Pearls and Pitfalls in Neurological Examination

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Neurological Examination

Cranial nerves
Motor system
Reflexes
Sensory system
Cerebellar system
Cranial nerves

**CN I:** Not tested! Why not?
Smoking is no longer popular!
Other choices?

Toiletries

Soap, toothpaste, shampoo, body lotion
Cranial nerves

CN II: VA Visual acuity

Pocket near-vision chart
14 inches

P.S. Be sure it’s 14 inches ..
Neurological Examination

Cranial nerves

CN II: VA Visual acuity
Pocket near-vision chart
14 inches
VF Visual field (confrontation test)
Examine each eye separately

Symmetry (height, distance)

Neurological Examination

Cranial nerves

CN II: Visual acuity

Pocket near vision chart 14 inches

Visual field (confrontation test)

✔️ height, distance
Neurological Examination

Cranial nerves

CN II: VA Visual acuity
Pocket near-vision chart
14 inches

VF Visual field (confrontation test)
Symmetry (height, distance)

Fundoscopic exam: Remove glasses
No hand on head please!
Avoid forced upper lid opening
Same eye, same hand
Neurological Examination

Cranial nerves
CN III, IV, VI:
Ptosis: complete, partial
Extraocular muscles movement
Pupillary reflexes

Complete in CN III palsy
Partial in CN III palsy
Horner’s syndrome
Myasthenia gravis
Neurological Examination

Cranial nerves

CN III, IV, VI:
- Ptosis: complete, partial
- Extraocular muscles movement
- Pupillary reflexes

Partial ptosis
Partial CN III palsy
Horner’s syndrome
Myasthenia gravis

Compensatory eyebrow elevation
Neurological Examination

Cranial nerves CN III, IV, VI: EOM

Pupillary reflexes RAPD

Enhanced ptosis
Neurological Examination

Cranial nerves CN III, IV, VI:
- Ptosis: partial, complete
- Extraocular muscles movement
- Pupillary reflexes
- RAPD
  - Check for proptosis
  - Eyes closed
  - ✔️ Observe from above forehead
  - ✔️ Eyeball protrusion in one side

Supine

Sitting

Neck bend forward
Neurological Examination

Cranial nerves

CN V: Motor
Sensory
Reflex

Vertex

Angle of mandible

Illustrated by Songkram Chotik-anuchit, MD
Cranial nerves

CN V: Motor

Sensory

Reflex: corneal reflex
touch at the limbus
Neurological Examination

Cranial nerves

CN V: Motor

Sensory

Reflex:

corneal reflex

jaw jerk

tap lower jaw downward, not backward, to stretch masseter muscles
Neurological Examination

Cranial nerves

CN VII:
- UMN versus LMN lesion
- LMN:
  - less blinking
  - facial synkinesia
    (post complete palsy)
  
Synchronous contraction of muscles supplied by CN VII (aberrantly regenerated fibers)

Check at platysma
Cranial nerves

CN VIII: Weber, Rinne tests
Not heard?
Press footplate firmly on the skull at the vertex
>> Bone conduction

P.S. No need to put the tuning fork on the forehead!
Neurological Examination

My curiosity:
How do you make a tuning fork vibrate?

a) Strike on a solid surface
b) Strike at your elbow
c) Strike on your hypothenar eminence
d) Strike on a jerk hammer
e) Squeeze both prongs together and release
Neurological Examination

- Cranial nerves
- Motor system
- Reflexes
- Sensory system
- Cerebellar system

**Compare both sides**

**Always check for tone**

**(muscles relaxed)**

**Avoid exert pressure directly upon muscles**

*Pictures: Boongird P. Peripheral Neuropathy 1996*
Neurological Examination

Motor system: Power, upper limb
Shoulder: Deltoid  Biceps  Triceps  Brachioradialis
Radioulnar: Pronator  Supinator
Wrist: Flexor  Extensor
Finger: Flexion (handgrip)  Extension  Abduction  Adduction
Triceps: Extend elbow ~ half way

To extend with arm flexed is very painful.

Picture: Boongird P. Peripheral Neuropathy 1996
To avoid pulling the patient forward (e.g. when checking the wrist flexion, wrist extension and handgrip, etc.), examine one side at a time by fix the distal part of the patient’s forearm with one hand and use the other hand to apply force.
Neurological Examination

Function of fingers

✔️: Flex-Extend
    Move vertical-horizontal to the palm

✔️: Adduct-Abduct
    Move to-from the middle finger
Neurological Examination

Thumb muscle functions

✔️: Flex-Extend

   Thumb in-out

- Flexor pollicis longus
  Anterior interosseous nerve C7, C8
- Flexor pollicis brevis
  Median, Ulnar nerves C8, T1
- Extensor pollicis longus
- Extensor pollicis brevis
  Posterior interosseous nerve C7, C8
Neurological Examination

Flexor pollicis longus FPL

Insert at **distal**

phalanx of the thumb
Neurological Examination

Flexor pollicis brevis FPB

Flex proximal phalanx towards index finger

Insertion at proximal phalanx of the thumb
Extensor pollicis longus EPL

Extend distal phalanx of thumb at interphalangeal, MCP joints
Neurological Examination

Extensor pollicis brevis (EPB)

Extend proximal phalanx of thumb at MCP joint
Neurological Examination

Thumb muscle functions
✔️ : Adduct-Abduct
   Thumb down-up
- Adductor pollicis
  Ulnar nerve C8, T1
- Abductor pollicis longus
  Posterior interosseous nerve C7, C8
- Abductor pollicis brevis
  Median nerve C8, T1
Adductor pollicis

Thumb down

Hand horizontal plane
Thumb down to palm
Neurological Examination

Abductor pollicis longus APL

Abduct at carpo-meta carpal joint

Hand horizontal plane
Thumb up, vertical to palm
Abductor pollicis brevis APB

Abduct at MCP joint

Thumb up, vertical to palm
Neurological Examination

Thumb muscle functions
✓: Opponens
   Thumb across
- Opponens pollicis
  Median nerve C8, T1
Opponens pollicis

Thumb across, touching the base of the little finger
Neurological Examination

Radial nerve

- Radial groove
- Triceps brachii
- Brachioradialis
- Extensor carpi radialis
- Supinator
- Extensor digiti minimi
- Extensor indicis
- Extensor carpi ulnaris
- Extensor pollicis longus & brevis
- Extensor digitorum communis
- Abductor pollicis longus

Boongird 1996
Extensor digitorum

Hint: Patient’s hand is supported; fingers extended at MCP joint

Extend at MCP joint

MCP: metacarpophalangeal joint
Neurological Examination

Radial nerve

Extensor carpi radialis
Triceps brachii
Brachioradialis
Supinator
Extensor carpi ulnaris
Extensor digiti minimi
Extensor indicis
Extensor pollicis longus & brevis
Extensor digitorum communis
Abductor pollicis longus

“Saturday night palsy”
Wrist and finger drop
Normal elbow extension

“Posterior interosseous nerve palsy”
Finger drop without wrist drop
Neurological Examination

Median nerve

Pronator teres
Flexor digitorum superficialis
Wrist flexor
Flexor carpi radialis
Palmaris longus
Lumbricals I, II
Opponens pollicis
Abductor pollicis brevis
Flexor pollicis brevis
Anterior interosseous nerve
Flexor pollicis longus
Flexor digitorum profundus I, II
Pinching
Carpal tunnel
Boongird 1996
Neurological Examination

Flexor digitorum superficialis (FDS)

Extend DIP joint

Hint: DIP is extended and fixed to minimize function of FDP.

Flex PIP joint

DIP: distal interphalangeal
PIP: proximal interphalangeal
FDP: flexor digitorum profundus

Ω NP
Neurological Examination

Flexor digitorum profundus FDP

Extend PIP joint

Hint: PIP is extended and fixed to minimize function of FDS.

<table>
<thead>
<tr>
<th>FDP</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>I,II</td>
<td>Median</td>
</tr>
<tr>
<td>III,IV</td>
<td>Ulnar</td>
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</tbody>
</table>

Flex DIP joint

PIP: proximal interphalangeal
DIP: distal interphalangeal
FDS: flexor digitorum
Ω NP superficialis
### Neurological Examination

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**Extend MCP, PIP joints**

**Extend distal phalanx**

**PIP:** proximal interphalangeal

**MCP:** metacarpophalangeal
Neurological Examination

Lumbricals III, IV
Flexor digitorum profundus III, IV
Flexor carpi ulnaris
Palmar interossei
Dorsal interossei
Opponens digiti minimi
Abductor digiti minimi
Adductor pollicis
Flexor pollicis brevis
Ulnar nerve
Cubital tunnel

Flexor digiti minimi
Lumbricals III, IV
Boongird 1996
Neurological Examination

Dorsal interossei

Abduct fingers
Neurological Examination

Palmar interossei

Adduct fingers
Neurological Examination

Abductor digiti minimi ADM

[Image of a hand with an arrow labeled ADM]
Neurological Examination

Flexor digiti minimi FDM

Flex little finger at MCP joint; extend at PIP and DIP joints
Froment’s sign: hold a paper by adducting the thumb against the index finger, then pull the paper apart.
Positive: flexor pollicis longus (median nerve) is used to compensate for adductor pollicis.
Neurological Examination

Froment's sign: Ulnar neuropathy

- Median nerve
- Ulnar nerve
- Flexor pollicis longus
- Adductor pollicis
Neurological Examination

Motor system: power, lower limb

Hip: flexion (iliopsoas)  extension
     abduction       adduction

Knee: flexion (hamstring)
      extension (quadriceps)

Ankle:
     flexion       extension
     inversion    eversion

Toe: flexion       extension
Neurological Examination

Motor system:
- Lower limb:
  - Hip: flexion (iliopsoas), extension, abduction, adduction
  - Knee: flexion (hamstring), extension (quadriceps)
  - Ankle: flexion, extension, inversion, eversion
  - Toe: flexion, extension

Always place your hands on the patient’s knees

Never ever at the thigh!

Picture: Boongird P. Peripheral Neuropathy 1996
Neurological Examination

Cranial nerves
Motor system
Reflexes
Sensory system
Cerebellar system

Compare both sides
Ascertain muscles relaxation

In generalized hyperreflexia, what else should be checked for?

: Tromner/Hoffman signs
: Jaw jerk >>> why?
Neurological Examination

- Cranial nerves
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Neurological Examination

Sensory ataxia:

- Use a vibrating tuning fork 128 Hz
- Place base of footplate (or round shaft) on distal phalanx (on nail or nail bed); support the patient’s finger with examiner’s finger
- Ask if the patient can feel the vibration
- Ask the patient to report when sensation disappears
Neurological Examination

Sensory ataxia:
- Impaired vibratory, joint position sense

- Fix patient’s finger (or toe) by holding sideway just proximal to distal joint
- Hold distal phalanx sideway
- Move distal phalanx up or down, randomly
Neurological Examination

Cranial nerves
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Cerebellar system
Neurological Examination

Cerebellar ataxia:
- nystagmus
- dysmetria
- dysdiadochokinesia
- cerebellar speech ‘scanning speech’
- hypotonia
- pendular reflex
Neurological Examination

Cerebellar ataxia:
- nystagmus
- dysmetria
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Dysmetria

Compare both sides

Arm: Finger-to-nose (FN)/(FNF) test
: allow the arm to extend fully
: change directions

Leg: Heel-to-knee test
: place the heel on the knee cap
: slide the heel not the sole down the shin
Neurological Examination

Cerebellar ataxia:
- nystagmus
- dysmetria
- dysdiadochokinesia
- cerebellar speech "scanning speech"
- hypotonia
- pendular reflex

Ataxic dysarthria (scanning speech)
Words in phrase/sentence are broken into separate syllables, with pauses and spoken with variable forces (loudness)
# Neurological Examination

## Cranial nerves
- CN: I
- II
- II, IV, VI
- V
- VII
- VIII
- IX, X
- XI
- XII

## Motor system
- **Motor tone and power:**
  - Upper limb
  - Lower limb

## Reflexes
- **Reflex:**
  - Relaxation

## Sensory system
- **Sensory:**
  - Vibratory
  - Joint position

## Cerebellar system
- **Cerebellar:**
  - Dysmetria
  - Dysdiadochokinesia