

The Neurological Exam

Introduction to the Neurological Exam

The neurological exam consists of the following components:

1. Higher cognitive function as assessed by the mental status examination. (This will be addressed elsewhere in the course.)
2. Cranial nerves
3. Motor system
4. Sensory systems
5. Stance and gait

I Olfactory Nerve

Examination Technique:

- stimulant should be non-irritating
- test one nostril at a time with the opposite side occluded
- patient should not be able to see the stimulus
- cloves ideal stimulant since it preserves it's scent
- improvise at bedside with soap, toothpaste, or perfume

Normal Response:

- to perceive the scent with either nostril

Abnormal Response:

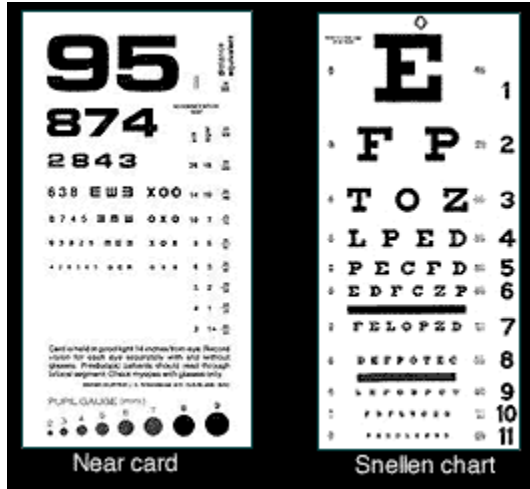
- a unilateral loss is more likely to be significant and may imply a structural brain lesion affecting the olfactory bulb or tract, but could also be due to local causes such as a deviated septum or blocked nasal passage
- bilateral loss can occur with rhinitis or damage to the cribriform plate

II Optic Nerve - Visual Acuity

Examination Technique:

- each eye is tested separately.
- test best corrected vision using eyeglasses.
- any patient with uncorrected visual acuity of less than 20/20 should be examined with a pinhole. Improvement of vision through a pinhole indicates that the error is refractive.

- test distant vision using a Snellen chart at 10 or 20 feet.



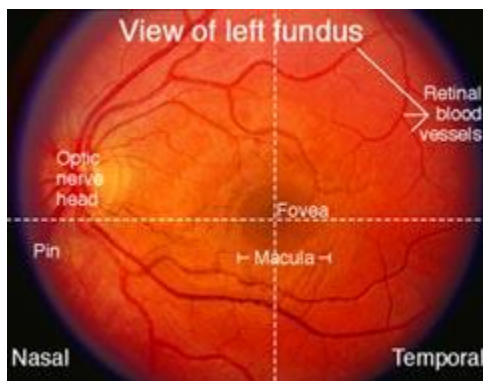
II Optic Nerve - Visual Fields

A. Peripheral visual field

- (a) wiggling fingers
- (b) counting fingers
- (c) white pin

B. Central visual field

- (a) red pin



Examination Technique:

- visual fields are assessed by confrontation , i.e. the examiner compares the patient's visual field to their own and assumes that theirs is normal.
- first test each eye separately.
- test both eyes together with wiggling fingers.
- the examiner places himself approximately 1 meter away from the patient and advises the patient to look directly at the examiner's eye for monocular testing or nose for binocular testing.

The test object (either a wiggling finger, one or two fingers, or a white pin head) is presented equidistant from the patient's and examiner's eye and the patient is asked either to state the number of fingers or say "yes" when they first see a moving target.

- for central vision (the 20 degrees on either side of the vertical meridian) a red pin is used. The patient is instructed to state when they see the pin as red. A red pin is also used to map the blind spot. Vision in the center of the visual field is more detailed than in the peripheral areas. This is because of both the structure of the retina and the connections of its neurons. Light rays from the center of the visual field are focused on the macula in the center of the retina. In the macula, the proportion of cones to rods is high. Cones are important for color vision.

Normal Response:

- the normal monocular visual field extends approximately 100 degrees laterally, 60 degrees medially, 60 degrees superiorly and 75 degrees inferiorly. It is divided into nasal and temporal halves and superior and inferior altitudinal halves. A blind spot is located 15 degrees temporal to fixation and just below the horizontal meridian.

II Optic Nerve - Fundoscopy

Fundoscopy is the assessment of the fundus using an ophthalmoscope

Examination Technique:

- dim the lights.
- ask the patient to fixate on a distant target.
- approach the patient from the side.
- examine the optic nerve and surrounding retina.

II Optic Nerve

Pupillary Light Reflex / Eyelid Elevation

Light entering the eye travels along the optic nerve to the pretectal region of the mid brain to cause pupillary constriction through the visceral motor and short ciliary nerve components of the ocular motor nerve.

Examination Technique:

- observe for ptosis.
- observe the pupils for size (measure the diameter of each pupil in mm).
- observe for any irregularities or asymmetry.
- dim the lights, ask the patient to look into the distance, shine a bright light obliquely (approaching laterally) into the pupil. Observe for the direct response (same eye) and consensual response (opposite eye).

- assess for an afferent pupillary defect (the swinging flashlight test) by moving the light from one pupil to the other, back and forth.
- to assess the accommodation reflex, ask the patient to look in the distance and then at the tip of their nose. (If the patient finds this manoeuvre difficult, have them follow their extended thumb as it is brought in towards the tip of their nose.)

Abnormal Response:

- ptosis is present, if the eyelid covers part or all of the pupil when looking directly ahead.

III Oculomotor, IV Trochlear, VI Abducens

Extraocular movements

Examination Technique:

- the examiner places themselves approximately 1 meter in front of the patient.
- ask the patient to look to each side, up and down following an "H" pattern.
- pursuit: ask the patient to follow a target such as your finger or a pen with their eyes without moving their head.
- pause at the ends of each direction of gaze to observe for nystagmus.
- assess saccadic eye movements by having the patient make quick horizontal and vertical eye movements.
- optokinetic nystagmus is performed by having the patient follow a series of moving horizontal or vertical stripes and observing for nystagmus.

V Trigeminal Nerve - Light Touch

The 5th cranial nerve, trigeminal, consists of three sensory (V1, V2 and V3) and a motor component, V3.

Sensation is tested to light touch with a cotton wisp, temperature with a cold tuning fork and pain with a disposable pin. If the patient complains of sensory symptoms, it is advisable to perform side to side comparisons moving from the impaired side to the normal side.

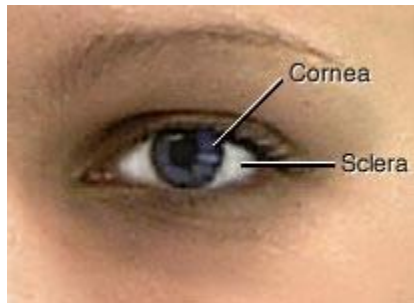


Examination Technique:

- touch a cotton wisp to the forehead, cheek and chin (avoid the angle of the jaw which is innervated by upper cervical roots)

V Trigeminal Nerve - Corneal Reflex

The corneal reflex allows an objective assessment of facial sensation. The afferent limb is V1 of the trigeminal nerve, the efferent limb is the facial or 7th cranial nerve.



Examination Technique:

- explain to the patient what you will be doing.
- avoid a visual threat response by asking the patient to look up and to the opposite side.
- stimulate the cornea since the scleral conjunctiva is less sensitive.
- touch the cornea lightly with a wisp of cotton, observe the direct (same) eye and consensual (opposite eye) blink in response to corneal stimulation.
- repeat on the opposite side.

V Trigeminal Nerve - Pain & Temperature

Examination Technique:

- explain to the patient that you will be touching them with a sharp object. Reassure them that it is disposable and has not been used on anyone else.
- for pain, use either a pin or the sharp end of a broken tongue depressor.
- use a cold tuning fork to assess temperature. If necessary, the tuning fork can be cooled by running it under cold water.
- ask the patient to report whether they feel sharp or dull or cold.
- ask the patient if the two sides feel the same.

V3 Trigeminal Nerve - Motor

The motor component of the trigeminal nerve (V3) supplies the muscles of mastication. The largest of these include the temporalis and masseter muscles.

Examination Technique:

- palpate the temporalis and masseter muscles on either side when the patient clenches their teeth.
- ask the patient to open their mouth and repeat this against resistance. Observe for any deviation of the jaw to one side.
- with their mouth open, ask the patient to protrude their jaw to either side against resistance.
- the jaw-jerk reflex is elicited by the examiner placing their index finger over the middle of the patient's chin with the mouth slightly open and the jaw relaxed. The index finger is then tapped with a reflex hammer, delivering a downward stroke. The afferent impulse for this reflex is the sensory portion of the trigeminal nerve. The efferent limb is through the motor (V3) branch of the trigeminal nerve.

Normal Response:

- the jaw should not deviate to either side.
- the jaw-jerk is usually absent or weakly present.

Abnormal Response:

- the jaw deviates towards the side of weakness.
- the jaw-jerk is exaggerated and pathologically brisk with lesions affecting the pyramidal pathways above the 5th nerve motor nucleus, especially if the lesions are bilateral.

VII Facial Nerve - Taste

Although taste is not typically assessed during a routine neurological examination, the 7th nerve does supply taste to the anterior two-thirds of the tongue and hard and soft palates. This can be tested using salty, bitter, sour or sweet solutions.

Examination Technique

- the tongue is protruded and held gently by the examiner.
- a small sample of solution is applied to one side of the anterior two-thirds of the tongue using a cotton tipped applicator saturated with the solution.

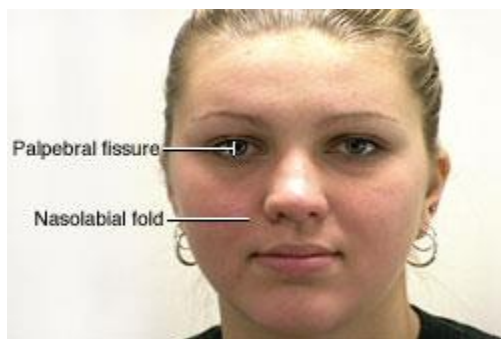
- with the tongue still protruded, the patient should be asked to point to a sign displaying one of the four possible tastes.
- the patient is then given a small sip of water and the test is repeated using an alternate stimulus.
- the reason the tongue is maintained protruded is because if the patient were allowed to put their tongue back in their mouth in order to verbalize their response, they could masticate and transfer the stimulus to the opposite side which could be affected if there was a lesion of the 7th nerve.

VII Facial Nerve - Motor

The major role of the facial nerve is to innervate the muscles of facial expression. These can be observed while taking the history and then more formally assessed during the neurological examination.

Examination Technique:

- observe for asymmetry – widening of the palpebral fissure or flattening of the nasolabial fold.



- observe for involuntary facial movements (e.g. hemifacial spasm, orofacial dyskinesia, myokymia, or synkinesis).
- ask the patient to wrinkle their forehead by raising their eyebrows and close their eyes tightly. Observe for asymmetry of ability to bury the eyelashes and palpate for differences of ability to resist eye opening. Ask the patient to show their teeth, puff out their cheeks and appose their lips.
- recall that the efferent limb of the corneal reflex (see trigeminal nerve) is through the 7th cranial nerve.

Normal Response:

- although patients may have an asymmetric face, there should be no facial weakness.

Abnormal Response:

- lower motor neuron weakness causes weakness of the entire side of the face with equal involvement of upper and lower facial muscles.
- an upper motor neuron lesion of the contralateral supranuclear pathway results in weakness primarily of lower muscles of facial expression. The upper muscles of facial expression (frontalis and orbicularis oculi) are much less affected because the facial nucleus that innervates them receives partial input from the ipsilateral hemisphere.

VIII Vestibulocochlear (Acoustic) Nerve

The auditory nerves subserves both hearing and vestibular function.

Examination Technique:

1. Hearing:

- mask the opposite ear and whisper numbers. The patient should not be able to read your lips. Ask the patient to repeat the numbers. If they cannot do so, increase the volume of your voice and repeat as needed. Note any asymmetry.
- compare air versus bone conduction using the Rinne test. Apply the vibrating fork against the mastoid process. Utilize the 512 Hertz tuning fork. Ask the patient when they can no longer hear it, then place it in front of the ear.



- test for lateralization using the Weber test. Apply the vibrating tuning fork to the center of the forehead and ask the patient where they hear it.

2. Vestibular Function:

- the vestibular component of the auditory nerve is tested by observing for nystagmus when extraocular movements are assessed.

Normal Response:

- Rinne – air conduction (perceiving the sound of the tuning fork in front of the ear) is greater than bone conduction (with the tuning fork held against the mastoid process).
- Weber – normally, patients will either hear it equally from both ears or respond that they are not sure.

Abnormal Response:

- Rinne: in conductive hearing loss, bone conduction is greater than air conduction. In sensorineural deafness, air conduction is greater than bone conduction.
- the Weber is abnormal if the patient clearly lateralizes it to one ear. With a conductive hearing loss, the patient lateralizes the sound to the affected ear. With sensorineural deafness the sound is best heard by the non-involved ear.

IX Glossopharyngeal and X Vagus

The 9th and 10th nerves are tested together. They are responsible for swallowing, phonation, guttural and palatal articulation (the 7th nerve has a component for labial articulation). The glossopharyngeal nerve also subserves taste to the posterior one-third of the tongue but this is rarely tested.

Examination Technique:

- check palatal elevation by having the patient sustain an "ah." When observing palatal movement, look at the palate rather than the uvula.
- assess the gag reflex by gently stroking the soft palate on each side.
- swallowing can be assessed by giving the patient a sip of water and observing them swallow.
- listen to the patient's speech. Is there a nasal quality?
- assess palatal articulation with a "KA" sound, guttural with a "GO" sound and labial with a "PA" sound.

Normal Response:

- the palate should elevate symmetrically, both when sustaining an "AH" and in response to stimulation on either side. Some patients however do not have a gag response and this can be normal if it is absent bilaterally. Patients should also be asked if they feel the stimulus.

Abnormal Response:

- with unilateral palatal weakness, the palate fails to elevate on the weak side and the gag reflex will be absent on that side.

XI Spinal Accessory Nerve

The spinal accessory supplies the trapezius and sternocleidomastoid muscles.

Examination Technique:

- observe for atrophy or asymmetry of the muscles.
- observe for quickness of shoulder shrug and ask the patient to shrug their shoulders against resistance.
- ask the patient to turn their head to the opposite side against resistance, both watch and palpate the sternocleidomastoid muscle.
- ask the patient to flex their head forward against resistance, placing your opposite hand against the back of the head gently to support the patient's neck should there be any weakness.

XII Hypoglossal Nerve

The hypoglossal nerve is motor to the tongue.

Examination Technique:

- observe for tongue atrophy or enlargement.
- do not overcall tongue fasciculations. It is very difficult to relax the tongue.
- ask the patient to protrude the tongue.
- ask the patient to push the tongue into each cheek or alternatively to protrude the tongue and push it laterally against a tongue depressor.
- ask the patient to move the tongue quickly from side to side.
- if there is facial weakness, correct this by supporting the upper lip on the side of weakness, otherwise there may appear to be deviation of the tongue but once the facial weakness is corrected for, the tongue will no longer appear to deviate.

Normal Response:

- the tongue should be able to protrude relatively straight. Minimal degrees of deviation (i.e. only millimeters) affecting only the tip are insignificant.

Abnormal Response:

- with tongue weakness, the tongue deviates towards the weak side.

Motor Exam Introduction

Components of the motor exam:

1. Abnormal Involuntary Movements
2. Posture
3. Muscle Bulk
4. Tone
5. Power
6. Co-ordination
7. Deep Tendon Reflexes

Abnormal Involuntary Movements, Posture and Bulk

Examination Technique:

- patient should be sufficiently undressed but draped to preserve modesty.
- compare left to right and proximal to distal.
- observe for asymmetry, atrophy or hypertrophy.
- observe for abnormal involuntary movements

Tone

Examination Technique:

- ensure the patient is relaxed.
- for assessment in the upper extremities, the patient may be lying or sitting. In the lower extremities, tone is best assessed with the patient lying down.
- explain the examination technique to the patient before proceeding.
- spasticity (clasp knife) is velocity dependent and should be assessed by a quick flexion/extension of the knee or the elbow or quick supination/pronation of the arm.
- rigidity (lead pipe) is continuous and not velocity dependent and the movement should be performed slowly.
- "activated" rigidity; minor degrees of rigidity may be enhanced by having the patient activate the opposite limb.
- rigidity in the neck can be assessed by slow flexion, extension and rotation movements

Normal Response:

- normally minimal, if any resistance to passive movement is encountered.

Abnormal Response:

- spasticity is a feature of an upper motor neuron lesion and maybe minor such as a spastic catch or a very stiff limb that cannot be moved passively. Accompanying features may include spasms, clonus, increased deep tendon reflexes and an extensor plantar response.
- rigidity is a continuous resistance to passive movement and is seen in extrapyramidal disorders such as Parkinson's disease.
- rigidity may be continuous or ratchety (cogwheeling). Cogwheeling is typically seen at the wrists.
- hypotonia (flaccidity) or decreased tone is more difficult to appreciate but is seen with lower motor neuron or cerebellar lesions

Power

Examination Technique:

- power or strength is tested by comparing the patient's strength against your own.
- start proximally and move distally.
- compare one side to the other.
- grade strength using the Medical Research Council (MRC) scale.

| MRC Scale | |
|-----------|--|
| Grade | Description |
| 0 | no contraction |
| 1 | flicker or trace of contraction |
| 2 | active movement with gravity eliminated |
| 3 | active movement against gravity |
| 4* | active movement against gravity and resistance |
| 5 | normal power |

* grades 4 -, 4 and 4+ maybe used to indicate movement against slight, moderate and strong resistance respectively

- where possible, palpate the muscle as the patient activates it.
- strength in the lower extremities is best assessed with the patient supine.

Co-ordination

Some textbooks and neurologists include co-ordination as a separate category of the neurological exam whereas here it is included as part of the motor exam. To perform tasks of co-ordination one requires normal motor, sensory, and cerebellar systems. Lesions affecting any of these areas could give rise to abnormal tests of co-ordination.

Examination Technique (upper extremities):

- finger to nose.
- rapid index to thumb movements or individual digits to thumb, rapid small index finger circles over the opposite dorsal webspace, rapidly alternate each hand palmar then dorsal aspect down over thigh or opposite hand.

Examination Technique (lower extremities):

- ask the patient to place their heel on their opposite knee and slide their heel down their shin to the ankle.
- ask the patient to tap their opposite knee with their heel.
- have the patient reach for your finger with their large toe.
- ask the patient to perform rapid foot taps.

Deep Tendon Reflexes

Examination Technique:

- Queen Square hammer preferred to shorter tomahawk hammer.
- the patient should be relaxed.
- explain to the patient the examination technique.
- before concluding that reflexes are absent, have the patient re-enforce by performing an isometric contraction of other muscles (e.g. clench teeth or opposite limb for upper extremity reflexes or pull hooked fingers apart for lower extremity reflexes).
- before concluding that ankle reflexes are absent, position the patient in a chair by having them kneel where one would normally sit, squeeze the back of the chair for reinforcement, on your count of three, just as you deliver the strike to the Achilles' tendon which should be gently stretched by passive dorsiflexion of the ankle.

Deep tendon reflexes tested:

- Upper extremities: biceps (C5, C6), brachioradialis (C5, C6), triceps (C6, C7), finger flexors (C6-T1)

- Lower extremities: knee or patellar (L2, 3, 4), ankle (S1, S2)
- Superficial reflexes: Abdominal - above umbilicus (T8, T9, T10) and below umbilicus (T10, T11, T12).

Reflexes are graded using a 0 to 4+ scale:

| Grade Description | |
|-------------------|----------------------------|
| 0 | absent |
| 1+ | hypoactive |
| 2+ | normal |
| 3+ | hyperactive without clonus |
| 4+ | hyperactive with clonus |

Babinski Response

- explain the examination technique to the patient and ask them to relax.
- stroke the lateral aspect of the sole of each foot and then come across the ball of the foot medially with a sharp object.

Clonus

If reflexes are hyperactive, test for ankle clonus.

- ask the patient to relax.
- support the knee in a partly flexed position.
- quickly dorsiflex the foot and observe for rhythmic clonic movements.

Abdominal Reflexes

- explain the examination technique.
- the patient should be lying down and relaxed with their arms by their side.
- a blunt object such as a key or tongue blade may be used (A safety pin may also be used as long as the stimulus is delivered lightly).
- stroke the abdomen lightly on each side in an inward direction above and below the umbilicus.

- note the contraction of the abdominal muscles and deviation of the umbilicus towards the stimulus.

Normal Response:

- Some studies indicate that up to 10% of people with no nervous system disease may have absence of one or more of the deep tendon reflexes. In general however, deep tendon reflexes

| Upper Extremity | | | |
|----------------------------|--|---------------------------------|------------------------------|
| Action | Muscle | Nerve | Nerve Roots |
| Arm abduction | Deltoid | Axillary | C5, C6 |
| Elbow flexion | Biceps | Musculocutaneous | C5, C6 |
| Elbow extension | Triceps | Radial | C6, C7, C8 |
| Extension at the wrist | Forearm extensors Forearm flexors | Radial Median & ulnar nerves | C6, C7, C8 C6, C7, C8, T1 |
| Flexion of the wrist | Flexor carpi radialis | Median | C6, C7 |
| Wrist abduction | Extensor digitorum | Posterior interosseous | C7, C8 |
| Finger extension | Forearm flexors | Median&anterior | C8, T1 |
| Finger flexion | First dorsal interosseous | interosseous | C8, T1 |
| Abduction of index finger | Abductor digiti minimi Abductor pollicis brevis | Ulnar Ulnar | C8, T1 C8, T1 |
| Abduction of little finger | Adductor pollicis Extensor pollicis longus | Median Ulnar | C8, T1 C7, C8 |
| Thumb abduction | | Posterior interosseous | |
| Thumb adduction | | | |
| Thumb extension | | | |

| Lower Extremity | | | |
|-----------------------|---|----------------------|-------------|
| Action | Muscle | Nerve | Nerve Roots |
| Hip flexion | Iliopsoas | Femoral | L1, L2, L3 |
| Hip extension | Gluteus maximus | Inferior gluteal | L5, S1, S2 |
| Hip abduction | Gluteus medius, minimus & tensor fasciae latae | Superior gluteal | L4, L5, S1 |
| Hip adduction | Adductors | Obturator | L2, L3, L4, |
| Knee extensors | Quadriceps femoris | Femoral | L2, L3, L4 |
| Knee flexion | Hamstring | Sciatic | L5, S1, S2 |
| Ankle dorsiflexion | Tibialis anterior | Deep peroneal | L4, L5 |
| Ankle plantar flexion | Gastrocnemius & soleus | Tibial | S1, S2 |
| Toe extension* | Lower leg extensors (extensor digitorum longus, extensor digitorum brevis, extensor hallucis longus [to the big toe]) | Deep peroneal | L5, S1 |
| Toe flexion | | Tibial | L5, S1, S2 |
| Foot eversion | Flexor digitorum longus, flexor hallucis longus | Superficial peroneal | L5, S1 |
| Foot inversion | Peroneus longus & brevis Tibialis posterior | Tibial | L4, L5 |

are rarely absent in normal persons if the technique of eliciting them is adequate. Note that the reflex response depends on the force of the stimulus. Reflexes should be symmetrical.

- some individuals especially young anxious people may have brisk reflexes which are not necessarily pathological. There should be no asymmetry.
- usually clonus is abnormal although a few beats of non-sustained transient clonus may occasionally be seen.
- abdominal reflexes are usually obtainable in healthy non-obese individuals. They may be absent in obese individuals or those with lax abdominal musculature. Local diminishment or absence, suggests a disturbance in the continuity of the reflex arc (afferent nerve, motor center, efferent nerve). Loss, when associated with exaggeration of deep tendon reflexes implies a pyramidal tract lesion.

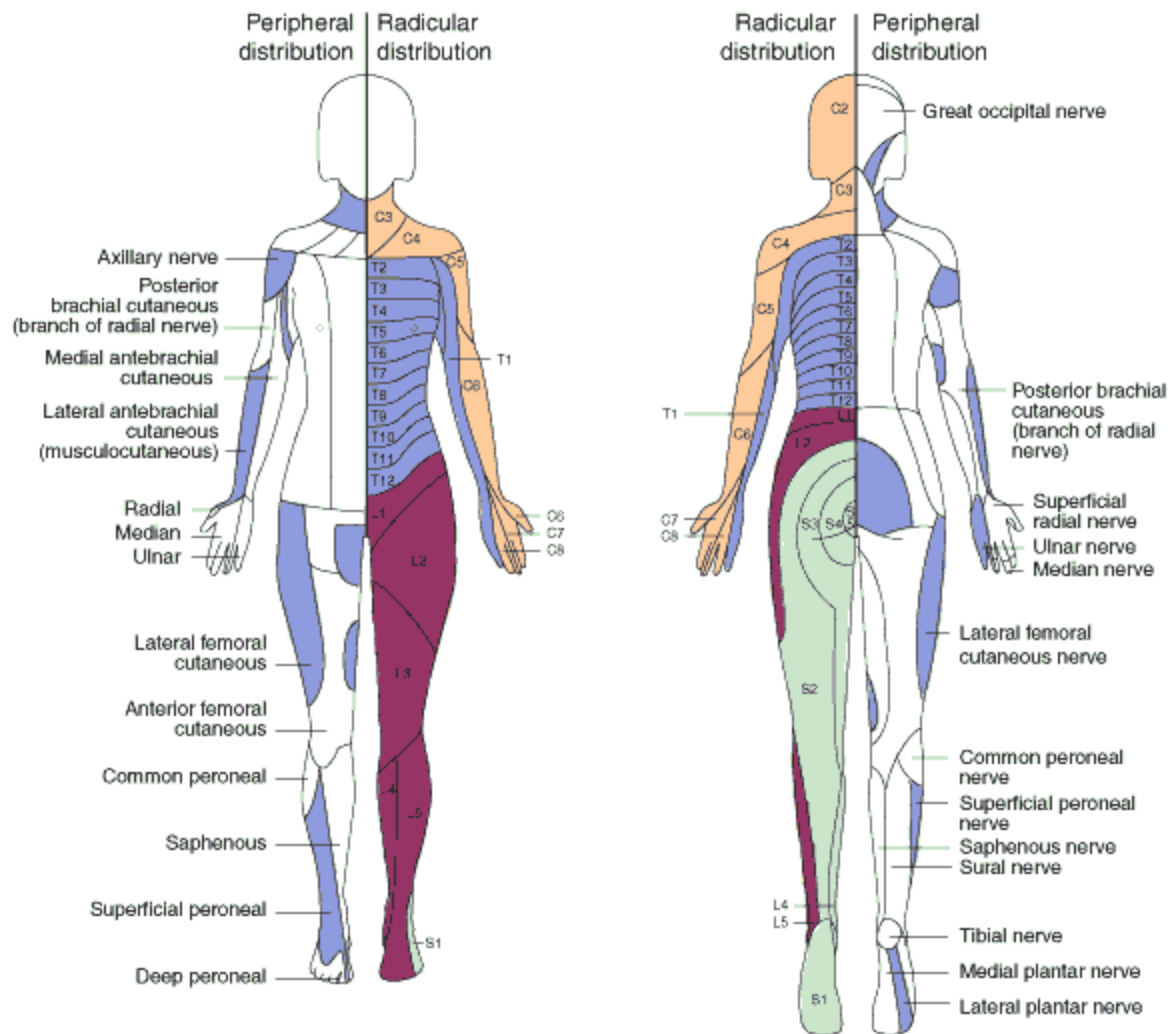
Muscle Actions and Innervations

- *The muscles are called extensors, the action is also sometimes described as toe dorsiflexion. (Curling of toes is called plantarflexion).
In the accompanying videotape since the muscles are extensors, I describe the action as extension of the toe.

Sensory Exam Introduction

Components of the sensory examination:

1. Light touch
2. Pain and temperature
3. Vibration sense
4. Position sense
5. 2 point discrimination
6. Graphesthesia
7. Stereognosis
8. Double simultaneous stimuli (extinction)



Examination Technique:

- patients should be sufficiently undressed but draped to preserve modesty.
- begin distally and move proximally and avoid calloused areas.
- compare right to left.
- when necessary assess for a sensory level, peripheral nerve or dermatomal sensory impairment.

Light Touch

Examination Technique:

- use a cotton wisp.
- apply a gentle touch (do not drag the stimulus).
- ask the patient to close their eyes and report "yes" every time they perceive the stimulus.

Pain

Examination Technique:

- use a disposable pin.
- ask the patient to close their eyes and report whether they feel sharp or dull.
- be sure to apply the sharp stimulus to all sites since if only the dull stimulus is applied, pain sensation has not been assessed.

Temperature

Examination Technique:

- use a cold vibration fork.
- if necessary, the fork can be cooled by running it under cold water.
- ask the patient if they perceive the vibration fork as cold.

Vibration Sense

Examination Technique:

- use a 128 hertz vibration fork.



- apply the stimulus over the distal phalanx of the index finger or large toe.
- ask the patient to report whether they feel vibration sense and then to report when it stops in order to assess the minimal threshold to perceive the stimulus.
- compare to your own extremities.

Position Sense

Examination Technique:

- demonstrate to the patient initially with eyes open that you will be moving their digit up (towards their head) or down (towards their feet).
- ask the patient to close their eyes.

- stabilize the distal interphalangeal joint of the upper extremity and make minimal movements upwards or downwards and ask the patient to report after each movement the direction of movement.
- similarly in the lower extremities, stabilize the interphalangeal joint and move the large toe up or down.

Two Point Discrimination

Examination Technique:

- use either calipers or a opened paper clip with two parallel ends.
- demonstrate to the patient with eyes open by applying either one or two points of the stimulus to the fingerpad.
- ask the patient to close their eyes.
- deliver the stimulus and ask the patient to report whether they feel one or two points.

Normal Response:

- normal values over the fingerpads are 2-4 mm.

Graphesthesia

Examination Technique:

- explain to the patient that you will be drawing a number in the palm of their hand.
- explain to the patient what is up and down, the distal side is usually up as this is a typical orientation of the palm.
- demonstrate with eyes open.
- ask the patient to close their eyes.
- with a blunt item such as your fingertip draw a number across the palm and ask the patient to identify it.

Stereognosis

Examination Technique:

- explain to the patient that you will be placing an item in their hand which they should then manipulate and identify with the eyes closed.
- stimuli include different coins, a key, a safety pin, a paper clip, a coin, etc.

Extinction (Double simultaneous stimuli)

Examination Technique:

1. Tactile (sensory)

- with eyes open demonstrate to the patient that you will touch them on the left side, the right side or both.
- this should only be done if the patient can perceive a unilateral stimulus (i.e. if there is loss of pain and temperature or light touch on one side, there would be no point assessing extinction).
- have the patient close their eyes and as you deliver a gentle touch, report whether they feel it on the left side, right side or both sides.

2. Visual extinction

- wiggle a finger in the left, right or both visual fields and ask the patient to report where they see it.

3. Auditory extinction

- snap your fingers on the left, right or both sides and have the patient report where they hear the stimulus.
- when testing for extinction, it is important to deliver bilateral stimuli simultaneously with no time lag in between.

Stance

Examination Technique:

1. General

- ask the patient to stand with feet together and once they feel comfortable, close their eyes.
- if they cannot balance well with eyes open, do not have them close their eyes.
- stand close to the patient and be ready to support them should they fall to either side.

2. Postural stability (retropulsion or forced pull back test)

- with eyes open, ask the patient to stand with feet comfortably apart, stand behind close to the patient and explain that you will deliver a quick pull back.
- ask the patient to maintain their stability and try not to move backwards.

- be prepared to catch the patient under the arms should they fall backwards.

Abnormal Response:

- patients with extrapyramidal disorders (e.g. Parkinson's disease) often show retropulsion and may take several steps backwards and be unable to maintain their stability.

Gait

Examination Technique:

- observe the patient walk.
- if there is a subtle abnormality this may be made more obvious by asking the patient to run.
- ask the patient to perform tandem gait by walking heel to toe (eyes open).

Glossary

A

abduction: movement away from a position near or parallel to the median axis of the body.

accommodation reflex: adaptation of the visual apparatus of the eye accomplished for achieving near vision consisting of an increase in the curvature of the lens, pupillary constriction and convergence of the eyes.

adduction: movement towards of past the median axis of the body (bring together).

afferent pupillary defect: seen with unilateral optic nerve lesions. During the swinging flashlight test when the light is directed in the unaffected eye both pupils.

articulation: enunciation.

atrophy: wasting of a muscle.

B

Babinski: (Joseph, 1857-1932). French neurologist of Polish origin.

binocular: both eyes.

C

chorea: irregular, unpredictable, brief, jerky movement.

clonus: series of alternating contractions and relaxations of a muscle.

conductive deafness: due to interference with transmission of sound to the cochlea usually the result of obstruction of the external auditory canal or disease of the middle ear.

cone: one of the types of visual receptors of the retina that are especially important in visual acuity and color vision.

conjunctiva: mucous membrane that lines the inner surface of the eyelids and continues over the anterior aspect of the eyeball.

convergence: both eyes move medially (i.e. toward the nose)

cornea: transparent part of the coat of the eyeball that covers the iris and the pupil.

D

distal: located away from the point of attachment or origin or central part (e.g. torso).

dorsal: related to the back or posterior aspect.

E

eversion: turn outward.

extinction: failure to perceive on one side in response to double simultaneous stimulation (whereas a single stimulus is perceived on that side).

extrapyramidal: the motor system related to the basal ganglia.

F

fasciculation: single, spontaneous, involuntary discharge of an individual motor unit.

fixation: fixation is achieved when the image of an object falls directly on the fovea.

fovea: A depression in the center of the macula of the retina where only cones are present and blood vessels are lacking.

fundoscopy: examination of the fundus of the eye with an ophthalmoscope.

fundus: the interior of the eyeball.

G

graphesthesia: ability to identify letters or numbers written on the skin (usually of the palm).

guttural: harsh, throaty sound produced in the throat.

H

hemifacial spasm: brief twitches that may increase periodically to culminate in more sustained tonic contractions, involving half the face, especially about the eye.

hypertrophy: excessive development of a muscle.

I - J

inversion: turn inward.

K - L

labial: related to the lips.

M

macula: a small oval area (3x5 mm) on the inner surface of the retina slightly below the level of the optic disc at a point corresponding to the posterior pole of the eyeball.

mid-brain: rostral (most cephalad) portion of the brainstem.

monocular: one eye only.

motor unit: axon, along with its anterior horn cell and all the muscle fibers with which it is connected.

myoclonus: rapid, brief, shock-like muscle jerks.

myokymia: abnormal irregular muscle twitching.

N

nasolabial fold: the fold located laterally between the cheek and the lips.

nystagmus: rapid involuntary oscillation of the eyes.

O

olfactory: cranial nerve I which subserves special sense of smell or olfaction

ophthalmoscope: an instrument for use in examination of the interior of the eye.

orofacial dyskinesia: abnormal involuntary movements involving the orofacial region (e.g. licking, chewing).

P - Q

palatal: related to the palate.

palmar: related to the palm surface of the hand.

palpebral fissure: the space between the margins of the eyelids.

phonation: the production of vocal sounds, especially speech.

plantar response: the response to stroking the sole of the foot. A flexor response (flexion of the large toe) is normal. An extensor response (extension or an up-going large toe) is abnormal and indicates an upper motor neuron lesion.

pretectal: transitional zone of the brainstem between the midbrain and diencephalons.

proximal: located near the point of attachment or origin or central part (e.g. torso).

ptosis: drooping of the upper eyelid.

pursuit: following movements of the eyes react normally. When the light is returned to the affected eye, both pupils will dilate.

R

refractive: pertaining to refraction, the deflection of a ray of light when it passes from one medium into another. The act of determining the nature and degree of refractive errors in the eye and correction of these errors by lenses or a pinhole.

retropulsion: involuntary backward walking.

S

saccades/saccadic: jerky rapid movements of the eyes.

sclera: dense fibrous opaque white outer coat enclosing the eyeball except that part covered by the cornea.

sensori-neural deafness: also known as nerve deafness due to disease of cochlea, cochlea nerve or its nuclei or the central pathways concerned with hearing.

spasm: abnormal involuntary contraction of muscle fibers.

stereognosis: ability to identify an object by shape.

supine: lying on the back.

synkinesis: involuntary movement accompanying a voluntary one.

T - U

tic: repetitive, irregular stereotypic movements (or vocalizations).

tremor: rhythmic, sinusoidal, oscillatory movement of a body part.

V - Z

vestibular function: relating to the vestibule of the inner ear