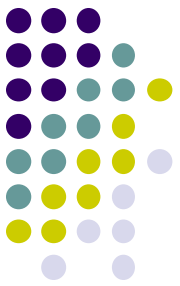
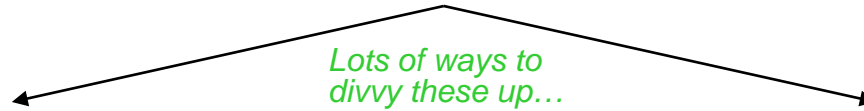


# *Ischemic Optic Neuropathy*

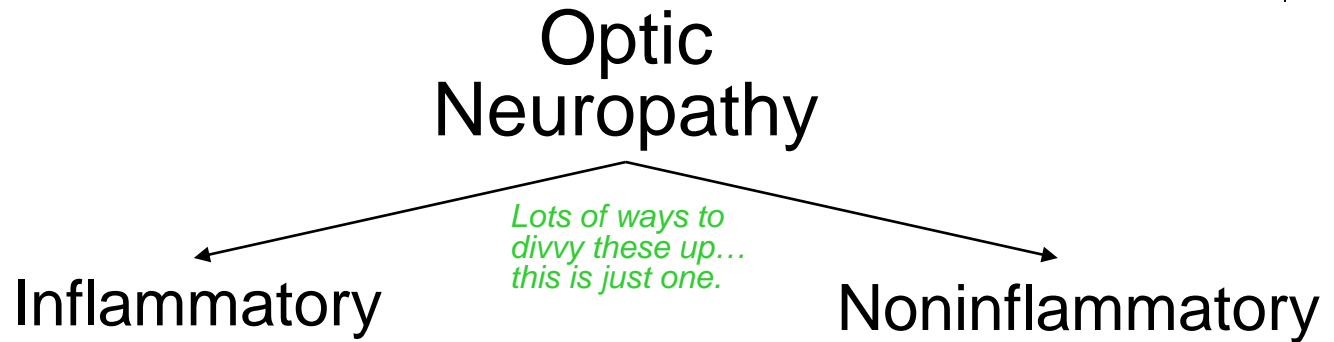
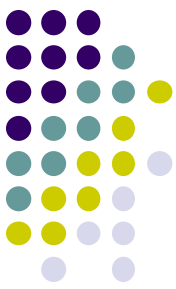


## Optic Neuropathy

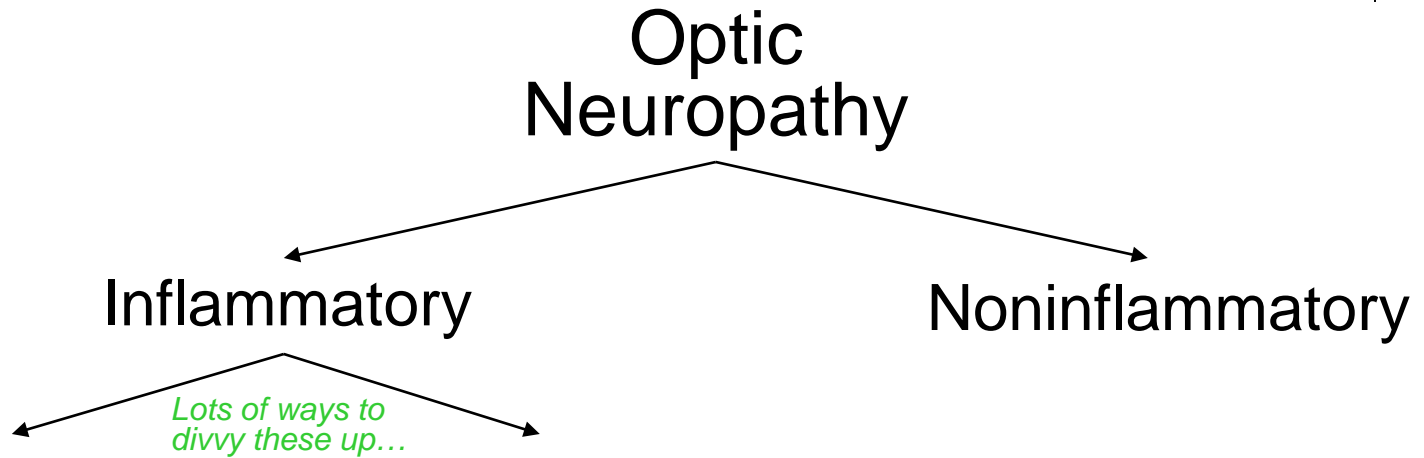
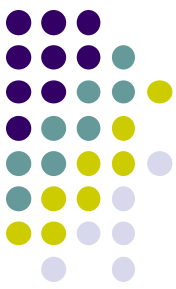


*Lots of ways to  
divvy these up...*

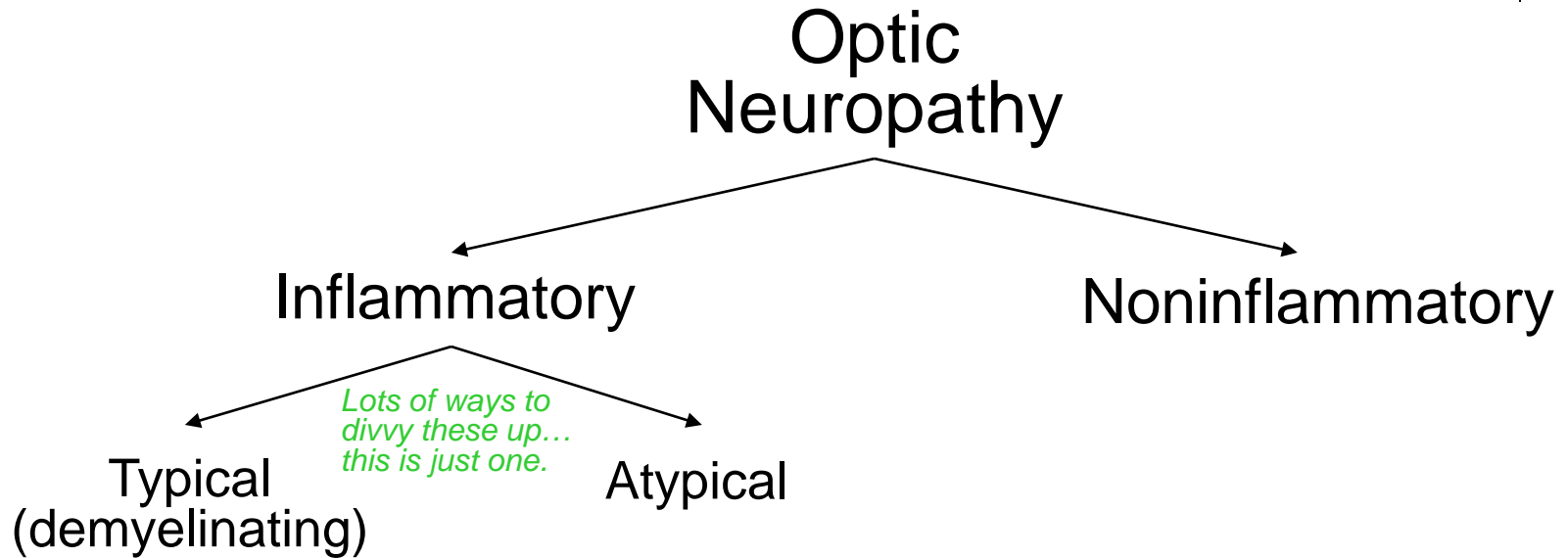
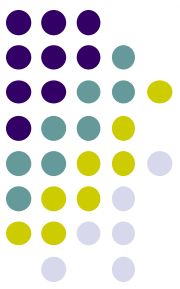
# Ischemic Optic Neuropathy



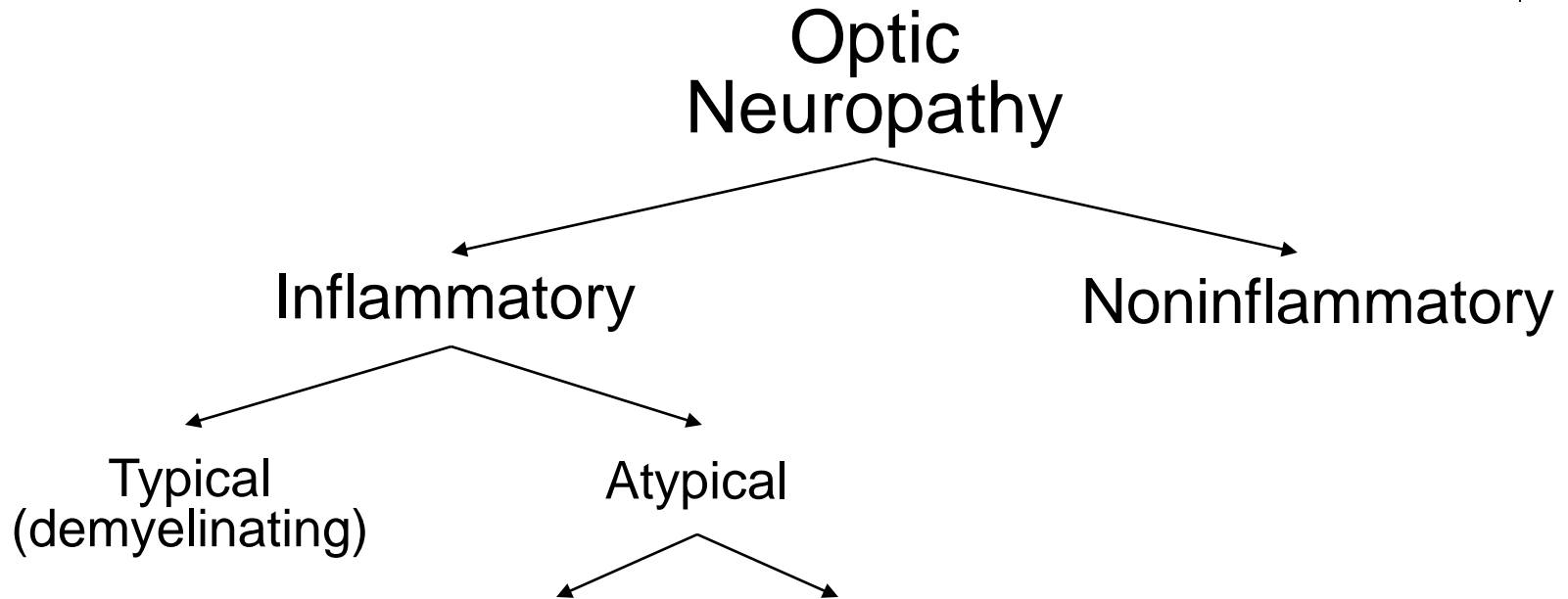
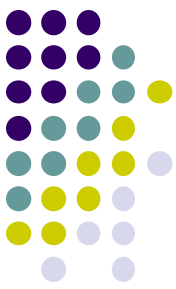
# *Ischemic Optic Neuropathy*



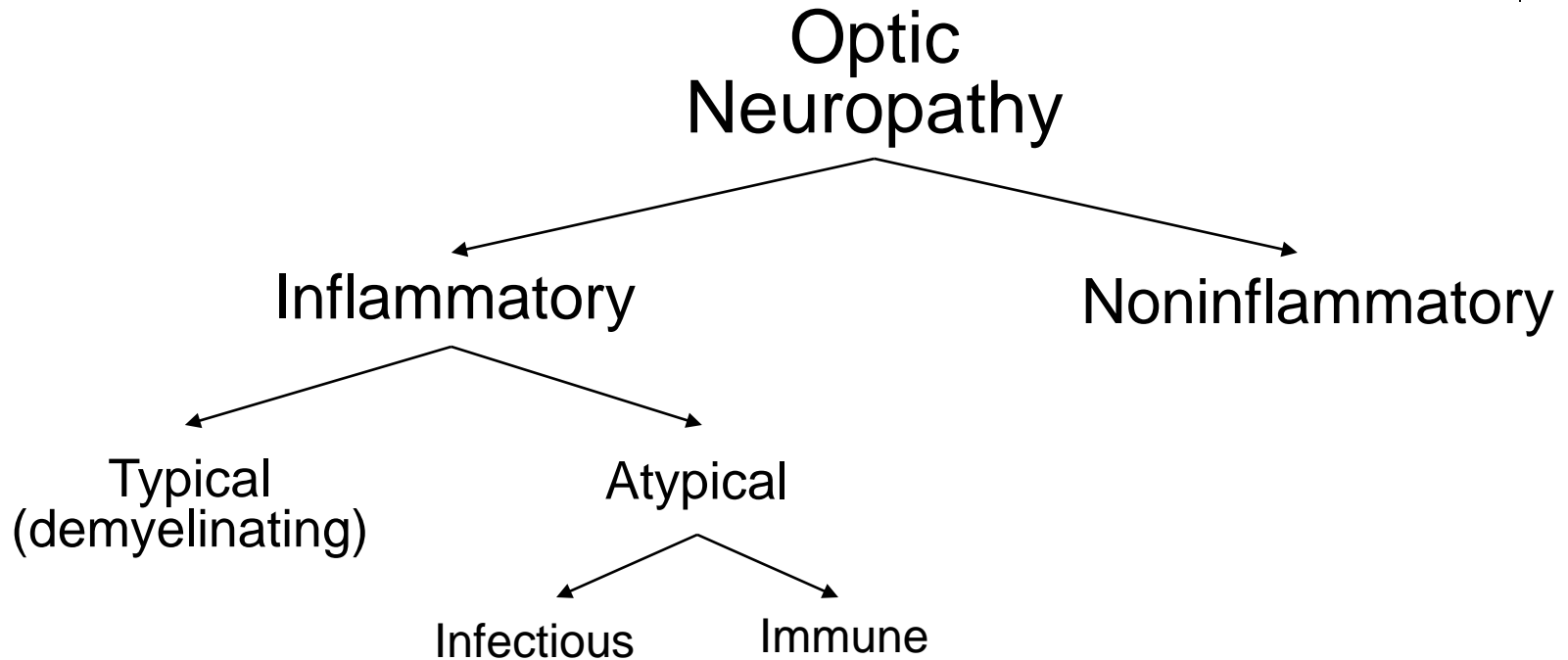
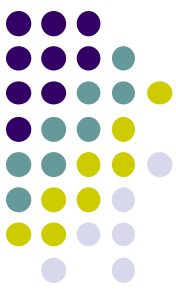
# Ischemic Optic Neuropathy



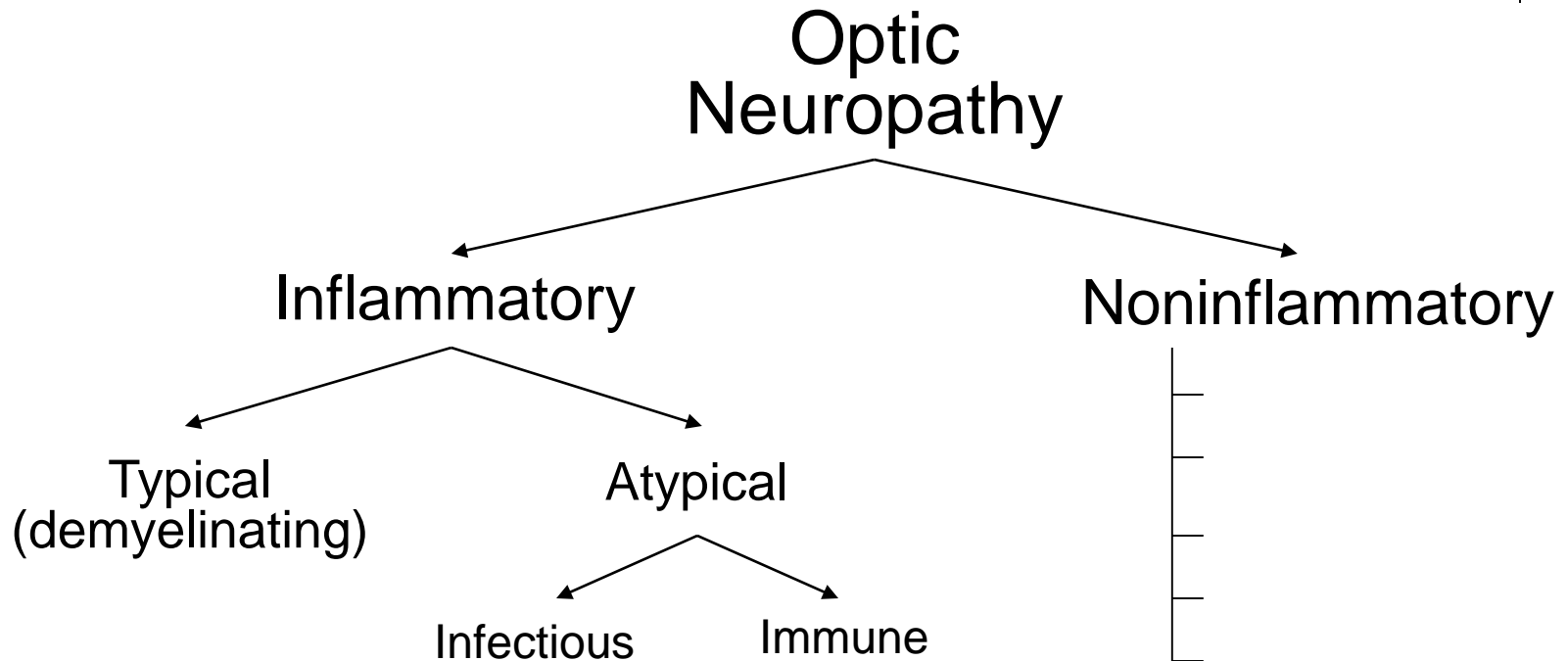
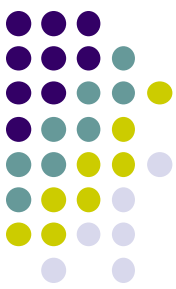
# *Ischemic Optic Neuropathy*

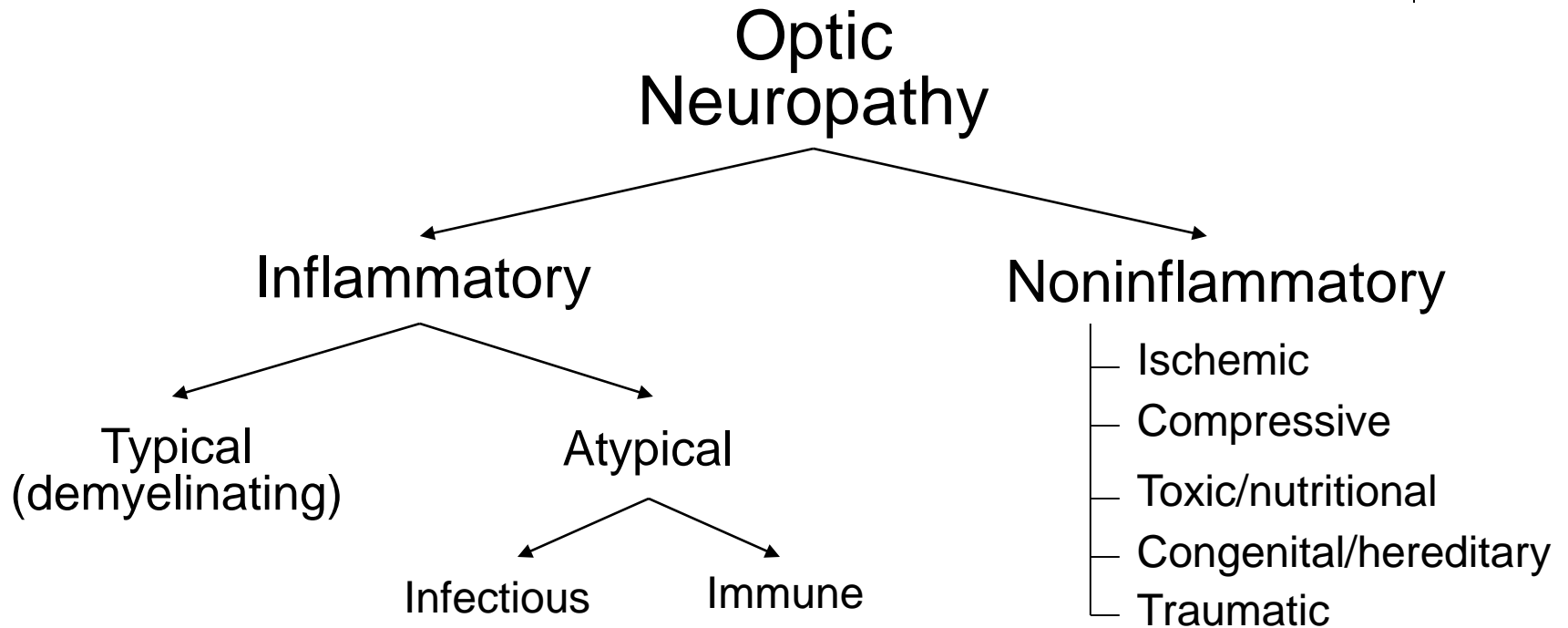
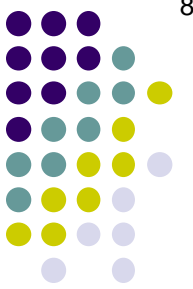


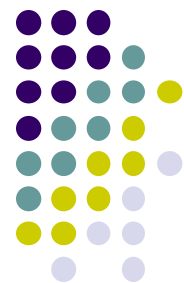
# *Ischemic Optic Neuropathy*



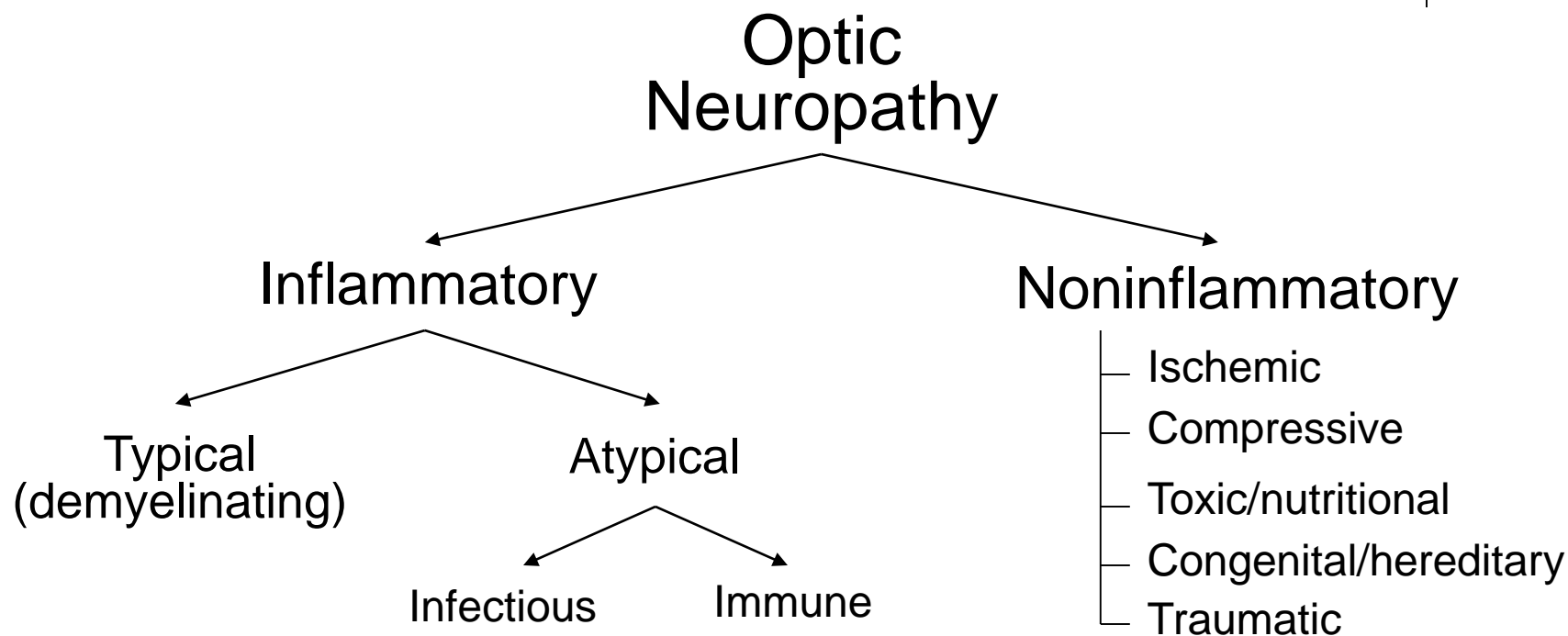
# *Ischemic Optic Neuropathy*





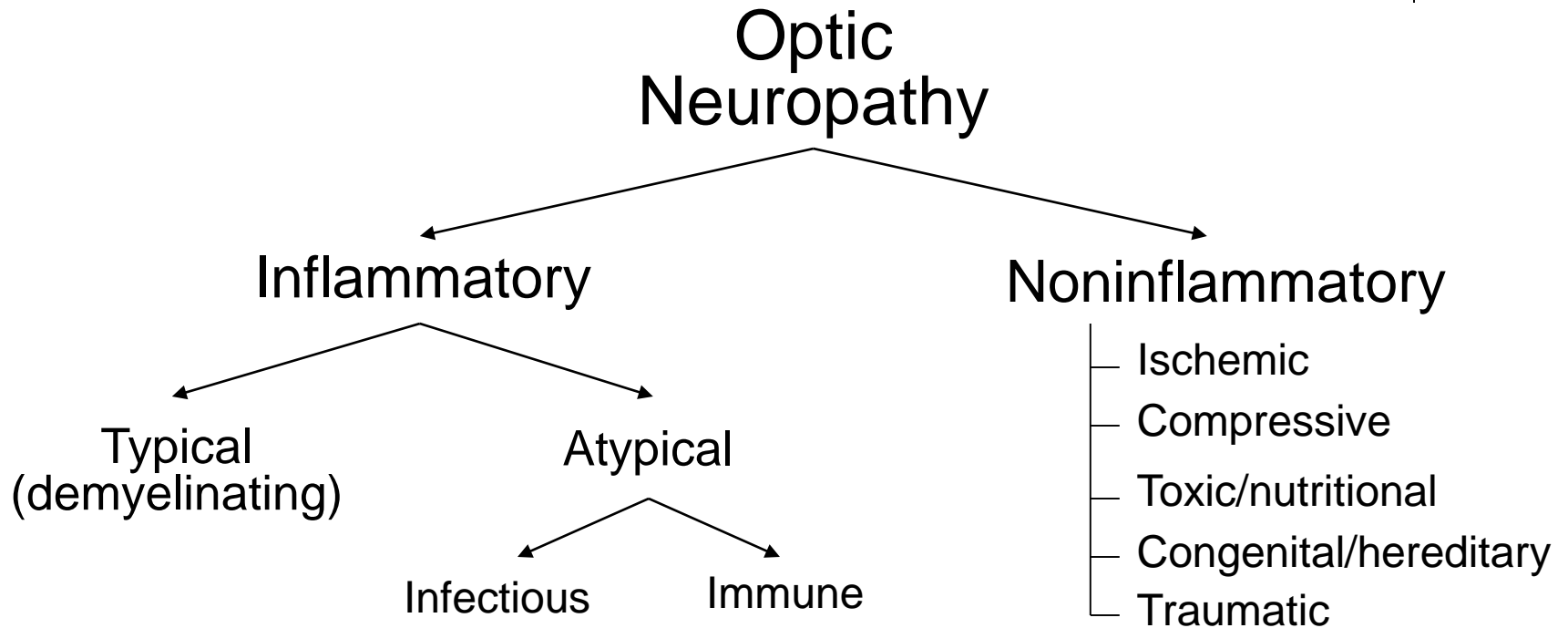
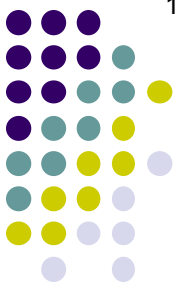


## *Ischemic Optic Neuropathy*



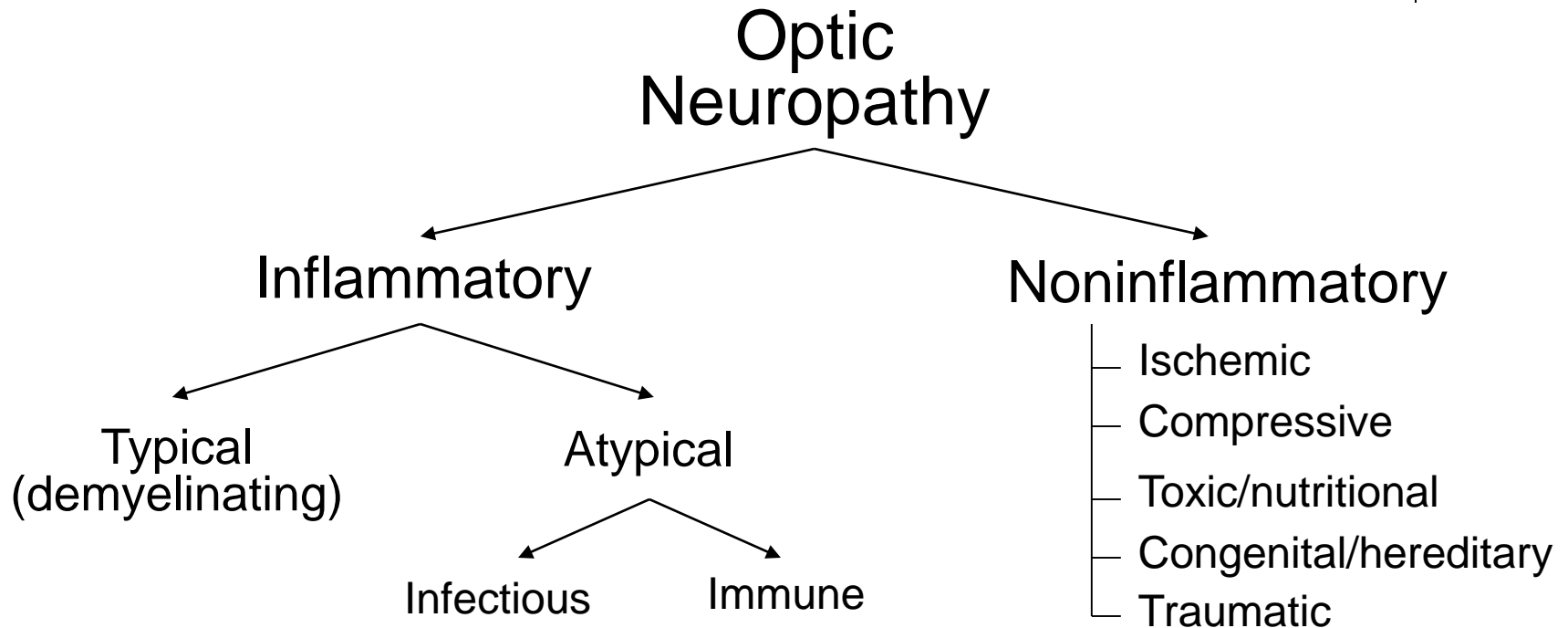
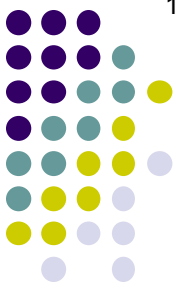
*What is far-and-away the most common type of optic neuropathy?  
Hint...*

# Ischemic Optic Neuropathy

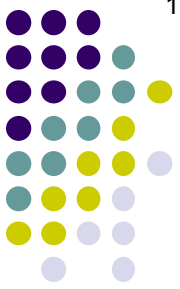


*What is far-and-away the most common type of optic neuropathy?  
Hint...It's not listed on this slide!  
Hint...*

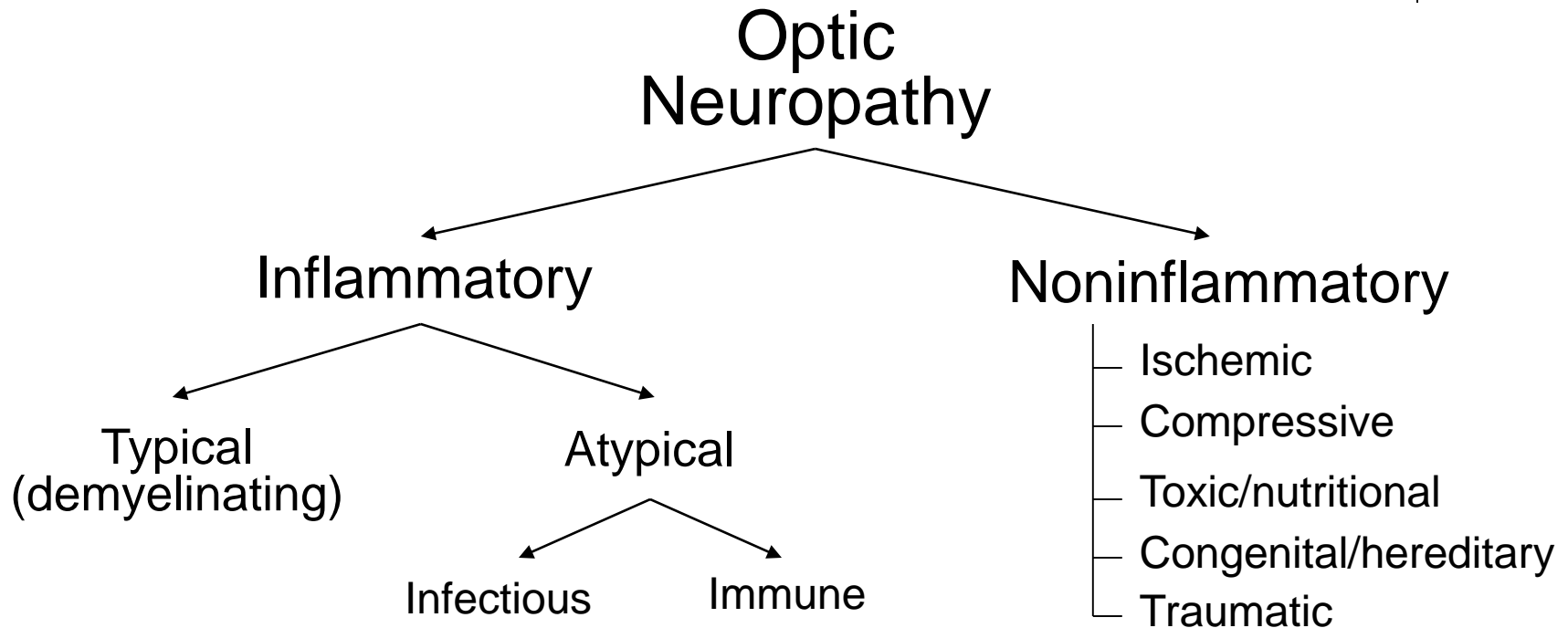
# Ischemic Optic Neuropathy



*What is far-and-away the most common type of optic neuropathy?*  
*Hint...It's not listed on this slide!*  
*Hint...It's so common, it gets its own ophthalmic subspecialty!*  
*It's...*



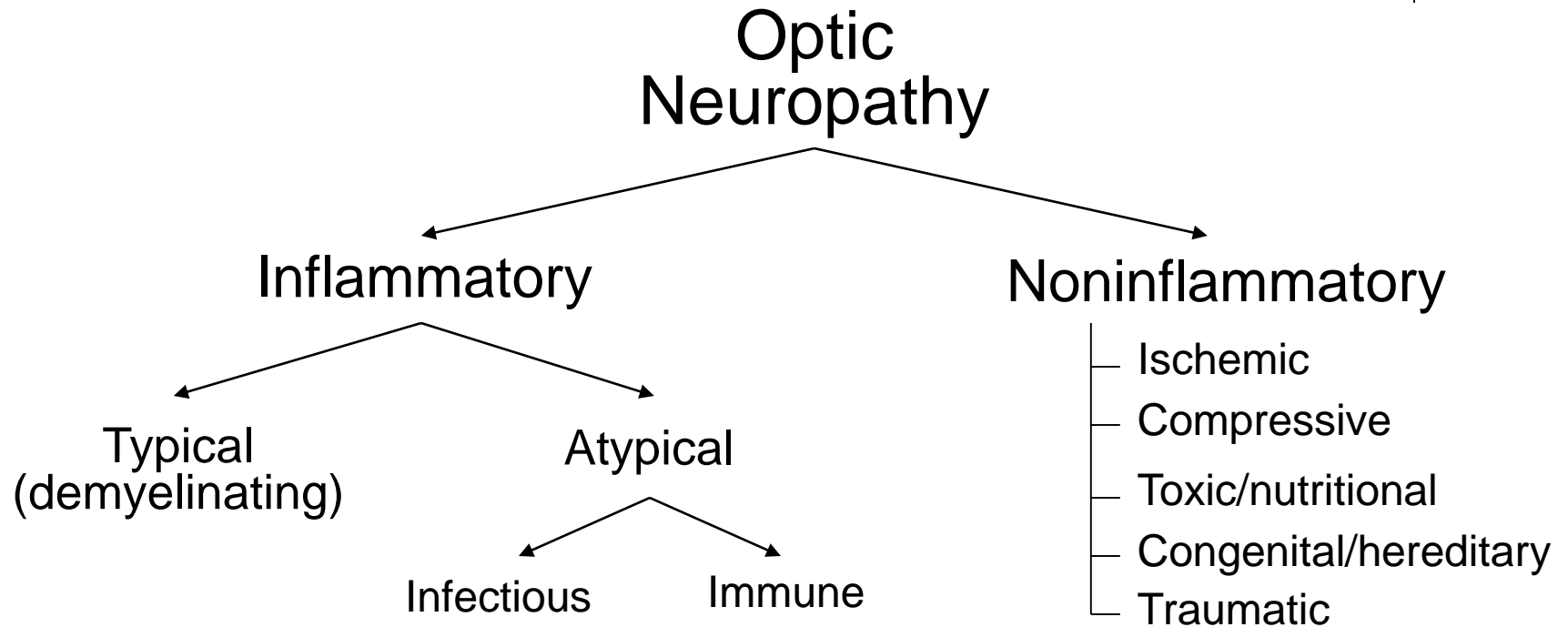
## Ischemic Optic Neuropathy



*What is far-and-away the most common type of optic neuropathy?*  
*Hint...It's not listed on this slide!*  
*Hint...It's so common, it gets its own ophthalmic subspecialty!*  
*It's...**Glaucoma** (don't forget—glaucoma is an optic neuropathy!)*



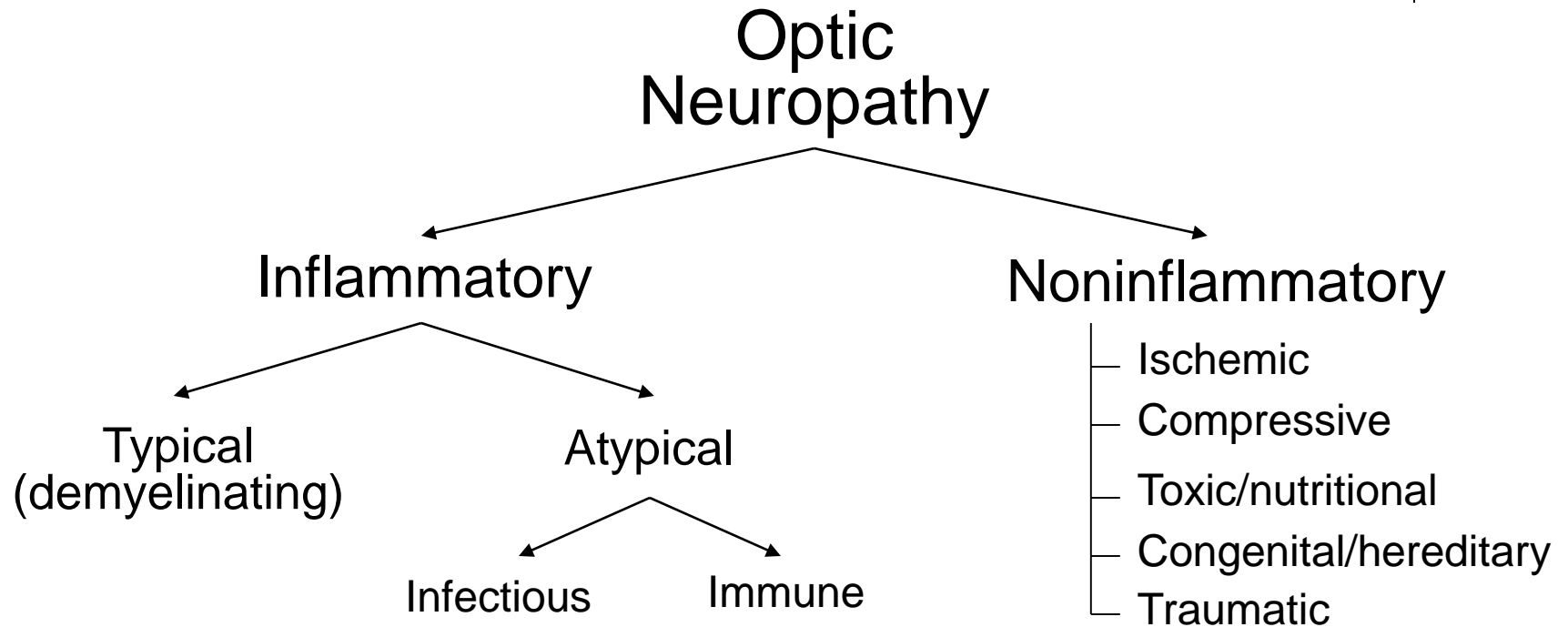
## *Ischemic Optic Neuropathy*



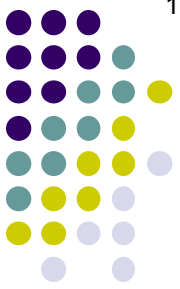
*What exam finding is the sine qua non of unilateral or asymmetric bilateral optic neuropathy?*



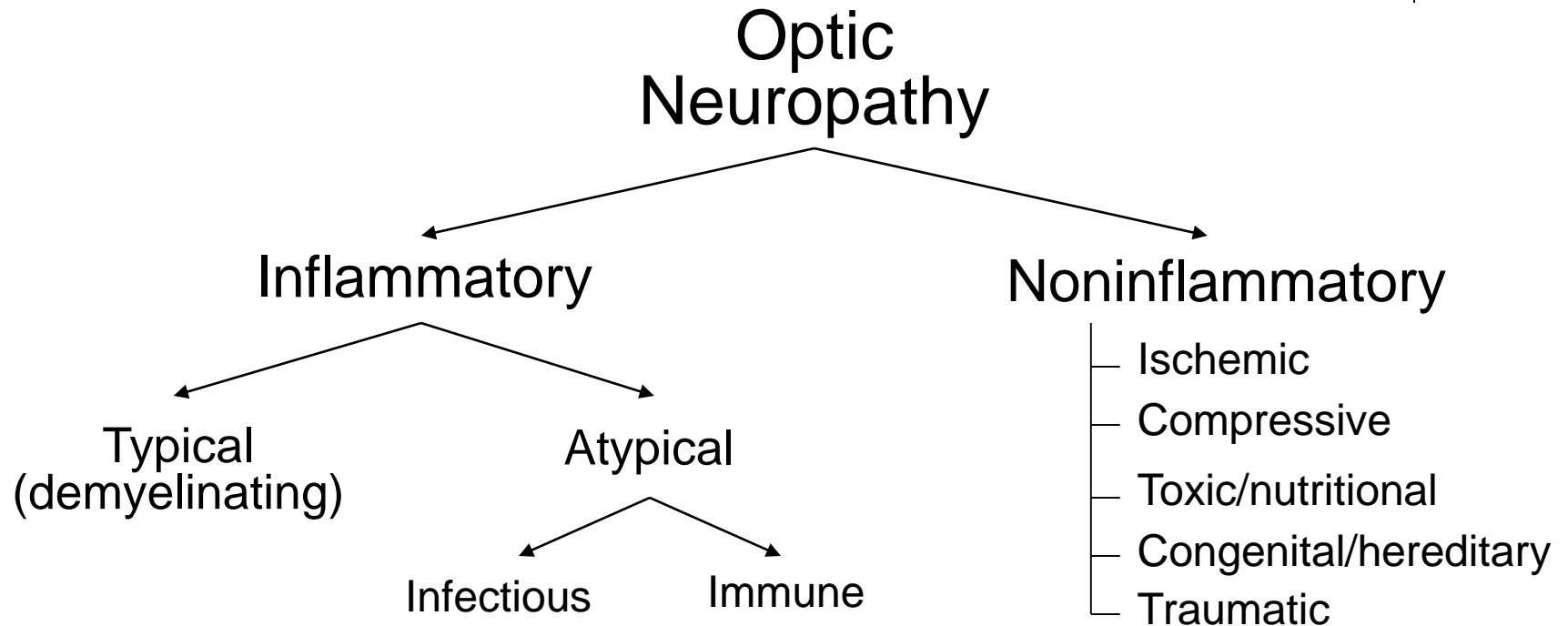
## *Ischemic Optic Neuropathy*



*What exam finding is the sine qua non of unilateral or asymmetric bilateral optic neuropathy?*  
A relative afferent pupillary defect (RAPD)



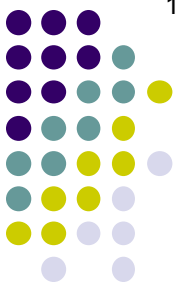
## *Ischemic Optic Neuropathy*



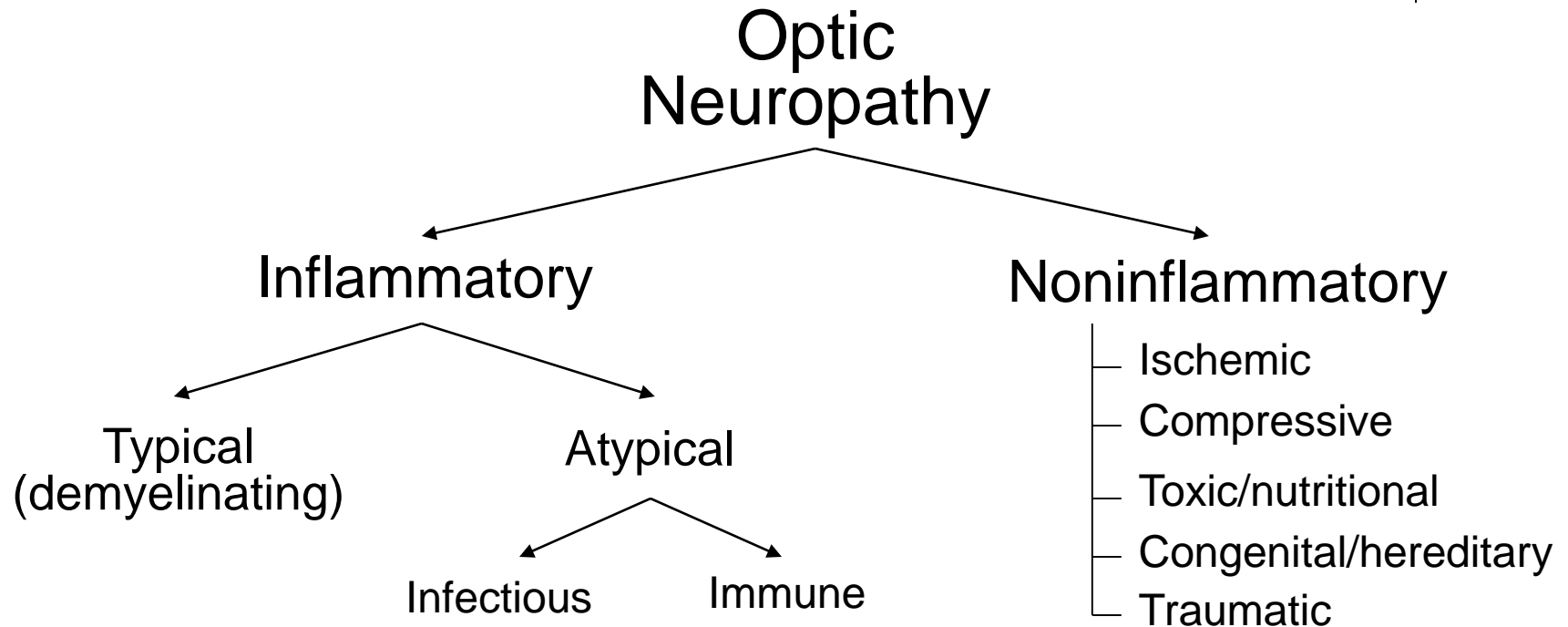
*What exam finding is the sine qua non of unilateral or asymmetric bilateral optic neuropathy?*

**A relative afferent pupillary defect (RAPD)**

*What should you do if a presumptive unilateral/asymmetric bilateral ON pt doesn't have an RAPD?*



## *Ischemic Optic Neuropathy*



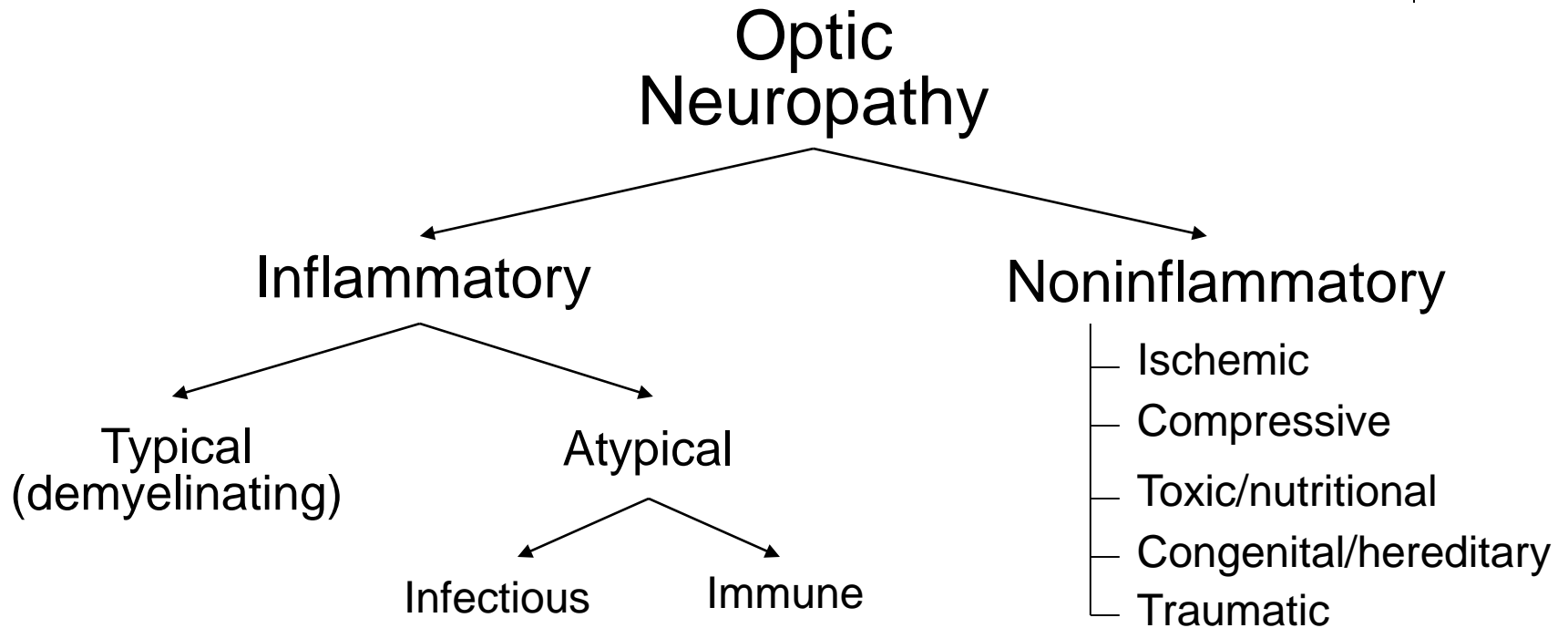
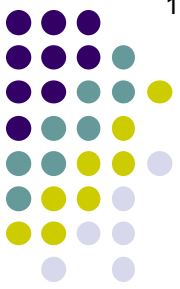
*What exam finding is the sine qua non of unilateral or asymmetric bilateral optic neuropathy?*

**A relative afferent pupillary defect (RAPD)**

*What should you do if a presumptive unilateral/asymmetric bilateral ON pt doesn't have an RAPD?*

You should question the diagnosis

# Ischemic Optic Neuropathy

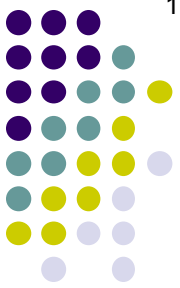


*What functional abnormalities are likely to be found in a pt with an optic neuropathy?*

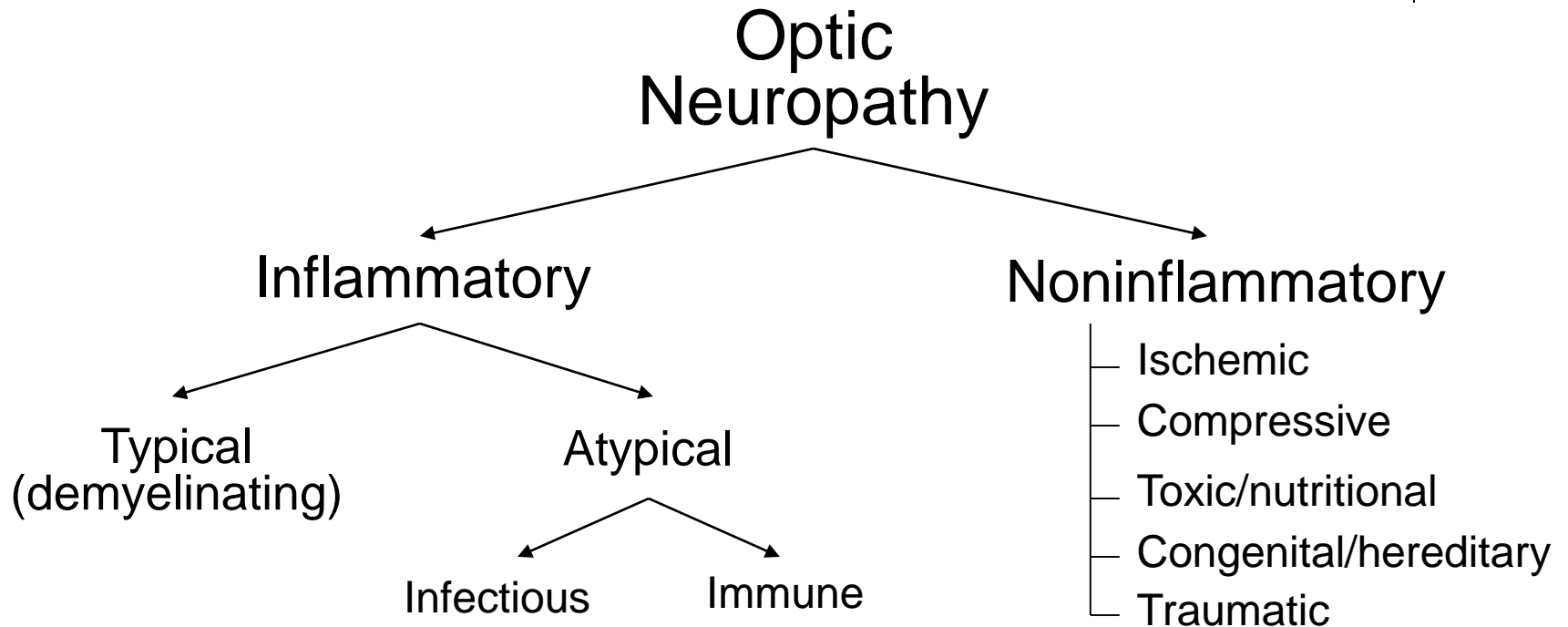
--Decreased two words

--Abnormal two diff words

--Impaired two diff diff words



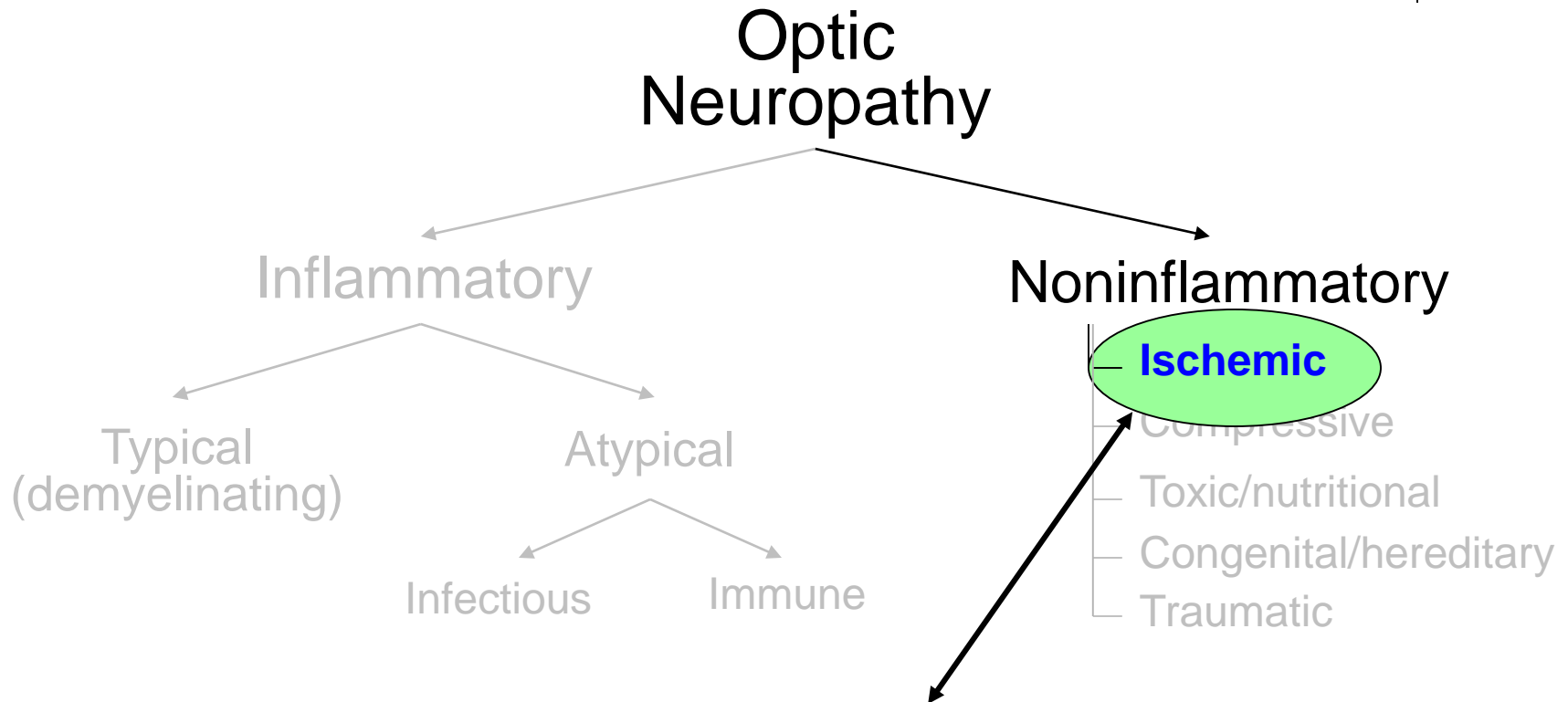
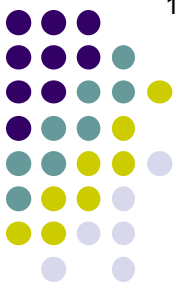
## Ischemic Optic Neuropathy



*What functional abnormalities are likely to be found in a pt with an optic neuropathy?*

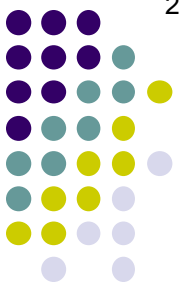
- Decreased **central acuity**
- Abnormal **visual fields**
- Impaired **color vision**

# Ischemic Optic Neuropathy

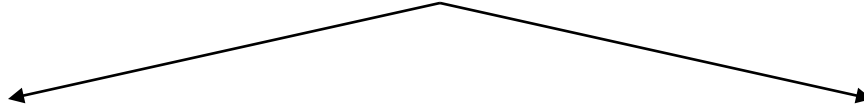


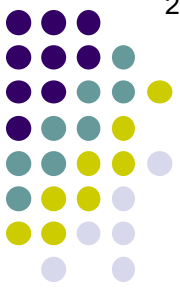
*Next, let's drill down and take a closer look at **ischemic optic neuropathy***

## *Ischemic Optic Neuropathy*

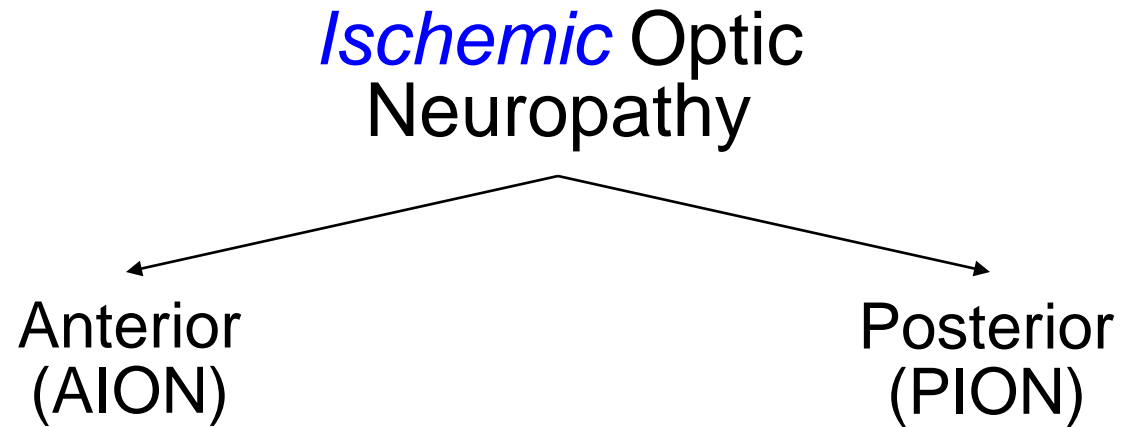


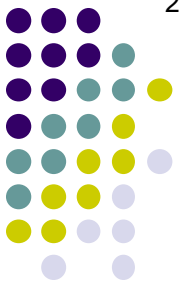
*Ischemic* Optic  
Neuropathy





## *Ischemic Optic Neuropathy*



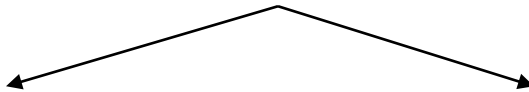


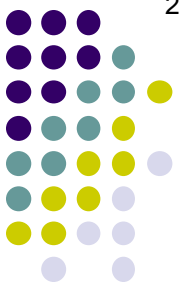
## *Ischemic Optic Neuropathy*

### *Ischemic* Optic Neuropathy

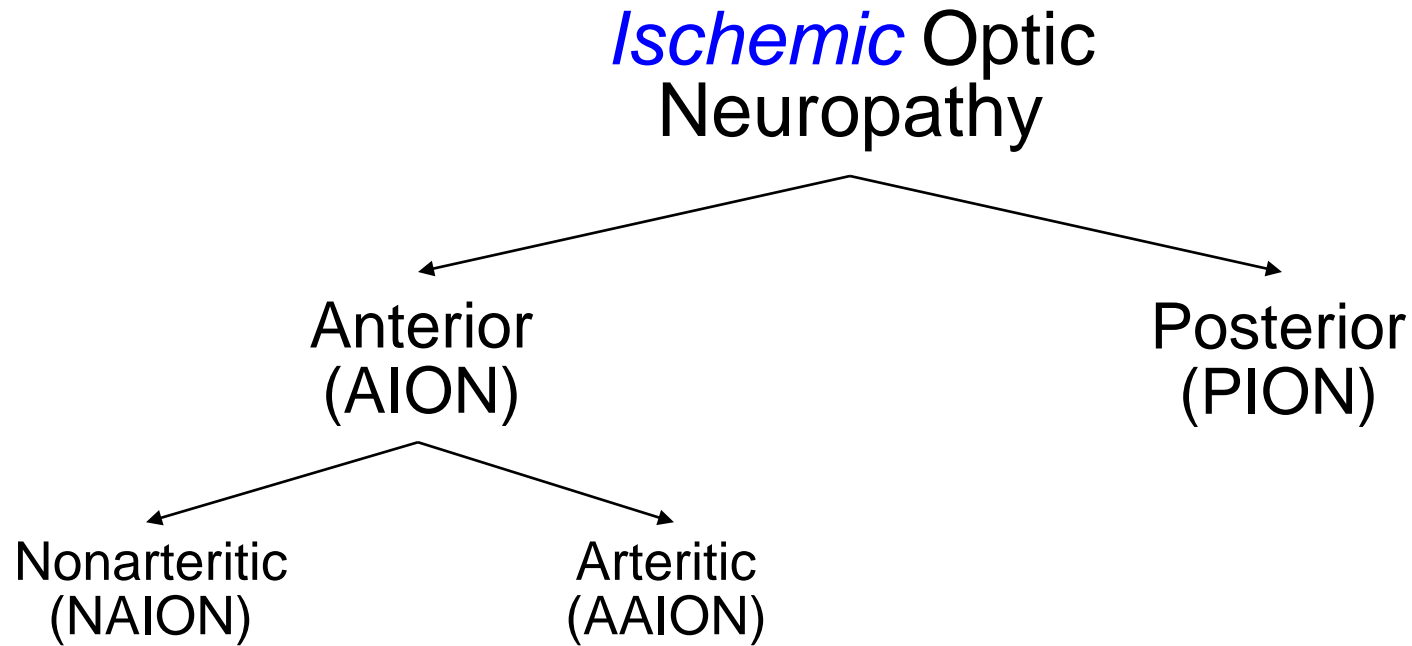
Anterior  
(AION)

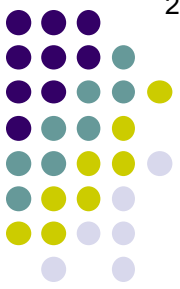
Posterior  
(PION)



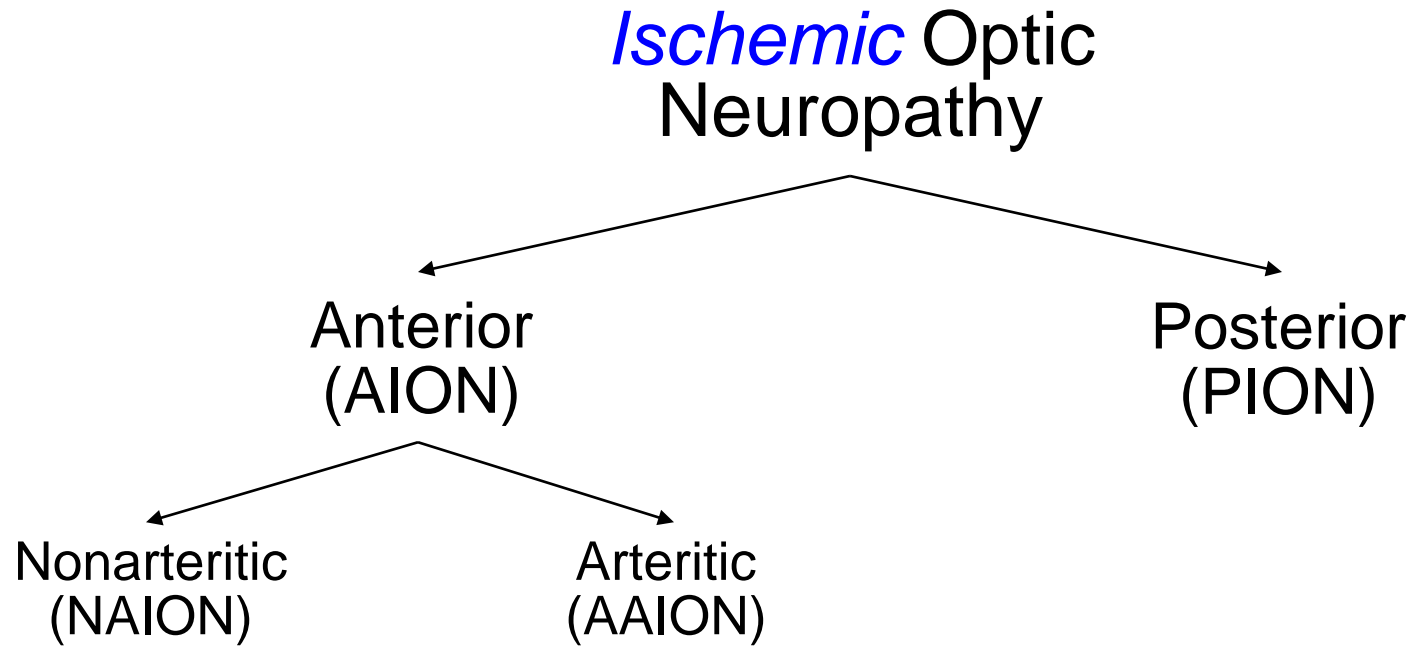


## *Ischemic Optic Neuropathy*

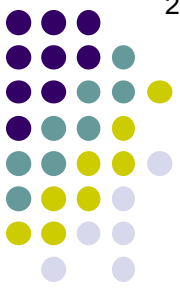




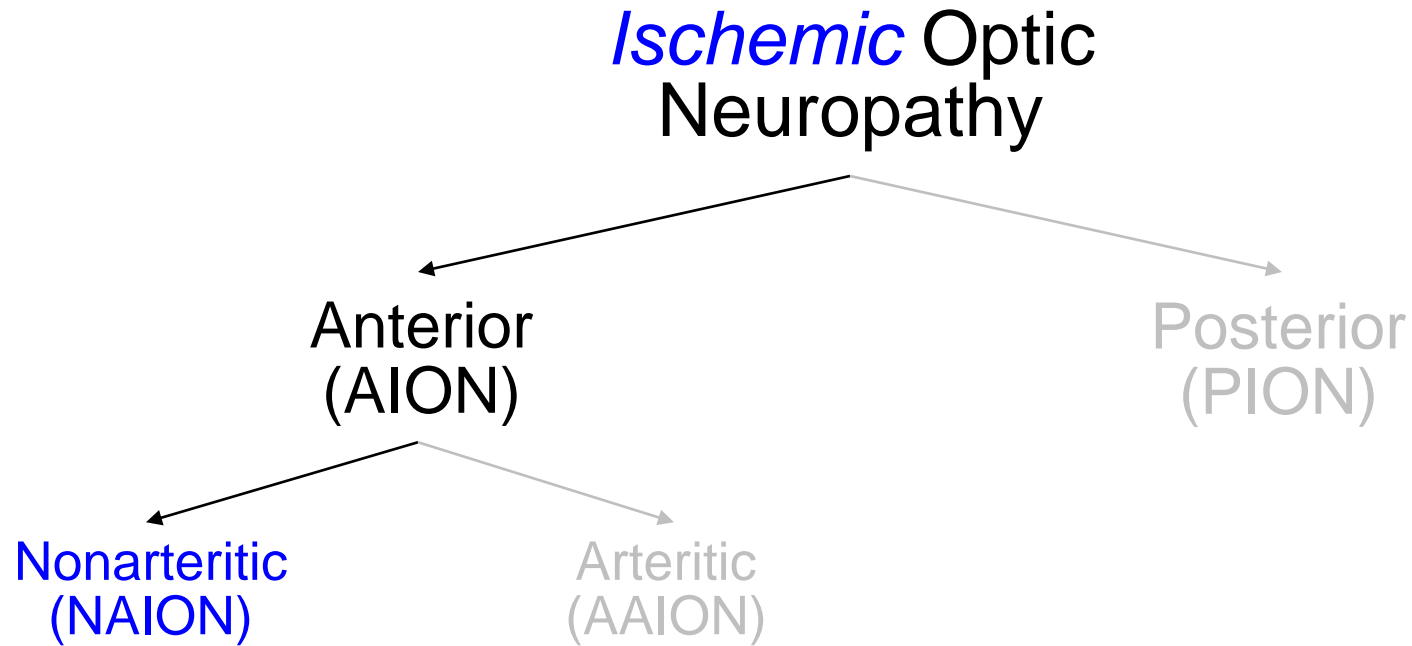
## *Ischemic Optic Neuropathy*



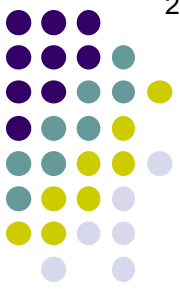
*Which is most common?*



## *Ischemic Optic Neuropathy*



*Which is most common?*  
NAION, by far



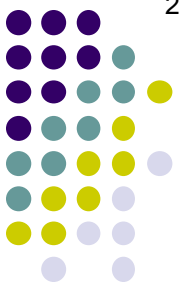
## *Ischemic Optic Neuropathy*

### *Ischemic* Optic Neuropathy

Anterior  
(AION)

*Who is the classic NAION patient?*

**Nonarteritic  
(NAION)**



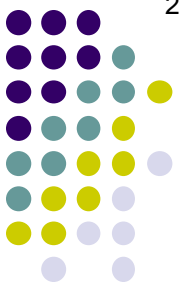
## *Ischemic Optic Neuropathy*

### *Ischemic* Optic Neuropathy

Anterior  
(AION)

**Nonarteritic  
(NAION)**

*Who is the classic NAION patient?*  
A vasculopath, age 50+



## *Ischemic Optic Neuropathy*

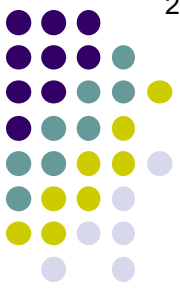
### *Ischemic* Optic Neuropathy

Anterior  
(AION)

*Who is the classic NAION patient?*  
A vasculopath, age 50+

*What is the classic complaint?*

**Nonarteritic  
(NAION)**



## *Ischemic Optic Neuropathy*

### *Ischemic* Optic Neuropathy

Anterior  
(AION)

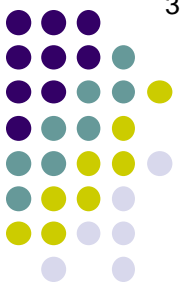
**Nonarteritic  
(NAION)**

*Who is the classic NAION patient?*

A vasculopath, age 50+

*What is the classic complaint?*

Painless vision loss upon awakening from an uneventful night's sleep



## *Ischemic Optic Neuropathy*

### *Ischemic* Optic Neuropathy

Anterior  
(AION)

**Nonarteritic  
(NAION)**

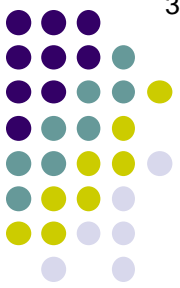
*Who is the classic NAION patient?*

A vasculopath, age 50+

*What is the classic complaint?*

**Painless vision loss upon awakening from an uneventful night's sleep**

*What does this suggest about the pathophysiology of NAION?*



## *Ischemic Optic Neuropathy*

### *Ischemic* Optic Neuropathy

Anterior  
(AION)

*Who is the classic NAION patient?*

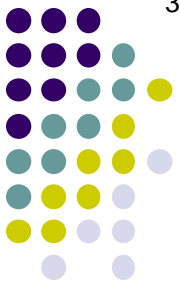
A vasculopath, age 50+

*What is the classic complaint?*

**Painless vision loss upon awakening from an uneventful night's sleep**

**Nonarteritic  
(NAION)**

*What does this suggest about the pathophysiology of NAION?*  
It suggests that nocturnal hypotension might play a causative role



# Ischemic Optic Neuropathy

## Ischemic Optic Neuropathy

Anterior  
(AION)

*Who is the classic NAION patient?*

A vasculopath, age 50+

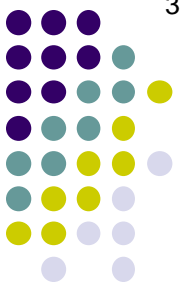
*What is the classic complaint?*

**Painless vision loss upon awakening from an uneventful night's sleep**

**Nonarteritic  
(NAION)**

*What does this suggest about the pathophysiology of NAION?*  
It suggests that nocturnal hypotension might play a causative role

*In addition to nocturnal hypotension, it is suggestive also that*  
**three words** *may contribute to NAION*



## *Ischemic Optic Neuropathy*

### *Ischemic* Optic Neuropathy

Anterior  
(AION)

*Who is the classic NAION patient?*  
A vasculopath, age 50+

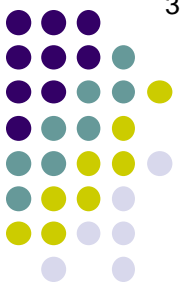
Nonarteritic  
(NAION)

*What is the classic complaint?*

**Painless vision loss upon awakening from an uneventful night's sleep**

*What does this suggest about the pathophysiology of NAION?*  
It suggests that nocturnal hypotension might play a causative role

*In addition to nocturnal hypotension, it is suggestive also that **obstructive sleep apnea (OSA)** may contribute to NAION*



## *Ischemic Optic Neuropathy*

### *Ischemic* Optic Neuropathy

Anterior  
(AION)

**Nonarteritic  
(NAION)**

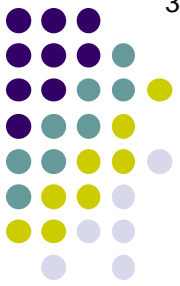
*Who is the classic NAION patient?*

A vasculopath, age 50+

*What is the classic complaint?*

Painless vision loss upon awakening from an uneventful night's sleep

*Formal visual field testing is likely to reveal what?*



## *Ischemic Optic Neuropathy*

### *Ischemic* Optic Neuropathy

Anterior  
(AION)

**Nonarteritic  
(NAION)**

*Who is the classic NAION patient?*

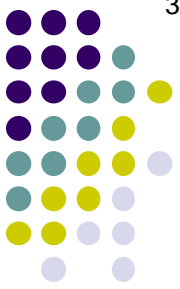
A vasculopath, age 50+

*What is the classic complaint?*

Painless vision loss upon awakening from an uneventful night's sleep

*Formal visual field testing is likely to reveal what?*

An altitudinal defect, usually the inferior vs superior field



## *Ischemic Optic Neuropathy*

### *Ischemic* Optic Neuropathy

Anterior  
(AION)

**Nonarteritic  
(NAION)**

*Who is the classic NAION patient?*

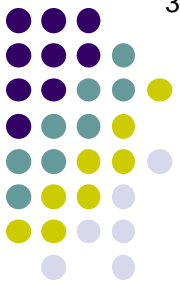
A vasculopath, age 50+

*What is the classic complaint?*

Painless vision loss upon awakening from an uneventful night's sleep

*Formal visual field testing is likely to reveal what?*

An altitudinal defect, usually the inferior field



## *Ischemic Optic Neuropathy*

### *Ischemic* Optic Neuropathy

Anterior  
(AION)

**Nonarteritic  
(NAION)**

*Who is the classic NAION patient?*

A vasculopath, age 50+

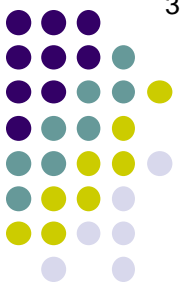
*What is the classic complaint?*

Painless vision loss upon awakening from an uneventful night's sleep

*Formal visual field testing is likely to reveal what?*

An altitudinal defect, usually the inferior field

*What will DFE of the affected eye reveal?*



## *Ischemic Optic Neuropathy*

### *Ischemic* Optic Neuropathy

Anterior  
(AION)

**Nonarteritic  
(NAION)**

*Who is the classic NAION patient?*

A vasculopath, age 50+

*What is the classic complaint?*

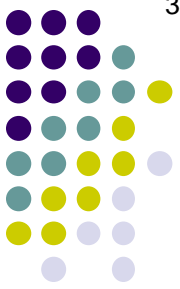
Painless vision loss upon awakening from an uneventful night's sleep

*Formal visual field testing is likely to reveal what?*

An altitudinal defect, usually the inferior field

*What will DFE of the affected eye reveal?*

Disc edema, perhaps sectoral



# *Ischemic Optic Neuropathy*

## *Ischemic* Optic Neuropathy

Anterior  
(AION)

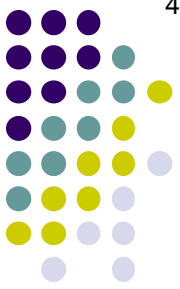
*Who is the classic NAION patient?*  
A vasculopath, age 50+

*What is the classic complaint?*

*What if the disc isn't edematous?*

**Nonarteritic  
(NAION)**

**Disc edema**, perhaps sectoral



# Ischemic Optic Neuropathy

## Ischemic Optic Neuropathy

Anterior  
(AION)

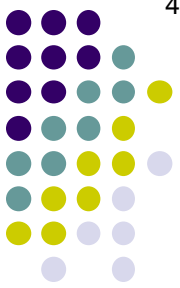
*Who is the classic NAION patient?*  
A vasculopath, age 50+

*What is the classic complaint?*

**Nonarteritic  
(NAION)**

*What if the disc isn't edematous?*  
Then **it isn't anterior ischemic optic neuropathy**. Disc edema **must** be present to make this diagnosis.

**Disc edema**, perhaps sectoral



# Ischemic Optic Neuropathy

## Ischemic Optic Neuropathy

Anterior  
(AION)

*Who is the classic NAION patient?*  
A vasculopath, age 50+

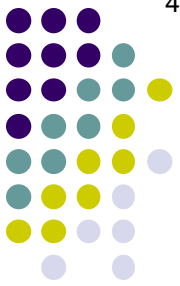
*What is the classic complaint?*

**Nonarteritic  
(NAION)**

*What if the disc isn't edematous?*  
Then **it isn't anterior ischemic optic neuropathy**. Disc edema **must** be present to make this diagnosis.

*What if the disc is edematous, but also pallorous?*

**Disc edema**, perhaps sectoral



# Ischemic Optic Neuropathy

## Ischemic Optic Neuropathy

Anterior  
(AION)

*Who is the classic NAION patient?*  
A vasculopath, age 50+

*What is the classic complaint?*

**Nonarteritic  
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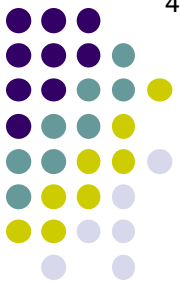
*What if the disc isn't edematous?*

Then **it isn't anterior ischemic optic neuropathy**. Disc edema **must** be present to make this diagnosis.

*What if the disc is edematous, but also pallorous?*

You should strongly consider a diagnosis of **arteritic** AION, and manage the pt accordingly

**Disc edema**, perhaps sectoral



## *Ischemic Optic Neuropathy*

### *Ischemic* Optic Neuropathy

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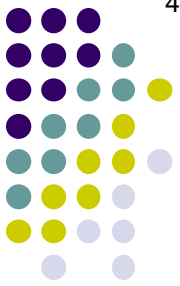
*Formal visual field testing is likely to reveal what?*

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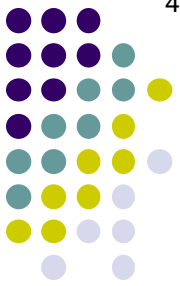
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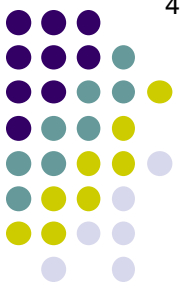
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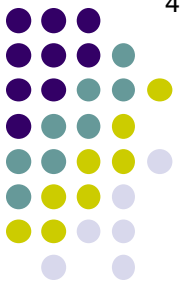
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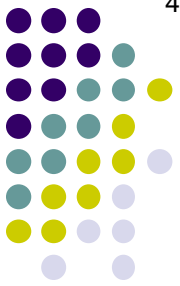
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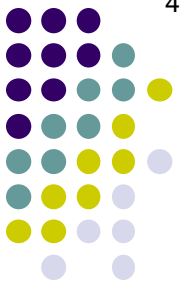
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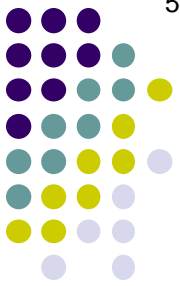
*What should you do if the appearance of the ONH in the fellow eye is not that of a disc at risk?*

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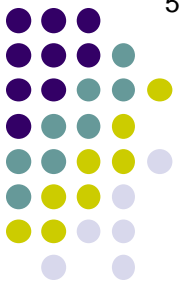
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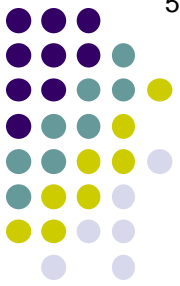
*What diagnosis **must** be considered in such a case?*

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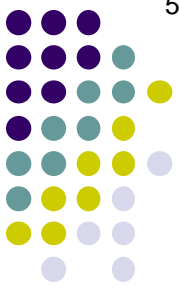
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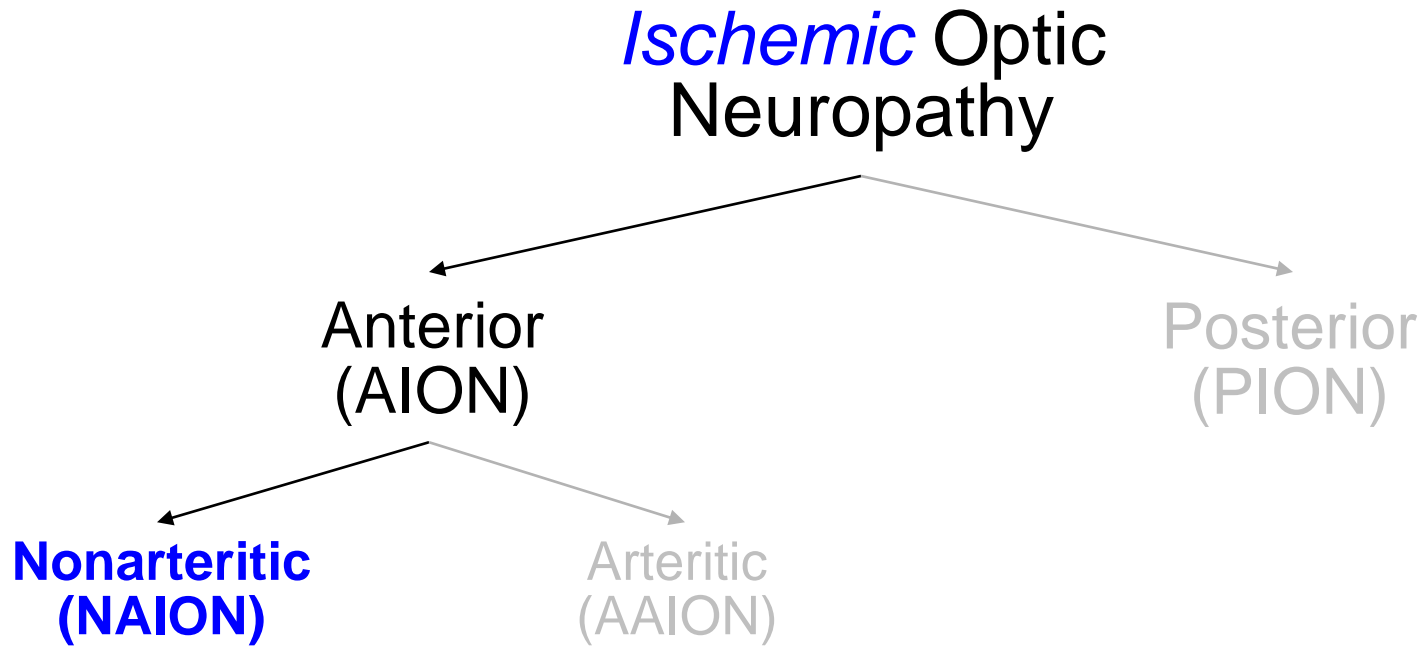
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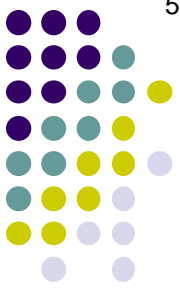
**A disc at risk**



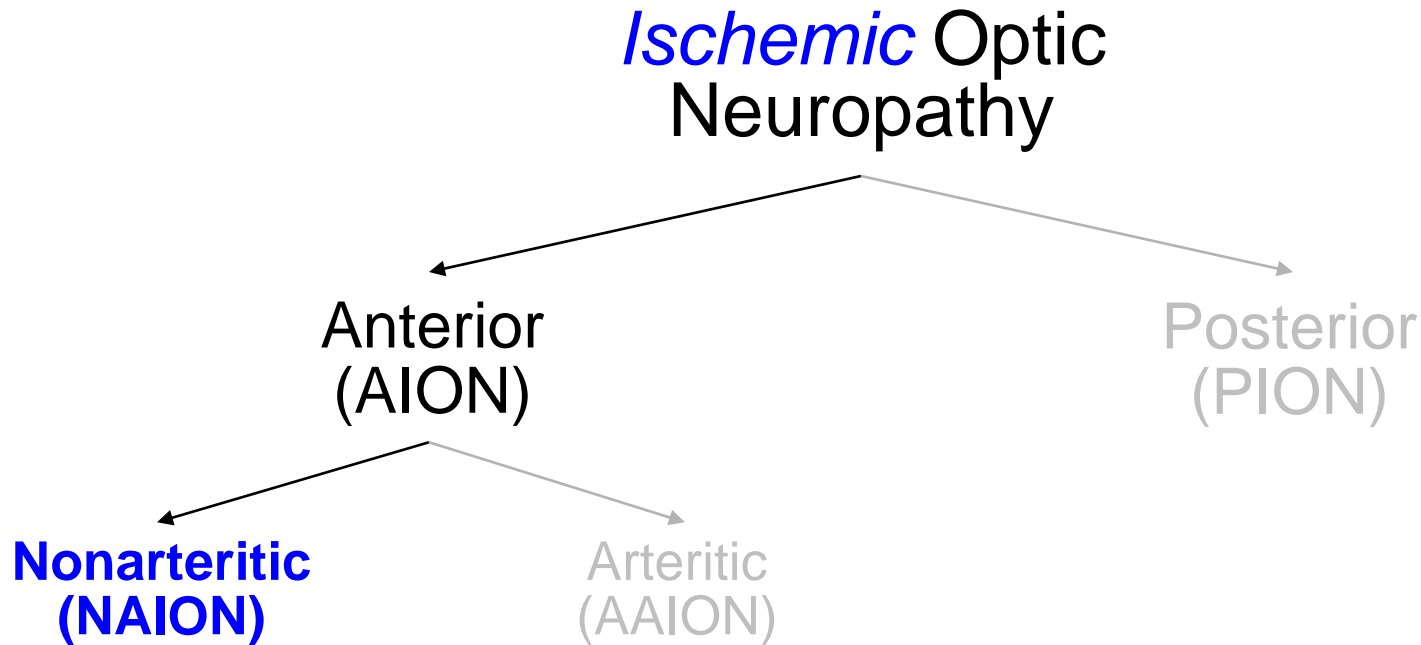
## *Ischemic Optic Neuropathy*



*What is the natural course of NAION?*

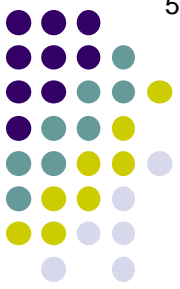


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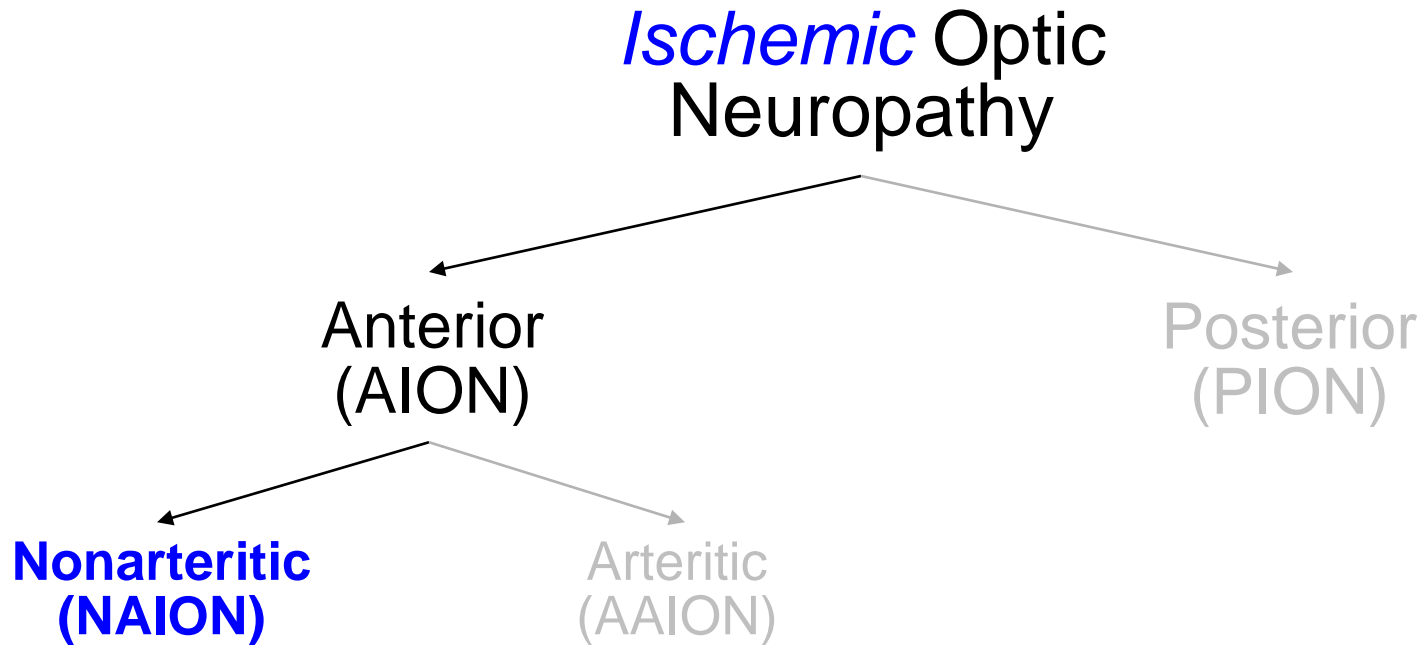


*What is the natural course of NAION?*

For most (~2/3) patients, visual acuity/field deficits remain stable. About 1/4 will experience a modest improvement, and the rest a modest worsening—usually over the following 6 weeks or so.



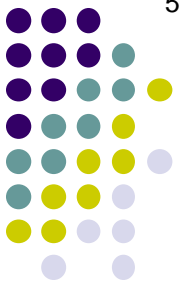
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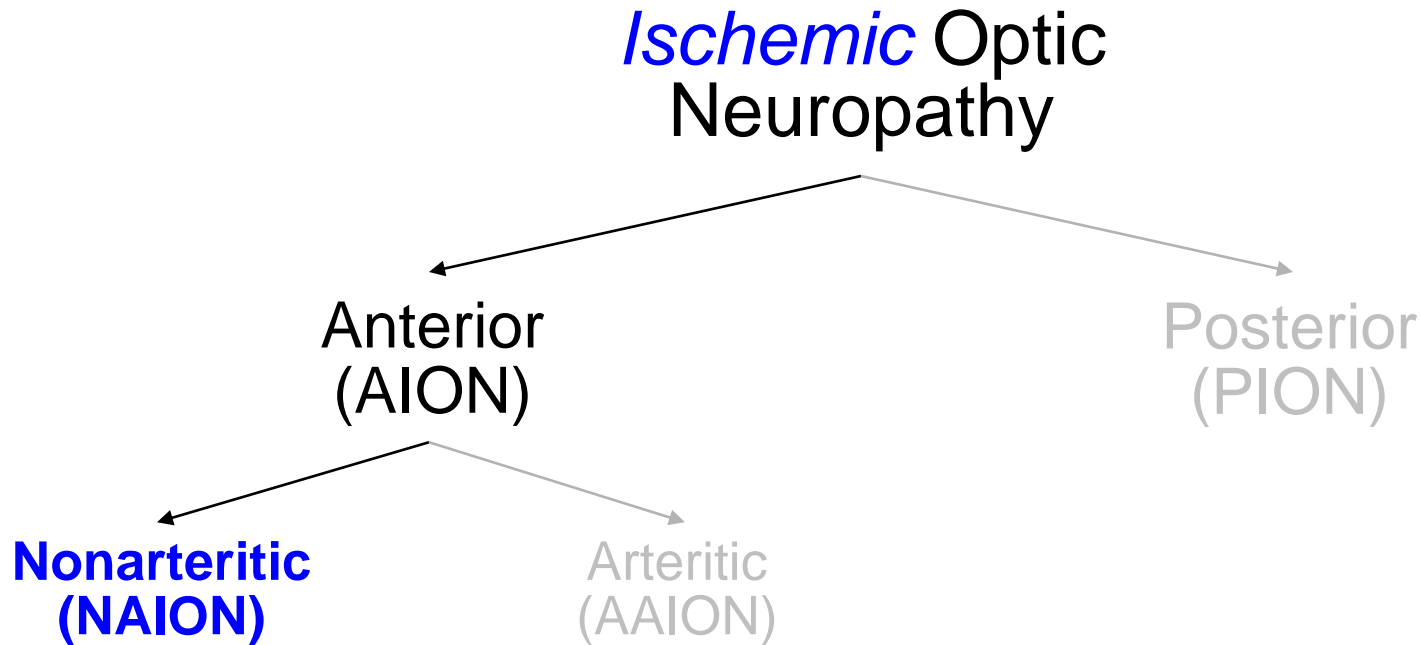
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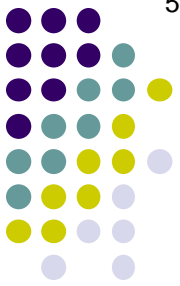


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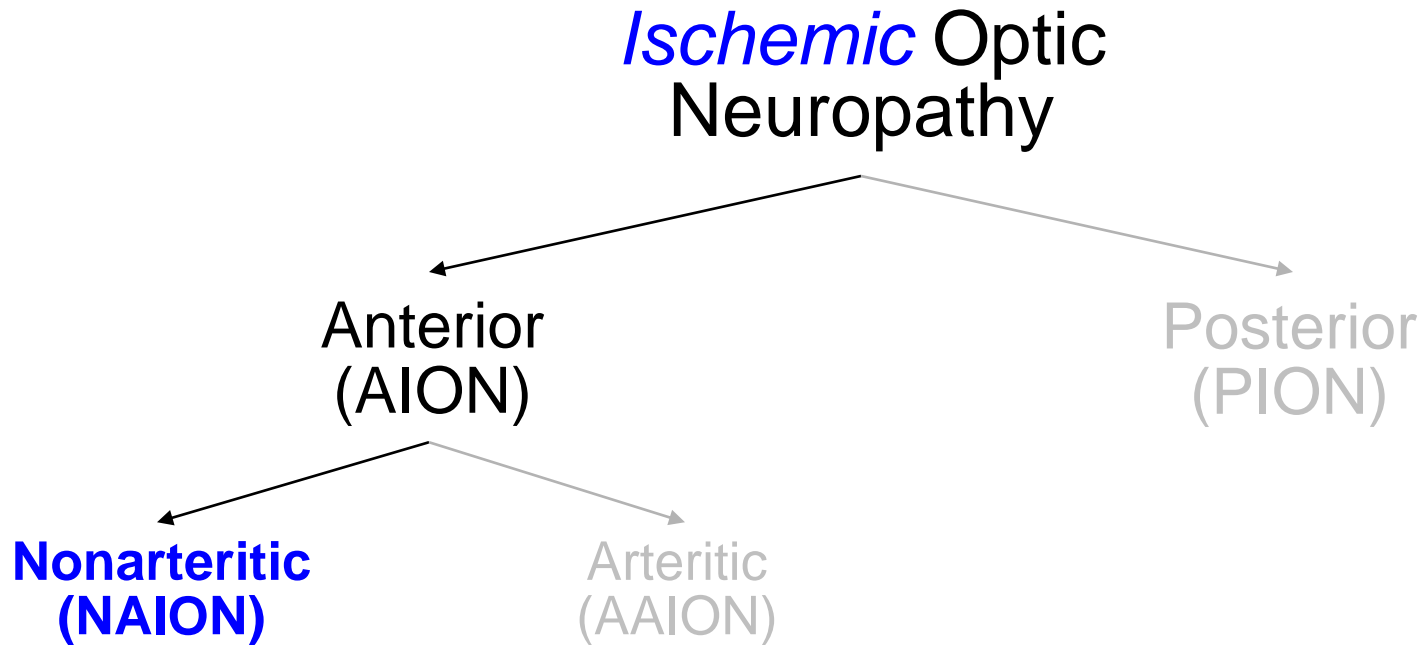
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*What is the risk of NAION in the fellow eye?*

Five-year risk is 15 - 20%



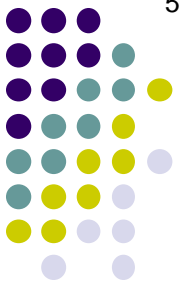
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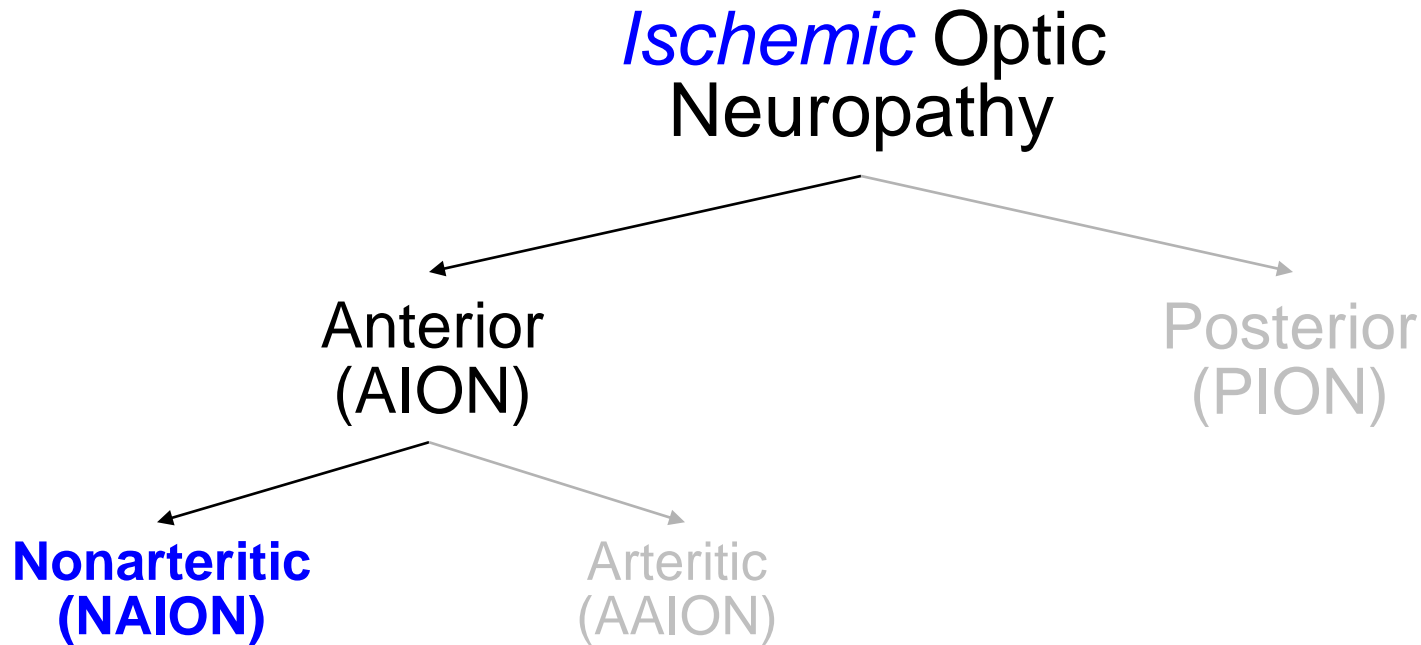
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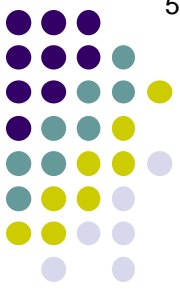
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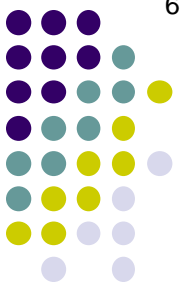
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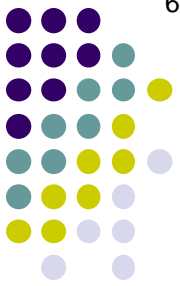
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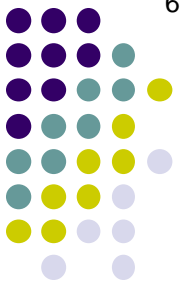
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*What about optic-nerve sheath decompression?*



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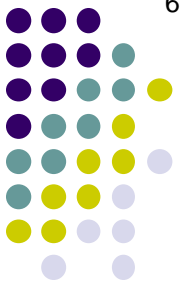
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*What about optic-nerve sheath decompression?*

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Trial



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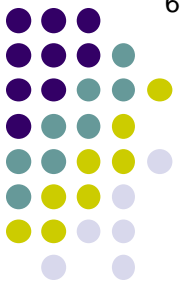
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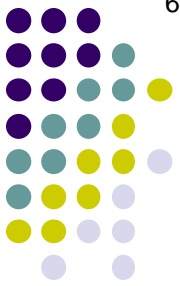
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on Trial



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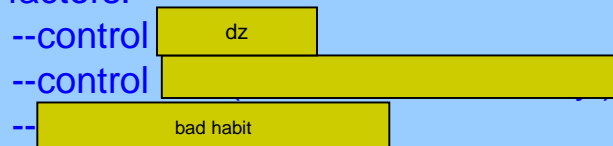
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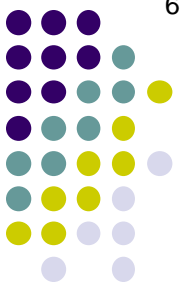
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on Trial



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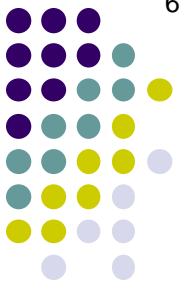
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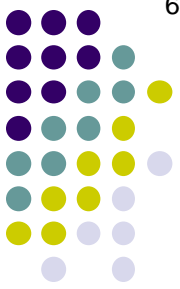
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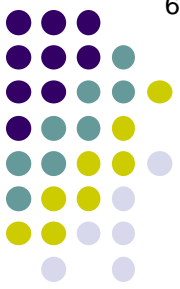
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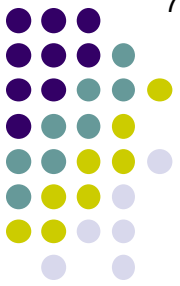
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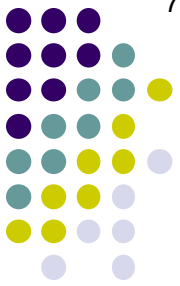
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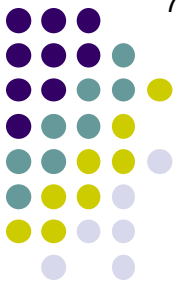
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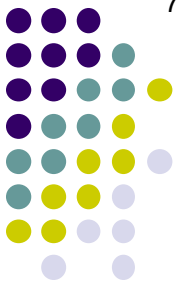
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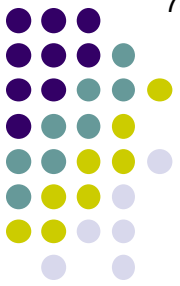
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Recall that nocturnal hypotension has been implicated in NAION, and management of HTN should take this into account. Dosing of HTN meds should be adjusted to avoid ‘bottoming out’ BP overnight.

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Regarding modifiable risk factors, neuro-ophthalmologist Andrew Lee emphasizes the 'Hs':

- Hypertension
- Hypotension (nocturnal)
- Hyperglycemia (ie, DM)

*We know these H's already...*

- H
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*...but what are these?*

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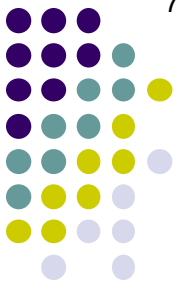
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on Trial

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  - Hypotension (nocturnal)
  - Hyperglycemia (ie, DM)
  - Hyperlipidemia
  - Hyperhomocysteinemia
  - Hypoxia/hypersomnia (ie, OSA)
  - Hypoperfusion (ie, low hematocrit)
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#### Nonarteritic (NAION)

#### Modify risk factors:

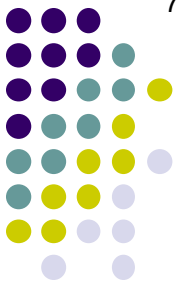
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on Trial

*Why the caveat re not "overzealously" controlling BP?*

Recall that nocturnal hypotension has been implicated in NAION, and management of HTN should take this into account. Dosing of HTN meds should be adjusted to avoid 'bottoming out' BP overnight.

While there is no evidence to support it, many clinicians will put their NAION pts on low-dose aspirin



# Ischemic Optic Neuropathy

## Ischemic Optic Neuropathy

Anterior

Posterior

(A) What is the treatment for NAION?  
**Nothing has proven effective**

**Nonarteritic (NAION)**

Then what **should** be done for these pts?  
Modify risk factors:

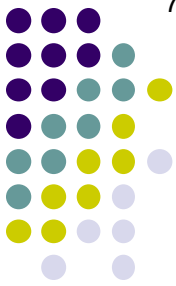
- control diabetes
- control BP (but not overzealously!)
- smoking cessation

*Why the caveat re not "overzealously" controlling BP?*

*Speaking of bottoming out BP...What class of meds should probably be avoided in NAION pts?*

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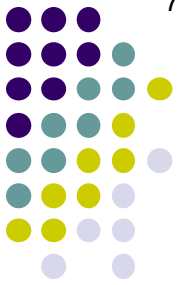
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 Phosphodiesterase-5 inhibitors; eg, Viagra

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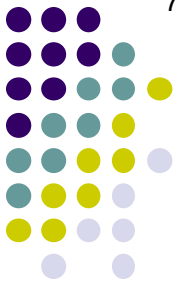
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Anterior  
(AION)

Posterior  
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*What is the classic clinical setting for PION?*



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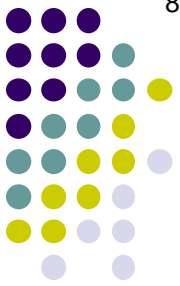
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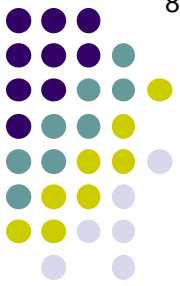
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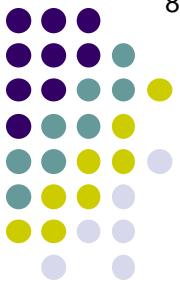
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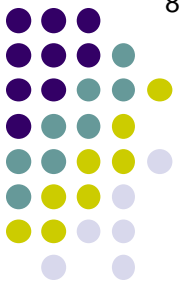
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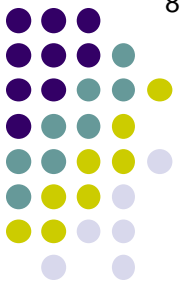
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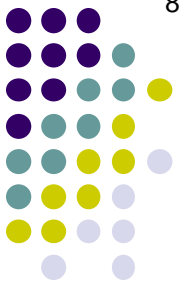
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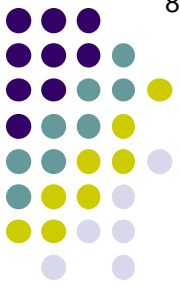
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Giant cell

*And again*

Nonarterit

*As a general rule, comprehensive ophthalmologists should **never diagnose PION outside of the acute post-op setting.** Refer (emergently!) such pts to your friendly neighborhood neuro-oph, and let **her** make that call.*

*red?*

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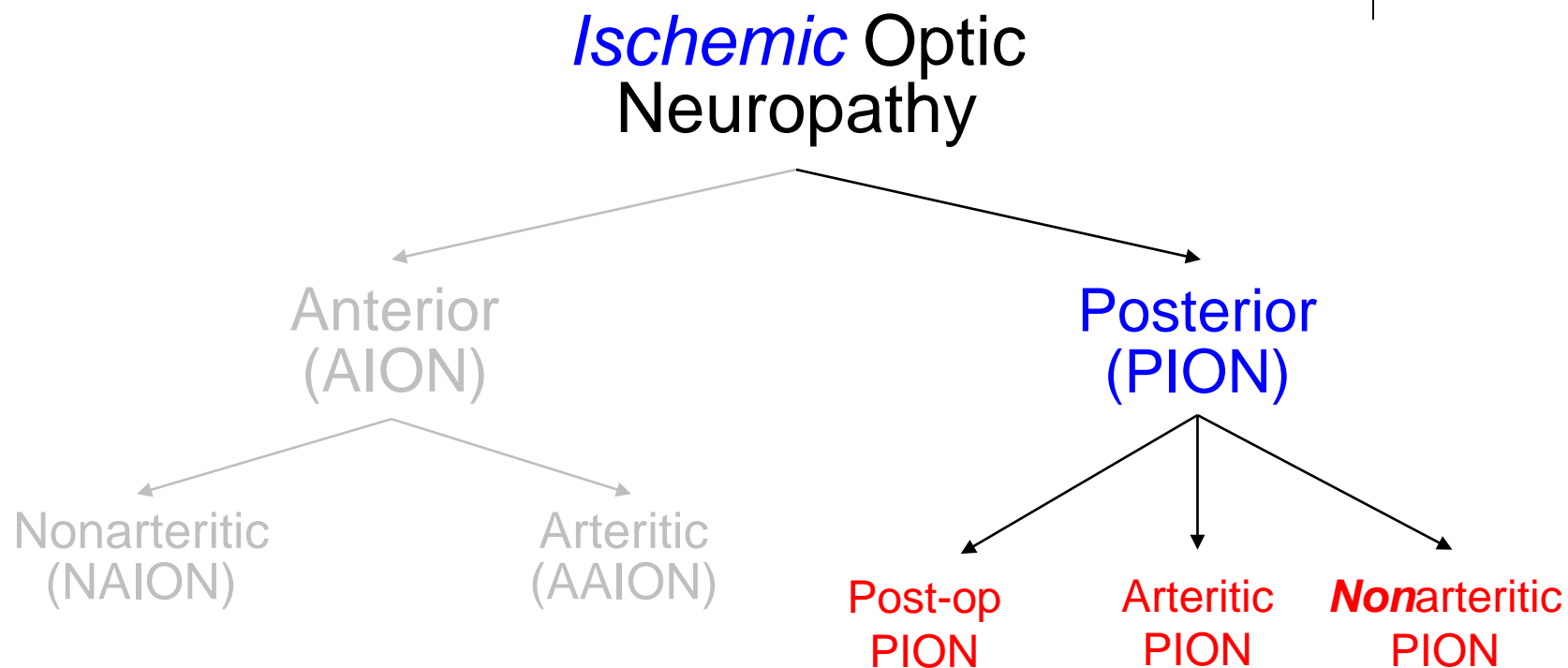
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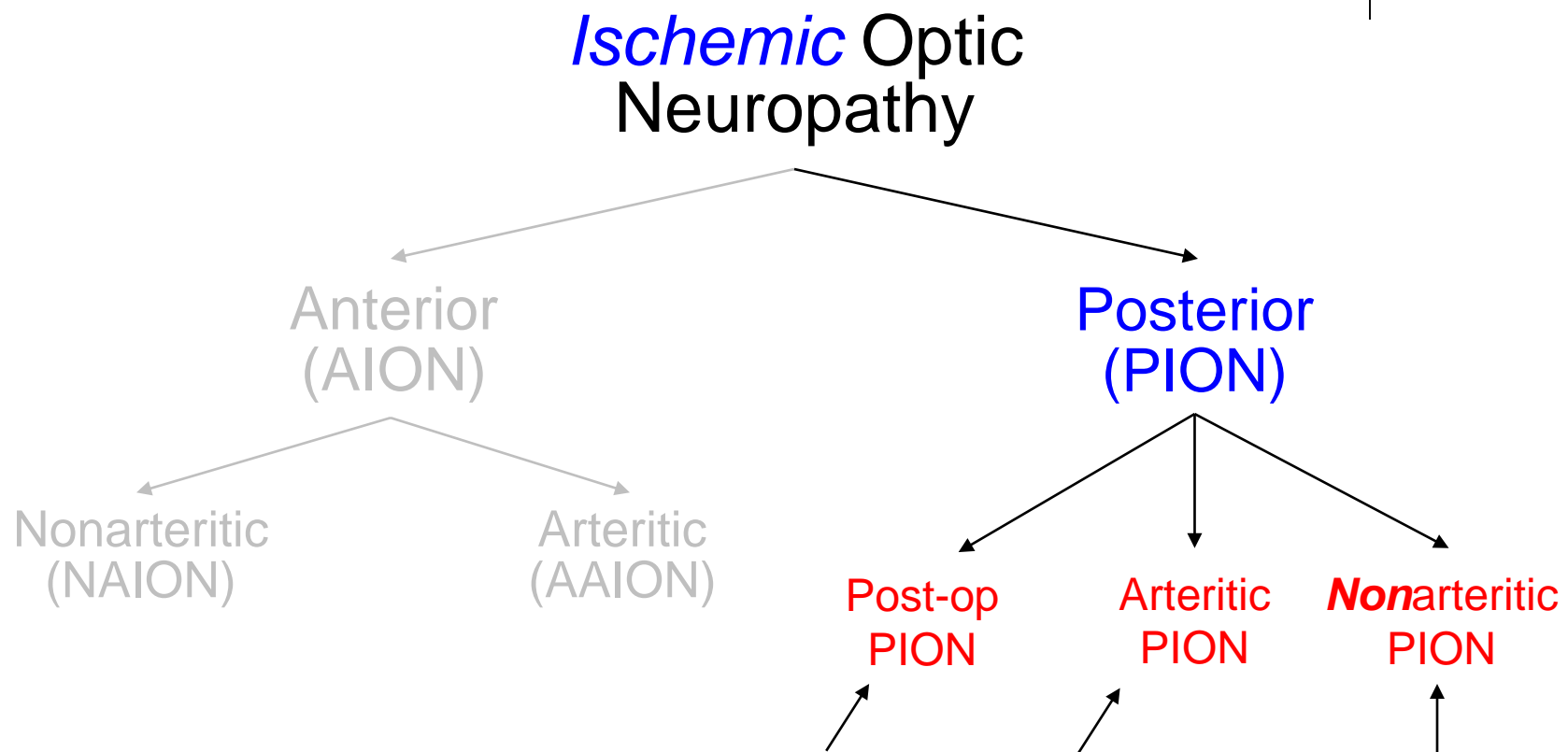
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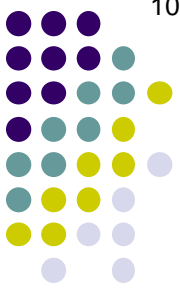


To reiterate: You can make **this** call, or **this** one...

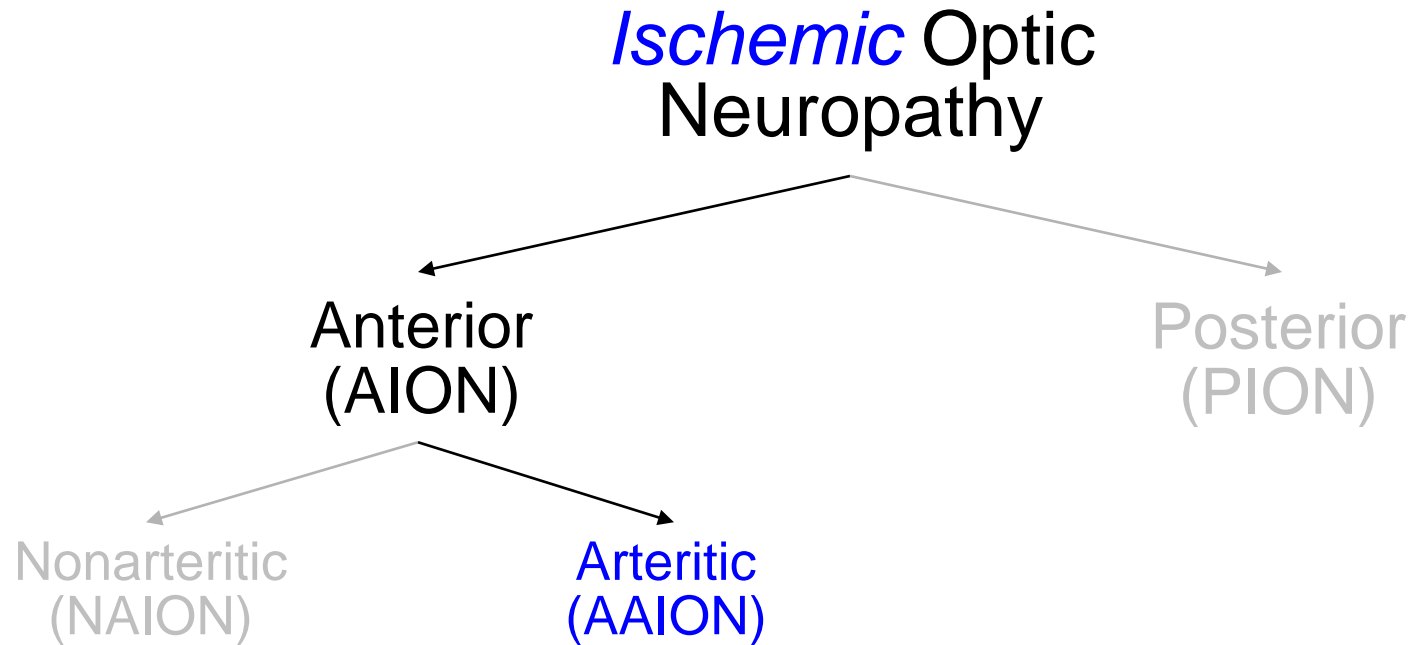


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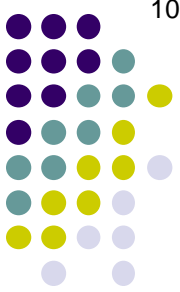




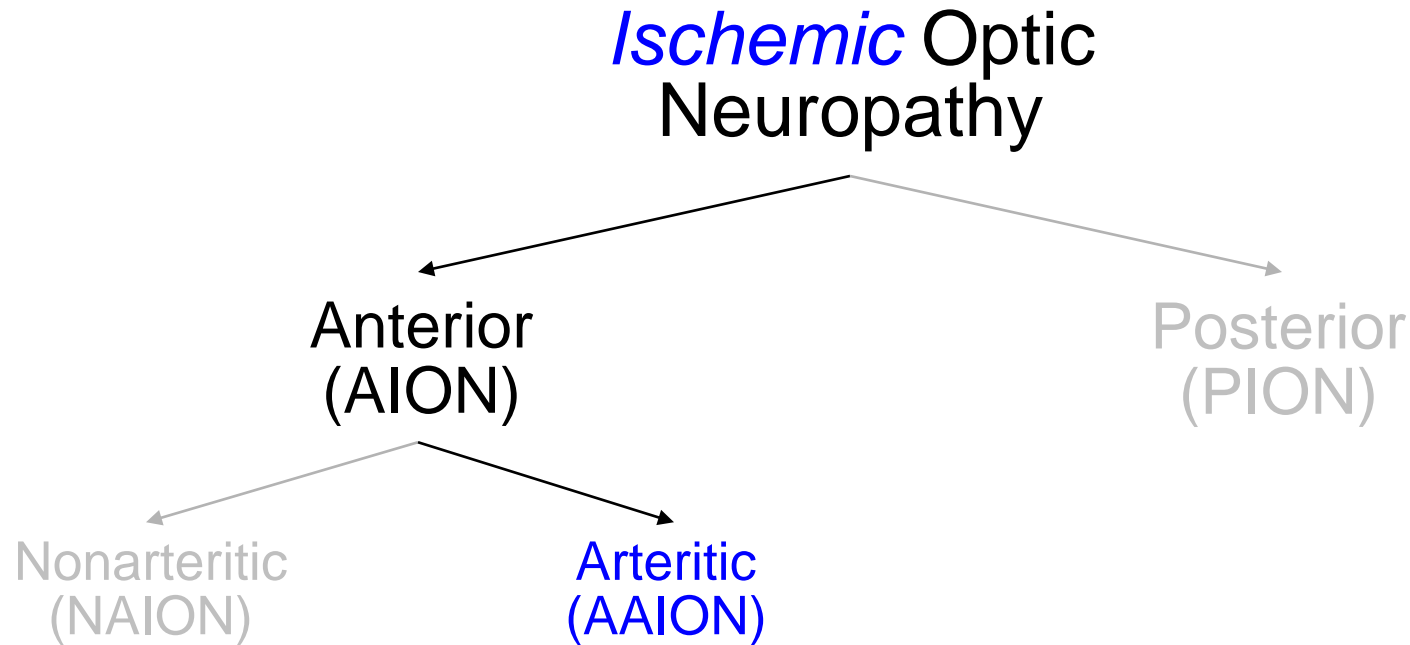
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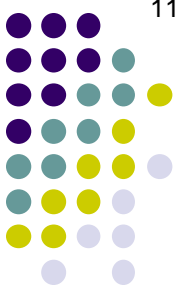
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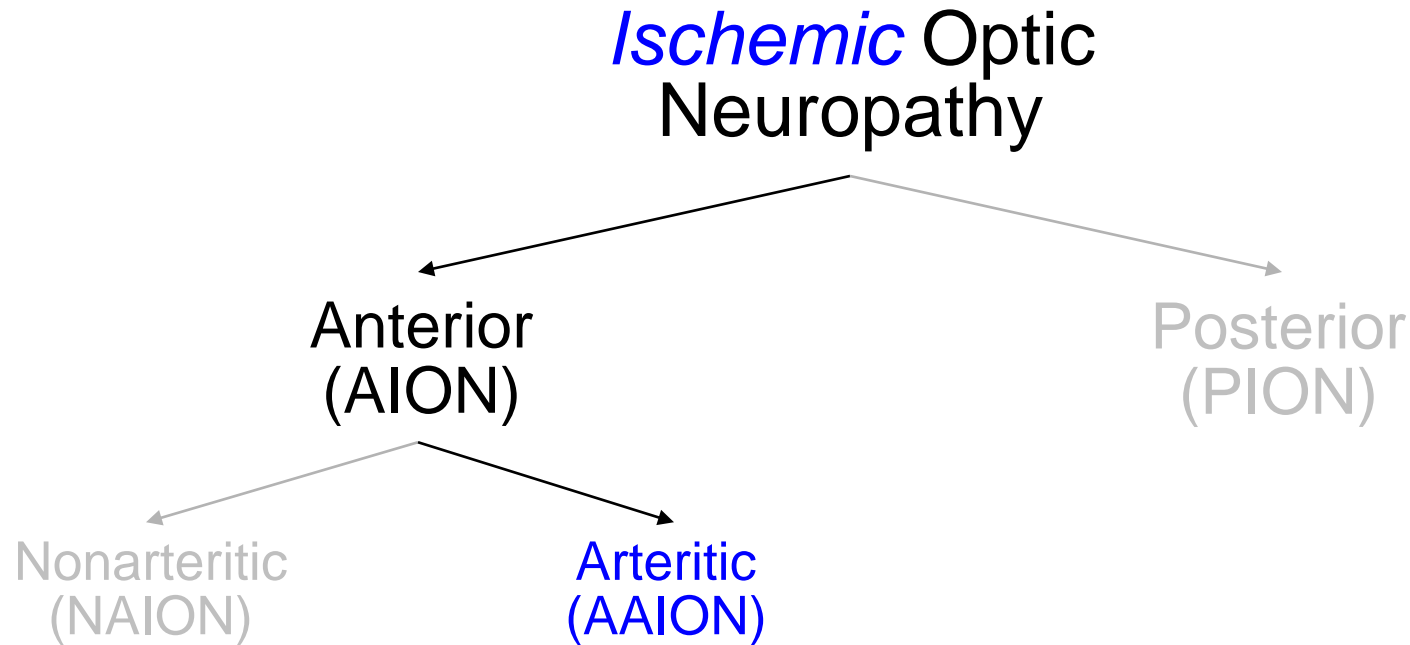
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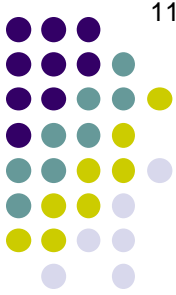


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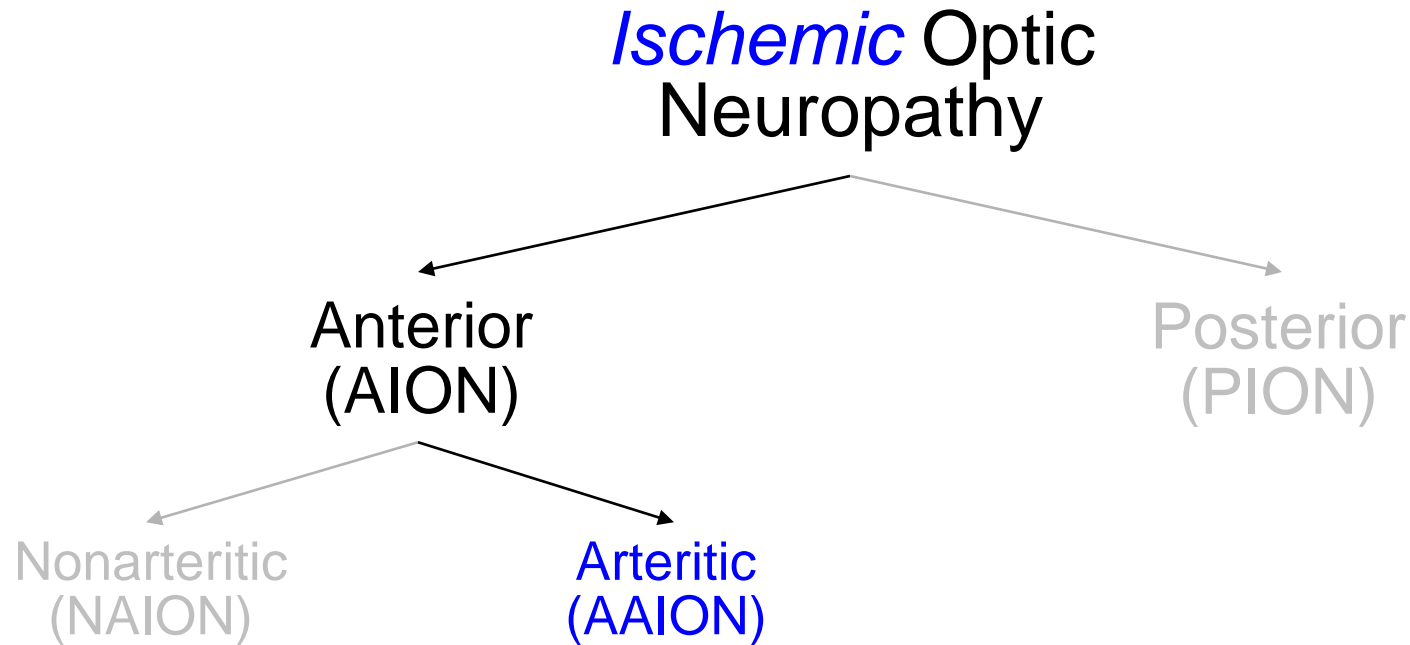


*What systemic disease is causative in AAION?*  
Giant-cell arteritis--GCA (aka *temporal arteritis*)

*In general terms, what is GCA?*



## *Ischemic Optic Neuropathy*



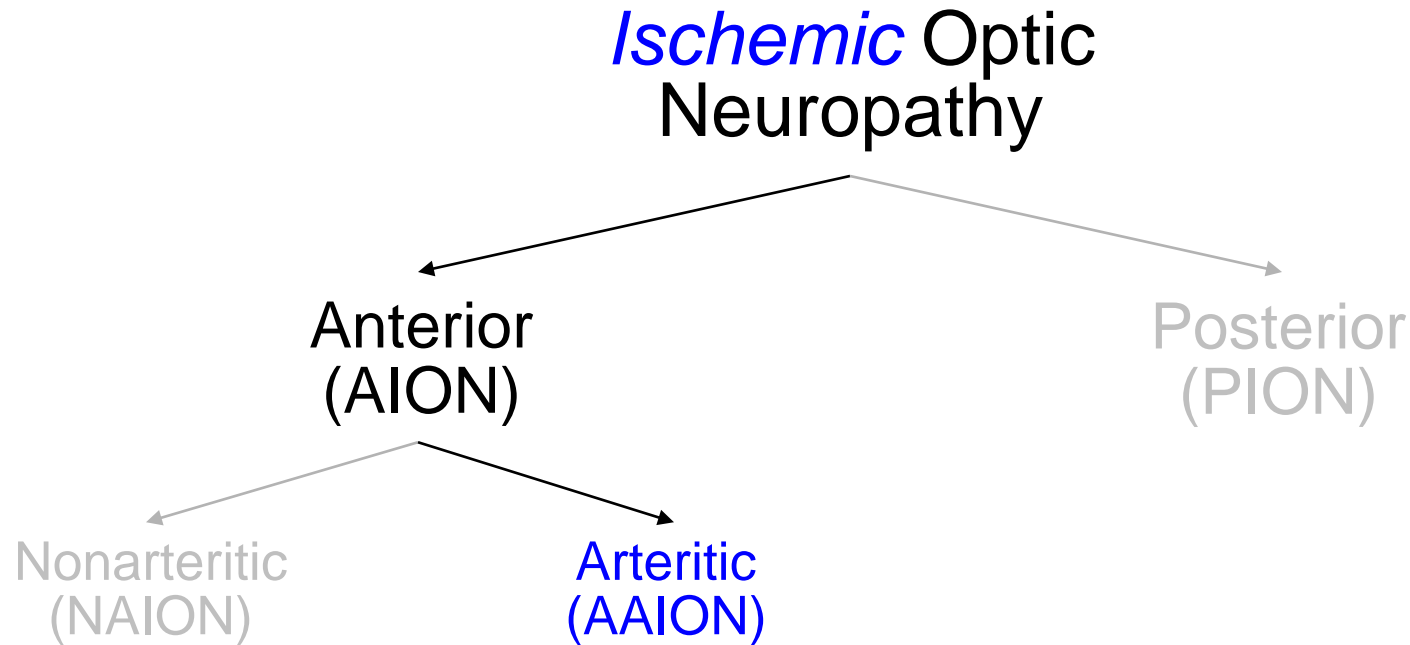
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An inflammatory disease that targets two-words indicating size arteries

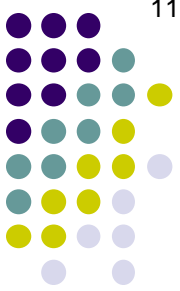


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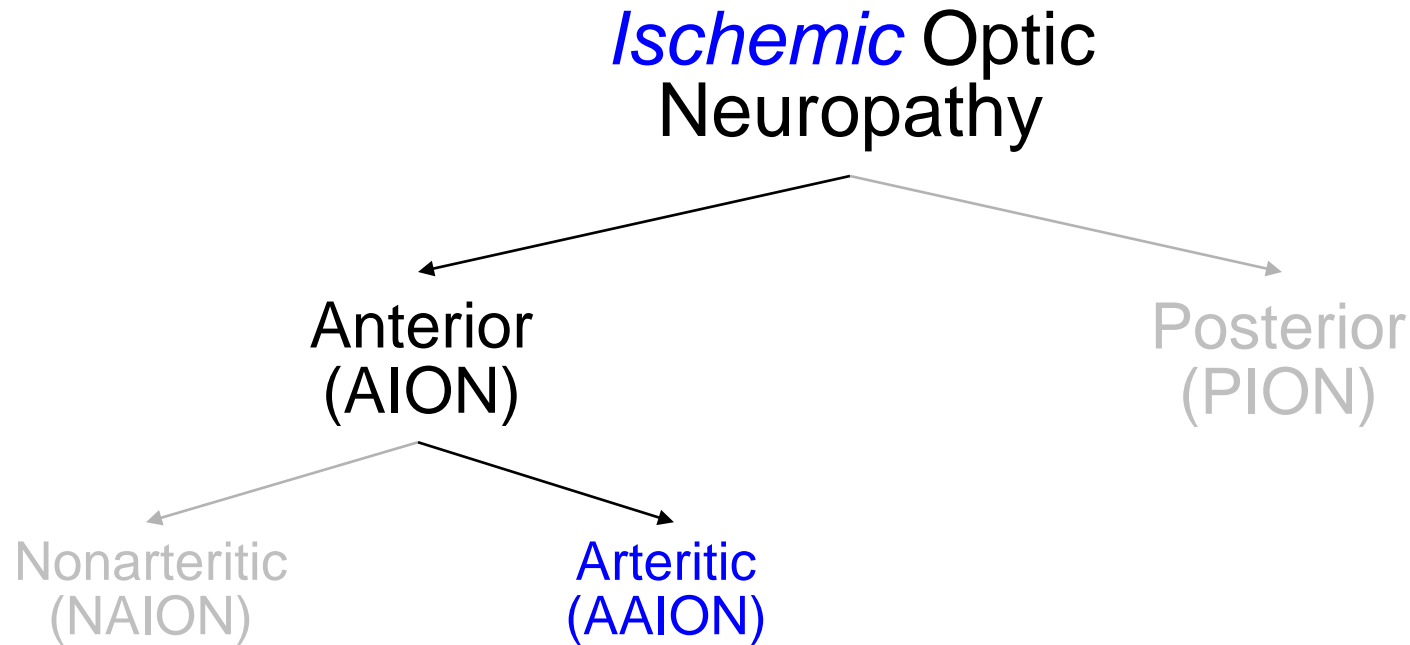


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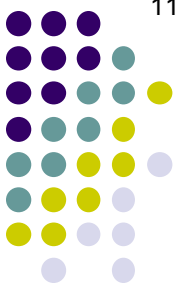
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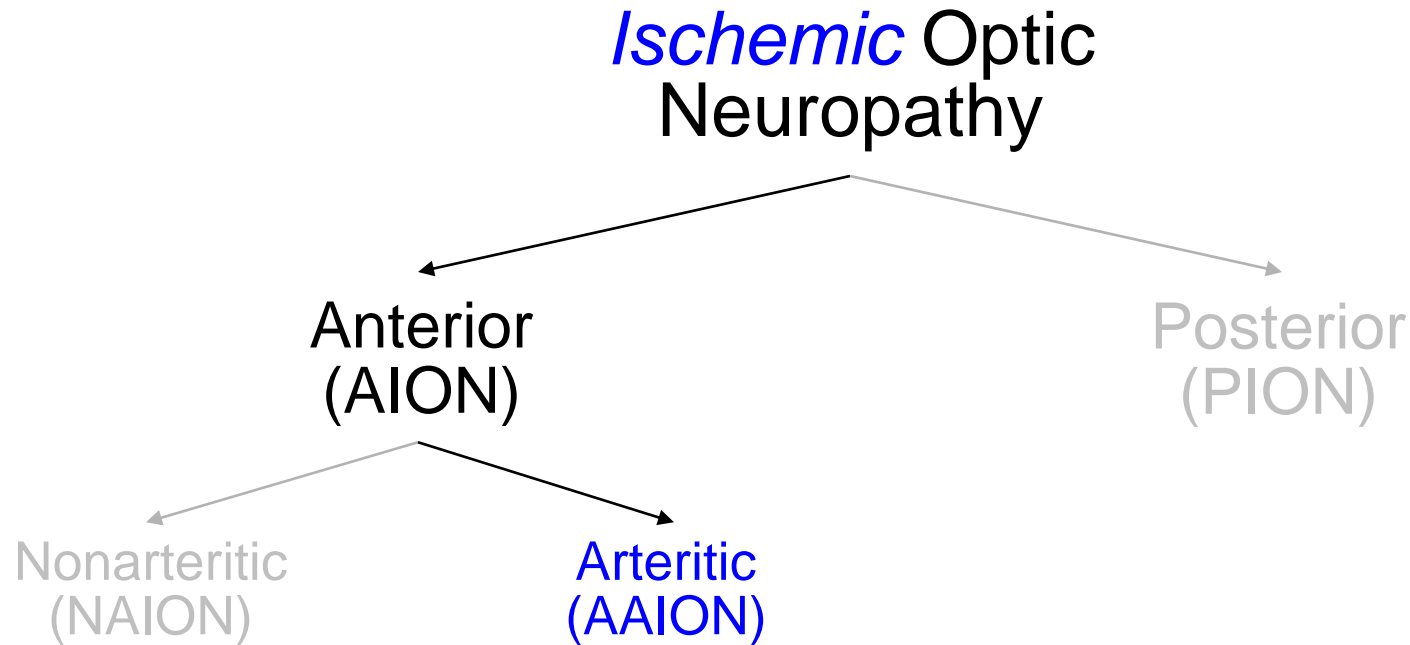
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*Do all GCA pts experience vision loss?*



## *Ischemic Optic Neuropathy*



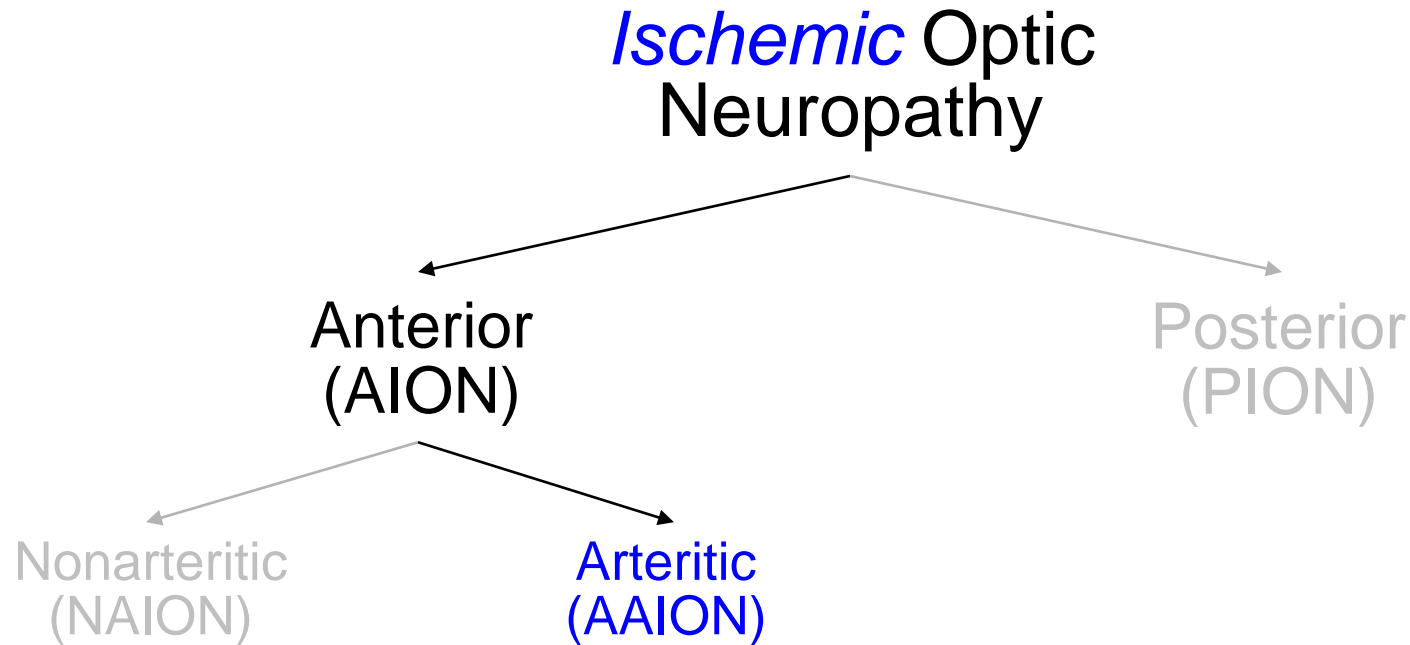
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 No, estimates are % - %, depending upon whom you ask



## *Ischemic Optic Neuropathy*



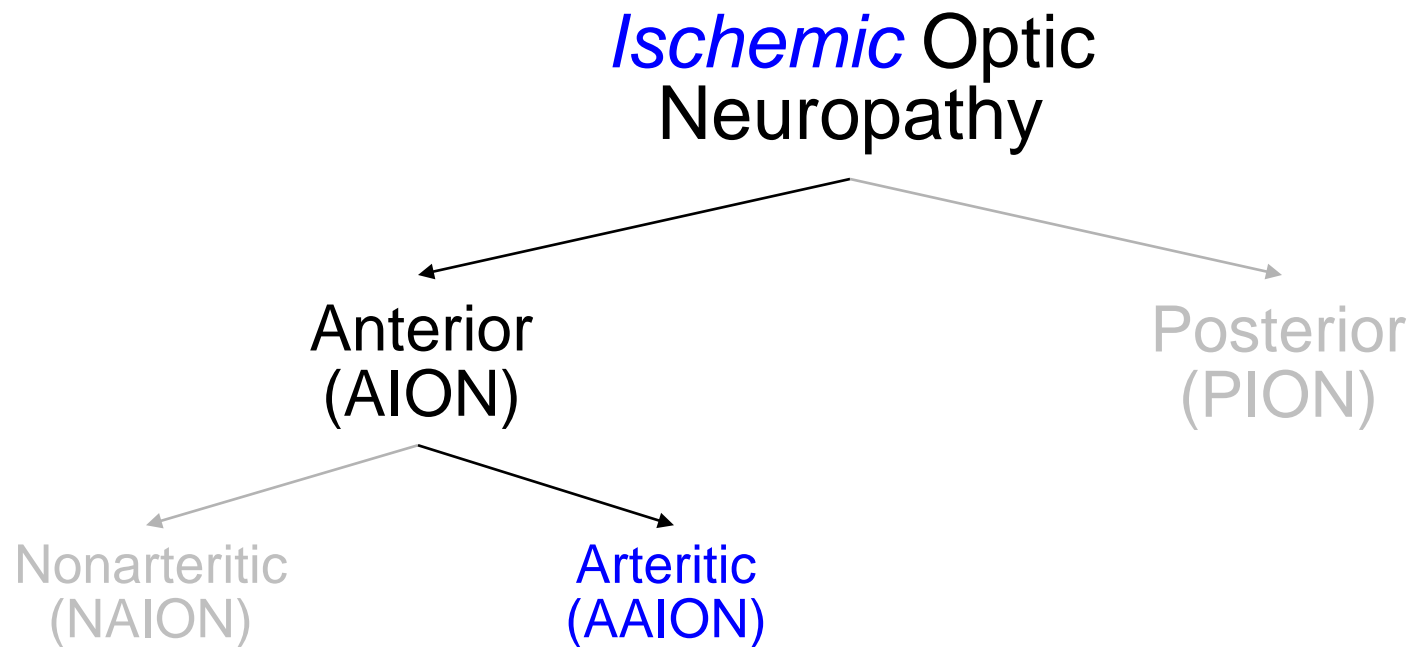
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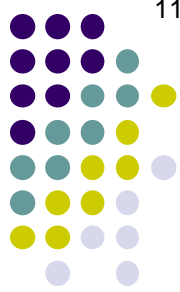
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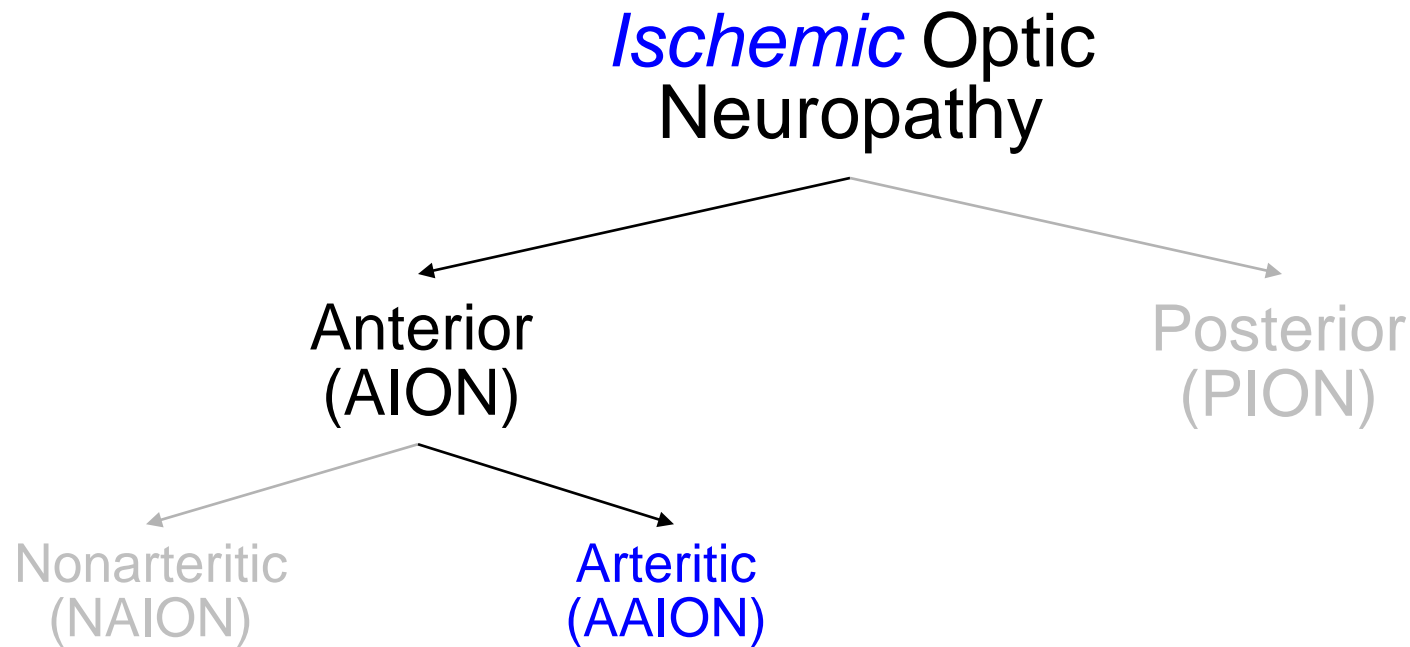
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## *Ischemic Optic Neuropathy*

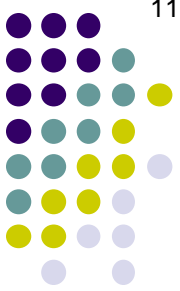


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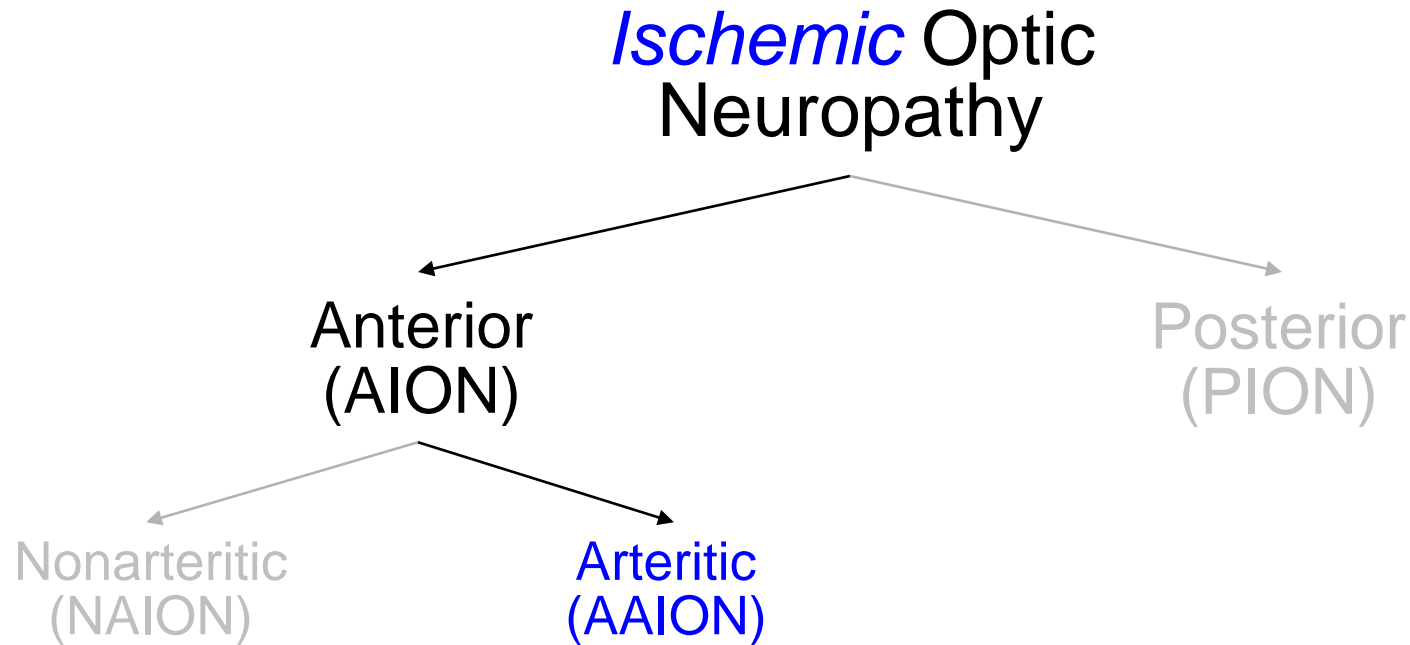
*In addition to infarction of the anterior optic nerve, by what two other events can a GCA pt lose vision?*

- CRAO (or BRAO)
- Choroidal ischemia

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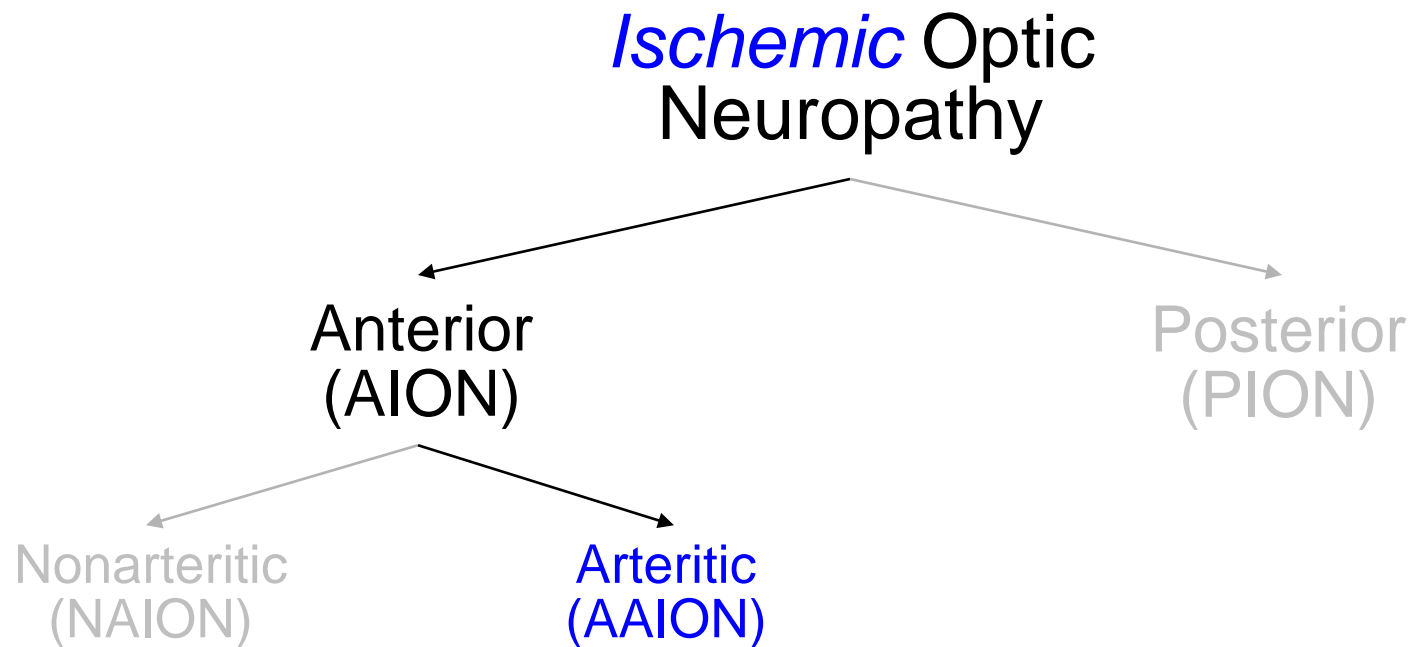
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*Of the three causes, which is most common?*

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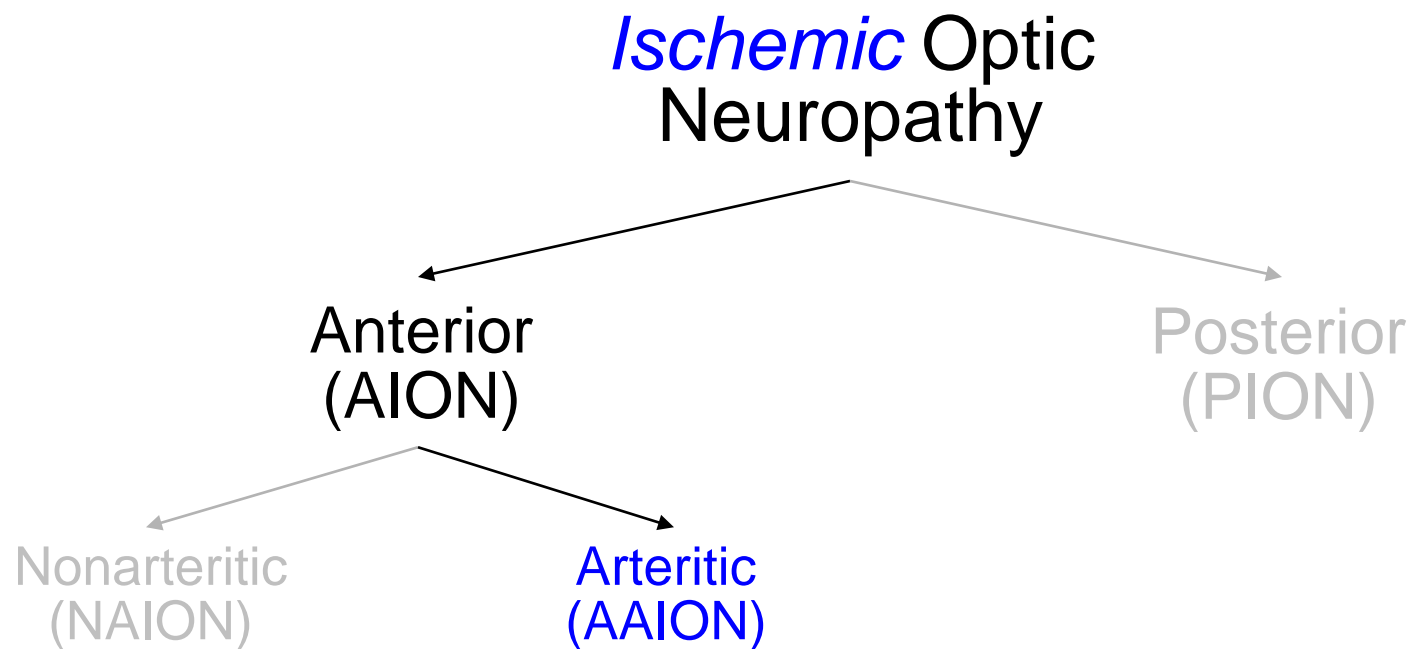
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# Ischemic Optic Neuropathy



*What systemic disease is causative in AAION?*

*In addition to infarction of*  
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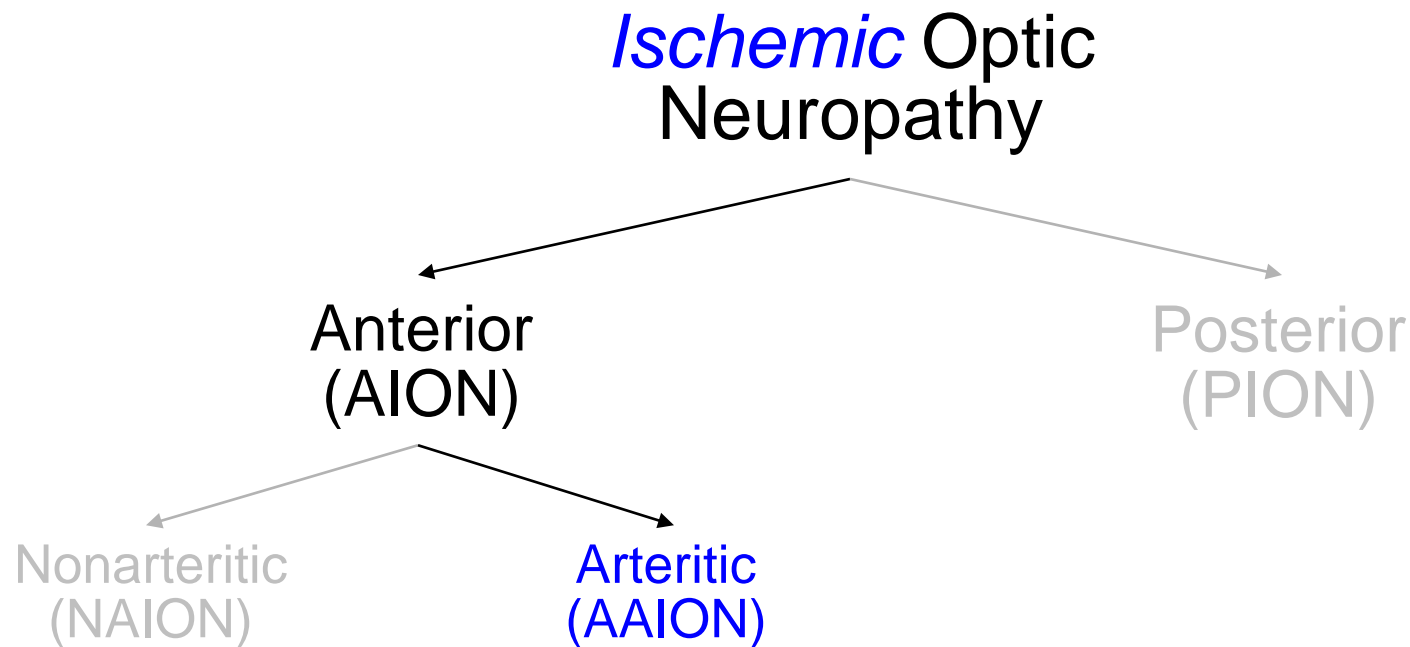
*Is there a way to bag both the choroidal and retinal arterial circulations with a single lesion?*

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 AAION

No, estimates are 10 – 50%, depending upon whom you ask



## *Ischemic Optic Neuropathy*



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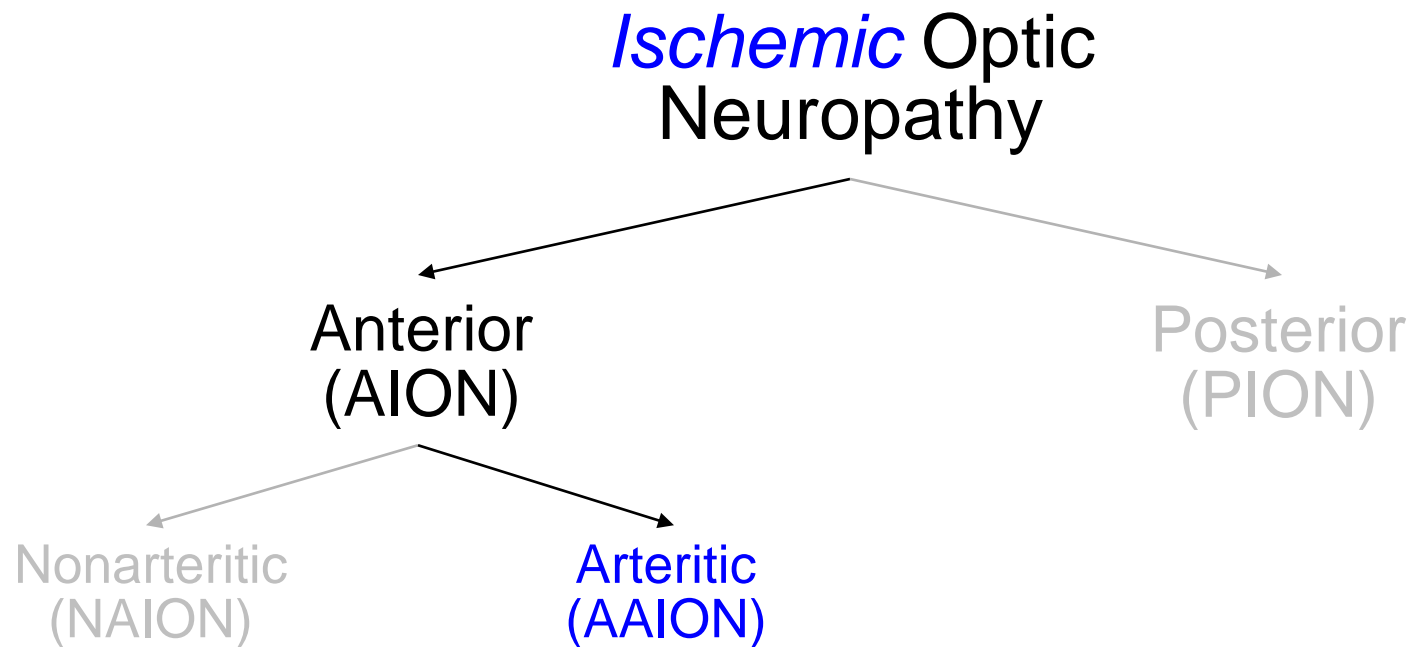
*Is there a way to bag both the choroidal and retinal arterial circulations with a single lesion?*

Yes, via occlusion of the ophthalmic artery

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## Ischemic Optic Neuropathy



*What systemic disease is causative in AAION?*

*In addition to infarction of the optic nerve head, there are two other causes of AION:*  
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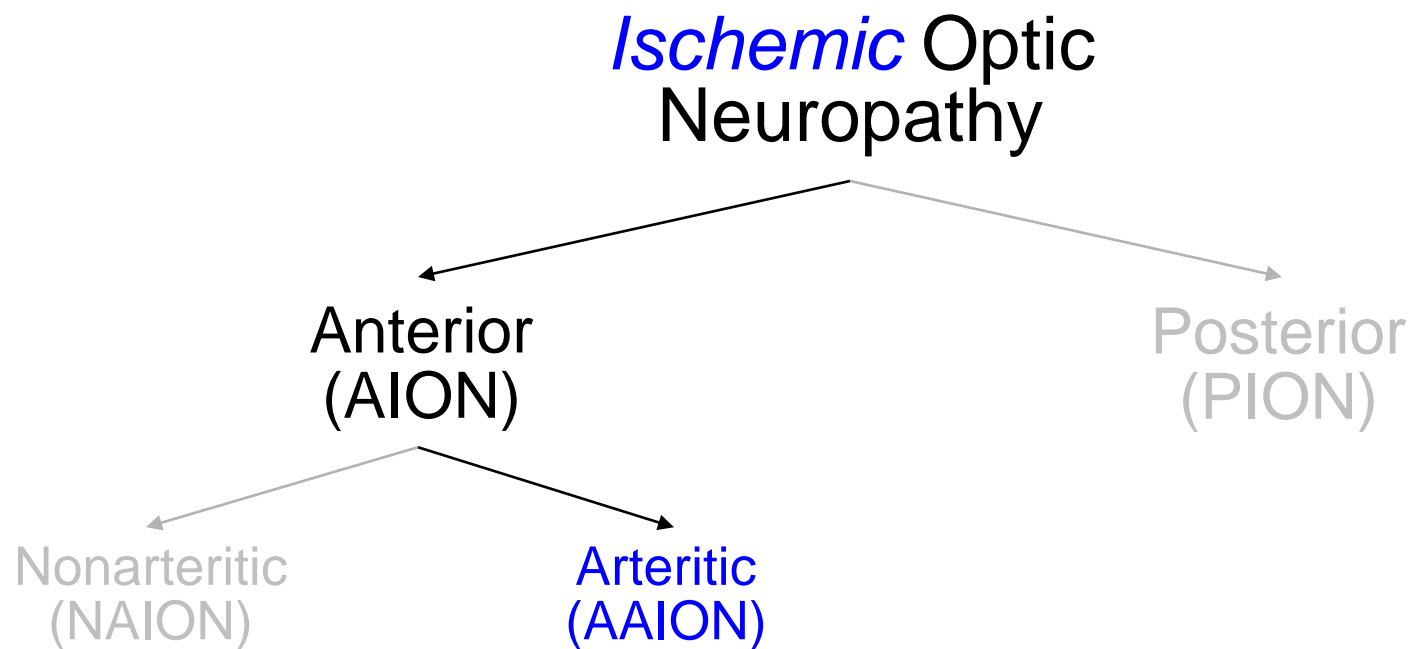
Yes, via occlusion of the ophthalmic artery

*Can GCA cause ophthalmic artery occlusion?*

No, estimates are 10 – 50%, depending upon whom you ask



## Ischemic Optic Neuropathy



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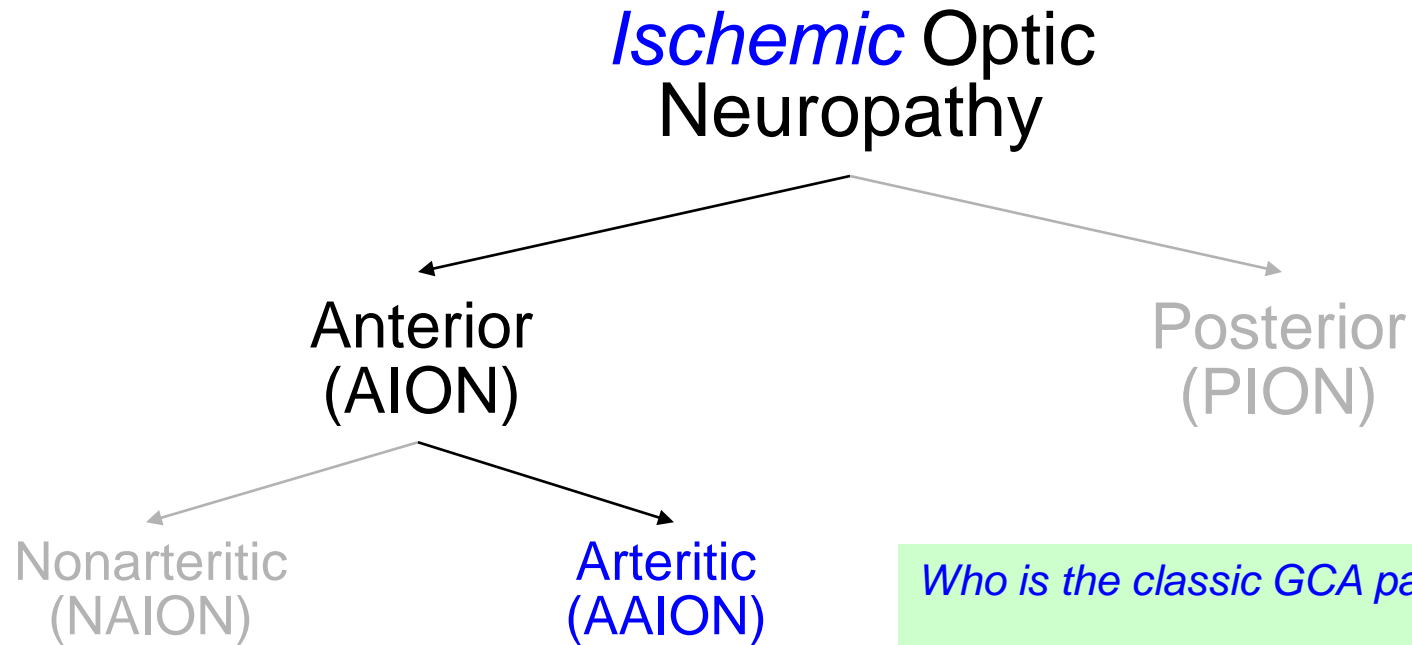
*Can GCA cause ophthalmic artery occlusion?*

Indeed it can

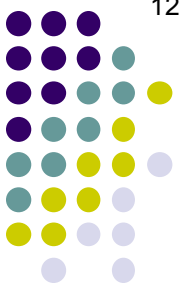
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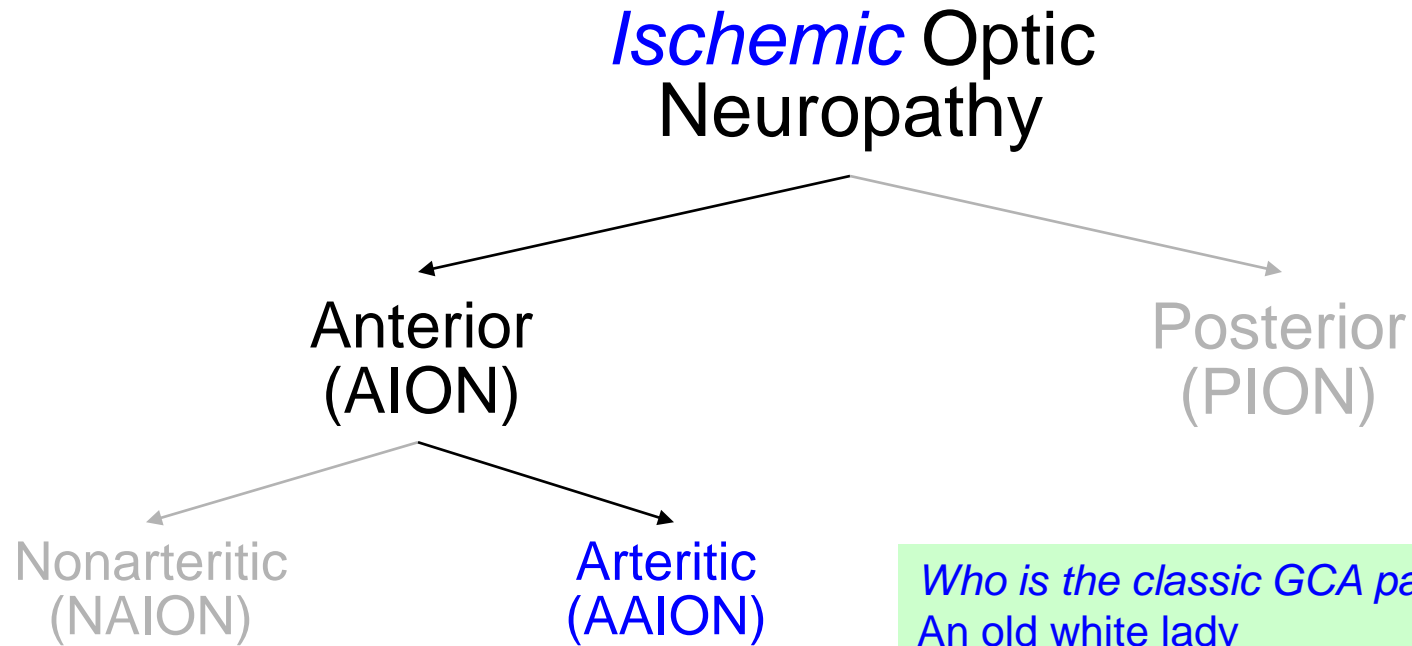
## *Ischemic Optic Neuropathy*



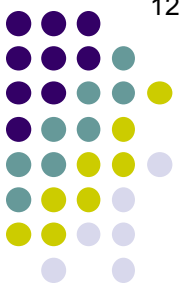
*Who is the classic GCA patient?*



## *Ischemic Optic Neuropathy*



*Who is the classic GCA patient?*  
An old white lady



## *Ischemic Optic Neuropathy*

### *Ischemic* Optic Neuropathy

Anterior  
(AION)

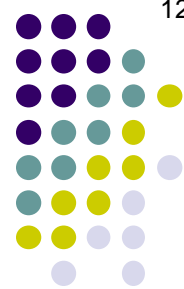
Posterior  
(PION)

Nonarteritic  
(NAION)

Arteritic  
(AAION)

*Who is the classic GCA patient?*  
An **old** white lady

*How old?*



# Ischemic Optic Neuropathy

## Ischemic Optic Neuropathy

Anterior  
(AION)

Posterior  
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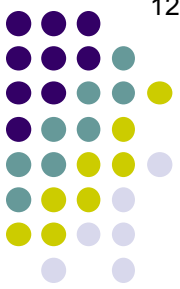
Nonarteritic  
(NAION)

Arteritic  
(AAION)

Who is the classic GCA patient?  
An **old** white lady

### How old?

Typically **#+**. While the youngest case of bx-proven GCA was **#**, it is very rare before age **#**.



## *Ischemic Optic Neuropathy*

### *Ischemic* Optic Neuropathy

Anterior  
(AION)

Posterior  
(PION)

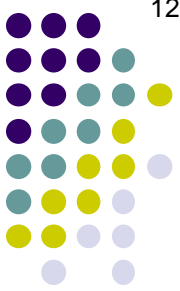
Nonarteritic  
(NAION)

Arteritic  
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*Who is the classic GCA patient?*  
An **old** white lady

#### *How old?*

Typically 70+. While the youngest case of bx-proven GCA was 39, it is very rare before age 50.



## *Ischemic Optic Neuropathy*

### *Ischemic* Optic Neuropathy

Anterior  
(AION)

Posterior  
(PION)

Nonarteritic  
(NAION)

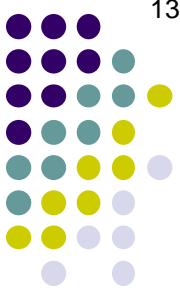
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## *Ischemic Optic Neuropathy*

### *Ischemic* Optic Neuropathy

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*Who is the classic GCA patient?*  
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*How white?*

Quite white. It is most common among whites of Northern European descent.



# Ischemic Optic Neuropathy

## Ischemic Optic Neuropathy

Anterior  
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Posterior  
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Nonarteritic  
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Arteritic  
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*Who is the classic GCA patient?*

An **old white lady**

*How old?*

Typically 70+. While the youngest case of bx-proven GCA was 39, it is very rare before age 50.

*How white?*

Quite white. It is most common among whites of Northern European descent.

*How lady?*



# Ischemic Optic Neuropathy

## Ischemic Optic Neuropathy

Anterior  
(AION)

Posterior  
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Nonarteritic  
(NAION)

Arteritic  
(AAION)

*Who is the classic GCA patient?*

An **old** **white** **lady**

**How old?**

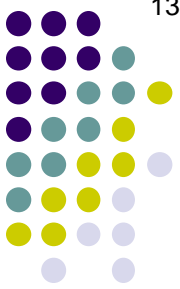
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**How white?**

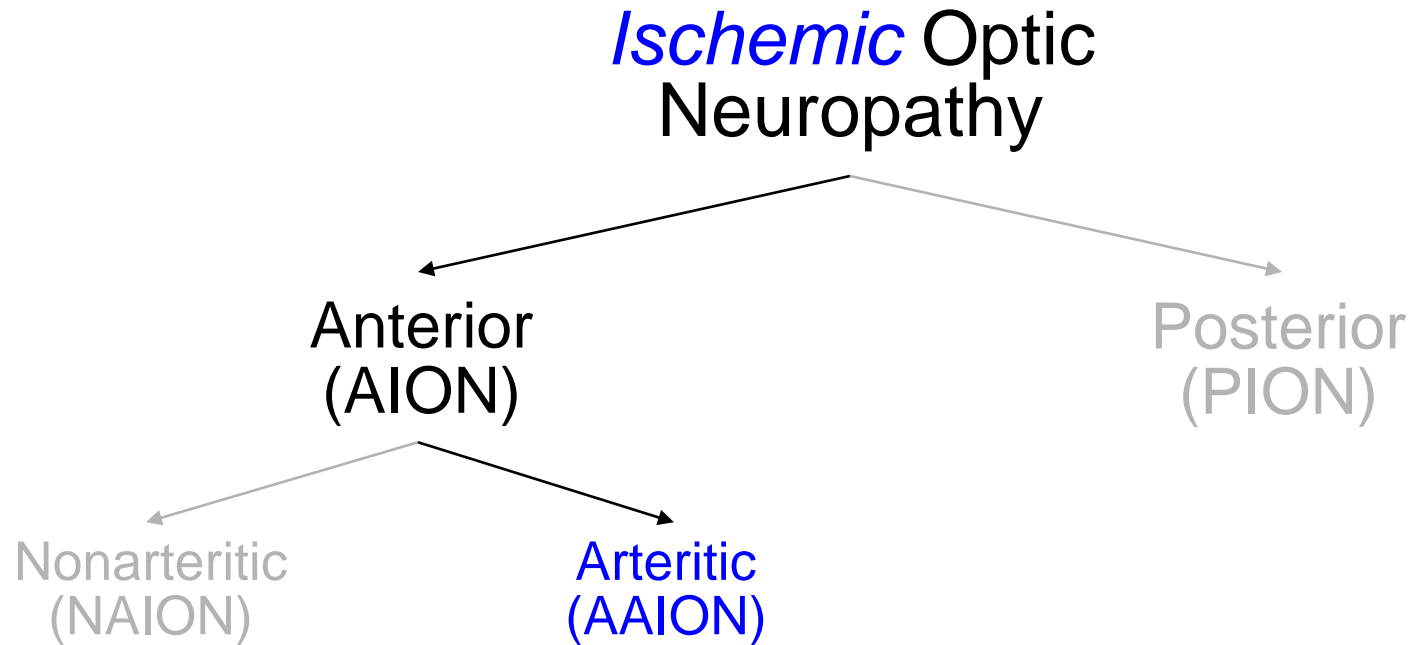
Quite white. It is most common among whites of Northern European descent.

**How lady?**

Females are 2-4 times more likely to develop GCA

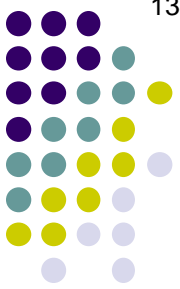


## *Ischemic Optic Neuropathy*

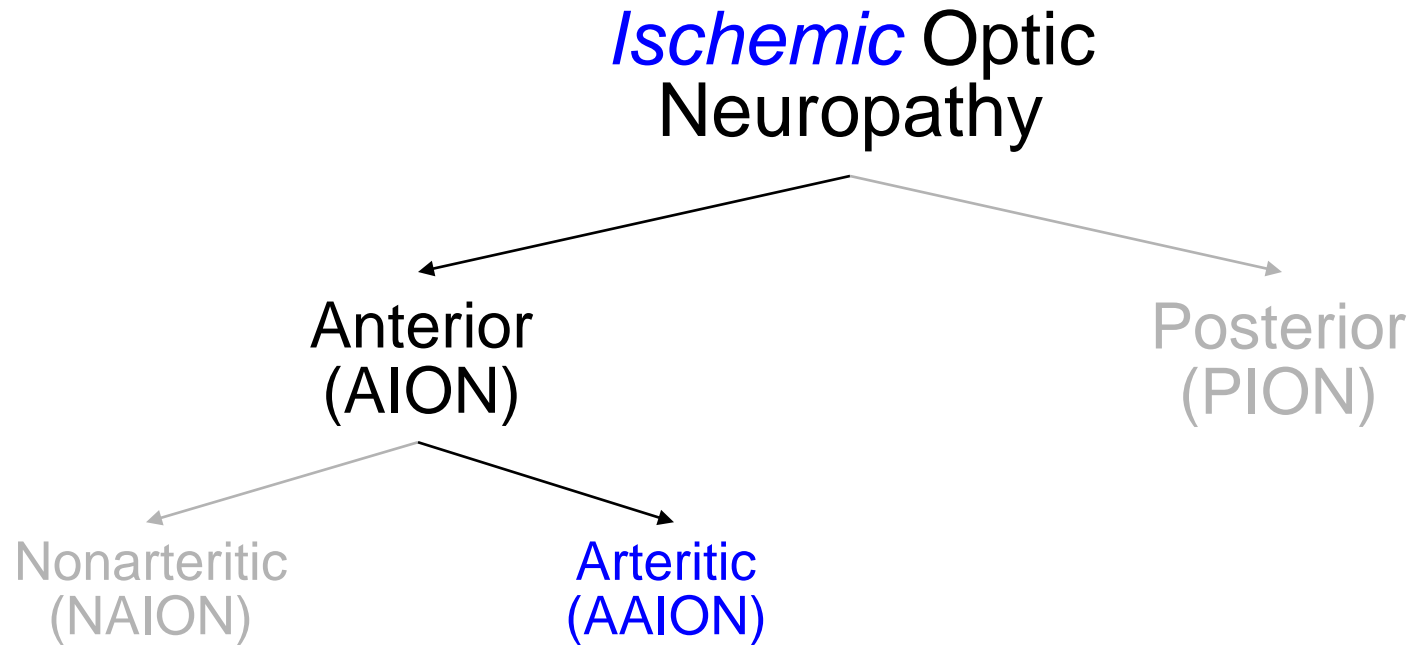


*Other than vision loss, what symptoms might a GCA pt report?*

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## *Ischemic Optic Neuropathy*

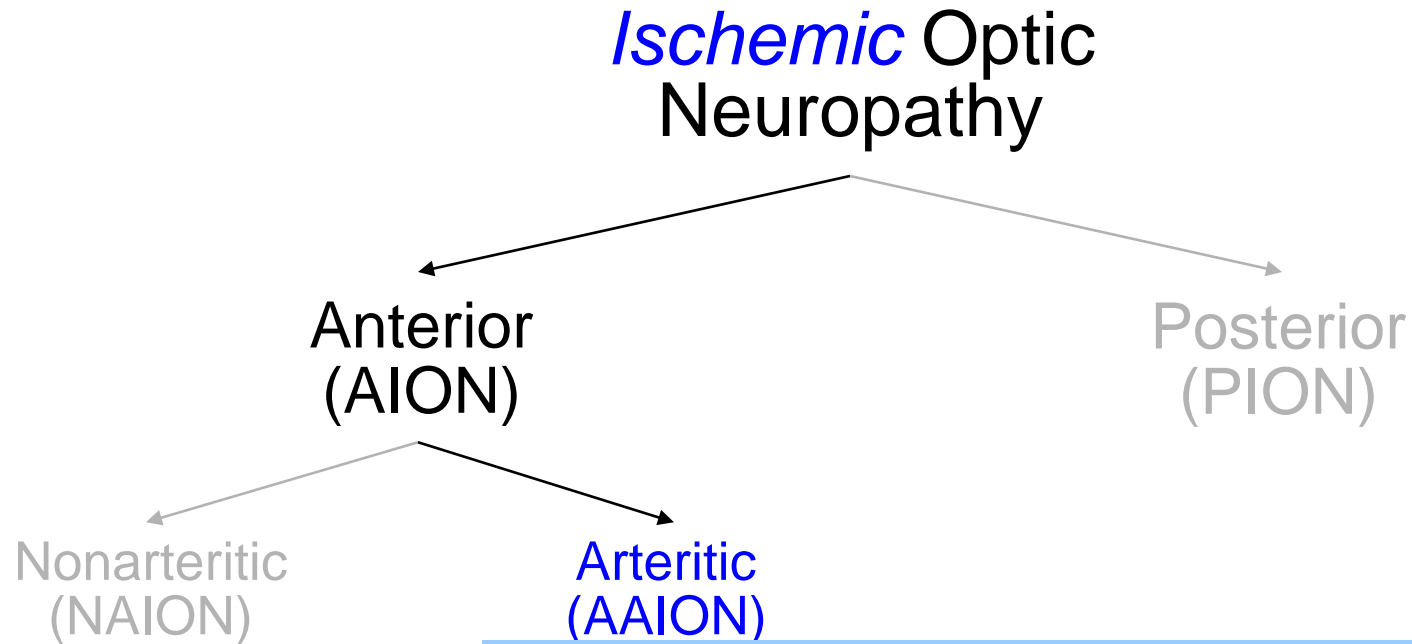


*Other than vision loss, what symptoms might a GCA pt report?*

- Headache
- Jaw claudication
- Fever
- Malaise
- PMR symptoms
- Diplopia



## *Ischemic Optic Neuropathy*



*Other than vision loss*

**--Headache**

--Jaw claudication

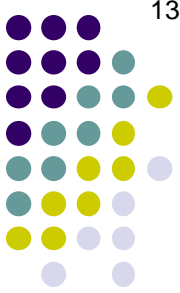
--Fever

--Malaise

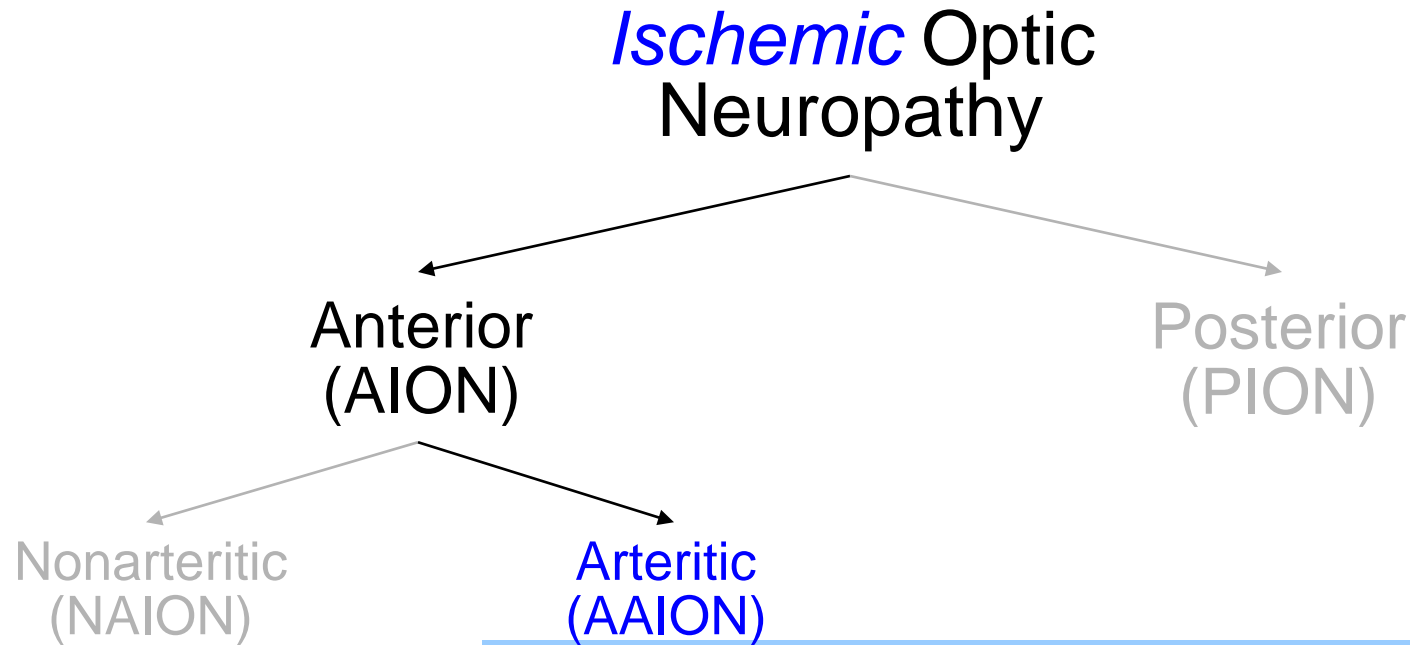
--PMR symptoms

--Diplopia

*Does it have to be a severe, 'worst HA of my life' complaint?*



# Ischemic Optic Neuropathy



*Other than vision loss*

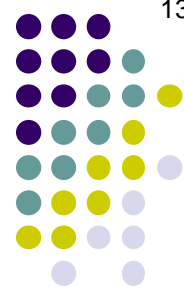
## --Headache

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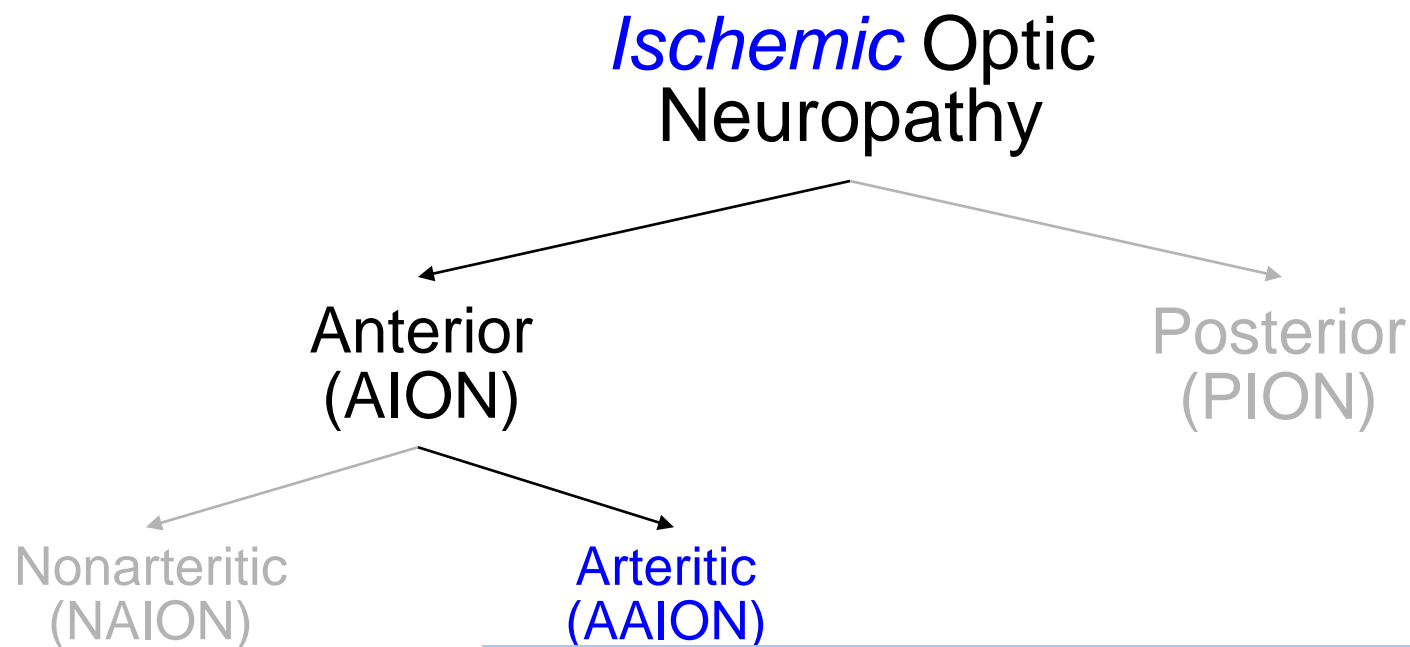
*Does it have to be a severe, 'worst HA of my life' complaint?*

No! The HA may be mild in intensity. However, to be worrisome for GCA, the HA should have two characteristics:

- 1) It is of two words
- 2) It is two different words from previous HAs (ie, a   HA)



## Ischemic Optic Neuropathy



*Other than vision loss*

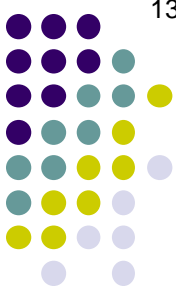
### --Headache

- Jaw claudication
- Fever
- Malaise
- PMR symptoms
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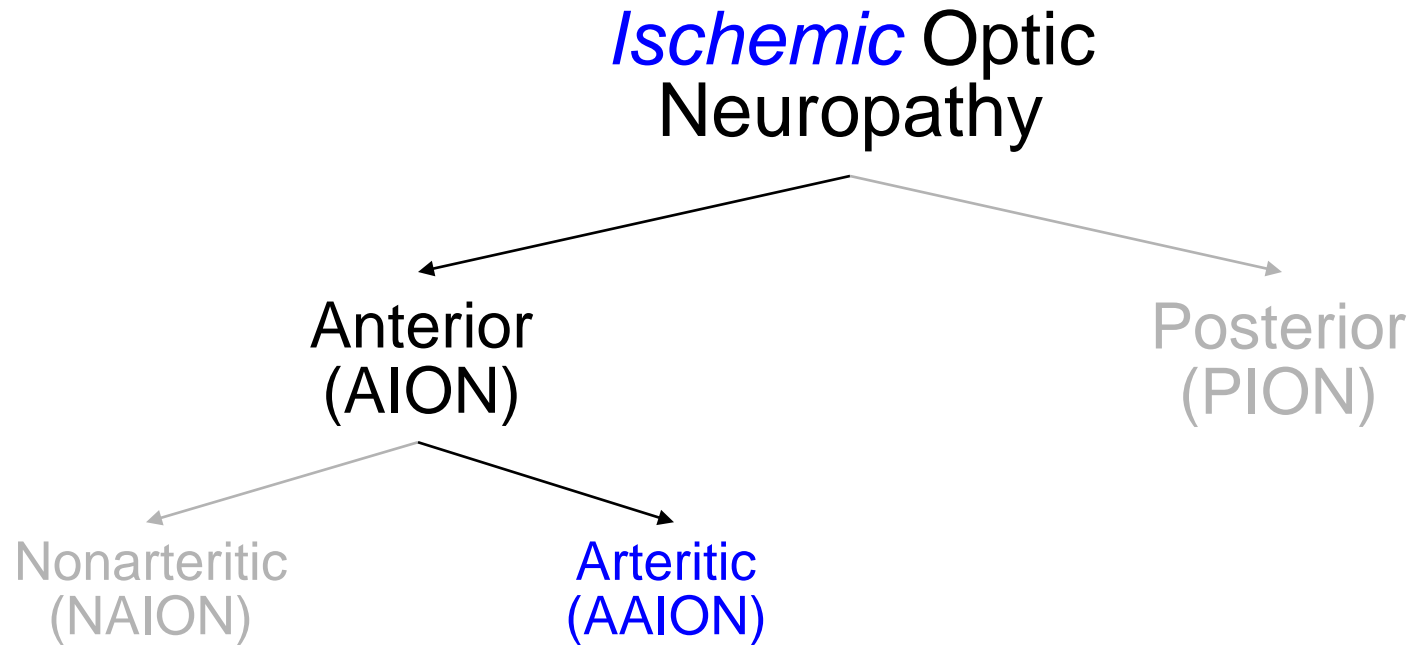
*Does it have to be a severe, 'worst HA of my life' complaint?*

No! The HA may be mild in intensity. However, to be worrisome for GCA, the HA should have two characteristics:

- 1) It is of recent onset
- 2) It is **qualitatively different** from previous HAs (ie, a 'new' HA)



## *Ischemic Optic Neuropathy*



*Other than vision loss*

--Headache

--**Jaw claudication**

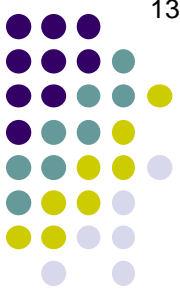
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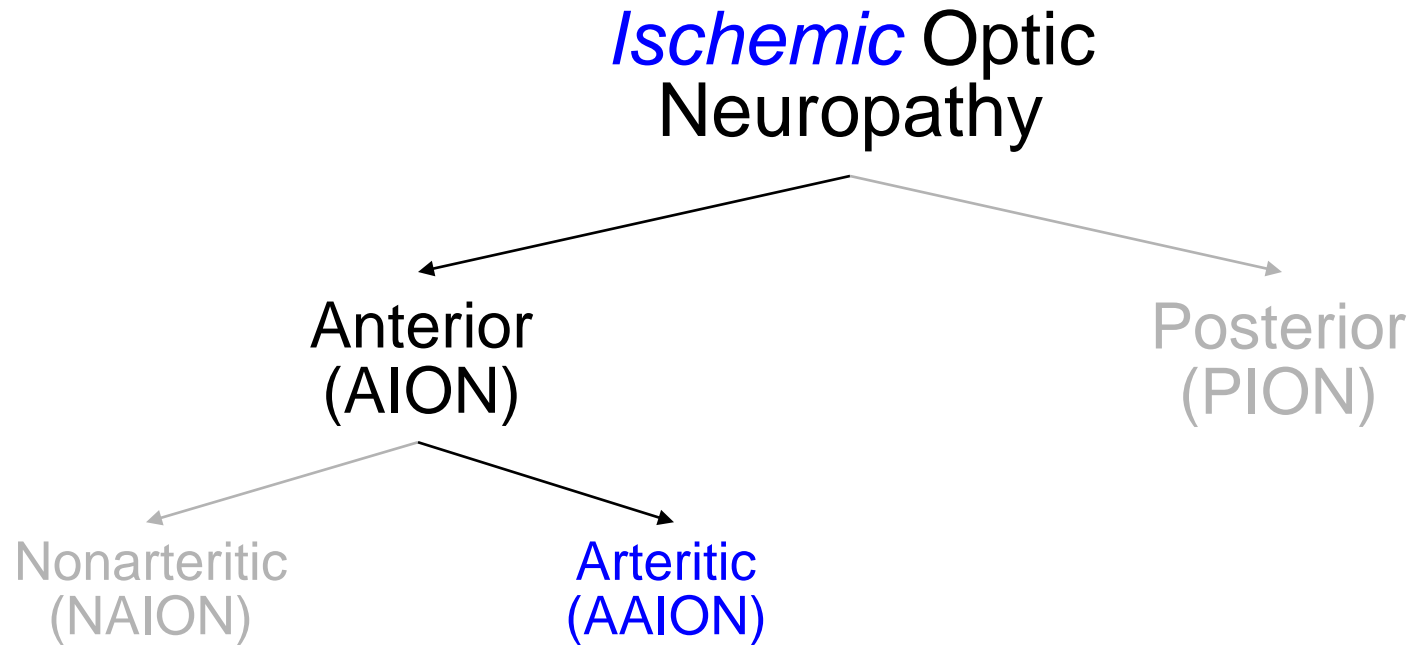
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*What is jaw claudication?*



## *Ischemic Optic Neuropathy*



*Other than vision loss*

--Headache

--**Jaw claudication**

--Fever

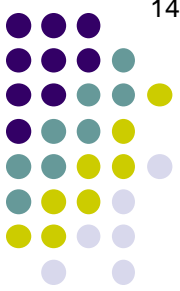
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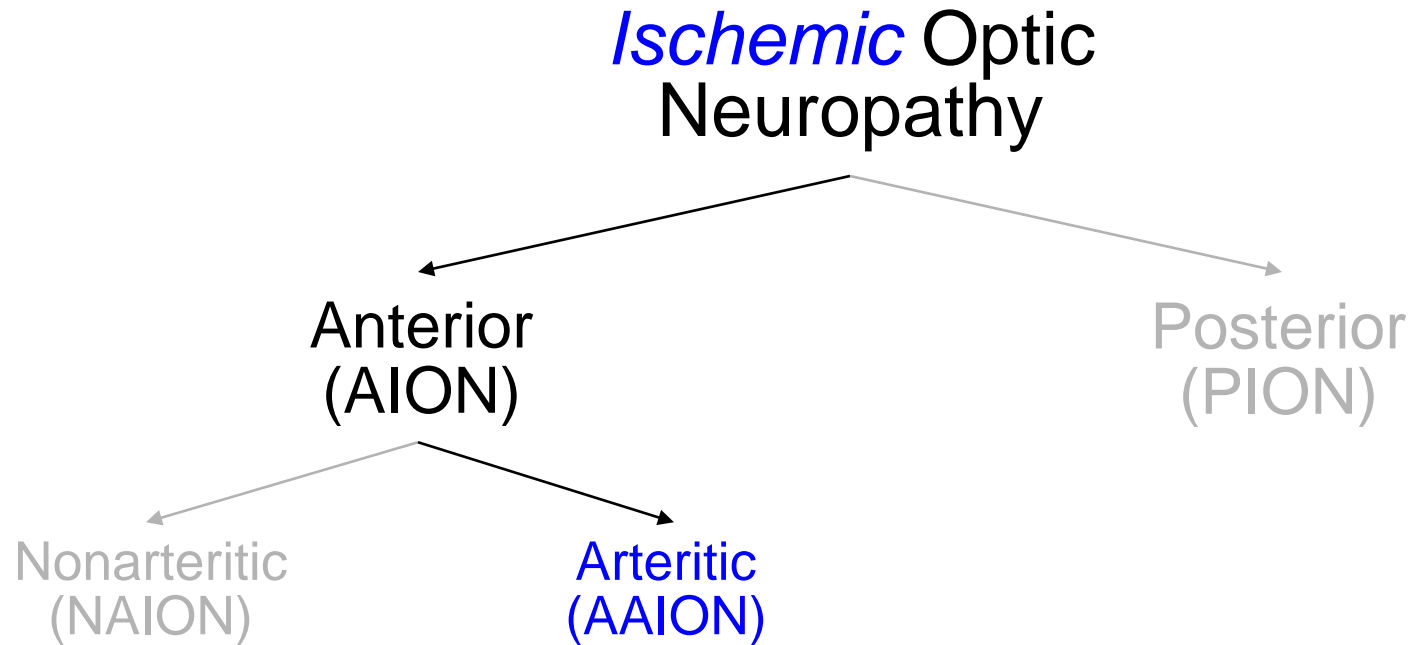
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*What is jaw claudication?*

Pain in the jaw brought on by chewing



## *Ischemic Optic Neuropathy*



*Other than vision loss*

--Headache

--**Jaw claudication**

--Fever

--Malaise

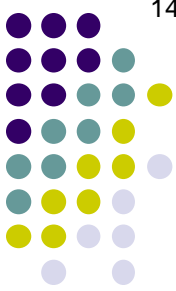
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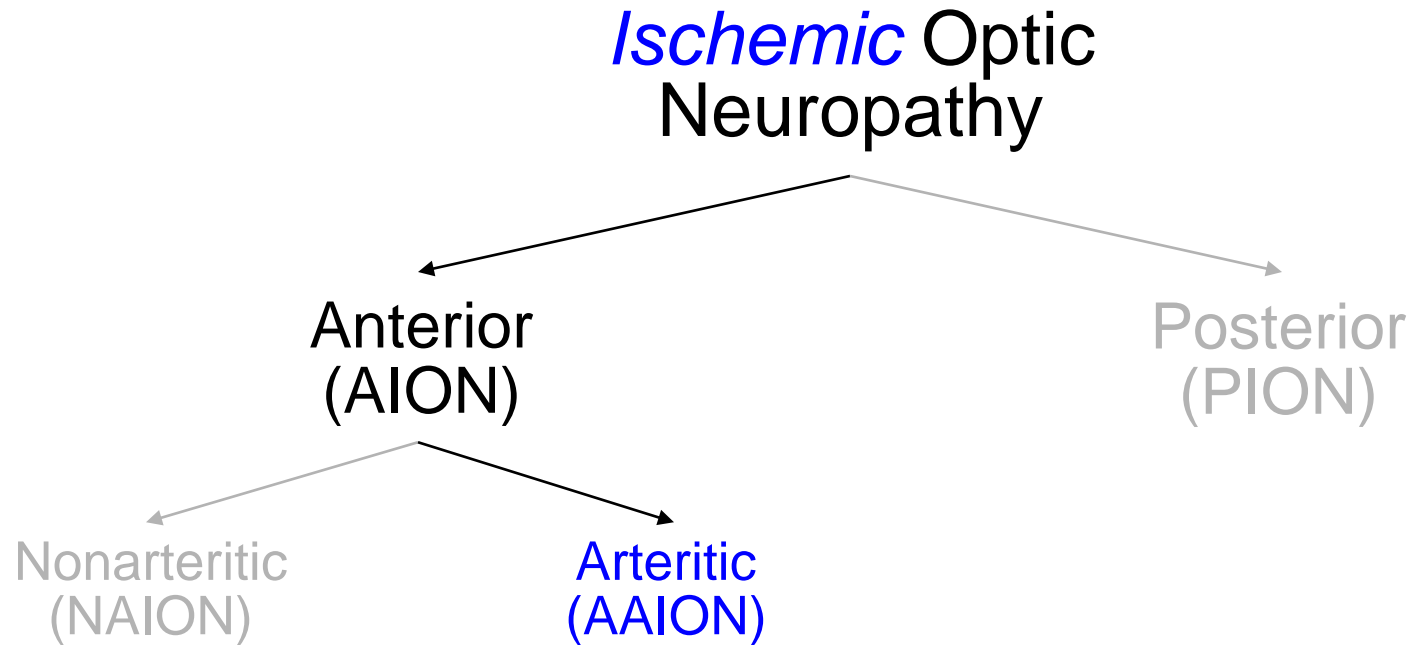
*What is jaw claudication?*

Pain in the jaw brought on by chewing

*What is the etiology?*



## Ischemic Optic Neuropathy



*Other than vision loss*

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*What is jaw claudication?*

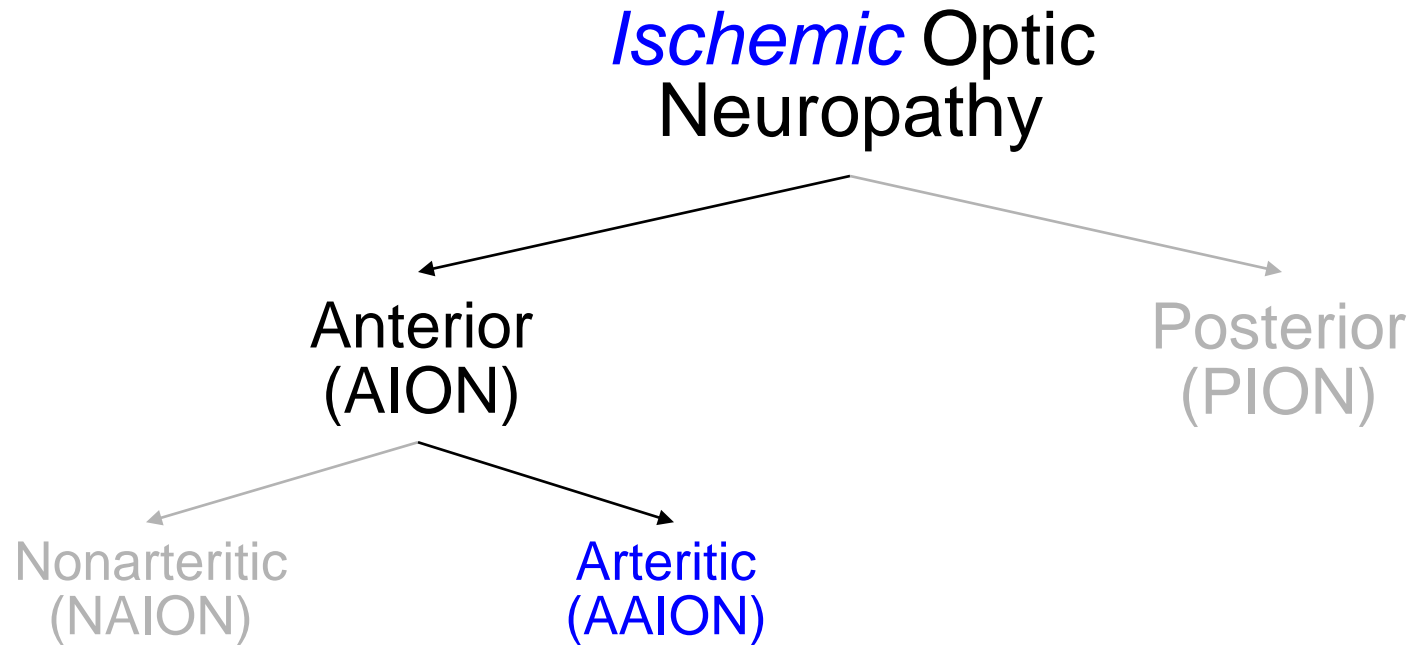
Pain in the jaw brought on by chewing

*What is the etiology?*

Same as the leg claudication that PAD pts get when walking—  
poor muscle perfusion → muscle ischemia → pain upon use



# Ischemic Optic Neuropathy



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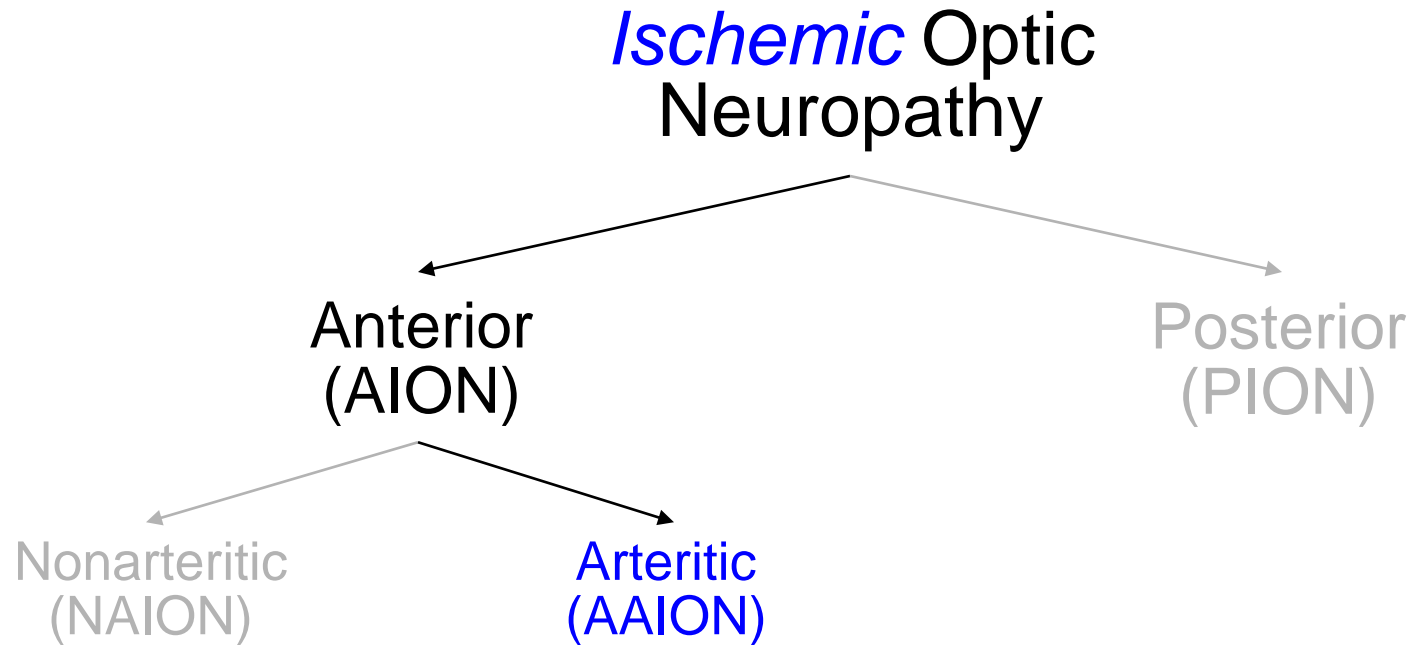
*What is the etiology?*

Same as the leg claudication that PAD pts get when walking—poor muscle perfusion→muscle ischemia→pain upon use

*Does the pain localize to the TMJ?*



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*Other than vision loss*

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*What is jaw claudication?*

Pain in the jaw brought on by chewing

*What is the etiology?*

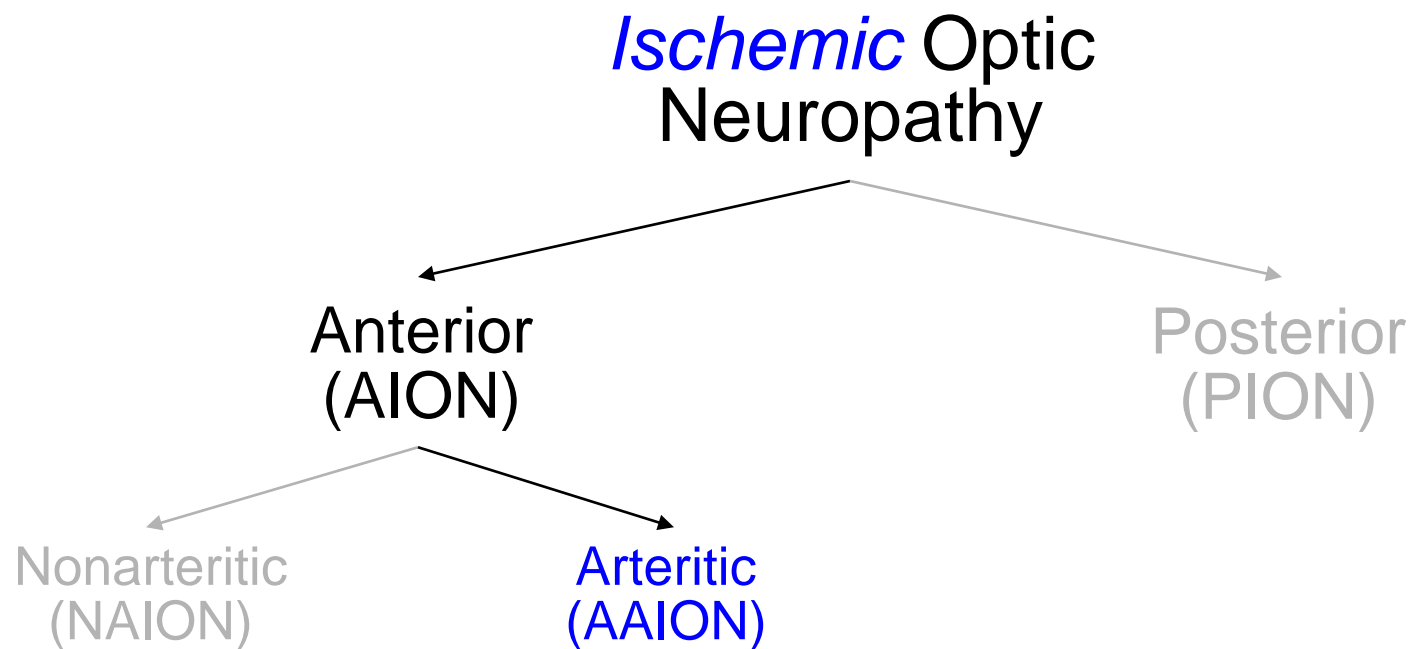
Same as the leg claudication that PAD pts get when walking—poor muscle perfusion→muscle ischemia→pain upon use

*Does the pain localize to the TMJ?*

No! If it does, it's not claudication



## *Ischemic Optic Neuropathy*



*Other than vision loss*

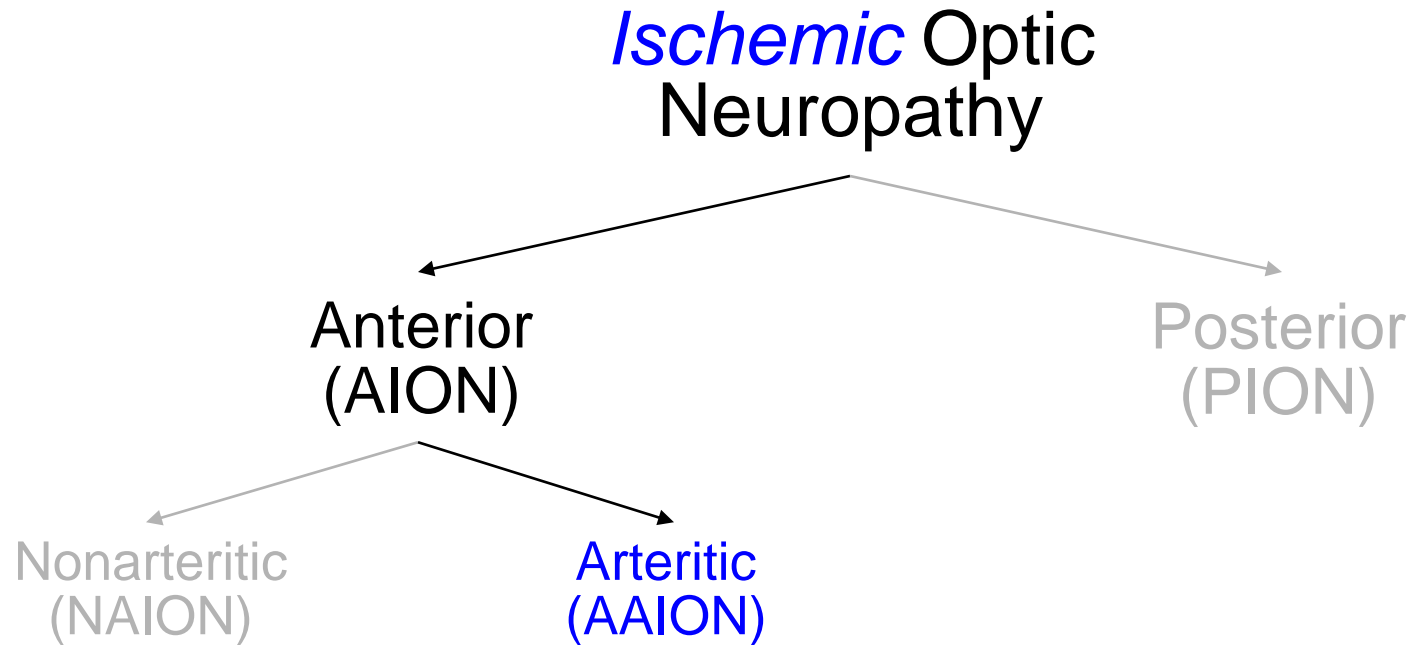
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- Jaw **claudication**
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- Malaise
- PMR symptoms
- Diplopia

*What nearby structure may claudicate in GCA as well?*

No! If it does, it's not claudication



# Ischemic Optic Neuropathy



*Other than vision loss*

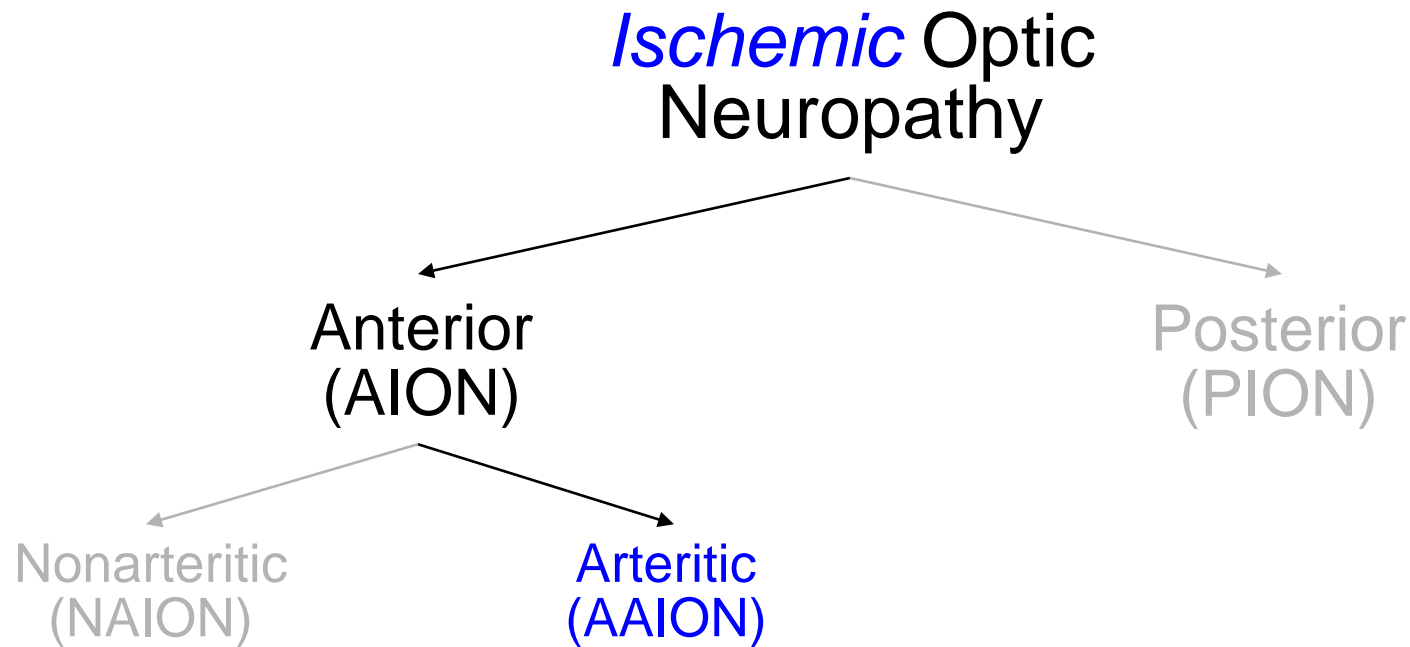
- Headache
- Jaw **claudication**
- Fever
- Malaise
- PMR symptoms
- Diplopia

*What nearby structure may claudicate in GCA as well?*  
The tongue

No! If it does, it's not claudication



## *Ischemic Optic Neuropathy*



*Other than vision loss*

- Headache
- Jaw **claudication**
- Fever
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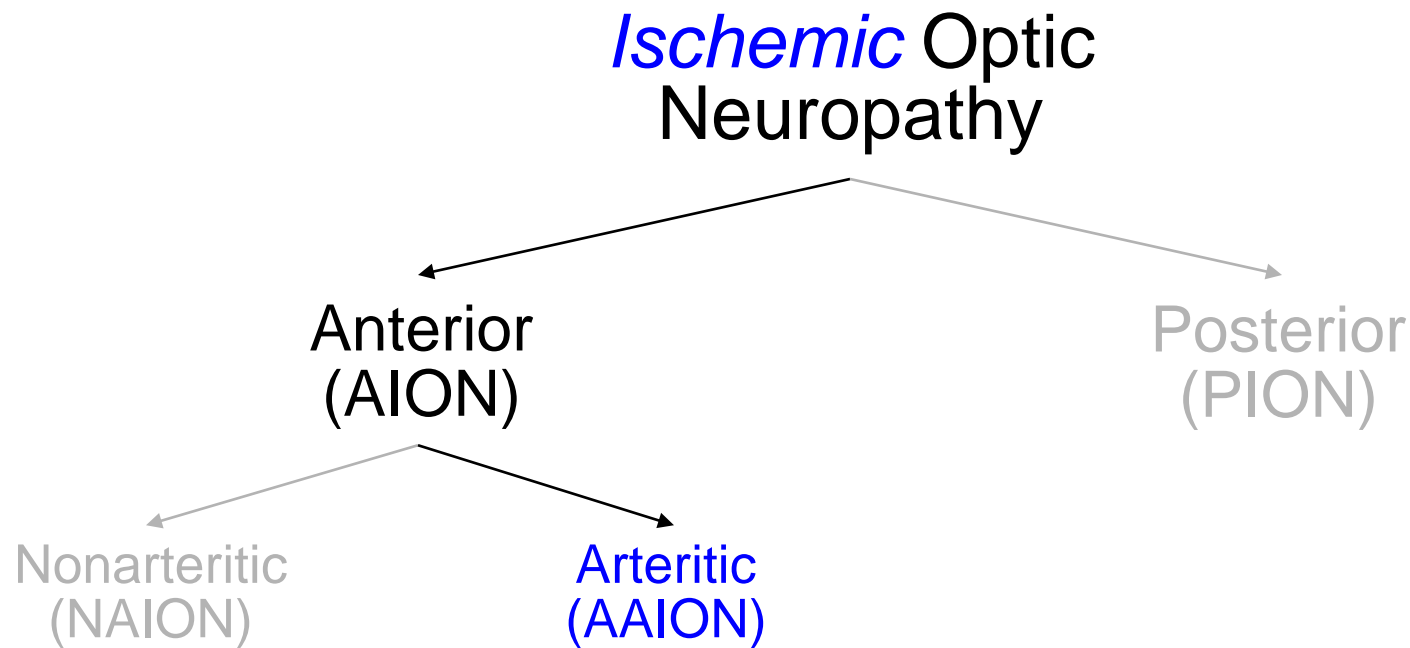
*What nearby structure may claudicate in GCA as well?*  
The tongue

*What is the classic provocative activity?*

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## Ischemic Optic Neuropathy



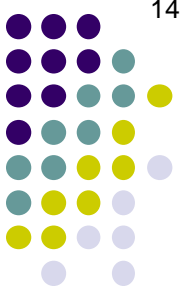
*Other than vision loss*

- Headache
- Jaw **claudication**
- Fever
- Malaise
- PMR symptoms
- Diplopia

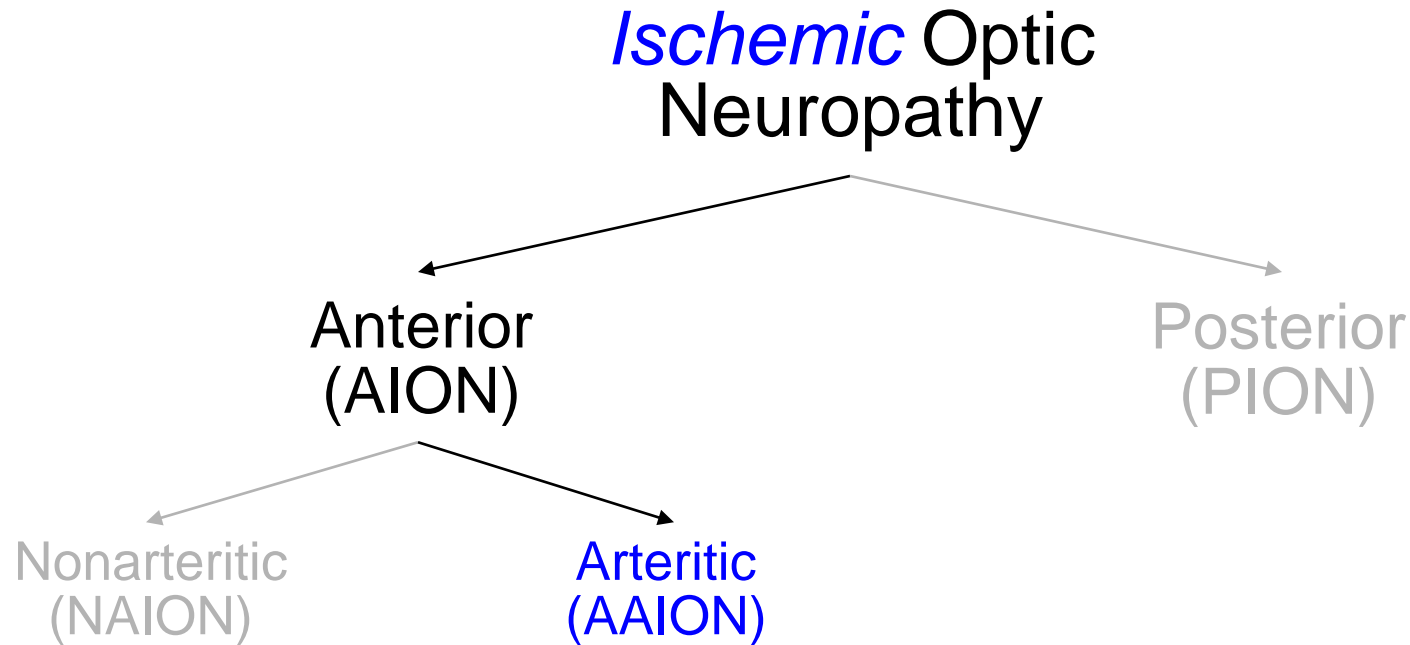
*What nearby structure may claudicate in GCA as well?*  
The tongue

*What is the classic provocative activity?*  
Extended speaking

No! If it does, it's not claudication



## *Ischemic Optic Neuropathy*



*Other than vision loss*

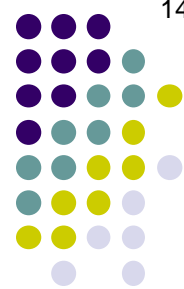
- Headache
- Jaw **claudication**
- Fever
- Malaise
- PMR symptoms
- Diplopia

*What nearby structure may claudicate in GCA as well?*  
The tongue

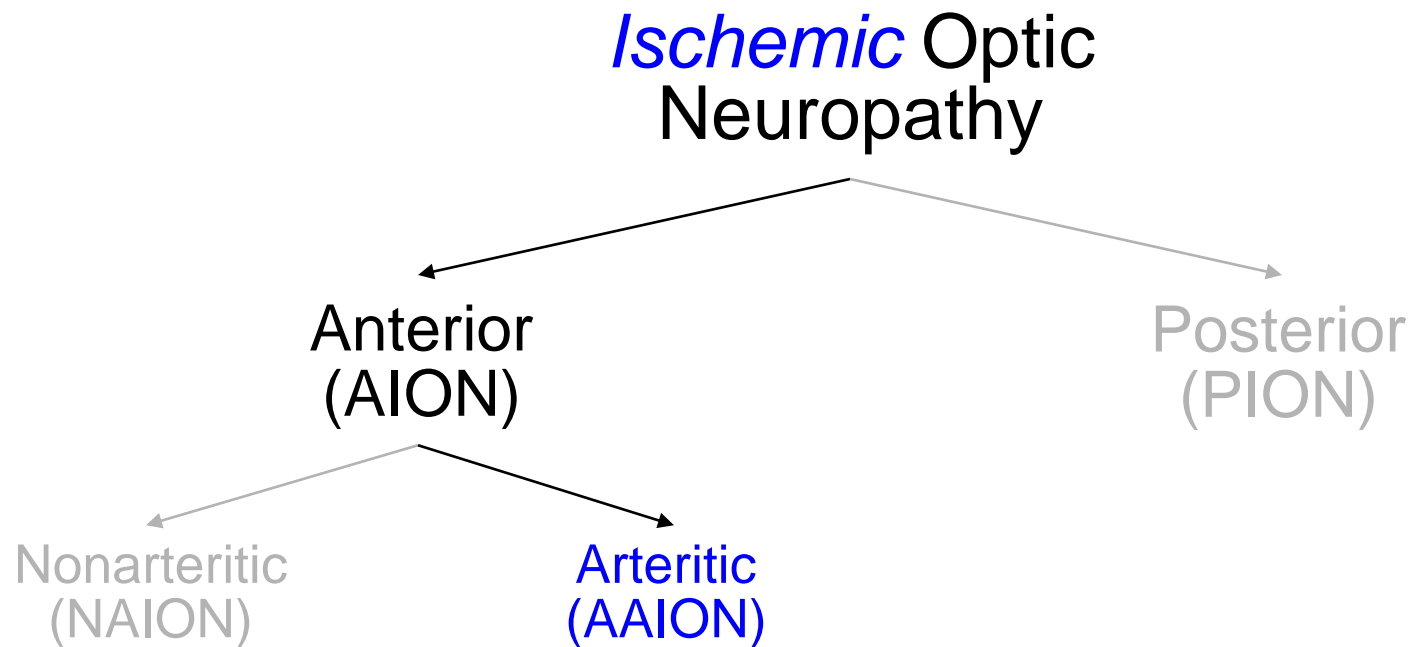
*What is the classic provocative activity?*  
Extended speaking

*How likely is it that a pt with tongue claudication has GCA?*

No! If it does, it's not claudication



## Ischemic Optic Neuropathy



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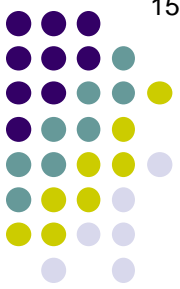
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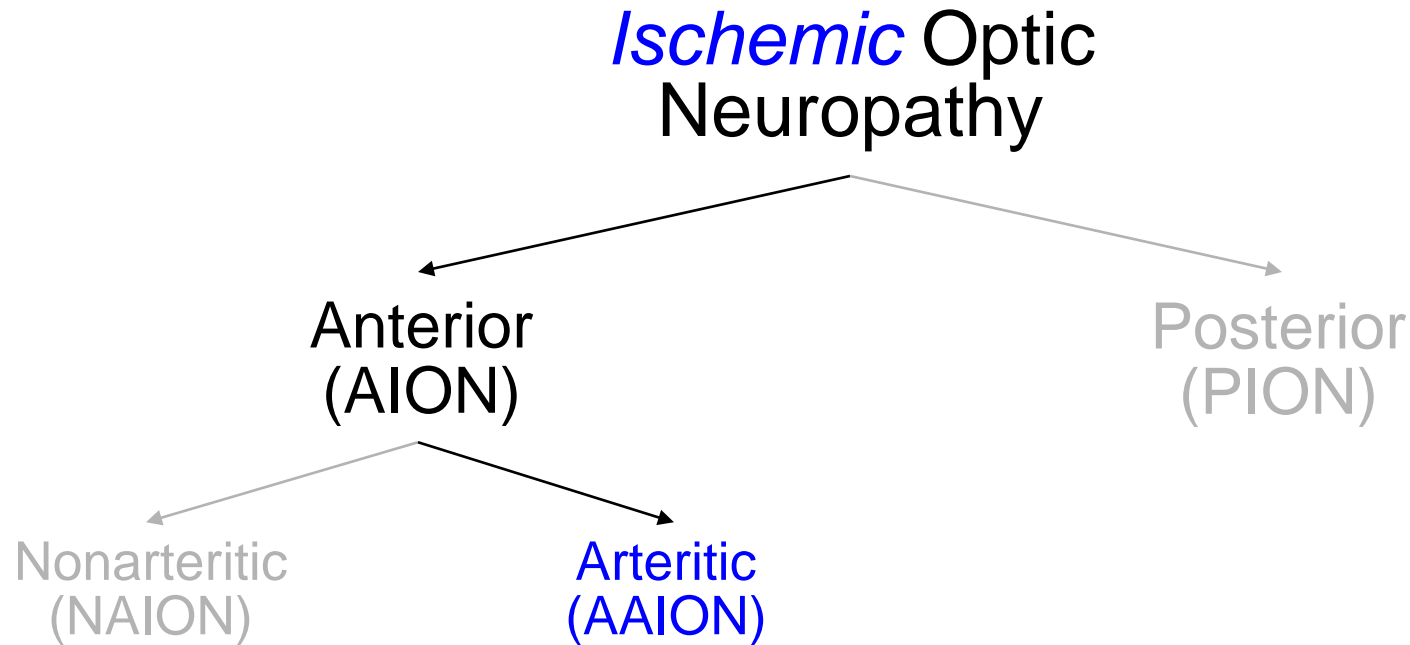
*How likely is it that a pt with tongue claudication has GCA?*

Tongue claudication is considered **pathognomonic** for GCA

No! If it does, it's not claudication



## *Ischemic Optic Neuropathy*



*Other than vision loss, what symptoms might a GCA pt report?*

--Headache

--Jaw claudication

--**Fever**

--**Malaise**

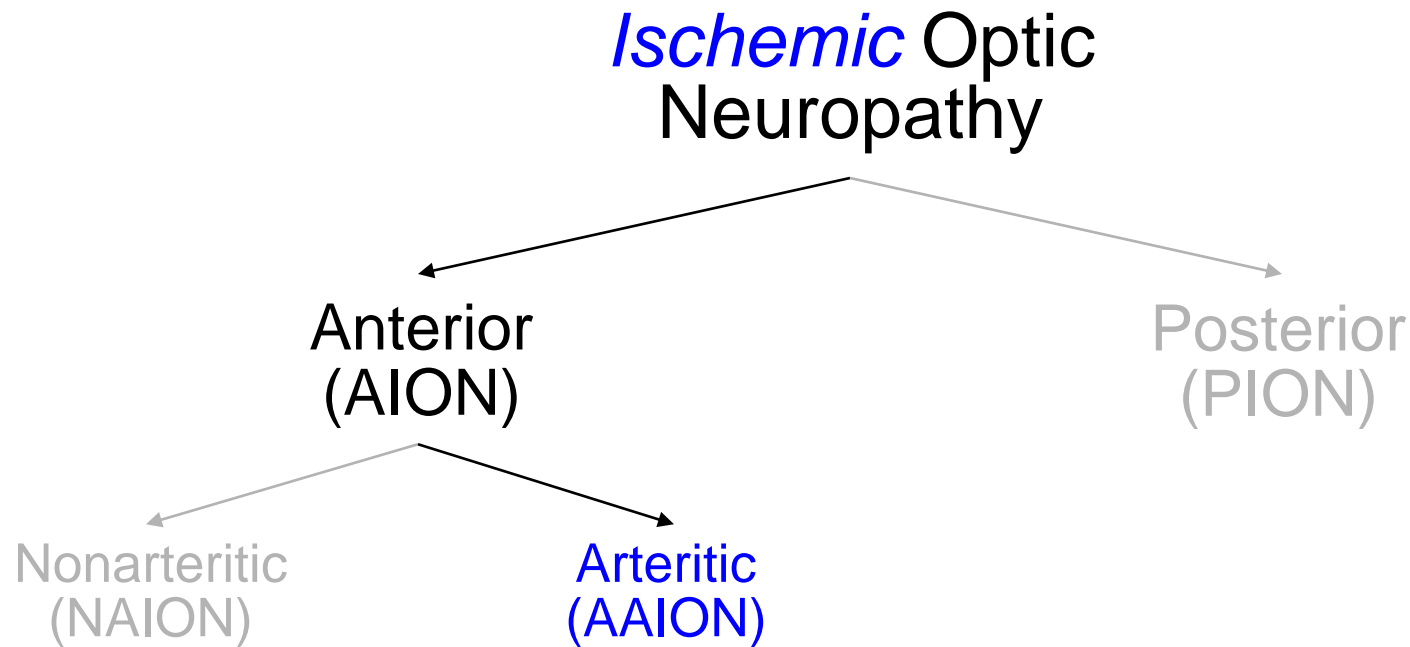
--PMR symp

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*Why do GCA pts get fever and malaise?*



## Ischemic Optic Neuropathy



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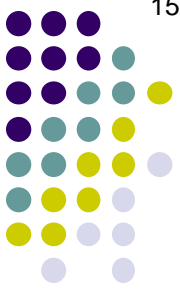
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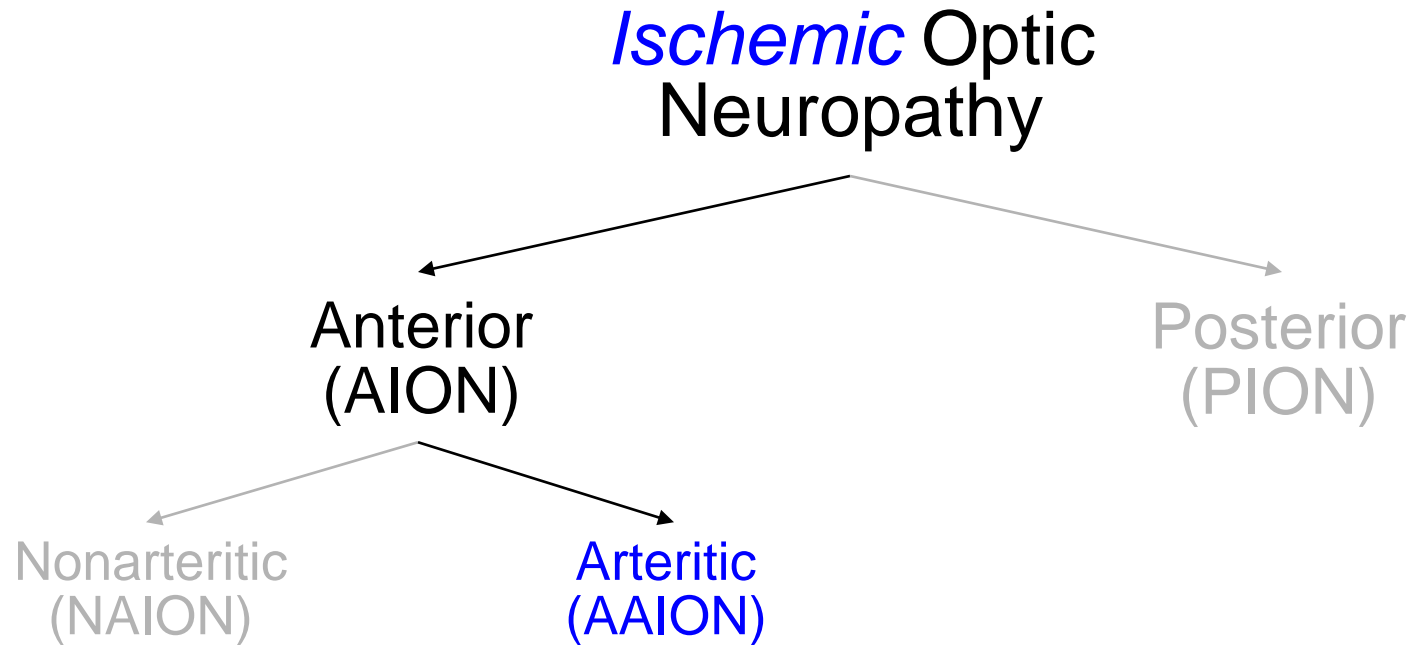
--Diplopia

*Why do GCA pts get fever and malaise?*

Because it's a systemic inflammatory disease. Remember, many (but not all) GCA pts present with more than just visual complaints. These pts can feel lousy in general—they're sick.



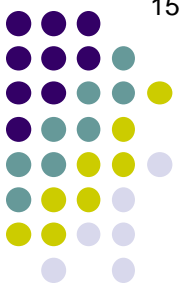
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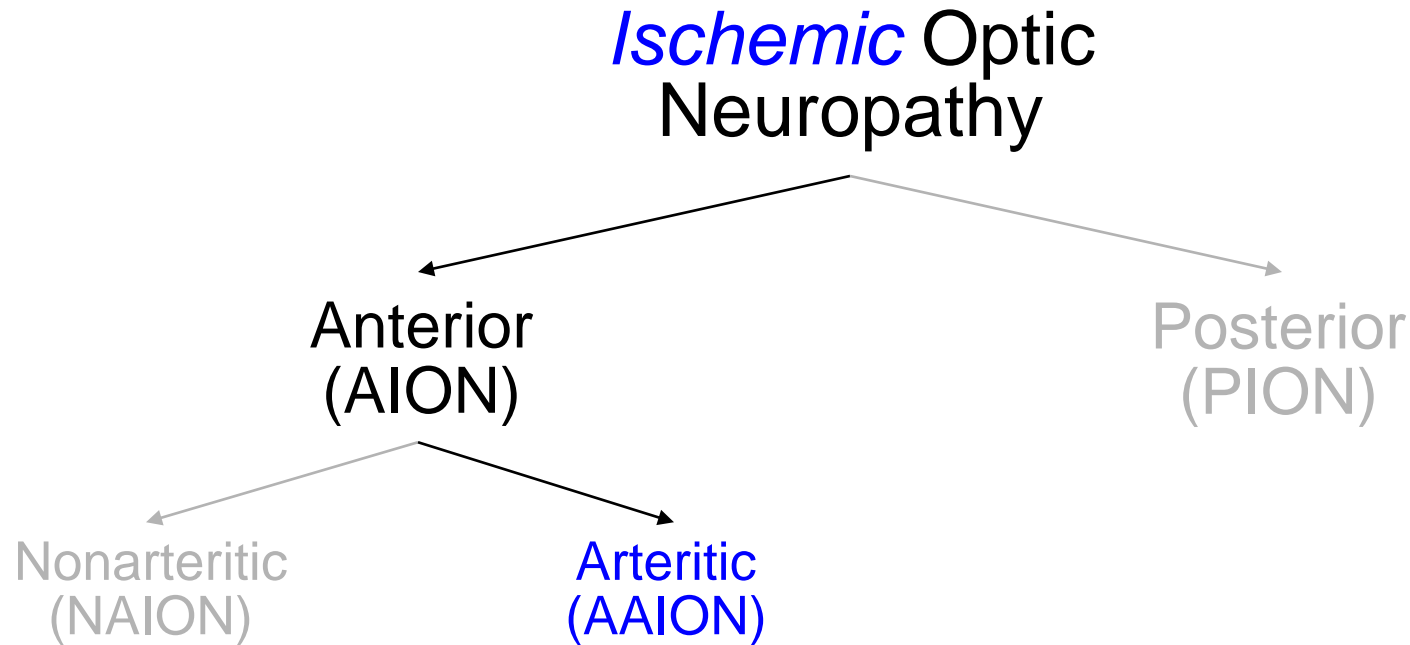
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*What does PMR stand for?*



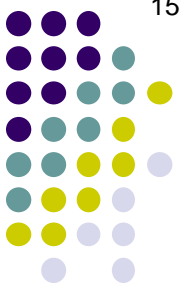
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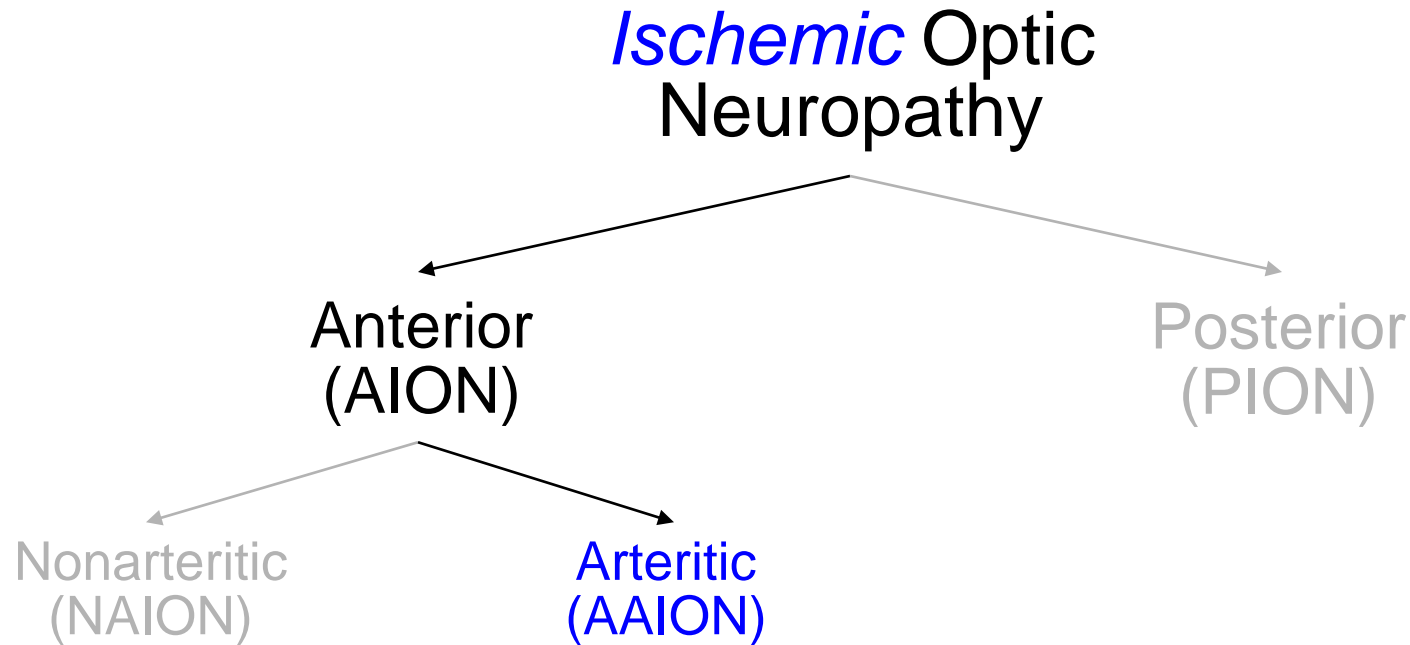
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*What does PMR stand for?*  
Polymyalgia rheumatica



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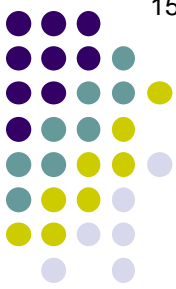


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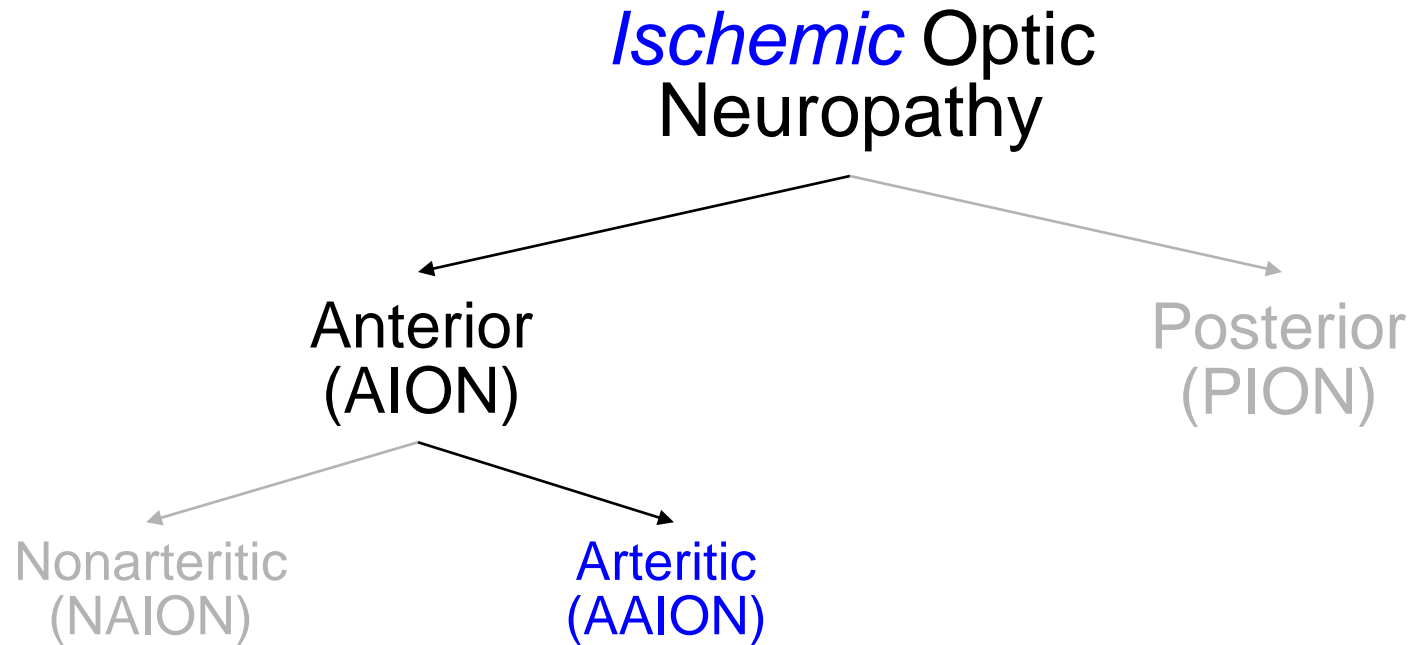
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*Which is...?*



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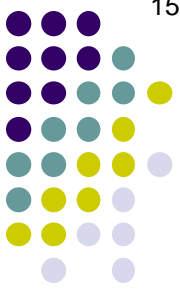
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*What does PMR stand for?*  
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*Which is...?*

A syndrome consisting of proximal muscle/joint pain and stiffness (ie, shoulder and hip joints/muscles)



## *Ischemic Optic Neuropathy*

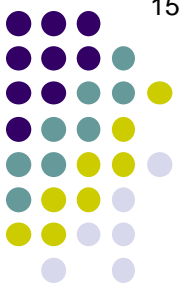
### *Ischemic* Optic Neuropathy

Anterior  
(AION)

Posterior  
(PION)

*Can a GCA pt present with an apparent cranial nerve palsy?*

--Diplopia



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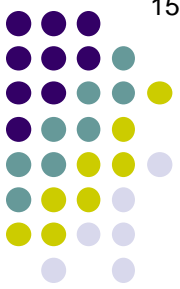
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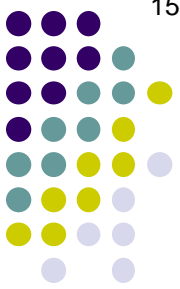
Posterior  
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*Can a GCA pt present with an apparent cranial nerve palsy?*

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*Which EOMs can be involved in creating the misalignment leading to diplopia?*

--Diplopia



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Anterior  
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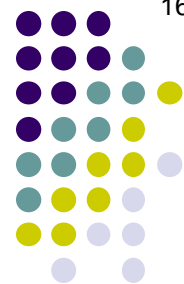
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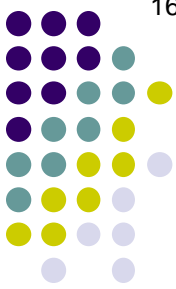
Yes

*Which EOMs can be involved in creating the misalignment leading to diplopia?*

Any of them

*Of the following, which apparent CN palsy can be a manifestation of GCA: CN3, CN4, and/or CN6?*

**--Diplopia**



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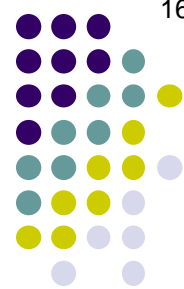
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*Of the following, which apparent CN palsy can be a manifestation of GCA: CN3, CN4, and/or CN6?*

All of them

*You keep saying 'apparent' CN palsy. Why the equivocation?*

**--Diplopia**



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All of them

*You keep saying 'apparent' CN palsy. Why the equivocation?*

Because EOM palsy secondary to GCA is much more likely to result from hypoperfusion of the muscle(s) involved rather than infarction of a cranial nerve

**--Diplopia**



## Ischemic Optic Neuropathy

### Ischemic Optic Neuropathy

Anterior  
(AION)

Posterior  
(PION)

Can a GCA pt present with an apparent cranial nerve palsy?

Yes

Which EOMs can be involved in creating the misalignment leading to diplopia?

Any of them

Just to be clear--Are you saying GCA **can't** cause an acute cranial-nerve palsy?

Of the follo

All of them

CN6?

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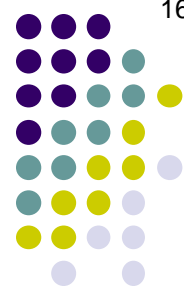
No, it definitely can. What I'm saying is EOM palsy in GCA is more likely to be caused by infarction of the muscle itself rather than infarction of its nerve supply

CN6?

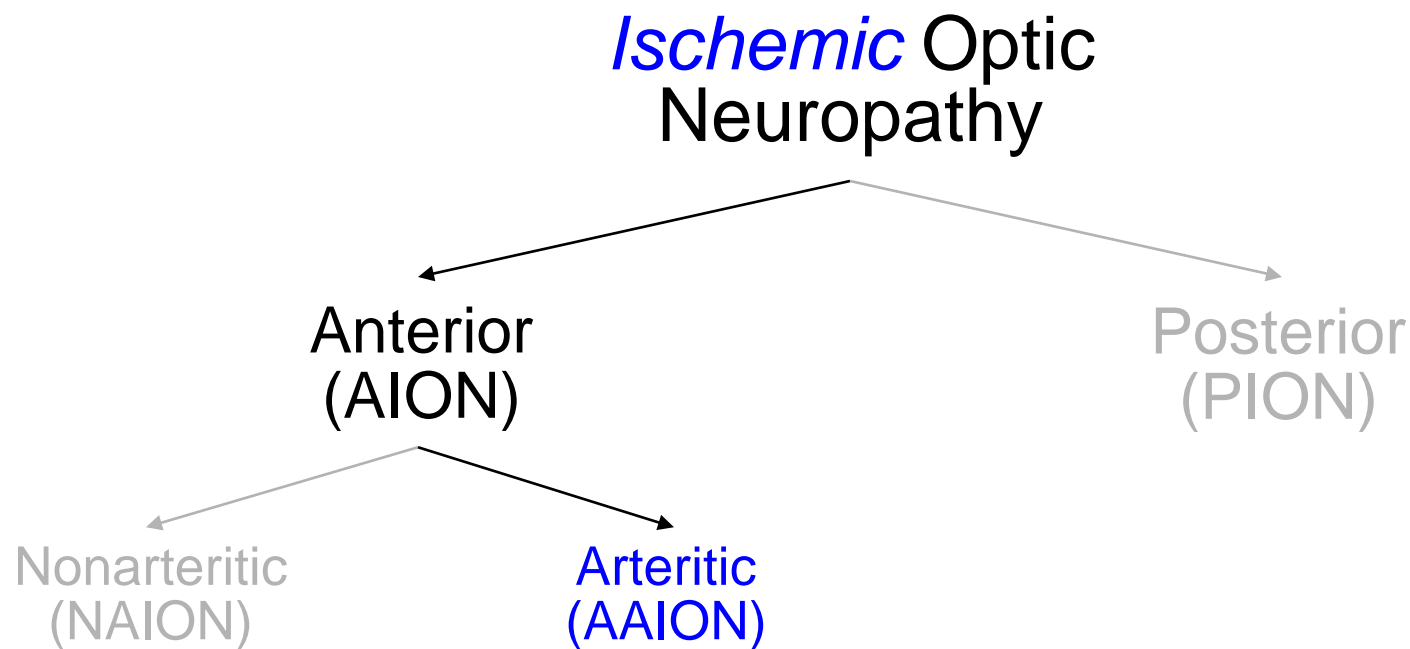
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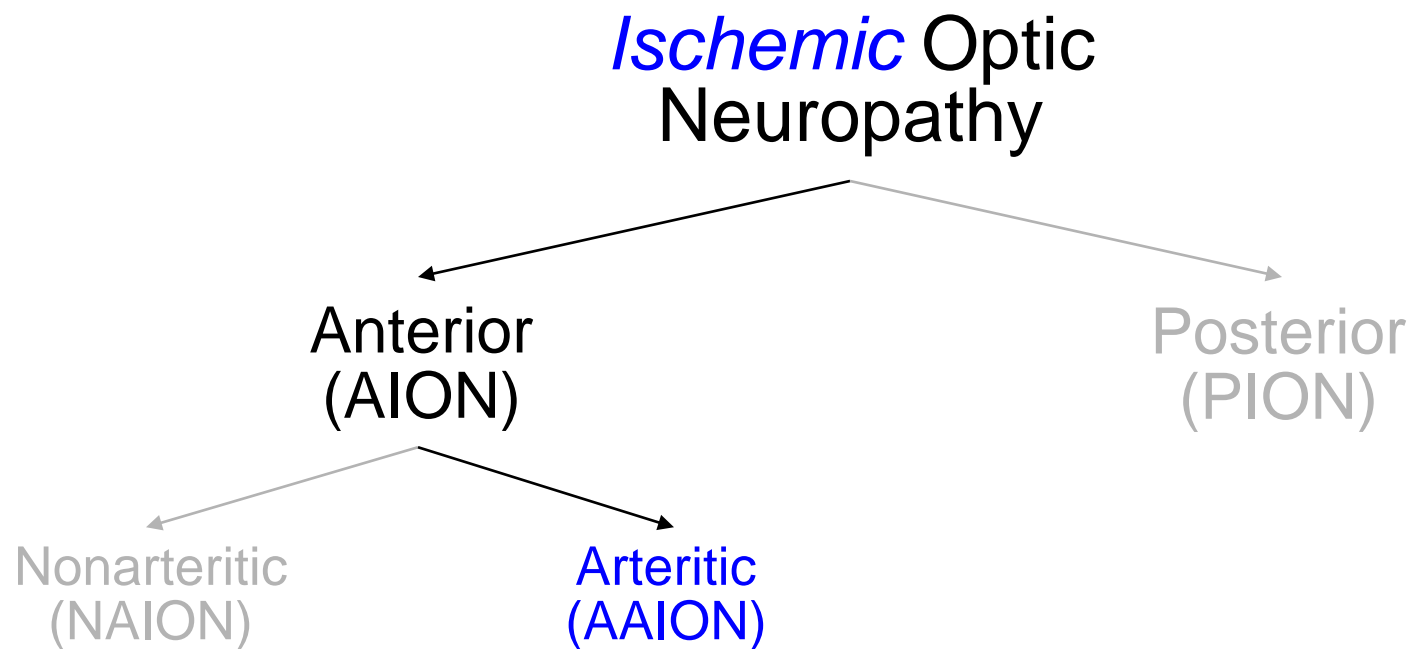
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*Finally, in what other bodypart do GCA pts report experiencing pain?*



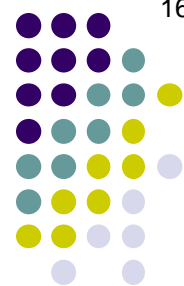
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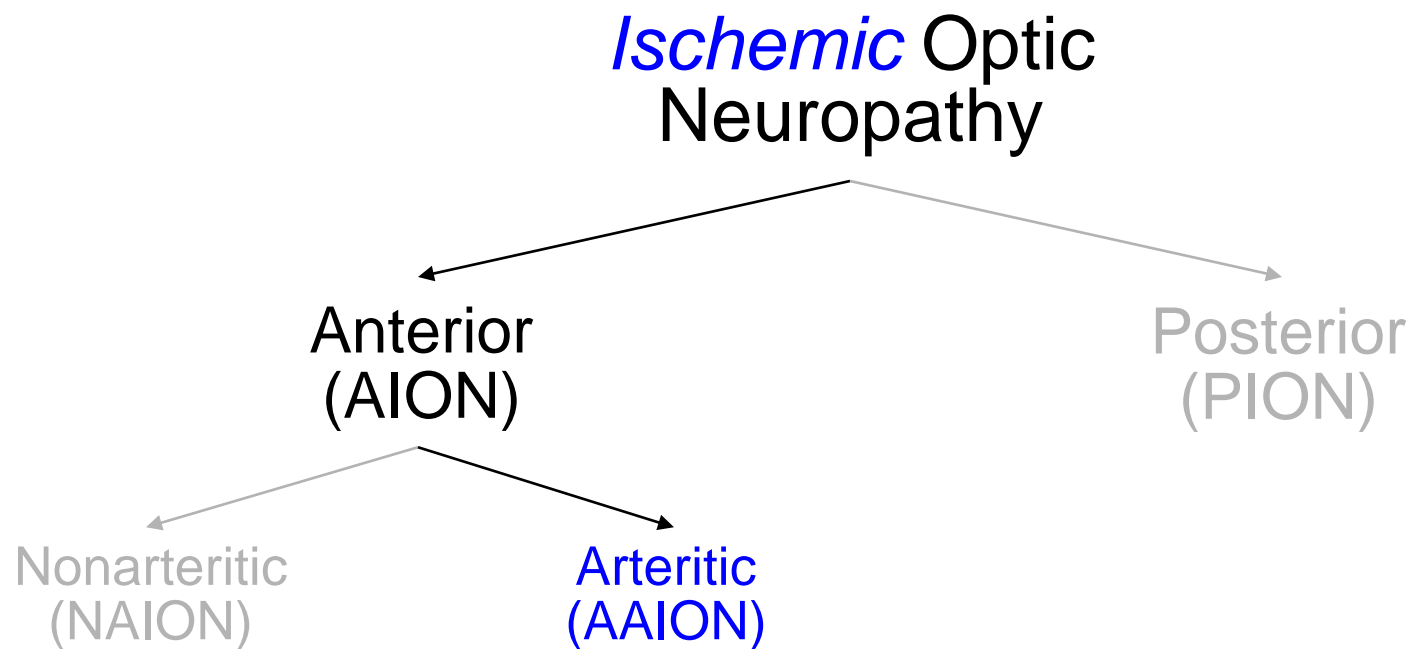
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Many GCA pts c/o **neck pain**, which may be part of their PMR



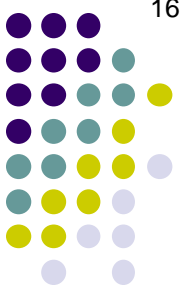
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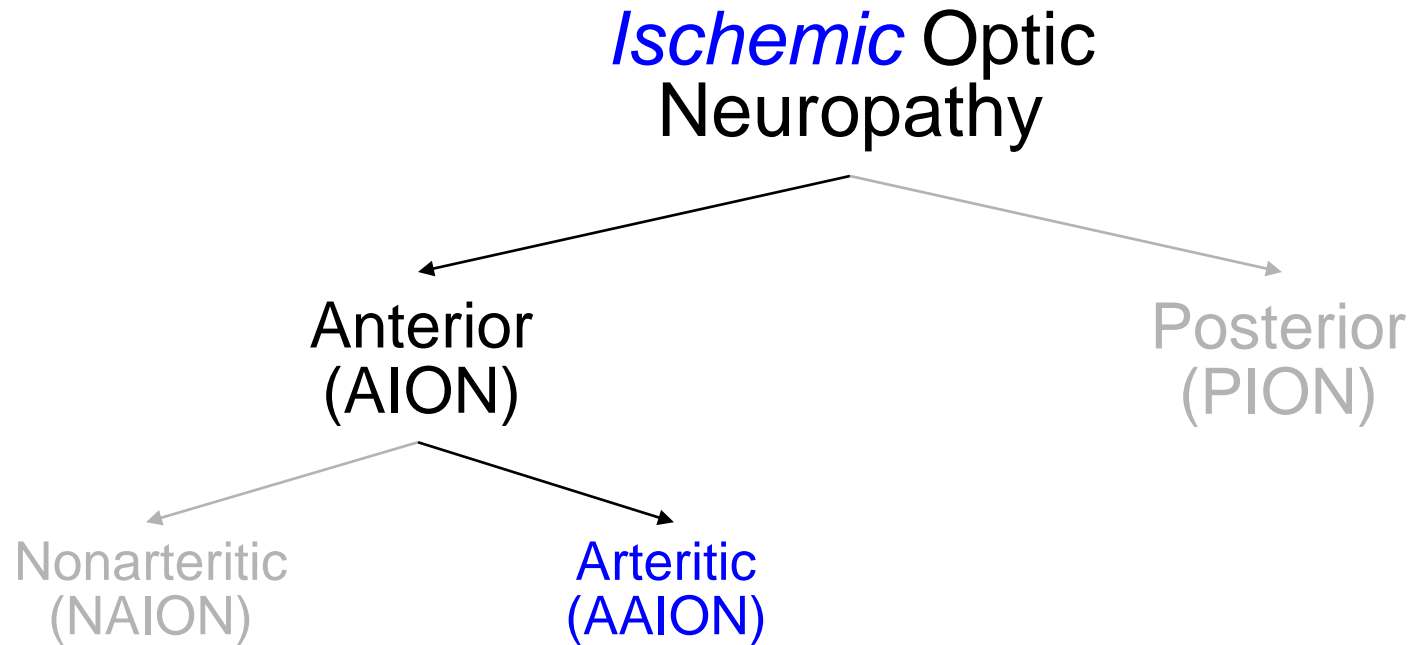
As a general rule, consider GCA in any pt 50+ who presents with any of the following:

- Diplopia
- CRAO (without emboli apparent on DFE)
- Amaurosis fugax (ditto)
- Ischemic optic neuropathy

--Diplopia

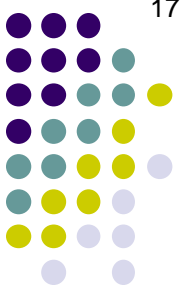


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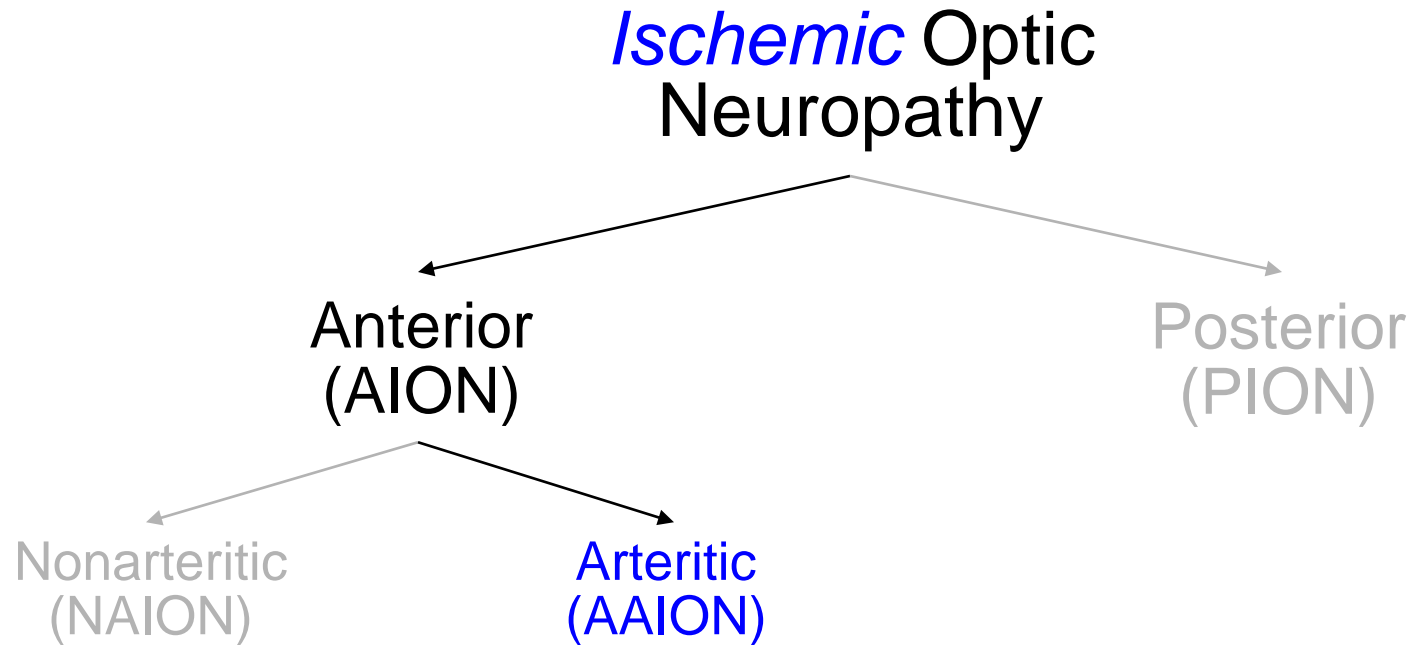


*What four lab studies might be useful in diagnosing GCA?*

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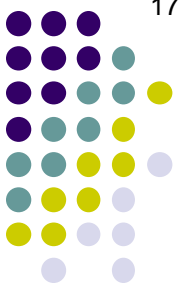


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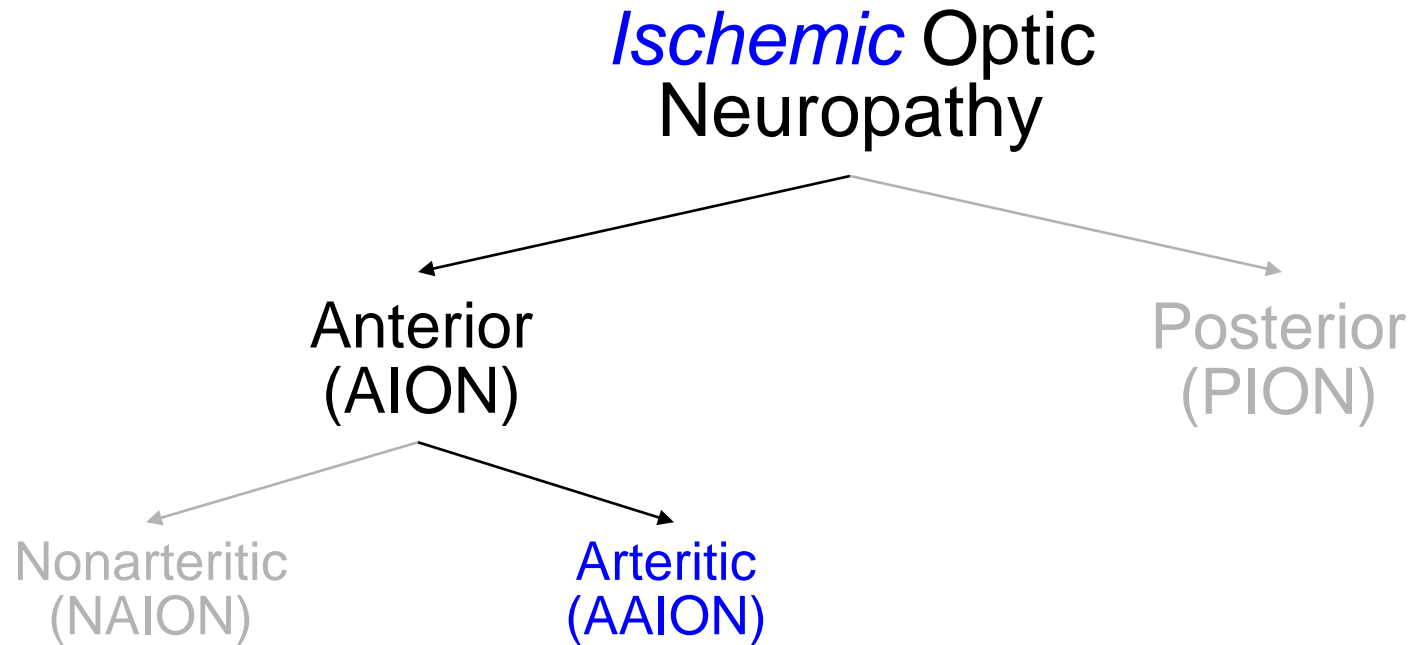


*What four lab studies might be useful in diagnosing GCA?*

- ESR
- CRP
- Platelet count
- H&H



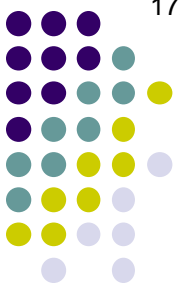
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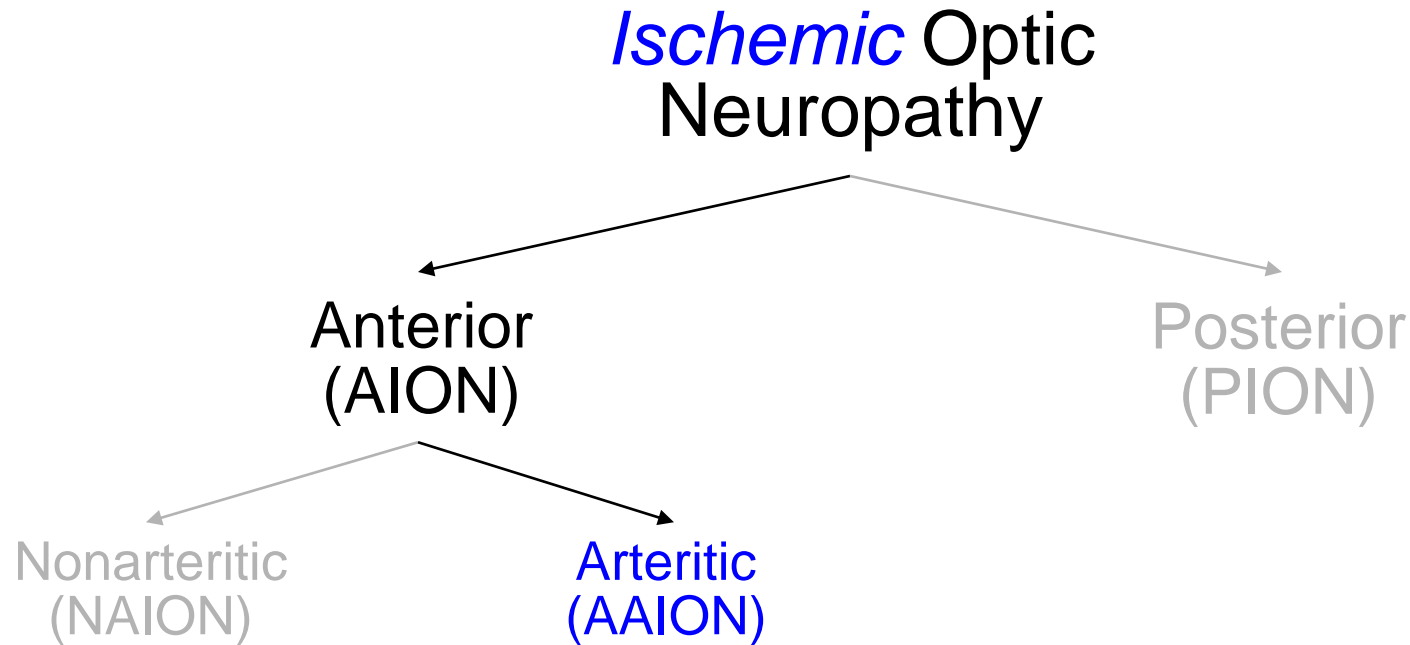
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*Which test is **most** useful in diagnosing GCA?*



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*What four lab studies might be useful in diagnosing GCA?*

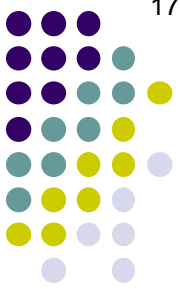
--**ESR**

--CRP

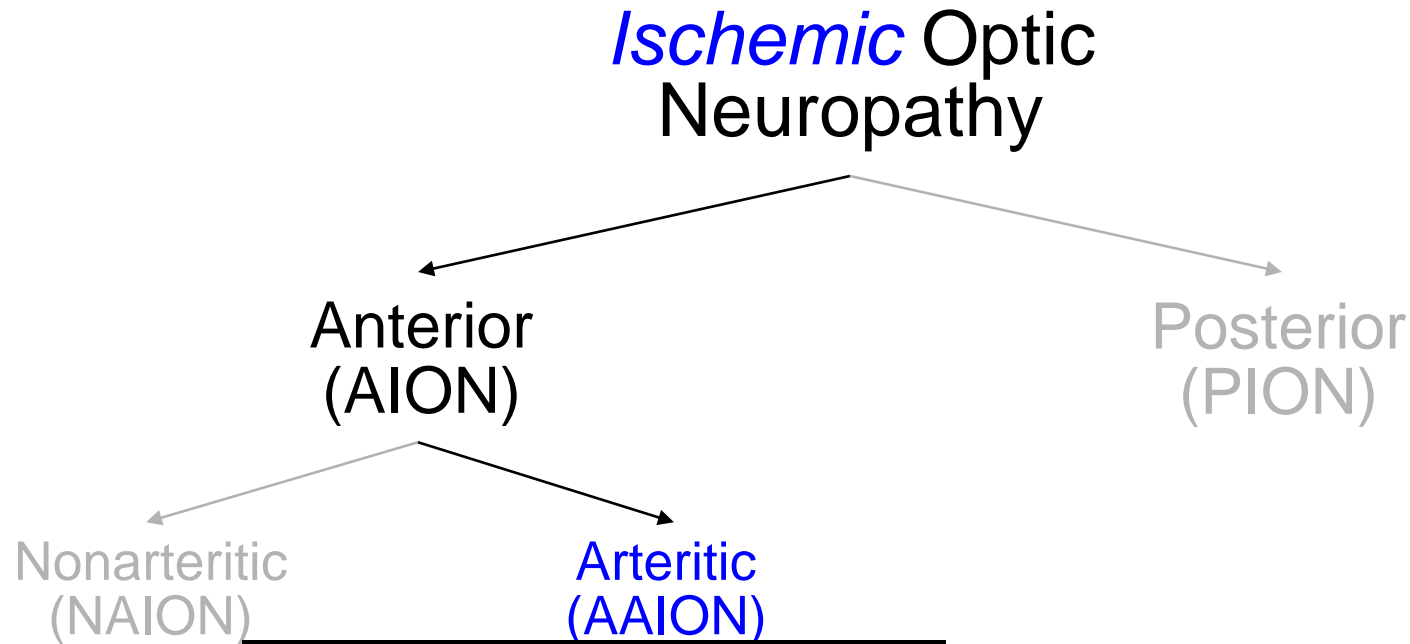
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--H&H

*Which test is **most** useful in diagnosing GCA?*  
ESR



## *Ischemic Optic Neuropathy*



What does ESR stand for?

What four

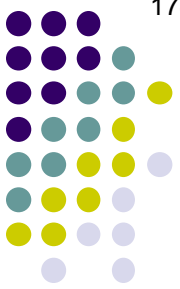
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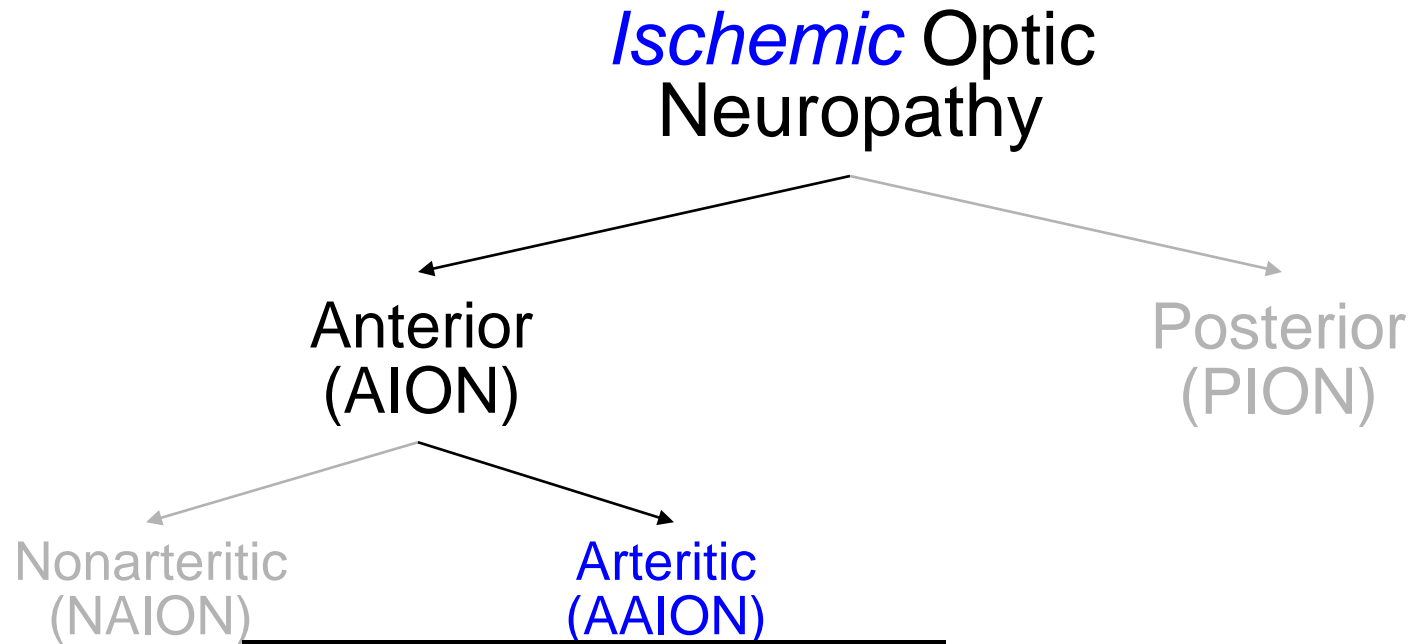
--Platelets

--H&H

Missing GCA?



# Ischemic Optic Neuropathy



What does ESR stand for?  
Erythrocyte sedimentation rate

What for

--ESR

--CRP

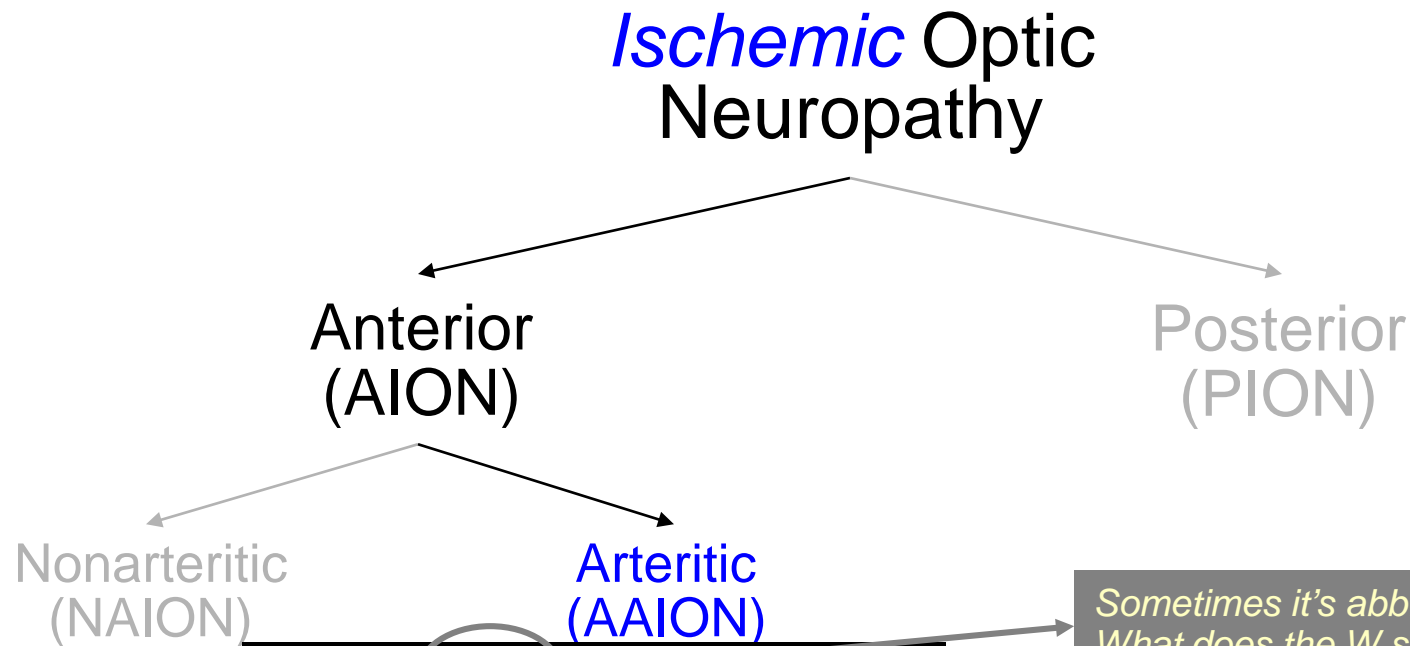
--Platelets

--H&H

osing GCA?



# Ischemic Optic Neuropathy



What does **ESR** stand for?  
Erythrocyte sedimentation rate

Sometimes it's abbreviated **WESR**.  
What does the **W** stand for?

What for

--**ESR**

--CRP

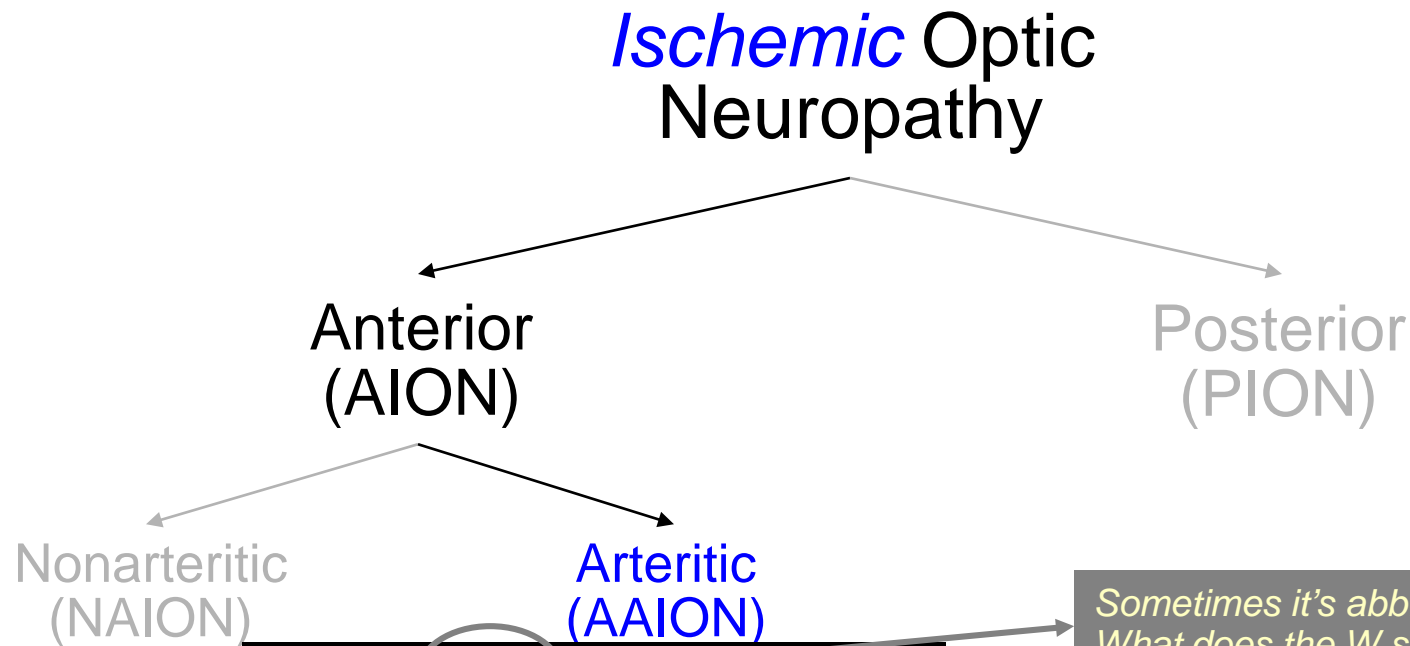
--Platelets

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osing C



# Ischemic Optic Neuropathy

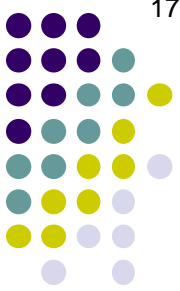


What does **ESR** stand for?  
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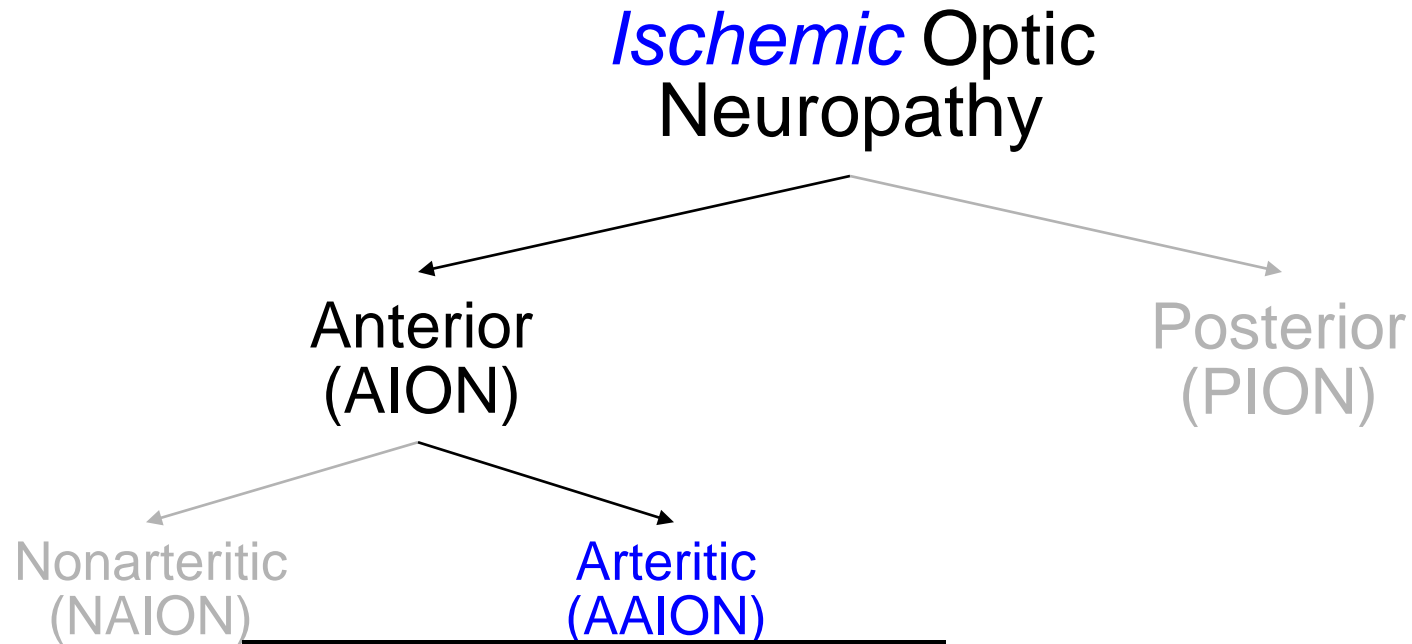
Sometimes it's abbreviated **WESR**.  
What does the **W** stand for?  
Westergren, the pathologist who studied it

What for  
--**ESR**  
--CRP  
--Platelets  
--H&H

osing C



## *Ischemic Optic Neuropathy*



What for

--ESR

--CRP

--Platelets

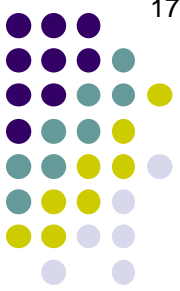
--H&H

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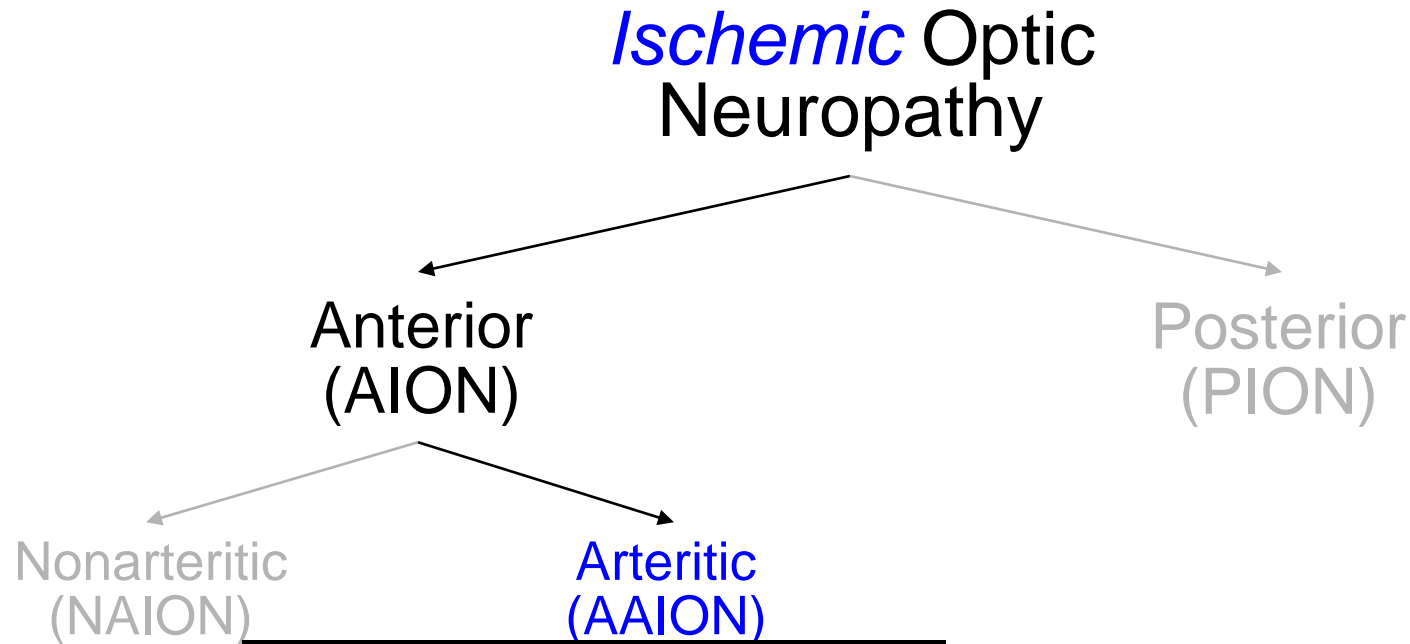
Erythrocyte sedimentation rate

What is it, exactly?

Missing GCA?



## *Ischemic Optic Neuropathy*



What for

--ESR

--CRP

--Platelets

--H&H

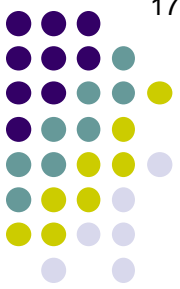
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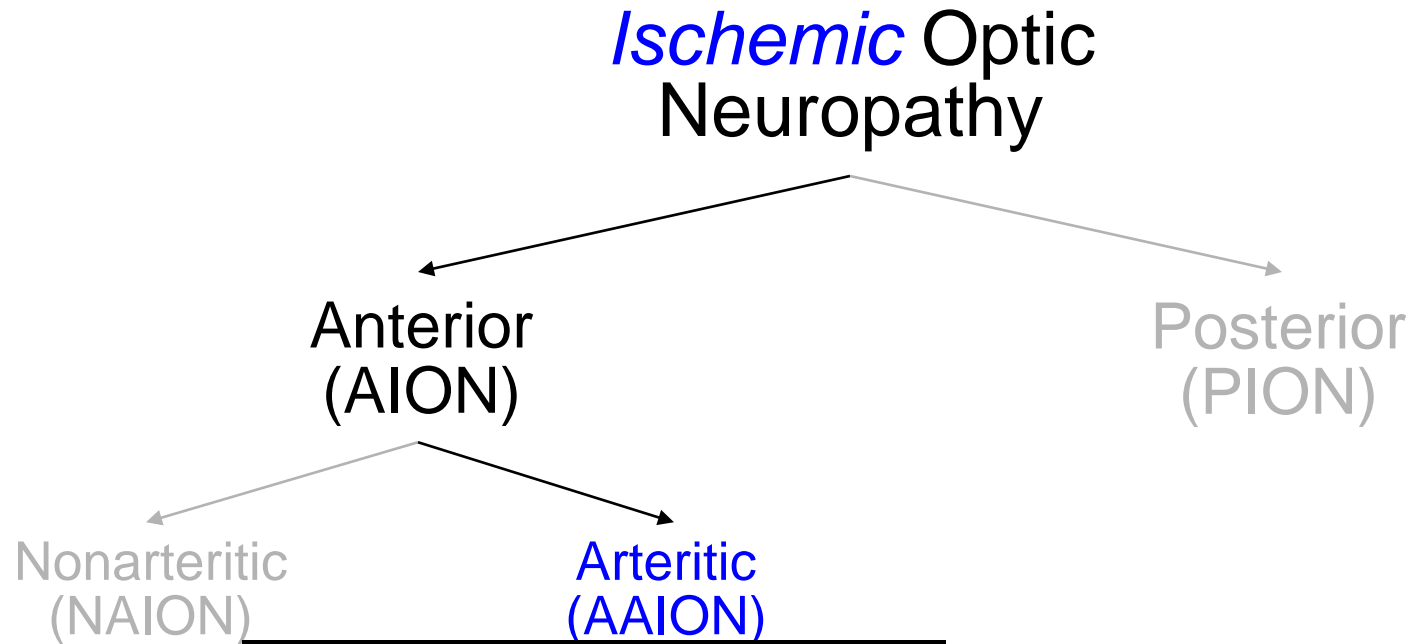
What is it, exactly?

A measure of how fast RBCs precipitate

Missing GCA?



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What for

--ESR

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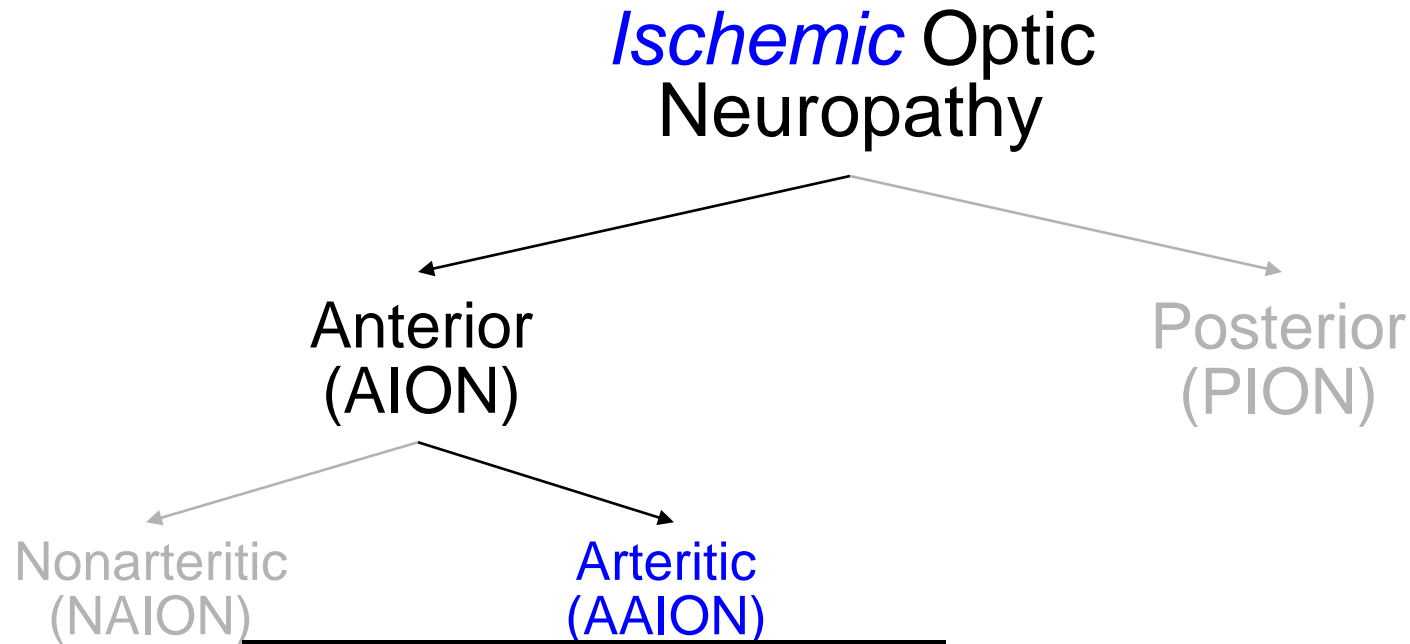
A measure of how fast RBCs precipitate

What are the units?

Missing GCA?



# Ischemic Optic Neuropathy



What for

--ESR

--CRP

--Platelets

--H&H

What does ESR stand for?

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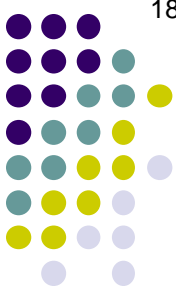
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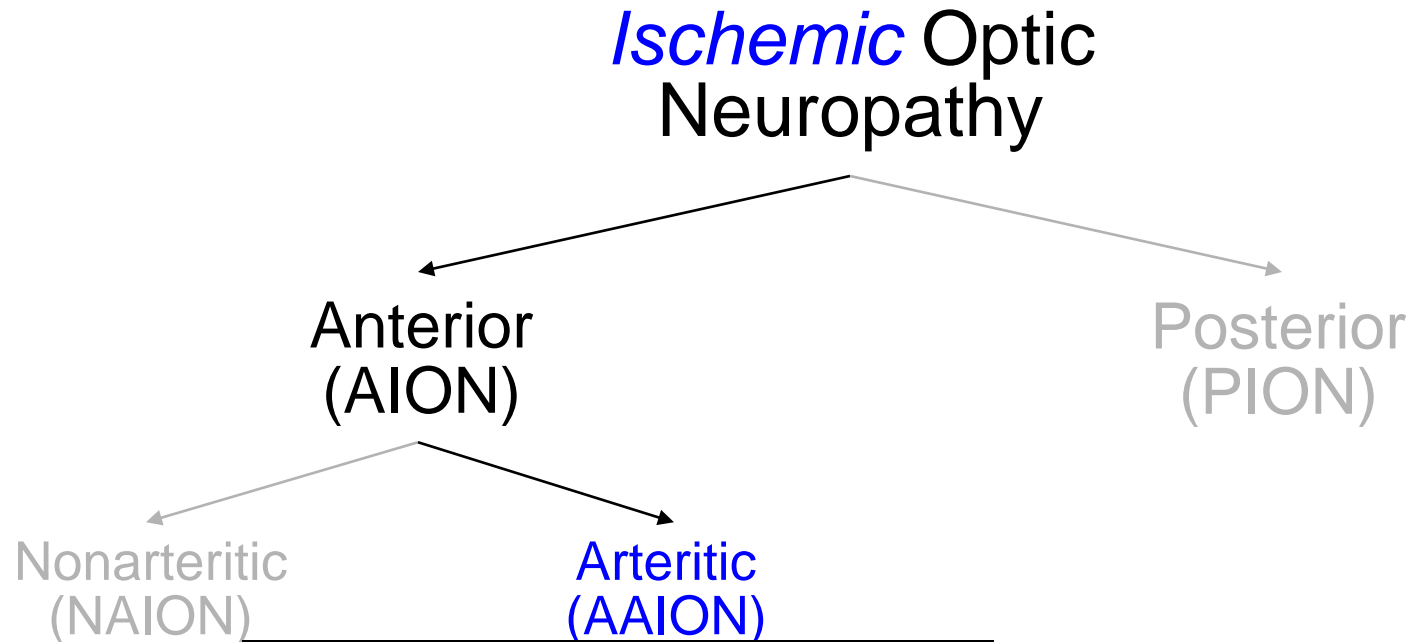
What are the units?

mm/Hr

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# Ischemic Optic Neuropathy



What four

--ESR

--CRP

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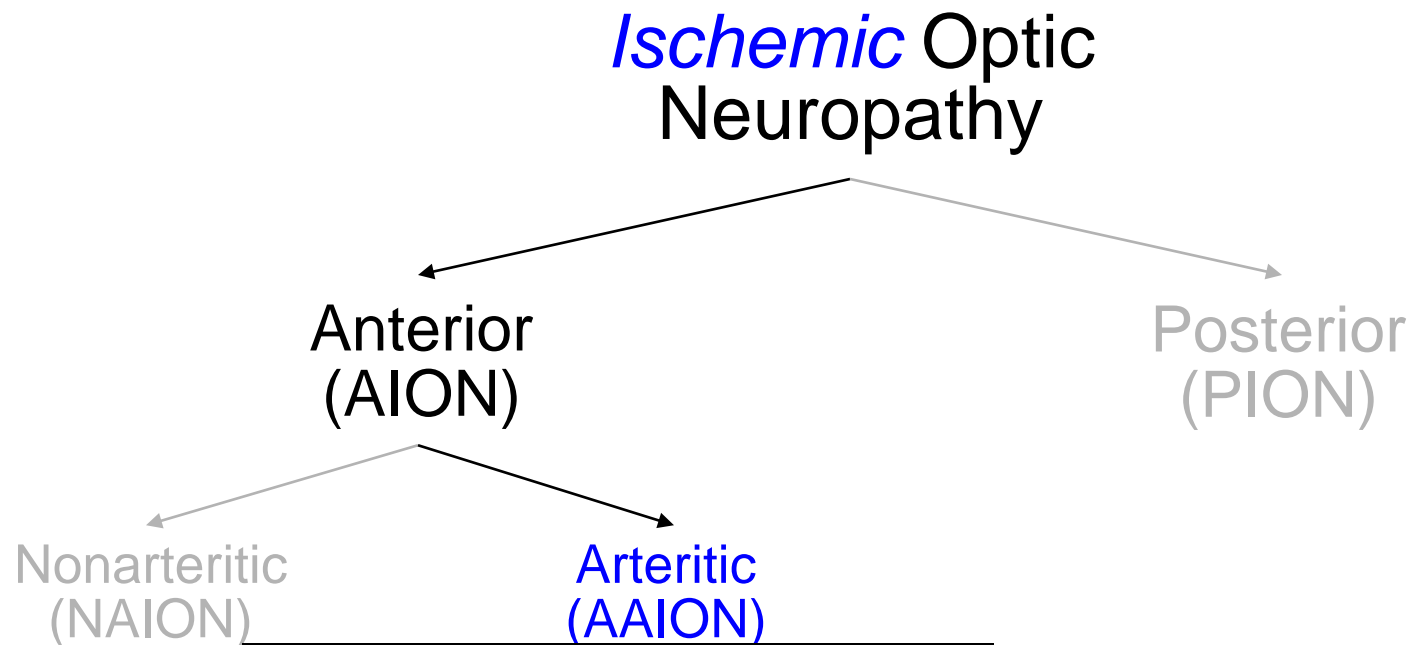
What are the units?  
mm/Hr

What is GCA?

*Why do RBCs precipitate faster in the presence of inflammation?*



## Ischemic Optic Neuropathy



What four

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What does ESR stand for?

Erythrocyte sedimentation rate

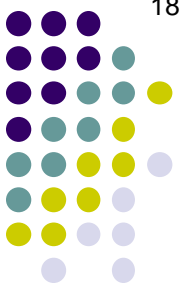
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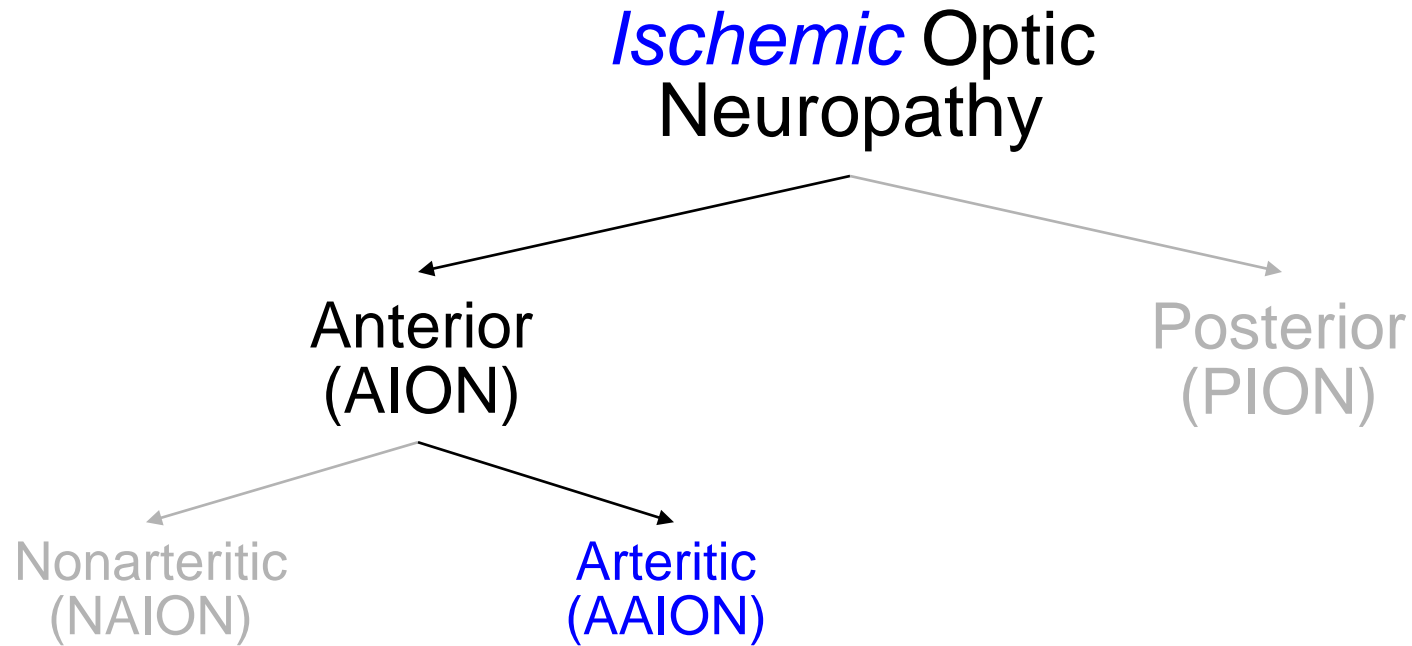
What are the units?  
mm/Hr

What about GCA?

*Why do RBCs precipitate faster in the presence of inflammation?*  
Inflammation increases serum concentrations of fibrinogen, which promotes inter-RBC adhesions. The stacks of stuck RBCs precipitate more quickly than individual RBCs will.



## *Ischemic Optic Neuropathy*



What for

--ESR

--CRP

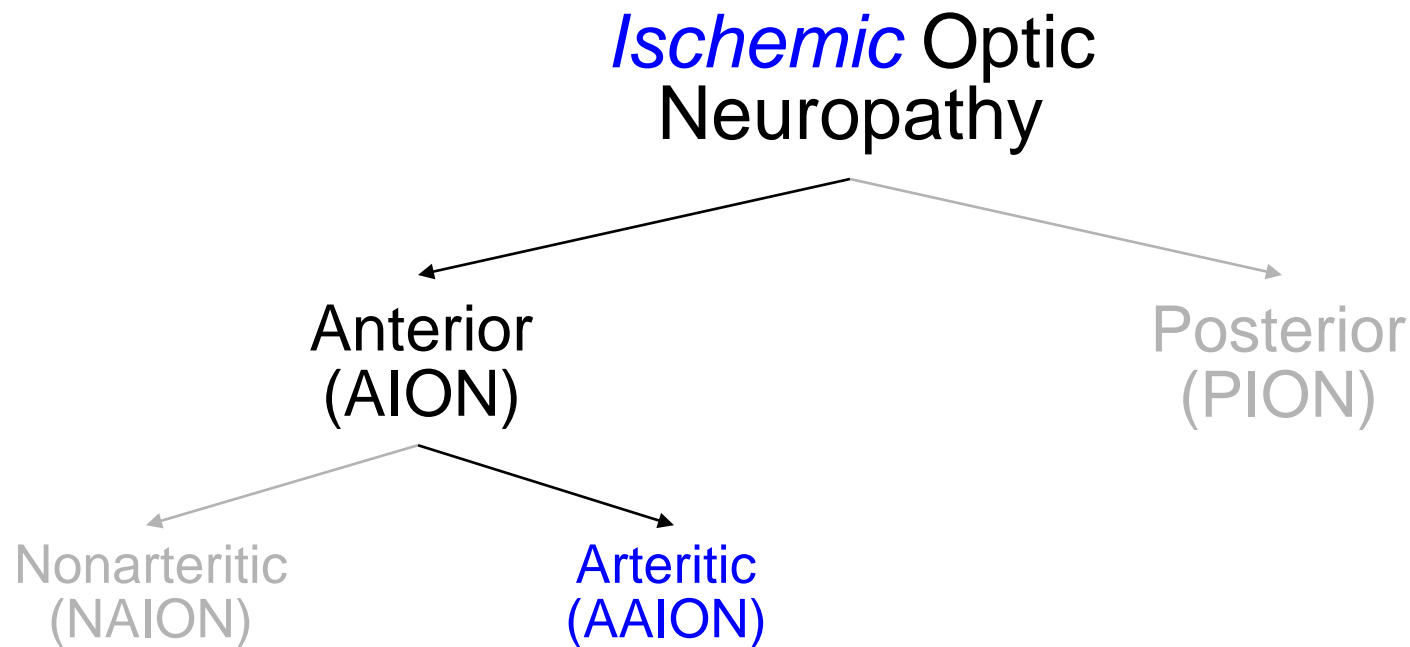
--Platelets

--H&H

What is the upper limit of normal for ESR?



## *Ischemic Optic Neuropathy*



What for

--ESR

--CRP

--Platelets

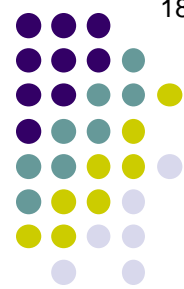
--H&H

*What is the upper limit of normal for ESR?*

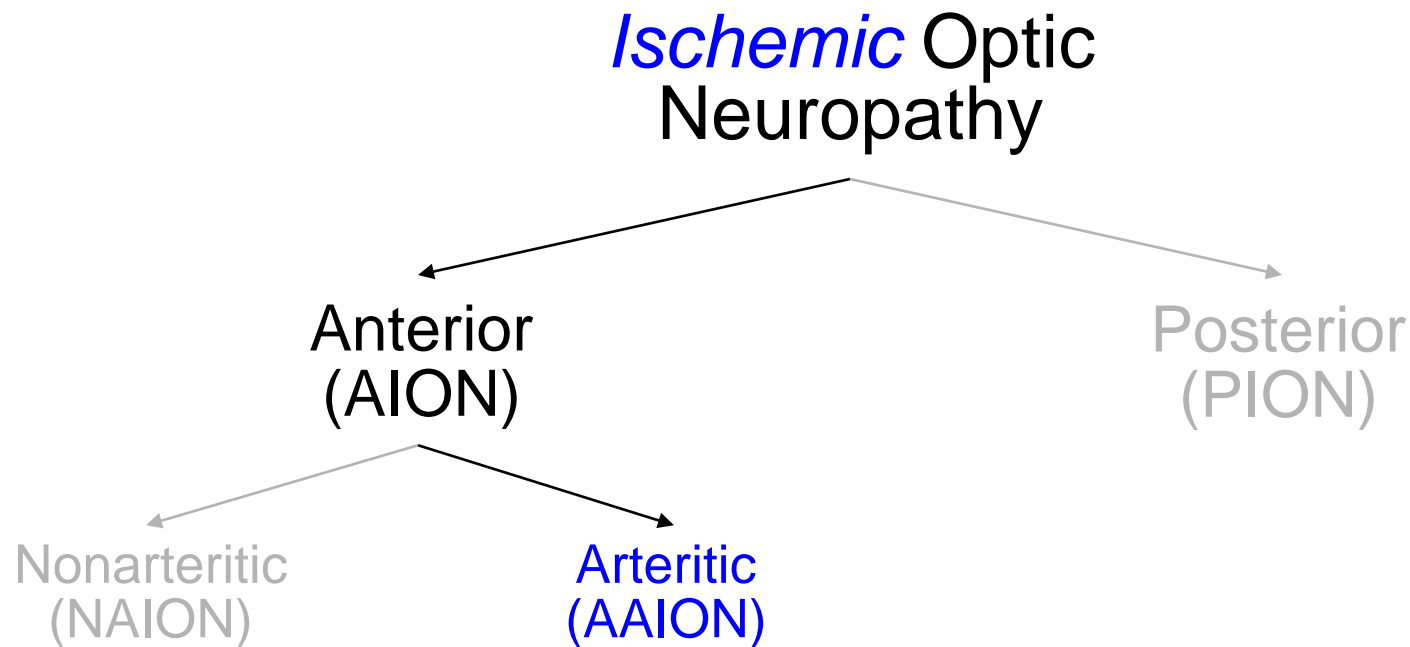
It is usually 20 mm/Hr, however, ESR tends to rise with age, and is higher in females. Thus the age- and gender-corrected formulae for the upper-limit-of-normal ESR are:

**Males:**

**Females:**



## Ischemic Optic Neuropathy



What for

--ESR

--CRP

--Platelets

--H&H

What is the upper limit of normal for ESR?

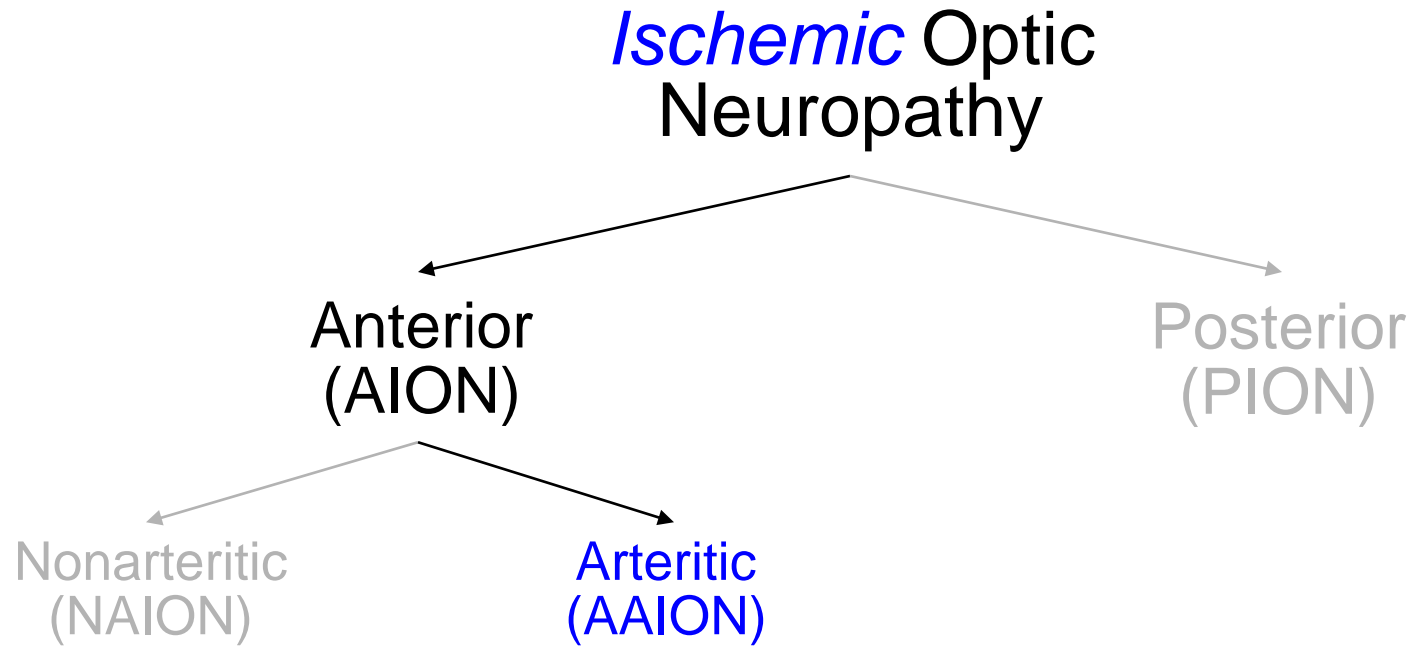
It is usually 20 mm/Hr, however, ESR tends to rise with age, and is higher in females. Thus the age- and gender-corrected formulae for the upper-limit-of-normal ESR are:

**Males:** Age/2

**Females:** (Age +10)/2



## *Ischemic Optic Neuropathy*



What for

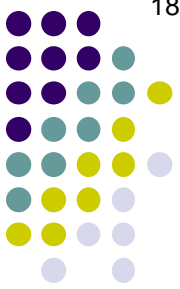
--ESR

--CRP

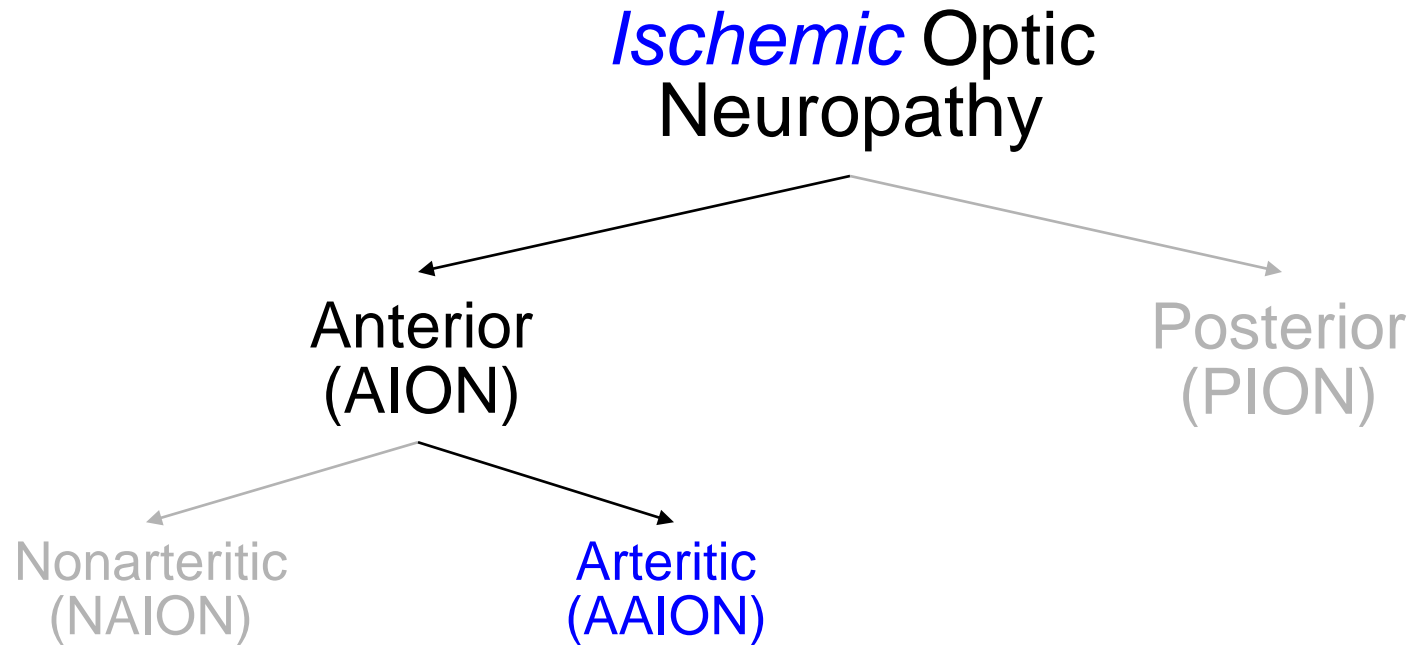
--Platelets

--H&H

Is the ESR always elevated in GCA?



## *Ischemic Optic Neuropathy*



What for

--ESR

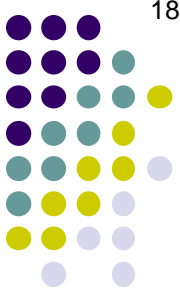
--CRP

--Platelets

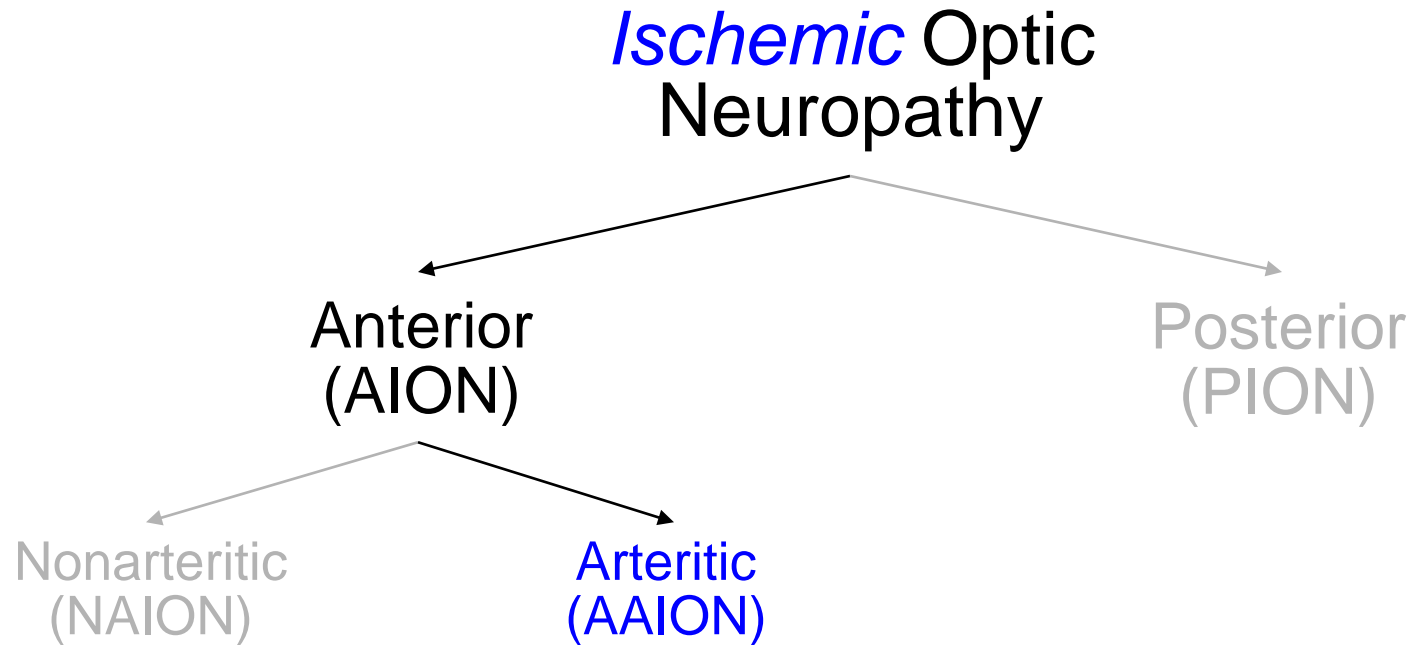
--H&H

*Is the ESR always elevated in GCA?*

No! In fact, studies have found that up to 20% of bx-proven GCA have a normal ESR!



## *Ischemic Optic Neuropathy*



What for

--ESR

--CRP

--Platelets

--H&H

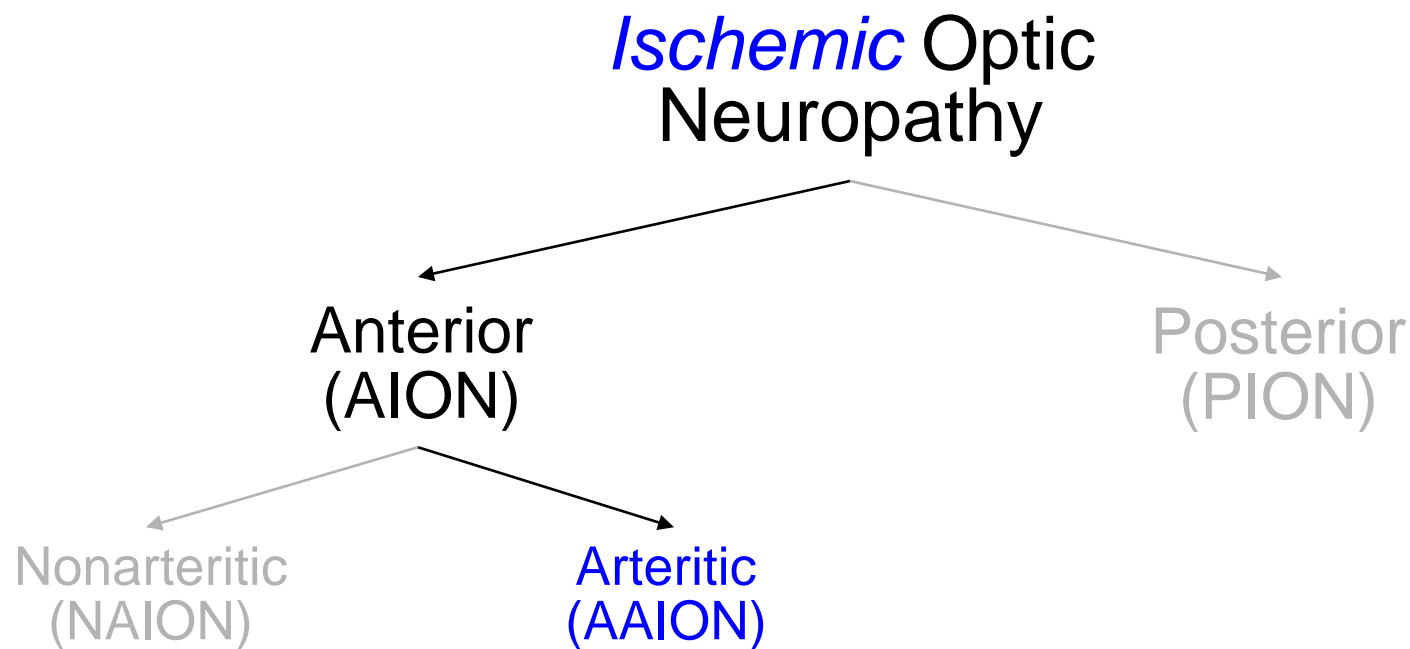
*Is the ESR always elevated in GCA?*

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*When elevated, does ESR correlate with GCA severity, ie, the higher the ESR, the more severe the inflammation?*



## Ischemic Optic Neuropathy



What for

--ESR

--CRP

--Platelets

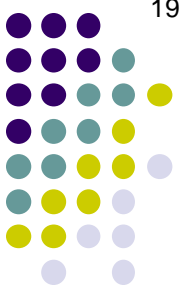
--H&H

*Is the ESR always elevated in GCA?*

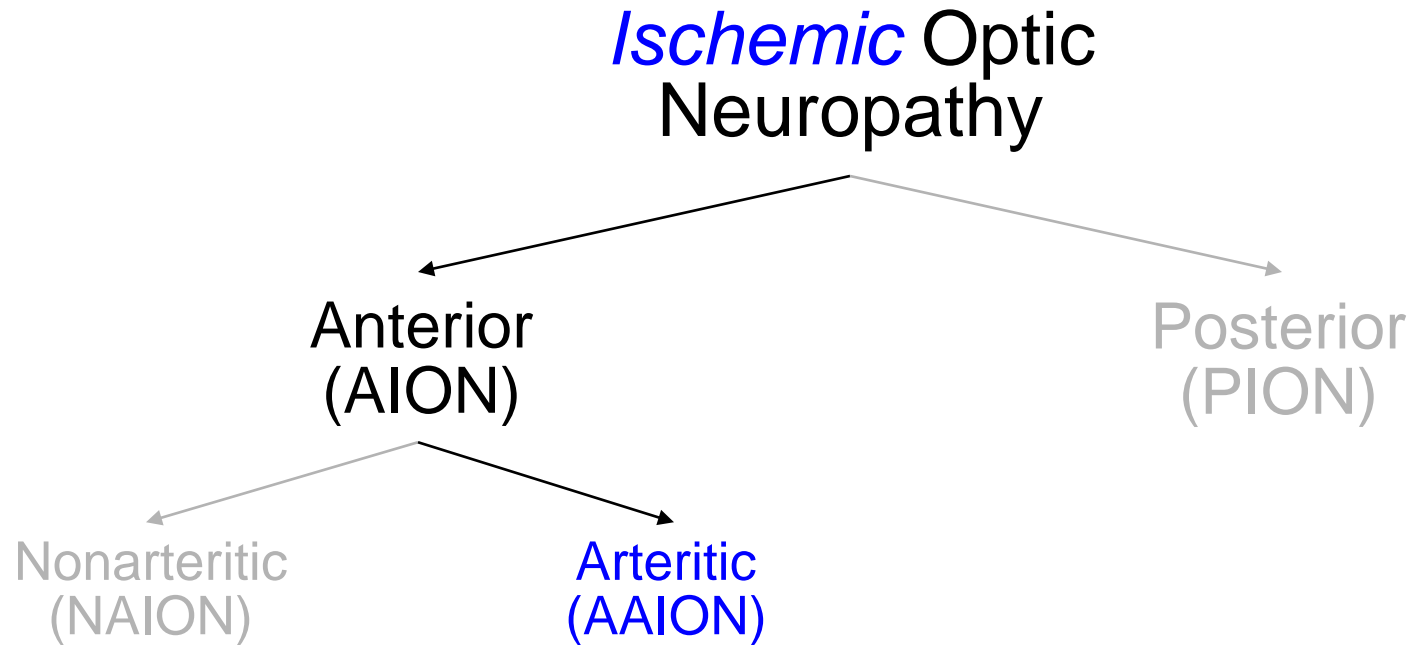
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*When elevated, does ESR correlate with GCA severity, ie, the higher the ESR, the more severe the inflammation?*

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## *Ischemic Optic Neuropathy*



*Is ESR specific for GCA?*

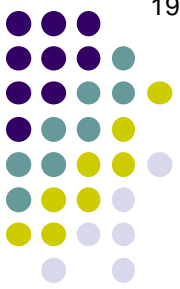
*What for*

--ESR

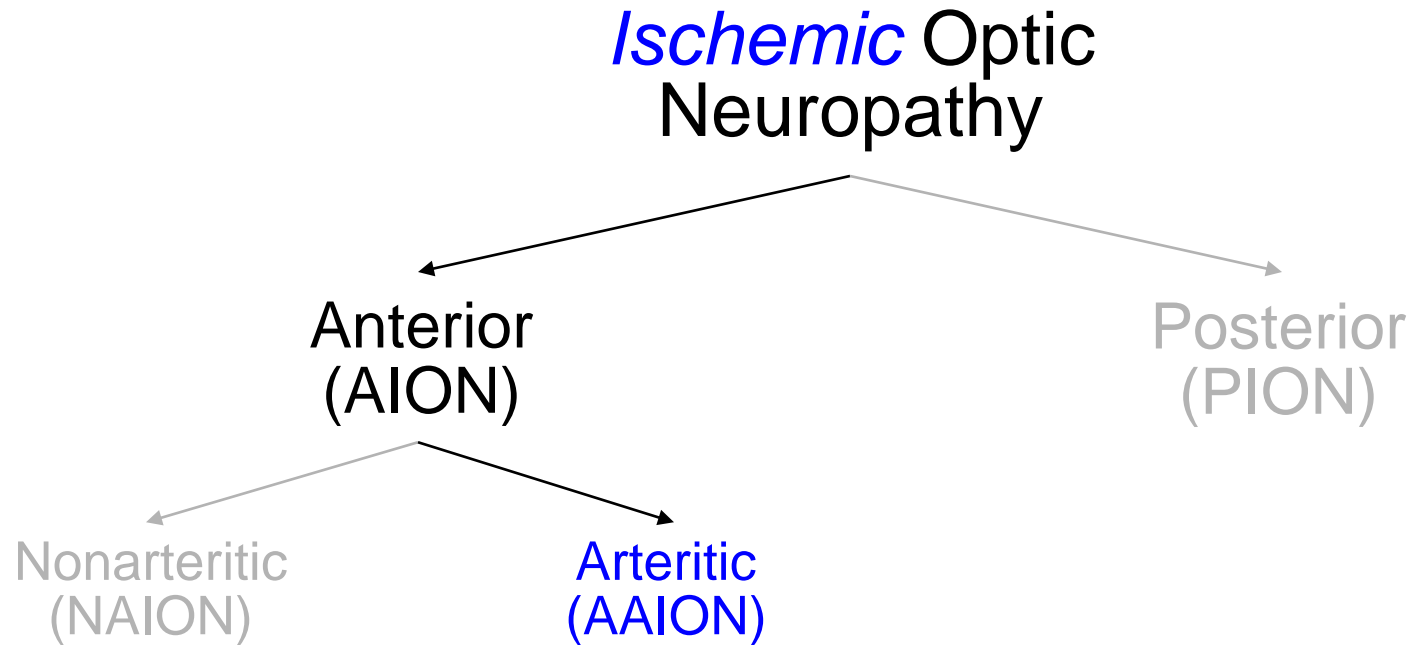
--CRP

--Platelets

--H&H



## *Ischemic Optic Neuropathy*



What for

--ESR

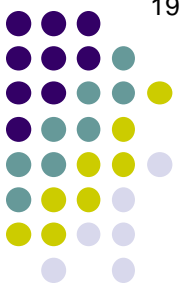
--CRP

--Platelets

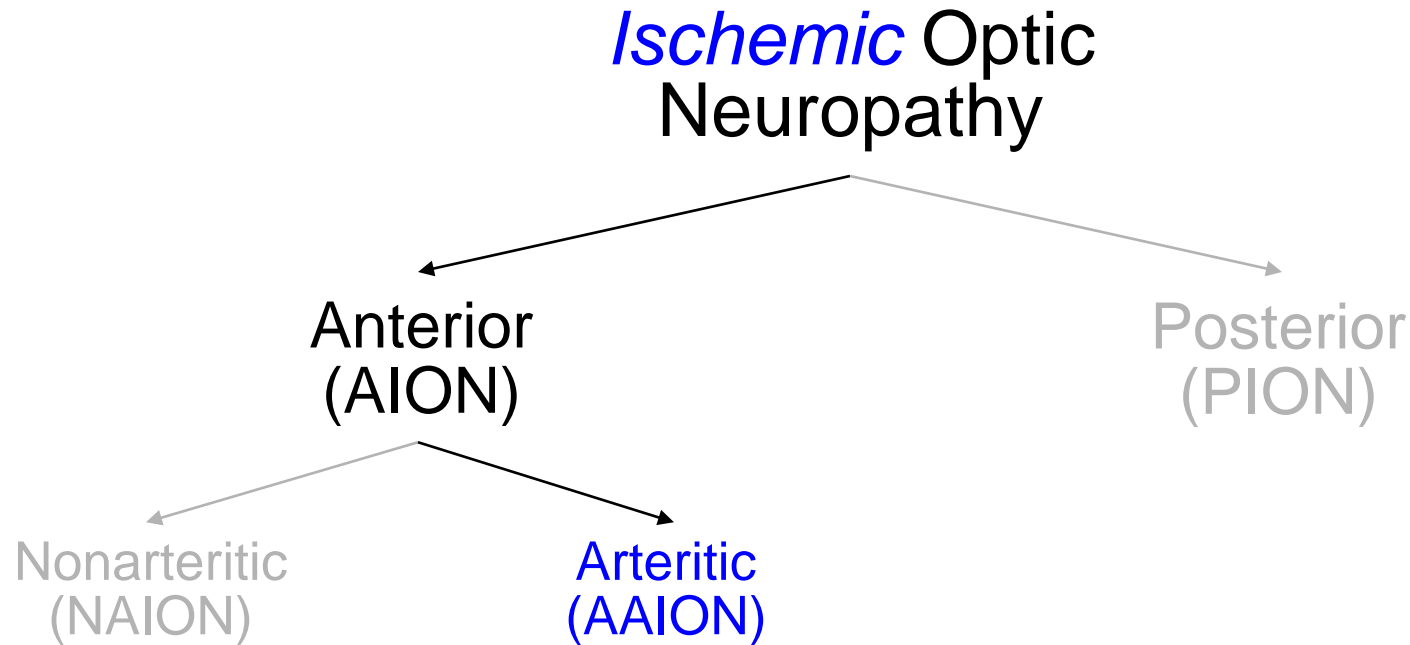
--H&H

Is ESR specific for GCA?

No



# *Ischemic Optic Neuropathy*



What four

--**ESR**

--CRP

--Platelets

--H&H

*Is ESR specific for GCA?*

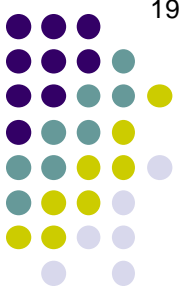
No

*In what other conditions will the ESR be elevated?*

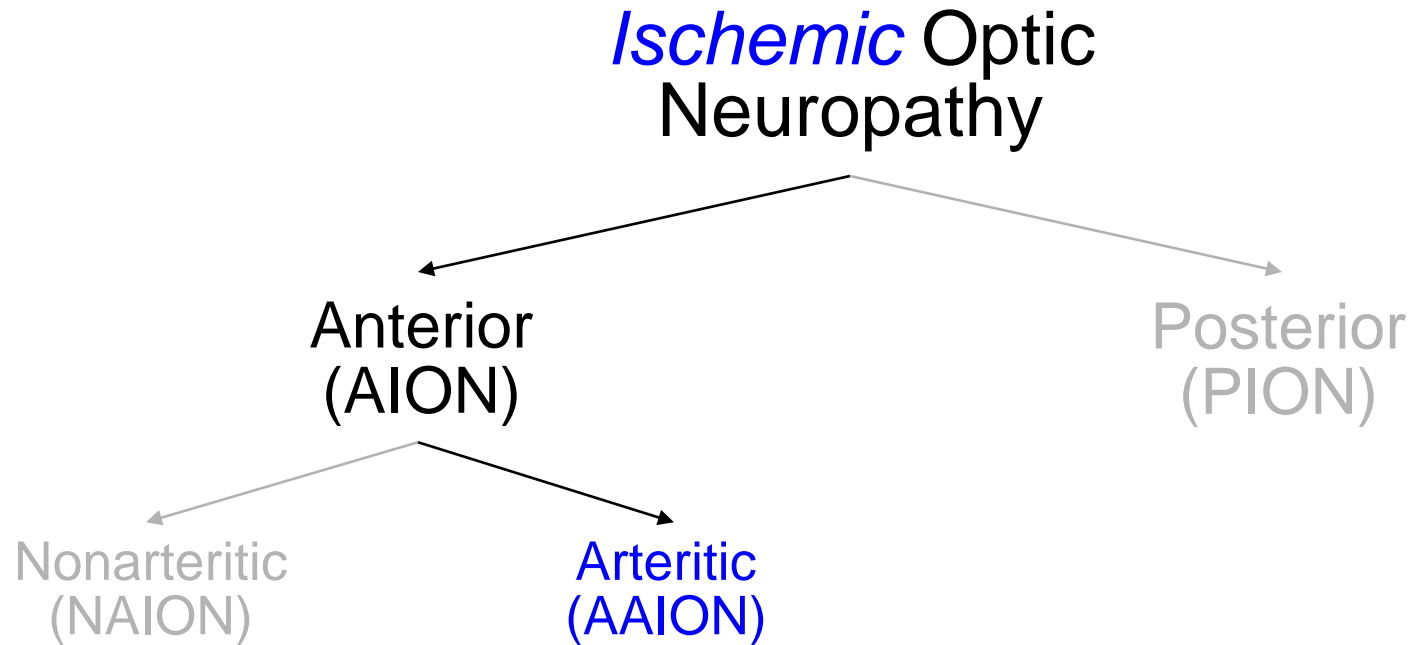
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## *Ischemic Optic Neuropathy*



What four

--**ESR**

--CRP

--Platelets

--H&H

*Is ESR specific for GCA?*

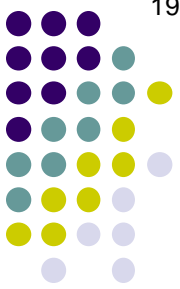
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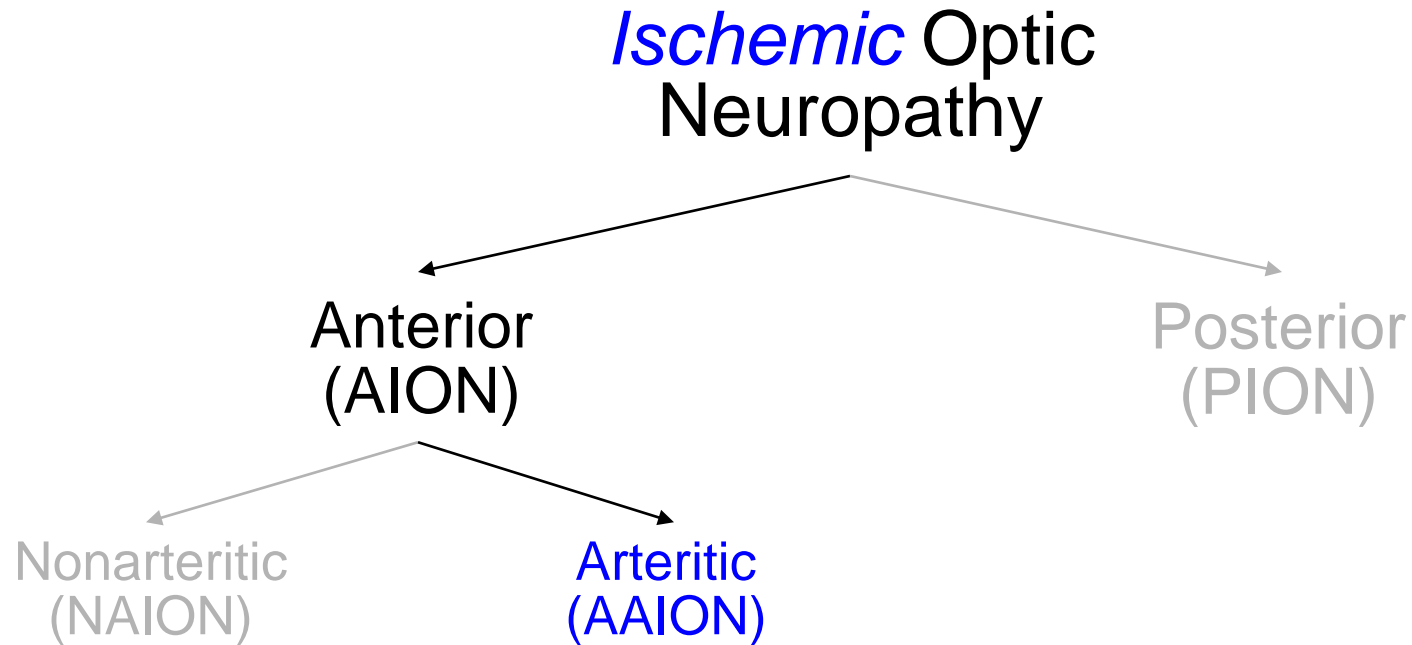
--Malignancy

--Non-vasculitic inflammatory conditions

--Noninflammatory vascular diseases (eg, arteriosclerosis)



## *Ischemic Optic Neuropathy*



What for

--ESR

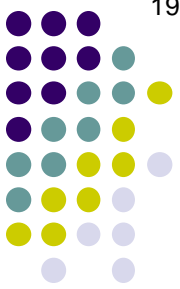
--CRP

--Platelets

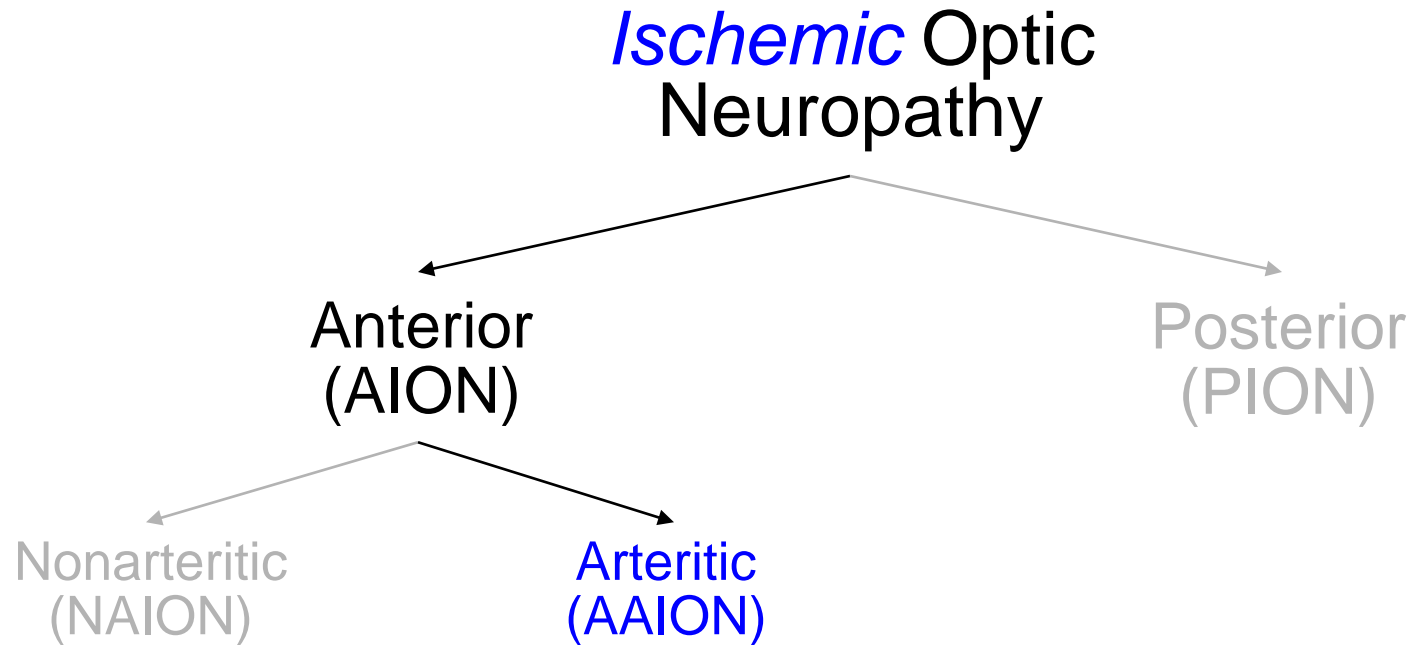
--H&H

What does CRP stand for?

g GCA?



## *Ischemic Optic Neuropathy*



What for

--ESR

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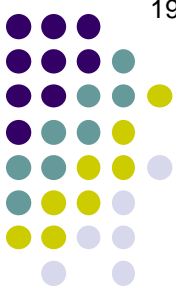
--Platelets

--H&H

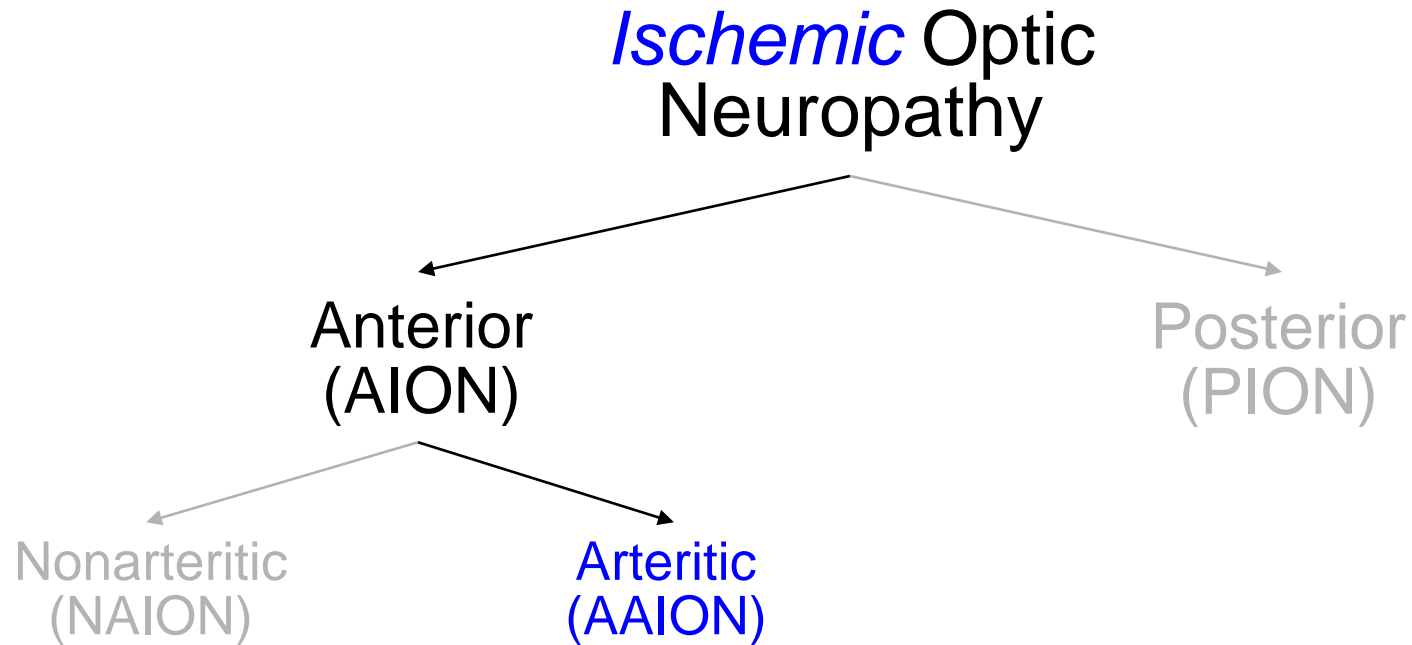
What does CRP stand for?

C-reactive protein

g GCA?



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What for

--ESR

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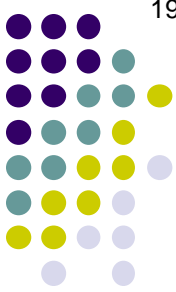
--H&H

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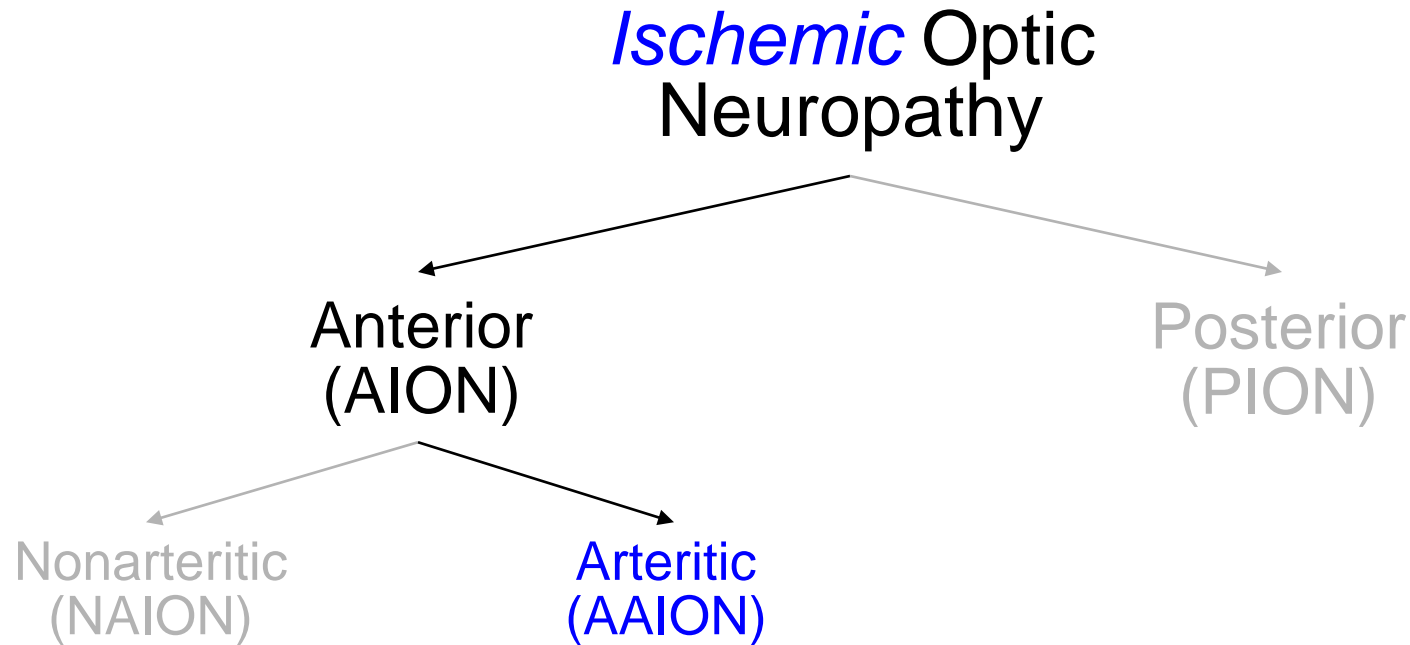
C-reactive protein

What is it?

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## *Ischemic Optic Neuropathy*



What for

--ESR

--CRP

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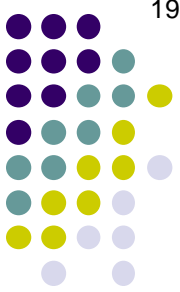
What does CRP stand for?

C-reactive protein

What is it?

An acute-phase reactant, produced by the liver

g GCA?



## *Ischemic Optic Neuropathy*

### *Ischemic* Optic Neuropathy

Anterior  
(AION)

Posterior  
(PION)

Nonarteriti  
(NAION)

*Which rises faster during acute inflammation (including GCA)—ESR or CRP?*

*What four*

--ESR

--CRP

--Platelet

--H&H



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*Which is more sensitive for GCA?*

*What four*

--ESR

--CRP

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*Which is more sensitive for GCA?*  
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*Which is less influenced by age, anemia, etc?*

*What four*

--ESR

--CRP

--Platelet

--H&H



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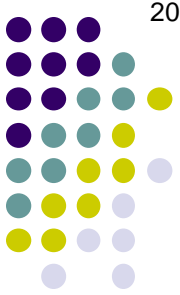
*What four*

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--CRP

--Platelet

--H&H



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*Are they both contributory; ie, if ESR and CRP are both elevated, is the likelihood of GCA higher than if only one or the other is elevated?*

*What four*

--ESR

--CRP

--Platelet

--H&H



# Ischemic Optic Neuropathy

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*Are they both contributory; ie, if ESR and CRP are both elevated, is the likelihood of GCA higher than if only one or the other is elevated?*  
Yes; specificity approaches **97%** if both are significantly elevated

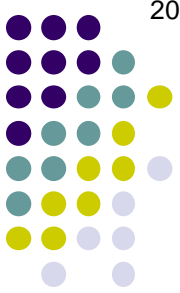
*What four*

--ESR

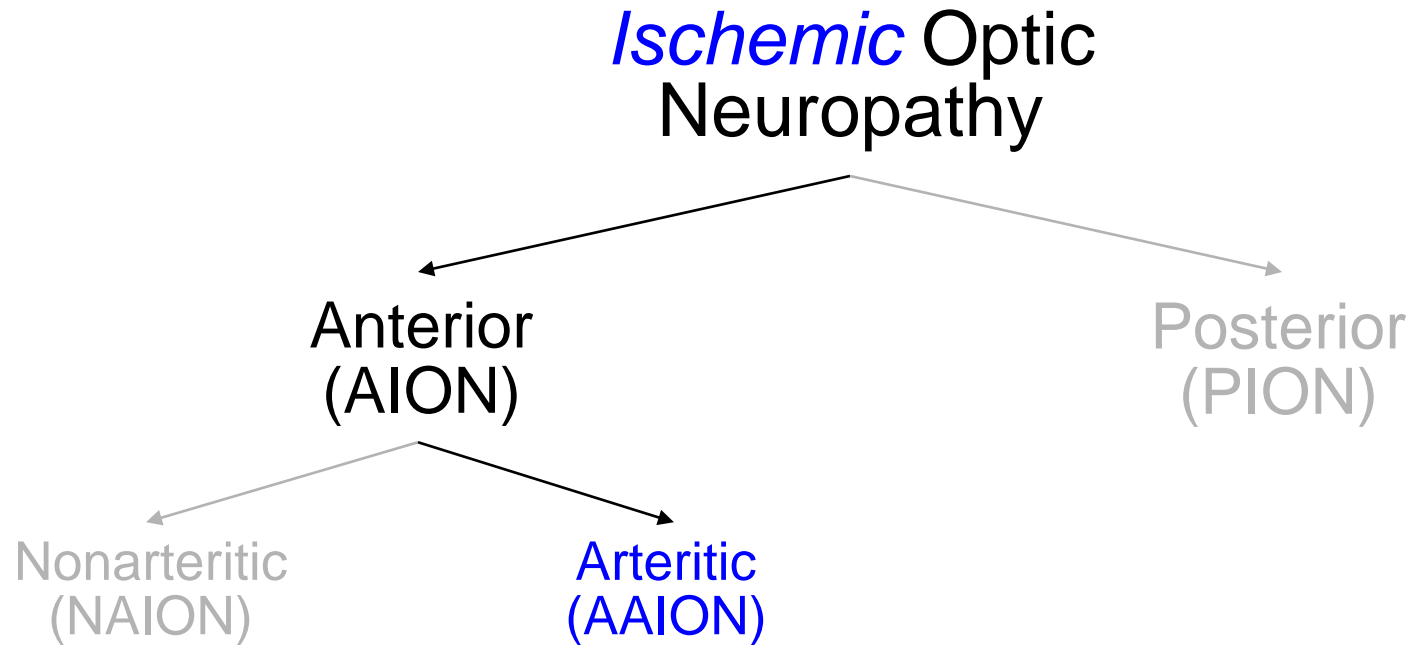
--CRP

--Platelet

--H&H



## *Ischemic Optic Neuropathy*



*What four lab studies might be useful in diagnosing GCA?*

--ESR

--CRP

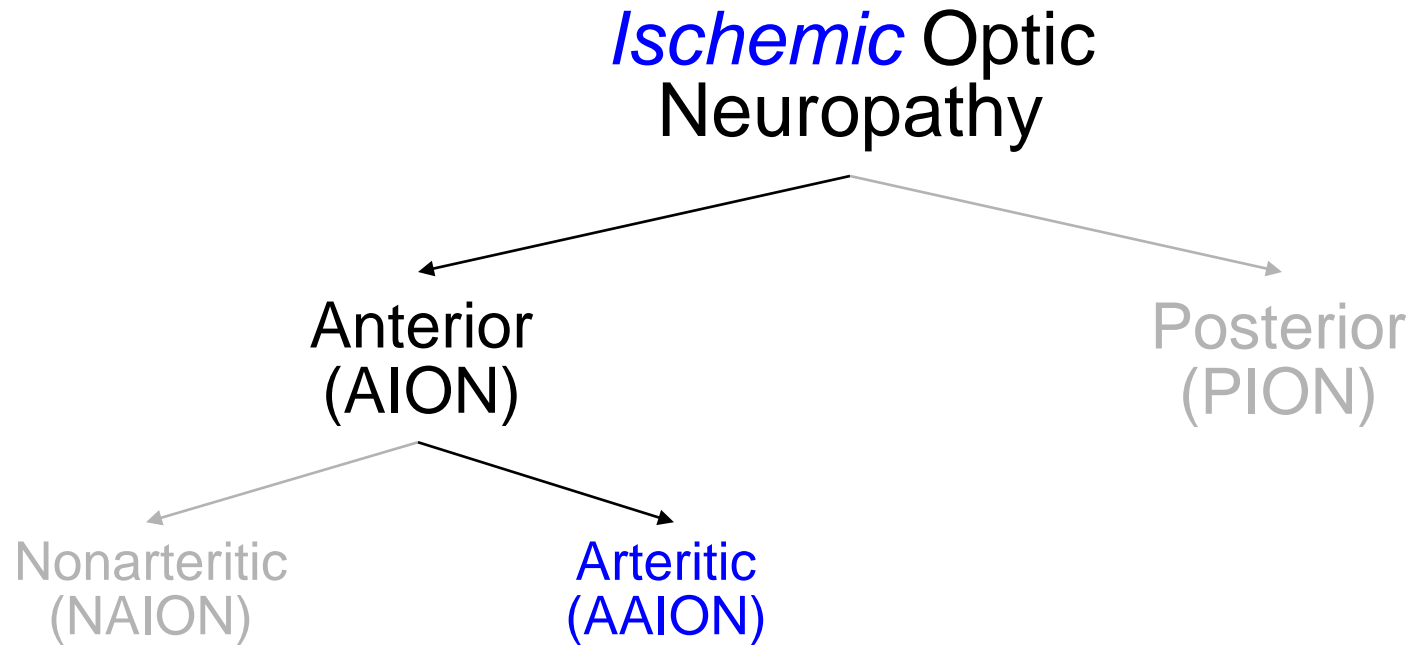
--**Platelet count**

--H&H

*Do you expect the platelet count to be high or low in GCA?*



## *Ischemic Optic Neuropathy*



*What four lab studies might be useful in diagnosing GCA?*

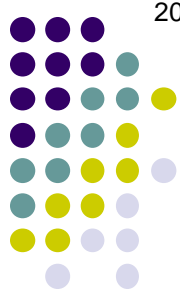
--ESR

--CRP

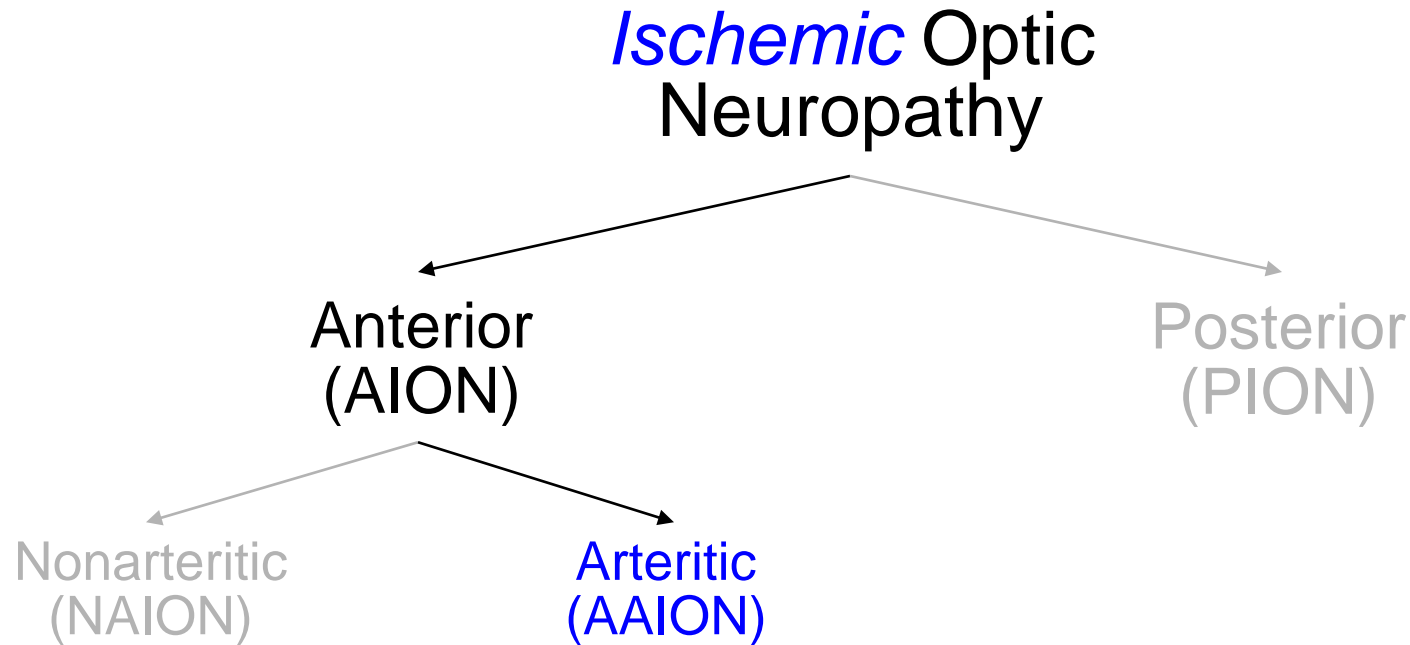
--**Platelet count**

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*Do you expect the platelet count to be high or low in GCA?*  
**High.** Platelet count acts like an acute-phase reactant.



## *Ischemic Optic Neuropathy*



*What four lab studies might be useful in diagnosing GCA?*

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--Platelet count

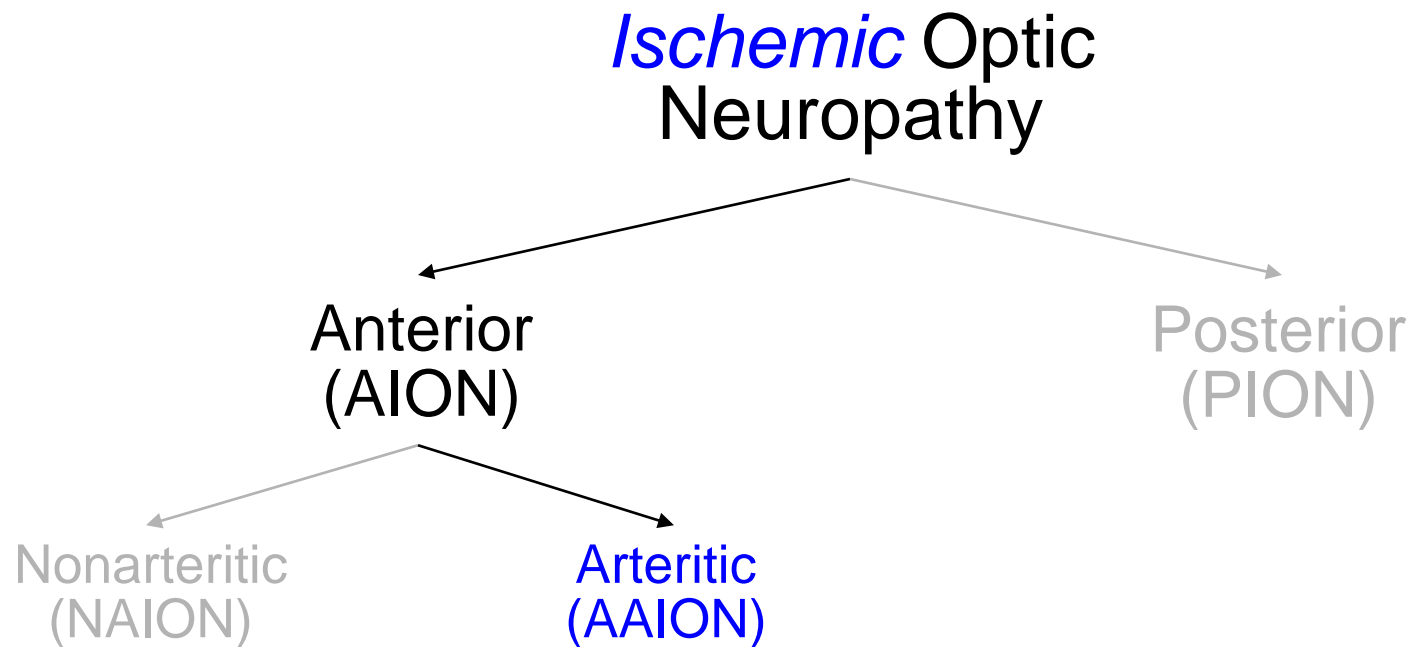
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## Ischemic Optic Neuropathy



What four lab studies might be useful in diagnosing GCA?

--ESR

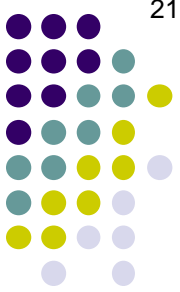
--CRP

--Platelet count

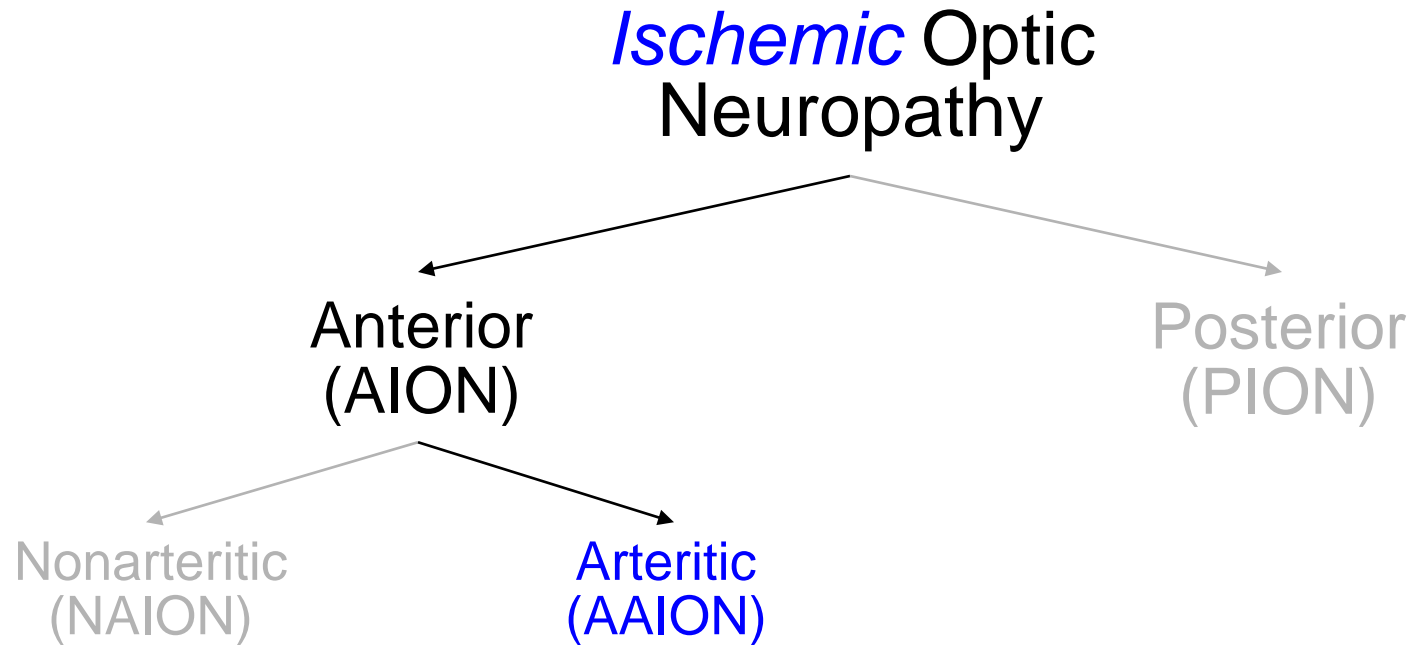
--H&H

Do you expect the platelet count to be high or low in GCA?  
**High.** Platelet count acts like an acute-phase reactant.

Do you expect the H&H to be high or low in GCA?  
**Low.** GCA is associated with anemia.



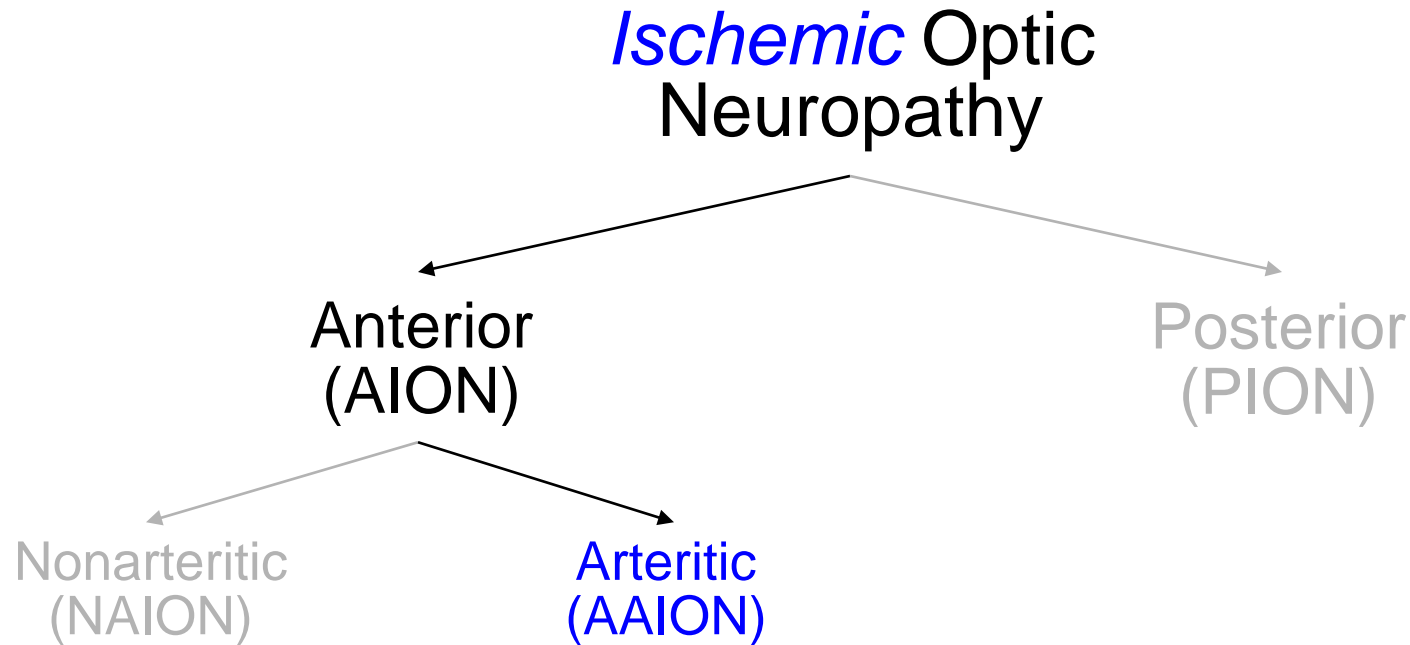
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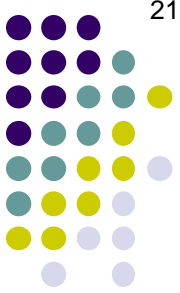
*What imaging study might be contributory in diagnosing GCA?*



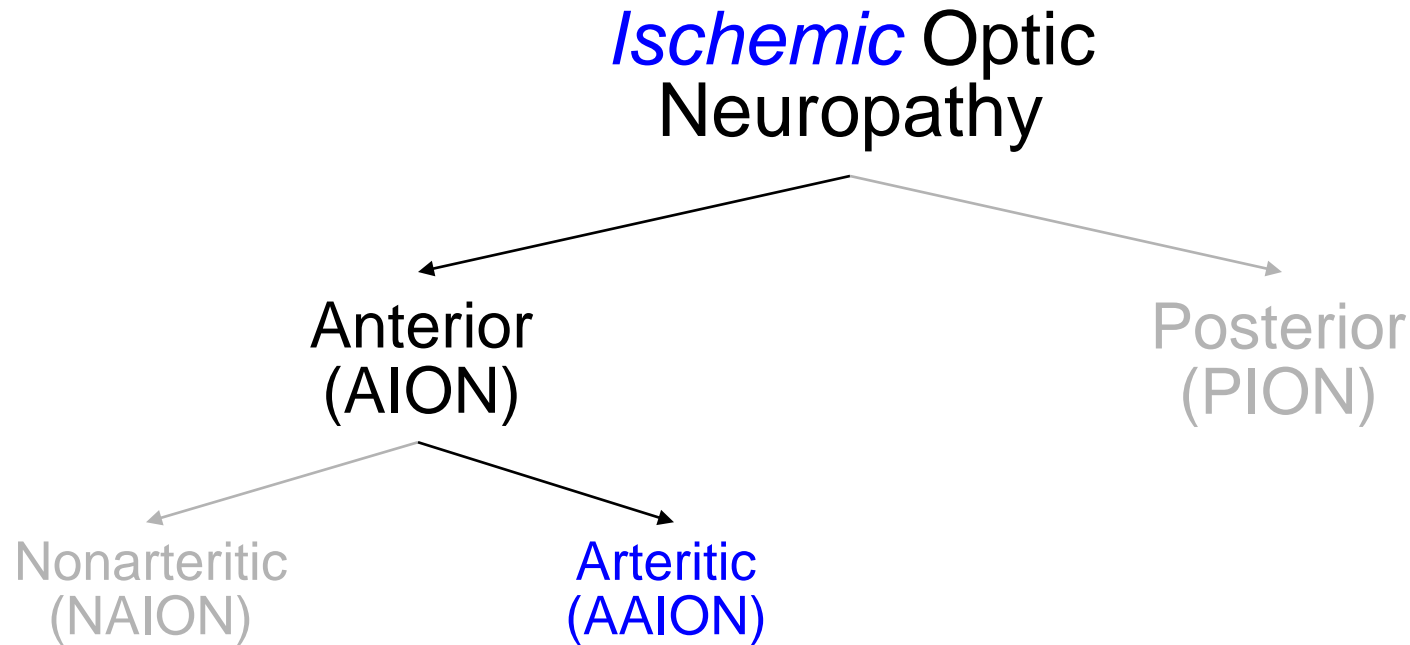
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## *Ischemic Optic Neuropathy*



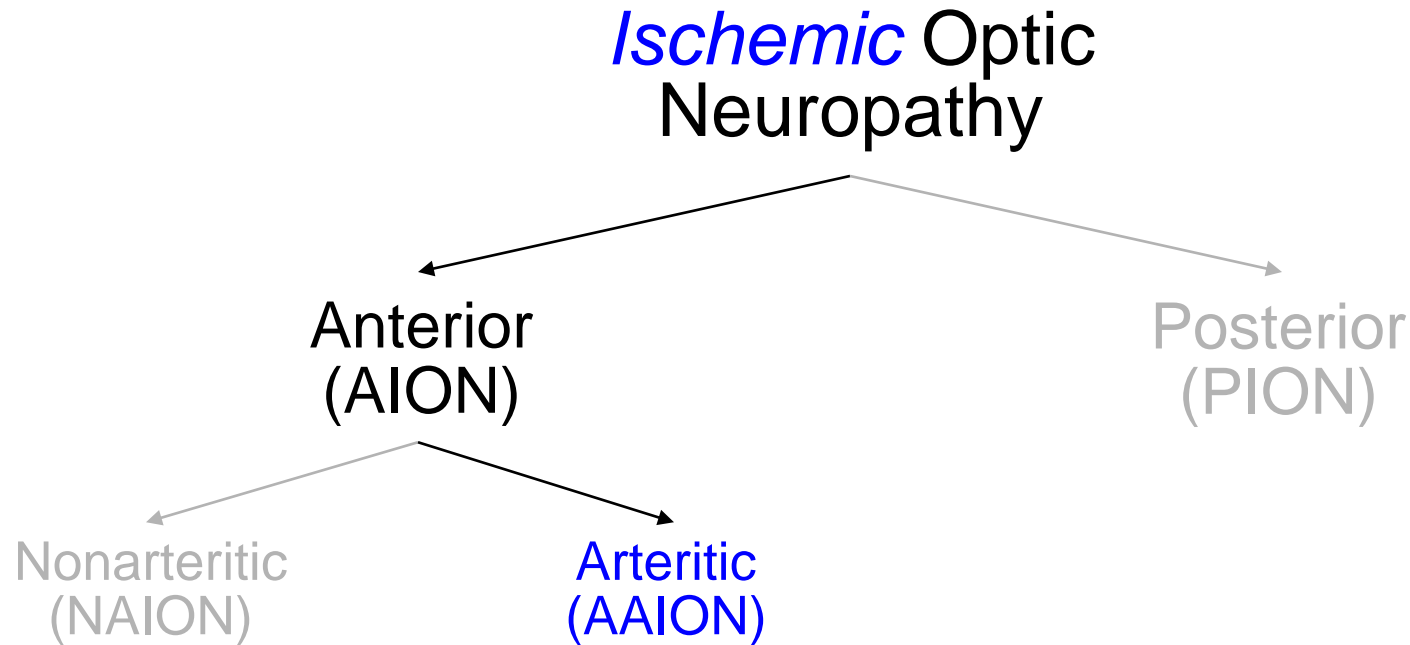
*What imaging study might be contributory in diagnosing GCA?  
Fluorescein angiography (FA)*

*What are the two classic FA findings in GCA?*

- 1)
- 2)

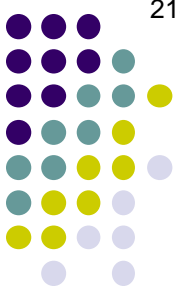


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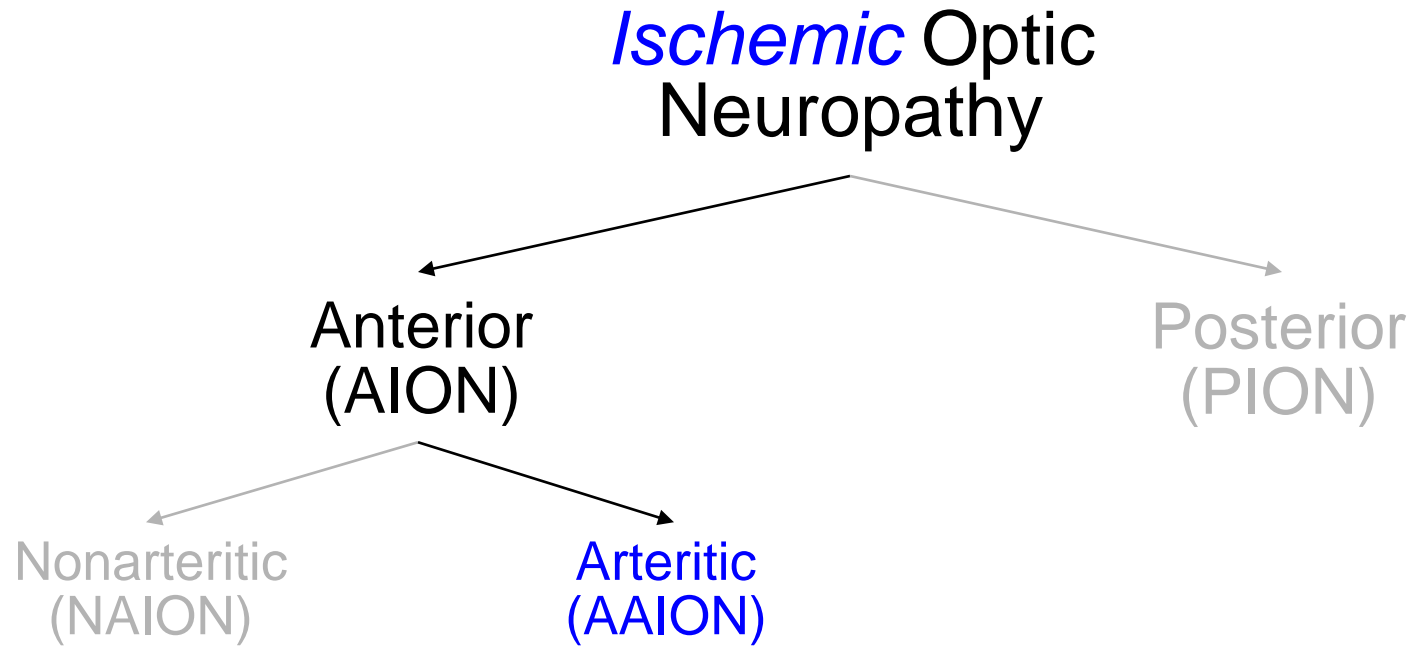


*What imaging study might be contributory in diagnosing GCA?*  
Fluorescein angiography (FA)

*What are the two classic FA findings in GCA?*  
1) Delayed arm-to-eye time  
2) Patchy choroidal hypofluorescence



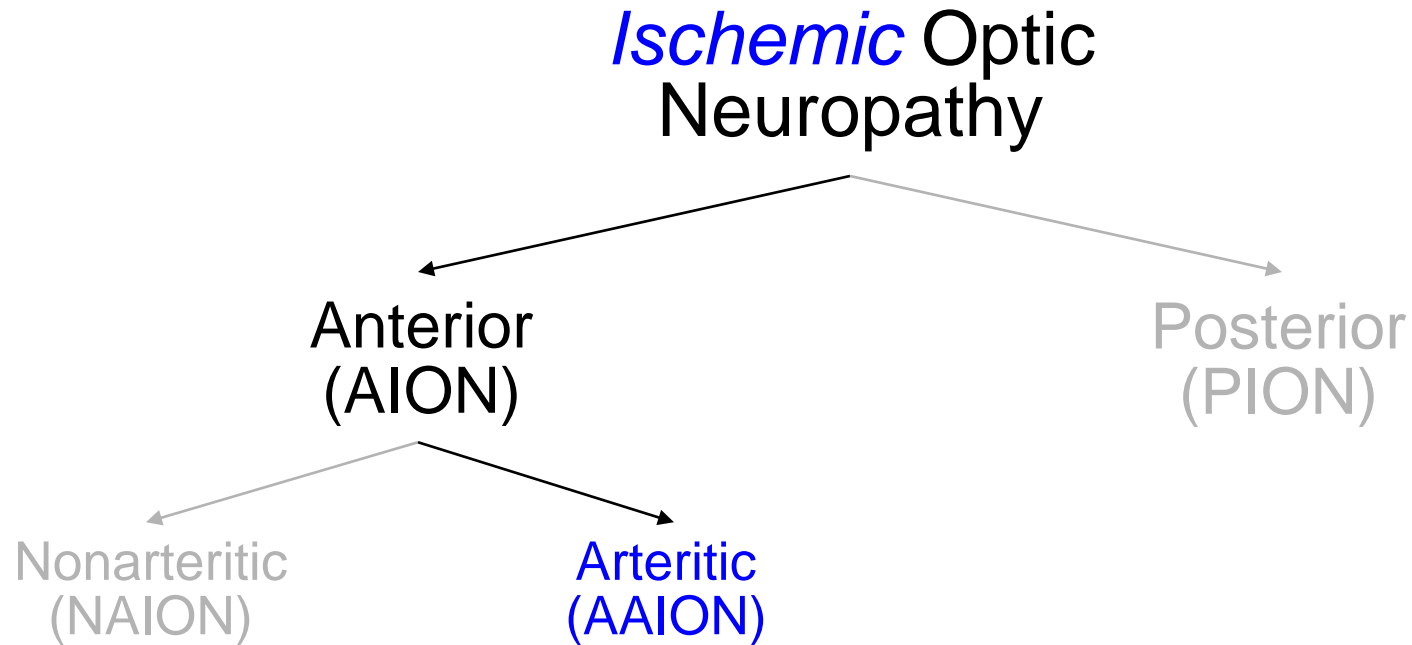
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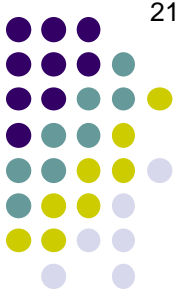
*What procedure is the gold standard for diagnosing GCA?*



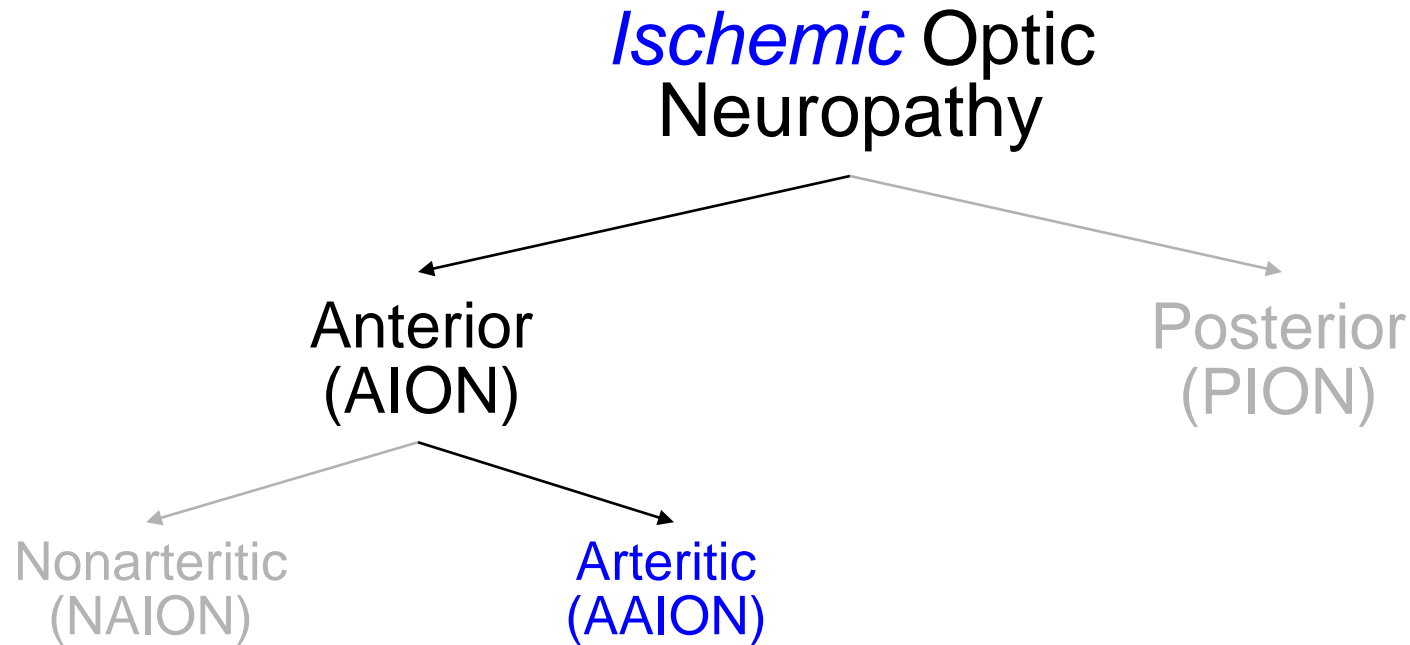
## *Ischemic Optic Neuropathy*



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Temporal artery biopsy (TAB)

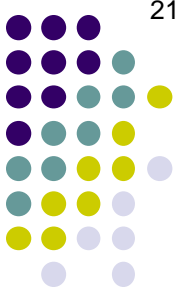


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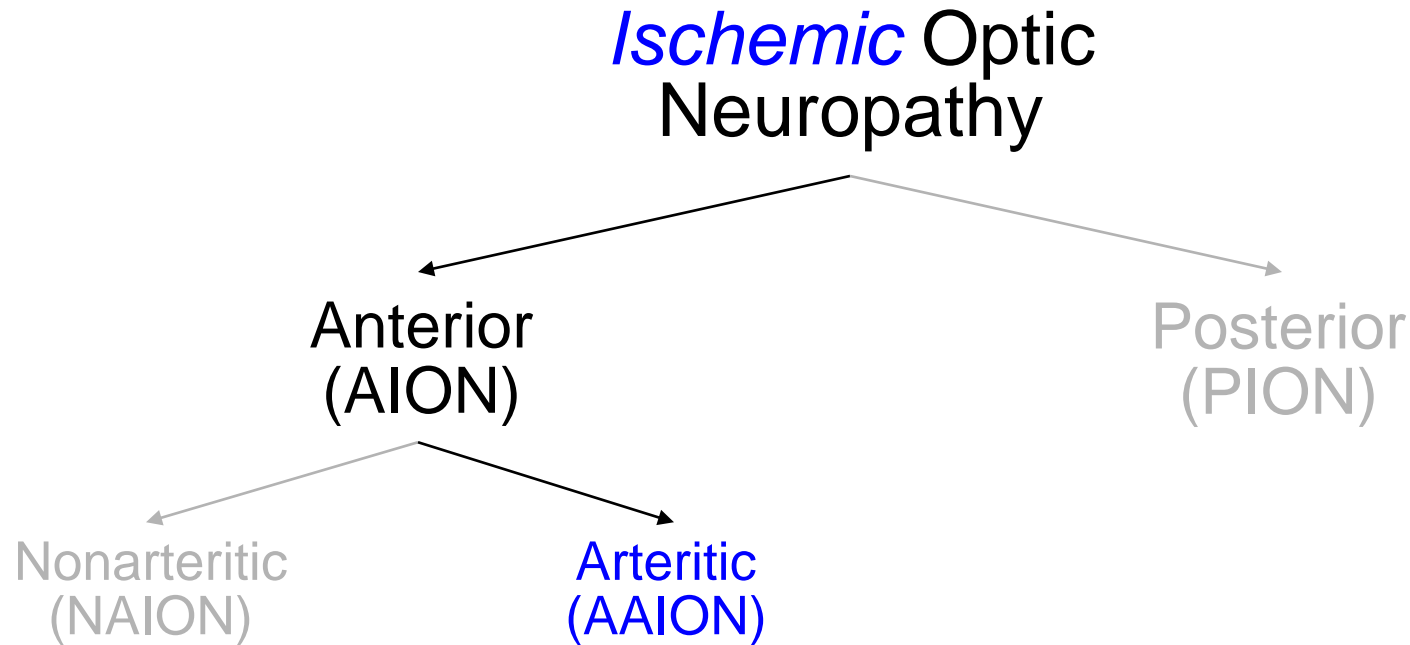


*What procedure is the gold standard for diagnosing GCA?  
Temporal artery biopsy (TAB)*

*Why biopsy the temporal artery?*

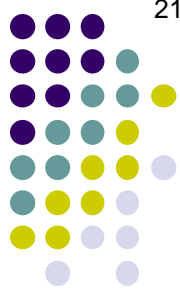


## *Ischemic Optic Neuropathy*



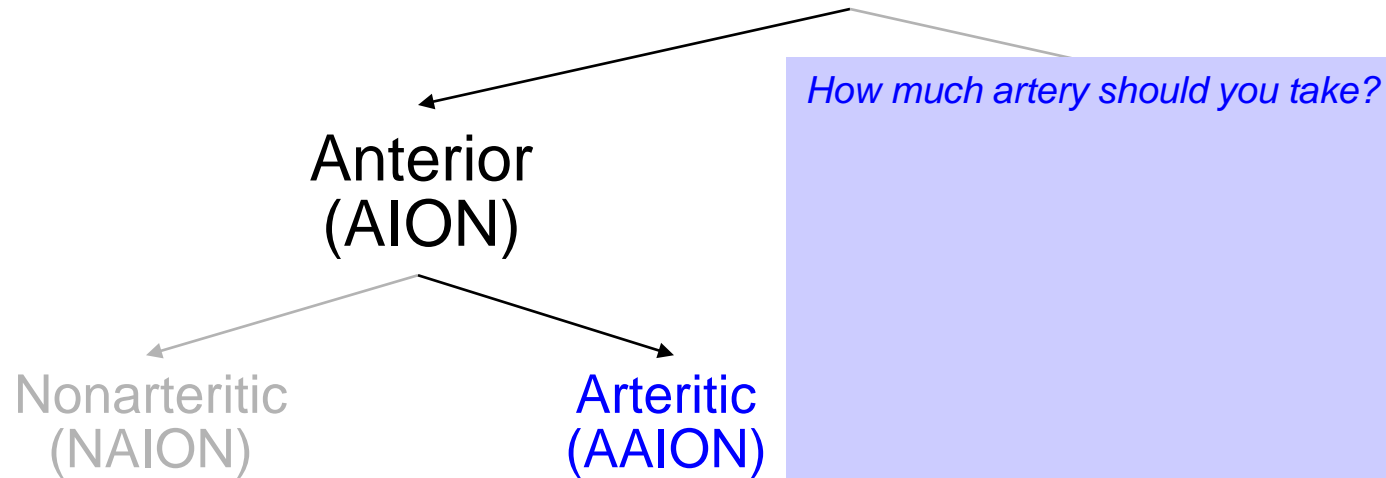
*What procedure is the gold standard for diagnosing GCA?*  
Temporal artery biopsy (TAB)

*Why biopsy the temporal artery?*  
It's readily accessible, and (usually) nonvital



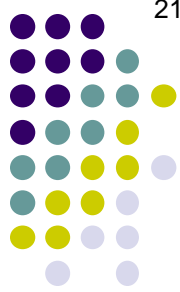
## *Ischemic Optic Neuropathy*

### *Ischemic* Optic Neuropathy



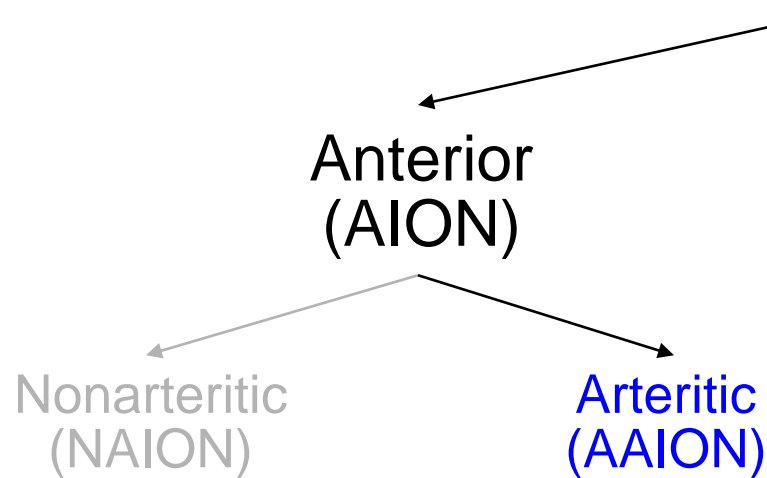
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## *Ischemic Optic Neuropathy*

### *Ischemic* Optic Neuropathy



*How much artery should you take?*  
At least 2 cm; some suggest as much as 6

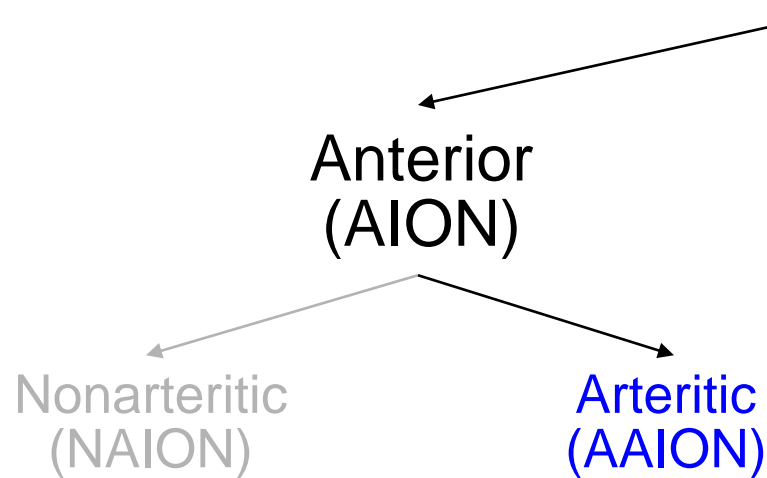
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### *Ischemic* Optic Neuropathy



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*Should treatment be withheld until after the biopsy?*

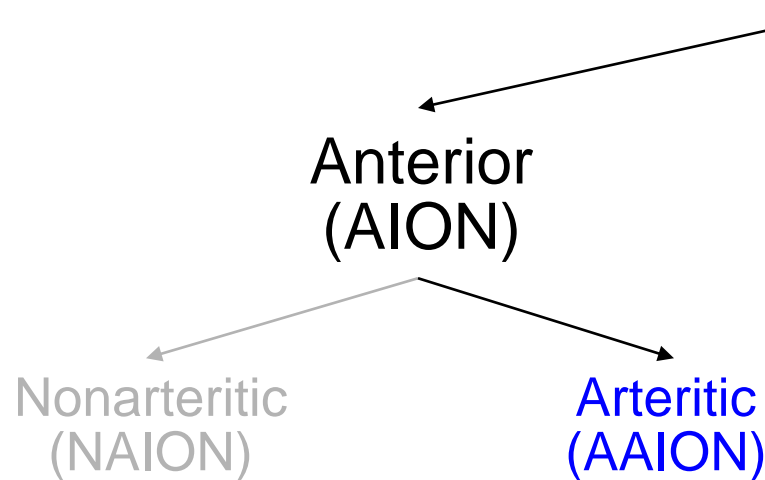
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**NO!** The biopsy will remain positive long after treatment is initiated. Most authorities say you can delay TAB a week or more without interfering with the results.

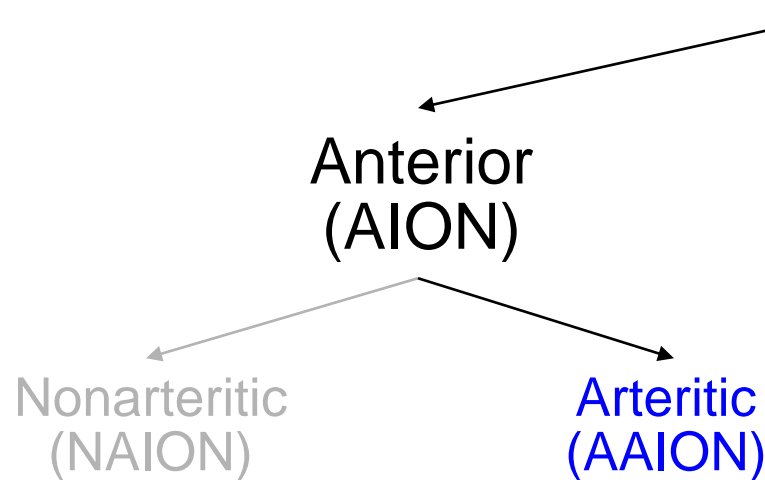
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*How should the specimen be sectioned?*

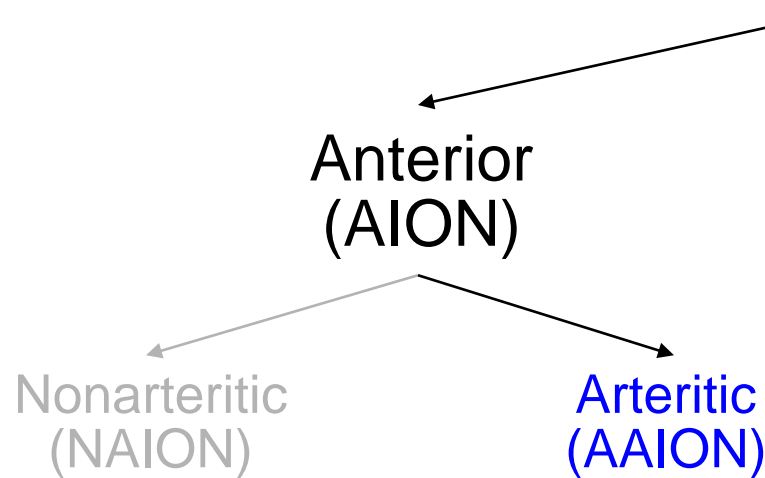
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*How should the specimen be sectioned?*

Finely. GCA is notorious for skip lesions, in which portion of the artery will be unaffected. If the sections aren't fine enough, the pathology will be missed.

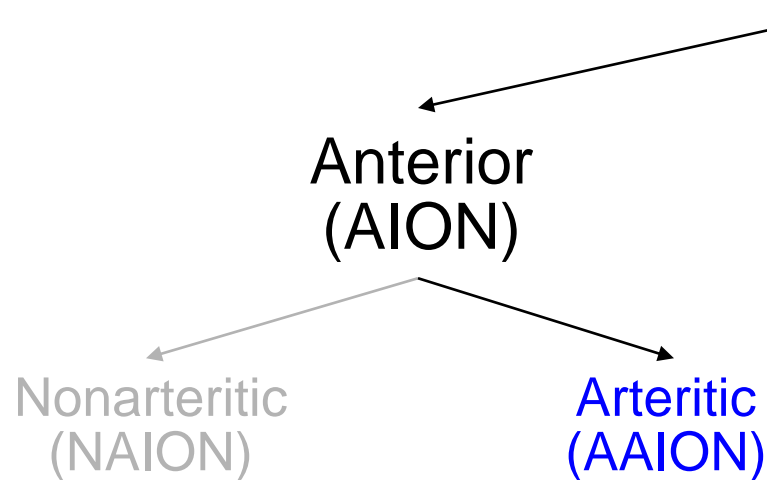
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*Should treatment be withheld until after the biopsy?*

**NO!** The biopsy will remain positive long after treatment is initiated. Most authorities say you can delay TAB a week or more without interfering with the results.

*How should the specimen be sectioned?*

Finely. GCA is notorious for skip lesions, in which portion of the artery will be unaffected. If the sections aren't fine enough, the pathology will be missed.

*What specifically is the pathologist looking for?*

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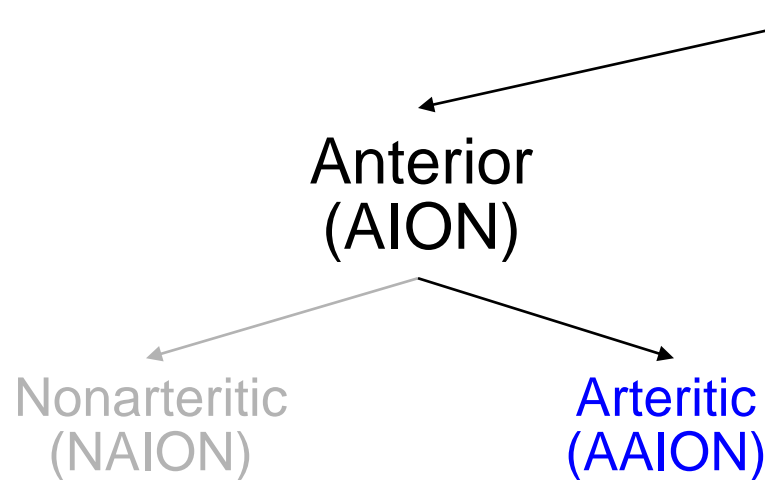
*What procedure is the gold standard?*  
**Temporal artery biopsy (TAB)**

*Why biopsy the temporal artery?*  
It's readily accessible, and (usual



# Ischemic Optic Neuropathy

## Ischemic Optic Neuropathy



*How much artery should you take?*

At least 2 cm; some suggest as much as 6

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Finely. GCA is notorious for skip lesions, in which portion of the artery will be unaffected. If the sections aren't fine enough, the pathology will be missed.

*What specifically is the pathologist looking for?*

- Giant cells (duh)
- Fragmentation of the internal elastic lamina
- Granulomas

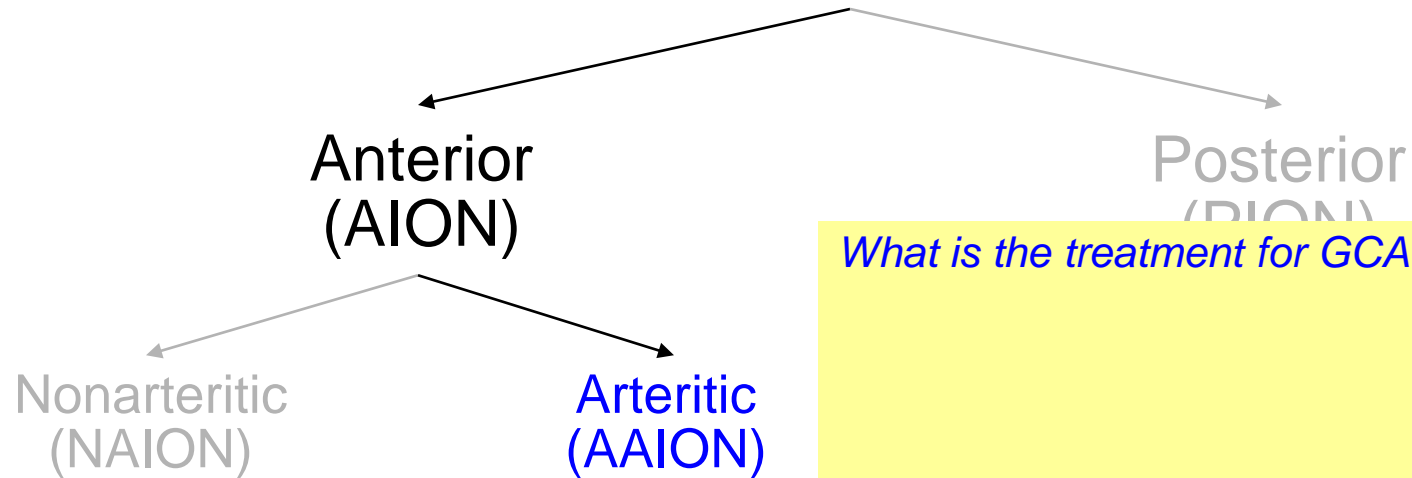
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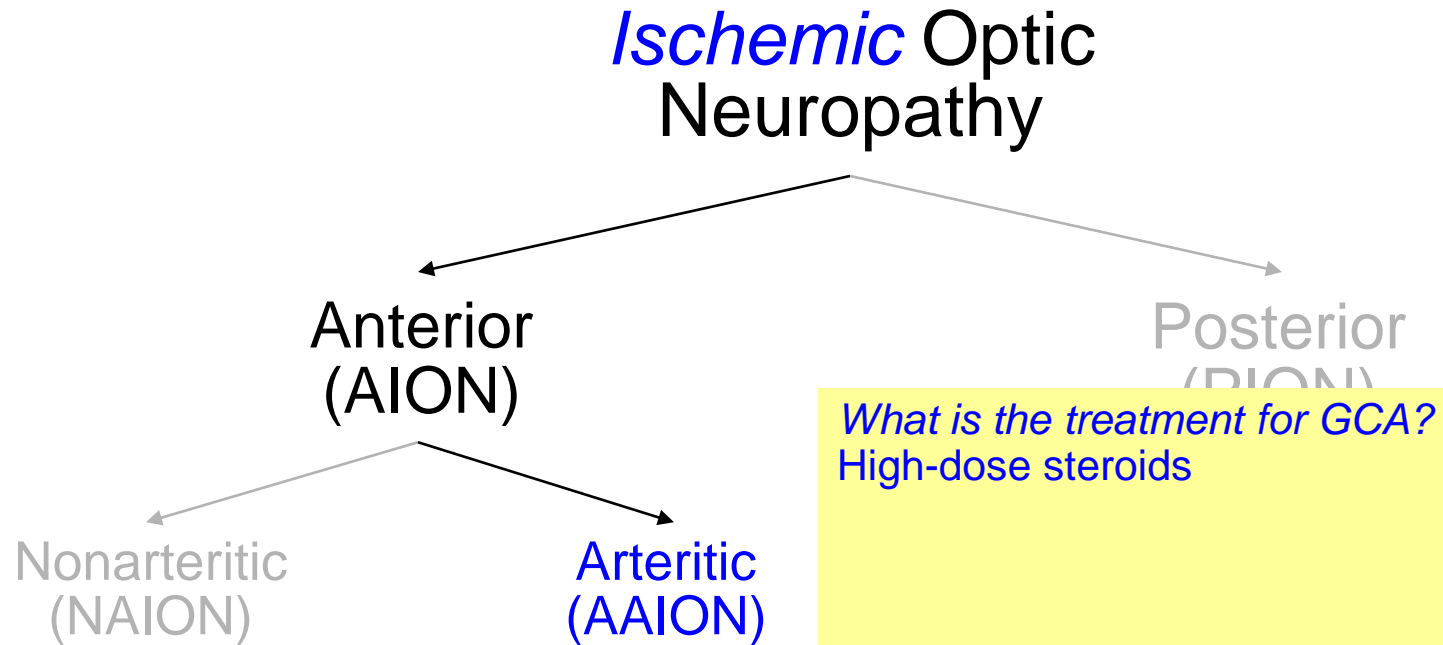
### *Ischemic* Optic Neuropathy



*What is the treatment for GCA?*

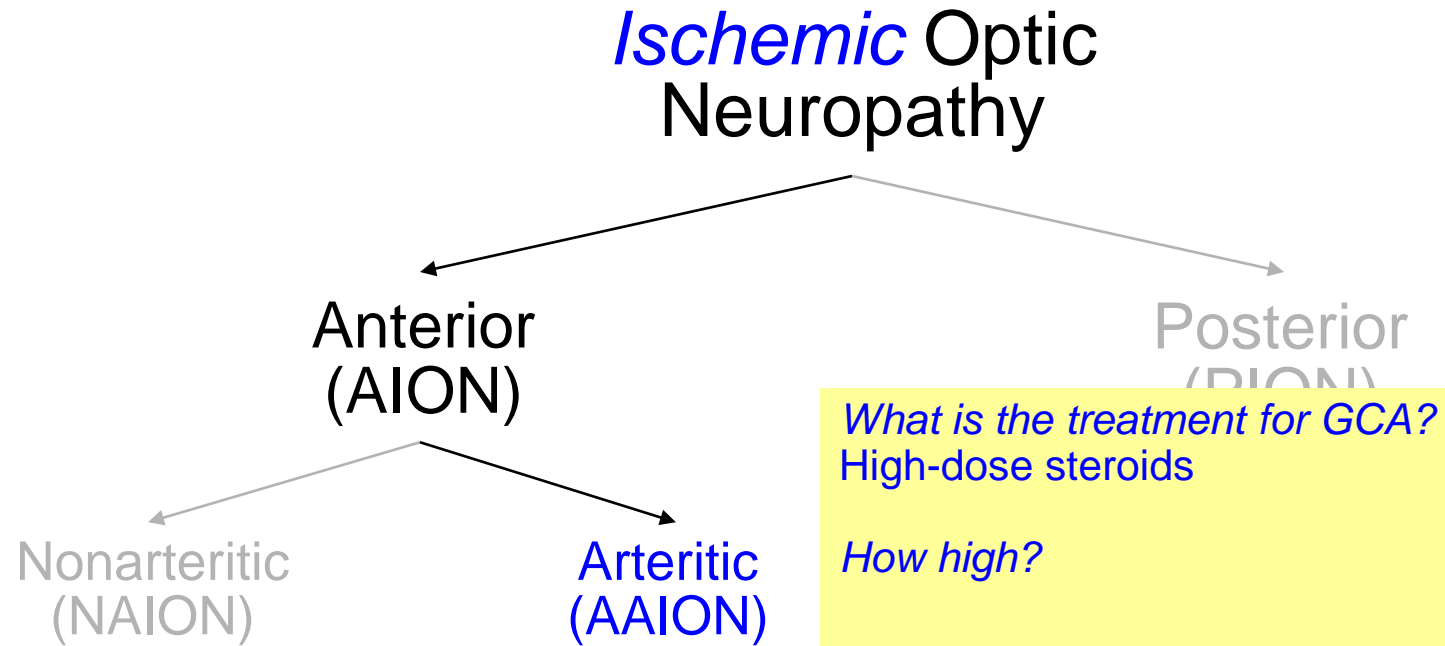


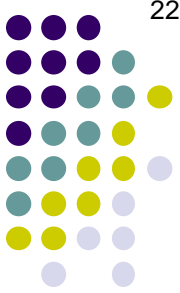
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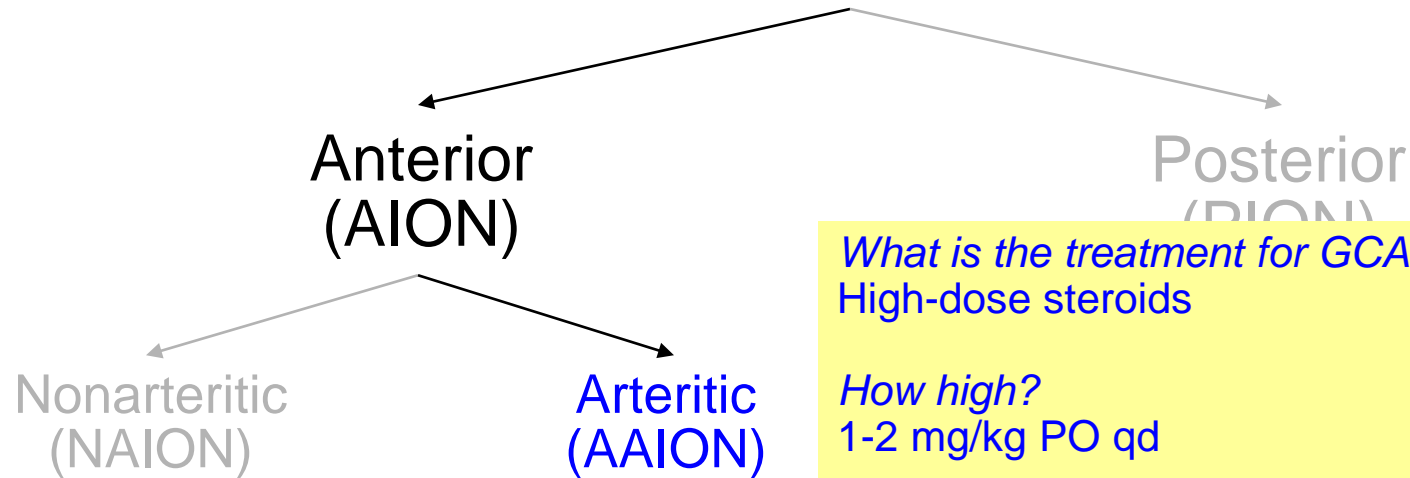
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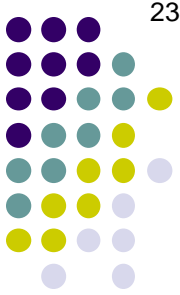
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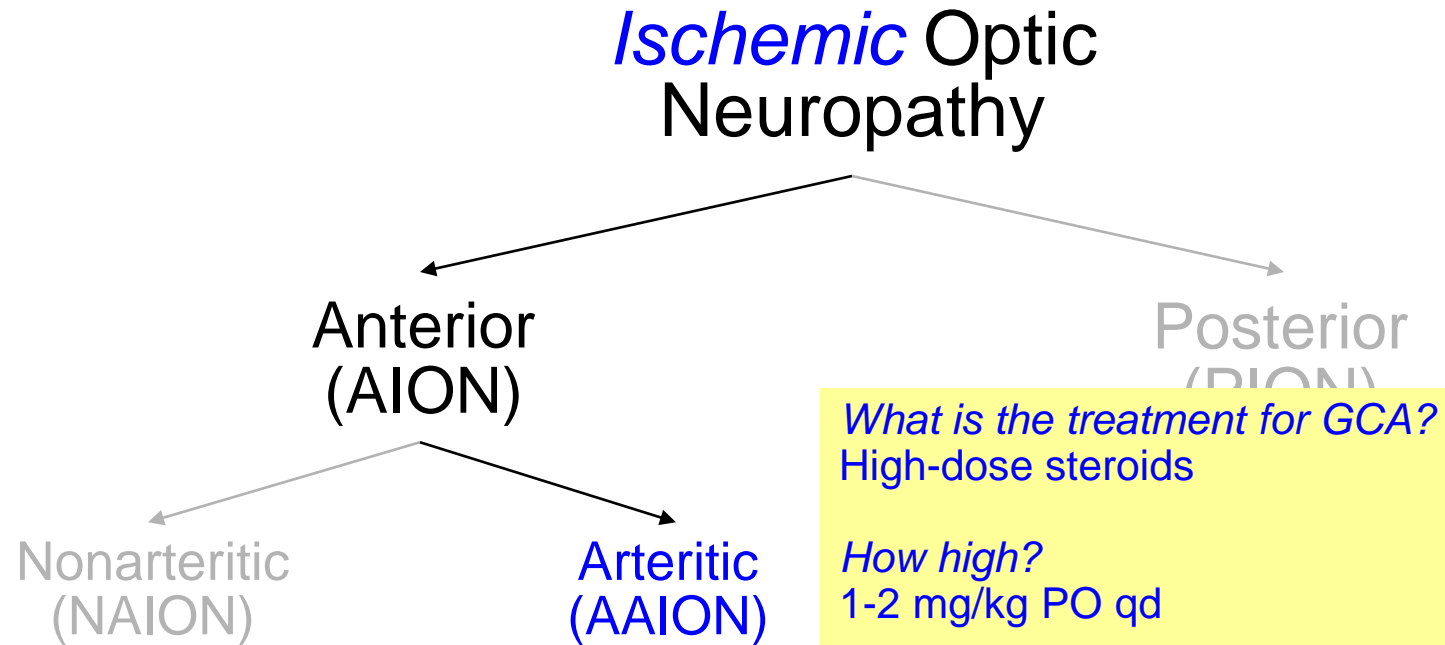


*What is the treatment for GCA?*  
High-dose steroids

*How high?*  
1-2 mg/kg PO qd



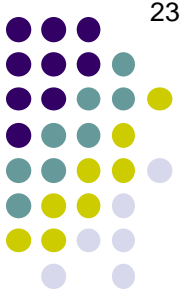
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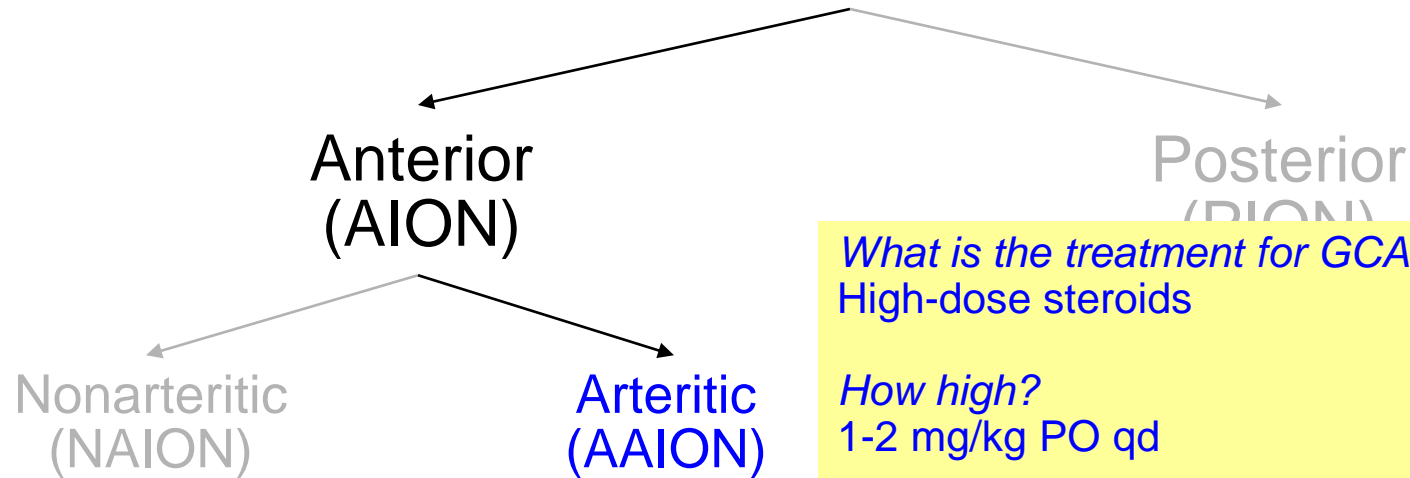
*How high?*  
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*What about IV induction?*



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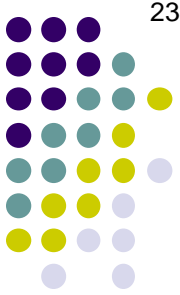
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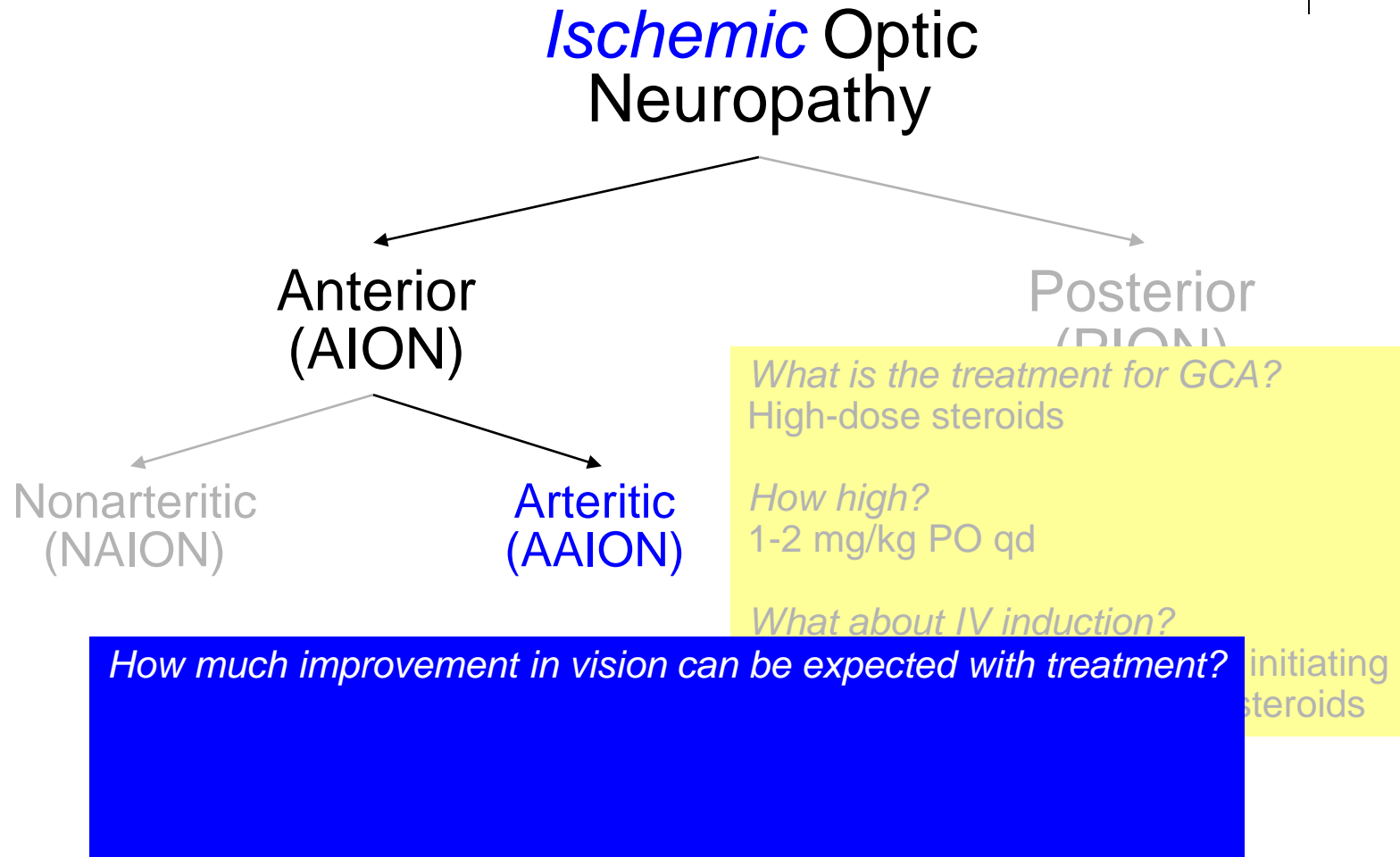
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*What about IV induction?*  
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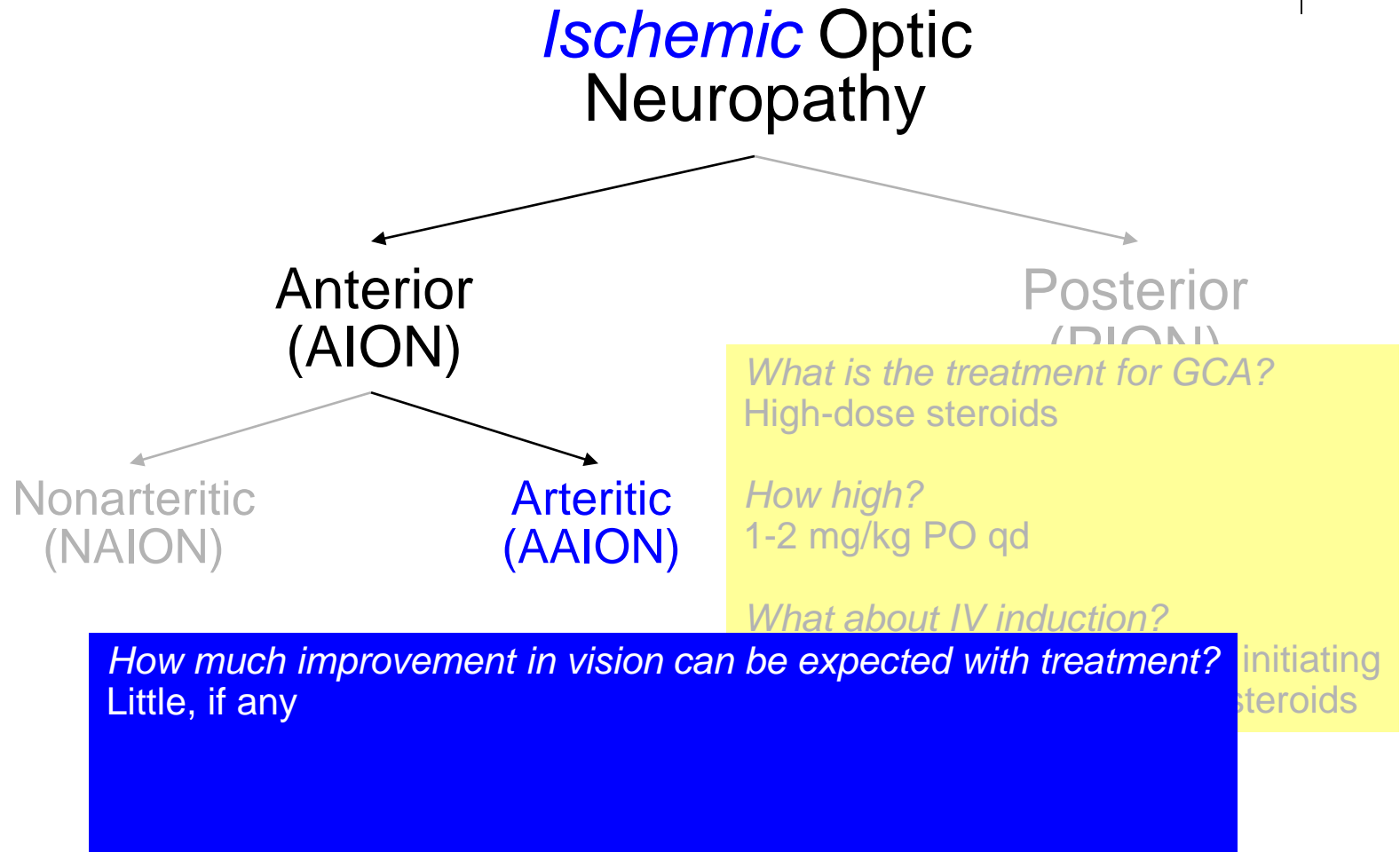


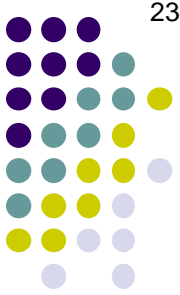
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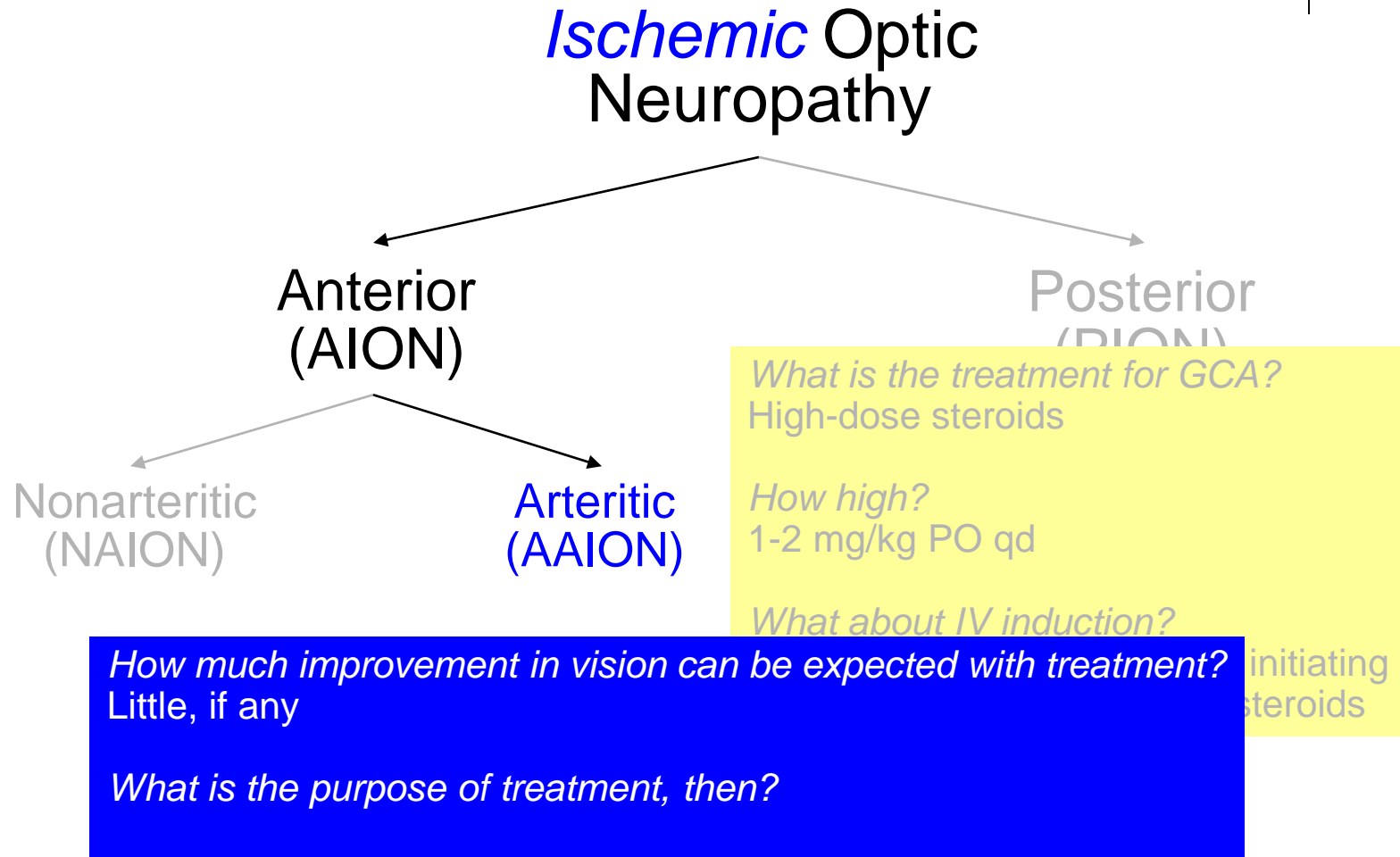


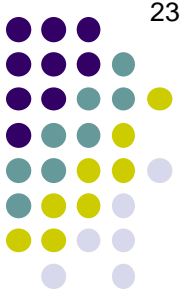
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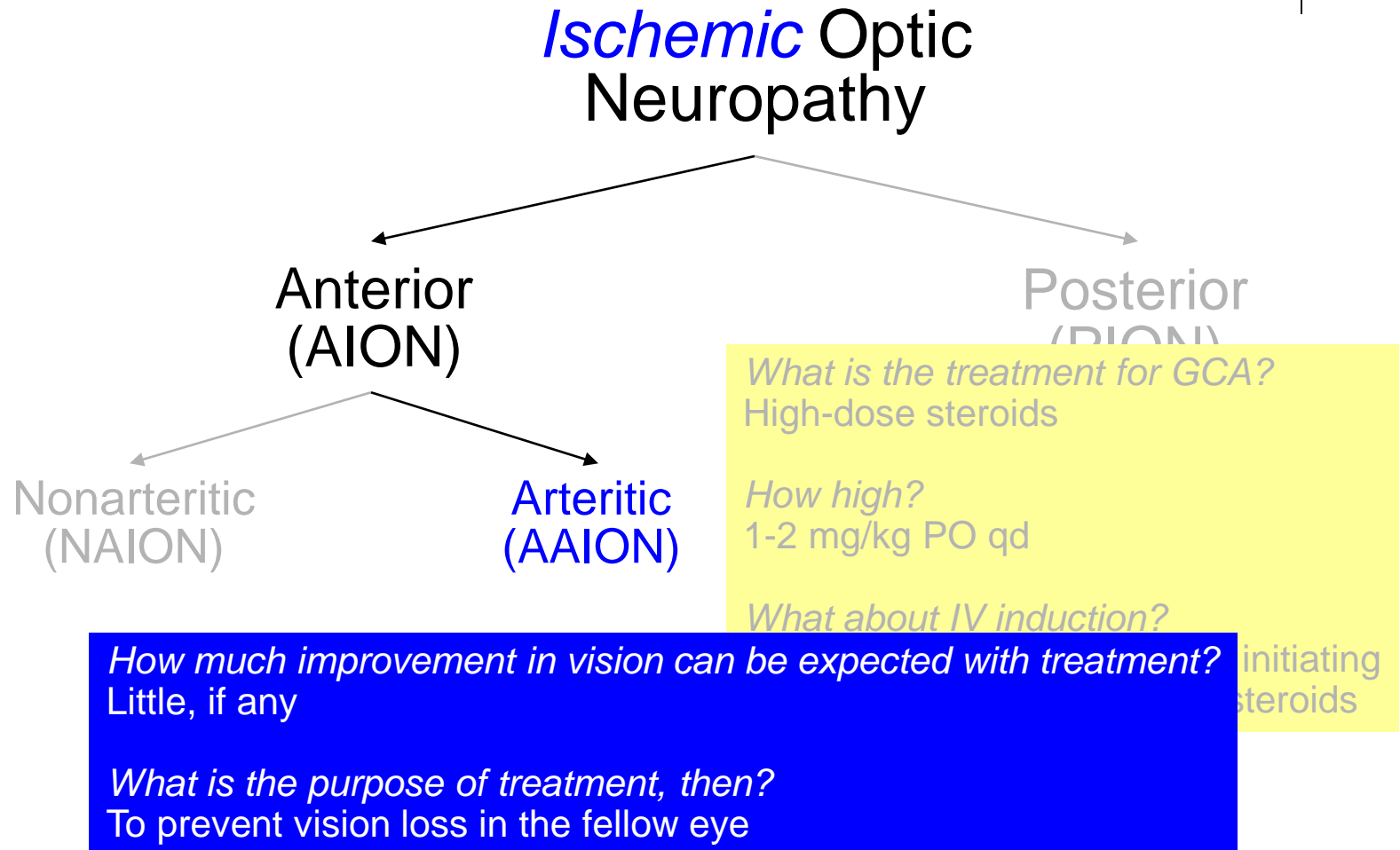


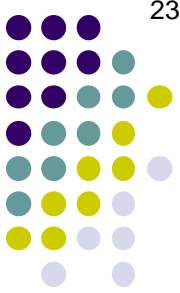
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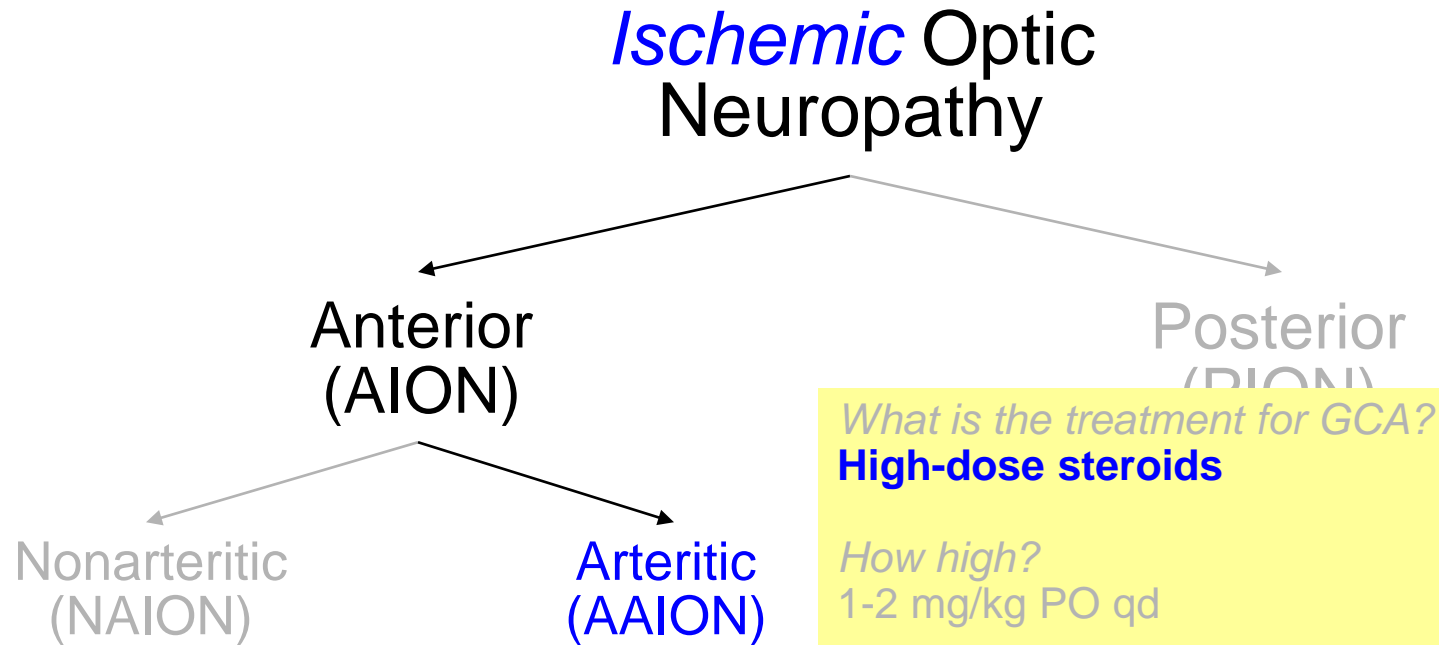


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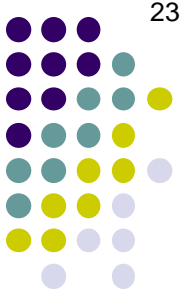


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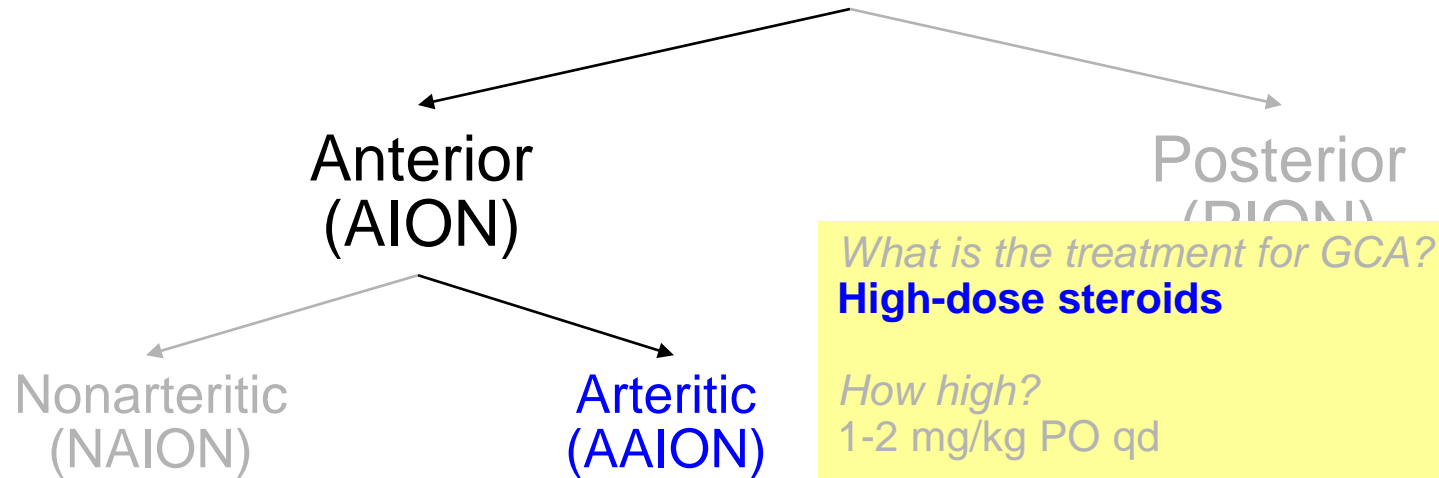
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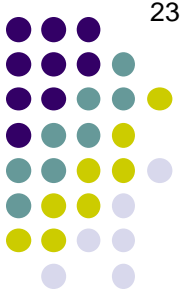
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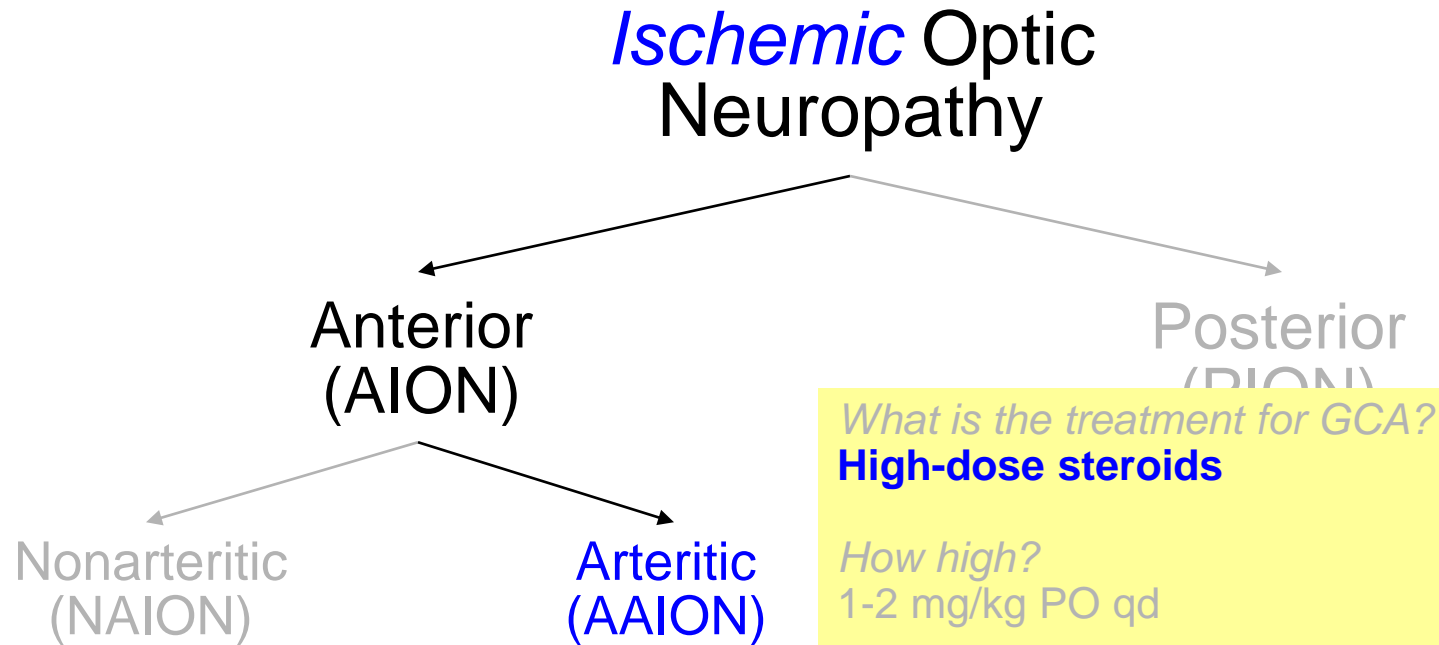
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Until the ESR and CRP have normalized, at which point steroid tapering can begin

tapering  
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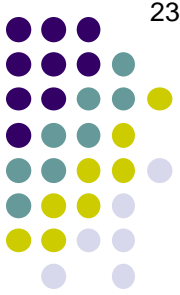
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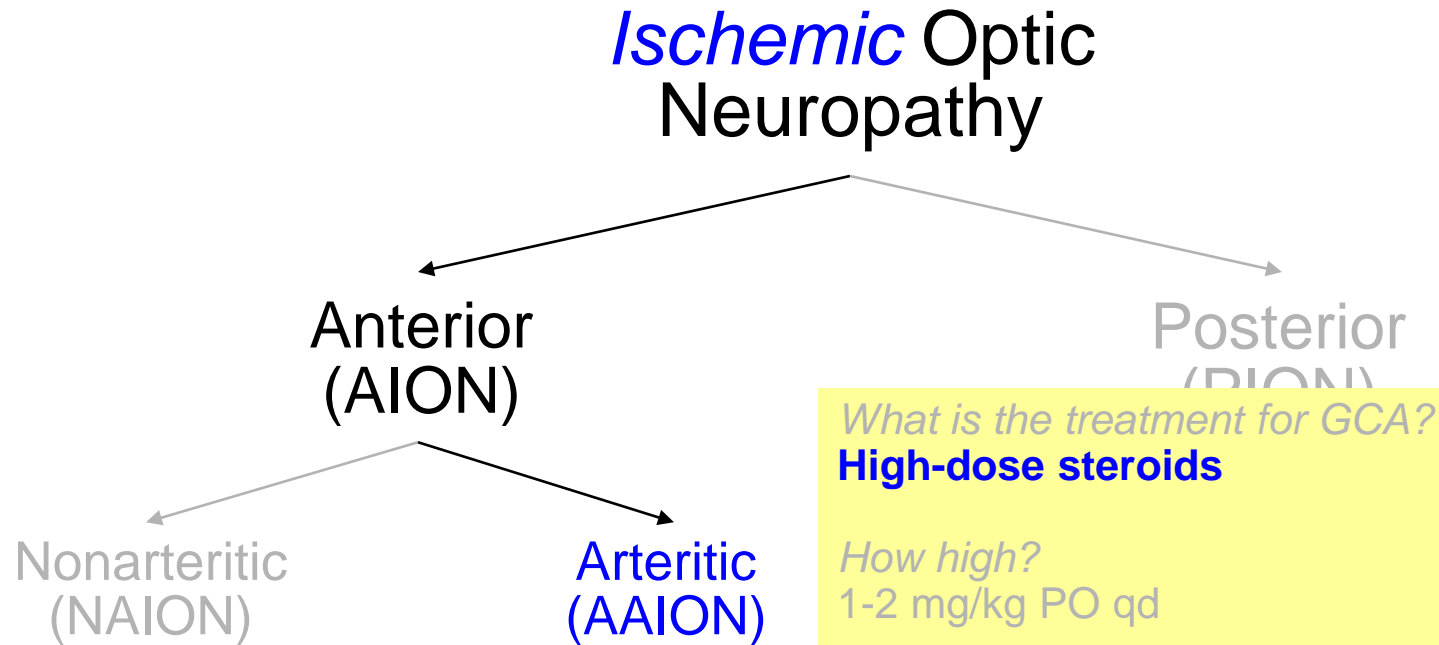
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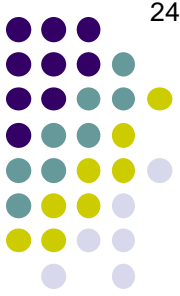
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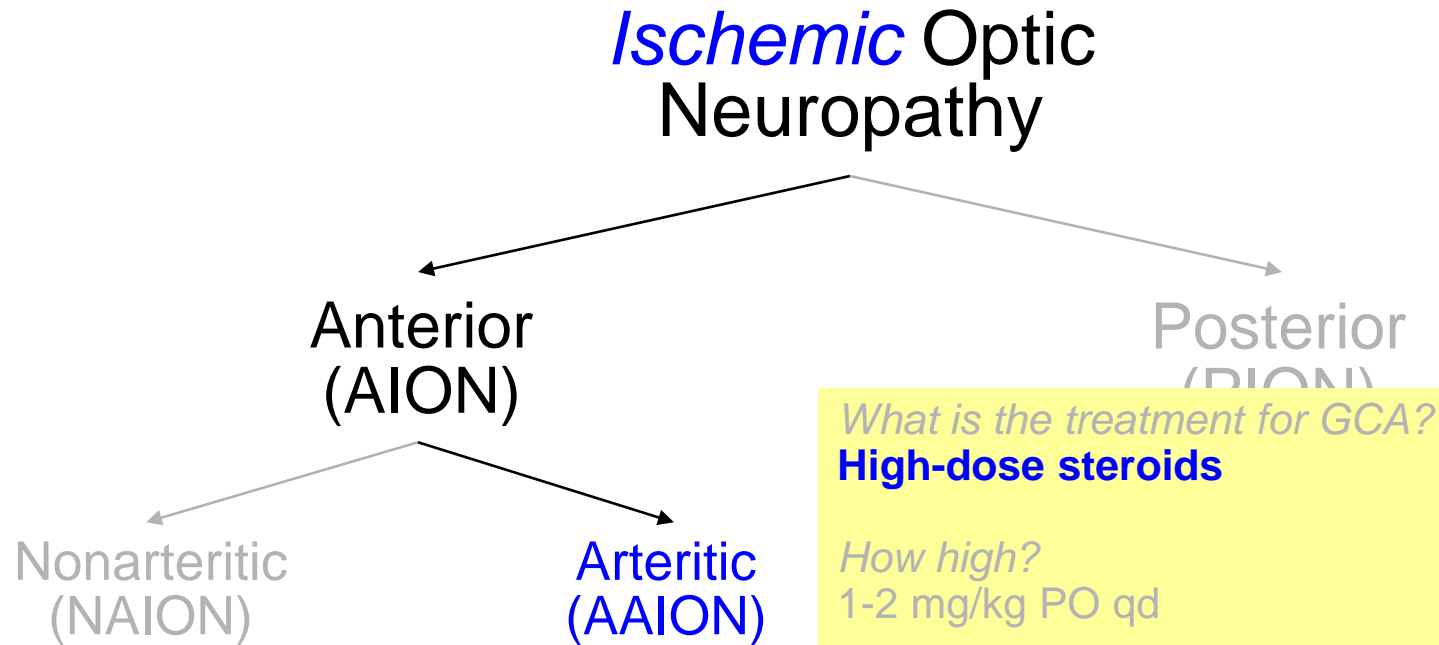
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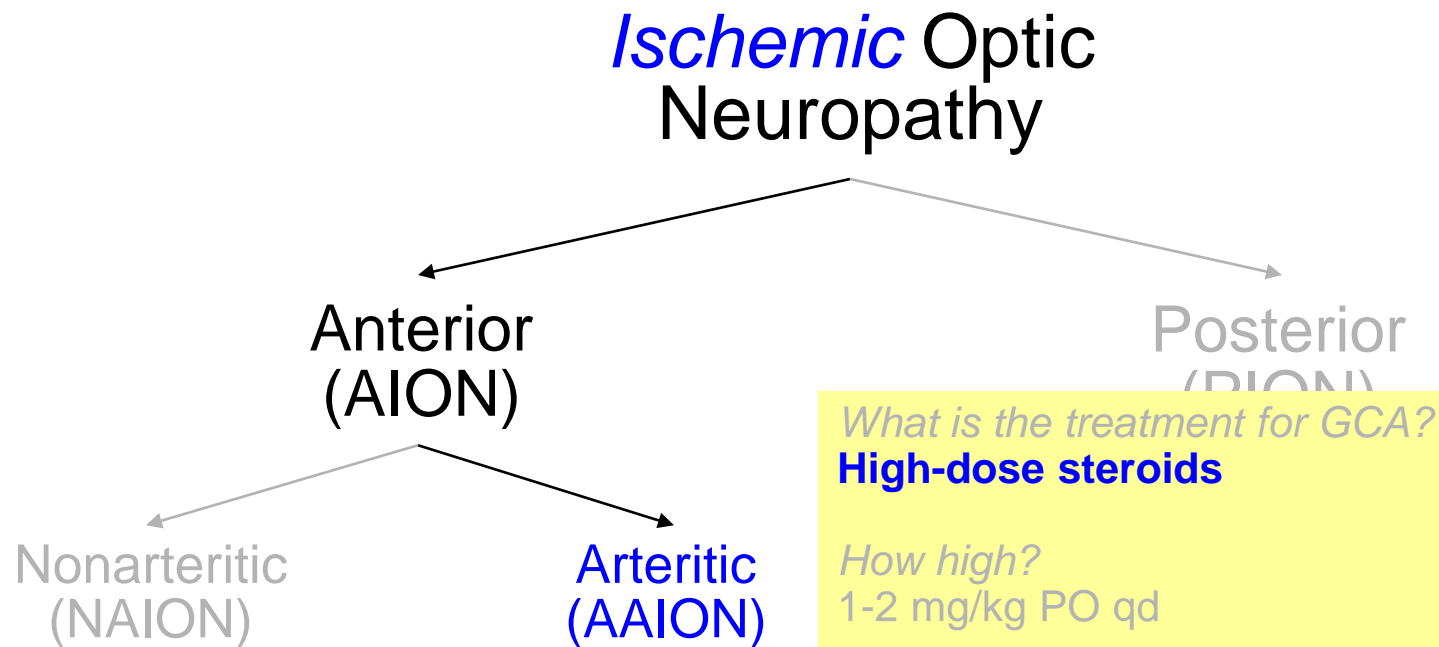
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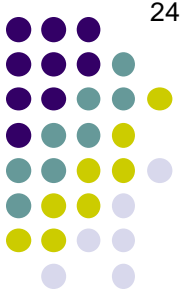
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Controversial—some authorities say the risk of recurrence is nil after one year, and the steroids can be stopped. Others say steroid therapy may need to be lifelong



# Ischemic Optic Neuropathy

## Ischemic Optic Neuropathy

Anterior  
(AION)

Posterior  
(PION)

Nonarteritic  
(NAION)

Arteritic  
(AAION)

What is the treatment for GCA?  
**High-dose steroids**

How high?  
1-2 mg/kg PO qd

*So if stopping steroids is controversial, why not just continue them indefinitely?*

can begin  
stopping  
ds

be reduced

*How long must low-dose steroid therapy be continued?*

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*So if stopping steroids is controversial, why not just continue them indefinitely? Because of their horrendous side effects, especially in the elderly population at risk for GCA. Your little old white lady is going to get:*

one word

and subsequently

three words

can begin  
steroids

be reduced

*How long must low-dose steroid therapy be continued?*

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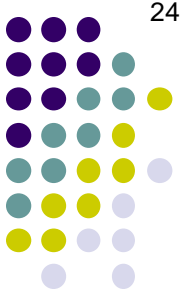
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can begin taking ds

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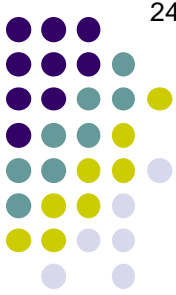
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can begin  
sting  
ds  
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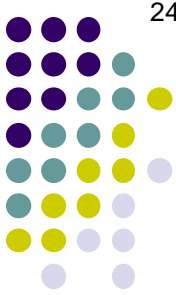
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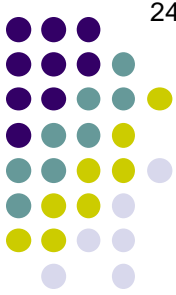
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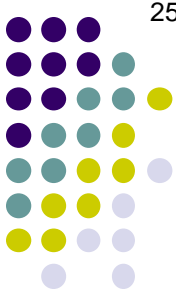
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can begin  
sting  
ds  
be reduced

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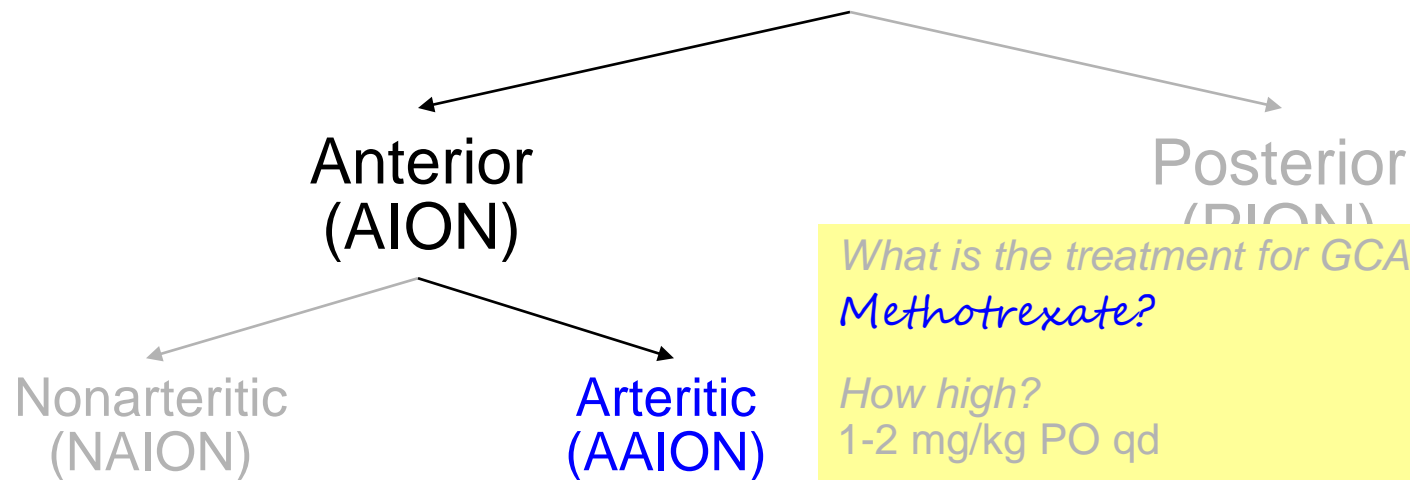
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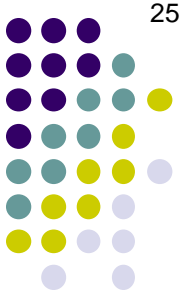
*What is the treatment for GCA?  
Methotrexate?*

*How high?  
1-2 mg/kg PO qd*

*Why not avoid these problems via steroid-sparing immunosuppressive therapy, eg, methotrexate (MTX)?*

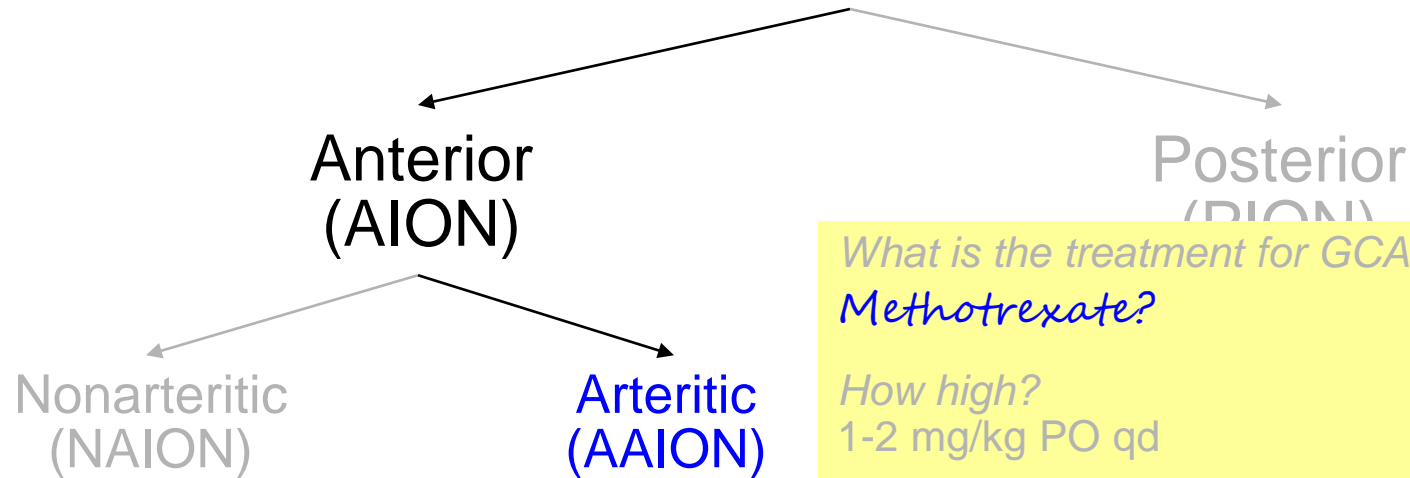
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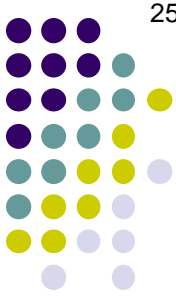
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How high?  
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Why not avoid these problems via steroid-sparing immunosuppressive therapy, eg, methotrexate (MTX)?  
MTX seems, at best, to produce a modest reduction in recurrence risk, and is not considered an appropriate stand-alone tx unless a pt is truly unable to tolerate systemic steroids

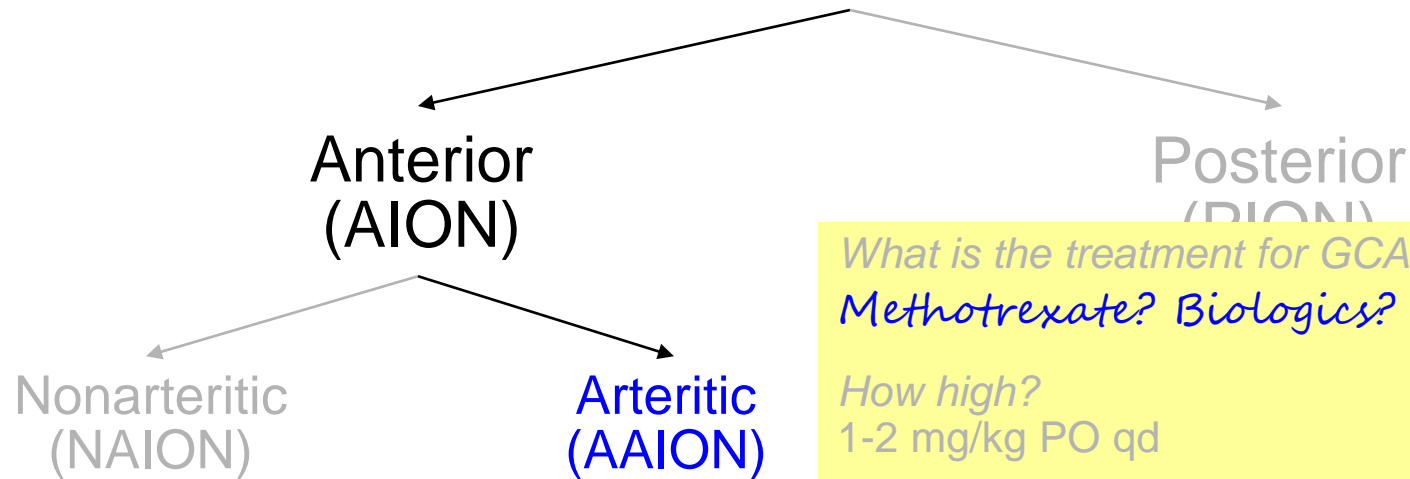
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What is the treatment for GCA?  
Methotrexate? Biologics?

How high?  
1-2 mg/kg PO qd

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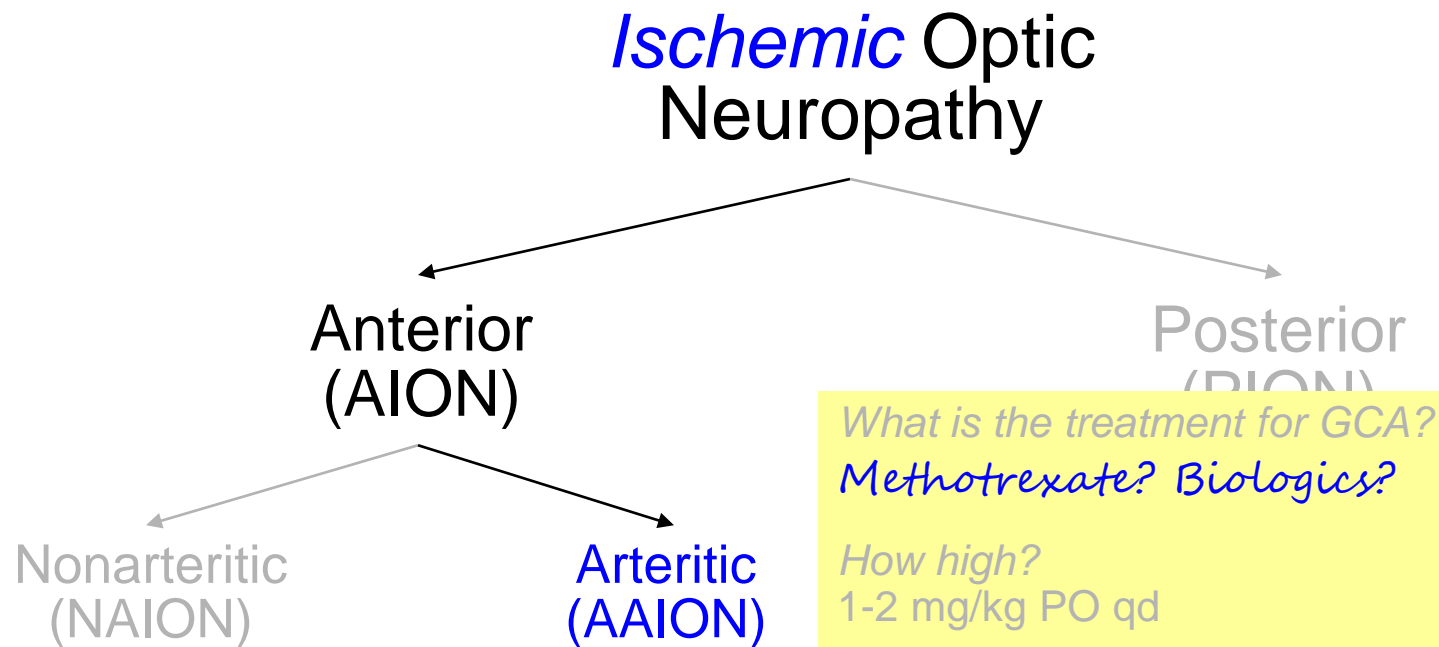
OK, how about one of those new-fangled biologics?

How long must low-dose steroid therapy be continued?

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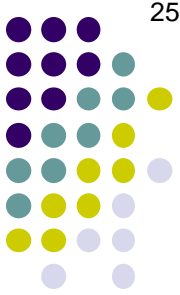


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*OK, how about one of those new-fangled biologics?*  
An interleukin-6 (IL-6) receptor antagonist (tocilizumab) is FDA approved for treating GCA.

*How long must low-dose steroid therapy be continued?*

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Methotrexate? **Biologics?**

How high?  
1-2 mg/kg PO qd

**What is the role of tocilizumab in the management of GCA?**

Why not  
MTX see  
appropriate

(MTX)?

OK, how

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1-2 mg/kg PO qd

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It allows steroids to be tapered off more rapidly. In other words, it **sustains remission**.

(MTX)?

OK, how

An interleukin-6 (IL-6) receptor antagonist (**tocilizumab**) is FDA approved for treating GCA.

How long must low-dose steroid therapy be continued?

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## Ischemic Optic Neuropathy

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(AION)

Posterior  
(PION)

Nonarteritic  
(NAION)

Arteritic  
(AAION)

What is the treatment for GCA?  
Methotrexate? **Biologics?**

How high?  
1-2 mg/kg PO qd

Why not  
MTX see  
appropriate

**What is the role of tocilizumab in the management of GCA?**

It allows steroids to be tapered off more rapidly. In other words, it **sustains remission**.

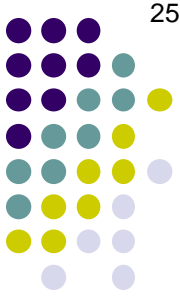
**Can tocilizumab be used as monotherapy for GCA?**

OK, how

An interleukin-6 (IL-6) receptor antagonist (**tocilizumab**) is FDA approved for treating GCA.

How long must low-dose steroid therapy be continued?

**Controversial**—some authorities say the risk of recurrence is nil after one year, and the steroids can be stopped. Others say steroid therapy may need to be lifelong



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**What is the role of tocilizumab in the management of GCA?**

It allows steroids to be tapered off more rapidly. In other words, it **sustains remission**.

**Can tocilizumab be used as monotherapy for GCA?**

As of this writing, there is no clinical evidence to support such an approach

OK, how

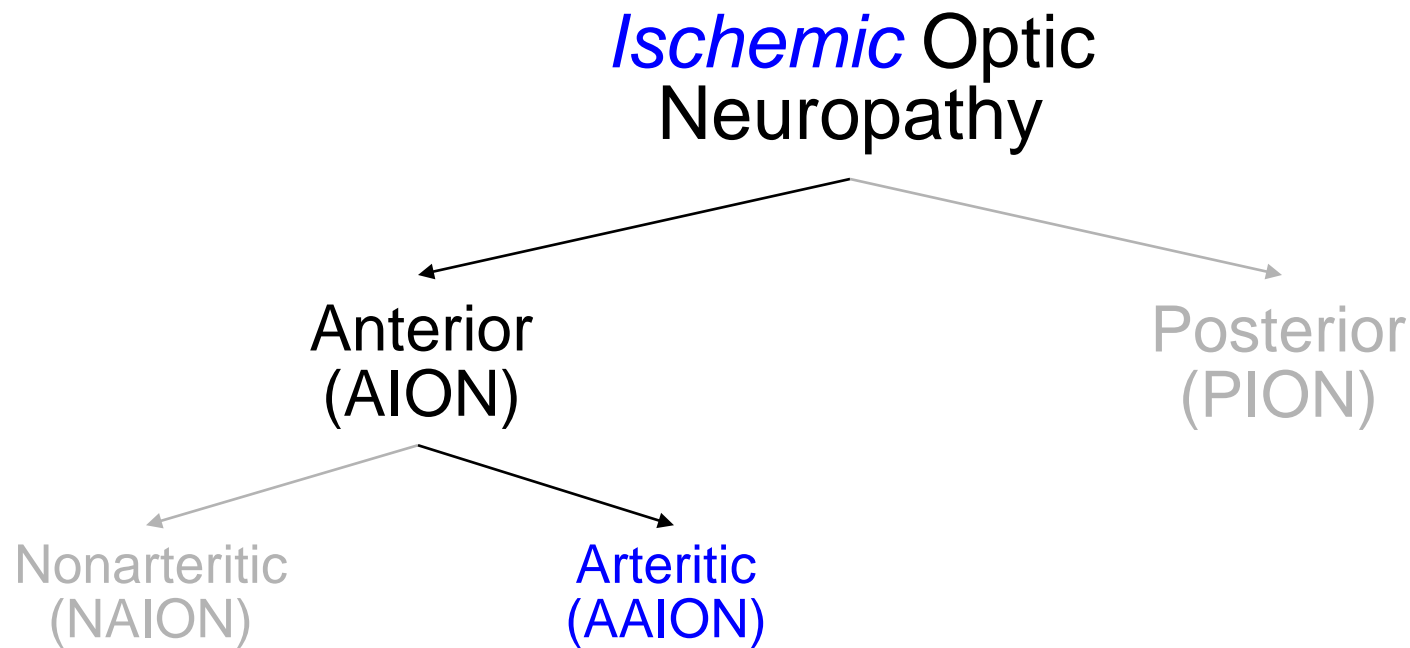
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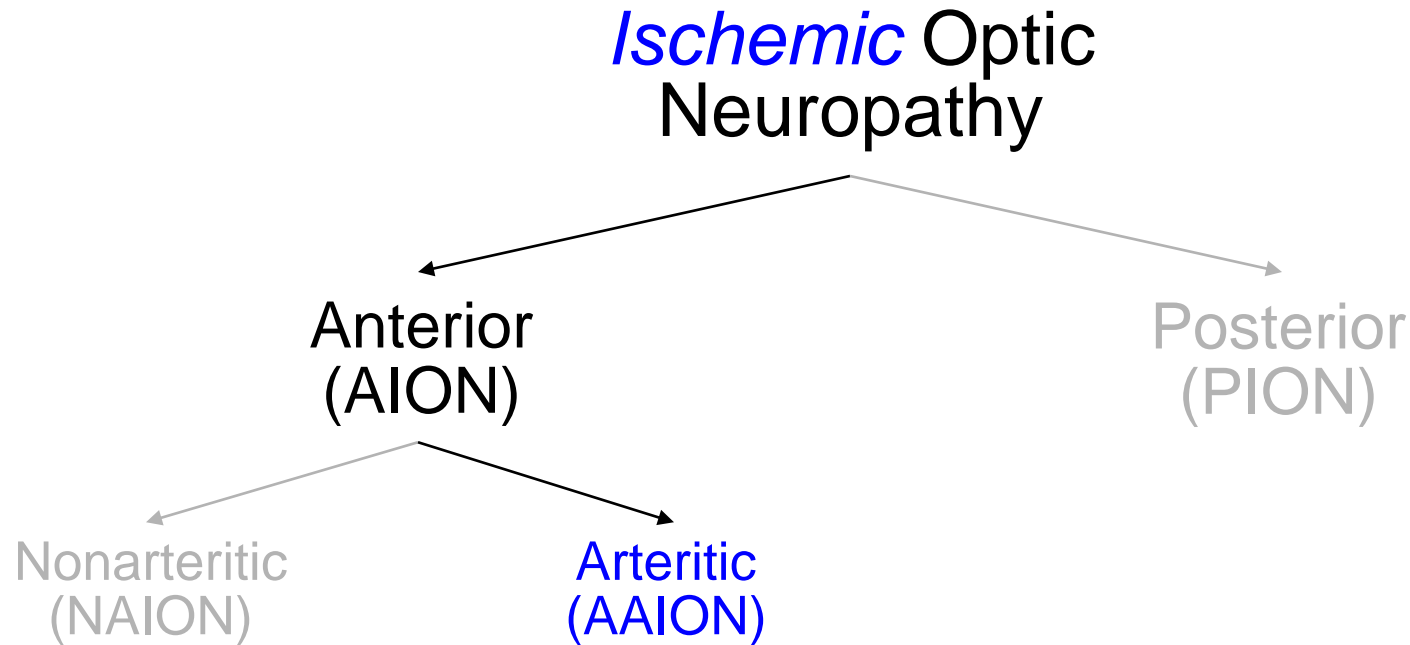
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*If a pt develops vision loss in one eye from GCA, what is the risk of occurrence in the fellow eye?*



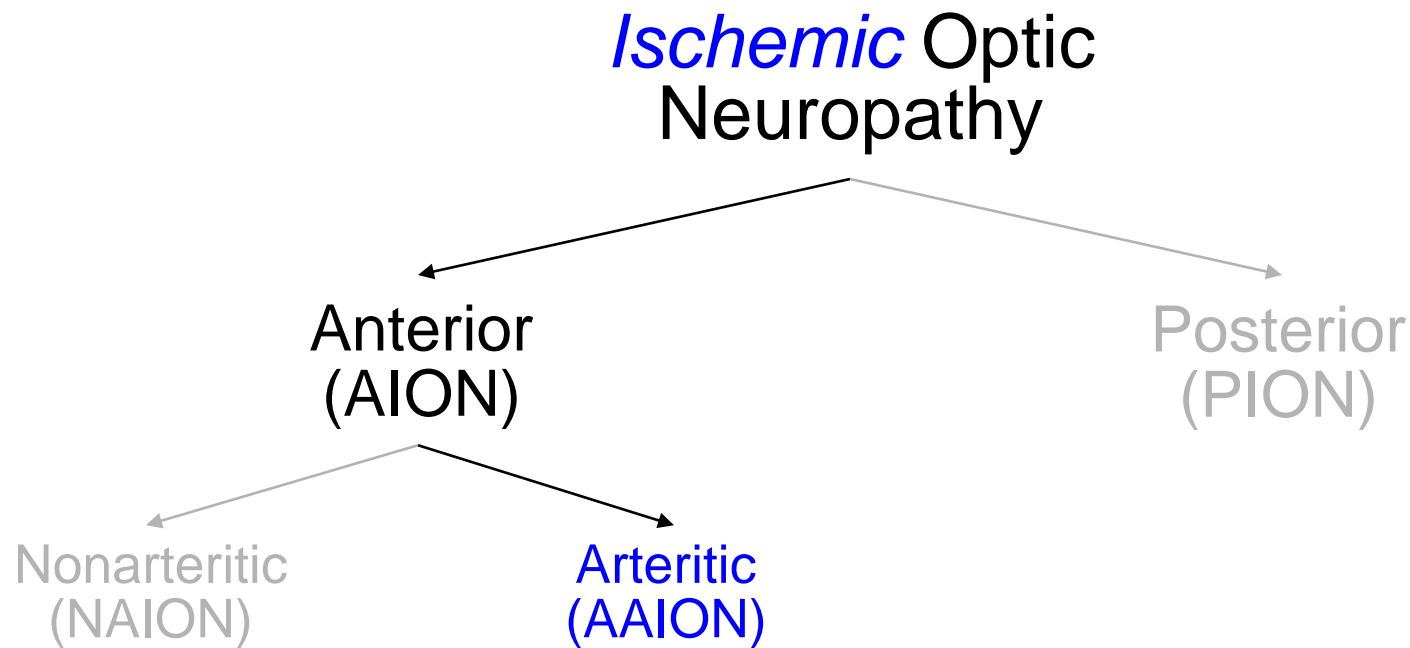
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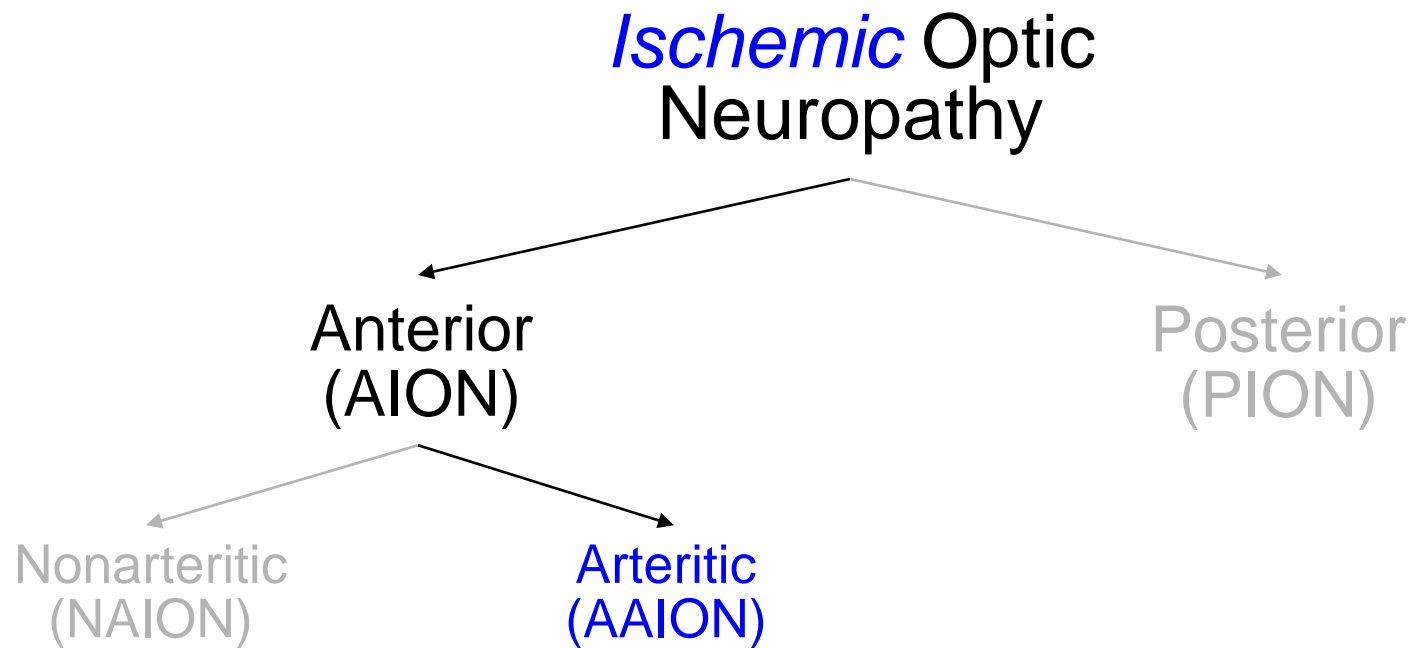


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*Of the 1/3 who will experience fellow-eye involvement, what is the time course?*

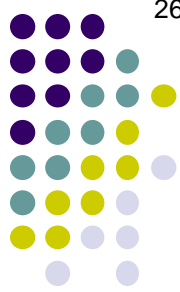


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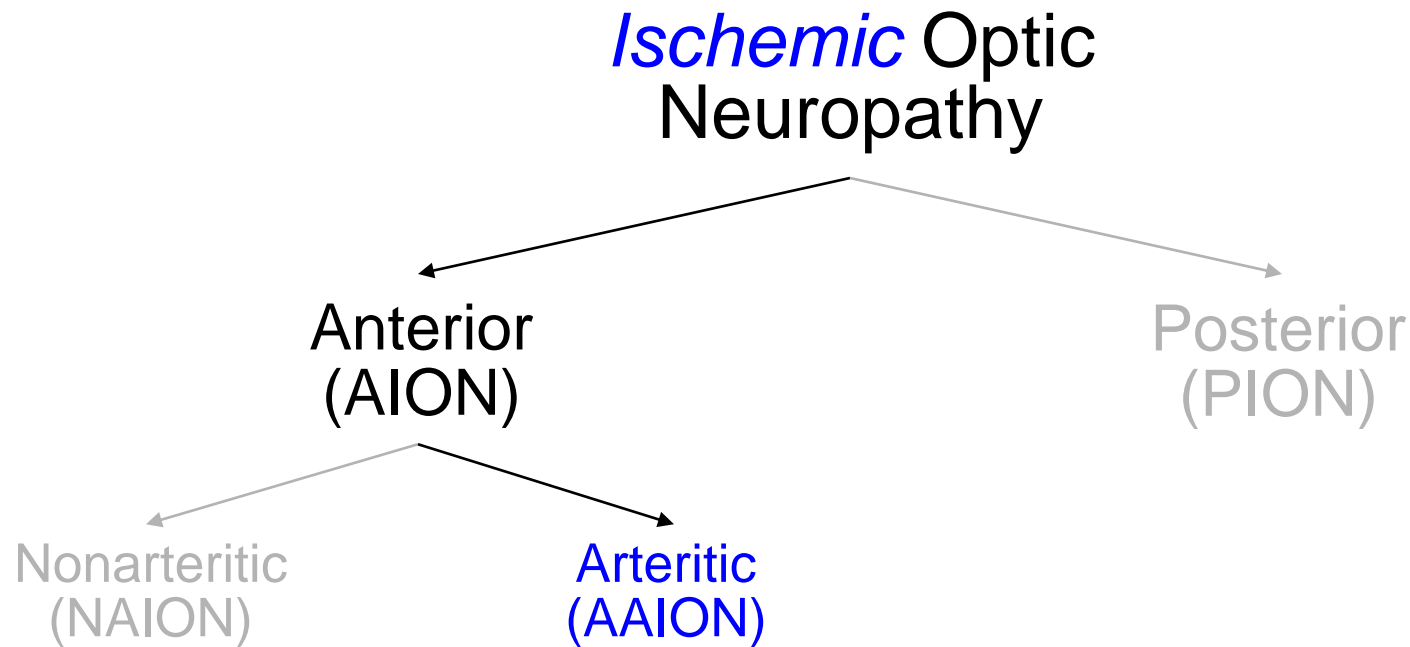


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 1/3 will lose vision within # and unit



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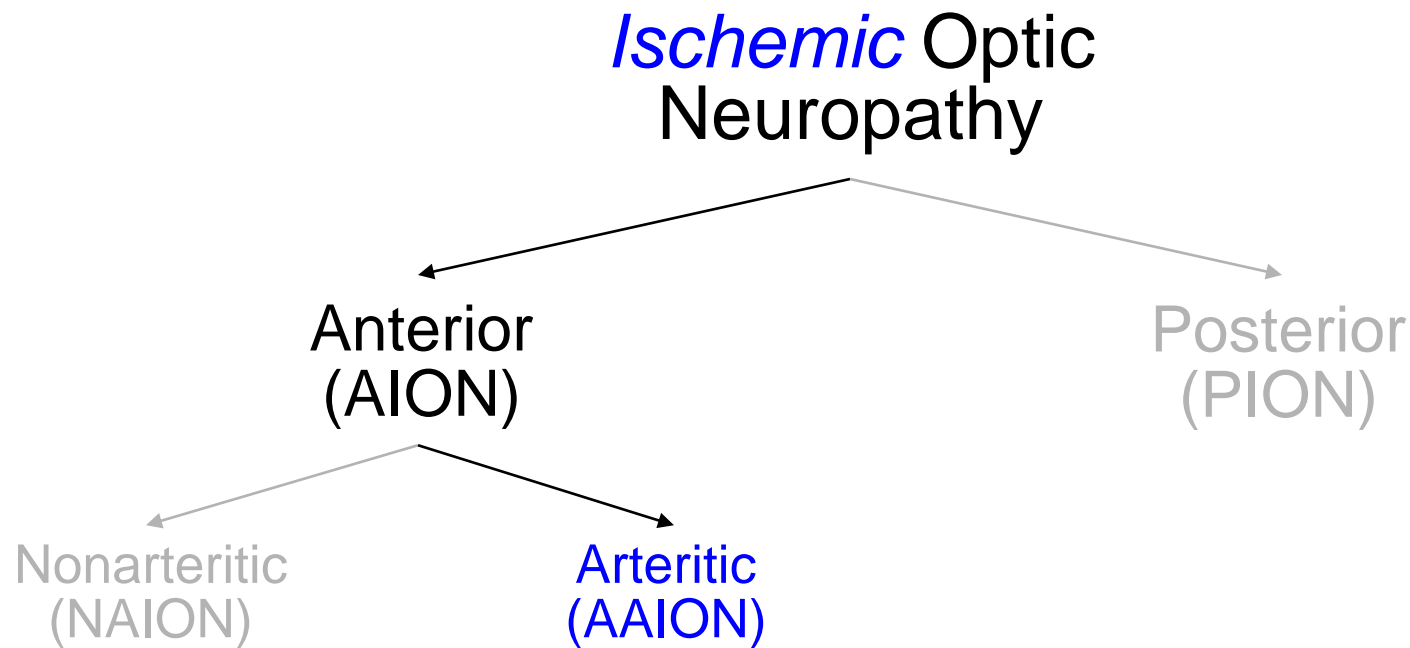


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1/3 will lose vision within **1 day**



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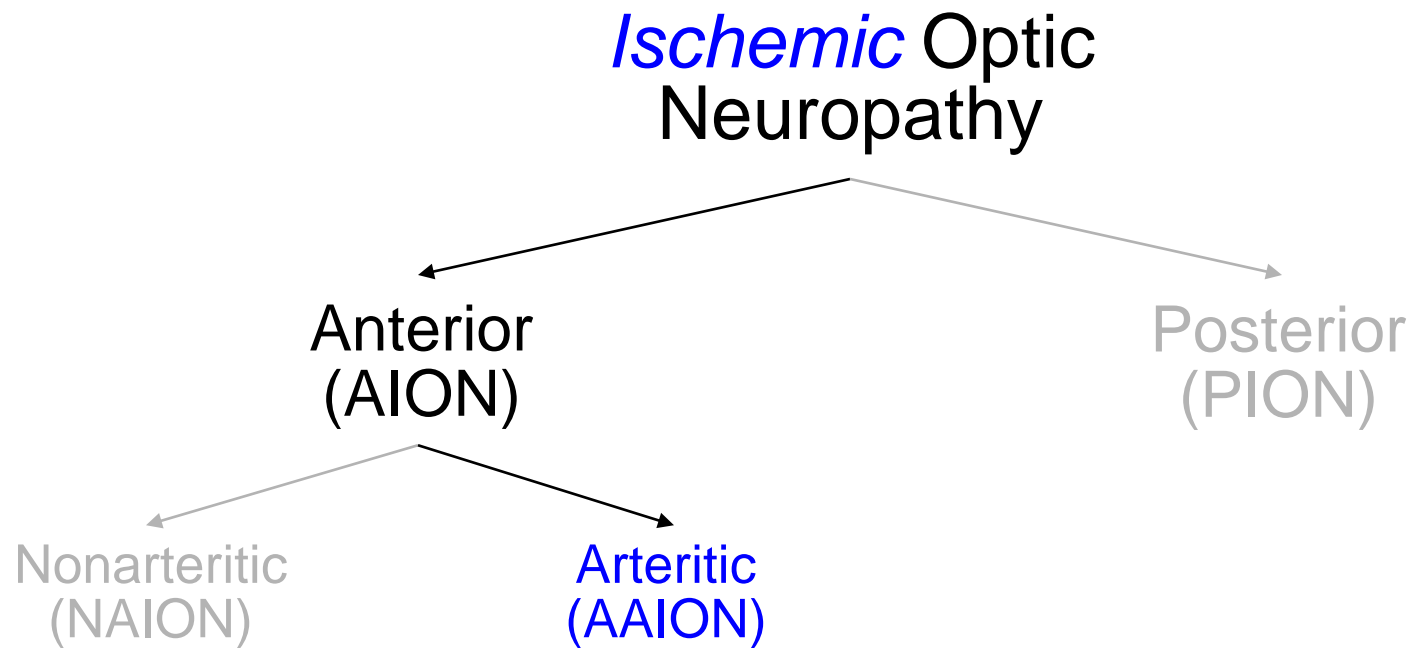
*This is what makes GCA with vision loss an ophthalmic emergency—  
you are fighting the clock to save vision in the **fellow eye!***

*Of the 1/3 who will experience fellow-eye involvement, what is the time course?*

**1/3 will lose vision within 1 day**



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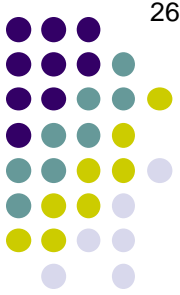
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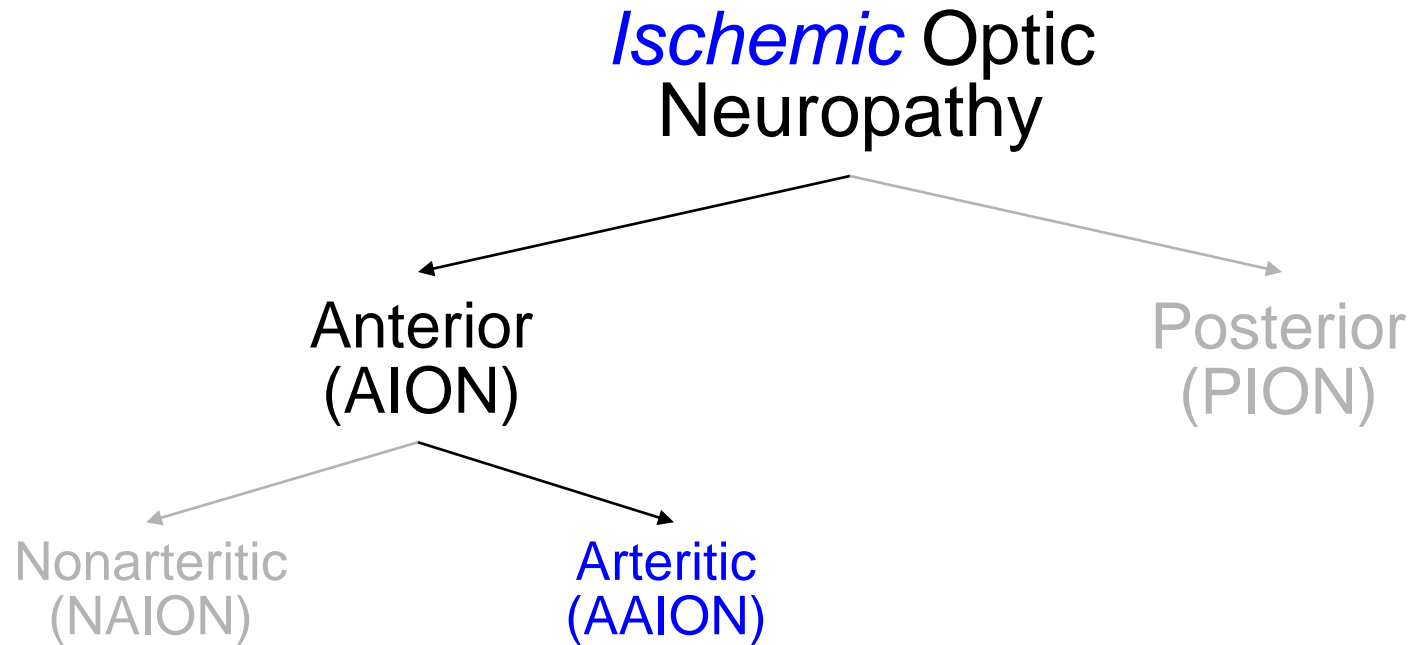
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Another 1/3 will lose vision within

# and unit



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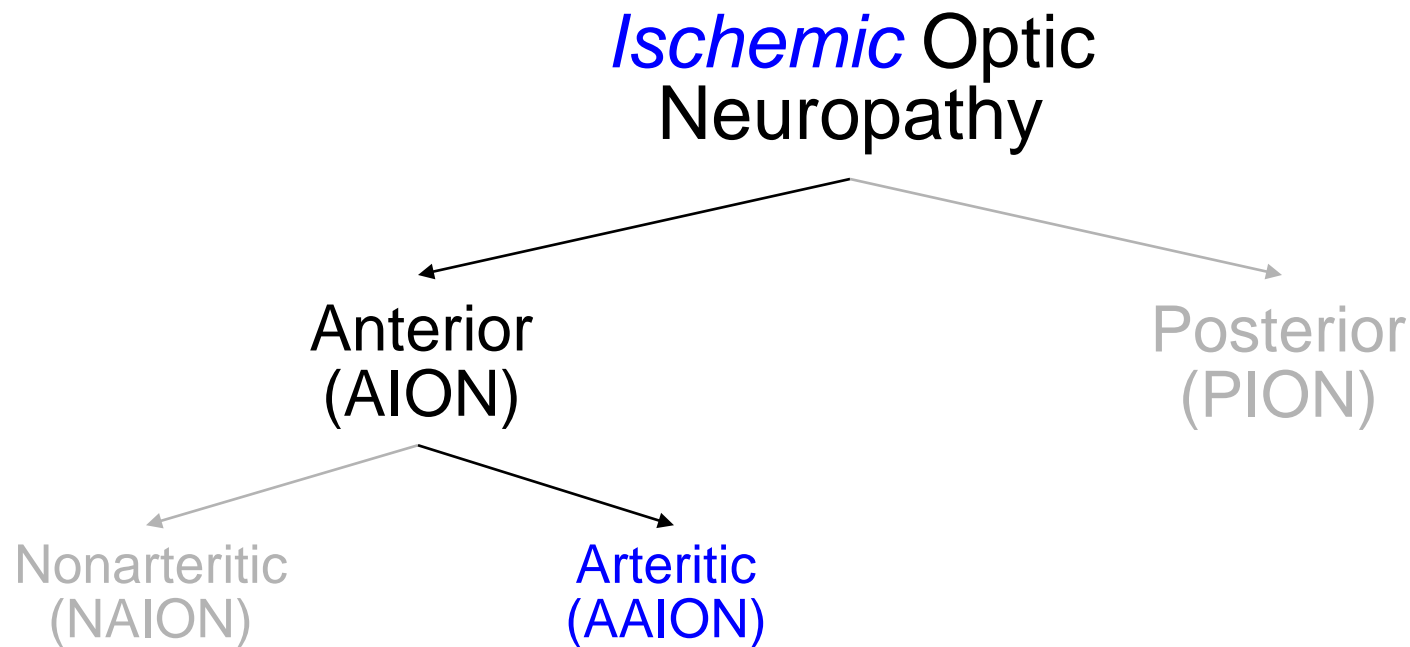


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*Of the 1/3 who will experience fellow-eye involvement, what is the time course?*  
1/3 will lose vision within **1 day**  
Another 1/3 will lose vision within **1 week**



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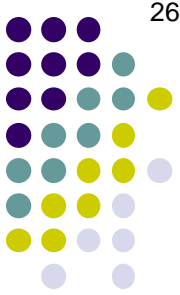
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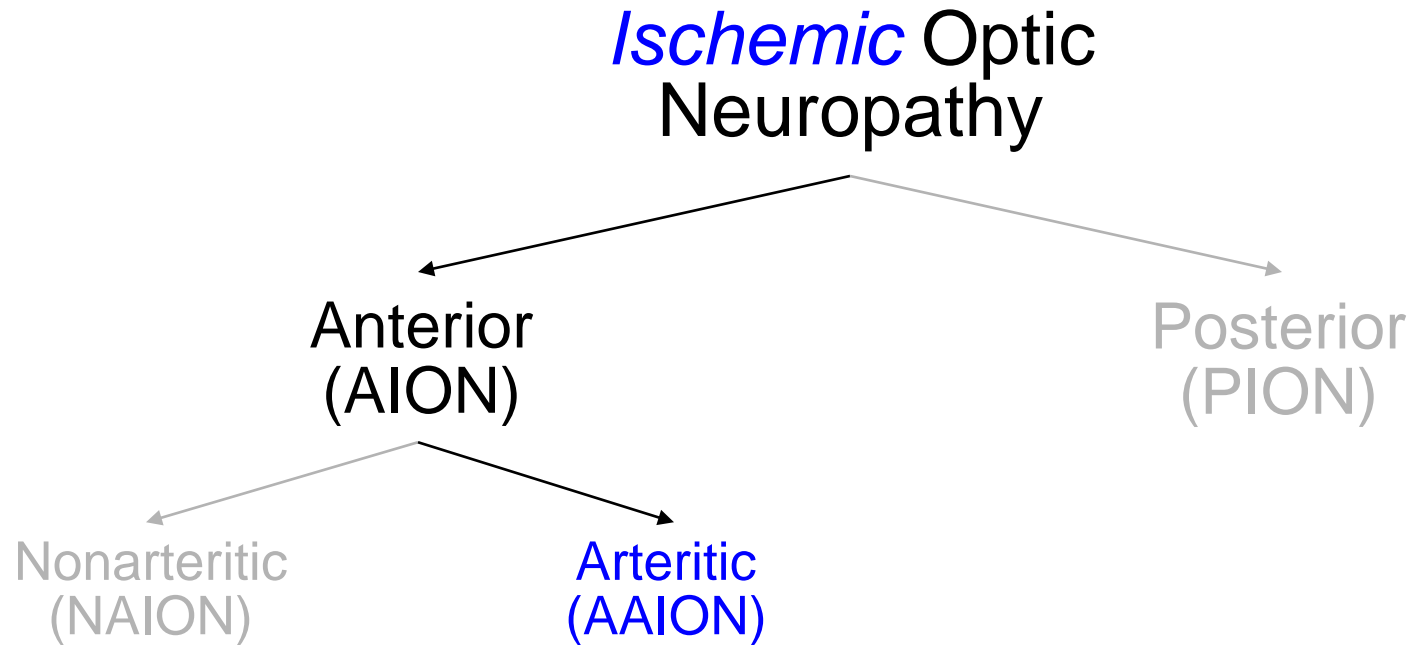
Another 1/3 will lose vision within **1 week**

Most of the remaining 1/3 will lose vision within

# and unit



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Very high—if untreated, about **1/3** will lose vision in the fellow eye

*Of the 1/3 who will experience fellow-eye involvement, what is the time course?*

1/3 will lose vision within **1 day**

Another 1/3 will lose vision within **1 week**

Most of the remaining 1/3 will lose vision within **1 month**