

The Cranial Nerve Connection
Leonid Skorin, Jr., OD, DO, MS, FAAO, FAOCO

1. Cranial Nerve 1 – Olfactory Nerve

- Testing – patient shuts eyes
 - Examiner occludes one nostril
 - Test each nostril separately
 - Identify coffee, tobacco, peppermint, vanilla
 - Do not test noxious odors such as ammonia
 - Function of mucous membranes of nose NOT olfactory nerve

2. Cranial Nerve 1 – Olfactory Nerve

- Results
 - Anosmia – loss of sense of smell
 - Bilateral loss – aging
 - Unilateral loss – trauma to cribriform plate
 - blocked nasal passages
 - Foster-Kennedy syndrome
 - anosmia
 - dementia
 - unilateral optic atrophy
 - contralateral disc edema

- etiology: subfrontal mass (olfactory groove meningioma)

3. Cranial Nerve 2 – Optic Nerve

- Testing
 - Visual acuity
 - Visual fields
 - Color vision
 - Pupil testing
 - direct light reflex
 - consensual light reflex
 - swinging flashlight test
 - near reflex

4. Cranial Nerve 2 – Optic Nerve

- 64-y-0 WF, optic nerve edema LT
- Blurred vision, grey inferior VF, LT
- Negative medical Hx, nonsmoker
- Family Hx: CVA, HTN, fatal valvular heart disease
- 20/20⁻¹ OD, 20/40⁺² OS
- 0.3 log units LT RAPD
- Red color saturation equal
- External/SLE negative

- BP: 158/95 mm Hg
- All blood test negative except cholesterol: 240 mg/dL, HDL 73 mg/dL
- Fundus: crowded discs, LT superior sectoral edema, blurred superior disc margins
- OCT: superior nerve fiber swelling LT
- VF: absolute infranasal altitudinal defect
- CT of head/orbit - negative
- Seen by internist 1 week later
- BP: 132/82
- Rx: 81 mg ASA daily
- Carotid US – no stenosis
- Seen again by us 5 weeks
- RAPD and VF same
- BP: 140/82
- Fundus sectoral edema – resolved
- 5. **Cranial Nerve 2 – Optic Nerve**
- NAION: acute, unilateral, painless vision loss
- Older than 50 years, Caucasian
- Disc at risk
- Inferior altitudinal VF defect

- Risk factors:
 - hypertension
 - nocturnal hypotension
 - hyperlipidemia
 - diabetes
 - obstructive sleep apnea
 - smoking
 - PDE-5 inhibitor use

● **Cranial Nerve 2 – Optic Nerve**

- White coat HTN: in-office BP > 140/90
- Marked HTN: in-office BP < 140/90 but elevated at home
- Increased risk of developing sustained HTN over 10 years
- Additional family hx:
 - all siblings have HTN
 - one had NAION
 - one had CRAO

● **Cranial Nerve 3 – Oculomotor Nerve**

- Testing

- Somatic motor controls
 - Superior, inferior, medial rectus muscles
 - Inferior oblique muscle
 - Levator palpebrae superior muscle

B. Parasympathetic motor

- Innervates fibers that control ciliary body and iris sphincter

6. Cranial Nerve 3 – Oculomotor Nerve

- Results
 - Hypodeviated and exotropic “down and out”
 - Ptosis
 - Difficulty accommodating

7. Cranial Nerve 3 – Oculomotor Nerve

2. Results

- Pupil dilation
 - benign ischemic infarction
 - compression from enlarging aneurysm at the junction of the carotid and posterior communicating arteries

8. Cranial Nerve 3 – Oculomotor Nerve

- 65 y.o. WF – acute, RT lid ptosis, binocular diplopia
- Dull pain behind RT eye and upper lid
- Diabetic Type II, HTN, hyperlipidemia, hypothyroid
- VA: 20/20⁻¹ RT, 20/15 LT

- Pupil normal, no RAPD
- Motility – down and out with ptosis
- VF, color testing, sinus transillumination, SLE, fundus all normal
- HbA1c: 6.2%, BS 103, CRP 10 mg/L, BP 139/71
- ICE Test – negative
- Temporal artery biopsy – negative
- MRI/MRA of brain - negative
- Microvascular ischemic 3rd nerve palsy
- Our patient had multiple risk factors
- Periorbital pain common – due to hypoxia
- Resolves in 8 – 12 weeks
- Always monitor for later pupil development

9. Cranial Nerve 4 – Trochlear Nerve

- Testing
 - Somatic control
 - Controls superior oblique muscle
 - Parks-Bielschowsky 3-Step Test
 - double Maddox rod test for cyclodeviation



Maddox Wing

- Results
 - Diplopia – vertical, diagonal or incyclotorsional, worse when reading
 - Head tilt to opposite side
 - Hyperdeviation worse on contralateral gaze, down gaze and ipsilateral head tilt
- **Cranial Nerve 5 - Trigeminal**
- Sensory – light touch, pain, pressure, temperature
- Corneal reflex test – sensory 5 & motor 7 lid closure
- Ophthalmic, Maxillary, Mandibular
- Motor – temporal, masseter, pterygoid muscles
- Jaw deviates toward side of weakness
- **Cranial Nerve 6 – Abducens Nerve**
- Testing
 - Somatic motor
 - Controls lateral rectus muscle
- Results
 - Diplopia – worse when looking laterally at distance

10. Cranial Nerve 6 – Abducens Nerve

- Work-up and management (Nerves 3, 4, 6)
 - Patients under 50
 - MRI
 - Blood tests (FBS, ANA, RPR, Lyme titer, ESR)
 - Lumbar puncture
 - Patients over 50
 - Atherosclerosis evaluation
 - ESR, CRP, platelets for temporal arteritis
 - Consider MRI
 - Don't forget
 - Myasthenia gravis
 - Thyroid ophthalmopathy

- **Cranial Nerve 7 – Facial Nerve**
 - Sensory – taste to anterior 2/3 tongue
 - Motor – muscles of facial expression
 - Stroke vs. Bell's Palsy
 - Upper motor neuron lesion
 - Contralateral loss of lower muscle function

- Spares the forehead
- Lower motor neuron lesion
- Affects one entire side of face
- Ipsilateral to the lesion