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

*What is the status of the angle?*
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
The first thought you should have when encountering a pt you suspect has glaucoma is…

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How does one go about determining the status of the angle? By performing gonioscopy 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?

What does it mean to say the angle is closed?
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)
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What is the status of the angle?

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This contact comes in two basic flavors—what are they?
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*I don’t know if syneched is actually a word, but you catch my drift
The first thought you should have when encountering a pt you suspect has glaucoma is…

What is the status of the angle?

Q

Glaucoma

Closed- or narrow-angle

Open-angle

Secondary Angle Closure Glaucoma

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?

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- **Closed- or narrow-angle**

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

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Secondary Angle Closure Glaucoma

**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.
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**Secondary Angle Closure Glaucoma**

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Does it matter what sort of gonio lens is used?

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

What is the status of the angle?

- Open-angle
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The iris can appose the TM, i.e., touch it without adhering to it.

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Secondary Angle Closure Glaucoma

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*Syneched*
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What is the status of the angle?

A

Glaucoma

Open-angle

Closed- or narrow-angle

Secondary Angle Closure Glaucoma

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

Secondary Angle Closure Glaucoma

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

- Open-angle
- Closed- or narrow-angle
  - Primary
  - Secondary

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

Open-angle

Closed- or narrow-angle

Primary

Secondary

What differentiates primary from secondary angle-closure glaucoma?
Glaucoma

Closed- or narrow-angle

Primary

Secondary

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
Glaucoma

- Open-angle
- Closed- or narrow-angle
  - Primary
  - Secondary

Primary angle-closure glaucoma is discussed in detail in its own slide-set; see the Table of Contents
Secondary Angle Closure Glaucoma

Two basic mechanisms of 2ndry angle closure

? ?
Secondary Angle Closure Glaucoma

Two basic mechanisms of 2ndry angle closure

w/ Pupillary Block   w/o Pupillary Block
What does pupillary block refer to, exactly?

Pupillary block 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

- w/ Pupillary Block
- w/o Pupillary Block
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Secondary Angle Closure Glaucoma

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

‘Pupillary block’
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Secondary Angle Closure Glaucoma

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

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

Location of resistance

‘Pupillary block’
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Secondary Angle Closure Glaucoma

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

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

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

‘Pupillary block’
Secondary Angle Closure Glaucoma

Normal angle

Trabecular meshwork
Secondary Angle Closure Glaucoma

Normal angle
- Trabecular meshwork

Angle closure
- Iris
- Blockage
- Lens
**Secondary Angle Closure Glaucoma**

**w/ Pupillary Block**

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

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It isn’t. The posterior chamber is the space immediately behind the iris and anterior to the lens. Vitreous resides in the vitreous cavity.
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In which pupil position—constricted, mid-dilated or fully dilated—is such contact likely to develop?
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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.

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

- w/ Pupillary Block
  - Two types of pupillary-block mechanism
- w/o Pupillary Block

Q
Secondary Angle Closure Glaucoma

w/ Pupillary Block

- Lens-Induced
- Two types of pupillary-block mechanism
- Aphakic/Pseudophakic

w/o Pupillary Block

A
Secondary Angle Closure Glaucoma

- w/ Pupillary Block
  - Lens-Induced
  - ?
  - ?

- w/o Pupillary Block
  - Aphakic/Pseudophakic
Secondary Angle Closure Glaucoma

w/ Pupillary Block

- Lens-Induced
  - Phacomorphic
  - Ectopia lentis

- Aphakic/Pseudophakic

w/o Pupillary Block
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.
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)
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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.
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Secondary Angle Closure Glaucoma

W/ Pupillary Block

How is phacomorphic ACG managed?

W/o Pupillary Block

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Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

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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.)

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**Secondary Angle Closure Glaucoma**

**w/ Pupillary Block**

- **Lens-Induced**
- **Phacomorphic**
- **Ectopia lentis**

**w/o Pupillary Block**

**Aphakic/Pseudophakic**

**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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**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.

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Secondary Angle Closure Glaucoma

- w/ Pupillary Block
  - Lens-Induced
    - Phacomorphic
    - Ectopia lentis
  - Aphakic/Pseudophakic
- w/o Pupillary Block

**What is ectopia lentis?**

Displacement of the lens from its normal anatomic position

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

- **Subluxated**: The lens is partially displaced, but remains in the 'general area'
- **Luxated**: The lens is dislocated—completely removed from the pupillary aperture. All zonular attachments have been disrupted.

How does ectopia lentis lead to pupillary block and ACG?

By allowing the displaced lens to move into and block the pupil, producing the pressure gradient, with subsequent iris bombé and angle closure.
What is ectopia lentis?
Displacement of the lens from its normal anatomic position
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Displacement of the lens from its normal anatomic position

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--Sublux(at)ed:
--Lux(at)ed
What is ectopia lentis?
Displacement of the lens from its normal anatomic position

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--Sublux(at)ed: The lens is partially displaced, but remains in the ‘general area’
--Lux(at)ed
Secondary Angle Closure Glaucoma

Subluxed lens
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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Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

Lens-Induced

Aphakic/Pseudophakic

Ectopia lentis

Phacomorphic

What is ectopia lentis?
Displacement of the lens from its normal anatomic position

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Secondary Angle Closure Glaucoma

Aphakic

Lens resting on the retina

b-scan: lens on ONH

Luxated lens
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(ated): The lens is partially displaced, but remains in the ‘general area’
--Lux(ated): The lens is dislocated—completely removed from the pupillary aperture. All zonular attachments have been disrupted.

How does ectopia lentis lead to pupillary block and ACG?


**Secondary Angle Closure Glaucoma**

\[w/\text{ Pupillary Block}\]  \[w/o\text{ Pupillary Block}\]

- **Lens-Induced**
  - **Phacomorphic**
  - **Ectopia lentis**

- **Aphakic/Pseudophakic**

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

- Congenital
  - ?
  - ?
  - ?
  - ?

- Developmental
  - ?
  - ?
  - ?

- Acquired
  - ?

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
Secondary Angle Closure Glaucoma

w/ Pupillary Block

- Lens-Induced
  - Phacomorphic
  - Ectopia lentis
  - In a few words, how would you describe the shape of a microspherophakic lens?

w/o Pupillary Block

- Aphakic/Pseudophakic

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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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**

- **w/ Pupillary Block**
  - Lens-Induced
    - Phacomorphic
    - Ectopia lentis
- **w/o Pupillary Block**
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---

**What is ectopia lentis?**
Displacement of the lens from its normal anatomic position

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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’)

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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
Microspherophakia. Note the small size, extreme curvature of the lens
**Secondary Angle Closure Glaucoma**

- **w/ Pupillary Block**
  - **Lens-Induced**
  - **Phacomorphic**
  - **Ectopia lentis**
- **w/o Pupillary Block**
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**What is ectopia lentis?**
Displacement of the lens from its normal anatomic position.

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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.

**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?**
Typically, the entirety of the lens equator can be seen in the pupillary aperture when the pt is widely dilated.
Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

Lens-Induced

Aphakic/Pseudophakic

Phacomorphic

Ectopia lentis

What is ectopia lentis?
Displacement of the lens

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By allowing the displaced lens to move into and block 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.
**Secondary Angle Closure Glaucoma**

- **w/ Pupillary Block**
  - Lens-Induced
    - Phacomorphic
      - Ectopia lentis
    - Aphakic/ Pseudophakic
  - With regard to lens ‘displacement’—what do the following terms mean?
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- **w/o Pupillary Block**

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**What is ectopia lentis?**
Displacement of the lens from its normal anatomic position.

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

**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. These two factors give the m’spheric lens vastly more converging power than a normal 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.
Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

Lens-Induced

Aphakic/ Pseudophakic

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Ectopia lentis

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Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

Lens-Induced

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What condition is microspherophakia most frequently associated with?
Weill-Marchesani syndrome.
**Secondary Angle Closure Glaucoma**

- **Aphakic/Pseudophakic**
  - With pupillary block
  - Without pupillary block

**Lens-Induced**

- Phacomorphic
- **Ectopia lentis**

**What is ectopia lentis?**

Displacement of the lens from its normal anatomic position.

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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.

**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

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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.
Secondary Angle Closure Glaucoma

Microspherophakia in Weill-Marchesani syndrome
Ectopia lentis

What is ectopia lentis?
Displacement of the lens from its normal anatomic position

With regard to lens 'displacement':
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How does ectopia lentis lead to pupillary block and ACG?
By allowing the displaced lens to move into and block the pupil, producing the pressure gradient, with subsequent iris bombé and angle closure

What are the findings in Weill-Marchesani?
Patients with Weill-Marchesani have:
- Short stature
- Short fingers
- Stiff joints (Think of it as the opposite of Marfan syndrome)

What is microspherophakia?
The lens is small ('micro') and round ('sphero')

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

With what condition is microspherophakia most frequently associated?
Weill-Marchesani syndrome

What are the findings in Weill-Marchesani?
**Secondary Angle Closure Glaucoma**

- **w/ Pupillary Block**
  - Lens-Induced
    - Phacomorphic
  - Aphakic/ Pseudophakic
    - Ectopia lentis

- **w/o Pupillary Block**
  - Aphakic/ Pseudophakic

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**Weill-Marchesani syndrome**

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

*With what condition is microspherophakia most frequently associated?*

*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.*

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

*With what condition is microspherophakia most frequently associated?*

*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.*

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

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

*short stature*
Weill-Marchesani syndrome: Short stature
Secondary Angle Closure Glaucoma

w/ Pupillary Block

- Lens-Induced
  - Phacomorphic
  - Ectopia lentis

w/o Pupillary Block

- Aphakic/ Pseudophakic

**Q**

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**What is microspherophakia most frequently associated with?**
Weill-Marchesani syndrome

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

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.

What is ectopia lentis?

Displacement of the lens from its normal anatomic position.

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…short stature

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Weill-Marchesani syndrome

What are the findings in Weill-Marchesani?

Patients with Weill-Marchesani have:

…short stature

…short fingers
Secondary Angle Closure Glaucoma

Weill-Marchesani syndrome: Short fingers
Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

Lens-Induced

Aphakic/Pseudophakic

Phacomorphic

Ectopia lentis

What is ectopia lentis?
Displacement of the lens from its normal anatomic position

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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

What is Weill-Marchesani syndrome?

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

What condition is microspherophakia most frequently associated with?

With what condition is microspherophakia most frequently associated?

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

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 a normal lens. These two factors give the m'spheric lens vastly more converging power than a normal lens possesses.

What are the findings in Weill-Marchesani?

Patients with Weill-Marchesani have:

...short stature
...short fingers
...stiff joints

(Tall stature)

(Think of it as the opposite of Marfan syndrome)
Secondary Angle Closure Glaucoma

Aphakic/ Pseudophakic

w/ Pupillary Block

Lens- Induced

Aphakic/ Pseudophakic

w/o Pupillary Block

Phacomorphic

Ectopia lentis

What is ectopia lentis?
Displacement of the lens from its normal anatomic position

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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

What is Weill-Marchesani syndrome?

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
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With what condition is microspherophakia most frequently associated?
Weill-Marchesani syndrome

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

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. These two factors give the spheric lens vastly more converging power than a normal lens possesses.

With what condition is microspherophakia most frequently associated?
Weill-Marchesani syndrome

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Patients with Weill-Marchesani have:
...short stature
...short fingers
...stiff joints
Secondary Angle Closure Glaucoma

w/ Pupillary Block

- Lens-Induced
  - Aphakic/ Pseudophakic
    - Phacomorphic
    - Ectopia lentis
      - W/ Pupillary Block
      - w/o Pupillary Block

What is ectopia lentis?
Displacement of the lens from its normal anatomic position.

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How does ectopia lentis lead to pupillary block and ACG?
By allowing the displaced lens to move into and block the pupil, producing the pressure gradient, with subsequent iris bombé and angle closure.

In a few words, how would you describe the shape of a microspherophakic lens?
Small ('micro') and round ('sphero').

What condition is microspherophakia most frequently associated with?
Weill-Marchesani syndrome.

What are the findings in Weill-Marchesani? Patients with Weill-Marchesani have:

---short stature
---short fingers
---stiff joints

Think of it as the opposite of Marfan syndrome.

With what condition is microspherophakia most frequently associated?
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What common slit-lamp observation owes to the lens' small size?
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Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

Lens-Induced

Aphakic/Pseudophakic

Phacomorphic

Ectopia lentis

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How does ectopia lentis lead to pupillary block and ACG?
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The name says it all: the lens is small ('micro') and round ('sphero')

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

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. These two factors give the spherical lens vastly more converging power than a normal lens possesses.

What is the Weill-Marchesani syndrome?
Patients with Weill-Marchesani have:
...short stature Tall stature
...short fingers Long fingers
...stiff joints Lax joints

Think of it as the opposite of Marfan syndrome

With what condition is microspherophakia most frequently associated?
Weill-Marchesani syndrome

What are the findings in Weill-Marchesani?
Patients with Weill-Marchesani have:
short stature Tall stature
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stiff joints Lax joints

Think of it as the opposite of Marfan syndrome
Secondary Angle Closure Glaucoma

Weill-Marchesani syndrome

Marfan syndrome
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Displacement of the lens from its normal anatomic position.

--Subluxated:
The lens is partially displaced, but remains in the 'general area'.

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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?

How does ectopia lentis lead to pupillary block and ACG?
Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

Lens-Induced

Aphakic/ Pseudophakic

Phacomorphic

Ectopia lentis

Weill-Marchesani syndrome

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

With what condition is microspherophakia most frequently associated?

Weill-Marchesani is strongly associated with microspherophakia.

With what conditions is microspherophakia occasionally associated?

--Lowe syndrome
--Alport syndrome
--Marfan syndrome
--Peters anomaly
--Congenital rubella

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

w/ Pupillary Block

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Lens-Induced

Aphakic/ Pseudophakic

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Weill-Marchesani is strongly associated with microspherophakia.

With what conditions is microspherophakia occasionally associated?

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- Alport syndrome
- Marfan syndrome
- Peters anomaly
- Congenital rubella

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.

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.
Secondary Angle Closure Glaucoma

w/ Pupillary Block

- Lens-Induced
  - Phacomorphic
  - Ectopia lentis

w/o Pupillary Block

- Aphakic/Pseudophakic

What is ectopia lentis?
Displacement of the lens from its normal anatomic position.

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

--Subluxated:
The lens is partially displaced, but remains in the 'general area'.

--Luxated:
The lens is dislocated—completely removed from the pupillary aperture. All zonular attachments have been disrupted.

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In a few words, how would you describe the shape of a microspherophakic lens?
Small ('micro') and round ('sphero').

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.

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 a normal lens. These two factors give the m'spheric lens vastly more converging power than a normal lens possesses.

With what condition is microspherophakia most frequently associated?
Weill-Marchesani syndrome.

With what conditions is microspherophakia occasionally associated?
--Lowe syndrome
--Alport syndrome
--Marfan syndrome
--Peters anomaly
--Congenital rubella

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

- Ruby = Rubella
- Lowe syndrome
- Alport syndrome
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**Secondary Angle Closure Glaucoma**

- **Lens-Induced**
  - Phacomorphic
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**In three words (including syndrome), what are Lowe and Alport syndromes?**
Familial oculorenal syndromes

**What is their classic (nonocular) presenting sign?**
Hematuria

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? Lenticonus
Secondary Angle Closure Glaucoma

- w/ Pupillary Block
- w/o Pupillary Block

- Lens-Induced
  - Aphakic/ Pseudophakic
    - Phacomorphic
    - Ectopia lentis
  - Weill-Marchesani syndrome
    - Subluxated
    - Luxated

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Small (‘micro’) and round (‘sphero’)

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

Why?

Further, because it is spherical, it is more curved than a normal lens. These two factors give the lens vastly more converging power than a normal lens possesses.

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**Secondary Angle Closure Glaucoma**

- **Lens-Induced**
  - Phacomorphic
  - **Ectopia lentis**

- **Aphakic/ Pseudophakic**

  - **w/ Pupillary Block**
  - **w/o Pupillary Block**

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**Lenticonus**
**Primary Angle Closure Glaucoma**

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Q

Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

Lens-Induced

Aphakic/Pseudophakic

Phacomorphic

Ectopia lentis

w/o Pupillary Block

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Weill-Marchesani is strongly associated with microspherophakia.

With what conditions is microspherophakia occasionally associated? Lowe syndrome, Alport syndrome, Marfan syndrome, Peters anomaly, Congenital rubella.

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Lenticonus.
Secondary Angle Closure Glaucoma

- Lens-Induced
  - Phacomorphic
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w/ Pupillary Block

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Secondary Angle Closure Glaucoma

Anterior lenticous in Alport syndrome
Secondary Angle Closure Glaucoma

- Aphakic/Pseudophakic
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Ectopia lentis

Phacomorphic

W/ Pupillary Block

w/o Pupillary Block

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

What common striking explanation gives to the lens' small size?

Weill-Marchesani syndrome

Weill-Marchesani is strongly associated with microspherophakia.

What conditions is microspherophakia occasionally associated?

- Lowe syndrome
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What protein is abnormal in Marfan's?

Fibrillin

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

- The eye
- The cardiovascular
- The musculoskeletal

With what condition is microspherophakia most frequently associated?

Marfan syndrome

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Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

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**Secondary Angle Closure Glaucoma**

- **w/ Pupillary Block**
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**Weill-Marchesani is strongly associated with microspherophakia.**
Weill-Marchesani is strongly associated with microspherophakia. **occasionally** associated?

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**What cardiovascular abnormalities are common?**
-- Dilatation of the aortic root and descending aorta
-- Aortic aneurysms
-- Mitral valve prolapse

**Are these abnormalities clinically significant?**
Indeed they are—they are responsible for the significantly shortened lifespan of Marfan pts.
Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

Lens-Induced

Aphakic/ Pseudophakic

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- w/ Pupillary Block
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Lens-Induced
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Aphakic/
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Q

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Weill-Marchesani is most frequently associated with microspherophakia.

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How significant is the lifespan shortening?

Indeed they are— they are responsible for the significantly shortened lifespan of Marfan pts.
**Q/A**

**Secondary Angle Closure Glaucoma**

- **Lens-Induced**
  - Phacomorphic
  - Ectopia lentis

- **Aphakic/Pseudophakic**

**w/ Pupillary Block**

**w/o Pupillary Block**

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

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**What is the most frequent association with microspherophakia?**

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
--Congenital rubella

**What protein is abnormal in Marfan’s?**

Fibrillin

**What cardiovascular abnormalities are common?**

--Dilatation of the aortic root and descending aorta
--Aortic aneurysms/dissection
--Mitral valve prolapse

**How significant is the lifespan shortening?**

Quite. The life-expectancy of Marfan pts is about half that of the so-called normal population. Indeed they are— they are responsible for the significantly shortened lifespan of Marfan pts
Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

Lens-Induced

Aphakic/ Pseudophakic

Phacomorphic

Ectopia lentis

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

--The eye (duh)
--The cardiovascular
--The musculoskeletal

What cardiovascular abnormalities are common?

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Secondary Angle Closure Glaucoma

Marfan syndrome: Aortic dissection
**Secondary Angle Closure Glaucoma**

- **w/ Pupillary Block**
  - Lens-Induced
    - Phacomorphic
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- **w/o Pupillary Block**
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**What is ectopia lentis?**
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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.

**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. These two factors give the m'spheric lens vastly more converging power than a normal lens possesses.

**With what condition is microspherophakia most frequently associated?**
Weill-Marchesani syndrome.

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**Q/A**

**Secondary Angle Closure Glaucoma**

**w/ Pupillary Block**

**w/o Pupillary Block**

**Lens-Induced**

**Aphakic/ Pseudophakic**

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

--- **The musculoskeletal**

--- **Fibrillin**

--- **Arachnodactyly**

--- **Hypermobile joints**

--- **Sternum deformities (e.g., pectus excavatum)**

--- **Marfan syndrome**

--- **Weill-Marchesani syndrome**

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Fibrillin

What proportion of Marfan pts manifest ocular abnormalities?

At least 80%

Other than ectopia lentis and (occasionally) microspherophakia, what two ocular structural abnormalities are often present?

--Corneal shape abnormalities--Increased axial length
Secondary Angle Closure Glaucoma

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With what condition is microspherophakia, Weill-Marchesani syndrome strongly associated?

Weill-Marchesani syndrome

With what condition is microspherophakia, Weill-Marchesani syndrome, occasionally associated?

-- Lowe syndrome
-- Alport syndrome
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What condition is microspherophakia most frequently associated with?

Weill-Marchesani syndrome

With what condition is microspherophakia occasionally associated?

-- Lowe syndrome
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What is the normal position and shape of the lens?

The lens is normally positioned and shaped such that the equator is visible in the pupil with the pt widely dilated.

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Phacomorphic ectopia lentis

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Q/A

Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

Lens-Induced

Aphakic/
Pseudophakic

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What proportion of Marfan pts manifest ocular abnormalities?

At least 80%.

Other than ectopia lentis and (occasionally) microspherophakia, what two ocular structural abnormalities are often present?

Corneal shape 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.

How does ectopia lentis with pupillary block lead to secondary angle closure glaucoma?
Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

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How does ectopia lentis lead to pupillary block and ACG?

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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?
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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

w/ Pupillary Block

- Lens-Induced
  - Phacomorphic
  - Ectopia lentis

w/o Pupillary Block

- 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? 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?
Secondary Angle Closure Glaucoma

w/ Pupillary Block  

Lens-Induced  
- Phacomorphic  
- Ectopia lentis

w/o Pupillary Block

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? 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.
What sort of IOL is commonly implicated in pupillary block secondary ACG?
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.
Secondary Angle Closure Glaucoma

w/ Pupillary Block

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OK, so why doesn’t this happen every time an AC IOL is placed?
Secondary Angle Closure Glaucoma

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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.
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That feeling when an AC IOL is implanted, but the surgeon forgets to create a PI
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Then why does ACG ever develop?
Q/A

Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

Lens-Induced Aphakic/Pseudophakic

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Then why does ACG ever develop?
Because on occasion the PI gets blocked, either by an \[\text{abb. + word}\] or the \[\text{two words}\]
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Because a peripheral iridotomy is created during the cataract surgery.

**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.
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How is pseudophakic ACG managed?
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Because a peripheral iridotomy is created during the cataract surgery.

Then why does ACG ever develop?
Because on occasion the PI gets blocked, either by an IOL haptic or the vitreous face.

How is pseudophakic ACG managed?
The usual way—aqueous suppressants and urgent LPI(s).
Secondary Angle Closure Glaucoma

\[ Q \]

- w/ Pupillary Block
- w/o Pupillary Block

  - Lens-Induced
    - Phacomorphic
    - Ectopia lentis

  - Aphakic/Pseudophakic

  \[ Two \text{ mechanisms} \]
Secondary Angle Closure Glaucoma

w/ Pupillary Block
- Lens-Induced
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w/o Pupillary Block
- ‘Push’
- ‘Pull’
  - Two mechanisms
What do push and pull mean in this context?
--Push refers to anterior displacement of the peripheral iris by…

--Pull refers to anterior displacement of the peripheral iris by…
Secondary Angle Closure Glaucoma

- w/ Pupillary Block
- w/o Pupillary Block

- Lens-Induced
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- ‘Push’
- ‘Pull’

What do push and pull mean in this context?

- 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…
Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

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**Secondary Angle Closure Glaucoma**

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What do push and pull mean in this context?

--**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…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

Lens-Induced, Aphakic/Pseudophakic

w/o Pupillary Block

‘Push’

‘Pull’

What do push and pull mean in this context?
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Both/Either

Some conditions have the ability to close the angle by both pushing and/or pulling the peripheral iris
Secondary Angle Closure Glaucoma

- w/ Pupillary Block
  - Lens-Induced
    - Phacomorphic
    - Ectopia lentis
  - Aphakic/Pseudophakic
- w/o Pupillary Block
  - ‘Push’
  - ‘Pull’
  - Both/ Either
Secondary Angle Closure Glaucoma

- w/ Pupillary Block
  - Lens-Induced
    - Phacomorphic
    - Ectopia lentis
  - Aphakic/Pseudophakic
- w/o Pupillary Block
  - ‘Push’
    - Aqueous misdirection
    - ERD/choroidal effusion
    - Retinal surgery
    - Nanophthalmos
    - Drug-induced
    - PFV
  - ‘Pull’

Both/Either
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 high IOP and a uniformly shallow AC in the acute post-op period after intraocular surgery.

What is the chief risk factor?
Surgery in an eye with tight angles or PAS.

By what other names is it known?
--Malignant glaucoma--Ciliary-block glaucoma.

How is aqueous misdirection syndrome managed medically?
With the triad of aggressive aqueous suppression, aggressive cycloplegia and dehydration 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.
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Take note—the iris does not have a ‘bombé’ configuration as occurs in pupillary-block ACG.

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

If a post-op pt presents with a flat chamber and low IOP, what tops the DDx?
Aqueous misdirection.
What is aqueous misdirection syndrome?
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With high IOP and a uniformly shallow AC in the acute post-op period after intraocular surgery. If a post-op pt presents with a flat chamber and low IOP, what tops the DDx? Wound leak.

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**Secondary Angle Closure Glaucoma**

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Q/A

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

What is the typical mechanism of secondary ACG after SB surgery?
The Glaucoma book mentions three types of retinal surgery that can lead to secondary angle-closure glaucoma—what are they?

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

- Scleral buckling
- PPV
- PRP

What specific PPV adjunct is associated with secondary ACG?

- Retinal surgery
  - Nanophthalmos
  - Drug-induced
  - PFV
  - Both/Either
The Glaucoma book mentions three types of retinal surgery that can lead to secondary angle-closure glaucoma—what are they?

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What specific PPV adjunct is associated with secondary ACG? The use of a tamponading injectable (eg, air; silicone oil)
The Glaucoma book mentions three types of retinal surgery that can lead to secondary angle-closure glaucoma—what are they?

- Scleral buckling
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How does PRP lead to secondary ACG?

- Aqueous misdirection
- Choroidal effusion

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

- Scleral buckling
- Scleral buckling
- PRP

How does PRP lead to secondary ACG?
It can produce a choroidal effusion that rotates the CB forward.
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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**Secondary Angle Closure Glaucoma**

**w/ Pupillary Block**

**w/o Pupillary Block**

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Secondary Angle Closure Glaucoma

Nanophthalmic eye. Note the thickness of the sclera.
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What is the proximate mechanism by which the angle closes w/o pupillary block in nanophthalmos?
**Secondary Angle Closure Glaucoma**

- **w/ Pupillary Block**
- **w/o Pupillary Block**

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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.
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**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.
**Secondary Angle Closure Glaucoma**

**w/ Pupillary Block**

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**How about filtering surgery?**

As these eyes are highly prone to intraoperative choroidal effusion, it should be avoided if possible.
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*W/ Pupillary Block*  
*W/o Pupillary Block*

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Secondary Angle Closure Glaucoma

w/ Pupillary Block

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

w/o Pupillary Block

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

What is the classic presentation of topiramate-induced ACG?

- Severe bilateral ocular pain, plus blurry vision
The Glaucoma book addresses only one drug re inducing ACG. Which one? Topiramate
Secondary Angle Closure Glaucoma

w/ Pupillary Block

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

What are the common indications for topiramate use?

--

w/o Pupillary Block

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? Severe bilateral ocular pain, plus blurry vision.

‘Push’

Aqueous misdirection

‘Pull’

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Drug-induced

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--Idiopathic intracranial hypertension

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The Glaucoma book mentions two other indications—what are they?
--
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Drug-induced
-- PFV
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Both/Either
Secondary Angle Closure Glaucoma

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What are the common indications for topiramate use?
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--Less common indications for topiramate use—what are they?
--Epilepsy
--Depression

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Drug-induced
**Q/A**

**Secondary Angle Closure Glaucoma**

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Secondary Angle Closure Glaucoma

"w/ Pupillary Block"

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"w/o Pupillary Block"

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uni- vs bilateral

Aqueous misdirection
ERD/choroidal effusion
Retinal surgery
Nanophthalmos
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'Push' 'Pull'

Drug-induced
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- *w/ Pupillary Block*
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The *bilateral*ity of topiramate-induced ACG must be stressed.
If it ain’t bilateral, it ain’t topiramate-induced!*

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

*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.
Secondary Angle Closure Glaucoma

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What are the common indications for topiramate use?
--Migraine prophylaxis
--Idiopathic intracranial hypertension

What is the mechanism of angle closure?
What causes the blurry vision? (Other than corneal edema.)

Severe bilateral ocular pain, plus blurry vision

Drug-induced
Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

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Aqueous misdirection
ERD/choroidal effusion
Retinal surgery
Nanophthalmos

Drug-induced

PFV
Both/ Either
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Why do these pts get myopic shift?

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w/o Pupillary Block

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Retinal surgery
Nanophthalmos
PFV

Both/ Either

‘Push’

‘Pull’
Q/A

Secondary Angle Closure Glaucoma

w/ Pupillary Block

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'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?
Severe bilateral ocular pain, plus blurry vision

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

Why do these pts get myopic shift?
Forward displacement of the lens increases its effective power (ie, the focal point of a previously emmetropic eye will be pulled forward into the vitreous)

w/o Pupillary Block

Aqueous misdirection
ERD/choroidal effusion
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w/o Pupillary Block

Q

How is topiramate-induced ACG managed?
Severe bilateral ocular pain, plus blurry vision

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.

‘Pull’

Aqueous misdirection
ERD/choroidal effusion
Retinal surgery
Nanophthalmos

‘Push’

Drug-induced
# Secondary Angle Closure Glaucoma

## w/ Pupillary Block

- **The Glaucoma book addresses only one drug re inducing ACG. Which one?**
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## w/o Pupillary Block

- **How is topiramate-induced ACG managed?**
  - The most important step is stopping the topiramate ASAP.
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<table>
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<tr>
<th>Drug-induced</th>
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As a helpful assistant, I've highlighted the key points and organized them into a structured format. This should make it easier to understand and reference the information.
Q

What does PFV stand for in this context?

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

Does it present unilaterally, or bilaterally?
It is unilateral in 90% of cases

What does PFV stand for in this context?

Persistent fetal vasculature

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Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

‘Push’
- Aqueous misdirection
- ERD/choroidal effusion
- Retinal surgery
- Nanophthalmos
- Drug-induced

‘Pull’

PFV

Both/Either

In general terms, how does anterior PFV manifest?
As a retrolental fibrovascular membrane that contracts over time, in the process shallowing the AC angle

Inheritance pattern for PFV?
None (it is sporadic)

Does it present unilaterally, or bilaterally?
It is unilateral in 90% of cases
What does PFV stand for in this context? Persistent fetal vasculature aka…

By what name was this condition known previously?

Persistent hyperplastic primary vitreous (PHPV) aka…
Secondary Angle Closure Glaucoma

w/ Pupillary Block

- Lens-Induced Aphakic/Pseudophakic w/ Pupillary Block w/o Pupillary Block
- Pseudophakic
- Phacomorphic Ectopia lentis
- ‘Push’ 'Pull'

w/o Pupillary Block

- ERD/choroidal effusion
- Retinal surgery
- Nanophthalmos
- Drug-induced
- PFV
- Both/ Either

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)

In general terms, how does anterior PFV manifest?
As a retrolental fibrovascular membrane that contracts over time, in the process shallowing the AC angle

What is the inheritance pattern for PFV?
None (it is sporadic)

Does it present unilaterally, or bilaterally?
It is unilateral in 90% of cases
What does PFV stand for in this context? Persistent fetal vasculature

PFV comes in two forms—what are they?

PFV comes in two forms:
- Anterior
- 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

Does it present unilaterally, or bilaterally?
- It is unilateral in 90% of cases

PFV comes in two forms: anterior and posterior. Anterior PFV presents as a retrolental fibrovascular membrane that contracts over time, shallowing the AC angle. Anterior PFV is unilateral in 90% of cases.
Secondary Angle Closure Glaucoma

w/ Pupillary Block

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

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

w/o Pupillary Block

‘Push’

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

‘Pull’

PFV

Both/Either

In general terms, how does anterior PFV manifest?

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

What is the inheritance pattern for PFV?

None (it is sporadic)

Does it present unilaterally, or bilaterally?

It is unilateral in 90% of cases
Secondary Angle Closure Glaucoma

w/ 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?

w/o Pupillary Block

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

Both/Either

‘Pull’
**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

- w/o Pupillary Block
  - ‘Push’
    - Aqueous misdirection
    - ERD/choroidal effusion
    - Retinal surgery
    - Nanophthalmos
    - Drug-induced
    - PFV
  - ‘Pull’
    - Both/Either

In general terms, how does anterior PFV manifest?
As a retrolental fibrovascular membrane that contracts over time, in the process shallowing the AC angle.

What is the inheritance pattern for PFV?
- None (sporadic)

Does it present unilaterally, or bilaterally?
- It is unilateral in 90% of cases.
Secondary Angle Closure Glaucoma

w/ 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?

w/o Pupillary Block

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

Both/Either

‘Pull’
**Secondary Angle Closure Glaucoma**

- **w/ Pupillary Block**
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- **w/o Pupillary Block**
  - ‘Push’
    - Aqueous misdirection
    - ERD/choroidal effusion
    - Retinal surgery
    - Nanophthalmos
    - Drug-induced
  - Both/Either

- ‘Pull’
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)
Secondary Angle Closure Glaucoma

w/ Pupillary Block

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

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

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w/o Pupillary Block

‘Push’

• Aqueous misdirection
• ERD/choroidal effusion
• Retinal surgery
• Nanophthalmos
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PFV

‘Pull’

Both/ Either
Secondary Angle Closure Glaucoma

**w/ Pupillary Block**

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**w/o Pupillary Block**

- ‘Push’
  - Aqueous misdirection
  - ERD/choroidal effusion
  - Retinal surgery
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  - Drug-induced

- ‘Pull’
  - Both/ Either

PFV
**Secondary Angle Closure Glaucoma**

**w/ Pupillary Block**

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*Does it present unilaterally, or bilaterally?*

**w/o Pupillary Block**

*‘Push’*
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- ERD/choroidal effusion
- Retinal surgery
- Nanophthalmos
- Drug-induced
- **PFV**

*‘Pull’*

Both/Either
Q/A

Secondary Angle Closure Glaucoma

w/ Pupillary Block

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w/o Pupillary Block

‘Push’

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

‘Pull’
Secondary Angle Closure Glaucoma

w/ Pupillary Block

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w/o Pupillary Block

‘Push’
- Aqueous misdirection
- ERD/choroidal effusion
- Retinal surgery
- Nanophthalmos
- Drug-induced

‘Pull’

PFV

Both/Either
Persistent fetal vasculature (PFV)

**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?**
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**In general terms, how does anterior PFV manifest?**
As a retrolental fibrovascular membrane that contracts over time, in the process shallowing the AC angle

**What is the inheritance pattern for PFV?**
None (it is sporadic)

**Does it present unilaterally, or bilaterally?**
It is unilateral in 90% of cases

**Is PFV inevitably a blinding disease?**
No—early cataract extraction and membranectomy may salvage the eye and useful vision
Primary Open-Angle Glaucoma

Secondary Angle Closure Glaucoma

w/ Pupillary Block

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w/o Pupillary Block

- ‘Push’
  - Aqueous misdirection
  - ERD/choroidal effusion
  - Retinal surgery
  - Nanophthalmos
  - Drug-induced
- ‘Pull’

- PFV

Is PFV inevitably a blinding disease? No—early cataract extraction and membranectomy may salvage the eye and useful vision
Secondary Angle Closure Glaucoma

w/ Pupillary Block

  - Lens-Induced
    - Phacomorphic
    - Ectopia lentis

  - Aphakic/Pseudophakic

w/o Pupillary Block

  'Push'
  - Aqueous misdirection
  - ERD/choroidal effusion
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  Both/ Either
Secondary Angle Closure Glaucoma

w/ Pupillary Block
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w/o Pupillary Block
- ‘Push’
  - Aqueous misdirection
  - ERD/choroidal effusion
  - Retinal surgery
  - Nanophthalmos
  - Drug-induced
    - PFV

- ‘Pull’
  - NVG
  - ICE
  - Flat AC
  - Epithelial/fibrous ingrowth

Both/Either
Neovascularization of what structure causes neovascular glaucoma (NVG)?

Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

Q

How does NVA lead to angle-closure glaucoma?

The NVA vessels don’t ride solo; rather, they are accompanied by contractile elements (e.g., 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?

In a desperate attempt to acquire the oxygen they’re lacking, the ischemic retinal cells release the signaling molecule VEGF, a potent inducer of new blood vessel formation. This VEGF diffuses from the vitreous cavity into the anterior segment, where it induces the NVI/NVA process.
Neovascularization of what structure causes neovascular glaucoma (NVG)?

Neovascularization of the angle (NVA)

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Secondary Angle Closure Glaucoma

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

Neovascularization of the angle (NVA)

Neovascularization of what structure causes neovascular glaucoma (NVG)?

Secondary Angle Closure Glaucoma

With Pupillary Block w/ Pupillary Block w/o Pupillary Block

Push 'Pull'

Retinal ischemia

Epithelial/fibrous ingrowth

Flat AC

ICE

Aqueous misdirection

Drug-induced

Nanophthalmos

PFV

ERD/choroidal effusion

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.

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

Neovascularization of the angle (NVA)

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Secondary Angle Closure Glaucoma

NVI
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Secondary Angle Closure Glaucoma

Drug-induced

Both/Either

Nanophthalmos

PFV

ERD/choroidal effusion

Retinal surgery

Aqueous misdirection

Epithelial/ fibrous ingrowth

Flat AC

ICE

'Pull'

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Drug-induced

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Secondary Angle Closure Glaucoma

Drug-induced

Both/Either

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PFV

ERD/choroidal effusion

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ICE

'Pull'

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Secondary Angle Closure Glaucoma

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

‘Pull’

NVG
ICE
Flat AC
Epithelial/fibrous ingrowth
Neovascularization of the angle (NVA) typically precedes and leads to NVG. Neovascularization of the iris (NVI) typically first appears at the pupillary margin as small ‘tufts’ of vessels. As it develops further, it grows in a meandering fashion toward the angle.

Neovascularization of the angle leads to angle-closure glaucoma because the newly formed vessels pull the iris up against the angle, rendering it closed. This is known as 'Pull'.

Retinal ischemia leads to NVI and NVA because the ischemic retinal cells release VEGF, a potent inducer of new blood vessel formation. VEGF diffuses from the vitreous cavity into the anterior segment, inducing the NVI/NVA process.
Neovascularization of what structure typically precedes and leads to NVA? Neovascularization of the iris (NVI)

- Where on the iris does NVI typically first appear? At the pupillary margin. As small ‘tufts’ of vessels.
- As it develops further, how does it grow (i.e., direction, and course)? In a meandering fashion toward the angle (normal iris vessels typically run in a rather direct radial fashion).

Is NVA always the result of NVI reaching the angle? No, it can arise de novo in the angle itself.
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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 (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?
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How far up the peripheral cornea do the NVA vessels go?
peripheral cornea

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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
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(No question—proceed when ready)
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Peripheral anterior synechiae (PAS)
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CRVOs are classified into one of two categories. What are these?

Ischemic and nonischemic

Which sort is implicated in the development of NVG?

Seriously?

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Can NVG develop after a CRAO?

Yes

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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.
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The NVA vessels don’t ride solo; rather, they are accompanied by contractile elements (e.g., 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?
In a desperate attempt to acquire the oxygen they’re lacking, the ischemic retinal cells release the signaling molecule VEGF, a potent inducer of new blood vessel formation. This VEGF diffuses from the vitreous cavity into the anterior segment, where it induces the NVI/NVA process.

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

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Why doesn’t the IOP spike during angle closure in OIS?
The IOP spike in OIS is not accompanied by a high IOP.

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Carotid occlusive disease

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!
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What is the treatment of choice for NVG 2ndry to retinal ischemia?
Panretinal photocoagulation (PRP)

What is the goal of PRP, ie, what are we trying to do?
To kill most of the cells in the peripheral retina

What is the therapeutic rationale? Why kill the peripheral retina?
As stated several times now: DBR renders portions of the retina hypoxic, and hypoxic cells release VEGF, initiating a cascade of deleterious events. OTOH, dead cells do not release VEGF. So by euthanizing the hypoxic retina, the intraocular VEGF burden is reduced, neovascularization is halted, and SVL is avoided.
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The NVI/NVA in FHI: In what regard is it highly unusual?

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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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Secondary Angle Closure Glaucoma
In this context, what does ICE stand for? **Iridocorneal endothelial syndrome**

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.

Who is the typical patient? A young-to-middle-aged adult female.

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? She will deny any family history of similar eye findings (recall it's sporadic, not inherited).
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In this context, what does ICE stand for?
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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's abnormal about the endothelial cells in ICE?

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

- NVG
- Ice
- Flat AC
- Epithelial/fibrous ingrowth
In this context, what does ICE stand for?
Iridocorneal endothelial syndrome

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’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.
**Secondary Angle Closure Glaucoma**

- **w/ Pupillary Block**
  - Lens-Induced Aphakic/Pseudophakic w/ Pupillary Block w/o Pupillary Block
  - ICE
  - Flat AC
  - Aqueous misdirection
  - Retinal surgery

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

**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’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. These cells and their associated membrane account for all of the signs and symptoms found in ICE.
In this context, what does ICE stand for?
Iridocorneal endothelial syndrome

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

Who is the typical patient?
In this context, what does ICE stand for?
Iridocorneal endothelial syndrome

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

Who is the typical patient?
A young-to-middle-aged adult female
In this context, what does ICE stand for?
Iridocorneal endothelial syndrome

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

Who is the typical patient?
A young-to-middle-aged adult female

What three sorts of complaints will she have?
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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

Who is the typical patient?
A young-to-middle-aged adult female

What three sorts of complaints will she have?
--Changes in the eye’s appearance
--Ocular pain
--Decreased VA
In this context, what does ICE stand for?
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A sporadic condition in which abnormal corneal endothelial cells lead to a variety of corneal, iris and angle problems

Who is the typical patient?
A young-to-middle-aged adult female

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?
**Secondary Angle Closure Glaucoma**

- **w/ Pupillary Block**
- **w/o Pupillary Block**

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

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

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**What three sorts of complaints will she have?**
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She will deny any family history of similar eye findings (recall it’s sporadic, not inherited)
In this context, what does ICE stand for?
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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?
-- Changes in the eye’s appearance
-- Ocular pain
-- Decreased VA

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What are the common signs of ICE syndrome?
--Iris changes
--Corneal changes
--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?
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In this context, what does ICE stand for? Iridocorneal endothelial syndrome.

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-- Corneal changes
-- Peripheral anterior synechiae (PAS)
-- 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

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).
**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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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?
- Iris changes
  - 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
- Changes in the eye’s appearance
  - Ocular pain
  - Decreased VA
- Elevated IOP/glaucoma
- Flat AC
- NVG
- ICE
- Epithelial/fibrous ingrowth

What sort of iris changes will be present?

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)
Secondary Angle Closure Glaucoma

ICE: Corectopia (displaced pupil)
Secondary Angle Closure Glaucoma

ICE: Iris atrophy
Secondary Angle Closure Glaucoma

ICE: Iris nodules (note also the ectropion uveae)
**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?*
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?*

- Iris changes
- **Corneal changes**
  - Peripheral anterior synechiae (PAS)
  - Elevated IOP/glaucoma
- Changes in the eye's appearance
  - Ocular pain
  - Decreased VA

*What sort of corneal changes will be present?*

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)
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Iridocorneal endothelial syndrome

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--Iris changes
--Corneal changes
--Peripheral anterior synechiae (PAS)
--Elevated IOP/glaucoma
--Changes in the eye's appearance
--Ocular pain
--Decreased VA

What sort of corneal changes will be present?
It may appear hazy or milky as a result of corneal edema

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)
Secondary Angle Closure Glaucoma

ICE: Corneal edema
Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

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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?
-- Iris changes
-- Corneal changes
-- Peripheral anterior synchiae
-- Elevated IOP/glaucoma
-- Changes in the eye's appearance
-- Ocular pain
-- Decreased VA

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

What 'pertinent negative' will be elicited when taking a history?
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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?
- Iris changes
- Corneal changes
  - 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)

What are the classic terms for describing the slit-lamp appearance of the abnormal endothelium?
‘Hammered silver’ or ‘beaten bronze’
Secondary Angle Closure Glaucoma

ICE: ‘Hammered silver’ corneal endothelium
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?
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?
- Iris changes
- Corneal changes
- Peripheral anterior synechiae (PAS)
- Elevated IOP/glaucoma
- Changes in the eye's appearance
- Ocular pain
- Decreased VA

What are the classic terms for describing the slit-lamp appearance of the abnormal endothelium?
- 'Hammered silver'
- 'Beaten bronze'

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

Fuchs dystrophy

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

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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?
--Iris changes
--Peripheral anterior synechiae (PAS)
--Elevated IOP/glaucoma
--Changes in the eye’s appearance
--Ocular pain
--Decreased VA

What are the classic terms for describing the slit-lamp appearance of the abnormal endothelium?
‘Hammered silver’ or ‘beaten bronze’

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

Who is the typical patient?
A young-to-middle-aged adult female

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?
She will deny any family history of similar eye findings (recall it’s sporadic, not inherited)
In this context, what does ICE stand for? Iridocorneal endothelial syndrome

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?
-- Iris changes
-- Corneal changes
-- **Peripheral anterior synechiae (PAS)**
-- Elevated IOP/glaucoma

Two words are used to describe the appearance of the PAS in ICE. What are they?

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

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?
--Iris changes
--Corneal changes
---Peripheral anterior synechiae (PAS)
--Elevated IOP/glaucoma

Two words are used to describe the appearance of the PAS in ICE. What are they?
‘Broad’ and ‘high’

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)
Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

In this context, what does ICE stand for?
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--Iris changes
--Corneal changes
--Peripheral anterior synechiae (PAS)
--Elevated IOP/glaucoma

Two words are used to describe the appearance of the PAS in ICE. What are they? ‘Broad’ and ‘high’

What does high mean in this context?
Taking a history? Findings (recall it’s sporadic, not inherited)
In this context, what does ICE stand for? Iridocorneal endothelial syndrome

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? -- Iris changes -- Corneal changes -- **Peripheral anterior synechiae (PAS)** -- Elevated IOP/glaucoma

Two words are used to describe the appearance of the PAS in ICE. What are they? ‘Broad’ and **‘high’**

What does **‘high’** mean in this context? That the PAS extend above Schwalbe’s line (SL)
Secondary Angle Closure Glaucoma

ICE: Broad and high PAS
**Secondary Angle Closure Glaucoma**

**w/ Pupillary Block**

- Lens-Induced Aphakic/Pseudophakic
- Phacomorphic Ectopia lentis
- Aqueous misdirection
- Retinal surgery

**w/o Pupillary Block**

- Nanophthalmos
- PFV
- ERD/choroidal effusion

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What are the common signs of ICE syndrome?
- Iris changes
- Corneal changes
- **Peripheral anterior synechiae (PAS)**
- Elevated IOP/glaucoma

Two words are used to describe the appearance of the PAS in ICE. What are they? *Broad* and *high*

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

That the PAS extend above Schwalbe’s line (SL)

What does high mean in this context?
That the PAS extend above Schwalbe’s line (SL)

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

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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- Corneal changes
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But we said earlier that PAS don’t cross SL. What’s the deal?

That the PAS extend above Schwalbe’s line (SL)

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What are the common signs of ICE syndrome?
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- Corneal changes
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Two words are used to describe the appearance of the PAS in ICE. What are they? *Broad* and *high*

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

That the PAS extend above Schwalbe’s line (SL)

What does high mean in this context?
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In this context, what does ICE stand for?
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In a nutshell, what is ICE?
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What are the common signs of ICE syndrome?
--Iris changes
--Corneal changes
--Peripheral anterior synechiae (PAS)
--Elevated IOP/glaucoma

Two words are used to describe the appearance of the PAS in ICE. What are they? '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)
Q

How common is glaucoma in ICE?

- 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)
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?
No—it is ineffective in ICE, and should be avoided.

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)
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?*

---

**Elevated IOP/glaucoma**

- Peripheral anterior synechiae (PAS)
- Changes in the eye’s appearance
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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.

What common signs of ICE syndrome are there? --Iris changes --Corneal changes --Peripheral anterior synechiae (PAS) --Elevated IOP/glaucoma

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).

Can the glaucoma be managed medically? In some cases, yes. However, many go on to filtering surgery.

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*Can the glaucoma be managed medically?*

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**Elevated IOP/glaucoma**
- Changes in the eye's appearance
  - Ocular pain
  - Decreased VA
- Peripheral anterior synechiae (PAS)
- Epithelial/fibrous ingrowth
- Flat AC
- NVG

*What ‘pertinent negative’ will be elicited when taking a history?*
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No—it is ineffective in ICE, and should be avoided.

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**Elevated IOP/glaucoma**
- Changes in the eye’s appearance
  -- Peripheral anterior synechiae (PAS)
  -- Iris changes
  -- Corneal changes
  -- Peripheral anterior synechiae (PAS)
  -- Elevated IOP/glaucoma
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- Decreased VA

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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

Elevated IOP/glaucoma

---Peripheral anterior synechiae (PAS)

---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)
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

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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?

--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
--Ocular pain
--Decreased VA

What ‘pertinent negative’ will be elicited when taking a history?
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The BCSC books recognize three variants of ICE. What are they?

- Iris nevus syndrome, *aka* Cogan-Reese syndrome
- Handler syndrome
- Essential iris atrophy

Take note of the sweet mnemonic!

=--=--
--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)
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 is the predominant finding for each?
--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
--Ocular pain
--Decreased VA

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Iridocorneal endothelial syndrome

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The BCSC books recognize three variants of ICE. What are they? 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
--Ocular pain
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In a nutshell, what is ICE?
The BCSC books recognize three variants of ICE. What are they?
*What is the predominant finding for each?*
--Iris nevus syndrome, aka Cogan-Reese syndrome: Iris nevi/nodules
--Chandler syndrome: Corneal edema
--Essential iris atrophy:

What three sorts of complaints will she have?
--Changes in the eye’s appearance
--Ocular pain
--Decreased VA

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In a nutshell, what is ICE?
The BCSC books recognize three variants of ICE. What are they? What is the predominant finding for each?
--Iris nevus syndrome, aka Cogan-Reese syndrome: Iris nevi/nodules
--Chandler syndrome: Corneal edema
--Essential iris atrophy: Iris atrophy/tears

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?
She will deny any family history of similar eye findings (recall it’s sporadic, not inherited)
Secondary Angle Closure Glaucoma

w/ Pupillary Block

- Lens-Induced
  - Phacomorphic
  - Ectopia lentis
- Aphakic/Pseudophakic

w/o Pupillary Block

- ‘Push’
  - Aqueous misdirection
- ‘Pull’
  - ERD/choroidal effusion
  - ICE
  - NVG
  - Epithelial/fibrous ingrowth

Flat AC

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

Low

By allowing PAS to form
What clinical scenario typically produces the flat AC that leads to secondary ACG?
Wound leak after cataract or filtering surgery.
**Secondary Angle Closure Glaucoma**

- **w/ Pupillary Block**
  - Lens-Induced
    - Phacomorphic
    - Ectopia lentis
  - Aphakic/ Pseudophakic
- **w/o Pupillary Block**
  - ‘Push’
    - Aqueous misdirection
  - ‘Pull’
    - ERD/choroidal effusion
    - NVG
    - ICE
    - 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
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
**Secondary Angle Closure Glaucoma**

- **w/ Pupillary Block**
  - Lens-Induced
  - Aphakic/Pseudophakic
  - Phacomorphic Ectopia lentis
  - ‘Push’
  - NVG
  - ICE
  - Epithelial/fibrous ingrowth
  - Flat AC
  - Aqueous misdirection

- **w/o Pupillary Block**
  - ‘Pull’
  - ERD/choroidal effusion
  - PFV
  - ERD/choroidal effusion

**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?**

By allowing PAS to form

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

w/ Pupillary Block
- Lens-Induced
  - Phacomorphic
  - Ectopia lentis
- Aphakic/Pseudophakic

w/o Pupillary Block
- ‘Push’
  - Aqueous misdirection
  - ERD/choroidal effusion
- ‘Pull’
  - NVG
  - ICE
  - Epithelial/fibrous ingrowth

Flat AC

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?
**Secondary Angle Closure Glaucoma**

- **w/ Pupillary Block**
  - Lens-Induced
    - Phacomorphic
    - Ectopia lentis
  - Aphakic/Pseudophakic

- **w/o Pupillary Block**
  - ‘Push’
    - Aqueous misdirection
    - ERD/choroidal effusion
  - ‘Pull’

**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?**

By allowing PAS to form
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 medically?

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Q/A

Secondary Angle Closure Glaucoma

w/ Pupillary Block

- Lens-Induced
  - Phacomorphic
  - Ectopia lentis

- Aphakic/Pseudophakic

w/o Pupillary Block

- ‘Push’
  - Aqueous misdirection
  - ERD/choroidal effusion

- ‘Pull’

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 medically? It’s as simple as ABC(D):

--A
--B
--C
--D
Secondary Angle Closure Glaucoma

w/ Pupillary Block

- Lens-Induced
  - Phacomorphic
  - Ectopia lentis
- Aphakic/Pseudophakic

w/o Pupillary Block

- ‘Push’
  - Aqueous misdirection
  - ERD/choroidal effusion
- ‘Pull’
  - NVG
  - ICE
  - 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 medically? It’s as simple as ABC(D):

- Aqueous suppressants
- Bandage contact lens (BCL), if we’re talking post-CE
- Cycloplegia
- Discontinue (or at least Diminish) topical steroids
Secondary Angle Closure Glaucoma

Q

w/ Pupillary Block
LensInduced
Phacomorphic
Ectopia lentis

Aphakic/
Pseudophakic

w/o Pupillary Block
‘Push’

‘Pull’

Aqueous misdirection

ERD/choroidal effusion
What clinical scenario typically produces the flat AC
that leads to secondary ACG?
Retinal surgery
Wound leak after cataract or filtering surgery
Nanophthalmos
Hol up—the IOP is already super low. What is the rationale
How is a wound leak managed
medically?
It’s
simple as ABC(D):
Will the for
IOP
be high,
or as
low?
using
aqueous
suppressants?
--Aqueous suppressants
Low
The idea is to promote closure ofDrug-induced
the leak by decreasing
--Bandage contact lens (BCL),the
if we’re
post-CE
flow oftalking
aqueous
across it
--Cycloplegia
How does a flat AC lead to ACG? PFV
--Discontinue (or at least
topical
steroids
Both/Either
ByDiminish)
allowing PAS
to form

NVG
ICE
Flat AC
Epithelial/
fibrous
ingrowth


Secondary Angle Closure Glaucoma

w/ Pupillary Block
- Lens-Induced
  - Phacomorphic
  - Ectopia lentis
- Aphakic/Pseudophakic

w/o Pupillary Block
- ‘Push’
  - Aqueous misdirection
  - ERD/choroidal effusion
- ‘Pull’

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 medically?

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

Hol 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.
Secondary Angle Closure Glaucoma

w/ Pupillary Block

- Lens-Induced
  - Phacomorphic
  - Ectopia lentis

- Aphakic/Pseudophakic

w/o Pupillary Block

- ‘Push’
  - Aqueous misdirection
  - ERD/choroidal effusion

- ‘Pull’

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

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How is a wound leak managed medically?

**Aqueous suppressants**

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

**Which 3 drug classes are aqueous suppressants?**

- --
- --
- --

Flat AC

Epithelial/fibrous ingrowth

NVG

ICE
Secondary Angle Closure Glaucoma

w/ Pupillary Block

- Lens-Induced
  - Phacomorphic
  - Ectopia lentis
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w/o Pupillary Block

- ‘Push’
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**Wound leak** after cataract or filtering surgery

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  - Bandage contact lens (BCL), if we’re talking post-CE
  - Cycloplegia
  - Discontinue (or at least Diminish) topical steroids

Hol up—the IOP is already super low. What is the rationale?

Which 3 drug classes are aqueous suppressants?
- α agonists
- β blockers
- Carbonic anhydrase inhibitors
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 medically? It’s as simple as ABC(D):
- Aqueous suppressants
- Bandage contact lens (BCL), if needed
- Cycloplegia
- Discontinue (or at least diminish) topical steroids

What is the purpose of cycloplegia?

- To deepen the AC by rotating the ciliary body back
Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

Lens-Induced

Aphakic/ Pseudophakic

‘Push’

‘Pull’

Phacomorphic

Ectopia lentis

Aqueous misdirection

ERD/choroidal effusion

Epithelial/ fibrous ingrowth

NVG

ICE

Flat AC

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 medically? It’s as simple as ABC(D):

--Aqueous suppressants

--Bandage contact lens (BCL), if corneal thinning at CE

--**Cycloplegia**

--Discontinue (or at least diminish) topical steroids

What is the purpose of cycloplegia?

To deepen the AC by rotating the ciliary body back

How is a wound leak after cataract or filtering surgery managed medically?
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 medically?**

As ABC(D):

- **Aqueous suppressants**
- Bandage contact lens (BCL), if we're talking post-CE
- **Cycloplegia**
- Discontinue (or at least Diminish) topical steroids

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

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

w/ Pupillary Block
- Lens-Induced
  - Phacomorphic
  - Ectopia lentis
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---Discontinue (or at least Diminish) topical steroids---

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

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

1) 2) 3) 4)
What clinical scenario typically produces the flat AC that leads to secondary ACG?

**Wound leak** after cataract or filtering surgery

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

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 diminish) topical steroids

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
Secondary Angle Closure Glaucoma

- w/ Pupillary Block
- w/o Pupillary Block

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?

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

What do they look like at the slit lamp?

- Epithelial ingrowth: A thin gray sheet
- Fibrous ingrowth: A thick, gray-white, vascular layer

What is the treatment?

Extensive intraocular debridement can be attempted.

What is the prognosis?

Poor
In a nutshell, what is epithelial/fibrous ingrowth?
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**Secondary Angle Closure Glaucoma**

**w/ Pupillary Block**

- Lens-Induced
- Phacomorphic
- Ectopia lentis

**w/o Pupillary Block**

- NVG
- ICE
- Flat AC

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**Prognosis**
Poor
**Secondary Angle Closure Glaucoma**

- **w/ Pupillary Block**
  - Lens-Induced
    - Phacomorphic Ectopia lentis
    - Epithelial/fibrous ingrowth
  - Aqueous misdirection
  - Retinal surgery

- **w/o Pupillary Block**
  - ‘Pull’
  - ‘Pull’

---

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Poor.
Secondary Angle Closure Glaucoma

Epithelial ingrowth after DSAEK
Secondary Angle Closure Glaucoma

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
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.
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?
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---Epithelial ingrowth: A thin gray sheet
---Fibrous ingrowth

---Pull'
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Retinal surgery
Drug-induced
Nanophthalmos
PFV
ERD/choroidal effusion
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-- Fibrous ingrowth
Q/A

Secondary Angle Closure Glaucoma

w/ Pupillary Block

Lens-Induced

Aphakic/Pseudophakic

w/o Pupillary Block

Phacomorphic

Ectopia lentis

‘Push’ ‘Pull’

NVG

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Epithelial/fibrous ingrowth

Flat AC

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Retinal surgery

Drug-induced

Both/Either

Nanophthalmos

PFV

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What is the prognosis?

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

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Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

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Secondary Angle Closure Glaucoma

Fibrous ingrowth after cataract surgery
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What is the prognosis?
Poor
Secondary Angle Closure Glaucoma

w/ Pupillary Block
- Lens-Induced
  - Phacomorphic
  - Ectopia lentis
- Aphakic/Pseudophakic

w/o Pupillary Block

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

‘Pull’
- NVG
- ICE
- Flat AC
- Epithelial/fibrous ingrowth

Both/Either

Next
Secondary Angle Closure Glaucoma

w/ Pupillary Block

- Lens-Induced
  - Phacomorphic
  - Ectopia lentis
- Aphakic/Pseudophakic

w/o Pupillary Block

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

‘Pull’
- NVG
- ICE
- Flat AC
- Epithelial/fibrous ingrowth

- Both/Either
  - Inflammation
  - Tumor

Next
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 present.
Secondary Angle Closure Glaucoma

w/ Pupillary Block

- Lens-Induced
- Aphakic/Pseudophakic

w/o Pupillary Block

- ‘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
- Inflammation
- Tumor
By what mechanism could inflammation **push** the angle closed?

A massive exudative RD could push the lens into the pupil.
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?

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Secondary Angle Closure Glaucoma

w/ Pupillary Block

w/o Pupillary Block

A

- Lens-Induced
- Aphakic/Pseudophakic
- ‘Push’

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.

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- NVG
- ICE
- Flat AC
- Epithelial/fibrous ingrowth
- Inflammation
- Both/ Either
- PFV
- Inflammation
- Tumor
Secondary Angle Closure Glaucoma

Inflammatory glaucoma. Note the posterior synechiae as well as PAS.
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
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.
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.)
How would a tumor push the angle closed?
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Secondary Angle Closure Glaucoma

w/ Pupillary Block

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w/o Pupillary Block

- ‘Push’
  - Aqueous misdirection
  - ERD/choroidal effusion
  - Flat AC
  - Epithelial/fibrous ingrowth
- ‘Pull’
  - NVG
  - ICE
  - Tumor

How would a tumor pull the angle closed?

- PFV
- Both/Either
- Inflammation
- Tumor
How would a tumor **pull** the angle closed? 
Via one of two mechanisms:

1. Tumor-induced NVI/NVA leading to NVG
2. Tumor necrosis can produce severe inflammation, leading to posterior synechiae and/or PAS
Secondary Angle Closure Glaucoma

w/ Pupillary Block

- Lens-Induced
  - Phacomorphic
  - Ectopia lentis

- Aphakic/Pseudophakic

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Both/ Either

Inflammation

Tumor
Secondary Angle Closure Glaucoma

w/ Pupillary Block

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‘Push’

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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 PAS

Which tumors are notorious for inducing NVI/NVA?

--

Both/Either

- Inflammation

Tumor

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

Tumor
Secondary Angle Closure Glaucoma

- w/ Pupillary Block
  - Lens-Induced
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    - Tumor-induced NVI/NVA leading to NVG
      - Tumor necrosis can produce severe inflammation, leading to posterior synechiae and/or PAS
  - Which tumors are notorious for inducing NVI/NVA?
    - Retinoblastoma
    - Medulloblastoma
    - Choroidal melanoma
  - Both/ Either
    - Inflammation

How would a tumor pull the angle closed?
Via one of two mechanisms:
--Tumor-induced NVI/NVA leading to NVG
Secondary Angle Closure Glaucoma

Q

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

- Retinoblastoma
- Medulloepithelioma
- Choroidal melanoma

Q

How would a tumor pull the angle closed?

Via one of two mechanisms:

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

Which tumors are notorious for inducing NVI/NVA?

- Retinoblastoma
- Medulloepithelioma
- Choroidal melanoma

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

A benign but 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
In a nutshell, what sort of tumor is a medulloepithelioma?
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-- Tumor necrosis can produce severe inflammation, leading to posterior synechiae and/or PAS

Inflammation

Both/Either

Tumor

Epithelial/fibrous ingrowth

Flat AC

ERD/choroidal effusion

ICE

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

Which tumors are notorious for inducing NVI/NVA?
- Retinoblastoma
- Medulloepithelioma
- Choroidal melanoma

How is it managed?
Enucleation is usually required.
In a nutshell, what sort of tumor is a medulloepithelioma?
A locally very aggressive tumor of the nonpigmented epithelium of the ciliary body.

By what other name is medulloepithelioma known?

Inflammation
Aqueous misdirection

Both/Either

Epithelial/fibrous ingrowth
Flat AC
ICE
NVG

Pull

Tumor

Both/Either

Inflammation

Retinoblastoma
Medulloepithelioma
Choroidal melanoma

How would a tumor pull the angle closed?

Tumor-induced NVI/NVA leading to NVG

Tumor necrosis can produce severe inflammation, leading to posterior synechiae and/or PAS

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Tumor

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Inflammation

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Medulloepithelioma
Choroidal melanoma
In a nutshell, what sort of tumor is a medulloepithelioma? A locally very aggressive tumor of the nonpigmented epithelium of the ciliary body. By what other name is medulloepithelioma known? Diktyoma

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

Which tumors are notorious for inducing NVI/NVA?--Retinoblastoma--Medulloepithelioma--Choroidal melanoma

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How is it managed? Enucleation is usually required

By what other name is medulloepithelioma known? Diktyoma
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?

- Retinoblastoma
- **Medulloepithelioma**
- Choroidal melanoma

Which tumors are notorious for inducing NVI/NVA?

- Retinoblastoma
- Medulloepithelioma
- Choroidal melanoma

Inflammation leading to NVG

- Aqueous misdirection
- ERD/choroidal effusion
- Epithelial/fibrous ingrowth
- Both/Either

How would a tumor pull the angle closed?

- Tumor-induced NVI/NVA leading to NVG
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Which tumors are notorious for inducing NVI/NVA?

- Retinoblastoma
- Medulloepithelioma
- Choroidal melanoma

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

**Medulloepithelioma** is a **locally very aggressive** tumor of the nonpigmented epithelium of the ciliary body.

How ‘locally aggressive’ is it?

- Aggressive enough to cause death
Secondary Angle Closure Glaucoma

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

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

Which tumors are notorious for inducing NVI/NVA?
- Retinoblastoma
- Medulloepithelioma
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**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

**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

**How ‘locally aggressive’ is it?**

Aggressive enough to cause death
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
Secondary Angle Closure Glaucoma

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- Iris mass
- Hyphema
- Sectoral cataract

How is it managed?

Enucleation is usually required
**Secondary Angle Closure Glaucoma**

**Q**

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Childhood

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How is it managed?
Enucleation is usually required

**A**

Which tumors are notorious for inducing NVI/NVA?
-- Retinoblastoma
-- Medulloepithelioma
-- Choroidal melanoma

**Both/Either**

Tumor

Inflammation

Flat AC

Epithelial/fibrous ingrowth

Drug-induced

ERD/choroidal effusion

Aqueous misdirection

NVG

ICE
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Is it common, or rare? Rare

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Via one of two mechanisms:

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Medulloepithelioma/diktyoma
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Is it common, or rare?
Rare

During what life-period does medulloepithelioma present?
Childhood

What clinical findings are commonly present?
-- ACG (duh)
--
--
--

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--Retinoblastoma
--Medulloepithelioma
--Choroidal melanoma

Inflammation

Both/ Either

Tumor

Secondary Angle Closure Glaucoma

Aphakic/Pseudophakic w/o Pupillary Block

Aqueous misdirection

ERD/choroidal effusion

Epithelial/fibrous ingrowth

Flat AC

ICE

NVG
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

Medulloepithelioma/diktyoma: Note the cataract
Secondary Angle Closure Glaucoma

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