Neuro-Ophthalmology Symposium

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Isolated third nerve palsy with pupillary involvement
Nuclear and fascicular structures

Oculomotor nuclear complex

central caudal nucleus

to bilateral levators

to contralateral superior rectus

to ipsilateral inferior rectus

to ipsilateral inferior oblique

to ipsilateral medial rectus

Edinger–Westphal subnucleus

to ipsilateral pupillary sphincter

third nerve

inferior rectus

to medical rectus

to superior rectus

to inferior oblique

Edinger–Westphal subnucleus

periaqueductal gray

cerebral aqueduct

nucleus of third nerve

medial lemniscus

medial longitudinal fasciculus

substantia nigra

red nucleus

interpeduncular fossa

crus cerebri

third nerve

basilar artery

nucleus of third nerve
Blood vessels on pia mater supply surface of the nerve including pupillary fibres (damaged by compressive lesions)

Vasa vasorum supply part of nerve but not pupillary fibres (damaged by medical lesions)

Pupillary fibres lie dorsal and peripheral
Further study disclosed “pupil sparing” is not an entirely safe

Patient age is not a guide; berry aneurysms become clinically manifest between ages 20-60 an enormous age span

The presence of arteriosclerotic risk factors favors a microvascular ischemic cause

However, patients with arteriosclerosis can also have aneurysms
New headache, especially if severe, tends to suggest aneurysm, but its absence does not exclude

Headache and periocular pain are reported in 30% of patients with aneurysmal third cranial nerve palsy*


Rupture aneurysm carries 66% of mortality rate*

Modalities used in neurovascular imaging

- Computerized topographic angiography (CTA)

- Magnetic resonance angiography (MRA)

- Catheter cerebral angiography (CCA)
  - 3-dimensional rendering of the rotational digital subtraction angiogram (3DRA DSA)
CTA

- x-ray source to display digital images on a screen
- The 128, 256-slice and the 320-slice Aquilion multidetector scanners
- Intravascular injection of contrast material
Several well-documented reports establishing that when third cranial nerve palsy is caused by aneurysms they will appear to be at least 4 mm in diameter on noninvasive studies***

- **Mathew MR, Teasdale E, McFadzean RM. Multidetector computed tomographic angiography in isolated third nerve palsy. Ophthalmology 2008**
To detect aneurysms

- CTA and MRA

  in aneurysms $\geq 3$ mm

Sensitivity $> 95\%$

post-processing
MRA

- MRA is based on the flow effects damping down signal from adjacent tissue while simultaneously enhancing signal from flowing blood within vessel.
Advantage over CT

- x-ray and dye exposure
- pregnant women
- children
- renal or cardiac dysfunction
Digital subtraction angiography (DSA)

- gold standard for imaging intracranial aneurysms
- risk of stroke 2%

may be higher older patients with arteriosclerosis
3D rotational angiography (3DRA)

Rotation of the image intensifier through 180 degrees during intraarterial injection of contrast material.
3DRA DSA

3-mm diameter aneurysm

after the aneurysm clipping
How Should We Evaluate New-Onset Isolated Nontraumatic Third Cranial Palsy?

1. Nonpregnant, adult patient without renal or cardiac failure should undergo emergency CTA if CTA results are negative and the clinical suspicion of aneurysm is high, MRI and MRA should be done.
How Should We Evaluate New-Onset Isolated Nontraumatic Third Cranial Palsy?

2. Children, pregnant women, and patients with renal or cardiac failure should undergo emergency MRA.

* MRI should be included because it allows excellent detection of nonaneurysmal causes.
How Should We Evaluate New-Onset Isolated Nontraumatic Third Cranial Palsy?

3. If the noninvasive imaging study is interpreted as negative, it should be reviewed by an experienced neuroradiologist before the diagnosis of aneurysm is dismissed.

Digital subtract angiogram should be perform in high suspicious aneurysm if noninvasive study are all negative.
1. Pupil Sparing/ Involve
2. Careful follow up
3. Imaging modality
4. Interpretation
Conventional CT scan or MRI are not the procedure of choice

High false negative rate 12 – 40 %

Magnetic resonance angiography (MRA)

Computed tomography angiography (CTA)

Overall sensitivity up to 95 %
Clinical suspected aneurysm

CTA (first choice)Reviewed by Neuroradiologist

MRA/MRI

3DRA CCA
THANK YOU