Neurologic Assessment

Introduction

The neurologic assessment can help to localize neurologic diseases and differentiate between urgent and chronic conditions. It can be challenging to perform a comprehensive neurologic exam especially in infants/young children and in patients with cognitive impairment or limited ability to cooperate. Some of the neurologic assessment can be gleaned as you interact with the patient, taking the health history and performing the other components of a full physical assessment.

When focusing on the neurologic system, it is helpful to organize the neurologic assessment into five areas:

1. mental status, speech, and language
2. cranial nerves (CNs)
3. motor system
4. sensory system
5. reflexes

Specific scales, such as the Glascow Coma Scale (GCS), can be useful to objectively describe levels of impaired consciousness or motor ability.

Please refer to our Mental Health Assessment Pocket Card and Cranial Nerves Pocket Card for detailed components of those aspects of the neurologic assessment. Below, we will focus on assessing the motor system, the sensory system, and reflexes.

Assessing the motor system

- Assess the motor system for involuntary movements, muscle bulk, and muscle tone. Throughout your assessment, also consider body position and coordination. Note whether abnormal findings occur with movement or at rest.
    - Involuntary movements
        - Look for tremors, tics, chorea (sudden, unintentional jerking movements), or fasciculations.
        - Note location, quality, rate, rhythm, and amplitude.
        - Observe relation to posture, activity, fatigue, emotion, and distraction.
    - Muscle bulk
        - Assess the size and contour of muscles, noting asymmetry, swelling or atrophy.
    - Palpate to assess for tenderness, masses, or lesions.Muscle tone
        - Assess tone by feeling the muscle's resistance to passive stretch.
            - Encourage the patient to relax; then hold one hand with yours and support the elbow. Flex and extend the patient's fingers, wrist, and elbow, and put the shoulder through a moderate range of motion.
        - To assess muscle tone in the legs, support the patient's thigh with one hand, grasp the foot with the other; flex and extend the patient's knee and ankle on each side.
        - Note the presence of spasticity or rigidity.
    - Ask the patient to close their eyes. Test for pronator drift by having the patient raise both arms straight forward with palms up and hold for 5-10 seconds.

- Test muscle strength against resistance and grade the patient's strength on a scale of 0 to 5. Compare both sides of the body.
  - Test abduction at the shoulder.
    - Ask the patient to raise the arm from the side to shoulder level. Then press down firmly on the patient's upper arm with shoulder abducted
    - Both arms can be tested simultaneously to aid in side-to-side comparison.
  - Test elbow flexion and extension.
    - Have the patient pull and push against your hand.
  - Test extension at the wrist.
    - Ask the patient to make a fist and resist as you press down or ask the patient to extend the forearms with fingers straight and palms up, then press the palms downward.
  - Test finger extension.
    - Grasp the patient's forearm or palm with one hand. Use the fingers of your other hand to press down on the patient's outstretched fingers
  - Test finger abduction.
    - Position the patient's hand with palm down or on its side and with fingers spread. Instruct the patient to prevent you from moving any fingers as you try to force them together.
  - Test abduction of the thumb.
    - Place the forearm in a fully supinated position. Ask the patient to point the thumb straight upwards toward the ceiling. Try to push the thumb straight down into the palm.
  - Test flexion at the hips.
    - With the patient sitting or supine, place your hand on the patient's mid-thigh and asking the patient to raise the leg against your hand.
  - Test adduction at the hips.
    - Place your hands firmly on the bed between the patient's knees. Ask the patient to bring both legs together.
  - Test abduction at the hips.
    - Place your hands firmly outside the patient's knees. Ask the patient to spread both legs against your hands.
  - Test extension at the hips.
    - Have the patient lie on the stomach and lift the leg off the bed. Push down on the posterior thigh.
  - Test extension at the knee.
    - With the patient supine, support the knee in flexion and ask the patient to straighten the leg against your hand.
    - This can also be performed with the patient sitting.
  - Test flexion at the knee.
    - With the patient supine, position the patient's leg so that the knee is flexed with the foot resting on the bed. Tell the patient to keep the foot down as you try to straighten the leg.
  - Test foot dorsiflexion and plantarflexion at the ankle.
    - Ask the patient to pull up and push down against your hand.

        - Heel and toe walk also assess foot dorsiflexion and plantar flexion, respectively.
- Assess coordination.
    - Rapid alternating movements – Observe speed, rhythm, and smoothness.
        - Have the patient repeat striking one hand on the thigh, flipping it over, and striking the back of the hand down on the same place.
        - Ask the patient to repeatedly tap the distal joint of the thumb with the tip of the index finger as rapidly as possible.
        - Instruct the patient to tap the ball of each foot in turn as quickly as possible on your hand or the floor.
    - Point-to-point movements: Observe for accuracy and smoothness.
        - Finger-to-nose test: Ask the patient to touch your index finger and then his or her nose alternately several times. Move your finger so that the patient must change directions and extend the arm fully to reach your finger. Observe the accuracy and smoothness of movement and watch for any tremor.
        - Heel-to-shin test: With the patient supine, ask the patient to place one heel on the opposite knee, then run it down the shin to the big toe. Observe this movement for smoothness and accuracy. Repetition with the patient's eyes closed tests for proprioception.
- Gait: Observe posture, balance, and stance.
    - Have the patient walk across the room and back, then walk on toes and on heels, and walk heel to toe in a straight line (tandem).
- Assess proprioception (Romberg test).
    - Have the patient first stand with feet together and eyes open and then close both eyes for about 30 seconds without support. Note the patient's ability to maintain an upright posture.

Assessing the sensory system

- Assess the sensory system for light touch, pain, temperature, proprioception, vibration, and discriminative sensation (stereognosis).
- Have the patient close their eyes for this testing.
- For pain, temperature, and touch sensation, compare distal to proximal areas of the extremities, and scatter the stimuli.
    - Light touch
        - Use a fine wisp of cotton and touch the skin lightly. Ask the patient to respond when a touch is felt.
    - Pain
        - Use the stick portion of a broken cotton swab, or other suitable tool.
        - Occasionally, substitute the blunt end for the point. Ask, "Is this sharp or dull?" or, "Does this feel the same as this?"
        - Apply the lightest pressure needed.
    - Temperature
        - This is often omitted if pain sensation is normal, however if sensory deficits are noted, you can use a tuning fork warmed or cooled by running water and ask the patient to identify "hot" or "cold."
    - Proprioception

        - Holding the patient's big toe by its sides between your thumb and index finger, then move it gently away from the other toes. Demonstrate "up" and "down" as you move the patient's toe clearly upward and downward. Then, ask the patient to say "up" or "down" when moving the large toe.
    - Vibration
        - Using a tuning fork, tap the prongs on the heel of your hand and place the base firmly over a distal interphalangeal joint of the patient's finger, then over the interphalangeal joint of the big toe. Ask what the patient feels. If it's unclear whether the patient is feeling pressure or vibration, ask the patient to tell you when the vibration stops; then touch the tuning fork to stop it from vibrating.
    - Stereognosis
        - Place a familiar object (for example, a coin, paper clip, key, or cotton ball) in the patient's hand and ask the patient to tell you what it is.
        - If necessary, proceed with other methods of assessing discriminative sensations.

Assessing reflexes

- Elicit muscle stretch reflexes.
    - Biceps reflex
        - With the patient's elbow partially flexed, and the forearm pronated, place your thumb or finger firmly on the biceps tendon. Strike the reflex hammer directly through your finger toward the biceps tendon.
        - Look for flexion at the elbow and contraction of the biceps muscle.
    - Triceps reflex
        - With the patient sitting or supine, flex the patient's arm at the elbow, with palm toward the body, and pull it slightly across the chest. Strike the triceps tendon with a direct blow directly behind and just above the elbow. Watch for contraction of the triceps muscle and extension at the elbow.
        - You can also elicit this reflex by supporting the upper arm and asking the patient to let the arm go limp. Then strike the triceps tendon.
    - Brachioradialis reflex
        - With the patient's hand resting on the abdomen or the lap, and the forearm partly pronated, strike the radius with the point or flat edge of the reflex hammer, about 2 to 4 inches above the wrist. Watch for flexion at the elbow and supination of the forearm.
    - Quadriceps (patellar) reflex
        - With the patient sitting or lying down, make sure the knee is flexed, and briskly tap the patellar tendon just below the patella. Note contraction of the quadriceps with extension at the knee.
    - Achilles (ankle) reflex
        - With the patient's foot dorsiflexed at the ankle, strike the Achilles tendon and watch and feel for plantar flexion at the ankle.
        - If the reflexes seem hyperactive, test for ankle clonus.
- Elicit cutaneous or superficial stimulation reflexes.
    - Abdominal reflexes
        - With the patient supine, lightly, but briskly stroking each side of the abdomen toward the umbilicus. Note the contraction of the abdominal muscles and movement of the umbilicus toward the stimulus.

- Plantar reflex
  - Stroke the lateral aspect of the sole from the heel to the ball of the foot, curving medially across the ball. Observe movement of the big toe, normally plantar flexion.
- Anal reflex
  - Using the broken end of an applicator stick, lightly stroke the anus on both sides. Watch for reflex contraction of the external anal sphincter.

PEARLS

- Patients with Parkinson disease may have a slow, "pill-rolling" tremor at rest.
- Fasciculations with atrophy and muscle weakness suggest peripheral motor neuron disease.
- Remember that when testing muscle strength, the patient's dominant side is usually slightly stronger than the nondominant side.
- When assessing vibration and position sense, test the fingers and toes first. If these are normal, you may safely assume that more proximal areas will also be normal.
- When testing the plantar response, dorsiflexion of the big toe is a *positive Babinski response,* arising from a CNS lesion affecting the corticospinal tract. It may be transiently positive in unconscious states from drug or alcohol intoxication and during the postictal phase.

Reference

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