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It is the only risk factor that is modifiable in a manner proven to influence the risk of glaucoma progression
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In addition to being the strongest risk factor for glaucoma, IOP has another quality that renders it unique—what is it?
It is the only risk factor that is modifiable in a manner proven to influence the risk of glaucoma progression.

That’s why glaucoma management consists of IOP-lowering maneuvers!
The first thought you should have when encountering a pt you suspect has glaucoma is…

Q

Normal-Tension Glaucoma (NTG)
The first thought you should have when encountering a pt you suspect has glaucoma is...

What is the status of the angle?
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?

How does one determine the status of the angle?
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?

How does one determine the status of the angle? 
Gonioscopy. Don’t assume your glaucoma pt has open angles—prove it by gonioing them!
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?

How does one determine the status of the angle?

Gonioscopy. Don’t assume your glaucoma pt has open angles—prove it by gonioing them!

Angle-closure glaucoma is covered in multiple slide-sets; see the Table of Contents
Once you have determined your glaucoma pt has open angles, the next ‘first thought’ is to ask…
Normal-Tension Glaucoma (NTG)

OAG

↑IOP

Normal-tension glaucoma (NTG)

Once you have determined your glaucoma pt has open angles, the next ‘first thought’ is to ask…

*Is it high-tension OAG, or low (ie, ‘normal’) tension OAG?*
Untreated IOP measurement always at or below 21 mmHg

Normal-Tension Glaucoma (NTG)

Untreated IOP measurement always above # mmHg

What IOP value is used to classify glaucoma pts as high- vs normal-tension?
Normal-Tension Glaucoma (NTG)

OAG

↑IOP

Normal-tension glaucoma (NTG)

What IOP value is used to classify glaucoma pts as high- vs normal-tension?

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Untreated IOP measurement always at or below 21 mmHg
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What IOP value is used to classify glaucoma pts as high- vs normal-tension?

Why ‘21’? What’s the justification for using this particular value as the cutoff?
Q/A

Normal-Tension Glaucoma (NTG)

OAG

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Normal-tension glaucoma (NTG)

Untreated IOP measurement always above 21 mmHg

Untreated IOP measurement always at or below 21 mmHg

What IOP value is used to classify glaucoma pts as high- vs normal-tension?

Why ‘21’? What’s the justification for using this particular value as the cutoff? It’s a statistical, not clinical, extrapolation. Back in the day, population studies indicated that the mean IOP is #, with a standard deviation (SD) of #.
Untreated IOP measurement always above 21 mmHg

What IOP value is used to classify glaucoma pts as high- vs normal-tension?

Normal-Tension Glaucoma (NTG)

What ‘21’? What’s the justification for using this particular value as the cutoff? It’s a statistical, not clinical, extrapolation. Back in the day, population studies indicated that the mean IOP is 15.5, with a standard deviation (SD) of 2.6.
Untreated IOP measurement always above 21 mmHg

What IOP value is used to classify glaucoma pts as high- vs normal-tension?

Why ‘21’? What’s the justification for using this particular value as the cutoff? It’s a statistical, not clinical, extrapolation. Back in the day, population studies indicated that the mean IOP is 15.5, with a standard deviation (SD) of 2.6. If one uses 2 SDs above the mean as the upper limit of normal (ie, non-pathologic) IOP, then the highest ‘normal’ IOP is 15.5 + (2×2.6) ≈ 21.
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It’s a statistical, not clinical, extrapolation. Back in the day, population studies indicated that the mean IOP is 15.5, with a standard deviation (SD) of 2.6. If one uses 2 SDs above the mean as the upper limit of normal (i.e., non-pathologic) IOP, then the highest normal IOP is 15.5 + (2×2.6) ≈ 21.

Untreated IOP measurement always above 21 mmHg

Untreated IOP measurement always at or below 21 mmHg

Note that, because this definition of normal vs abnormal IOP is purely statistical, some glaucomologists reject the notion that NTG is a distinct disease entity!
Why ‘21’? What’s the justification for using this particular value as the cutoff? It’s a statistical, not clinical, extrapolation. Back in the day, population studies indicated that the mean IOP is 15.5, with a standard deviation (SD) of 2.6. If one uses 2 SDs above the mean as the upper limit of normal (i.e., non-pathologic) IOP, the highest 'normal' IOP is 15.5 + (2×2.6) ≈ 21.

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Normal-Tension Glaucoma (NTG)

Normal-tension glaucoma (NTG)

↑IOP

What IOP value is used to classify glaucoma pts as high- vs normal-tension?

But other glaucoma docs argue that the NTG haters need to slow their roll, because in fact there are clinical differences between high-tension OAG and NTG (as we shall soon see…)

Note that, because this definition of normal vs abnormal IOP is purely statistical, some glaucomologists reject the notion that NTG is a distinct disease entity!
When compared to high-tension glaucoma pts:

- Some studies indicate NTG pts are more likely to be migraineurs
When compared to high-tension glaucoma pts:

- Some studies indicate NTG pts are more likely to be migraineurs  
  
  T
When compared to high-tension glaucoma pts:

- Some studies indicate NTG pts are more likely to be migraineurs  \textcolor{green}{T}
- NTG pts are less likely to have optic disc hemorrhages
Normal-Tension Glaucoma (NTG)

When compared to high-tension glaucoma pts:
- Some studies indicate NTG pts are more likely to be migraineurs  T
- NTG pts are less likely to have optic disc hemorrhages  F
Normal-Tension Glaucoma (NTG) vs High-Tension Glaucoma: T/F

When compared to high-tension glaucoma pts:
- Some studies indicate NTG pts are more likely to be migraneurs **T**
- NTG pts are less likely to have optic disc hemorrhages **F**  **T**
Normal-Tension Glaucoma (NTG) vs High-Tension Glaucoma: T/F

Disc hemorrhage in NTG
Normal-Tension Glaucoma (NTG)

When compared to high-tension glaucoma pts:

- Some studies indicate NTG pts are more likely to be migraineurs \textcolor{red}{T}\textsuperscript{more}.
- NTG pts are less likely to have \textcolor{red}{optic disc hemorrhages} \textcolor{green}{F}.\textsuperscript{more}

In the context of NTG, are disc hemorrhages a finding of clinical significance (other than as evidence supporting the NTG diagnosis)?
When compared to high-tension glaucoma pts:

- Some studies indicate NTG pts are more likely to be migraineurs  \( \text{True} \)
- NTG pts are less likely to have optic disc hemorrhages  \( \text{False} \)

In the context of NTG, are disc hemorrhages a finding of clinical significance (other than as evidence supporting the NTG diagnosis)?

Yes. Disc hemorrhages are worrisome in that they indicate the glaucoma is progressing.
Normal-Tension Glaucoma (NTG) vs High-Tension Glaucoma: T/F

When compared to high-tension glaucoma pts:
- Some studies indicate NTG pts are more likely to be migraineurs **T**
- NTG pts are less likely to have optic disc hemorrhages **F**
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When compared to high-tension glaucoma pts:

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Normal-Tension Glaucoma (NTG) vs High-Tension Glaucoma: T/F

When compared to high-tension glaucoma pts:

- Some studies indicate NTG pts are more likely to be migraineurs  **T**
- NTG pts are **less** likely to have optic disc hemorrhages **F**  **T**
- NTG pts are **more** likely to have optic disc hemorrhages **T**
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When compared to high-tension glaucoma pts:

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Does this mean syphilis testing plays no role in evaluating NTG?
When compared to high-tension glaucoma pts:

- Some studies indicate NTG pts are more likely to be migraineurs: **T**
- NTG pts are less likely to have optic disc hemorrhages: **F**
- NTG pts are more likely to test positive for syphilis: **F**

Does this mean syphilis testing plays no role in evaluating NTG?
To the contrary—some experts perform syphilis testing routinely during the initial evaluation of a possible NTG case.
When compared to high-tension glaucoma pts:

- Some studies indicate NTG pts are more likely to be migraineurs **T**
- NTG pts are **more** likely to have optic disc hemorrhages **F**
- NTG pts are **more** likely to test positive for syphilis **F**
- Some studies indicate NTG pts have a higher rate of Raynaud’s
When compared to high-tension glaucoma pts:

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- NTG pts are less likely to have optic disc hemorrhages  
  - $T$
- NTG pts are more likely to test positive for syphilis  
  - $T$
- Some studies indicate NTG pts have a higher rate of Raynaud’s  
  - $T$
Normal-Tension Glaucoma (NTG) vs High-Tension Glaucoma: T/F

Image of NTG patient’s hand. Erythema demonstrates hyperemic phase of Raynaud’s, which usually follows vasospasm and reversible ischemia of peripheral arterioles.
When compared to high-tension glaucoma pts:

- Some studies indicate NTG pts are more likely to be migraineurs.
- NTG pts are less likely to have optic disc hemorrhages.
- NTG pts are more likely to test positive for syphilis.
- Some studies indicate NTG pts have a higher rate of Raynaud’s.

The increased prevalence of these conditions in the NTG population converges with the fact that vascular abnormalities may play a role in NTG.
Normal-Tension Glaucoma (NTG) vs High-Tension Glaucoma: T/F

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- VF defects in NTG tend to be more peripheral and diffuse
Normal-Tension Glaucoma (NTG)

When compared to high-tension glaucoma pts:

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- VF defects in NTG tend to be more peripheral and diffuse **F**
Standard automated perimetry in a patient with normal tension glaucoma. Note the dense inferior arcuate scotomas occurring near fixation with minimal involvement of periphery.
When compared to high-tension glaucoma pts:

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- NTG pts are **no** more likely to test positive for syphilis **T**
- Some studies indicate NTG pts have a higher rate of Raynaud’s **T**
- VF defects in NTG tend to be more **central** and **focal** **F**
- NTG pts have a higher rate of congenital disc anomalies **F**
- Some studies indicate NTG pts are more likely to suffer with an autoimmune disease **T**
When compared to high-tension glaucoma pts:

- Some studies indicate NTG pts are more likely to be migraineurs — True
- NTG pts are less likely to have optic disc hemorrhages — False
- NTG pts are more likely to test positive for syphilis — True
- Some studies indicate NTG pts have a higher rate of Raynaud’s — True
- VF defects in NTG tend to be more central and focal — False
- NTG pts have a higher rate of congenital disc anomalies — False
- Some studies indicate NTG pts are more likely to suffer with an autoimmune disease — True
Normal-Tension Glaucoma (NTG)

You have a pt with ONH and VF changes c/w glaucomatous optic neuropathy (GON), but at every exam, her IOP is never high. **Other than NTG, what is in the DDx?**

**DDx**

-- Duh, it’s NTG

-- ?

-- ?

-- ?

-- ?

(Not specific diseases—broad categories of causes)
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--The IOP is intermittently high, and you keep missing it

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Other than instrumentation error, what factor is most likely to account for an artifically low applanation IOP measurement?

A thinner-than-normal central corneal thickness

We know a ‘naturally’ thin CCT will produce an artifically-low applanation IOP. Is the same true for an iatrogenically thin cornea, ie, one that is s/p laser keratorefractive surgery for myopia?

Yes
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*Other than instrumentation error, what factor is most likely to account for an artifactually low applanation IOP measurement? A thinner-than-normal central corneal thickness*

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What is the most likely cause of IOP suppression in an ‘untreated’ (note the quotes) pt?

--The IOP is intermittently high, and you keep missing it

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What is the most likely cause of IOP suppression in an ‘untreated’ (note the quotes) pt?
Systemic treatment of HTN with a β blocker
**Normal-Tension Glaucoma (NTG)**

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**What are some of the causes of intermittent IOP elevation in a pt with open angles?**

--

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What are some of the causes of intermittent IOP elevation in a pt with open angles?

--Diurnal IOP variation in high-tension OAG
--Posner-Schlossman syndrome

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What is the range of diurnal variation typical of nonglaucomatous eyes?

2 to 6 mmHg

Is there a relationship between IOP and the degree of fluctuation?

Yes—the higher the IOP, the greater the amount of variation

Do glaucomatous eyes tend to have more, or less variation?

More

At what amount of diurnal variation can one be fairly confident the pt has glaucoma?

The BCSC Glaucoma book mentions 10 mmHg in this regard

--Duh, it’s NTG
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**Q/A**

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**Diurnal IOP variation in high-tension OAG**

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---

**What is the range of diurnal variation typical of nonglaucomatous eyes?**

2 to 6 mmHg

**Is there a relationship between IOP and the degree of fluctuation?**

Yes—the higher the IOP, the greater the amount of variation

**Do glaucomatous eyes tend to have more, or less variation?**

More

---

**Diurnal IOP variation in high-tension OAG**

--Posner-Schlossman syndrome
Normal-Tension Glaucoma (NTG)

You have a pt with ONH and VF changes c/w glaucomatous optic neuropathy (GON), but at every exam, her IOP is never high. **Other than NTG, what is in the DDx?**

**DDx**

--Duh, it’s NTG

--The IOP is high, but you missed it

--The IOP is high, but it’s being suppressed

--The IOP is **intermittently** high, and you keep missing it

--The IOP used to be high, but it’s not anymore

--It ain’t GON

**What is the range of diurnal variation typical of nonglaucomatous eyes?**

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**Do glaucomatous eyes tend to have more, or less variation?**

More

**At what amount of diurnal variation can one be fairly confident the pt has glaucoma?**

--Diurnal IOP variation in high-tension OAG

--Posner-Schlossman syndrome
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Yes—the higher the IOP, the greater the amount of variation

Do glaucomatous eyes tend to have more, or less variation?
More

At what amount of diurnal variation can one be fairly confident the pt has glaucoma?
The BCSC Glaucoma book mentions 10 mmHg in this regard

--Diurnal IOP variation in high-tension OAG
--Posner-Schlossman syndrome
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--It ain’t GON

What are some of the causes of intermittent IOP elevation in a pt with open angles?

--Diurnal IOP variation in high-tension OAG

As a clinician, what can one do to minimize the chance of missing the high readings in a pt with wide diurnal variation?
Normal-Tension Glaucoma (NTG)

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---

What are some of the causes of intermittent IOP elevation in a pt with open angles?

--Diurnal IOP variation in high-tension OAG

As a clinician, what can one do to minimize the chance of missing the high readings in a pt with wide diurnal variation?

Determine a **pressure curve** for all ‘NTG’ pts, ie, check their IOP at multiple time points throughout the day.
Normal-Tension Glaucoma (NTG)

You have a pt with ONH and VF changes c/w glaucomatous optic neuropathy.

Q

What is the noneponymous name for Posner-Schlossman?

DDx

--Duh, it’s NTG

--The IOP is high, but you missed it

--The IOP is high, but it’s being suppressed

--The IOP is intermittently high, and you keep missing it

--The IOP used to be high, but it’s not anymore

--It ain’t GON

--Diurnal IOP variation in high-tension OAG

--Posner-Schlossman syndrome
**Normal-Tension Glaucoma (NTG)**

You have a patient with ONH and VF changes compatible with glaucomatous optic neuropathy.

What is the noneponymous name for Posner-Schlossman?

- Glaucotocytic crisis

**DDx**

-- Duh, it’s NTG

-- The IOP is high, but you missed it

-- The IOP is high, but it’s being suppressed

-- The IOP is intermittently high, and you keep missing it

-- The IOP used to be high, but it’s not anymore

-- It ain’t GON

---Duh, it’s NTG

---The IOP is high, but you missed it

---The IOP is high, but it’s being suppressed

---The IOP is intermittently high, and you keep missing it

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--The IOP is **intermittently** high, and you keep missing it

--The IOP used to be high, but it’s not anymore

--It ain’t GON

---Normal-Tension Glaucoma (NTG)

---The IOP is high, but you missed it

---The IOP is intermittently high, and you keep missing it

---The IOP used to be high, but it’s not anymore

---It ain’t GON

---Diurnal IOP variation in high-tension OAG

---Posner-Schlossman syndrome

---Glaucomatocyclitic crisis

---Who is the typical pt?

---An adult age 20-50

---Does the inflammatory component tend to be mild, or severe? Mild

---Does the IOP elevation tend to be mild, or severe? Severe

---How long do the crises last? Hours to days

---Do they recur? Yes
Normal-Tension Glaucoma (NTG)

- The IOP is high, but you missed it
- The IOP is intermittently high, and you keep missing it
- The IOP used to be high, but it’s not anymore
- The IOP is high, but it’s being suppressed
- It ain’t GON

DDx

--Duh, it’s NTG
--The IOP is high, but you missed it
--The IOP is high, but it’s being suppressed
--The IOP is intermittently high, and you keep missing it
--The IOP used to be high, but it’s not anymore
--It ain’t GON

What is the noneponymous name for Posner-Schlossman?
Glaucocmatocyclitic crisis

Who is the typical pt?
An adult age 20-50
Normal-Tension Glaucoma (NTG)

You have a pt with ONH and VF changes of glaucomatous optic neuropathy.

--- The IOP is high, but you missed it
--- The IOP is high, and you keep missing it
--- The IOP used to be high, but it's not anymore
--- The IOP is high, but it's being suppressed
--- It ain't GON

DDx

--- Duh, it's NTG
--- The IOP is high, but you missed it
--- The IOP is high, but it's being suppressed
--- The IOP is intermittently high, and you keep missing it
--- The IOP used to be high, but it's not anymore

DDx

--- The IOP is intermittently high, and you keep missing it
--- Normal IOP variation in high-tension OAG

--- Posner-Schlossman syndrome

--- Duh, it's NTG

- What is the noneponymous name for Posner-Schlossman? Glaucomatocyclitic crisis

- Who is the typical pt?
  An adult age 20-50

- Does the inflammatory component tend to be mild, or severe?
Normal-Tension Glaucoma (NTG)

You have a patient with ONH and VF changes of glaucomatous optic neuropathy. What is the noneponymous name for Posner-Schlossman?

Glaucmotocyclitic crisis

Who is the typical pt?

An adult age 20-50

Does the inflammatory component tend to be mild, or severe?

Mild

DDx

--Duh, it’s NTG

--The IOP is high, but you missed it

--The IOP is intermittently high, and you keep missing it

--The IOP used to be high, but it’s not anymore

--It ain’t GON

--Diurnal IOP variation in high-tension OAG

--Posner-Schlossman syndrome
Normal-Tension Glaucoma (NTG)

- The IOP is high, but you missed it
- The IOP is intermittently high, and you keep missing it
- The IOP used to be high, but it’s not anymore
- The IOP is high, but it’s being suppressed
- It ain’t GON

DDx

--Duh, it’s NTG
--The IOP is high, but you missed it
--The IOP is intermittently high, and you keep missing it
--The IOP used to be high, but it’s not anymore
--It ain’t GON

What is the noneponymous name for Posner-Schlossman?
Glaucmatocyclitic crisis

Who is the typical pt?
An adult age 20-50

Does the inflammatory component tend to be mild, or severe?
Mild

Does the eye tend to be red and angry?

--Posner-Schlossman syndrome

Diurnal IOP variation in high-tension OAG
--Posner-Schlossman syndrome
Normal-Tension Glaucoma (NTG)

You have a pt with ONH and VF changes, c/w glaucomatous optic neuropathy.

**DDx**

--Duh, it’s NTG

--The IOP is high, but you missed it

--The IOP is intermittently high, and you keep missing it

--The IOP used to be high, but it’s not anymore

--It ain’t GON

What is the noneponymous name for Posner-Schlossman?

Glaucmotocyclitic crisis

Who is the typical pt?

An adult age 20-50

Does the inflammatory component tend to be mild, or severe?

Mild

Does the eye tend to be red and angry?

No, it is usually white and quiet

Diurnal IOP variation in high-tension OAG

--Posner-Schlossman syndrome

Does the IOP elevation tend to be mild, or severe?

Severe

How long do the crises last?

Hours to days

Do they recur?

Yes
Normal-Tension Glaucoma (NTG)

You have a pt with CNH and VF changes of glaucomatous optic neuropathy. What is the noneponymous name for Posner-Schlossman? Glaucmatocyclitic crisis

**DDx**

--Duh, it’s NTG

--The IOP is high, but you missed it

--The IOP is high, but it’s being suppressed

--The IOP is **intermittently** high, and you keep missing it

--The IOP used to be high, but it’s not anymore

--It ain’t GON

--Diurnal IOP variation in high-tension OAG

--Posner-Schlossman syndrome

**Who is the typical pt?**
An adult age 20-50

**Does the inflammatory component tend to be mild, or severe?**
Mild

**Does the IOP elevation tend to be mild, or severe?**
Severe

Hours to days

Yes
Normal-Tension Glaucoma (NTG)

You have a pt with ONH and VF changes of glaucomatous optic neuropathy.

DDx

--Duh, it’s NTG

--The IOP is high, but you missed it

--The IOP is high, but it’s being suppressed

--The IOP is intermittently high, and you keep missing it

--The IOP used to be high, but it’s not anymore

--It ain’t GON

What is the noneponymous name for Posner-Schlossman?
Glaucmotocyclitic crisis

Who is the typical pt?
An adult age 20-50

Does the inflammatory component tend to be mild, or severe?
Mild

Does the IOP elevation tend to be mild, or severe?
Severe

--Diurnal IOP variation in high-tension OAG

--Posner-Schlossman syndrome
Normal-Tension Glaucoma (NTG)

You have a pt with ONH and VF changes of a glaucomatous optic neuropathy.

What is the noneponymous name for Posner-Schlossman?
Glaucocmatocyclitic crisis

Who is the typical pt?
An adult age 20-50

Does the inflammatory component tend to be mild, or severe?
Mild

Does the IOP elevation tend to be mild, or severe?
Severe

How severe?

DDx

--Duh, it’s NTG

--The IOP is high, but you missed it

--The IOP is high, but it’s being suppressed

--The IOP is intermittently high, and you keep missing it

--The IOP used to be high, but it’s not anymore

--It ain’t GON

--Normal IOP variation in high tension OAG

--Posner-Schlossman syndrome
Normal-Tension Glaucoma (NTG)

You have a patient with ONH and VF changes of a glaucomatous optic neuropathy. What is the noneponymous name for Posner-Schlossman? Glaucomatocyclitic crisis

DDx

--Duh, it’s NTG

--The IOP is high, but you missed it

--The IOP is high, but it’s being suppressed

--The IOP is intermittently high, and you keep missing it

--The IOP used to be high, but it’s not anymore

--It ain’t GON

What are some of the causes of intermittent IOP elevation in a pt with open angles?

--Diurnal IOP variation in high-tension OAG
--Posner-Schlossman syndrome

Who is the typical pt?
An adult age 20-50

Does the inflammatory component tend to be mild, or severe?
Mild

Does the IOP elevation tend to be mild, or severe?
Severe

How severe?
IOP in the 40-60 range is typical

Does it recur?
Yes
You have a pt with CNH and VF changes of glaucomatous optic neuropathy (GON). What is the noneponymous name for Posner-Schlossman? Glaucomatocyclitic crisis

What are some of the causes of intermittent IOP elevation in a pt with open angles?

- Diurnal IOP variation in high-tension OAG
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What is the typical pt?
An adult age 20-50

Does the inflammatory component tend to be mild, or severe?
Mild

Does the IOP elevation tend to be mild, or severe?
Severe

How long do the crises last?
Hours to days

Do they recur?
Yes

Duh, it’s NTG

The IOP is high, but you missed it

The IOP is high, but it’s being suppressed

The IOP is intermittently high, and you keep missing it

The IOP used to be high, but it’s not anymore

It ain’t GON
Normal-Tension Glaucoma (NTG)

- The IOP is high, but you missed it
- The IOP is intermittently high, and you keep missing it
- The IOP used to be high, but it’s not anymore
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--The IOP used to be high, but it’s not anymore

--It ain’t GON

**What is the nonpneonymous name for Posner-Schlossman?**

Glaucocatocyclitic crisis

**Who is the typical pt?**

An adult age 20-50

**Does the inflammatory component tend to be mild, or severe?**

Mild

**Does the IOP elevation tend to be mild, or severe?**

Severe

**How long do the crises last?**

Hours to days
Normal-Tension Glaucoma (NTG)

You have a pt with ONH and VF changes of glaucomatous optic neuropathy.

**What is the noneponymous name for Posner-Schlossman?**
Glaucematocyclitic crisis

**Who is the typical pt?**
An adult age 20-50

**Does the inflammatory component tend to be mild, or severe?**
Mild

**Does the IOP elevation tend to be mild, or severe?**
Severe

**How long do the crises last?**
Hours to days

**Do they recur?**
Yes

**DDx**

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--The IOP is high, but it’s being suppressed

--The IOP is intermittently high, and you keep missing it

--The IOP used to be high, but it’s not anymore

--It ain’t GON

--Diurnal IOP variation in high-tension OAG

--Posner-Schlossman syndrome
Normal-Tension Glaucoma (NTG)

You have a pt with ONH and VF changes consistent with glaucomatous optic neuropathy.

What is the non-eponymous name for Posner-Schlossman?
Glaucmatotoxic ciliclir crisis

Who is the typical pt?
An adult age 20-50

Does the inflammatory component tend to be mild, or severe?
Mild

Does the IOP elevation tend to be mild, or severe?
Severe

How long do the crises last?
Hours to days

Do they recur?
Yes

--Duh, it’s NTG
--The IOP is high, but you missed it
--The IOP is high, but it’s being suppressed
--The IOP is intermittently high, and you keep missing it
--The IOP used to be high, but it’s not anymore
--It ain’t GON

--Diurnal IOP variation in high-tension OAG
--Posner-Schlossman syndrome
You have a pt with ONH and VF changes consistent with glaucomatous optic neuropathy.

What is the noneponymous name for Posner-Schlossman?
- Glaucamotocyclitic crisis

Who is the typical pt?
- An adult age 20-50

Does the inflammatory component tend to be mild, or severe?
- Mild

Does the IOP elevation tend to be mild, or severe?
- Severe

How long do the crises last?
- Hours to days

Do they recur?
- Yes

--Duh, it’s NTG

--The IOP is high, but you missed it

--The IOP is high, but it’s being suppressed

--The IOP is **intermittently** high, and you keep missing it

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**Normal-Tension Glaucoma (NTG)**

- The IOP is high, but you missed it
- The IOP is intermittently high, and you keep missing it
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--The IOP is **intermittently** high, and you keep missing it

--The IOP used to be high, but it’s not anymore

--It ain’t GON

What are some of the causes of intermittent IOP elevation in a pt with open angles?
- Diurnal IOP variation in high-tension OAG
- Posner-Schlossman syndrome

What is the noneponymous name for Posner-Schlossman?
- Glaucamotocyclitic crisis

Who is the typical pt?
- An adult age 20-50

Does the inflammatory component tend to be mild, or severe?
- Mild

Does the IOP elevation tend to be mild, or severe?
- Severe

How long do the crises last?
- Hours to days

Do they recur?
- Yes

**Normal-Tension Glaucoma (NTG)**

- The IOP is high, but you missed it
- The IOP is intermittently high, and you keep missing it
- The IOP used to be high, but it’s not anymore
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- It ain’t GON
Normal-Tension Glaucoma (NTG)

You have a pt with ONH and VF changes of glaucomatous optic neuropathy.

What is the non-eponymous name for Posner-Schlossman?
Glaucomaticocyclitic crisis

Who is the typical pt?
An adult age 20-50

Does the inflammatory component tend to be mild, or severe?
Mild

Does the IOP elevation tend to be mild, or severe?
Severe

How long do the crises last?
Hours to days

Do they recur?
Yes

--Posner-Schlossman syndrome

What are the presenting complaints in Posner-Schlossman?
--Unilateral discomfort
--Blurred vision
--Haloes around lights

DDx

--Duh, it’s NTG

--The IOP is high, but you missed it

--The IOP is high, but it’s being suppressed

--The IOP is intermittently high, and you keep missing it

--The IOP used to be high, but it’s not anymore

--It ain’t GON
Normal-Tension Glaucoma (NTG)

You have a pt with ONH and VF changes of glaucomatous optic neuropathy. What is the noneponymous name for Posner-Schlossman? Glaucomatocyclitic crisis

**DDx**

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--The IOP is high, but it’s being suppressed

--The IOP is intermittently high, and you keep missing it

--The IOP used to be high, but it’s not anymore

--It ain’t GON

--Diurnal IOP variation in high-tension OAG

**--Posner-Schlossman syndrome**

**Who is the typical pt?**
An adult age 20-50

**Does the inflammatory component tend to be mild, or severe?**
Mild

**Does the IOP elevation tend to be mild, or severe?**
Severe

**How long do the crises last?**
Hours to days

**Do they recur?**
Yes

**What are the presenting complaints in Posner-Schlossman?**
--Unilateral discomfort
--**Blurred vision**
--Haloes around lights

**What is the cause of the blurred vision/haloes?**
Corneal edema secondary to the high IOP
Normal-Tension Glaucoma (NTG)

You have a pt with ONH and VF changes of glaucomatous optic neuropathy.

What is the noneponymous name for Posner-Schlossman?
Glucomatocyclitic crisis

Who is the typical pt?
An adult age 20-50

Does the inflammatory component tend to be mild, or severe?
Mild

Does the IOP elevation tend to be mild, or severe?
Severe

How long do the crises last?
Hours to days

Do they recur?
Yes

--Duh, it’s NTG

DDx

--The IOP is high, but you missed it

--The IOP is high, but it’s being suppressed

--The IOP is intermittently high, and you keep missing it

--The IOP used to be high, but it’s not anymore

--It ain’t GON

What are the presenting complaints in Posner-Schlossman?
--Unilateral discomfort
--Blurred vision
--Haloes around lights

What is the cause of the blurred vision/haloes?
Corneal edema secondary to the high IOP

--Posner-Schlossman syndrome
Normal-Tension Glaucoma (NTG)

You have a pt with ONH and VF changes c/w glaucomatous optic neuropathy (GON), but at every exam, her IOP is never high. Other than NTG, what is in the DDx?

**DDx**

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--The IOP is intermittently high, and you keep missing it

--The IOP used to be high, but it’s not anymore

--It ain’t GON

*What clinical scenarios might explain why an eye once had elevated IOP, but no longer does?*
Normal-Tension Glaucoma (NTG)

You have a pt with ONH and VF changes c/w glaucomatous optic neuropathy (GON), but at every exam, her IOP is never high. Other than NTG, what is in the DDx?

DDx

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--The IOP is intermittently high, and you keep missing it

--The IOP used to be high, but it’s not anymore

--It ain’t GON

What clinical scenarios might explain why an eye once had elevated IOP, but no longer does?

Histories of the following:
--Systemic steroid use with steroid-response glaucoma
--Trauma with angle damage and/or severe inflammation
--Uveitis
Also, so-called ‘burned out pigment-dispersion glaucoma’
Normal-Tension Glaucoma (NTG)

You have a pt with ONH and VF changes c/w glaucomatous optic neuropathy (GON), but at every exam, her IOP is never high. Other than NTG, what is in the DDx?

**DDx**

--Duh, it’s NTG

--The IOP is high, but you missed it

--The IOP is high, but it’s being suppressed

--The IOP is intermittently high, and you keep missing it

--The IOP used to be high, but it’s not anymore

--It ain’t GON

**What is pigment-dispersion glaucoma (PDG)?**
Normal-Tension Glaucoma (NTG)

You have a pt with ONH and VF changes c/w glaucomatous optic neuropathy (GON), but at every exam, her IOP is never high. Other than NTG, what is in the DDx?

**DDx**

--Duh, it’s NTG

--The IOP is high, but you missed it

--The IOP is high, but it’s being suppressed

--The IOP is intermittently high, and you keep missing it

--The IOP used to be high, but it’s not anymore

--It ain’t GON

**What is pigment-dispersion glaucoma (PDG)?**

A form of secondary OAG in which pigment liberated from the posterior aspect of the iris leads to elevated IOP

What clinical scenarios might explain why an eye once had elevated IOP, but no longer does?

Histories of the following:

--Systemic steroid use with steroid-response glaucoma
--Trauma with angle damage and/or severe inflammation
--Uveitis

Also, so-called ‘burned out’ pigment-dispersion glaucoma.
Normal-Tension Glaucoma (NTG)

You have a pt with ONH and VF changes c/w glaucomatous optic neuropathy (GON), but at every exam, her IOP is never high. Other than NTG, what is in the DDx?

**DDx**
--Duh, it’s NTG
--The IOP is high, but you missed it
--The IOP is high, and it’s being suppressed
--The IOP is intermittently high, and you keep missing it
--The IOP used to be high, but it’s not anymore
--It ain’t GON

What is pigment-dispersion glaucoma (PDG)?
A form of secondary OAG in which pigment liberated from the posterior aspect of the iris leads to elevated IOP

What is the mechanism by which pigment is liberated from the posterior iris?

What clinical scenarios might explain why an eye once had elevated IOP, but no longer does?
Histories of the following:
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--Trauma with angle damage and/or severe inflammation
--Uveitis
Also, so-called ‘burned out’ pigment-dispersion glaucoma
**Normal-Tension Glaucoma (NTG)**

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--It ain’t GON

---

**What is pigment-dispersion glaucoma (PDG)?**
A form of secondary OAG in which pigment liberated from the posterior aspect of the iris leads to elevated IOP

**What is the mechanism by which pigment is liberated from the posterior iris?**
Rubbing of the lens zonules against the iris

---

**What clinical scenarios might explain why an eye once had elevated IOP, but no longer does?**
Histories of the following:
--Systemic steroid use with steroid-response glaucoma
--Trauma with angle damage and/or severe inflammation
--Uveitis
Also, so-called ‘burned out’ pigment-dispersion glaucoma
**Normal-Tension Glaucoma (NTG)**

You have a pt with ONH and VF changes c/w glaucomatous optic neuropathy (GON), but at every exam, her IOP is never high. **Other than NTG, what is in the DDx?**

**DDx**

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--The IOP is high, but you missed it

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--The IOP used to be high, but it’s not anymore

--It ain’t GON

What is pigment-dispersion glaucoma (PDG)?
A form of secondary OAG in which pigment liberated from the posterior aspect of the iris leads to elevated IOP

What are the classic clinical signs of PDG located on…
…the iris?

What clinical scenarios might explain why an eye once had elevated IOP, but no longer does?
Histories of the following:
--Systemic steroid use with steroid-response glaucoma
--Trauma with angle damage and/or severe inflammation
--Uveitis
Also, so-called ‘burned out’ pigment-dispersion glaucoma.
Normal-Tension Glaucoma (NTG)

You have a pt with ONH and VF changes c/w glaucomatous optic neuropathy (GON), but at every exam, her IOP is never high. Other than NTG, what is in the DDx?

**DDx**

--Duh, it’s NTG

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--The IOP is high, and it’s being suppressed

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--The IOP used to be high, but it’s not anymore

--It ain’t GON

**What is pigment-dispersion glaucoma (PDG)?**
A form of secondary OAG in which pigment liberated from the posterior aspect of the iris leads to elevated IOP

**What are the classic clinical signs of PDG located on…**
…the iris? Transillumination defects

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Histories of the following:
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Also, so-called ‘burned out’ pigment-dispersion glaucoma (PDG)
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You have a pt with ONH and VF changes c/w glaucomatous optic neuropathy (GON), but at every exam, her IOP is never high. **Other than NTG, what is in the DDx?**

**DDx**

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**How are the transillumination defects typically oriented?**

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Radially

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Pigment dispersion syndrome: Radial TID
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Radially

If they were limited to the pupillary margin, what dz process would be suggested?

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How are the transillumination defects typically oriented?
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Pseudoexfoliation syndrome (PXS)

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Pseudoexfoliation syndrome: Marginal TID
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What factors account for the location and shape of the spindle?

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Transillumination defects

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What is a Krukenberg spindle?

A vertical distribution of pigment on the endothelial surface of the cornea

What factors account for the location and shape of the spindle?

Convection currents within the anterior chamber funnel pigment into this area.
Normal-Tension Glaucoma (NTG)

Krukenberg spindle
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**What is a Sampaolesi line?**

A scalloped line of pigment located anterior (ie, ‘above’ on gonioscopy) to Schwalbe’s line in the angle
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--- What is a Scheie stripe?

A ribbon-shaped deposition of pigment on the posterior capsule, where the zonules insert

--- By what other eponym name is this sign known?

Zentmayer line (the Glaucoma book prefers this term)
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Retroillumination

Direct illumination

Scheie stripe
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…the lens? Scheie stripe?

**Which (if any) of these is/are pathognomonic for PDG?**

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What does it mean to say PDG ‘burns out’?

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Age-related changes in the architecture of the anterior segment, coupled with decreased accommodation-related movement of the lens, result in less and less contact between the posterior iris and the zonules, and therefore smaller and smaller amounts of liberated pigment. By middle age, the signs of PDG often fade, and the IOP normalizes.

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One sign doesn’t fade with time— which one?

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One sign doesn’t fade with time—**which one?**
Scheie’s stripe (a fact that increases its value as an exam finding)

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Also, so-called ‘**burned out** pigment-dispersion glaucoma’
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**DDx**

--Duh, it’s NTG

--The IOP is high, but you missed it

--The IOP is high, but it’s being suppressed

--The IOP is intermittently high, and you keep missing it

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Normal-Tension Glaucoma (NTG)

Optic nerve pit

Optic nerve coloboma

Optic nerve hypoplasia

Superior segmental optic nerve coloboma
**Q**

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**What are the 4 D’s of optic nerve hypoplasia?**

--D

--D

--D

--D

*Hints forthcoming…*

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What are the 4 D’s of optic nerve hypoplasia?

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--D

These three concern mom’s life while she was pregnant with the child who will have ON hypoplasia

A rare congenital condition

Four congenital disc anomalies can mimic NTG. What are they?

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**What are the 4 D’s of optic nerve hypoplasia?**

- Drink (ie, heavy EtOH consumption)
- Diabetes
- Drugs (especially anti-sz meds, esp. Dilantin)
- De Morsier syndrome

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**What specific pattern of ON hypoplasia is associated with maternal DM?**

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**What does AION stand for in this context?**

Anterior ischemic optic neuropathy

**What are the two types of AION?**

Arteritic (AAION) and nonarteritic (NAION)
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What does AION stand for in this context? What is suggestive of GON?

What disease is being referred to by the modifier ‘arteritic’?

What are the two types of AION?

**Arteritic (AAION)** and nonarteritic (NAION)
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**What does AION stand for in this context?**

Anterior ischemic optic neuropathy

**What disease is being referred to by the modifier ‘arteritic’?**

Temporal arteritis (aka giant cell arteritis)

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What does PION stand for in this context?

A history of a prolonged hypotensive event is suggestive of GON?
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**Posterior** ischemic optic neuropathy

Is suggestive of GON?
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**What does PION stand for in this context?**

*Posterior* ischemic optic neuropathy

**What is the classic backstory for PION?**

A history of a prolonged hypotensive event
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The fact that you’re looking for a ‘history’ of something suggests what?

That you have to inquire directly about this during the H&P (remember: When all else fails, talk to the pt)
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A history of a prolonged hypotensive event
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What sorts of events should one ask about?

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A history of a prolonged hypotensive event

The fact that you’re looking for a ‘history’ of something suggests what? That you have to inquire directly about this during the H&P (remember: When all else fails, talk to the pt)

What sorts of events should one ask about?
--Cardiac arrest
--Cardiac surgery involving a bypass machine
--Significant blood loss during surgery or after trauma
--A history of shock with profound hypotension
--A history of severe anemia
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*What specific portion of the optic nerve is affected in toxic/nutritional optic neuropathy?*

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The papillomacular bundle (PMB)

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*What specific portion of the optic nerve is affected in toxic/nutritional optic neuropathy?*

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*Why are fibers of the PMB affected preferentially?*

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**What specific portion of the optic nerve is affected in toxic/nutritional optic neuropathy?**

The **papillomacular bundle** (PMB)

**Why are fibers of the PMB affected preferentially?**

Think of the PMB fibers as the canary in the coal mine. These fibers are small, have high metabolic activity rates, and are unmyelinated. Taken together, these characteristics make them highly vulnerable to toxins and/or nutritional deficiencies.

**Toxic/nutritional optic neuropathy**
Objective: Determine whether IOP is involved in the pathogenesis of NTG

What was the name of the clinical trial that had this as its objective?
Normal-Tension Glaucoma (NTG)

**Collaborative Normal-Tension Glaucoma Study**

- Objective: Determine whether IOP is involved in the pathogenesis of NTG

*What was the name of the clinical trial that had this as its objective?*
Normal-Tension Glaucoma (NTG)

Collaborative Normal-Tension Glaucoma Study

Objective: Determine whether IOP is involved in the pathogenesis of NTG

What was the name of the clinical trial that had this as its objective? Depending on who you ask, there are 6-8 glaucoma clinical trials a resident might be expected to know by name, and the CNTGS is one of them. (As for the others, we'll meet one shortly, and the rest of mine can be found in the Glaucoma Clinical Trials slide-set.)
Collaborative Normal-Tension Glaucoma Study

- Objective: Determine whether IOP is involved in the pathogenesis of NTG
- Subjects: 70 patients (140 eyes) with normal IOP and VF loss
Collaborative Normal-Tension Glaucoma Study

Objective: Determine whether IOP is involved in the pathogenesis of NTG

Subjects: 70 patients (140 eyes) with normal IOP and VF loss

Protocol: 1 eye assigned to tx, the other to no tx

Tx: 3 modalities as needed to lower IOP
Collaborative Normal-Tension Glaucoma Study

Objective: Determine whether IOP is involved in the pathogenesis of NTG

Subjects: 70 patients (140 eyes) with normal IOP and VF loss

Protocol: 1 eye assigned to tx, the other to no tx
- Tx: Meds/ALT/surgery as needed to lower IOP 30%
**Collaborative Normal-Tension Glaucoma Study**

- Objective: Determine whether IOP is involved in the pathogenesis of NTG
- Subjects: 70 patients (140 eyes) with normal IOP and VF loss
- Protocol: 1 eye assigned to tx, the other to no tx
  - Tx: **Meds/ALT/surgery** as needed to lower IOP 30%

*What one topical hypotensive was used?*
Collaborative Normal-Tension Glaucoma Study

- **Objective**: Determine whether IOP is involved in the pathogenesis of NTG
- **Subjects**: 70 patients (140 eyes) with normal IOP and VF loss
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*What one topical hypotensive was used?*
Pilo
Collaborative Normal-Tension Glaucoma Study

Objective: Determine whether IOP is involved in the pathogenesis of NTG

Subjects: 70 patients (140 eyes) with normal IOP and VF loss

Protocol: 1 eye assigned to tx, the other to no tx
- Tx: Meds/ALT/surgery as needed to lower IOP 30%

Findings:
- Lowering IOP 30% → reduced rate of ONH/VF loss, but...
**Collaborative Normal-Tension Glaucoma Study**

- **Objective:** Determine whether IOP is involved in the pathogenesis of NTG
- **Subjects:** 70 patients (140 eyes) with normal IOP and VF loss
- **Protocol:** 1 eye assigned to tx, the other to no tx
  - **Tx:** Meds/ALT/surgery as needed to lower IOP 30%
- **Findings:**
  - Lowering IOP 30% → reduced rate of ONH/VF loss, *but*…
    - 65% of untreated eyes had two words
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If you remember nothing else about the CNTGS, remember this!
If asked--on the OKAP, the WQE, the Boards, or in clinic--what your initial treatment goal is for a NTG pt, the answer is a 30% reduction in IOP from baseline.
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The CNTGS employed pilo—très passé. Regarding other meds, is there a reason to use a particular med (or to avoid one)? Yes and yes. The Glaucoma book is at pains to point out that the Early Manifest Glaucoma Trial (EMGT—another know-by-name glaucoma clinical trial) found that in NTG pts, tx with a β blocker + ALT combo failed to produce a significant reduction in IOP. So, maybe avoid β blockers.
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Q/A

Normal-Tension Glaucoma (NTG)

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Lowering IOP

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Normal-Tension Glaucoma (NTG)

Speaking of the

Early Manifest Glaucoma Trial...
Normal-Tension Glaucoma (NTG)

- Early Manifest Glaucoma Trial
  - Objective:
Early Manifest Glaucoma Trial

- Objective: Compare immediate treatment vs observation in newly-diagnosed POAG/NTG
Early Manifest Glaucoma Trial

Objective: Compare immediate treatment vs observation in newly-diagnosed POAG/NTG

Protocol: 1 eye assigned to ALT + betaxolol, the other to no treatment
Normal-Tension Glaucoma (NTG)

- **Early Manifest Glaucoma Trial**
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Early Manifest Glaucoma Trial

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Normal-Tension Glaucoma (NTG)
**Early Manifest Glaucoma Trial**

- **Objective:** Compare immediate treatment vs observation in newly-diagnosed POAG/NTG
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  - Significantly more progression in untreated eyes (62%) than in treated eyes (45%)
Early Manifest Glaucoma Trial

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- Findings:
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  - Every 1 mmHg decrease in IOP translated into a roughly 10% risk reduction regarding progression
Early Manifest Glaucoma Trial

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Protocol: 1 eye assigned to ALT + betaxolol, the other to no treatment.

Findings:

- Significantly more progression in untreated eyes (62%) than in treated eyes (45%).
  - Every 1 mmHg decrease in IOP translated into a roughly 10% risk reduction regarding progression.
- Progression occurred later in treated eyes.
- ALT + betaxolol had little IOP-lowering effect on eyes for which the baseline IOP was # or less.
Early Manifest Glaucoma Trial

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  - Every 1 mmHg decrease in IOP translated into a roughly 10% risk reduction regarding progression
- Progression occurred later in treated eyes
- ALT + betaxolol had little IOP-lowering effect on eyes for which the baseline IOP was 15 or less