Overvew of Nervous System Evaluation: Clinical approach to neurological diseases

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Contents

1 Introduction

The nervous system is a complex, sophisticated system that regulates and coordinates body activities. It is made up of two major divisions, including the following:

1. Central nervous system. This consists of the brain and spinal cord.
2. Peripheral nervous system. This consists of all other neural elements, including the peripheral nerves and the autonomic nerves.

In addition to the brain and spinal cord, principal organs of the nervous system include the following:

- Eyes
- Ears
- Sensory organs of taste
- Sensory organs of smell
- Sensory receptors located in the skin, joints, muscles, and other parts of the body

2 Disorders of the nervous system

Structural, biochemical or electrical abnormalities in the brain, spinal cord or other nerves can result in a range of symptoms. Examples of symptoms include paralysis, muscle weakness, poor coordination, loss of sensation, seizures, confusion, pain, tauopathies, and altered levels of consciousness. There are many recognized neurological disorders, some relatively common, but many rare. They may be assessed by neurological examination.

Disorders of the nervous system may involve the following:

- Vascular disorders, such as stroke, transient ischemic attack (TIA), subarachnoid hemorrhage, subdural hemorrhage and hematoma, and extradural hemorrhage

- Infections, such as meningitis, encephalitis, polio, and epidural abscess
- Structural disorders, such as brain or spinal cord injury, Bell's palsy, cervical spondylosis, carpal tunnel syndrome, brain or spinal cord tumors, peripheral neuropathy, and Guillain-Barré syndrome
- Functional disorders, such as headache, epilepsy, dizziness, and neuralgia
- Degeneration, such as Parkinson disease, multiple sclerosis, amyotrophic lateral sclerosis (ALS), Huntington chorea, and Alzheimer disease

2.1 Neurological examination

A neurological examination is the assessment of sensory neuron and motor responses to determine whether the nervous system is impaired. This typically includes a physical examination and a review of the patient's medical history. It can be used both as a screening tool and as an investigative tool, the former of which when examining the patient when there is no expected neurological deficit and the latter of which when examining a patient where you do expect to find abnormalities. If a problem is found either in an investigative or screening process, then further tests can be carried out to focus on a particular aspect of the nervous system (such as lumbar punctures, blood tests, or neuroimaging).

In general, a neurological examination is focused on finding out whether there are lesions in the central and peripheral nervous systems. Specific tests in a neurological examination include the following:

Mental status examination

- The assessment of consciousness
- Mental status examination, often including some mental test scores
- Global assessment of higher functions

Cranial nerve examination

- **Cranial nerves (I-XII)**: sense of smell (I), visual fields and acuity (II), eye movements (III, IV, VI) and pupils (III, sympathetic and parasympathetic), sensory function of face (V), strength of facial (VII) and shoulder girdle muscles (XI), hearing (VII, VIII), taste (VII, IX, X), pharyngeal movement and reflex (IX, X), tongue movements (XII).

Motor system

- Muscle strength
- Muscle tone and signs of rigidity.
- Examination of posture
- Resting tremors
- Abnormal movements (seizure, fasciculations, spasticity, rigidity)
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- Deep tendon reflexes:
  - Reflexes: masseter, biceps and triceps tendon, knee tendon, ankle jerk and plantar (i.e., Babinski sign). A reflex hammer is used for this testing.

Sensory system

- Sensory system testing involves provoking sensations of fine touch, pain and temperature. Fine touch can be evaluated with a monofilament test, touching various dermatomes with a nylon monofilament to detect any subjective absence of touch perception.
- Examination of the sensory includes:
  - Light touch
  - Pain
  - Temperature
  - Vibration
  - Position sense
  - Graphesthesia
  - Stereognosis, and
  - Two-point discrimination (for discriminative sense)
  - Extinction
  - Romberg test

Cerebellum

Cerebellar testing includes:

- Dysmetria (finger-to-nose test and ankle-over-tibia test)
- Dysdiadochokinesis (rapid pronation-supination)
- Ataxia and assessment of gait
- Nystagmus
- Intention tremor