Neuro Exam Workshop
PCAPNA 2026

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1

Objectives

1. Accurately Perform a full neuro exam on a healthy individual

2. Interpret abnormal neuro physical exam findings.

2

Subjective

- Fatigue, lethargy
- Dizziness; lightheadedness
- h/a
- Seizures/syncope
- Numbness, tingling
- Muscle weakness; palsy
- Sensory changes
- Tremor
- Balance issues; gait disturbances
- Concussion; whiplash injury; TBI
- Cognitive complaints
- Back/neck issues

3

Family History

- Seizures or convulsions
- Neuro-degenerative disease: MS, MG, Huntington's, Parkinson's
- Dementia
- Stroke
- Seizure disorder

4

Personal and Social History

- Environmental or occupational hazards
- Hand, eye, foot dominance, family patterns of dexterity and dominance
- Ability to care for self
- Sleeping and eating patterns
- Use of alcohol and drugs

5

Infants

- Prenatal history
- Birth history
- Respiratory status at birth
- Neonatal health
- Congenital anomalies
- Hypotonia or hypertonia in infancy, developmental delay

6

Children

- Developmental milestones
  - Age attained
  - Pattern of development
- Performance of self-care activities: dressing, toileting, feeding
- Hyperactive or impulsive behavior
- Health problems
  - Headaches, seizures, clumsiness or unsteady gait, muscle weakness or falling

7

Pregnant Women

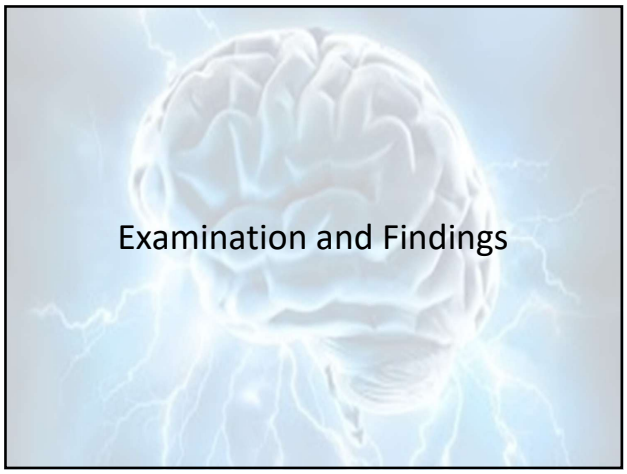
- Weeks of gestation or estimated date of delivery
- Seizure activity: past history of seizures or pregnancy-induced hypertension; frequency, duration, character of movement
- Headache
- Nutritional status

8

Older Adults

- Pattern of increased stumbling, falls, unsteadiness, or decreased agility
- Interference with performance of ADLs, social withdrawal, feelings about symptoms
- Hearing loss, vision deficit, or anosmia
- Fecal or urinary incontinence
- Transient neurologic deficits
  - May indicate transient ischemic attacks (TIAs)

9



10

General

- Orientation
- Alertness
- Remote and recent memory
- Mini-cog
  - Three word recall
  - Clock drawing
  - Delayed recall
- Speech pattern
- Involuntary movements; tics

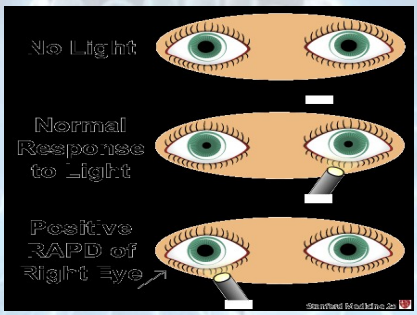
11

Cranial Nerves

- Olfactory (CN I) *Sensory* and smell
  - Test for odor identification
- Optic (CN II) *Sensory* and visual acuity
  - Test for visual acuity – Snellen chart
  - Test visual fields
    - Confrontation
    - Pupillary response

12

Consensual response and accommodation



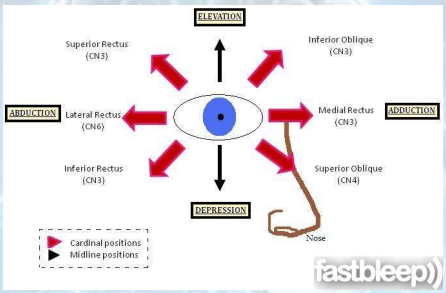
13

Cranial Nerves (Cont'd)

- Oculomotor, trochlear, and abducens (CN III, IV, and VI) *Motor* and eye movement, pupil size, eyelid opening
  - Inspect eyelids for drooping.
  - Inspect pupils for size and equality.
  - Test consensual response and accommodation.
  - Test extraocular eye movements.

14

E O M



15

Cranial Nerves (Cont'd)

- Trigeminal (CN V) *Mixed*: muscle tone and sensation
  - Inspect face for atrophy or tremors.
  - Palpate jaw for tone and strength.
  - Test for pain and sensation.
  - Test corneal reflex.

16

Trigeminal (CN V) Motor



17

Trigeminal (CN V) Sensory

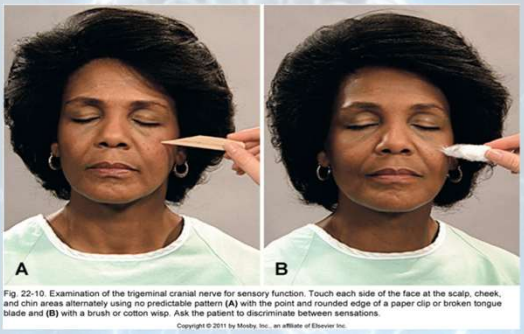


Fig. 22-10. Examination of the trigeminal cranial nerve for sensory function. Touch each side of the face at the scalp, cheek, and chin areas alternately using no predictable pattern **(A)** with the point and rounded edge of a paper clip or broken tongue blade and **(B)** with a brush or cotton wisp. Ask the patient to discriminate between sensations.

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18

Cranial Nerves (Cont'd)

- Facial (CN VII) *Mixed*: facial expressions and taste
  - Inspect facial symmetry: smile, frown, puff out cheeks
  - Test tongue for salt and sweet.
- Acoustic (CN VIII) *Sensory*, hearing, and balance
  - Whisper
  - Rinne
  - Weber

19

Facial (CN VII)

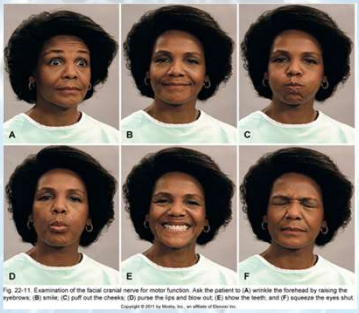


Fig. 22-11. Examination of the facial cranial nerve for motor function. Ask the patient to (A) wrinkle the forehead by raising the eyebrows; (B) smile; (C) puff out the cheeks; (D) purse the lips and blow out; (E) show the teeth; and (F) squeeze the eyes shut.

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20

Cranial Nerves (Cont'd)

- Glossopharyngeal (CN IX) *Mixed*: taste and swallowing
  - Test tongue for sour and bitter.
  - Test gag reflex and swallow.
- Vagus (CN X) *Mixed*: swallowing and speech
  - Inspect palate and uvula for symmetry while patient says "ahhh"
  - Inspect for swallow difficulty.

21

Cranial Nerves (Cont'd)

- Spinal accessory (CN XI) *Motor* and muscle strength
  - Test trapezius and sternocleidomastoid muscle strength.
- Hypoglossal (CN XII) *Motor* and tongue strength
  - Inspect tongue for symmetry/tremors/atrophy.
  - Test tongue movement.
  - Test tongue strength.
  - Evaluate lingual speech sounds: light, bright, dynamite.

22

Hypoglossal (CN XII)

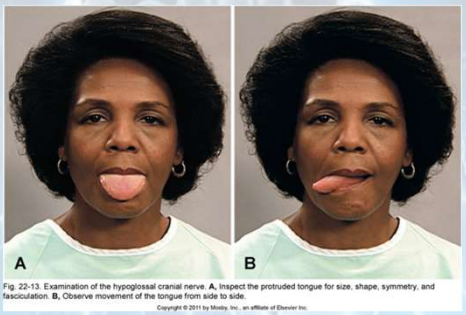


Fig. 22-13. Examination of the hypoglossal cranial nerve. **A,** Inspect the protruded tongue for size, shape, symmetry, and fasciculation. **B,** Observe movement of the tongue from side to side.

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23

Sensory Function

- Tested with the patient's eyes closed
- Observe all sensory function tests for:
  - Side-to-side differences
  - Interpretation of sensation
  - Discrimination
  - Location
- If impairments are found, map boundaries by dermatome.
- Evaluate both primary and cortical discriminatory sensation.

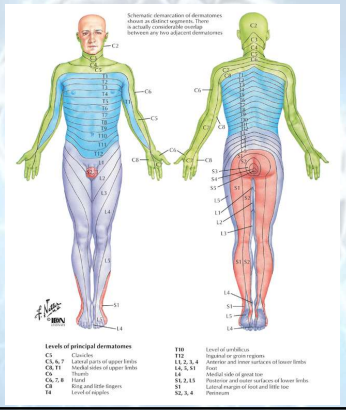
24

Sensory Function

- Sharp/dull sensation
- Test vibratory response to tuning fork over joints or bony prominences on upper and lower extremities.
- Temperature differentiation
- Evaluate perception of position sense with movement of the great toes or a finger on each hand.

25

Dermatones



26

Sensory (Cont'd)

- Assess two-point discrimination: 2mm to 5mm
- Stereognosis: Assess ability to identify familiar object by touch and manipulation.
- Graphesthesia: Assess ability to identify letter or number "drawn" on palm of hand.
- Extinction phenomenon: ability to distinguish two different body parts touched simultaneously

27

Motor

- Assess strength against resistance – rated 0-5
- Hand grasp
  - Cross hand grip
- Upper extremity
  - Bicep/tricep with push/pull
- Lower extremity
  - Quad/ham with push/pull
  - Leg lift
- Pronator drift

28

Reflexes

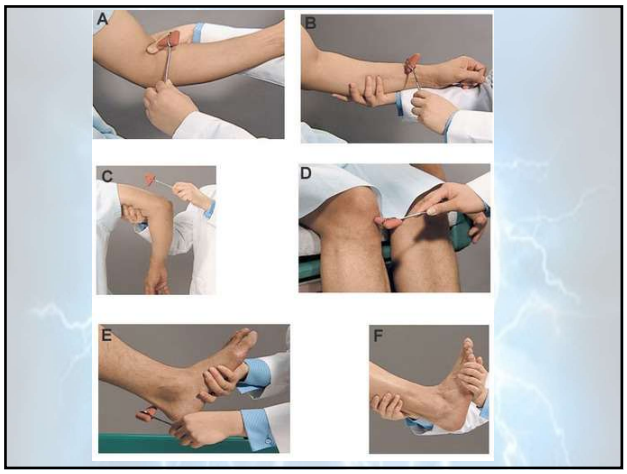
- Deep tendon reflexes
  - Symmetric visible or palpable responses should be noted.
  - Scoring deep tendon reflexes:
    - 0 No response
    - 1+ Sluggish or diminished
    - 2+ Active or expected response
    - 3+ More brisk than expected, slightly hyperactive
    - 4+ Brisk, hyperactive, with intermittent or transient clonus

29

Reflexes

- Deep tendon reflexes
  - Biceps: elbow flexion
  - Triceps: elbow extension
  - Brachioradial: forearm pronation and elbow flexion
  - Patellar: lower leg extension
  - Achilles: foot flexion
  - Clonus: rhythmic oscillating movements
    - Ankle
    - Associated with upper motor neuron disease

30



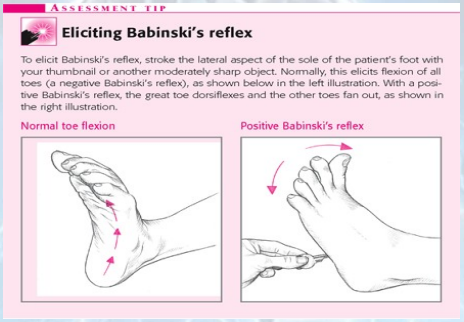
31

Reflexes

- Superficial reflexes
  - Plantar reflex
    - Stroke the lateral side of the foot from the heel to the ball and then curve across the ball of the foot to the medial side.
    - Patient should have plantarflexion of all toes.
    - Babinski sign is present when there is dorsiflexion of the great toe.
    - Indicates pyramidal tract disease

32

Plantar Reflex



33

Cerebellar Function

- Rapid rhythmic alternating movements
- Finger to nose testing
- Heel-to-shin testing
- Romberg
- Observe the patient's gait
  - Walk
  - Tandem
  - Heel
  - Toe



34



35

Additional Procedures

- Protective sensation
  - Test for protective sensation on several sites of the foot in all patients with diabetes mellitus and peripheral neuropathy.
  - Use the 5.07 monofilament
  - Loss of protective pain sensation that alerts patients to skin breakdown and injury

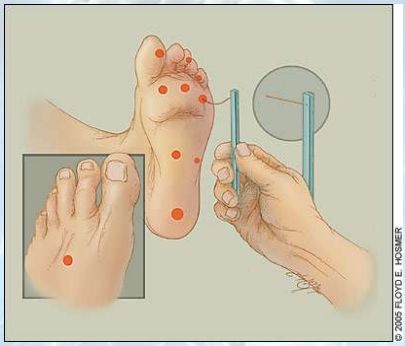
36

Acute Low Back Radicular Assessment

Nerve root	L4	L5	S1
Pain			
Numbness			
Motor weakness	Extension of quadriceps	Dorsiflexion of great toe and foot	Plantar flexion of great toe and foot
Screening examination	Squat and rise	Heel walking	Walking on toes
Reflexes	Knee jerk diminished	None reliable	Ankle jerk diminished

(From Thompson et al, 1997.)

37



38

Additional Procedures (Cont'd)

- Meningeal signs
  - Stiff neck or *nuchal rigidity* is a sign that may be associated with meningitis and intracranial hemorrhage.
  - With the patient supine, slip your hand under the head and raise it, flexing the neck.
  - Pain and a resistance to neck motion are associated with nuchal rigidity.

39

Additional Procedures (Cont'd)

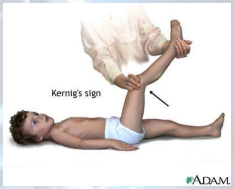
- Meningeal signs
  - Brudzinski
    - May also be present when neck stiffness is assessed
    - May indicate meningeal irritation
    - Involuntary flexion of the hips and knees when flexing the neck is a positive Brudzinski sign.



40

Additional Procedures (Cont'd)

- Meningeal signs
  - Kernig
    - May indicate meningeal irritation
    - Evaluated by flexing the leg at the knee and hip when the patient is supine, then attempting to straighten the leg
    - Pain in the lower back and resistance to straightening the leg at the knee constitute a positive Kernig sign.



41

Infants

- Cranial nerves indirectly assessed by observing:
  - CN II, III, IV, and VI
    - Optical blink reflex
    - Gaze and tracking
    - Doll's eye
  - CN V
    - Rooting
    - Sucking

42

Infants (Cont'd)

- Cranial nerves
  - CN VII
    - Facial expressions
    - Forehead wrinkling
    - Smile
  - CN VIII
    - Acoustic blink reflex
    - Doll's eye maneuver

43

Infants (Cont'd)

- Cranial nerves
  - CN IX and X
    - Swallow and gag reflex
  - CN XII
    - Sucking and swallowing ability
    - Tongue position with pinch test

44

Infants (Cont'd)

- Observe the infant's spontaneous activity for symmetry and smoothness of movement.
- Coordinated sucking and swallowing is also a function of the cerebellum.
- A withdrawal of all limbs from a painful stimulus provides a measure of sensory integrity.
- The patellar tendon reflexes are present at birth, and the Achilles and brachioradial tendon reflexes appear at 6 months of age.

45

Infants (Cont'd)

- Posture and movement are routinely evaluated by primitive reflexes:
  - Palmar grasp (birth)
  - Plantar grasp (birth)
  - Moro (birth)
  - Placing (4 days of age)
  - Stepping (between birth and 8 weeks)
  - Asymmetric tonic neck (by 2 to 3 months)
- Inspect and palpate muscle for strength and tone.

46

Children

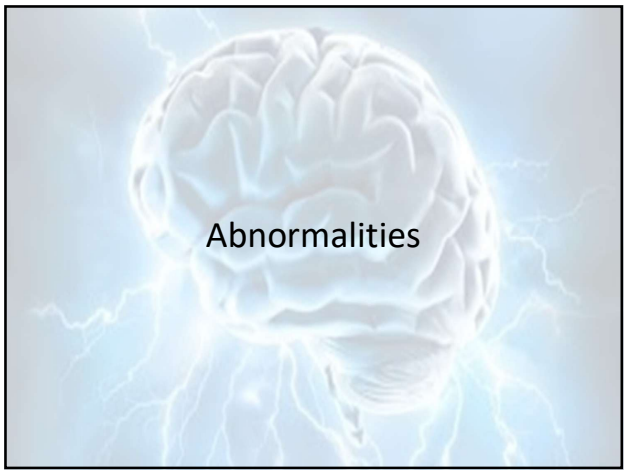
- Observe neuromuscular development progress and skills displayed during physical exam.
- Evaluate developmental level.
- Modify CN examination according to age.
- Observe at play:
  - Gait and fine motor coordination
  - Heel-to-toe walking, hopping, jumping

47

Children (Cont'd)

- Deep tendon reflexes are not always tested in a child who demonstrates appropriate development.
- Evaluate light touch sensation by asking the child to close his or her eyes and point to where you touch or tickle.
  - Use the tuning fork to evaluate vibration sensation.
- Superficial pain sensation is not routinely tested in young children.

48



49

Abnormalities

- Disorders of the central and peripheral nervous systems often fall into groups.
  - *Static* problems develop at any age and do not get better or worse (e.g., nerve deafness and some trauma).
  - *Degenerative* problems occur when function is lost and it progressively worsens.
  - Some problems are *intermittent*, whereas others are *genetic* or related to a *metabolic disorder.*

50

Central Nervous System

- Multiple sclerosis
  - Progressive autoimmune disorder characterized by a combination of inflammation and degeneration of the myelin of the brain's white matter leading to decreased brain mass and obstructed transmission of nerve impulses
  - Gradual, but unpredictable, progression, with or without remissions

51

Central Nervous System (Cont'd)

- Seizure disorder
  - Episodic abnormal electrical discharges (excessive concurrent firing) of cerebral neurons may be caused by:
    - Central nervous system (CNS) disorder
    - CNS structural defect
    - Disorder that affects functioning of the CNS
  - Examples include brain injury, toxins, stroke, brain tumor, or hypoxic syndromes

52

Central Nervous System (Cont'd)

- Encephalitis
  - Acute inflammation of the brain and spinal cord, involving the meninges, often due to a virus such as herpes simplex virus
- Meningitis
  - Inflammatory process in the meninges, the membrane around the brain and spinal cord
- Intracranial tumors
  - Abnormal growth of neural or nonneural tissue within the cranial cavity that may be a primary or metastatic cancer

53

Central Nervous System (Cont'd)

- Stroke (brain attack or cerebrovascular accident)
  - Sudden interruption of blood supply to a part of the brain or the rupture of a blood vessel, spilling blood into spaces around brain cells
    - Ischemic
    - Hemorrhagic

54

Peripheral Nervous System

- Myasthenia gravis
  - Autoimmune disorder of neuromuscular transmission
- Guillain-Barré syndrome
  - Autoimmune-mediated destruction of peripheral nerve myelin sheaths and inflammation of nerve roots
  - Occurs following a nonspecific gastrointestinal or upper respiratory infection 1 to 3 weeks earlier or following an immunization

55

Peripheral Nervous System (Cont'd)

- Trigeminal neuralgia (tic douloureux)
  - Recurrent paroxysmal sharp pain that radiates into one or more branches of the fifth cranial nerve
- Bell's palsy
  - Temporary acute paralysis or weakness of one side of the face

56

Peripheral Nervous System (Cont'd)

- Peripheral neuropathy
  - Disorder of the peripheral nervous system that results in motor and sensory loss in the distribution of one or more nerves
    - Diabetes mellitus
    - B_{12} or folate deficiency
    - Lyme disease
    - HIV infection

57

Children

- Cerebral palsy
  - Permanent disorder of movement and posture development
- Myelomeningocele (spina bifida)
  - Congenital defect of one or more vertebrae (commonly the lumbar or sacral) that permits a meningeal sac filled with a portion of the spinal cord to protrude

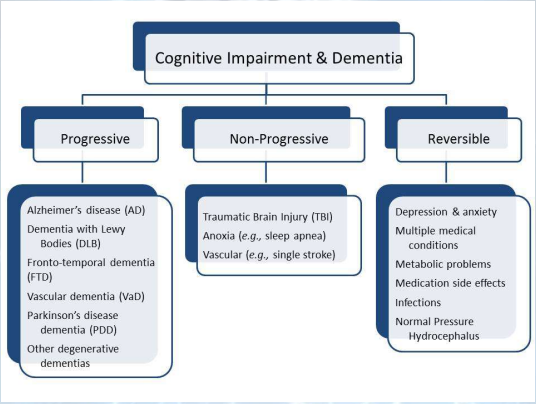
58

Children (Cont'd)

- Shaken baby syndrome
  - Severe form of child abuse resulting from the violent shaking of infants under 1 year of age
  - Stretching and tearing of nerve tissue and blood vessels causes brain damage and a subdural hematoma
  - Spinal cord may also be damaged

59

Older Adults



60

Older Adults (Cont'd)

- Huntingtons Disease
  - Genetic defect on chromosome 4 causing degenerative changes in movement, bahavior and dementia
- Normal-pressure hydrocephalus
  - Syndrome simulating degenerative diseases that is caused by noncommunicating hydrocephalus
- Postpolio syndrome
  - Reappearance of neurologic signs in survivors of the polio epidemics

61