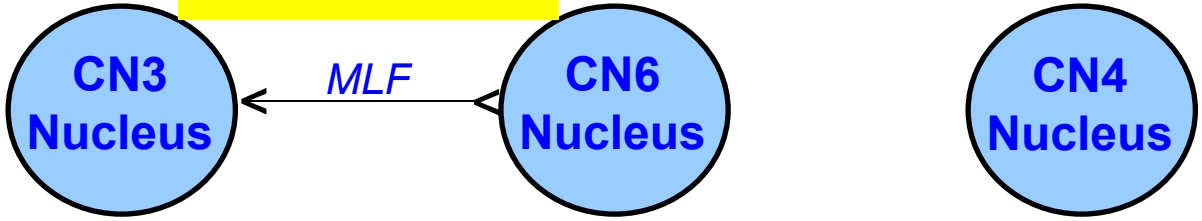
Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Supranuclear

Internuclear

Nuclear



Infranuclear

- Fascicular
- Subarachnoid
- Cavernous sinus
- Orbital
- Neuromuscular junction
- Extraocular muscle

This slide encapsulates one way to think about the motility disorders. If it is unfamiliar, I strongly suggest you review the slide-set entitled '***Motility disorders: Overview***' before proceeding.
Now on with the show!

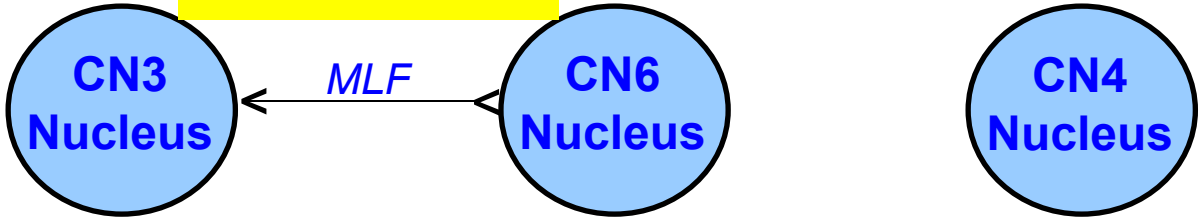
Motility Disorders: *Nontraumatic* ***Isolated*** *Unilateral CN3 Palsy*

What does **isolated** *mean in this context?*

Supranuclear

Internuclear

Nuclear



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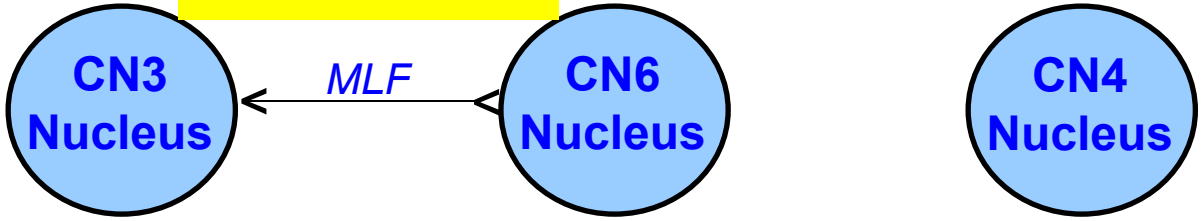
Motility Disorders: *Nontraumatic* ***Isolated*** *Unilateral CN3 Palsy*

What does **isolated** *mean in this context?*
It means 'absent nonocular CNS signs'

Supranuclear

Internuclear

Nuclear



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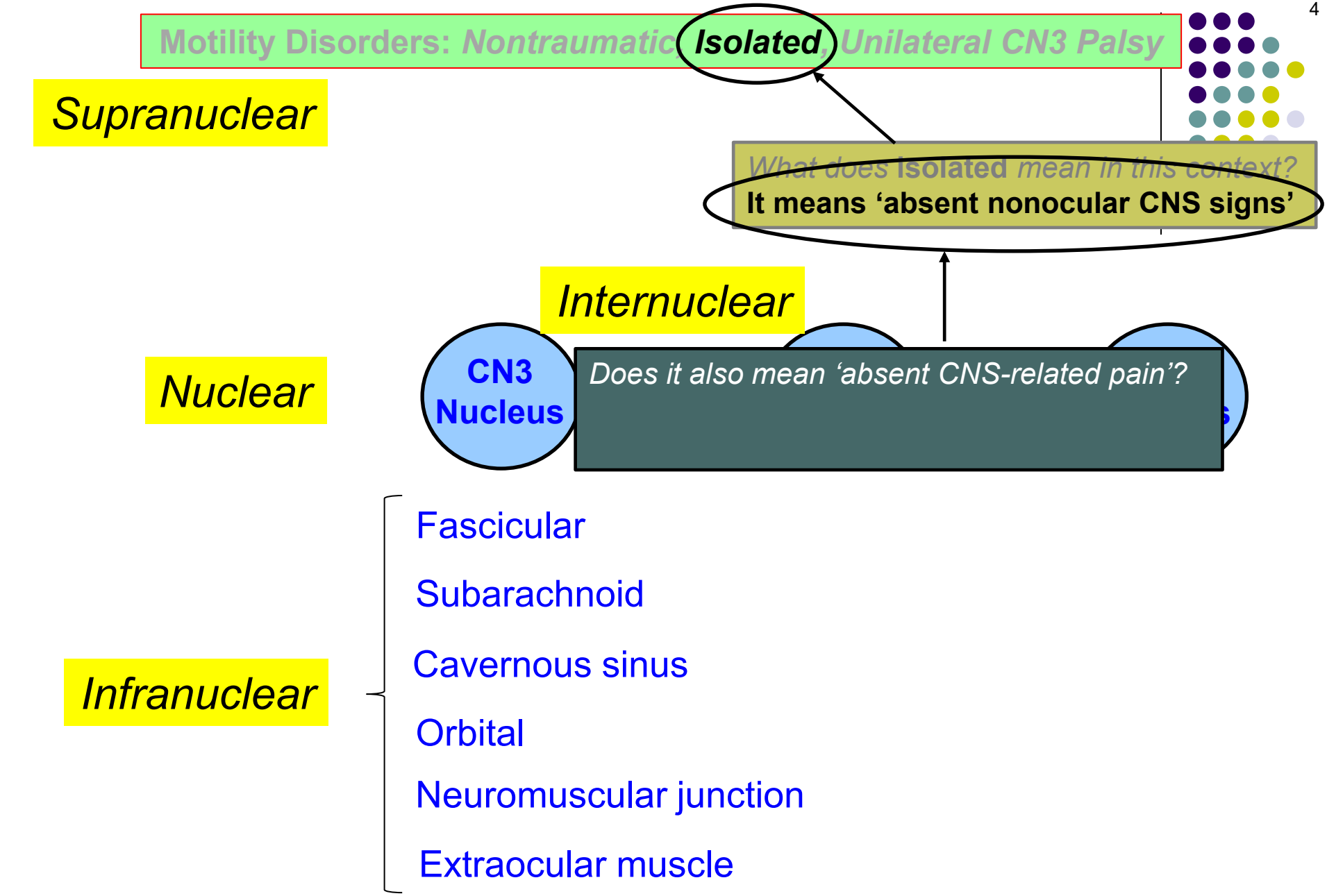

Motility Disorders: Nontraumatic, Isolated, Unilateral CN3 Palsy
Supranuclear
What does Isolated mean in this context?
It means 'absent nonocular CNS signs'
Internuclear
Nuclear
CN3 Nucleus
Does it also mean 'absent CNS-related pain'?
Infranuclear
Fascicular
Subarachnoid
Cavernous sinus
Orbital
Neuromuscular junction
Extraocular muscle

Motility Disorders: *Nontraumatic* ***Isolated*** *Unilateral CN3 Palsy*

Supranuclear

What does **Isolated** *mean in this context?*

It means 'absent nonocular CNS signs'

Internuclear

Nuclear

CN3 Nucleus

Does it also mean 'absent CNS-related pain'?
It does not. The sorts of CN3 palsies covered in this slide-set can be associated with pain

Infranuclear

- Fascicular
- Subarachnoid
- Cavernous sinus
- Orbital
- Neuromuscular junction
- Extraocular muscle

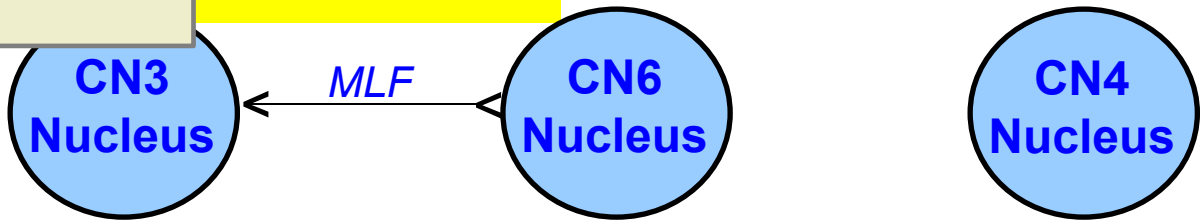
Motility Disorders: *Nontraumatic*, ***Isolated***, ***Unilateral*** *CN3 Palsy*

Supranuclear

What does 'isolated and unilateral' imply re etiology?

Internuclear

Nuclear



Infranuclear

- Fascicular
- Subarachnoid
- Cavernous sinus
- Orbital
- Neuromuscular junction
- Extraocular muscle

Motility Disorders: *Nontraumatic*, ***Isolated, Unilateral*** *CN3 Palsy*

Supranuclear

What does 'isolated and unilateral' imply re etiology?
It implies the lesion is infranuclear, somewhere along the path from the subarachnoid to the orbital portions

Internuclear

Nuclear

CN3 Nucleus ← *MLF* ← CN6 Nucleus

CN4 Nucleus

Infranuclear

- *Fascicular*
- **Subarachnoid**
- **Cavernous sinus**
- **Orbital**
- *Neuromuscular junction*
- *Extraocular muscle*

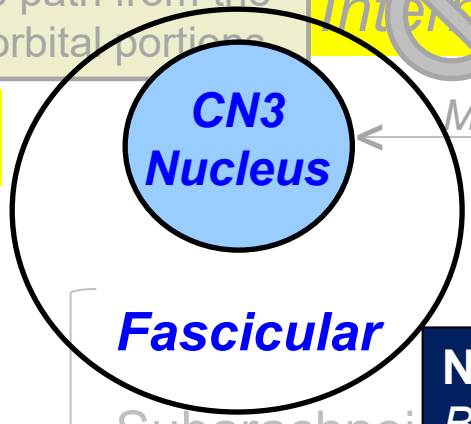
Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

~~*Supranuclear*~~

What does 'isolated and unilateral' imply re etiology?
It implies the lesion is infranuclear, somewhere along the path from the subarachnoid to the orbital portion

~~*Internuclear*~~

Nuclear



MLF

CN6 Nucleus

CN4 Nucleus

Infranuclear

Subarachnoi

Cavernous si

Orbital

Ne muscular junction

Ex ular muscle

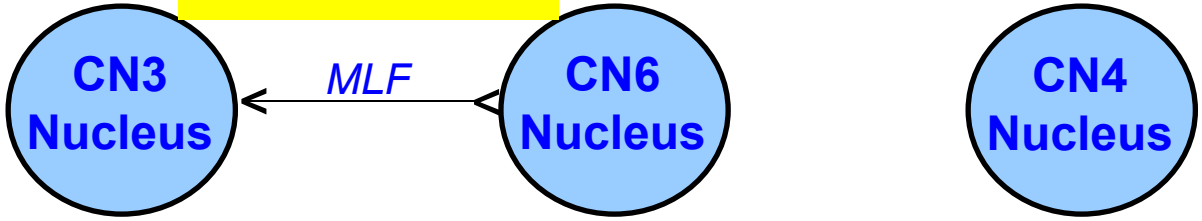
Note: *It should be mentioned (because the BCSC* Neuro *book mentions it) that,* ***rarely****, a brainstem lesion (ie, nuclear; fascicular) can produce an isolated unilateral CN3 palsy*

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Supranuclear

Internuclear

Nuclear



Infranuclear

- Fascicular
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- Cavernous sinus
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The majority of nontraumatic isolated third nerve palsies are secondary to what pathologic event?

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

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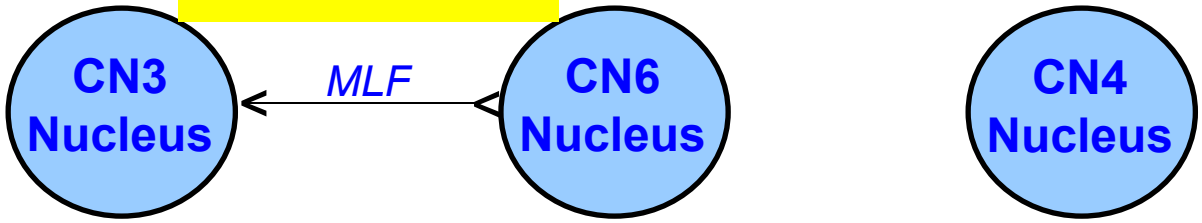

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The majority of nontraumatic isolated third nerve palsies are secondary to what pathologic event?
Microvascular injury; ie, ischemia

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

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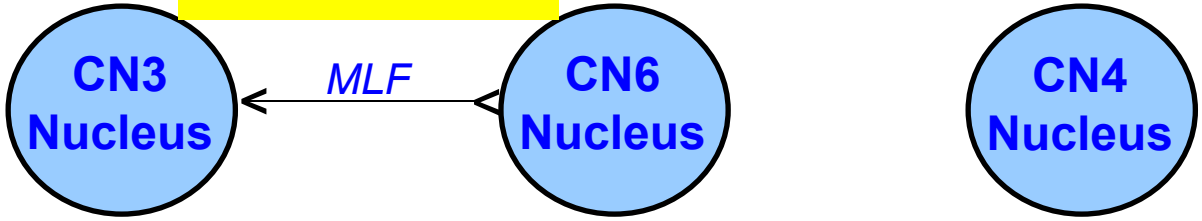

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The majority of nontraumatic isolated third nerve palsies are secondary to what pathologic event?

Microvascular injury; ie, ischemia

We'll unpack this concept in detail later in the side-set

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

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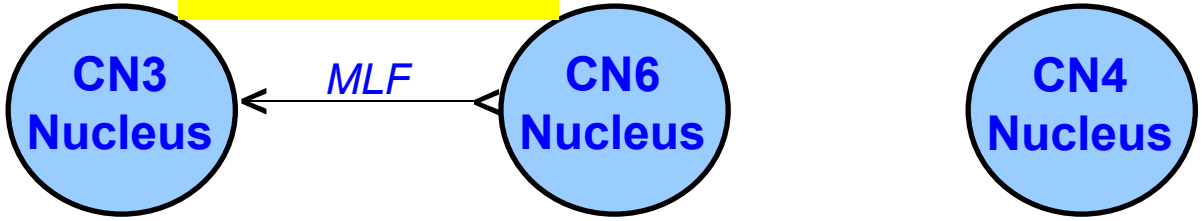

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In which portion of the pathway does this sort of injury occur?

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

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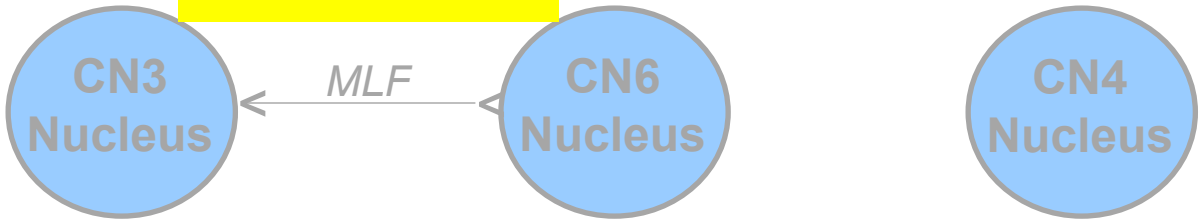
Nuclear



Infranuclear

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- **Subarachnoid**
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In which portion of the pathway does this sort of injury occur?
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Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

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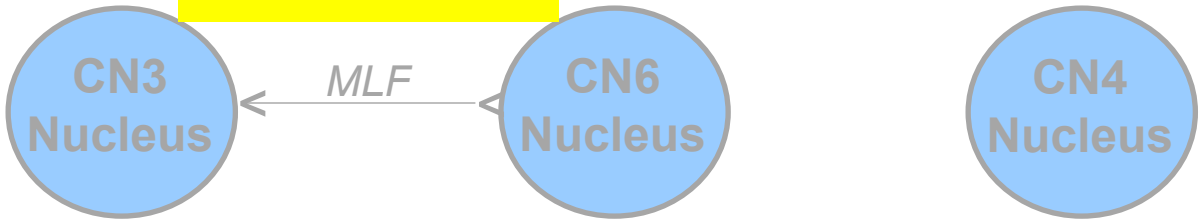

Infranuclear

- *Fascicular?*
- **Subarachnoid**
- *Cavernous sinus?*
- *Orbital?*
- *Neuromuscular junction?*
- *Extraocular muscle?*

The majority of nontraumatic isolated third nerve palsies are secondary to what pathologic event?
Microvascular injury; ie, ischemia

In which portion of the pathway does this sort of injury occur?
The subarachnoid (although it must be noted that it could occur along the portion as well)

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

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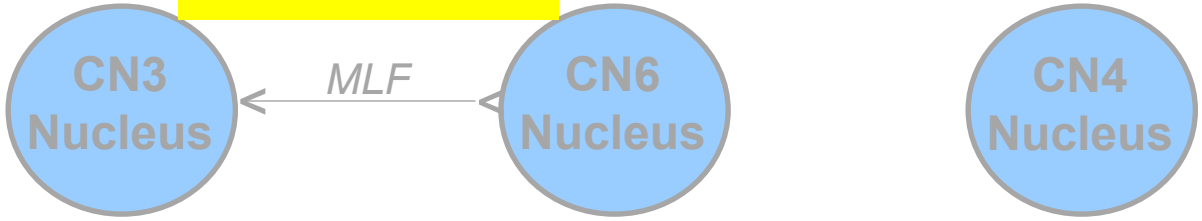

Infranuclear

- Fascicular
- **Subarachnoid**
- **Cavernous sinus**
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The majority of nontraumatic isolated third nerve palsies are secondary to what pathologic event?
Microvascular injury; ie, ischemia

In which portion of the pathway does this sort of injury occur?
The subarachnoid (although it must be noted that it could occur along the cavernous sinus portion as well)

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

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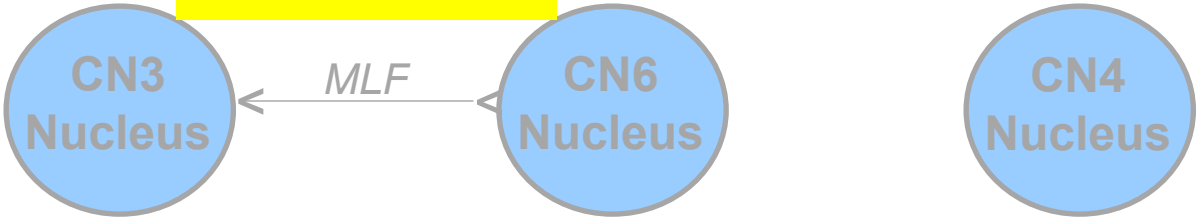

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- Fascicular
- Subarachnoid
- **Cavernous sinus**
- Extraocular muscle

The majority of nontraumatic isolated third nerve palsies are secondary to what pathologic event?
Microvascular injury; ie, ischemia

Note that this refers to a microvascular injury that *just happens* to occur to the cavernous sinus portion of the nerve. It is **not** referring to ophthalmoparesis owing to a process intrinsic to the cavernous sinus itself!

be noted that it could occur along the **cavernous sinus** portion as well)

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

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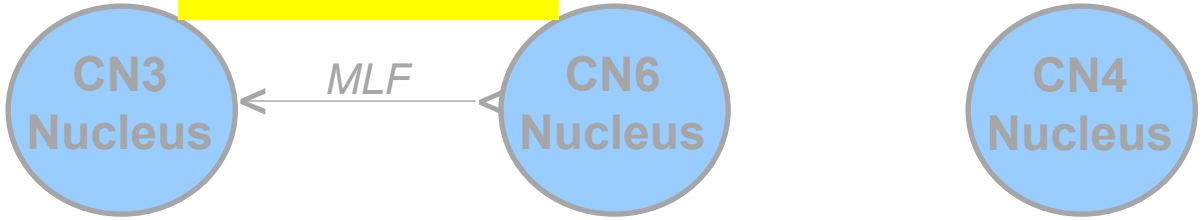

Infranuclear

- Fascicular
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- **Cavernous sinus**
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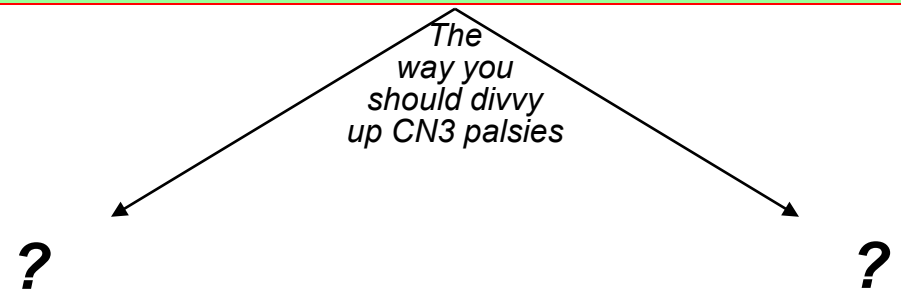
The majority of nontraumatic isolated third nerve palsies are secondary to what pathologic event?
Microvascular injury; ie, ischemia

Note that this refers to a microvascular injury that *just happens* to occur to the cavernous sinus portion of the nerve. It is **not** referring to *ophthalmoparesis owing to a process intrinsic to the cavernous sinus itself*!

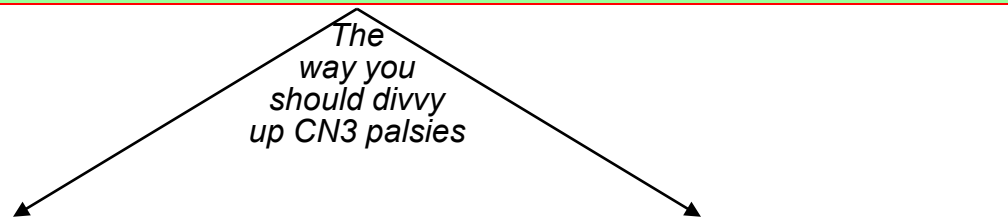
be noted that it could occur along the **cavernous sinus** portion as well)

Ophthalmoparesis owing to a cavernous-sinus process is addressed in its own slide-set (N19)

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



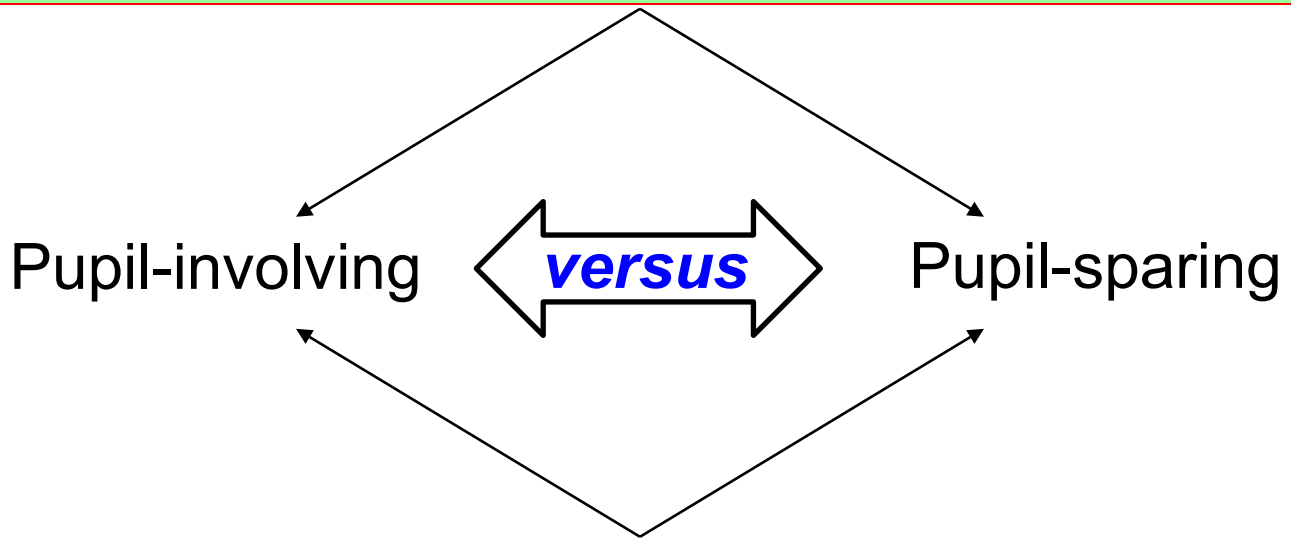
Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



Pupil-involving

Pupil-sparing

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

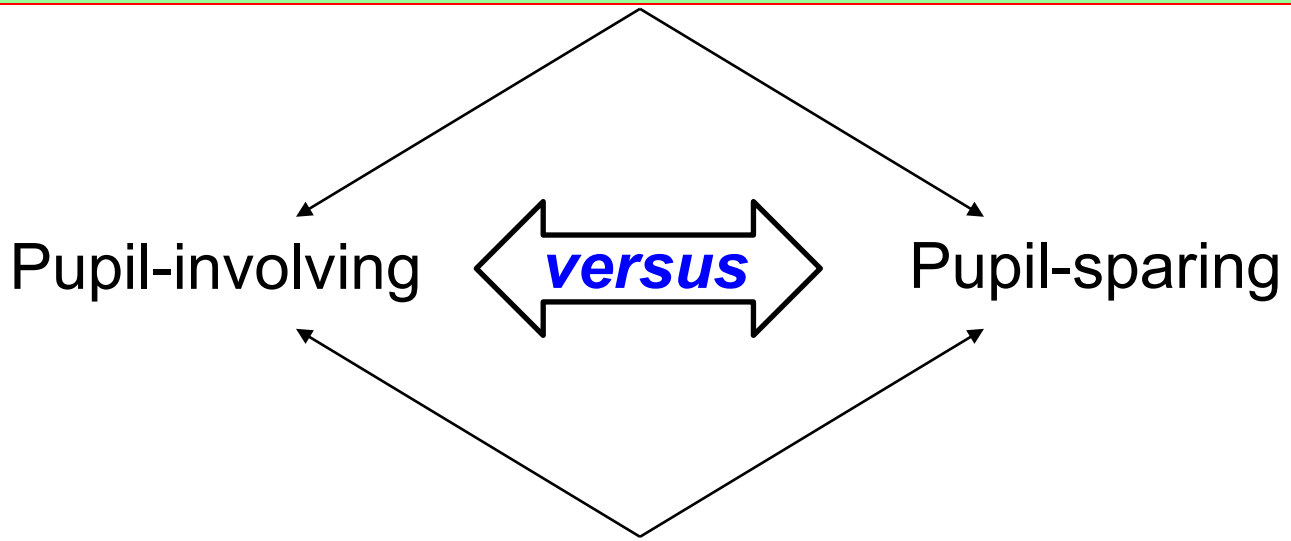


What does it mean to say a CN3 palsy 'involves the pupil'? That is, what will be abnormal about the pt's exam?

1)

2)

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

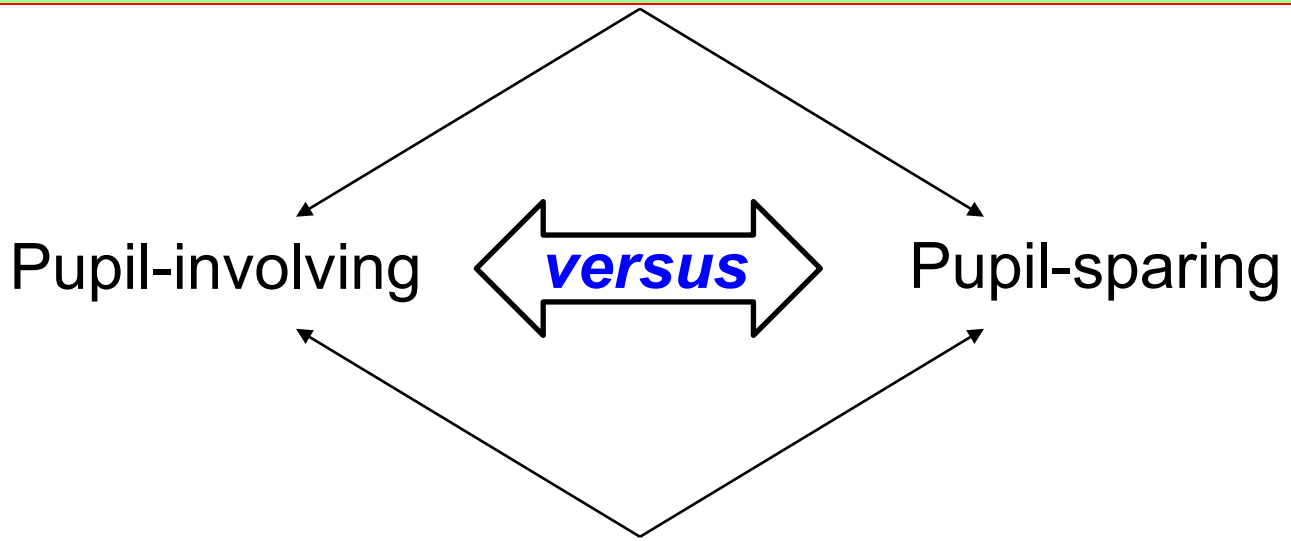


What does it mean to say a CN3 palsy 'involves the pupil'? That is, what will be abnormal about the pt's exam?

1) The pt will have unilateral ophthalmoparesis in a pattern consistent with innervation by CN3; and

2)

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

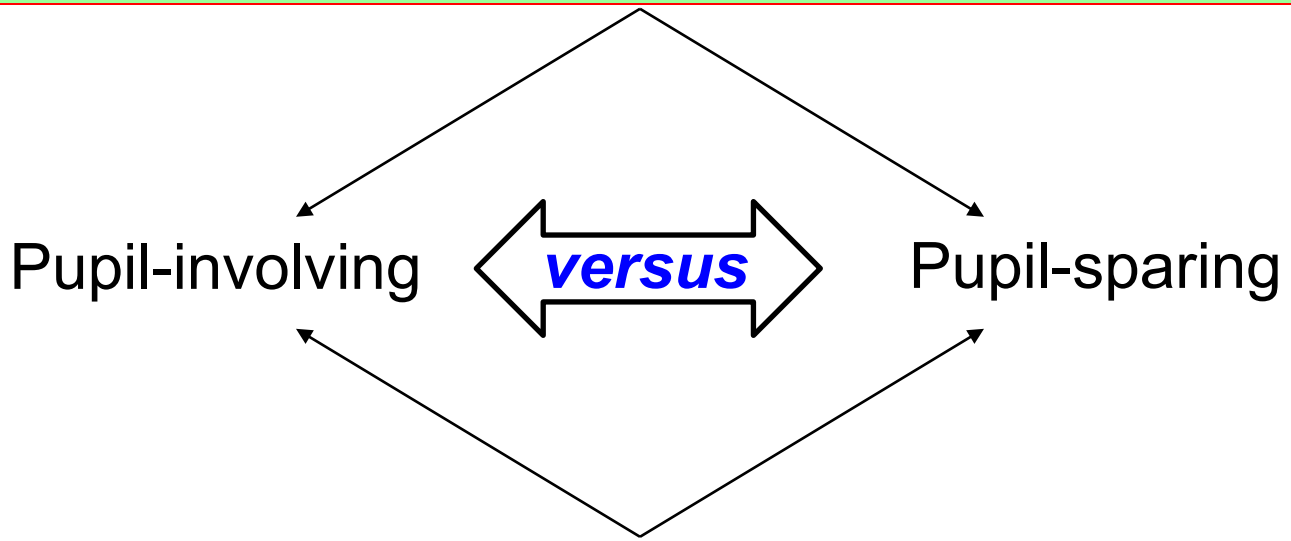


What does it mean to say a CN3 palsy 'involves the pupil'? That is, what will be abnormal about the pt's exam?

1) The pt will have unilateral ophthalmoparesis in a pattern consistent with innervation by CN3; and

2) The pt will have pupil finding (one word)

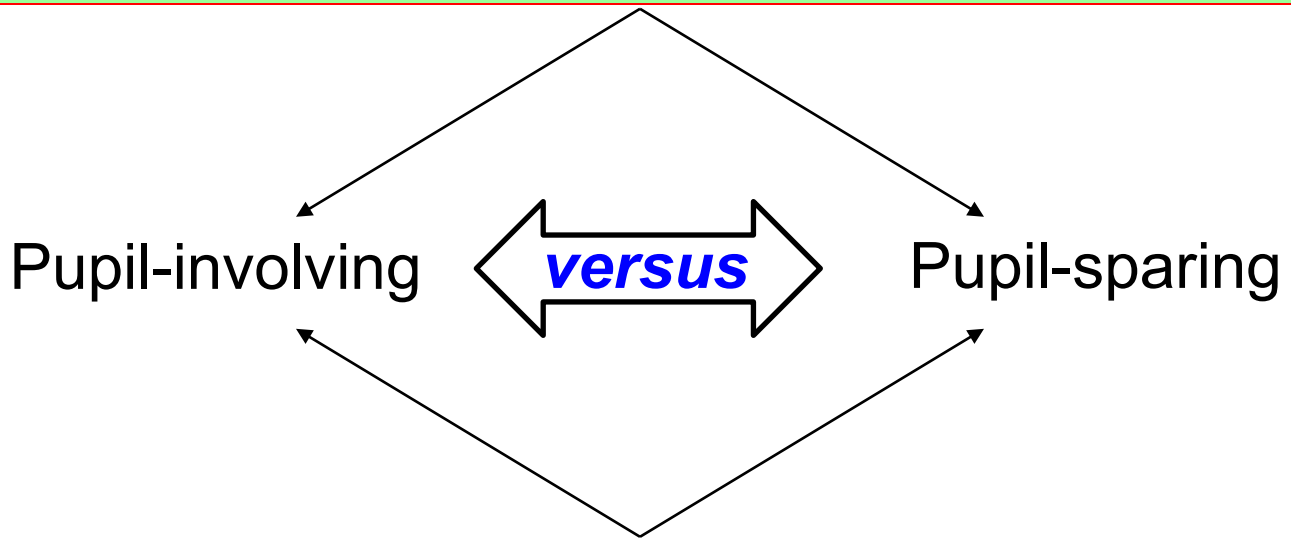
Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



What does it mean to say a CN3 palsy 'involves the pupil'? That is, what will be abnormal about the pt's exam?

1) The pt will have unilateral ophthalmoparesis in a pattern consistent with innervation by CN3; and
2) The pt will have anisocoria

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

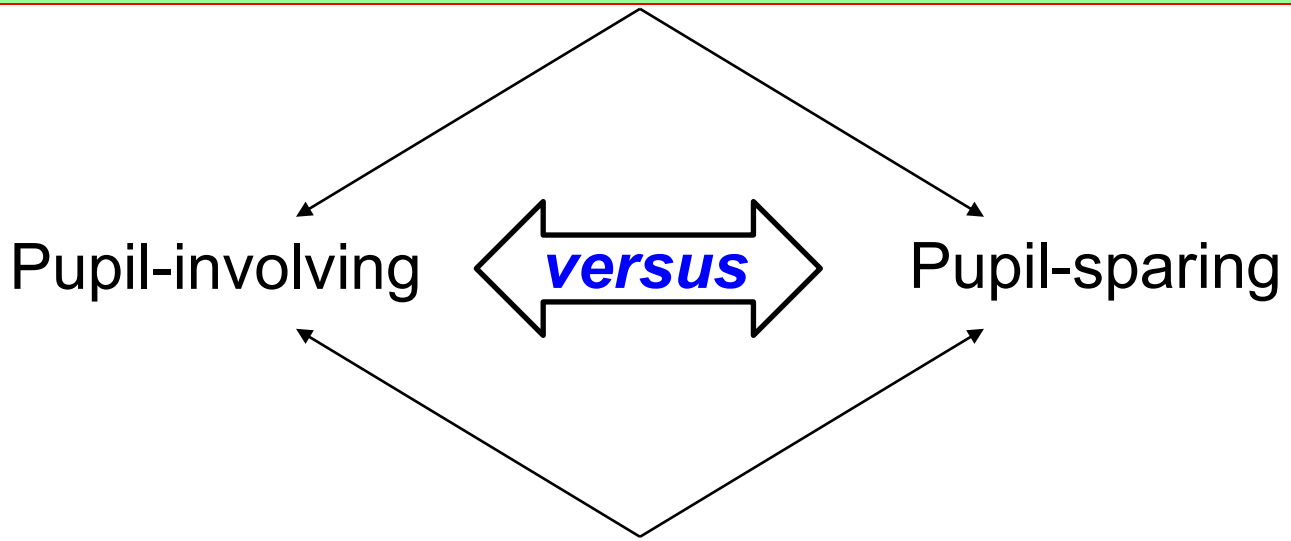


What does it mean to say a CN3 palsy 'involves the pupil'? That is, what will be abnormal about the pt's exam?

1) The pt will have unilateral ophthalmoparesis in a pattern consistent with innervation by CN3; and

2) The pt will have anisocoria , and the larger vs smaller pupil will be ipsilateral to the paresis

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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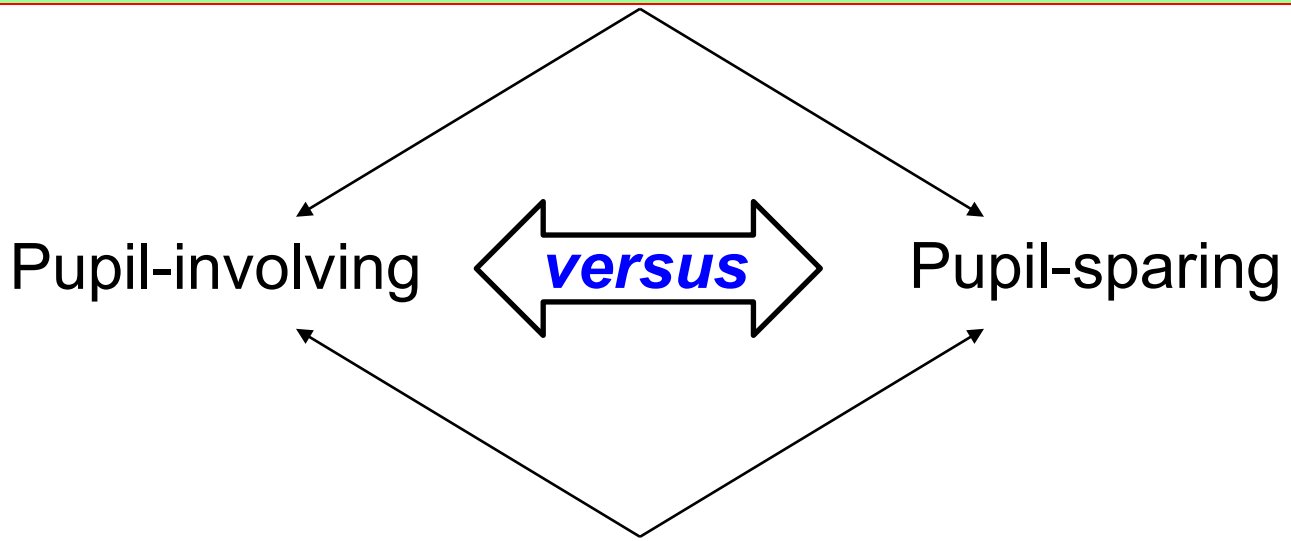
Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Pupil-involving CN3 palsy of the right eye

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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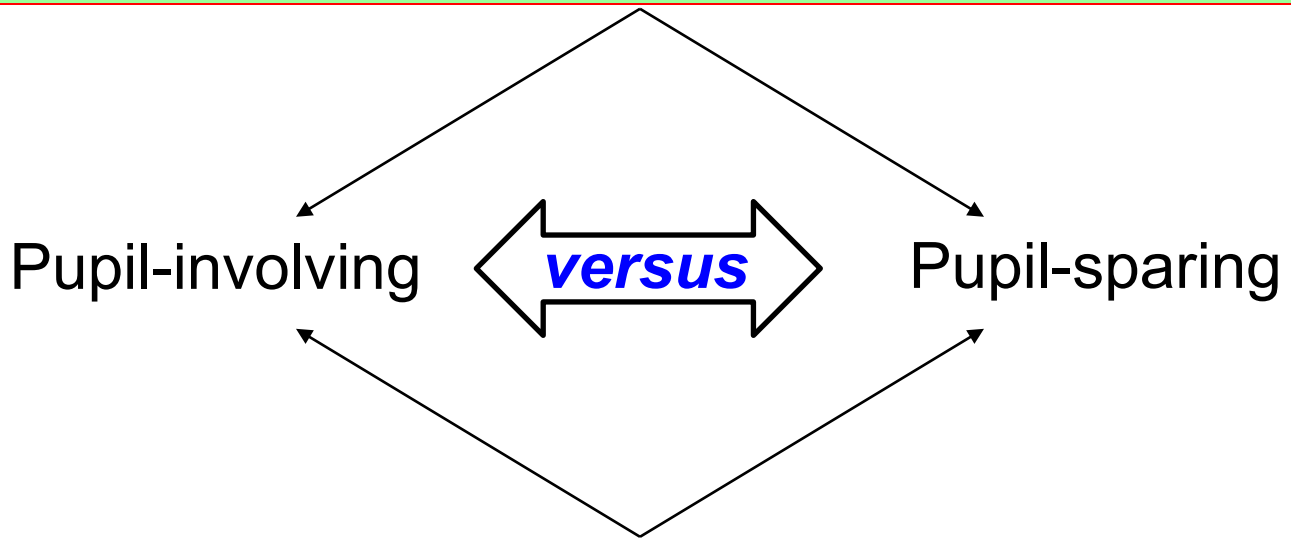
How much larger are we talking about here?

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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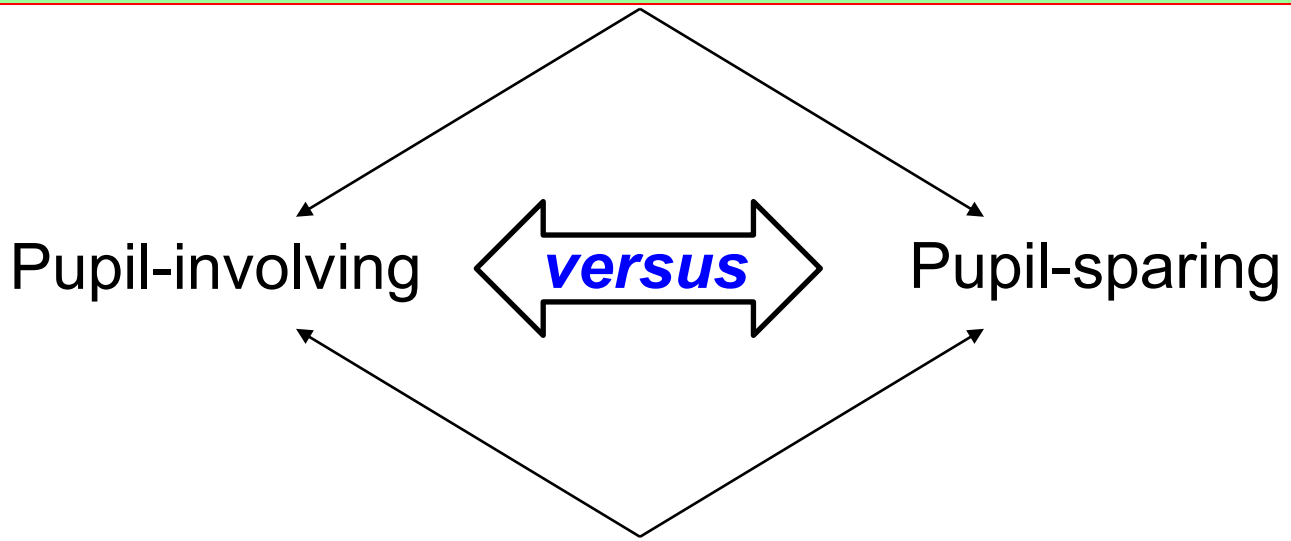
How much larger are we talking about here?

Well, in the context of concurrent ophthalmoparesis c/w a CN3 lesion, **any** enlargement is concerning. But in general, the anisocoria will be a couple of millimeters, maybe a little more.

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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What if the pupil is 'blown,' ie, 8+ mm? Is that even more concerning?

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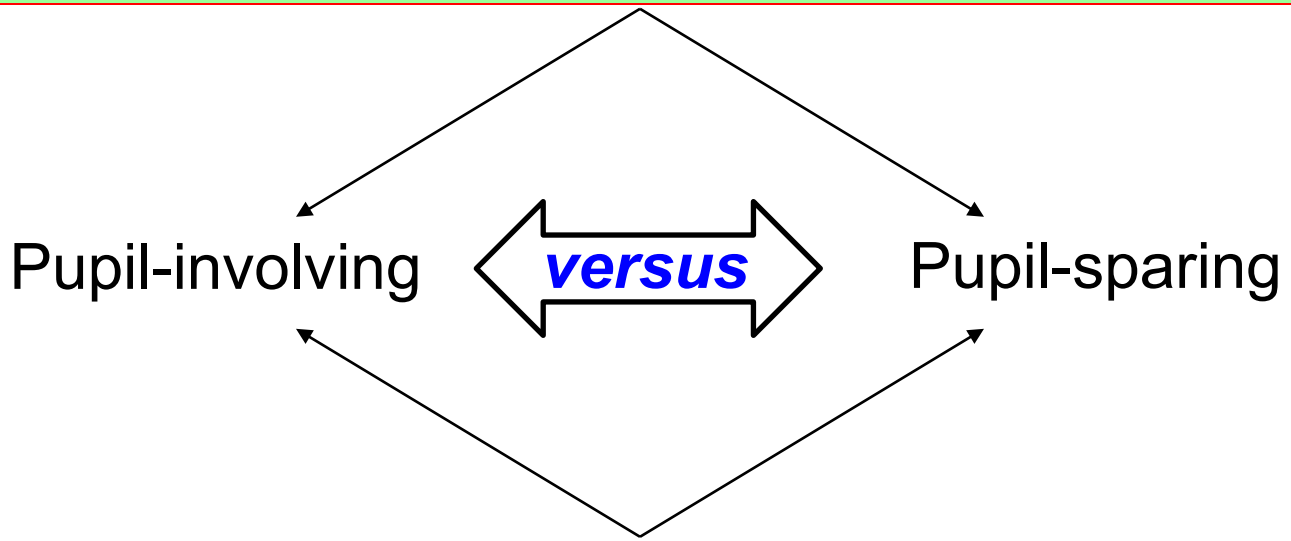

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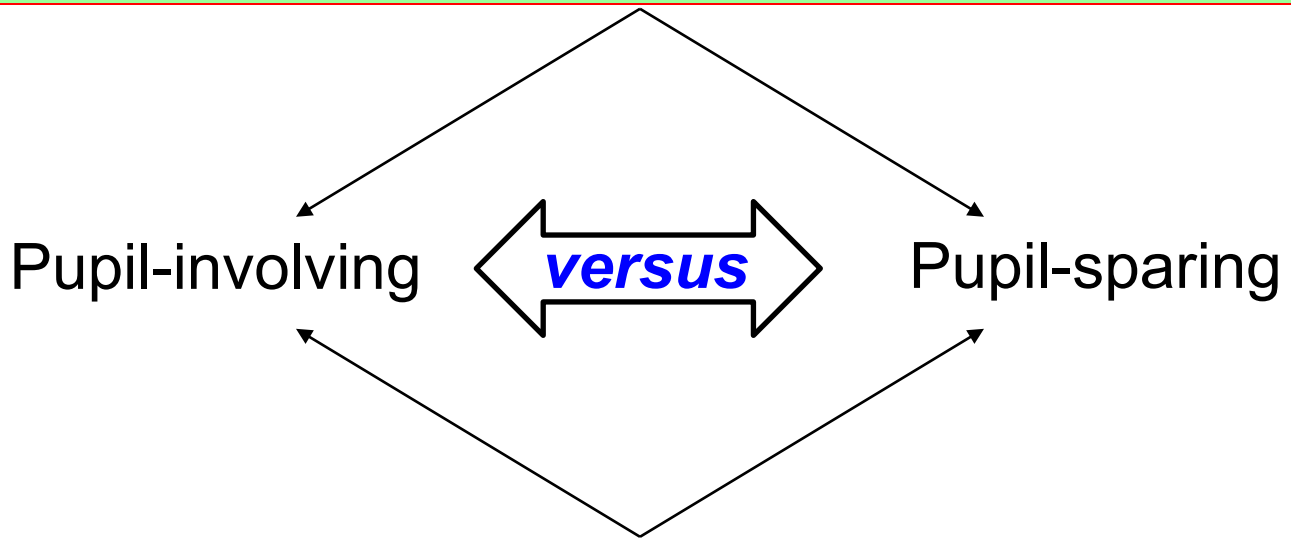
The opposite, actually. A pupil **that** large has almost always been one word dilated (ie, is a so-called two words).

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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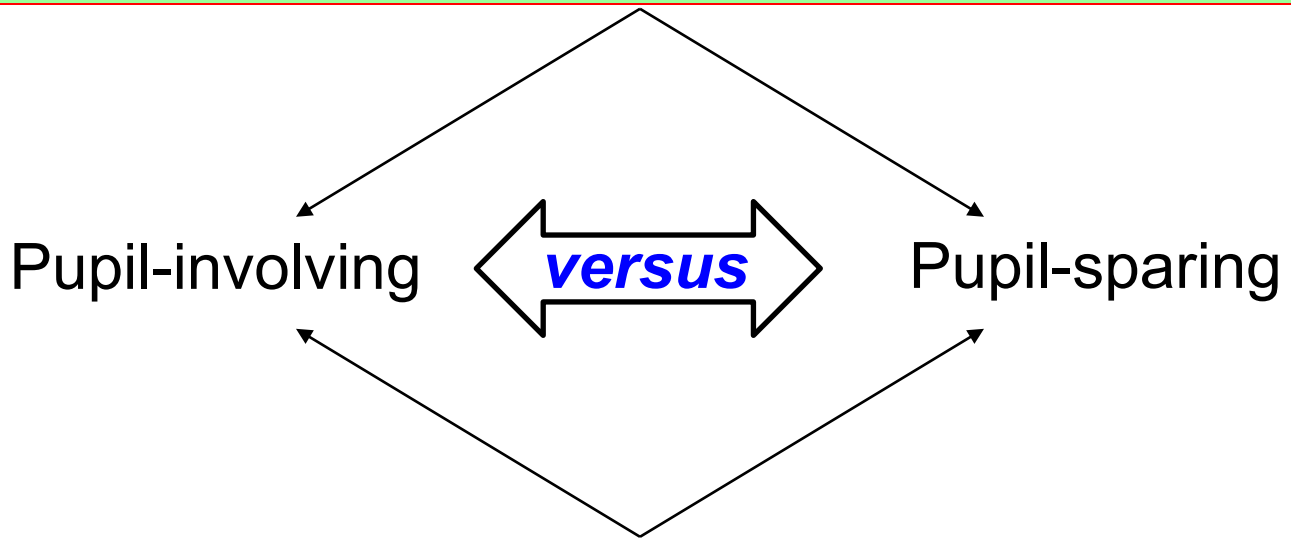
What if the pupil is 'blown,' ie, 8+ mm? Is that even more concerning?
The opposite, actually. A pupil **that** large has almost always been pharmacologically dilated (ie, is a so-called *drug pupil*).

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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1) The pt will have unilateral ophthalmoparesis in a pattern consistent with innervation by CN3; and

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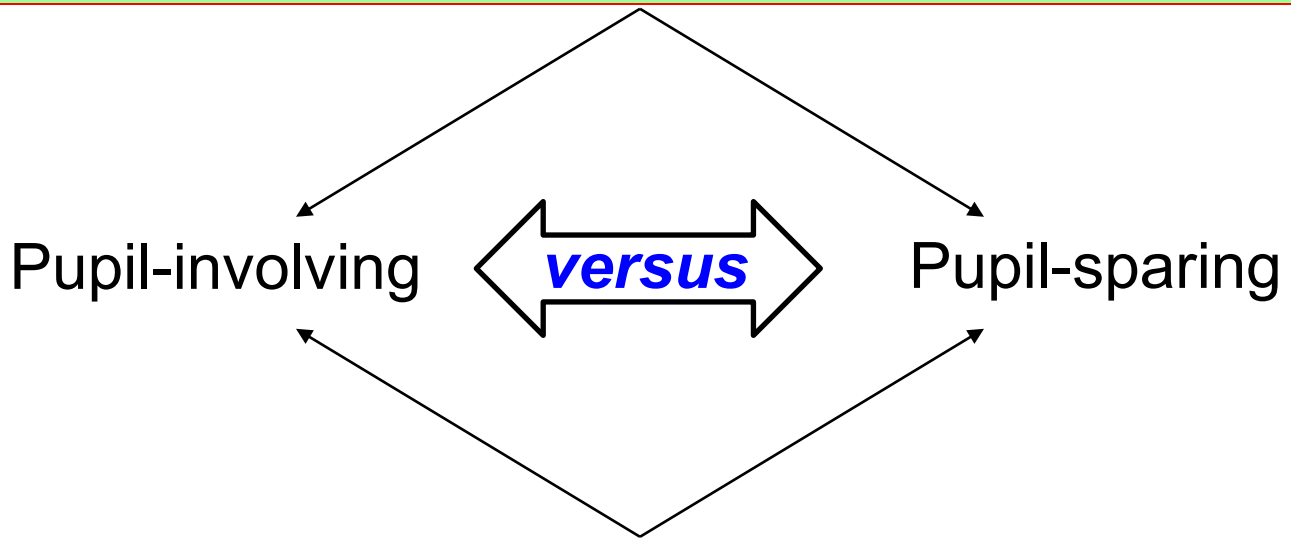
In addition to be being larger, what else will be abnormal about the involved pupil?

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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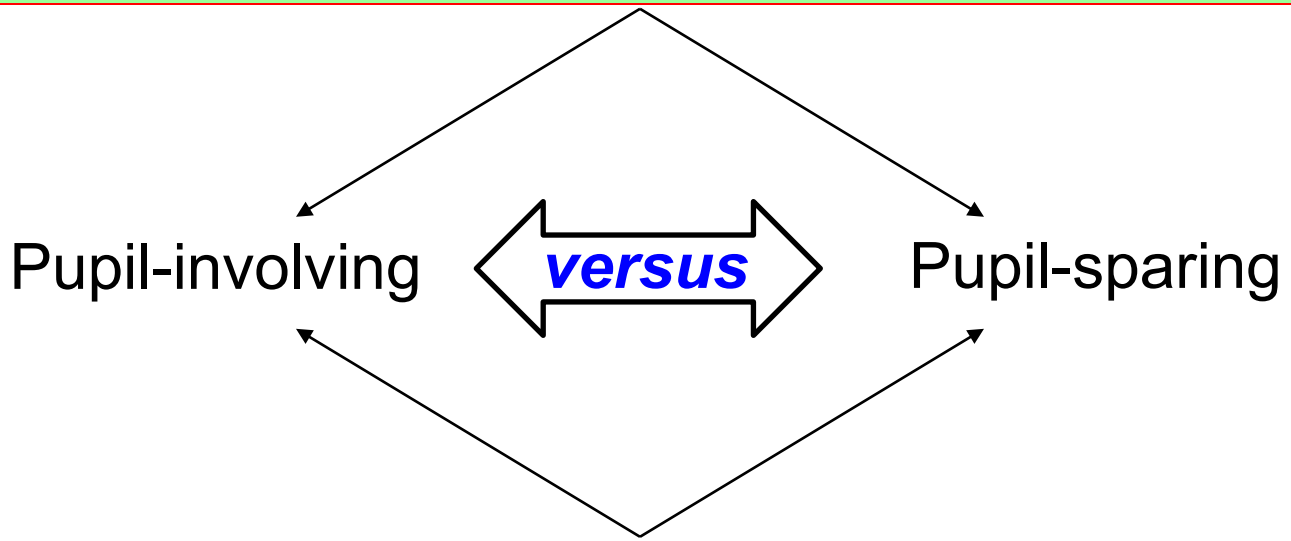
In addition to be being larger, what else will be abnormal about the involved pupil?

It will react poorly to both word and another word

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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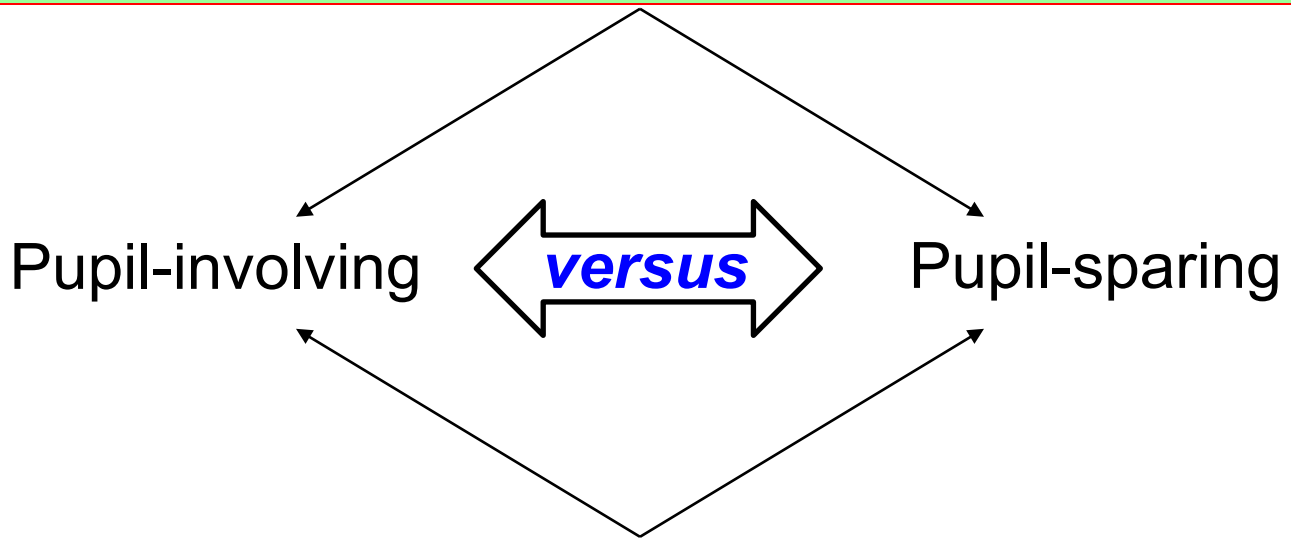
2) The pt will have anisocoria , and the larger pupil will be ipsilateral to the paresis

In addition to be being larger, what else will be abnormal about the involved pupil?

It will react poorly to both light and accommodation

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



What does it mean to say a CN3 palsy 'involves the pupil'? That is, what will be

Which portion of the nervous system controls pupil size?

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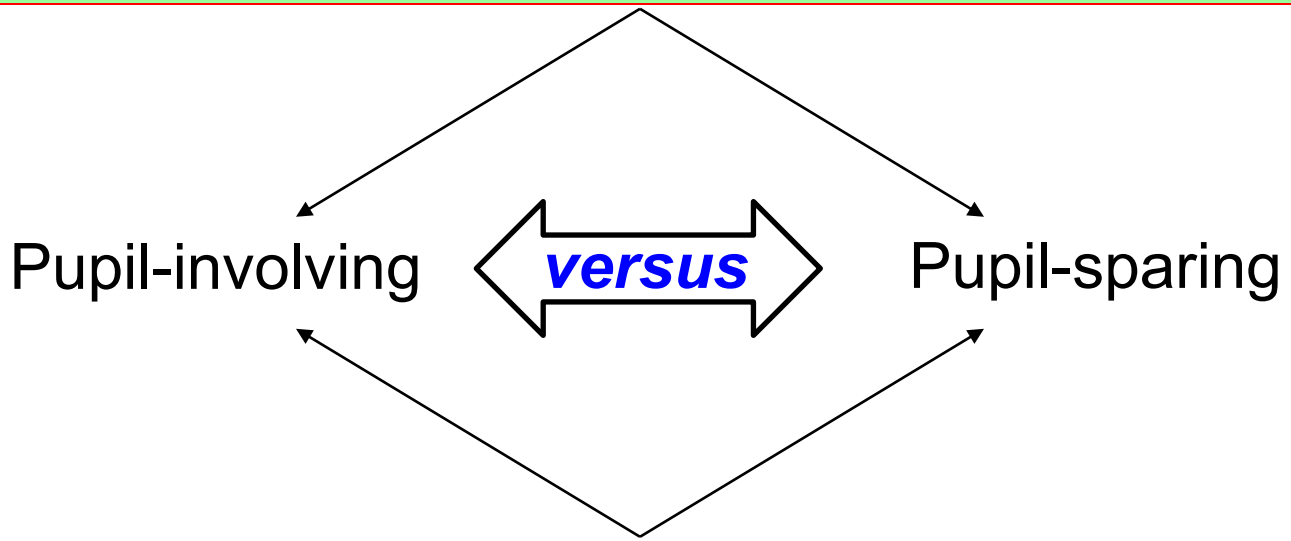
Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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The **autonomic nervous system** (ANS)

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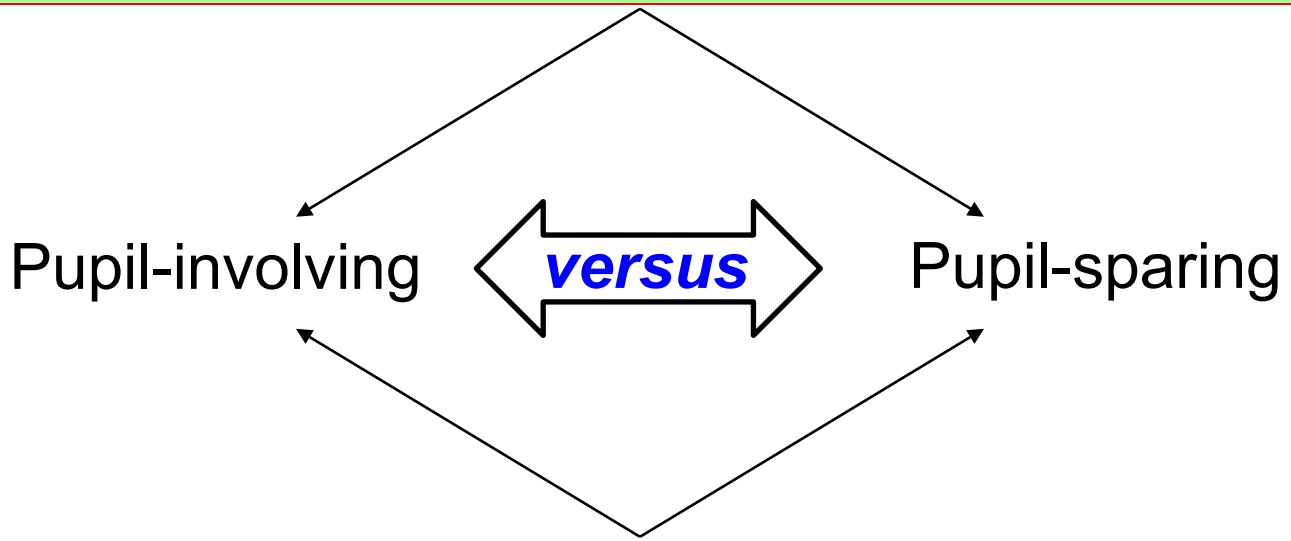

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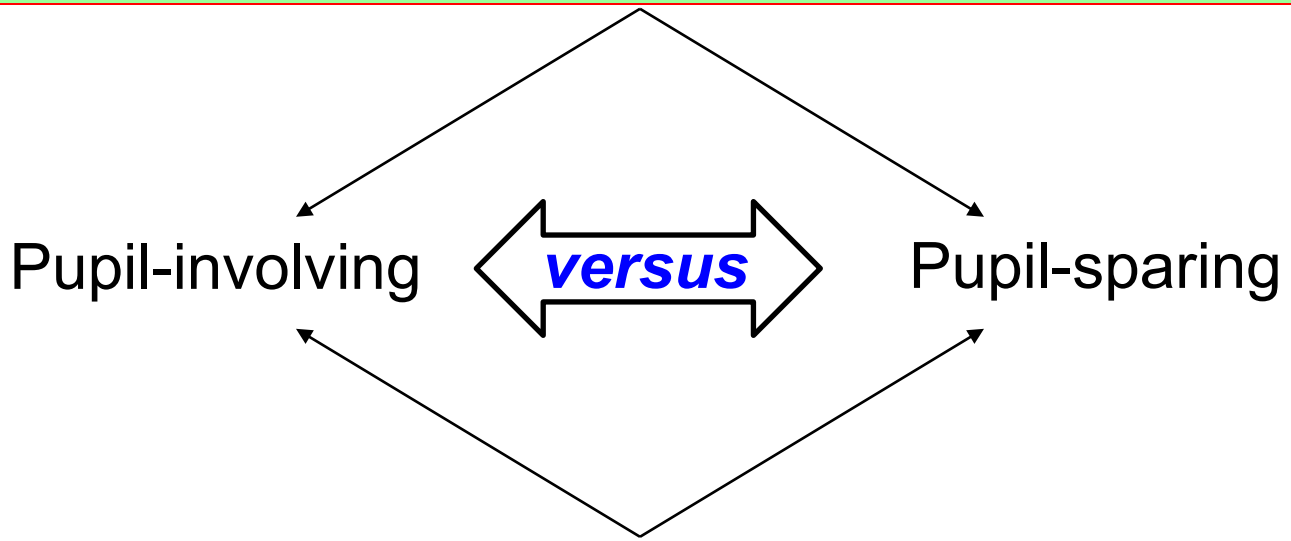

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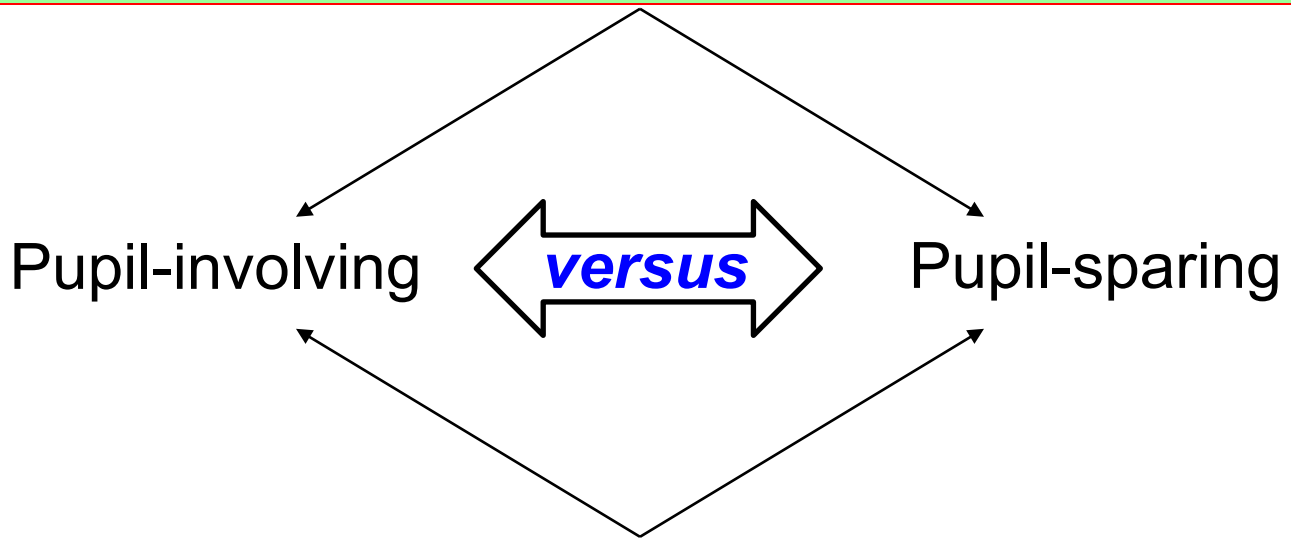
--Increased input from the one component fibers causes the pupil to be smaller
--Increased input from the the other fibers causes the pupil to be larger

In addition to be being larger, what else will be abnormal about the involved pupil?
It will react poorly to both light and accommodation

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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--Increased input from the parasympathetic fibers causes the pupil to be smaller
--Increased input from the sympathetic fibers causes the pupil to be larger

In addition to be being larger, what else will be abnormal about the involved pupil?
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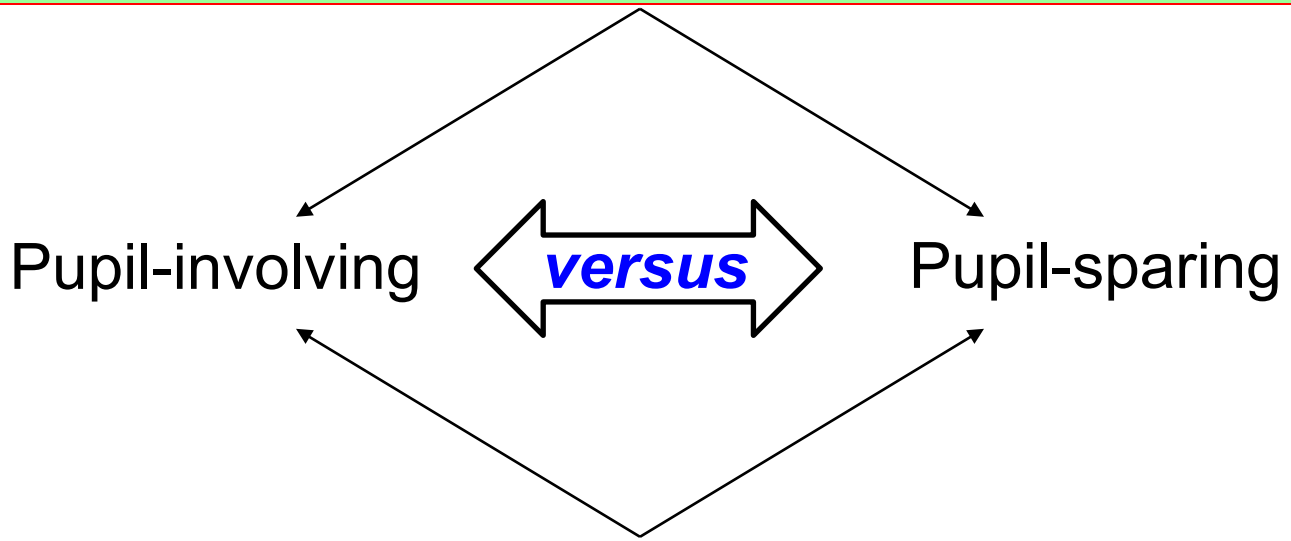
Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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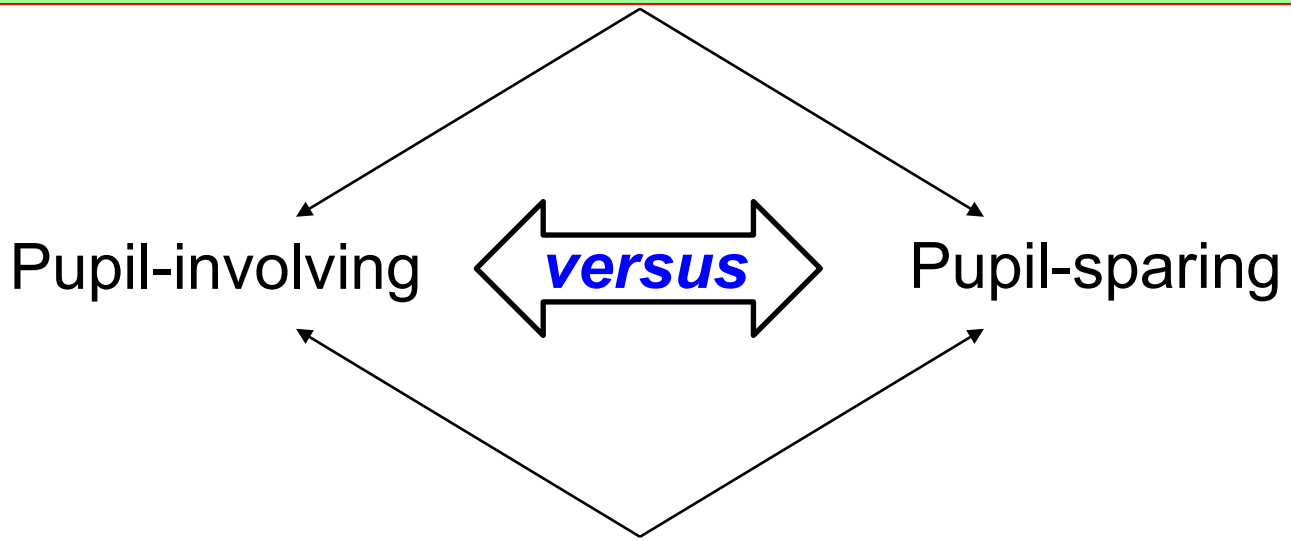
Which portion of the nervous system controls pupil size?
The **autonomic nervous system** (ANS)

The ANS has two components--what are they, and what role does each play in determining pupil size?
--Decreased input from the parasympathetic fibers causes the pupil to be larger?
--Decreased input from the sympathetic fibers causes the pupil to be smaller?

In addition to be being larger, what else will be abnormal about the involved pupil?

Is the opposite the case--that is, does **decreased** *parasympathetic input lead to pupil dilation, and* **decreased** *sympathetic input lead to miosis?*

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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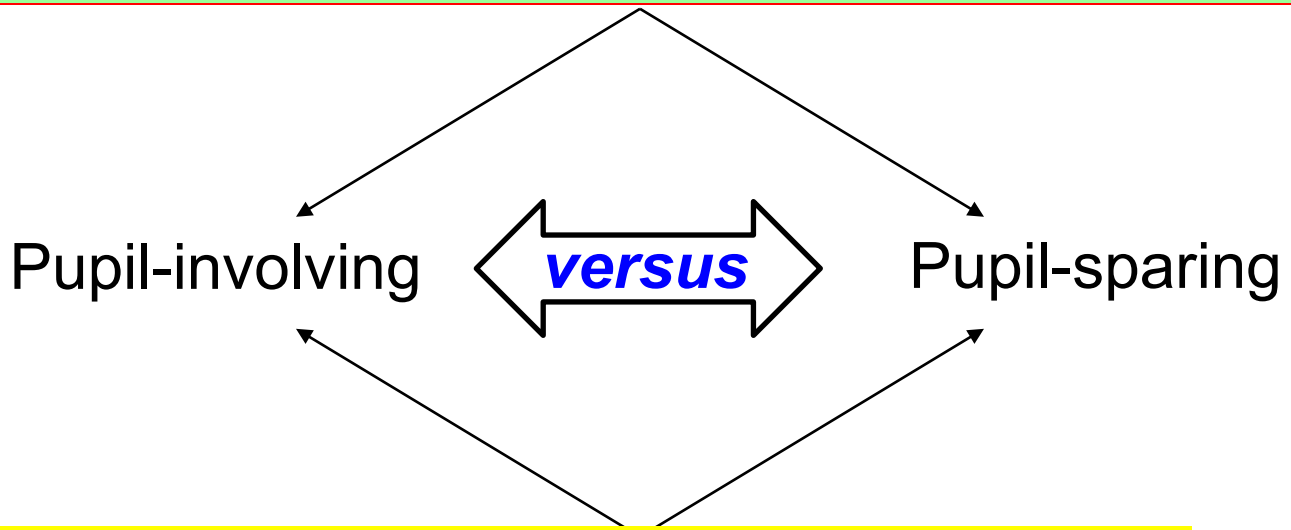
--Increased input from the sympathetic fibers causes the pupil to be larger

Decreased input from the parasympathetic fibers causes the pupil to be larger? Yes
Decreased input from the sympathetic fibers causes the pupil to be smaller? Yes

In addition to be being larger, what else will be abnormal about the involved pupil?

Is the opposite the case--that is, does **decreased** *parasympathetic input lead to pupil dilation, and* **decreased** *sympathetic input lead to miosis?*
These are, in fact, the case. Remember, pupil size is based on the aggregate autonomic input. So if input from one component of the ANS decreases, the net effect of input from the other will be greater.

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



Is it the case that the larger pupil associated with a CN3 palsy is secondary to decreased parasympathetic input to that pupil?

Decreased input from the parasympathetic fibers causes the pupil to be smaller? larger? Yes

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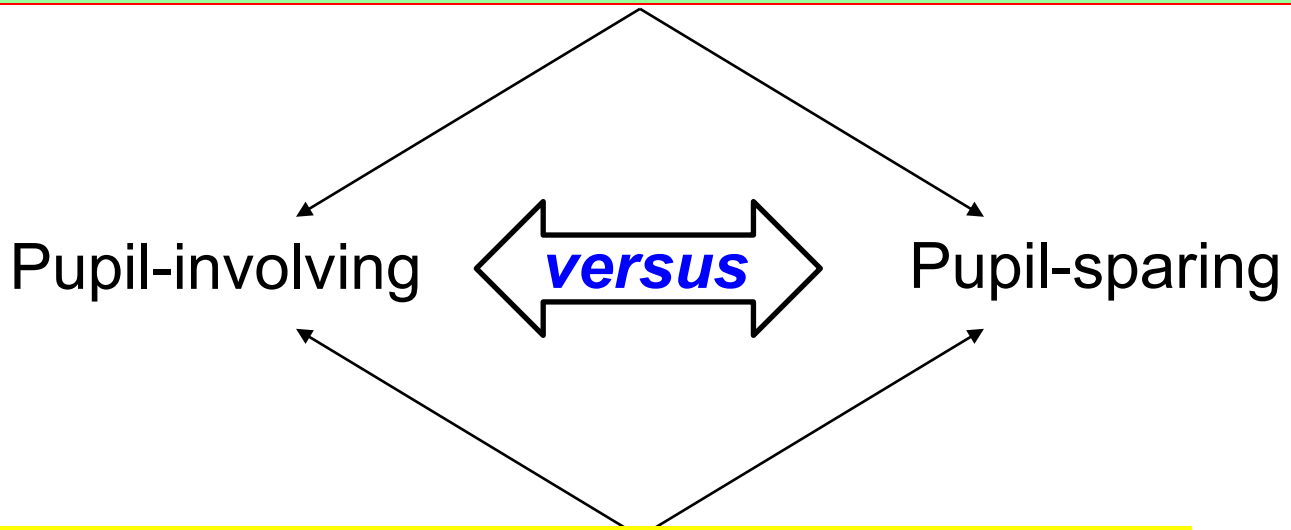

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Indeed it is

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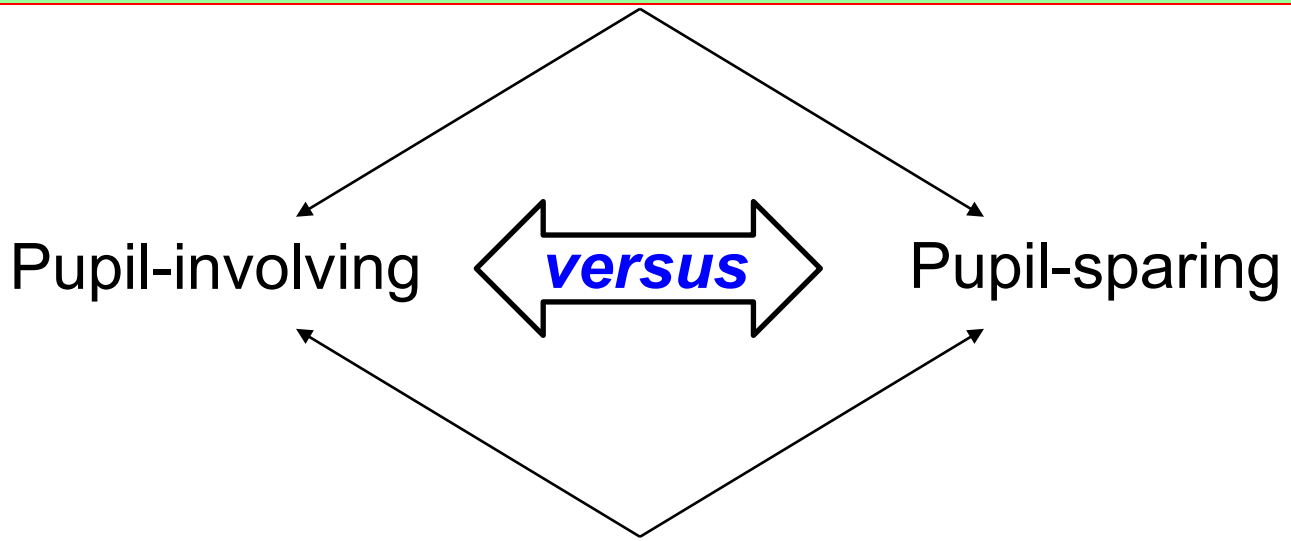

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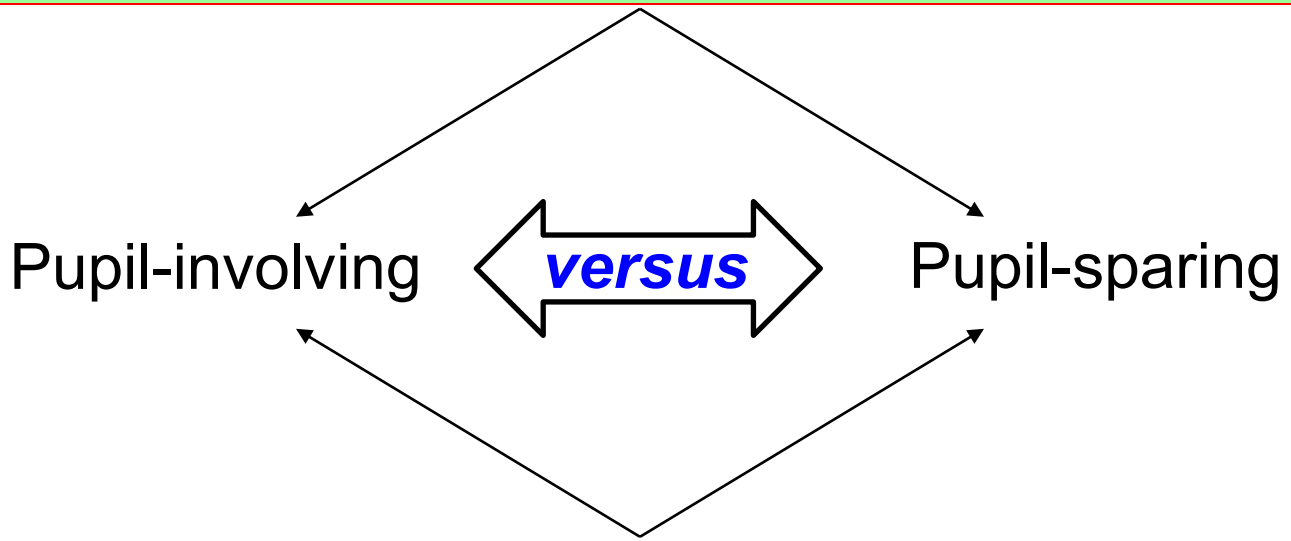
--Decreased input from the sympathetic fibers causes the pupil to be larger

Decreased ... smaller? Yes

Is the ... pupil dilation, and de...
These ... nomic input.
So if in... the other will be gre...

Is decreased sympathetic input leading to ipsilateral pupil miosis a thing?

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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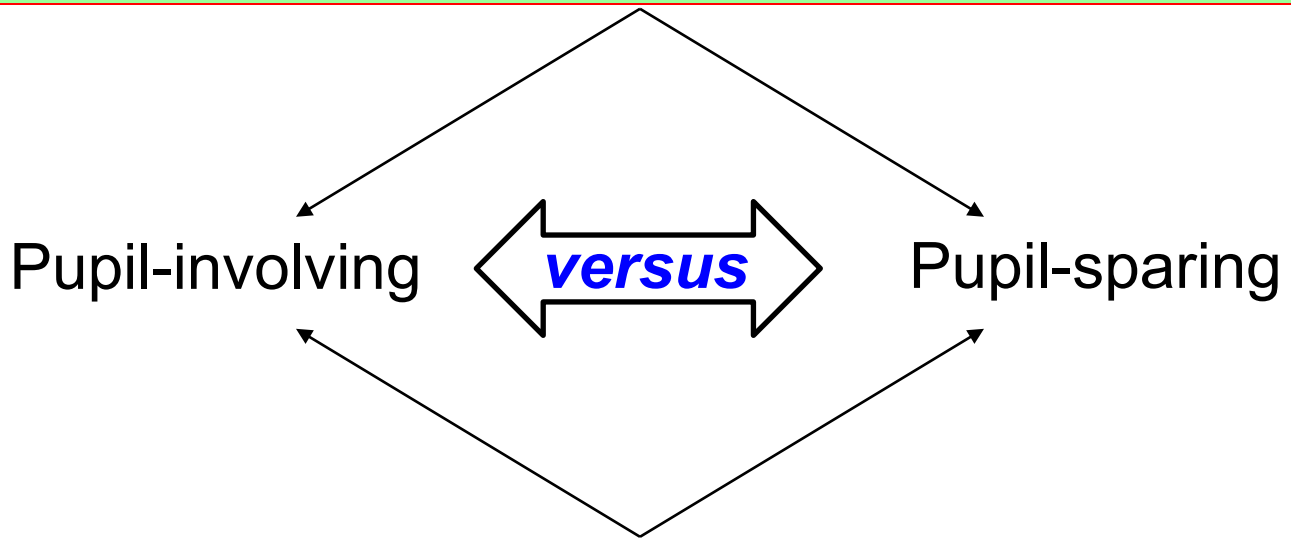
It is indeed, as well

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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Decreased smaller? Yes

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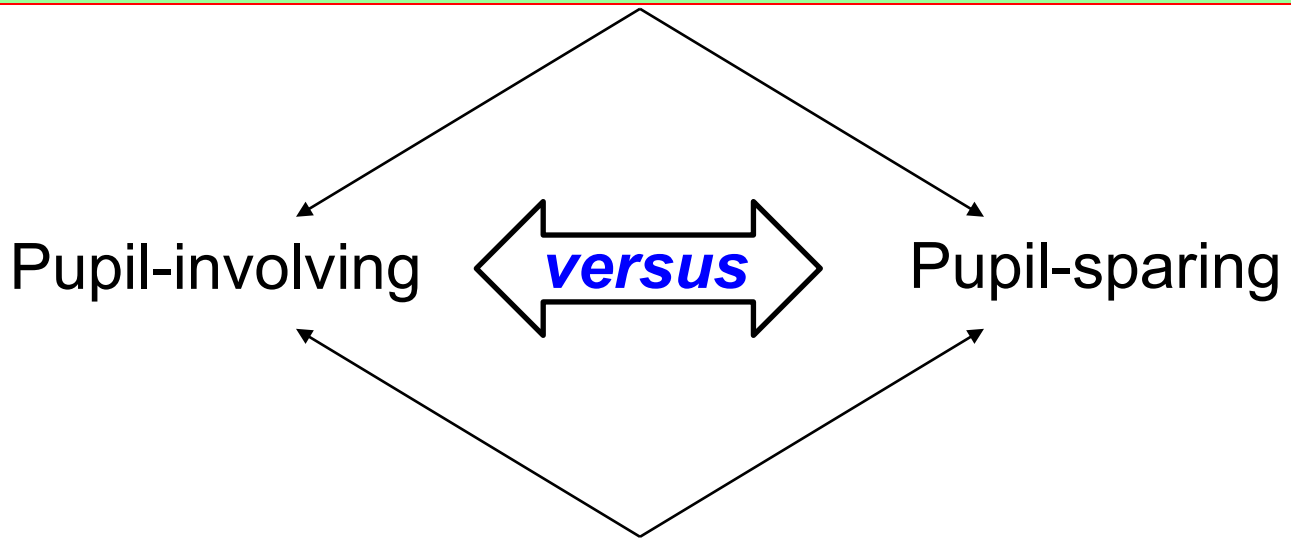
It is indeed, as well

What is the name for this condition?

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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The **autonomic nervous system** (ANS)

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--~~Increased~~ input from the parasympathetic fibers causes the pupil to be ~~smaller~~
--~~Increased~~ Decreased input from the sympathetic fibers causes the pupil to be ~~larger~~ smaller? Yes

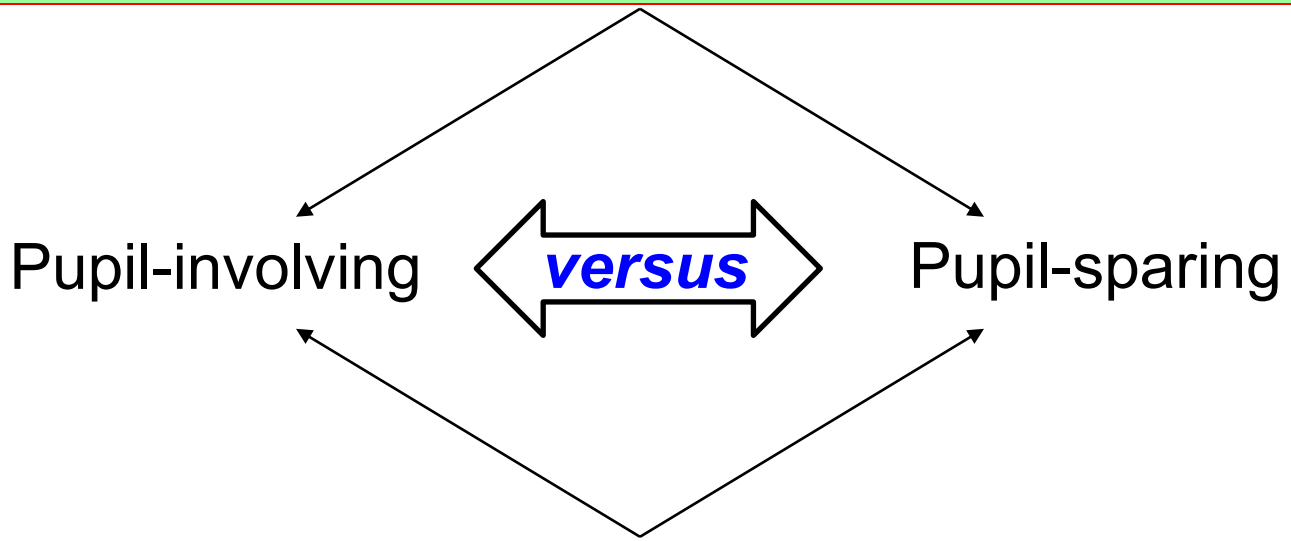
It will react poorly to both light and accommodation

Is the … pupil dilation, and de…
These … nomic input.
So if in… the other will be gre…

Is decreased sympathetic input leading to ipsilateral pupil miosis a thing?
It is indeed, as well

What is the name for this condition?
Horner syndrome

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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In addition to be being larger, what else will be abnormal about the involved pupil?
It will react poorly to both light and accommodation

Next we will take a side-trip to cover the sympathetic and parasympathetic pupil pathways. These are important topics, so unless you know them cold, you should probably come with…

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:

First-order neurons

Second-order neurons

Third-order neurons

(No question—just get your bearings, then proceed)

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:

First-order neurons

--Originate in structure

Second-order neurons

Third-order neurons

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:

First-order neurons

--Originate in hypothalamus

Second-order neurons

Third-order neurons

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:

First-order neurons

--Originate in hypothalamus

--Travel in two words

Second-order neurons

Third-order neurons

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:

First-order neurons

--Originate in hypothalamus

--Travel in spinal cord

Second-order neurons

Third-order neurons

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:

First-order neurons

--Originate in hypothalamus

--Travel in spinal cord

--Synapse in four words

Second-order neurons

Third-order neurons

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:

First-order neurons

--Originate in hypothalamus

--Travel in spinal cord

--Synapse in ciliospinal center of Budge

Second-order neurons

Third-order neurons

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:

First-order neurons

--Originate in hypothalamus

--Travel in spinal cord

--Synapse in ciliospinal center of Budge

Second-order neurons

Third-order neurons

At what level of the spinal cord is the center of Budge found?

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:

First-order neurons

--Originate in hypothalamus

--Travel in spinal cord

--Synapse in ciliospinal center of Budge

Second-order neurons

Third-order neurons

At what level of the spinal cord is the center of Budge found?

C8-T2

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:

First-order neurons

--Originate in hypothalamus

--Travel in spinal cord

--Synapse in ciliospinal center of Budge

Second-order neurons

--Originate at Budge center

--Exit two words

Third-order neurons

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:

First-order neurons

--Originate in hypothalamus

--Travel in spinal cord

--Synapse in ciliospinal center of Budge

Second-order neurons

--Originate at Budge center

--Exit spinal cord

Third-order neurons

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:

First-order neurons

--Originate in hypothalamus

--Travel in spinal cord

--Synapse in ciliospinal center of Budge

Second-order neurons

--Originate at Budge center

--Exit spinal cord

--Travel in two words

Third-order neurons

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:

First-order neurons

--Originate in hypothalamus

--Travel in spinal cord

--Synapse in ciliospinal center of Budge

Second-order neurons

--Originate at Budge center

--Exit spinal cord

--Travel in sympathetic chain

Third-order neurons

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:

First-order neurons
--Originate in hypothalamus
--Travel in spinal cord
--Synapse in ciliospinal center of Budge

Second-order neurons
--Originate at Budge center
--Exit spinal cord
--Travel in sympathetic chain

What major structure do these fibers pass over?

Third-order neurons

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:

First-order neurons
--Originate in hypothalamus
--Travel in spinal cord
--Synapse in ciliospinal center of Budge

Second-order neurons
--Originate at Budge center
--Exit spinal cord
--Travel in sympathetic chain

What major structure do these fibers pass over?
The lung apex

Third-order neurons

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:

First-order neurons

--Originate in hypothalamus

--Travel in spinal cord

--Synapse in ciliospinal center of Budge

Second-order neurons

--Originate at Budge center

--Exit spinal cord

--Travel in sympathetic chain

--Synapse in three words

Third-order neurons

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:

First-order neurons

--Originate in hypothalamus

--Travel in spinal cord

--Synapse in ciliospinal center of Budge

Second-order neurons

--Originate at Budge center

--Exit spinal cord

--Travel in sympathetic chain

--Synapse in superior cervical ganglion

Third-order neurons

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:

First-order neurons
--Originate in hypothalamus
--Travel in spinal cord
--Synapse in ciliospinal center of Budge

Second-order neurons
--Originate at Budge center
--Exit spinal cord
--Travel in sympathetic chain
--Synapse in superior cervical ganglion *aka...?*

Third-order neurons

By what other name is the superior cervical ganglion known?

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:

First-order neurons
--Originate in hypothalamus
--Travel in spinal cord
--Synapse in ciliospinal center of Budge

Second-order neurons
--Originate at Budge center
--Exit spinal cord
--Travel in sympathetic chain
--Synapse in superior cervical ganglion *aka...the* ***stellate ganglion***

Third-order neurons

By what other name is the superior cervical ganglion known?
The **stellate ganglion**

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:

First-order neurons
--Originate in hypothalamus
--Travel in spinal cord
--Synapse in ciliospinal center of Budge

Second-order neurons *aka…?*
--Originate at Budge center
--Exit spinal cord
--Travel in sympathetic chain
--Synapse in superior cervical ganglion *aka…the stellate ganglion*

Third-order neurons

By what other name is the superior cervical ganglion known?
The **stellate ganglion**

Speaking of other names…The second-order neurons are often referred to by another name, one owing to the relationship between these neurons and the ganglion to which they are headed. What is that name?

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:
First-order neurons
--Originate in hypothalamus
--Travel in spinal cord
--Synapse in ciliospinal center of Budge

Second-order neurons *aka…**pre-ganglionic neurons***
--Originate at Budge center
--Exit spinal cord
--Travel in sympathetic chain
--Synapse in superior cervical ganglion *aka…the stellate ganglion*

Third-order neurons

By what other name is the superior cervical ganglion known?
The **stellate ganglion**

Speaking of other names…The second-order neurons are often referred to by another name, one owing to the relationship between these neurons and the ganglion to which they are headed. What is that name?
Pre-ganglionic neurons

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:

First-order neurons

--Originate in hypothalamus

--Travel in spinal cord

--Synapse in ciliospinal center of Budge

Second-order neurons *aka...pre-ganglionic neurons*

--Originate at Budge center

--Exit spinal cord

--Travel in sympathetic chain

--Synapse in superior cervical ganglion *aka...the stellate ganglion*

Third-order neurons

--Originate in superior cervical ganglion

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:

First-order neurons
--Originate in hypothalamus
--Travel in spinal cord
--Synapse in ciliospinal center of Budge

Second-order neurons *aka...pre-ganglionic neurons*
--Originate at Budge center
--Exit spinal cord
--Travel in sympathetic chain
--Synapse in superior cervical ganglion *aka...the stellate ganglion*

Third-order neurons *aka...?*
--Originate in superior cervical ganglion

Likewise, the third-order neurons are also referred to by a term owing to their relationship with the stellate ganglion. What is that term?

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:

First-order neurons
--Originate in hypothalamus
--Travel in spinal cord
--Synapse in ciliospinal center of Budge

Second-order neurons *aka...pre-ganglionic neurons*
--Originate at Budge center
--Exit spinal cord
--Travel in sympathetic chain
--Synapse in superior cervical ganglion *aka...the stellate ganglion*

Third-order neurons *aka...**post-ganglionic neurons***
--Originate in superior cervical ganglion

Likewise, the third-order neurons are also referred to by a term owing to their relationship with the stellate ganglion. What is that term?
Post-ganglionic neurons

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:

First-order neurons

--Originate in hypothalamus

--Travel in spinal cord

--Synapse in ciliospinal center of Budge

Second-order neurons *aka...pre-ganglionic neurons*

--Originate at Budge center

--Exit spinal cord

--Travel in sympathetic chain

--Synapse in superior cervical ganglion *aka...the stellate ganglion*

Third-order neurons *aka...post-ganglionic neurons*

--Originate in superior cervical ganglion

--Travel with three words to enter the two words

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:

First-order neurons

--Originate in hypothalamus

--Travel in spinal cord

--Synapse in ciliospinal center of Budge

Second-order neurons *aka...pre-ganglionic neurons*

--Originate at Budge center

--Exit spinal cord

--Travel in sympathetic chain

--Synapse in superior cervical ganglion *aka...the stellate ganglion*

Third-order neurons *aka...post-ganglionic neurons*

--Originate in superior cervical ganglion

--Travel with internal carotid artery to enter the cavernous sinus

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:

First-order neurons

--Originate in hypothalamus

--Travel in spinal cord

--Synapse in ciliospinal center of Budge

Second-order neurons *aka...pre-ganglionic neurons*

--Originate at Budge center

--Exit spinal cord

--Travel in sympathetic chain

--Synapse in superior cervical ganglion *aka...the stellate ganglion*

Third-order neurons *aka...post-ganglionic neurons*

--Originate in superior cervical ganglion

--Travel with internal carotid artery to enter the cavernous sinus

--In the sinus, hop onto cranial nerve # then cranial nerve # to enter orbit

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:

First-order neurons

--Originate in hypothalamus

--Travel in spinal cord

--Synapse in ciliospinal center of Budge

Second-order neurons *aka...pre-ganglionic neurons*

--Originate at Budge center

--Exit spinal cord

--Travel in sympathetic chain

--Synapse in superior cervical ganglion *aka...the stellate ganglion*

Third-order neurons *aka...post-ganglionic neurons*

--Originate in superior cervical ganglion

--Travel with internal carotid artery to enter the cavernous sinus

--In the sinus, hop onto cranial nerve 6 , then cranial nerve V_1 to enter orbit

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:

First-order neurons
--Originate in hypothalamus
--Travel in spinal cord
--Synapse in ciliospinal center of Budge

Second-order neurons *aka...pre-ganglionic neurons*
--Originate at Budge center

For a more detailed review of the postganglionic sympathetics pathway and Horner syndrome, see slide-set N3

Third-order neurons *aka...post-ganglionic neurons*
--Originate in superior cervical ganglion
--Travel with internal carotid artery to enter the cavernous sinus
--In the sinus, hop onto cranial nerve 6 , then cranial nerve V_1 to enter orbit

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Sympathetic pathway:

First-order neurons
--Originate in hypothalamus
--Travel in spinal cord
--Synapse in ciliospinal center of Budge

Second-order neurons *aka...* **pre-ganglionic neurons**
--Origi
--Exit s
--Trave
--Syna

Note that the sympathetic pre-ganglionic neurons are relatively **short** (the Budge center and stellate ganglion are very close to one another), whereas the post-ganglionic neurons are relatively **long** (they have travel the length of the ICA, then the length of the orbit). We shall see that this is not the case with the parasympathetics.

Third-order neurons *aka...* **post-ganglionic neurons**
--Originate in superior cervical ganglion
--Travel with internal carotid artery to enter the cavernous sinus
--In the sinus, hop onto cranial nerve 6 , then cranial nerve V_1 to enter orbit

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway**

And now, the parasympathetic portion of the pathway

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

First-order neurons?

Second-order neurons?

Third-order neurons?

Speaking of: *Is the parasympathetic pathway similarly divided into 1st, 2nd and 3rd order neurons?*

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ *'Top' inputs*

Second-order neurons?

Third-order neurons?

Speaking of: *Is the parasympathetic pathway similarly divided into 1st, 2nd and 3rd order neurons?*
No. The 'top' inputs that influence parasympathetic innervation of the pupil are widely distributed, and cannot reasonably be conceptualized as a unitary 'first-order neuron.' (Note: I made up the term 'top inputs' for illustrative purposes; it is not used in practice.)

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

~~Second-order neurons~~

~~Third-order neurons~~

Speaking of: *Is the parasympathetic pathway similarly divided into 1st, 2nd and 3rd order neurons?*
No. The 'top' inputs that influence parasympathetic innervation of the pupil are widely distributed, and cannot reasonably be conceptualized as a unitary 'first-order neuron.' (Note: I made up the term 'top inputs' for illustrative purposes; it is not used in practice.) It follows that if there are no 1st-order neurons, the terms *second-* and *third-order neurons* are not applicable.

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

[redacted] neurons

~~Second-order neurons~~

[redacted] neurons

~~Third-order neurons~~

Speaking of: *Is the parasympathetic pathway similarly divided into 1st, 2nd and 3rd order neurons?*
No. The 'top' inputs that influence parasympathetic innervation of the pupil are widely distributed, and cannot reasonably be conceptualized as a unitary 'first-order neuron.' (Note: I made up the term 'top inputs' for illustrative purposes; it is not used in practice.) It follows that if there are no 1st-order neurons, the terms *second-* and *third-order neurons* are not applicable. **For this reason,** [redacted] **are the preferred terms for these neurons.**

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

Pre-ganglionic neurons

~~Second-order neurons~~

Post-ganglionic neurons

~~Third-order neurons~~

Speaking of: *Is the parasympathetic pathway similarly divided into 1st, 2nd and 3rd order neurons?* No. The 'top' inputs that influence parasympathetic innervation of the pupil are widely distributed, and cannot reasonably be conceptualized as a unitary 'first-order neuron.' (Note: I made up the term 'top inputs' for illustrative purposes; it is not used in practice.) It follows that if there are no 1st-order neurons, the terms *second-* and *third-order neurons* are not applicable. **For this reason, *pre-* and *post-ganglionic* are the preferred terms for these neurons.**

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate (mainly) in the two words

Pre-ganglionic neurons

~~Second-order neurons~~

Post-ganglionic neurons

~~Third-order neurons~~

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate (mainly) in the pretectal nuclei

~~Second-order neurons~~ Pre-ganglionic neurons

~~Third-order neurons~~ Post-ganglionic neurons

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate (mainly) in the **pretectal nuclei**

Where are the pretectal nuclei located?

Pre-ga

~~Second~~

Post-ganglionic neurons

~~Third-order neurons~~

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate (mainly) in the **pretectal nuclei**

Where are the pretectal nuclei located?

The dorsal midbrain

Pre-ga

~~Second~~

Post-ganglionic neurons

~~Third-order neurons~~

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate (mainly) in the **pretectal nuclei**

Where are the pretectal nuclei located?
The dorsal midbrain

Damage to the pretectal nuclei of the dorsal midbrain produces what eponymous syndrome?

Pre-ga
~~Second~~

Post-ganglionic neurons
~~Third-order neurons~~

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate (mainly) in the **pretectal nuclei**

Where are the pretectal nuclei located?
The dorsal midbrain

Damage to the pretectal nuclei of the dorsal midbrain produces what eponymous syndrome?
Parinaud syndrome

Pre-ga
~~Second~~

Post-ganglionic neurons
~~Third-order neurons~~

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate (mainly) in the **pretectal nuclei**

Where are the pretectal nuclei located?

The dorsal midbrain

Damage to the pretectal nuclei of the dorsal midbrain produces what eponymous syndrome?

Parinaud syndrome aka [two words] syndrome

Pre-ga

~~Second~~

Post-ganglionic neurons

~~Third-order neurons~~

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate (mainly) in the **pretectal nuclei**

Where are the pretectal nuclei located?
The dorsal midbrain

Damage to the pretectal nuclei of the dorsal midbrain produces what eponymous syndrome?
Parinaud syndrome aka dorsal midbrain syndrome

Pre-ga
~~Second~~

Post-ganglionic neurons
~~Third-order neurons~~

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate (mainly) in the **pretectal nuclei**

Where are the pretectal nuclei located?
The dorsal midbrain

Damage to the pretectal nuclei of the dorsal midbrain produces what eponymous syndrome?
Parinaud syndrome aka dorsal midbrain syndrome, aka [redacted] syndrome

Pre-ga
~~Second~~

Post-ganglionic neurons
~~Third-order neurons~~

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate (mainly) in the **pretectal nuclei**

Where are the pretectal nuclei located?
The dorsal midbrain

Damage to the pretectal nuclei of the dorsal midbrain produces what eponymous syndrome?
Parinaud syndrome aka dorsal midbrain syndrome, aka pretectal syndrome

Pre-ga
~~Second~~

Post-ganglionic neurons
~~Third-order neurons~~

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate (mainly) in the **pretectal nuclei**

Where are the pretectal nuclei located?
The dorsal midbrain

Damage to the pretectal nuclei of the dorsal midbrain produces what eponymous syndrome?
Parinaud syndrome aka dorsal midbrain syndrome, aka pretectal syndrome. (We will come back to Parinaud's later in the slide-set.)

Pre-ga
~~Second~~

Post-ganglionic neurons
~~Third-order neurons~~

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the eponym-eponym nucleus

Post-ganglionic neurons

~~Third-order neurons~~

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the Edinger-Westphal nucleus

Post-ganglionic neurons

~~Third-order neurons~~

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the **Edinger-Westphal nucleus**

Where in relation to the CN3 nuclear complex is the Edinger-Westphal nucleus located?

Post-ganglionic neurons

~~Third-order neurons~~

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the **Edinger-Westphal nucleus**

Where in relation to the CN3 nuclear complex is the Edinger-Westphal nucleus located?

It is a part of the complex

Post-ganglionic neurons

~~Third-order neurons~~

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the Edinger-Westphal nucleus

--Travels with CN3 into the important intracranial space

Post-ganglionic neurons

~~Third-order neurons~~

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the Edinger-Westphal nucleus

--Travels with CN3 into the cavernous sinus (CS)

Post-ganglionic neurons

~~Third-order neurons~~

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ *'Top' inputs*

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the Edinger-Westphal nucleus

--**Travels with CN3** into the cavernous sinus (CS)

With respect to the cross-sectional organization of CN3, in what aspect of the nerve do the pre-ganglionic fibers run?

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the Edinger-Westphal nucleus

--**Travels with CN3** into the cavernous sinus (CS)

With respect to the cross-sectional organization of CN3, in what aspect of the nerve do the pre-ganglionic fibers run?

They run superficially, ie, on the outermost surface of the nerve

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ *'Top' inputs*

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the Edinger-Westphal nucleus

--**Travels with CN3** into the cavernous sinus (CS)

With respect to the cross-sectional organization of CN3, in what aspect of the nerve do the pre-ganglionic fibers run?

They run superficially, ie, on the outermost surface of the nerve

Take note: This is going to be really important in a few slides!

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ *'Top' inputs*

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the Edinger-Westphal nucleus

--Travels with **CN3** into the cavernous sinus (CS)

As ocular-motor nerves go, is CN3 large, or small?

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ *'Top' inputs*

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the Edinger-Westphal nucleus

--Travels with **CN3** into the cavernous sinus (CS)

As ocular-motor nerves go, is CN3 large, or small?

Quite large, with over # fibers (contrast that with the itty-bitty CN4 and its # fibers)

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ *'Top' inputs*

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the Edinger-Westphal nucleus

--Travels with **CN3** into the cavernous sinus (CS)

As ocular-motor nerves go, is CN3 large, or small?
Quite large, with over 15,000 fibers (contrast that with the itty-bitty CN4 and its 2000 fibers)

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ *'Top' inputs*

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the Edinger-Westphal nucleus

--Travels with **CN3** into the cavernous sinus (CS)

As ocular motor nerves go, is CN3 large, or small?

Quite large, with over 15,000 fibers (contrast that with the itty-bitty CN4 and its 2000 fibers)

Take note part deaux: The fact that CN3 is a relatively large nerve will come up again as well!

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ *'Top' inputs*

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the Edinger-Westphal nucleus

--Travels with CN3 into **the cavernous sinus** (CS)

CN3 undergoes an important conformational change while inside the CS. What is this change?

Post-g

~~Third-order neurons~~

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the Edinger-Westphal nucleus

--Travels with CN3 into **the cavernous sinus** (CS)

CN3 undergoes an important conformational change while inside the CS. What is this change?

It divides into two divisions: The [ ], and the [ ]

Post-g

~~Third-order neurons~~

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the Edinger-Westphal nucleus

--Travels with CN3 into **the cavernous sinus** (CS)

CN3 undergoes an important conformational change while inside the CS. What is this change?

It divides into two divisions: The Superior , and the Inferior

Post-g

~~Third-order neurons~~

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the Edinger-Westphal nucleus

--Travels with CN3 into **the cavernous sinus** (CS)

CN3 undergoes an important conformational change while inside the CS. What is this change?

It divides into two divisions: **The Superior** , and the Inferior

Post-g

~~Third-order neurons~~

Which muscles are innervated by fibers in the:
Superior division?
Inferior division?

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the Edinger-Westphal nucleus

--Travels with CN3 into **the cavernous sinus** (CS)

CN3 undergoes an important conformational change while inside the CS. What is this change?

It divides into two divisions: **The Superior** , and the Inferior

Post-g

~~Third-order neurons~~

Which muscles are innervated by fibers in the:

Superior division? **Superior rectus**, and the **levator**

Inferior division?

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate mainly in the pretectal nuclei

***Pre-ganglionic* neurons**

~~Second-order neurons~~

--Originate in the Edinger-Westphal nucleus

--Travels with CN3 into **the cavernous sinus** (CS)

CN3 undergoes an important conformational change while inside the CS. What is this change?

It divides into two divisions: **The Superior** , and **the Inferior**

Post-g

~~Third-order neurons~~

Which muscles are innervated by fibers in the:

Superior division? **Superior rectus**, and the **levator**

Inferior division?

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the Edinger-Westphal nucleus

--Travels with CN3 into **the cavernous sinus** (CS)

CN3 undergoes an important conformational change while inside the CS. What is this change?

It divides into two divisions: **The Superior** , and **the Inferior**

Post-g

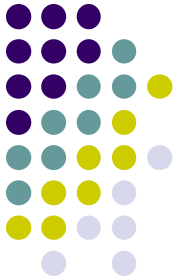
~~Third-order neurons~~

Which muscles are innervated by fibers in the:

Superior division? **Superior rectus**, and the **levator**

Inferior division? The **medial rectus**, **inferior rectus** and **inferior oblique**

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the Edinger-Westphal nucleus

--Travels with CN3 into the cavernous sinus (CS)

--Exit CS with inferior v superior division of CN3

Post-ganglionic neurons

~~Third-order neurons~~

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the Edinger-Westphal nucleus

--Travels with CN3 into the cavernous sinus (CS)

--Exit CS with inferior division of CN3

Post-ganglionic neurons

~~Third-order neurons~~

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the Edinger-Westphal nucleus

--Travels with CN3 into the cavernous sinus (CS)

--Exit CS with inferior division of CN3

--Synapse in [redacted] ganglion

Post-ganglionic neurons

~~Third-order neurons~~

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the Edinger-Westphal nucleus

--Travels with CN3 into the cavernous sinus (CS)

--Exit CS with inferior division of CN3

--Synapse in ciliary ganglion

Post-ganglionic neurons

~~Third-order neurons~~

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ *'Top' inputs*

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the Edinger-Westphal nucleus

--Travels with CN3 into the cavernous sinus (CS)

--Exit CS with inferior division of CN3

--Synapse in **ciliary ganglion**

Post-ganglionic neurons

~~Third-order neurons~~

Where is the ciliary ganglion located?

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ *'Top' inputs*

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the Edinger-Westphal nucleus

--Travels with CN3 into the cavernous sinus (CS)

--Exit CS with inferior division of CN3

--Synapse in **ciliary ganglion**

Post-ganglionic neurons

~~Third-order neurons~~

Where is the ciliary ganglion located?
At the orbital apex

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the Edinger-Westphal nucleus
--Travels with CN3 until the cavernous sinus (CS)
--Exit CS with inferior division of CN3
--Synapse in ciliary ganglion

Post-ganglionic neurons

~~Third-order neurons~~

--Originate in ciliary ganglion

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the Edinger-Westphal nucleus
--Travels with CN3 until the cavernous sinus (CS)
--Exit CS with inferior division of CN3
--Synapse in ciliary ganglion

Post-ganglionic neurons

~~Third-order neurons~~

--Originate in ciliary ganglion
--Travel with nerve to the [redacted] muscle

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the Edinger-Westphal nucleus
--Travels with CN3 until the cavernous sinus (CS)
--Exit CS with inferior division of CN3
--Synapse in ciliary ganglion

Post-ganglionic neurons

~~Third-order neurons~~

--Originate in ciliary ganglion
--Travel with nerve to the inferior oblique muscle

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the Edinger-Westphal nucleus
--Travels with CN3 until the cavernous sinus (CS)
--Exit CS with inferior division of CN3
--Synapse in ciliary ganglion

Post-ganglionic neurons

~~Third-order neurons~~

--Originate in ciliary ganglion
--Travel with nerve to the inferior oblique muscle
--At eye, jumps to [two words] nerves to reach the sphincter muscle

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ 'Top' inputs

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

~~Second-order neurons~~

--Originate in the Edinger-Westphal nucleus
--Travels with CN3 until the cavernous sinus (CS)
--Exit CS with inferior division of CN3
--Synapse in ciliary ganglion

Post-ganglionic neurons

~~Third-order neurons~~

--Originate in ciliary ganglion
--Travel with nerve to the inferior oblique muscle
--At eye, jumps to posterior ciliary nerves to reach the sphincter muscle

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

***Parasympathetic* pathway:**

~~First-order neurons~~ *'Top' inputs*

--Originate mainly in the pretectal nuclei

Pre-ganglionic neurons

Note that the relative lengths of the pre- and post-ganglionic ***para***sympathetic neurons are opposite of what they were for the sympathetics. Their pre-ganglionic fibers are relatively long, wending their way out to ganglia located near the end-organs they innervate. (Recall that sympathetic ganglia are all axial-CNS-adjacent.) From these far-flung ganglia, it is just a hop, skip and jump for the post-ganglionics to reach their targets.

Post-ganglionic neurons

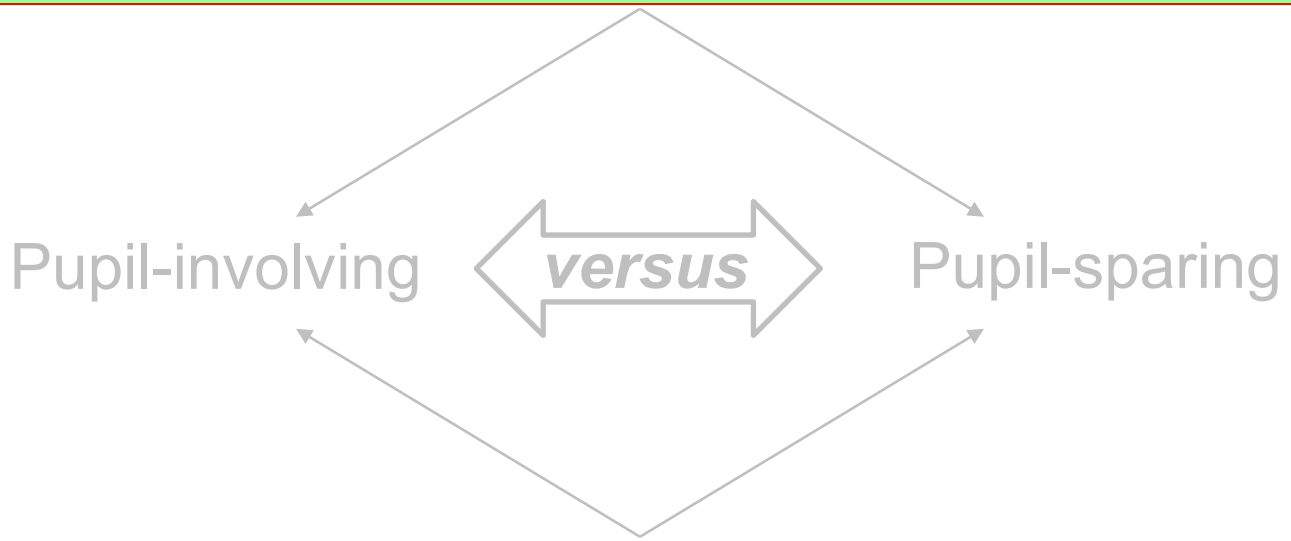
~~Third-order neurons~~

--Originate in ciliary ganglion

--Travel with nerve to the inferior oblique muscle

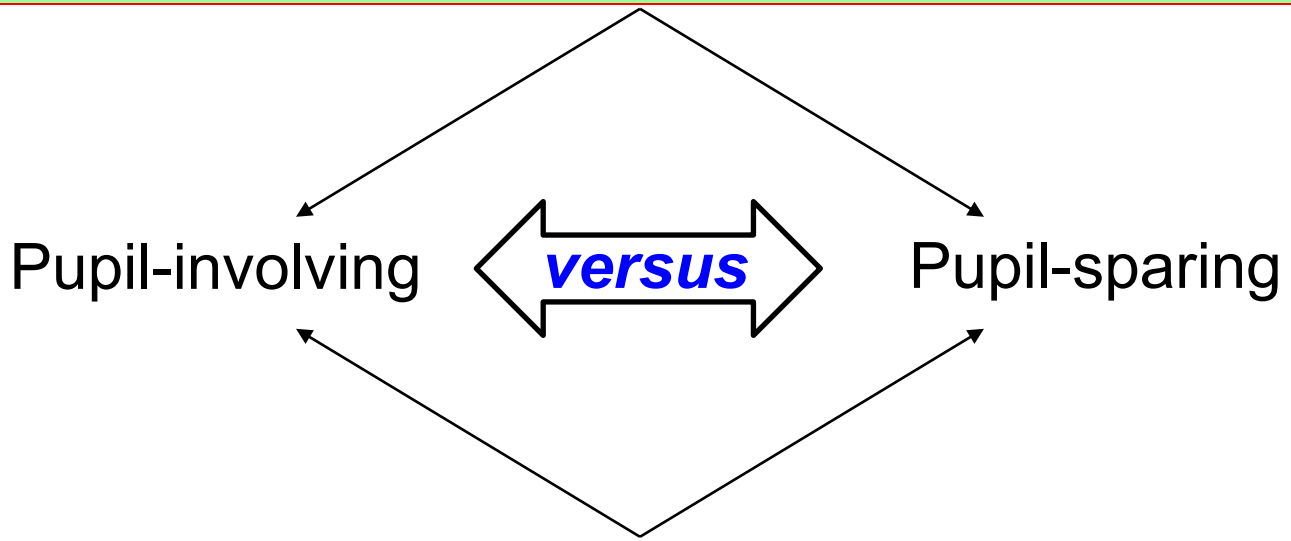
--At eye, jumps to posterior ciliary nerves to reach the sphincter muscle

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



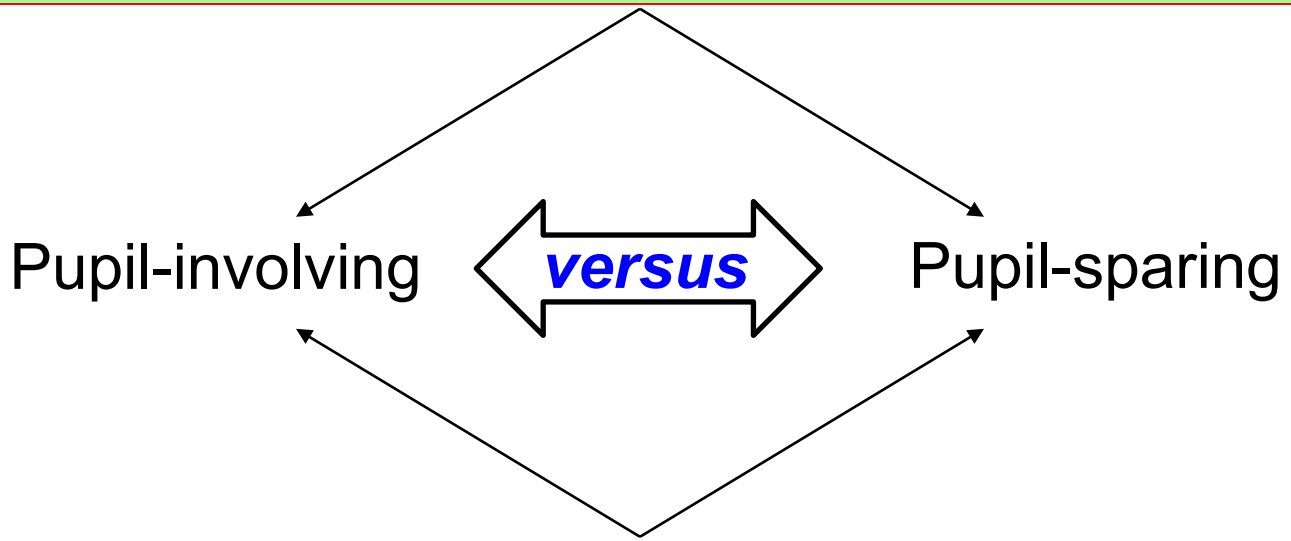
OK, side-trip over. Now let's use what we've learned to better understand the pathophysiology of CN3 palsies

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



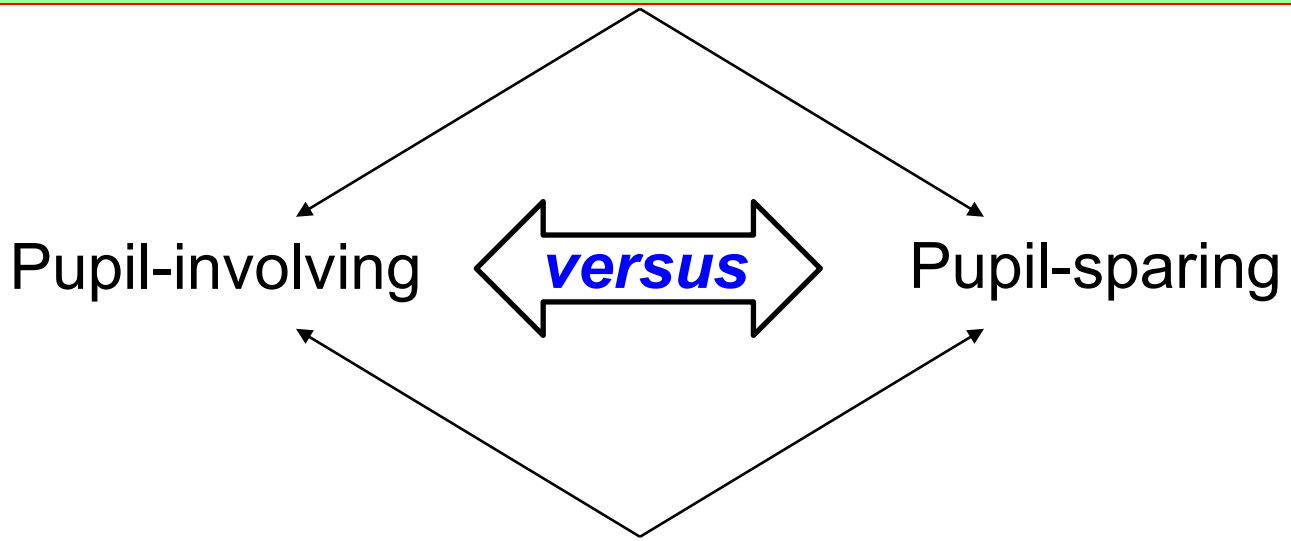
Why is pupil involvement the key issue regarding CN3 palsies?

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



Why is pupil involvement the key issue regarding CN3 palsies?
Because of its implications regarding the underlying cause of the palsy

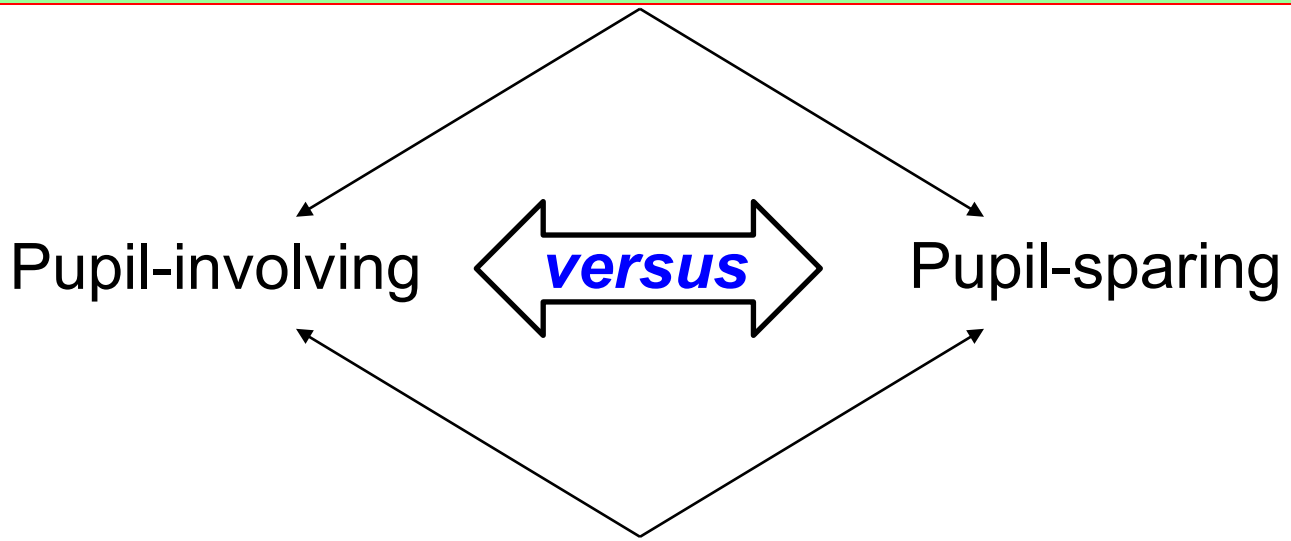
Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



Why is pupil involvement the key issue regarding CN3 palsies?
Because of its implications regarding the underlying cause of the palsy

Which potential cause of CN3 palsy in particular are we concerned about?

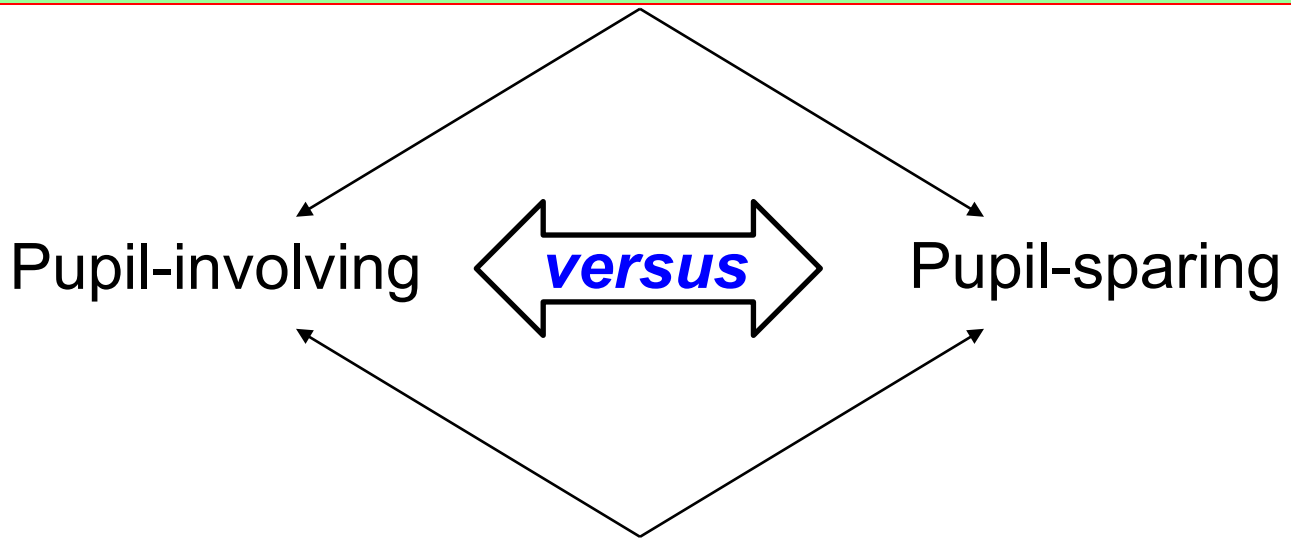
Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



Why is pupil involvement the key issue regarding CN3 palsies?
Because of its implications regarding the underlying cause of the palsy

Which potential cause of CN3 palsy in particular are we concerned about?
Compression of the nerve by an one word of the three words

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



Why is pupil involvement the key issue regarding CN3 palsies?
Because of its implications regarding the underlying cause of the palsy

Which potential cause of CN3 palsy in particular are we concerned about?
Compression of the nerve by an aneurysm of the posterior communicating artery

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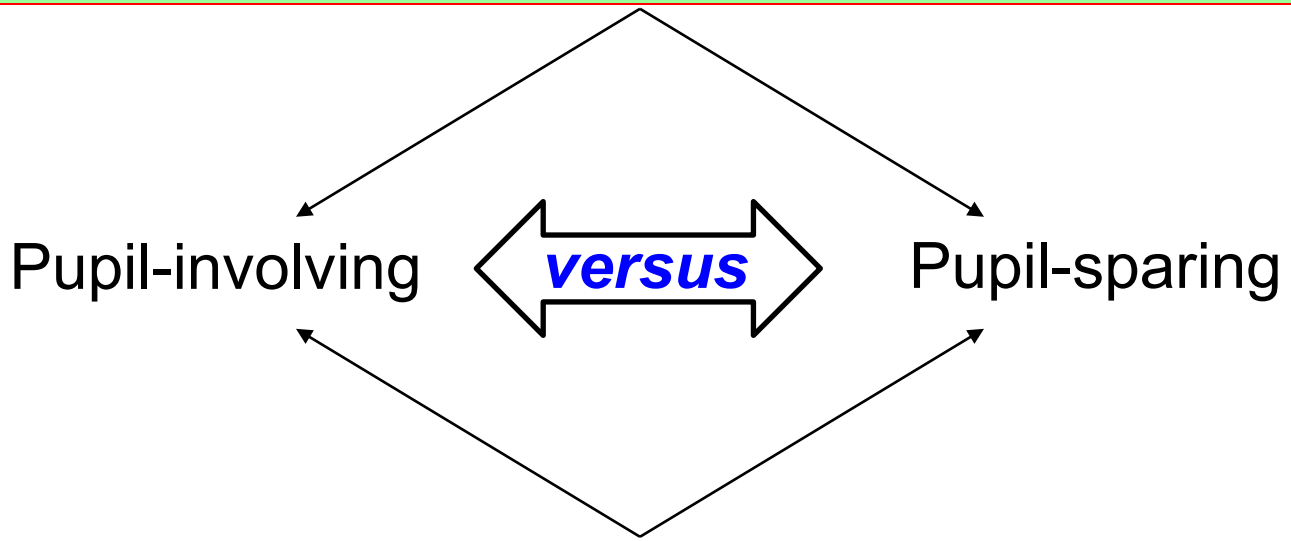

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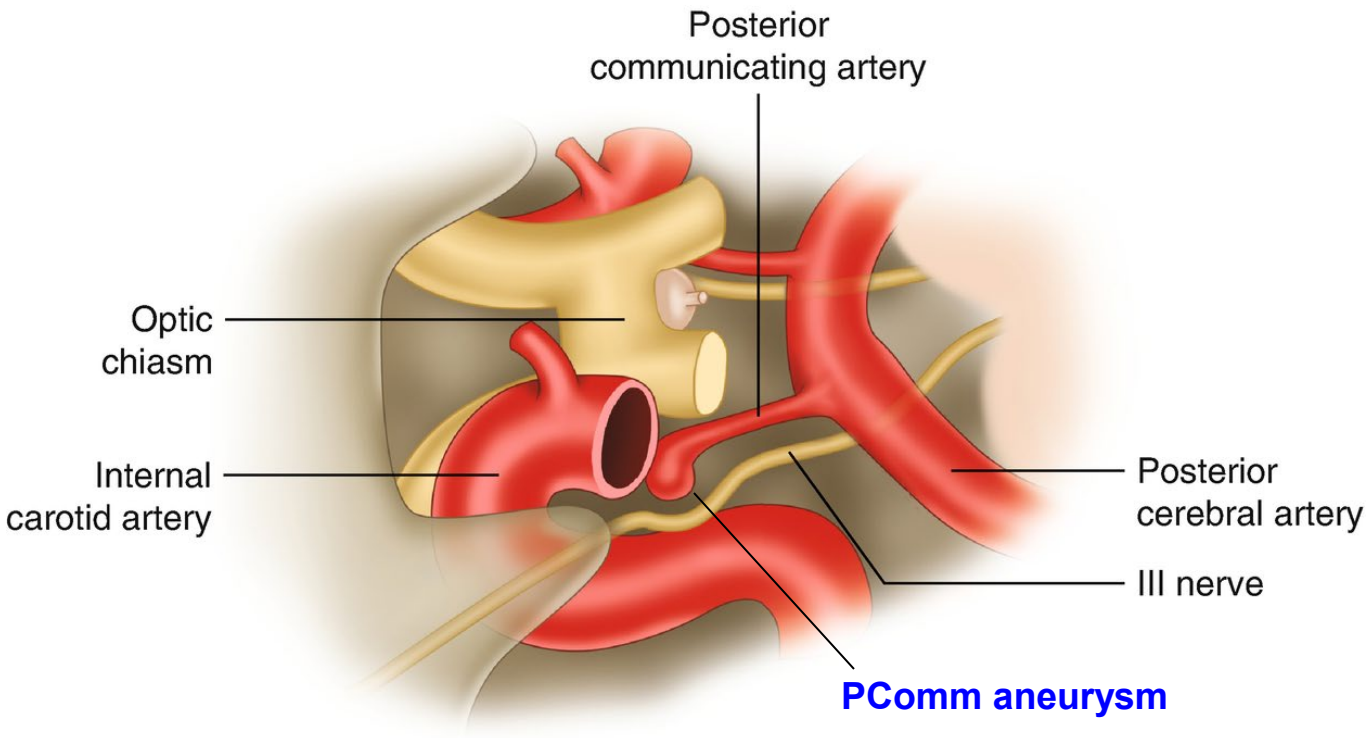
(More specifically, the aneurysm usually is located at the junction of the PComm and internal-carotid arteries)

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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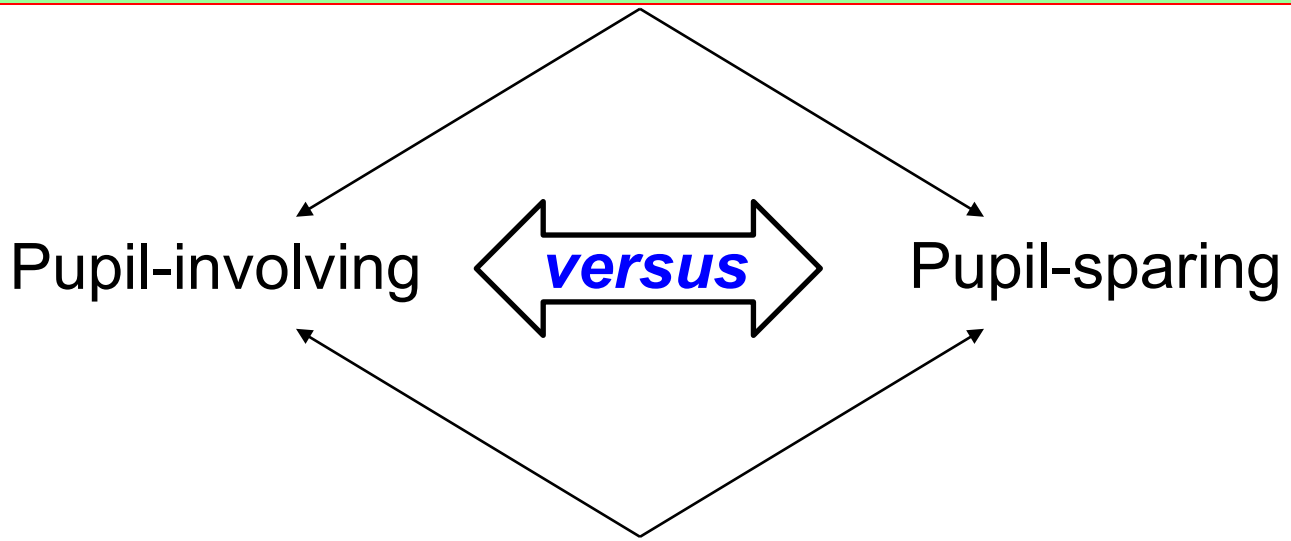

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Why should we be concerned about a PComm aneurysm?

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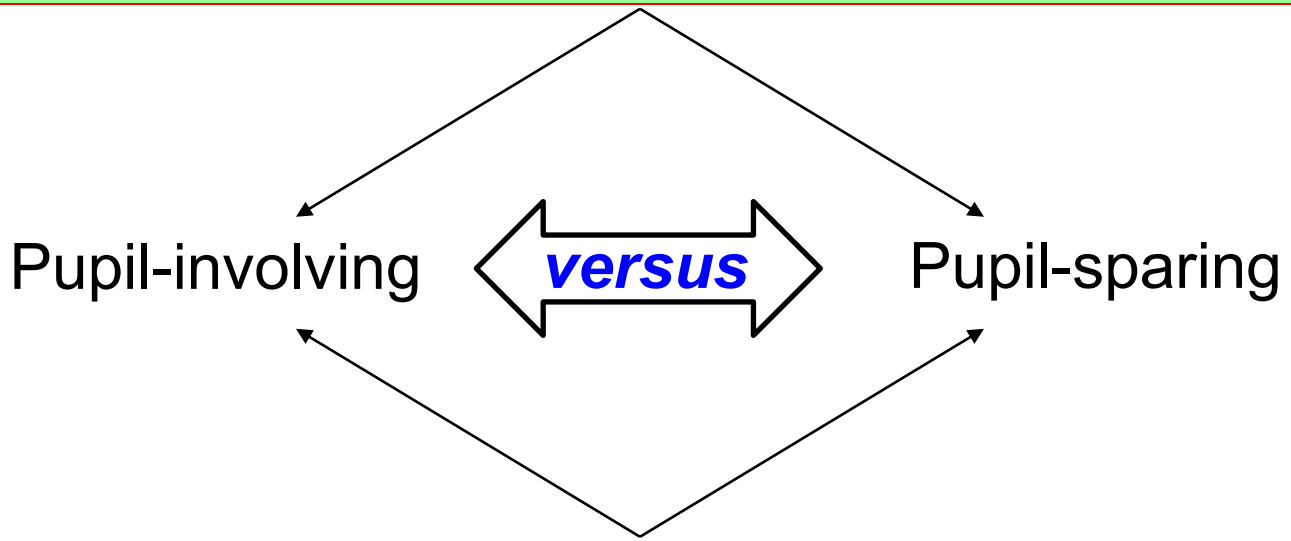

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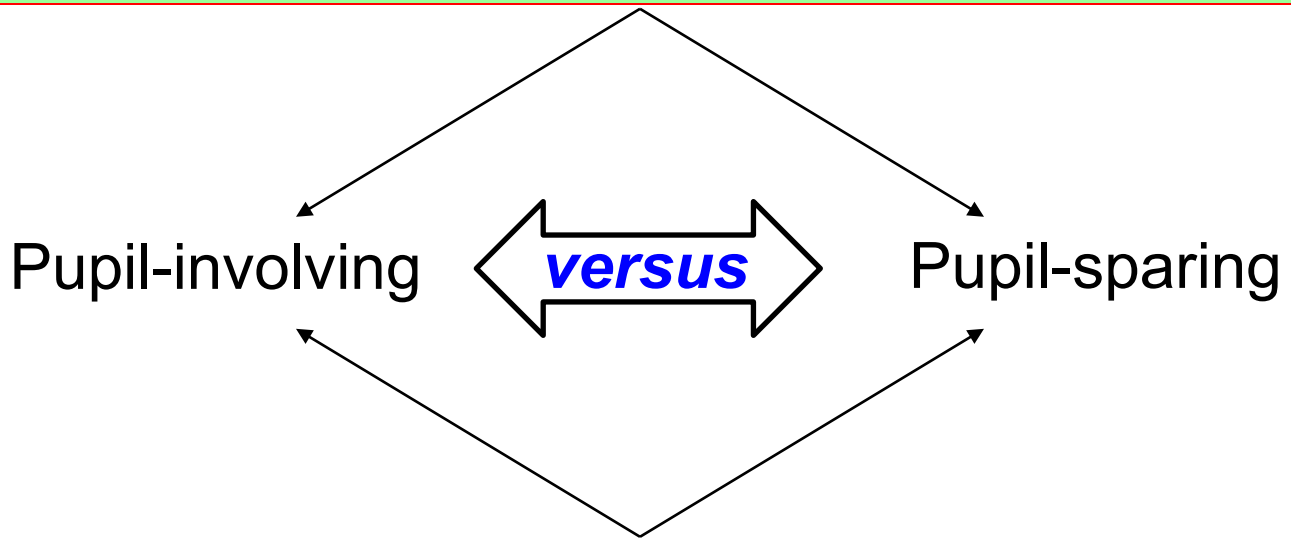
Why should we be concerned about a PComm aneurysm?
Because it is a potentially lethal condition, and its proper and timely dx may well save the pt's life

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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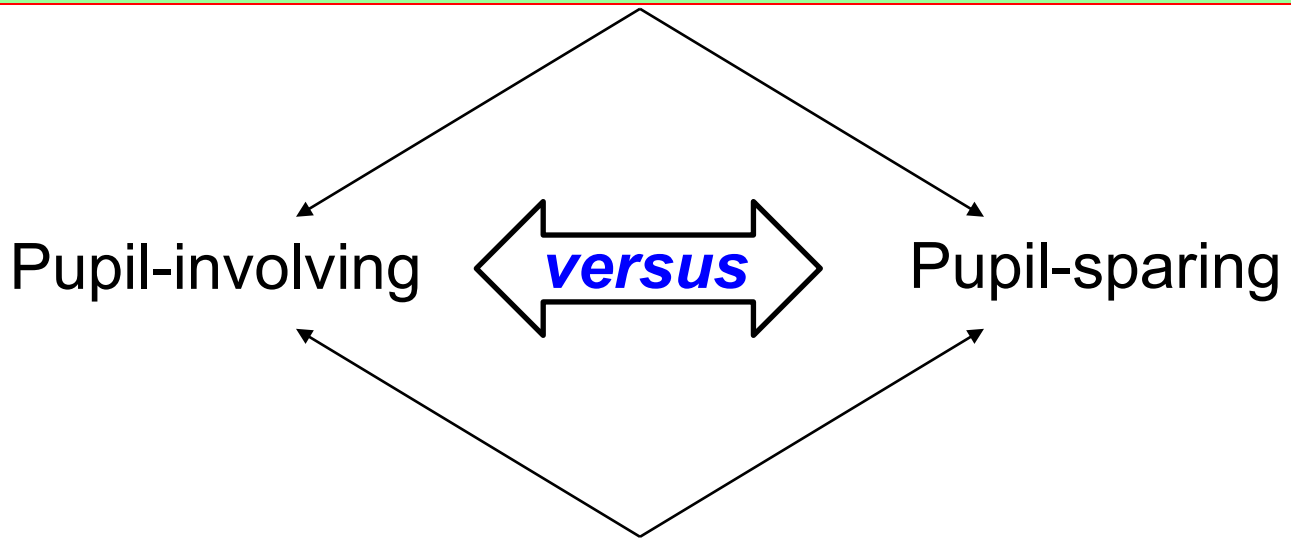

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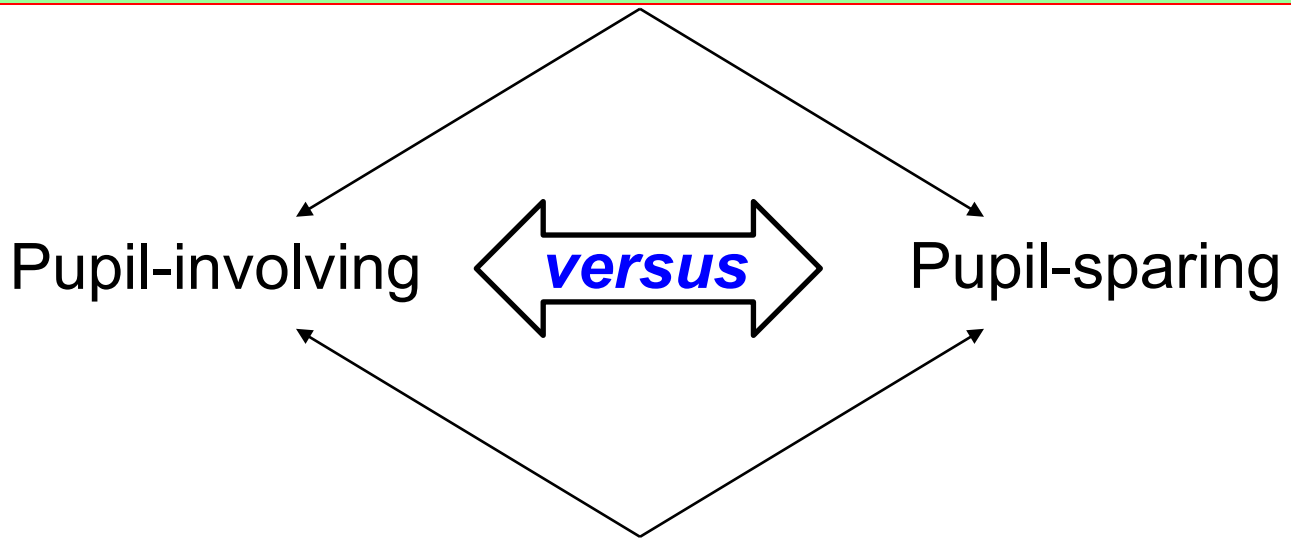

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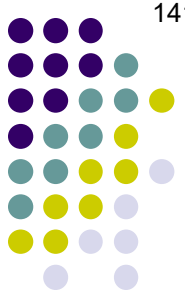
It has everything to do with the topography of the third nerve. Recall that the pre-ganglionic parasympathetics run in the superficial, outermost portion of the nerve. Given this, it stands to reason that *a lesion compressing the nerve will bag these fibers, leaving the sympathetics unopposed to dilate the pupil on that side.*

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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Getting down to clinical brass tacks: A pt presents with an apparent pupil-involving CN3 palsy. How should you approach this situation?

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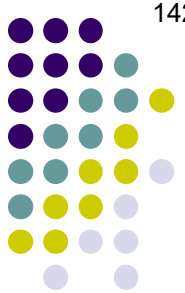

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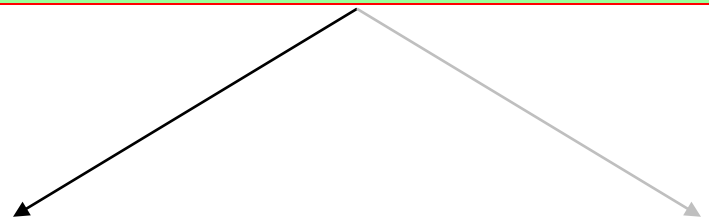

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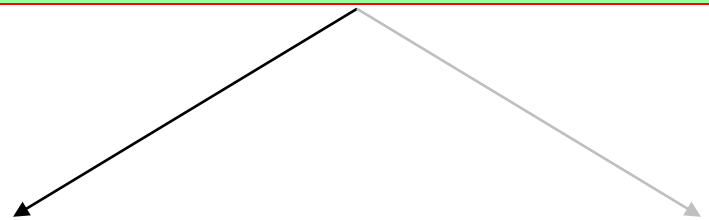

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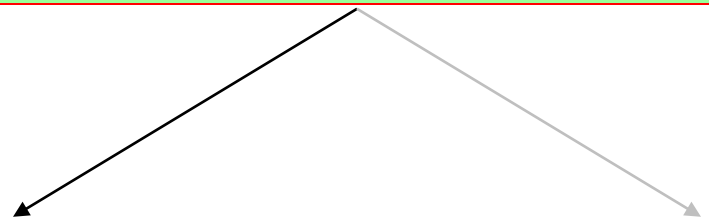

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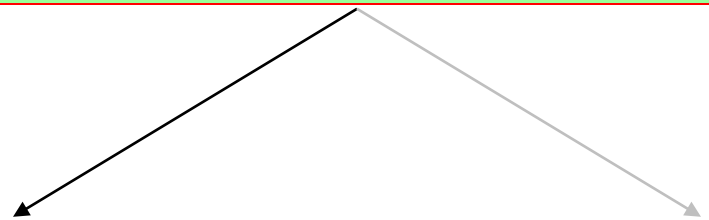

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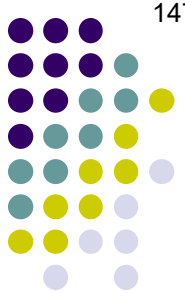
What does appropriate *mean in this context?*
It means 1) the temporal relationship between the trauma and the onset of the palsy make sense, and 2) the trauma must have been severe enough to plausibly produce a CN3 palsy

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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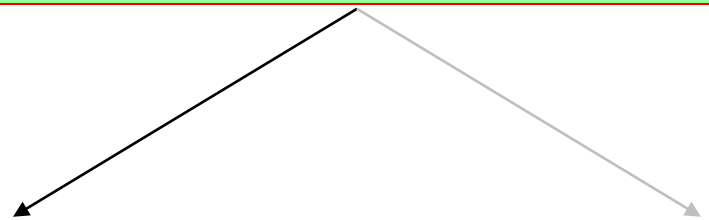

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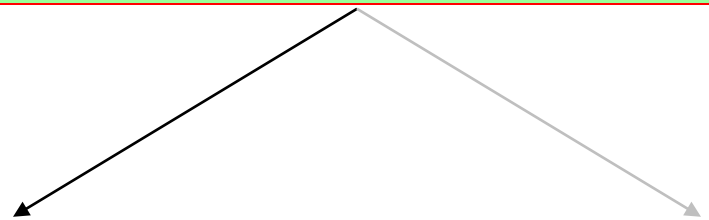

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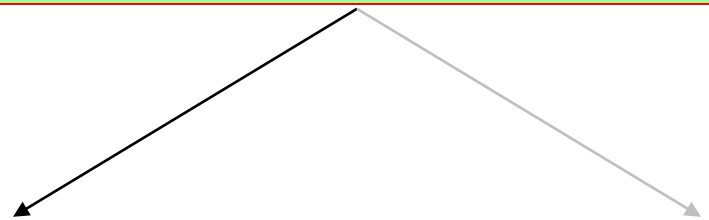

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Cover testing should be performed while the pt is 'face turned' so as to place the eye in the fields of gaze in which a CN3 palsy would manifest; ie, in down-, up- and medial gaze. If a subtle palsy is present, putting the eye into the fields of action of the CN3-controlled EOMs will bring it out.

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

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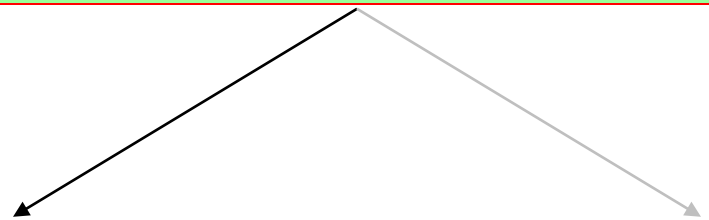
Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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What are the two exceptions?
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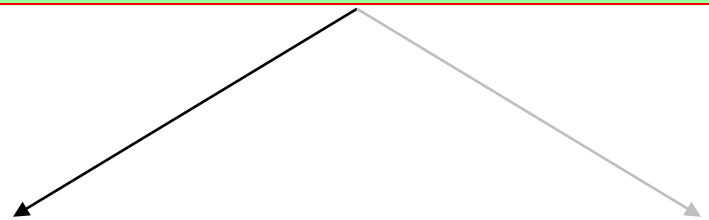

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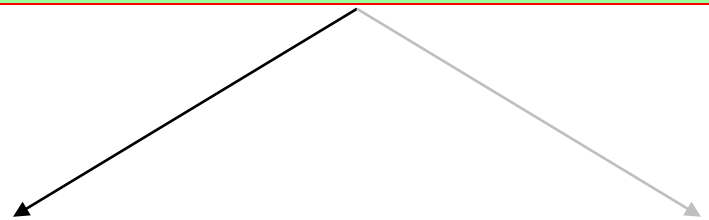
--Pharmacologic dilation
--Adie's tonic pupil
--Local iris damage (eg, posterior synechiae; post-surgical)

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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(***Adie's tonic pupil*** *is addressed at length in slide-set* N4)

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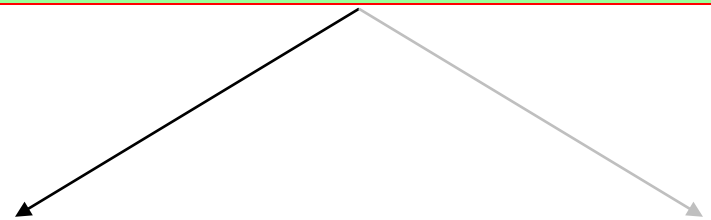

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Further brass tacks: How should a pupil-involving CN3 palsy be handled?

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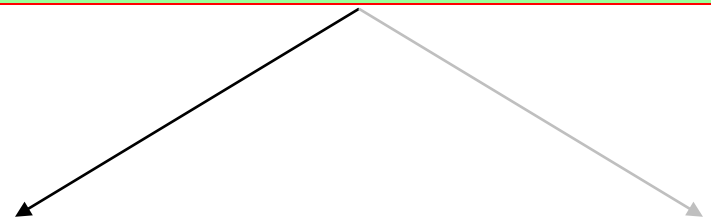

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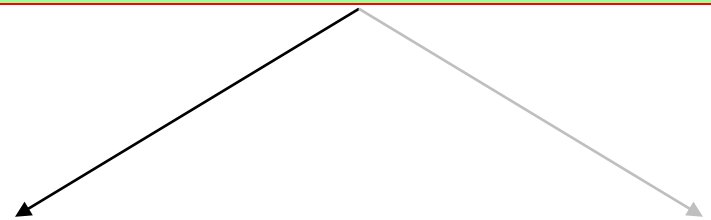

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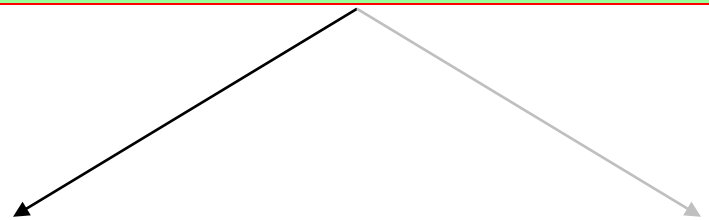

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--MR angiography (MRA)
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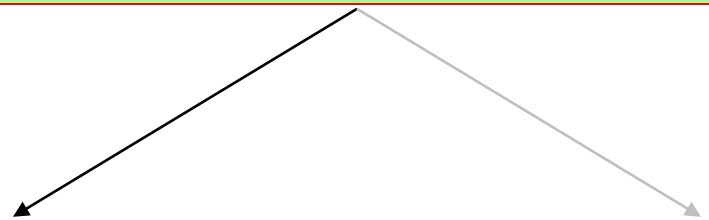

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Pupil-sparing

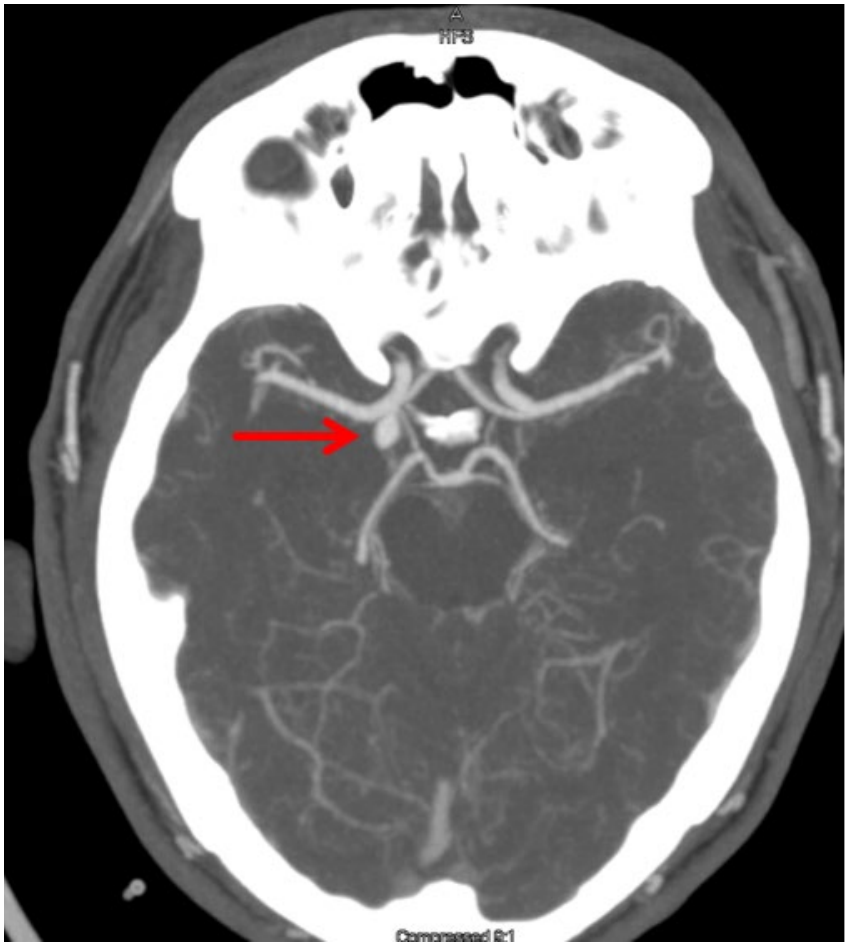
Getting down to clinical brass tacks: A pt presents with a pupil-involving CN3 palsy. How should you approach this situation?
Thusly: With two exceptions, a pupil-involving CN3 palsy is assumed to represent a Pcomm aneurysm until proven otherwise

Further brass tacks: How should a pupil-involving CN3 palsy be handled?
Emergent **imaging of the CNS vasculature** must be performed to rule out a Pcomm aneurysm

What three imaging modalities are appropriate/available for detecting a Pcomm aneurysm?
--CT angiography (CTA)
--MR angiography (MRA)
--Catheter angiography

Which is best?
Each has advantages and disadvantages; selection should be done in consultation with one's local neuro-radiologist (although it should be said that the convenience and safety of CTA and MRA have rendered catheter angiography a distant third choice for diagnostic imaging)

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



Right posterior communicating artery aneurysm on CTA

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Pupil-involving

Pupil-sparing

What does it mean to say a CN3 palsy is pupil-sparing*?*

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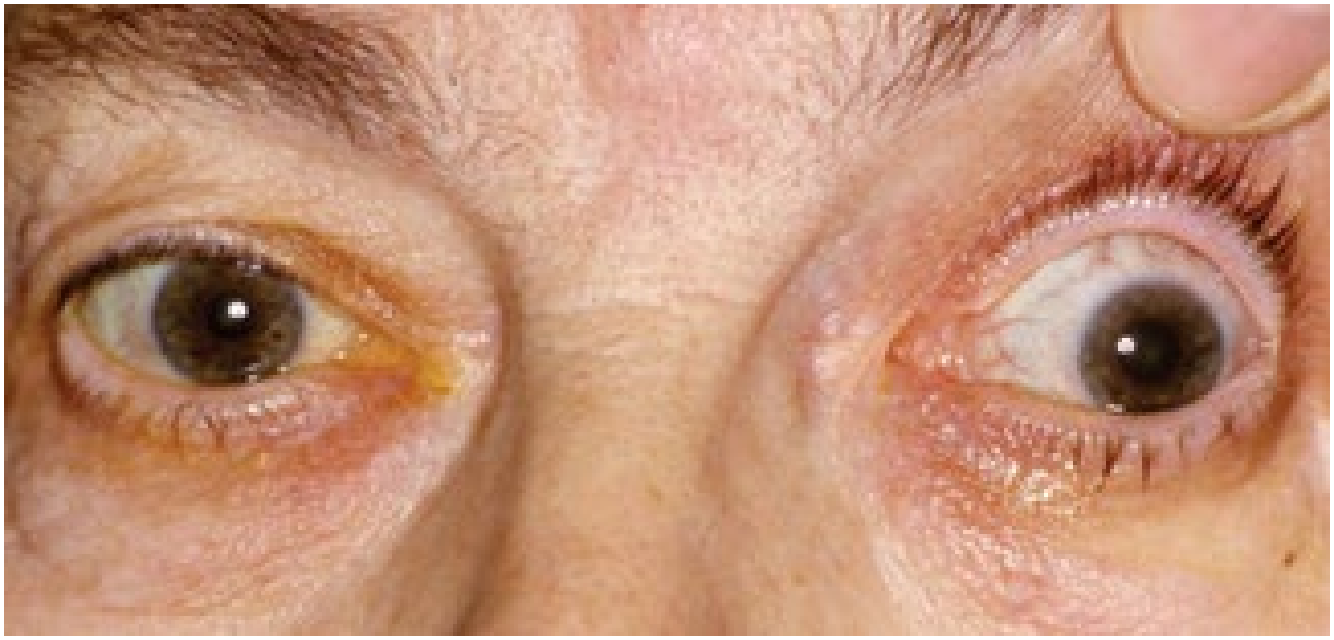

Pupil-sparing CN3 palsy

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It was noted at the outset of the slide-set that most CN3 palsies are ischemic. What is the pathophysiology of this?

(Recall this box from early in the slide-set)

The majority of nontraumatic isolated third nerve palsies are secondary to what pathologic event?
Microvascular injury; ie, ischemia

In which portion of the pathway does this sort of injury occur?
The subarachnoid (although it must be noted that it could occur along the cavernous sinus portion as well)

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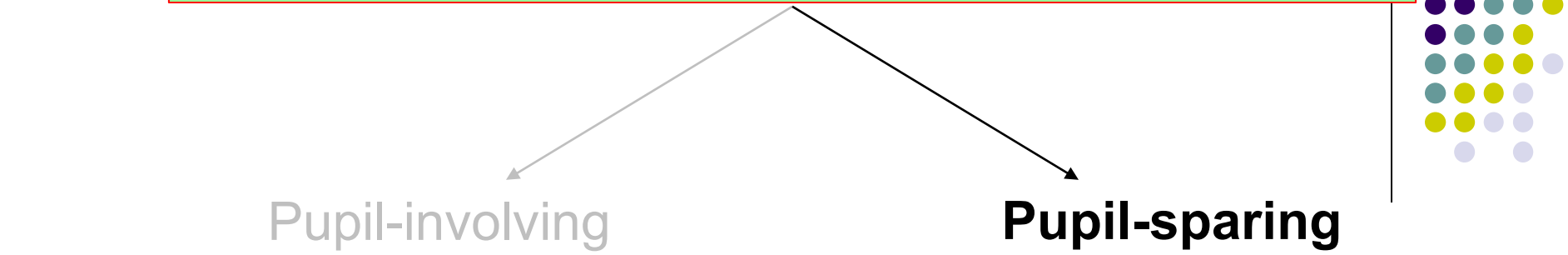

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As with compressive lesions, it's all about CN3 anatomy. Recall that CN3 is a large-diameter nerve. Because of its size, its inner fibers are too far from its surface to receive oxygen via passive diffusion. Thus, its inner fibers are nourished via vessels that perforate the nerve's sheath and dive into its substance.

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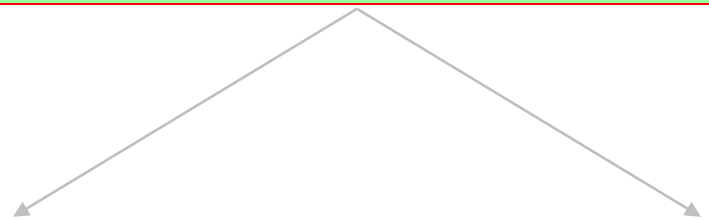

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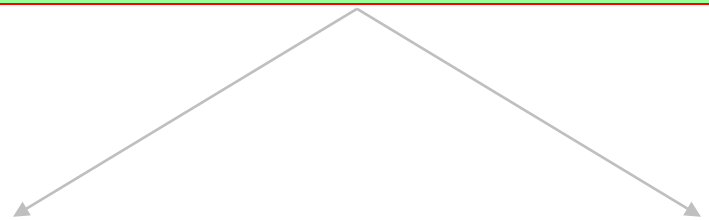

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In a vascular, pupil-involving CN3 palsy, does the amount of anisocoria tend to be small, or large?

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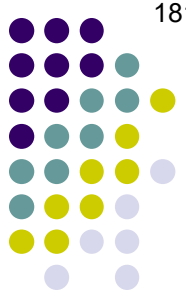

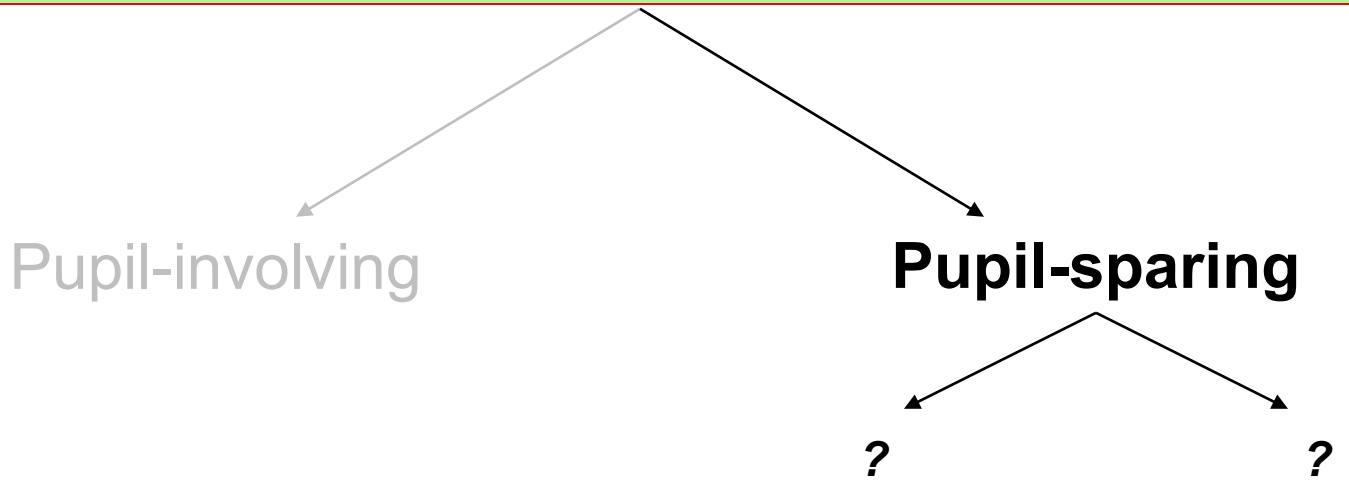

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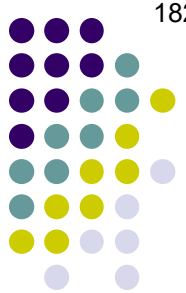

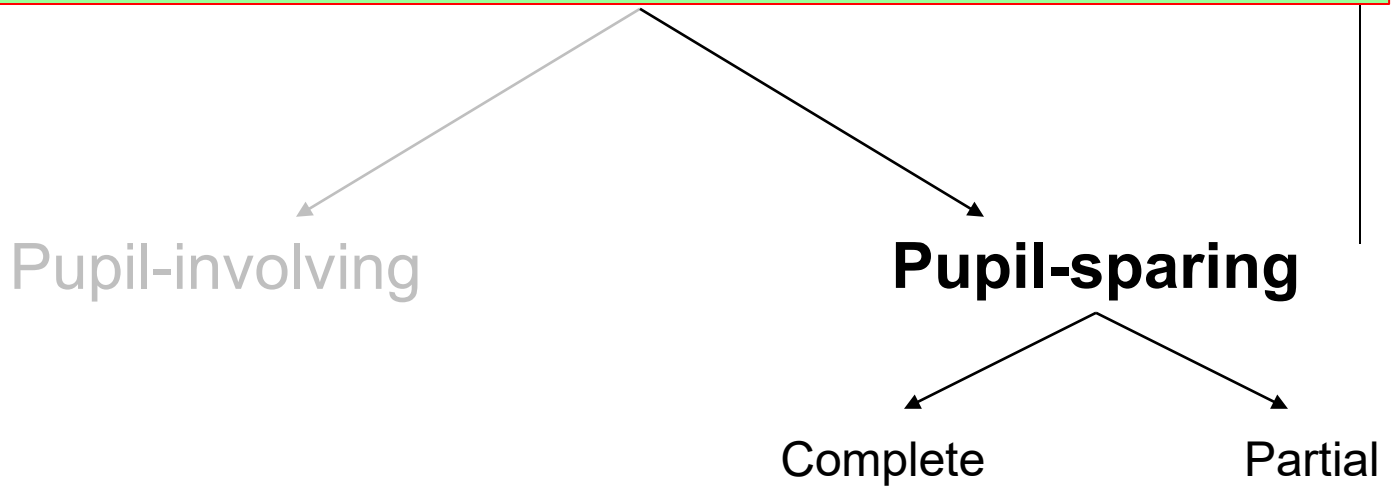

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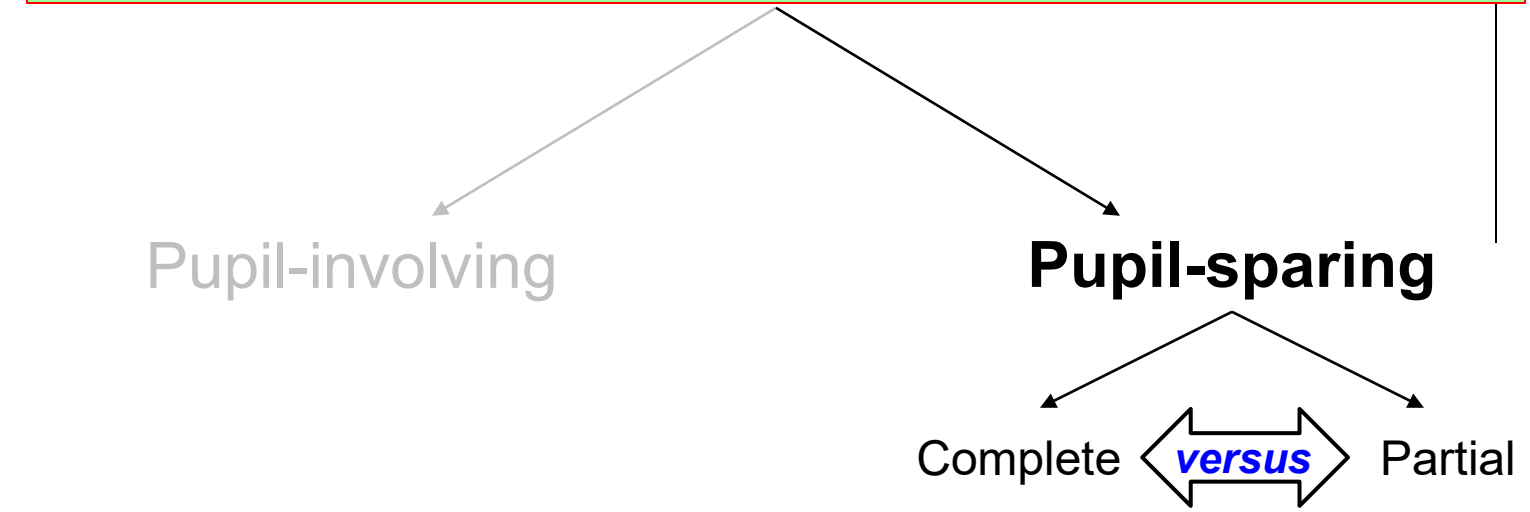

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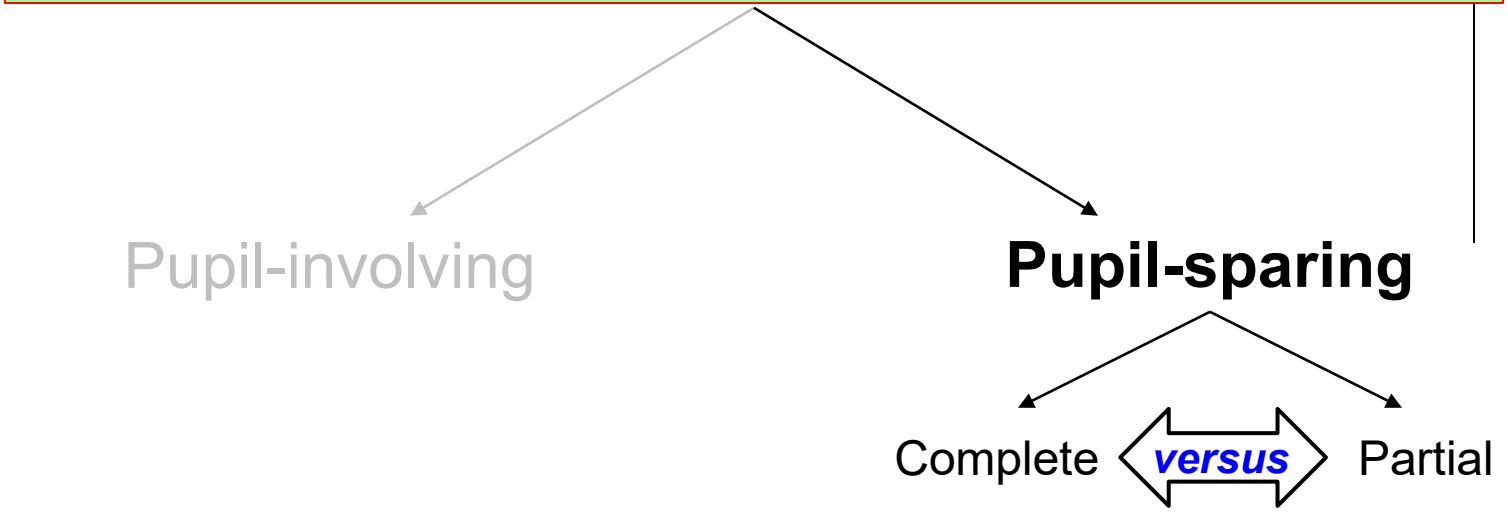

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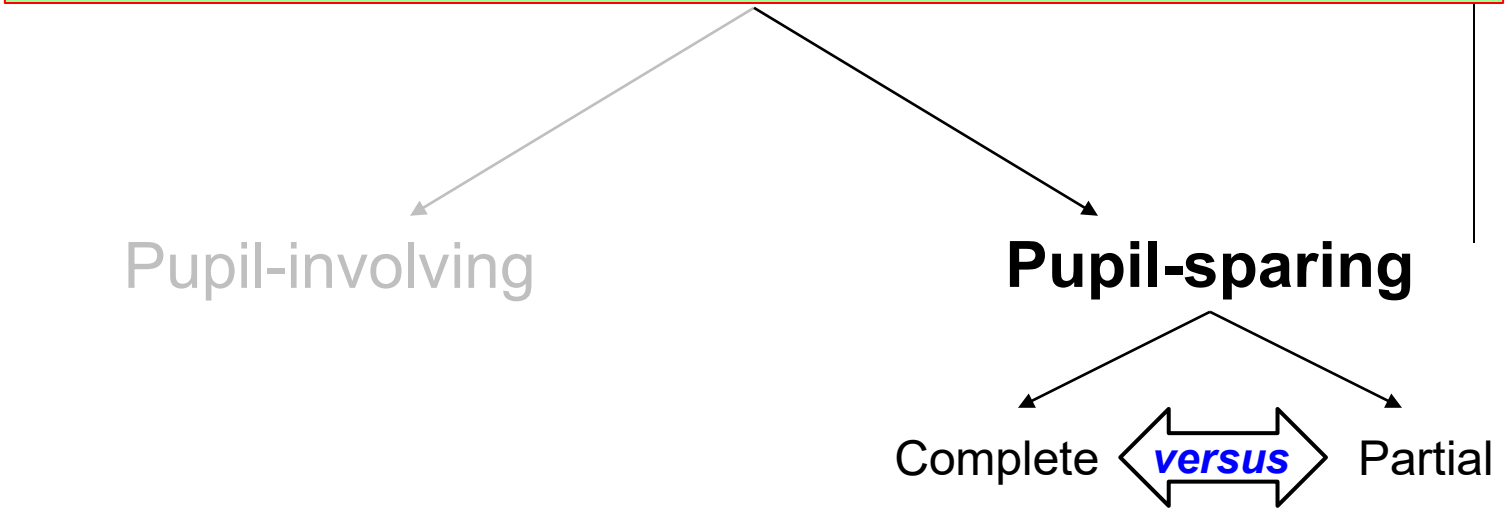

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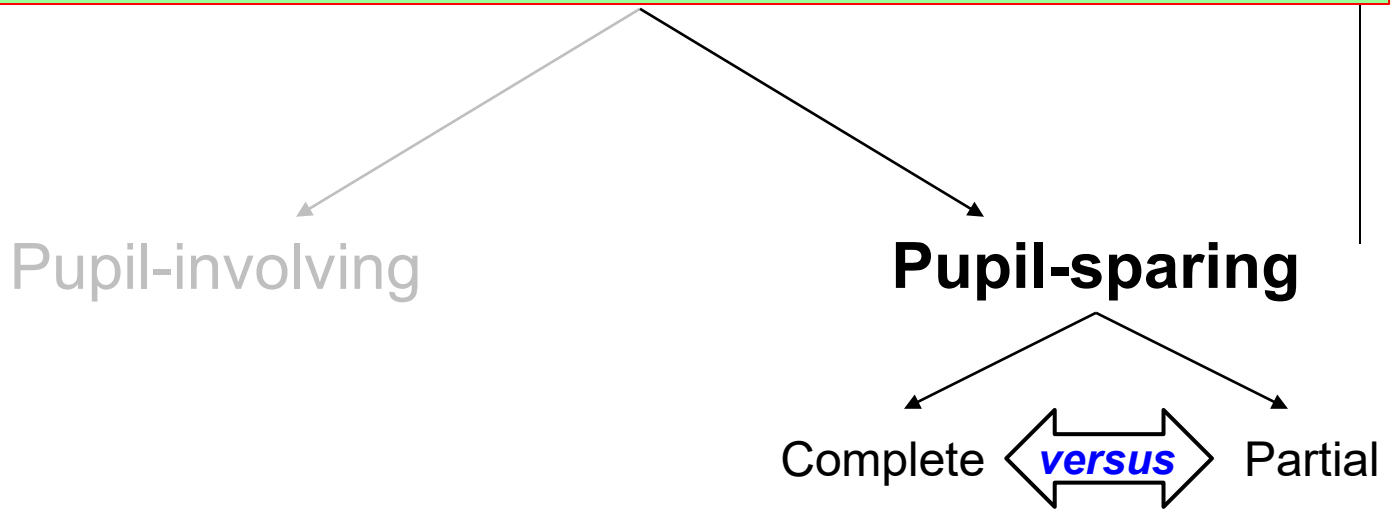

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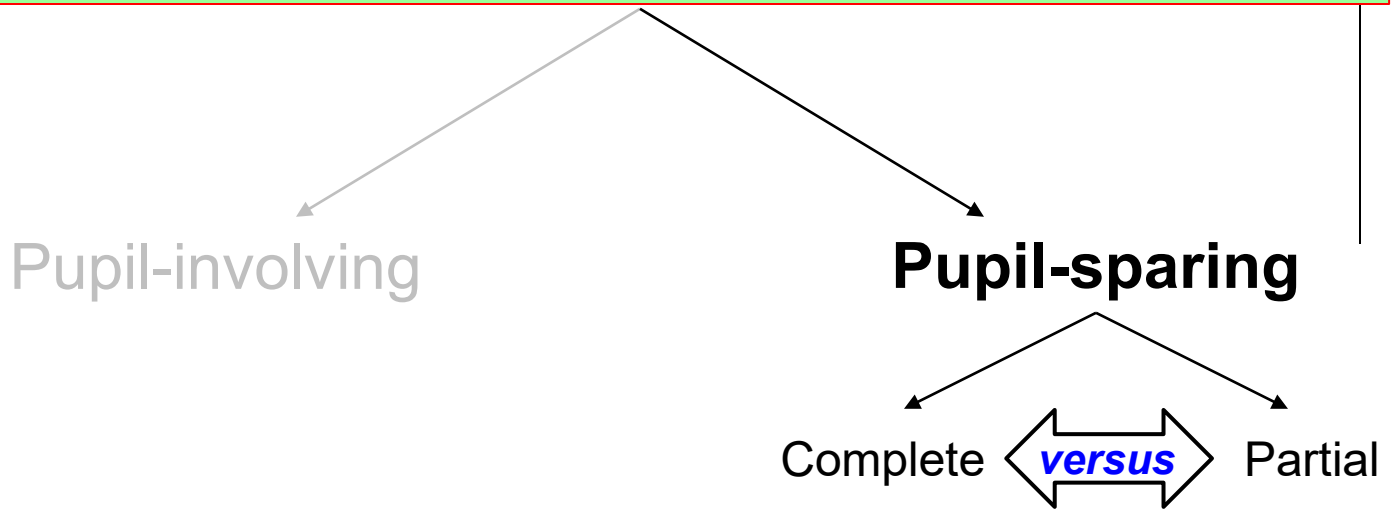

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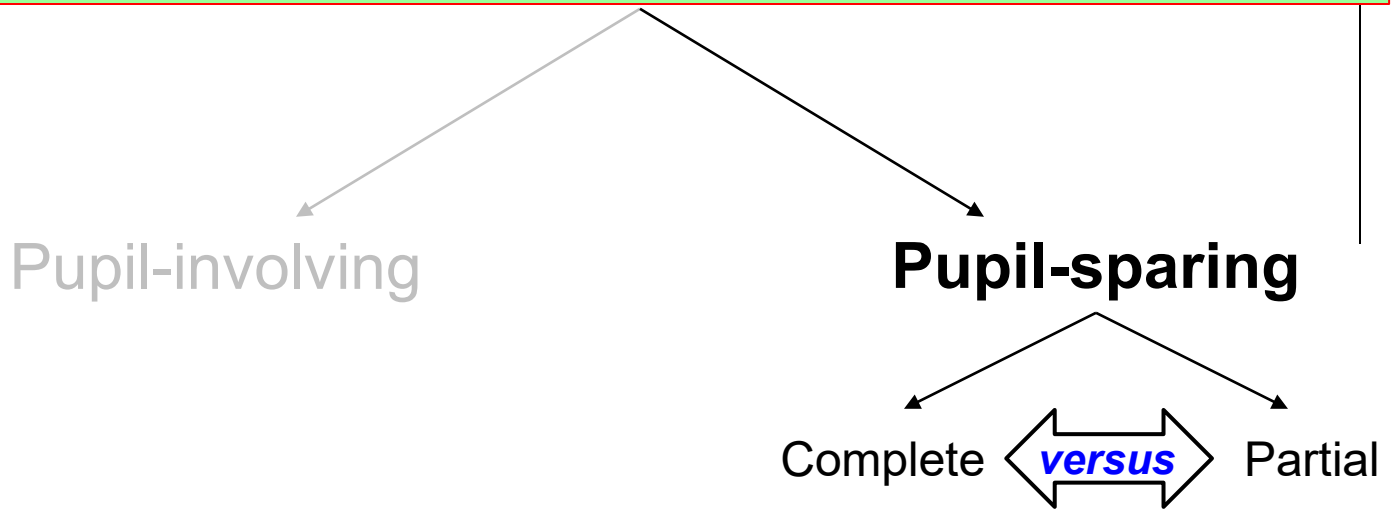

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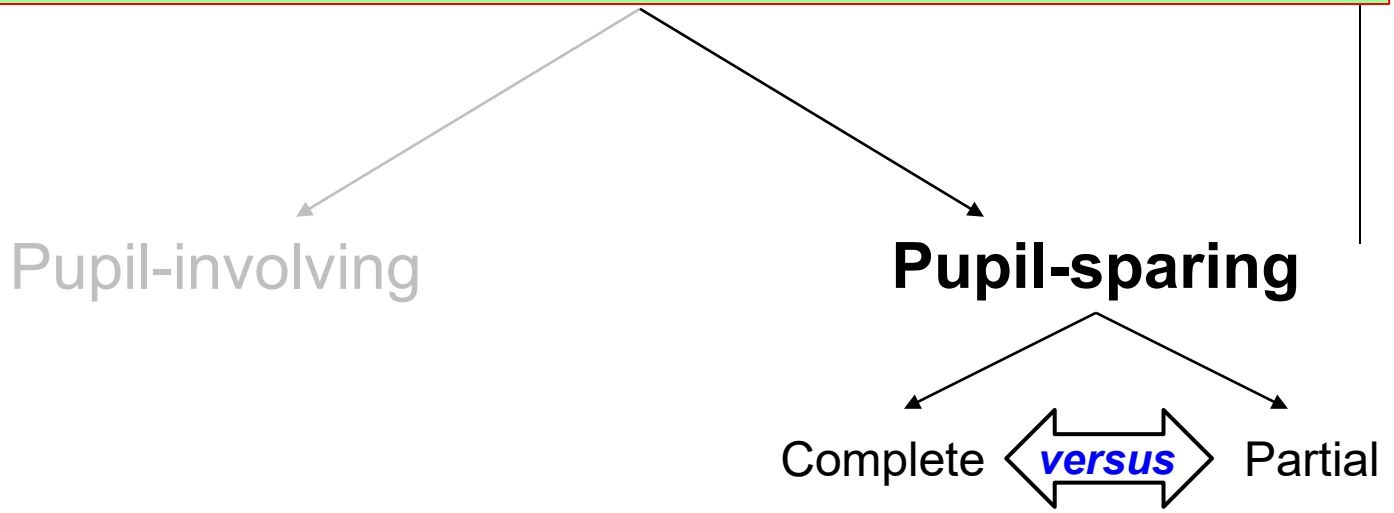

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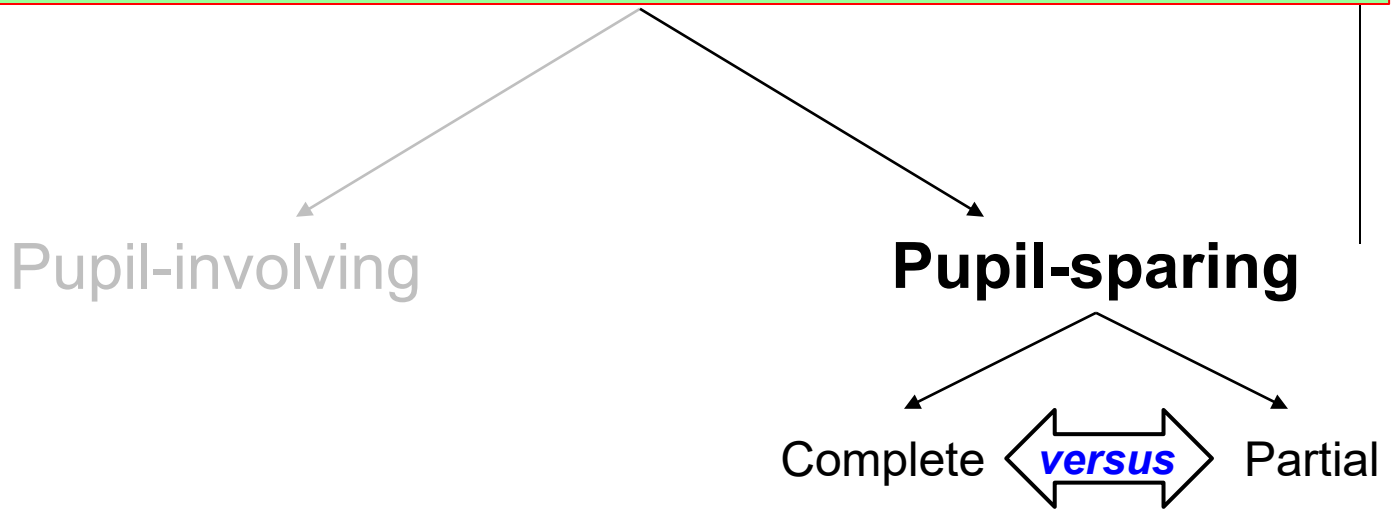

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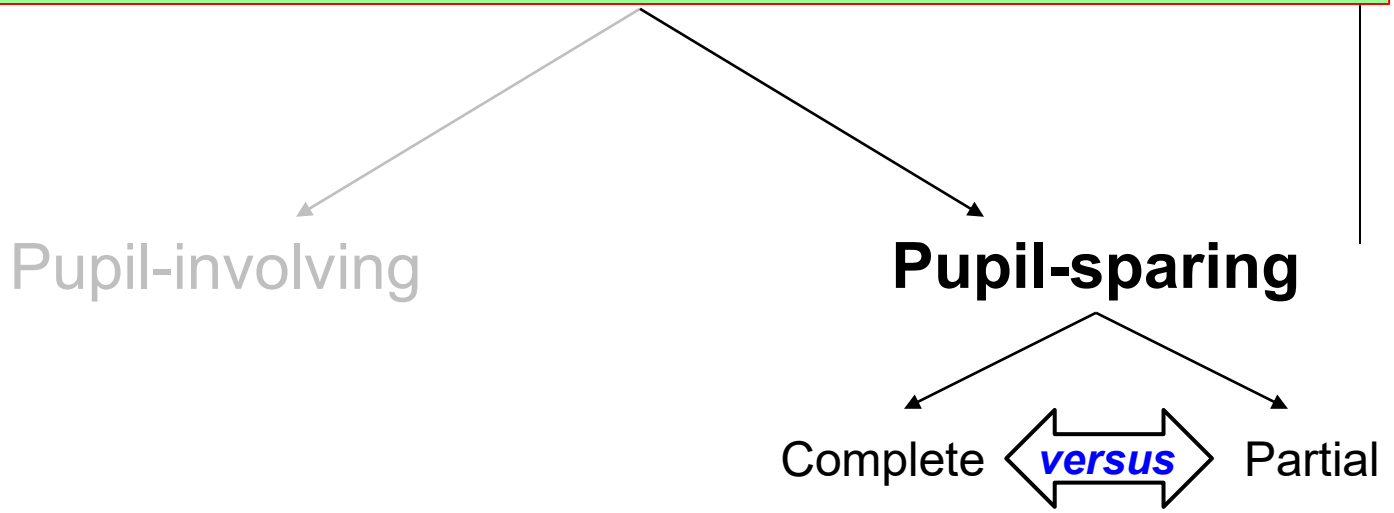

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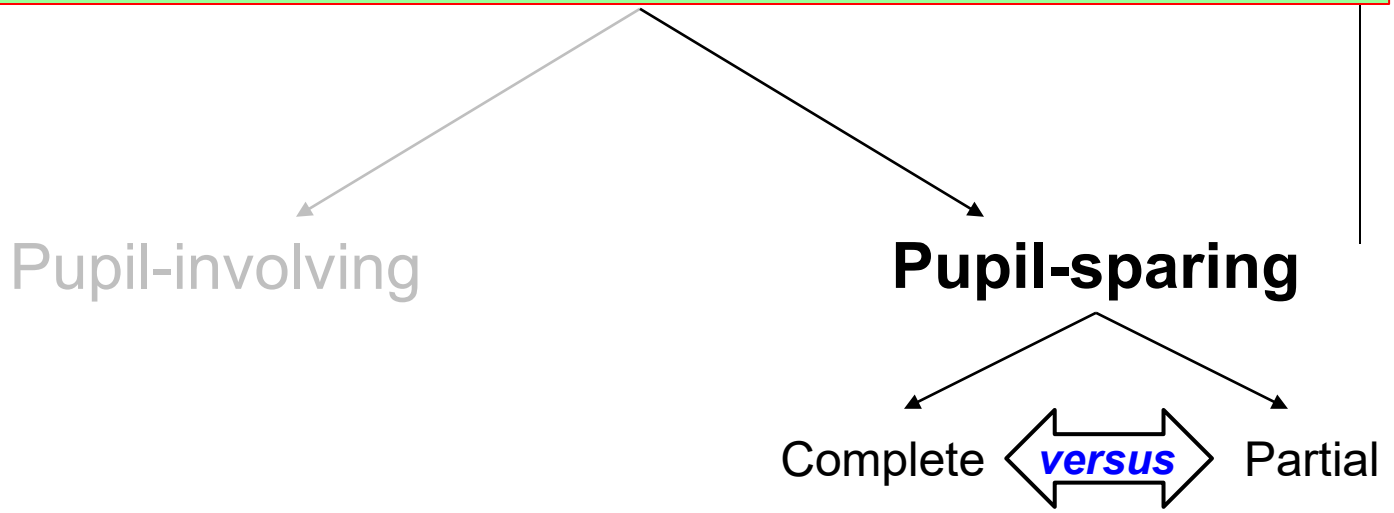
Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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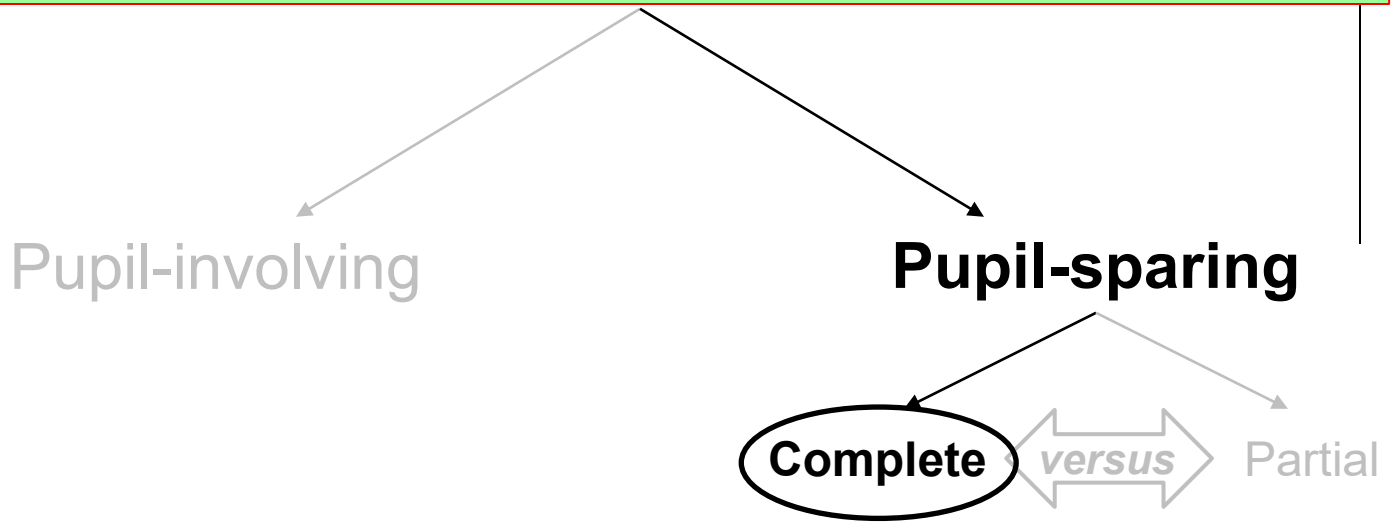

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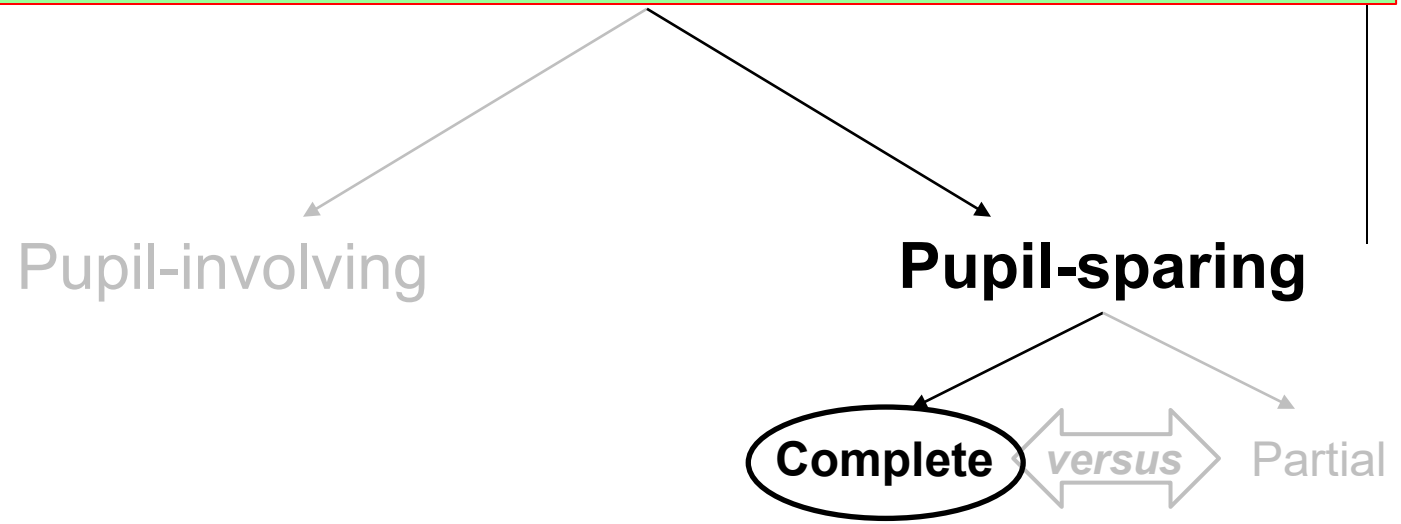
Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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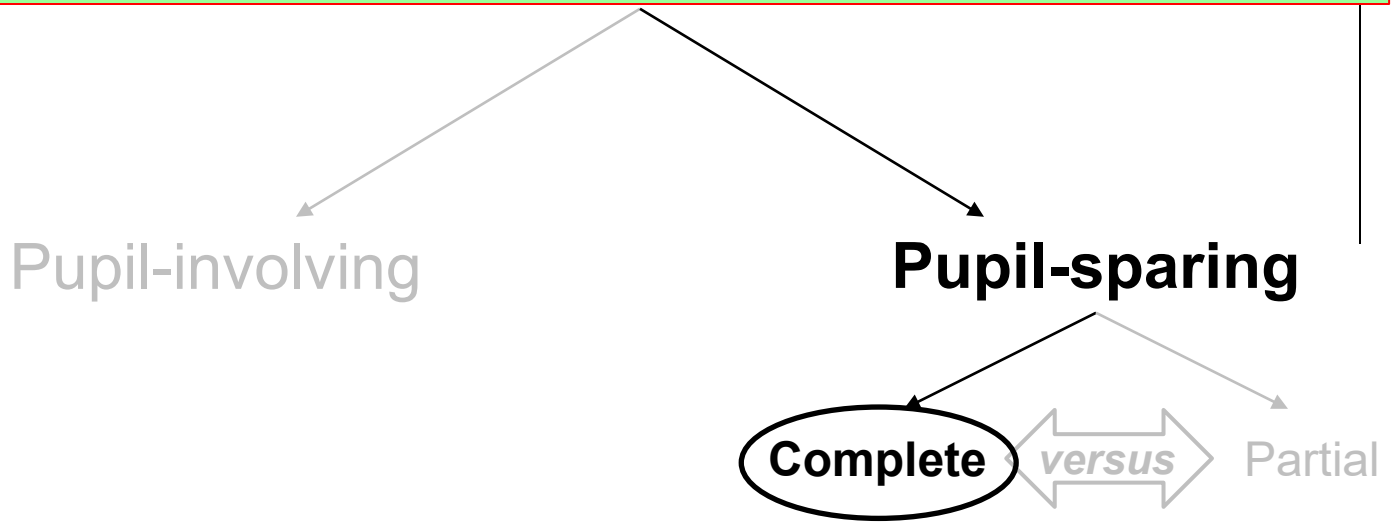
OK, so a vasculopathic, cancer-free, 50+ pt has a complete pupil-sparing CN3 palsy. Does this carry significant implications for management?
It does, in that it means the pt need not undergo emergent imaging to r/o an aneurysm

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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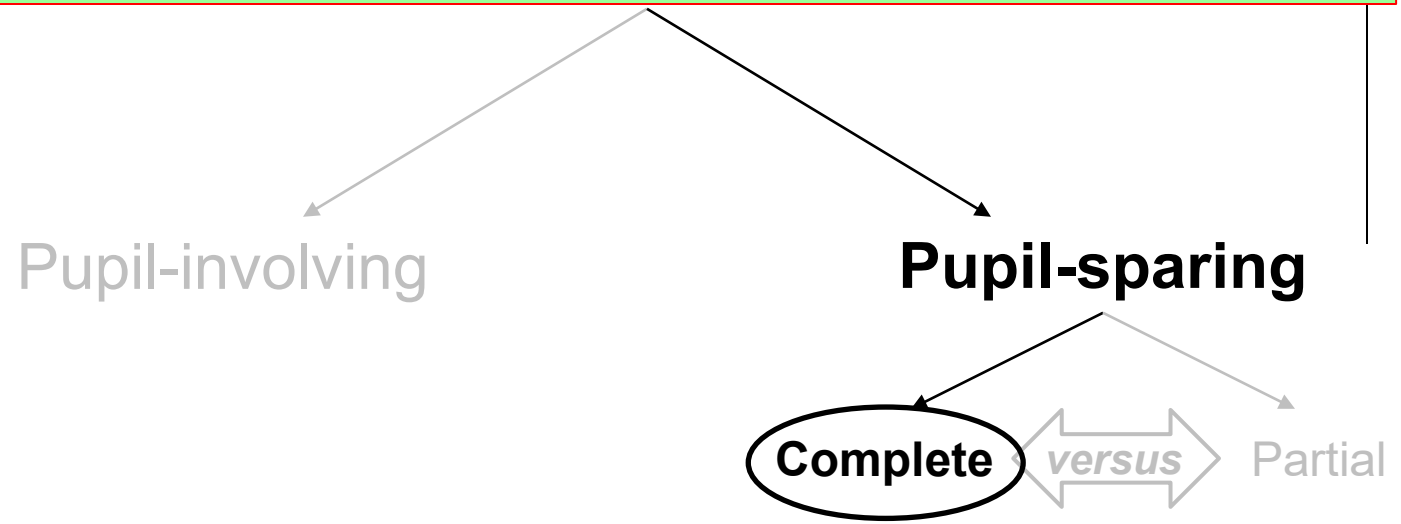
Does this mean you can cut the pt loose, telling her to come back when she needs cataract surgery?

emergent imaging to r/o an aneurysm

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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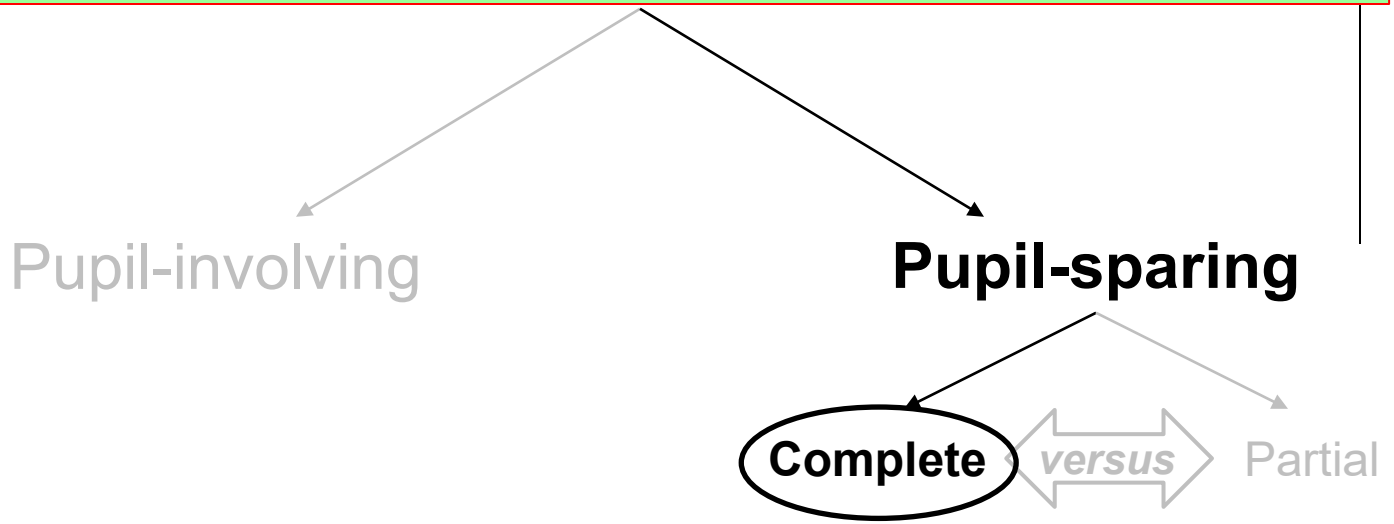
Does this mean you can cut the pt loose, telling her to come back when she needs cataract surgery?
No, such pts must be followed closely, and a general medical eval should be considered

emergent imaging to r/o an aneurysm

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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--**The pt is a vasculopath** ;
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What should this 'general medical eval' consist of?
--*?*
--*?*
--*?*
--*?*

g her to come back when she needs cataract surgery?
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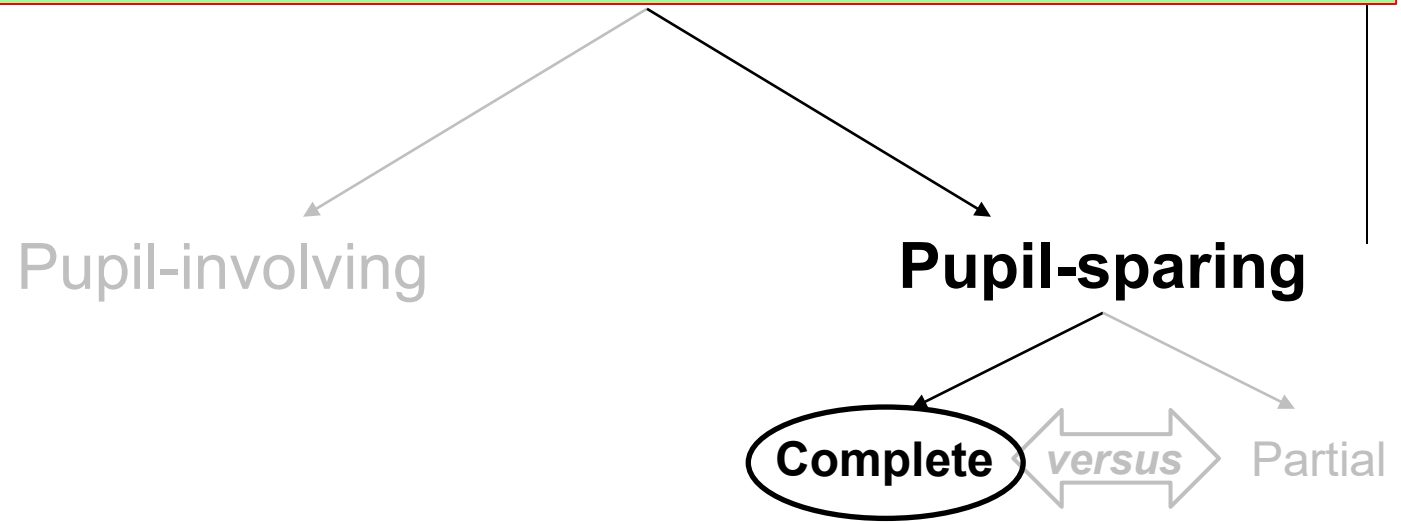

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What should this 'general medical eval' consist of?
--BP assessment
--Check blood glucose status (A1c, etc)
--Fasting lipid panel
--Consider checking inflammatory markers (eg, ESR)

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to come back when she needs cataract surgery?
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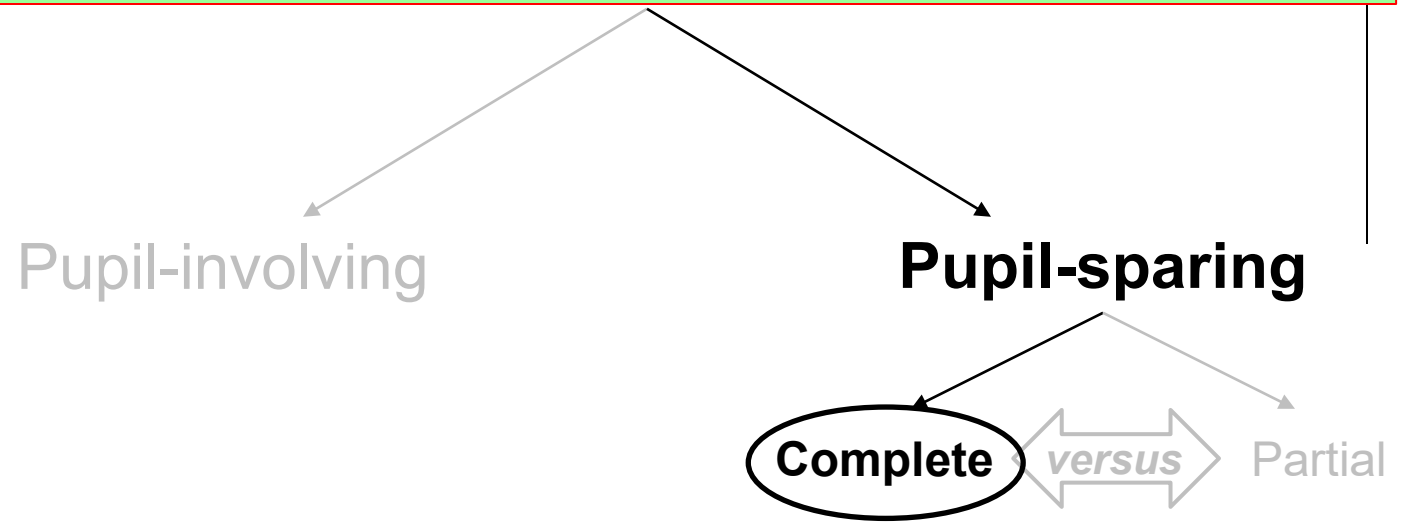
Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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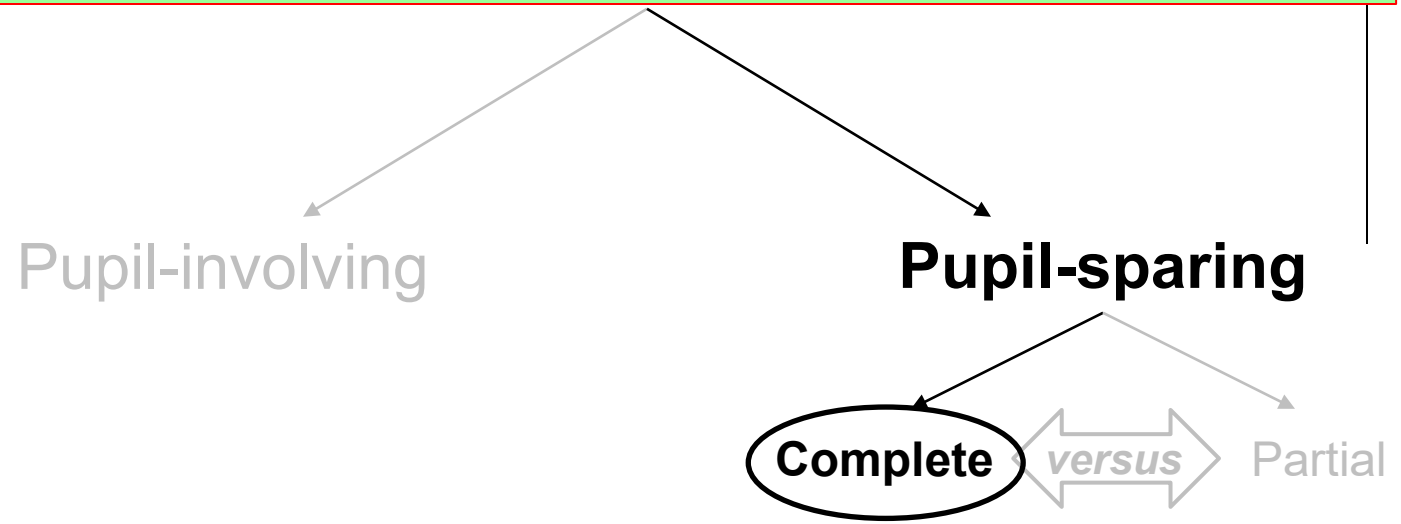
While following the pt, what are you on the lookout for?
--?
--?
--?

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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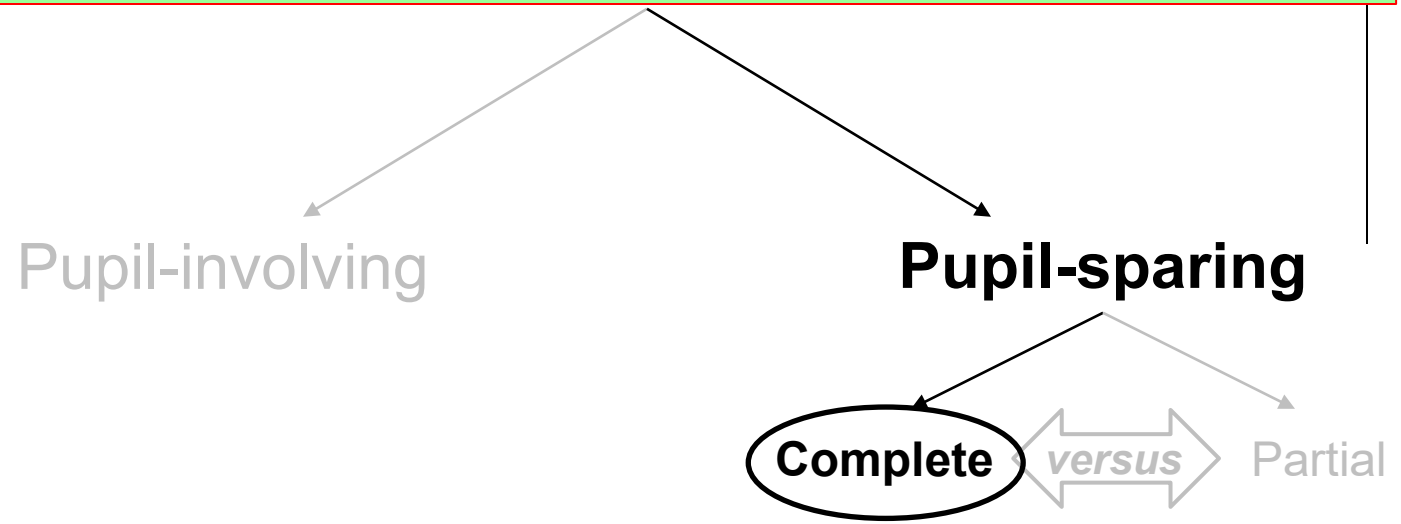
While following the pt, what are you on the lookout for?
--The onset of pupil involvement
--The development of signs/symptoms involving other cranial nerves
--Failure of the palsy to resolve by amount of time

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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an aneurysm

While following the pt, what are you on the lookout for?
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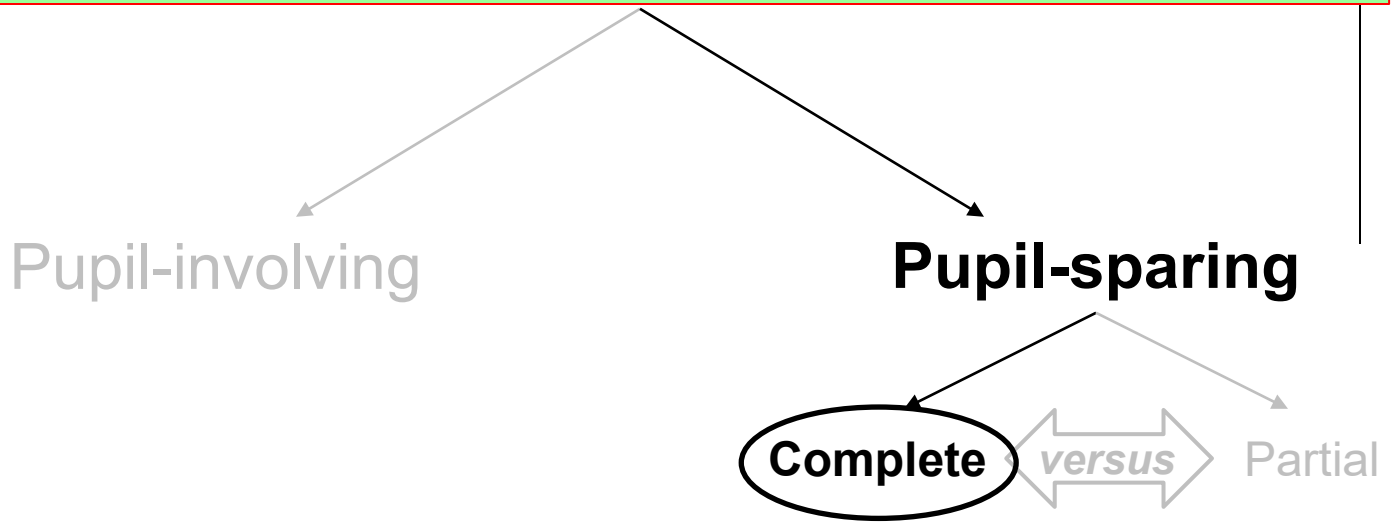
Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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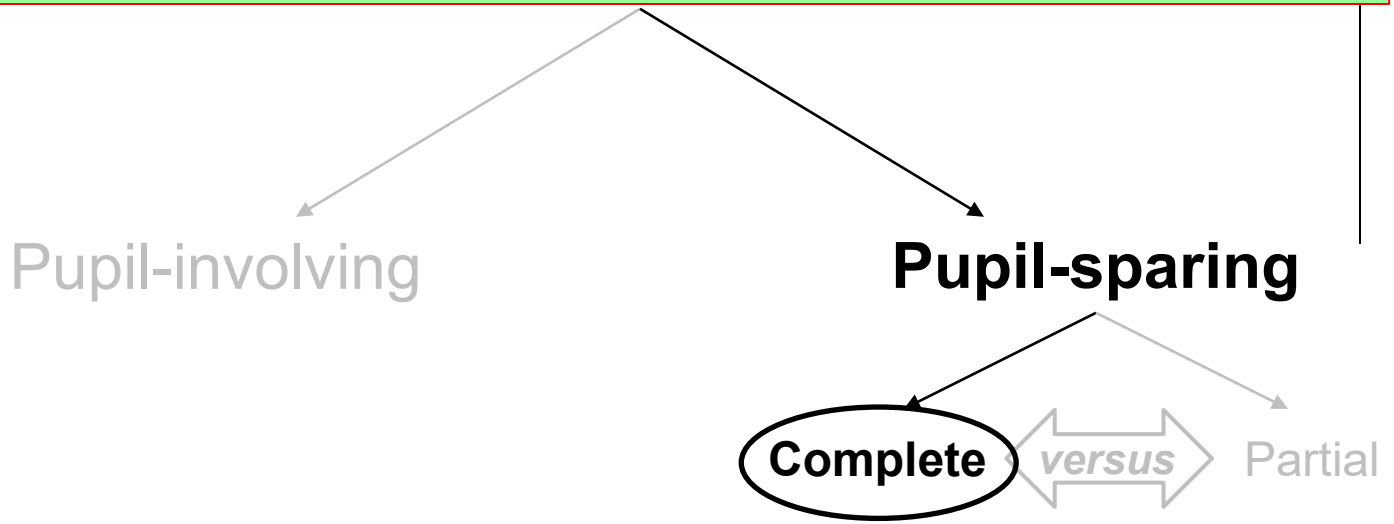

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Imaging should be pursued

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Pupil-involving

Pupil-sparing

Complete *versus* Partial

What are you looking for on imaging if…

(No question yet—keep going)

What is meant by re… partial'?
It refers to the status… all involved, the palsy is complete

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Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

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What are you looking for on imaging if…
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What are you looking for on imaging if…
…anisocoria develops? Dat Pcomm aneurysm
…other S/S develop?

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Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Pupil-involving

Pupil-sparing

Complete *versus* Partial

What are you looking for on imaging if…
…anisocoria develops? Dat Pcomm aneurysm
…other S/S develop? A malignancy
…the palsy fails to resolve by month 3?

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What are you looking for on imaging if…
…anisocoria develops? Dat Pcomm aneurysm
…other S/S develop? A malignancy
…the palsy fails to resolve by month 3? Malignancy

Does this mean you can cut the pt …ose, telling her to come back when she needs cat…act surgery?
No! **such pts must be followed** c…sely, and a general medical eval should be co…sidered …an aneu…sm

While following the pt, what are you … the lookout for?
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Imaging should be pursued

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Pupil-involving

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Complete *versus* Partial

What are you looking for on imaging if…

At what location might one expect a malignancy to be found?
--?
--?

A **malignancy**

olve by month 3? **Malignancy**

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Imaging should be pursued

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

Pupil-involving

Pupil-sparing

Complete *versus* Partial

What are you looking for on imaging if…

At what location might one expect a malignancy to be found?
--The skull base
--The cavernous sinus

A **malignancy**

olve by month 3? **Malignancy**

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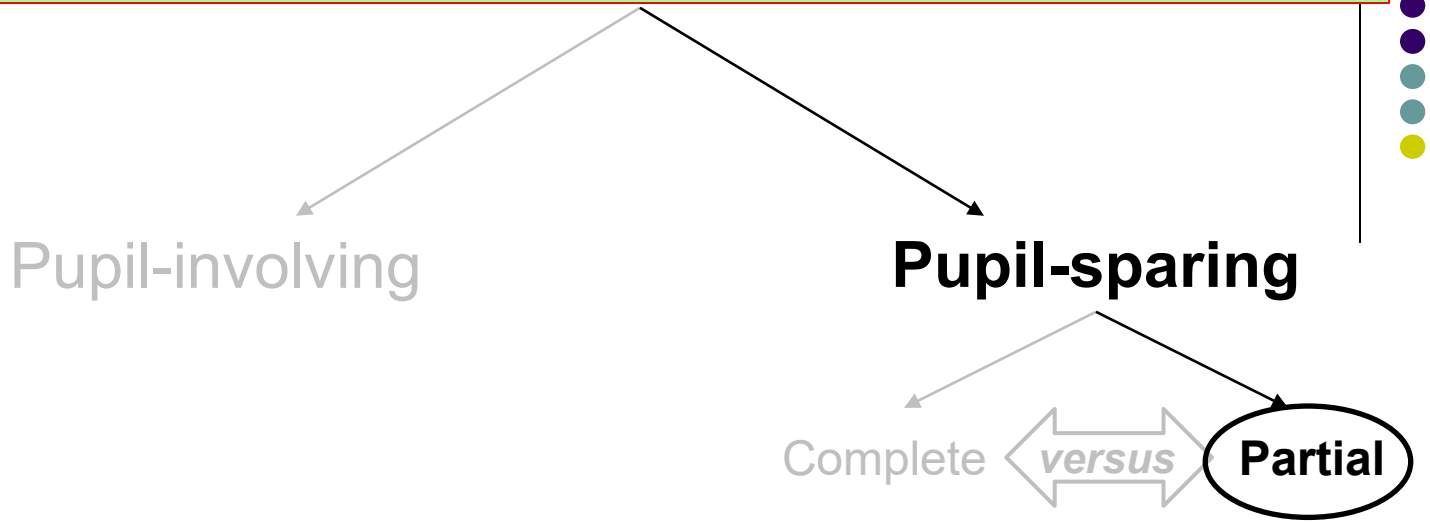

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It refers to the status of the external muscles controlled by CN3. If they are all involved, the palsy is complete; if they are not, it is partial.

Why is the degree of involvement important?
Because of its clinical implications. **A** ~~complete~~ partial **pupil-sparing CN3 palsy** is virtually a lock to be vascular if the following pt-related conditions are met:
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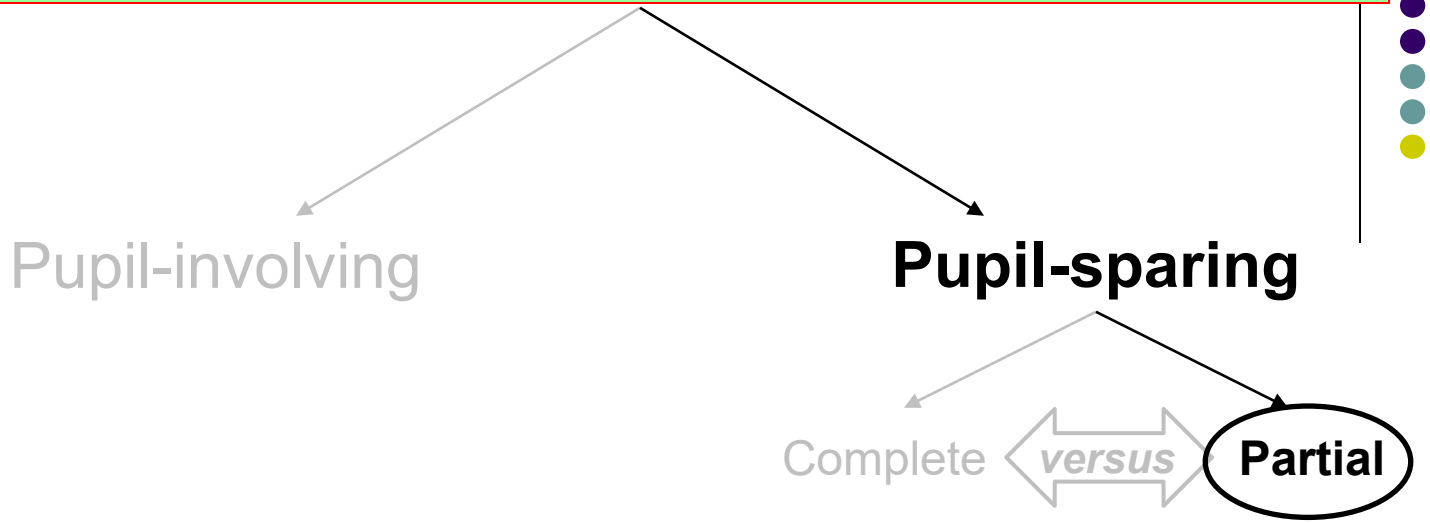
So a pt has a **partial** *pupil-sparing CN3 palsy. What implications does* **this** *carry for etiology?*

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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Why is the degree of involvement important?
Because of its clinical implications. **A** ~~complete~~ partial **pupil-sparing CN3 palsy** is not virtually a lock to be vascular if the following pt-related conditions are met:
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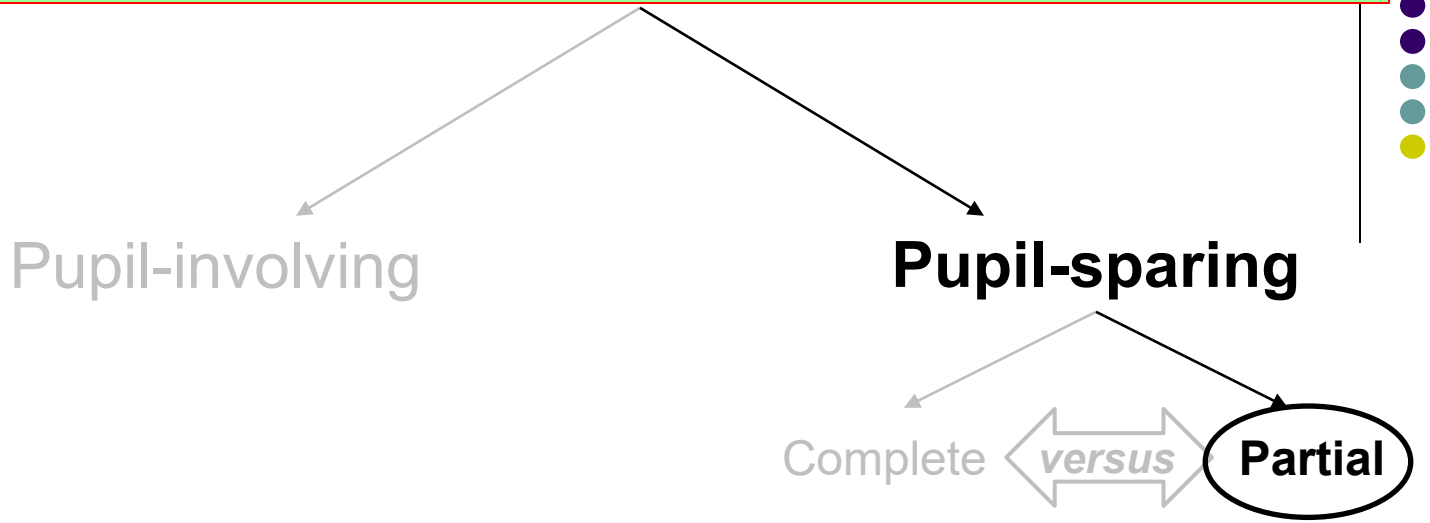
--the pt has no hx of cancer

So a pt has a **partial** *pupil-sparing CN3 palsy. What implications does* **this** *carry for etiology?*
It is much more concerning for a compressive lesion than is a *complete* pupil-sparing third

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



What is meant by referring to a pupil-sparing CN3 palsy as 'complete' vs 'partial'?
It refers to the status of the external muscles controlled by CN3. If they are all involved, the palsy is complete; if they are not, it is partial.

Why is the degree of involvement important?
Because of its clinical implications. **A** ~~complete~~ partial **pupil-sparing CN3 palsy** is not virtually a lock to be vascular if the following pt-related conditions are met:
--The pt is a vasculopath ;
--the pt is over 50 ; and
--the pt has no hx of cancer

So a pt has a **partial** *pupil-sparing CN3 palsy. What implications does* **this** *carry for etiology?*
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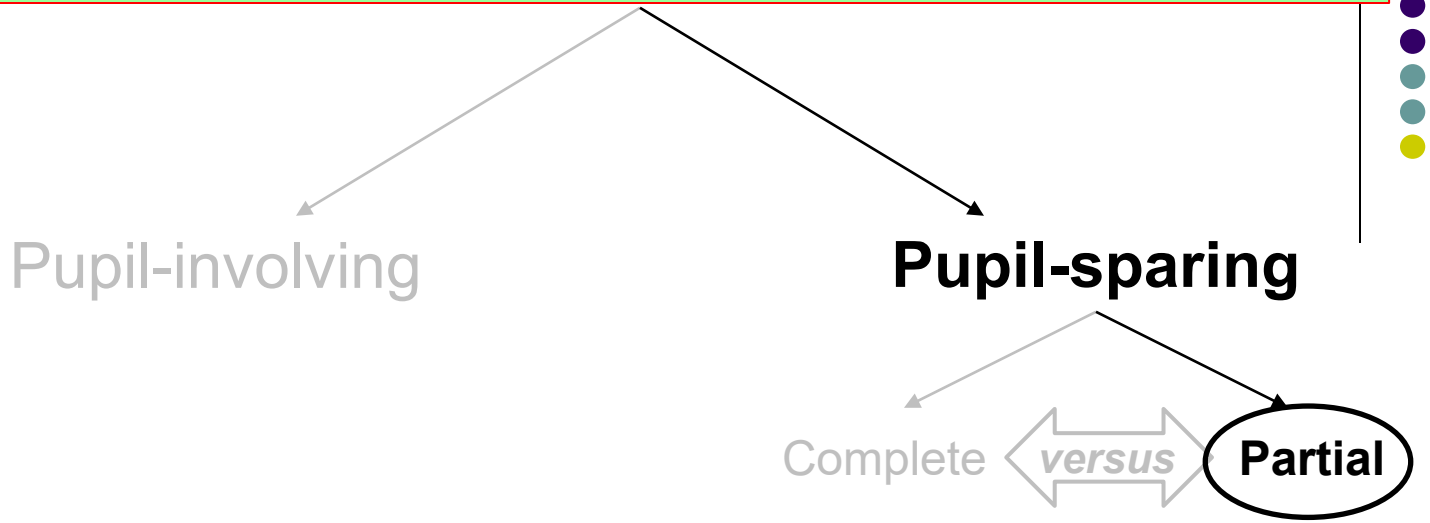
How should such pts be managed?

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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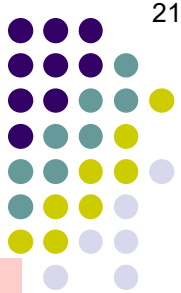
How should such pts be managed?
They should be imaged immediately

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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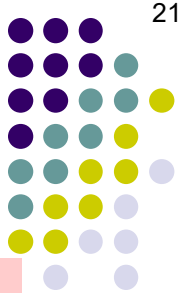
Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



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Post-viral or -vaccinal syndromes

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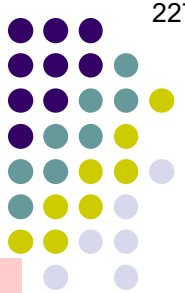

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--Attempted adduction→ two words n
--*?*

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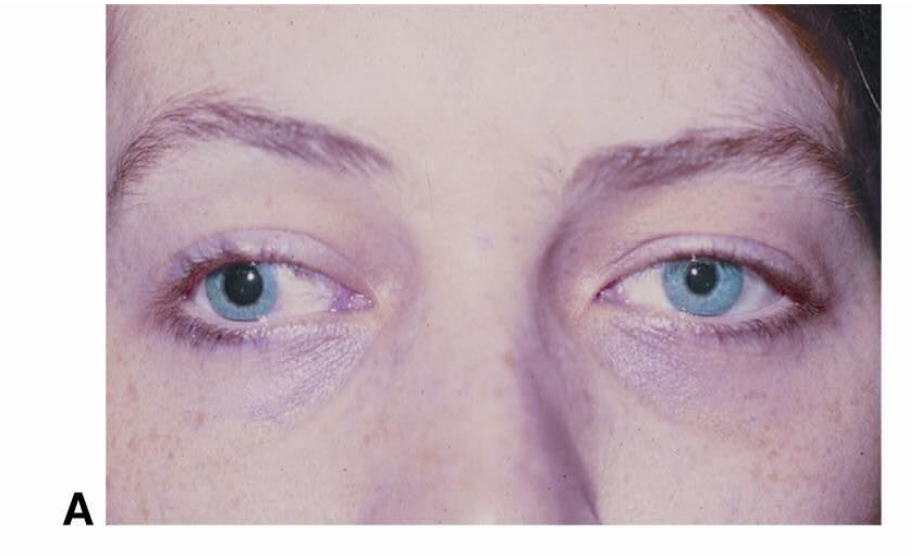
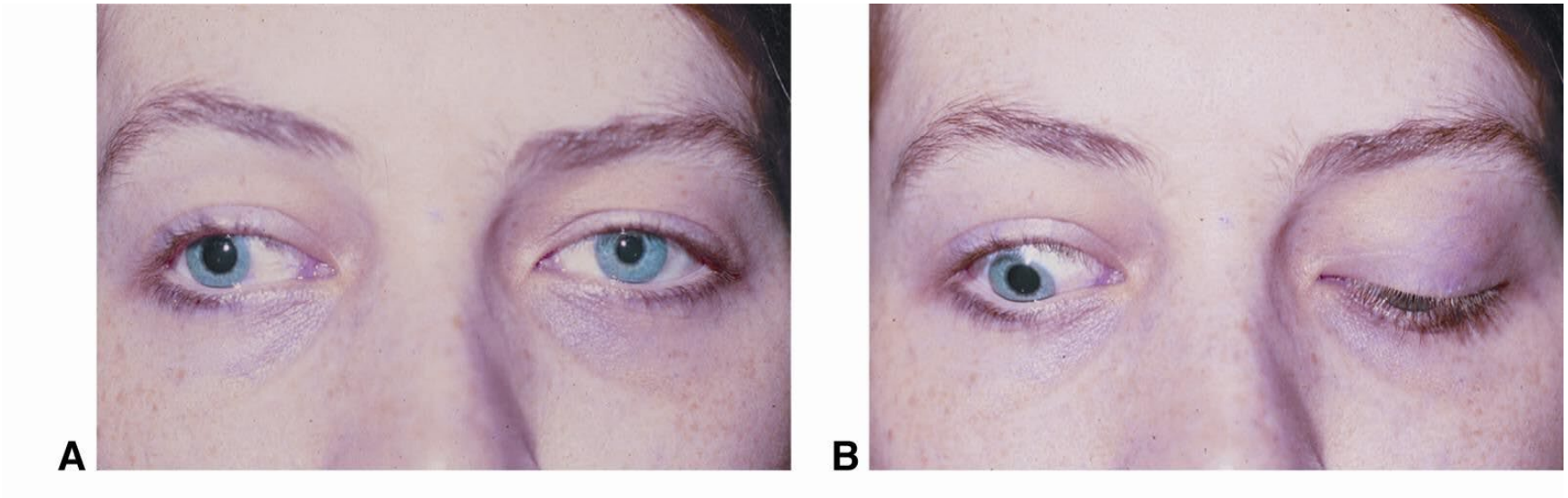


Aberrant regeneration of the right third nerve. A, In primary gaze, there is mild ptosis, pupillary mydriasis, and exotropia, all on the right.

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



Aberrant regeneration of the right third nerve. A, In primary gaze, there is mild ptosis, pupillary mydriasis, and exotropia, all on the right. B, With attempted downward gaze, the right eyelid retracts as fibers of the right third nerve supplying the inferior rectus now also innervate the levator muscle.

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--Attempted adduction→eyelid retraction
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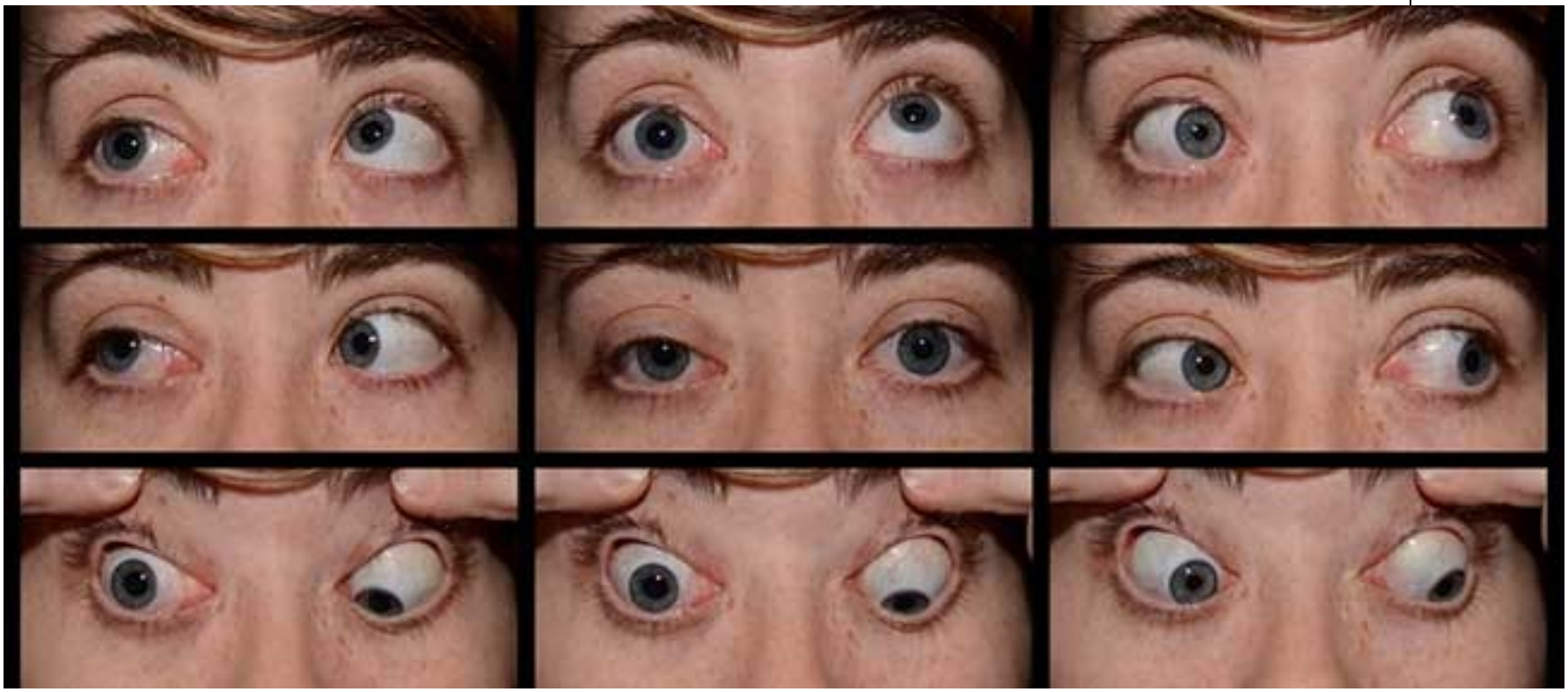
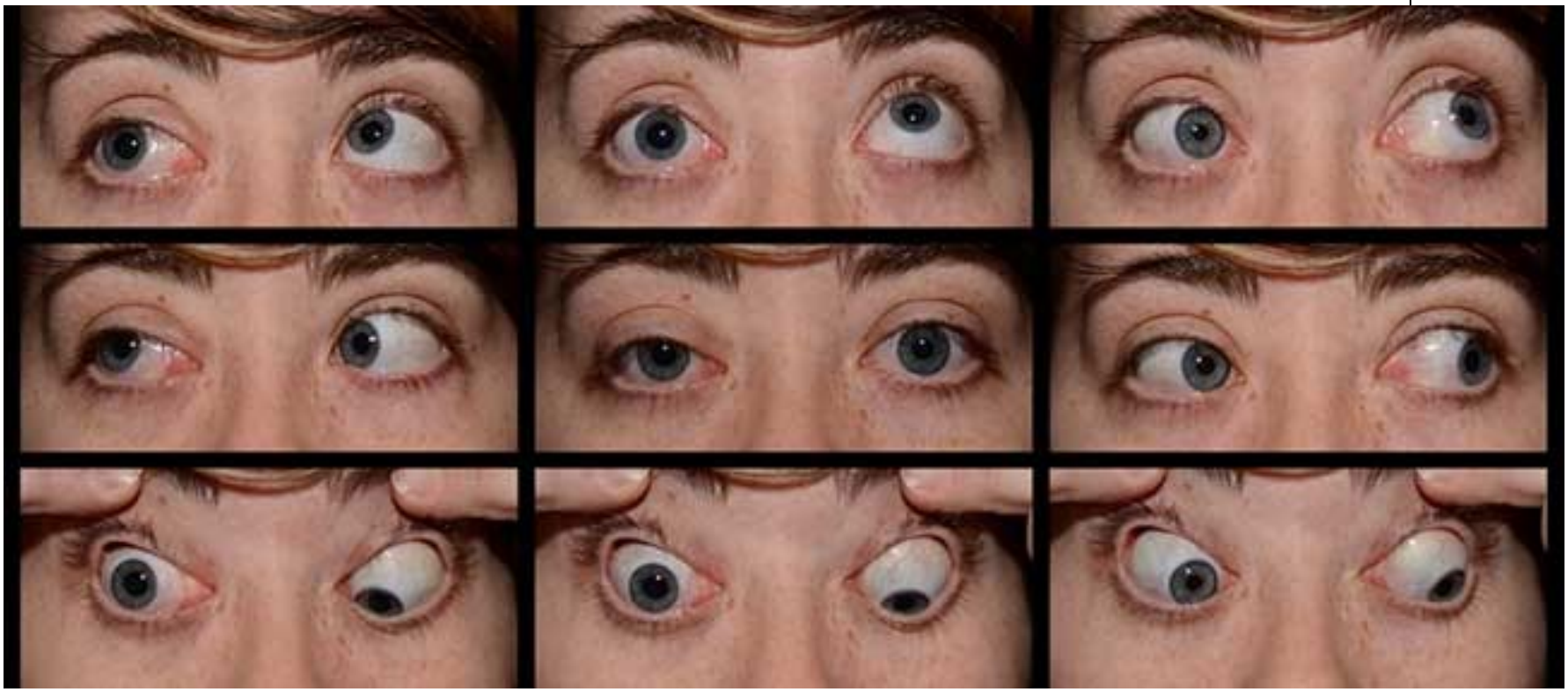


This patient has a long-standing right 3rd nerve palsy causing anisocoria, partial ptosis OD, mild adduction deficit OD, and moderate elevation and depression deficits OD.

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



This patient has a long-standing right 3rd nerve palsy causing anisocoria, partial ptosis OD, mild adduction deficit OD, and moderate elevation and depression deficits OD. In addition, there are signs of aberrant regeneration (miosis of the pupil and mild lid elevation on adduction OD).

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

The phrase *eyelid retraction* should bring to mind several conditions…

First, what is the most common cause of lid retraction?

ged

ed

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TED: Lid retraction

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When TED pts move their eyes into downgaze, the upper lid will fail to follow the globe down. What is the name for this phenomenon?

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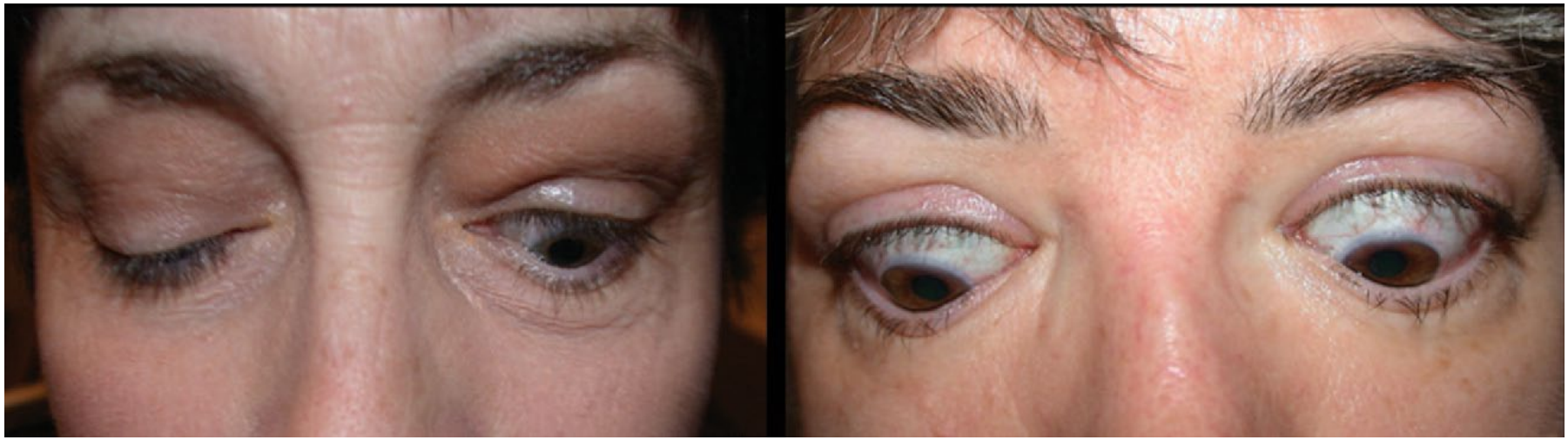

Unilateral. Note how the normal right upper lid has ‘followed’ the globe into downgaze

Bilateral

TED: Lid lag

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When T… globe down.
What is
Lid lag

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(Recall we mentioned Parinaud's earlier in the set and said we'd get back to it)

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Parinaud's has four cardinal findings. What are the other three?
--Lid retraction
--***?***
--***?***
--***?***

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What well-known brainstem syndrome is associated with lid retraction?
Parinaud syndrome

What is the eponymous name for lid retraction in Parinaud syndrome?
Collier's sign

Parinaud's has four cardinal findings. What are the other three?
--Lid retraction
--Light-near dissociation
--*?*
--*?*

…ged
…ed
…l and most
…in-status

Topic 3: Aberrant regeneration. *What the heck is it?*
A phenomenon in which healing nerve fibers form incorrect connections, resulting in impulses intended for one muscle stimulating a different one

What are the classic aberrant regeneration mis-connections?
--Attempted adduction→ **eyelid retraction**
--Attempted globe adduction, elevation or depression→ miosis of the pupil

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

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vo… ed

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What is light-near dissociation*?*
A phenomena in which pupils miose less v more robustly in response to light than they do as part of the near response

…r three?
--…retraction
--**Light-near dissociation**
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--Impaired gaze direction
--*?*

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--*?*

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--Light-near dissociation
--Impaired upgaze
--[two-words] nystagmus

…ged …ed …l and most …in-status

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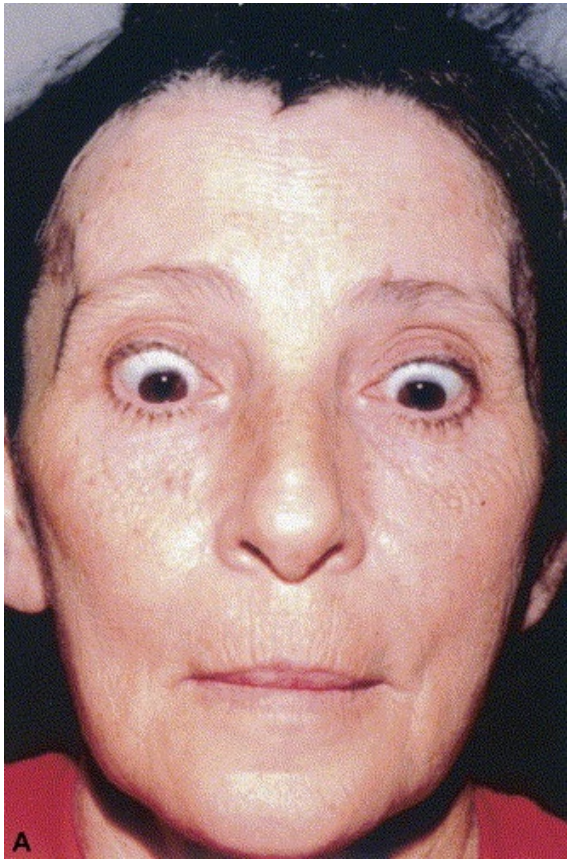
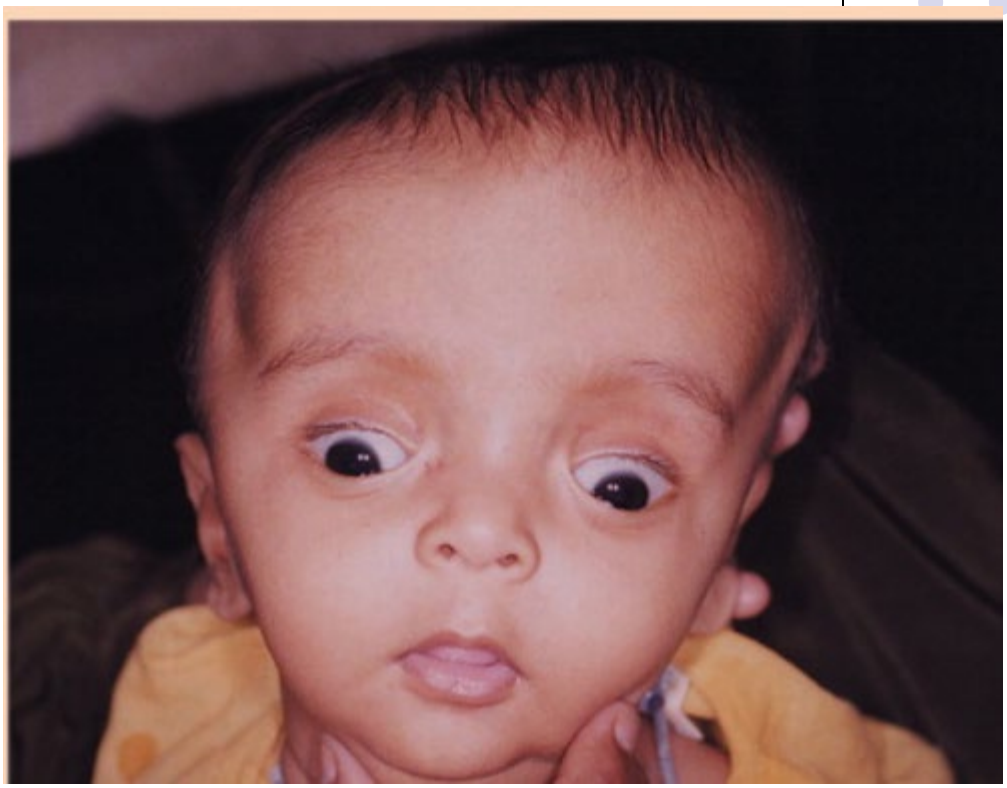
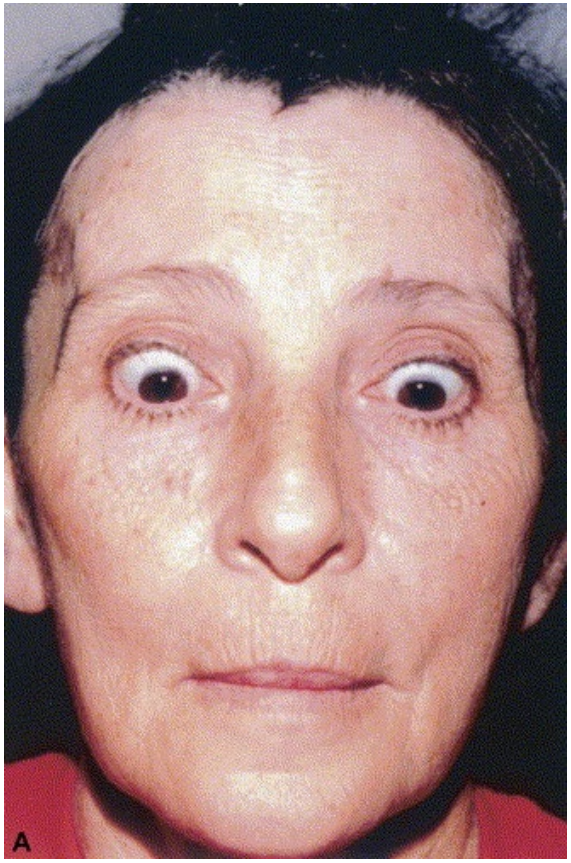
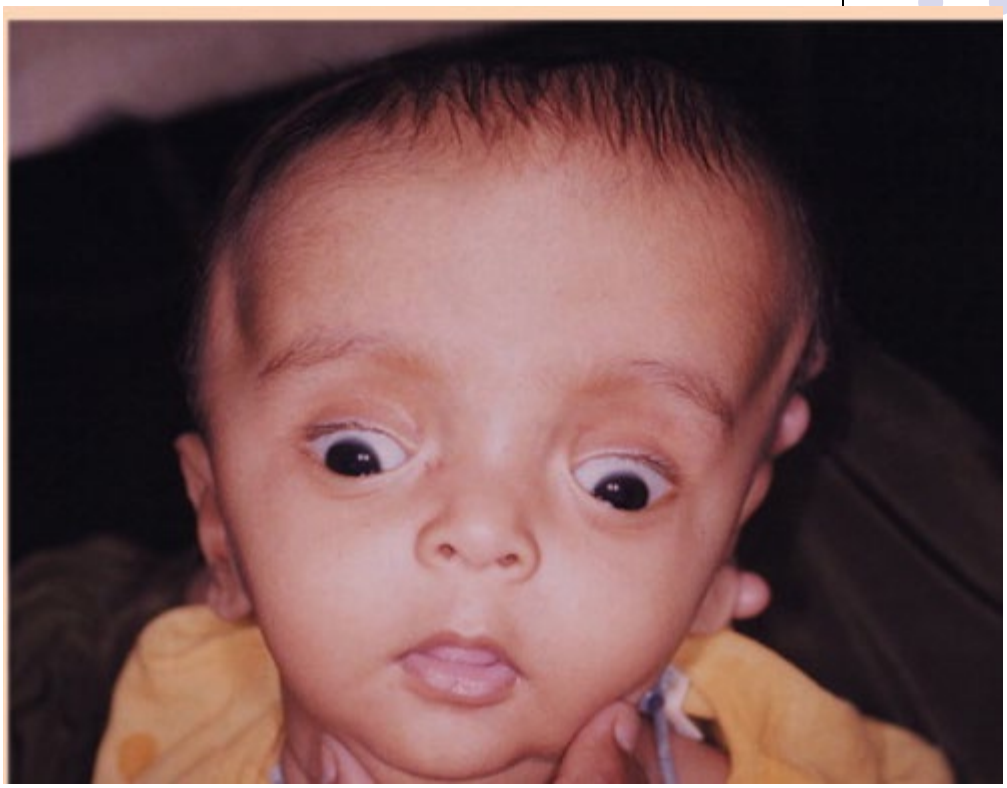




Parinaud syndrome. The combination of lid retraction + impaired upgaze gives rise to a characteristic appearance known as [two words] ***sign***

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*





Parinaud syndrome. The combination of lid retraction + impaired upgaze gives rise to a characteristic appearance known as ***setting sun sign***

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There is a form of ptosis that is associated with lid lag—which one?

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OK, I can see how a lack of functioning levator leads to ptosis, but why do these pts have lid lag?
Because the fibrofatty tissue can neither contract (causing ptosis) *nor* relax (causing lid lag)

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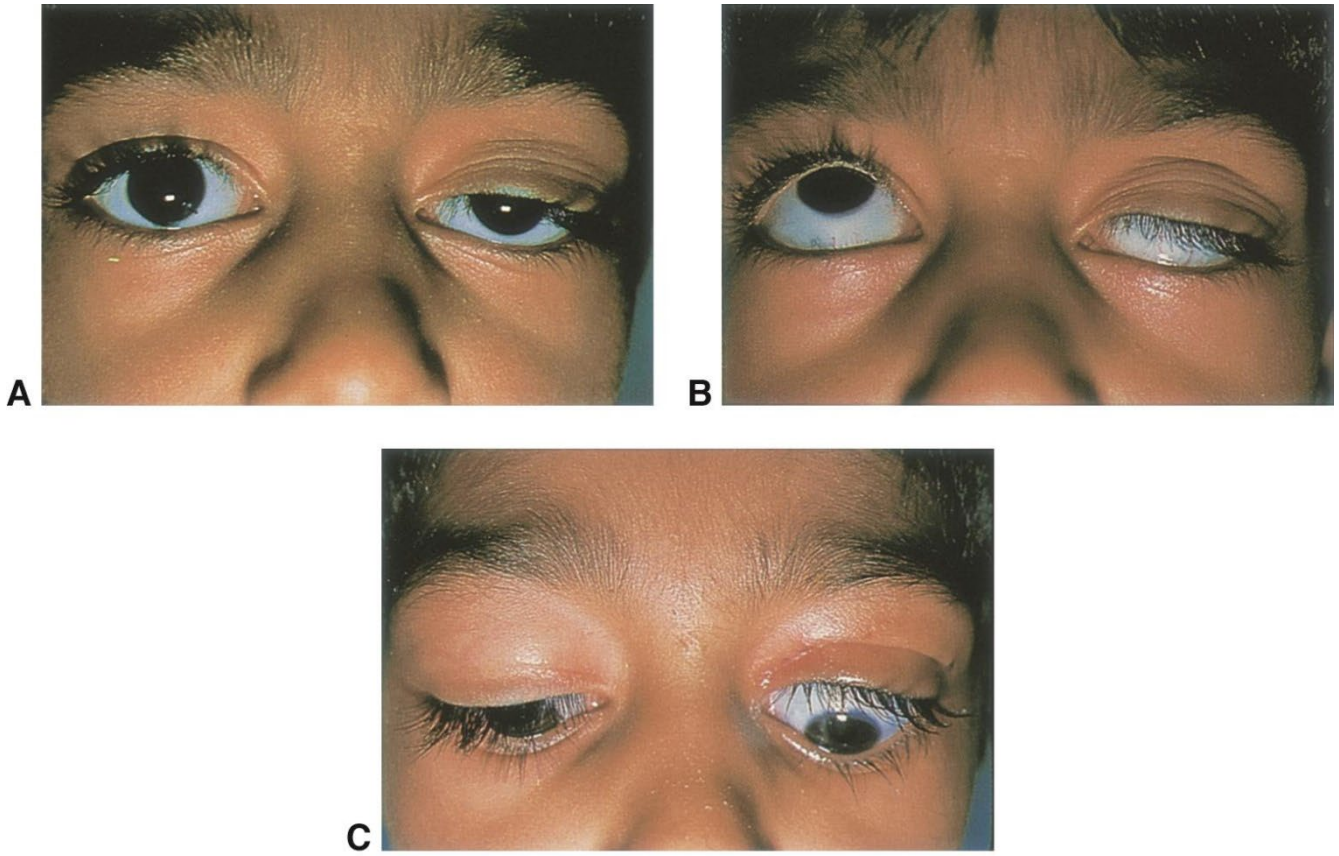

Congenital myogenic ptosis. A, ptosis in primary. B, failed elevation in upgaze. C, lid lag in downgaze.

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OK, I can see how a lack of functioning le…
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More info: Slide-set O5

More info: Slide-set N16

More info: Slide-set O2

These are some of the conditions that must be considered when faced with a case of lid retraction

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And finally, three related topics:

Topic 1: CN3 palsies in kids. *How should they be managed?*
If pupil-sparing, they can be followed; if pupil-involving, they must be imaged

Topic 2: Pain. *Can etiology (ie, compressive vs ischemic) be differentiated on the basis of whether pain is present?*
No. While it is the case that most aneurysmal thirds are painful and most vascular are painless, exceptions are frequent enough that pain-status cannot reliably differentiate between them.

Topic 3: Aberrant regeneration. *What the heck is it?*
A phenomenon in which healing nerve fibers form incorrect connections, resulting in impulses intended for one muscle stimulating a different one

Of the three main causes of isolated unilateral CN3 palsy (ie, traumatic, compressive and ischemic), which is/are capable of resulting in aberrant regeneration?

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Both [ ] and [ ] can; on the other hand, [ ] **never** does

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Both traumatic and compressive can; on the other hand, ischemic **never** does

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So if you encounter aberrant regeneration, what should you inquire about?

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Both traumatic and compressive can ischemic **never** does

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So if you encounter aberrant regeneration, what should you inquire about?
Whether the pt has a hx of head trauma significant enough to produce a traumatic CN3 palsy

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Both traumatic and compressive can ischemic **never** does

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So if you encounter aberrant regeneration, what should you inquire about?
Whether the pt has a hx of head trauma significant enough to produce a traumatic CN3 palsy

And what should you do if the pt denies such a history?

tions,
t one

pressive

Both traumatic and compressive can ischemic **never** does

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

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No. While it is the case that most aneurysmal thirds are painful and most vascular are painless, exceptions are frequent enough that pain-status cannot reliably differentiate between them.

So if you encounter aberrant regeneration, what should you inquire about?
Whether the pt has a hx of head trauma significant enough to produce a traumatic CN3 palsy

And what should you do if the pt denies such a history?
Assume there's a compressive etiology, and pursue imaging

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Both traumatic and compressive can ischemic **never** does

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

And finally, three related topics:

In this context, to what does the term primary aberrant regeneration *refer?*

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Primary

Topic 3: Aberrant regeneration. *What the heck is it?*

A phenomenon in which healing nerve fibers form incorrect connections, resulting in impulses intended for one muscle stimulating a different one

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

And finally, three related topics:

In this context, to what does the term primary aberrant regeneration *refer?*
It refers to the presence of aberrant-regeneration-type EOM movements absent a clear history of a precipitating CN3 palsy

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What etiology is suggested by this presentation?

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Primary

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What etiology is suggested by this presentation?
A slowly-expanding compressive lesion in the CNS locale region

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Primary

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What etiology is suggested by this presentation?
A slowly-expanding compressive lesion in the parasellar region

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Primary

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How should one manage a pt with primary aberrant regeneration?

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Primary

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What etiology is suggested by this presentation?
A slowly-expanding compressive lesion in the parasellar region

How should one manage a pt with primary aberrant regeneration?
Via imaging with special attention to the parasellar region (looking for a -oma) and cavernous sinus (looking for an four words)

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Primary

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In this context, to what does the term primary aberrant regeneration *refer?*
It refers to the presence of aberrant-regeneration-type EOM movements absent a clear history of a precipitating CN3 palsy

What etiology is suggested by this presentation?
A slowly-expanding compressive lesion in the parasellar region

How should one manage a pt with primary aberrant regeneration?
Via imaging with special attention to the parasellar region (looking for a meningioma) and cavernous sinus (looking for an aneurysm of the internal carotid)

maged

iated

ost

s

Primary

Topic 3: Aberrant regeneration. *What the heck is it?*

A phenomenon in which healing nerve fibers form incorrect connections, resulting in impulses intended for one muscle stimulating a different one

Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*

And finally, three related topics:

Topic 1: CN3 palsies in kids. *How should they be managed?*
If pupil-sparing, they can be followed; if pupil-involving, they must be imaged

Topic 2: Pain. *Can etiology (ie, compressive vs ischemic) be differentiated on the basis of whether pain is present?*
No. While it is the case that most aneurysmal thirds are painful and most vascular are painless, exceptions are frequent enough that pain-status cannot reliably differentiate between them.

Topic 3: Aberrant regeneration *of the…?*

Finally—the Neuro *book addresses in some depth the aberrant regeneration of another cranial nerve—which one?*

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Topic 3: Aberrant regeneration *of the…facial nerve*

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What is the classic prior event that results in aberrant regeneration of CN7?

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Topic 3: Aberrant regeneration *of the…facial nerve*

Finally—the Neuro *book addresses in some depth the aberrant regeneration*

What are the classic ophthalmic manifestations of aberrant regeneration of CN7?
--?
--?

What is the classic prior event that results in aberrant regeneration of CN7?
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What are the classic ophthalmic manifestations of aberrant regeneration of CN7?
--Blinking causes…*[one of two things, or both]*
--?

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What are the classic ophthalmic manifestations of aberrant regeneration of CN7?
--Blinking causes…twitching at the corner of the mouth, or chin dimpling
--*?*

What is the classic prior event that results in aberrant regeneration of CN7?
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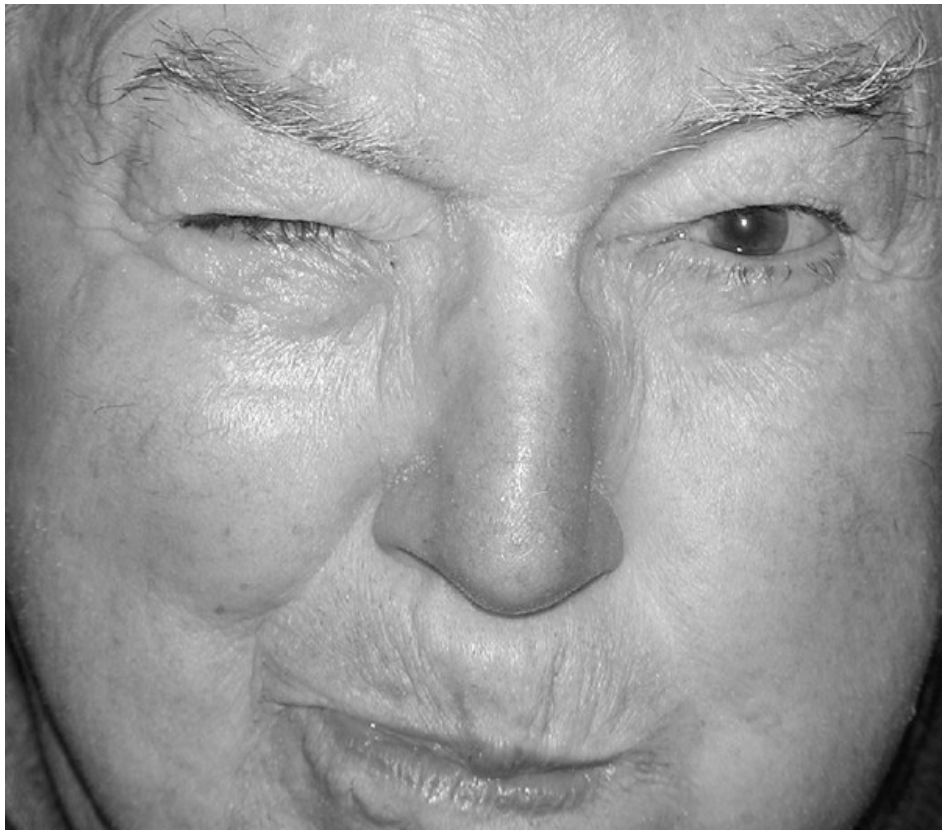
Motility Disorders: *Nontraumatic, Isolated, Unilateral CN3 Palsy*



Aberrant regeneration of CN7 after Bell's palsy: narrowing of the palpebral aperture on the affected side during cheek puffing

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--Blinking causes…twitching at the corner of the mouth, or chin dimpling
--Movements of the lower face cause…***?***

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What are the classic ophthalmic manifestations of aberrant regeneration of CN7?
--Blinking causes…twitching at the corner of the mouth, or chin dimpling
--Movements of the lower face cause…involuntary lid closure

What is the classic prior event that results in aberrant regeneration of CN7?
Bell's palsy