The Cranial Nerve Connection

Leonid Skorin, Jr., OD, DO, MS, FAAO, FAOC

CRANIAL NERVES

I. Olfactory Nerve
   A. Testing - patient shuts eyes
      1. Examiner occludes one nostril
      2. Test each nostril separately
      3. Identify coffee, tobacco, peppermint, vanilla
   B. Results -
      1. Anosmia - loss of sense of smell
      2. Bilateral loss - aging
      3. Unilateral loss - trauma to cribriform plate
         a. blocked nasal passages
         b. Foster-Kennedy syndrome
            (1) anosmia
            (2) dementia
            (3) unilateral optic atrophy
            (4) contralateral disc edema
            (5) etiology: subfrontal mass (olfactory groove meningioma)
   C. Do not test noxious odors such as ammonia
      1. Function of mucous membranes of nose **NOT** olfactory nerve

II. Optic Nerve
   A. Testing -
      1. Visual acuity
      2. Visual fields
      3. Color vision
      4. Pupil testing
         a. direct light reflex
         b. consensual light reflex
         c. swinging flashlight test
         d. near reflex
   B. Clinical Case

III. Oculomotor Nerve
   A. Testing -
      1. Somatic motor
         a. controls superior, inferior, medial rectus muscles
         b. controls inferior oblique muscle
         c. controls levator palpebrae superioris muscle
      2. Parasympathetic motor
         a. innervates fibers that control ciliary body and iris sphincter
B. Results -
1. Diplopia - hypodeviated and exotropic
   “down and out”
2. Ptosis
3. Difficulty accommodating
   a. loss of convergence and pupillary constriction
4. Enlarged pupil
   a. benign ischemic infarction
   b. compression from an enlarging aneurysm at the junction of the
carotid and posterior communicating arteries
C. Clinical Case

IV. Trochlear Nerve
A. Testing
   1. Somatic motor
      a. controls superior oblique muscle
         (1) Parks-Bielschowsky 3-Step Test
         (2) Double Maddox rod test for cyclodeviation
         (3) Maddox Wing
   B. Results -
      1. Diplopia - vertical, diagonal or incyclotorsional, worse when reading
      2. Head tilt to opposite side
      3. Hyperdeviation worse on contralateral gaze, down gaze and ipsilateral
head tilt

V. Trigeminal Nerve
A. Testing - controls both sensory and motor functions
   1. Sensory - ophthalmic
      - maxillary
      - mandibular
      - Light touch, pain
   2. Motor - temporal muscles
      - masseter muscles
      - pterygoid muscles
   3. Palpate temporal, masseter muscles as patient clenches jaw -
      note strength and mass
   4. Jaw deviation with mouth opened
   5. Corneal reflex (blink reflex)
B. Clinical Case

VI. Abducens Nerve
A. Testing
   1. Somatic motor
      a. controls lateral rectus muscle
B. Results -
   1. Diplopia - worse when looking laterally at distance
C. Work-up and Management (Nerves 3, 4, 6)
   1. patients under 50
      - MRI
      - Blood tests (FBS, ANA, RPR, Lyme titer, ESR)
      - Lumbar puncture
   2. patients over 50
      - atherosclerosis evaluation
      - ESR, CRP, platelets for temporal arteritis
      - consider MRI
   3. don’t forget
      - myasthenia gravis
      - thyroid ophthalmopathy

D. Clinical Case

VII. Facial Nerve
   A. Testing - controls both sensory and motor function
      1. Sensory - controls taste to anterior two-thirds of tongue
         a. alternately, place salt and sugar on anterior of tongue. Keep tongue protruded. Indicate on card “salty” or “sweet.” Rinse between testing with water.
      2. Motor - controls muscles of facial expression
         a. can patient smile, frown, furrow the brow, pucker the lips
         b. testing - push in on patient’s cheek as they attempt to push them out
         c. orbicularis oculi - try to open patient’s tightly closed eyelids
   B. Results
      1. Upper motor neuron (corticobulbar pathway lesion)
         a. contralateral loss of lower muscles of facial expression
      2. Lower motor neuron (Bell’s palsy)
         a. ipsilateral loss of all (upper and lower) muscles of facial expression
      3. Dystonia - involuntary sustained (tonic) and spasmodic (rapid or clonic), repetitive contractions
      4. Benign essential blepharospasm
      5. Hemifacial spasm

VIII. Acoustic Nerve
   A. Testing - has auditory and vestibular branches
      1. Ticking watch, finger rubbing
      2. Otoscopic examination
      3. Weber test - tuning fork at vertex of skull
         a. normal - sound at midline
         b. sensorineural loss - heard better on normal side
         c. conduction loss - heard better on occluded side
      2. Rinne test - compares bone and air conduction
         a. hold tuning fork against mastoid process. When sound no longer heard, move fork to external canal. Can sound still be heard?
         b. normal - sound heard after bone conduction stops
         c. sensorineural loss - both reduced but relationship remains normal
         d. conduction loss - bone conduction better than air
B. Clinical Case

IX. Glossopharyngeal Nerve
   A. Testing - has both sensory and motor fibers
      1. Innervate pharynx and posterior one-third of the tongue
      2. Examine oropharynx with tongue depressor. Have patient say “AH,”
         look for symmetric elevation of soft palate and uvula
      3. Gag reflex - touch back of throat with cotton applicator

X. Vagus Nerve
   A. Testing - tested with glossopharyngeal nerve
      - is swallowing and voice quality normal

XI. Spinal Accessory Nerve
   A. Testing - motor fibers to sternocleidomastoid and trapezius muscles
      1. Trapezius
         a. elevation and upward rotation of scapula
         b. enables abduction of arm beyond 90 degrees
         c. shoulder shrug - press down on shoulders as patient tries to raise
            them
      2. Sternomastoid
         a. tilts face and elevates chin to opposite side
         b. have patient turn head to one side against your hand (resistance).
            Observe contraction of opposite sternomastoid muscle.

XII. Hypoglossal Nerve
   A. Testing - motor innervation to the tongue
      1. Have patient stick out their tongue
         a. normal - no deviation
         b. abnormal - tongue deviates toward lesion
      2. Test by pushing cotton tip to either side
      3. Ask patient to push tongue against inside of cheek while examiner
         pushes against cheek with their hand

MOTOR SYSTEM
   A. Gait: walk across room
   B. Cerebellar Disease: walk heel-to-toe
   C. Rhomberg Test: Patient stands with his feet together and with eyes closed.
      Tests for cerebellar ataxia.

DEEP TENDON REFLEX
   A. Knee Reflex: with patient sitting, briskly tap the patellar tendon just below
      the patella. Note contraction of the quadriceps with extension of the knee.
   B. Holmes-Adie syndrome: tonic pupil and diminished deep tendon reflexes