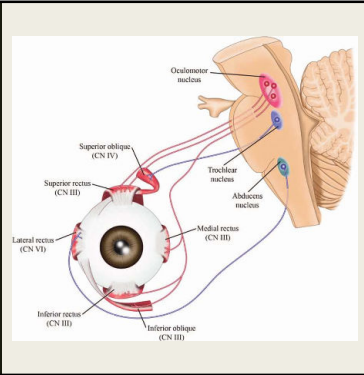


ISOLATED OCULAR MOTOR NERVE PALSIES: *WHO TO SCAN AND WHY*

Todd A. Zelczak, OD, FAAO

- ## Objectives
- Review anatomy and recognize common patterns associated with isolated ocular motor CN palsies
 - Identify common causes of isolated ocular motor CN palsies
 - Review and discuss accepted protocol in management and work-up of isolated ocular motor CN palsies
 - Discussion and debate on neuroimaging isolated ocular motor CN palsies

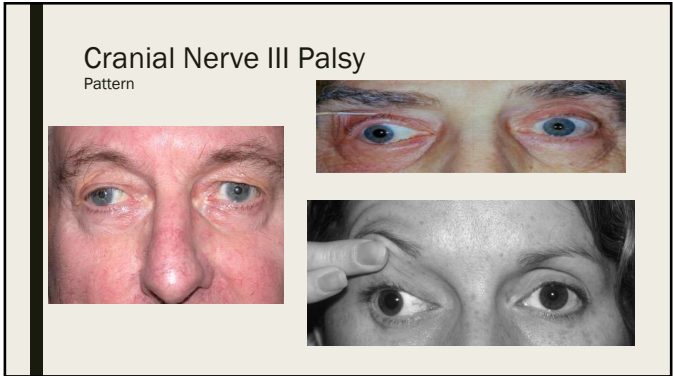
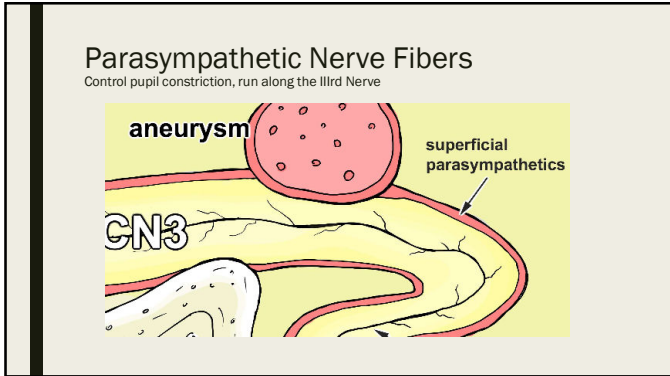
Review of Anatomy and Common Patterns of Ocular Motor CN Palsies



Cranial Nerve III

Exits off front of the brainstem
 Innervates SR, IR, MR, IO, levator
 Parasympathetic nerves that control pupil constriction run along IIIrd nerve

Primary gaze: Down and out, droopy lid, potential for blown pupil
Pattern: Reversing hypertropia



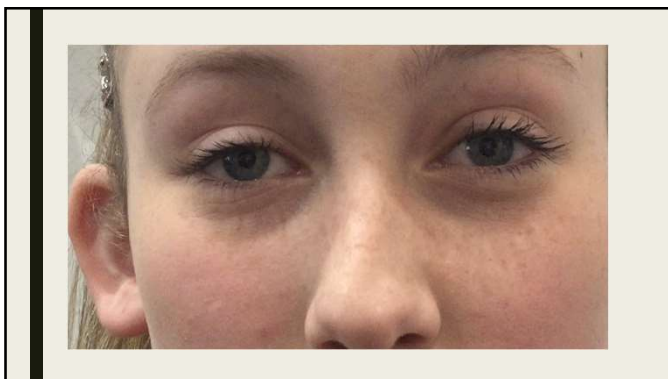
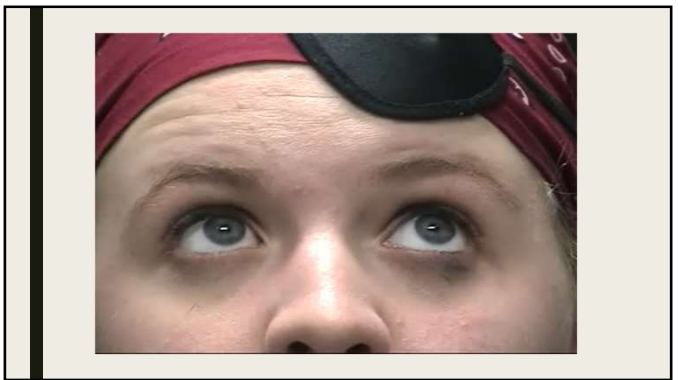


Cranial Nerve IV

Only CN comes off back of brainstem
 Longest CN
 Innervates SO
 MOA's: intorts, depresses and abducts
Primary gaze: Hypertropia
 Head tilt opposite paretic muscle
Pattern: Nasal upshoot

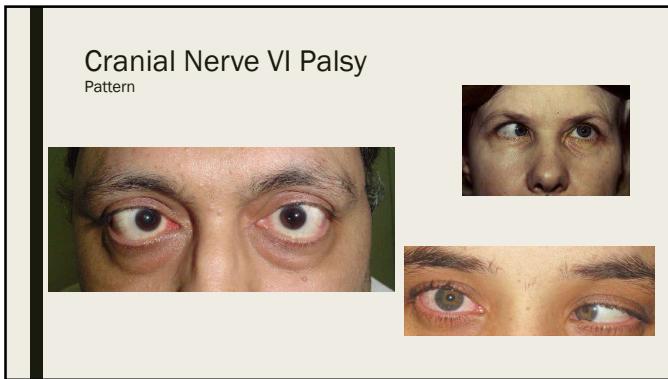
Cranial Nerve IV Palsy

Pattern



Cranial Nerve VI

Comes out lower in the brainstem
 Innervates LR
 Easier to diagnose
Primary gaze: Eye turns in (crossed eye)
 Head turn to side of paresis
Pattern: Abduction deficit



- ### Causes of Isolated Ocular Motor CN Palsies
- **Microvascular Ischemia**
 - Brain stem strokes
 - Aneurysms/Hemorrhages
 - Tumors
 - Demyelination
 - Pituitary apoplexy
 - Metastasis
 - Increased intraocular pressure (IV and VI)
 - Trauma (IV)
 - Congenital (IV)

Presumptive Nature of Microvascular Ischemia Isolated Ocular Motor CN Palsies

- Limited histopathologic data
- Absence of additional neurological s/s
- No new findings in f/u period
- Stable course and spontaneous recovery
- Occurring in older adults w vasculopathic RF's
- Not based on negative high quality imaging

Third Nerve Palsies

The Pupillary Rule Conundrum

Summary: Mgmt of CN III Palsy	Complete Ophthalmoplegia	Partial Ophthalmoplegia	Normal EOM's
Tonic Pupil	High risk of aneurysm: Emergent MRA/CTA head	Highest risk of aneurysm: Emergent MRA/CTA head	Low risk of aneurysm: Rule out angle closure glaucoma/Adie's pupil
Anisocoria worse in bright illumination	Uncertain risk of aneurysm: Strongly c/o MRA/CTA head if demo agree. Systemic vasc evaluation, ESR, C-reactive protein	High risk of aneurysm: Emergent MRA/CTA head	Low risk of aneurysm: Rule out angle closure glaucoma/Adie's pupil
Normal pupil	Low risk of aneurysm: Systemic vasc evaluation, ESR, C-reactive protein	Low risk of aneurysm: Close observation over 1 st week for pupil involvement. Systemic vasc eval, ESR, CRP	Normal

Adapted from DeGiordano, PCOJN December 2015

Exceptions to the Rule?

Using "Pupil Sparing" as a safety net

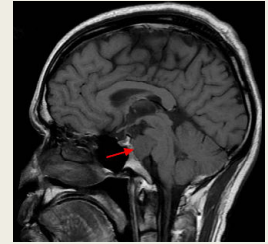
- Associated **PAIN**?
- Alternative diagnoses rare?
- Faulty assumptions
- Accuracy of pupil sparing finding
 - Clinical error
 - Pupil sparing early in clinical course
 - Diabetic affects on iris sphincter
 - Pupillary variability on PRP pts

**NATURE
PROVIDES
EXCEPTIONS TO
EVERY RULE.**

Margaret Fuller

Sixth Nerve Palsies

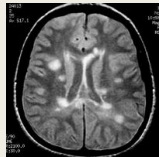
*Proceed With
Caution*



The Book on 6th Nerve Palsies



- Common consequence of microvascular ischemia (ie. Diabetes)
- Wealth of literature
 - Tumors
 - **Demyelinating disease**
 - Aneurysms
 - Strokes
 - Metastasis
 - Elevated intracranial pressure
- Higher prevalence <50yo
- Spontaneous recovery in presence of compressive lesions



Fourth Nerve Palsies

*"So You're
Saying There's
a Chance"*



Isolated Fourth Nerve Palsies

- Most common causes
 - Vasculopathic
 - Trauma
 - Congenital
- Other differential diagnoses
 - Thyroid eye disease
 - Myasthenia gravis
 - Skew deviations
- Rare cases of intracranial disease reported



Prospective Data

Acute Monocular Ocular Motor Mononeuropathies

- Due to advances in MRI technology
- Increase in number of anecdotal cases
- Importance and significance of "other" causes
- Prior retrospective analysis

CHARACTERISTICS OF PATIENTS WITH ACUTE OCULAR MOTOR MONONEUROPATHIES OF PERIPHERAL MICROVASCULAR VS. OTHER ETIOLOGY

Total Patients (n=66)	Peripheral Microvascular (n=57) n(%)	Other Etiologies (n=9) n(%)
Age in years (n=median range)	68 (52-85)	66 (56-71)
Sex		
Male	36 (63%)	4 (44%)
Female	21 (37%)	5 (56%)
CN III	25 (44%)	4 (44%)
Pupil involved	7 (29%)	2 (50%)
Pupil spared	18 (71%)	2 (50%)
CN IV	13 (23%)	1 (12%)
CN VI	19 (33%)	4 (44%)
Presence of Vascular RF's (diabetes, hypertension, chol...)	53 (95%)	4 (56%)

11%

Chou KL, Galetta SL, Liu GT, et al. Acute ocular motor mononeuropathies: prospective study of the roles of neuroimaging and clinical assessment. J Neurol Sci 2004;219:35-39.

ETIOLOGIES OTHER THAN PERIPHERAL MICROVASCULAR ISCHEMIA IDENTIFIED BY NEUROIMAGING

ETIOLOGY	CRANIAL NERVE AFFECTED			
	III	IV	VI	TOTAL
NEOPLASM	1	1	1	3
BRAINSTEM INFARCT	1	0	1	2
ANEURYSM	2	0	0	2
DEMYELINATING DISEASE	0	0	1	1
PITUITARY APOPLEXY	0	0	1	1
TOTAL	4(2)	1	4	9(7)

Chou KL, Galetta SL, Liu GT, et al. Acute ocular motor mononeuropathies: prospective study of the roles of neuroimaging and clinical assessment. J Neurol Sci 2004;219:35-39.

CHARACTERISTICS OF PATIENTS WITH ACUTE ISOLATED OCULAR MOTOR PALSY OF PRESUMED MICROVASCULAR VERSUS OTHER CAUSES

Total Patients (n=109)	Presumed Microvascular Ischemia n=91 (83.5%)	Other Causes N=18 (16.5%)
Age median (range)	64 (54-90)	64 (50-80)
Sex		
Male	56 (61.5%)	10 (55.6%)
Female	35 (38.5%)	8 (44.4%)
CN involved (n)	91 (83.5%)	18 (16.5%)
III (22)	19 (21%)	3 (17%)
IV (25)	22 (24%)	3 (17%)
VI (62)	50 (55%)	12 (67%)
History of Vasculopathic RF's		
Yes	83 (91.2%)	11 (61.1%)
No	8 (8.8%)	7 (38.9%)

Tamhankar MA, Blouise V, Ying GS, Prasad S, Subramanian PS, Lee MS, Eggenberger E, Moss HE, Pineles S, Bennett J, et al. Ophthalmology. 2013 Nov; 120(11):2264-9. Epub 2013 Jun6.

THE PROPORTION OF PATIENTS WITH PRESUMED MICROVASCULAR ISCHEMIA VERSUS OTHER CAUSES OF ACUTE ISOLATED OCULAR MOTOR NERVE PALSY

GROUPS	SUBGROUPS	PRESUMED MICROVASCULAR CAUSES N=91 (83.5%)	OTHER CAUSES N=18 (16.5%)
Significant past medical history (n=29)	No prior imaging (n=10)	8 (8.8%)	2 (11.1%)
	Prior imaging (n=19)	11 (12.1%)	8 (44.4%)
Vasculopathic risk factors only (n=80)	No prior imaging (n=28)	26 (28.6%)	2 (11.1%)
	Prior imaging (n=52)	46 (50.6%)	6 (33.3%)

10(34.4%)

8(10%)


Tamhankar MA, Blouise V, Ying GS, Prasad S, Subramanian PS, Lee MS, Eggenberger E, Moss HE, Pineles S, Bennett J, et al. Ophthalmology. 2013 Nov; 120(11):2264-9. Epub 2013 Jun6.

NEUROIMAGING AND ACUTE OCULAR MOTOR MONONEUROPATHIES: A PROSPECTIVE STUDY

- OBJECTIVE: To evaluate the necessity of neuroimaging in patients with acute, isolated ocular motor mononeuropathies
- METHODS: Evaluate MRI results in 93 patients, >50yo, with acute isolated mononeuropathies
- RESULTS: 1/93 patients
- IMAGING COSTS: \$131,688
- CONCLUSION: It may not be medically necessary to perform MRI scanning on every patient with an isolated cranial nerve III, IV, or VI palsy.

Murchison AP, Gilbert ME, Savino PJ. Neuroimaging and acute ocular motor mononeuropathies: a prospective study. Arch Ophthalmol. 2011;129:301-5.

STUDIES:
SUMMARIES
AND
COMPARISONS



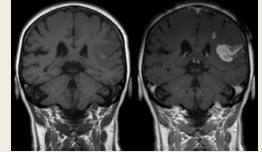
THE DEBATE:

TO IMAGE,
OR NOT TO IMAGE.
THAT IS THE QUESTION?



To Image...

- Facilitated by hi-quality imaging studies
- Inexperience of non-specialist
- Psychological and emotional benefit
- Rate of positive findings compare favorably to other accepted practices in imaging
- The advances in the management of multiple sclerosis, stroke and neoplasms
- Medical legal implications



Without Contrast

With Contrast

...Or Not To Image

- Relatively low yield
- Unnecessarily uses resources/cost burden
- Work-up can be delayed
- Health risks/benefits
- Staff productivity



SUMMARY