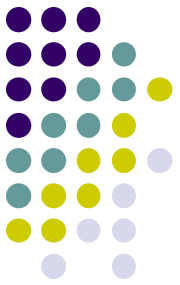




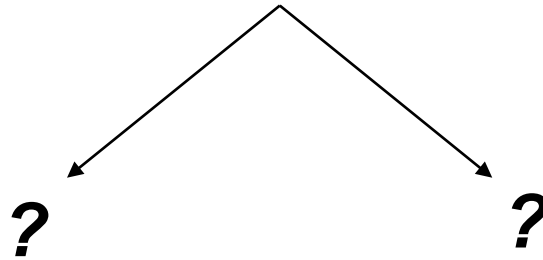
Before you begin: This is a big topic, and big topics beget big slide-sets. There's a natural break around slide 247; I placed a *break time!* slide at that location.

Q

## Secondary Angle Closure Glaucoma



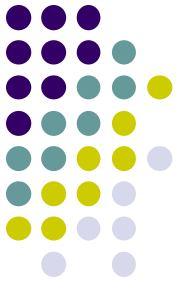
# Glaucoma



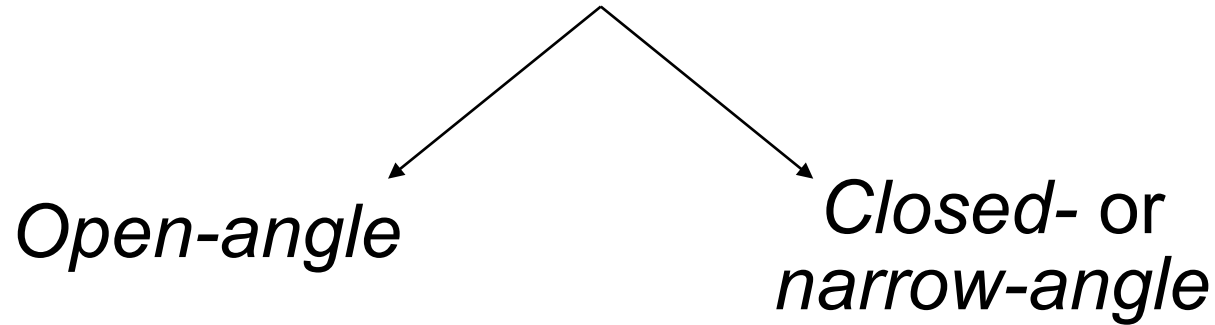
The first thought you should have when encountering a pt you suspect has glaucoma is...

# A

## Secondary Angle Closure Glaucoma

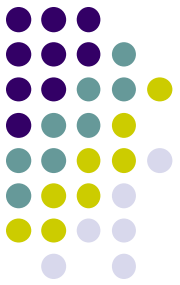


### Glaucoma

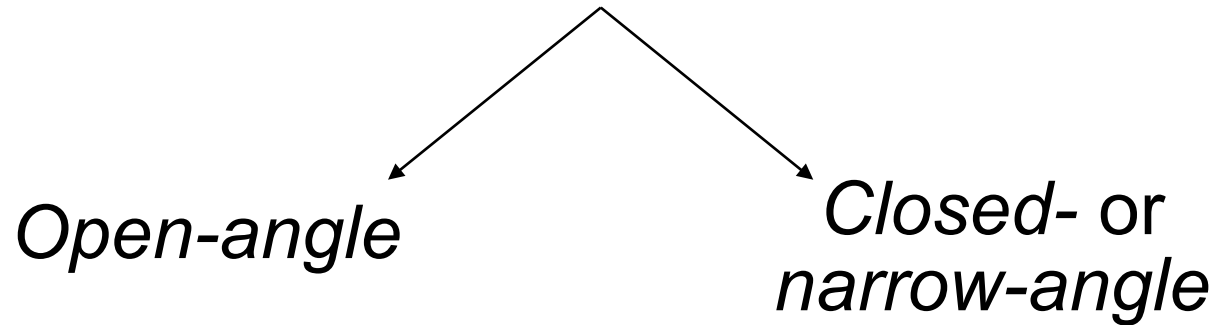


The first thought you should have when encountering a pt you suspect has glaucoma is...

***What is the status of the angle?***



# Glaucoma

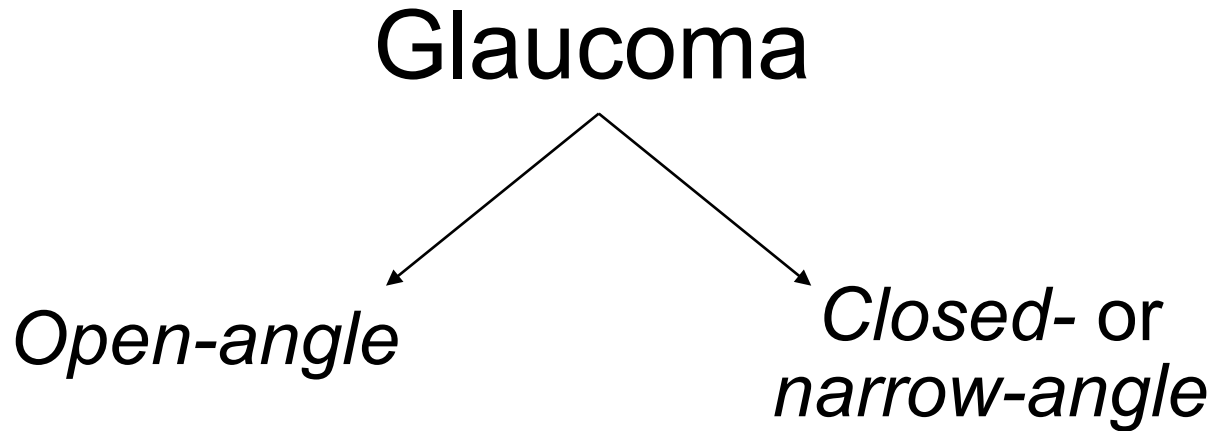
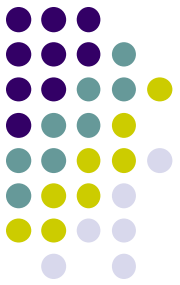


The first thought you should have when encountering a pt you suspect has glaucoma is...

***What is the status of the angle?***

*How does one go about determining the status of the angle?*

By performing   on the pt



The first thought you should have when encountering a pt you suspect has glaucoma is...

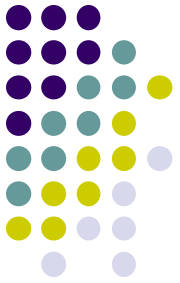
***What is the status of the angle?***

*How does one go about determining the status of the angle?*

By performing gonioscopy on the pt

Q

## Secondary Angle Closure Glaucoma



# Glaucoma

*Open-angle*

***Closed- or  
narrow-angle***

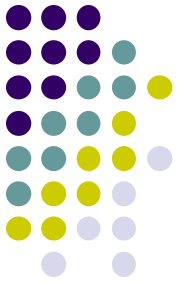
The first thought you should have when  
encountering a pt you suspect has glaucoma is...

***What is the status of the angle?***

*What does it mean to say the angle is closed?*

# A

## Secondary Angle Closure Glaucoma



### Glaucoma

*Open-angle*

***Closed- or  
narrow-angle***

The first thought you should have when  
encountering a pt you suspect has glaucoma is...

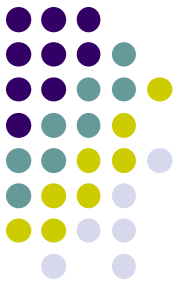
***What is the status of the angle?***

***What does it mean to say the angle is closed?***

It means the peripheral iris is in contact with the trabecular meshwork (TM)

Q

## Secondary Angle Closure Glaucoma



# Glaucoma

*Open-angle*

***Closed- or  
narrow-angle***

The first thought you should have when  
encountering a pt you suspect has glaucoma is...

***What is the status of the angle?***

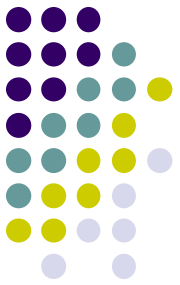
*What does it mean to say the angle is closed?*

It means the peripheral iris is in contact with the trabecular meshwork (TM)

*This contact comes in two basic flavors—what are they?*

--  
--





# Glaucoma

*Open-angle*

***Closed- or  
narrow-angle***

The first thought you should have when  
encountering a pt you suspect has glaucoma is...

***What is the status of the angle?***

*What does it mean to say the angle is closed?*

It means the peripheral iris is in contact with the trabecular meshwork (TM)

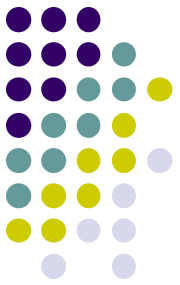
*This contact comes in two basic flavors—what are they?*

--The iris can        the TM, ie, touch it without adhering to it

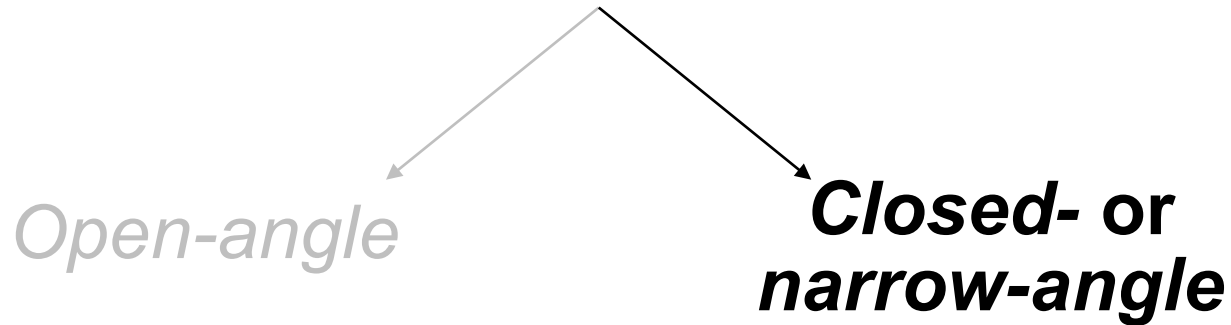
--The iris can be                      to the TM, ie, adhered to it

# A

## Secondary Angle Closure Glaucoma



### Glaucoma



The first thought you should have when encountering a pt you suspect has glaucoma is...

*What is the status of the angle?*

*What does it mean to say the angle is closed?*

It means the peripheral iris is in contact with the trabecular meshwork (TM)

*This contact comes in two basic flavors—what are they?*

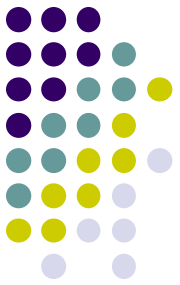
--The iris can *appose* the TM, ie, touch it without adhering to it

--The iris can be *syneched*\* to the TM, ie, adhered to it

\*I don't know if *syneched* is actually a word, but you catch my drift

Q

## Secondary Angle Closure Glaucoma



# Glaucoma

*Open-angle*

***Closed- or  
narrow-angle***

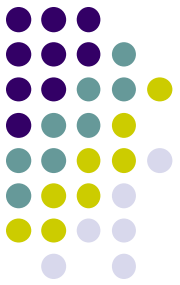
*How do you go about determining whether the iris-angle touch is appositional, or synechial?*

*This contact comes in two basic flavors—what are they?*

- The iris can **appose** the TM, ie, touch it without adhering to it
- The iris can be **syneched\*** to the TM, ie, adhered to it

A

## Secondary Angle Closure Glaucoma



# Glaucoma

*Open-angle*

***Closed- or  
narrow-angle***

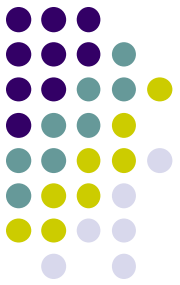
*How do you go about determining whether the iris-angle touch is appositional, or synechial?  
Via dynamic (aka compression, aka indentation) gonioscopy*

*This contact comes in two basic flavors—what are they?*

- The iris can *appose* the TM**, ie, touch it without adhering to it
- The iris can be *syneched\** to the TM**, ie, adhered to it

Q

## Secondary Angle Closure Glaucoma



# Glaucoma

*Open-angle*

***Closed- or  
narrow-angle***

*How do you go about determining whether the iris-angle touch is appositional, or synechial?  
Via dynamic (aka compression, aka indentation) gonioscopy*

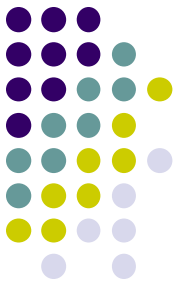
*How is dynamic gonioscopy performed?*

*This contact comes in two basic flavors—what are they?*

- The iris can *appose* the TM**, ie, touch it without adhering to it
- The iris can be *syneched\** to the TM**, ie, adhered to it

A

## Secondary Angle Closure Glaucoma



# Glaucoma

*Open-angle*

***Closed- or  
narrow-angle***

*How do you go about determining whether the iris-angle touch is appositional, or synechial?  
Via dynamic (aka compression, aka indentation) gonioscopy*

*How is dynamic gonioscopy performed?*

*During gonioscopy, the examiner manipulates the lens to gently compress the central cornea, in the process displacing aqueous peripherally, toward the angle.*

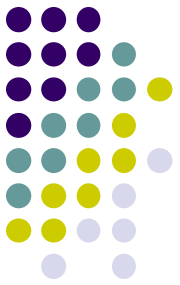
*This contact comes in two basic flavors—what are they?*

--**The iris can appose the TM**, ie, touch it without adhering to it

--**The iris can be syneched\*** to the TM, ie, adhered to it

# A

## Secondary Angle Closure Glaucoma



### Glaucoma

*Open-angle*

***Closed- or  
narrow-angle***

*How do you go about determining whether the iris-angle touch is appositional, or synechial?  
Via dynamic (aka compression, aka indentation) gonioscopy*

*How is dynamic gonioscopy performed?*

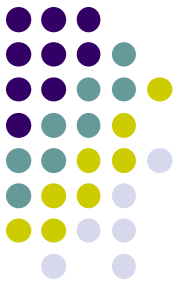
*During gonioscopy, the examiner manipulates the lens to gently compress the central cornea, in the process displacing aqueous peripherally, toward the angle. If the iris-angle contact is appositional, the influx of displaced aqueous will separate them.*

*This contact comes in two basic flavors—what are they?*

- The iris can appose the TM**, ie, touch it without adhering to it
- The iris can be syneched\*** to the TM, ie, adhered to it

# A

## Secondary Angle Closure Glaucoma



### Glaucoma

*Open-angle*

***Closed- or  
narrow-angle***

*How do you go about determining whether the iris-angle touch is appositional, or synechial?  
Via dynamic (aka compression, aka indentation) gonioscopy*

*How is dynamic gonioscopy performed?*

*During gonioscopy, the examiner manipulates the lens to gently compress the central cornea, in the process displacing aqueous peripherally, toward the angle. If the iris-angle contact is appositional, the influx of displaced aqueous will separate them. But at locations where the iris is syneched to the angle, the aqueous influx will have no effect on the iris-angle contact.*

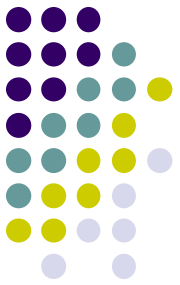
*This contact comes in two basic flavors—what are they?*

- The iris can appose the TM**, ie, touch it without adhering to it
- The iris can be syneched\*** to the TM, ie, adhered to it



Q

## Secondary Angle Closure Glaucoma



# Glaucoma

*Open-angle*

***Closed- or  
narrow-angle***

*How do you go about determining whether the iris-angle touch is appositional, or synechial?*

*Via gonioscopy (aka compression aka indentation) gonioscopy*

*Does it matter what sort of gonio lens is used?*

*How*

*During*

*in the*

*app*

*ea,*

*iris*

*is syneched to the angle, the aqueous influx will have no effect on the iris-angle contact.*

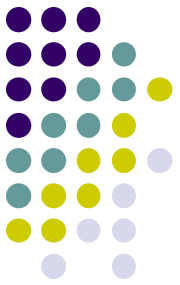
*This contact comes in two basic flavors—what are they?*

--**The iris can *appose* the TM**, ie, touch it without adhering to it

--**The iris can be *syneched\** to the TM**, ie, adhered to it

A

## Secondary Angle Closure Glaucoma



# Glaucoma

*Open-angle*

***Closed- or  
narrow-angle***

*How do you go about determining whether the iris-angle touch is appositional, or synechial?*

*Via gonioscopy (aka compression, aka indentation) gonioscopy.*

*Does it matter what sort of gonio lens is used?*

*How*

*During*

*in the*

*app*

It does indeed. The lens of choice is a Posner, Zeiss or Sussman. These applanate the *central* cornea, pushing aqueous peripherally and thereby opening (or not) the angle.

*ea,*

*iris*

*is syneched to the angle, the aqueous influx will have no effect on the iris-angle contact.*

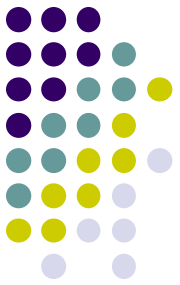
*This contact comes in two basic flavors—what are they?*

--**The iris can *appose* the TM**, ie, touch it without adhering to it

--**The iris can be *syneched\** to the TM**, ie, adhered to it

# A

## Secondary Angle Closure Glaucoma



### Glaucoma

*Open-angle*

***Closed- or  
narrow-angle***

*How do you go about determining whether the iris-angle touch is appositional, or synechial?*

*Via the gonio (aka compression aka indentation) gonioscopy.*

*Does it matter what sort of gonio lens is used?*

*How* It does indeed. The lens of choice is a Posner, Zeiss or Sussman. These applanate the *central* cornea, pushing aqueous peripherally and thereby opening (or not) the angle. In contrast, the flange on a Goldmann-style goniolens compresses the *peripheral* cornea, and thus is less efficient for displacing aqueous into the angle.

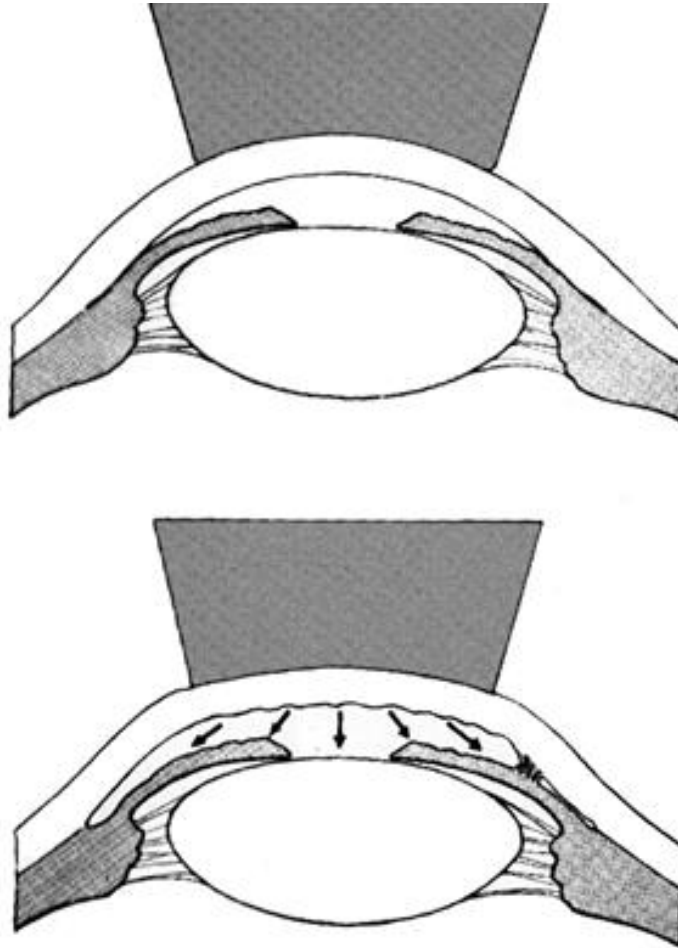
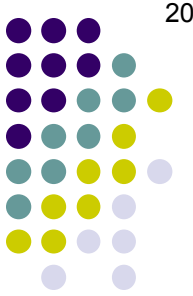
*During* If the iris is syneched to the angle, the aqueous influx will have no effect on the iris-angle contact.

*This contact comes in two basic flavors—what are they?*

--The iris can **appose** the TM, ie, touch it without adhering to it

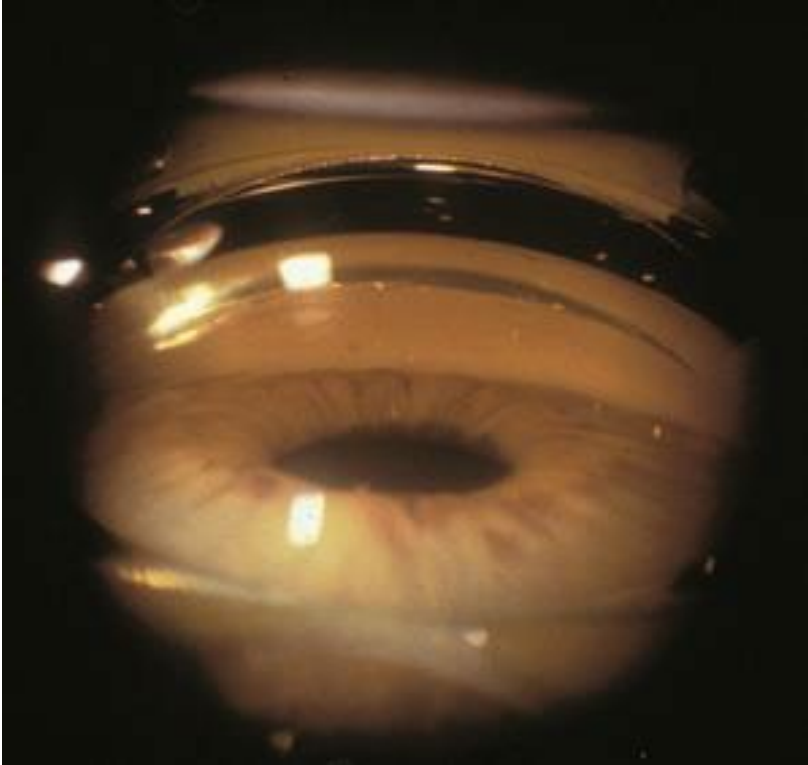
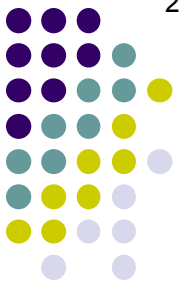
--The iris can be **syneched\*** to the TM, ie, adhered to it

## Secondary Angle Closure Glaucoma



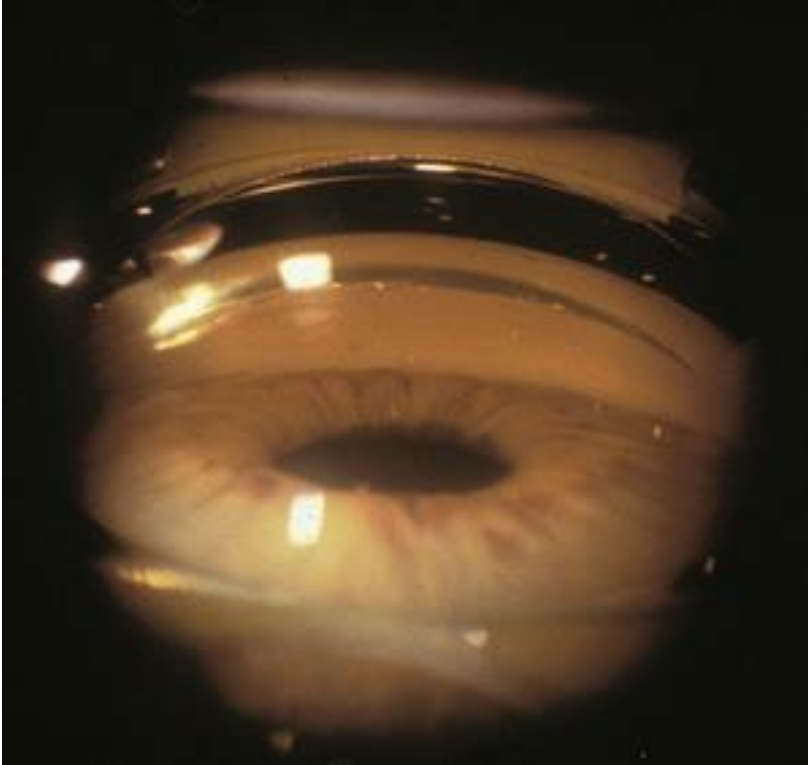
Indentation with Zeiss four-mirror lens causes deepening of the anterior chamber, which opens areas of appositional angle closure or exposes synechiae

## Secondary Angle Closure Glaucoma

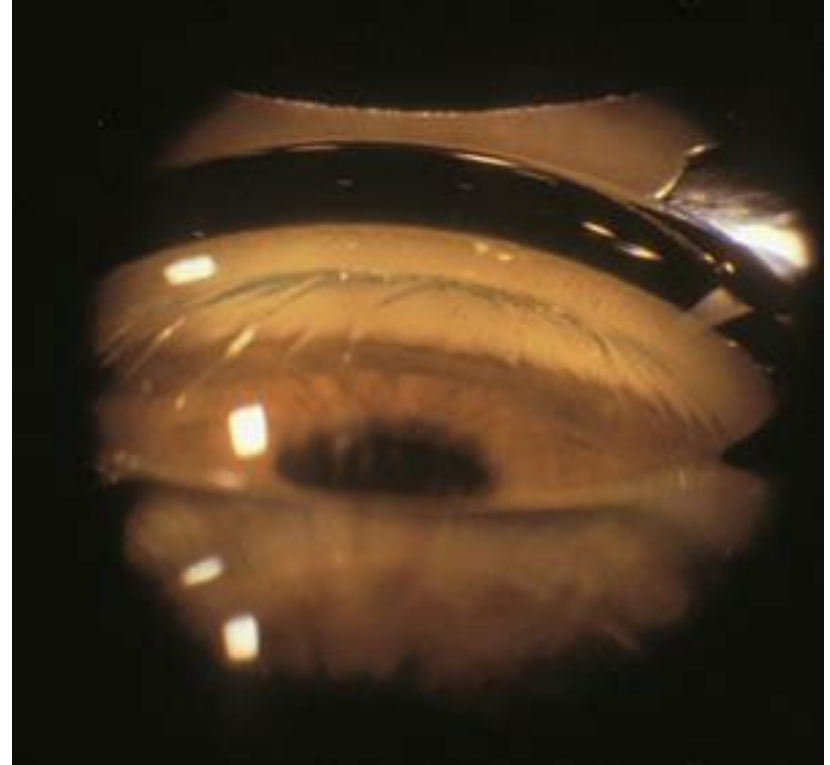


Zeiss four-mirror view of iris bombé in an elderly hyperopic patient. The trabecular meshwork is not visualized

## Secondary Angle Closure Glaucoma

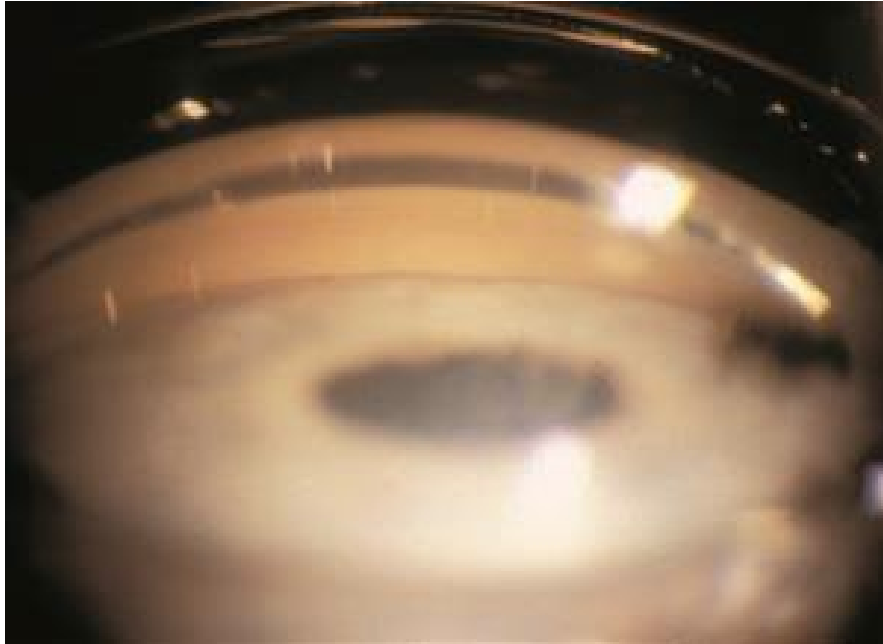
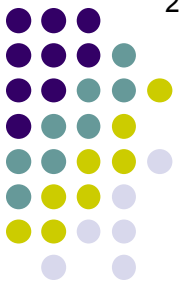


Zeiss four-mirror view of iris bombé in an elderly hyperopic patient. The trabecular meshwork is not visualized



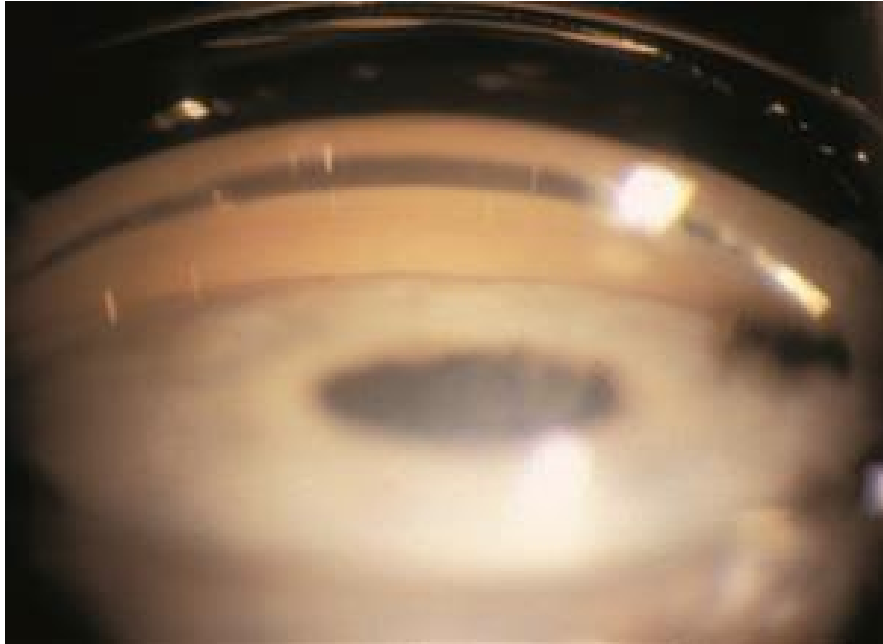
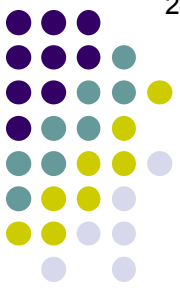
Same patient when a Zeiss lens is used to indent the cornea. The trabecular meshwork is visible

## Secondary Angle Closure Glaucoma

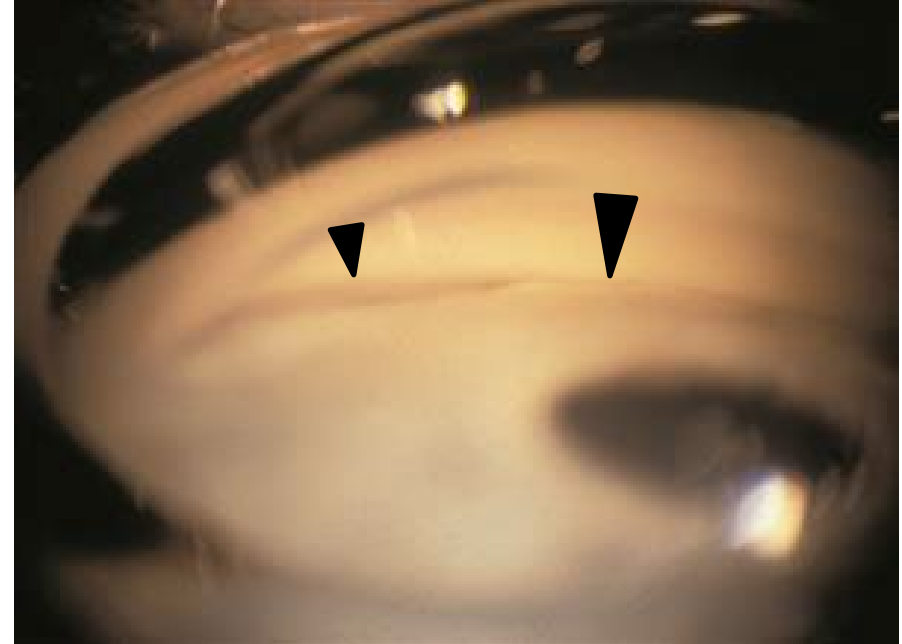


Eye in angle closure. No TM is visible.

## Secondary Angle Closure Glaucoma



Eye in angle closure. No TM is visible.

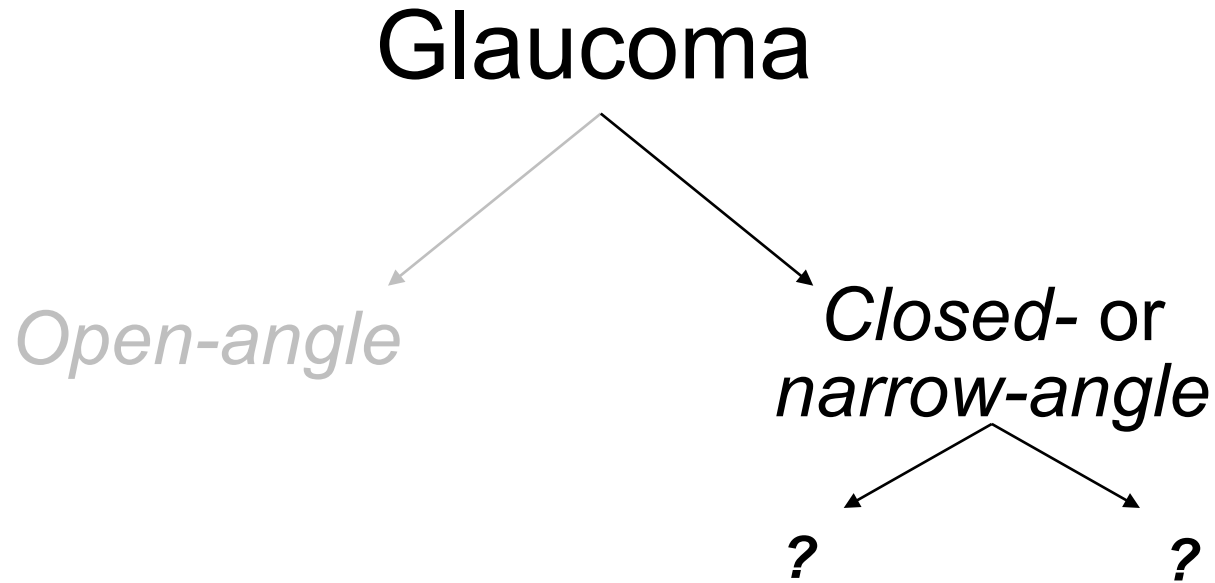
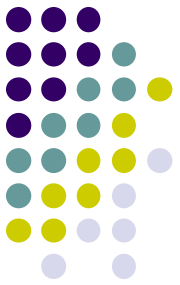


With indentation gonioscopy parts of the TM are visualized (small arrow), but here is a broad peripheral anterior synechia (large arrow) precluding visualization of the remainder of the TM.



Q

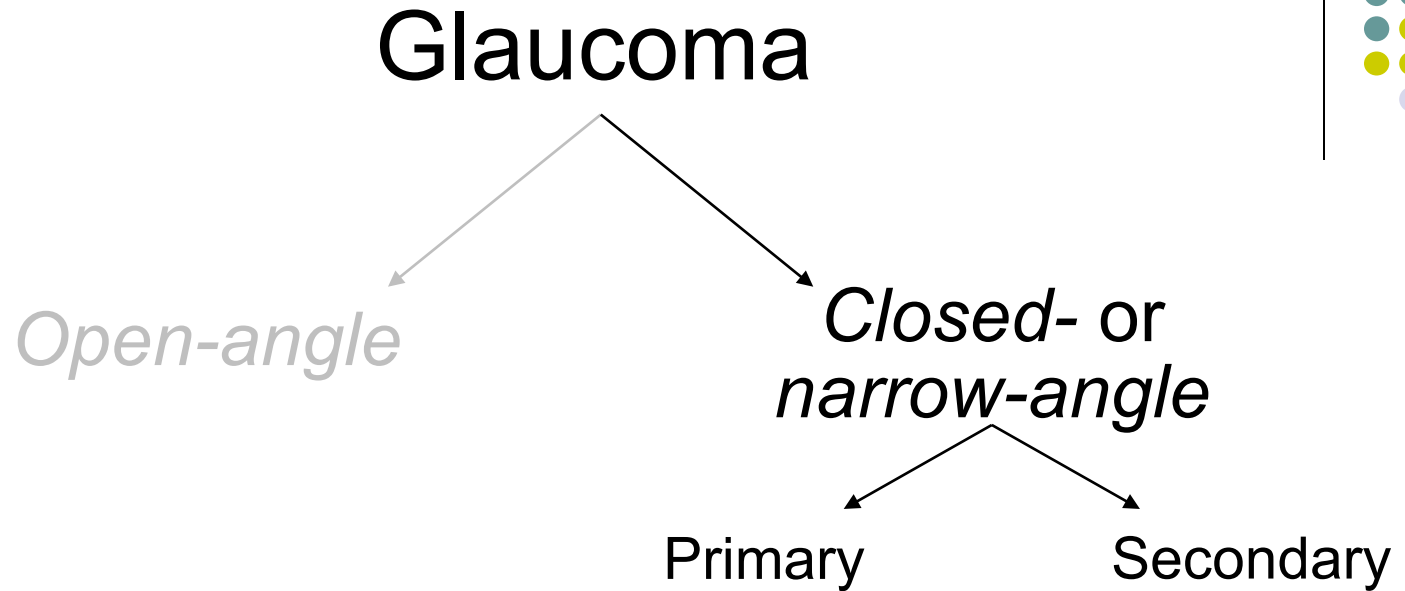
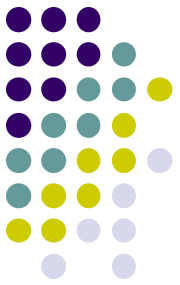
## Secondary Angle Closure Glaucoma



The first thought you should have when encountering a pt you suspect has angle-closure glaucoma is...

A

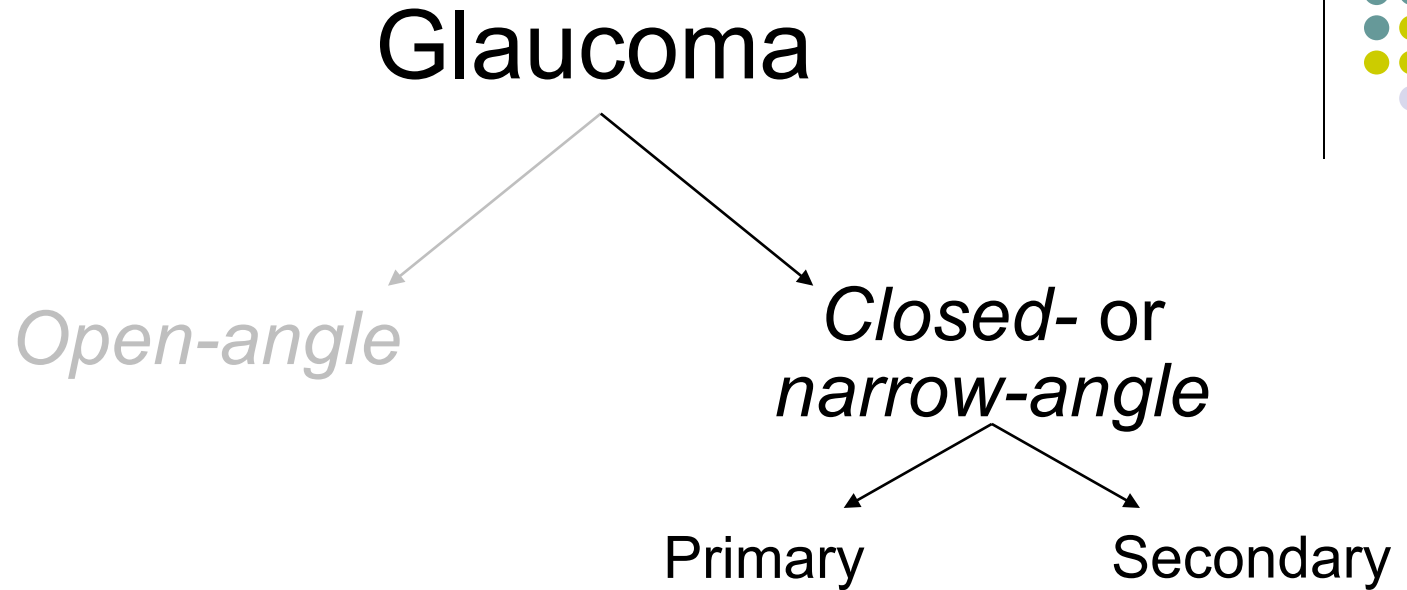
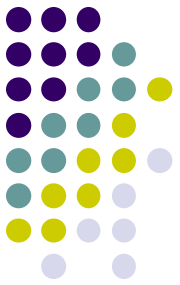
## Secondary Angle Closure Glaucoma



The first thought you should have when encountering a pt you suspect has angle-closure glaucoma is...  
***is it primary or secondary?***

Q

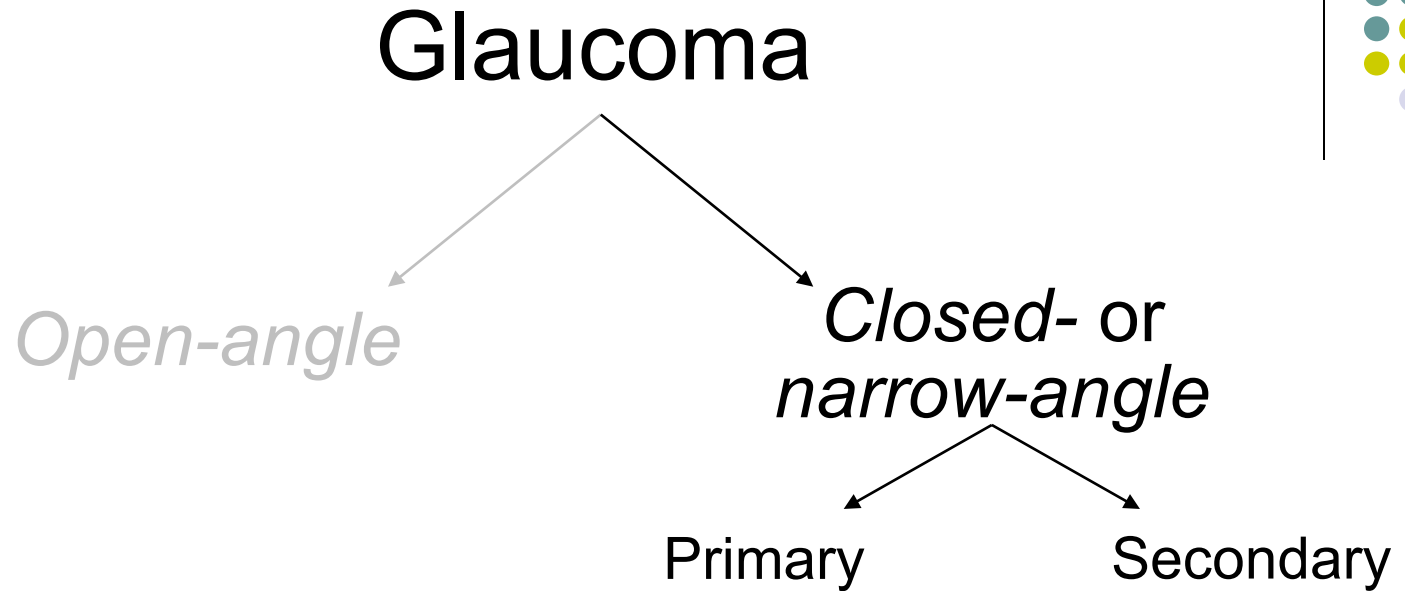
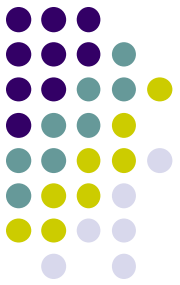
## Secondary Angle Closure Glaucoma



*What differentiates primary from secondary angle-closure glaucoma?*

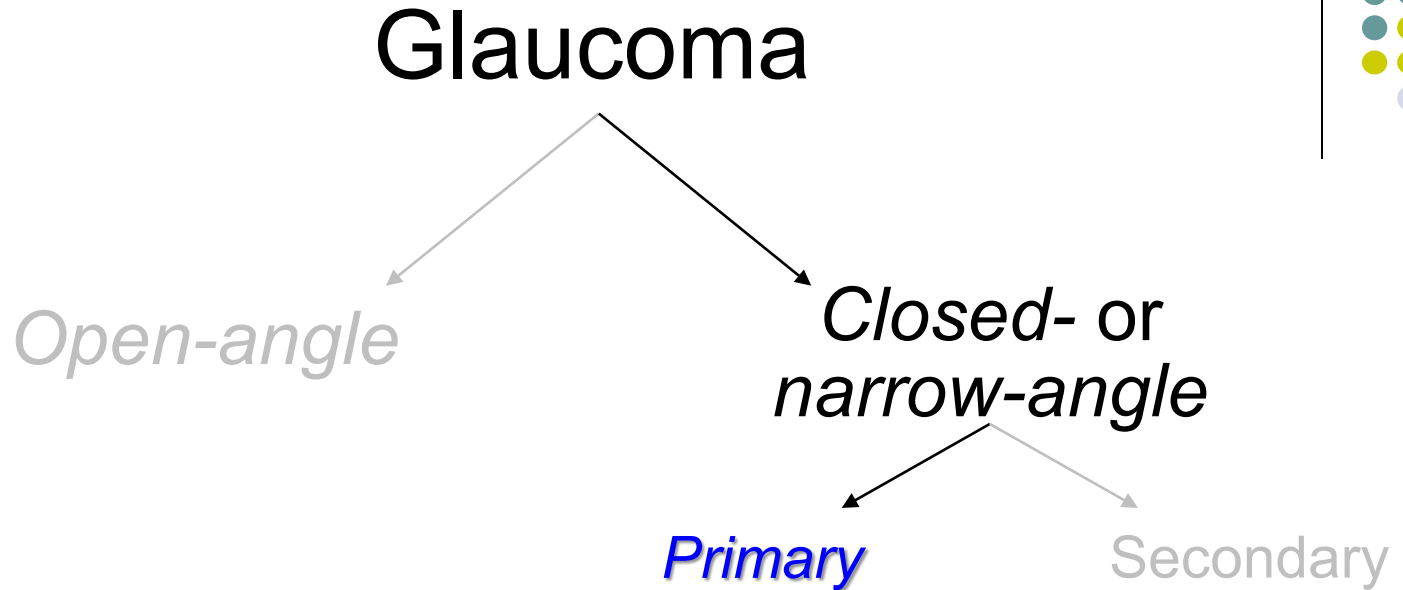
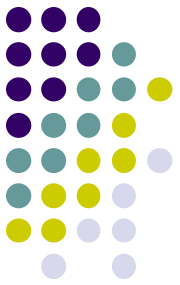
A

## Secondary Angle Closure Glaucoma



*What differentiates primary from secondary angle-closure glaucoma?*

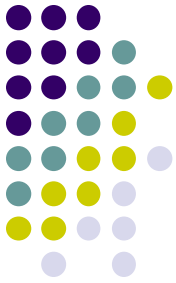
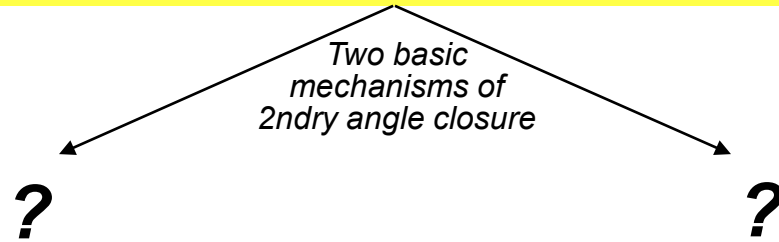
In secondary, a specific pathological cause of angle closure can be identified, whereas no such cause is present in primary dz



*Primary angle-closure glaucoma is discussed in detail in its own slide-set; see the Table of Contents*

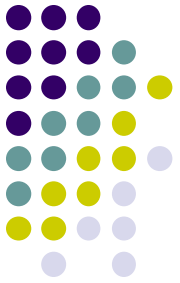
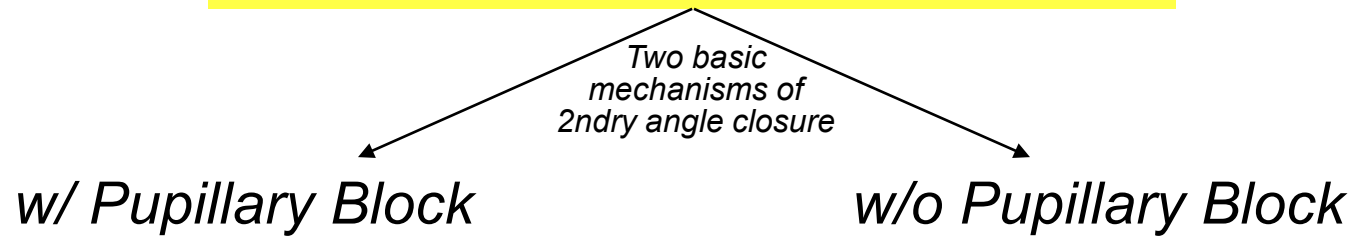
Q

## Secondary Angle Closure Glaucoma



A

## Secondary Angle Closure Glaucoma

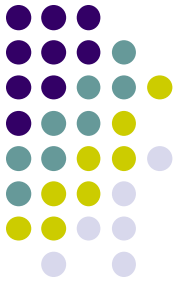


Q

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*



*What does **pupillary block** refer to, exactly?*

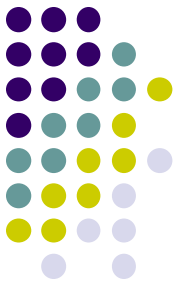


Q/A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*



*What does **pupillary block** refer to, exactly?*

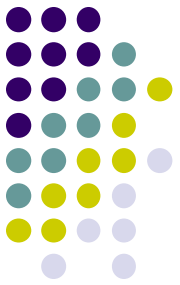
It refers to contact between the two words and the one word that impedes the normal flow of aqueous from the two diff words to the two still different words through the pupillary aperture.

A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

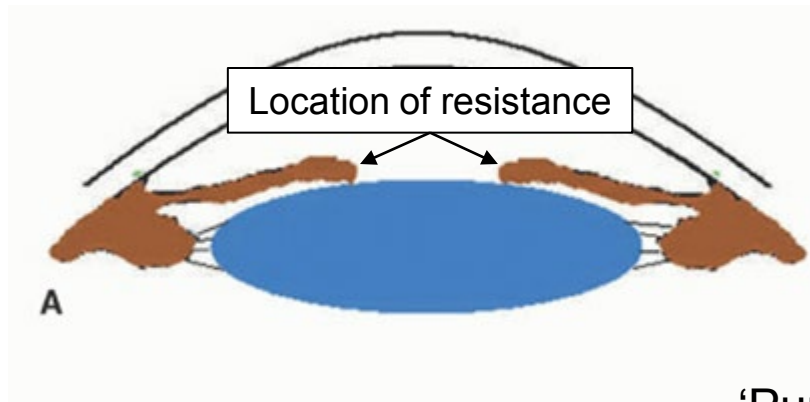
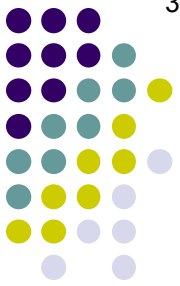
*w/o Pupillary Block*



*What does **pupillary block** refer to, exactly?*

It refers to contact between the pupil margin and the lens that impedes the normal flow of aqueous from the posterior chamber (PC) to the anterior chamber (AC) through the pupillary aperture.

## Secondary Angle Closure Glaucoma



*1. Resistance to aqueous flow  
from the PC to the AC*

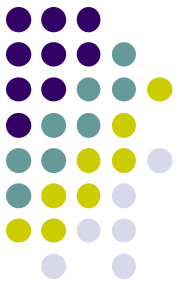
‘Pupillary block’

Q/A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*



*What does **pupillary block** refer to, exactly?*

It refers to contact between the pupil margin and the lens that impedes the normal flow of aqueous from the posterior chamber (PC) to the anterior chamber (AC) through the pupillary aperture.

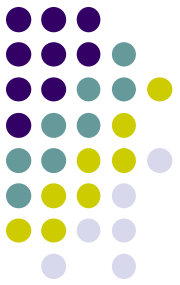
Pupillary block leads to the development of a  across the iris, which causes the iris to .

A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

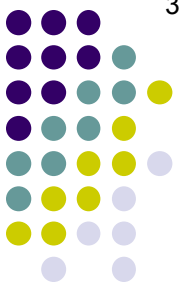


*What does **pupillary block** refer to, exactly?*

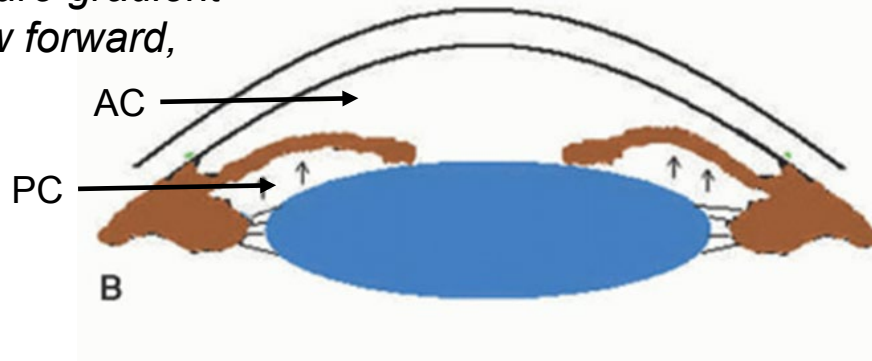
It refers to contact between the pupil margin and the lens that impedes the normal flow of aqueous from the posterior chamber (PC) to the anterior chamber (AC) through the pupillary aperture.

Pupillary block leads to the development of a pressure gradient across the iris, which causes the iris to bow forward .

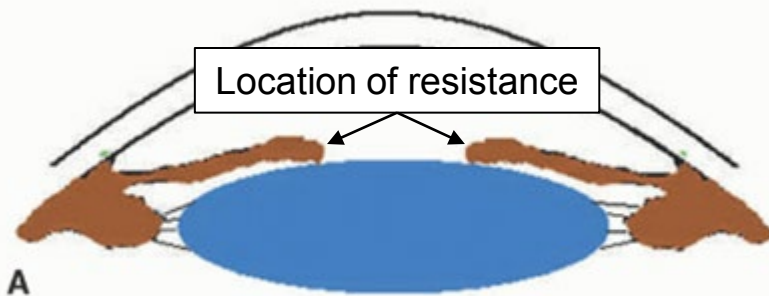
# Secondary Angle Closure Glaucoma



2. The  $PC > AC$  pressure gradient causes the iris to bow forward, like a sail in the wind



1. Resistance to aqueous flow from the PC to the AC



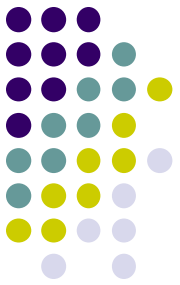
‘Pupillary block’

A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*



*What does **pupillary block** refer to, exactly?*

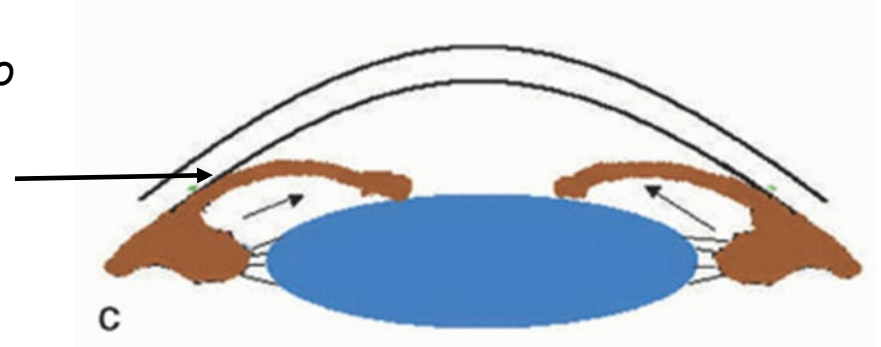
It refers to contact between the pupil margin and the lens that impedes the normal flow of aqueous from the posterior chamber (PC) to the anterior chamber (AC) through the pupillary aperture.

Pupillary block leads to the development of a pressure gradient across the iris, which causes the iris to bow forward. If the iris bows far enough, the peripheral iris will come into apposition with and occlude the drainage angle, precipitating acute closure of the angle and a prodigious rise in IOP.

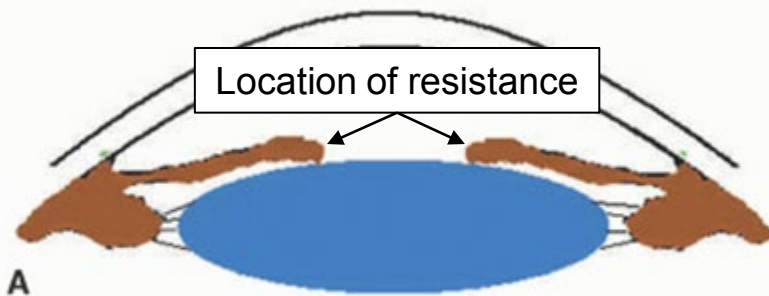
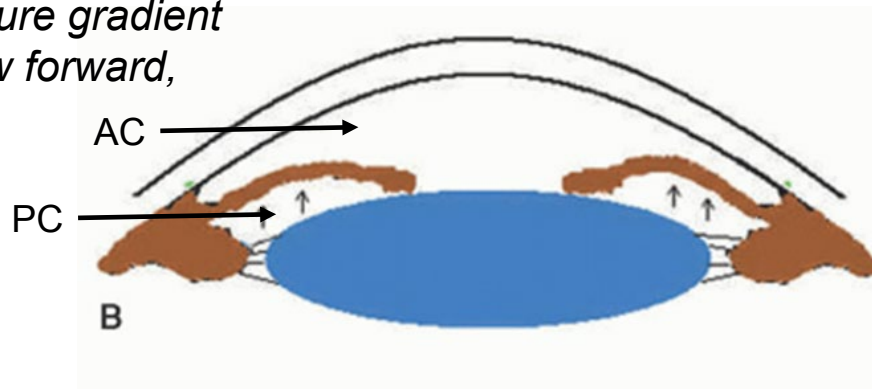
# Secondary Angle Closure Glaucoma



3. Forward movement of the iris leads to apposition of the peripheral iris against the drainage angle, occluding it



2. The  $PC > AC$  pressure gradient causes the iris to bow forward, like a sail in the wind

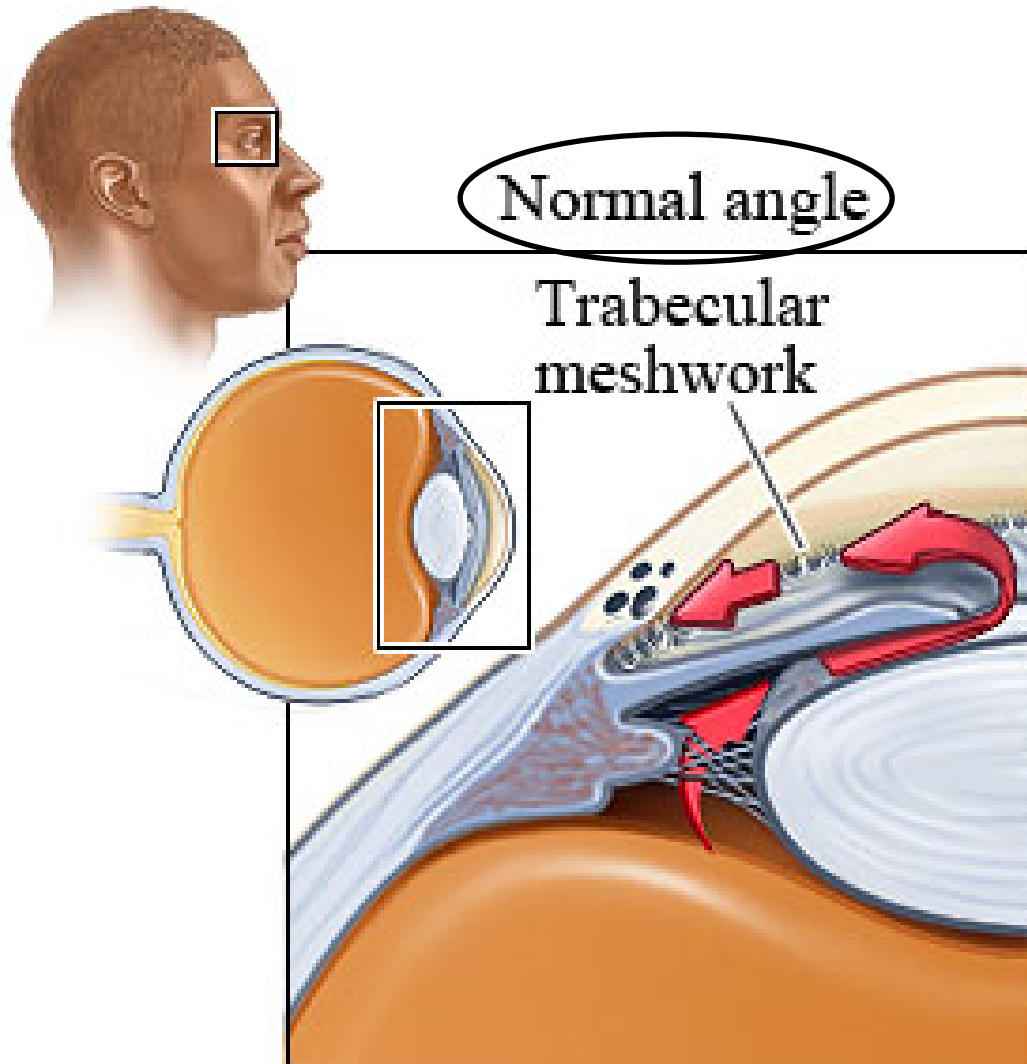


1. Resistance to aqueous flow from the PC to the AC

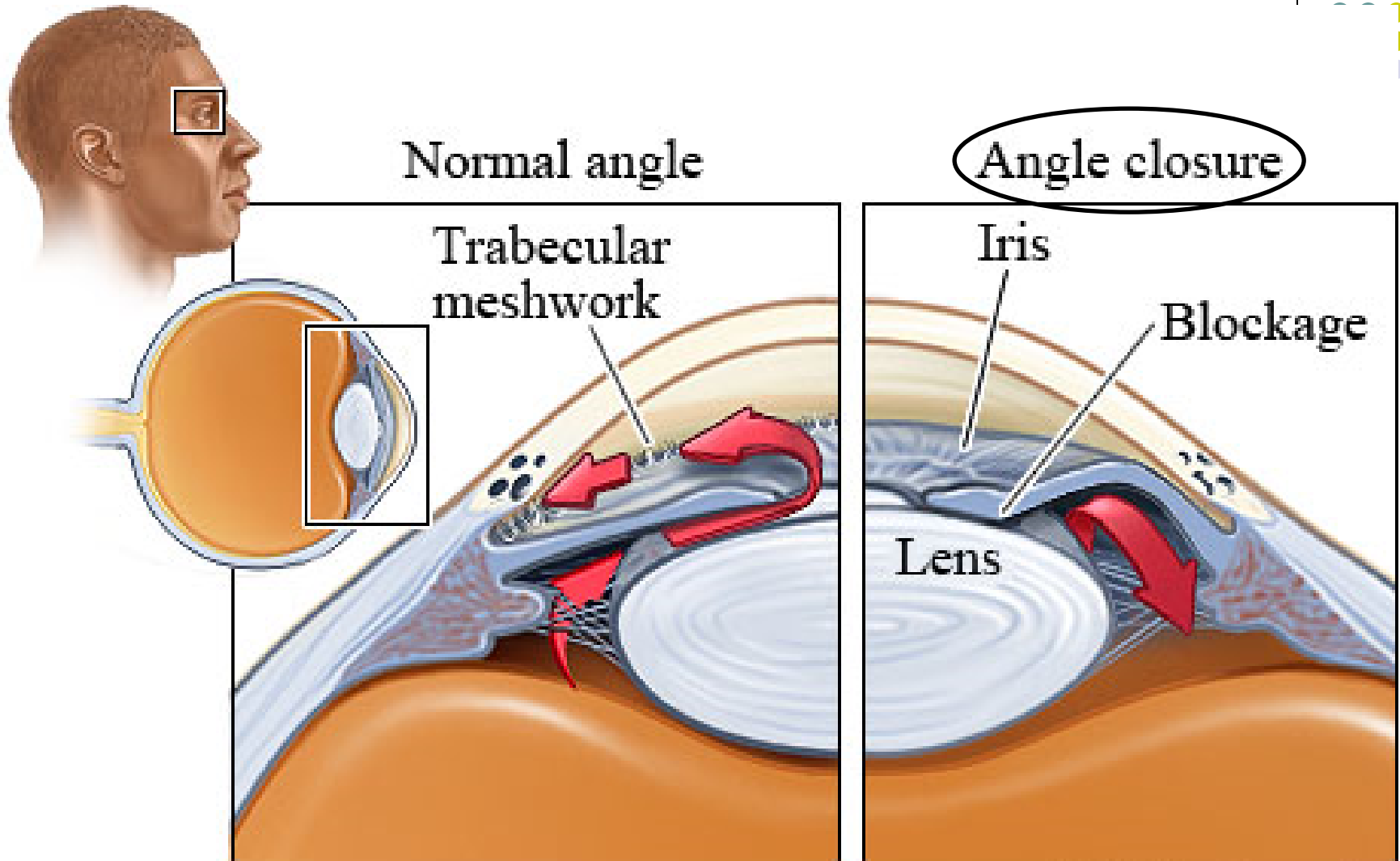
‘Pupillary block’



# Secondary Angle Closure Glaucoma



# Secondary Angle Closure Glaucoma

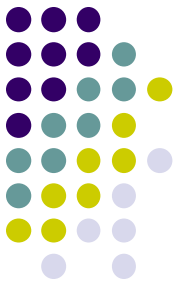


Q

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*



*What does **pupillary block** refer to, exactly?*

It refers to contact between the pupil margin and the lens that impedes the normal flow of aqueous from the posterior chamber (PC) to the anterior chamber (AC) through the pupillary aperture.

Pupillary block leads to the development of a pressure gradient across the iris, which causes the iris to bow forward. **If the iris bows far enough, the peripheral iris will come into apposition with and occlude the drainage angle, precipitating acute closure of the angle and a prodigious rise in IOP.**

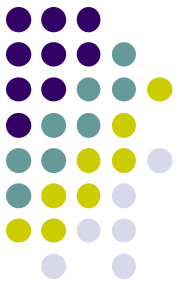
*The posterior chamber? I didn't know the vitreous was involved.*

Q/A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*



*What does **pupillary block** refer to, exactly?*

It refers to contact between the pupil margin and the lens that impedes the normal flow of aqueous from the posterior chamber (PC) to the anterior chamber (AC) through the pupillary aperture.

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*The posterior chamber? I didn't know the vitreous was involved.*

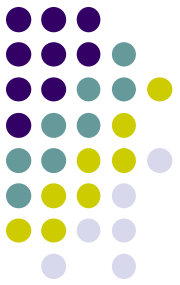
It isn't. The posterior chamber is the space immediately behind the one word and anterior to the two words. Vitreous resides in the two diff words.

A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*



*What does **pupillary block** refer to, exactly?*

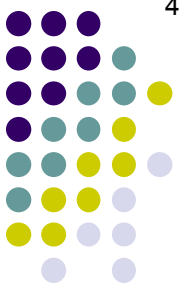
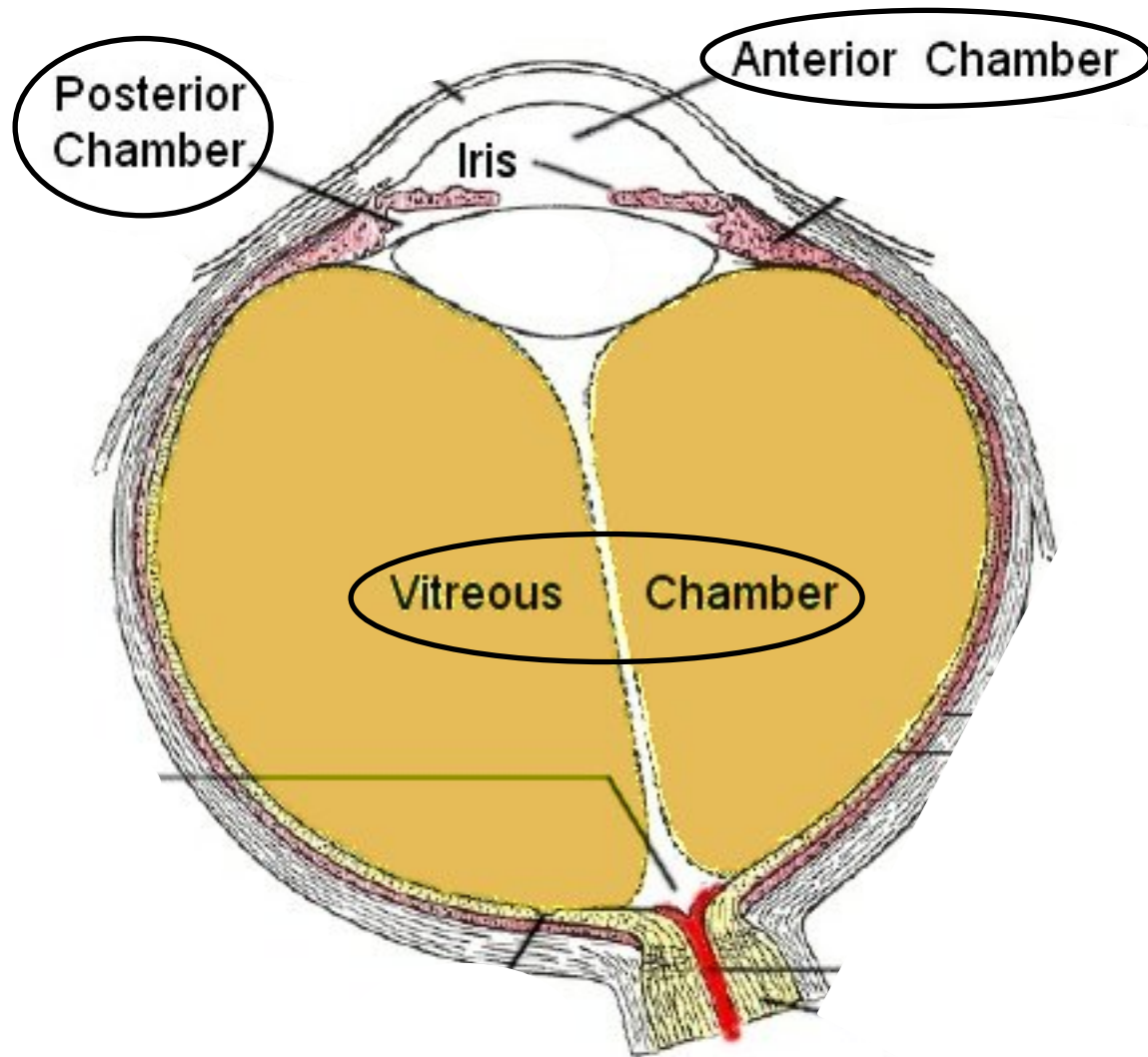
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*The posterior chamber? I didn't know the vitreous was involved.*

It isn't. The posterior chamber is the space immediately behind the iris and anterior to the lens/zonules. Vitreous resides in the vitreous cavity.

## Secondary Angle Closure Glaucoma

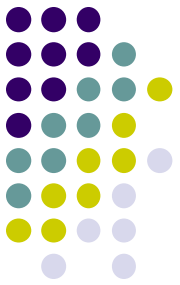


Q

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*



*What does pupillary block refer to, exactly?*

It refers to **★ contact between the pupil margin and the lens ★** that impedes the normal flow of aqueous from the posterior chamber (PC) to the anterior chamber.

*In which pupil position—constricted, mid-dilated or fully dilated—is such contact likely to develop?*

Pupillary block leads to the development of a pressure gradient across the iris, which causes the iris to bow forward. **If the iris bows far enough, the peripheral iris will come into apposition with and occlude the drainage angle, precipitating acute closure of the angle and a prodigious rise in IOP.**

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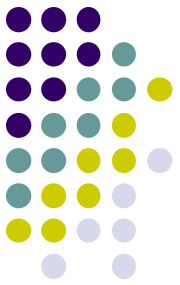
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A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*



*What does pupillary block refer to, exactly?*

It refers to  contact between the pupil margin and the lens  that impedes the normal flow of aqueous from the posterior chamber (PC) to the anterior chamber

*In which pupil position—constricted, mid-dilated or fully dilated—is such contact likely to develop?*

The **mid-dilated position** is the danger zone for the development of pupillary block

Pupillary block leads to the development of a pressure gradient across the iris, which causes the iris to bow forward. **If the iris bows far enough, the peripheral iris will come into apposition with and occlude the drainage angle, precipitating acute closure of the angle and a prodigious rise in IOP.**

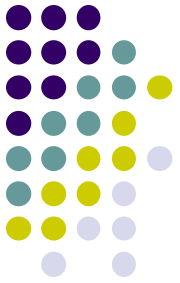
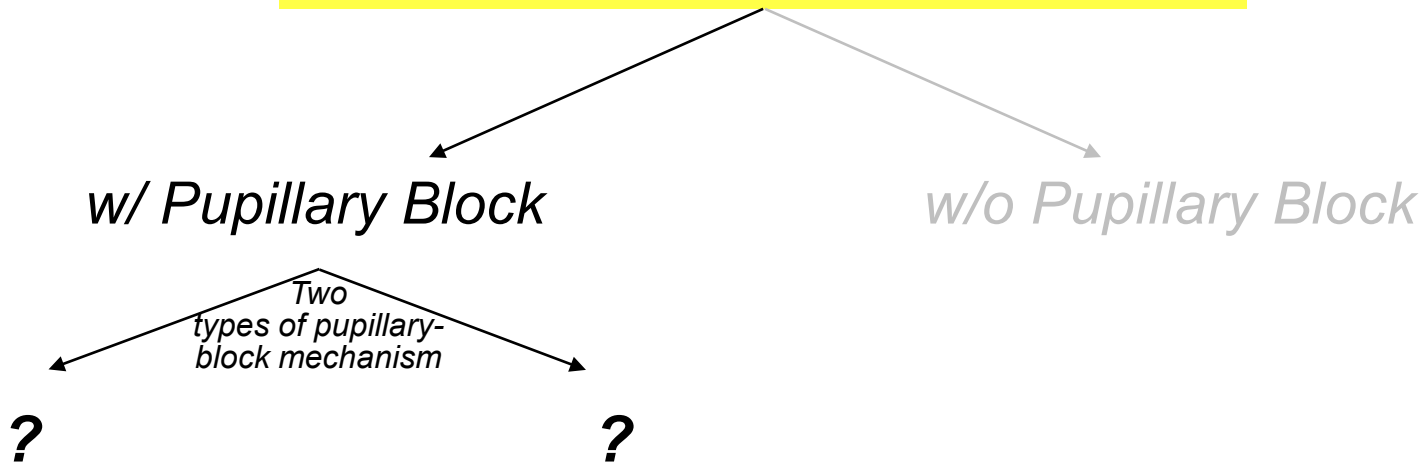
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Q

## Secondary Angle Closure Glaucoma



A

## Secondary Angle Closure Glaucoma

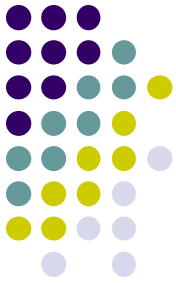
*w/ Pupillary Block*

*w/o Pupillary Block*

*Two  
types of pupillary-  
block mechanism*

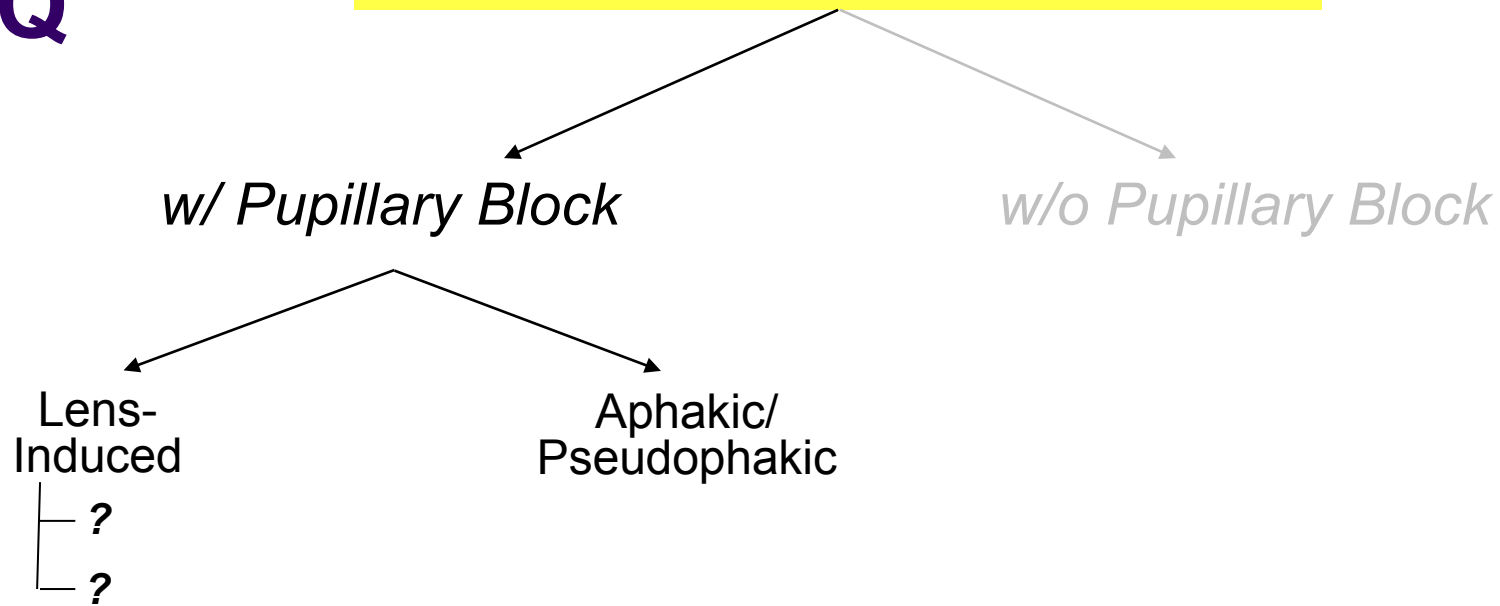
Lens-  
Induced

Aphakic/  
Pseudophakic



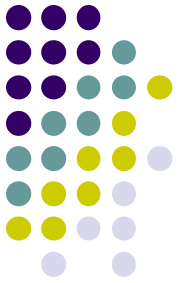
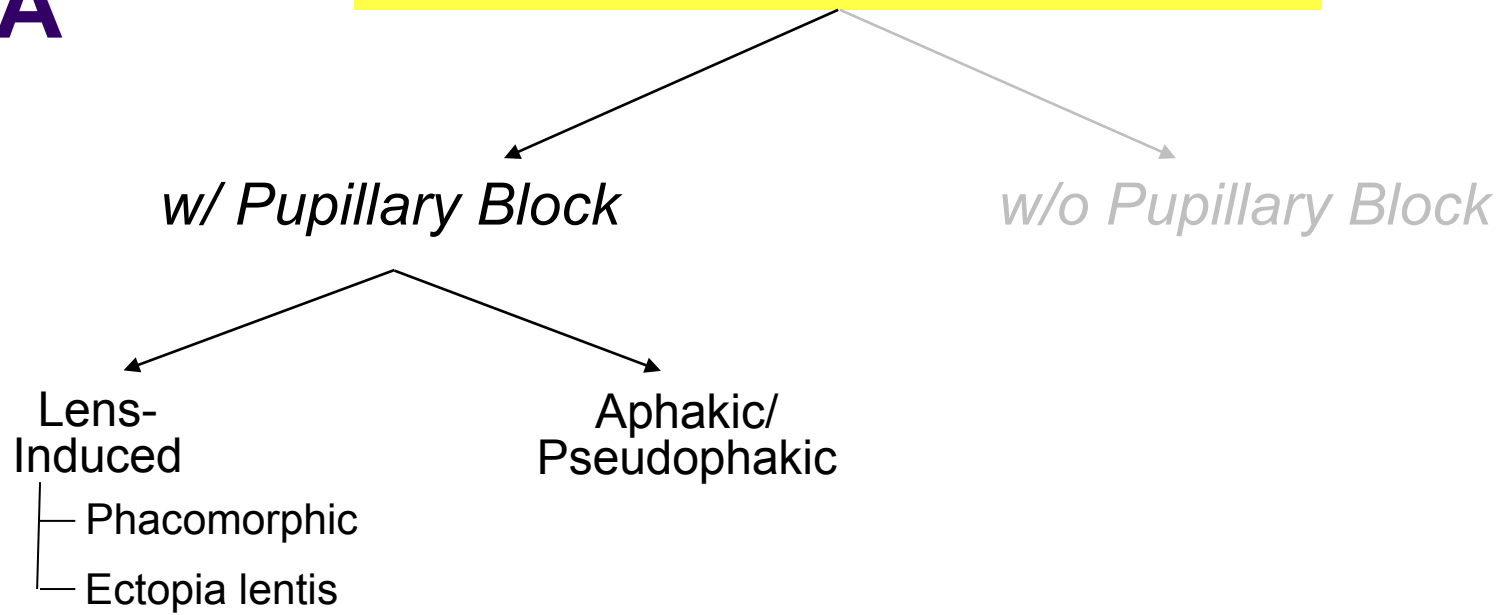
Q

## Secondary Angle Closure Glaucoma



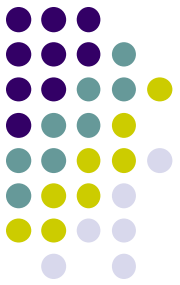
A

## Secondary Angle Closure Glaucoma



Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-  
Induced

Anhaki/

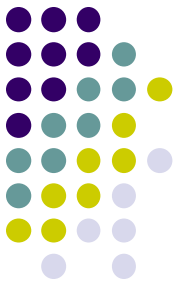
**Phacomorphic**

Ectopia lentis

*In a nutshell, what is the pathologic process in phacomorphic ACG?*

Q/A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-  
Induced

**Phacomorphic**

Ectopia lentis

Anhaki/

*In a nutshell, what is the pathologic process in phacomorphic ACG?*  
Cataractous increase in lens size has two effects that are a setup for the development of pupillary-block ACG:

1)

2)

A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-  
Induced

**Phacomorphic**

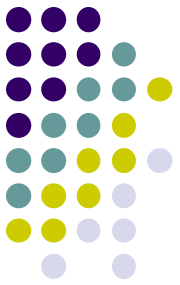
Ectopia lentis

Anhaptic/

*In a nutshell, what is the pathologic process in phacomorphic ACG?*

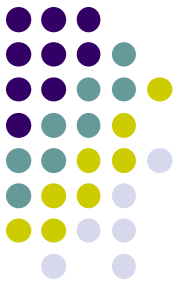
Cataractous increase in lens size has two effects that are a setup for the development of pupillary-block ACG:

- 1) It alters the anatomic relationship between the anterior lens surface and the pupil margin in a manner that leads to pupillary block and subsequent angle closure; and
- 2) it pushes the peripheral iris forward, narrowing the angle, thereby reducing the magnitude of the PC-AC pressure gradient needed to induce angle closure



Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-  
Induced

**Phacomorphic**

Ectopia lentis

Anphakic/

*In a nutshell, what is the pathologic process in phacomorphic ACG?*

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*A crowded eye with a tight angle and a lens-iris relationship prone to pupillary block...  
That sounds like a garden-variety primary angle-closure glaucoma (PACG) eye.  
How do you differentiate between a phacomorphic glaucoma eye and a PACG eye?*



A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

**Phacomorphic**

Ectopia lentis

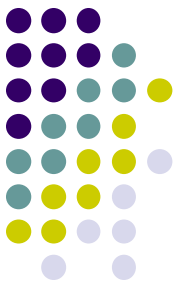
Anphakic/

*In a nutshell, what is the pathologic process in phacomorphic ACG?*

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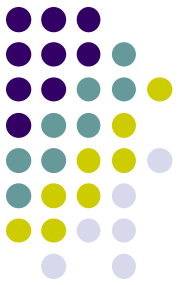
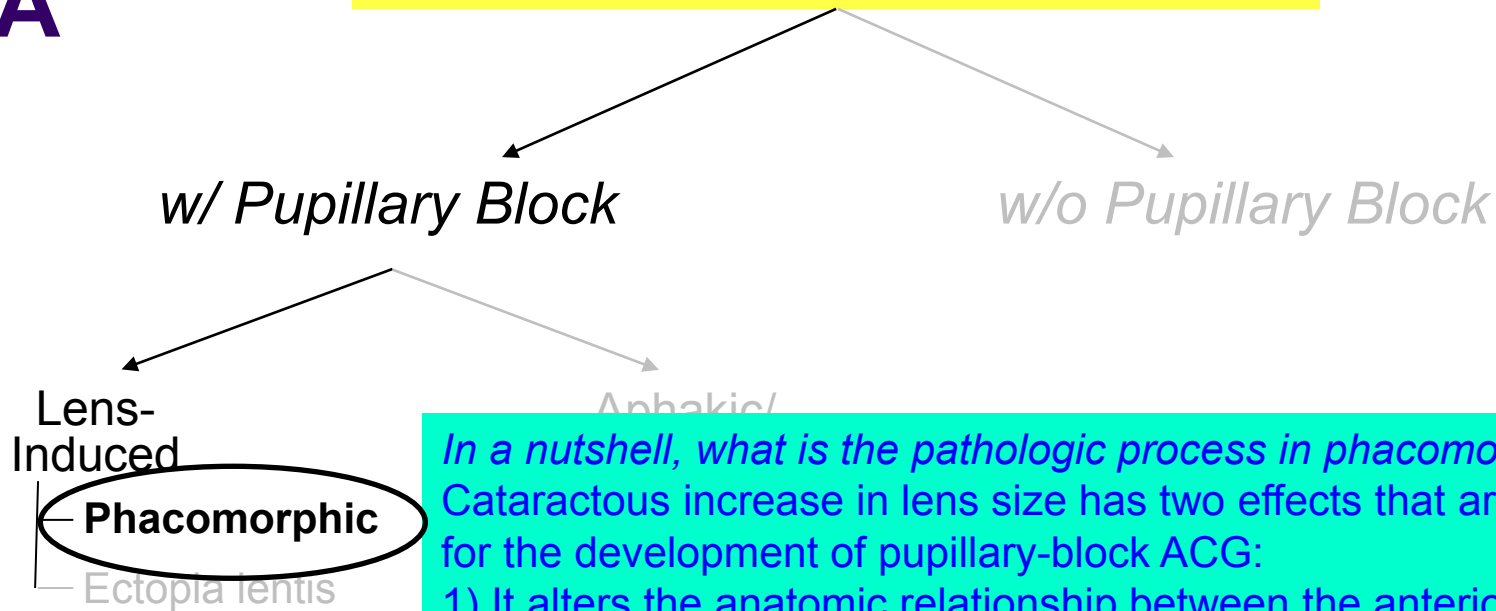
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*A crowded eye with a tight angle and a lens-iris relationship prone to pupillary block... That sounds like a garden-variety primary angle-closure glaucoma (PACG) eye. How do you differentiate between a phacomorphic glaucoma eye and a PACG eye? Some eyes defy ready classification as one vs the other. In this regard, it can be helpful to examine the fellow eye. Recall that PACG is a **bilateral** condition.*



# A

## Secondary Angle Closure Glaucoma



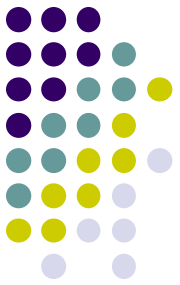
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Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

**Phacomorphic**

Ectopia lentis

Anhaptic/

*In a nutshell, what is the pathologic process in phacomorphic ACG? Cataractous increase in lens size has two effects that are a setup for the development of pupillary-block ACG:*

*1) It alters the anatomic relationship between the anterior lens surface and the posterior surface of the iris, thereby pushing the iris forward and causing pupillary block.*

*How is phacomorphic ACG managed?*

*A crowded eye with a tight angle and a lens-iris relationship prone to pupillary block...*

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*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

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*How is phacomorphic ACG managed?*

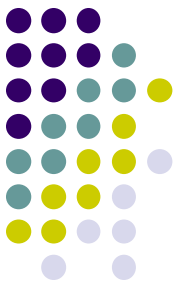
The same way as PACG—LPI ASAP. The offending cataract should be removed once the eye quiets down. (Some ophthos forego the LPI and go straight to CE.)

*A crowded eye with a tight angle and a lens-iris relationship prone to pupillary block...*

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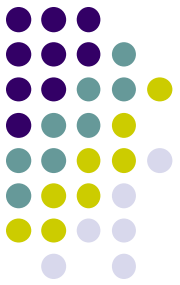
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Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

**Phacomorphic**

Ectopia lentis

Anhaptic/

*In a nutshell, what is the pathologic process in phacomorphic ACG? Cataractous increase in lens size has two effects that are a setup for the development of pupillary-block ACG:*

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The same way as PACG—LPI ASAP. The offending cataract should be removed once the eye quiets down. (Some ophthos forego the LPI and go straight to CE.)

*Should miotics be employed?*

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A

## Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

Lens-Induced

**Phacomorphic**

Ectopia lentis

Anphakic/

*In a nutshell, what is the pathologic process in phacomorphic ACG? Cataractous increase in lens size has two effects that are a setup for the development of pupillary-block ACG:*

1) It alters the anatomic relationship between the anterior lens surface and the iris, thereby narrowing the angle, thereby setting up the potential for pupillary

*How is phacomorphic ACG managed?*

The same way as PACG—LPI ASAP. The offending cataract should be removed once the eye quiets down. (Some ophthos forego the LPI and go straight to CE.)

*Should miotics be employed?*

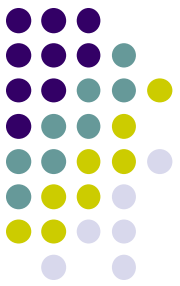
No, because they will likely only narrow the angle more by allowing the lens to drift anteriorly. Further, their use may make the soon-to-occur CE more difficult.

*A crowded eye with a tight angle and a lens-iris relationship prone to pupillary block...*

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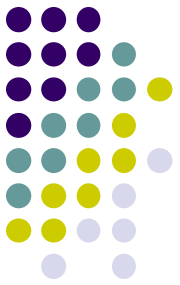
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Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-  
Induced

Aphakic/  
Pseudophakic

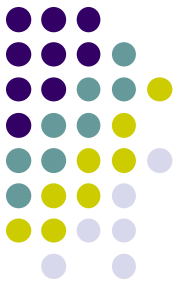
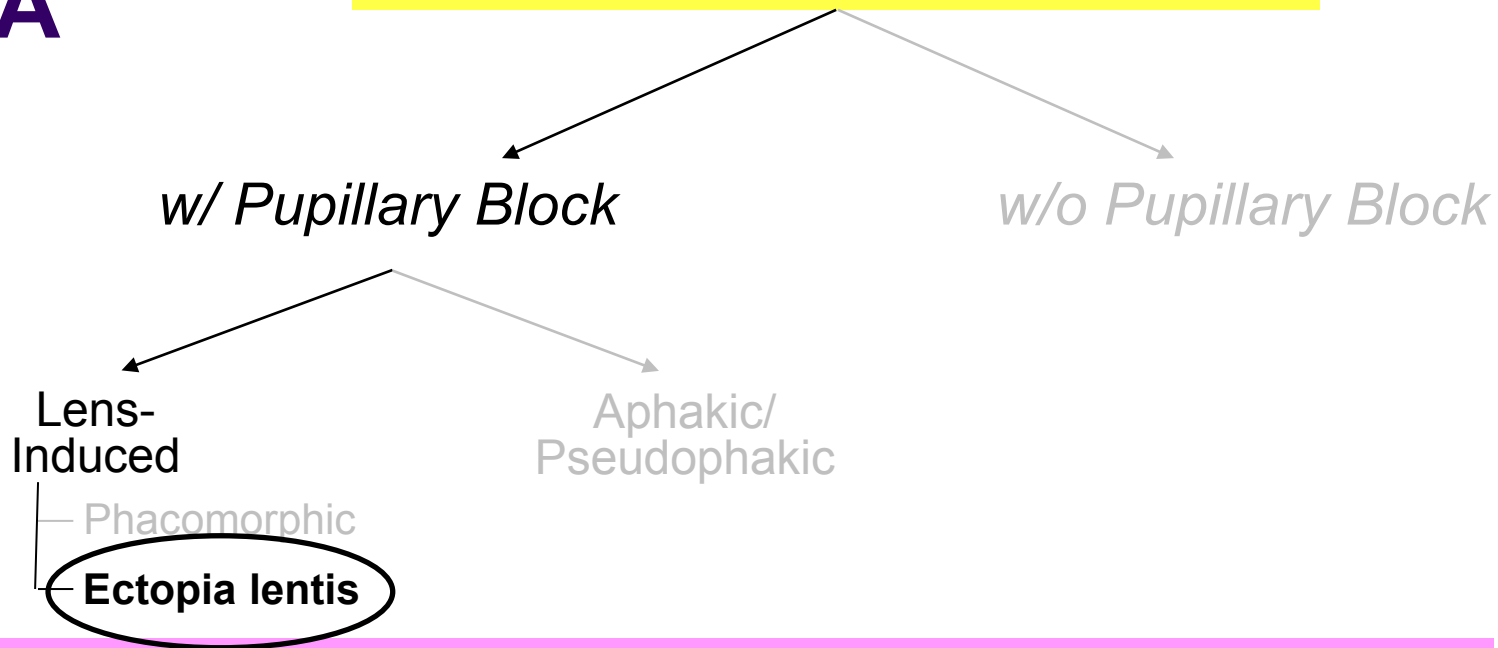
Phacomorphic

**Ectopia lentis**

*What is ectopia lentis?*

A

## Secondary Angle Closure Glaucoma



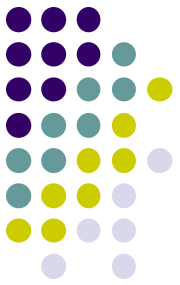
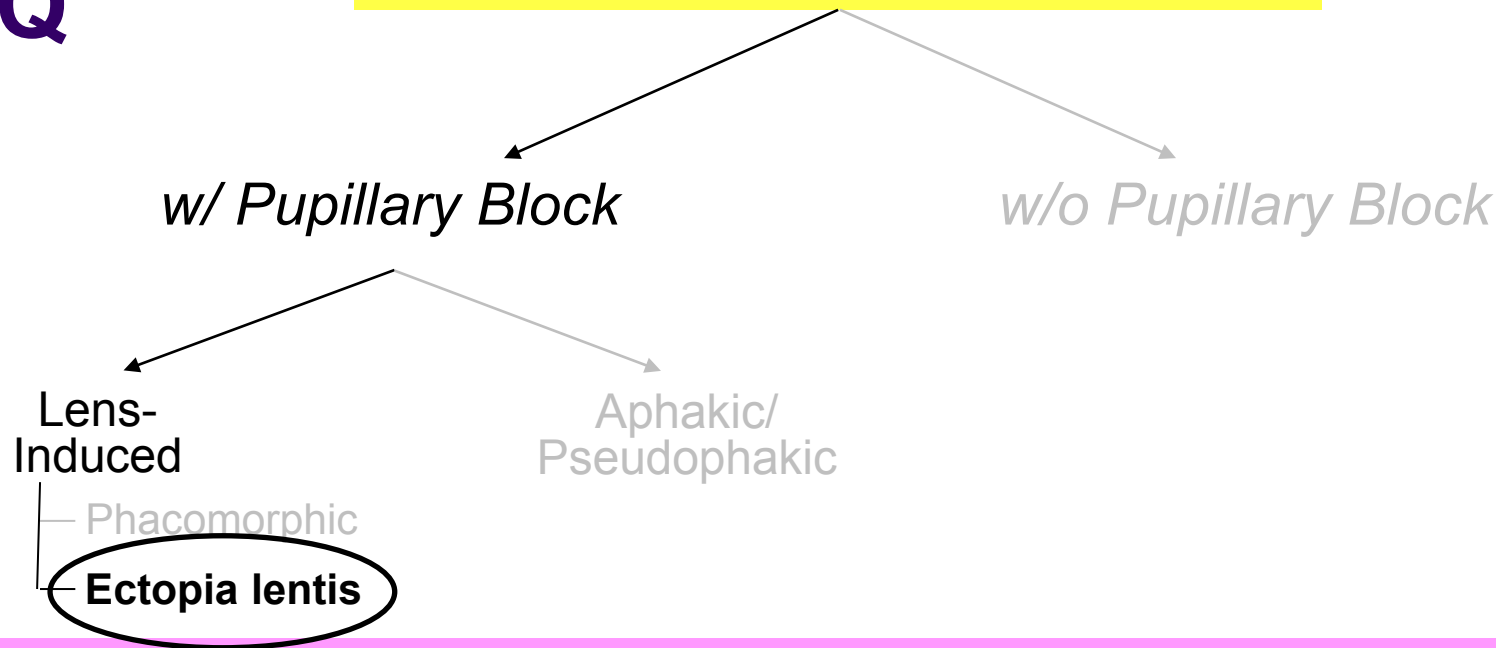
*What is ectopia lentis?*

Displacement of the lens from its normal anatomic position



Q

## Secondary Angle Closure Glaucoma



*What is ectopia lentis?*

Displacement of the lens from its normal anatomic position

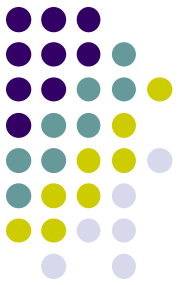
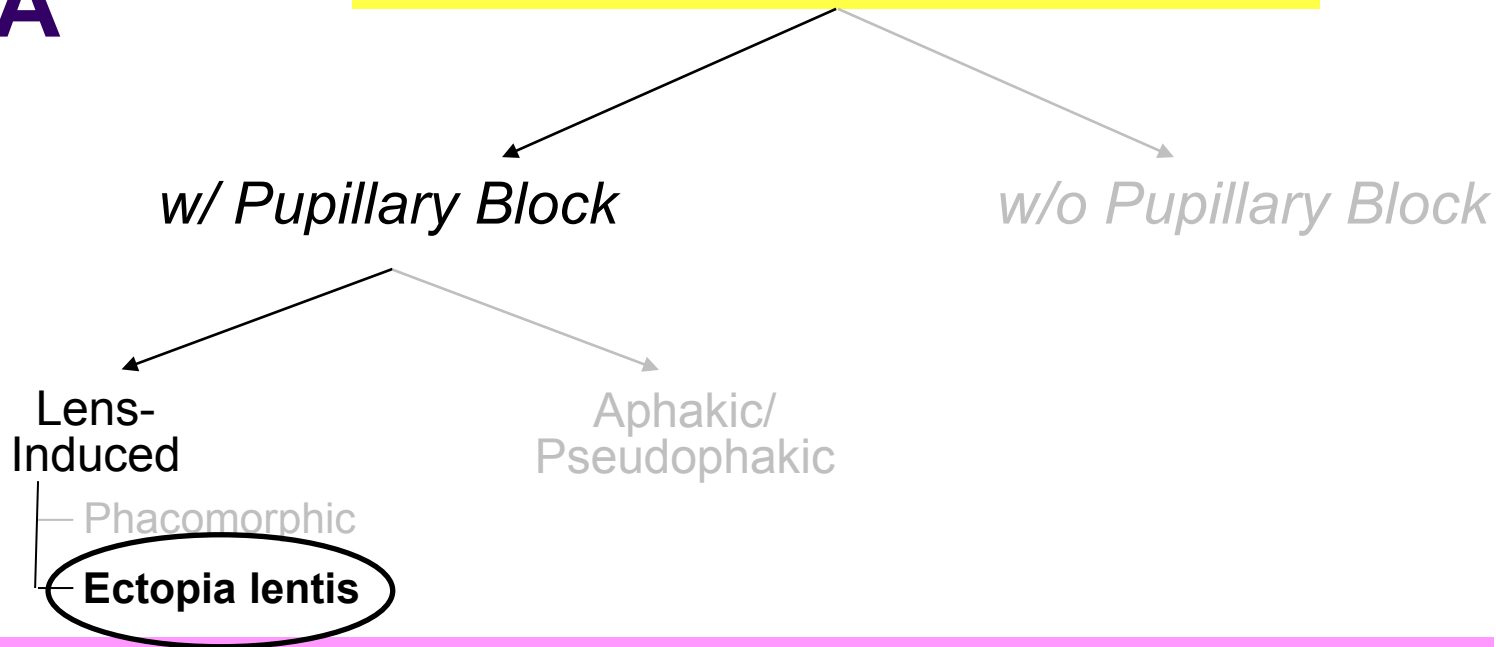
*With regard to lens 'displacement'—what do the following terms mean?*

--Sublux(at)ed:

--Lux(at)ed

A

## Secondary Angle Closure Glaucoma



*What is ectopia lentis?*

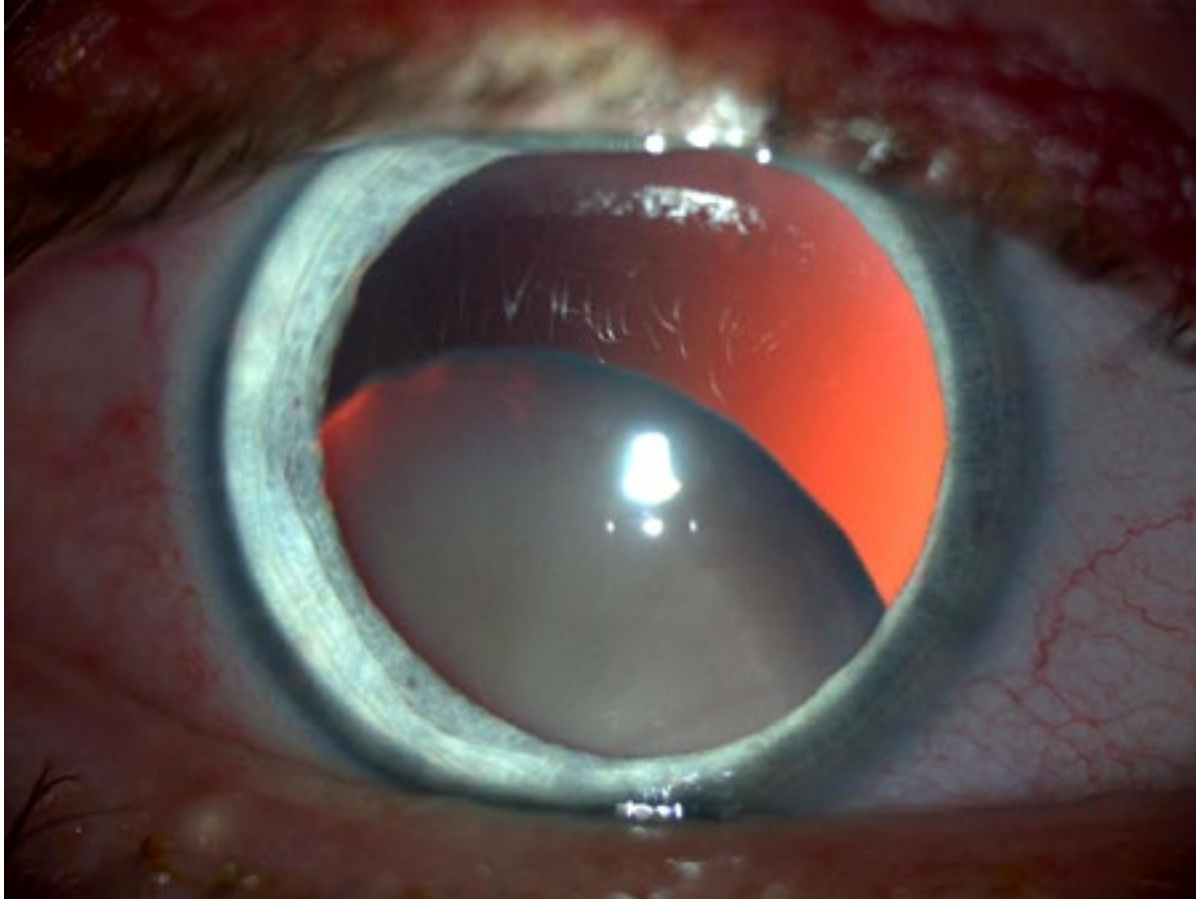
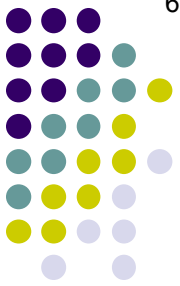
Displacement of the lens from its normal anatomic position

*With regard to lens 'displacement'—what do the following terms mean?*

--*Sublux(at)ed*: The lens is partially displaced, but remains in the 'general area'

--*Lux(at)ed*

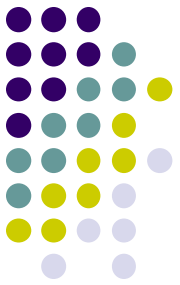
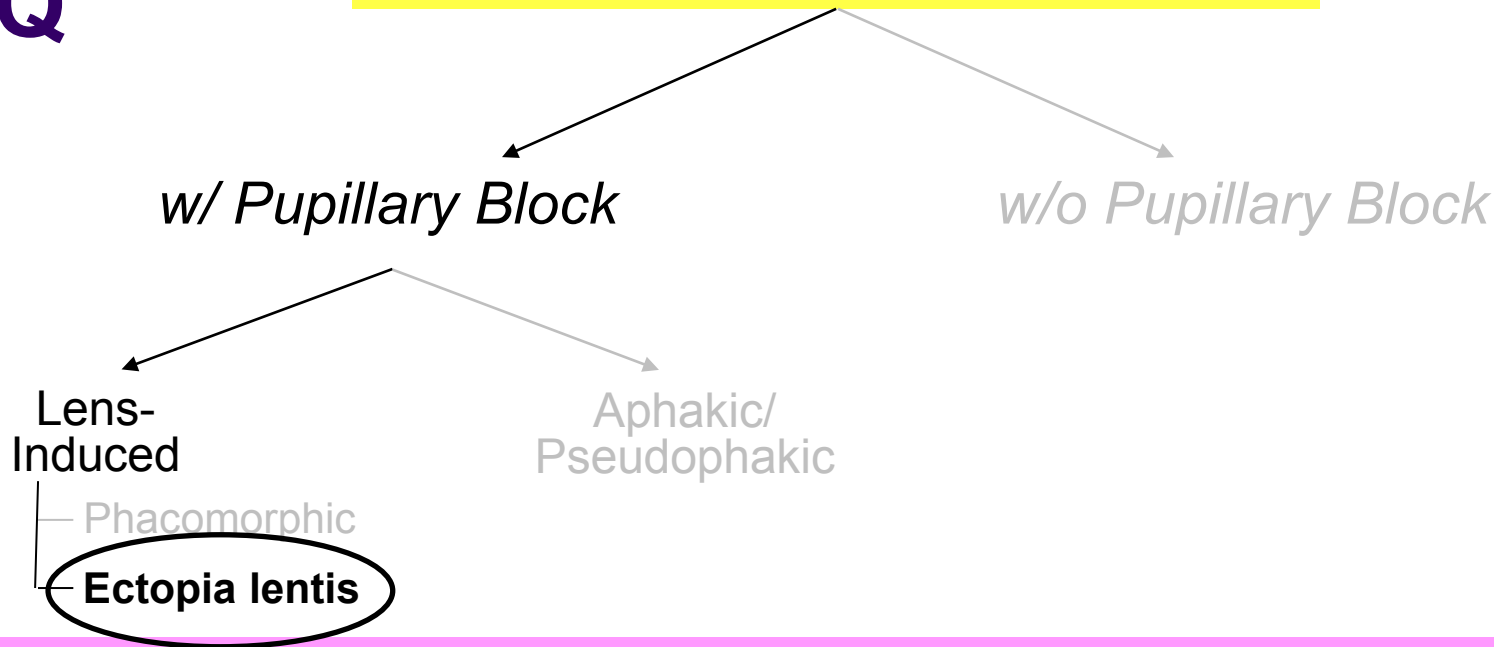
# Secondary Angle Closure Glaucoma



Subluxed lens

Q

## Secondary Angle Closure Glaucoma



*What is ectopia lentis?*

Displacement of the lens from its normal anatomic position

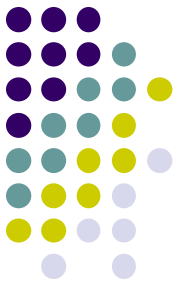
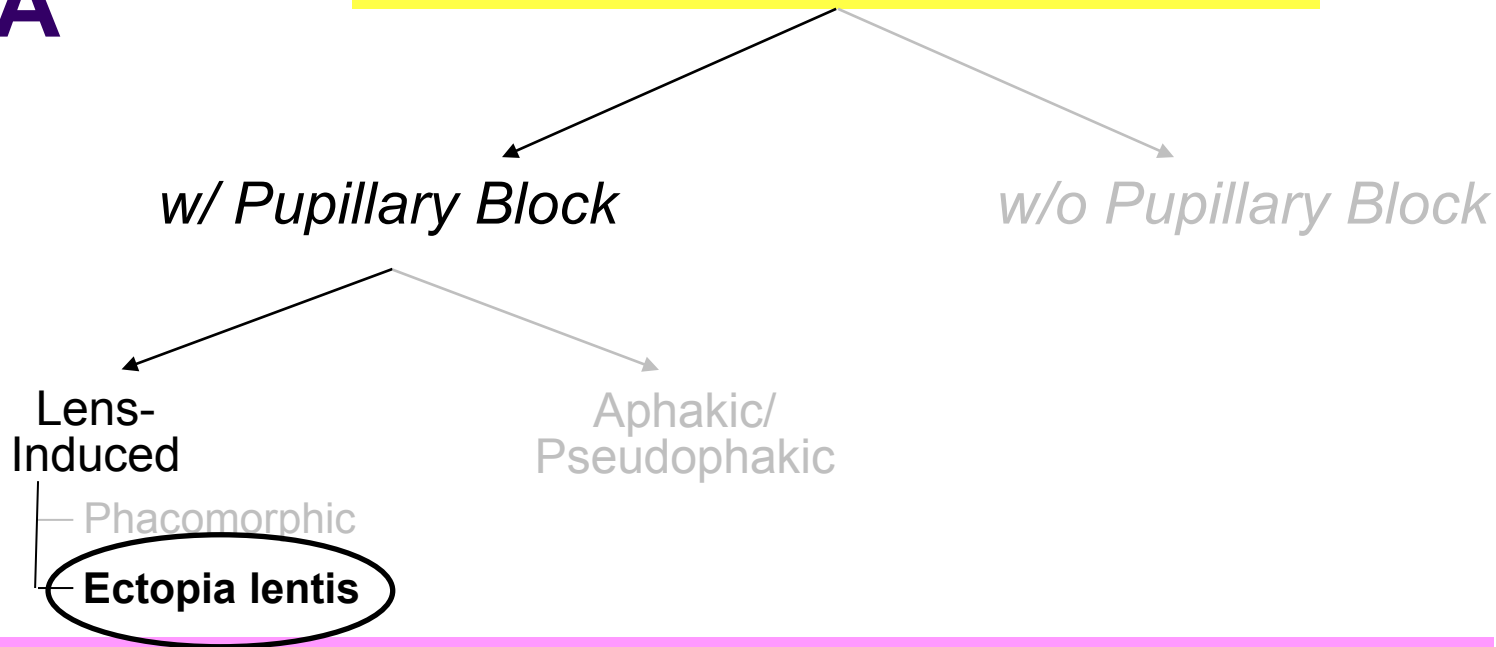
*With regard to lens 'displacement'—what do the following terms mean?*

--*Sublux(at)ed*: The lens is partially displaced, but remains in the 'general area'

--*Lux(at)ed*:

A

## Secondary Angle Closure Glaucoma



*What is ectopia lentis?*

Displacement of the lens from its normal anatomic position

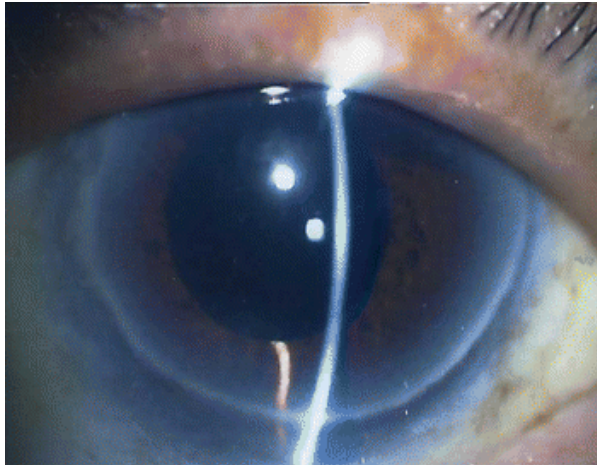
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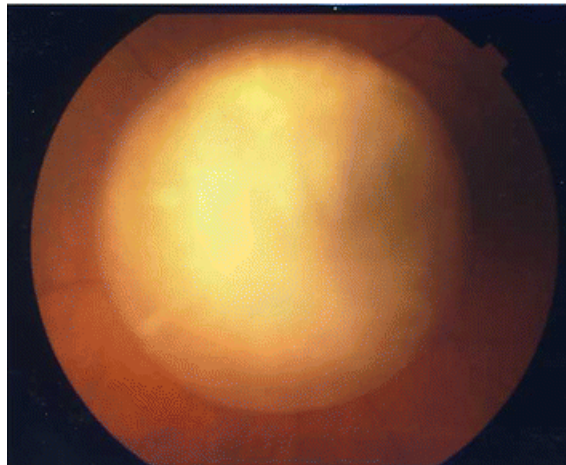
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# Secondary Angle Closure Glaucoma

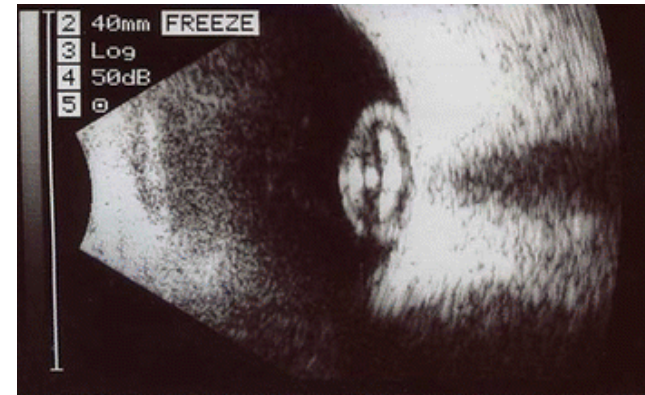
70



Aphakic



Lens resting on the retina

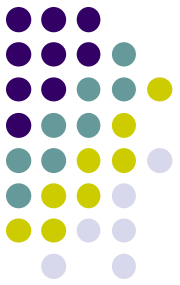
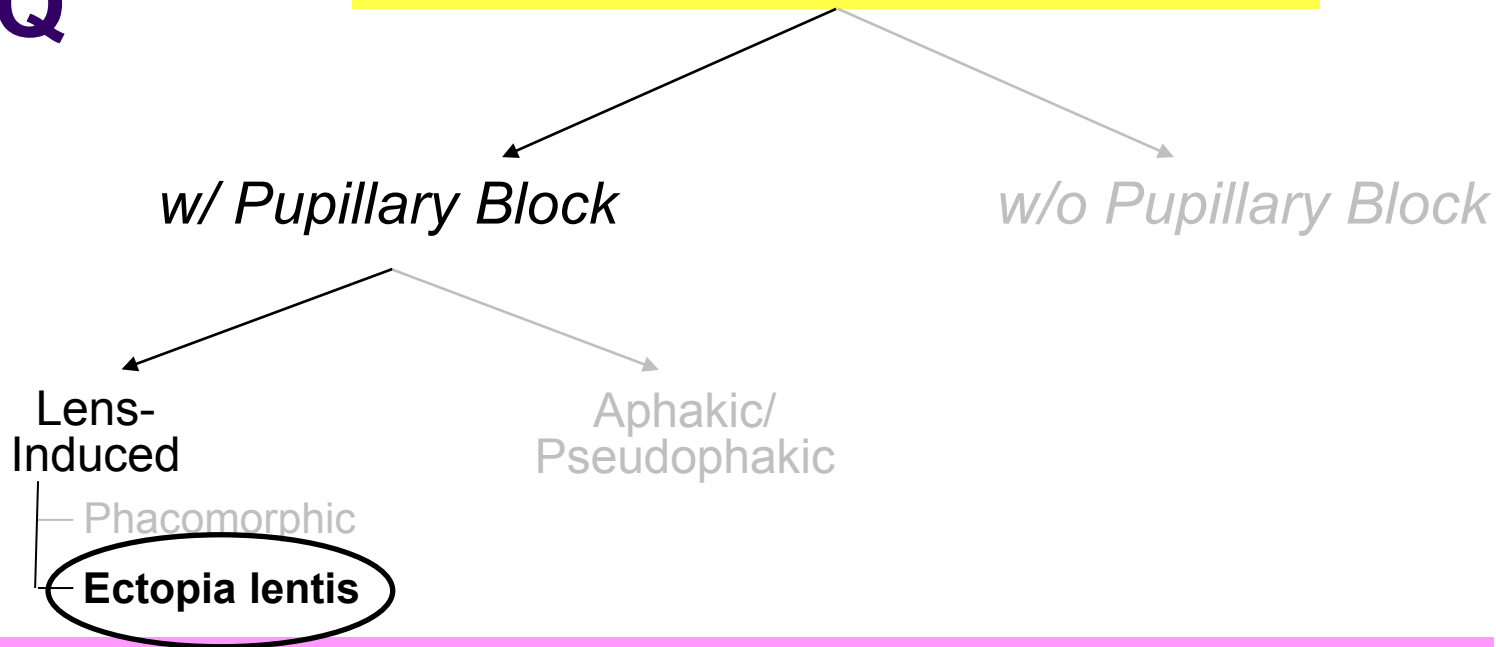


b-scan: lens on ONH

Luxated lens

Q

## Secondary Angle Closure Glaucoma



*What is ectopia lentis?*

Displacement of the lens from its normal anatomic position

*With regard to lens 'displacement'—what do the following terms mean?*

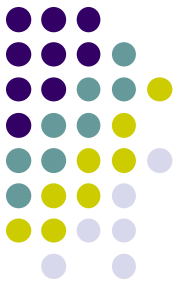
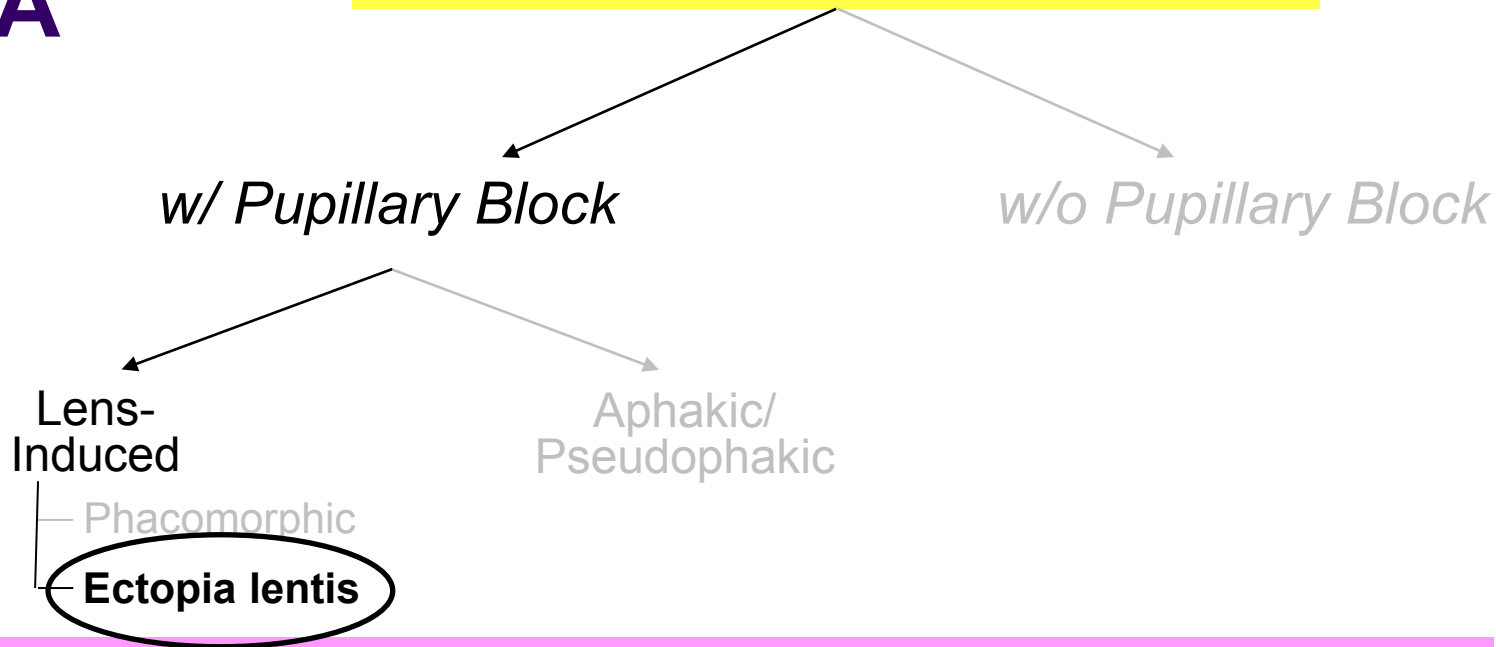
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*How does ectopia lentis lead to pupillary block and ACG?*

A

## Secondary Angle Closure Glaucoma



*What is ectopia lentis?*

Displacement of the lens from its normal anatomic position

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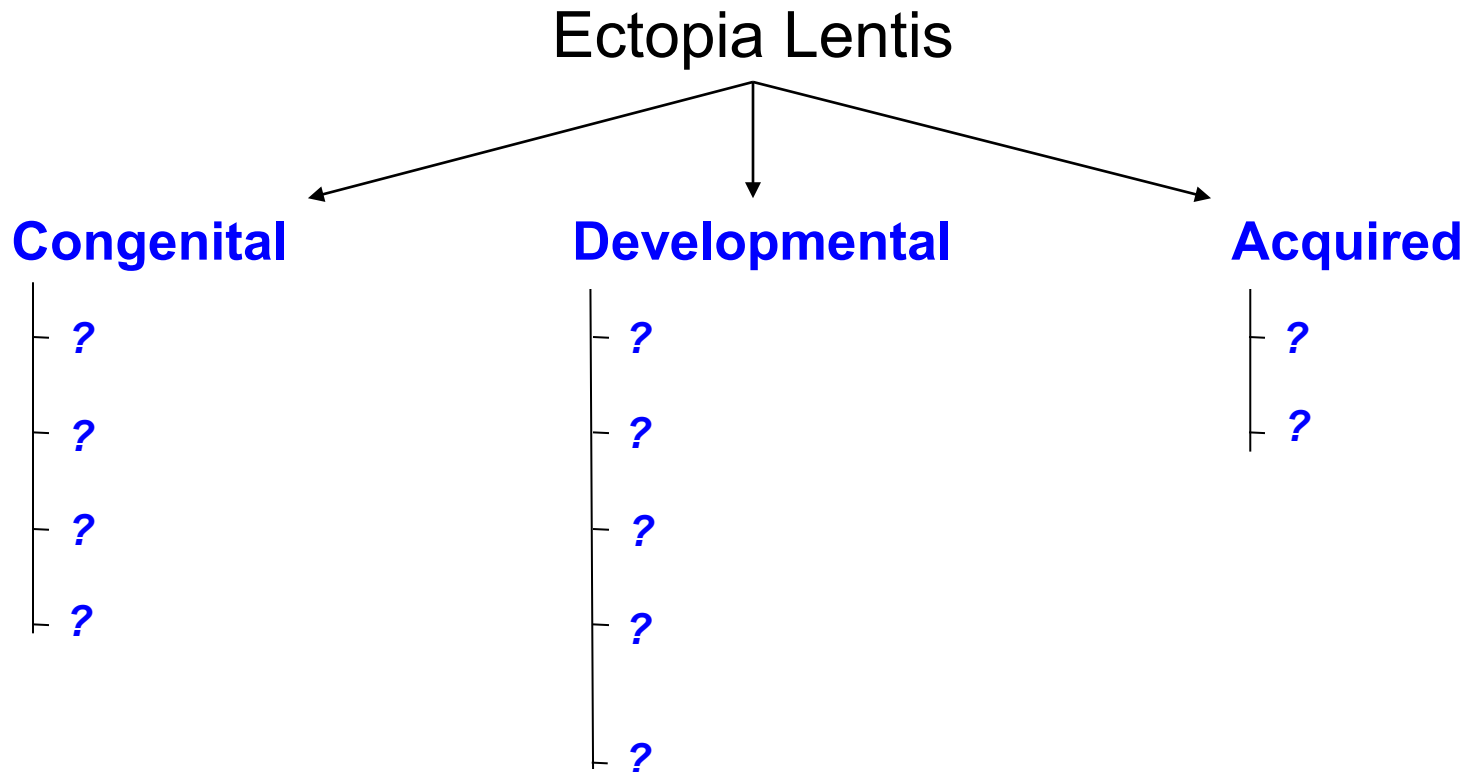
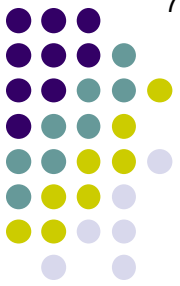
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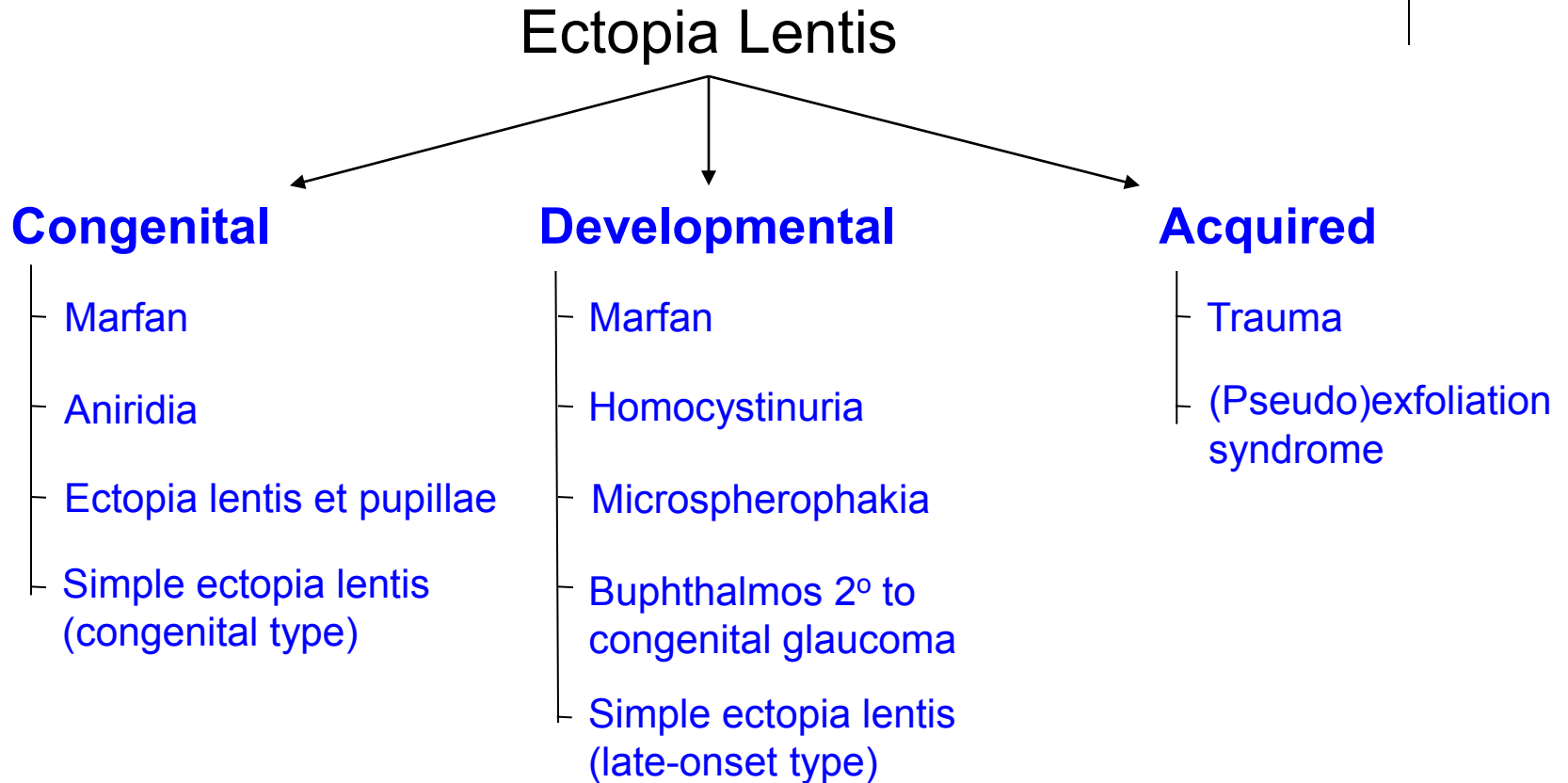
*How does ectopia lentis lead to pupillary block and ACG?*

By allowing the displaced lens to move into and blocks the pupil, producing the pressure gradient, with subsequent iris bombé and angle closure

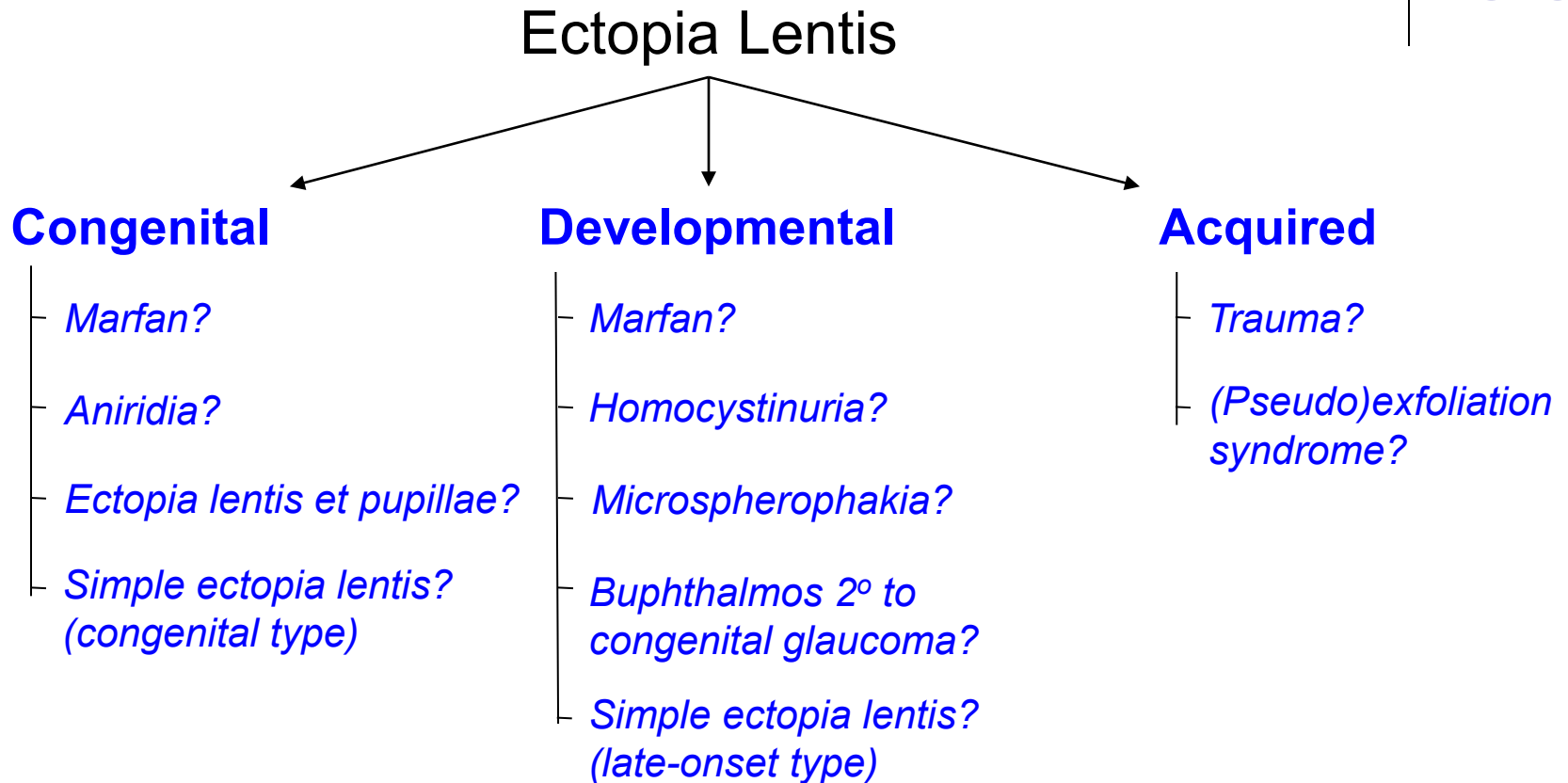
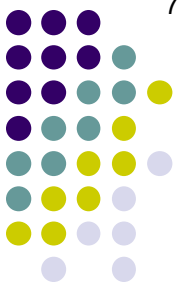




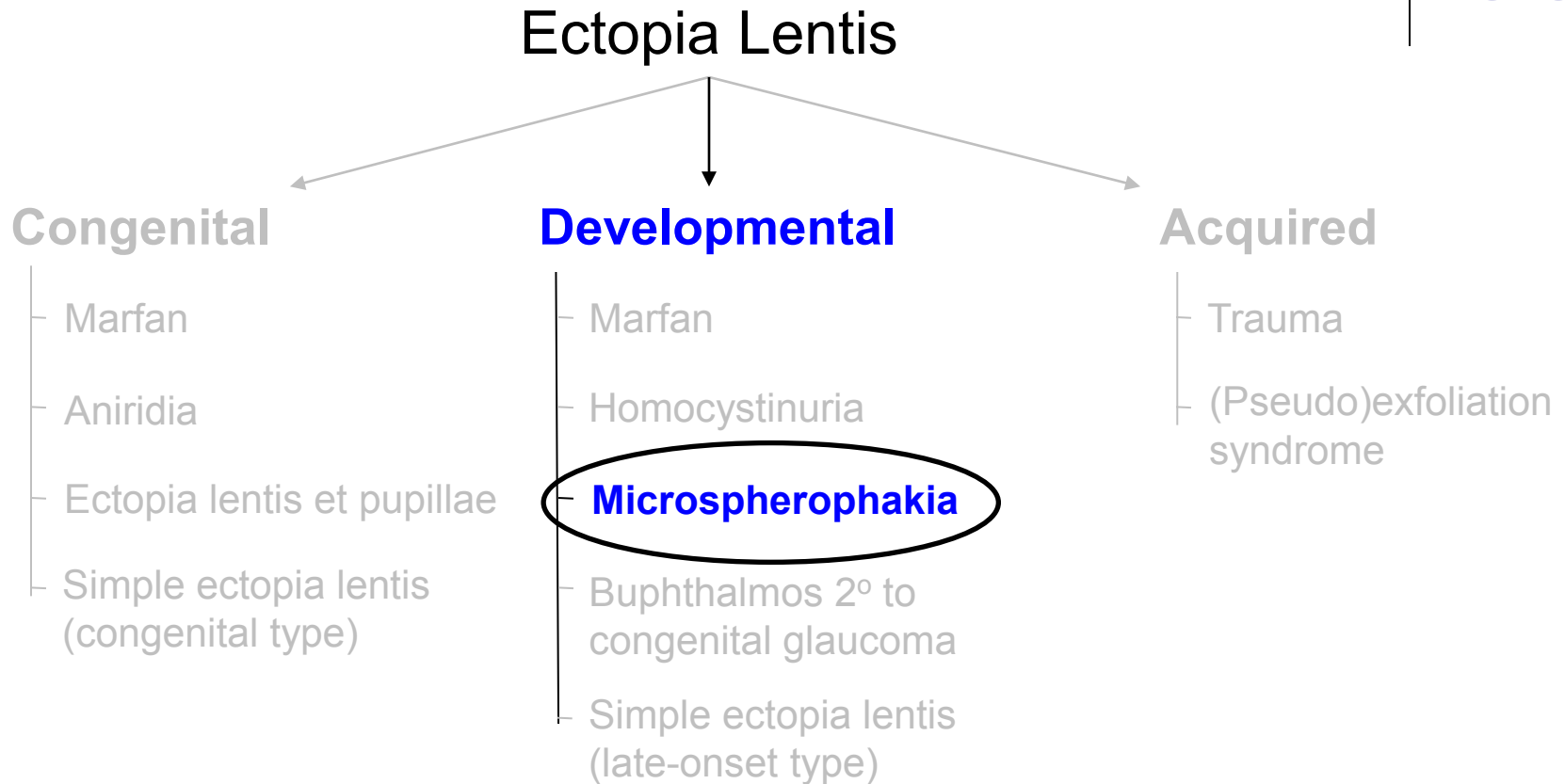
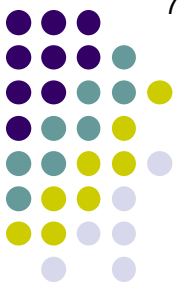
*While there are many conditions associated with ectopia lentis...*



*While there are many conditions associated with ectopia lentis...*



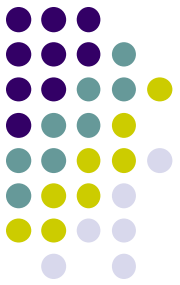
*While there are many conditions associated with ectopia lentis...  
The BCSC Glaucoma book singles out only one for discussion  
as causing pupillary block. Which one?*



*While there are many conditions associated with ectopia lentis...  
The BCSC Glaucoma book singles out only one for discussion  
as causing pupillary block. Which one? **Microspherophakia***

Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

Phacomorphic

**Ectopia lentis**

*In a few words, how would you describe the shape of a microspherophakic lens?*

*What is ectopia lentis?*  
Displacement of the lens

*With regard to lens 'displacement'—what do the following terms mean?*

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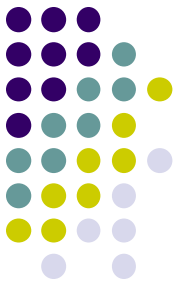
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*How does ectopia lentis lead to pupillary block and ACG?*

By allowing the displaced lens to move into and blocks the pupil, producing the pressure gradient, with subsequent iris bombé and angle closure

A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

Phacomorphic

**Ectopia lentis**

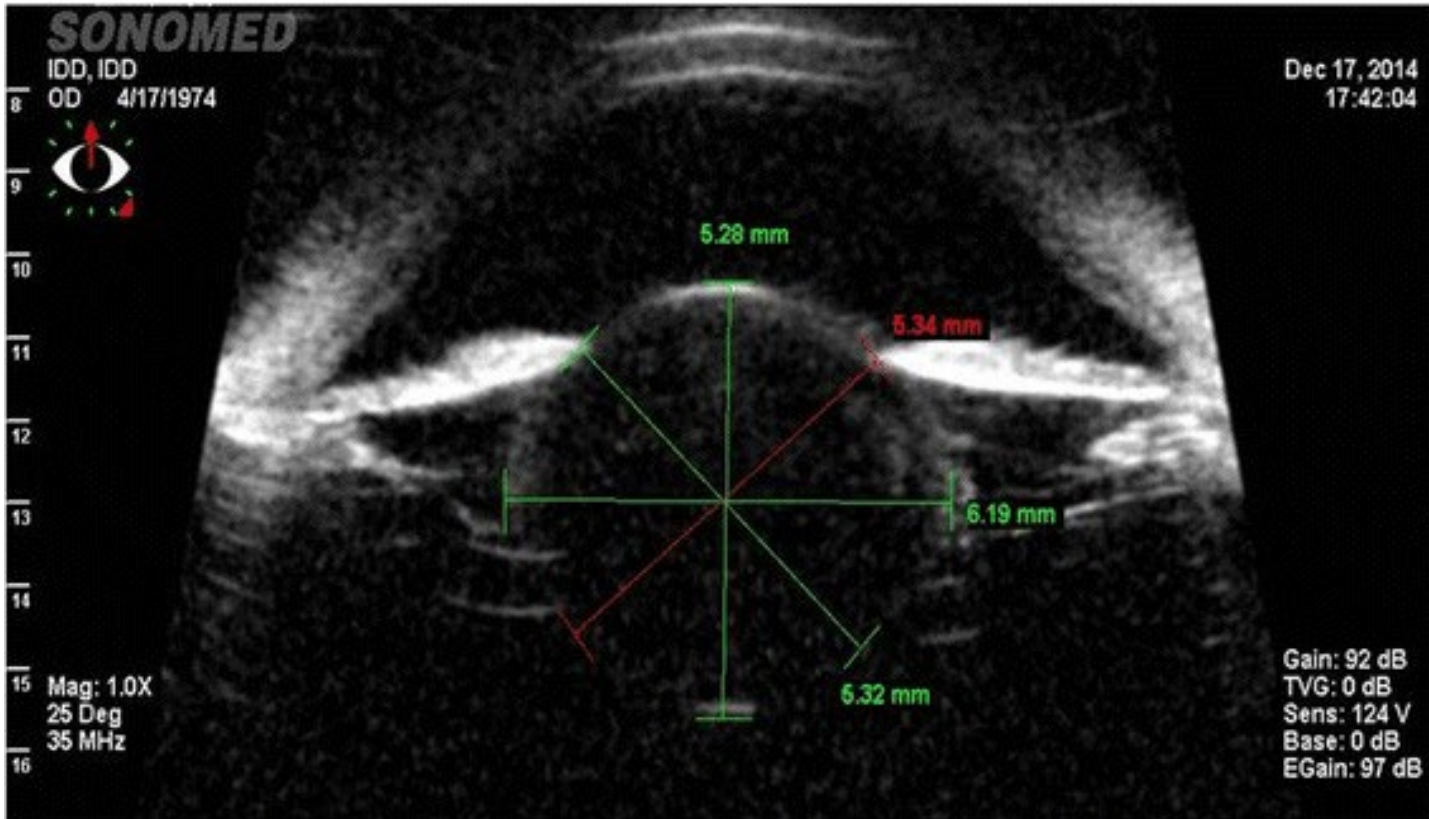
*In a few words, how would you describe the shape of a microspherophakic lens?*  
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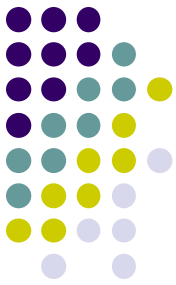
## Secondary Angle Closure Glaucoma



Microspherophakia. Note the small size, extreme curvature of the lens

Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

Phacomorphic

**Ectopia lentis**

*In a few words, how would you describe the shape of a microspherophakic lens?*

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What is ectopia lentis?  
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A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

Phacomorphic

**Ectopia lentis**

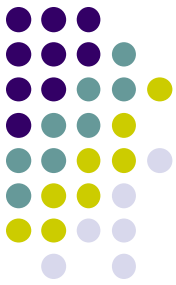
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Typically, the entirety of the lens equator can be seen in the pupillary aperture when the pt is widely dilated

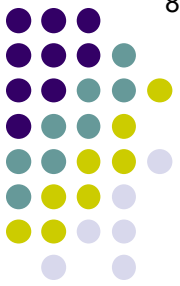
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By allowing the displaced lens to move into and blocks the pupil, producing the pressure gradient, with subsequent iris bombé and angle closure



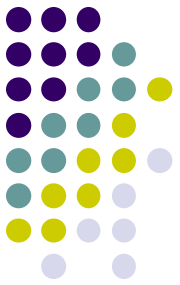
## Secondary Angle Closure Glaucoma



Microspherophakia. With mydriasis, the lens is able to fit through the pupillary aperture

Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

Phacomorphic

**Ectopia lentis**

*In a few words, how would you describe the shape of a microspherophakic lens?*  
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Displacement of the lens

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*Pts with microspherophakia are almost always high myopes. Why?*

*How does ectopia lentis lead to pupillary block and ACG?*

By allowing the displaced lens to move into and blocks the pupil, producing the pressure gradient, with subsequent iris bombé and angle closure

A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
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Phacomorphic

**Ectopia lentis**

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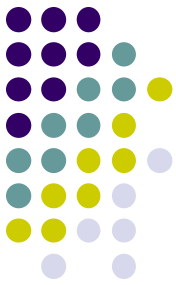
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Because the lens is small, it has a short radius of curvature.

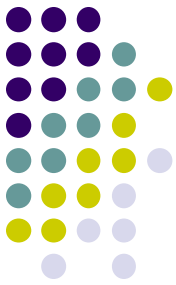
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## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

Phacomorphic

**Ectopia lentis**

*In a few words, how would you describe the shape of a microspherophakic lens?*  
The name says it all: the lens is **small ('micro')** and **round ('sphero')**

*What common slit-lamp observation owes to the lens' small size?*  
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Displacement of the lens

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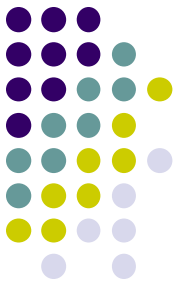
*Pts with microspherophakia are almost always high myopes. Why?*  
Because the lens is small, it has a short radius of curvature. Further, because it is spherical, it is more curved than is a normal lens.

*How does ectopia lentis lead to pupillary block and ACG?*

By allowing the displaced lens to move into and blocks the pupil, producing the pressure gradient, with subsequent iris bombé and angle closure

A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

Phacomorphic

**Ectopia lentis**

*In a few words, how would you describe the shape of a microspherophakic lens?*

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*What common slit-lamp observation owes to the lens' small size?*

Typically, the entirety of the lens equator can be seen in the pupillary aperture when the pt is widely dilated

*What is ectopia lentis?*  
Displacement of the lens

*With regard to lens 'displacement':*  
--Sublux(at)ed: The lens is partially displaced  
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*Pts with microspherophakia are almost always high myopes. Why?*

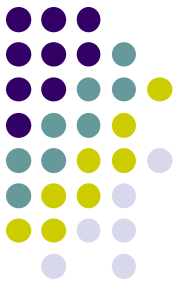
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*How does ectopia lentis lead to pupillary block and ACG?*

By allowing the displaced lens to move into and blocks the pupil, producing the pressure gradient, with subsequent iris bombé and angle closure

Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

Phacomorphic

**Ectopia lentis**

*In a few words, how would you describe the shape of a microspherophakic lens?*

*With what condition is microspherophakia most frequently associated?*

*What is ectopia lentis?*  
Displacement of the lens

*What common slit lamp observation owes to the lens' small size?*

Typically, the entirety of the lens equator can be seen in the pupillary aperture when the pt is widely dilated

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A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

Phacomorphic

**Ectopia lentis**

*In a few words, how would you describe the shape of a microspherophakic lens?*

*With what condition is microspherophakia most frequently associated?*

*Weill-Marchesani syndrome*

*What is ectopia lentis?*  
Displacement of the lens

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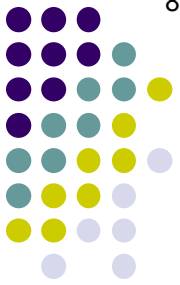
*How does ectopia lentis lead to pupillary block and ACG?*

By allowing the displaced lens to move into and blocks the pupil, producing the pressure gradient, with subsequent iris bombé and angle closure





## Secondary Angle Closure Glaucoma



Microspherophakia in Weill-Marchesani syndrome

Q

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

Phacomorphic

**Ectopia lentis**

*In a few words, how would you describe the shape of a microspherophakic lens?*

*With what condition is microspherophakia most frequently associated?*

**Weill-Marchesani syndrome**

*What is ectopia lentis?*  
Displacement of the lens

*With regard to lens 'displacement':*  
--Sublux(at)ed: The lens is partially displaced  
--Lux(at)ed: The lens is completely displaced from the pupillary aperture. All zonular attachments are lost.

*What condition can lamp-vibration owes to the lens small size?*

Typically, the entirety of the lens equator can be seen in the pupillary aperture

**What are the findings in Weill-Marchesani?**

Patients with Weill-Marchesani have:

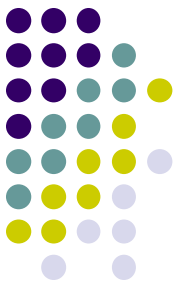
stature

eyes. Why?

re. Further, because it  
the two factors give the  
nal lens possesses.

*How does ectopia lentis lead to pupillary block and ACG?*

By allowing the displaced lens to move into and blocks the pupil, producing the pressure gradient, with subsequent iris bombé and angle closure



A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

Phacomorphic

**Ectopia lentis**

*In a few words, how would you describe the shape of a microspherophakic lens?*

*With what condition is microspherophakia most frequently associated?*

**Weill-Marchesani syndrome**

*What is ectopia lentis?*

*Displacement of the lens*

*With regard to lens 'displacement':*

*--Sublux(at)ed: The lens is partially displaced*

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*What condition can cause ectopia lentis due to the lens' small size?*

*Typically, the entirety of the lens equator can be seen in the pupillary aperture*

***What are the findings in Weill-Marchesani?***

***Patients with Weill-Marchesani have:***

***...short stature***

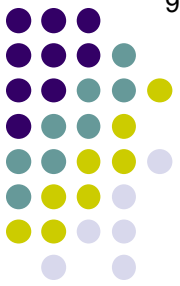
*...brachydactyly.*

*Why? Because the lens is small. Further, because it is biconvex, the two factors give the lens a high refractive index.*

*How does ectopia lentis lead to pupillary block and ACG?*

*By allowing the displaced lens to move into and blocks the pupil, producing the pressure gradient, with subsequent iris bombé and angle closure*

## Secondary Angle Closure Glaucoma



Weill-Marchesani syndrome: Short stature

Q

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

Phacomorphic

**Ectopia lentis**

*In a few words, how would you describe the shape of a microspherophakic lens?*

*With what condition is microspherophakia most frequently associated?*

**Weill-Marchesani syndrome**

*What is ectopia lentis?*  
Displacement of the lens

*With regard to lens 'displacement':*  
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*What condition can lamp-vision owe to the lens' small size?*  
Typically, the entirety of the lens equator can be seen in the pupillary aperture

**What are the findings in Weill-Marchesani?**

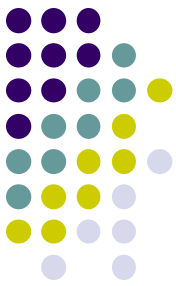
**Patients with Weill-Marchesani have:**

...**short stature**

**brachydactyly** fingers

*How does ectopia lentis lead to pupillary block and ACG?*

By allowing the displaced lens to move into and blocks the pupil, producing the pressure gradient, with subsequent iris bombé and angle closure



A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

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Aphakic/  
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*What condition can lens displacement lead to?*  
Typically, the entirety of the lens equator can be seen in the pupillary aperture

**What are the findings in Weill-Marchesani?**

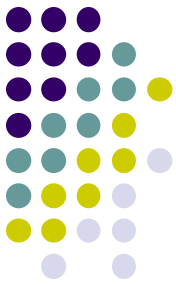
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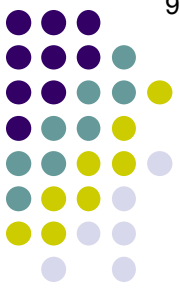
...**short** fingers

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By allowing the displaced lens to move into and blocks the pupil, producing the pressure gradient, with subsequent iris bombé and angle closure



# Secondary Angle Closure Glaucoma



Weill-Marchesani syndrome: Short fingers



Q

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

Phacomorphic

**Ectopia lentis**

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*With what condition is microspherophakia most frequently associated?*

**Weill-Marchesani syndrome**

*What is ectopia lentis?*

*Displacement of the lens*

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*--Sublux(at)ed: The lens is partially displaced*

*--Lux(at)ed: The lens is completely displaced*

*aperture. All zonular attachments are intact.*

*What condition can cause ectopia lentis due to the lens' small size?*

*Typically, the entirety of the lens equator can be seen in the pupillary aperture*

***What are the findings in Weill-Marchesani?***

***Patients with Weill-Marchesani have:***

***...short stature***

***...short fingers***

***...joint contractures***

*...Why?*

*...Further, because it*

*...the two factors give the*

*...lens possesses.*

*How does ectopia lentis lead to pupillary block and ACG?*

*By allowing the displaced lens to move into and blocks the pupil, producing the pressure gradient, with subsequent iris bombé and angle closure*



A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

Phacomorphic

**Ectopia lentis**

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*With what condition is microspherophakia most frequently associated?*

**Weill-Marchesani syndrome**

*What is ectopia lentis?*

*Displacement of the lens*

*With regard to lens 'displacement':*

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***...stiff joints***

*...eyes. Why?*

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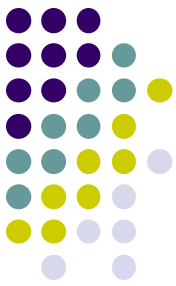
***...short fingers***

***...stiff joints***

***Think of it as the opposite of Marfan syndrome***

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***...short stature***

***Tall stature***

***...short fingers***

***Long fingers***

***...stiff joints***

***Lax joints***

***Think of it as the opposite of Marfan syndrome***

*...Why?*

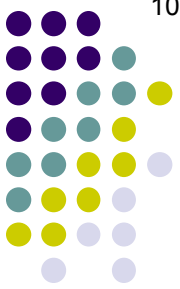
*...Further, because it is the combination of these two factors that give the normal lens its shape.*

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# Secondary Angle Closure Glaucoma

100



Weill-Marchesani syndrome



Marfan syndrome

Q

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

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*With what conditions is microspherophakia occasionally associated?*

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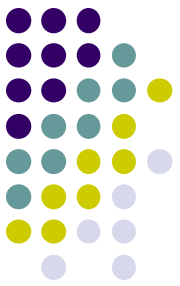
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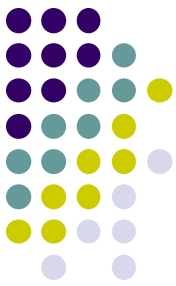
*Weill-Marchesani is strongly associated with microspherophakia.*

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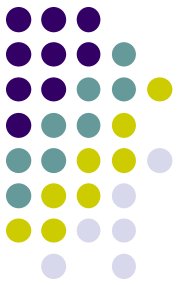
- Lowe syndrome
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*the pupillary aperture*

*With what conditions is*

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Note: The *Glaucoma* book mentions only two syndromic associations for microspherophakia: Weill-Marchesani and Marfan. Further, it implies that microspherophakia occurs at equal rates in the two conditions. However, as the other *BCSC* books make clear, microspherophakia is associated with these other conditions as well. Further, it is far more likely to occur in Weill-Marchesani than in any of these other conditions, including Marfan.

*How does ectopia lentis*

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# Secondary Angle Closure Glaucoma

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**Ruby LAMP Weill-Marchesani** is a mnemonic for the conditions associated with microspherophakia:

**Ruby** = Rubella

**L**owe syndrome  
**A**lport syndrome  
**M**arfan syndrome  
**P**eters anomaly

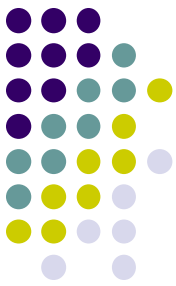
*How does ectopia lentis lead to angle closure?*  
By allowing the displaced lens to block the pressure gradient, with subsequent iris bombé and angle closure

pupillary aperture

s. Why?

Further, because it has two factors give the lens possesses.

the





Q

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

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Lens-Induced

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two words

syndromes

pupillary aperture

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*Microspherophakia is **not** the classic lens finding in the oculorenal syndromes (and should not be the first one out of your mouth if pimped about them). What is?*

pupillary aperture

*Why?*

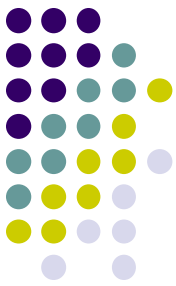
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**Lenticonus**

How does ectopia lentis

By allowing the displac

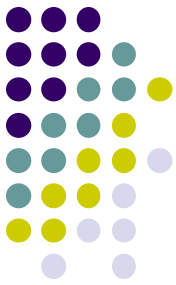
pressure gradient, with subsequent iris bombe and angle closure

pupillary aperture

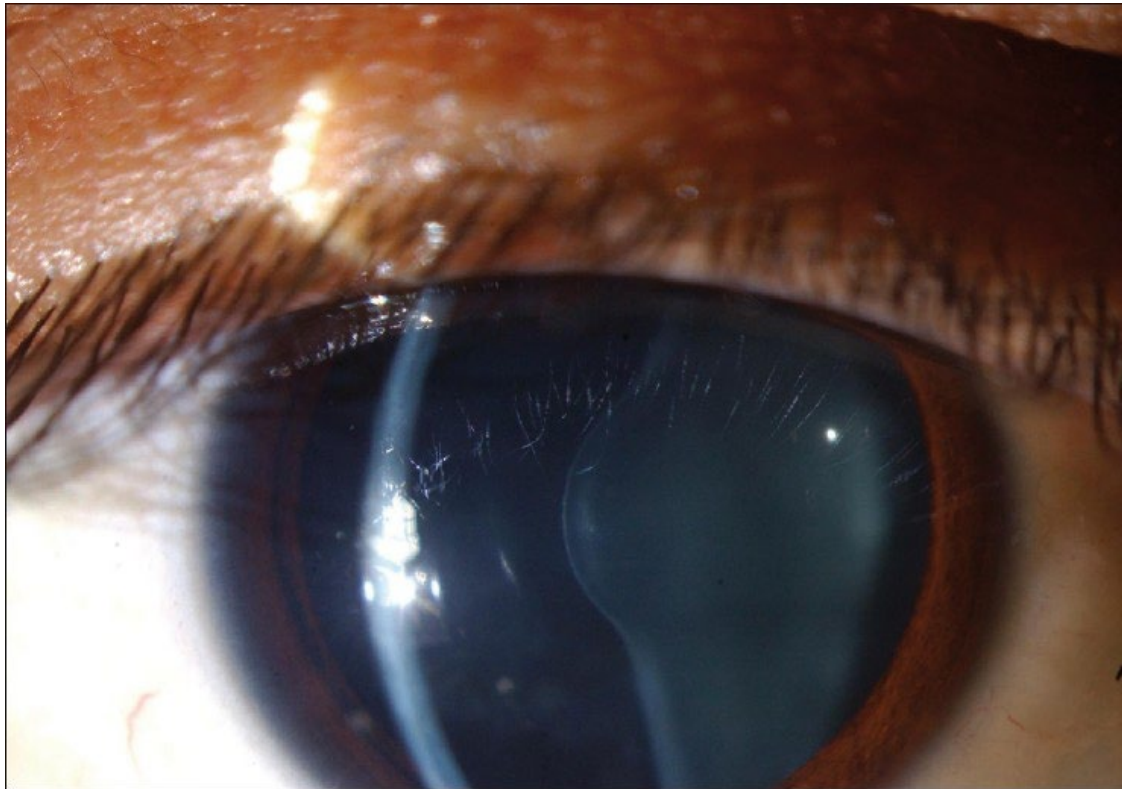
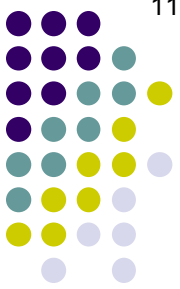
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## Secondary Angle Closure Glaucoma



Anterior lenticonus in Alport syndrome

Q

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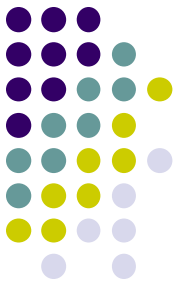
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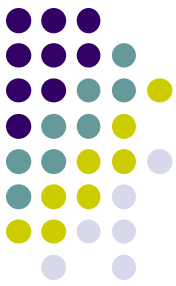
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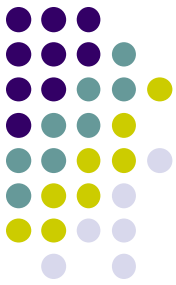
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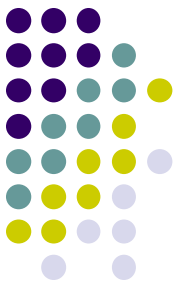
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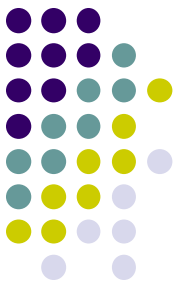
--Dilatation of the aortic root and descending aorta

--Aortic aneurysms/dissection

--Mitral valve prolapse

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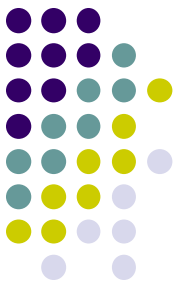
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*Are these abnormalities clinically significant?*

*How does ectopia lentis*

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What cardiovascular abnormalities are common?

--Dilatation of the aortic root and descending aorta

--Aortic aneurysms/dissection

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Are these abnormalities clinically significant?

Indeed they are—they are responsible for the significantly shortened lifespan of Marfan pts

How does ectopia lentis

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Fibrillin

*What three structures/s*

--The eye (duh)

**--The cardiovascular**

--The musculoskeletal

*What cardiovascular abnormalities are common?*

--Dilatation of the aortic root and descending aorta

--Aortic aneurysms/dissection

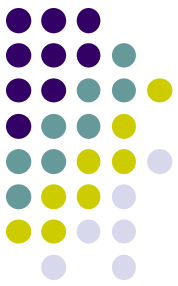
*How significant is the lifespan shortening?*

Indeed they are—they are responsible for the

**significantly shortened lifespan of Marfan pts**

*How does ectopia lentis*

By allowing the displaced lens to move into a pressure gradient, with subsequent iris bomb





Q/A

## Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

Lens-Induced

Aphakic/  
Pseudophakic

Phacomorphic

**Ectopia lentis**

In a few words, how would you describe the shape of a microspherophakic lens?

With what condition is microspherophakia most frequently associated?

**Weill-Marchesani syndrome**

Weill-Marchesani is strongly associated with microspherophakia.

With what conditions is microspherophakia occasionally associated?

--Lowe syndrome

--Alport syndrome

**--Marfan syndrome**

--Peters anomaly

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How significant is the lifespan shortening?

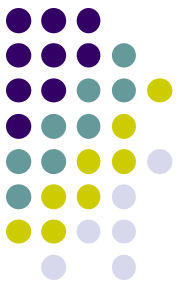
Quite. The life-expectancy of Marfan pts is about

% that of the so-called normal population.

**significantly shortened lifespan of Marfan pts**

How does ectopia lentis

By allowing the displaced lens to move into the angle, increasing the pressure gradient, with subsequent iris bombé



A

## Secondary Angle Closure Glaucoma

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How significant is the lifespan shortening?

Quite. The life-expectancy of Marfan pts is about **half** that of the so-called normal population.

**significantly shortened lifespan of Marfan pts**

How does ectopia lentis...  
By allowing the displaced lens to move into...  
pressure gradient, with subsequent iris bomb

## Secondary Angle Closure Glaucoma



Marfan syndrome: Aortic dissection

Q

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

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Aphakic/  
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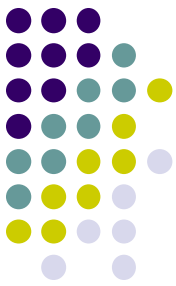
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*How does ectopia lentis*

*By allowing the displaced lens to move into an angle, creating a pressure gradient, with subsequent iris bombé and angle closure*



Q/A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

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--The cardiovascular

**--The musculoskeletal**

*What musculoskeletal abnormalities are common?*

--Arachnodactyly

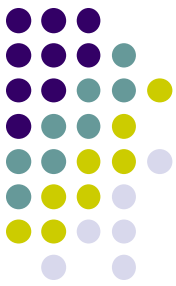
--Hypermobile joints

--Sternum deformities (eg,

two-us word-ums

*How does ectopia lentis*

*By allowing the displaced lens to move into and block the angle, creating a pressure gradient, with subsequent iris bombé and angle closure*



A

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w/ Pupillary Block

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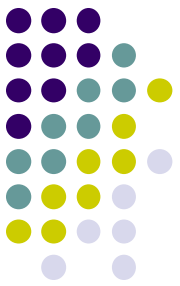
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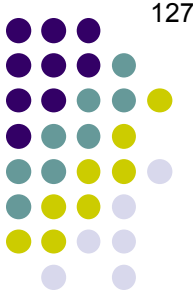
--Sternum deformities (eg, pectus excavatum)

How does ectopia lentis

By allowing the displaced lens to move into an angle, creating a pressure gradient, with subsequent iris bombé and angle closure



## Secondary Angle Closure Glaucoma

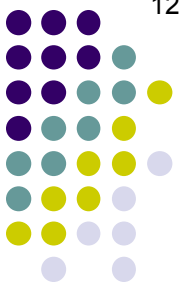


127



Marfan syndrome: Arachnodactyly

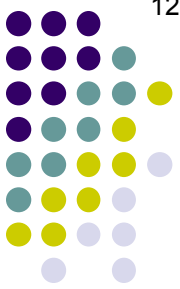
## Secondary Angle Closure Glaucoma



Marfan syndrome: Hypermobile joints



## Secondary Angle Closure Glaucoma



Marfan syndrome: Pectus excavatum

Q

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

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*With what conditions is n*

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--Alport syndrome

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--Congenital rubella

W  
Fib

*What three structures/systems manifest abnormalities in Marfan's?*

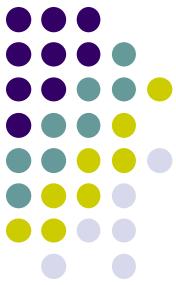
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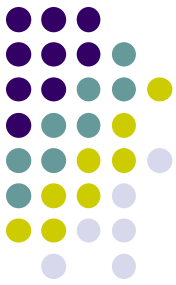
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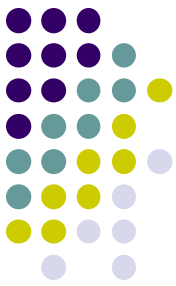
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--Increased axial length

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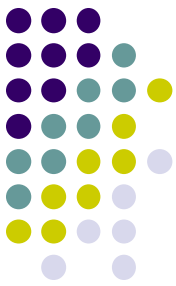
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*What proportion of Marfan's manifest ocular abnormalities?*

*What's abnormal about corneal shape in Marfan's?*

*Weill-Marchesani is*

*With what condition*

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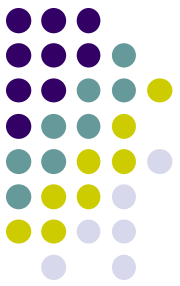
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What proportion of Marfan's manifest ocular abnormalities?

What's abnormal about corneal shape in Marfan's?

The cornea tends to be flatter vs steeper than normal as well as

smaller vs larger than normal

What two ocular structural abnormalities are often present?

**--Corneal shape abnormalities**

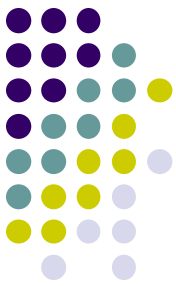
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What three structures/systems manifest abnormalities in Marfan's?

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--The cardiovascular

--The musculoskeletal



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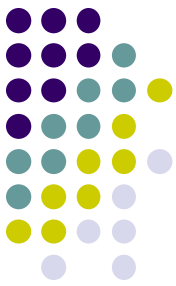
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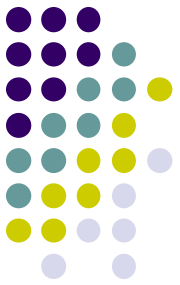
--The musculoskeletal





Q

## Secondary Angle Closure Glaucoma



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Lens-  
Induced

— Phacomorphic

— Ectopia lentis

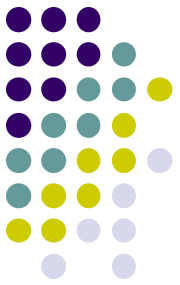
**Aphakic/**

Pseudophakic

*We said earlier that 'pupillary block' involves contact between the pupillary margin and the lens. If there's no lens, what's blocking the pupil in aphakic secondary ACG?*

Q/A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-  
Induced

- Phacomorphic
- Ectopia lentis

**Aphakic/**

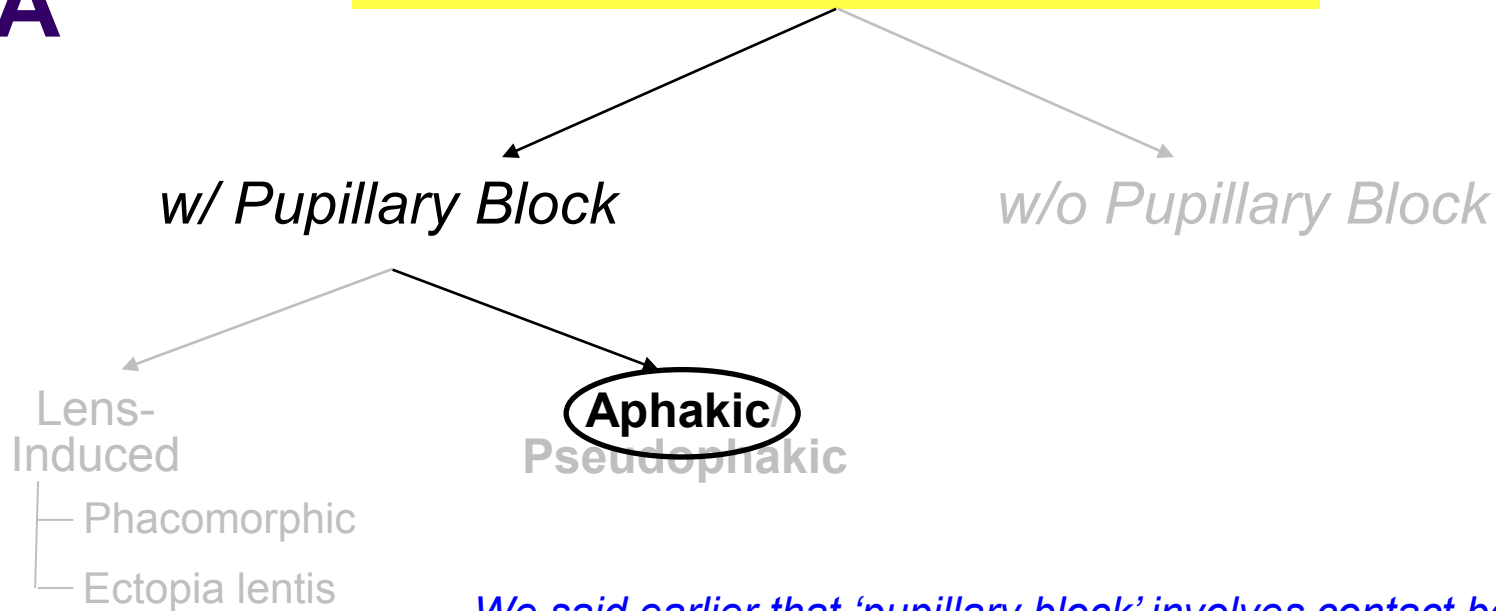
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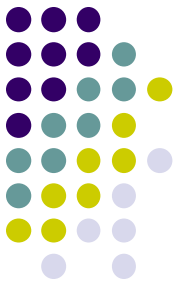
*The culprit is the [redacted] face.*

A

## Secondary Angle Closure Glaucoma

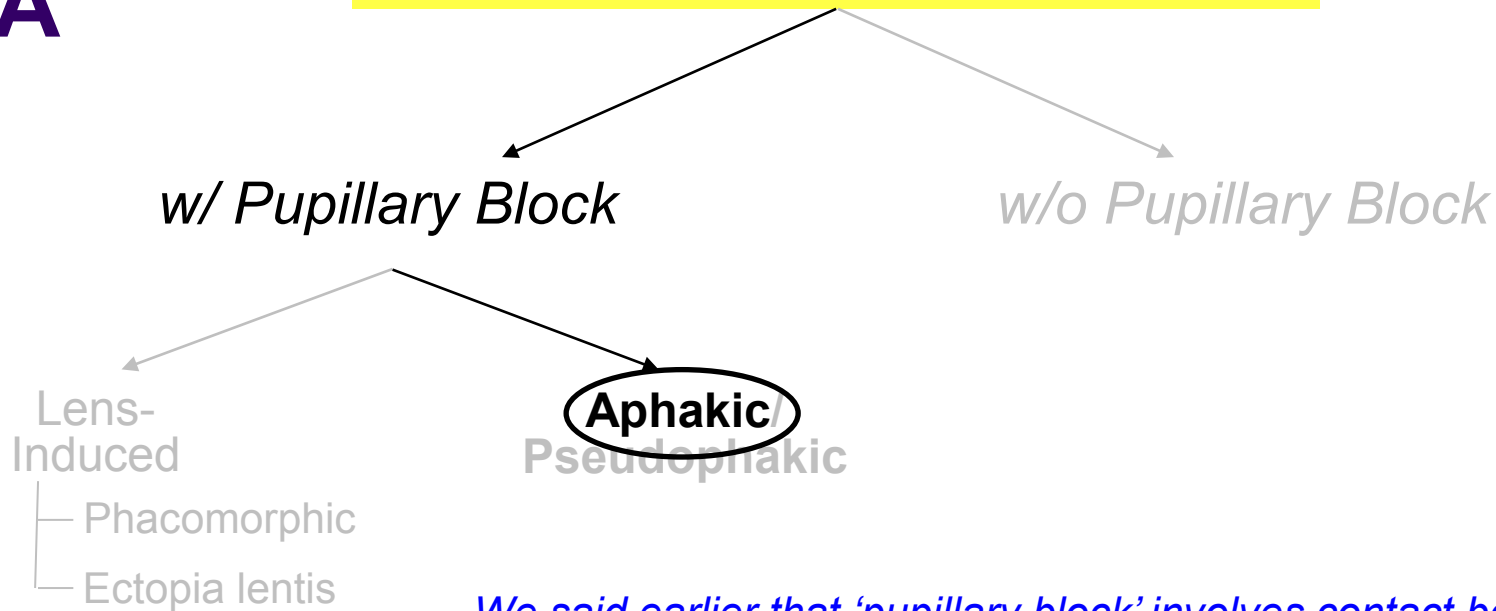


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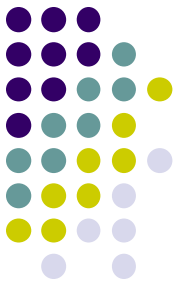
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## Secondary Angle Closure Glaucoma

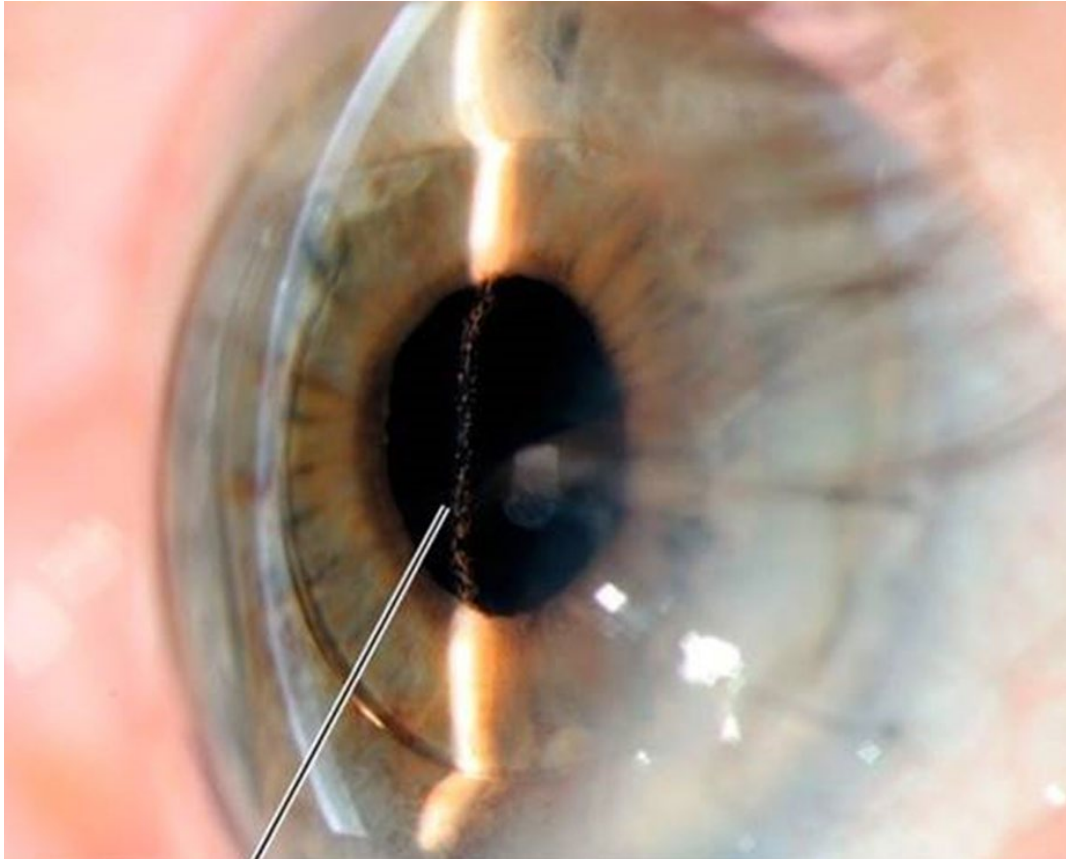
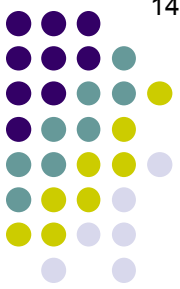


*We said earlier that 'pupillary block' involves contact between the pupillary margin and the lens. If there's no lens, what's blocking the pupil in aphakic secondary ACG?*

The culprit is the *vitreous face*. If it bulges forward, it can block the pupil just as readily as can the lens.



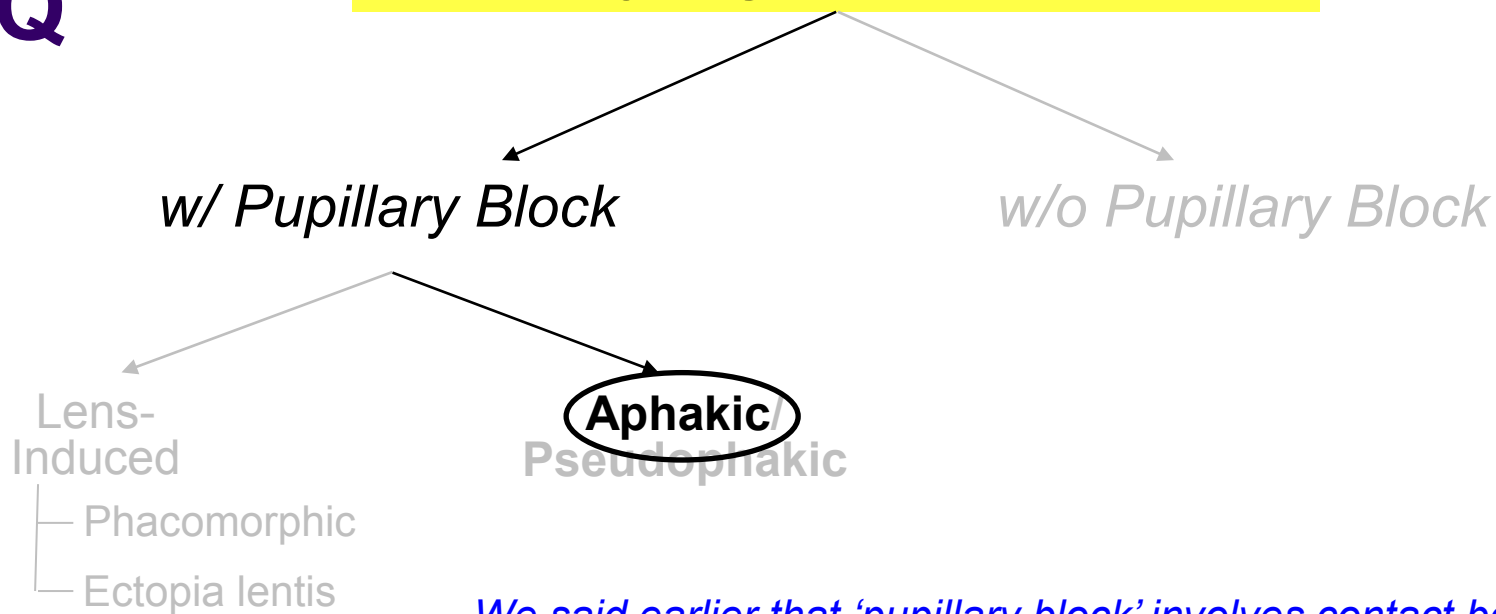
## Secondary Angle Closure Glaucoma



Aphakic pupillary block. Now, this pt is not aphakic (an AC IOL is present). Nevertheless, the pic beautifully depicts the mechanism of aphakic pupillary block, that being the vitreous face (*line*) occupying the pupillary aperture, thereby impeding the circulation of newly-created aqueous from the PC to the AC.

Q

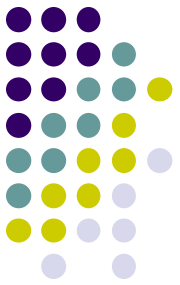
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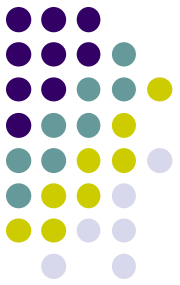
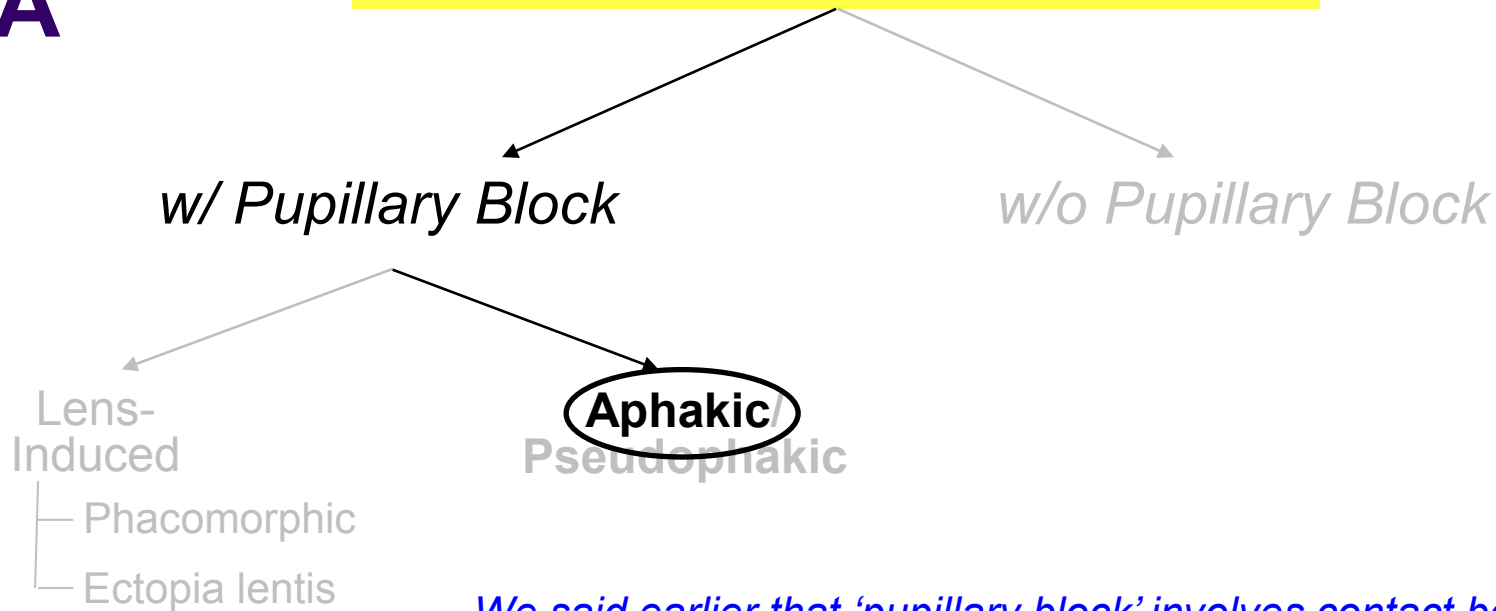
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*How is aphakic secondary ACG managed?*



A

## Secondary Angle Closure Glaucoma



*We said earlier that ‘pupillary block’ involves contact between the pupillary margin and the lens. If there’s no lens, what’s blocking the pupil in aphakic secondary ACG?*

The culprit is the *vitreous* face. If it bulges forward, it can block the pupil just as readily as can the lens.

*How is aphakic secondary ACG managed?*

Pretty much the same as if the culprit was the native lens—pour aqueous suppressants onto the eye (+/- hyperosmotic agents to dehydrate the V), then perform as many LPIs as necessary as soon as possible

Q

## Secondary Angle Closure Glaucoma

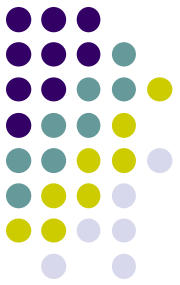
*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-  
Induced

Aphakic/  
**Pseudophakic**

*What sort of IOL is commonly implicated in pupillary block secondary ACG?*





A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

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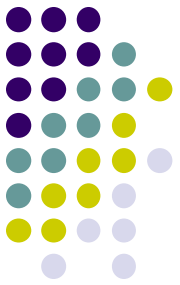
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The AC sort. Pressure in the posterior chamber pushes the iris against the IOL from behind, preventing aqueous from passing freely through the pupil. This initiates the now-familiar PC>AC pressure gradient → anterior bowing of the peripheral iris → occlusion of the angle.



Q

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

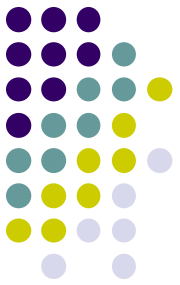
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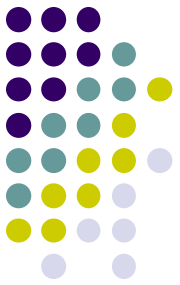
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*OK, so why doesn't this happen **every** time an AC IOL is placed?*



Q/A

## Secondary Angle Closure Glaucoma



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Because a two words is created during the cataract surgery

A

## Secondary Angle Closure Glaucoma

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Aphakic/

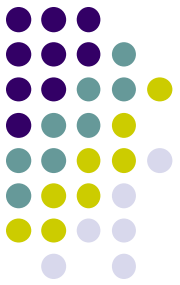
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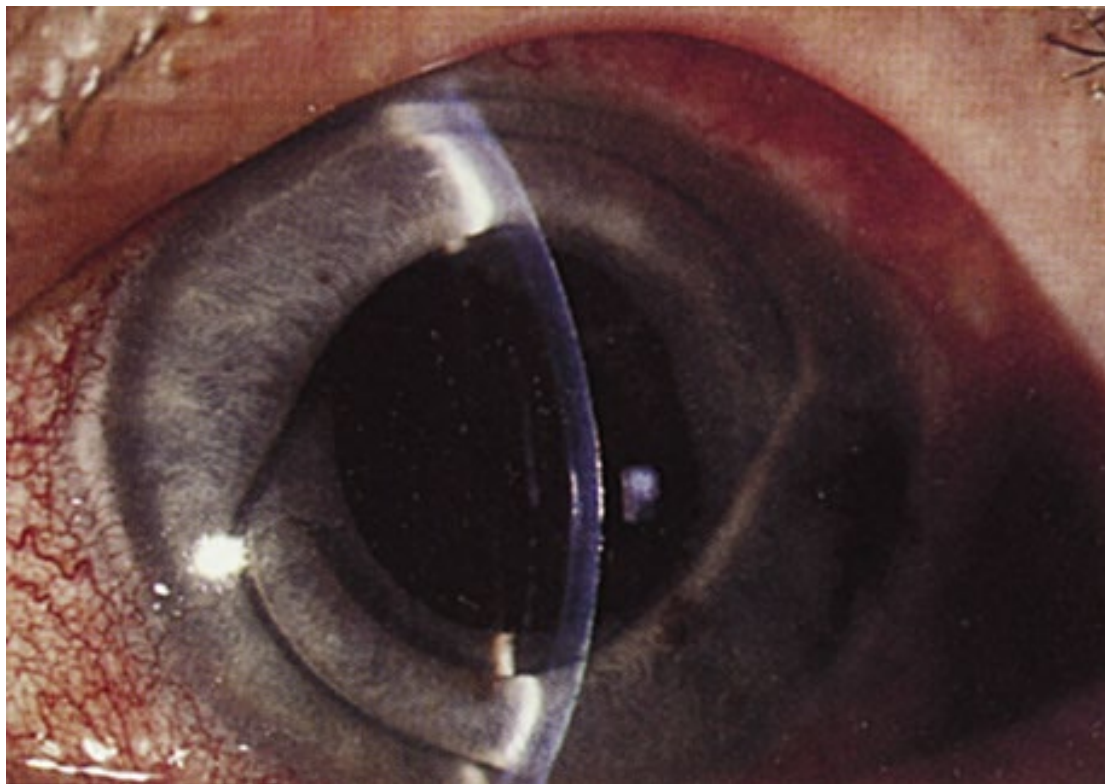
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*OK, so why doesn't this happen **every** time an AC IOL is placed?*

Because a peripheral iridotomy is created during the cataract surgery



## Secondary Angle Closure Glaucoma



That feeling when an AC IOL is implanted, but the surgeon forgets to create a PI

Q

## Secondary Angle Closure Glaucoma

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*w/o Pupillary Block*

Lens-  
Induced

Aphakic/

**Pseudophakic**

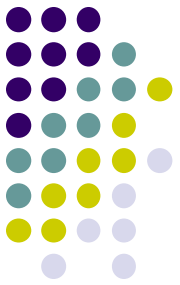
*What sort of IOL is commonly implicated in pupillary block secondary ACG?*

The AC sort. Pressure in the posterior chamber pushes the iris against the IOL from behind, preventing aqueous from passing freely through the pupil. This initiates the now-familiar PC>AC pressure gradient → anterior bowing of the peripheral iris → occlusion of the angle.

*OK, so why doesn't this happen **every** time an AC IOL is placed?*

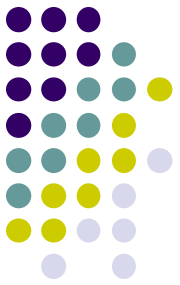
Because a peripheral iridotomy is created during the cataract surgery

*Then why does ACG ever develop?*



Q/A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-  
Induced

Aphakic/

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Because on occasion the PI gets blocked, either by an

abb. + word

or the

two words

A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

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Lens-  
Induced

Aphakic/  
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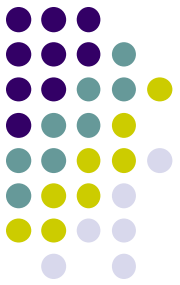
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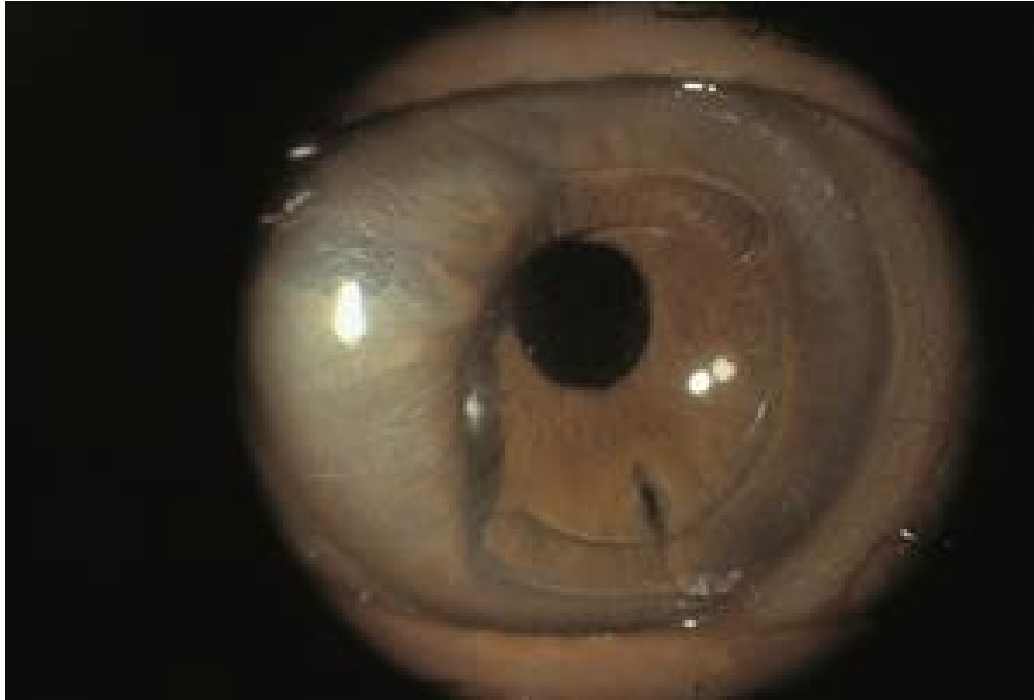
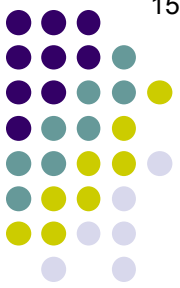
*Then why does ACG ever develop?*

Because on occasion the PI gets blocked, either by an IOL haptic or the vitreous face





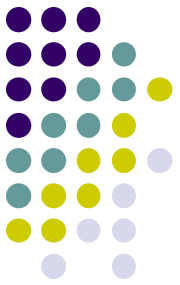
## Secondary Angle Closure Glaucoma



Pseudophakic secondary ACG. In this case, a too-central PI (@5 o'clock) is occluded by the IOL optic. Note the ballooning iris.

Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

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Lens-  
Induced

Aphakic/

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*How is pseudophakic ACG managed?*

A

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Lens-  
Induced

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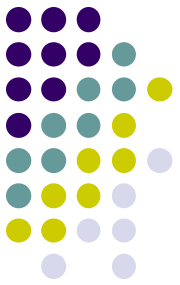
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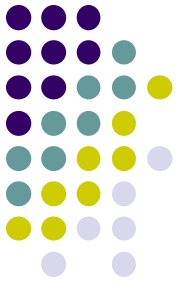
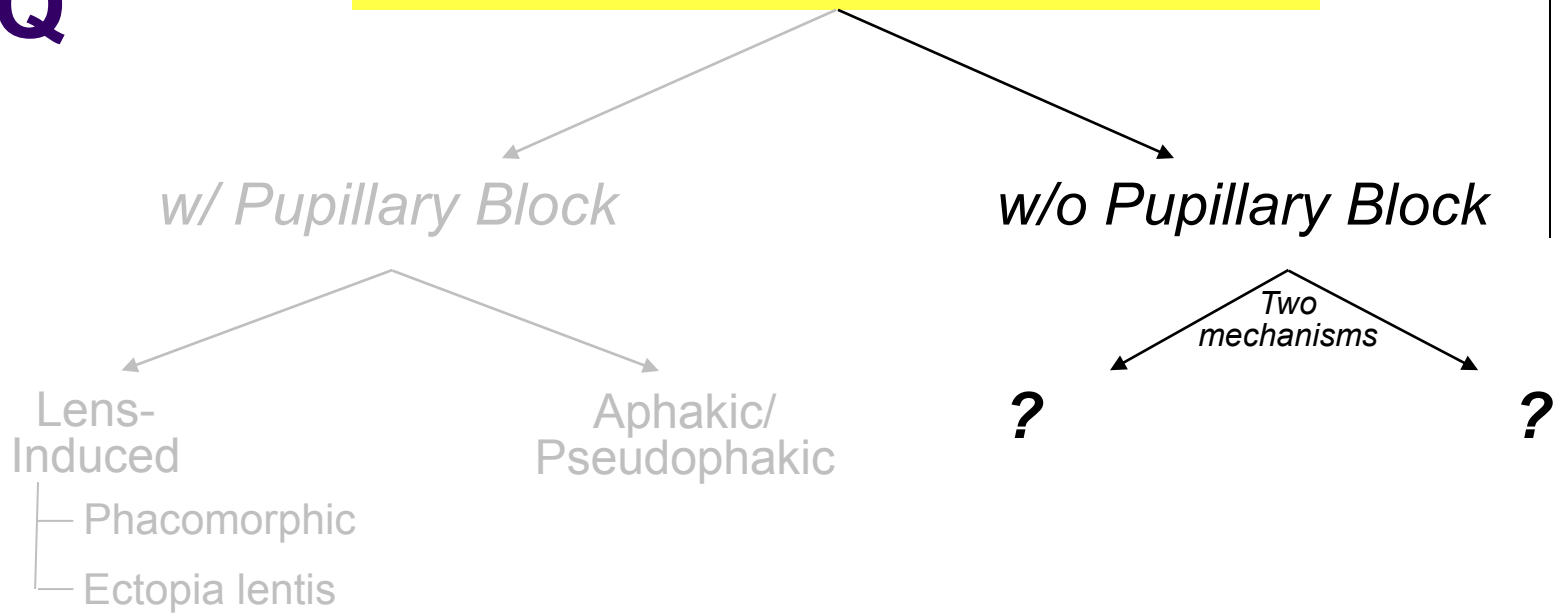
*How is pseudophakic ACG managed?*

The usual way—aqueous suppressants and urgent LPI(s)



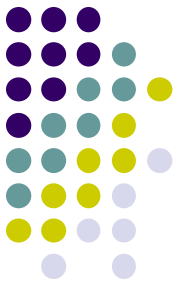
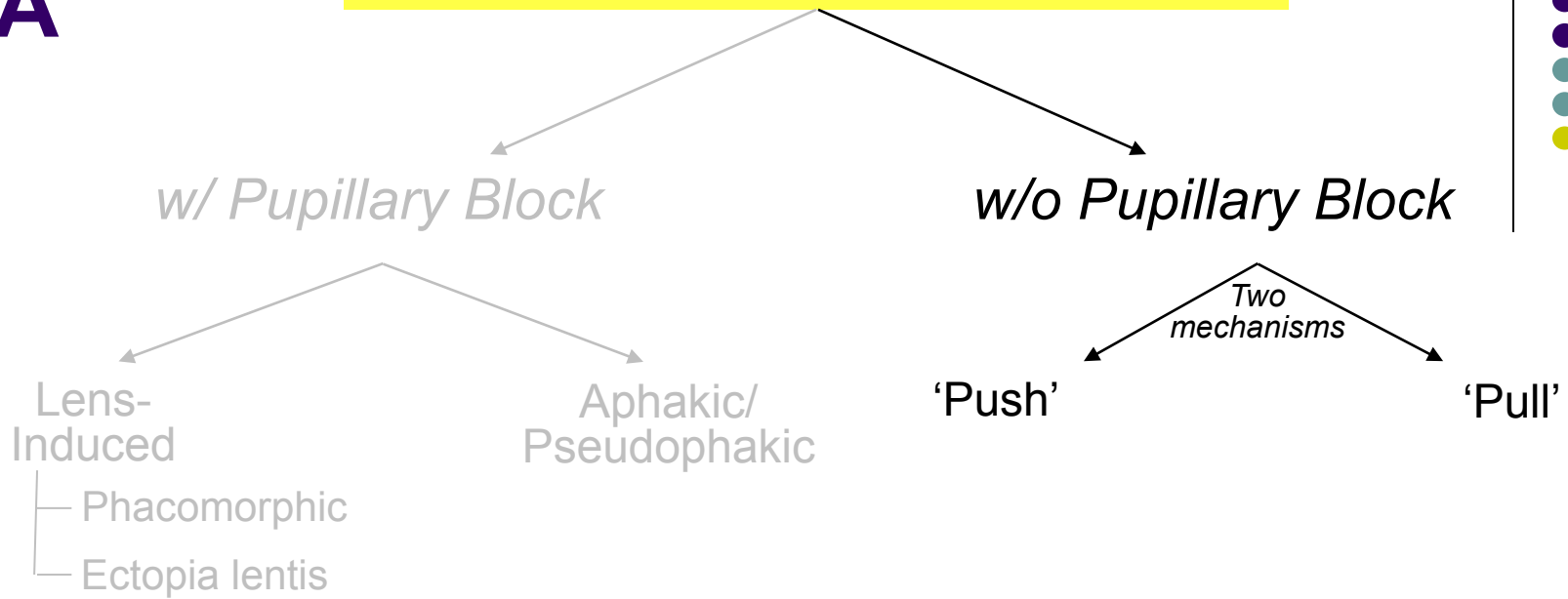
Q

## Secondary Angle Closure Glaucoma



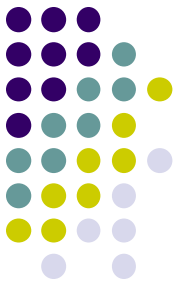
A

## Secondary Angle Closure Glaucoma



Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-  
Induced

Aphakic/  
Pseudophakic

**'Push'**

**'Pull'**

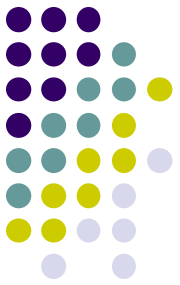
*What do push and pull mean in this context?*

--*Push* refers to anterior displacement of the peripheral iris by...

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A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-  
Induced

Aphakic/  
Pseudophakic

**'Push'**

**'Pull'**

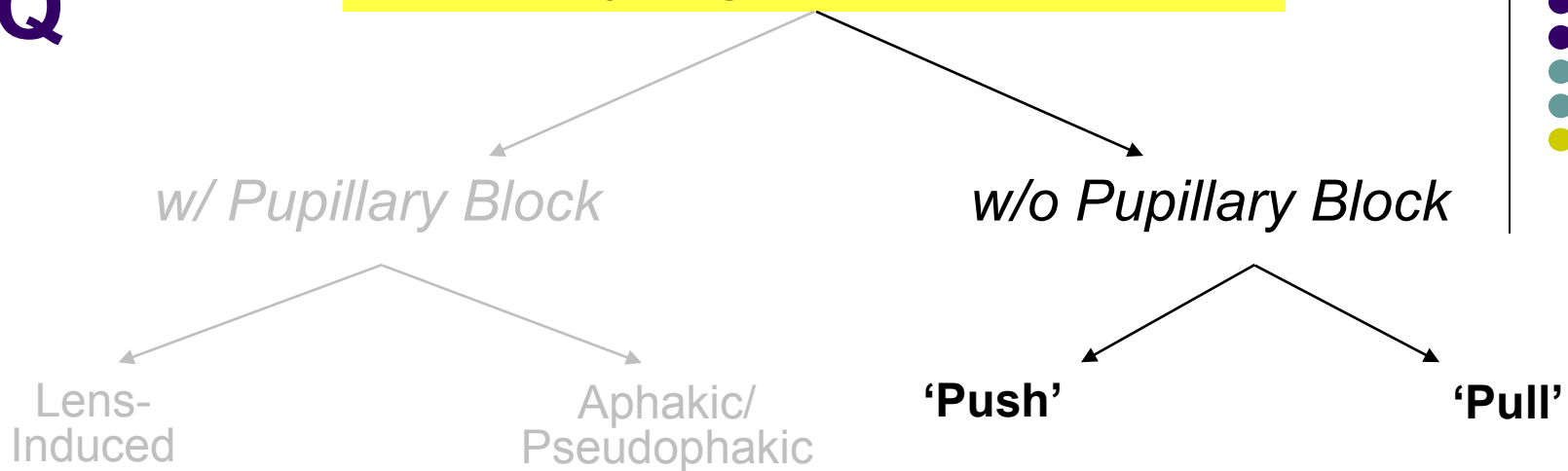
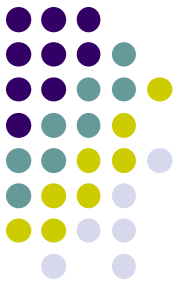
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--*Push* refers to anterior displacement of the peripheral iris by...a space-occupying process occurring immediately behind it; ie, the peripheral iris is being 'pushed' into the angle

--*Pull* refers to anterior displacement of the peripheral iris by...

Q

## Secondary Angle Closure Glaucoma



*What do push and pull mean in this context?*

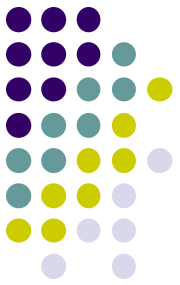
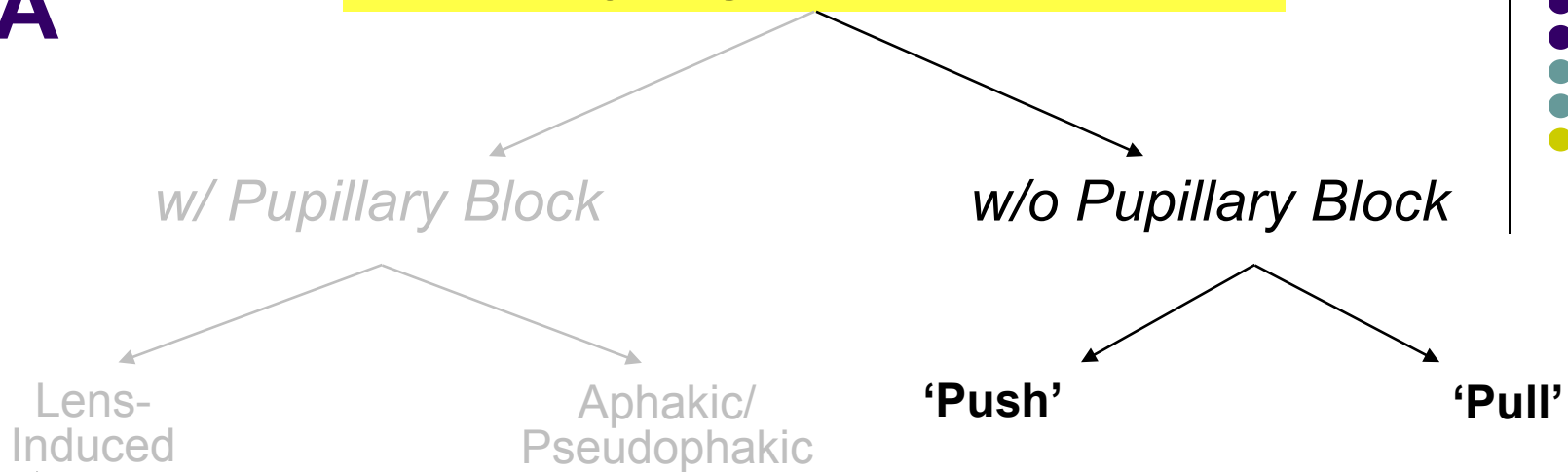
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A

## Secondary Angle Closure Glaucoma

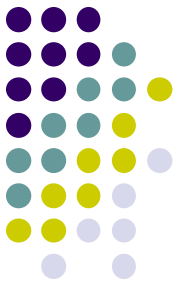


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--*Pull* refers to anterior displacement of the peripheral iris by...a contractile process occurring on its anterior surface; ie, the peripheral iris is being 'pulled' into the angle

# Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-  
Induced

Aphakic/  
Pseudophakic

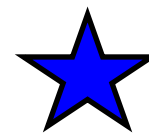
**'Push'**

**'Pull'**

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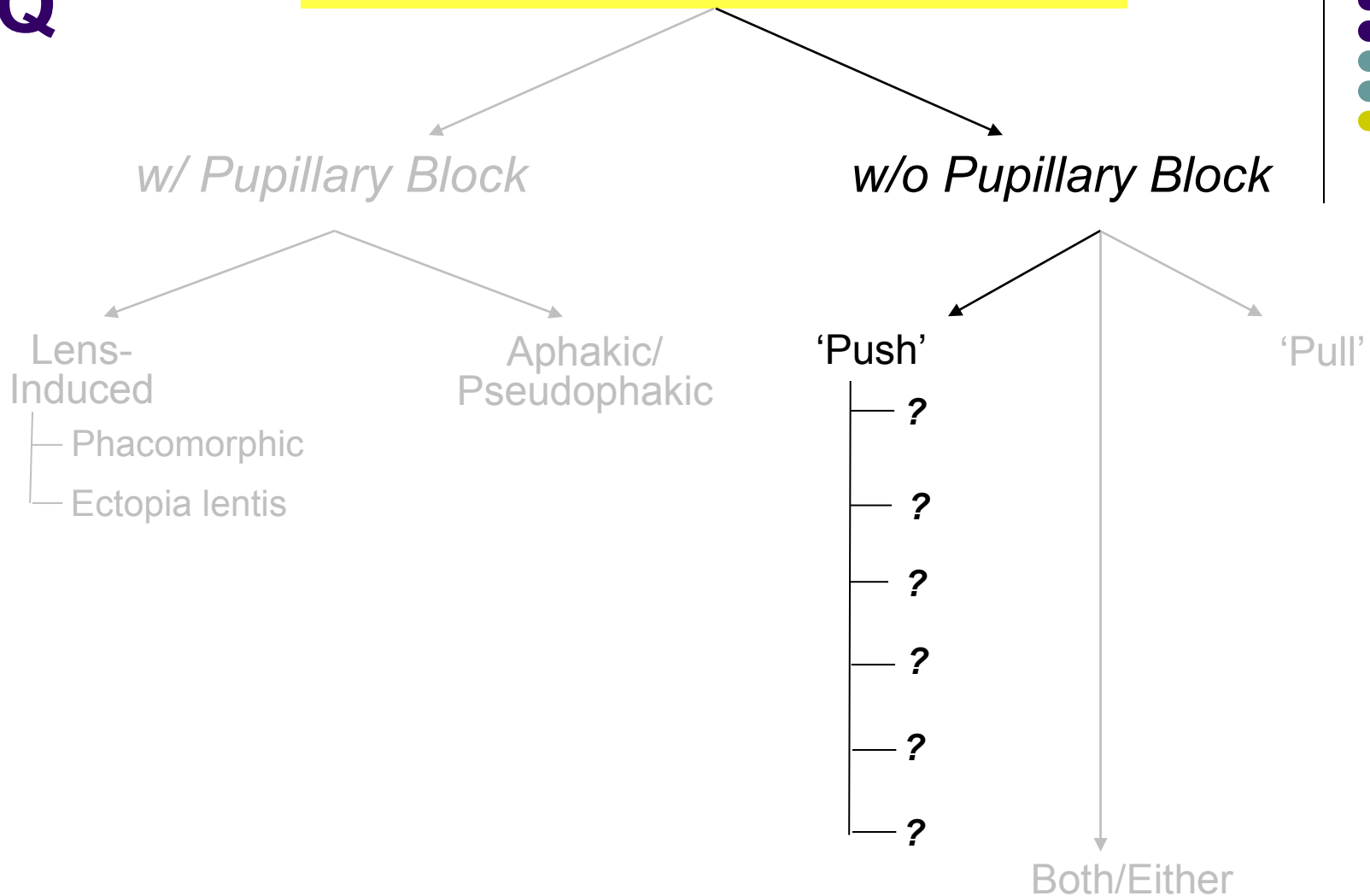
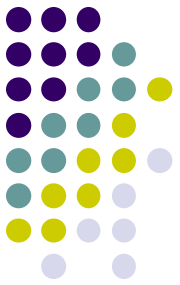
**Both/Either**



*Some conditions have the ability to close the angle by both pushing and/or pulling the peripheral iris*

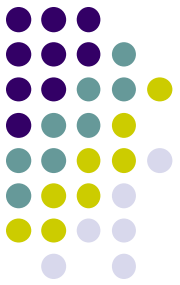
Q

## Secondary Angle Closure Glaucoma



A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

- Phacomorphic
- Ectopia lentis

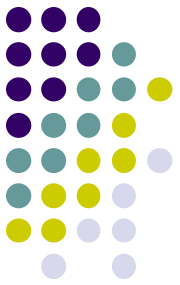
‘Push’

‘Pull’

- Aqueous misdirection
- ERD/choroidal effusion
- Retinal surgery
- Nanophthalmos
- Drug-induced
- PFV

Both/Either

# Secondary Angle Closure Glaucoma



What is aqueous misdirection syndrome?

**Aqueous misdirection**

block

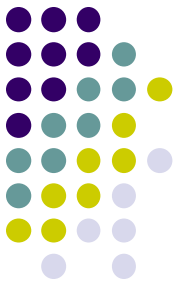
'Pull'

fusion

her

A

## Secondary Angle Closure Glaucoma



*What is aqueous misdirection syndrome?*

A rare condition in which anterior rotation of the ciliary body causes newly-produced aqueous to be (mis)directed toward the vitreous rather than into the posterior, then anterior chambers

block

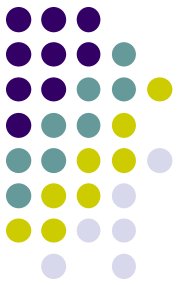
'Pull'

**Aqueous misdirection**

fusion

her

## Secondary Angle Closure Glaucoma



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*How does it present?*

**Aqueous misdirection**

block

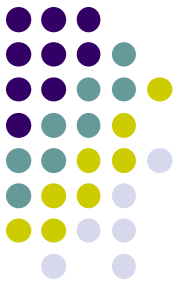
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# A

## Secondary Angle Closure Glaucoma



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With high IOP and a uniformly shallow AC in the acute post-op period after intraocular surgery

**Aqueous misdirection**

block

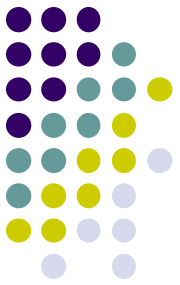
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## Secondary Angle Closure Glaucoma



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*Take note—the iris does not have a 'bombé' configuration as occurs in pupillary-block ACG*

**Aqueous misdirection**

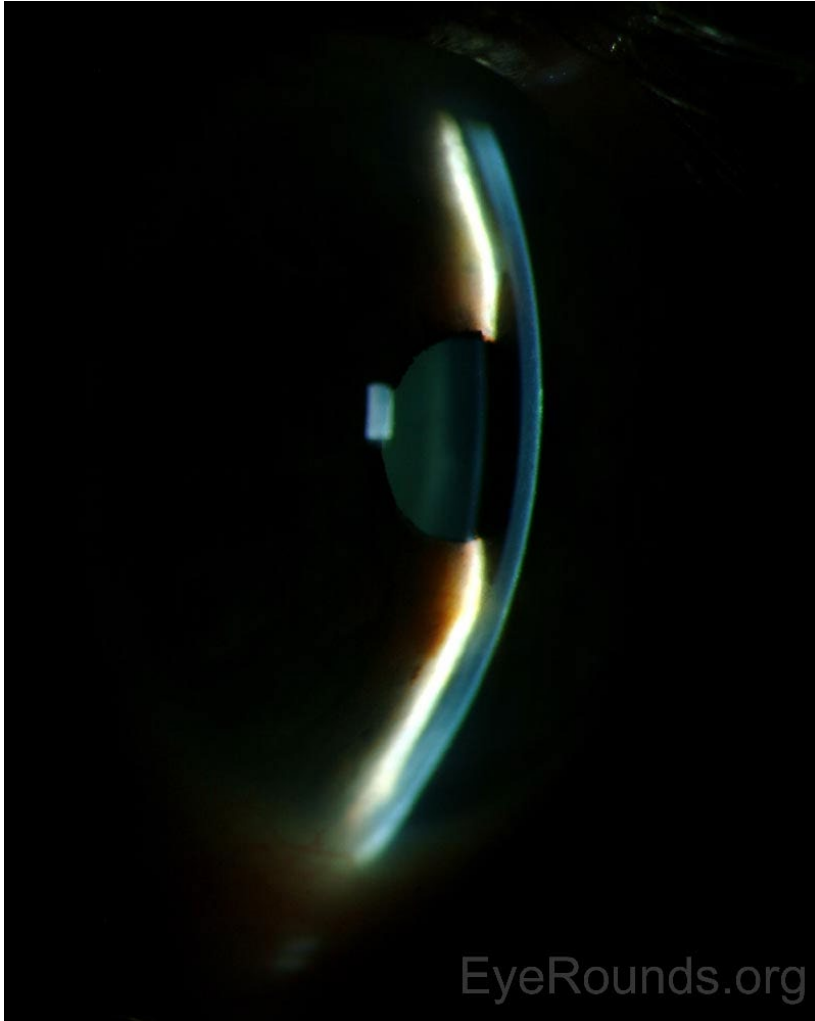
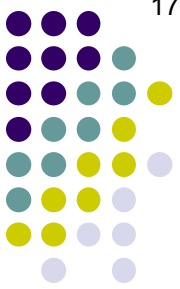
block

'Pull'

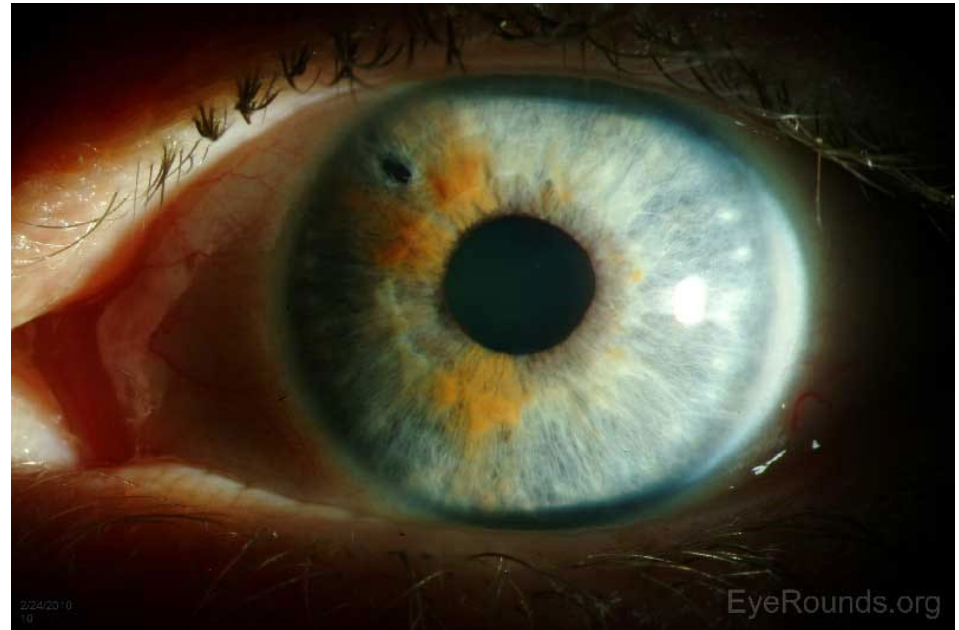
fusion

her

## Secondary Angle Closure Glaucoma

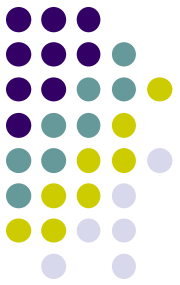


Aqueous misdirection. The iris does not have a bombé configuration



Aqueous misdirection. Lateral illumination produces shadowing nasally, revealing the extent of AC shallowing. Note the presence of an LPI, ineffective because pupillary block is not present.

## Secondary Angle Closure Glaucoma



What is aqueous misdirection syndrome?

A rare condition in which anterior rotation of the ciliary body causes newly-produced aqueous to be (mis)directed toward the vitreous rather than into the posterior, then anterior chambers

How does it present?

With <sup>low</sup> high IOP and a uniformly shallow AC in the acute post-op period after

*If a post-op pt presents with a flat chamber and low IOP, what tops the DDx?*

Aqueous misdirection

block

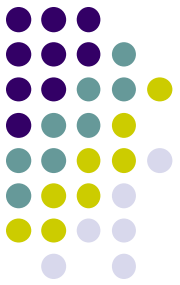
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fusion

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Wound leak

Aqueous misdirection

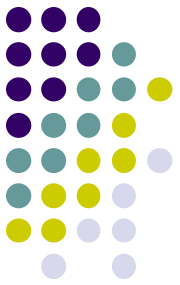
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*What is the chief risk factor?*

**Aqueous misdirection**

block

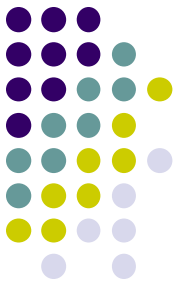
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Surgery in an eye with tight angles or PAS

**Aqueous misdirection**

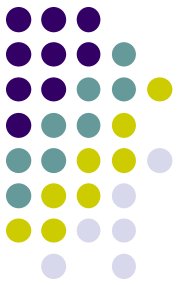
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--

**Aqueous misdirection**

block

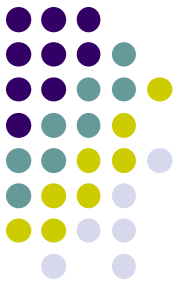
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# A

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*By what other names is it known?*

- Malignant glaucoma
- Ciliary-block glaucoma

**Aqueous misdirection**

block

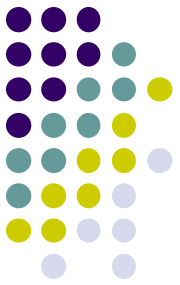
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**Aqueous misdirection**

block

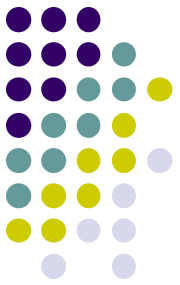
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Q/A

## Secondary Angle Closure Glaucoma



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With the triad of aggressive <sup>1)</sup> [two words], aggressive <sup>2)</sup> [ ] and <sup>3)</sup> [ ] of the vitreous with [two words]

**Aqueous misdirection**

block

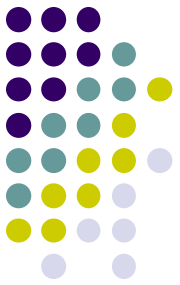
'Pull'

fusion

her

# A

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**Aqueous misdirection**

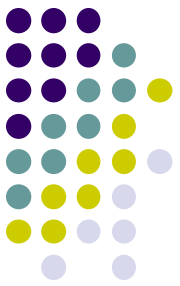
block

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fusion

her

## Secondary Angle Closure Glaucoma



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*Is there a role for surgery in managing aqueous misdirection?*

**Aqueous misdirection**

block

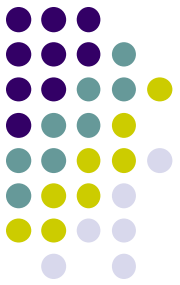
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# A

## Secondary Angle Closure Glaucoma



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With the triad of aggressive aqueous suppression<sup>1)</sup>, aggressive cycloplegia<sup>2)</sup> and dehydration<sup>3)</sup> of the vitreous with hyperosmotic agents

*Is there a role for surgery in managing aqueous misdirection?*

Yes; resolution often requires surgical or laser disruption of the vitreous face

block

'Pull'

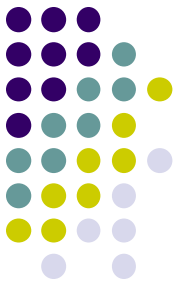
**Aqueous misdirection**

fusion

her

Q

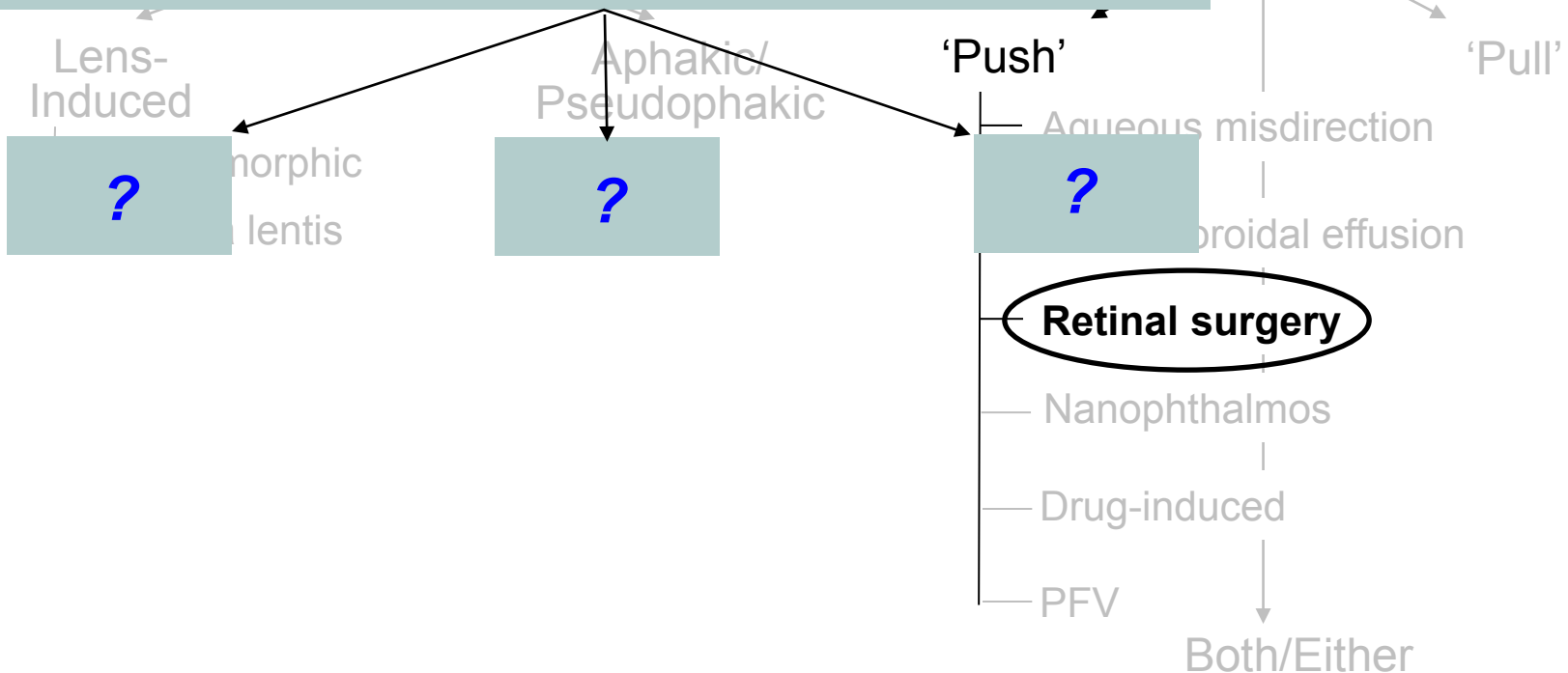
## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

*The Glaucoma book mentions three types of retinal surgery that can lead to secondary angle-closure glaucoma—what are they?*



A

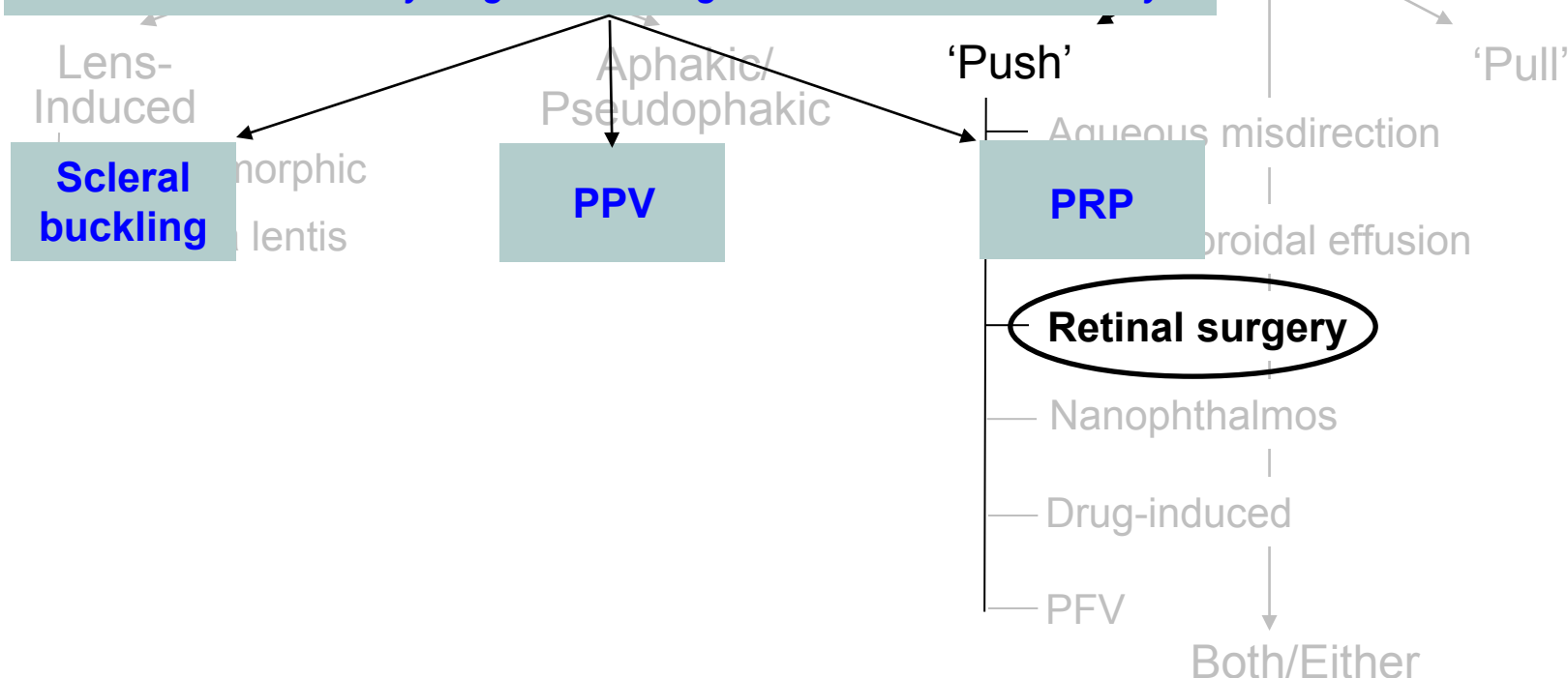
## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

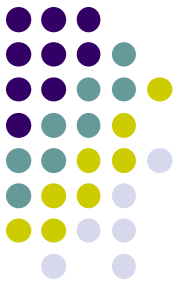
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Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

*The Glaucoma book mentions three types of retinal surgery that can lead to secondary angle-closure glaucoma—what are they?*

Lens-Induced

Aphakic/  
Pseudophakic

'Push'

'Pull'

**Scleral buckling**

**PPV**

**PRP**

*What is the typical mechanism of secondary ACG after SB surgery?*

Aqueous misdirection  
Iridodialysis  
Iridodialysis

**Retinal surgery**

Nanophthalmos

Drug-induced

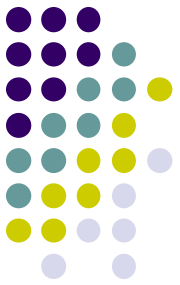
PFV

Both/Either



A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

*The Glaucoma book mentions three types of retinal surgery that can lead to secondary angle-closure glaucoma—what are they?*

Lens-Induced

Aphakic/  
Pseudophakic

'Push'

'Pull'

**Scleral buckling**

**PPV**

**PRP**

*What is the typical mechanism of secondary ACG after SB surgery?*

Elongation of the eye produces shallowing of the peripheral AC, sometimes aggravated by a choroidal effusion rotating the CB forward

**Retinal surgery**

Nanophthalmos

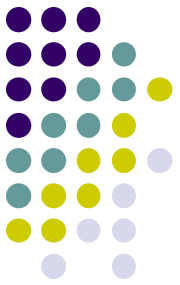
Drug-induced

PFV

Both/Either

Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

*The Glaucoma book mentions three types of retinal surgery that can lead to secondary angle-closure glaucoma—what are they?*

Lens-Induced

Aphakic/  
Pseudophakic

'Push'

'Pull'

Scleral buckling  
morphologic  
lenticis

PPV

PRP

Aqueous misdirection  
choroidal effusion

*What specific PPV adjunct is associated with secondary ACG?*

**Retinal surgery**

Nanophthalmos

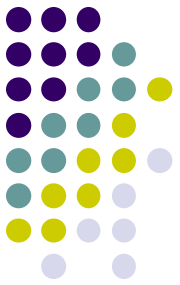
Drug-induced

PFV

Both/Either

A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

*The Glaucoma book mentions three types of retinal surgery that can lead to secondary angle-closure glaucoma—what are they?*

Lens-Induced

Aphakic/  
Pseudophakic

'Push'

'Pull'

Scleral buckling  
morphologic  
lenticis

PPV

PRP

Aqueous misdirection  
choroidal effusion

*What specific PPV adjunct is associated with secondary ACG?*  
*The use of a tamponading injectable (eg, air; silicone oil)*

**Retinal surgery**

Nanophthalmos

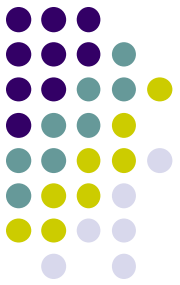
Drug-induced

PFV

Both/Either

Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

*The Glaucoma book mentions three types of retinal surgery that can lead to secondary angle-closure glaucoma—what are they?*

Lens-Induced

**Scleral buckling**

morphic  
lenticis

Aphakic/  
Pseudophakic

**Scleral buckling**

'Push'

**PRP**

**Retinal surgery**

*How does PRP lead to secondary ACG?*

Drug-induced

PFV

Both/Either

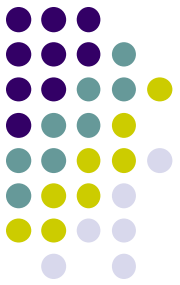
Aqueous misdirection

choroidal effusion

'Pull'

A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

*The Glaucoma book mentions three types of retinal surgery that can lead to secondary angle-closure glaucoma—what are they?*

Lens-Induced

**Scleral buckling**

morphy  
lentis

Aphakic/  
Pseudophakic

**Scleral buckling**

'Push'

**PRP**

**Retinal surgery**

*How does PRP lead to secondary ACG?*

*It can produce a choroidal effusion that rotates the CB forward*

Drug-induced

PFV

Both/Either

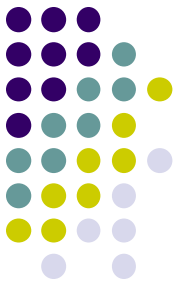
Aqueous misdirection

choroidal effusion

'Pull'

Q

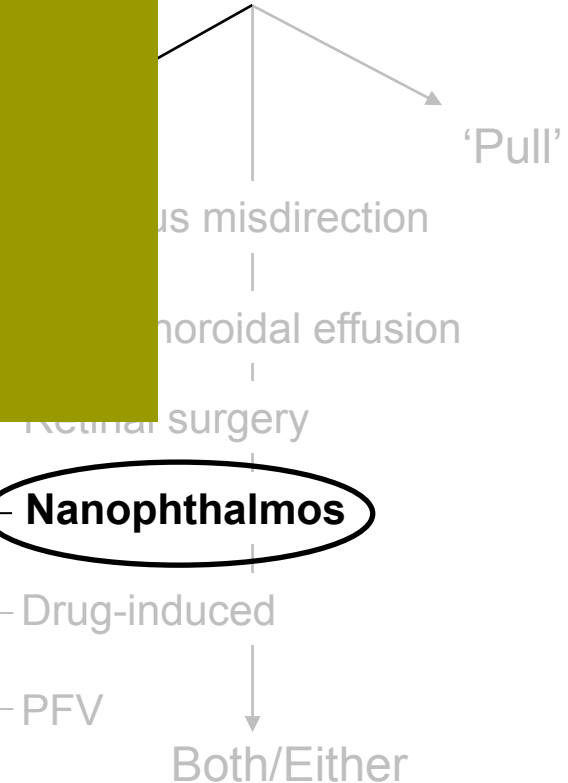
## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

*What does it mean to say an eye is nanophthalmic?*



Q/A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

What does it mean to say an eye is nanophthalmic?

It means the eye is small—axial length < 22 mm; small/shallow

anterior chamber, small (possibly micro-) angle.

Anterior chamber angle misdirection

Choroidal effusion

Retinal surgery

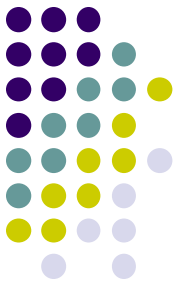
**Nanophthalmos**

Drug-induced

PFV

Both/Either

'Pull'



A

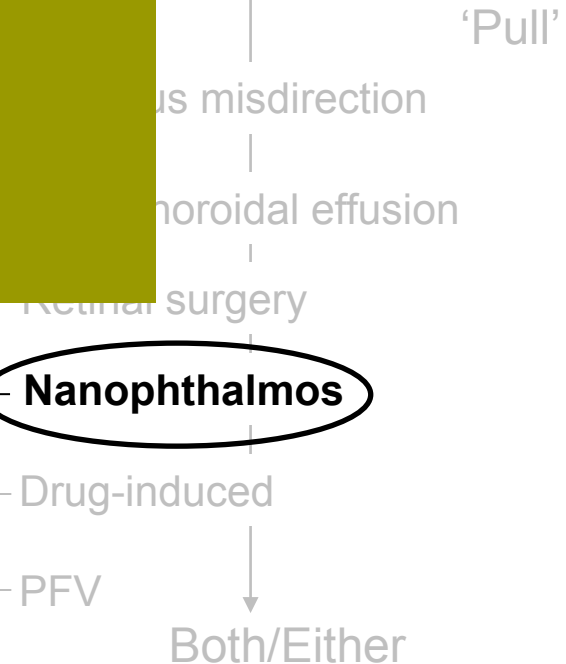
## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

*What does it mean to say an eye is nanophthalmic?*

It means the eye is small—axial length < 20 mm; small/shallow AC, small (possibly micro-) cornea.





Q

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

*What does it mean to say an eye is nanophthalmic?*

It means the eye is small—axial length < 20 mm; small/shallow AC, small (possibly micro-) cornea. The exception is the **nanophthalmos**, which is comparatively large for the otherwise small eye.

'Pull'

— Iris misdirection

— Choroidal effusion

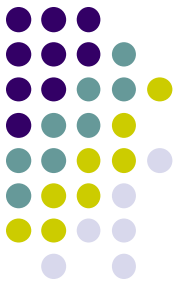
— Retinal surgery

— **Nanophthalmos**

— Drug-induced

— PFV

Both/Either



A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

*What does it mean to say an eye is nanophthalmic?*

It means the eye is small—axial length < 20 mm; small/shallow AC, small (possibly micro-) cornea. The exception is the lens, which is comparatively large for the otherwise small eye.

us misdirection

choroidal effusion

Retinal surgery

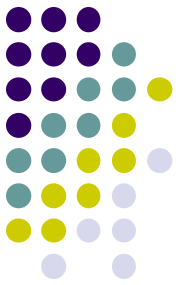
**Nanophthalmos**

Drug-induced

PFV

Both/Either

'Pull'



Q

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

*What does it mean to say an eye is nanophthalmic?*

It means the eye is small—axial length < 20 mm; small/shallow AC, small (possibly micro-) cornea. The exception is the lens, which is comparatively large for the otherwise small eye. Further, the sclera tends to be abnormally [redacted], which can impede venous drainage of the eye by compromising flow through the [redacted].

two words

**Nanophthalmos**

Drug-induced

PFV

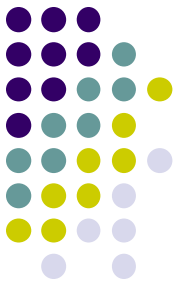
Both/Either

'Pull'

lens misdirection

choroidal effusion

Retinal surgery



A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

*What does it mean to say an eye is nanophthalmic?*

It means the eye is small—axial length < 20 mm; small/shallow AC, small (possibly micro-) cornea. The exception is the lens, which is comparatively large for the otherwise small eye. Further, the sclera tends to be abnormally thick, which can impede venous drainage of the eye by compromising flow through the vortex veins.

**Nanophthalmos**

Drug-induced

PFV

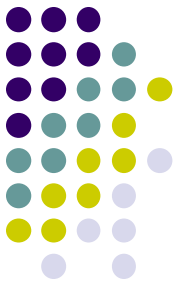
Both/Either

'Pull'

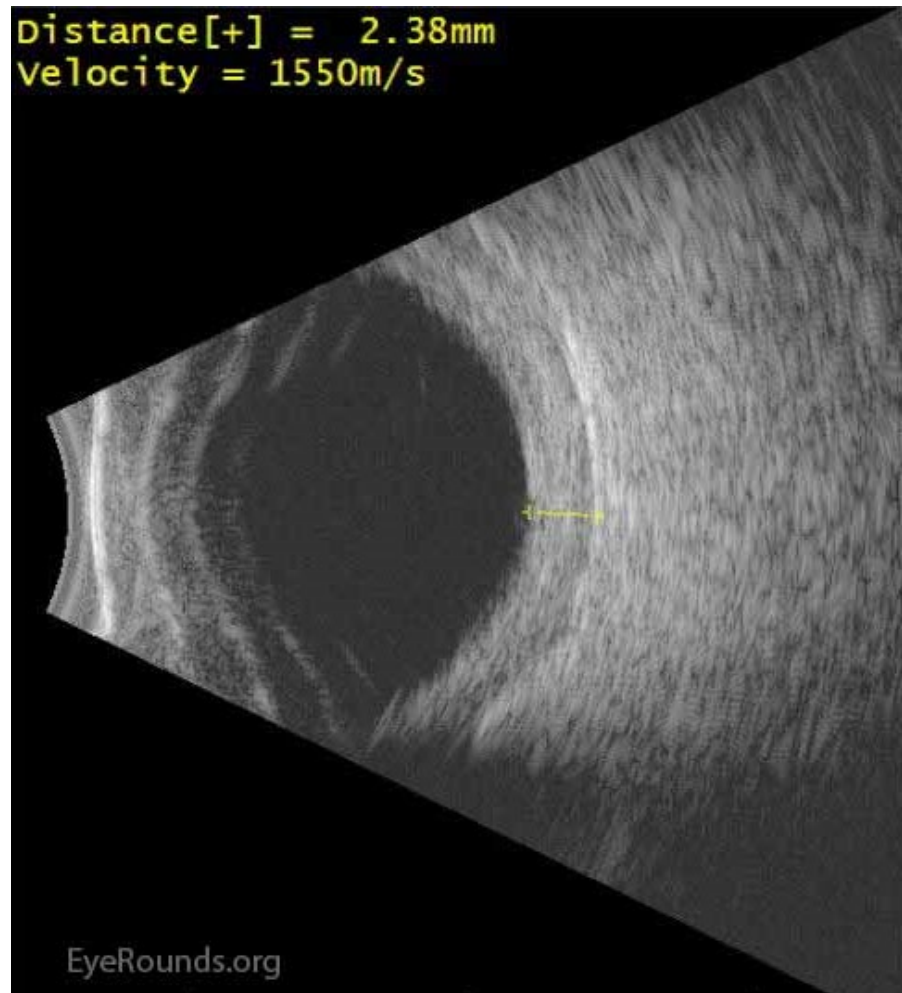
lens misdirection

choroidal effusion

Retinal surgery



## Secondary Angle Closure Glaucoma



Nanophthalmic eye. Note the thickness of the sclera.

A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

*What does it mean to say an eye is nanophthalmic?*

It means the eye is small—axial length < 20 mm; small/shallow AC, small (possibly micro-) cornea. The exception is the lens, which is comparatively large for the otherwise small eye. Further, the sclera tends to be abnormally thick, which can impede venous drainage of the eye by compromising flow through the vortex veins. **All of these factors combine to render nanophthalmic eyes highly susceptible to angle closure.**

**Nanophthalmos**

Drug-induced

PFV

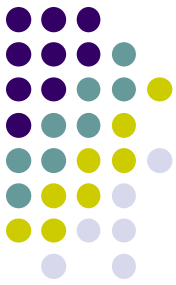
Both/Either

'Pull'

lens misdirection

choroidal effusion

Retinal surgery



Q

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

*What does it mean to say an eye is nanophthalmic?*

It means the eye is small—axial length < 20 mm; small/shallow AC, small (possibly micro-) cornea. The exception is the lens, which is comparatively large for the otherwise small eye. Further, the sclera tends to be abnormally thick, which can impede venous drainage of the eye by compromising flow through the vortex veins. **All of these factors combine to render nanophthalmic eyes highly susceptible to angle closure.**

*What is the proximate mechanism by which the angle closes w/o pupillary block in nanophthalmos?*

**Nanophthalmos**

Drug-induced

PFV

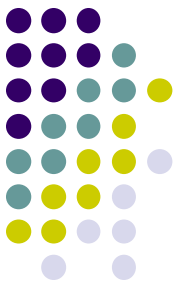
Both/Either

'Pull'

lens misdirection

choroidal effusion

Retinal surgery



# A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

*What does it mean to say an eye is nanophthalmic?*

It means the eye is small—axial length < 20 mm; small/shallow AC, small (possibly micro-) cornea. The exception is the lens, which is comparatively large for the otherwise small eye. Further, the sclera tends to be abnormally thick, which can impede venous drainage of the eye by compromising flow through the vortex veins. **All of these factors combine to render nanophthalmic eyes highly susceptible to angle closure.**

*What is the proximate mechanism by which the angle closes w/o pupillary block in nanophthalmos?*  
It's usually a result of choroidal effusion, which can arise spontaneously

**Nanophthalmos**

Drug-induced

PFV

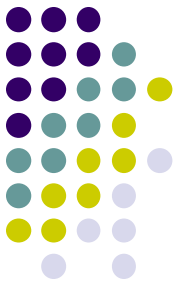
Both/Either

'Pull'

us misdirection

choroidal effusion

Retinal surgery





Q

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

*What does it mean to say an eye is nanophthalmic?*

It means the eye is small—axial length < 20 mm; small/shallow AC, small (possibly micro-) cornea. The exception is the lens, which is comparatively large for the otherwise small eye. Further, the sclera tends to be abnormally thick, which can impede venous drainage of the eye by compromising flow through the vortex veins. **All of these factors combine to render nanophthalmic eyes highly susceptible to angle closure.**

*What is the proximate mechanism by which the angle closes w/o pupillary block in nanophthalmos?*

It's usually a result of choroidal effusion, which can arise spontaneously

*How should an ACG event in nanophthalmos be managed?*

**Nanophthalmos**

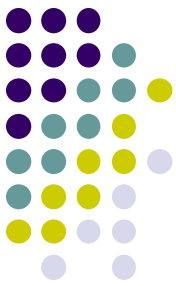
Drug-induced

Retinal surgery

Choroidal effusion

Optic nerve misdirection

'Pull'



# A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

*What does it mean to say an eye is nanophthalmic?*

It means the eye is small—axial length < 20 mm; small/shallow AC, small (possibly micro-) cornea. The exception is the lens, which is comparatively large for the otherwise small eye. Further, the sclera tends to be abnormally thick, which can impede venous drainage of the eye by compromising flow through the vortex veins. **All of these factors combine to render nanophthalmic eyes highly susceptible to angle closure.**

*What is the proximate mechanism by which the angle closes w/o pupillary block in nanophthalmos?*

It's usually a result of choroidal effusion, which can arise spontaneously

*How should an ACG event in nanophthalmos be managed?*

Medically if at all possible. An LPI should be performed if a pupillary-block component is suspected. Iridoplasty can be considered to reduce any appositional component.

**Nanophthalmos**

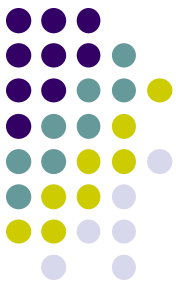
Drug-induced

Retinal surgery

Choroidal effusion

Iris misdirection

'Pull'



Q

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

*What does it mean to say an eye is nanophthalmic?*

It means the eye is small—axial length < 20 mm; small/shallow AC, small (possibly micro-) cornea. The exception is the lens, which is comparatively large for the otherwise small eye. Further, the sclera tends to be abnormally thick, which can impede venous drainage of the eye by compromising flow through the vortex veins. **All of these factors combine to render nanophthalmic eyes highly susceptible to angle closure.**

*What is the proximate mechanism by which the angle closes w/o pupillary block in nanophthalmos?*

It's usually a result of choroidal effusion, which can arise spontaneously

*How should an ACG event in nanophthalmos be managed?*

Medically if at all possible. An LPI should be performed if a pupillary-block component is suspected. Iridoplasty can be performed if a pupillary-block component is suspected.

*How about filtering surgery?*

**Nanophthalmos**

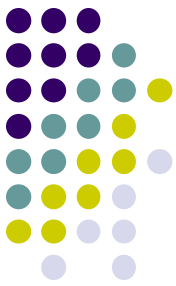
Drug-induced

Retinal surgery

Choroidal effusion

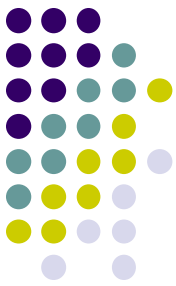
Angle misdirection

'Pull'



# Q/A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

*What does it mean to say an eye is nanophthalmic?*

It means the eye is small—axial length < 20 mm; small/shallow AC, small (possibly micro-) cornea. The exception is the lens, which is comparatively large for the otherwise small eye. Further, the sclera tends to be abnormally thick, which can impede venous drainage of the eye by compromising flow through the vortex veins. **All of these factors combine to render nanophthalmic eyes highly susceptible to angle closure.**

*What is the proximate mechanism by which the angle closes w/o pupillary block in nanophthalmos?*

It's usually a result of choroidal effusion, which can arise spontaneously

*How should an ACG event in nanophthalmos be managed?*

Medically if at all possible. An LPI should be performed if a pupillary-block component is suspected. Iridoplasty can be attempted.

*How about filtering surgery?*

As these eyes are highly prone to intraoperative hypotension, it should be avoided if possible

two words

**Nanophthalmos**

Drug-induced

via filtering surgery? **NO!**

iris misdirection

choroidal effusion

Retinal surgery

'Pull'

A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

*What does it mean to say an eye is nanophthalmic?*

It means the eye is small—axial length < 20 mm; small/shallow AC, small (possibly micro-) cornea. The exception is the lens, which is comparatively large for the otherwise small eye. Further, the sclera tends to be abnormally thick, which can impede venous drainage of the eye by compromising flow through the vortex veins. **All of these factors combine to render nanophthalmic eyes highly susceptible to angle closure.**

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It's usually a result of choroidal effusion, which can arise spontaneously

*How should an ACG event in nanophthalmos be managed?*

Medically if at all possible. An LPI should be performed if a pupillary-block component is suspected. Iridoplasty can be performed if a pupillary-block component is suspected.

*How about filtering surgery?*

As these eyes are highly prone to intraoperative choroidal effusion, it should be avoided if possible

**Nanophthalmos**

Drug-induced

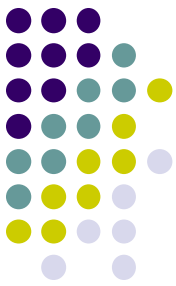
*via filtering surgery? NO!*

'Pull'

lens misdirection

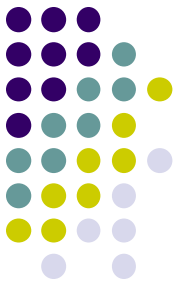
choroidal effusion

Retinal surgery



Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

*The Glaucoma book addresses only one drug re inducing ACG. Which one?*

h'

'Pull'

Aqueous misdirection

ERD/choroidal effusion

Retinal surgery

Nanophthalmos

**Drug-induced**

PFV

Both/Either

A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

*The Glaucoma book addresses only one drug re inducing ACG. Which one?*  
Topiramate

h'

'Pull'

Aqueous misdirection

ERD/choroidal effusion

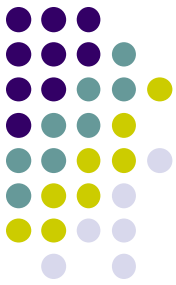
Retinal surgery

Nanophthalmos

**Drug-induced**

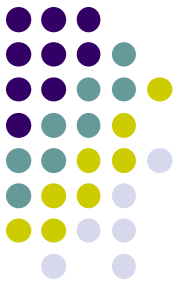
PFV

Both/Either



Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

*The Glaucoma book addresses only one drug re inducing ACG. Which one?*

Topiramate

*What are the common indications for topiramate use?*

--  
--

h'

'Pull'

Aqueous misdirection

ERD/choroidal effusion

Retinal surgery

Nanophthalmos

**Drug-induced**

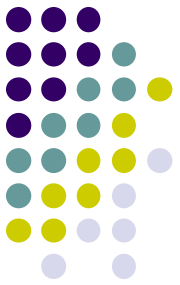
PFV

Both/Either



A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

*The Glaucoma book addresses only one drug re inducing ACG. Which one?*

Topiramate

*What are the common indications for topiramate use?*

- Migraine prophylaxis
- Idiopathic intracranial hypertension

*h'*

*'Pull'*

Aqueous misdirection

ERD/choroidal effusion

Retinal surgery

Nanophthalmos

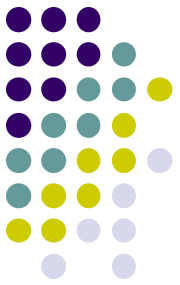
**Drug-induced**

PFV

Both/Either

Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

*The Glaucoma book addresses only one drug re inducing ACG. Which one?*

Topiramate

*What are the <sup>less</sup> common indications for topiramate use?*

--Migraine prophylaxis

--*The Glaucoma book mentions two other indications—  
what are they?*

--

--

h'

'Pull'

Aqueous misdirection

ERD/choroidal effusion

Retinal surgery

Nanophthalmos

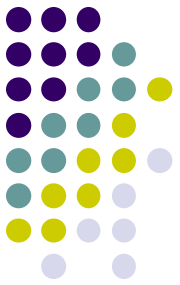
**Drug-induced**

PFV

Both/Either

A

## Secondary Angle Closure Glaucoma



w/ Pupillary Block

w/o Pupillary Block

The Glaucoma book addresses only one drug re inducing ACG. Which one?

Topiramate

What are the <sup>less</sup> common indications for topiramate use?

--Migraine prophylaxis

--The Glaucoma book mentions two other indications—  
what are they?

--Epilepsy

--Depression

h'

'Pull'

Aqueous misdirection

ERD/choroidal effusion

Retinal surgery

Nanophthalmos

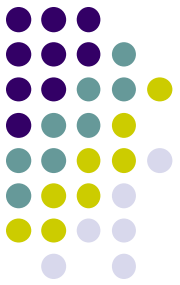
**Drug-induced**

PFV

Both/Either

Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

*The Glaucoma book addresses only one drug re inducing ACG. Which one?*

Topiramate

*What are the common indications for topiramate use?*

- Migraine prophylaxis
- Idiopathic intracranial hypertension

*What is the mechanism of angle closure?*

h'

'Pull'

Aqueous misdirection

ERD/choroidal effusion

Retinal surgery

Nanophthalmos

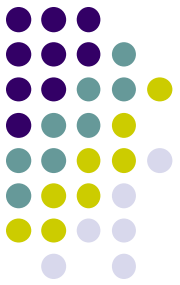
**Drug-induced**

PFV

Both/Either

Q/A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

*The Glaucoma book addresses only one drug re inducing ACG. Which one?*

Topiramate

*What are the common indications for topiramate use?*

- Migraine prophylaxis
- Idiopathic intracranial hypertension

*What is the mechanism of angle closure?*

two words

leads to zonular relaxation, which leads to pronounced anterior movement of the lens-iris diaphragm, which shallows the AC and causes the peripheral iris to appose and close the angle

h'

'Pull'

Aqueous misdirection

ERD/choroidal effusion

Retinal surgery

Nanophthalmos

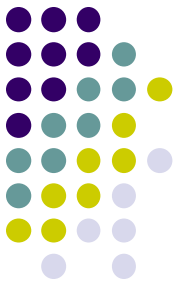
**Drug-induced**

PFV

Both/Either

A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

*The Glaucoma book addresses only one drug re inducing ACG. Which one?*

Topiramate

*What are the common indications for topiramate use?*

- Migraine prophylaxis
- Idiopathic intracranial hypertension

*What is the mechanism of angle closure?*

Ciliochoroidal effusion leads to zonular relaxation, which leads to pronounced anterior movement of the lens-iris diaphragm, which shallows the AC and causes the peripheral iris to appose and close the angle

h'

'Pull'

Aqueous misdirection

ERD/choroidal effusion

Retinal surgery

Nanophthalmos

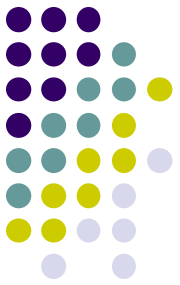
**Drug-induced**

PFV

Both/Either

Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

*The Glaucoma book addresses only one drug re inducing ACG. Which one?*

Topiramate

*What are the common indications for topiramate use?*

- Migraine prophylaxis
- Idiopathic intracranial hypertension

*What is the mechanism of angle closure?*

Ciliochoroidal effusion leads to zonular relaxation, which leads to pronounced anterior movement of the lens-iris diaphragm, which shallows the AC and causes the peripheral iris to appose and close the angle

*What is the classic presentation of topiramate-induced ACG?*

h'

'Pull'

Aqueous misdirection

ERD/choroidal effusion

Retinal surgery

Nanophthalmos

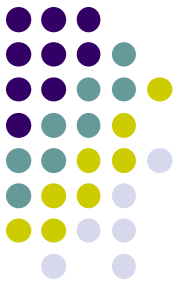
**Drug-induced**

PFV

Both/Either

Q/A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

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*What is the classic presentation of topiramate-induced ACG?*

Severe uni- vs bilateral ocular pain, plus blurry vision

h'

'Pull'

Aqueous misdirection

ERD/choroidal effusion

Retinal surgery

Nanophthalmos

**Drug-induced**

PFV

Both/Either



A

## Secondary Angle Closure Glaucoma

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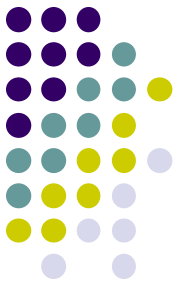
Retinal surgery

Nanophthalmos

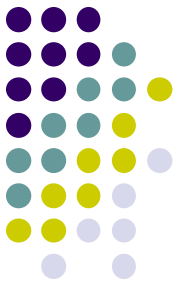
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PFV

Both/Either



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**The *bilaterality* of topiramate-induced ACG must be stressed. If it ain't bilateral, it ain't topiramate-induced!\***

Severe [bilateral ocular pain, plus blurry vision](#)

'h'

Aqueous misdirection

ERD/choroidal effusion

Retinal surgery

Nanophthalmos

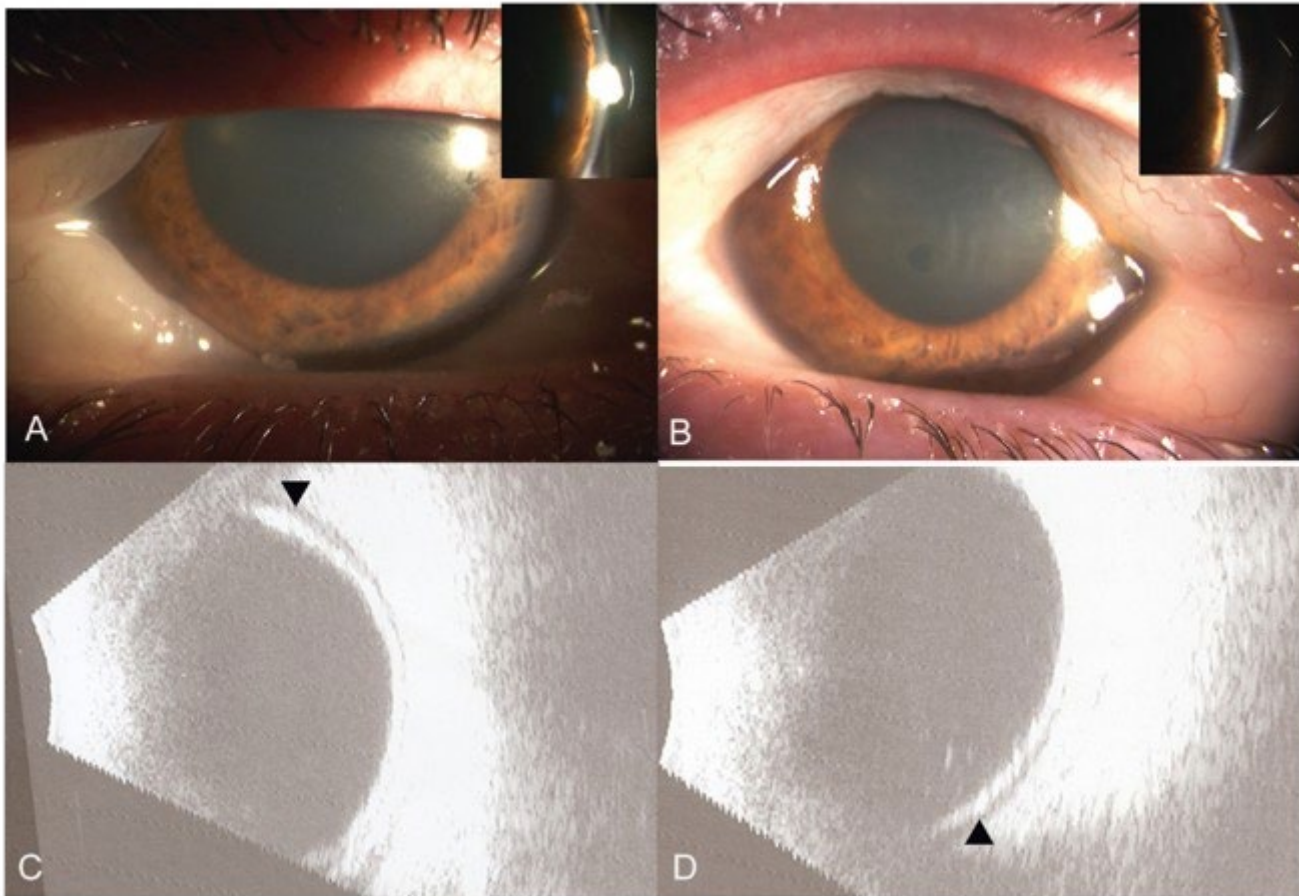
**Drug-induced**

PFV

Both/Either

\*On the OKAP and/or Boards, that is

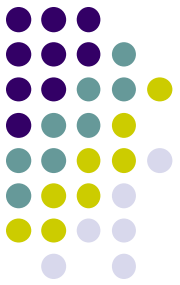
## Secondary Angle Closure Glaucoma



Slit-lamp photograph at presentation, revealing conjunctival chemosis, corneal edema and markedly shallow anterior chamber in right (A) and left eye (B). Insets: Slit-image showing shallow peripheral anterior chamber; depth is marked with line. B-scan ultrasound at presentation showed peripheral choroidal effusions (arrow) in Right (C) and left (D) eyes.

Q

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*What causes the blurry vision? (Other than corneal edema.)*

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'h'

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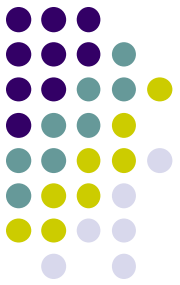
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Myopic shift

Severe bilateral ocular pain, plus **blurry vision**

'h'

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Aqueous misdirection

ERD/choroidal effusion

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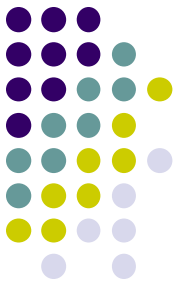
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*Why do these pts get myopic shift?*

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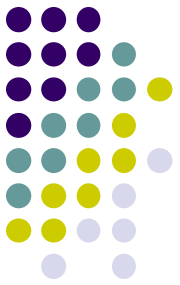
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*Why do these pts get myopic shift?*

Forward displacement of the lens increases its effective power (ie, the primary vs secondary focal point of a previously emmetropic eye will be pulled forward into the vitreous)

Severe bilateral ocular pain, plus **blurry vision**

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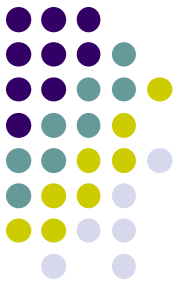
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h'

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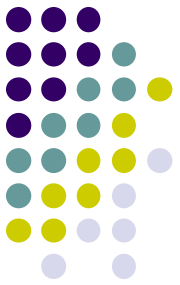
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'h'

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Nanophthalmos

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'Pull'

A

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*What is the clinical presentation of ACG?*

Severe bilate

*How is topiramate-induced ACG managed?*

The most important step is stopping the topiramate ASAP. Aqueous suppressants should be used to acutely lower IOP. Finally, aggressive cycloplegia may pull the iris back and lessen or break the angle closure.

'h'

Aqueous misdirection

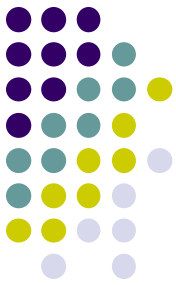
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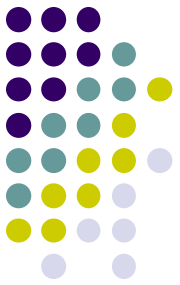
**Drug-induced**

'Pull'



Q

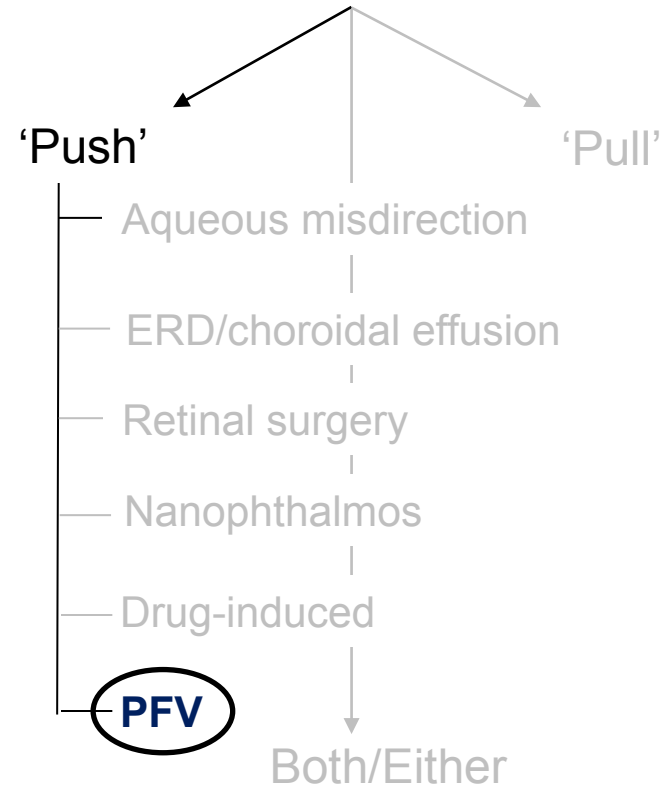
## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

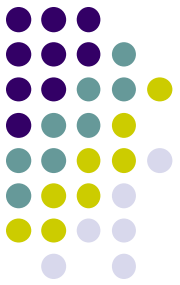
*w/o Pupillary Block*

*What does PFV stand for in this context?*



A

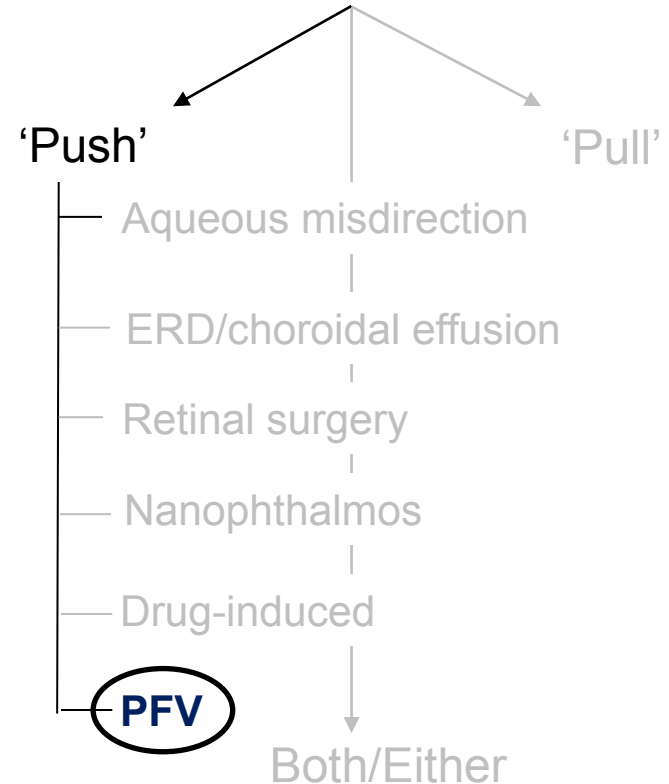
## Secondary Angle Closure Glaucoma



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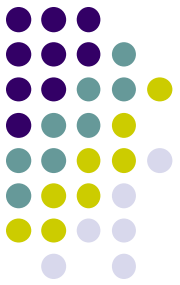
*w/o Pupillary Block*

What does PFV stand for in this context?  
Persistent fetal vasculature



Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

What does PFV stand for in this context?

Persistent fetal vasculature *aka...*

By what name was this condition known previously?

'Push'

'Pull'

Aqueous misdirection

ERD/choroidal effusion

Retinal surgery

Nanophthalmos

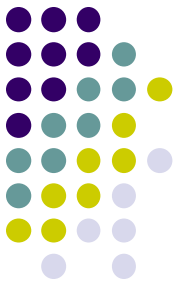
Drug-induced

**PFV**

Both/Either

A

## Secondary Angle Closure Glaucoma

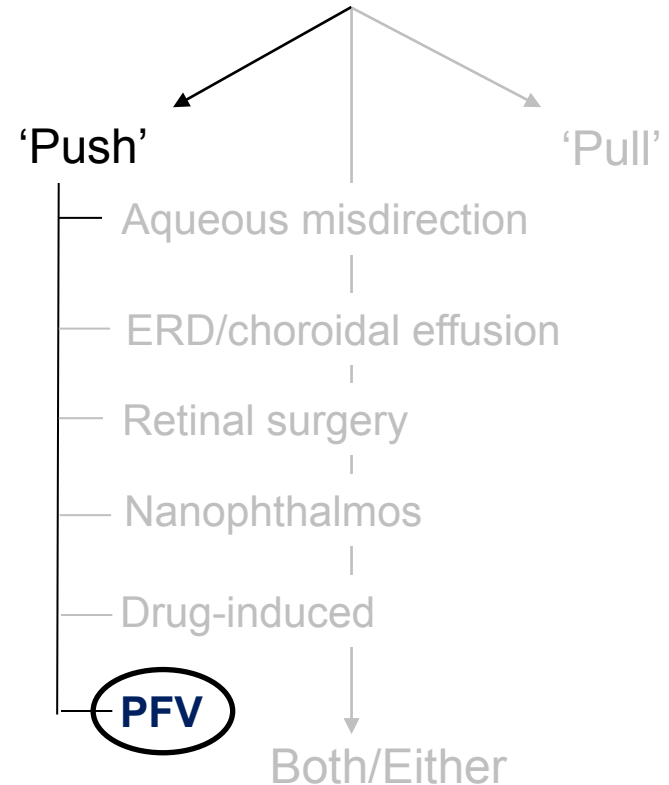


*w/ Pupillary Block*

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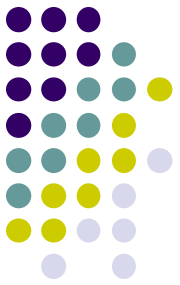
What does PFV stand for in this context?  
Persistent fetal vasculature *aka...* PHPV

By what name was this condition known previously?  
Persistent hyperplastic primary vitreous (PHPV)



Q

## Secondary Angle Closure Glaucoma

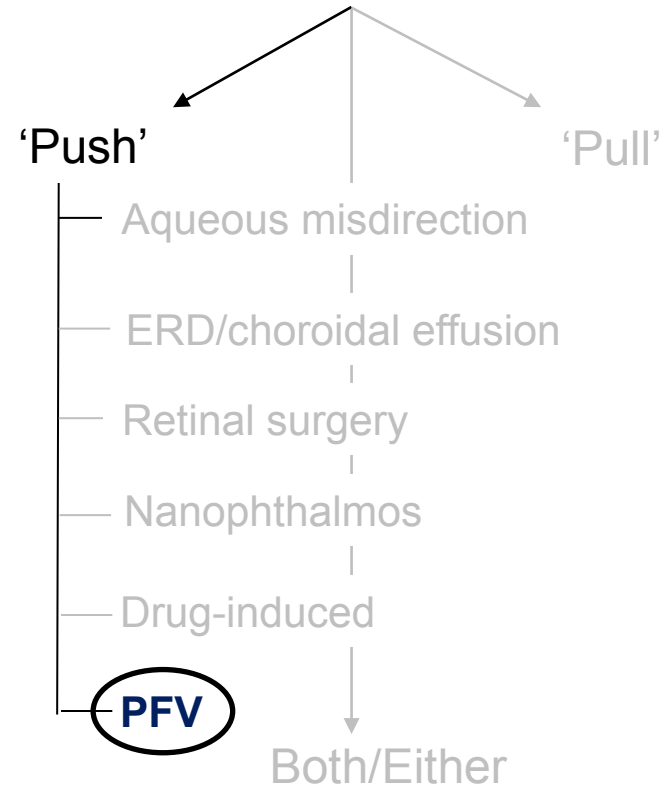


*w/ Pupillary Block*

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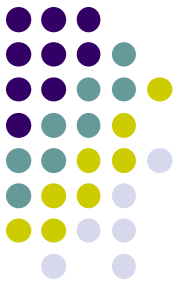
What does PFV stand for in this context?  
Persistent fetal vasculature

PFV comes in two forms—what are they?



A

## Secondary Angle Closure Glaucoma

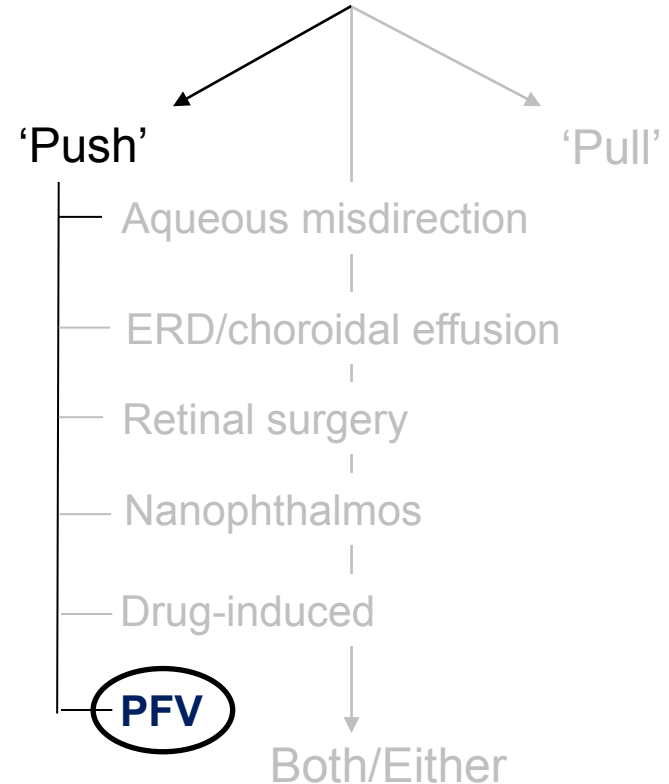


*w/ Pupillary Block*

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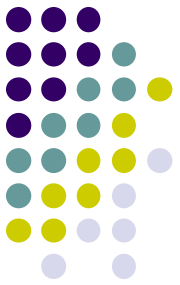
PFV comes in two forms—what are they?  
Anterior and posterior





Q

## Secondary Angle Closure Glaucoma



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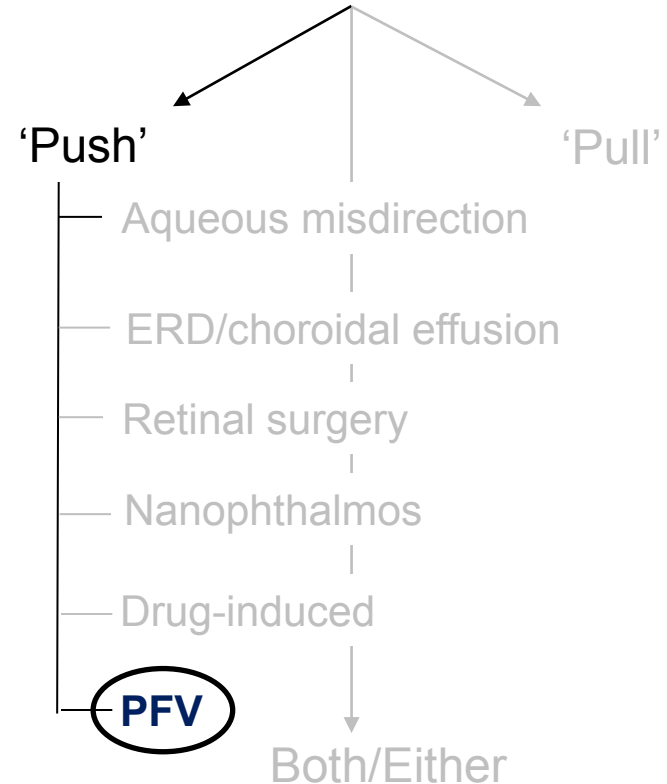
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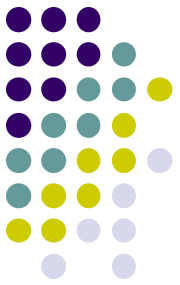
Anterior and posterior

*Which form can cause secondary ACG?*



A

## Secondary Angle Closure Glaucoma



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*w/o Pupillary Block*

*What does PFV stand for in this context?*

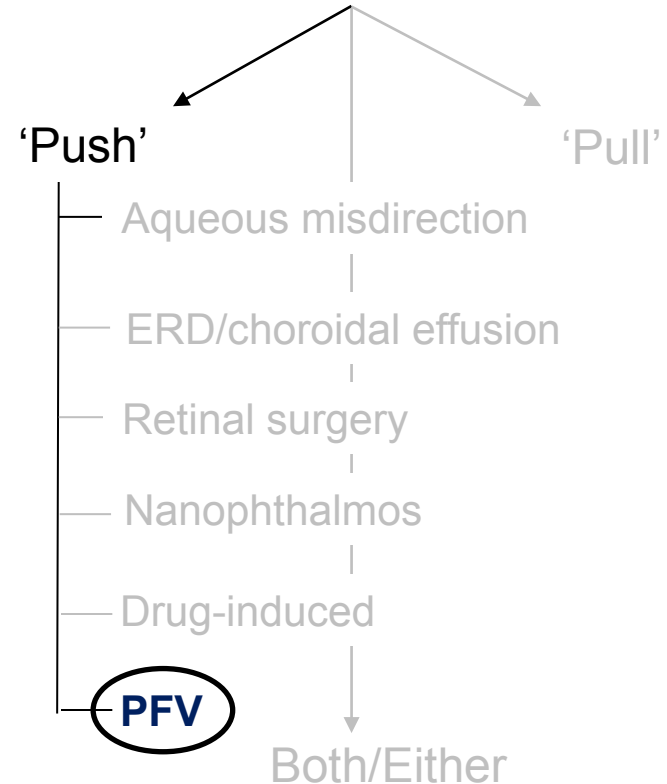
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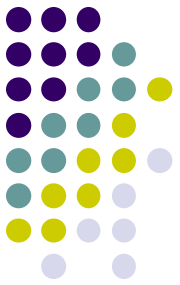
*Which form can cause secondary ACG?*

The anterior



Q

## Secondary Angle Closure Glaucoma



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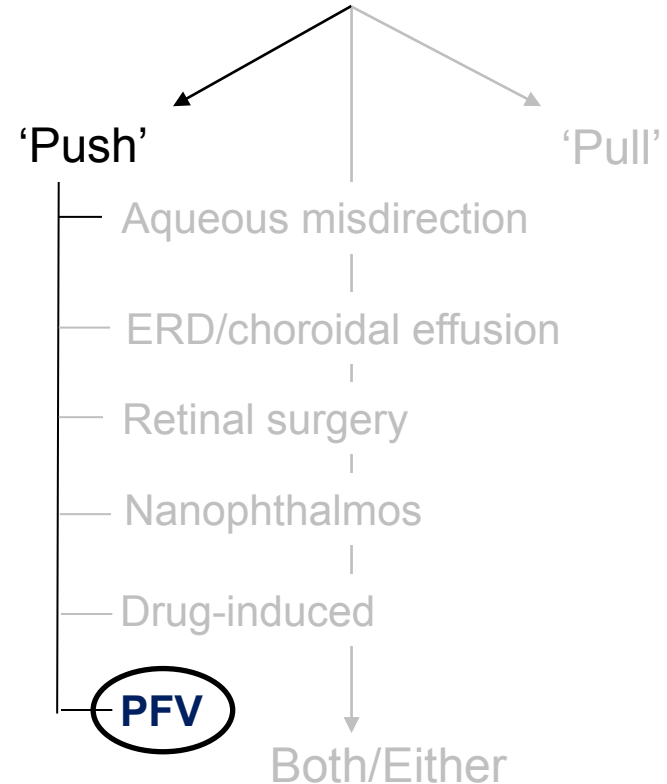
*PFV comes in two forms—what are they?*

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*Which form can cause secondary ACG?*

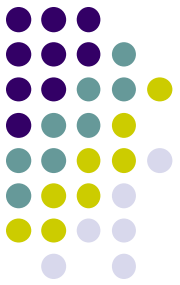
The anterior

*In general terms, how does anterior PFV manifest?*



# A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

*What does PFV stand for in this context?*

Persistent fetal vasculature

*PFV comes in two forms—what are they?*

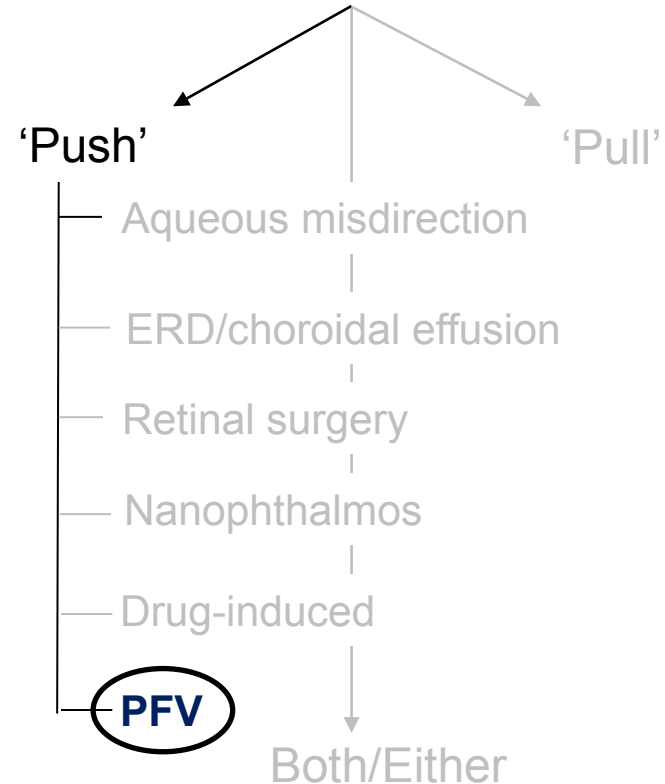
Anterior and posterior

*Which form can cause secondary ACG?*

The anterior

*In general terms, how does anterior PFV manifest?*

As a retrolental fibrovascular membrane that contracts over time, in the process shallowing the AC angle

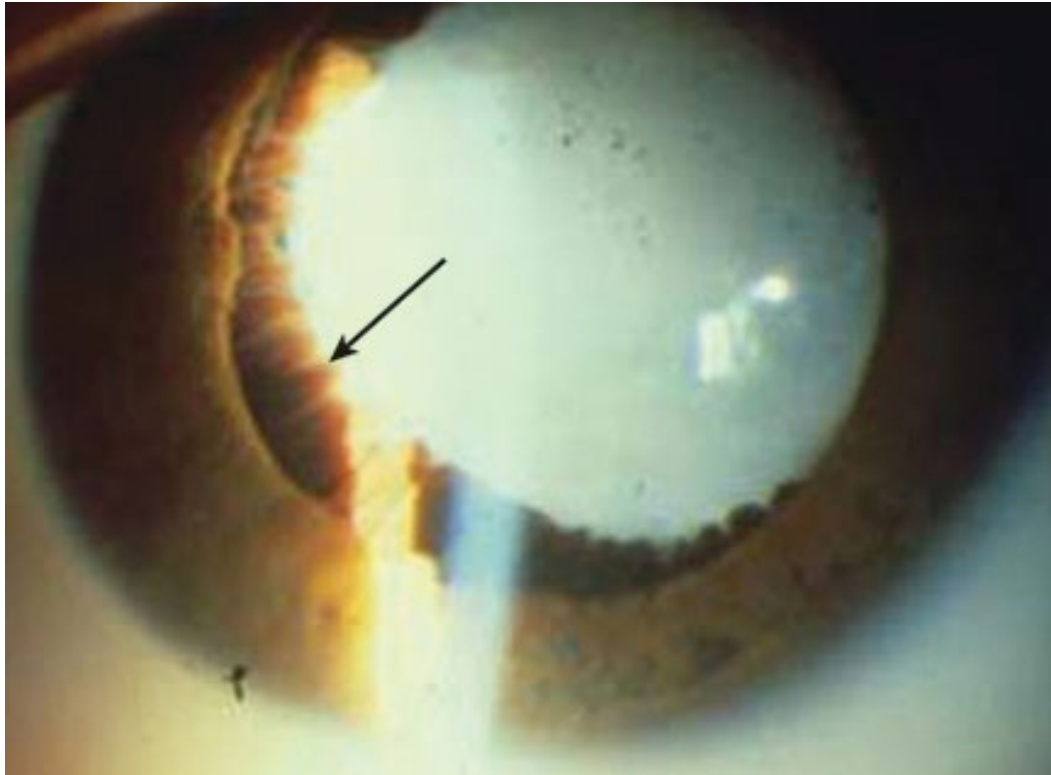
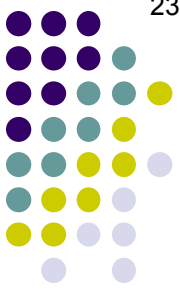


## Secondary Angle Closure Glaucoma



PFV: Retrolental membrane

## Secondary Angle Closure Glaucoma



PFV: Retrolental membrane. Note the ciliary processes (arrow)

## Secondary Angle Closure Glaucoma

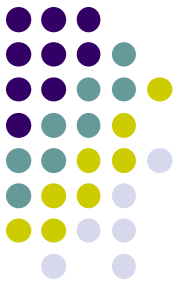


PFV: Shallow AC

PFV: Retrolental membrane (2); ciliary processes (3); note also the very shallow AC.  
 (4 is pointing to the iris in what amounts to the world's worst PAS on that side)

Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

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Persistent fetal vasculature

*PFV comes in two forms—what are they?*

Anterior and posterior

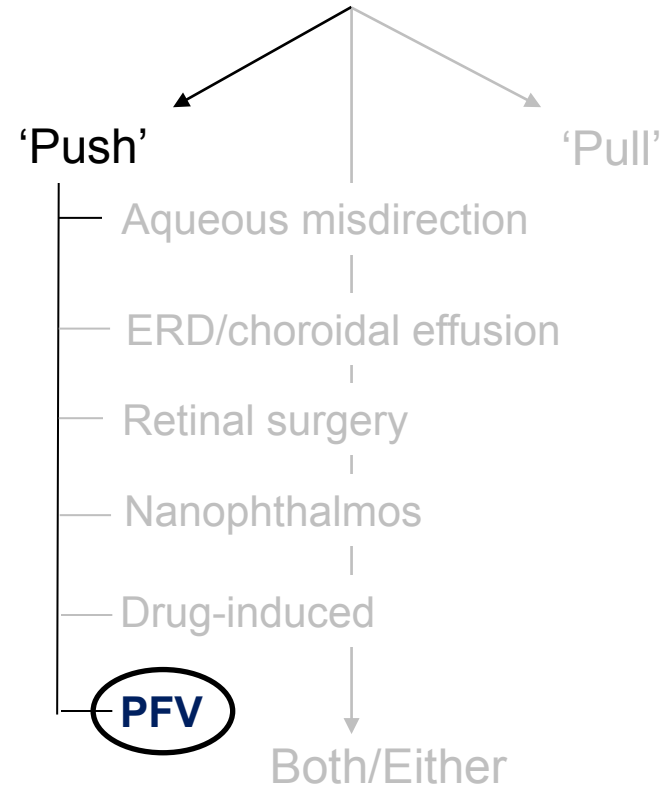
*Which form can cause secondary ACG?*

The anterior

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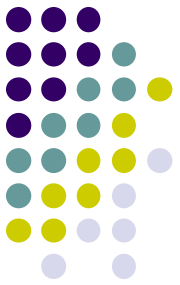
*What is the inheritance pattern for PFV?*





# A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

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*What does PFV stand for in this context?*

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Anterior and posterior

*Which form can cause secondary ACG?*

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*In general terms, how does anterior PFV manifest?*

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*What is the inheritance pattern for PFV?*

None (it is sporadic)

**'Push'**

**'Pull'**

Aqueous misdirection

ERD/choroidal effusion

Retinal surgery

Nanophthalmos

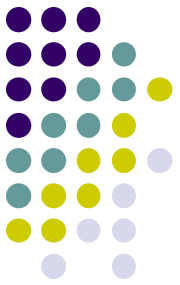
Drug-induced

**PFV**

Both/Either

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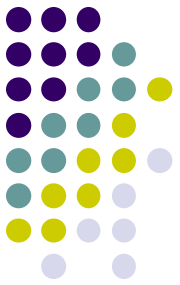
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# Q/A

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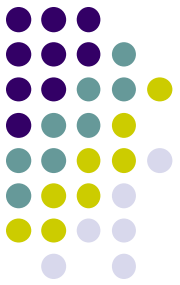
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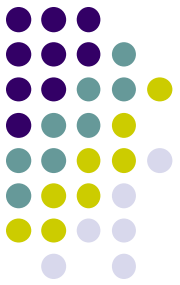
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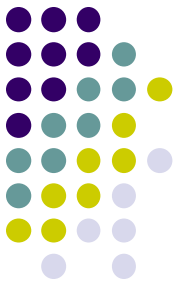
**PFV**

Both/Either

*Is PFV inevitably a blinding disease?*

# A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

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Drug-induced

**PFV**

Both/Either

*Is PFV inevitably a blinding disease?*

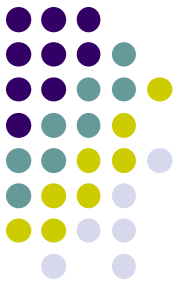
No—early cataract extraction and membranectomy may salvage the eye and useful vision



(This is a good point in the set to take a break)

Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

- Phacomorphic
- Ectopia lentis

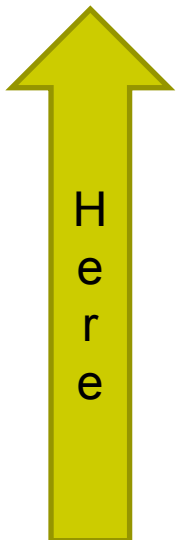
'Push'

'Pull'

- Aqueous misdirection
- ERD/choroidal effusion
- Retinal surgery
- Nanophthalmos
- Drug-induced
- PFV

- ?
- ?
- ?
- ?

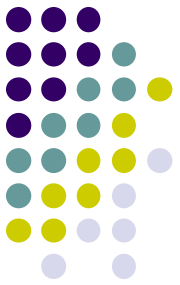
Both/Either





A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

Phacomorphic

Ectopia lentis

'Push'

'Pull'

Aqueous misdirection

NVG

ERD/choroidal effusion

ICE

Retinal surgery

Flat AC

Nanophthalmos

Epithelial/  
fibrous  
ingrowth

Drug-induced

PFV

Both/Either

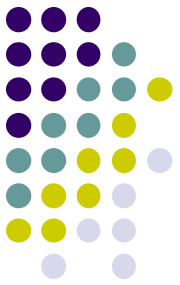
Q

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

*Neovascularization of what structure causes neovascular glaucoma (NVG)?*



'Pull'

**NVG**

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

A

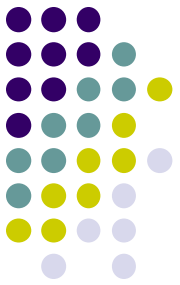
## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

Neovascularization of what structure causes neovascular glaucoma (NVG)?

Neovascularization of the angle (NVA)



'Pull'

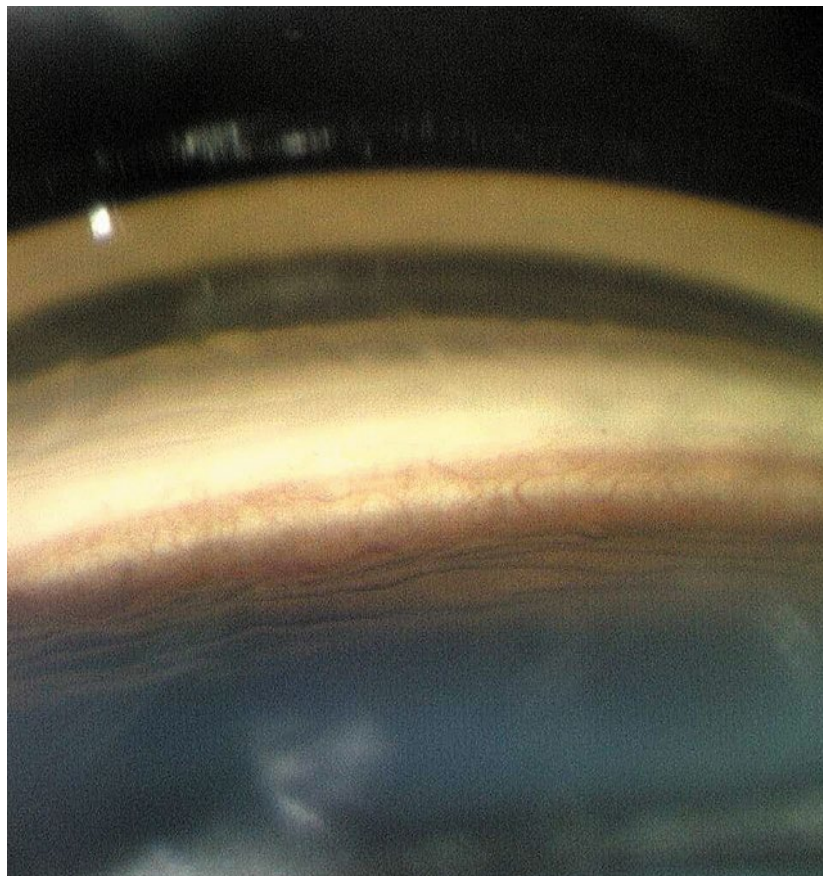
**NVG**

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

## Secondary Angle Closure Glaucoma



NVA



Q

## Secondary Angle Closure Glaucoma

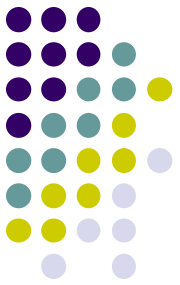
*w/ Pupillary Block*

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**Neovascularization of the angle (NVA)**

*Neovascularization of what structure typically precedes and leads to NVA?*



'Pull'

**NVG**

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

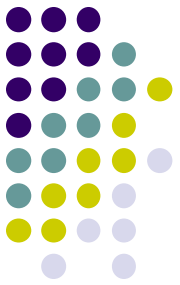
*w/o Pupillary Block*

*Neovascularization of what structure causes neovascular glaucoma (NVG)?*

**Neovascularization of the angle (NVA)**

*Neovascularization of what structure typically precedes and leads to NVA?*

Neovascularization of the **iris** (NVI)



'Pull'

**NVG**

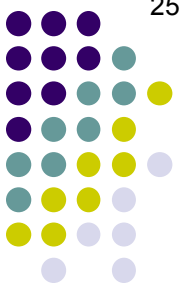
ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

# Secondary Angle Closure Glaucoma

255



NVI

Q

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

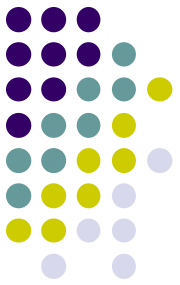
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**Neovascularization of the angle (NVA)**

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Neovascularization of the **iris** (NVI)

*Where on the iris does NVI typically first appear?*



'Pull'

**NVG**

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth



A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

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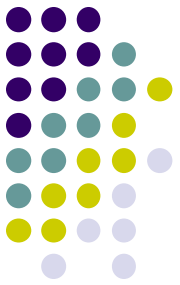
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At the pupillary margin



'Pull'

**NVG**

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

Q

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

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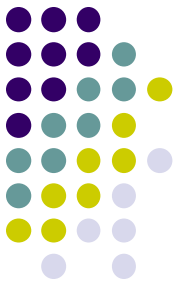
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Neovascularization of the **iris** (NVI)

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At the pupillary margin.



'Pull'

**NVG**

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

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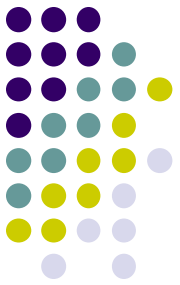
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*Neovascularization of what structure typically precedes and leads to NVA?*

Neovascularization of the **iris** (NVI)

*Where on the iris does NVI typically first appear? What does it look like?*

At the pupillary margin. As small 'tufts' of vessels.



'Pull'

**NVG**

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

Q

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

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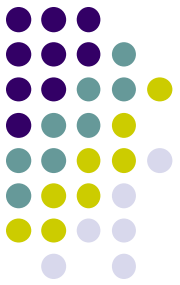
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Neovascularization of the **iris** (NVI)

*Where on the iris does NVI typically first appear? What does it look like?*

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*As it develops further, how does it grow (ie, direction, and course)?*



'Pull'

**NVG**

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

*Neovascularization of what structure causes neovascular glaucoma (NVG)?*

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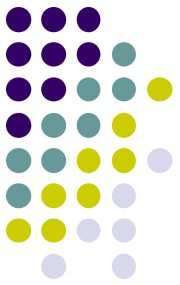
Neovascularization of the **iris** (NVI)

*Where on the iris does NVI typically first appear? What does it look like?*

At the pupillary margin. As small 'tufts' of vessels.

*As it develops further, how does it grow (ie, direction, and course)?*

In a meandering fashion toward the angle (normal iris vessels typically run in a rather direct radial fashion)



'Pull'

**NVG**

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

Q

## Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

Neovascularization of what structure causes neovascular glaucoma (NVG)?

**Neovascularization of the angle (NVA)**

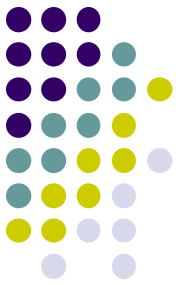
Neovascularization of what structure typically precedes and leads to NVA?

Neovascularization of the **iris** (NVI)

Where on the iris does NVI typically develop? Is NVA always the result of NVI reaching the angle? What does it look like?

As it develops further, how does it grow (ie, direction, and course)?

In a meandering fashion toward the angle (normal iris vessels typically run in a rather direct radial fashion)



'Pull'

**NVG**

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

A

## Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

Neovascularization of what structure causes neovascular glaucoma (NVG)?

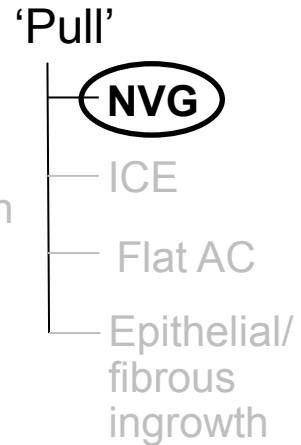
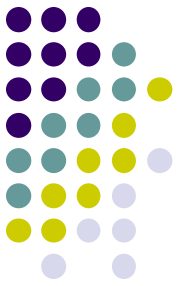
**Neovascularization of the angle (NVA)**

Neovascularization of what structure typically precedes and leads to NVA?  
Neovascularization of the **iris** (NVI)

Where on the iris does NVI typically develop?  
At the pupillary margin

Is NVA always the result of NVI reaching the angle? Look like?  
No, it can arise de novo in the angle itself

As it develops further, how does it grow (ie, direction, and course)?  
In a meandering fashion toward the angle (normal iris vessels typically run in a rather direct radial fashion)



Q

## Secondary Angle Closure Glaucoma

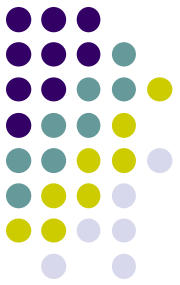
*w/ Pupillary Block*

*w/o Pupillary Block*

*Neovascularization of what structure causes neovascular glaucoma (NVG)?*

*Neovascularization of the angle (NVA)*

*How does NVA lead to angle-closure glaucoma?*



'Pull'

**NVG**

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth



A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

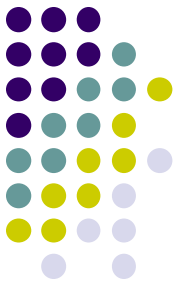
*w/o Pupillary Block*

*Neovascularization of what structure causes neovascular glaucoma (NVG)?*

Neovascularization of the angle (NVA)

*How does NVA lead to angle-closure glaucoma?*

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'Pull'

**NVG**

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

Q

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

*Neovascularization of what structure causes neovascular glaucoma (NVG)?*

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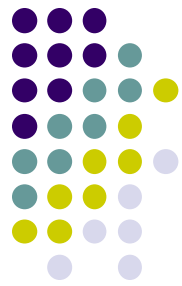
*How does NVA lead to angle-closure glaucoma?*

The NVA vessels don't ride solo; rather, they are accompanied by contractile elements

elements will establish

*How far up the peripheral cornea do the NVA vessels go?*

**peripheral cornea**



'Pull'

**NVG**

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

Q/A

## Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

Neovascularization of what structure causes neovascular glaucoma (NVG)?

Neovascularization of the angle (NVA)

How does NVA lead to angle-closure glaucoma?

The NVA vessels don't ride solo; rather, they are accompanied by contractile elements

elements will establish

How far up the peripheral cornea do the NVA vessels go?

No higher than

angle structure

peripheral cornea

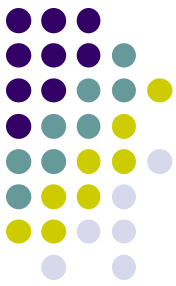
'Pull'

NVG

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth



A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

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Neovascularization of the angle (NVA)

*How does NVA lead to angle-closure glaucoma?*

The NVA vessels don't ride solo; rather, they are accompanied by contractile elements

elements will establish

*How far up the peripheral cornea do the NVA vessels go?*

No higher than Schwalbe's line

**peripheral cornea**

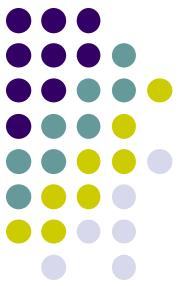
'Pull'

**NVG**

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth



Q

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

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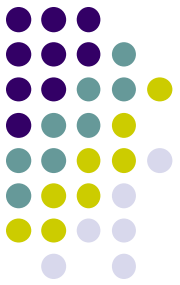
elements will establish

**peripheral cornea**

*How far up the peripheral cornea do the NVA vessels go?*

No higher than Schwalbe's line

*Why can't they go any higher?*



'Pull'

**NVG**

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

A

## Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

Neovascularization of what structure causes neovascular glaucoma (NVG)?

Neovascularization of the angle (NVA)

How does NVA lead to angle-closure glaucoma?

The NVA vessels don't ride solo; rather, they are accompanied by contractile elements

elements will establish

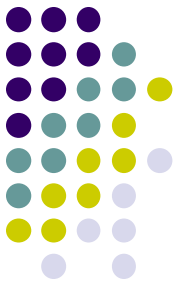
**peripheral cornea**

How far up the peripheral cornea do the NVA vessels go?

No higher than Schwalbe's line

Why can't they go any higher?

Because vessels cannot grow onto normal corneal endothelium



'Pull'

**NVG**

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

# Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

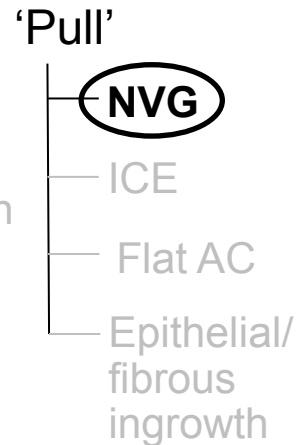
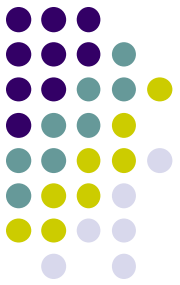
*Neovascularization of what structure causes neovascular glaucoma (NVG)?*

Neovascularization of the angle (NVA)

*How does NVA lead to angle-closure glaucoma?*

The NVA vessels don't ride solo; rather, they are accompanied by contractile elements (eg, fibroblasts). Along with the neo vessels, these elements will establish a network that crosses from the peripheral iris to the peripheral cornea. Once established, contractile elements gonna contract, and when they do, they pull the iris up against the angle, rendering it closed.

*(No question—proceed when ready)*



Q

## Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

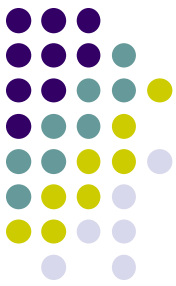
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*This configuration—iris affixed to the angle—is known by what name?*



'Pull'

NVG

ICE

Flat AC

Epithelial/  
ous  
ingrowth



A

## Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

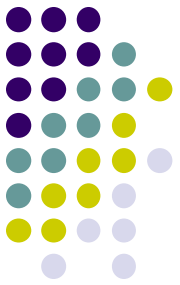
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This configuration—iris affixed to the angle—is known by what name?  
**Peripheral anterior synechiae (PAS)**



'Pull'



ICE

Flat AC

Epithelial/  
ous  
ingrowth

Q

## Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

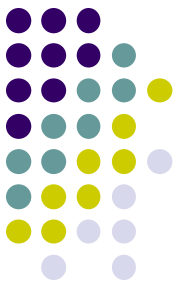
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What two-word phrase (**not** 'diabetic retinopathy'--think more generally) describes the fundamental cause of most cases of NVG?



'Pull'

NVG

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

A

## Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

*Neovascularization of what structure causes neovascular glaucoma (NVG)?*

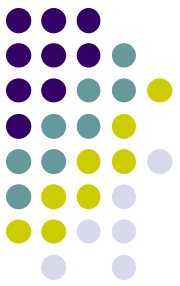
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*How does NVA lead to angle-closure glaucoma?*

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*What two-word phrase (not 'diabetic retinopathy'--think more generally) describes the fundamental cause of most cases of NVG?*

'Retinal ischemia'



'Pull'

NVG

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

Q

## Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

Neovascularization of what structure causes neovascular glaucoma (NVG)?

Neovascularization of the angle (NVA)

How does NVA lead to angle-closure glaucoma?

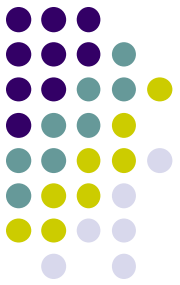
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What two-word phrase (not 'diabetic retinopathy' think more generally) describes the fundam

**'Retinal ischemia'**

What are the three most common causes of ischemia that result in the development of NVG?

--  
--  
--



'Pull'

**NVG**

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

A

## Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

Neovascularization of what structure causes neovascular glaucoma (NVG)?

Neovascularization of the angle (NVA)

How does NVA lead to angle-closure glaucoma?

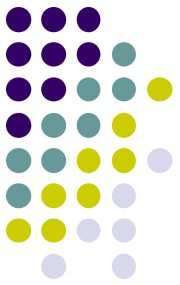
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**'Retinal ischemia'**

What are the three most common causes of ischemia that result in the development of NVG?

- Diabetic retinopathy
- CRVO
- Ocular ischemic syndrome (OIS; note that OIS involves ischemia of non-retinal ocular structures as well)



'Pull'

**NVG**

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

Q

## Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

Neovascularization of what structure causes neovascular glaucoma (NVG)?

Neovascularization of the angle (NVA)

How does NVA lead to angle-closure glaucoma?

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**'Retinal ischemia'**

What are the three most common causes of ischemia that result in t

- Diabetic
- CRVO**
- Ocular i
- ischemia

CRVOs are classified into one of two categories. What are these?



'Pull'

**NVG**

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

A

## Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

Neovascularization of what structure causes neovascular glaucoma (NVG)?

Neovascularization of the angle (NVA)

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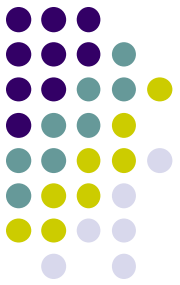
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- ischemia

CRVOs are classified into one of two categories. What are these?

**Ischemic and nonischemic**



'Pull'

**NVG**

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

Q

## Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

Neovascularization of what structure causes neovascular glaucoma (NVG)?

Neovascularization of the angle (NVA)

How does NVA lead to angle-closure glaucoma?

The NVA vessels don't ride solo; rather, they are accompanied by contractile elements (eg, fibroblasts). Along with the neo vessels, these elements will establish a network that crosses from the peripheral iris to the peripheral cornea. Once established, contractile elements gonna contract, and when they do, they pull the iris up against the angle, rendering it closed.

What two-word phrase (not 'diabetic retinopathy' think more generally) describes the fundam

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--Diabetic

**CRVO**

--Ocular i  
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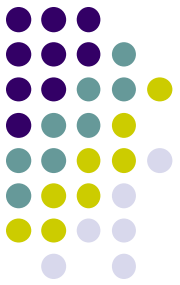
CRVOs are classified into one of two categories. What are these?

**Ischemic and nonischemic**

Which sort is more likely to result in the development of NVG? Seriously?

What is the typical timeframe for development of NVG after CRVO?

It usually occurs about 3 month's after. Because of this, NVG after CRVO is often called '**100-day glaucoma**' (or, '90-day glaucoma')



'Pull'

**NVG**

ICE

Flat AC

Epithelial/  
fibrous  
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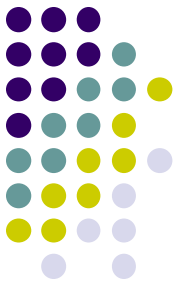
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- Diabetic re
- CRAO**
- Ocular isch
- ischemia of

Can NVG develop after a CRAO?



'Pull'

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ICE

Flat AC

Epithelial/  
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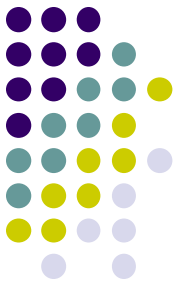
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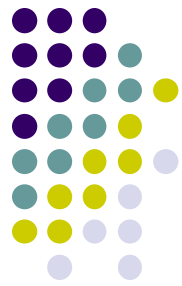
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ischemia of

Can NVG develop after a CRAO?

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Is NVG more, or less likely to develop after CRAO compared to CRVO?



'Pull'

**NVG**

ICE

Flat AC

Epithelial/  
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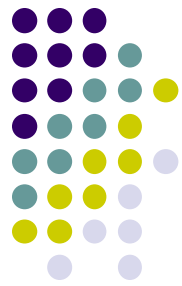
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'Pull'

**NVG**

ICE

Flat AC

Epithelial/  
fibrous  
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What two-word phrase (not 'diagnosis') describes the fundamental mechanism?

**'Retinal ischemia'**

What are the two main causes of CRAO?

**CRAO**

--Diabetic retinopathy  
--Ocular ischemic syndrome

But surely a CRAO causes more retinal ischemia than does a CRVO. Given this, why isn't NVG more common after CRAO?

**Much less likely**

'Pull'

**NVG**

ICE

Flat AC

ial/

th



A

## Secondary Angle Closure Glaucoma

w/ Pupillary Block

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What are the two main causes that result in the ischemia?

--Diabetic retinopathy

**CRAO**

--Ocular ischemic syndrome

ischemia of the retina

But surely a CRAO causes more retinal ischemia than does a CRVO. Given this, why isn't NVG more common after CRAO? Because the retina is **too** ischemic after CRAO. That is, CRAO-induced ischemia is so profound that retinal cells die prior to being able to produce and release VEGF.

compared to CRVO?

**Much less likely**

'Pull'

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ICE

Flat AC

ial/

th

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w/ Pupillary Block

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**'Retinal ischemia'**

What are the two main causes that result in the ischemia?

-- Diabetic retinopathy

**CRAO**

-- Ocular ischemic syndrome

ischemia of the retina

But surely a CRAO causes more retinal ischemia than does a CRVO. Given this, why isn't NVG more common after CRAO? Because the retina is **too** ischemic after CRAO. That is, CRAO-induced ischemia is so profound that retinal cells die prior to being able to produce and release VEGF. **Contrast this with CRVO, in which enough blood flow is maintained to allow the dying retinal cells time to 'cry for help.'**

How likely is NVG after CRAO compared to CRVO?

**Much less likely**

'Pull'

**NVG**

ICE

Flat AC

Normal

th

Q

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If NVG develops after CRAO, what is the typical timeframe?

...compared to CRVO?

**Much less likely**

'Pull'

**NVG**

ICE

Flat AC

ial/

th

th

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**CRAO**

-- Ocular ischemia syndrome  
ischemia of

But surely a CRAO causes more retinal ischemia than does a CRVO. Given this, why isn't NVG more common after CRAO? Because the retina is **too** ischemic after CRAO. That is, CRAO-induced ischemia is so profound that retinal cells die.

If NVG develops after CRAO, what is the typical timeframe? It usually occurs about 1 month after. Because of this, NVG after CRAO is often called **30-day glaucoma**.

compared to CRVO?

**Much less likely**

'Pull'

**NVG**

ICE

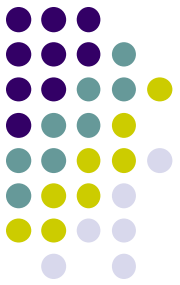
Flat AC

ial/

th

Q

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'Pull'

NVG

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

What two-word phrase describes the fundam

'Retinal ischemia'

There's an important difference in the clinical presentation of NVG in DBR and CRVO vs the presentation of 'NVG' in OIS. What is it?

--CRVO

Ocular ischemic syndrome (OIS; note that OIS involves ischemia of non-retinal ocular structures as well)

A

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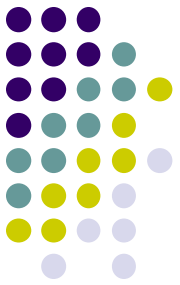
What two-word phrase describes the fundamental mechanism?

**'Retinal ischemia'**

There's an important difference in the clinical presentation of NVG in DBR and CRVO vs the presentation of 'NVG' in OIS. What is it? Angle closure in DBR and CRVO inevitably produces a dramatic spike in IOP. However, angle closure in OIS frequently is **not** accompanied by a high IOP.

--CRVO

**Ocular ischemic syndrome** (OIS; note that OIS involves ischemia of non-retinal ocular structures as well)



'Pull'

**NVG**

ICE

Flat AC

Epithelial/  
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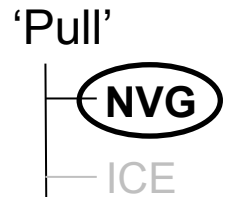
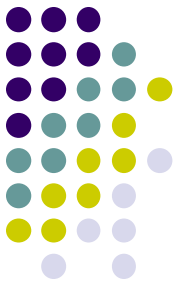
What two-word phrase describes the fundamental mechanism of angle closure in OIS?

**'Retinal ischemia'**

Why doesn't the IOP spike during angle closure in OIS?

spike in IOP. However, angle closure in OIS frequently is not accompanied by a high IOP.

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at AC

epithelial/

orous

ingrowth

# Q/A

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What two-word phrase describes the fundamental mechanism of angle closure in NVA?

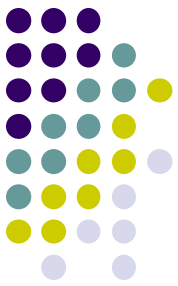
**'Retinal ischemia'**

Why doesn't the IOP spike during angle closure in OIS?

In a word--hypoperfusion. That is, the same lack of blood flow that resulted in ocular ischemia leads to resulting in very little aqueous being made.

spike in IOP. However, angle closure in OIS frequently is not accompanied by a high IOP.

**Ocular ischemic syndrome** (OIS; note that OIS involves ischemia of non-retinal ocular structures as well)



'Pull'

**NVG**

ICE

at AC

epithelial/  
porous  
ingrowth



A

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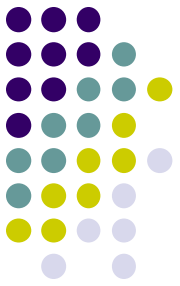
**'Retinal ischemia'**

Why doesn't the IOP spike during angle closure in OIS?

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spike in IOP. However, angle closure in OIS frequently is not accompanied by a high IOP.

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'Pull'



ICE

at AC

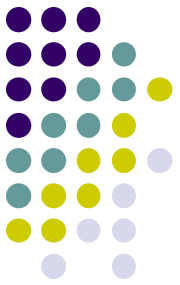
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**'Retinal ischemia'**

What is the most common cause of OIS?

--CRVO

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'Pull'

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ICE

flow down, epithelial/  
porous  
ingrowth

A

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The NVA vessels don't ride solo; rather, they are accompanied by contractile elements (e.g., pericytes). These elements will establish a contractile ring at the peripheral cornea. Once the ring is established, and when they do, the angle is pulled closed.

What two-word phrase describes the fundamental mechanism of NVG?

**'Retinal ischemia'**

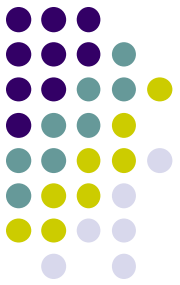
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--CRVO

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'Pull'

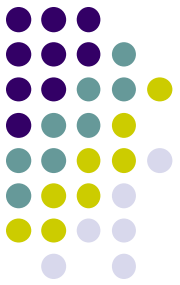
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What two-word phrase describes the fundamental mechanism of NVG?

**'Retinal ischemia'**

What is the most common cause of OIS?

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If an eye has a zipped-up angle secondary to NVA from OIS, what can happen to IOP after successful CEA re-establishes blood flow to the ciliary body?

'Pull'

**NVG**

ICE

flow down, epithelial/choroidal growth

--CRVO

**Ocular ischemic syndrome**

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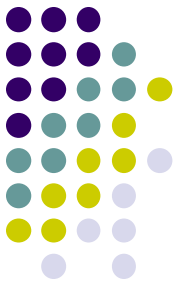
If an eye has a zipped-up angle secondary to NVA from OIS, what can happen to IOP after successful CEA re-establishes blood flow to the ciliary body?

IOP often spikes dramatically. The patient's ophthalmologist **must** be prepared for this development in OIS pts who undergo CEA!

--CRVO

**Ocular ischemic syndrome**

(OIS; note that OIS involves ischemia of non-retinal ocular structures as well)



'Pull'

**NVG**

ICE

flow down, epithelial/choroidal growth

Q

## Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

*Neovascularization of what structure causes neovascular glaucoma (NVG)?*

Neovascularization of the angle (NVA)

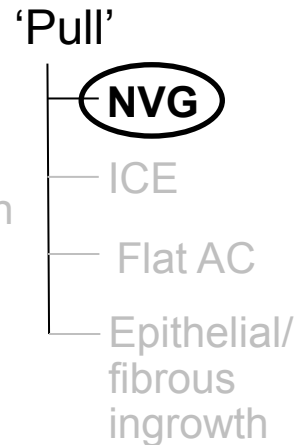
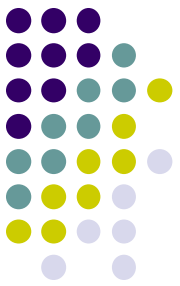
*How does NVA lead to angle-closure glaucoma?*

The NVA vessels don't ride solo; rather, they are accompanied by contractile elements (eg, fibroblasts). Along with the neo vessels, these elements will establish a network that crosses from the peripheral iris to the peripheral cornea. Once established, contractile elements gonna contract, and when they do, they pull the iris up against the angle, rendering it closed.

*What two-word phrase (not 'diabetic retinopathy'--think more generally) describes the fundamental cause of most cases of NVG?*

'Retinal ischemia'

*How does retinal ischemia lead to NVI and NVA?*



# Q/A

## Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

*Neovascularization of what structure causes neovascular glaucoma (NVG)?*

Neovascularization of the angle (NVA)

*How does NVA lead to angle-closure glaucoma?*

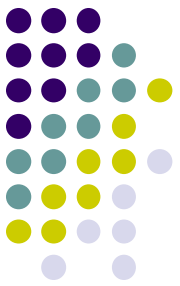
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In a desperate attempt to acquire the oxygen they're lacking, the ischemic retinal cells release the signaling molecule abb., a potent inducer of new blood vessel formation.



'Pull'

**NVG**

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

# A

## Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

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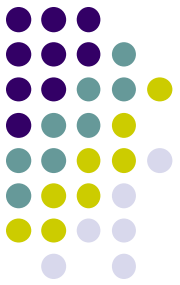
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'Pull'

NVG

ICE

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Epithelial/  
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# A

## Secondary Angle Closure Glaucoma

w/ Pupillary Block

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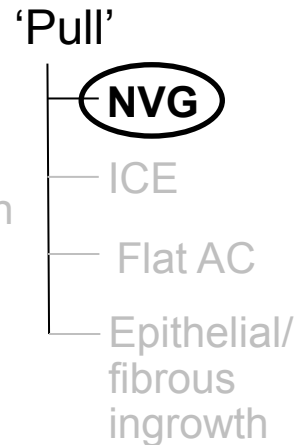
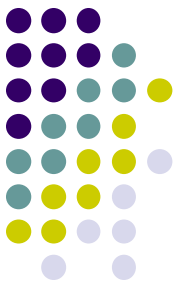
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Q

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w/ Pupillary Block

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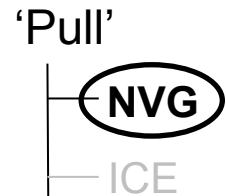
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**'Retinal ischemia'**

How does retinal ischemia lead to NVG?

In a desperate attempt to survive, retinal cells release factors that stimulate blood vessel formation in the anterior segment, where it induces the NVI/NVA process.

What is the treatment of choice for NVG 2ndry to retinal ischemia?



A

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w/ Pupillary Block

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'Pull'

NVG

ICE

al/  
h

## Secondary Angle Closure Glaucoma



PRP

Q

## Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

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**'Retinal ischemia'**

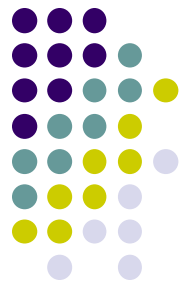
How does retinal is

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What is the goal of PRP, ie, what are we trying to do?



'Pull'

**NVG**

ICE

A

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'Pull'

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As stated several times now: DBR renders portions of the retina hypoxic, and hypoxic cells release VEGF, initiating a cascade of deleterious events



'Pull'



ICE



A

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w/ Pupillary Block

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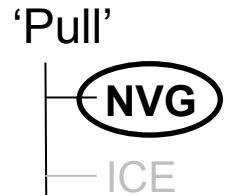
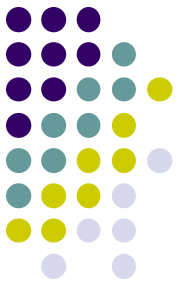
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Q

## Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

Neovascularization of what structure causes neovascular glaucoma (NVG)?

**Neovascularization of the angle (NVA)**

Finally: There are a few clinical scenarios in which NVI/NVA develop in the **absence** of retinal ischemia. One condition in particular is notorious for this—what is it?

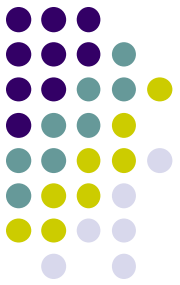
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'Pull'

**NVG**

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

# A

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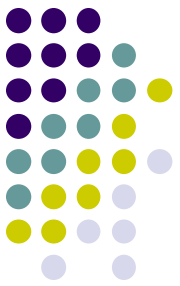
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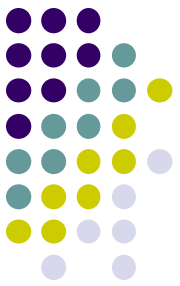
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Epithelial/  
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The NVI/NVA in FHI: In what regard is it highly unusual?

It never leads to the development of PAS, and thus doesn't provoke NVG

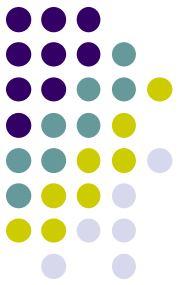
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'Pull'

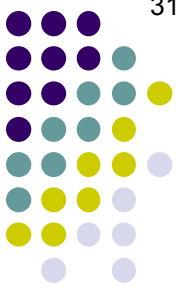
**NVG**

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

## Secondary Angle Closure Glaucoma



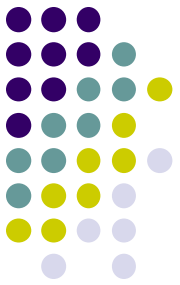
FHI

Q

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*



*In this context, what does ICE stand for?*

'Pull'

NVG

**ICE**

Flat AC

Epithelial/  
fibrous  
ingrowth

A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

*In this context, what does ICE stand for?*  
Iridocorneal endothelial syndrome

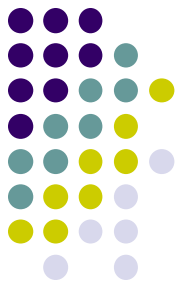
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Flat AC

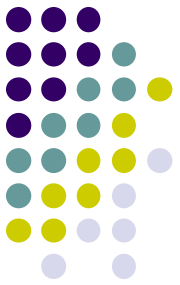
Epithelial/  
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Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

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*In a nutshell, what is ICE?*

'Pull'

NVG

ICE

Flat AC

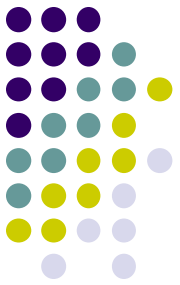
Epithelial/  
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A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*



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*In a nutshell, what is ICE?*

A sporadic condition in which abnormal corneal endothelial cells lead to a variety of corneal, iris and angle problems

'Pull'

NVG

ICE

Flat AC

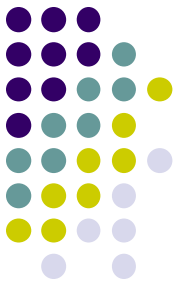
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*What's abnormal about the endothelial cells in ICE?*

'Pull'

NVG

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## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

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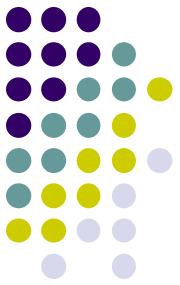
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*What's abnormal about the endothelial cells in ICE?*

They behave like epithelial cells, with a strong tendency to migrate. These so-called 'ICE cells' will migrate across the angle and onto the iris, laying down a fibrillar membrane as they go.



'Pull'

NVG

ICE

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Epithelial/  
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## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

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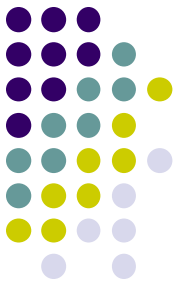
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'Pull'

NVG

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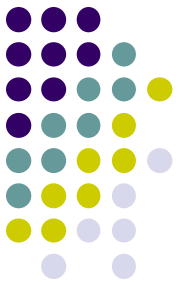
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'Pull'

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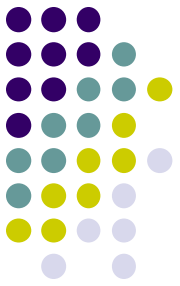
Epithelial/  
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A

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'Pull'

NVG

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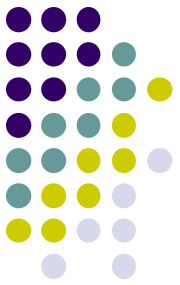
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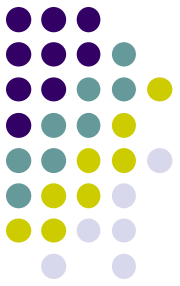


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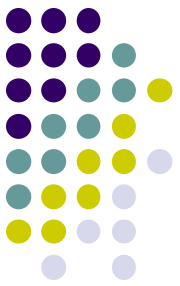
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NVG

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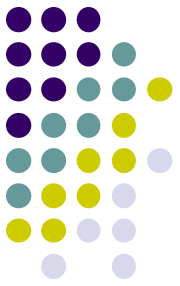
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She will deny any family history of similar eye findings (recall it's sporadic, not inherited)

'Pull'

NVG

ICE

Flat AC

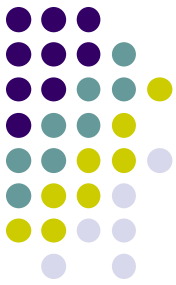
Epithelial/  
fibrous  
ingrowth

Q

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*



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*In a nutshell, what is ICE?*

A sporadic condition in which abnormal corneal endothelial cells lead to a variety of corneal, iris and angle problems

*What are the common signs of ICE syndrome?*

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--Changes in the eye's appearance  
--Ocular pain  
--Decreased VA

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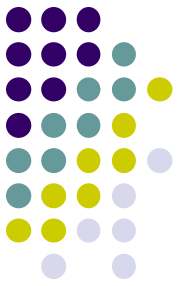
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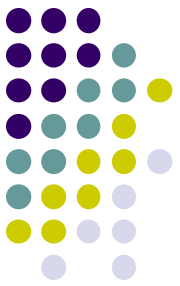
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Epithelial/  
fibrous  
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--Iris changes

--Corneal changes

--Peripheral anterior

--Elevated IOP/glaucoma

*What sort of iris changes will be present?*

--

--

--

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--Changes in the eye's appearance

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--Decreased VA

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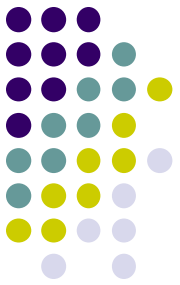
Epithelial/  
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--Peripheral anterior

--Elevated IOP/glaucoma

--Changes in the eye's appearance

--Ocular pain

--Decreased VA

*What sort of iris changes will be present?*

--The pupil may be out-of-round or displaced

--The iris may be atrophic and 'torn'

--Ectropion uveae may be present

--Iris nodules and/or nevi may be present

'Pull'

NVG

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

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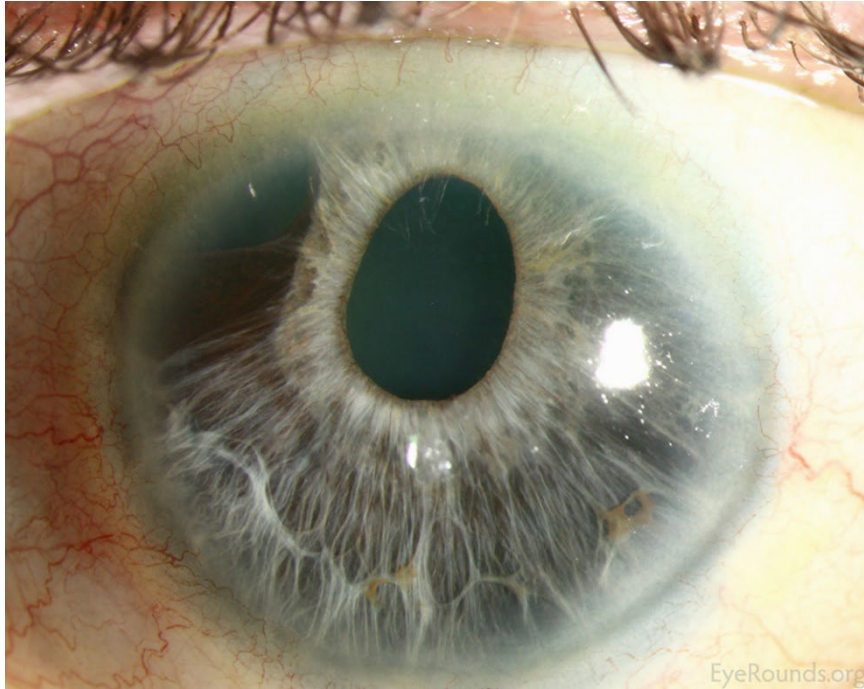
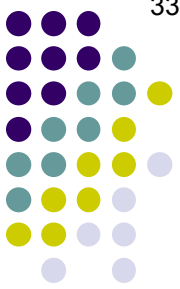


ICE: Corectopia (displaced pupil)



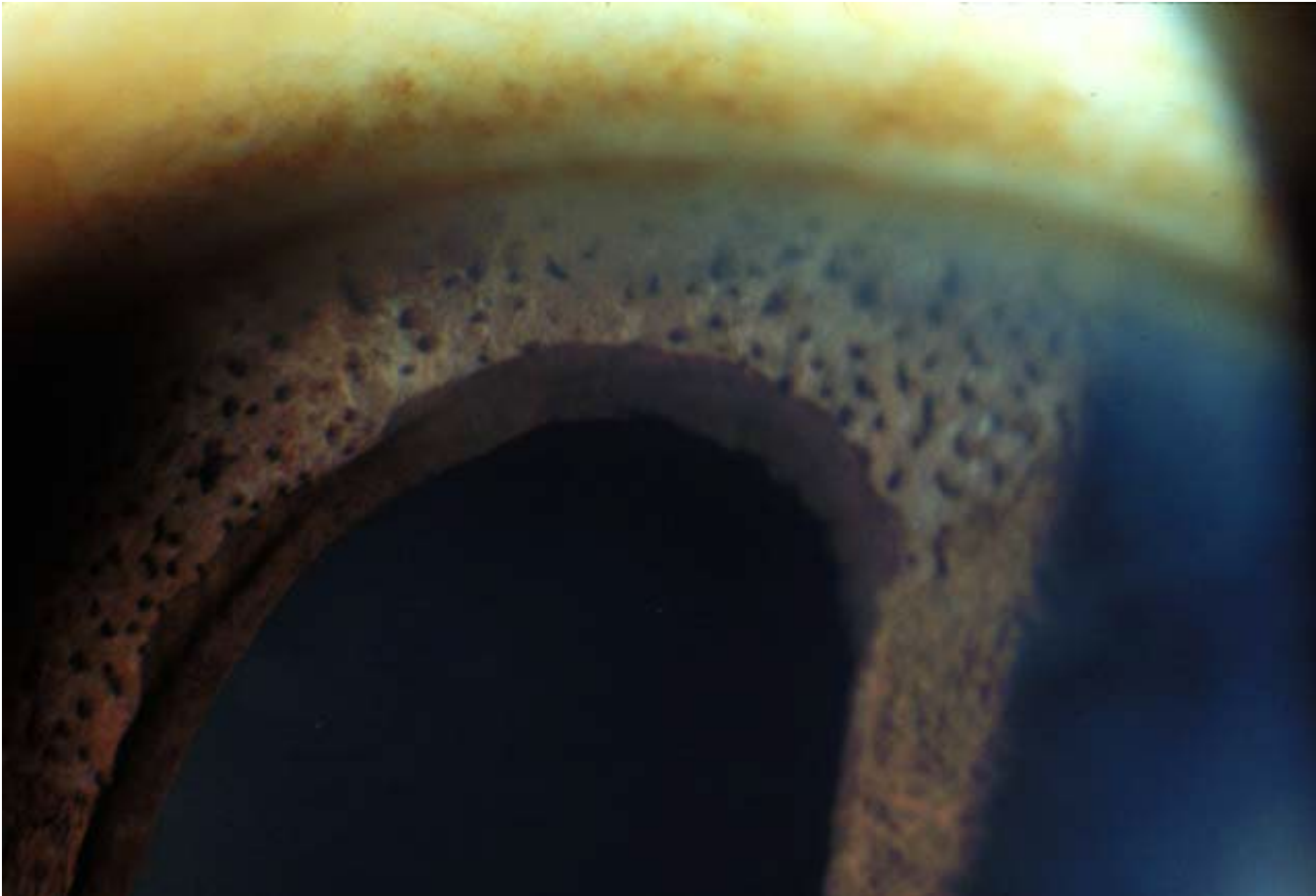
# Secondary Angle Closure Glaucoma

337



ICE: Iris atrophy

## Secondary Angle Closure Glaucoma



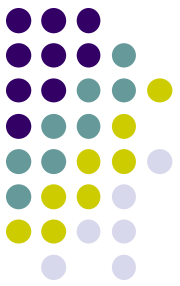
ICE: Iris nodules (note also the ectropion uveae)

Q

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*w/ Pupillary Block*

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--**Corneal changes**

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--Elevated IOP/glaucoma

--Changes in the eye's appearance

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--Decreased VA

*What sort of corneal changes will be present?*

'Pull'

NVG

**ICE**

Flat AC

Epithelial/  
fibrous  
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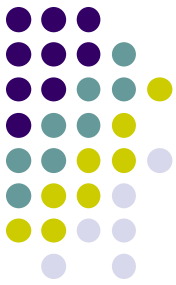
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*What sort of corneal changes will be present?*

It may appear hazy or milky as a result of corneal edema

'Pull'

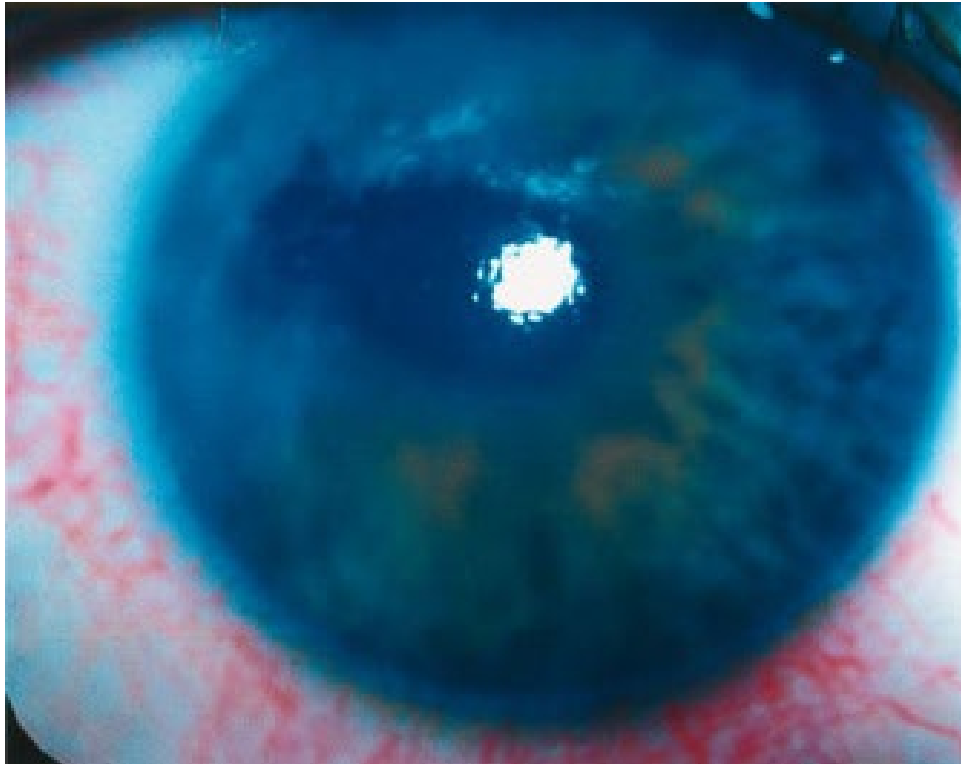
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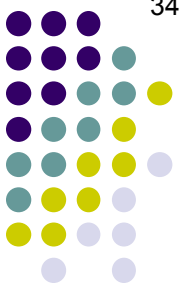
Flat AC

Epithelial/  
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ingrowth

## Secondary Angle Closure Glaucoma



ICE: Corneal edema

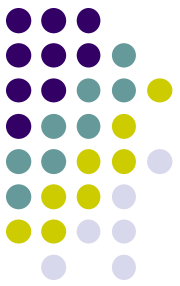


Q

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*What are the classic terms for describing the slit-lamp appearance of the abnormal endothelium?*

'Pull'

NVG

**ICE**

Flat AC

Epithelial/  
fibrous  
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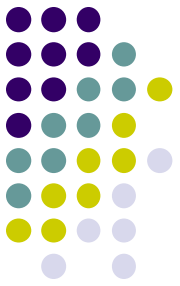
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*What are the classic terms for describing the slit-lamp appearance of the abnormal endothelium?*  
'Hammered silver' or 'beaten bronze'

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'Pull'

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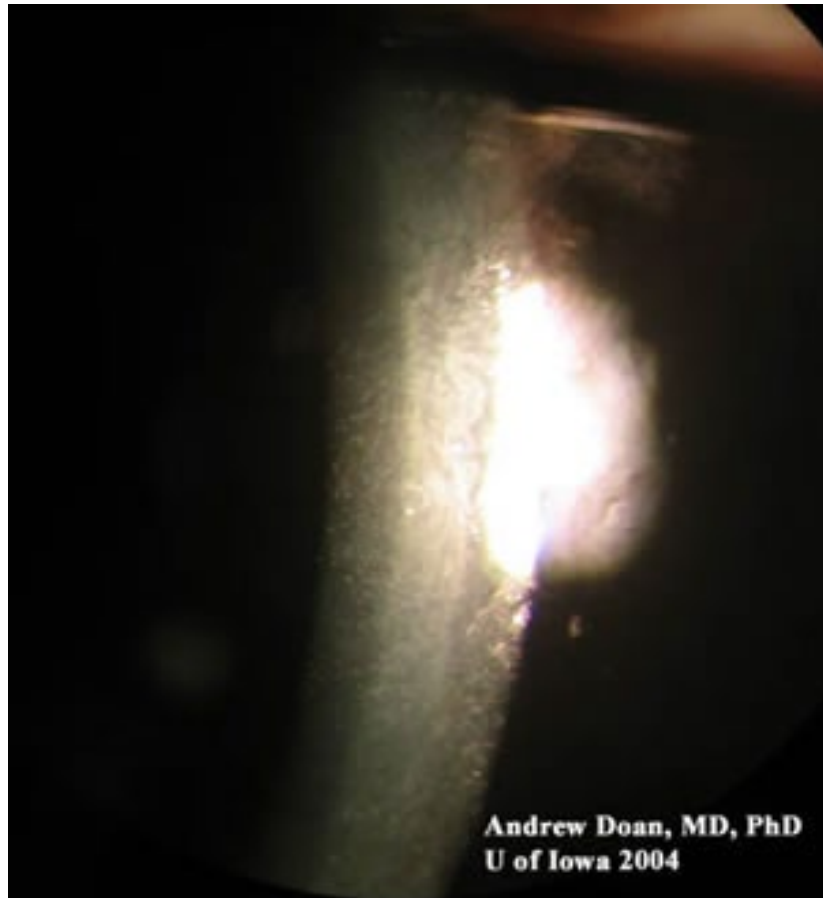
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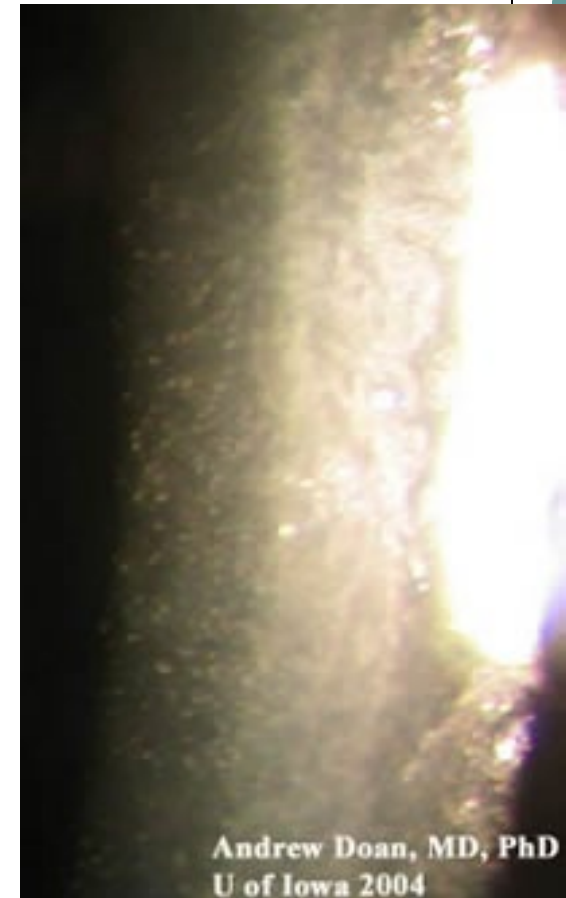
Epithelial/  
fibrous  
ingrowth



## Secondary Angle Closure Glaucoma



Low res



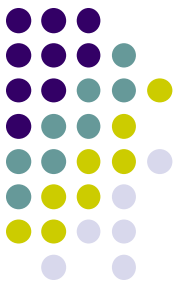
High res

ICE: 'Hammered silver' corneal endothelium



Q

## Secondary Angle Closure Glaucoma



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*What are the classic terms for describing the slit-lamp appearance of the abnormal endothelium?*

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**'beaten bronze'**

*Beaten bronze is also used to describe the appearance of the endothelium in what condition?*

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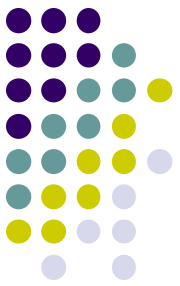
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'Pull'

NVG

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Flat AC

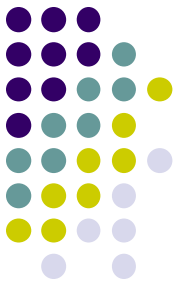
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What are they?*

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'Pull'

NVG

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Flat AC

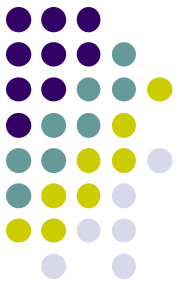
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'Broad' and 'high'

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NVG

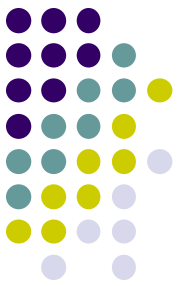
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'Pull'

NVG

**ICE**

Flat AC

Epithelial/  
fibrous  
ingrowth

*What does high mean in this context?*

not inherited)

*taking a history?*

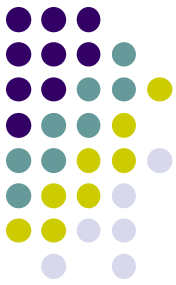
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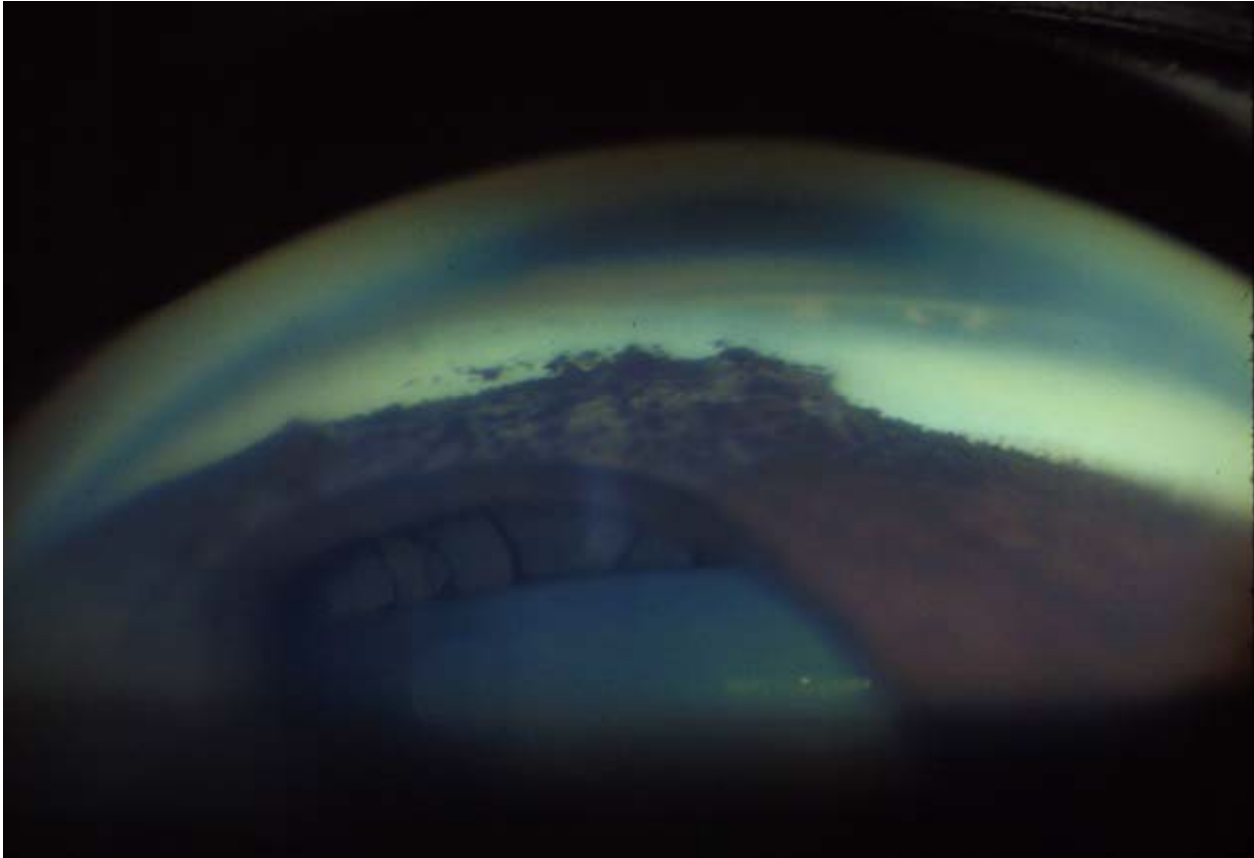
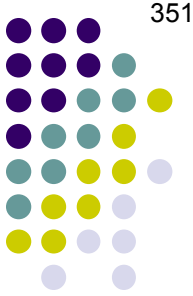
*What does high mean in this context?*

That the PAS extend above Schwalbe's line (SL)  
not inherited)

*taking a history?*

findings (recall it's sporadic,

## Secondary Angle Closure Glaucoma



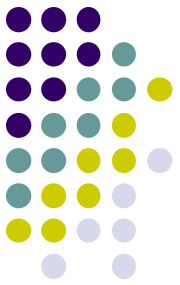
ICE: Broad and high PAS

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*But we said earlier that PAS don't cross SL. What's the deal?*

*What does high mean in this context?*

That the PAS **extend above Schwalbe's line** (SL), findings (recall it's sporadic, not inherited)

'Pull'

NVG

**ICE**

Flat AC

Epithelial/  
fibrous  
ingrowth

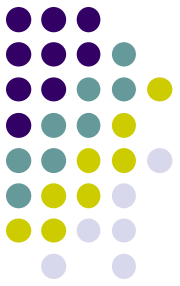


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'Broad' and **'high'**

*But we said earlier that PAS don't cross SL. What's the deal?*

What we said was that PAS don't cross **normal** endothelium, but the endothelium in ICE is highly **abnormal**

*What does high mean in this context?*

That the **PAS extend above Schwalbe's line** (SL), findings (recall it's sporadic, not inherited)

'Pull'

NVG

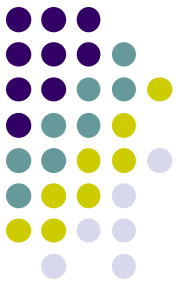
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Flat AC

Epithelial/  
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## Secondary Angle Closure Glaucoma



*How common is glaucoma in ICE?*

*lary Block*

'Pull'

NVG

ICE

Flat AC

Epithelial/  
fibrous  
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--**Elevated IOP/glaucoma**

--Changes in the eye's appearance

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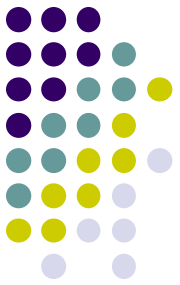
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# A

## Secondary Angle Closure Glaucoma



*How common is glaucoma in ICE?*

Quite—it develops in about half of cases

*lary Block*

‘Pull’

NVG

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Flat AC

Epithelial/  
fibrous  
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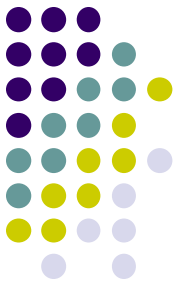
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*Pupillary Block*

‘Pull’

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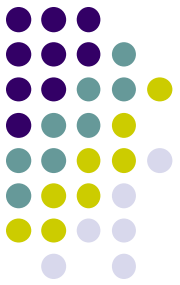
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*How does ICE produce secondary pupillary-block glaucoma?*

As mentioned earlier, ICE cells may cross the angle, leaving a membrane in their wake. This membrane can contract, producing the broad and high PAS discussed previously. Or, the membrane can occlude the angle simply by covering it.

*Pupillary Block*

lead to a

‘Pull’

NVG

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Flat AC

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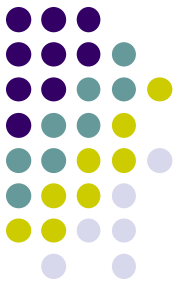
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*Can the glaucoma be managed medically?*

--Peripheral anterior synechiae (PAS)

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*Pupillary Block*

'Pull'

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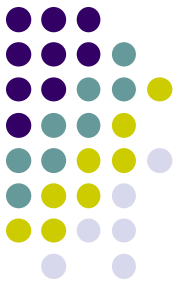
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*Can the glaucoma be managed medically?*

In some cases, yes. However, many go on to filtering surgery.

*Pupillary Block*

--Peripheral anterior synechiae (PAS)

--**Elevated IOP/glaucoma**

--Changes in the eye's appearance

--Ocular pain

--Decreased VA

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'Pull'

NVG

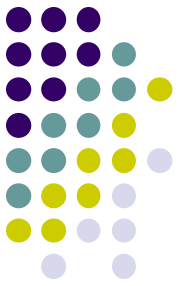
**ICE**

Flat AC

Epithelial/  
fibrous  
ingrowth

Q

## Secondary Angle Closure Glaucoma



*How common is glaucoma in ICE?*

Quite—it develops in about half of cases

*How does ICE produce secondary pupillary-block glaucoma?*

As mentioned earlier, ICE cells may cross the angle, leaving a membrane in their wake. This membrane can contract, producing the broad and high PAS discussed previously. Or, the membrane can occlude the angle simply by covering it.

*Can the glaucoma be managed medically?*

In some cases, yes. However, many go on to filtering surgery.

*Is SLT a good option?*

--Peripheral anterior synechiae (PAS)

--**Elevated IOP/glaucoma**

--Changes in the eye's appearance

--Ocular pain

--Decreased VA

*What 'pertinent negative' will be elicited when taking a history?*

She will deny any family history of similar eye findings (recall it's sporadic, not inherited)

*Pupillary Block*

'Pull'

NVG

**ICE**

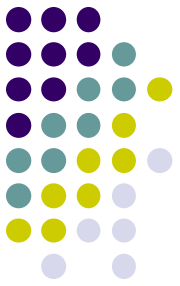
Flat AC

Epithelial/  
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# A

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As mentioned earlier, ICE cells may cross the angle, leaving a membrane in their wake. This membrane can contract, producing the broad and high PAS discussed previously. Or, the membrane can occlude the angle simply by covering it.

*Can the glaucoma be managed medically?*

In some cases, yes. However, many go on to filtering surgery.

*Is SLT a good option?*

No—it has no role in managing ICE, and should be avoided

--Peripheral anterior synechiae (PAS)

--**Elevated IOP/glaucoma**

--Changes in the eye's appearance

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'Pull'

NVG

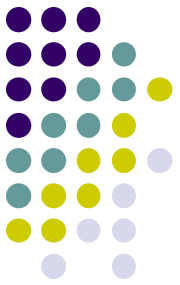
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Flat AC

Epithelial/  
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Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

*In this context, what does ICE stand for?*  
Iridocorneal endothelial syndrome

*In a nutshell, what is ICE?*

*The BCSC books recognize three variants of ICE. What are they?*

*What three sorts of complaints will she have?*

- Changes in the eye's appearance
- Ocular pain
- Decreased VA

*What 'pertinent negative' will be elicited when taking a history?*

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'Pull'

NVG

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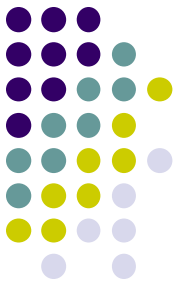
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## Secondary Angle Closure Glaucoma

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- Iris nevus syndrome, aka Cogan-Reese syndrome
- Chandler syndrome
- Essential iris atrophy

*What three sorts of complaints will she have?*

- Changes in the eye's appearance
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'Pull'

NVG

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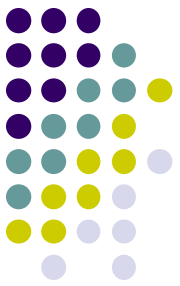
Flat AC

Epithelial/  
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# Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*



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- **I**ris nevus syndrome, aka Cogan-Reese syndrome
- **C**handler syndrome
- **E**ssential iris atrophy

*What three sorts of complaints will she have?*

**Take note of the sweet mnemonic!**

- Ocular pain
- Decreased VA

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She will deny any family history of similar eye findings (recall it's sporadic, not inherited)

'Pull'

NVG

**ICE**

Flat AC

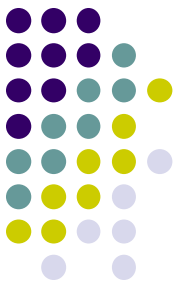
Epithelial/  
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## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

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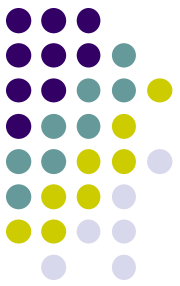
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# Q/A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*



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*What is the predominant finding for each?*

--Iris nevus syndrome, aka Cogan-Reese syndrome: Iris nevi/nodules

--Chandler syndrome:

--Essential iris atrophy

*What three sorts of complaints will she have?*

--Changes in the eye's appearance

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ICE

Flat AC

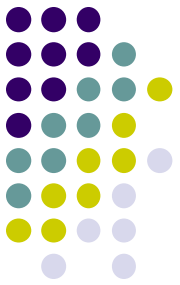
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# Q/A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*



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- Chandler syndrome: Corneal edema
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NVG

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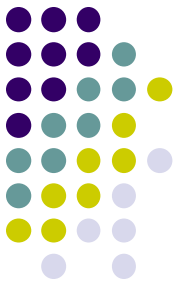
Epithelial/  
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## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

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- Chandler syndrome: Corneal edema
- Essential iris atrophy: Iris atrophy/tears

*What three sorts of complaints will she have?*

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- Ocular pain
- Decreased VA

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She will deny any family history of similar eye findings (recall it's sporadic, not inherited)

'Pull'

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ICE

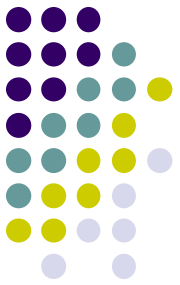
Flat AC

Epithelial/  
fibrous  
ingrowth



Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

'Push'

'Pull'

- Phacomorphic
- Ectopia lentis

Aqueous misdirection

FDP/choroidal effusion

NVG

ICE

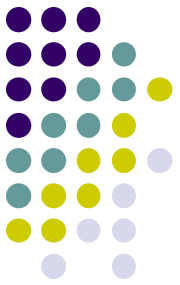
**Flat AC**

Epithelial/  
fibrous  
ingrowth

*What clinical scenario typically produces the flat AC that leads to secondary ACG?*

A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
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'Push'

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**Flat AC**

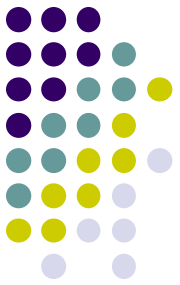
Epithelial/  
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ingrowth

*What clinical scenario typically produces the flat AC that leads to secondary ACG?*

Wound leak after cataract or filtering surgery

Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

'Push'

'Pull'

— Phacomorphic

— Ectopia lentis

— Aqueous misdirection

— FPD (choroidal effusion)

— NVG

— ICE

**Flat AC**

— Epithelial/  
fibrous  
ingrowth

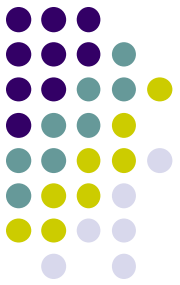
*What clinical scenario typically produces the flat AC that leads to secondary ACG?*

Wound leak after cataract or filtering surgery

*Will the IOP be high, or low?*

A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

'Push'

'Pull'

- Phacomorphic
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Aqueous misdirection

FDP/choroidal effusion

NVG

ICE

**Flat AC**

Epithelial/  
fibrous  
ingrowth

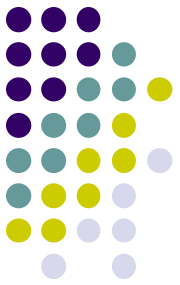
*What clinical scenario typically produces the flat AC that leads to secondary ACG?*

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*Will the IOP be high, or low?*

Low

# Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

'Push'

'Pull'

**Aqueous misdirection**

NVG

ICE

**Flat AC**

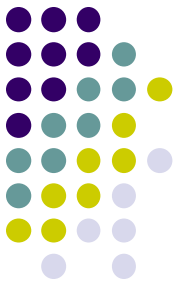
Epithelial/  
fibrous  
ingrowth

Recall that a flat AC + *high* (or even normal) IOP after CE is suggestive of **aqueous misdirection syndrome**

Will the IOP **high**, or low?  
Low

Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

'Push'

'Pull'

- Phacomorphic
- Ectopia lentis

- Aqueous misdirection
- FDP (choroidal effusion)

- NVG
- ICE
- Flat AC**
- Epithelial/fibrous ingrowth

*What clinical scenario typically produces the flat AC that leads to secondary ACG?*

Wound leak after cataract or filtering surgery

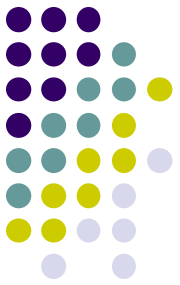
*Will the IOP be high, or low?*

Low

*How does a flat AC lead to ACG?*

A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
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'Push'

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**Flat AC**

Epithelial/  
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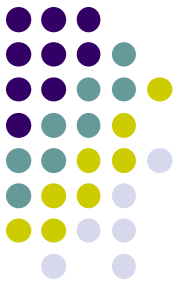
Low

*How does a flat AC lead to ACG?*

By allowing PAS to form

Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

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Aphakic/  
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'Push'

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**Flat AC**

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**Wound leak** after cataract or filtering surgery

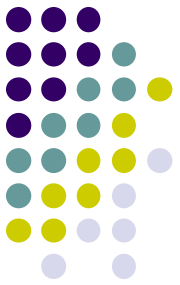
*How is a wound leak managed medically?*

--  
--  
--  
--



Q/A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

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Aphakic/  
Pseudophakic

'Push'

'Pull'

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Ectopia lentis

Aqueous misdirection

NVG

ICE

**Flat AC**

Epithelial/  
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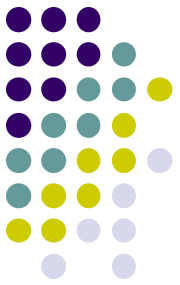
**Wound leak** after cataract or filtering surgery

*How is a wound leak managed medically?* It's as simple as ABC(D):

- A
- B
- C
- D

A

## Secondary Angle Closure Glaucoma



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Aphakic/  
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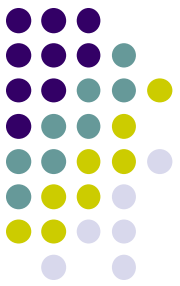
**Wound leak** after cataract or filtering surgery

*How is a wound leak managed medically?* It's as simple as ABC(D):

- A**queous suppressants
- B**andage contact lens (BCL), if we're talking post-CE
- C**ycloplegia
- D**iscontinue (or at least **D**iminish) topical steroids

Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
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'Push'

'Pull'

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Aqueous misdirection

NVG

ICE

**Flat AC**

Epithelial/  
fibrous  
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*What clinical scenario typically produces the flat AC that leads to secondary ACG?*

Wound leak after cataract or filtering surgery

*Hold up—the IOP is already super low. What is the rationale for using aqueous suppressants?*

*How is a wound leak managed?*

**Aqueous suppressants**

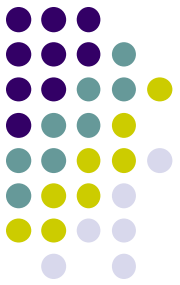
--Bandage contact lens (BCL)

--Cycloplegia

--Discontinue (or at least Diminish) topical steroids

A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
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'Push'

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Aqueous misdirection

NVG

ICE

**Flat AC**

Epithelial/  
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*What clinical scenario typically produces the flat AC that leads to secondary ACG?*

**Wound leak** after cataract or filtering surgery

*Hold up—the IOP is already super low. What is the rationale for using aqueous suppressants?*

The idea is to promote closure of the leak by decreasing the flow of aqueous across it

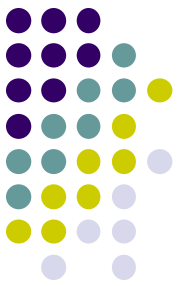
*How is a wound leak managed?*

**Aqueous suppressants**

- Bandage contact lens (BCL)
- Cycloplegia
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Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

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'Push'

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Aqueous misdirection

FDP (choroidal effusion)

NVG

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Epithelial/  
fibrous  
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*What clinical scenario typically produces the flat AC that leads to secondary ACG?*

Wound leak after cataract or filtering surgery

*Hold up—the IOP is already super low. What is the rationale*

*Which 3 drug classes are aqueous suppressants?*

--  
--  
--

*How is a wound leak managed?*

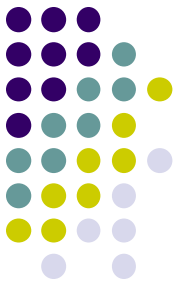
**Aqueous suppressants**

- Bandage contact lens (BCL)
- Cycloplegia
- Discontinue (or at least Diminish) topical steroids

*Increasing*

A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

'Push'

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NVG

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**Wound leak** after cataract or filtering surgery

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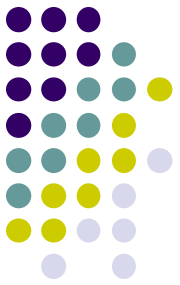
- $\alpha$  agonists
- $\beta$  blockers
- Carbonic anhydrase inhibitors

*How is a wound leak managed?*

- Aqueous suppressants**
- Bandage contact lens (BCL)
- Cycloplegia
- Discontinue (or at least Diminish) topical steroids

Q

## Secondary Angle Closure Glaucoma



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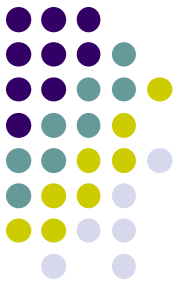
*How is a wound leak managed medically? It's as simple as ABC(D):*

- Aqueous suppressants
- Bandage contact lens (BCL) if not contraindicated
- Cycloplegia**
- Discontinue (or at least diminish) topical steroids

*What is the purpose of cycloplegia?*

A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

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Epithelial/  
fibrous  
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**Wound leak** after cataract or filtering surgery

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--Bandage contact lens (BCL) if not contraindicated

**Cycloplegia**

*What is the purpose of cycloplegia?*

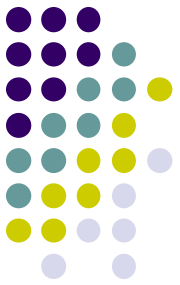
To deepen the AC by rotating the ciliary body back

--Discontinue (or at least diminish) topical steroids



Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

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Pseudophakic

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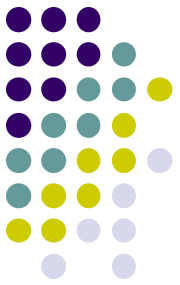
*Why stop steroids? Won't that increase inflammation?*

as ABC(D):

**Discontinue (or at least Diminish) topical steroids**

A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
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*Why stop steroids? Won't that increase inflammation?*

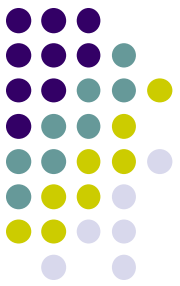
Yes, but it will also promote leak closure by removing steroid-induced inhibition of wound healing

as ABC(D):

**Discontinue (or at least Diminish) topical steroids**

Q

# Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

'Push'

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Ectopia lentis

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**Flat AC**

Epithelial/  
fibrous  
ingrowth

*What clinical scenario typically produces the flat AC that leads to secondary ACG?*

**Wound leak** after cataract or filtering surgery

How is a *wound leak* managed *surgically*? It's as simple as ABC(D):

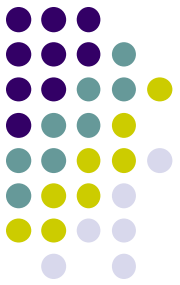
--Aqu  
--Bar  
--Cyc  
--Dis

*Under what circumstances should a wound leak be managed surgically?*

- 1)
- 2)
- 3)
- 4)

A

# Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

'Push'

'Pull'

- Phacomorphic
- Ectopia lentis

Aqueous misdirection

NVG

ICE

**Flat AC**

Epithelial/  
fibrous  
ingrowth

*What clinical scenario typically produces the flat AC that leads to secondary ACG?*

**Wound leak** after cataract or filtering surgery

How is a *wound leak* managed *surgically*? It's as simple as ABC(D):

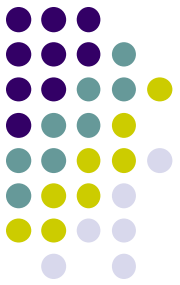
--Aqu  
--Bar  
--Cyc  
--Dis

*Under what circumstances should a wound leak be managed surgically?*

- 1) No improvement by about 48 hours or so
- 2) Obvious wound gape
- 3) IOL-cornea touch
- 4) Iris prolapse

Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Phacolytic

Ectopic

*In a nutshell, what is epithelial/fibrous ingrowth?*

'Pull'

NVG

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced  
— Phacolytic  
— Ectopic

*In a nutshell, what is epithelial/fibrous ingrowth?*

Intraocular invasion by epithelial or fibrous tissue via a surgical or traumatic wound

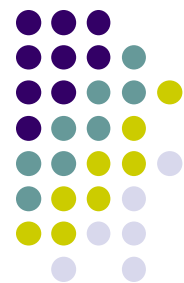
'Pull'

NVG

ICE

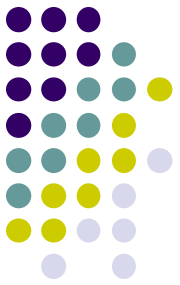
Flat AC

Epithelial/  
fibrous  
ingrowth



Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

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Lens-Induced

Phacolytic

Ectopic

*In a nutshell, what is epithelial/fibrous ingrowth?*

Intraocular invasion by epithelial or fibrous tissue via a surgical or traumatic wound

*How do these entities produce secondary ACG?*

'Pull'

NVG

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced  
— Phacolytic  
— Ectopic

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*How do these entities produce secondary ACG?*

If the invading tissue grows over the angle, it can produce PAS, or even destroy the TM

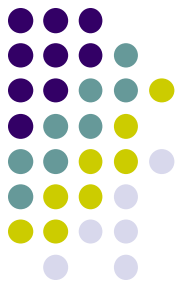
'Pull'

NVG

ICE

Flat AC

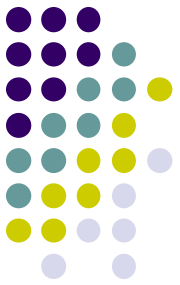
Epithelial/  
fibrous  
ingrowth





Q

## Secondary Angle Closure Glaucoma



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— Phacolytic  
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*What do they look like at the slit lamp?*

--Epithelial ingrowth:

--Fibrous ingrowth

'Pull'

— NVG

— ICE

— Flat AC

Epithelial/  
fibrous  
ingrowth

A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

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*What do they look like at the slit lamp?*

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--Fibrous ingrowth

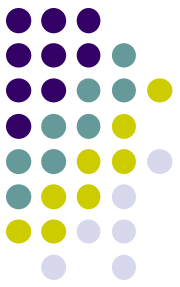
'Pull'

NVG

ICE

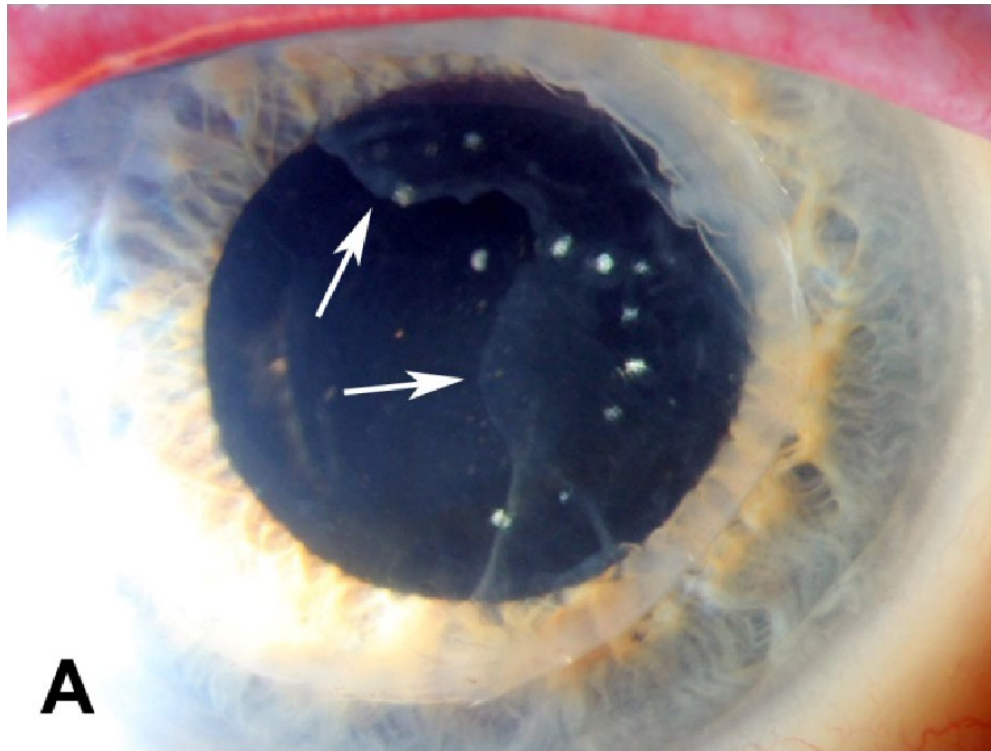
Flat AC

Epithelial/  
fibrous  
ingrowth



## Secondary Angle Closure Glaucoma

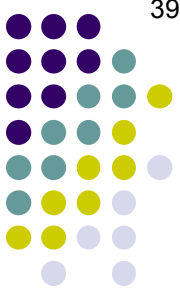
395



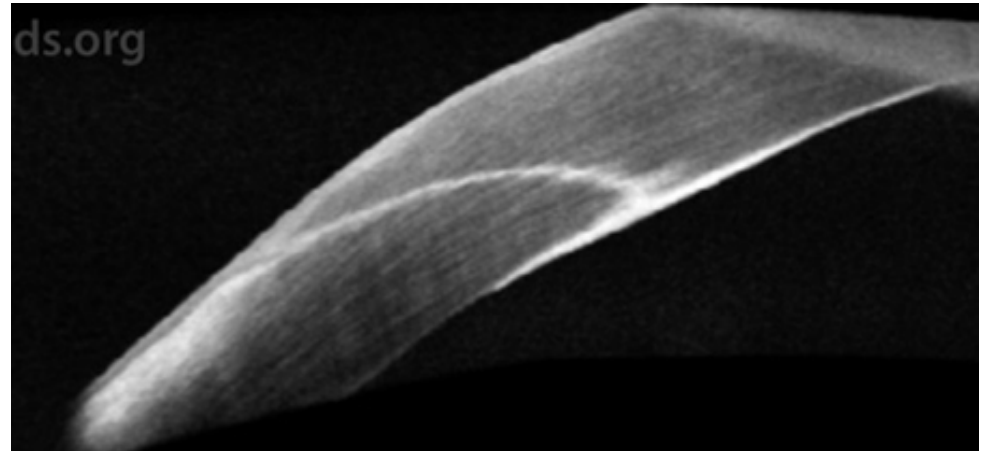
Epithelial ingrowth after DSAEK

# Secondary Angle Closure Glaucoma

396



Eye with a grey sheet with scalloped edges extending along the endothelium with overlying mild corneal edema



Anterior segment optical coherence tomography of the eye demonstrating a hyperreflective sheet extending through the surgical incision and spreading across the endothelium

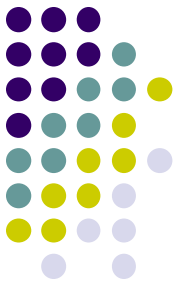
Epithelial ingrowth after cataract surgery

Q

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*



Lens-Induced  
Phacolytic

*In a nutshell, what is epithelial/fibrous ingrowth?*

Intraocular invasion by epithelial or fibrous tissue via a surgical or traumatic wound

*What simple procedure can be performed in the clinic to confirm the presence of epithelial ingrowth?*

'Pull'

NVG

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

--**Epithelial ingrowth: A thin gray sheet**

--Fibrous ingrowth

Q/A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced  
Phacolytic

*In a nutshell, what is epithelial/fibrous ingrowth?*

Intraocular invasion by epithelial or fibrous tissue via a surgical or traumatic wound

*What simple procedure can be performed in the clinic to confirm the presence of epithelial ingrowth?*

Shoot the suspected sheet of epithelial ingrowth with an type of laser

--**Epithelial ingrowth: A thin gray sheet**

--Fibrous ingrowth

'Pull'

NVG

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*



Lens-Induced  
Phacolytic

*In a nutshell, what is epithelial/fibrous ingrowth?*

Intraocular invasion by epithelial or fibrous tissue via a surgical or traumatic wound

*What simple procedure can be performed in the clinic to confirm the presence of epithelial ingrowth?*

Shoot the suspected sheet of epithelial ingrowth with an argon laser

'Pull'

NVG

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

--**Epithelial ingrowth: A thin gray sheet**

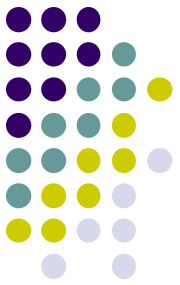
--Fibrous ingrowth

Q

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*



Lens-Induced  
Phacolytic

*In a nutshell, what is epithelial/fibrous ingrowth?*

Intraocular invasion by epithelial or fibrous tissue via a surgical or traumatic wound

*What simple procedure can be performed in the clinic to confirm the presence of epithelial ingrowth?*

Shoot the suspected sheet of epithelial ingrowth with an argon laser

*What reaction to a laser burn would indicate the tissue is in fact epithelial?*

--**Epithelial ingrowth: A thin gray sheet**

--Fibrous ingrowth

'Pull'

NVG

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth



Q/A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced  
Phacolytic

*In a nutshell, what is epithelial/fibrous ingrowth?*

Intraocular invasion by epithelial or fibrous tissue via a surgical or traumatic wound

*What simple procedure can be performed in the clinic to confirm the presence of epithelial ingrowth?*

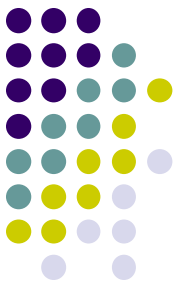
Shoot the suspected sheet of epithelial ingrowth with an argon laser

*What reaction to a laser burn would indicate the tissue is in fact epithelial?*

The production of a color burn

--**Epithelial ingrowth: A thin gray sheet**

--Fibrous ingrowth



'Pull'

NVG

ICE

Flat AC

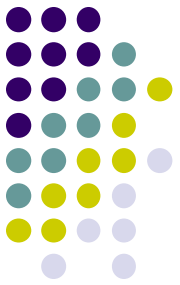
Epithelial/  
fibrous  
ingrowth

A

## Secondary Angle Closure Glaucoma

*w/ Pupillary Block*

*w/o Pupillary Block*



Lens-Induced  
Phacolytic

*In a nutshell, what is epithelial/fibrous ingrowth?*

Intraocular invasion by epithelial or fibrous tissue via a surgical or traumatic wound

*What simple procedure can be performed in the clinic to confirm the presence of epithelial ingrowth?*

Shoot the suspected sheet of epithelial ingrowth with an argon laser

*What reaction to a laser burn would indicate the tissue is in fact epithelial?*

The production of a white burn

--**Epithelial ingrowth: A thin gray sheet**

--Fibrous ingrowth

'Pull'

NVG

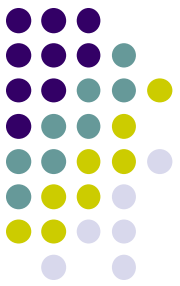
ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

Q

## Secondary Angle Closure Glaucoma



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— Ectopic

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'Pull'

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Epithelial/  
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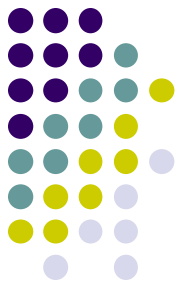
'Pull'

NVG

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth



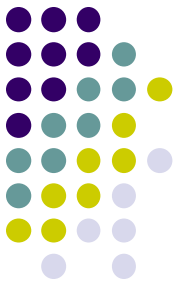
## Secondary Angle Closure Glaucoma



Fibrous ingrowth after cataract surgery

Q

## Secondary Angle Closure Glaucoma



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*What is the treatment?*

'Pull'

NVG

ICE

Flat AC

Epithelial/  
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## Secondary Angle Closure Glaucoma

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*What is the treatment?*

Extensive intraocular debridement can be attempted

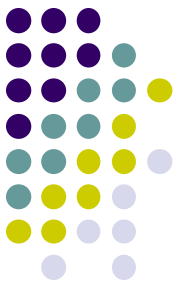
'Pull'

NVG

ICE

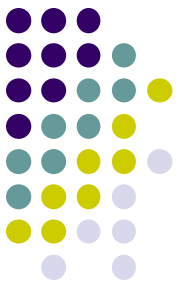
Flat AC

Epithelial/  
fibrous  
ingrowth



Q

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*What is the prognosis?*

'Pull'

NVG

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth



A

## Secondary Angle Closure Glaucoma

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*w/o Pupillary Block*

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— Phacolytic  
— Ectopic

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Extensive intraocular debridement can be attempted

*What is the prognosis?*

Poor

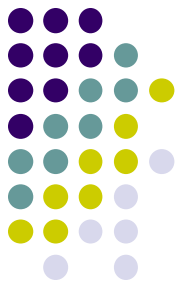
'Pull'

NVG

ICE

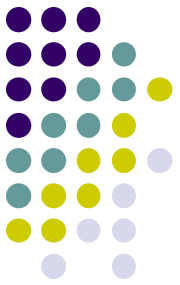
Flat AC

Epithelial/  
fibrous  
ingrowth



Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

Phacomorphic

Ectopia lentis

'Push'

Aqueous misdirection

ERD/choroidal effusion

Retinal surgery

Nanophthalmos

Drug-induced

PFV

'Pull'

NVG

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

Both/Either

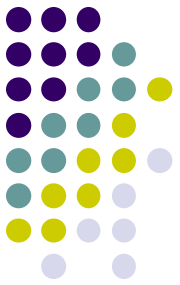
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?

Next

A

## Secondary Angle Closure Glaucoma



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*w/o Pupillary Block*

Lens-Induced

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Pseudophakic

Phacomorphic

Ectopia lentis

'Push'

Aqueous misdirection

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Retinal surgery

Nanophthalmos

Drug-induced

PFV

'Pull'

NVG

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

Both/Either

Inflammation

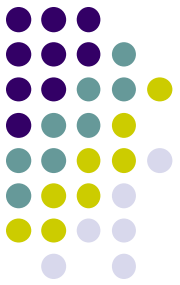
Tumor

Next



Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-  
Induced

Aphakic/  
Pseudophakic

'Push'

'Pull'

*By what mechanism could inflammation **push** the angle closed?*

NVG

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

PFV

Both/Either

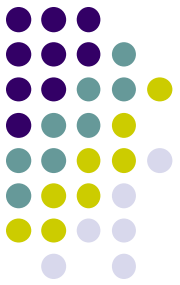
Inflam-  
mation

Inflammation

Tumor

Q/A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-  
Induced

Aphakic/  
Pseudophakic

'Push'

'Pull'

By what mechanism could inflammation **push** the angle closed?  
A massive three words could push the lens into the pupil

NVG

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

PFV

Both/Either

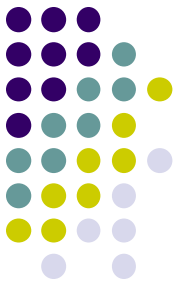
Inflam-  
mation

Inflammation

Tumor

A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-  
Induced

Aphakic/  
Pseudophakic

'Push'

'Pull'

*By what mechanism could inflammation **push** the angle closed?  
A massive exudative RD could push the lens into the pupil*

NVG

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

PFV

Both/Either

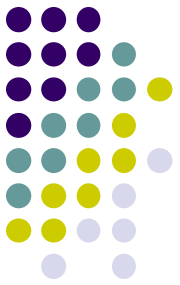
Inflam-  
mation

Inflammation

Tumor

Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-  
Induced

Aphakic/  
Pseudophakic

'Push'

'Pull'

*By what mechanism could inflammation **push** the angle closed?  
A massive exudative RD could push the lens into the pupil*

*How does inflammation **pull** the angle closed?*

NVG

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

**Inflam-  
mation**

PFV

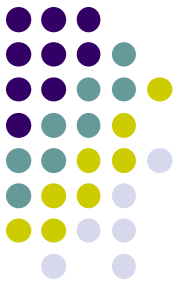
Both/Either

**Inflammation**

Tumor

A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-  
Induced

Aphakic/  
Pseudophakic

'Push'

'Pull'

*By what mechanism could inflammation **push** the angle closed?*

*A massive exudative RD could push the lens into the pupil*

*How does inflammation **pull** the angle closed?*

Inflammation compromises the blood-aqueous barrier, allowing copious amounts of inflammatory proteins and fibrin to accumulate in the AC. These substances can produce posterior synechiae leading to iris bombé and eventually angle closure. Additionally, PAS can form, especially if peripheral iris edema is already narrowing the angle.

NVG

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

Inflam-  
mation

PFV

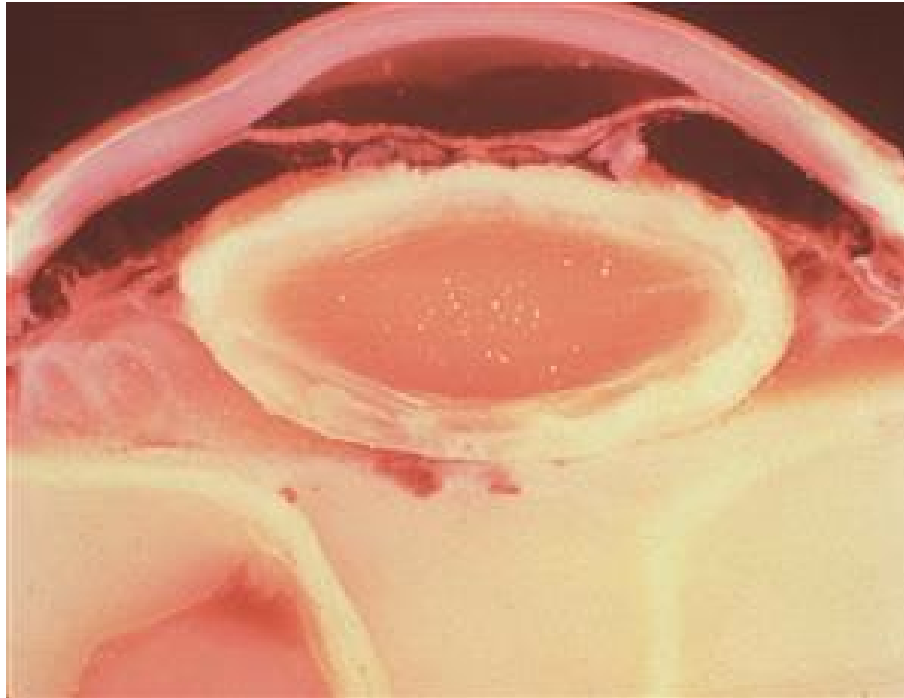
Both/Either

Inflammation

Tumor



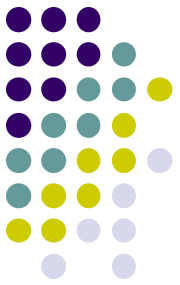
## Secondary Angle Closure Glaucoma



Inflammatory glaucoma. Note the posterior synechiae as well as PAS

Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

'Push'

Aqueous misdirection

'Pull'

NVG

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

*How would a tumor push the angle closed?*

PFV

Tumor

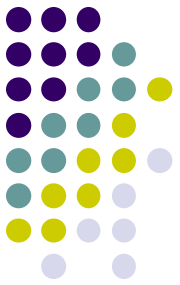
Both/Either

Inflammation

Tumor

A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

'Push'

Aqueous misdirection

'Pull'

NVG

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

*How would a tumor push the angle closed?*

If a tumor is anterior enough (or large enough), it can either directly (via mass effect) or indirectly (via associated exudation) move the lens-iris diaphragm forward, thereby shallowing the angle

PFV

Tumor

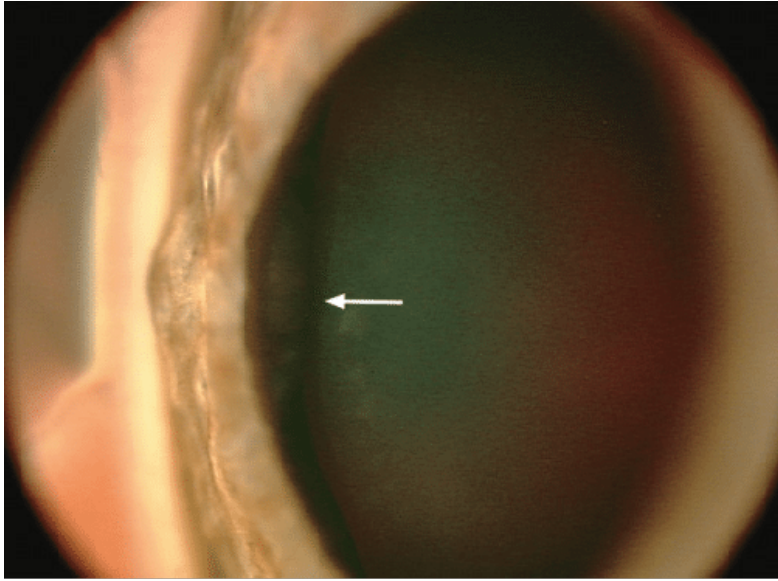
Both/Either

Inflammation

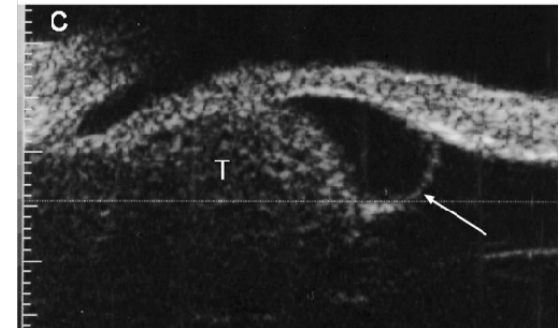
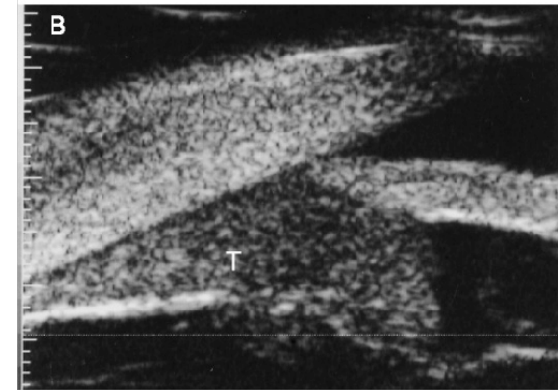
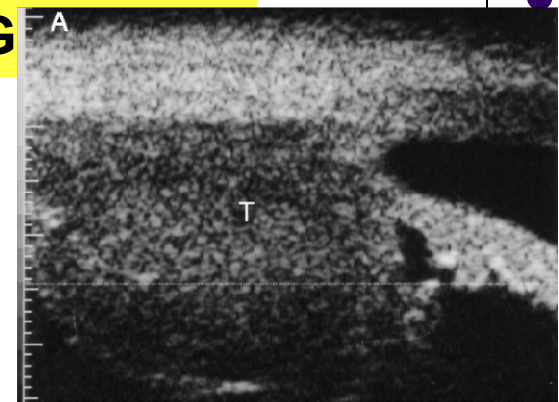
Tumor

## Secondary Angle Closure G

420



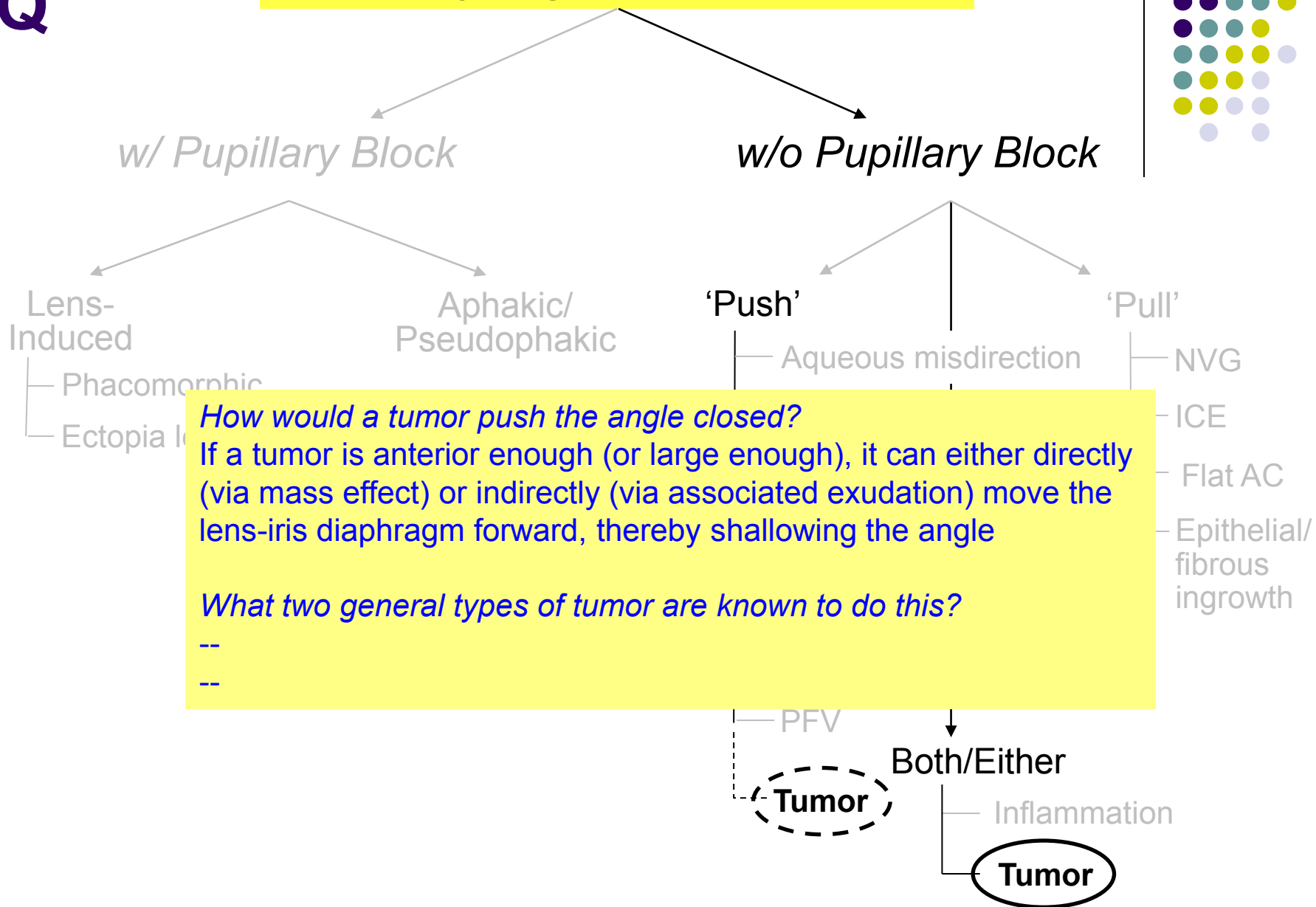
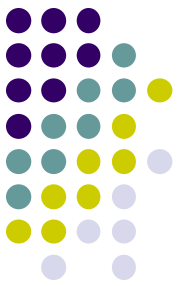
Ring melanoma of the ciliary body. Pigmented ciliary body lesion noted on gonioscopy (arrow)



Ultrasound biomicroscopy of a ring melanoma of the ciliary body. (A) Main mass of tumor at 9:00 o'clock. (B) Tumor involving ciliary body at 11:00 o'clock. (C) Tumor extends under the iris at 6:00 o'clock and is associated with a small cyst (arrow). (T, tumor.)

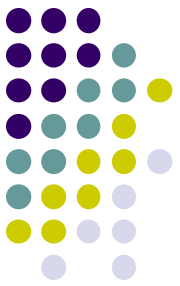
Q

## Secondary Angle Closure Glaucoma



A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

'Push'

Aqueous misdirection

'Pull'

NVG

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

*How would a tumor push the angle closed?*

If a tumor is anterior enough (or large enough), it can either directly (via mass effect) or indirectly (via associated exudation) move the lens-iris diaphragm forward, thereby shallowing the angle

*What two general types of tumor are known to do this?*

- Choroidal
- Retinal

PFV

Tumor

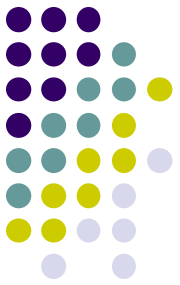
Both/Either

Inflammation

Tumor

Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

- Phacomorphic
- Ectopia lentis

'Push'

Aqueous misdirection

ERD/choroidal effusion

'Pull'

NVG

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

**Tumor**

*How would a tumor pull the angle closed?*

PFV

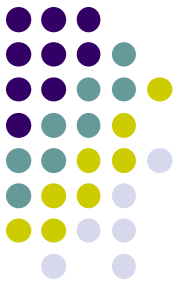
Both/Either

Inflammation

**Tumor**

Q/A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

- Phacomorphic
- Ectopia lentis

'Push'

Aqueous misdirection

ERD/choroidal effusion

'Pull'

NVG

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

**Tumor**

*How would a tumor **pull** the angle closed?  
Via one of two mechanisms:*

--  
--

PFV

Both/Either

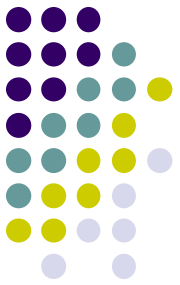
Inflammation

**Tumor**



A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

- Phacomorphic
- Ectopia lentis

'Push'

Aqueous misdirection

ERD/choroidal effusion

'Pull'

NVG

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

**Tumor**

*How would a tumor **pull** the angle closed?*

*Via one of two mechanisms:*

- Tumor-induced NVI/NVA leading to NVG
- Tumor necrosis can produce severe inflammation, leading to posterior synechiae and/or PAS

PFV

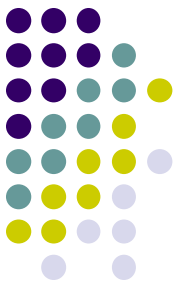
Both/Either

Inflammation

**Tumor**

Q

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

- Phacomorphic
- Ectopia lentis

‘Push’

— Aqueous misdirection

— ERD/choroidal effusion

‘Pull’

— NVG

— ICE

— Flat AC

— Epithelial/  
fibrous  
ingrowth

— **Tumor**

*How would a tumor pull the angle closed?*

*Via one of two mechanisms:*

**--Tumor-induced NVI/NVA leading to NVG**

*Tumor necrosis can produce severe inflammation,*

*Which tumors are notorious for inducing NVI/NVA?*

--  
--  
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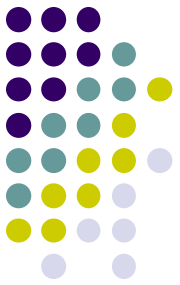
Both/Either

— Inflammation

— **Tumor**

A

## Secondary Angle Closure Glaucoma



*w/ Pupillary Block*

*w/o Pupillary Block*

Lens-Induced

Aphakic/  
Pseudophakic

- Phacomorphic
- Ectopia lentis

‘Push’

— Aqueous misdirection

— ERD/choroidal effusion

‘Pull’

— NVG

— ICE

— Flat AC

— Epithelial/  
fibrous  
ingrowth

— **Tumor**

*How would a tumor pull the angle closed?*

*Via one of two mechanisms:*

**--Tumor-induced NVI/NVA leading to NVG**

*Which tumors are notorious for inducing NVI/NVA?*

- Retinoblastoma
- Medulloepithelioma
- Choroidal melanoma

Both/Either

— Inflammation

— **Tumor**

Q

## Secondary Angle Closure Glaucoma



*In a nutshell, what sort of tumor is a medulloepithelioma?*

*w/o Pupillary Block*

*'Push'*

— Aqueous misdirection

— ERD/choroidal effusion

*'Pull'*

— NVG

— ICE

— Flat AC

— Epithelial/  
fibrous  
ingrowth

**Tumor**

*Angle closed?*

*Leading to NVG*

*Severe inflammation,*

*UVA?*

**Both/Either**

— Inflammation

**Tumor**

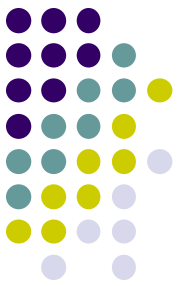
--Retinoblastoma

--**Medulloepithelioma**

--Choroidal melanoma

Q/A

## Secondary Angle Closure Glaucoma



*In a nutshell, what sort of tumor is a medulloepithelioma?*

A locally very aggressive tumor of the epithelium of the ciliary body

non- vs pigmented

*W/o Pupillary Block*

'Push'

- Aqueous misdirection
- ERD/choroidal effusion

'Pull'

NVG

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

**Tumor**

*Angle closed?*

*Leading to NVG*

*Severe inflammation,*

*Uveitis/NVA?*

Both/Either

Inflammation

**Tumor**

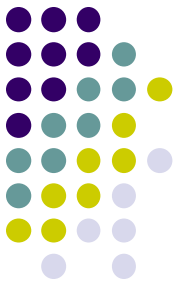
--Retinoblastoma

--**Medulloepithelioma**

--Choroidal melanoma

A

## Secondary Angle Closure Glaucoma



*In a nutshell, what sort of tumor is a medulloepithelioma?*  
A locally very aggressive tumor of the nonpigmented epithelium of the ciliary body

*W/o Pupillary Block*

*'Push'*

— Aqueous misdirection  
— ERD/choroidal effusion

*'Pull'*

— NVG

— ICE

— Flat AC

— Epithelial/  
fibrous  
ingrowth

**Tumor**

*Angle closed?*

*Leading to NVG*

*Severe inflammation,*

*Uveitis/NVA?*

**Both/Either**

— Inflammation

**Tumor**

--Retinoblastoma

--**Medulloepithelioma**

--Choroidal melanoma

Q

## Secondary Angle Closure Glaucoma



In a nutshell, what sort of tumor is a medulloepithelioma?

A locally very aggressive epithelium of the

By what other name is medulloepithelioma known?

Capillary Block

'Push'

Aqueous misdirection

ERD/choroidal effusion

Is the angle closed?

Leading to NVG

Severe inflammation, NVA?

Both/Either

Inflammation

Tumor

'Pull'

NVG

ICE

Flat AC

Epithelial/fibrous ingrowth

Tumor

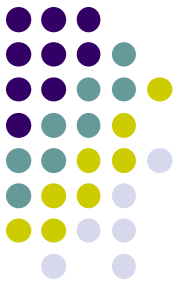
--Retinoblastoma

--Medulloepithelioma

--Choroidal melanoma

A

## Secondary Angle Closure Glaucoma



In a nutshell, what sort of tumor is a medulloepithelioma?

A locally very aggressive epithelium of the

By what other name is medulloepithelioma known?

**Diktyoma**

*pillary Block*

h'

Aqueous misdirection

ERD/choroidal effusion

closed?

ng to NVG

vere inflammation,

NVA?

'Pull'

NVG

ICE

Flat AC

Epithelial/  
fibrous  
ingrowth

**Tumor**

--Retinoblastoma

**Medulloepithelioma**

--Choroidal melanoma

Both/Either

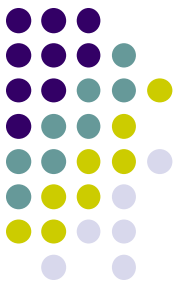
Inflammation

**Tumor**



Q

## Secondary Angle Closure Glaucoma



In a nutshell, what sort of tumor is a medulloepithelioma?  
A **locally very aggressive** tumor of the nonpigmented epithelium of the ciliary body

How 'locally aggressive' is it?

W/o Pupillary Block

'Push'

— Aqueous misdirection

— ERD/choroidal effusion

'Pull'

— NVG

— ICE

— Flat AC

— Epithelial/  
fibrous  
ingrowth

**Tumor**

Angle closed?

Leading to NVG

Severe inflammation,

Uveitis/NVA?

Both/Either

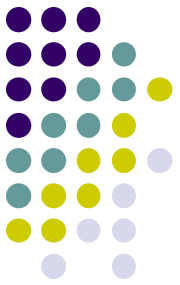
— Inflammation

**Tumor**

- Retinoblastoma
- Medulloepithelioma**
- Choroidal melanoma

A

## Secondary Angle Closure Glaucoma



*In a nutshell, what sort of tumor is a medulloepithelioma?*  
A **locally very aggressive** tumor of the nonpigmented epithelium of the ciliary body

*How 'locally aggressive' is it?*  
Aggressive enough to cause death

*w/o Pupillary Block*

*'Push'*

— Aqueous misdirection  
— ERD/choroidal effusion

*'Pull'*

— NVG

— ICE

— Flat AC

— Epithelial/  
fibrous  
ingrowth

**Tumor**

*Angle closed?*

*Leading to NVG*

*Severe inflammation,*

*UVA?*

Both/Either

— Inflammation

**Tumor**

--Retinoblastoma

--**Medulloepithelioma**

--Choroidal melanoma

Q

## Secondary Angle Closure Glaucoma



*In a nutshell, what sort of tumor is a medulloepithelioma?*  
A locally very aggressive tumor of the nonpigmented epithelium of the ciliary body

*Is it common, or rare?*

*W/o Pupillary Block*

*'Push'*

— Aqueous misdirection

— ERD/choroidal effusion

*'Pull'*

— NVG

— ICE

— Flat AC

— Epithelial/  
fibrous  
ingrowth

**Tumor**

*Angle closed?*

*Leading to NVG*

*Severe inflammation,*

*Uveitis/NVA?*

**Both/Either**

— Inflammation

**Tumor**

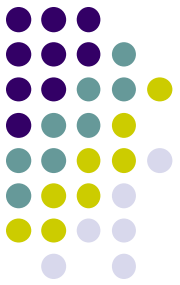
--Retinoblastoma

--**Medulloepithelioma**

--Choroidal melanoma

A

## Secondary Angle Closure Glaucoma



*In a nutshell, what sort of tumor is a medulloepithelioma?*  
A locally very aggressive tumor of the nonpigmented epithelium of the ciliary body

*Is it common, or rare?*  
Rare

*W/o Pupillary Block*

*'Push'*

— Aqueous misdirection  
— ERD/choroidal effusion

*'Pull'*

— NVG

— ICE

— Flat AC

— Epithelial/  
fibrous  
ingrowth

**Tumor**

*Angle closed?*

*Leading to NVG*

*Severe inflammation,*

*UVA?*

--Retinoblastoma

--**Medulloepithelioma**

--Choroidal melanoma

Both/Either

— Inflammation

**Tumor**

Q

## Secondary Angle Closure Glaucoma



*In a nutshell, what sort of tumor is a medulloepithelioma?*

A locally very aggressive tumor of the nonpigmented epithelium of the ciliary body

*Is it common, or rare?*

Rare

*During what life-period does medulloepithelioma present?*

--Retinoblastoma

--**Medulloepithelioma**

--Choroidal melanoma

*W/o Pupillary Block*

*'Push'*

— Aqueous misdirection

— ERD/choroidal effusion

*Angle closed?*

*Leading to NVG*

*Severe inflammation,*

*UVA?*

*'Pull'*

— NVG

— ICE

— Flat AC

— Epithelial/  
fibrous  
ingrowth

**Tumor**

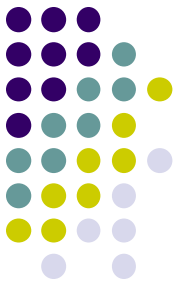
Both/Either

— Inflammation

**Tumor**

A

## Secondary Angle Closure Glaucoma



*In a nutshell, what sort of tumor is a medulloepithelioma?*  
A locally very aggressive tumor of the nonpigmented epithelium of the ciliary body

*Is it common, or rare?*  
Rare

*During what life-period does medulloepithelioma present?*  
Childhood

*W/o Pupillary Block*

*'Push'*

— Aqueous misdirection  
— ERD/choroidal effusion

*Angle closed?*

— Leading to NVG  
— Severe inflammation,  
— M/INVA?

*'Pull'*

— NVG  
— ICE  
— Flat AC  
— Epithelial/  
fibrous  
ingrowth  
— **Tumor**

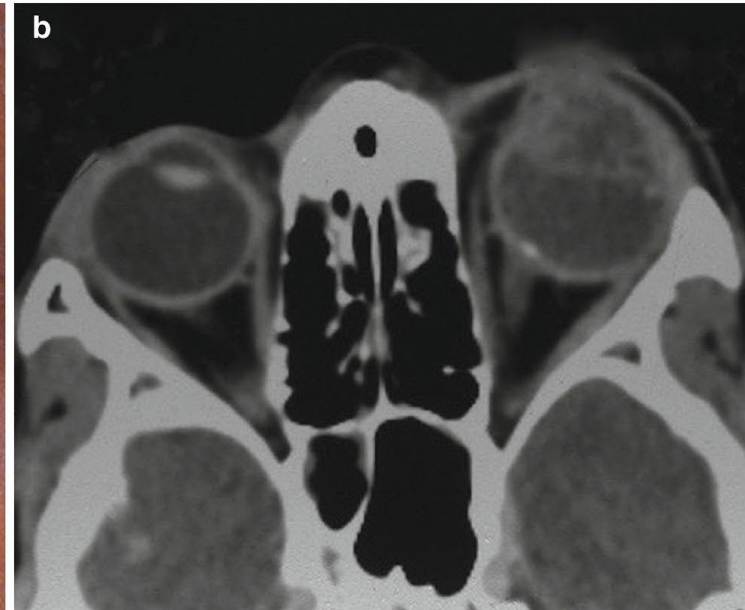
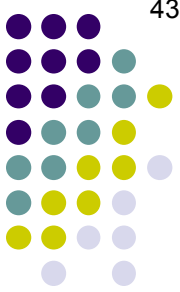
Both/Either

— Inflammation

**Tumor**

--Retinoblastoma  
--**Medulloepithelioma**  
--Choroidal melanoma

## Secondary Angle Closure Glaucoma



Medulloepithelioma/diktyoma

Q

## Secondary Angle Closure Glaucoma



*In a nutshell, what sort of tumor is a medulloepithelioma?*

A locally very aggressive tumor of the nonpigmented epithelium of the ciliary body

*Is it common, or rare?*

Rare

*During what life-period does medulloepithelioma present?*

Childhood

*What clinical findings are commonly present?*

--ACG (duh)

--

--

--

--Retinoblastoma

--**Medulloepithelioma**

--Choroidal melanoma

*W/o Pupillary Block*

'Push'

--Aqueous misdirection

--ERD/choroidal effusion

*Angle closed?*

*Leading to NVG*

*Severe inflammation,*

*UVA?*

'Pull'

--NVG

--ICE

--Flat AC

--Epithelial/  
fibrous  
ingrowth

--**Tumor**

Both/Either

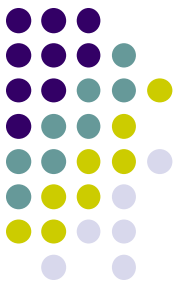
--Inflammation

--**Tumor**



A

## Secondary Angle Closure Glaucoma



*In a nutshell, what sort of tumor is a medulloepithelioma?*  
A locally very aggressive tumor of the nonpigmented epithelium of the ciliary body

*Is it common, or rare?*  
Rare

*During what life-period does medulloepithelioma present?*  
Childhood

*What clinical findings are commonly present?*  
--ACG (duh)  
--Iris mass  
--Hyphema  
--Sectoral cataract

--Retinoblastoma  
--**Medulloepithelioma**  
--Choroidal melanoma

*W/o Pupillary Block*

*'Push'*

--Aqueous misdirection  
--ERD/choroidal effusion

*Angle closed?*

--Leading to NVG  
--Severe inflammation,  
--M/AS

*'Pull'*

--NVG  
--ICE  
--Flat AC  
--Epithelial/  
fibrous  
ingrowth  
--**Tumor**

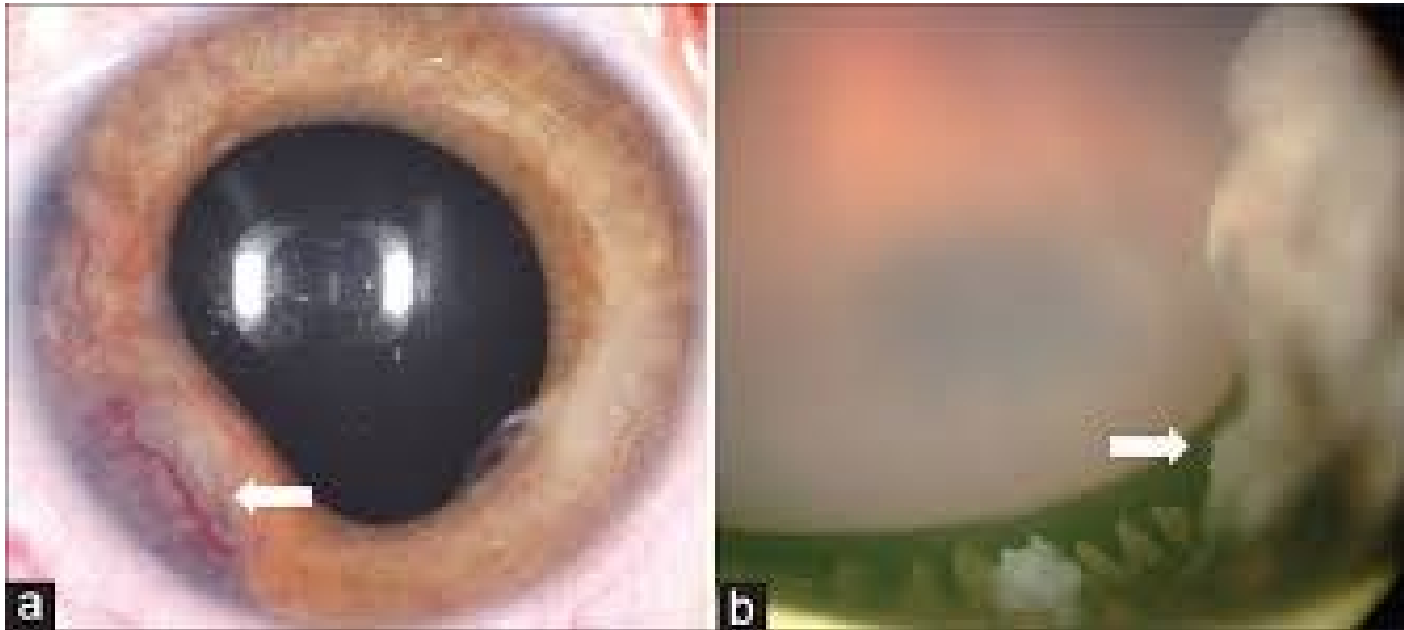
Both/Either

--Inflammation

**Tumor**



## Secondary Angle Closure Glaucoma

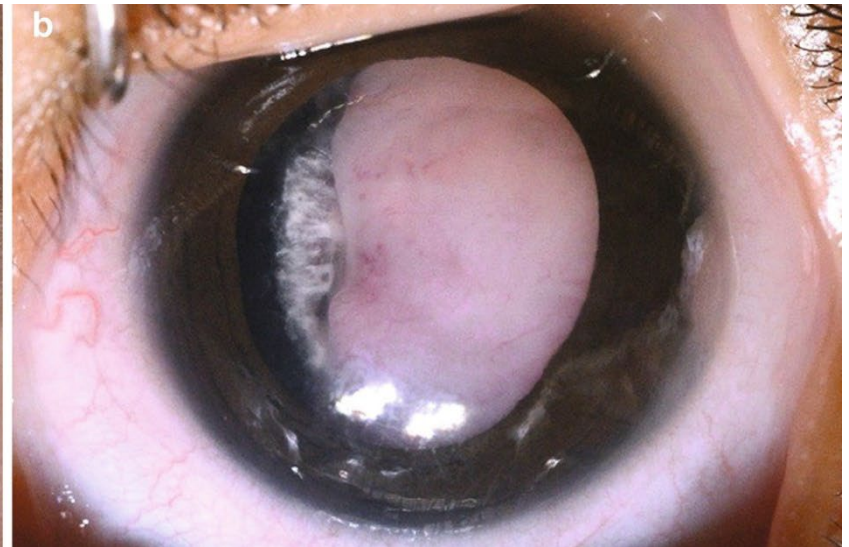
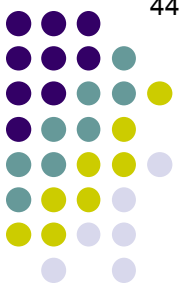


(a) 2-year-old girl who presented with translucent white mass (arrow) and NVI.  
(b) Beige-white medulloepithelioma of the ciliary body.

Medulloepithelioma/diktyoma

## Secondary Angle Closure Glaucoma

443



Medulloepithelioma/diktyoma: Note the cataract

Q

## Secondary Angle Closure Glaucoma



*In a nutshell, what sort of tumor is a medulloepithelioma?*

A locally very aggressive tumor of the nonpigmented epithelium of the ciliary body

*Is it common, or rare?*

Rare

*During what life-period does medulloepithelioma present?*

Childhood

*What clinical findings are commonly present?*

- ACG (duh)
- Iris mass
- Hyphema
- Sectoral cataract

*How is it managed?*

- Retinoblastoma
- Medulloepithelioma**
- Choroidal melanoma

*W/o Pupillary Block*

*'Push'*

- Aqueous misdirection
- ERD/choroidal effusion

*Angle closed?*

*Leading to NVG*

*Severe inflammation, Iritis, I/NVA?*

*'Pull'*

- NVG
- ICE
- Flat AC
- Epithelial/fibrous ingrowth

**Tumor**

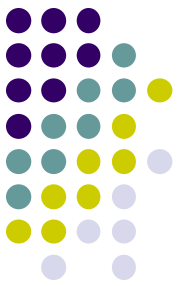
**Both/Either**

*Inflammation*

**Tumor**

A

## Secondary Angle Closure Glaucoma



*In a nutshell, what sort of tumor is a medulloepithelioma?*  
A locally very aggressive tumor of the nonpigmented epithelium of the ciliary body

*Is it common, or rare?*  
Rare

*During what life-period does medulloepithelioma present?*  
Childhood

*What clinical findings are commonly present?*  
--ACG (duh)  
--Iris mass  
--Hyphema  
--Sectoral cataract

*How is it managed?*  
Enucleation is usually required

--Retinoblastoma  
--**Medulloepithelioma**  
--Choroidal melanoma

*W/o Pupillary Block*

*'Push'*

--Aqueous misdirection  
--ERD/choroidal effusion

*Angle closed?*

--Leading to NVG  
--Severe inflammation,  
--M/NA?

*'Pull'*

--NVG  
--ICE  
--Flat AC  
--Epithelial/  
fibrous  
ingrowth  
--**Tumor**

Both/Either

--Inflammation

**Tumor**