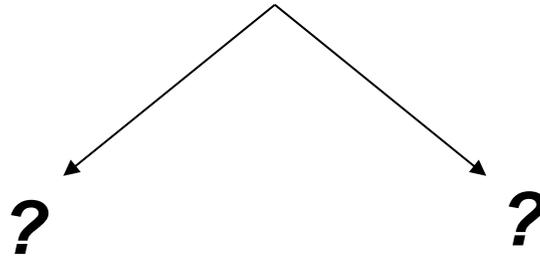


Q

Acute Primary Angle Closure Glaucoma

Glaucoma

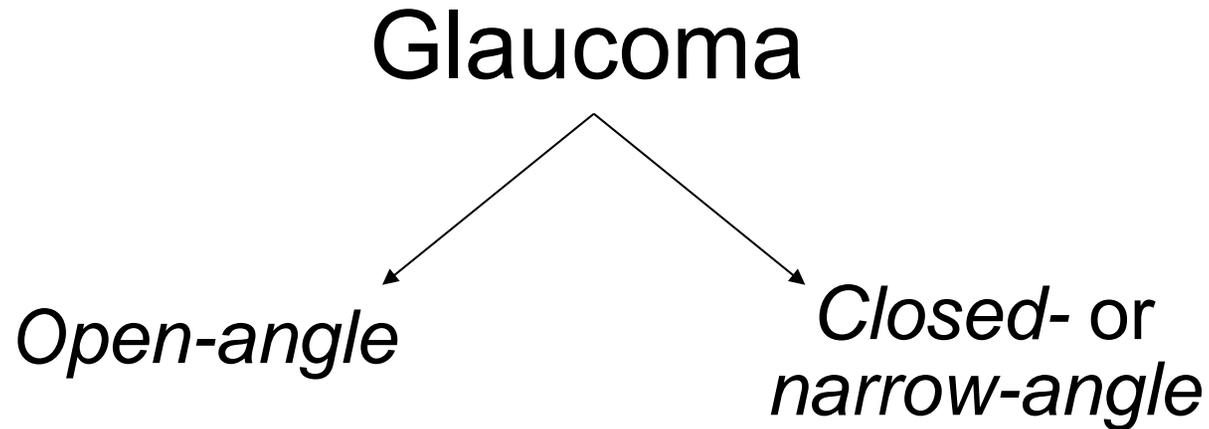


The first thought you should have when encountering a pt you suspect has glaucoma is...



A

Acute Primary Angle Closure Glaucoma



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

Q

Acute Primary Angle Closure Glaucoma



Glaucoma

Open-angle

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

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

What does it mean to say the angle is closed?

A

Acute Primary Angle Closure Glaucoma



Glaucoma

Open-angle

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

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

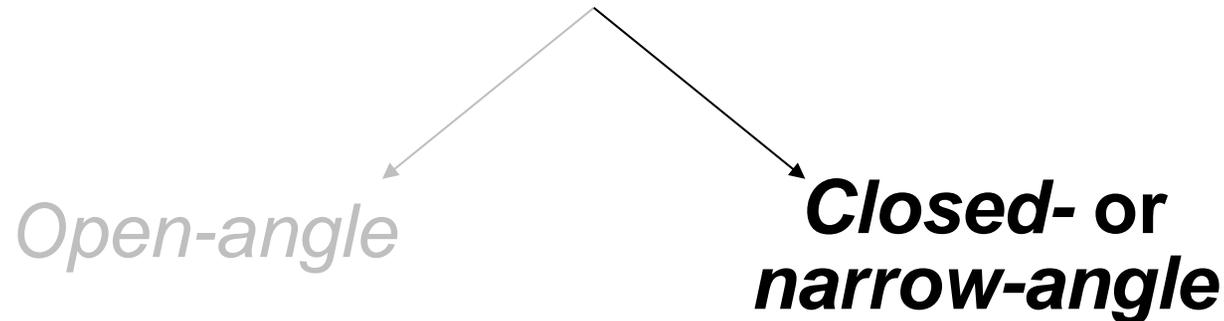
What does it mean to say the angle is closed?
It means the peripheral iris is in contact with the trabecular meshwork (TM)

Q

Acute Primary Angle Closure Glaucoma



Glaucoma



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

What does it mean to say the angle is closed?

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

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

--

--

Q/A

Acute Primary Angle Closure Glaucoma



Glaucoma

Open-angle

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

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

What does it mean to say the angle is closed?

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

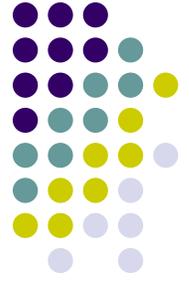
This contact comes in two basic flavors—what are they?

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

--

A

Acute Primary Angle Closure Glaucoma



Glaucoma

Open-angle

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

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

What does it mean to say the angle is closed?

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

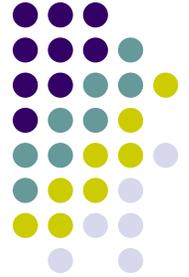
This contact comes in two basic flavors—what are they?

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

--

Q/A

Acute Primary Angle Closure Glaucoma



Glaucoma

Open-angle

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

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

What does it mean to say the angle is closed?

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

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

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

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

A

Acute Primary Angle Closure Glaucoma



Glaucoma

Open-angle

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

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

What does it mean to say the angle is closed?

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

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

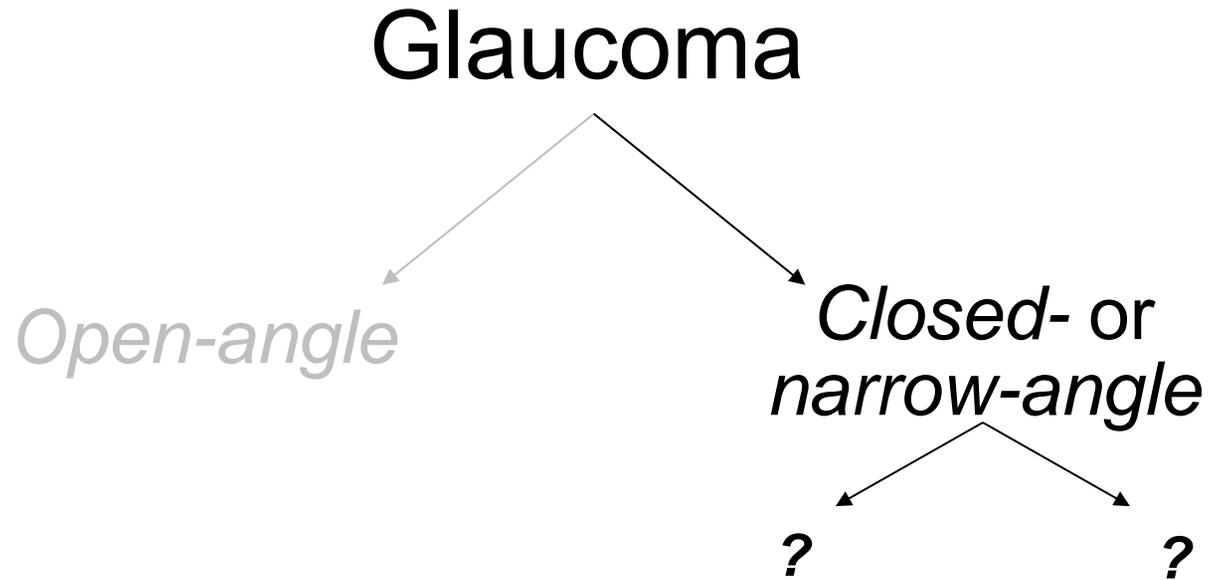
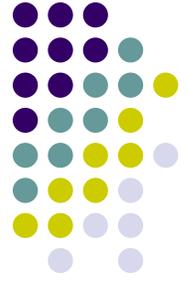
--The iris can *appose* the TM, ie, touch it without adhering to it

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

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

Q

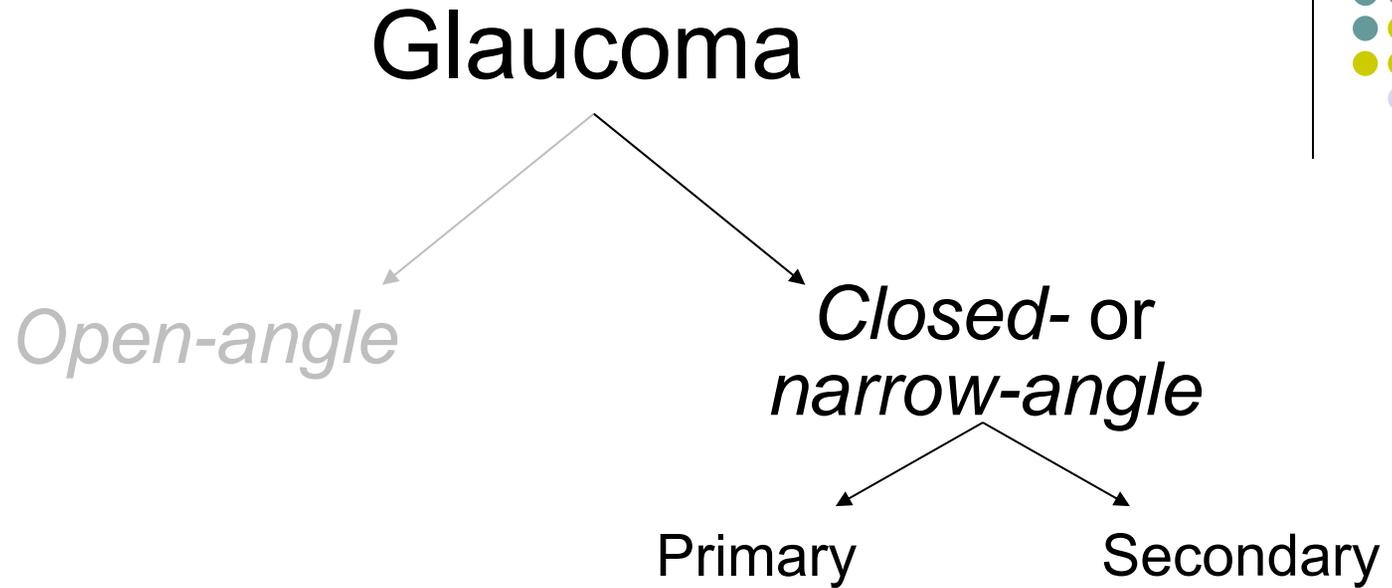
Acute Primary Angle Closure Glaucoma



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

A

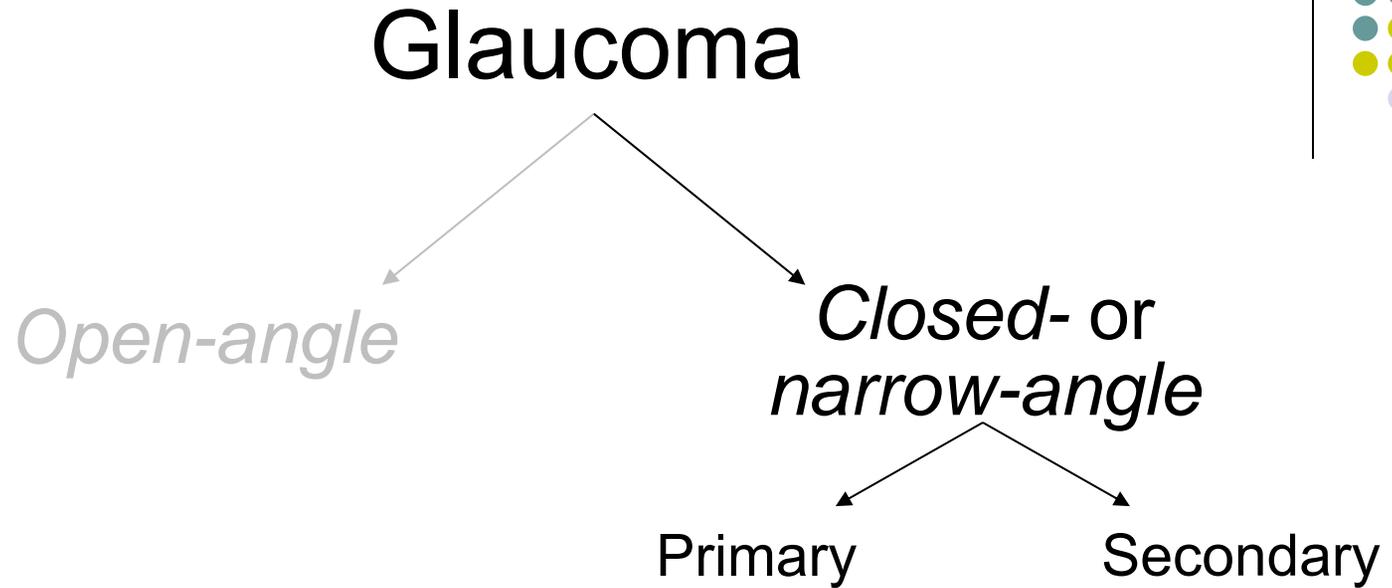
Acute Primary Angle Closure Glaucoma



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

Q

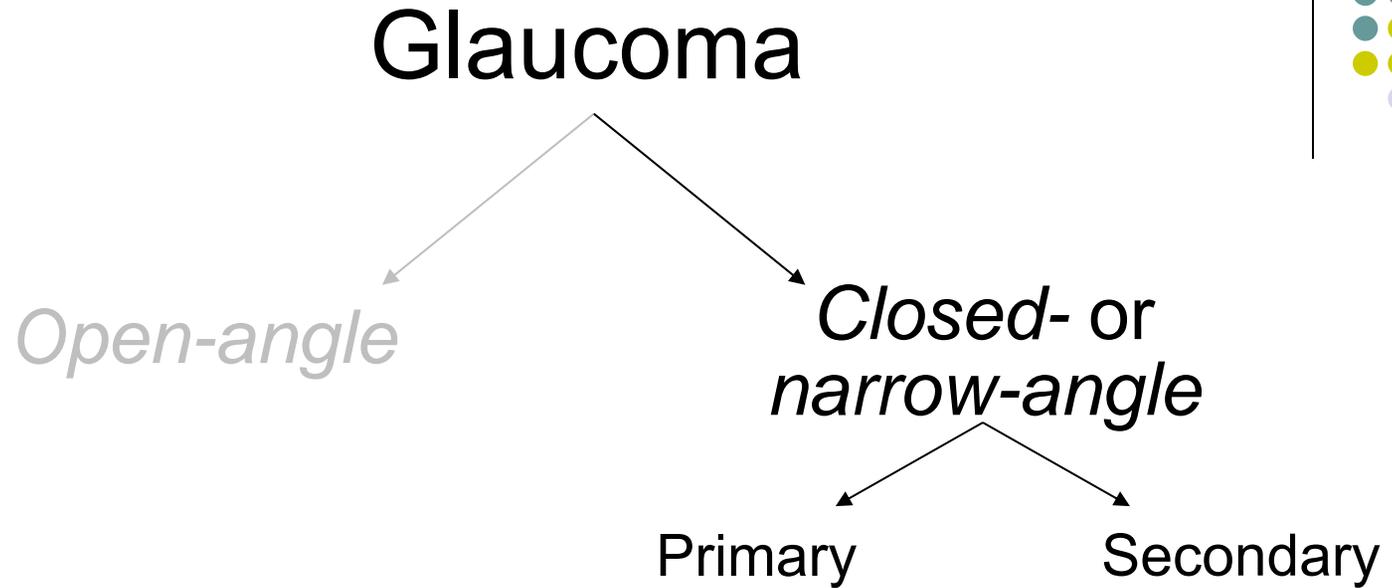
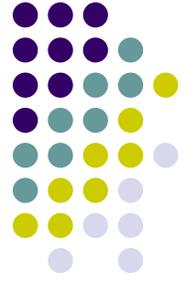
Acute Primary Angle Closure Glaucoma



What differentiates primary from secondary angle-closure glaucoma?

A

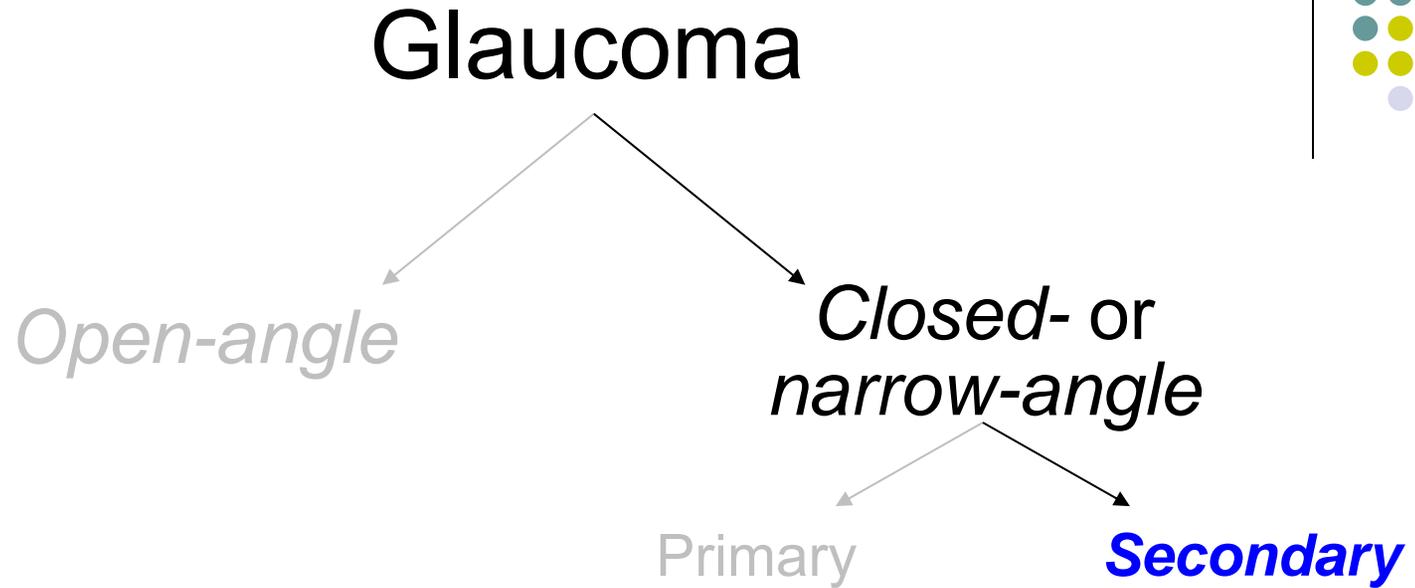
Acute Primary Angle Closure Glaucoma



What differentiates primary from secondary angle-closure glaucoma?

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

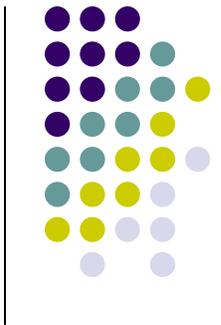
Acute Primary Angle Closure Glaucoma



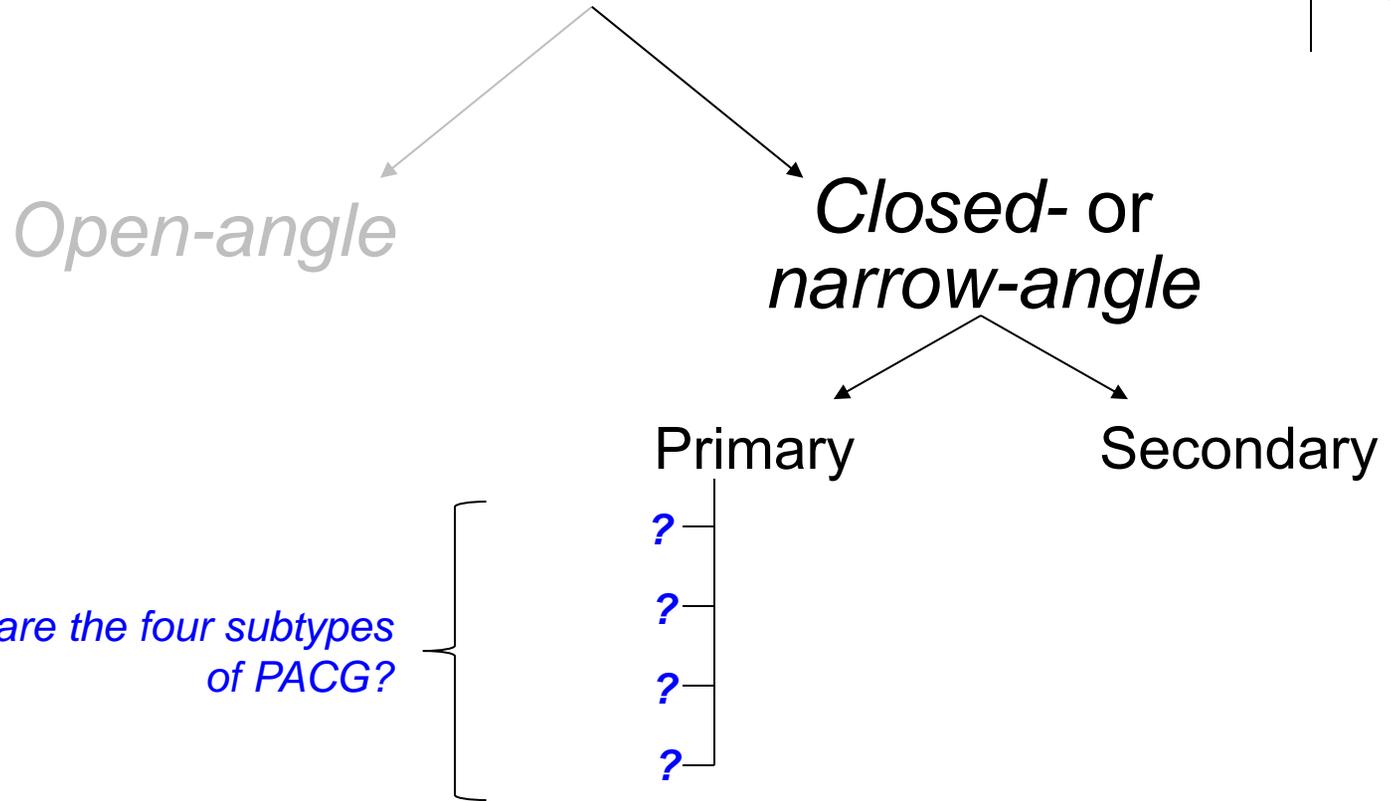
Secondary angle-closure glaucoma is discussed in detail in its own slide-set; see the Table of Contents

Q

Acute Primary Angle Closure Glaucoma



Glaucoma



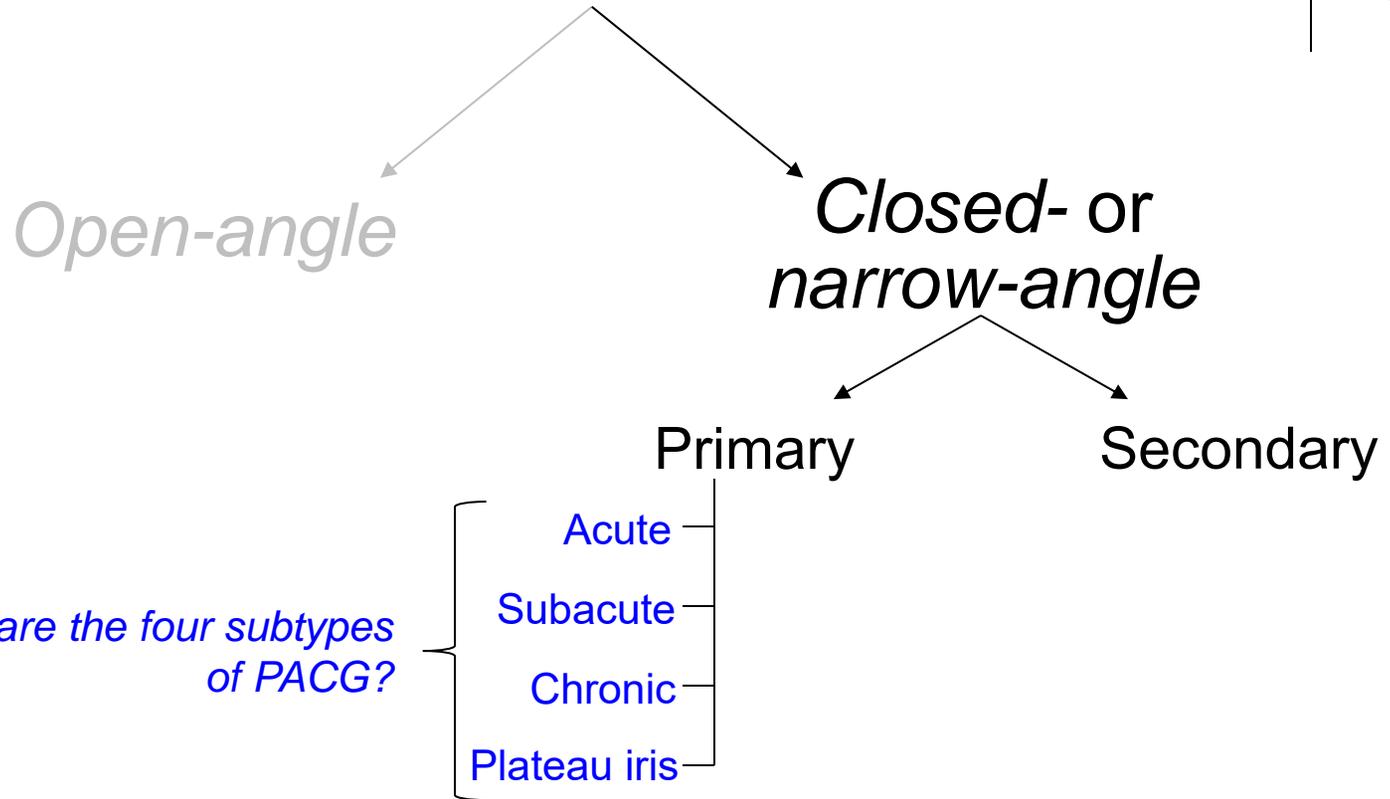
What are the four subtypes of PACG?

A

Acute Primary Angle Closure Glaucoma



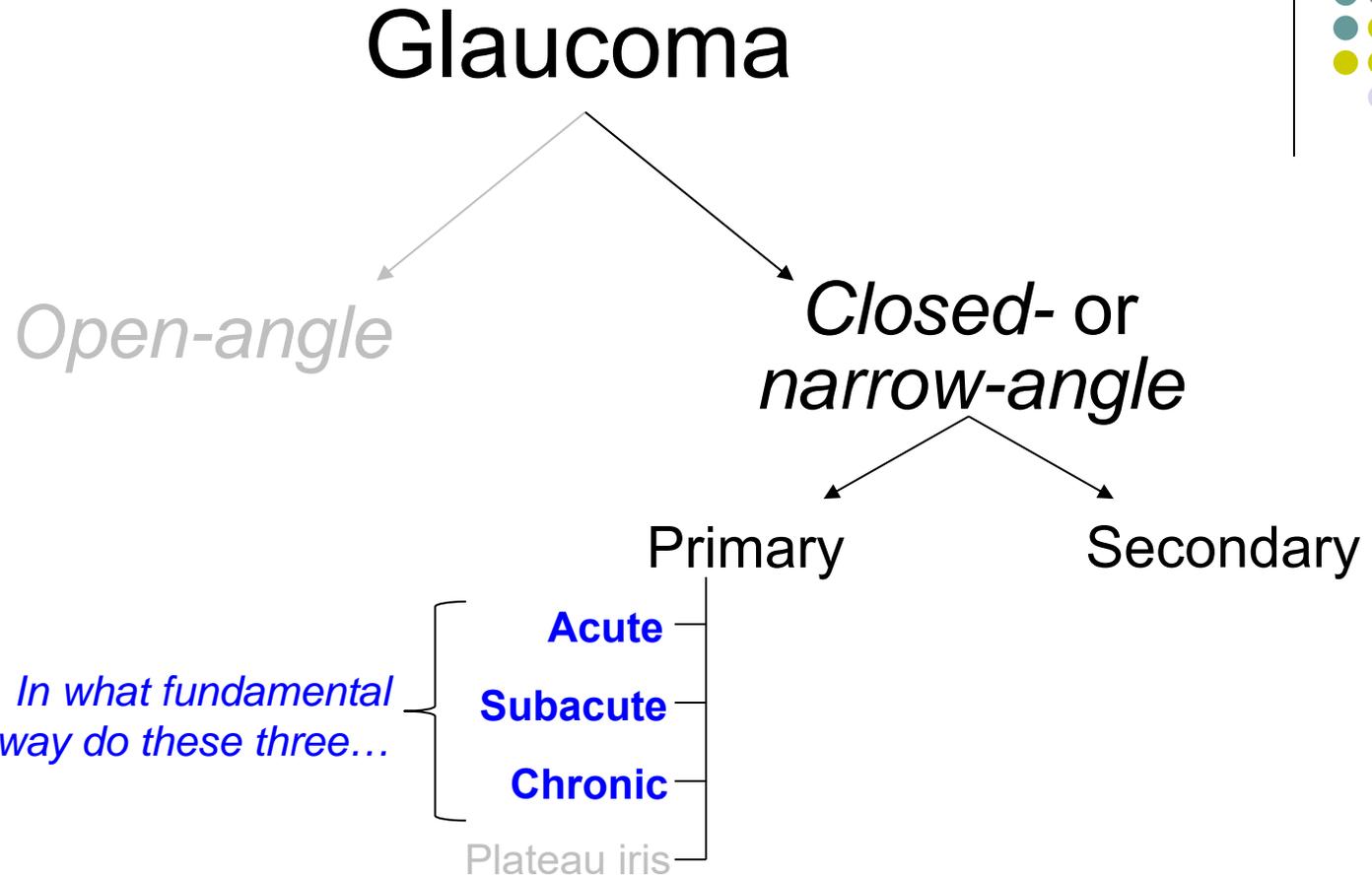
Glaucoma



What are the four subtypes of PACG?

Q

Acute Primary Angle Closure Glaucoma

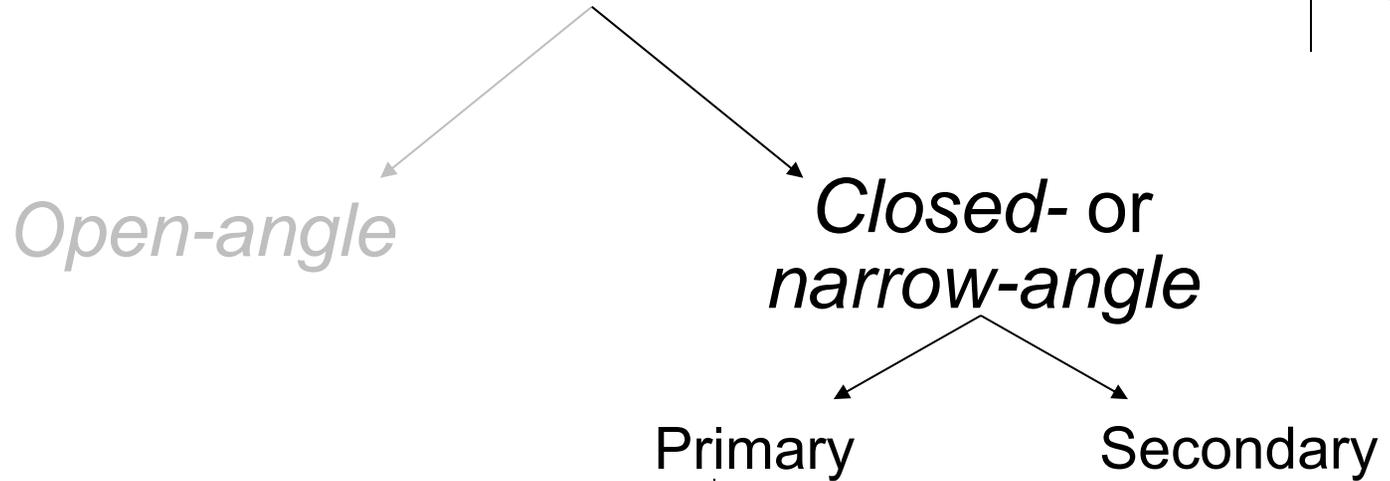


Q

Acute Primary Angle Closure Glaucoma



Glaucoma



*In what fundamental way do these three...
...differ from this one?*

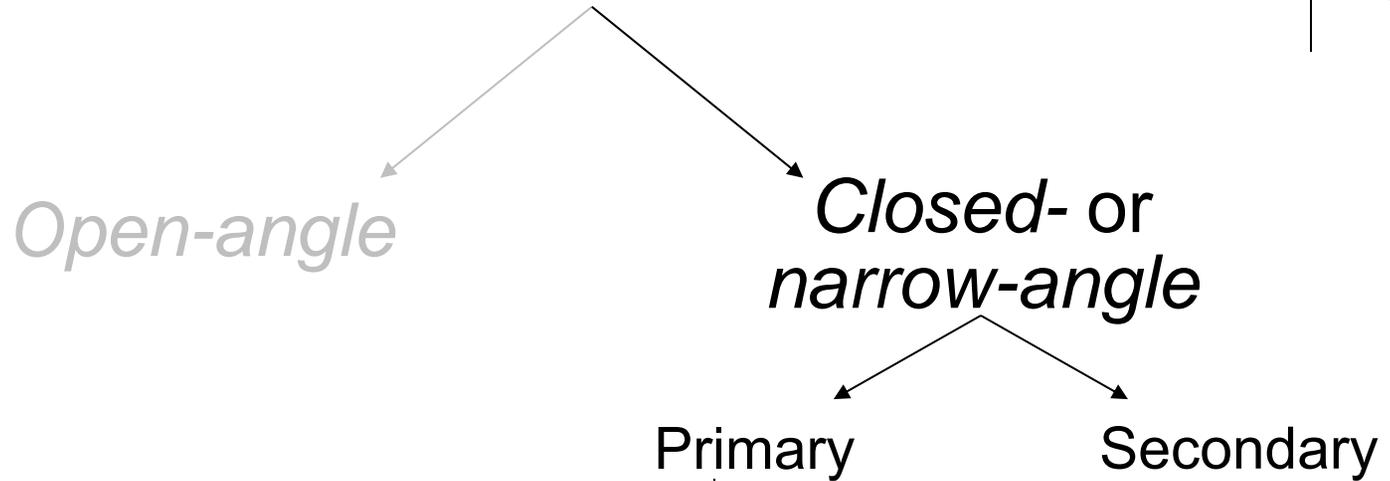
- Acute
- Subacute
- Chronic
- Plateau iris

Q

Acute Primary Angle Closure Glaucoma



Glaucoma



In what fundamental way do these three...

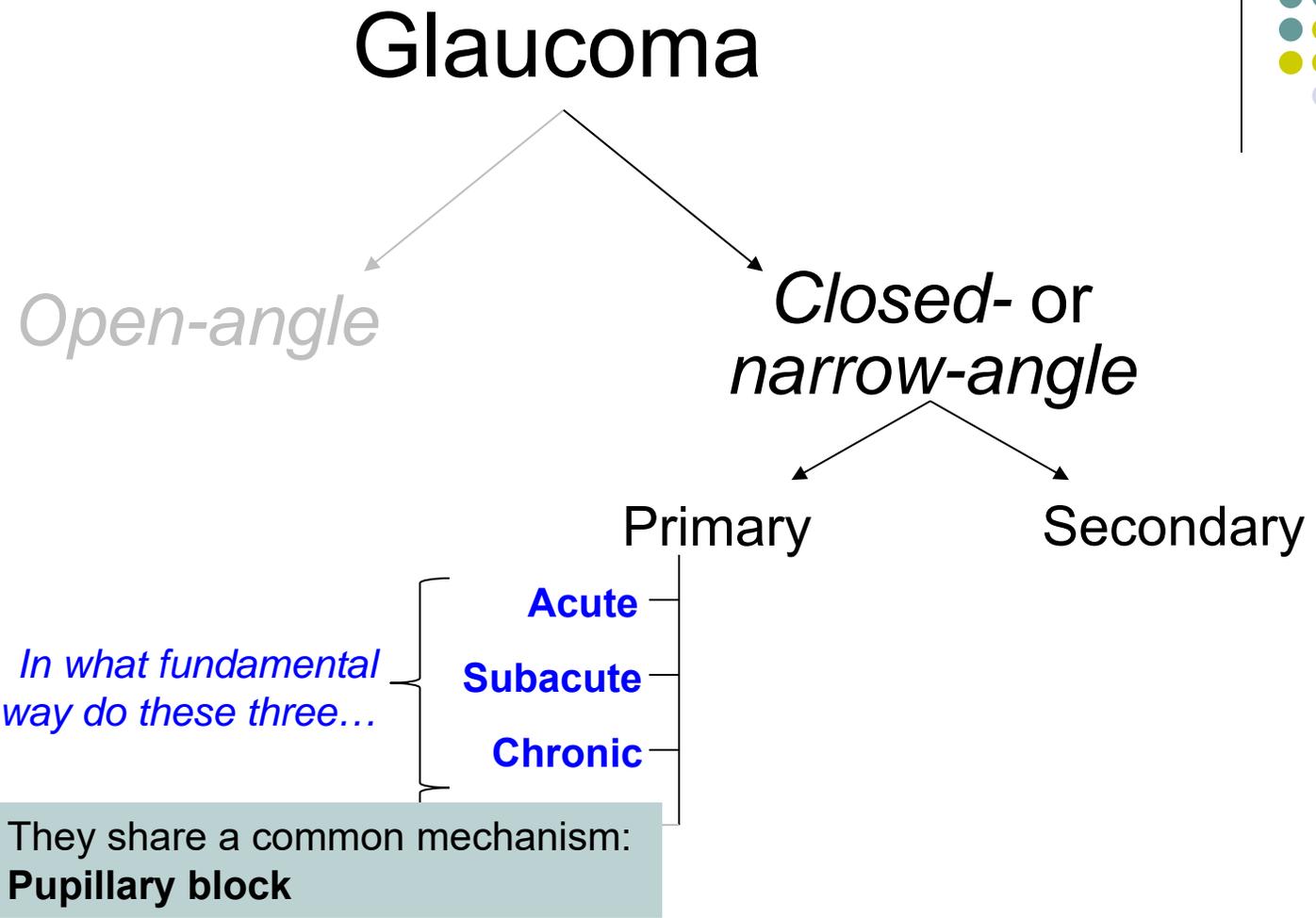
- Acute
- Subacute
- Chronic

They share a common mechanism:

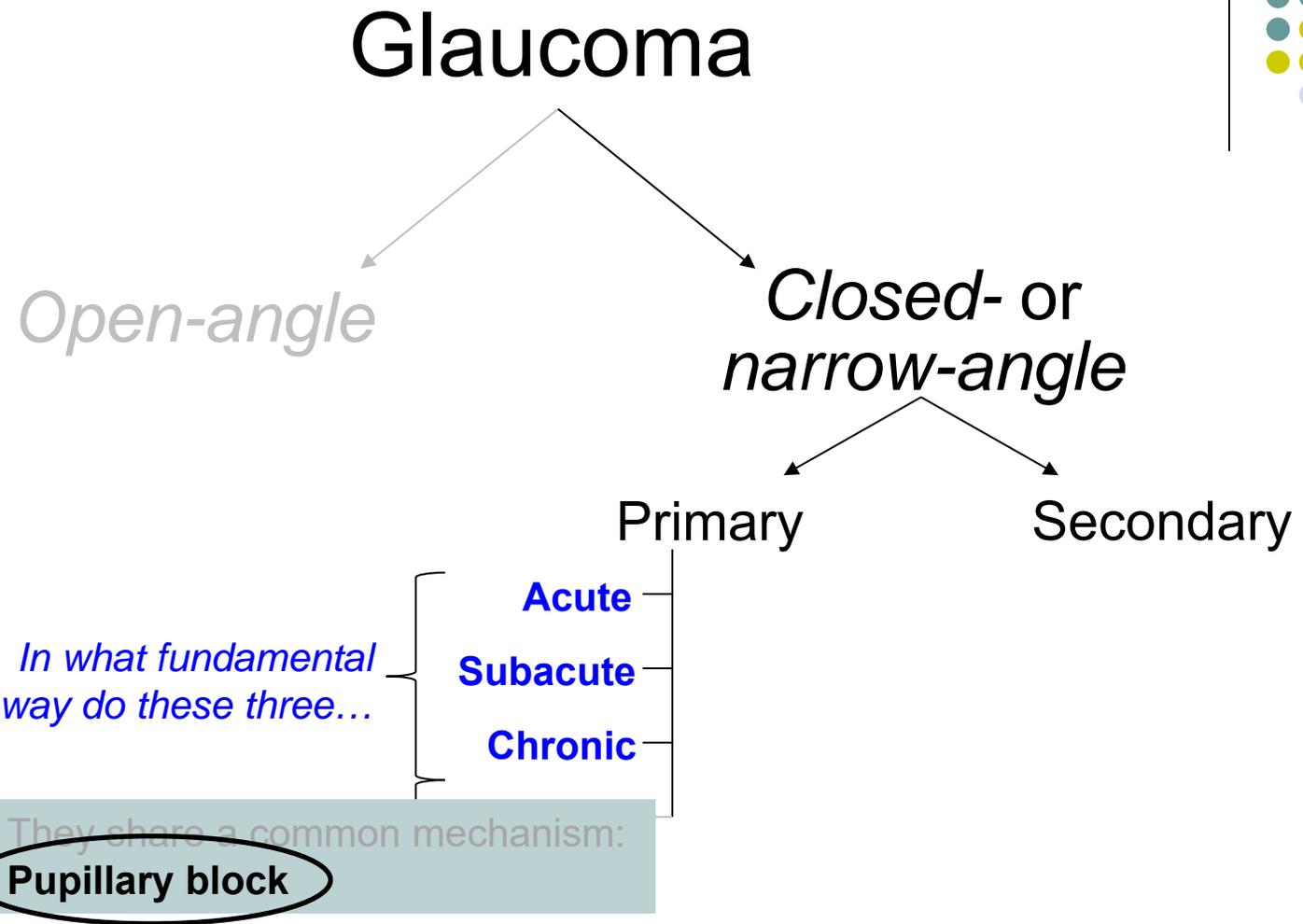
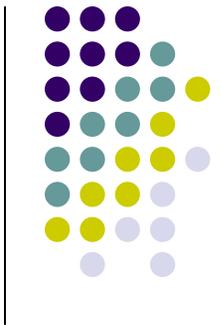
two words

A

Acute Primary Angle Closure Glaucoma



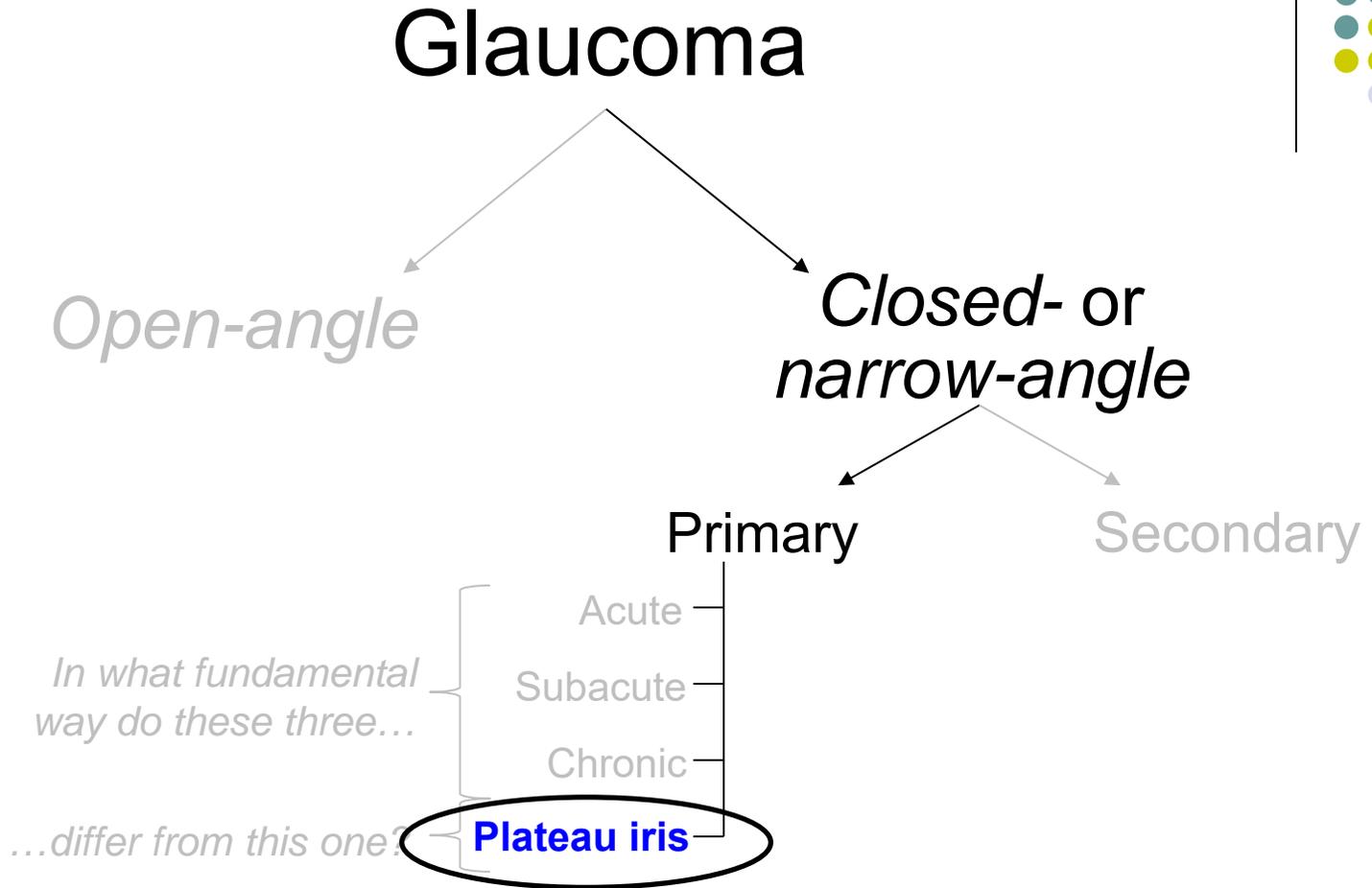
Acute Primary Angle Closure Glaucoma



(We will have much more to say about pupillary block shortly)

Q

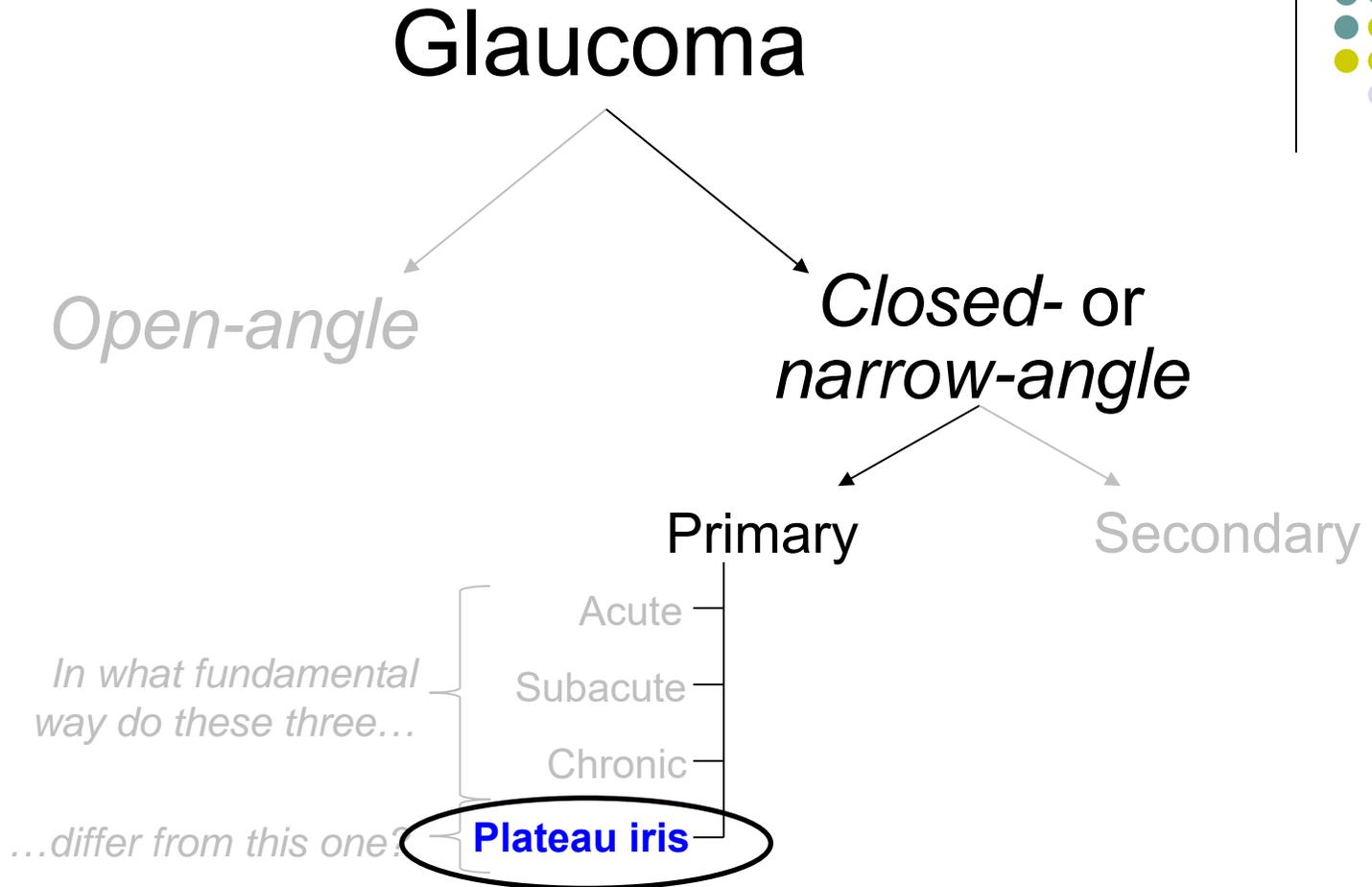
Acute Primary Angle Closure Glaucoma



What's the dealio with plateau iris syndrome?

Q/A

Acute Primary Angle Closure Glaucoma

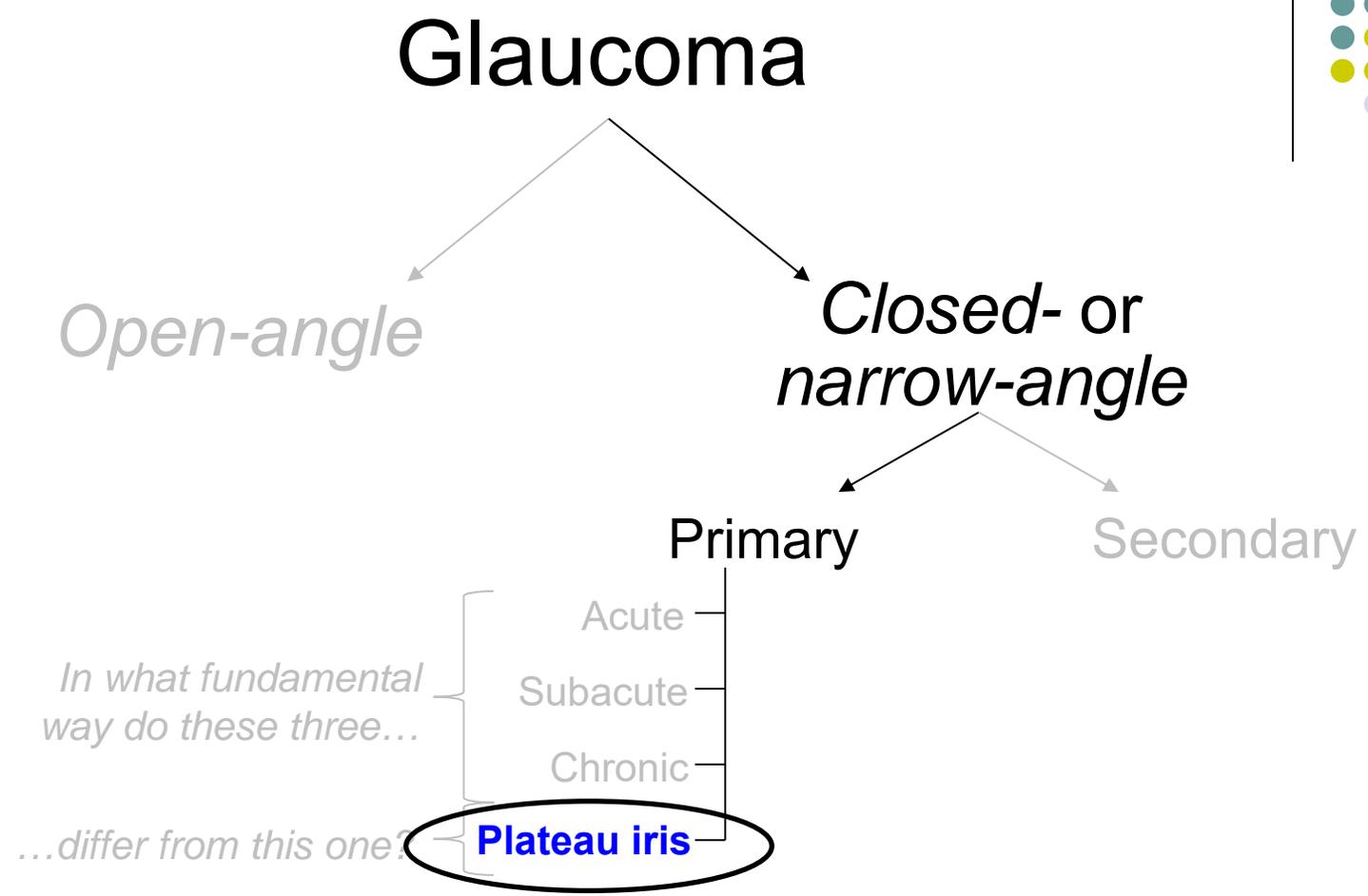


What's the dealio with plateau iris syndrome?

In plateau iris, angle closure is due 'bad anatomy.' Specifically, the **two words** are more **direction** than normal, which in turn displace the **two diff words** perilously close to the **two diff words**. (Some plateau-iris cases have a pupillary block component as well.)

A

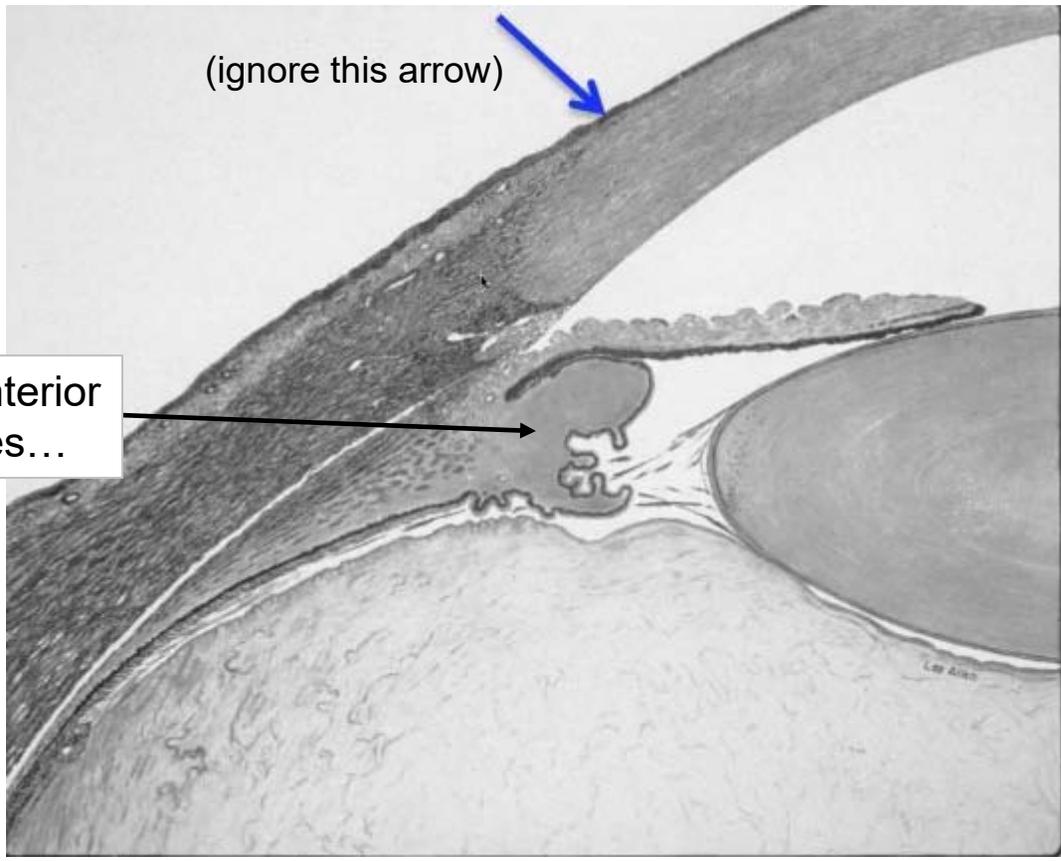
Acute Primary Angle Closure Glaucoma



What's the dealio with plateau iris syndrome?
In plateau iris, angle closure is due 'bad anatomy.' Specifically, the ciliary processes are more anterior than normal, which in turn displace the peripheral iris perilously close to the drainage angle. (Some plateau-iris cases have a pupillary block component as well.)



Acute Primary Angle Closure Glaucoma

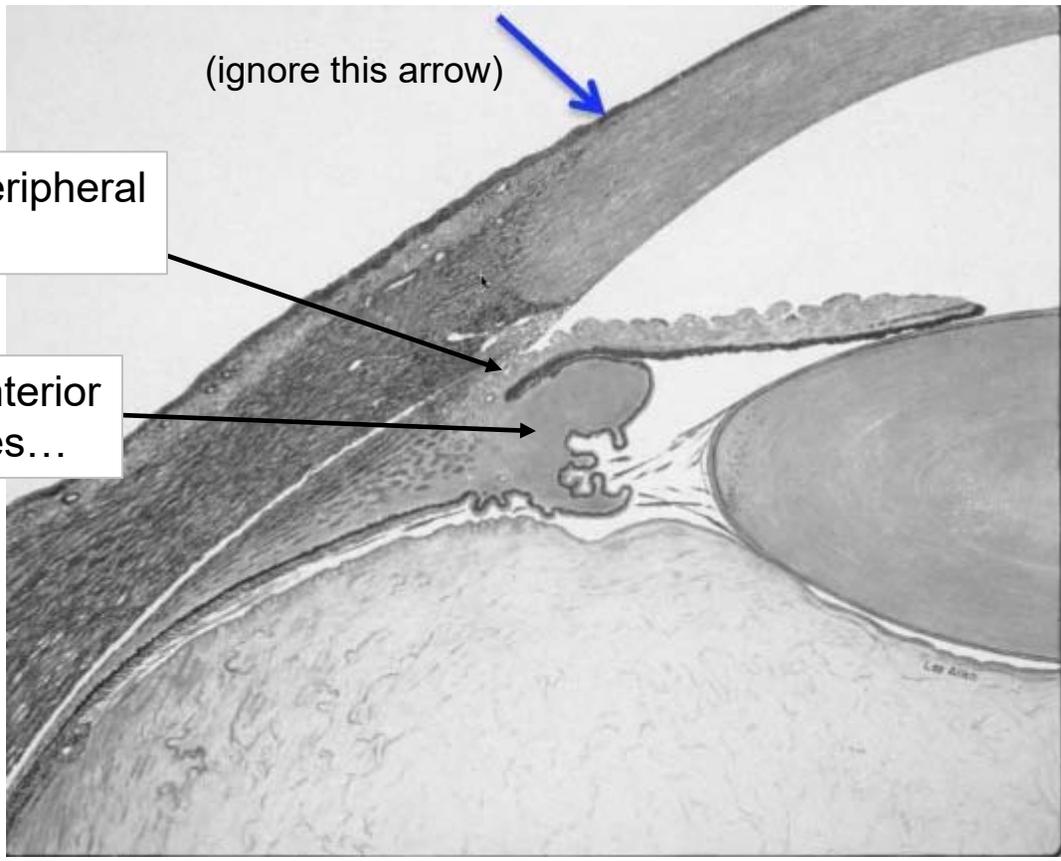


Note the too-anterior ciliary processes...

Plateau iris



Acute Primary Angle Closure Glaucoma



...displacing the peripheral iris into the angle

Note the too-anterior ciliary processes...

Plateau iris

Q

Acute Primary Angle Closure Glaucoma



Is there a racial predilection regarding the risk of PACG?

Q/A

Acute Primary Angle Closure Glaucoma



Is there a racial predilection regarding the risk of PACG?

Yes, individuals of [redacted] heritage have the highest known risk of PACG--their relative risk has been estimated to be as high as [redacted] #x that of whites.

A

Acute Primary Angle Closure Glaucoma

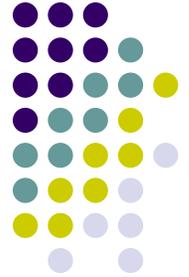


Is there a racial predilection regarding the risk of PACG?

Yes, individuals of **Inuit** heritage have the highest known risk of PACG--their relative risk has been estimated to be as high as **40x** that of whites.

Q

Acute Primary Angle Closure Glaucoma



Is there a racial predilection regarding the risk of PACG?

Yes, individuals of **Inuit** heritage have the highest known risk of PACG--their relative risk has been estimated to be as high as **40x** that of whites.

What about people of Asian descent?

A

Acute Primary Angle Closure Glaucoma



Is there a racial predilection regarding the risk of PACG?

Yes, individuals of **Inuit** heritage have the highest known risk of PACG--their relative risk has been estimated to be as high as **40x** that of whites.

What about people of Asian descent?

Their relative risk is somewhere between that of the Inuit and whites

Q

Acute Primary Angle Closure Glaucoma



Is there a racial predilection regarding the risk of PACG?

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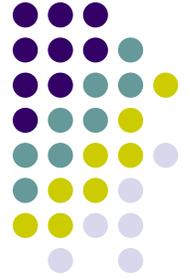
What about people of Asian descent?

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Is age a risk factor?

Q/A

Acute Primary Angle Closure Glaucoma



Is there a racial predilection regarding the risk of PACG?

Yes, individuals of **Inuit** heritage have the highest known risk of PACG--their relative risk has been estimated to be as high as **40x** that of whites.

What about people of Asian descent?

Their relative risk is somewhere between that of the Inuit and whites

Is age a risk factor?

Yes, the incidence **↑ vs ↓** with age

A

Acute Primary Angle Closure Glaucoma



Is there a racial predilection regarding the risk of PACG?

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Their relative risk is somewhere between that of the Inuit and whites

Is age a risk factor?

Yes, the incidence **increases** with age

Q

Acute Primary Angle Closure Glaucoma



Is there a racial predilection regarding the risk of PACG?

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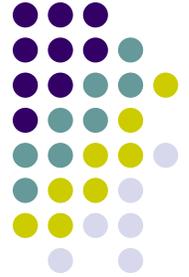
Is age a risk factor?

Yes, the incidence **increases** with age

Is gender a risk factor?

Q/A

Acute Primary Angle Closure Glaucoma



Is there a racial predilection regarding the risk of PACG?

Yes, individuals of **Inuit** heritage have the highest known risk of PACG--their relative risk has been estimated to be as high as **40x** that of whites.

What about people of Asian descent?

Their relative risk is somewhere between that of the Inuit and whites

Is age a risk factor?

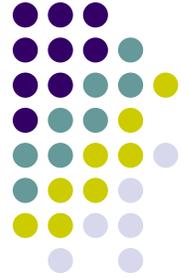
Yes, the incidence **increases** with age

Is gender a risk factor?

Yes, **males** are at higher risk

A

Acute Primary Angle Closure Glaucoma



Is there a racial predilection regarding the risk of PACG?

Yes, individuals of **Inuit** heritage have the highest known risk of PACG--their relative risk has been estimated to be as high as **40x** that of whites.

What about people of Asian descent?

Their relative risk is somewhere between that of the Inuit and whites

Is age a risk factor?

Yes, the incidence **increases** with age

Is gender a risk factor?

Yes, **women** are at higher risk

Q

Acute Primary Angle Closure Glaucoma



Is there a racial predilection regarding the risk of PACG?

Yes, individuals of **Inuit** heritage have the highest known risk of PACG--their relative risk has been estimated to be as high as **40x** that of whites.

What about people of Asian descent?

Their relative risk is somewhere between that of the Inuit and whites

Is age a risk factor?

Yes, the incidence **increases** with age

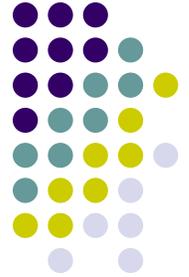
Is gender a risk factor?

Yes, **women** are at higher risk

Is refraction a risk factor?

Q/A

Acute Primary Angle Closure Glaucoma



Is there a racial predilection regarding the risk of PACG?

Yes, individuals of **Inuit** heritage have the highest known risk of PACG--their relative risk has been estimated to be as high as **40x** that of whites.

What about people of Asian descent?

Their relative risk is somewhere between that of the Inuit and whites

Is age a risk factor?

Yes, the incidence **increases** with age

Is gender a risk factor?

Yes, **women** are at higher risk

Is refraction a risk factor?

Yes; PACG is more likely to occur in **[redacted]**

A

Acute Primary Angle Closure Glaucoma



Is there a racial predilection regarding the risk of PACG?

Yes, individuals of **Inuit** heritage have the highest known risk of PACG--their relative risk has been estimated to be as high as **40x** that of whites.

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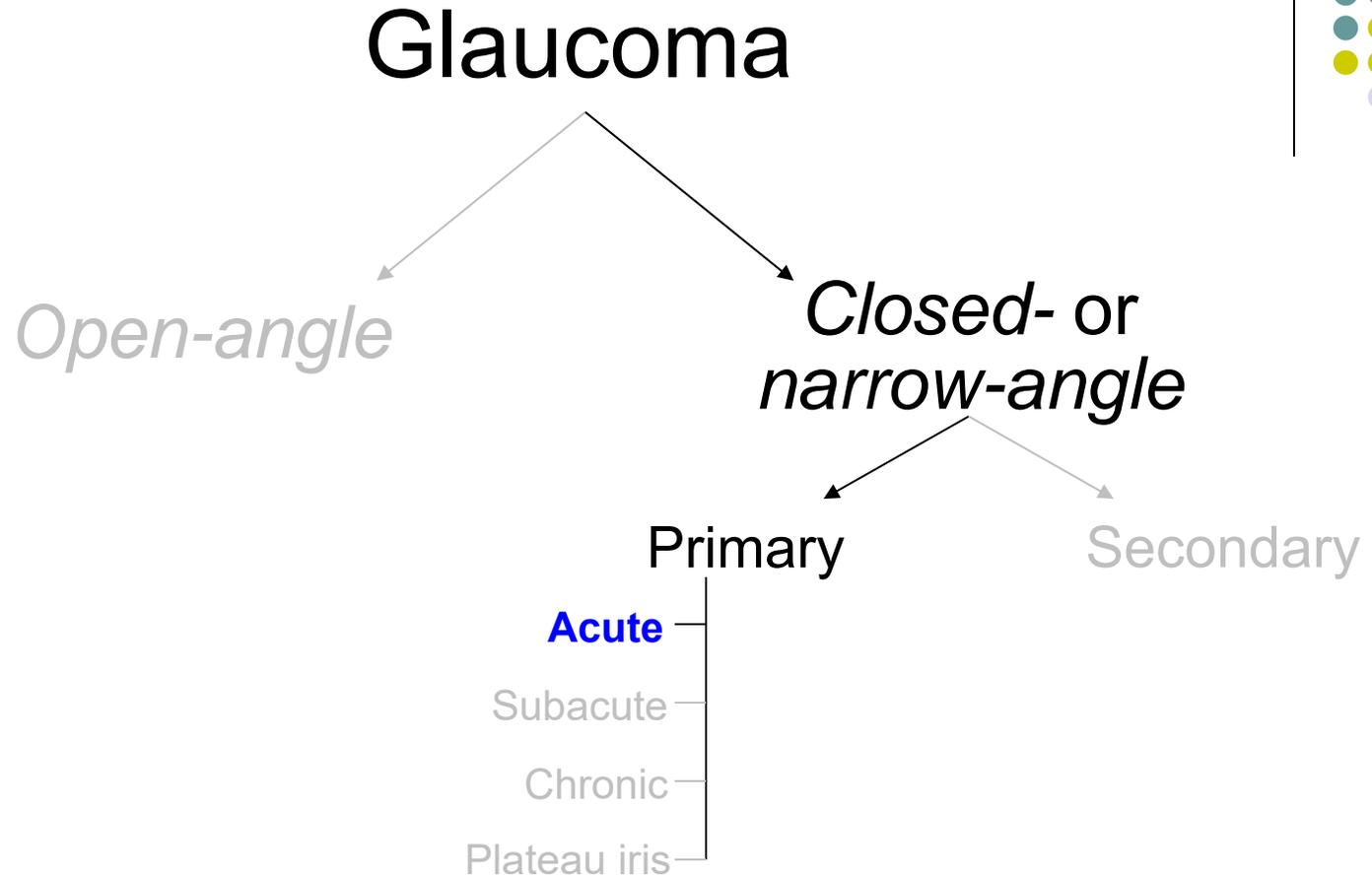
Is gender a risk factor?

Yes, **women** are at higher risk

Is refraction a risk factor?

Yes; PACG is more likely to occur in **hyperopes**

Acute Primary Angle Closure Glaucoma



Next let's look at **acute primary angle-closure glaucoma** in more detail
(the other forms of PACG are addressed in slide-set G18)

Q

Acute Primary Angle Closure Glaucoma

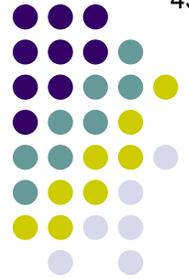
- *Acute PACG mechanism:*



A

Acute Primary Angle Closure Glaucoma

- *Acute PACG mechanism: Pupillary block*



Q

Acute Primary Angle Closure Glaucoma

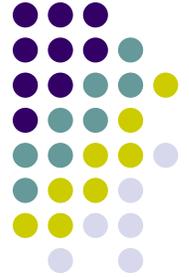
- *Acute PACG mechanism:* Pupillary block



What does pupillary block refer to, exactly?

Q/A

Acute Primary Angle Closure Glaucoma



- *Acute PACG mechanism: Pupillary block*

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

It refers to contact between the and the that impedes the normal flow of aqueous from the to the through the pupillary aperture.

A

Acute Primary Angle Closure Glaucoma

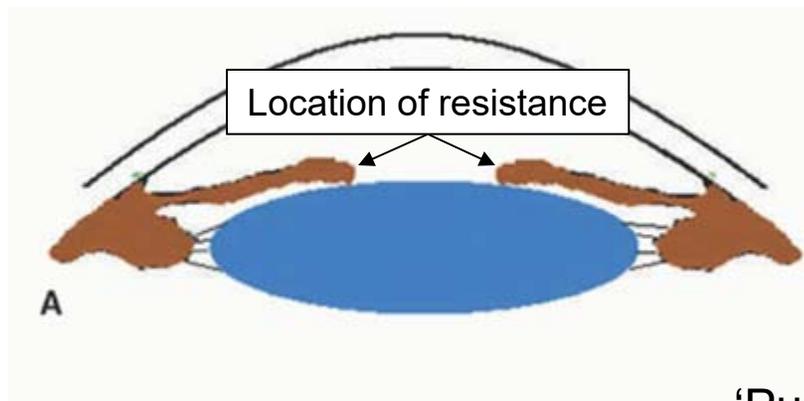
- *Acute PACG mechanism: Pupillary block*



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

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

Acute Primary Angle Closure Glaucoma

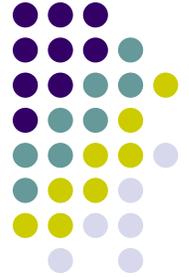


1. *Resistance to aqueous flow from the PC to the AC*

'Pupillary block'

Q/A

Acute Primary Angle Closure Glaucoma



- *Acute PACG mechanism: Pupillary block*

What does pupillary block refer to, exactly?

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

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

A

Acute Primary Angle Closure Glaucoma

- *Acute PACG mechanism: Pupillary block*



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

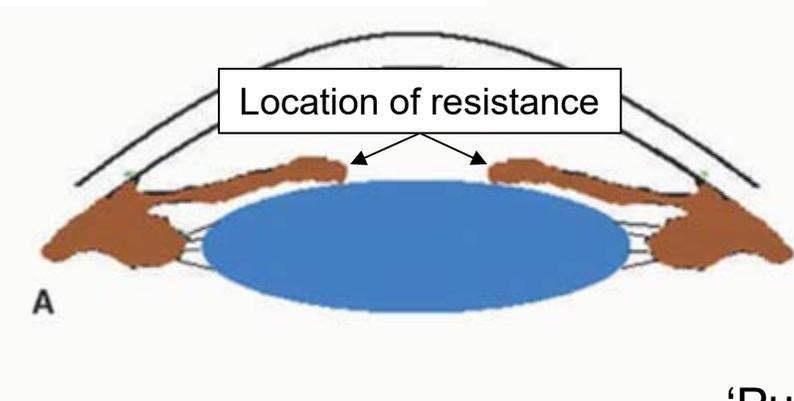
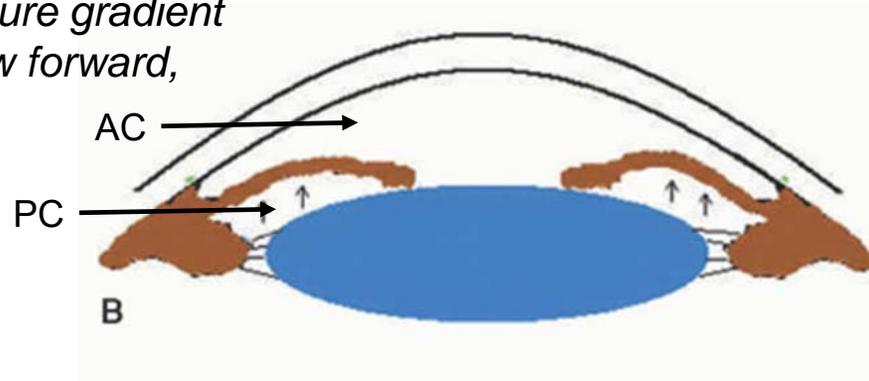
It refers to contact between the pupil margin and the lens that impedes the normal flow of aqueous from the posterior chamber (PC) to the anterior chamber (AC) through the pupillary aperture.

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



Acute Primary Angle Closure Glaucoma

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



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

'Pupillary block'

A

Acute Primary Angle Closure Glaucoma

- *Acute PACG mechanism: Pupillary block*



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

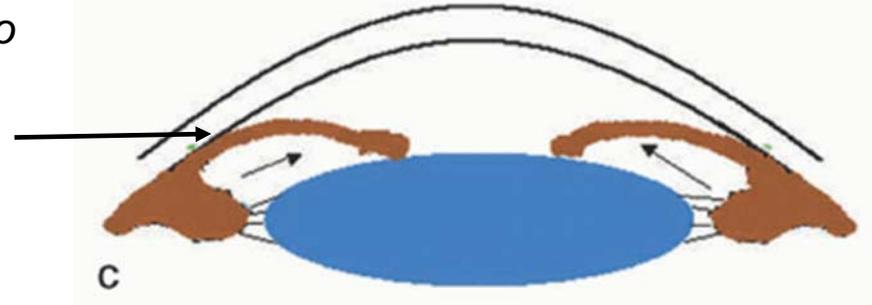
It refers to contact between the pupil margin and the lens that impedes the normal flow of aqueous from the posterior chamber (PC) to the anterior chamber (AC) through the pupillary aperture.

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

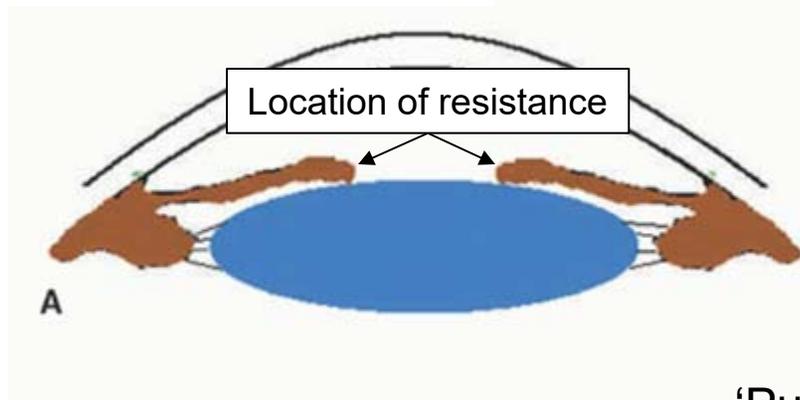
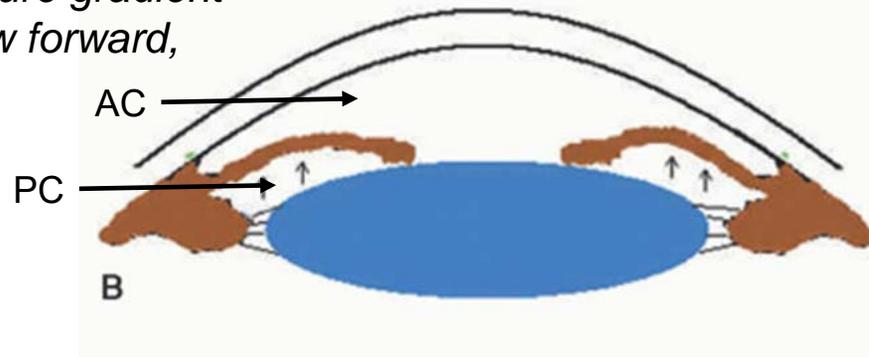


Acute Primary Angle Closure Glaucoma

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



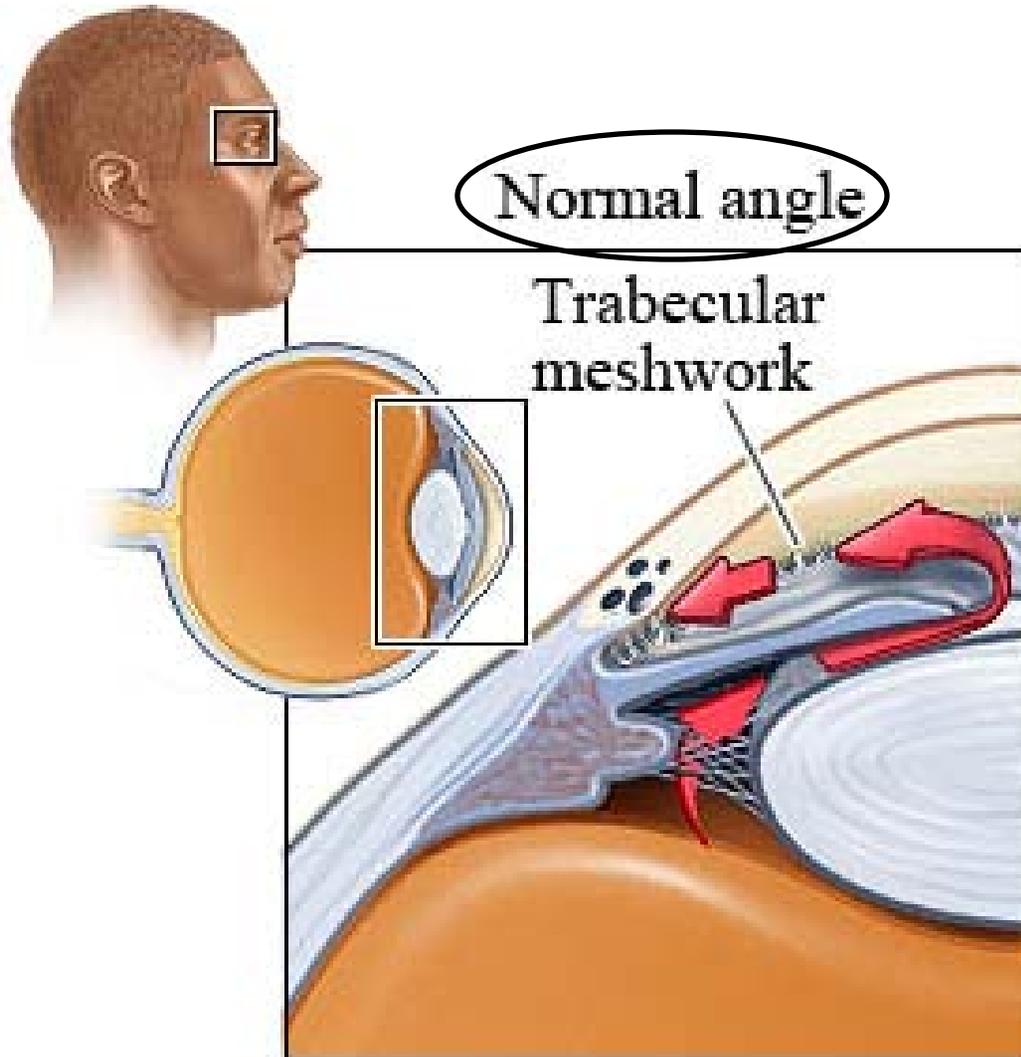
2. The $PC > AC$ pressure gradient causes the iris to bow forward, like a sail in the wind



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

'Pupillary block'

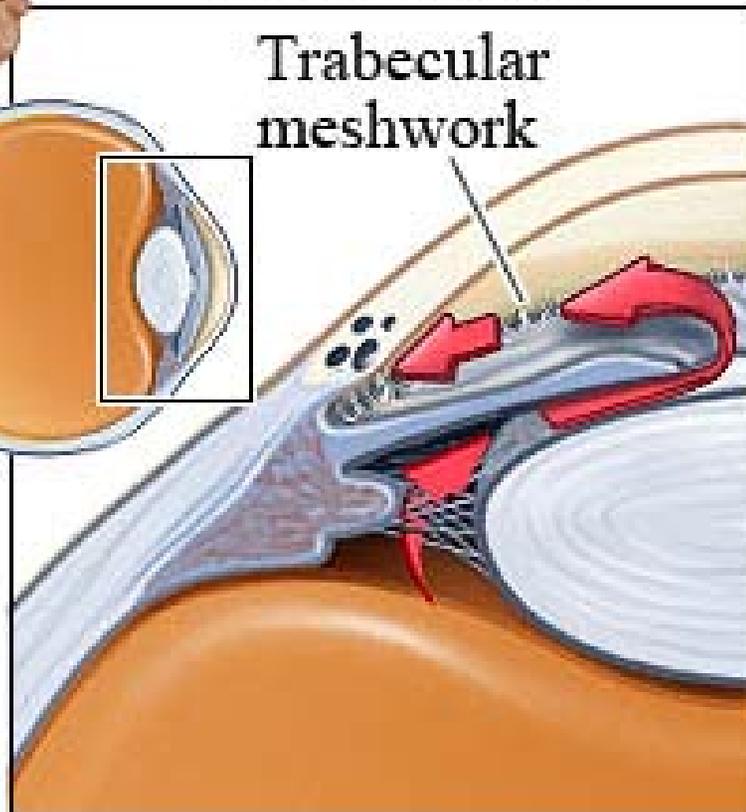
Acute Primary Angle Closure Glaucoma



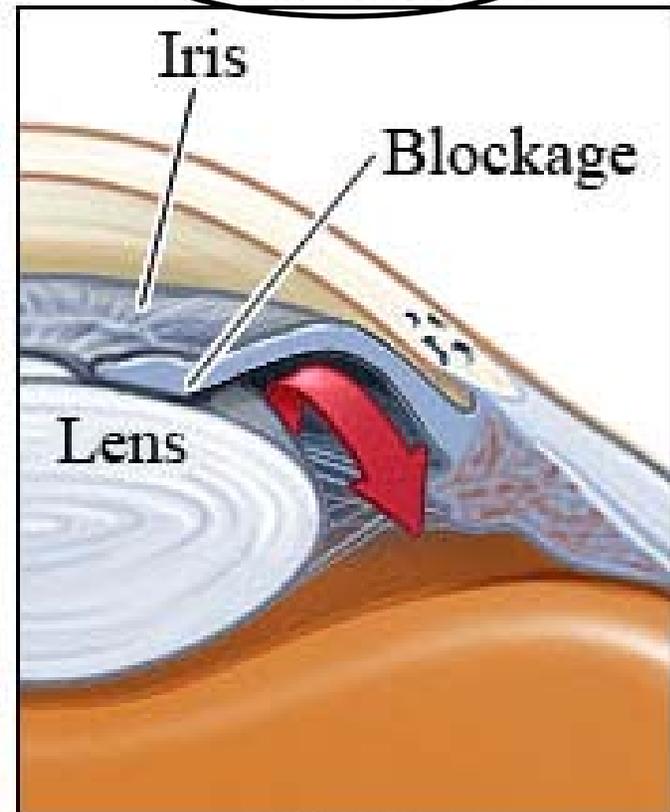
Acute Primary Angle Closure Glaucoma



Normal angle



Angle closure



Q

Acute Primary Angle Closure Glaucoma

- *Acute PACG mechanism: Pupillary block*



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

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

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

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

Q/A

Acute Primary Angle Closure Glaucoma



- *Acute PACG mechanism: Pupillary block*

What does pupillary block refer to, exactly?

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

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

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

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

A

Acute Primary Angle Closure Glaucoma



- *Acute PACG mechanism: Pupillary block*

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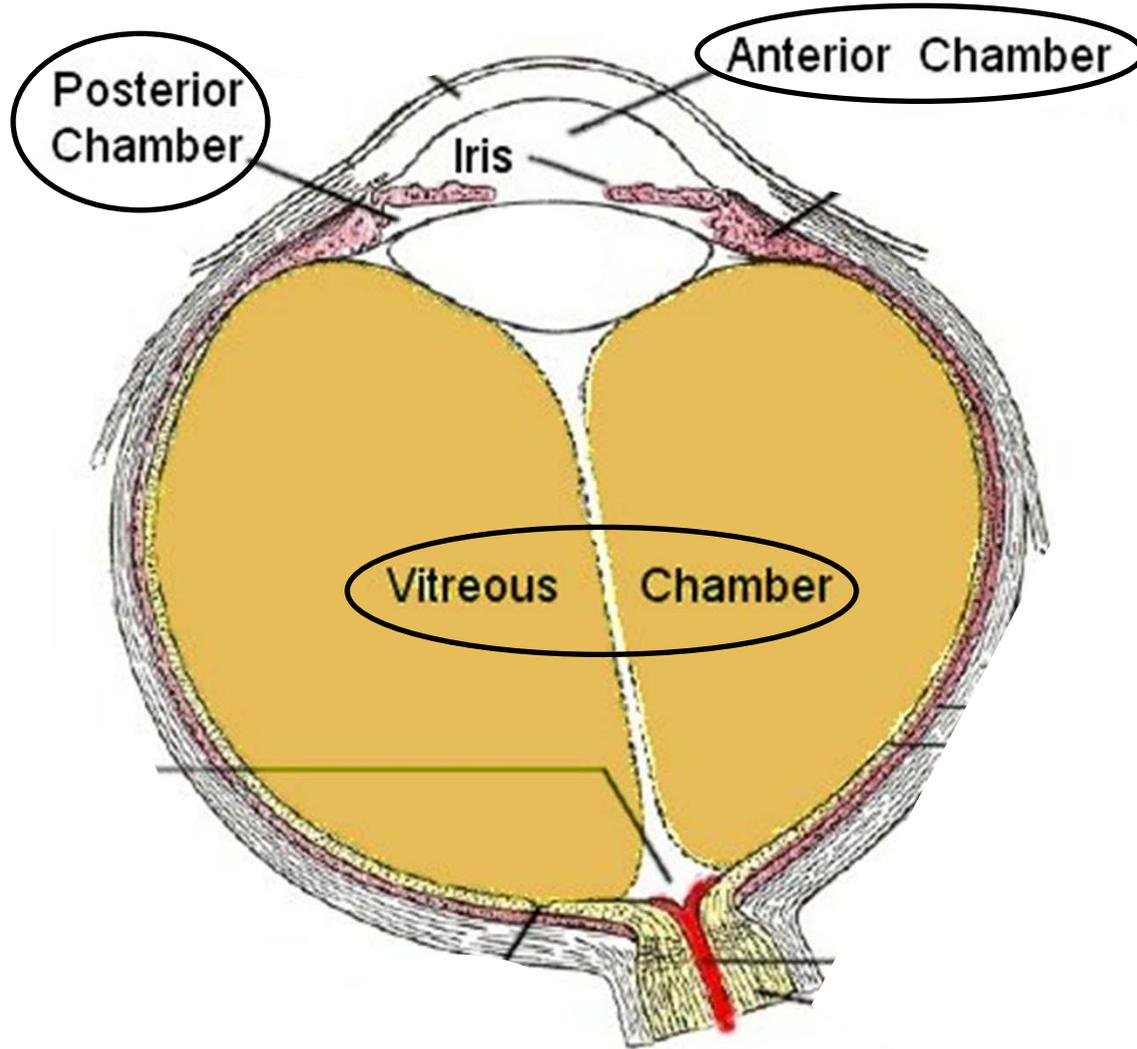
Pupillary block leads to the development of a pressure gradient across the iris, which causes the iris to bow forward. **If the iris bows far enough, the peripheral iris will come into apposition with and occlude the drainage angle, precipitating acute closure of the angle and a prodigious rise in IOP.**

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

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.



Acute Primary Angle Closure Glaucoma





Q

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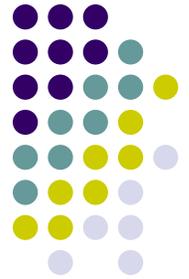
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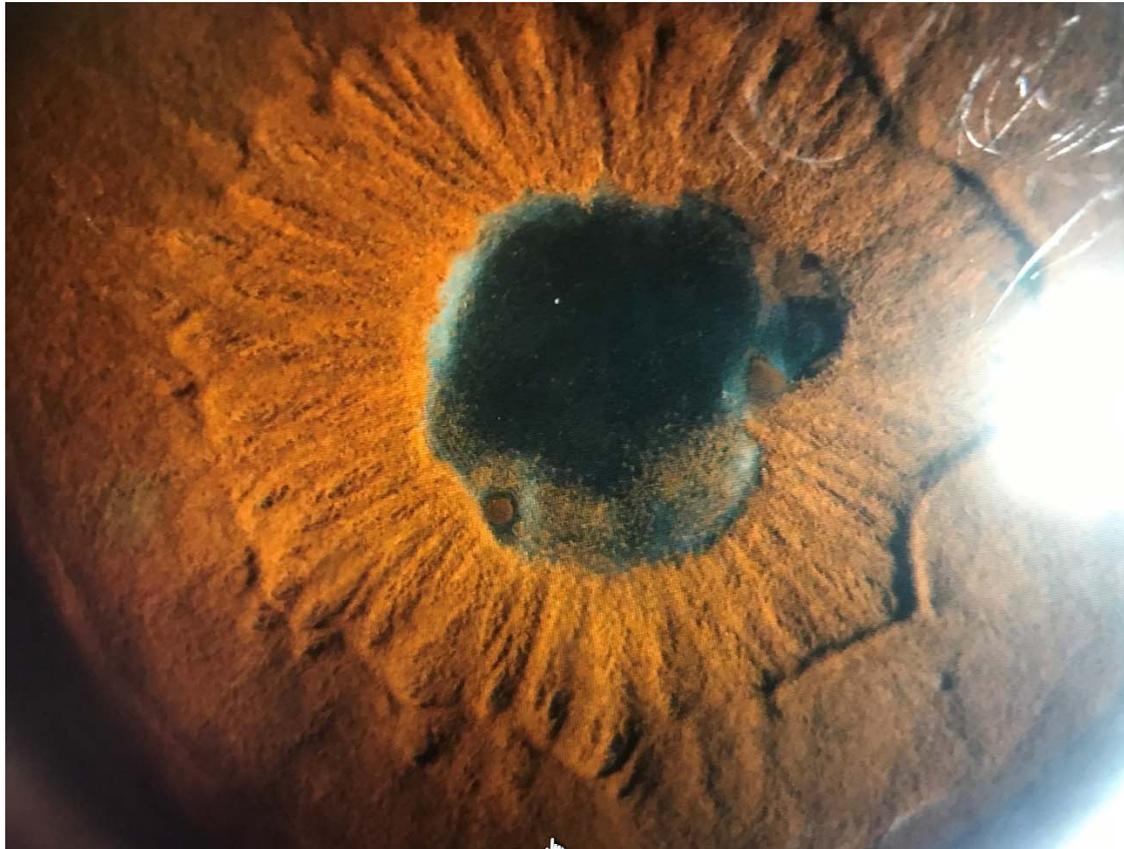
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Acute Primary Angle Closure Glaucoma



Posterior synechiae





Q

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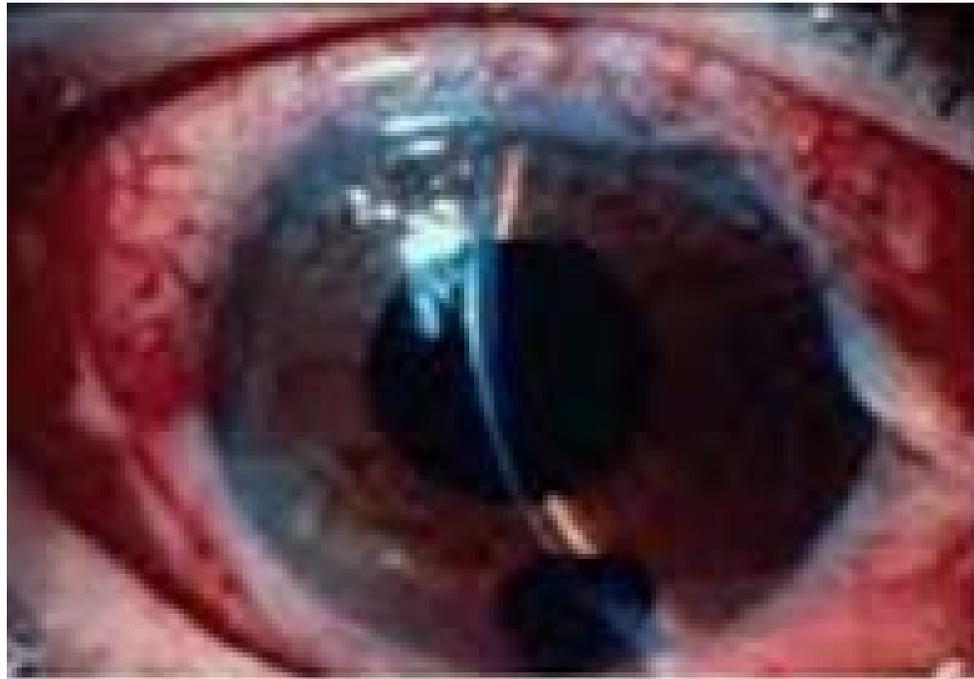
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Acute Primary Angle Closure Glaucoma



Silicone oil producing pupillary block



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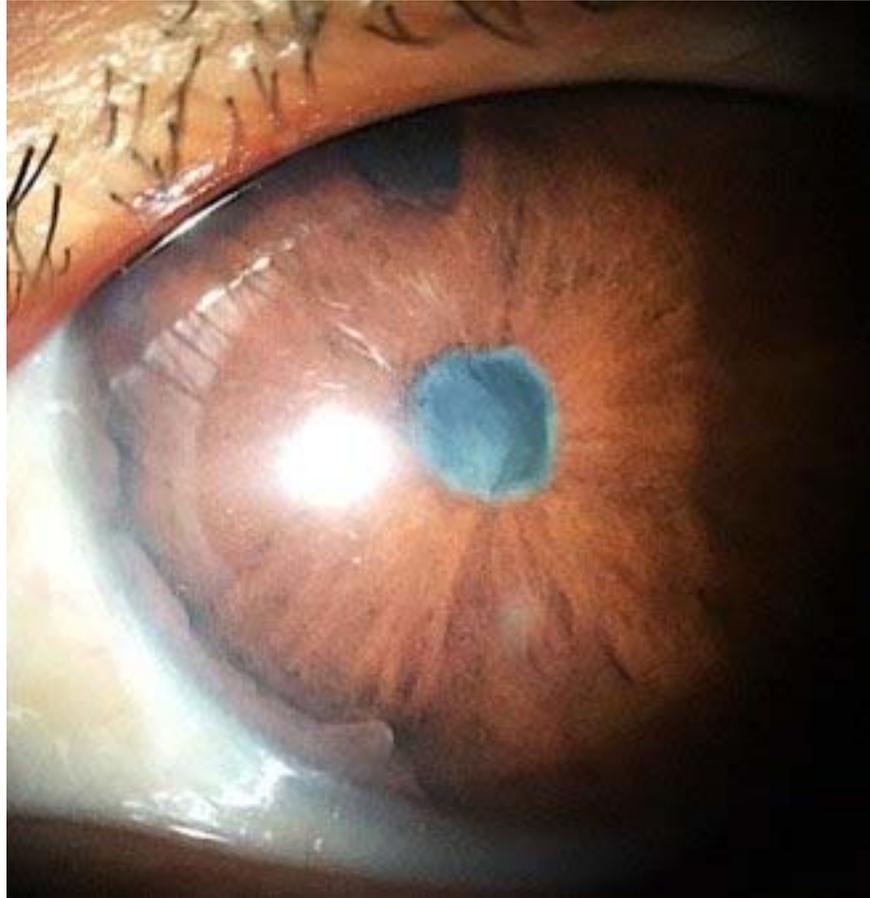
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Acute Primary Angle Closure Glaucoma



Seclusio pupillae. Note also the presence of PAS





Q

Acute Primary Angle Closure Glaucoma

- *Acute PACG: Symptoms*

-
-
-
-
-

What are the typical manifestations of acute PACG?



A

Acute Primary Angle Closure Glaucoma

● *Acute PACG: Symptoms*

- Severe eye pain
- Severe HA
- Blurred vision
- Haloes around lights
- Nausea/vomiting

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Elevated IOP → endothelial-cell dysfunction



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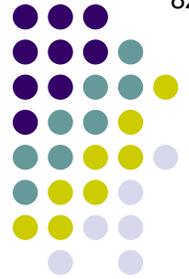
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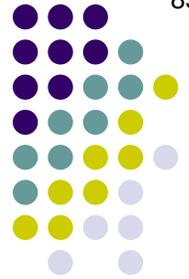
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The haloes are said to have a particular appearance—what is it?

They are

two words



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They are **'rainbow-colored'**



Q

Acute Primary Angle Closure Glaucoma

- *Acute PACG: Signs*
 - High duh



A

Acute Primary Angle Closure Glaucoma

- *Acute PACG: Signs*
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Q

Acute Primary Angle Closure Glaucoma

- *Acute PACG: Signs*

- High IOP

- Pupil is , , and



A

Acute Primary Angle Closure Glaucoma

- *Acute PACG: Signs*

- High IOP
- Pupil is mid-dilated, sluggish, and out-of-round

Acute Primary Angle Closure Glaucoma



Acute PACG: Mid-dilated, OOR pupil



Q

Acute Primary Angle Closure Glaucoma

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- High IOP
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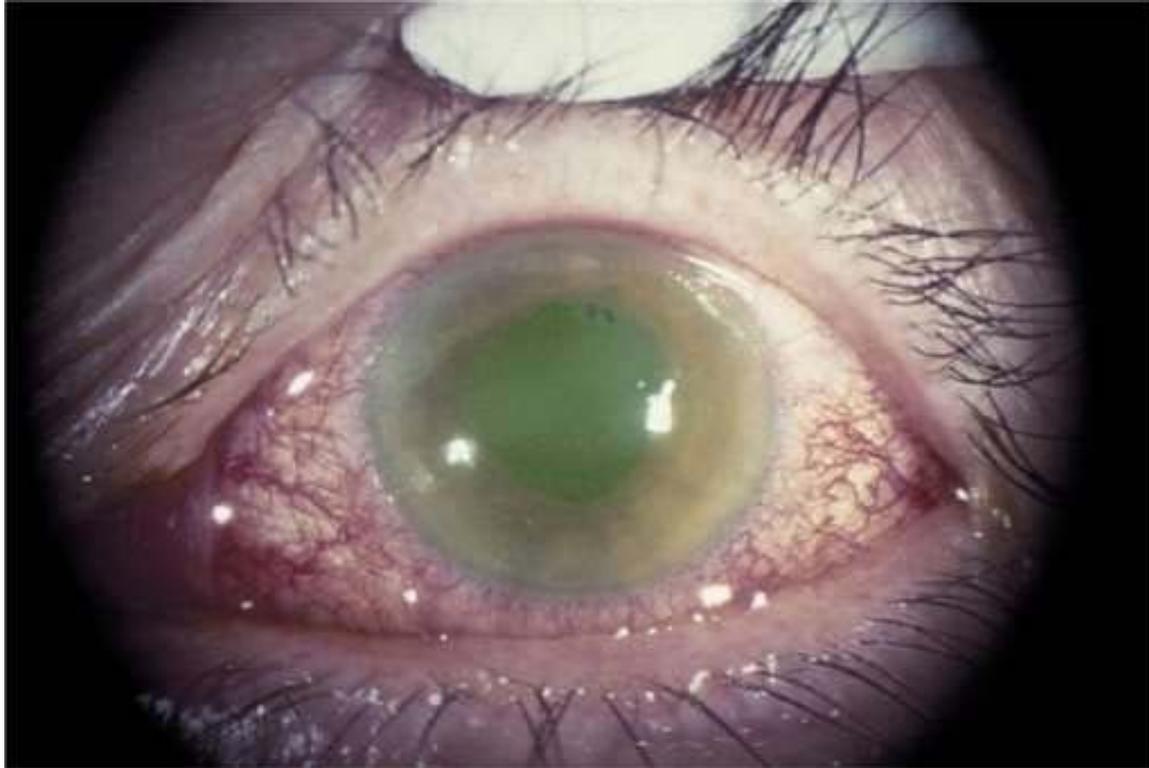
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- Pupil is mid-dilated, sluggish, and out-of-round
- Cornea is cloudy

Acute Primary Angle Closure Glaucoma



Acute PACG: Cloudy cornea





Q

Acute Primary Angle Closure Glaucoma

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Why is the cornea cloudy?



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Acute Primary Angle Closure Glaucoma

- *Acute PACG: Signs*

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Why is the cornea cloudy?

The same edema that's affecting vision



Q

Acute Primary Angle Closure Glaucoma

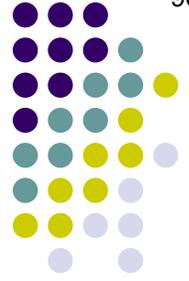
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'Steamy'



Q

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- Pupil is mid-dilated, sluggish, and out-of-round
- Cornea is cloudy
- AC: with mild and



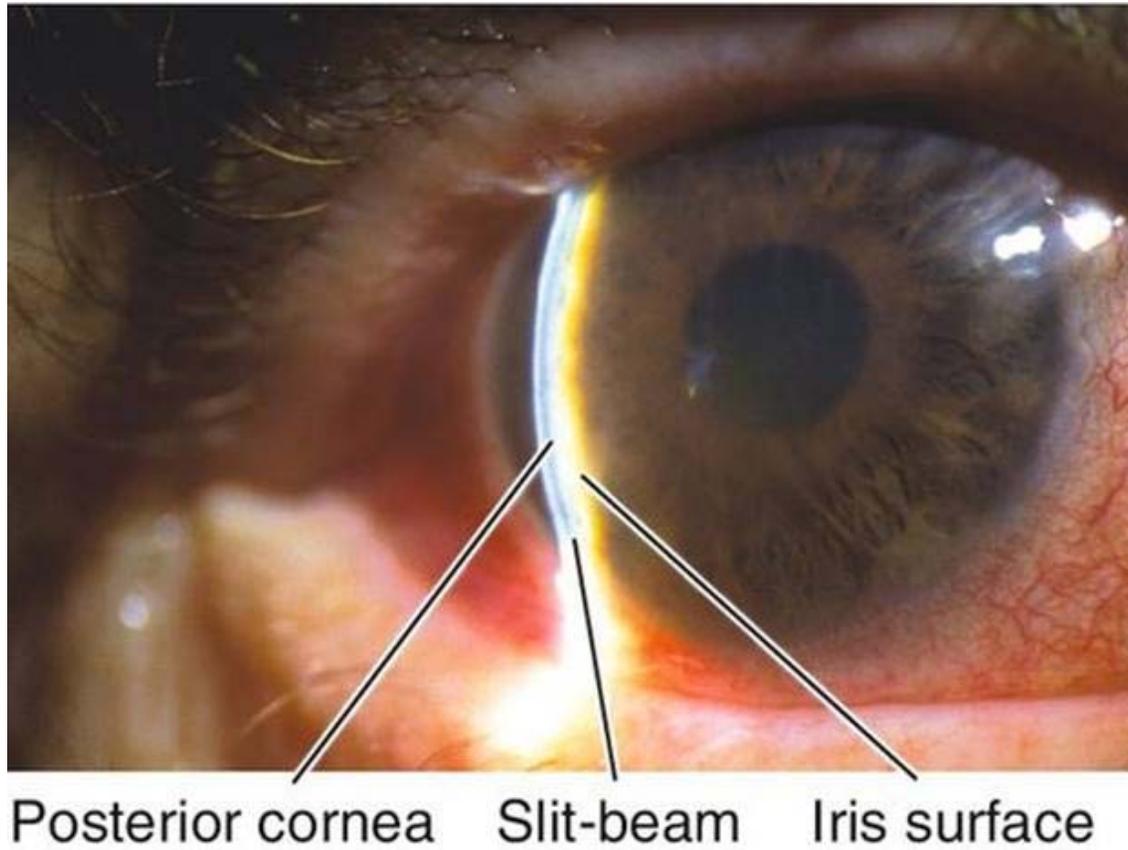
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- High IOP
- Pupil is mid-dilated, sluggish, and out-of-round
- Cornea is cloudy
- AC: Shallow with mild cell and flare

Acute Primary Angle Closure Glaucoma



Acute PACG: Shallow AC





Q

Acute Primary Angle Closure Glaucoma

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- ONH may be



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- ONH may be **edematous**
- Germanic word = opacities of the sub-anterior lens capsule (evidence of *previous* acute attacks)



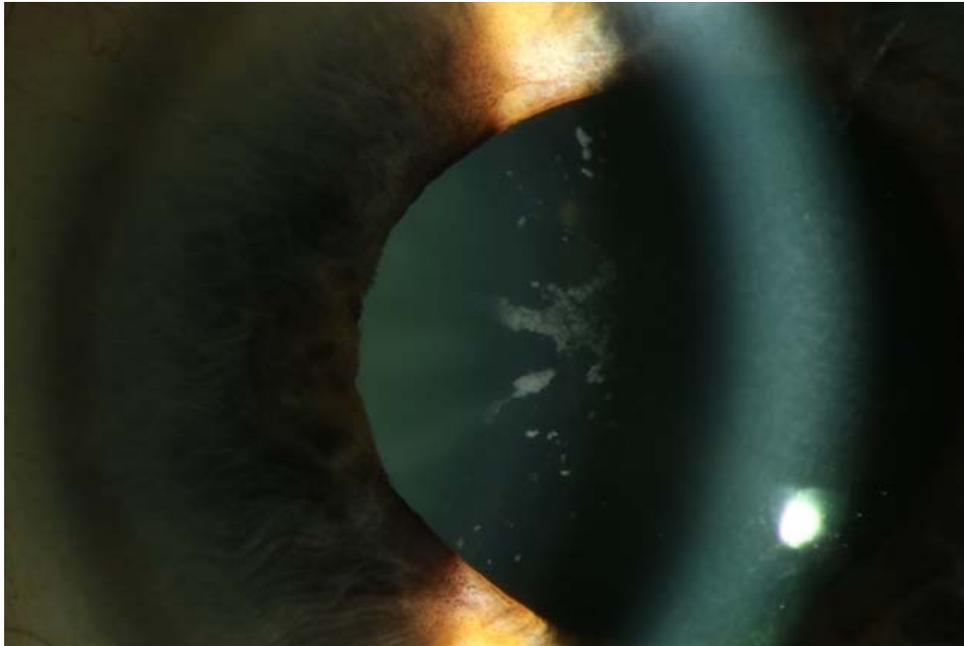
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Acute Primary Angle Closure Glaucoma



Glaukomflecken



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What causes glaucomflecken?



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What causes glaucomflecken?
Necrosis of the lens epithelium



Q

Acute Primary Angle Closure Glaucoma

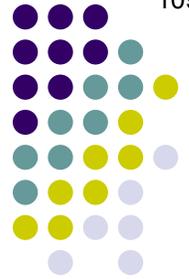
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 - What exam maneuver **must** be performed to diagnose acute PACG?



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Acute Primary Angle Closure Glaucoma

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Q

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Gonioscopy in acute PACG has three objectives. What are they?

--First:

--Second

--Third



Q/A

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- *Acute PACG: Diagnosis*

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Q/A

Acute Primary Angle Closure Glaucoma

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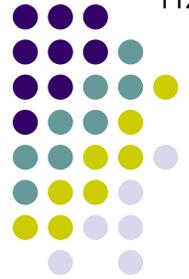
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--First: Confirm that the angle is in fact closed

--Second: Ascertain whether the iris-angle touch is appositional vs synechial

--Third:



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Acute Primary Angle Closure Glaucoma

- *Acute PACG: Diagnosis*

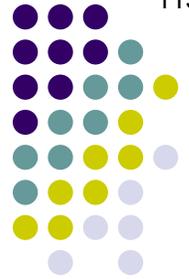
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Q

Acute Primary Angle Closure Glaucoma

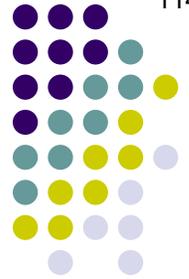
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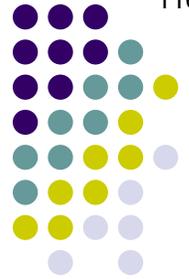
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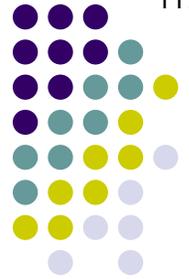
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OK, but how are you supposed to gonio a cloudy cornea?

By first taking steps to un-cloudy it



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What two steps should be taken to clear the corneal edema?

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Q/A

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What two steps should be taken to clear the corneal edema?

--Lower the IOP with two words

--



A

Acute Primary Angle Closure Glaucoma

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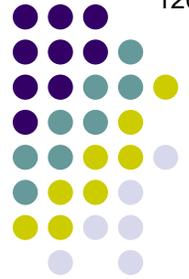
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Q/A

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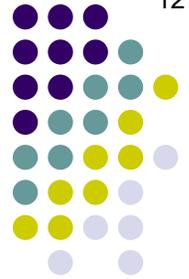
No, it really needs to be done

OK, but how are you supposed to gonio a cloudy cornea?

By first taking steps to un-cloudy it

What two steps should be taken to clear the corneal edema?

- Lower the IOP with hypotensive agents
- Directly clear the epithelial edema with topical



A

Acute Primary Angle Closure Glaucoma

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What two steps should be taken to clear the corneal edema?

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No, it really shouldn't. **Which hypotensive agents should be used?**

--

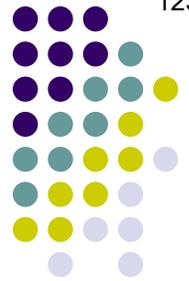
OK, but how do you break the attack?

By first taking

--

What two steps should be taken to clear the corneal edema?

- Lower the IOP with **hypotensive agents**
- Directly clear the epithelial edema with topical glycerin



A

Acute Primary Angle Closure Glaucoma

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OK, but how about *Prostaglandins*?

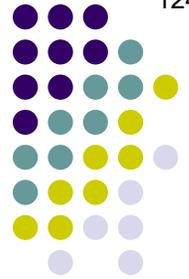
By first taking *Highly selective α_2 agonist*

--Carbonic anhydrase inhibitors

What two steps should be taken to clear the corneal edema?

--Lower the IOP with **hypotensive agents**

--Directly clear the epithelial edema with topical glycerin



Q

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By first taking *Highly selective α_2 agonist*

-- **Carbonic anhydrase inhibitors**

Should the CAI be administered topically, PO or IV?

What two steps should be taken to clear the corneal edema?

--Lower the IOP with **hypotensive agents**

--Directly clear the epithelial edema with topical glycerin



A

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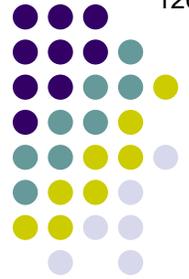
-- **Carbonic anhydrase inhibitors**

*Should the CAI be administered topically, PO or IV?
Any/all are acceptable*

What two steps should be taken to clear the corneal edema?

--Lower the IOP with **hypotensive agents**

--Directly clear the epithelial edema with topical glycerin



Q

Acute Primary Angle Closure Glaucoma

● Acute PACG: Diagnosis

- What exam maneuver **must** be performed to diagnose acute PACG? **Gonioscopy**

Gonioscopy in acute PACG has three objectives. What are they?

- First: Confirm that the angle is closed
- Second: Ascertain whether the angle is shallow or deep
- Third: Break the acute attack

In the present context, how many subtypes of α receptors are we concerned about?

Hold up—in acute PACG, the cornea is cloudy. If this is the case, should you forego gonioscopy? No, it really should be done. Which hypotensive agents should you use?

-- β blockers

OK, but how about prostaglandins?

-- Prostaglandins

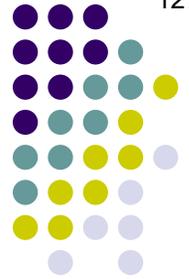
*By first taking the **Highly selective α_2 agonist**...*

-- Carbonic anhydrase inhibitors

What two steps should be taken to clear the angle?

-- Lower the IOP with **hypotensive agents**

-- Directly clear the epithelial edema with topically applied osmotic agents



A

Acute Primary Angle Closure Glaucoma

● Acute PACG: Diagnosis

- What exam maneuver **must** be performed to diagnose acute PACG? **Gonioscopy**

Gonioscopy in acute PACG has three objectives. What are they?

- First: Confirm that the angle is closed. *In the present context, how many subtypes of α receptors are we concerned about?*
- Second: Ascertain whether the angle is closed anteriorly or posteriorly.
- Third: Break the acute attack. **Two**

Hold up—in acute PACG, the cornea is cloudy. If this is the case, should you forego gonioscopy? No, it really should be done. Which hypotensive agents should be used?

- β blockers
- Prostaglandins
- **Highly selective α_2 agonist**
- Carbonic anhydrase inhibitors

What two steps should be taken to clear the angle? --Lower the IOP with hypotensive agents --Directly clear the epithelial edema with topically applied osmotic agents.



Q

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Two

What are these two α receptor subtypes called?

Hold up—in acute PACG, the cornea is cloudy. If this is the case, should you forego gonioscopy?

No, it really shouldn't. *Which hypotensive agents should you use?*

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OK, but how about α agonists? *Which ones?*

-- Prostaglandins

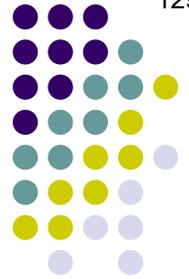
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What are they 'selecting'?

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No, it really doesn't matter. *Which hypotensive agents should you use?*

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OK, but how about prostaglandins?

--Prostaglandins

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-- β blockers

-- Prostaglandins

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What two steps should be taken to clear the angle?

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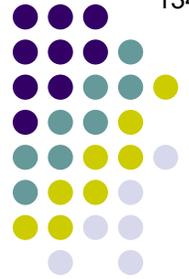
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Q

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No, it really doesn't matter. *Which hypotensive agents should you use?*

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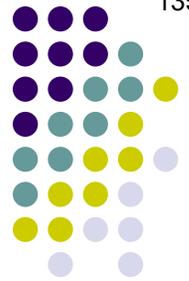
-- **Highly selective α_2 agonist**

-- Carbonic anhydrase inhibitors

What two steps should be taken to clear the angle?

-- Lower the IOP with **hypotensive agents**

-- Directly clear the epithelial edema with topical steroids



A

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Brimonidine



Q

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Gonioscopy in acute PACG has three objectives. What are they?

- First: Confirm that the angle is open
- Second: Ascertain whether there is peripheral anterior synechia
- Third: Break the acute attack

In the present context, how many subtypes of α receptors are we concerned about?

Two

With respect to the eyes, what does activation of each subtype produce?

α_1 :

--
--

α_2 :

--
--

What are these two α receptors?

They are called **α_1 and α_2**

What does it mean to say that they are 'selective'?

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It means they preferentially

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No, it really shouldn't. *Which hypotensive agents should you use?*

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-- Prostaglandins

-- **Highly selective α_2 agonist**

-- Carbonic anhydrase inhibitors

What two steps should be taken to clear the cornea?

-- Lower the IOP with **hypotensive agents**

-- Directly clear the epithelial edema with topical



Q/A

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Two

What are these two α receptors?

They are called **α_1 and α_2**

With respect to the eyes, what does activation of each subtype produce?

α_1 :

--Vasoconstriction

--Pupil one word

--Eyelid one word

α_2 :

--Reduced acronym

Hold up—in acute PACG, the cornea is cloudy. If this is the case, should you forego gonioscopy? No, it really is not. Which hypotensive agents should you use?

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OK, but how about prostaglandins?

--Highly selective α_2 agonist

--Carbonic anhydrase inhibitors

What two steps should be taken to clear the angle?

--Lower the IOP with **hypotensive agents**

--Directly clear the epithelial edema with topically applied osmotic agents

What does it mean to say that these receptors are 'selective'?

What are they 'selecting'?

It means they preferentially bind to α_1 or α_2 receptors

Which two agents are considered selective α_2 agents?

Apraclonidine and brimonidine

One agent is significantly more α_2 -selective than the other (it is often described as a 'highly selective α agonist'). Which is it?

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What are these two α receptors?

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With respect to the eyes, what does activation of each subtype produce?

α_1 :

- Vasoconstriction
- Pupil mydriasis
- Eyelid retraction

α_2 :

- Reduced IOP

Hold up—in acute PACG, the cornea is cloudy. If this is the case, should you forego gonioscopy?

No, it really shouldn't. *Which hypotensive agents should you use?*

-- β blockers

OK, but how about prostaglandins?

--**Highly selective α_2 agonist**

--Carbonic anhydrase inhibitors

What two steps should be taken to clear the angle?

--Lower the IOP with **hypotensive agents**

--Directly clear the epithelial edema with topically applied agents

What does it mean to say that an agent is 'selective'?

What are they 'selecting'?

It means they preferentially activate one subtype over the other.

Which two agents are considered selective α_2 agents?

Apraclonidine and brimonidine

One agent is significantly more α_2 -selective than the other (it is often described as a 'highly selective α agonist'). Which is it?

Brimonidine



Q

Acute Primary Angle Closure Glaucoma

● *Acute PACG: Diagnosis*

- What exam maneuver **must** be performed to diagnose acute PACG? **Gonioscopy**

Gonioscopy in acute PACG has three objectives. What are they?

- First: Confirm that the angle is open
- Second: Ascertain whether the angle is open

In the present context, how many subtypes of α receptors are we concerned about?

Is there such a thing as a nonselective adrenergic agonist?

With respect to the eyes, what does activation of each subtype produce?

- α_1 :
 - Vasoconstriction
 - Pupil mydriasis
 - Eyelid retraction
- α_2 :
 - Reduced IOP

Hold up—in acute PACG, the cornea is cloudy. If this is the case, should you forego gonioscopy? No, it really is important to know whether the angle is open. Which hypotensive agents should you use?

They are called α_1 and α_2 .

- β blockers
- Prostaglandins
- Highly selective α_2 agonist**
- Carbonic anhydrase inhibitors

What does it mean to say that an agent is α_2 -selective? What are they 'selecting'? It means they preferentially activate α_2 receptors.

- What two steps should be taken to clear the angle?*
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Which two agents are considered selective α_2 agents? Apraclonidine and brimonidine.

One agent is significantly more α_2 -selective than the other (it is often described as a 'highly selective α agonist'). Which is it? Brimonidine.



Q/A

Acute Primary Angle Closure Glaucoma

● Acute PACG: Diagnosis

- What exam maneuver **must** be performed to diagnose acute PACG? **Gonioscopy**

Gonioscopy in acute PACG has three objectives. What are they?

--First: Confirm that the angle is open

Second: Ascertain whether there is peripheral anterior synechia

In the present context, how many subtypes of α receptors are we concerned about?

Is there such a thing as a nonselective adrenergic agonist?
 Yes—both and are nonselective α/β agonists

With respect to the eyes, what does activation of each subtype produce?

α_1 :
 --Vasoconstriction
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What does it mean to say that an agent is α_2 -selective?

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It means they preferentially activate α_2 receptors.

OK, but how do you use them? By first taking the β blocker.

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Apraclonidine and brimonidine

What two steps should be taken to clear the cornea?

- Lower the IOP with **hypotensive agents**
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A

Acute Primary Angle Closure Glaucoma

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- By first taking a highly selective α_2 agonist

- Carbonic anhydrase inhibitors

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- Lower the IOP with hypotensive agents

One agent is significantly more α_2 -selective than the other (it is often described as a 'highly selective α agonist'). Which is it?

- Directly clear the epithelial edema with topical steroids

Brimonidine



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Acute Primary Angle Closure Glaucoma

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They are called α_1 and α_2

In treating acute PACG, why not use the less-selective α_2 agonist (apraclonidine), or a nonselective α/β agonist (eg, epinephrine)?

--Highly selective α_2 agonist
 --Carbonic anhydrase inhibitors

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 - Vasoconstriction
 - Pupil mydriasis
 - Eyelid retraction
- α_2 :
 - Reduced IOP

Hold up—in acute PACG, the cornea is pushed back

If you have a narrow angle, the cornea is pushed back

No, because the angle is open

Oh, because the angle is open

By first taking a look at the angle

They are called α_1 and α_2

In treating acute PACG, why not use the less-selective α_2 agonist (apraclonidine), or a nonselective α/β agonist (eg, epinephrine)?

Because these meds will stimulate α_1 receptors

--Highly selective α_2 agonist

--Carbonic anhydrase inhibitors

Which two agents are considered selective α_2 agents?

What two steps should be taken to clear the angle?

--Lower the IOP with hypotensive agents

--Directly clear the epithelial edema with topically applied agents

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Apraclonidine

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Q

Acute Primary Angle Closure Glaucoma

Acute PACG: Diagnosis

- What exam maneuver **must** be performed to diagnose acute PACG? **Gonioscopy**

Why is α_1 stimulation undesirable during an acute PACG attack?

Gonioscopy in acute PACG has
 --First: Confirm that the angle is open
 Second: Ascertain whether the angle is open

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 --Eyelid retraction
 α_2 :
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In treating acute PACG, why not use the less-selective α_2 agonist (apraclonidine), or a nonselective α/β agonist (eg, epinephrine)?
Because these meds will stimulate α_1 receptors

By first taking
 --Highly selective α_2 agonist
 --Carbonic anhydrase inhibitors

Apraclonidine

What two steps should be taken to clear the angle?
 --Lower the IOP with
 --Directly clear the epithelial edema with topically

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A

Acute Primary Angle Closure Glaucoma

● Acute PACG: Diagnosis

- What exam maneuver **must** be performed to diagnose acute PACG? **Gonioscopy**

Gonioscopy in acute PACG has

- First: Confirm that the angle is closed
- Second: Ascertain whether the angle is shallow or deep

Why is α_1 stimulation undesirable during an acute PACG attack?
 Because it promotes **mydriasis** (we want the pupil to **miose**, not dilate)

Is there such a thing as a nonselective adrenergic agonist?
 Yes—both **epinephrine** and **dipivefrin** are nonselective α/β agonists

- α_1 :
 - Vasoconstriction
 - Pupil mydriasis**
 - Eyelid retraction
- α_2 :
 - Reduced IOP

Hold up—in acute PACG, the cornea is pushed back against the iris. They are called α_1 and α_2

In treating acute PACG, why not use the less-selective α_2 agonist (apraclonidine), or a nonselective α/β agonist (eg, epinephrine)?
Because these meds will stimulate α_1 receptors

- Highly selective α_2 agonist
- Carbonic anhydrase inhibitors

Apraclonidine

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Yes—both **epinephrine** and **dipivefrin** are

α/β agonists

Hold up—in acute PACG, the cornea is

If

No

Only

By first taking

What two steps should be taken to clear the

--Lower the IOP with

--Directly clear the epithelial edema with top

Why is α_1 stimulation undesirable during an acute PACG attack?

Because it promotes **mydriasis** (we want the pupil to *miose*, not dilate), as well as **vasoconstriction** (which might exacerbate iris ischemia)

Vasoconstriction
Pupil mydriasis

--Eyelid retraction

α_2 :

--Reduced IOP

In treating acute PACG, why not use the less-selective α_2 agonist (apraclonidine), or a nonselective α/β agonist (eg, epinephrine)?

Because these meds will stimulate α_1 receptors

--Highly selective α_2 agonist

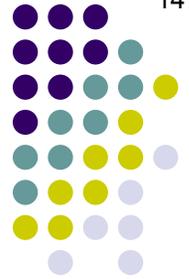
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Q

Acute Primary Angle Closure Glaucoma

● Acute PACG: Diagnosis

- What exam maneuver **must** be performed to diagnose acute PACG? **Gonioscopy**

Gonioscopy in acute PACG has three objectives. What are they?

--First: Confirm that the angle is in fact closed

-- *Finally, two other IOP-lowering maneuvers can be considered.* synechial

-- *What are they?*

--

--

Hol up—in acute PACG, the angle is closed. What is the mechanism of the angle.

If this is the case, should you forego gonioscopy?

No, it really is. *Which hypotensive agents should be used?*

-- β blockers

OK, but how about *Prostaglandins*?

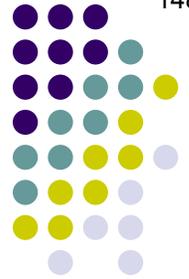
By first taking *Highly selective α_2 agonist*

--Carbonic anhydrase inhibitors

What two steps should be taken to clear the corneal edema?

--Lower the IOP with **hypotensive agents**

--Directly clear the epithelial edema with topical glycerin



A

Acute Primary Angle Closure Glaucoma

● Acute PACG: Diagnosis

- What exam maneuver **must** be performed to diagnose acute PACG? **Gonioscopy**

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-- *What are they?*

--Dehydrating the vitreous with an oral/IV hyperosmotic

--AC paracentesis with a 30-g needle

Hold up—in acute PACG, the angle is closed by synechial tissue. If this is the case, should you forego gonioscopy? the angle.

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No, it really isn't. *Which hypotensive agents should be used?*

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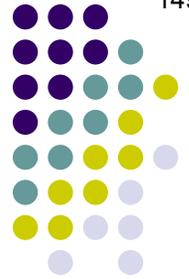
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Q

Acute Primary Angle Closure Glaucoma

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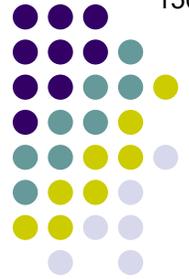
Gonioscopy in acute PACG has three objectives. What are they?

--First: Confirm that the angle is in fact closed

--**Second: Ascertain whether the iris-angle touch is appositional vs synechial**

--Third: Break the acute attack (if possible)

OK, so you managed to clear the cornea, and initial gonioscopy indicates the majority of the angle is closed. How do you go about determining whether the iris-angle touch is appositional, or synechial?



A

Acute Primary Angle Closure Glaucoma

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*Via dynamic (aka *compression* or *indentation*) gonioscopy*



Q

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How is dynamic gonioscopy performed?



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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.



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Via

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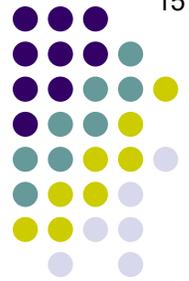
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Via **It does indeed. The lens of choice is a Posner, Zeiss or Sussman. These applanate the central cornea, pushing aqueous peripherally and thereby opening (or not) the angle.**

How **the angle.**
 During **the angle.**
 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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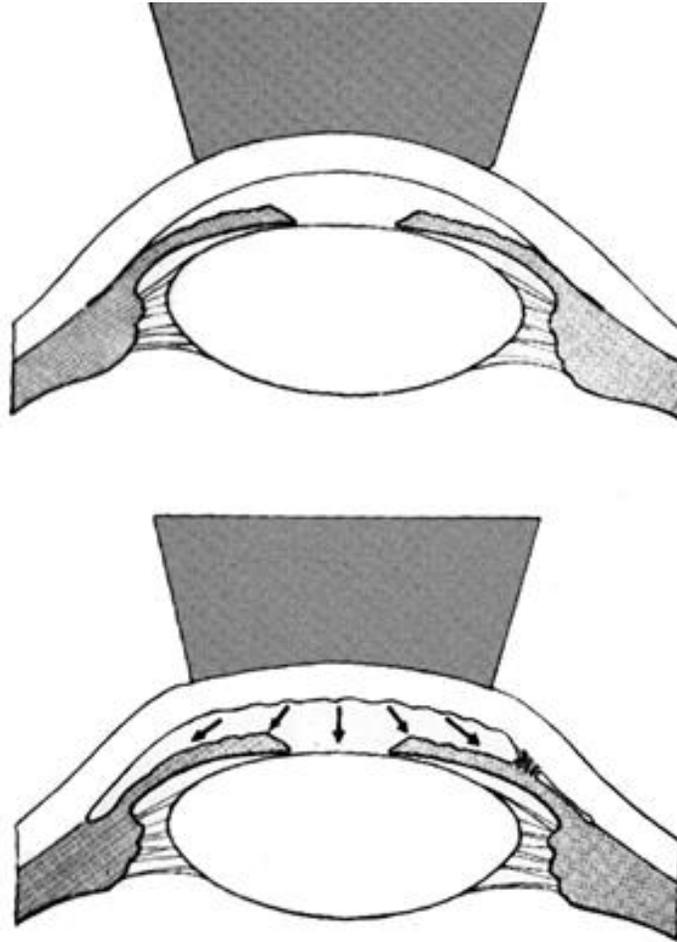
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How the angle. In contrast, the flange on a Goldmann-style goniolens compresses the **peripheral** cornea, and thus is less efficient for displacing aqueous into the angle.

Due 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.

Acute Primary Angle Closure Glaucoma

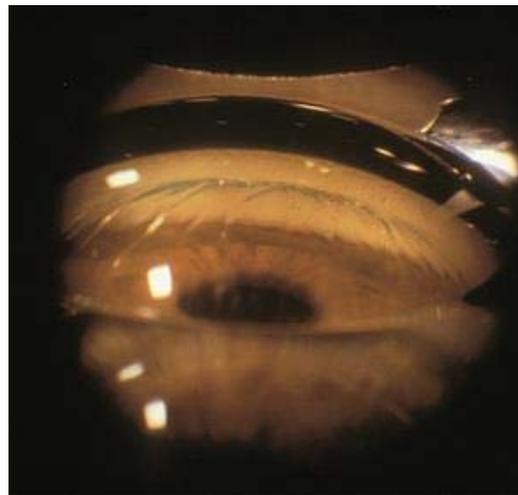
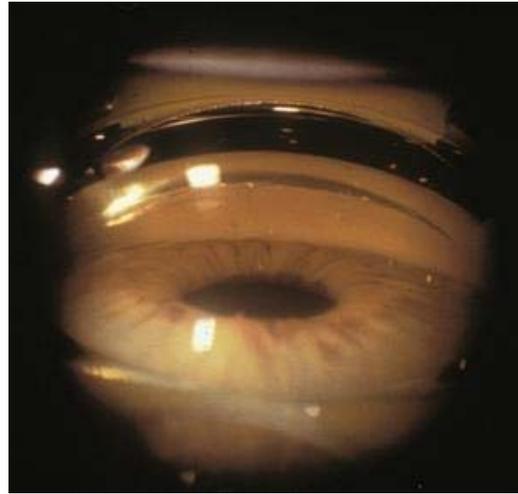


Indentation with Zeiss four-mirror lens causes deepening of the anterior chamber, which opens areas of appositional angle closure or exposes synechiae





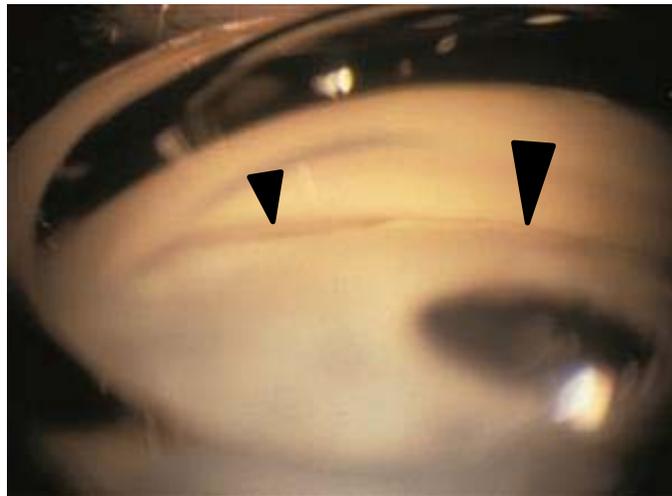
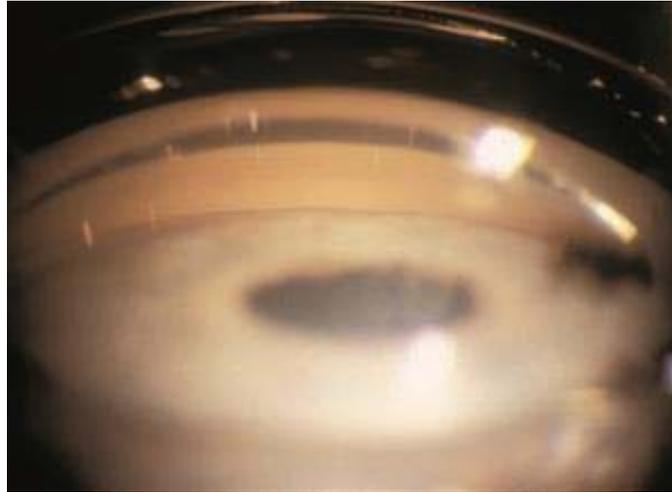
Acute Primary Angle Closure Glaucoma



The top photograph is a Zeiss four-mirror view of iris bombé in an elderly hyperopic patient. The trabecular meshwork is not visualized. The bottom photograph is of the patient when a Zeiss lens is used to indent the cornea. The trabecular meshwork is visible



Acute Primary Angle Closure Glaucoma



The top illustration shows an eye with appositional angle closure. No trabecular meshwork is visible. With indentation gonioscopy parts of the trabecular meshwork are visualized (small arrow) but there is a broad peripheral anterior synechia (large arrow), which precludes visualization of the remainder of the trabecular meshwork.



Q

Acute Primary Angle Closure Glaucoma

- *Acute PACG: Diagnosis*

- What exam maneuver **must** be performed to diagnose acute PACG? **Gonioscopy**

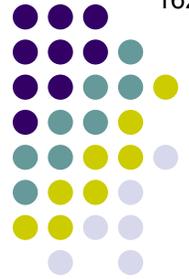
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--First: Confirm that the angle is in fact closed

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How can gonioscopy be used to actually break an acute angle-closure attack?



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Acute Primary Angle Closure Glaucoma

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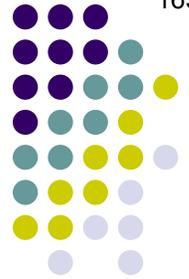
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--Third: **Break the acute attack (if possible)**

How can gonioscopy be used to actually break an acute angle-closure attack?

Via the same dynamic gonioscopy maneuvers used to determine whether the closure is appositional vs synechial. If it's appositional, the act of separating the iris from the angle during dynamic gonioscopy *may* allow enough aqueous to egress that IOP falls precipitously, thereby interrupting the attack.



Q

Acute Primary Angle Closure Glaucoma

- *Acute PACG: Diagnosis*

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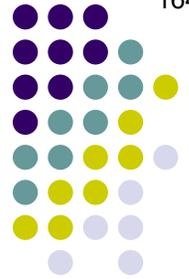
--First: Confirm that the angle is in fact closed

--Second: Ascertain whether the iris-angle touch is appositional vs synechial

--Third: Break the acute attack (if possible)

--*Fourth: ?*

Another gonioscopy maneuver, crucial to cinching a diagnosing of acute PACG, often goes unperformed. What is it?



A

Acute Primary Angle Closure Glaucoma

● Acute PACG: Diagnosis

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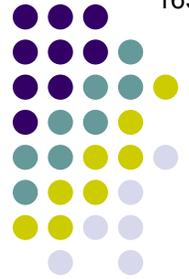
--Second: Ascertain whether the iris-angle touch is appositional vs synechial

--Third: Break the acute attack (if possible)

--*Fourth: Support the dx by confirming a tight angle in the fellow eye*

Another gonioscopy maneuver, crucial to cinching a diagnosing of acute PACG, often goes unperformed. What is it?

Gonioscopy of the fellow eye. Remember, like all forms of PACG, acute PACG is a **bilateral disease**. Thus, gonioscopy of the fellow eye should reveal that it is at risk for angle closure as well.



A

Acute Primary Angle Closure Glaucoma

● *Acute PACG: Diagnosis*

- What exam maneuver **must** be performed to diagnose acute PACG? **Gonioscopy**

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Q

Acute Primary Angle Closure Glaucoma

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If the fellow eye doesn't seem occludable, and one is contemplating a dx of secondary ACG, what specific conditions should come to mind?

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Q/A

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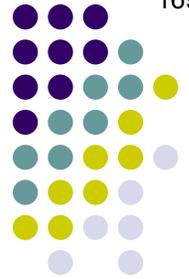
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- A posterior segment mass
 - Zonular insufficiency
 - ICE syndrome
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What does ICE stand for in this context?



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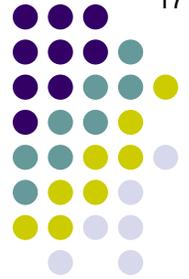
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question the diagnosis of PACG and search for **a cause of secondary angle closure.**

What does ICE stand for in this context?
Iridocorneal endothelial (syndrome)



Q

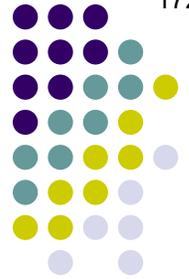
Acute Primary Angle Closure Glaucoma

- **Acute PACG: Management: Three goals**
 - *First:*
 - *Second*
 - *Third*

Q/A

Acute Primary Angle Closure Glaucoma

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Q/A

Acute Primary Angle Closure Glaucoma

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A

Acute Primary Angle Closure Glaucoma

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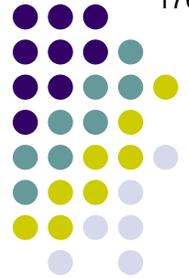


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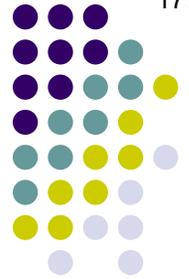
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Q

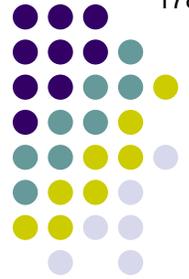
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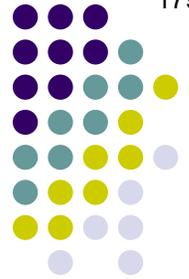
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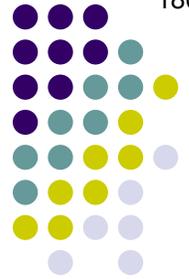
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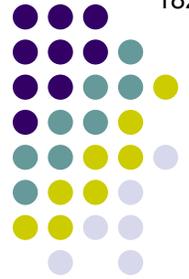
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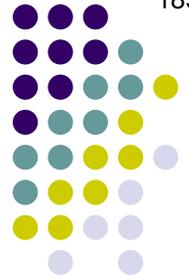
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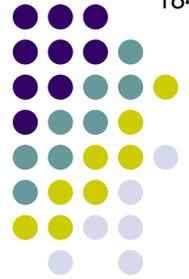
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When IOP is greater than **range** or so, circulation to the sphincter is compromised.

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Q

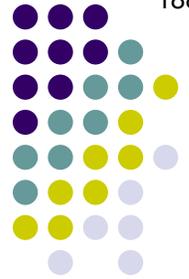
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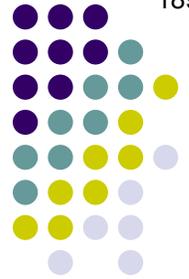
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What has the contact lens done?
 I have some 4% pilo on hand. Should I use it?
 No! Stronger miotics may worsen iris-TM apposition by rotating the ciliary body forward .

How should you attempt to achieve a 20% reduction in IOP?
 By **instilling pilo 1 or 2%**
 I instilled pilo 2%, but the iris didn't budge. Why not?
 The culprit is probably ischemia of the sphincter muscle. When IOP is greater than 40-50 or so, circulation to the sphincter is compromised.

What is the hoped-for effect of pilocarpine?
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What has the contact lens broken?
 I have some 4% pilo on hand. Should I use it?
 No! Stronger miotics may worsen iris-TM apposition by rotating the ciliary body forward .

How should you attempt to achieve ciliary miosis?
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What is the hoped for effect of ciliary miosis?
 Pilo is a parasympathetic agonist that causes ciliary miosis by inducing ciliary muscle contraction.
 Ok then, what should be done in this situation?
 Lower the IOP (via the methods discussed previously) until sphincter blood flow is re-established, and it becomes responsive

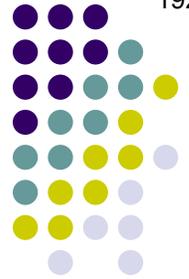


Q

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What is the definitive treatment for an acute PACG attack?



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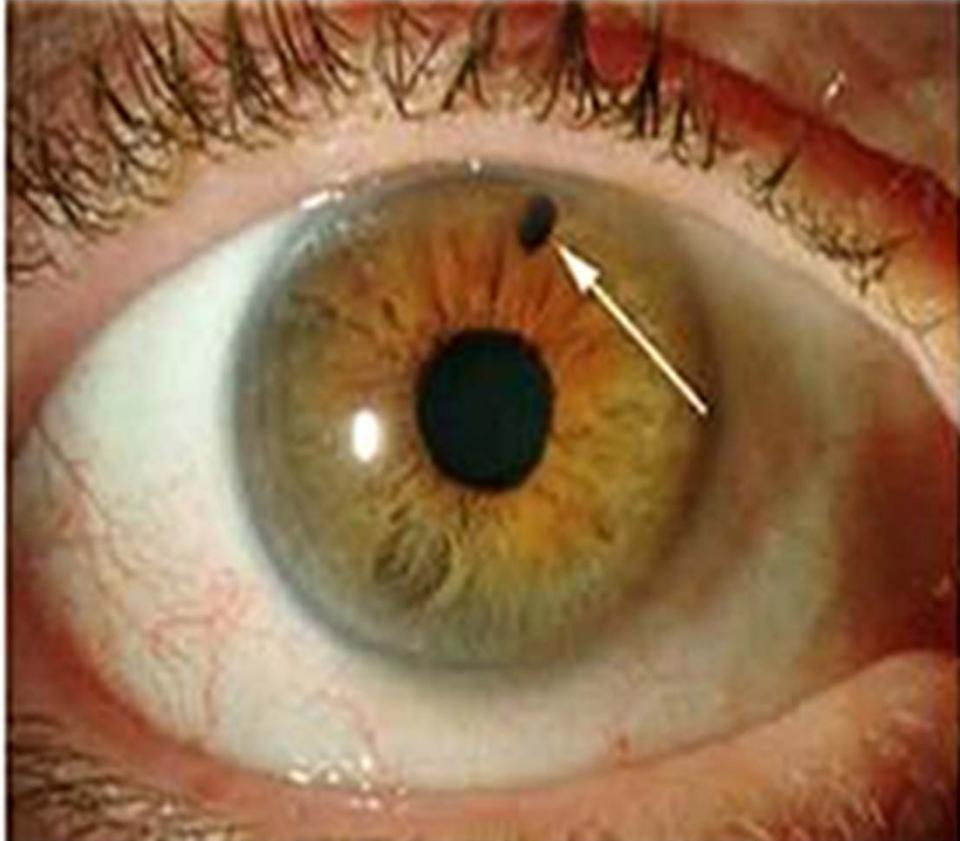
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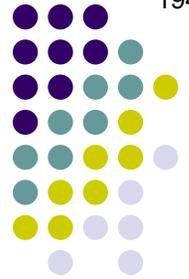
An iridotomy—a hole in the iris. Almost always, creation of this hole is performed with a laser—a *laser peripheral iridotomy* (LPI). Rarely, a surgical iridectomy must be performed instead.

Acute Primary Angle Closure Glaucoma



LPI





Q

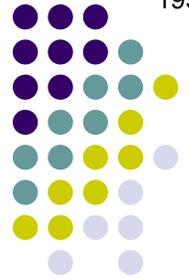
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What is the rationale for performing LPI in acute PACG?



Q/A

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Recall that the mechanism underlying acute PACG is two words .



A

Acute Primary Angle Closure Glaucoma

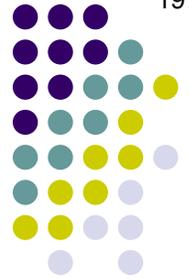
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Recall that the mechanism underlying acute PACG is pupillary block .



Q/A

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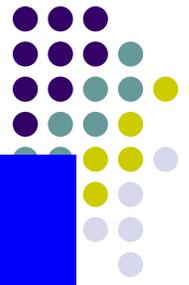
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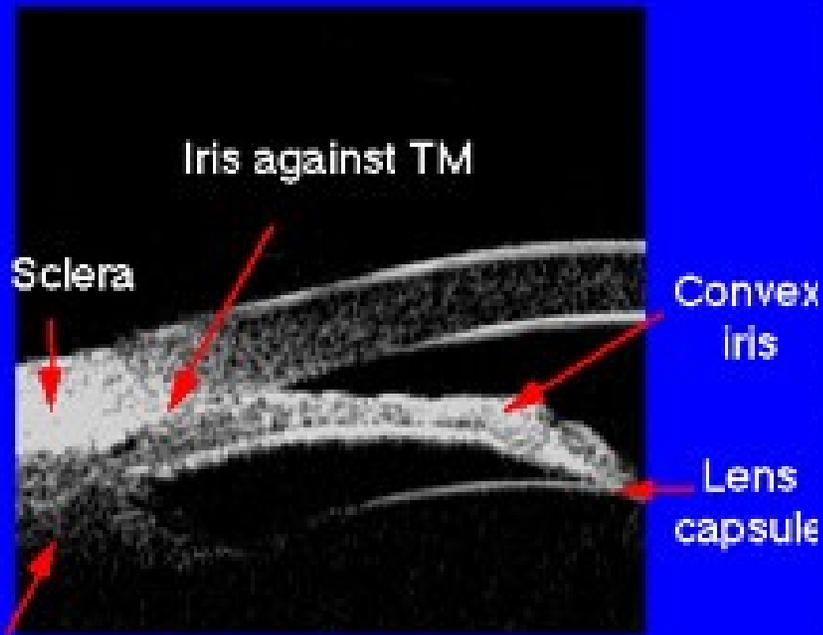
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Acute Primary Angle Closure Glaucoma



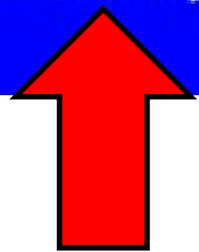
Angle Closure due to Relative Pupillary Block



Ciliary body

Before laser iridectomy

NYEEI, Ocular Imaging Center





A

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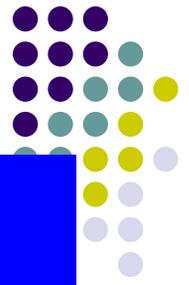
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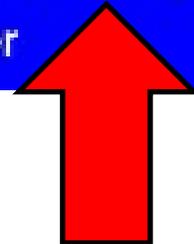
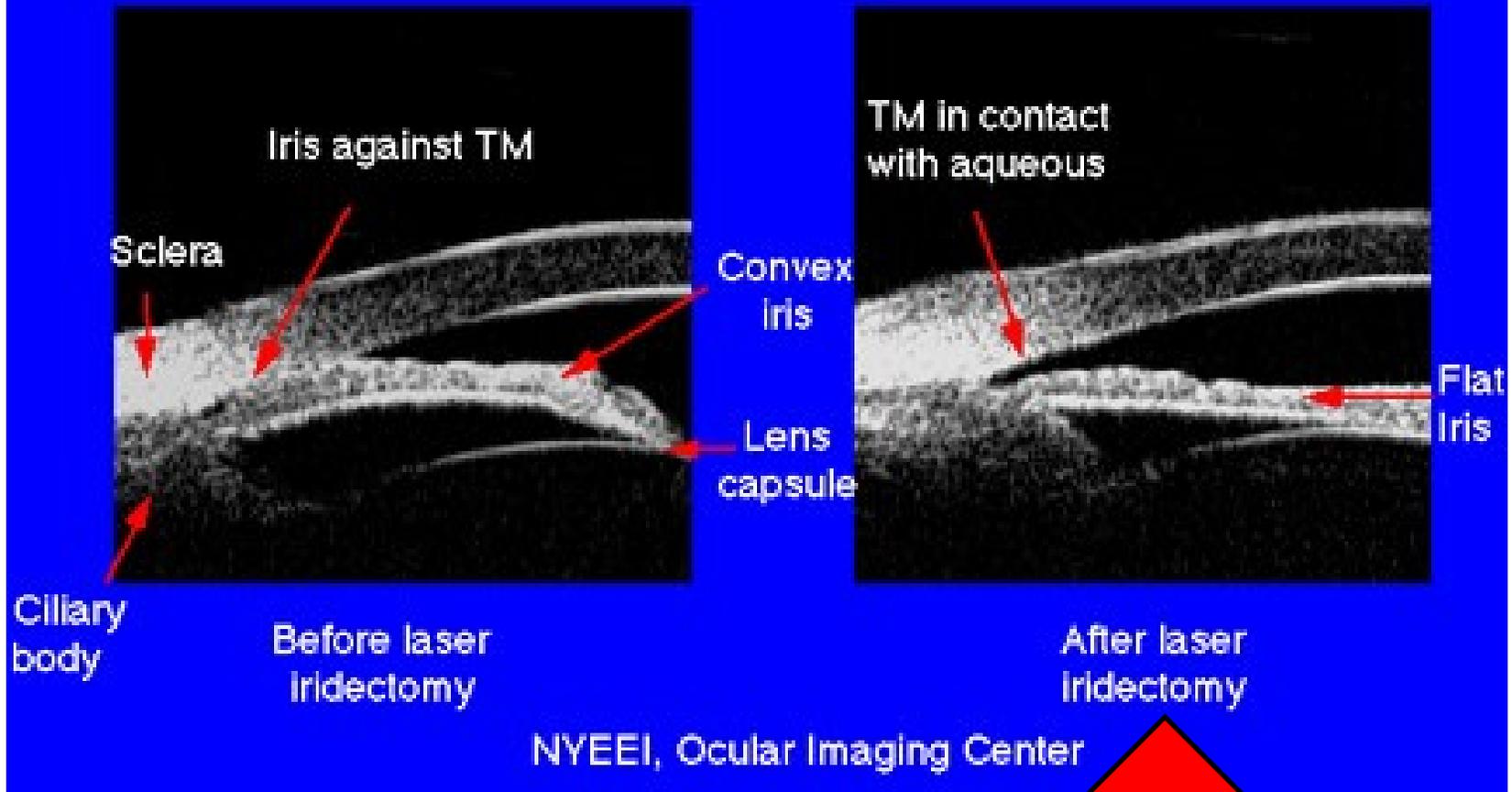
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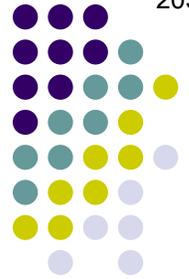
Recall that the mechanism underlying acute PACG is pupillary block. Further recall the result of pupillary block—the creation of a **pressure gradient** (PC>AC) across the iris. This gradient causes the iris to bow forward, and this forward displacement eventually results in obstruction of the angle by the peripheral iris. The LPI provides an alternative route for aqueous to get from the PC to the AC. Re-establishment of aqueous flow dissipates the pressure gradient, causing the iris to fall back and away from the angle, opening it and allowing aqueous egress from the AC.

Acute Primary Angle Closure Glaucoma



Angle Closure due to Relative Pupillary Block





Q

Acute Primary Angle Closure Glaucoma

- **Acute PACG: Management: Three goals**
 - *First:* Break the acute attack
 - **Second: Definitely treat the acute attack**
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What is the definitive treatment for an acute PACG attack?

An iridotomy—a hole in the iris. Almost always, creation of this hole is performed with a laser—a **laser peripheral iridotomy** (LPI). Rarely, a surgical iridectomy must be performed instead. ? or ?

If LPI can't be performed, what two laser procedures can be performed to break the attack and buy time until a definitive surgical iridectomy can be performed?

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Further recall
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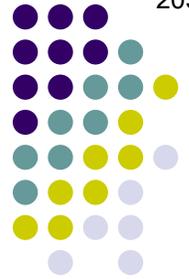
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--Iridoplasty

--Pupilloplasty

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If LPI can't be performed, what other options are available to break the attack and buy time for definitive treatment?

--Iridoplasty
--Pupilloplasty

By what other name is iridoplasty called?

the iris. This procedure eventually results in

an alternative route for aqueous to get from the PC to the AC. Re-establishment of aqueous flow dissipates the pressure gradient, causing the iris to fall back and away from the angle, opening it and allowing aqueous egress from the AC.

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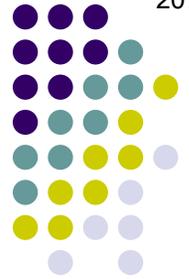
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--Iridoplasty

--Pupilloplasty

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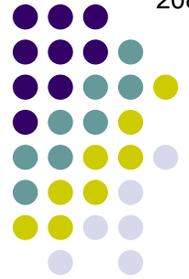
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If LPI can't be performed during the attack and pupilloplasty is not an option, what is the next best thing to do?

--**Iridoplasty**

--Pupilloplasty

the iris. This procedure eventually results in an alternative route for aqueous to get from the PC to the AC.

Re-establishment of aqueous flow dissipates the pressure gradient, causing the iris to fall back and away from the angle, opening it and allowing aqueous egress from the AC.

By what other name is iridoplasty called?

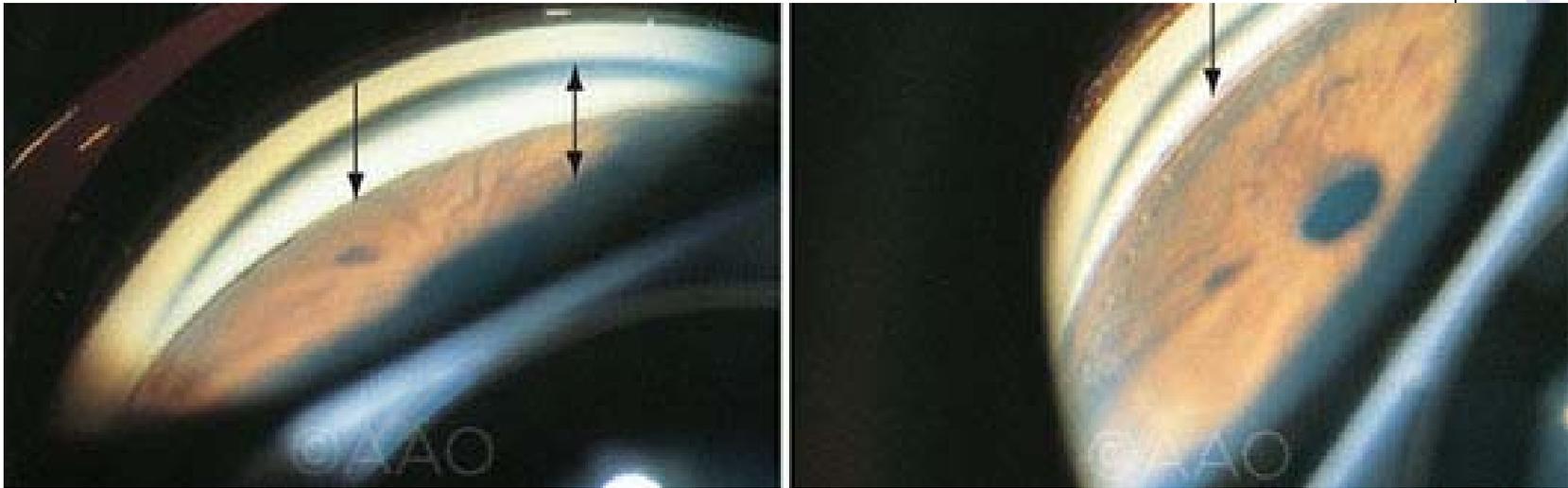
Gonioplasty

In a nutshell, how is it performed, and how does it break the attack?

Laser burns are placed in the peripheral iris stroma, and the resulting contraction causes the iris to flatten and pull away from the angle

or recall across ement ovides

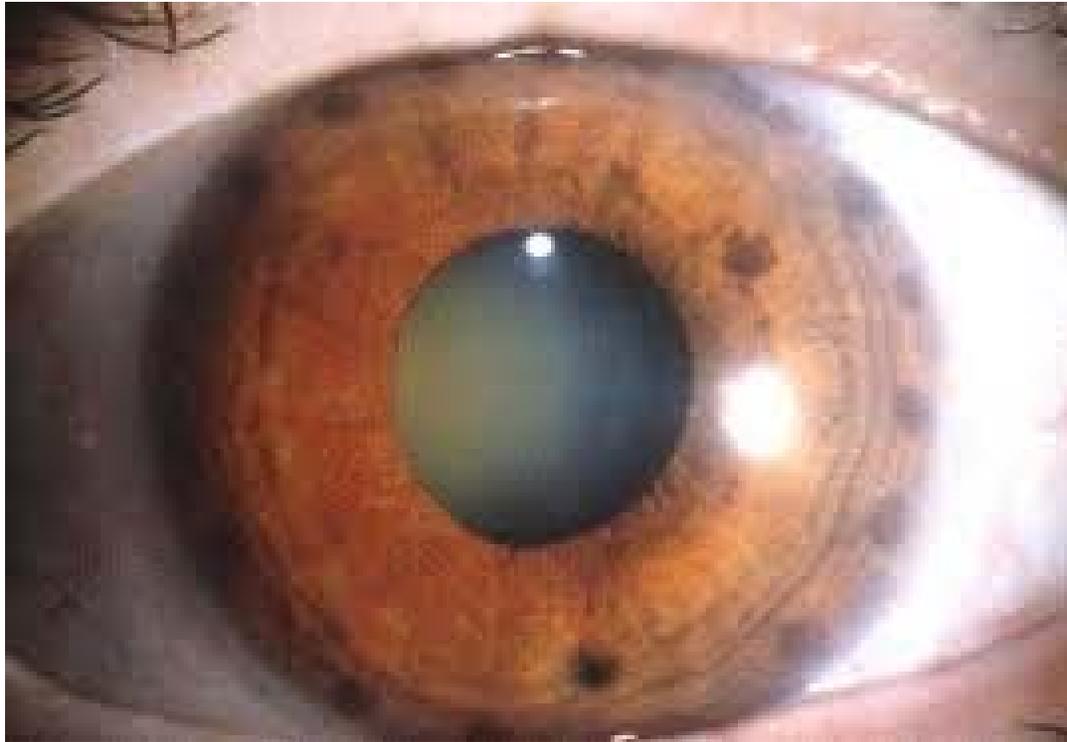
Acute Primary Angle Closure Glaucoma



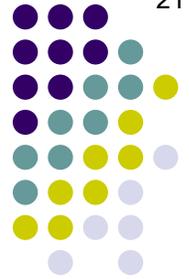
Left: A flat iris plane but shallow angle recess (**arrow**). Note that the midperipheral angle appears deeper (**double arrow**) than the narrow angles associated with pupillary block. **Right:** A much deeper angle recess (**arrow**) following laser peripheral iridoplasty.

Plateau iris pre- and post-iridoplasty

Acute Primary Angle Closure Glaucoma



S/p iridoplasty (note the peripheral burns)



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If LPI can't be performed, what two laser procedures can be performed to break the attack and buy time until a definitive surgical iridectomy can be performed?

--Iridoplasty

--**Pupilloplasty**

the iris. This gradually
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In a nutshell, how is laser pupilloplasty performed, and how does it break the attack?

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- Iridoplasty
- Pupilloplasty**

In a nutshell, how is laser pupilloplasty performed, and how does it break the attack?
 There are several techniques described on *EyeWiki*. The upshot is, laser burns are placed so as to reshape/enlarge the pupil, thereby interrupting the pupillary block.

the iris. This gradually... eventually results... an alternative route... aqueous flow dissipates the pressure gradient, causing the iris to fall back and away from the angle, opening it and allowing aqueous egress from the AC.

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--Pupilloplasty

To reiterate:

--Iridoplasty breaks the attack by

three words

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- Pupiloplasty

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--Iridoplasty breaks the attack by **opening the angle** ; whereas

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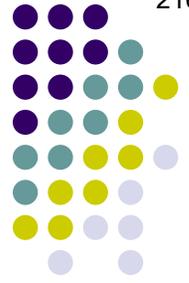
--Iridoplasty
--Pupiloplasty

To reiterate:

--Iridoplasty breaks the attack by **opening the angle** ; whereas
--Pupiloplasty breaks the attack by relieving

two words

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Also to reiterate: Remember, these are temporizing measures—definitive treatment must be performed ASAP!

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Pupilloplasty

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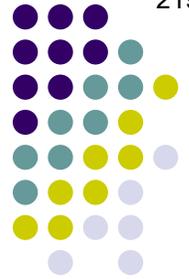
eventually results in

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aqueous flow dissolves

away from the angle, opening it and allowing aqueous egress from the AC.

Note 1: Oddly, while *pupilloplasty* is mentioned in the acute PACG section of the *Glaucoma* book, the term does **not** appear in the book's index, nor is it discussed in the section of the book concerning laser procedures. Further, the BCSC *General Index* lists only one mention, and that is in the *Cataract* book. The point being, it's unclear how much bandwidth (if any) pupilloplasty warrants vis a vis your OKAP prep. Caveat emptor.



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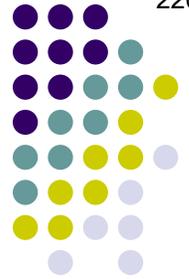
Note 2: Don't confuse *laser pupilloplasty* (for treating pupillary block) with *surgical pupilloplasty* (for improving the function and/or appearance of a misshapen pupil)

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Finally, another option exists for definitive treatment—what is it?

What

Recall

Further recall the result of pupillary block—the creation of a **pressure gradient** (PC>AC) across the iris. This gradient causes the iris to bow forward, and this forward displacement eventually results in obstruction of the angle by the peripheral iris. The LPI provides an alternative route for aqueous to get from the PC to the AC. Re-establishment of aqueous flow dissipates the pressure gradient, causing the iris to fall back and away from the angle, opening it and allowing aqueous egress from the AC.



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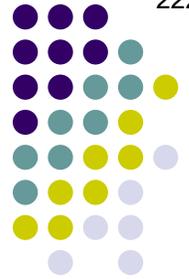
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Lensectomy

What is Lensectomy? *Lensectomy is a particularly appealing option if PAS are present—why?*

Recall that the acute attack is the result of pupillary block—the creation of a **pressure gradient** ($PC > AC$) across the iris. This gradient causes the iris to bow forward, and this forward displacement eventually results in obstruction of the angle by the peripheral iris. The LPI provides an alternative route for aqueous to get from the PC to the AC. Re-establishment of aqueous flow dissipates the pressure gradient, causing the iris to fall back and away from the angle, opening it and allowing aqueous egress from the AC. Further recall



Q/A

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Acute Primary Angle Closure Glaucoma

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Don't forget to LPI the fellow eye!

