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?

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)
What is the status of the angle?

Closed- or narrow-angle

Open-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?
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 first thought you should have when encountering a pt you suspect has glaucoma is…

*What is the status of the angle?*

**Open-angle**

**Closed- or narrow-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 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
The first thought you should have when encountering a pt you suspect has glaucoma is…

What is the status of the angle?

**Acute Primary Angle Closure Glaucoma**

Glaucoma

Open-angle

Closed- or narrow-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*
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 angle-closure glaucoma is…
Glaucoma

Closed- or narrow-angle

Primary

Secondary

Open-angle

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?
What differentiates primary from secondary angle-closure glaucoma?
What differentiates primary from secondary angle-closure glaucoma?
In secondary, a specific pathological cause of angle closure can be identified, whereas no such cause is present in primary dz.
Glaucoma

Acute Primary Angle Closure Glaucoma

Open-angle

Closed- or narrow-angle

Primary

Secondary

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

Open-angle

Closed- or narrow-angle

Primary

Secondary

What are the four subtypes of PACG?
What are the four subtypes of PACG?
Acute Primary Angle Closure Glaucoma

Glaucoma

- Open-angle
- Closed- or narrow-angle
  - Primary
  - Secondary
    - Acute
    - Subacute
    - Chronic
    - Plateau iris

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

They share a common mechanism: Pupillary block
In what fundamental way do these three…

They share a common mechanism: Pupillary block

*Acute Primary Angle Closure Glaucoma*
Acute Primary Angle Closure Glaucoma

Glaucoma

Open-angle

Closed- or narrow-angle

Primary
Secondary

Acute
Subacute
Chronic

In what fundamental way do these three...

They share a common mechanism:

Pupillary block

(We will have much more to say about pupillary block shortly)
Acute Primary Angle Closure Glaucoma

Glaucoma

Open-angle

Closed- or narrow-angle

Primary

Secondary

Plateau iris

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

What’s the dealio with plateau iris syndrome?
Acute Primary Angle Closure Glaucoma

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

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

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

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

(ignore this arrow)
Acute Primary Angle Closure Glaucoma

Plateau iris

…displacing the peripheral iris into the angle

(ignore this arrow)

Note the too-anterior ciliary processes…
Is there a racial predilection regarding the risk of PACG?
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.
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.
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?
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 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?
**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
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 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?
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, are at higher risk
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 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?
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...
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 hyperopes
Next let’s look at **acute primary angle-closure glaucoma** in more detail (the other forms of PACG are addressed in slide-set G18)
Acute Primary Angle Closure Glaucoma

- *Acute PACG mechanism:*
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 PACG mechanism: Pupillary block
What does pupillary block refer to, exactly?
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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’
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.
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’
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

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

‘Pupillary block’

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
Acute Primary Angle Closure Glaucoma
Acute Primary Angle Closure Glaucoma

Normal angle

- Trabecular meshwork

Angle closure

- Iris
- Blockage
- Lens
**Acute Primary Angle Closure Glaucoma**

- **Acute PACG mechanism:** Pupillary block

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**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.*
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 lens and anterior to the vitreous. Vitreous resides in the vitreous cavity.
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 iris and anterior to the lens/zonules. Vitreous resides in the vitreous cavity.
Acute Primary Angle Closure Glaucoma
Acute Primary Angle Closure Glaucoma

**Acute PACG mechanism:** Pupillary block

---

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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

- **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 iris and anterior to the lens/zonules. Vitreous resides in the vitreous cavity.
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).
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.

In which pupil position—constricted, mid-dilated or fully dilated—is such contact likely to develop?
The mid-dilated position is the danger zone for the development of pupillary block. Pupillary block with a more constricted position is uncommon but far from rare. What is this clinical circumstance?

There is a clinical circumstance—uncommon but far from rare—in which pupillary block occurs with the pupil in a more constricted position. What circumstance is this?

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/A

- **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.

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. There is a clinical circumstance—uncommon but far from rare—in which pupillary block occurs with the pupil in a more constricted position. What circumstance is this?

It’s when posterior synechiae of significant extent have developed.

**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

**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.

**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.

**There is a clinical circumstance—uncommon but far from rare—in which pupillary block occurs with the pupil in a more constricted position. What circumstance is this?**
It’s when posterior synechiae of significant extent have developed.

**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

Posterior synechiae
**Acute Primary Angle Closure Glaucoma**

- **Acute PACG mechanism**: Pupillary block

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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.

*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.

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.

There is a clinical circumstance—uncommon but far from rare—in which pupillary block occurs with the pupil in a more constricted position. What circumstance is this?

It’s when posterior synechiae of significant extent have developed.

What about eyes that don’t have a native lens—can they develop posterior synechiae of enough extent to produce pupillary block?

Indeed they can—posterior synechiae can develop between the iris and an IOL, the anterior capsular remnant after cataract surgery, and/or the vitreous face.
**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 iris and anterior to the lens/zonules. Vitreous resides in the vitreous cavity.

**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.

There is a clinical circumstance—uncommon but far from rare—in which pupillary block occurs with the pupil in a more constricted position. What circumstance is this? It’s when **posterior synechiae of significant extent** have developed.

What about eyes that don’t have a native lens—can they develop posterior synechiae of enough extent to produce pupillary block?

Indeed they can—posterior synechiae can develop between the iris and an IOL, or the anterior capsular remnant after cataract surgery, and/or the vitreous face.
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.

What about eyes that don’t have a native lens—can they develop posterior synechiae of enough extent to produce pupillary block? Indeed they can—posterior synechiae can develop between the iris and an IOL, or the anterior capsular remnant after cataract surgery, and/or the vitreous face.

Speaking of pupillary block post-intraocular surgery...What is the classic mechanism for its development after vitrectomy?
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.

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.

There is a clinical circumstance—uncommon but far from rare—in which pupillary block occurs with the pupil in a more constricted position. What circumstance is this? It’s when posterior synechiae of significant extent have developed.

The posterior chamber? I didn’t know the vitreous was involved. What about eyes that don’t have a native lens—can they develop posterior synechiae of enough extent to produce pupillary block? Indeed they can—posterior synechiae can develop between the iris and an IOL, or the anterior capsular remnant and/or the vitreous face.

Speaking of pupillary block post-intraocular surgery... What is the classic mechanism for its development after vitrectomy? Occlusion of the pupillary aperture by silicone oil or gas.
**Acute Primary Angle Closure Glaucoma**

**Acute PACG mechanism:** Pupillary block

What does *pupillary block* refer to, exactly?

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

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

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There is a clinical circumstance—uncommon but far from rare—in which pupillary block occurs with the pupil in a more constricted position. What circumstance is this?

It's when *posterior synechiae of significant extent* have developed.

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

What about eyes that don’t have a native lens—can they develop posterior synechiae of enough extent to produce pupillary block?

Indeed they can—posterior synechiae can develop between the iris and an IOL, or the anterior capsular remnant after cataract surgery, and/or the vitreous face.

*Speaking of pupillary block post-intraocular surgery... What is the classic mechanism for its development after vitrectomy?*

Occlusion of the pupillary aperture by silicone oil or gas.
Acute Primary Angle Closure Glaucoma

Silicone oil producing pupillary block
Acute Primary Angle Closure Glaucoma

**Acute PACG mechanism:** Pupillary block

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

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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.

**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.

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Indeed they can—posterior synechiae can develop between the iris and an IOL, or the anterior capsular remnant after cataract surgery, and/or the vitreous face.

**Speaking of pupillary block post-intraocular surgery...What is the classic mechanism for its development after vitrectomy?**

Occlusion of the pupillary aperture by silicone oil or gas.

**Finally: What term is used to describe a pupil syneched x 360 deg, ie, all the way round?**

Such a pupil is said to be secluded (the fancy term is seclusio pupillae).
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.

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Finally: What term is used to describe a pupil syneched x 360 deg, ie, all the way round? Such a pupil is said to be secluded (the fancy term is **seclusio pupillae**).
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There is a clinical circumstance—uncommon but far from rare—in which pupillary block occurs with the pupil in a more constricted position. What circumstance is this?

It's when posterior synechiae of significant extent have developed.

Finally: What term is used to describe a pupil syneched x 360 deg, ie, all the way round? Such a pupil is said to be secluded (the fancy term is seclusio pupillae).

Speaking of pupillary block post-intraocular surgery... What is the classic mechanism for its development after vitrectomy?

Occlusion of the pupillary aperture by silicone oil or gas.
Seclusio pupillae. Note also the presence of PAS
Acute Primary Angle Closure Glaucoma

**Acute PACG: Symptoms**

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

**What are the typical manifestations of acute PACG?**
Acute Primary Angle Closure Glaucoma

- **Acute PACG: Symptoms**
  - Severe eye pain
  - Severe HA
  - Blurred vision
  - Haloes around lights
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What are the typical manifestations of acute PACG?
Acute Primary Angle Closure Glaucoma

**Acute PACG: Symptoms**
- Severe eye pain
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*What causes the visual symptoms?*
Acute PACG: Symptoms

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

*What causes the visual symptoms?*
Corneal edema
Acute Primary Angle Closure Glaucoma

**Acute PACG: Symptoms**
- Severe eye pain
- Severe HA
- **Blurred vision**
- **Haloes around lights**
- Nausea/vomiting

*What causes the visual symptoms?*
Corneal edema

*What causes the edema?*
Acute Primary Angle Closure Glaucoma

- **Acute PACG: Symptoms**
  - Severe eye pain
  - Severe HA
  - **Blurred vision**
  - **Haloes around lights**
  - Nausea/vomiting

What causes the visual symptoms?
Corneal edema

What causes the edema?
Elevated IOP → endothelial-cell dysfunction
Q

Acute PACG: Symptoms

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

*What causes the visual symptoms?*
Corneal edema

*What causes the edema?*
Elevated IOP ➔ endothelial-cell dysfunction

*Edema of which corneal layer is responsible for the visual symptoms?*
**Acute Primary Angle Closure Glaucoma**

- **Acute PACG: Symptoms**
  - Severe eye pain
  - Severe HA
  - **Blurred vision**
  - **Haloes around lights**
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The epithelium
Acute PACG: Symptoms
- Severe eye pain
- Severe HA
- Blurred vision
- Haloes around lights
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What causes the visual symptoms?
Corneal edema

What causes the edema?
Elevated IOP → endothelial-cell dysfunction

Edema of which corneal layer is responsible for the visual symptoms?
The epithelium

The haloes are said to have a particular appearance—what is it?
They are rainbow-colored.
Acute Primary Angle Closure Glaucoma

- **Acute PACG: Symptoms**
  - Severe eye pain
  - Severe HA
  - Blurred vision
  - **Haloes around lights**
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What causes the visual symptoms?
Corneal edema

What causes the edema?
Elevated IOP \(\rightarrow\) endothelial-cell dysfunction

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The epithelium

*The haloes are said to have a particular appearance—what is it?*
They are ‘**rainbow-colored**’
Q

Acute Primary Angle Closure Glaucoma

- *Acute PACG: Signs*
  - High *duh*
Acute PACG: Signs

- High IOP
Acute PACG: Signs

- High IOP
- Pupil is mid-dilated, sluggish, and out-of-round
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
Acute Primary Angle Closure Glaucoma

**Acute PACG: Signs**

- High **IOP**
- Pupil is **mid-dilated, sluggish, and out-of-round**
- Cornea is **cloudy**
Acute Primary Angle Closure Glaucoma

- **Acute PACG: Signs**
  - High IOP
  - Pupil is *mid-dilated, sluggish, and out-of-round*
  - Cornea is *cloudy*
Acute Primary Angle Closure Glaucoma

Acute PACG: Cloudy cornea
Acute Primary Angle Closure Glaucoma

Acute PACG: Signs

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

Why is the cornea cloudy?
Acute Primary Angle Closure Glaucoma

- **Acute PACG: Signs**
  - High IOP
  - Pupil is mid-dilated, sluggish, and out-of-round
  - Cornea is **cloudy**

*Why is the cornea cloudy?*
The same edema that’s affecting vision
Acute Primary Angle Closure Glaucoma

**Acute PACG: Signs**

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

*Why is the cornea cloudy?*
The same edema that’s affecting vision

*What is the classic one-word descriptor for the appearance of the edematous cornea in acute PACG?*
Acute PACG: Signs

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

Why is the cornea cloudy? The same edema that’s affecting vision

What is the classic one-word descriptor for the appearance of the edematous cornea in acute PACG? ‘Steamy’
Acute Primary Angle Closure Glaucoma

**Acute PACG: Signs**

- 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: Signs**
- 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
Acute Primary Angle Closure Glaucoma

**Acute PACG: Signs**

- High **IOP**
- Pupil is **mid-dilated, sluggish, and out-of-round**
- Cornea is **cloudy**
- AC: **Shallow** with mild **cell** and **flare**
- ONH may be **edematous**
Acute Primary Angle Closure Glaucoma

**Acute PACG: Signs**

- High **IOP**
- Pupil is **mid-dilated, sluggish, and out-of-round**
- Cornea is **cloudy**
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Acute PACG: Signs

- High **IOP**
- Pupil is *mid-dilated, sluggish, and out-of-round*
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**Glaucomflecken** = opacities of the sub-anterior lens capsule (evidence of *previous* acute attacks)


Acute Primary Angle Closure Glaucoma

- **Acute PACG: Signs**
  - High IOP
  - Pupil is mid-dilated, sluggish, and out-of-round
  - Cornea is cloudy
  - AC: Shallow with mild cell and flare
  - ONH may be edematous
  - *Glaucomflecken* = opacities of the sub-anterior lens capsule (evidence of previous acute attacks)
Acute Primary Angle Closure Glaucoma

Glaukomflecken
Acute PACG: Signs

- High IOP
- Pupil is mid-dilated, sluggish, and out-of-round
- Cornea is cloudy
- AC: Shallow with mild cell and flare
- ONH may be edematous
- **Glaucomflecken** = opacities of the sub-anterior lens capsule (evidence of previous acute attacks)

What causes glaucomflecken?
**Acute PACG: Signs**

- High IOP
- Pupil is mid-dilated, sluggish, and out-of-round
- Cornea is cloudy
- AC: Shallow with mild cell and flare
- ONH may be edematous
- **Glaukomflecken** = opacities of the sub-anterior lens capsule (evidence of previous acute attacks)

*What causes glaukomflecken?*
Necrosis of the lens epithelium
Acute PACG: Diagnosis

What exam maneuver must be performed to diagnose acute PACG?
Acute Primary Angle Closure Glaucoma

- **Acute PACG: Diagnosis**
  - What exam maneuver **must** be performed to diagnose acute PACG? **Gonioscopy**
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:
--Second
--Third
Acute Primary Angle Closure Glaucoma

**Q/A**

*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

--Second:

--Third
Acute Primary Angle Closure Glaucoma

**Q/A**

- **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
  - Second: Ascertain whether the iris-angle touch is appositional vs synechial
  - Third:
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
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--Third: Break the acute attack (if possible)
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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*Hol up—in acute PACG, the cornea is cloudy, often enough so as to preclude visualizing the angle. If this is the case, should you forego gonioscopy?*
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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No, it really needs to be done
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
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OK, but how are you supposed to gonio a cloudy cornea?
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
  --Second: Ascertain whether the iris-angle touch is appositional vs synechial
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*Hol up—in acute PACG, the cornea is cloudy, often enough so as to preclude visualizing the angle. If this is the case, should you forego gonioscopy?*
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
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
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--Third: Break the acute attack (if possible)

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If this is the case, should you forego gonioscopy?
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?
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--
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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If this is the case, should you forego gonioscopy?
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 two words
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
--Second: Ascertain whether the iris-angle touch is appositional vs synechial
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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
--
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?

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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
**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?
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  *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 glycerin
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?

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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-cloud it

Which hypotensive agents should be used?

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--
--

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
Acute Primary Angle Closure Glaucoma

Acute PACG: Diagnosis

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

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Hol up—in acute PACG, the cornea is cloudy, often enough so as to preclude visualizing the angle. If this is the case, should you forego gonioscopy?
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

Which hypotensive agents should be used?
-- β blockers
-- Prostaglandins
-- Highly selective α₂ 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
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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Hol up—in acute PACG, the cornea is cloudy, often enough so as to preclude visualizing the angle.

If this is the case, should you forego gonioscopy?

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

Which hypotensive agents should be used?

- β blockers
- Prostaglandins
- Highly selective α₂ agonist
- 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
Acute Primary Angle Closure Glaucoma

Acute PACG: Diagnosis

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

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If this is the case, should you forego gonioscopy?
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

**Which hypotensive agents should be used?**
- β blockers
- prostaglandins
- Highly selective α₂ agonists
- 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
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
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Hol up—in acute PACG, the cornea is cloudy, often enough so as to preclude visualizing the angle. If this is the case, should you forego gonioscopy?

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 glycerin

Which hypotensive agents should be used?

--β blockers
--Prostaglandins
--Highly selective α₂ agonist
--Carbonic anhydrase inhibitors

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

Two

What are these two α receptor subtypes called?

They are called α₁ and α₂

What does it mean to say the selective α agonists are selective?

It means they preferentially stimulate α₂ receptors more than α₁

Which two agents are considered selective α₂ agents?

Apraclonidine and brimonidine

One agent is significantly more α₂-selective than the other (it is often described as a ‘highly selective α agonist’). Which is it?

Brimonidine
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
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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 glycerin

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

Hol up—in acute PACG, the cornea is cloudy, often enough so as to preclude visualizing the angle.

If this is the case, should you forego gonioscopy?
No, it really needs to be done.

OK, but how are you supposed to gonio a cloudy cornea?
By first taking steps to un-cloud 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 glycerin

Which hypotensive agents should be used?
- β blockers
- Prostaglandins
- **Highly selective α₂ agonist**
- Carbonic anhydrase inhibitors

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Two

What are these two α receptor subtypes called?

The selective α₂ agonists are 'selective'. What are they 'selecting'?
It means they preferentially stimulate α₂ receptors more than α₁ receptors.

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Apraclonidine and brimonidine

One agent is significantly more α₂-selective than the other (it is often described as a 'highly selective α agonist'). Which is it?
Brimonidine
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
  - Second: Ascertain whether the iris-angle touch is appositional vs synechial
  - Third: Break the acute attack

  *Hol up*—in acute PACG, the cornea is cloudy. It can be so bad as to prevent visualization of the angle.

  *In the present context, how many subtypes of \( \alpha \) receptors are we concerned about?*
  Two

  *What are these two \( \alpha \) receptor subtypes called?*
  They are called \( \alpha_1 \) and \( \alpha_2 \)

Which hypotensive agents should be used?
- \( \beta \) blockers
- Prostaglandins
- **Highly selective \( \alpha_2 \) agonist**
- Carbonic anhydrase inhibitors

Which is the **highly selective \( \alpha_2 \) agonist**?
Brimonidine

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
**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
- Second: Ascertain whether the iris-angle touch is appositional vs synechial
- Third: Break the acute attack (if possible)

Hol up—in acute PACG, the cornea is cloudy, often enough so as to preclude visualizing the angle. If this is the case, should you forego gonioscopy?
- 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 glycerin

Which hypotensive agents should be used?
- **β** blockers
- Prostaglandins
- Highly selective **α<sub>2</sub>** agonist
- Carbonic anhydrase inhibitors

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

What are these two **α** receptor subtypes called?
- They are called **α<sub>1** and **α<sub>2**

What does it mean to say the selective **α** agonists are selective?
- What are they ‘selecting’?
Acute Primary Angle Closure Glaucoma

Acute PACG: Diagnosis

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

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

- Lower the IOP with hypotensive agents
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Brimonidine
Acute PACG: Diagnosis

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

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Hol up—in acute PACG, the cornea is cloudy, often enough so as to preclude visualizing the angle. If this is the case, should you forego gonioscopy?
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 glycerin

Which hypotensive agents should be used?
--β blockers
--Prostaglandins
--Highly selective α₂ agonist
--Carbonic anhydrase inhibitors

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

What are these two α receptor subtypes called?
They are called α₁ and α₂

What does it mean to say the selective α agonists are selective?
What are they ‘selecting’?
It means they preferentially stimulate α₂ receptors more than α₁

Which two agents are considered selective α₂ agents?
Acute Primary Angle Closure Glaucoma

**Acute PACG: Diagnosis**

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  With respect to the eyes, what does activation of each subtype produce?
  α₁:
  --
  α₂:
  --
Acute PACG: Diagnosis

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Which hypotensive agents should be used?

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

Two

What are these two α receptors?

They are called α1 and α2

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

α1:
--- Vasoconstriction
--- Pupil
--- Eyelid

α2:
--- Reduced

Which two agents are considered selective α2 agents?

Apraclonidine and brimonidine

One agent is significantly more α2-selective than the other (it is often described as a ‘highly selective α agonist’). Which is it?

Brimonidine

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Acute PACG: Diagnosis

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- Prostaglandins
- Highly selective α2 agonist
- Carbonic anhydrase inhibitors

Which α1 and α2 agonists are we concerned about?

In the present context, how many subtypes of α receptors are we concerned about?
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α1 and α2

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Which two agents are considered selective α2 agents?
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- Vasoconstriction
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Is there such a thing as a nonselective adrenergic agonist?

Yes—both epinephrine and dipivefrin are nonselective α/β agonists
Acute Primary Angle Closure Glaucoma

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α2:
- Reduced IOP

Which hypotensive agents should be used?

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- Prostaglandins
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  - Prostaglandins
  - Highly selective α<sub>2</sub> agonists
  - Carbonic anhydrase inhibitors

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  One agent is significantly more α<sub>2</sub>-selective than the other (it is often described as a ‘highly selective α agonist’). Which is it?
  - Brimonidine

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  - α<sub>1</sub>:
    - Vasoconstriction
    - Pupil mydriasis
    - Eyelid retraction
  - α<sub>2</sub>:
    - Reduced IOP

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

  They are called α<sub>1</sub> and α<sub>2</sub>?

  What does it mean to say they are ‘selecting’?
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In treating acute PACG, why not use the less-selective α2 agonist (apraclonidine), or a nonselective α/β agonist (eg, epinephrine)?

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- Prostaglandins
- Highly selective α2 agonist
- Carbonic anhydrase inhibitors

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

In treating acute PACG, why not use the less-selective α2 agonist (apraclonidine), or a nonselective α/β agonist (eg, epinephrine)?
Because these meds will stimulate α1 receptors.

With respect to the eyes, what does activation of each subtype produce?
- α1:
  - Vasoconstriction
  - Pupil mydriasis
  - Eyelid retraction
- α2:
  - Reduced IOP

Is there such a thing as a nonselective adrenergic agonist?
Yes—both epinephrine and dipivefrin are nonselective α/β agonists. They are called α1 and α2 receptors.

Which two agents are considered selective α2 agents?
- Apraclonidine
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One agent is significantly more α2-selective than the other (it is often described as a "highly selective α agonist"). Which is it?
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Acute Primary Angle Closure Glaucoma

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- **Highly selective α₂ agonist**
- **Carbonic anhydrase inhibitors**

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

What are these two α receptor subtypes called?
- They are called α₁ and α₂

What does it mean to say the selective α₂ agonists are selective? It means they preferentially stimulate α₂ receptors more than α₁.

Which two agents are considered selective α₂ agents? Apraclonidine and brimonidine

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

In treating acute PACG, why not use the less-selective α₂ agonist (apraclonidine), or a nonselective α/β agonist (e.g., epinephrine)? Because these meds will stimulate α₁ receptors.

---

α₁:
- Vasoconstriction
- Pupil mydriasis
- Eyelid retraction

α₂:
- Reduced IOP
Acute PACG: Diagnosis

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In the present context, how many subtypes of α receptors are we concerned about?
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One agent is significantly more α2-selective than the other (it is often described as a ‘highly selective α agonist’). Which is it? Brimonidine

Why is α1 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

In treating acute PACG, why not use the less-selective α2 agonist (apraclonidine), or a nonselective α/β agonist (eg, epinephrine)? Because these meds will stimulate α1 receptors

-- Highly selective α2 agonist
-- Carbonic anhydrase inhibitors

Apraclonidine

---Hypotensive agents
---Nonselective α/β agents
---Reduced IOP

---Vasoconstriction
---Eyelid retraction
---Pupil mydriasis
**Acute PACG: Diagnosis**

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

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

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**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**

**Which hypotensive agents should be used?**

- **β blockers**
- **Prostaglandins**
- **Highly selective α2 agonist**
- **Carbonic anhydrase inhibitors**

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

**Two**

What are these two α receptor subtypes called?

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**What does it mean to say the selective α2 agonists are selective?**

**What are they 'selecting'?**

It means they preferentially stimulate α2 receptors more than α1.

Which two agents are considered selective α2 agents?

- **Apraclonidine**
- **Brimonidine**

One agent is significantly more α2-selective than the other (it is often described as a 'highly selective α agonist'). Which is it? Brimonidine.

**Why is α1 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).

Is there such a thing as a nonselective adrenergic agonist?

Yes—both epinephrine and dipivefrin are nonselective α/β agonists.

In treating acute PACG, why not use the less-selective α2 agonist (apraclonidine), or a nonselective α/β agonist (eg, epinephrine)?

**Because these meds will stimulate α1 receptors**

--- Highly selective α2 agonist
--- Carbonic anhydrase inhibitors

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

--- Hypotensive agents

--- Apraclonidine
--- Brimonidine
**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
  - Second: Ascertain whether the iris-angle touch is appositional vs synechial
  - Third: Break the acute attack (if possible)

  *Hol up*—in acute PACG, the cornea is cloudy, often enough so as to preclude visualizing the angle. 
  If this is the case, should you forego gonioscopy?
  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

  Which hypotensive agents should be used?
  - β blockers
  - Prostaglandins
  - Highly selective α₂ agonist
  - Carbonic anhydrase inhibitors

  Finally, two other IOP-lowering maneuvers can be considered. What are they?
  --
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  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
Acute PACG: Diagnosis

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**Finally, two other IOP-lowering maneuvers can be considered.**
- **What are they?**
  - Dehydrating the vitreous with an oral/IV hyperosmotic
  - AC paracentesis with a 30-g needle

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Acute Primary Angle Closure Glaucoma

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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.
Acute Primary Angle Closure Glaucoma

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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.

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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.

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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 synechted to the angle, the aqueous influx will have no effect on the iris-angle contact.
Indentation with Zeiss four-mirror lens causes deepening of the anterior chamber, which opens areas of appositional angle closure or exposes synechiae
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.
Acute Primary Angle Closure Glaucoma

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How can gonioscopy be used to actually break an acute angle-closure attack?
Acute Primary Angle Closure Glaucoma

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*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.
Acute Primary Angle Closure Glaucoma

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

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  --First: Confirm that the angle is in fact closed
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  --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.
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?*

The list of potential suspects is long, but these three were mentioned in the Glaucoma book, and thus should top the list:

--- A posterior segment mass
--- Zonular insufficiency
--- ICE
Acute Primary Angle Closure Glaucoma

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- These two are categories, not specific conditions
- Is a specific condition
- a cause of secondary angle closure.
Acute Primary Angle Closure Glaucoma

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Acute Primary Angle Closure Glaucoma

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What does ICE stand for in this context?

ICE syndrome

a cause of secondary angle closure.
Acute Primary Angle Closure Glaucoma

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Iridocorneal endothelial (syndrome)
Acute Primary Angle Closure Glaucoma

- **Acute PACG**: **Management**: Three goals
  - First:
  - Second
  - Third
Q/A

Acute Primary Angle Closure Glaucoma

● **Acute PACG: Management:** Three goals
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Acute Primary Angle Closure Glaucoma

**Q/A**

**Acute PACG: Management:** Three goals

- **First:** Break the acute attack
- **Second:** Definitively treat the acute attack
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Acute Primary Angle Closure Glaucoma

● **Acute PACG:** **Management:** Three goals
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Acute Primary Angle Closure Glaucoma

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What has to happen to break an acute PACG attack?
Acute Primary Angle Closure Glaucoma

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- **First**: Break the acute attack
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*What has to happen to break an acute PACG attack?*

The contact between the peripheral iris and the TM must be broken.
Acute Primary Angle Closure Glaucoma

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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.
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Pilo is a parasympathomimetic, and thus should cause pupillary miosis by inducing contraction of the sphincter muscle

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.

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  How should you attempt to accomplish this?
  By instilling pilocarpine 1% or 2%.

  What is the hoped-for effect of the pilocarpine?
  Pilocarpine is a parasympathomimetic, and thus should cause pupillary miosis by inducing contraction of the sphincter muscle.

  **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.

  **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.
Acute Primary Angle Closure Glaucoma

**Acute PACG: Management: Three goals**

- **First:** Break the acute attack
- **Second:** Definitively treat the acute attack
- **Third:** Prophylax the fellow eye against an attack

What has to happen to break an acute PACG attack?
The contact between the peripheral iris and the TM must be broken

How should you attempt to accomplish this?
By instilling pilo 1 or 2%

What is the hoped-for effect of the pilo?
Pilo is a parasympathomimetic, and thus should cause pupillary miosis by inducing contraction of the sphincter muscle.

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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.
Acute Primary Angle Closure Glaucoma

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*What is the definitive treatment for an acute PACG attack?*
Acute Primary Angle Closure Glaucoma

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Recall that the mechanism underlying acute PACG is pupillary block.
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**What is the rationale for performing LPI in acute PACG?**
Recall that the mechanism underlying acute PACG is pupillary block. Further recall the result of pupillary block—the creation of a pressure gradient across the iris.
Acute Primary Angle Closure Glaucoma

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Acute Primary Angle Closure Glaucoma

Angle Closure due to Relative Pupillary Block

Iris against TM

Sclera

Convex iris

Lens capsule

Ciliary body

Before laser iridectomy

NYEEI, Ocular Imaging Center
Acute PACG: Management: Three goals

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Acute Primary Angle Closure Glaucoma

Angle Closure due to Relative Pupillary Block

Before laser iridectomy

After laser iridectomy

NYEEI, Ocular Imaging Center
Acute Primary Angle Closure Glaucoma

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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?

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**Acute Primary Angle Closure Glaucoma**

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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
Acute Primary Angle Closure Glaucoma

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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

By what other name is iridoplasty called?
Gonioplasty

In a nutshell, how is it performed, and how does it deepen the angle?
Laser burns are placed in the peripheral iris stroma, and the resulting contraction causes the iris to flatten and pull away from the angle.
Acute Primary Angle Closure Glaucoma

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

By what other name is iridoplasty called? Gonioplasty

- Laser iridoplasty

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

What is the rationale for performing LPI in acute PACG? 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.
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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)
**Acute Primary Angle Closure Glaucoma**

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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?**

**Pupilloplasty**

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

There are several techniques described on [EyeWiki](http://www.eyewiki.com). The upshot is, laser burns are placed so as to reshape/enlarge the pupil, thereby interrupting the pupillary block. This gradient 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

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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**

To reiterate:
--Iridoplasty breaks the attack by opening the angle; whereas--Pupilloplasty breaks the attack by relieving pupillary block.
Acute Primary Angle Closure Glaucoma

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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?

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- **Iridoplasty**
- **Pupilloplasty**

To reiterate:

- **Iridoplasty** breaks the attack by opening the angle; whereas
- **Pupilloplasty** breaks the attack by relieving two words.
Acute Primary Angle Closure Glaucoma

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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**

To reiterate: **Iridoplasty** breaks the attack by opening the angle; whereas **Pupilloplasty** breaks the attack by relieving pupillary block, eventually results in obstruction of the angle by the peripheral iris. The LPI provides definitive treatment of angle closure, and also to reiterate: Remember, these are temporizing measures—definitive treatment must be performed ASAP!
Acute Primary Angle Closure Glaucoma

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**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.
**Acute Primary Angle Closure Glaucoma**

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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--

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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?**

**Lensectomy**

Lensectomy is a particularly appealing option if PAS are present—**why?** Because goniosynechialysis can be performed simultaneously.
Acute Primary Angle Closure Glaucoma

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

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What is the definitive treatment for an acute PACG attack? **Lensectomy!**

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.

What is the rationale for performing LPI in acute PACG?

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.

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

Lensectomy is a particularly appealing option if PAS are present—why?
Acute Primary Angle Closure Glaucoma

**Acute PACG: Management** Three goals

- *First:* Break the acute attack
- **Second:** *Definitively treat the acute attack*
- *Third:* Prophylax the fellow eye against an attack

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Acute Primary Angle Closure Glaucoma

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**Lensectomy is a particularly appealing option if PAS are present—why?** Because goniosynechialysis can be performed simultaneously.

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**Acute PACG: Management:** Three goals

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*Don’t forget to LPI the fellow eye!*