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Glaucoma is a group of optic neuropathies that present with progressive ONH damage and characteristic VF loss.
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Elevated IOP is a strong risk factor for glaucoma, but it need not be present—IOP can be normal, or even low. (Hence this slide-set.)
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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.
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Why isn't elevated IOP mentioned above? Elevated IOP is a strong risk factor for glaucoma, but it need not be present—IOP can be normal, or even low. (Hence this slide-set.)

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…
Glaucoma

- Normal-Tension Glaucoma (NTG)

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?*
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?

Normal-Tension Glaucoma (NTG)
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!
Once you have determined your glaucoma pt has open angles, the next ‘first thought’ is to ask…
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?*
Normal-Tension Glaucoma (NTG)

OAG

$\uparrow IOP$

Normal-tension glaucoma (NTG)

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

Untreated IOP measurement always above 21 mmHg

Untreated IOP measurement always at or below 21 mmHg
Untreated IOP measurement always above 21 mmHg

Normal-Tension Glaucoma (NTG)

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Normal-Tension Glaucoma (NTG)

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Untreated IOP measurement always at or below 21 mmHg

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.
Q/A

Normal-Tension Glaucoma (NTG)

OAG

↑IOP

Normal-tension glaucoma (NTG)

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Untreated IOP measurement always above 21 mmHg

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Normal-Tension Glaucoma (NTG)

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

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**Normal-Tension Glaucoma (NTG)**

OAG

↑IOP

**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?*

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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, then the highest ‘normal’ IOP is $15.5 + (2 \times 2.6) \approx 21$.

Untreated IOP measurement always above $21$ mmHg

Untreated IOP measurement always at or below $21$ mmHg

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…)

Normal-Tension Glaucoma (NTG)

OAG

↑IOP

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  \textbf{T}
When compared to high-tension glaucoma pts:

- Some studies indicate NTG pts are more likely to be migraineurs  \text{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 migraineurs **T**
- NTG pts are **less** likely to have optic disc hemorrhages **F** **T**
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
- NTG pts are less likely to have optic disc hemorrhages

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

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.
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 test positive for syphilis
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**
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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**
- NTG pts are more likely to test positive for syphilis: **F**

Does this mean syphilis testing plays no role in evaluating NTG? **T**
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 test positive for syphilis: F T

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 less likely to have optic disc hemorrhages [F/T]
- NTG pts are more likely to test positive for syphilis [F/T]
- Some studies indicate NTG pts have a higher rate of Raynaud’s
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 more 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

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. (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)

The increased prevalence of these conditions in the NTG population converges with the fact that vascular abnormalities may play a role in NTG.
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**
- NTG pts are more likely to test positive for syphilis **F** ← **T**
- Some studies indicate NTG pts have a higher rate of Raynaud’s **T**
- VF defects in NTG tend to be more peripheral and diffuse **T**
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**
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- VF defects in NTG tend to be more **central and focal** **T**
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
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- VF defects in NTG tend to be more peripheral and diffuse F T
- NTG pts have a higher rate of congenital disc anomalies
When compared to high-tension glaucoma pts:

- Some studies indicate NTG pts are more likely to be migraineurs **T**
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- NTG pts are more likely to test positive for syphilis **F T**
- Some studies indicate NTG pts have a higher rate of Raynaud’s **T**
- VF defects in NTG tend to be more central, focal, and peripheral **F T**
- NTG pts have a higher rate of congenital disc anomalies **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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- Some studies indicate NTG pts have a higher rate of Raynaud’s \( T \)
- VF defects in NTG tend to be more \( central \) and \( diffuse \) \( T \)
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Normal-Tension Glaucoma (NTG) vs High-Tension Glaucoma: T/F

*When compared to high-tension glaucoma pts:*

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- NTG pts are more likely to have optic disc hemorrhages **T**
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- Some studies indicate NTG pts have a higher rate of Raynaud’s **T**
- VF defects in NTG tend to be more peripheral and diffuse **T**
- NTG pts have a higher rate of congenital disc anomalies **T**
- Some studies indicate NTG pts are more likely to suffer with an autoimmune disease **T**
Normal-Tension Glaucoma (NTG) vs High-Tension Glaucoma (HTG):

**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**
- Some studies indicate NTG pts have a higher rate of Raynaud’s **T**
- VF defects in NTG tend to be more **central** and **focal** and **do not** diffuse **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**
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)
Normal-Tension Glaucoma (NTG)

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

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

A thinner-than-normal central corneal thickness
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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

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

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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

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

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?*

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**What is the most likely cause of IOP suppression in an ‘untreated’ (note the quotes) pt?**
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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
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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
Normal-Tension Glaucoma (NTG)

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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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2 to 6 mmHg

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

Yes—the higher the IOP, the **> or <** the amount of variation

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

--Posner-Schlossman syndrome
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**Do glaucomatous eyes tend to have more, or less variation?**

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More

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Q

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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

--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?

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?

--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?

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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

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--Diurnal IOP variation in high-tension OAG

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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?
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)

Q

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

Q

What is the noneponymous name for Posner-Schlossman?

DDx

--Duh, it’s NTG

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--Normal IOP variation in high tension OAG

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What is the noneponymous name for Posner-Schlossman? Glaucomatocyclitic crisis
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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?
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
Normal-Tension Glaucoma (NTG)

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

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**Normal-Tension Glaucoma (NTG)**

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

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

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Normal IOP variation in high tension OAG

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--Posner-Schlossman syndrome
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- The IOP used to be high, but it’s not anymore
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---Normal IOP variation in high tension OAG

---Posner-Schlossman syndrome

---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 eye tend to be red and angry?

---Normal-Tension Glaucoma (NTG)

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

Glaucomatocyclitic crisis

---Inflammatory component tend to be mild, or severe?

Mild

---Duh, it’s NTG

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

---An adult age 20-50

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

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---Does the eye tend to be red and angry?

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Mild

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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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DDx

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

--It ain’t GON

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?
Mild

Does the eye tend to be red and angry?
No, it is usually white and quiet

--Duh, it’s NTG

--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?

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**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?**

Mild

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

Severe

---

**Normal IOP variation in high tension OAG**

--Posner-Schlossman syndrome
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?

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

--It ain’t GON

---Normal-Tension Glaucoma (NTG)---

*What is the noneponymous name for Posner-Schlossman?*  
Glaucatocyclitic 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

---Normal 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?

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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 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?**

- Mild

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

- Severe

**How severe?**

- IOP in the 40-60 range is typical
Normal-Tension Glaucoma (NTG)

You have a pt with ONH and VF changes consistent with 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

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

Severe

---

How severe?

IOP in the 40-60 range is typical

---

--Duh, it’s NTG

**Normal IOP variation in high tension OAG**

--Posner-Schlossman syndrome
Q

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?

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Normal-Tension Glaucoma (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?
Mild

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

How long do the crises last?

--Duh, it's NTG

--Normal 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 (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 noneponymous name for Posner-Schlossman?**

Glucomaocyclitic 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 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 nonneponymous 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

--Normal IOP variation in high tension OAG

**--Posner-Schlossman syndrome**
You have a pt with ONH and VF changes c/w glaucomatous optic neuropathy (GON), but her IOP is never high. Other than NTG, what is in the 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

**Normal-Tension Glaucoma (NTG)**

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

Glaucamatocyclitic 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

--Normal IOP variation in high tension OAG

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Normal-Tension Glaucoma (NTG)

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

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

What are the presenting complaints in Posner-Schlossman?

--
--
--
Normal-Tension Glaucoma (NTG)

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What is the noneponymous name for Posner-Schlossman?
Glaucosmatocyclitic 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
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?

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

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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**

What is the cause of the blurred vision/haloes?

Corneal edema secondary to the high IOP
Normal-Tension Glaucoma (NTG)

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Does the IOP elevation tend to be mild, or severe?
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How long do the crises last?
Hours to days

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Yes

--Diurnal IOP variation in high-tension OAG
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What are the presenting complaints in Posner-Schlossman?
--Unilateral discomfort
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*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

What is pigment-dispersion glaucoma (PDG)?

--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

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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
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--Trauma with angle damage and/or severe inflammation
--Uveitis
Also, so-called ‘burned out’ pigment-dispersion glaucoma

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?
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?

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

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**What is a Krukenberg spindle?**

A vertical distribution of pigment on the endothelial surface of the cornea
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Convection currents within the anterior chamber funnel pigment into this area

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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 eponymous name is this sign known?
Zentmayer line (the Glaucoma book prefers this term)
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Which (if any) of these is/are pathognomonic for PDG?

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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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Scheie’s stripe (a fact that increases its value as an exam finding)

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

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

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

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--D

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A rare congenital condition

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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 (5th ‘D’)

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--Arteritic (AAION) and nonarteritic (NAION)

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

**Anterior ischemic optic neuropathy**

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Arteritic (AAION) and nonarteritic (NAION)

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?**

Posterior ischemic optic neuropathy

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

A history of a prolonged hypotensive event
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What ‘ain’t GON’?
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*Posterior* ischemic optic neuropathy

Is suggestive of GON?
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The fact that you’re looking for a ‘history’ of something suggests what?

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What is the classic etiology for PION?

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What sorts of events should one ask about?

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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)

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

--Certain
--Hx of AIH
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The *papillomacular bundle* (PMB)

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The papillomacular bundle (PMB)

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.

**What ‘ain’t GON’ conditions might present with ONH/VF findings suggestive of GON?**

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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?
Collaborative Normal-Tension Glaucoma Study

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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
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- Protocol: 1 eye assigned to tx, the other to no tx
  - Tx: 3 modalities as needed to lower IOP %
Collaborative Normal-Tension Glaucoma (NTG) 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
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What one topical hypotensive was used?
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Pilo
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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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Normal-Tension Glaucoma (NTG)

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. As for preferred meds, the book mentions that there is some evidence of a ‘neuroprotective effect’ imparted by the highly selective α agonists, in particular brimonidine. So you might give that a shot.
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Normal-Tension Glaucoma (NTG)

Speaking of the

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

Early Manifest Glaucoma Trial

Objective:
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Objective: Compare immediate treatment vs observation in newly-diagnosed POAG/NTG
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- Findings:
  - Significantly more progression in untreated eyes than in treated eyes

Normal-Tension Glaucoma (NTG)
Early Manifest Glaucoma Trial

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

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Findings:
- Significantly more progression in untreated eyes (62%) than in treated eyes (45%)
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- Progression occurred later in treated eyes
- ALT + betaxolol had little IOP-lowering effect on eyes for which the baseline IOP was # or less
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