcomes of trabeculectomy, aqueous shunts, and cyclophotocoagulation in NVG eyes have been equivocal.[15,16] Most studies on IOP-lowering interventions for NVG pool all etiologies of NVG, but the etiology of NVG may affect prognosis and outcome. For example, RVO has been shown to be a risk factor for worse visual prognosis in NVG studies.[1,17,18] Studying NVG outcomes stratified by etiology has been challenging because NVG is a relatively rare disease. Electronic health records and larger databases may be potential avenues for future research.

Improving the Multidisciplinary Treatment Approach

Multidisciplinary treatment models should be reformed to provide streamlined care with a commitment from the patient, glaucoma specialist, and retinal specialist. There is limited evidence regarding current practice patterns for NVG in retina and glaucoma clinics. A lone 2016 survey of glaucoma and retinal specialists found that most providers agreed that anti-VEGF injections should be included in the initial management of NVG given its rapid onset of action, and that stabilized patients should receive PRP, but there was no consensus regarding how to combine glaucoma and retinal interventions or how to manage patients after the initial acute phase.[19] To improve outcomes, a paradigm shift is needed to develop a standardized multidisciplinary treatment protocol for NVG. Consensus panels including both retina and glaucoma specialists are needed to mitigate discrepancies in NVG management and develop care paths for more effective and efficient care delivery. A prospective interventional study from Peking University enrolled 51 eyes with NVG and implemented a comprehensive treatment strategy for NVG.[20] All eyes received immediate intravitreal anti-VEGF upon NVG diagnosis, and anti-VEGF injections were continued monthly until full PRP could be completed; trabeculectomy was the primary IOP-lowering procedure, and cataract surgery or vitrectomy was performed as needed. Overall, 100% of eyes that completed the treatment protocol had regression of anterior-segment neovascularization, 93% had stable or improved vision, and 87% had IOP ≤ 21 mmHg up to postoperative month 6. This study, which was performed between 2010 and 2012 (during the anti-VEGF era), highlights the favorable clinical outcomes that can be achieved with close collaboration between glaucoma and retinal specialists who share the patient-centric goal of preserving visual function by controlling the IOP and suppressing the underlying ischemic drive.

Patient Adherence to Treatment

Adherence has been a subject of long-standing interest in patients with glaucoma and retinal conditions, because treatment success requires long-term engagement from the patient. Because complex multidisciplinary care is required to adequately manage NVG, it is important that patients understand the underlying etiology of their NVG and ophthalmic manifestations. However, extensive physician-led patient counseling may not be an option given time constraints in most ophthalmology clinics, so other providers on the care team may need to play a central role in offering patient education.[21]

In conclusion, the detection and management of NVG have substantial room for improvement. Although recent advancements in retinal and glaucoma treatment have increased therapeutic options, guidelines for the care of patients with NVG have not evolved. The ophthalmology community should work synergistically across specialties and with patients to surmount barriers to optimal NVG care.

Footnotes and Disclosures

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All authors have completed and submitted the ICMJE disclosures form.

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Case Report

Neovascular Glaucoma from Ocular Ischemic Syndrome Treated with Serial Monthly Intravitreal Bevacizumab and Panretinal Photocoagulation: A Case Report

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Purpose. To describe a case of open-angle neovascular glaucoma (NVG) secondary to ocular ischemic syndrome (OIS) treated with a planned series of 6 monthly anti-VEGF injections with interspersed panretinal photocoagulation (PRP) sessions. We term this treatment protocol the Salvaging Conventional Outflow Pathway in Neovascular Glaucoma (SCOPING) Protocol, and this is our (MQ and DS) standard of care for all NVG patients presenting with partially or completely open angles. *Case*. A 66-year-old man's right eye had a visual acuity of 20/50, intraocular pressure (IOP) of 42 mmHg on 0 IOP-lowering medications, and neovascularization of the iris and angle with no peripheral anterior synechiae. Fundoscopy revealed midperipheral dot-blot hemorrhages without diabetic retinopathy or vein occlusion. Fluorescein angiography revealed peripheral retinal nonperfusion in both eyes. The patient was diagnosed with open-angle NVG secondary to OIS and treated with 6 serial monthly anti-VEGF injections interspersed with 4 PRP sessions, after which his anterior segment neovascularization regressed and IOP normalized on 0 medications. Ten weeks after the last injection, the anterior segment neovascularization and elevated IOP recurred, so he underwent 4 more monthly anti-VEGF injections and 4 PRP sessions, after which his anterior segment neovascularization regressed and his IOP normalized on 0 medications. However, 6 weeks after the last injection, the anterior segment neovascularization and elevated IOP again recurred, so he was resumed on a third course of lifetime monthly anti-VEGF injections, which may be continued in perpetuity. *Conclusion*. The patient's NVG was quiescent while under the protection of serial anti-VEGF injections with interspersed PRP; however, the disease recurred each time injections were stopped. Therefore, in patients with open-angle NVG secondary to OIS, serial monthly anti-VEGF injections may be necessary combined with PRP to suppress underlying neovascular drive and regress anterior segment neovascularization, maintain physiologic IOP, and prevent synechial angle closure.

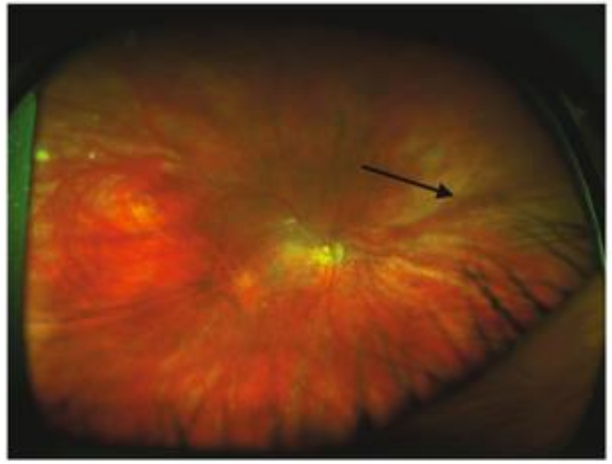

FIGURE 1: Optos fundus photo shows midperipheral retinal hemorrhages in the right eye.

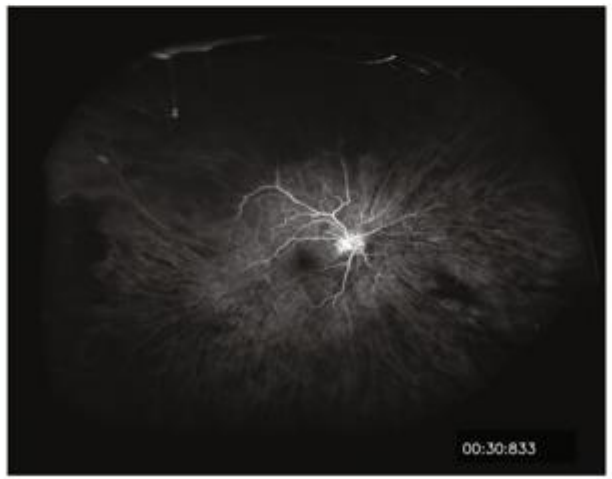

FIGURE 2: Fluorescein angiography at 30 seconds shows peripheral nonperfusion and prolonged filling time.

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Gonioscopy-assisted transluminal trabeculotomy in neovascular glaucoma: Salvaging the conventional outflow pathway

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ARTICLE INFO

Keywords:
Neovascular glaucoma
Gonioscopy-assisted transluminal trabeculotomy
Peripheral anterior synechiae

ABSTRACT

Purpose: To report a case of acute neovascular glaucoma with partial synechial angle closure secondary to central retinal vein occlusion that underwent gonioscopy-assisted transluminal trabeculotomy as well as near-monthly anti-vascular endothelial growth factor (VEGF) injections and panretinal photocoagulation (PRP) treatments.

Observations: Nine months after GATT, the patient had achieved intraocular pressure control on no medications. However, she was lost to follow up for 4 months and received no anti-VEGF or PRP during that time; she re-presented with acute NVG and complete synechial closure, and ultimately underwent aqueous shunt implantation.

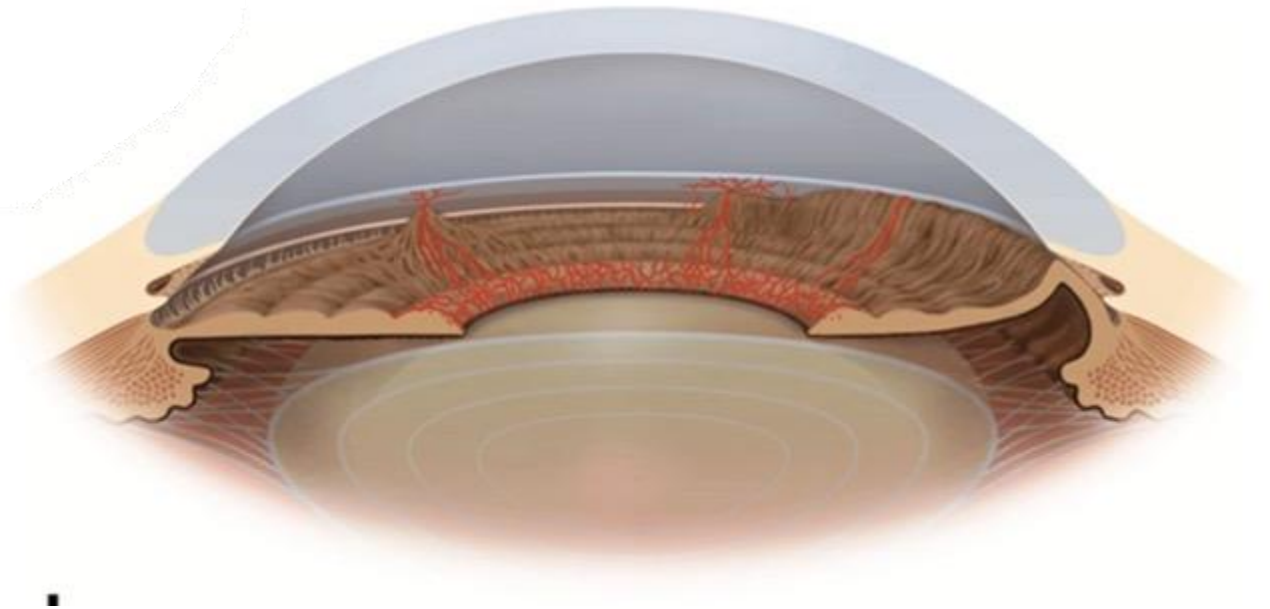
Conclusions and Importance: To our knowledge, this is the first reported attempt of an *ab interno* angle surgery to successfully restore aqueous outflow through the conventional outflow pathway in an eye with acute NVG and partial synechial angle closure. We posit that this can be an effective approach to achieve IOP control in NVG with at least partially open angles, as long as sufficient anti-neovascular treatments are administered until the underlying neovascular drive achieves quiescence.

Case A

- 57 yo pseudophakic woman presented to ER
- Worsening vision x 3 weeks and 2 days eye pain, headache, nausea
- NVG OS 2/2 CRVO

- VA HM
- IOP 45 (came down to 34 with MMT)
- Active NVI & NVA, **50% PAS**
- Retina flat, no prior PRP

Partial Angle Closure Stage



Anti-VEGF

prompt regression of anterior segment NV, continue serial injections until PRP is complete

PRP

to suppress underlying neovascular drive

Max Meds

IOP might come down

Surgery

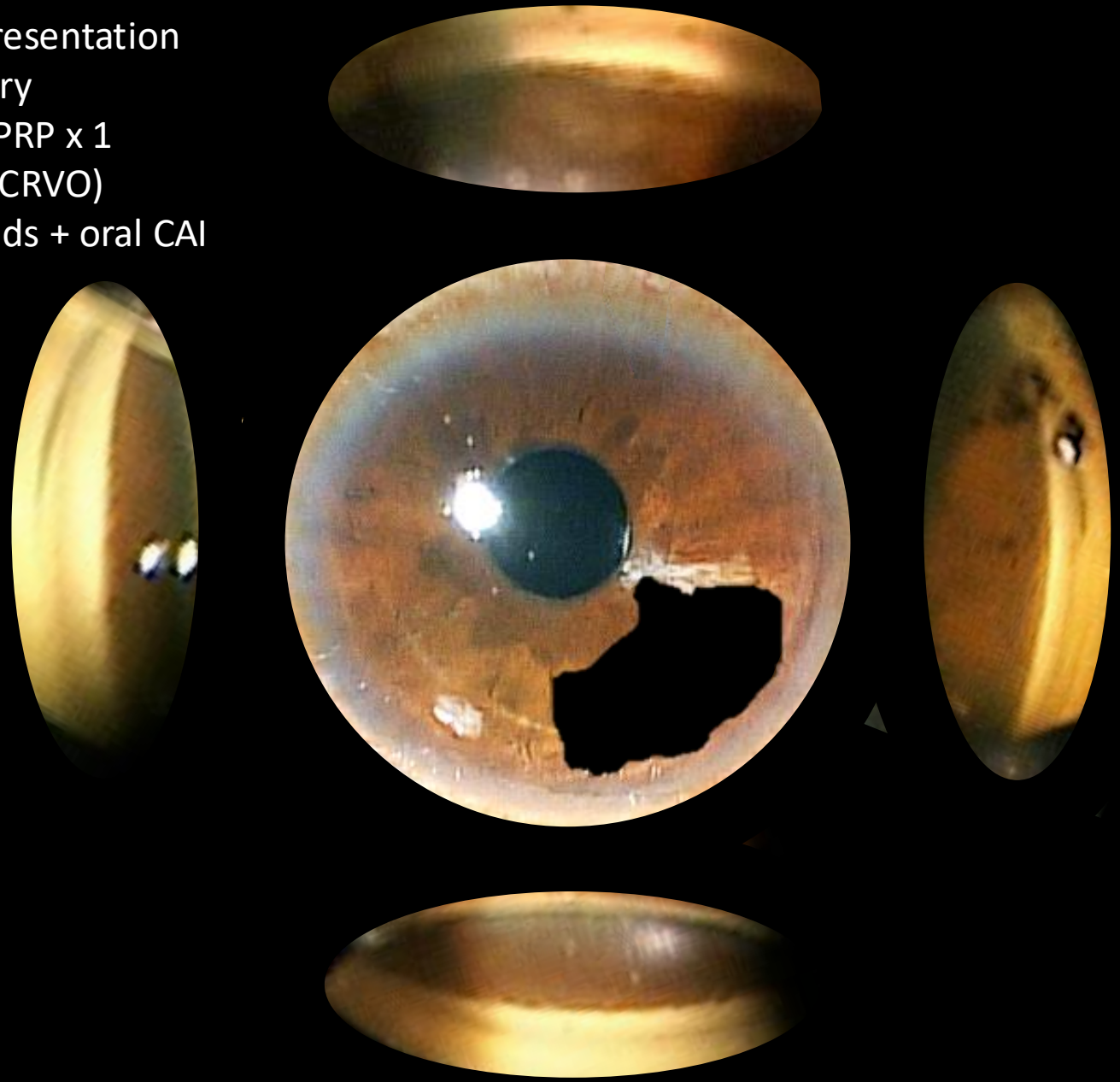
after ant-seg NV regresses, angle procedure if possible, phaco if possible, sulcus tube later if needed, CPC if visual potential poor

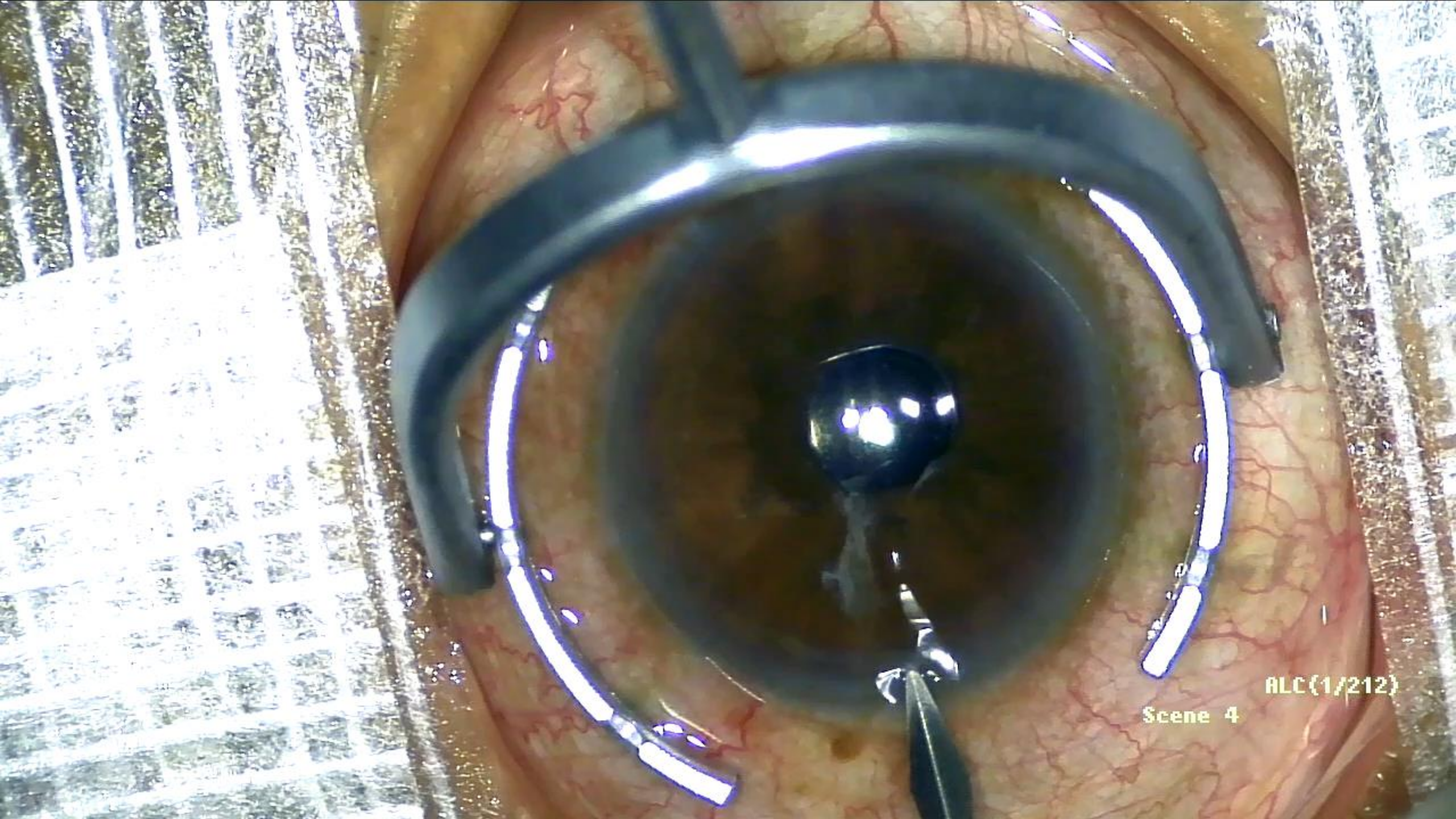
Case A

- Anti-VEGF & AC tap
- Max meds
- PRP 10 days later
- NVI/NVA regressed, IOP controlled on max meds

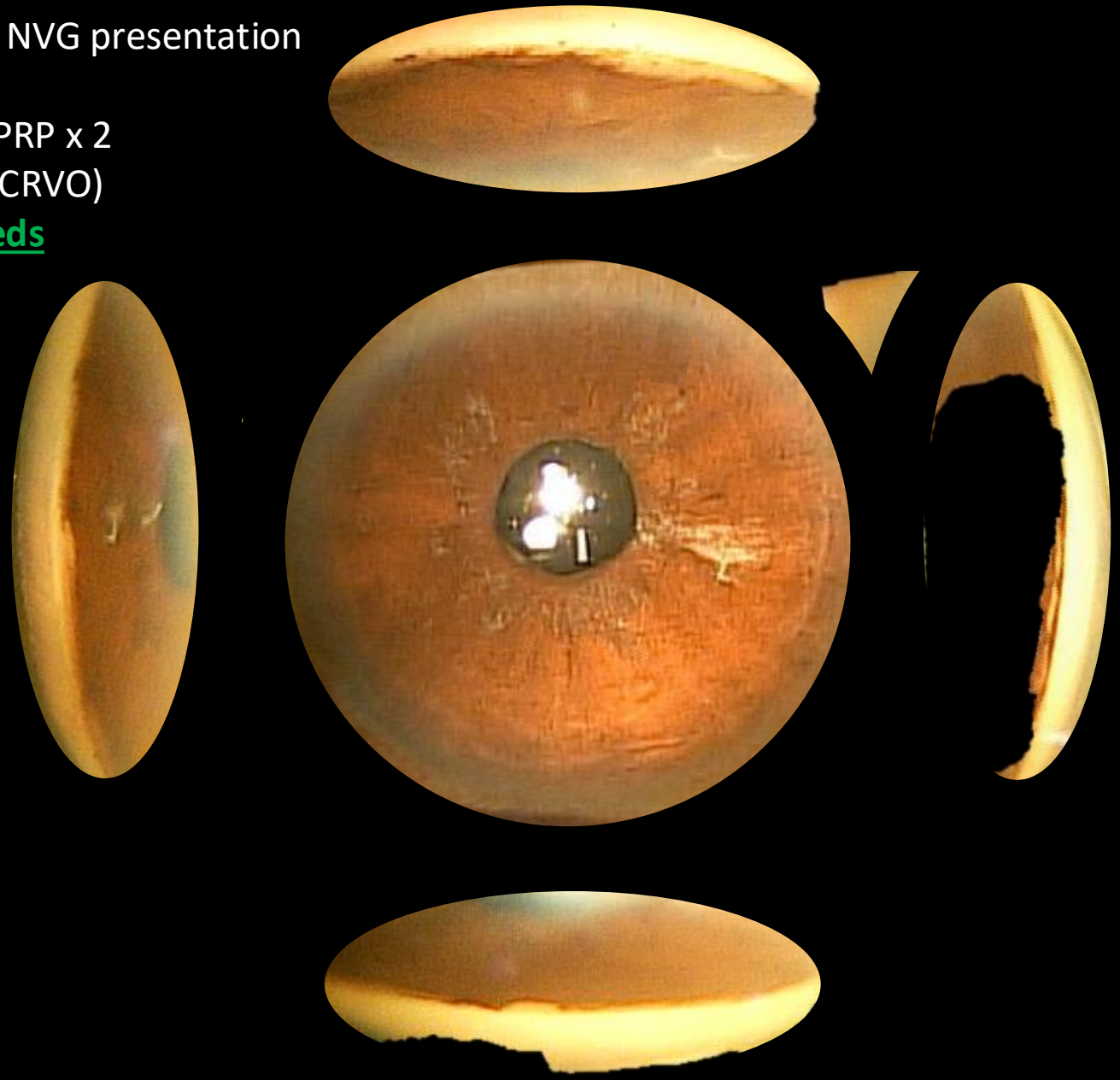
- 1 month later
- VA 20/200 (limited by CRVO)
- IOP 22mmHg on 5 meds + oral CAI

2 months after NVG presentation
No IOP-lowering surgery
s/p anti-VEGF x 2 and PRP x 1
VA 20/200 (limited by CRVO)
IOP **35 mmHg** on 5 meds + oral CAI




ALC(1/212)
Scene 4

11 months after acute NVG presentation
9 months after GATT
s/p anti-VEGF x 8 and PRP x 2
VA 20/200 (limited by CRVO)
IOP 16 mmHg on 0 meds



Clinical Ophthalmology

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ORIGINAL RESEARCH

SCOPING: A Multidisciplinary Treatment Protocol for Neovascular Glaucoma with Completely Open or Partially Open Angles

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Introduction: A standardized multidisciplinary treatment protocol for NVG was developed in 2020 at the University of Chicago and has been termed Salvaging the Conventional Outflow Pathway in Neovascular Glaucoma (SCOPING). We describe 9 eyes with anterior segment neovascularization and at least partially open angles that underwent the SCOPING protocol to suppress the underlying neovascular drive, control intraocular pressure, and medically or surgically salvage the angle whenever possible.

Methods: Nine eyes from 8 patients with first-time anterior segment neovascularization, at least partially open angles, and normal or elevated IOP were treated with 6 serial monthly intravitreal bevacizumab injections interspersed with pan-retinal photocoagulation.

Results: Five eyes with completely open angles without any peripheral anterior synechiae and each achieved and/or maintained physiologic IOP without requiring surgery. The other 4 eyes presented with partially open angles. Three out of these 4 eyes required subsequent IOP-lowering surgery. None of the 9 eyes developed recurrence of anterior segment neovascularization during the treatment protocol.

Discussion: This protocol may be utilized to salvage the conventional outflow pathway for patients with partially or completely open angles. The etiology and diagnosis of neovascular glaucoma have been established. Current treatment strategies include reduction of neovascular drive including panretinal photocoagulation, intravitreal injections, intraocular pressure lowering medications, and filtration surgery. However, a protocol has not been developed to treat neovascular glaucoma (NVG). Our SCOPING protocol may be helpful for glaucoma specialists in treating patients with neovascular glaucoma.

Keywords: neovascular glaucoma, micro invasive glaucoma surgeries, anti-vascular endothelial growth factor, pan-retinal photocoagulation

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Case Series

Cyclophotocoagulation in Neovascular Glaucoma with Near-Total Synechial Angle Closure

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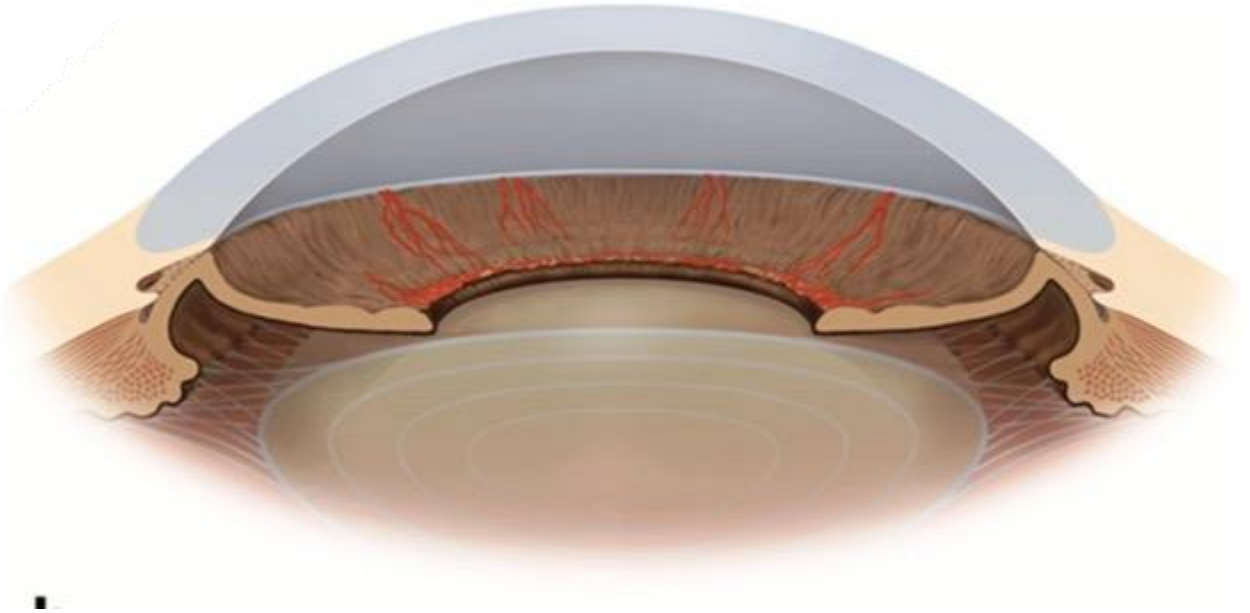
Objective. To describe a single surgeon's experience utilizing prompt primary slow-burn transscleral cyclophotocoagulation (CPC) with prior or concurrent anti-VEGF and subsequent aqueous shunt as needed in NVG eyes with near-total synechial angle closure at presentation. *Methods*. Retrospective chart review of all NVG patients with uncontrolled IOP, active anterior segment NV, near-total synechial angle closure, and no contraindications to prompt anti-VEGF who received CPC within 3 days of presentation with at least 6 months of follow-up. *Results*. Eight patients with mean age 60.6 years were included. Underlying etiologies were CRVO ($N = 3$), PDR ($N = 2$), CRAO ($N = 1$), BRVO ($N = 1$), and chronic RD ($N = 1$). All eyes underwent CPC with intravitreal anti-VEGF within 3 days of presentation. Five patients did not require subsequent aqueous shunts through a mean follow-up of 15 months; most recent visual acuities ranged from 20/40 to LP, and IOPs ranged from 5 to 11 mmHg on 0 to 3 IOP-lowering medications. Three patients who required subsequent tubes had complete regression of active anterior segment NV at the time of surgery. Most recent visual acuities ranged from 20/100 to 20/125, and IOPs ranged from 8 to 14 mmHg on 0 meds at a mean follow-up of 10 months. No eyes developed uncontrolled inflammation, sympathetic ophthalmia, or phthisis. *Conclusion*. Prompt primary slow-burn CPC with prior or concurrent anti-VEGF may be an effective strategy to immediately lower IOP in acute NVG eyes with active anterior segment NV and near-total synechial angle closure. If IOP becomes uncontrolled later, an aqueous shunt can be implanted in a controlled setting after active anterior segment NV has regressed.

Case B

- 59 yo phakic man presented to outside eye clinic
- Hx CRVO 2 years ago, s/p multiple injections and PRP x 1
- Worsening vision and dull ache x 1 month
- NVG OS 2/2 CRVO

- VA CF
- IOP 52 (did not come down with MMT)
- Active NVI & NVA, **100% PAS**
- Retina flat, prior light PRP, room for fill-in

Total Angle Closure Stage



Anti-VEGF

prompt regression of anterior segment NV, continue serial injections until PRP is complete

PRP

to suppress underlying neovascular drive

Max Meds

IOP will not come down

Surgery

cannot wait until after ant-seg NV fully regresses, prompt CPC first, phaco + sulcus tube later

Case

- CPC 1 day later
- 1250-1400 mw x 4 seconds x 20 spots
- Peribulbar dex 10mg
- Pred Q2H, very slow taper

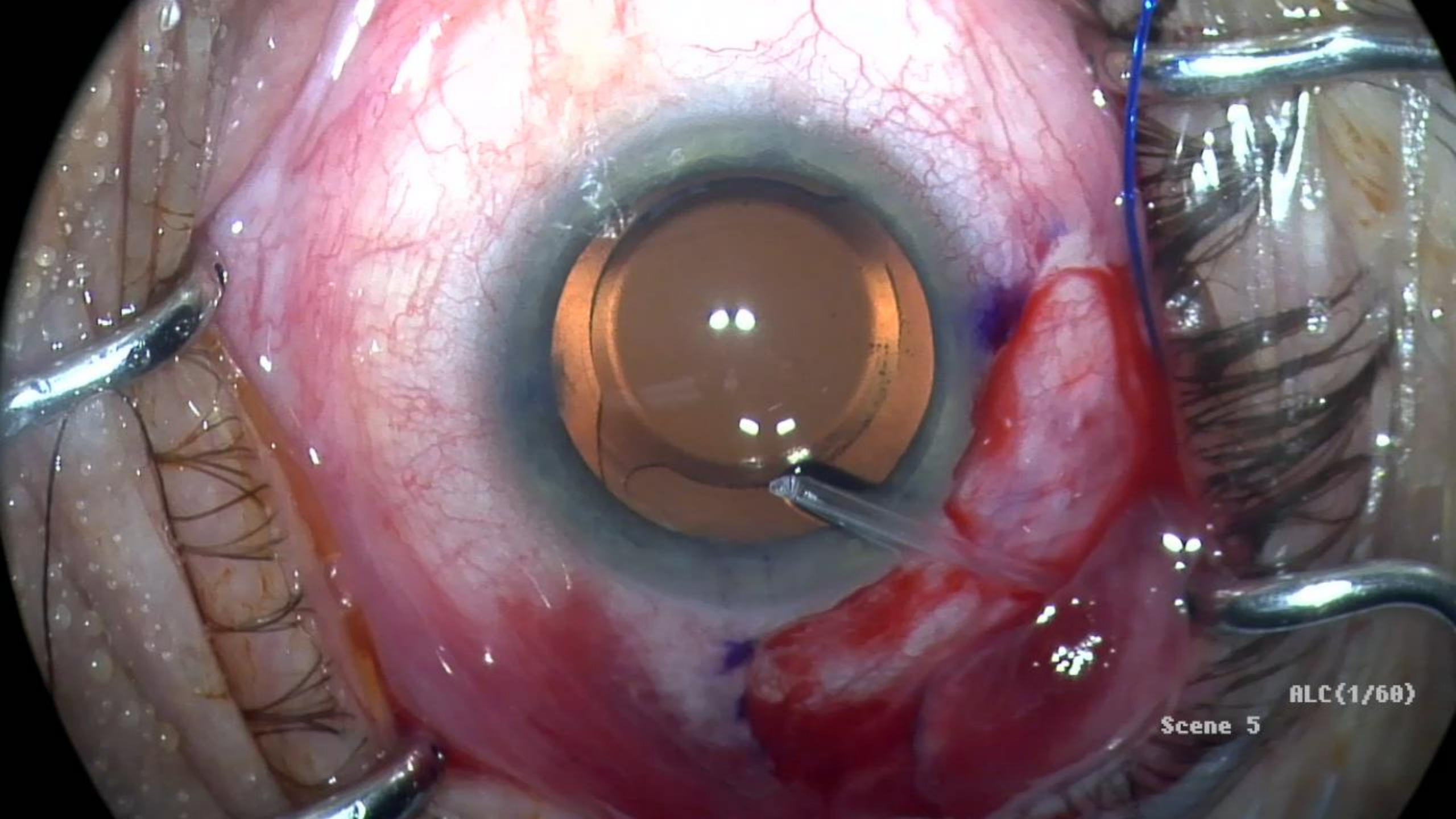
- 1 week later, fill-in PRP
- 1 month later, anti-VEGF in case of future staged phaco + tube
- 2 months later, fill-in PRP
- 3 months later, anti-VEGF in case of future staged phaco + tube
- 4 months later, anti-VEGF in case of future staged phaco + tube

Case

- 5 months later

- VA still CF
- IOP 31 on 4 meds
- NVI/NVA regressed, still **100% PAS**

- Phaco + BGI-350 in sulcus (with 3-0 Prolene ripcord)


ALC(1/60)
Scene 5

Case

- POW6
- VA still CF, IOP 6 mmHg on 4 meds
- Fluid over the plate, ligature dissolved on schedule
- AC deep, 4+ cell with fibrin tracking to tube tip, not obstructed
- Keep ripcord in place, increase steroids, stop IOP drops

- POM9
- VA still CF, IOP 7 on 2 meds
- Ripcord has not been removed
- AC deep & quiet, tube in good position in sulcus
- Retina quiescent

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Video

Predictors of anterior chamber angle status at the time of neovascular glaucoma diagnosis

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Keywords:
Neovascular glaucoma
Anterior chamber angle
Peripheral anterior synechiae

ABSTRACT

Purpose: To identify clinical features which may predict the angle status of a large cohort of NVG eyes at the time of diagnosis.

Observations: Chart review was performed for all NVG eyes from 2010 to 2022. Complete angle closure was defined as having >75 % PAS, partial angle closure as having 1–75 % PAS, and open angles as having 0 % PAS. Among 190 eyes (174 patients) with a diagnosis of NVG, 29 eyes (28 patients) had a prior NVG diagnosis and 32 eyes (31 patients) did not undergo gonioscopy; 129 eyes (115 patients, mean 65.5 years, 50 % women) had a gonioscopy documented at the time of diagnosis. There were 32 eyes (25 %) with open angles, 39 eyes (30 %) with partially closed angles, and 58 eyes (45 %) with completely closed angles. Mean BCVAs were 20/138 (logMar 0.84, CI = 0.78–0.90), 20/662 (logMar 1.52, CI = 1.41–1.62), and 20/4375 (logMar 2.34, CI = 2.17–2.51), respectively ($p < 0.05$). The mean presenting IOP was 31 mmHg, 40 mmHg, and 59 mmHg, and the proportion of eyes that were phakic were 47 %, 46 %, and 67 %, respectively. The proportion of eyes presenting to the emergency room were 6 %, 21 %, and 26 %, respectively.

Conclusions and importance: Among NVG eyes with a documented initial gonioscopy, nearly half had total synechial closure. While eyes with increasing degrees of angle closure trended towards worse vision and higher IOP, these clinical characteristics are not perfectly predictive of angle anatomy and should not replace gonioscopy. Eyes with closed angles trended towards being phakic, presenting to the emergency department (ED), having undergone prior panretinal photocoagulation (PRP), and belonging to new patients.

	OPEN ANGLE (N=32, 24.8%)	PARTIALLY CLOSED (N=39, 30.2%)	COMPLETELY CLOSED (N=58, 45.0%)
MEAN AGE (yrs)	67.5 (SD 10.9)	67.4 (SD 15.2)	63.1 (SD 14.8)
GENDER			
Male	15 (46.9%)	20 (51.3%)	30 (51.7%)
Female	17 (53.1%)	19 (48.7%)	28 (48.3%)
RACE			
AA	17 (53.1%)	28 (71.8%)	40 (69.0%)
White	15 (46.9%)	10 (25.6%)	16 (27.6%)
Other	0 (0%)	1 (2.6%)	2 (3.4%)
ETIOLOGY			
PDR	19 (59.4%)	20 (51.3%)	29 (50.0%)
RVO	7 (21.9%)	13 (33.3%)	18 (31.0%)
RD	1 (3.1%)	3 (7.7%)	5 (8.6%)
RAO	1 (3.1%)	1 (2.6%)	6 (10.3%)
OIS	1 (3.1%)	2 (5.1%)	0 (0%)
Radiation Retinopathy	1 (3.1%)	0 (0%)	0 (0%)
Idiopathic	2 (6.3%)	0 (0%)	0 (0%)
BCVA			
20/20-20/40	14 (43.8%)	8 (20.5%)	0 (0%)
20/50-20/200	8 (25.0%)	7 (17.9%)	5 (8.6%)
20/250-20/1250	4 (12.5%)	5 (12.8%)	2 (3.4%)
CF-HM	5 (15.6%)	10 (25.6%)	26 (44.8%)
LP	1 (3.1%)	8 (20.5%)	15 (25.9%)
NLP	0 (0%)	1 (2.6%)	10 (17.2%)
MEAN IOP (mmHg)	31.0 (SD 11.0)	40.3 (SD 12.9)	44.8 (SD 11.9)
MEAN # OF IOP-LOWERING MEDS	0.9 (SD 1.4)	1.3 (SD 1.7)	0.9 (SD 1.5)
NEW PT			
YES	13 (40.6%)	18 (46.2%)	32 (55.2%)
NO	19 (59.4%)	21 (53.8%)	26 (44.8%)
SETTING			
ED	2 (6.3%)	8 (20.5%)	15 (25.9%)
Clinic	30 (93.8%)	31 (79.5%)	43 (74.1%)
SYMPTOMATIC			
YES	16 (50.0%)	32 (82.1%)	56 (96.6%)
NO	16 (50.0%)	7 (17.9%)	2 (3.4%)
MICROCYSTIC EDEMA			
YES	5 (15.6%)	13 (33.3%)	30 (51.7%)
NO	27 (84.4%)	26 (66.7%)	28 (48.3%)
HYPHEMA			
YES	3 (9.4%)	7 (17.9%)	10 (17.2%)
NO	29 (90.6%)	32 (82.1%)	48 (82.8%)
LENS STATUS			
Phakic	15 (46.9%)	18 (46.2%)	39 (67.2%)
Pseudophakic	16 (50.0%)	21 (53.8%)	18 (31.0%)
Aphakic	1 (3.1%)	0 (0%)	1 (1.7%)
VITREOUS HEMORRHAGE			
YES	7 (21.9%)	4 (10.3%)	21 (36.2%)
NO	25 (78.1%)	35 (89.7%)	37 (63.8%)
PRIOR PRP			
YES	4 (12.5%)	11 (28.2%)	24 (41.4%)
NO	28 (87.5%)	28 (71.8%)	34 (58.6%)
PRIOR PPV			
YES	4 (12.5%)	6 (15.4%)	12 (20.7%)
NO	28 (87.5%)	33 (84.6%)	46 (79.3%)


Angle-Based Management of Neovascular Glaucoma:
Evaluating Surgical Strategies and Treatment
Outcomes in Open and Partially Open Angles
Jessie Wang, MD
October 19th, 2024
Duke Eye Center
THE UNIVERSITY OF CHICAGO
Department of Ophthalmology and Visual Science
UCHICAGO Medicine


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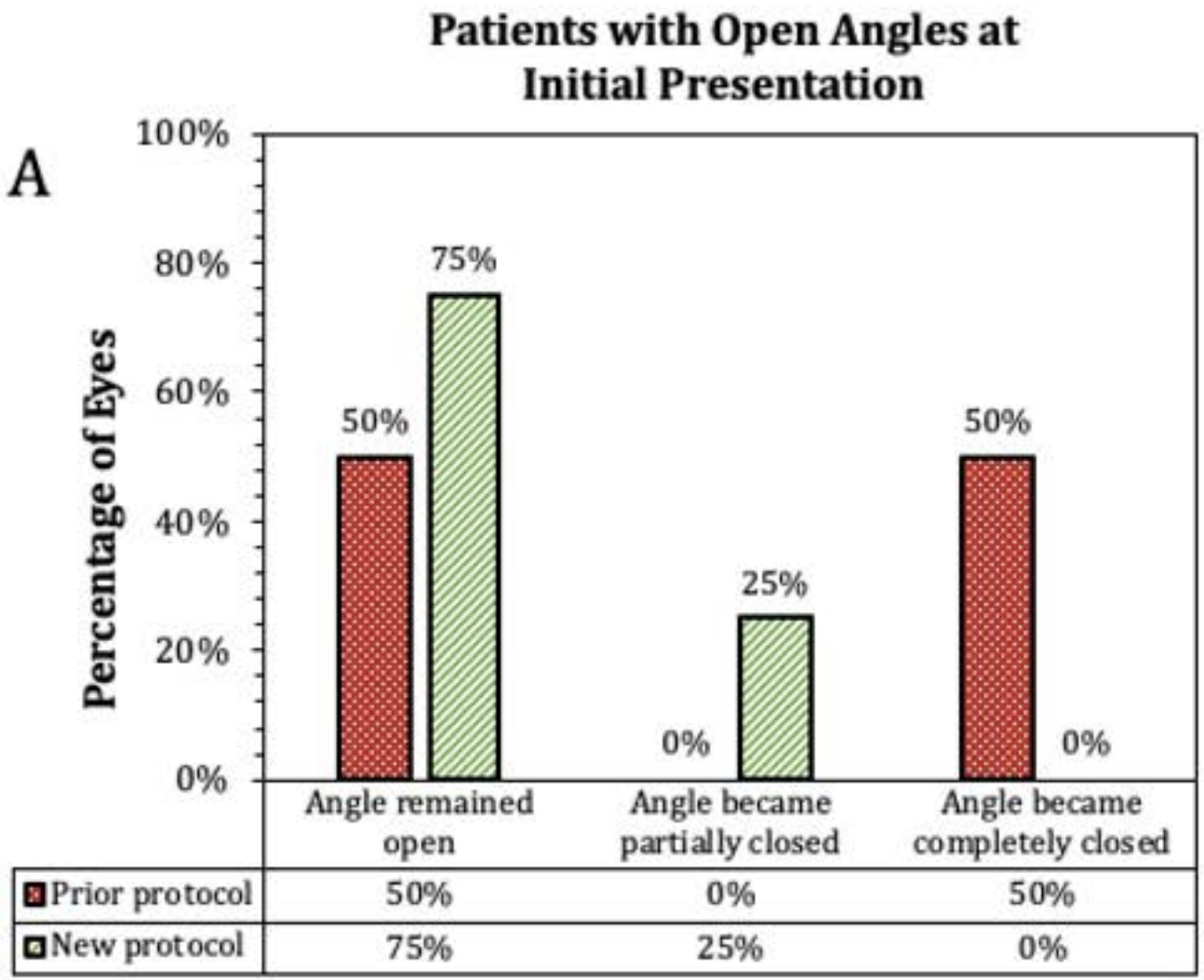
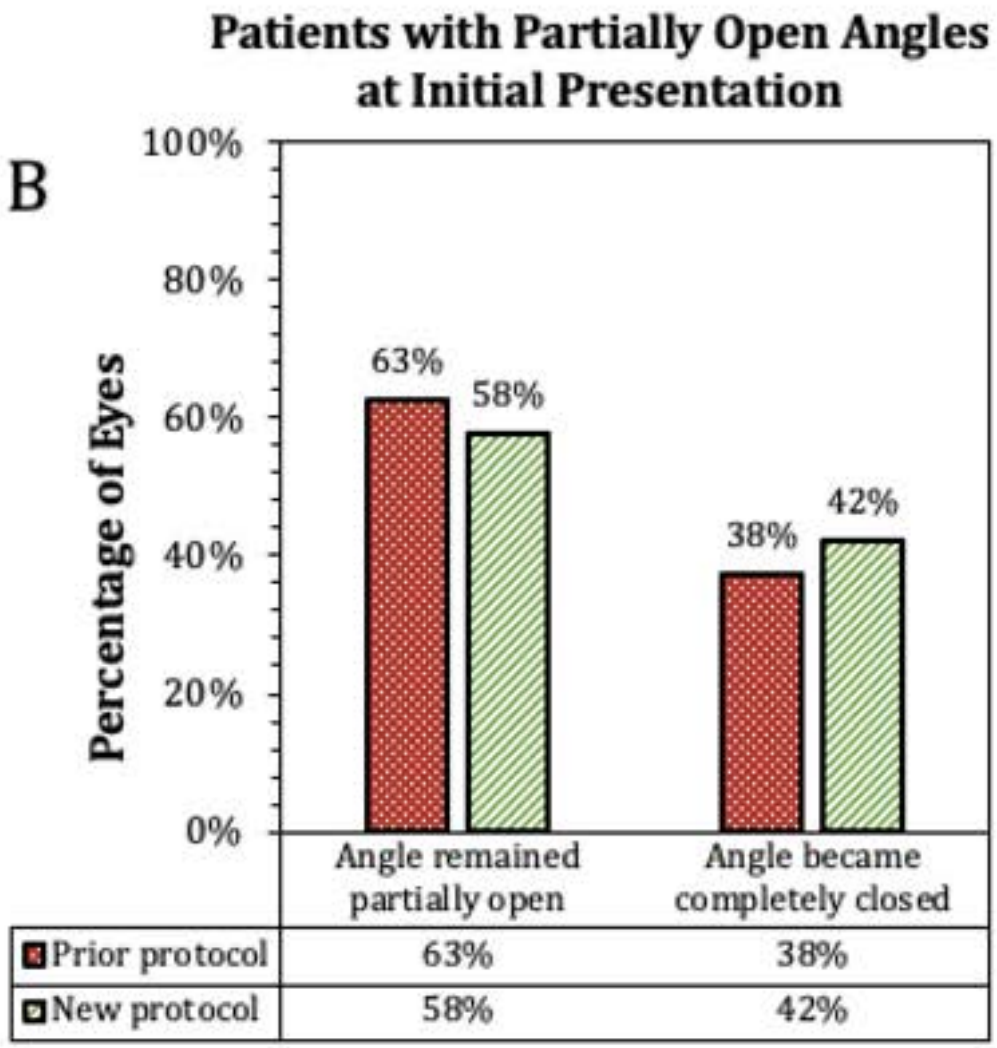
First glaucoma surgery

	Prior Protocol			SCOPING Protocol			P-value
	Open (n=5)	Partially Open (n=6)	All Eyes (n=11)	Open (n=1)	Partially Open (n=11)	All Eyes (n=12)	
First glaucoma surgery, n (%)							
Cyclodestruction (CPC/MPCPC)	3 (60.0)	5 (83.3)	**8 (72.7)**	0	4 (36.4)	**4 (33.3)**	
Tube Surgery (Ahmed/Baerveldt)	2 (40.0)	1 (16.7)	**3 (27.3)**	0	2 (18.2)	**2 (16.7)**	**0.025**
Angle Surgery (GATT/KDB)	0	0	**0**	1 (100)	5 (45.4)	**6 (50.0)**	
Additional glaucoma surgery, n (%)	1 (20.0)	2 (16.7)	3 (27.3)	1 (100)	3 (43.9)	4 (33.3)	>0.99

P-value compares all eyes of the baseline protocol with all eyes of the SCOPING protocol.

Angle status one year after NVG diagnosis





Neovascular Glaucoma (NVG)

AT THE FOREFRONT UChicagoMedicine

What is neovascular glaucoma?

Glaucoma is an eye condition that can cause blindness if not treated. It is usually caused by high pressure in the eye, which damages the nerve in the back of the eye called the optic nerve. Neovascular glaucoma is a type of glaucoma caused by abnormal blood vessel growth in the eye, leading to high eye pressure.

Normal Eye

Glaucoma

What causes neovascular glaucoma?

The most common causes of neovascular glaucoma are problems in the retina, a layer of tissue in the back of the eye, that lead to new blood vessel growth, such as a stroke in the eye ("central retinal vein occlusion") or diabetes affecting the eye ("proliferative diabetic retinopathy").

How will I k… neovascula…

Patients often d… the disease is ve… vision damage. … to have regular … pressure or new … as soon as it is …

A diseased … of the eye s… vessel growt…

The "drainag… with new blo… causes high…

Figures adapted from … of neovascular glauc… Current Concepts in …

What can we do about it?

Vision changes that occur from neovascular glaucoma are permanent. If it is identified early and treated, however, further worsening of vision can be prevented. Eye drops and procedures are used to lower the pressure in the eye in patients with glaucoma. In neovascular glaucoma, treatment must also focus on controlling and reversing the dangerous new blood vessel growth in the eye.

What is the treatment for neovascular glaucoma?

Your glaucoma doctor will work with the retina doctor to begin a treatment plan that includes both laser treatments and injections of a medication that prevents new blood vessel growth. The effect of an injection lasts for one month, while treatment with laser stops the blood vessels from growing back. Multiple injections and laser treatments are usually needed. In addition, high eye pressure is treated with eye drops, pills, and procedures. Injections may also be needed to treat swelling in the retina.

What can I expect once I begin my treatment?

You will see both your glaucoma and retina doctor regularly, and it is important to keep all of your appointments. Permanent vision loss, including blindness, can occur from either high pressure in the eye, disease in the retina, or both. Getting repeated monthly injections is important to control disease until blood vessel growth in the retina is permanently treated with laser.

Treatment Passport

Retina injection / Laser (circle one)	Glaucoma Appointment
☐ I / L ___/___/___	☐ ___/___/___
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☐ I / L ___/___/___	☐ ___/___/___
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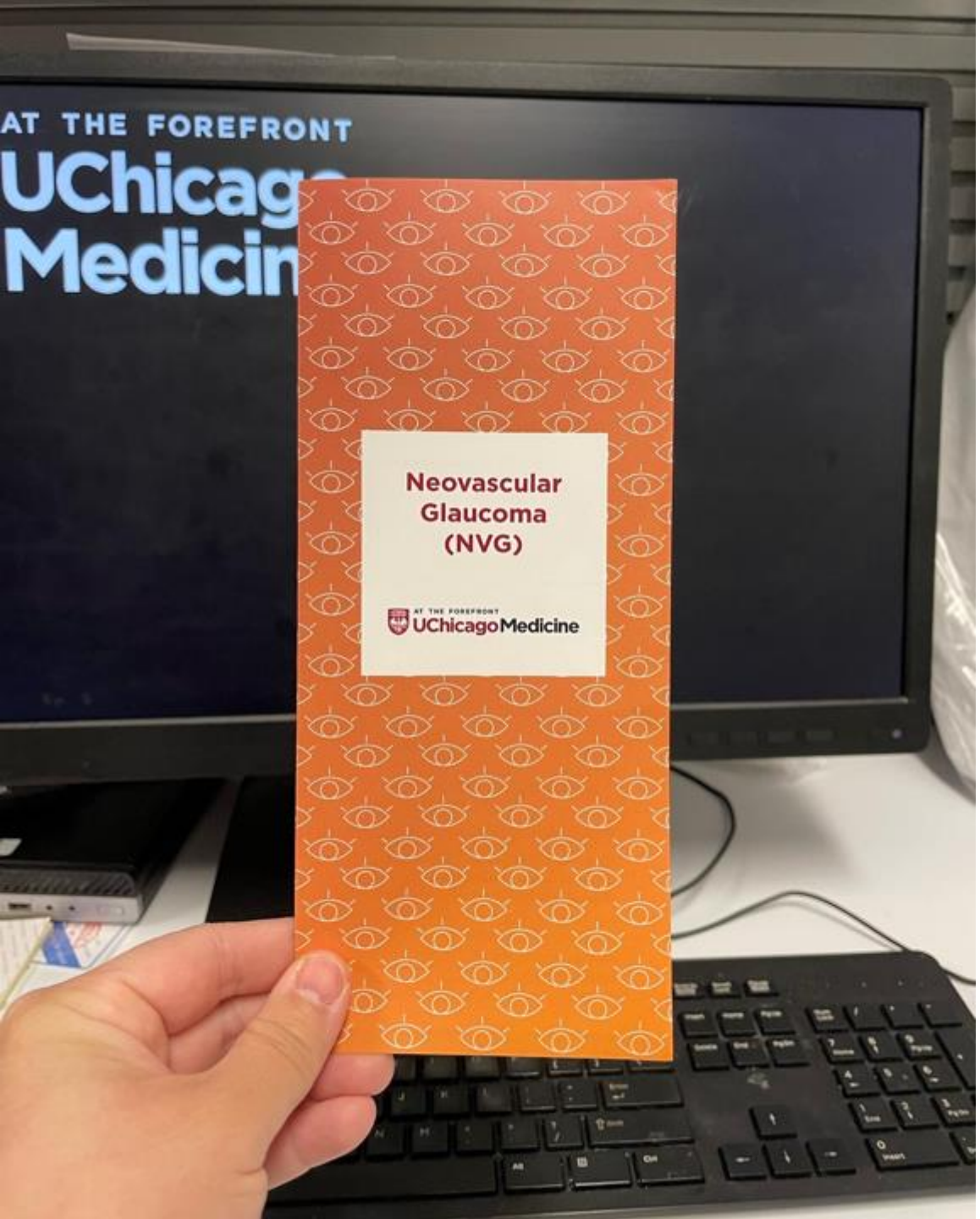


Abstract Title:
Assessing patient understanding of disease and treatment plan in neovascular glaucoma

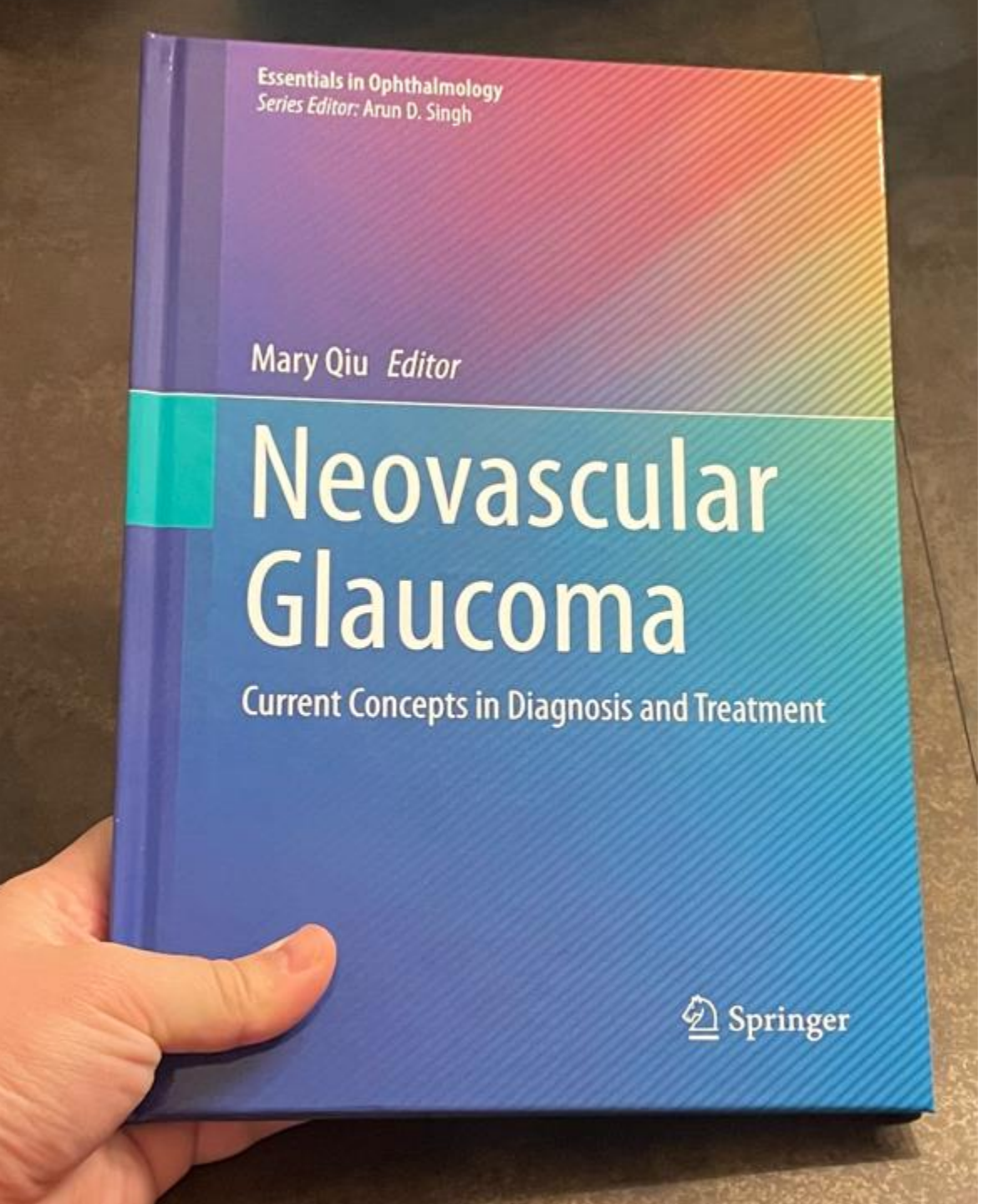
Poster Authors:
Rebecca E. Tanenbaum, M.D. and Mary Qiu, M.D.

Abstract Body:
Purpose: Assess gaps in patient understanding of neovascular glaucoma (NVG) pathogenesis and treatment, identify barriers to follow up, and provide patients with specific educational materials on NVG and its management.

Methods: Participants were identified via retrospective review of medical records of all patients with a diagnosis of NVG at the University of Chicago Department of Ophthalmology & Visual Science who were seen in the past calendar year. Participants completed a 13-question survey wherein they were asked to self-assess their level of understanding of NVG as well as answer specific questions on the treatment of NVG. Following survey administration, participants were provided with an educational pamphlet on NVG, with the opportunity to ask any questions from the survey administrator.

Results: Twenty patients completed the survey. The mean age was 58.5 years (range 26-81). Patients were using a mean of 1.85 topical or oral pressure-lowering medications (0-5), and had undergone a mean of 1.5 glaucoma procedures (0-5). All but one patient had received at least one intravitreal injection and one session of PRP in the affected eye(s). Patients had missed a mean of 4.44 appointments with the glaucoma specialist (0-15) and 4.72 appointments with the retina specialist (0-21) (one patient followed with a retina specialist elsewhere and number of missed appointments was not known). The majority of patients rated their understanding of NVG, their retinal disease, and the plan for treatment as "Somewhat well" or better (mean 75%, range 60-80). However, knowledge gaps were identified on the various treatment modalities, the relationship between retinal disease and NVG, and the importance of keeping appointments with the retina specialist for the control of their glaucoma: a mean of 38% answers were incorrect (11-64%). The main barriers to follow-up were identified as inability for a family member to miss work (26%), lack of transportation (21%), and illness or other medical needs (16%).

Conclusions: NVG is a notoriously difficult-to-treat disease whose management requires not only a high level of coordination between glaucoma and retina specialists, but also high patient compliance. In this survey, we found that perception of understanding was incongruent with genuine comprehension of key parts of the treatment plan. In addition to addressing important barriers to follow up cited by patients above, improving patient understanding by providing educational materials that target specific knowledge gaps may increase adherence to the treatment protocol.



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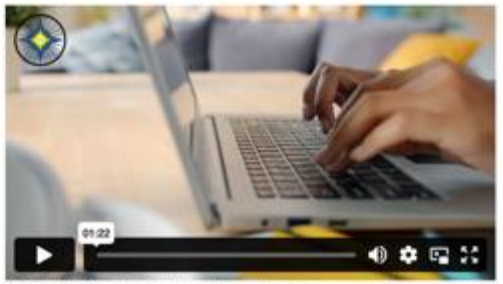
Online courses

The WGA offers free access for its members to several online courses in glaucoma.

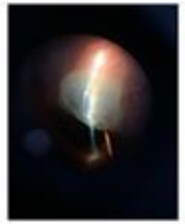
All modules were written by world-renowned experts in the field and reviewed by members of the WGA Education Committee. They are intended for ophthalmologists and other eye-care providers, and available in several languages. All texts, pictures, and videos were adapted to an online platform by a team of e-learning experts. This will allow the participant to have a pleasant learning experience. At the end of each module, there is a multiple-choice test that will auto-correct once the exam is completed. Participants can also download a Certificate of Completion.



Watch the 1-minute video to see how to access the courses in only a few clicks.

View Your Enrolled Courses

Advanced Course in Glaucoma



Managing complications of post-surgical hypotony

By Ricardo Abe and Vital Costa

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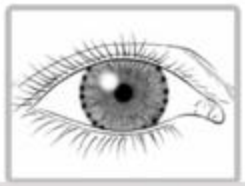

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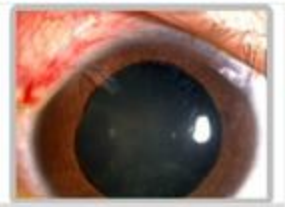

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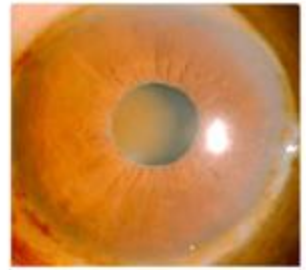

Approach to Exfoliation Syndrome and Exfoliation Glaucoma

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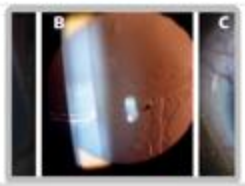

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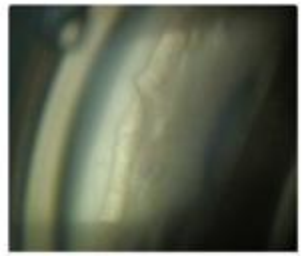

Uveitic / steroid-induced glaucoma

By Soledad Aguilar-Munoa and Keith Barton

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Post-Surgical Glaucoma

By David Chen, Fábio B. Daga, Rodrigo L. Lindenmeyer, Augusto Paranhos Jr., Chelvin Sng

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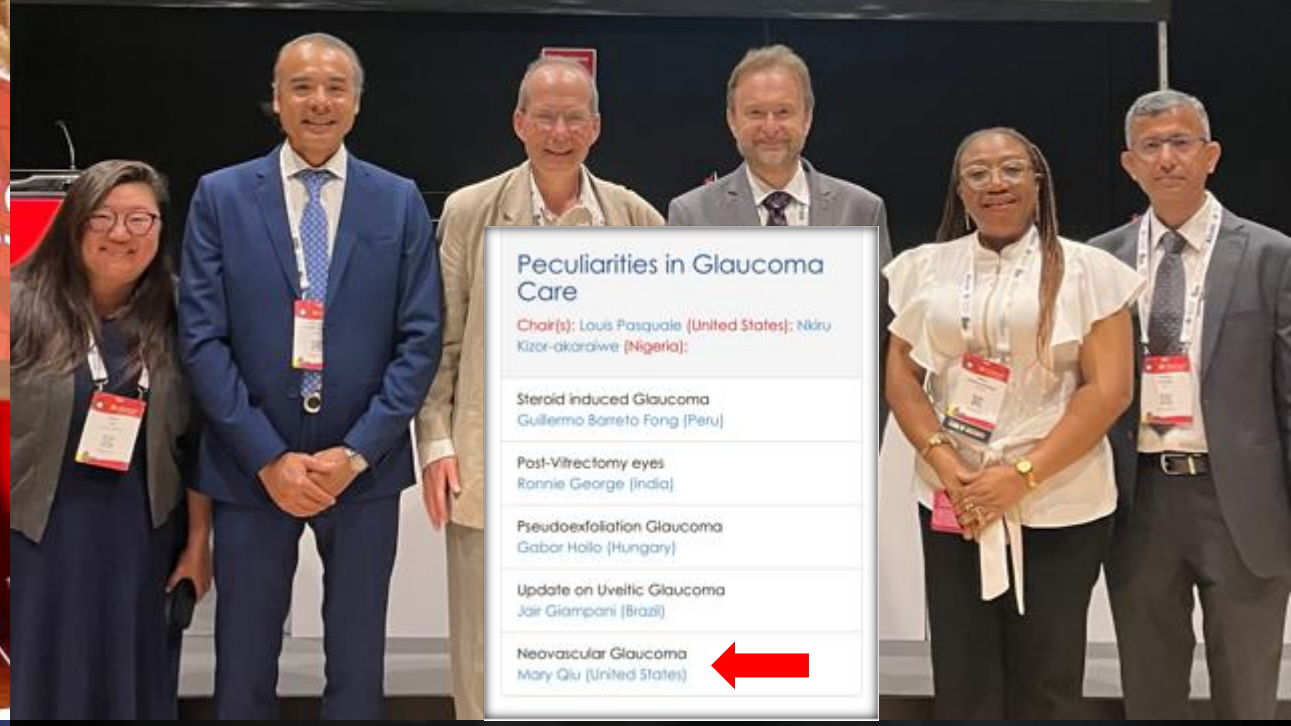
Peculiarities in Glaucoma Care
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Guillermo Barreto Fong (Peru)
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Ronnie George (India)
Pseudoexfoliation Glaucoma
Gabor Hollo (Hungary)
Update on Uveitic Glaucoma
Jair Giampani (Brazil)
Neovascular Glaucoma
Mary Qiu (United States)


WORLD GLAUCOMA CONGRESS

Future Directions

Future Directions

Future Directions

Future Directions

Cole Eye Accelerator Grants

Summarize 1

AB

Anand-Apte, Bela <ANANDAB@ccf....

Yesterday at 11:24 AM

To: Qiu, Mary; Mammo, Danny A.

Dear Mary and Danny

We are pleased to inform you that your application for the *Cole Eye Accelerator Grant* has been successful. After careful consideration and review of all applications, we have determined that your proposal aligns well with our goals and criteria.

Your proposal titled "Anterior segment OCTA for early detection of anterior segment neovascularization in eyes at high risk of developing neovascular glaucoma" stood out, and we are confident that the awarded funds will enable you to achieve significant progress in your project.

Detailed instructions on the disbursement of funds will be sent to you in a follow-up letter shortly. Please ensure compliance with all CCF policies. We hope to facilitate a smooth disbursement process.

We are excited to see the positive impact your efforts will bring, and we are proud to support you in this endeavor. Should you have any questions or require further clarification, please feel free to contact us.

Congratulations once again on your successful application, and we look forward to seeing the great work you will accomplish with this grant.

Best regards,

Sunil, BJ and Bela

Bela Anand-Apte, MBBS, PhD, MBA Chair-Ophthalmic Research
The Llura and Gordon Gund Endowed Chair in Ophthalmology Research
Professor Cleveland Clinic Lerner College of Medicine-CWRU- Dept. of Ophthalmology
Cole Eye Institute, Cleveland Clinic Foundation
9500 Euclid Avenue, Cleveland, OH 44195
Tel: 216-445-9739 anandab@ccf.org

Future Directions

Future Directions


EGS


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Salt Lake City


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AGS


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JUNE 28 - JULY 1, 2023 ROME, ITALY
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Mary Qiu

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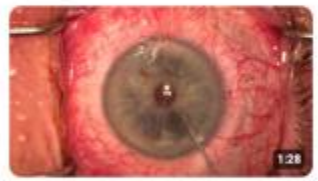
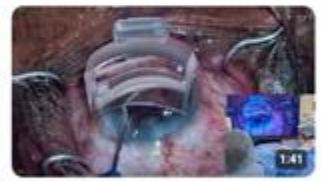


iTrack Advance GATT by PGY-2 Kevin Allan MD PhD with NGENUITY

26 views • 1 day ago



iTrack Advance Inferior Hemi-GATT

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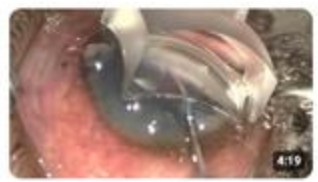

GATT with iTrack Advance 3 ways

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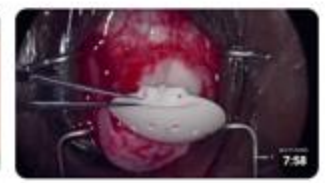

Same-Quadrant Tube Exchange: Baerveldt-250 (AC) to Baerveldt-350 (sulcus)

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

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Baerveldt-350 Removal for Retained Plate

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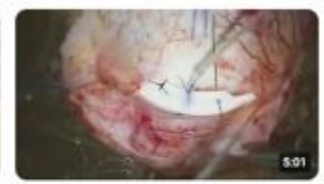

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Thank You!

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