

THE NERVOUS SYSTEM

EXAMINATION OF THE LIMBS

Overview

Neurological examination of the limbs should include:

- Inspection
- Tone
- Power
- Coordination
- Reflexes
- Sensation

Examination of upper and lower limbs are described separately and left and right limbs should be directly compared at each step.

Preparation

- Wash your hands
- Introduce yourself to the patient if you have not already done so and check the identity of the patient
- Ask the patients permission to carry out the examination
- Give a brief explanation to the patient before you start. Further explanation/instructions can be given as you proceed.
- Equipment
 - o Cotton wool
 - o Neurotips
 - o Tendon hammer
 - o Tuning fork 128Hz
- Patient position
 - o Ideally the patient should be sitting at 45 degrees
 - o The limbs should be exposed

General Observations

- Check visually from the end of the bed. Note:
 - o Resting posture, Leaning/facial asymmetry
 - o Surrounding items – walking aids, callipers (LMN problem)

Upper Limbs

INSPECTION

- Look closely at limbs for
 - o Wasting
 - o Fasciculations
 - o Asymmetry
 - o Resting position
 - o Abnormal movements

TONE

- Ask the patient to relax their arms

- Hold one of their hands, support at the elbow, flex and extend the wrist and elbow, pronate and supinate the forearm and rotate at the shoulder.
- Compare with other arm. You should be able to recognise and know the significance of:
 - o Increased or decreased tone
 - o Clasp knife rigidity
 - o Cog Wheel rigidity

POWER

Pronator Drift

- Ask the patient to close their eyes and extend both arms straight forwards with palms up
- A weak arm will drift downwards and pronate

Next you will test both left and right limbs, directly comparing each side for each movement in turn. Let the patient perform each movement on their own and then attempt it with you resisting the movement. It is often easier to demonstrate the movement to the patient than try to explain it. **You should know which muscles and the nerve root you are testing with each movement.**

***Pronator Drift** - indicates UMN weakness. In this condition, supination is weaker than pronation in the upper extremity, leading to a pronation of the affected arm. This test is useful to confirm consistency. If a patient fakes weakness, they will almost always drop the arm without pronating it.*

Shoulders

- Ask the patient to abduct their arms to about 45° with elbows flexed
- Ask them to abduct the arm from the shoulder
- Ask them to adduct the arm

Elbows

- Ask the patient to flex the elbows to 90°
- Hold their arm below the elbow with one hand and provide resistance to movement with the other
- ask them to flex at the elbow
- ask them to extend at the elbow

Wrists

- Ask the patient to make fists
- Hold their lower arm with one hand
- Ask them to flex at the wrist
- Ask them to extend at the wrist

Fingers

- Ask the patient to squeeze your fingers (making a fist, testing flexion)
- Ask them to open their fist against resistance
- Ask them to lift their thumb away from a flat palm (Abduction)
- Ask them to lift their thumb towards a flat palm (Adduction)
- Ask them to spread their fingers (abduction)
- Ask them to bring their fingers together (adduction)

Grading Muscle Power	
0	<i>There is no muscle contraction</i>
1	<i>Contraction may be felt or seen but is ineffective</i>
2	<i>Active movement possible with gravity eliminated</i>
3	<i>Can overcome gravity but not resistance from examiner</i>
4	<i>Can move against some resistance from examiner</i>
5	<i>Full and normal power against resistance</i>

CO-ORDINATION

Remember that coordination will be affected by weakness and loss of sensation (especially proprioception) not just cerebellar function.

Finger-Nose test.

- Ask the patient to touch their nose.
- Then ask them reach out to touch your finger, held in front of them
 - o be sure your finger is far away enough so that their arm is fully extended
- Ask them to repeat this as quickly as possible
- Repeat for left and right hands.
- Note the presence of past pointing, intention and resting tremor as well as coordination

Rapidly alternating movements

- Ask the to place their left hand in their right, palm up
- Then turn their left hand, so the back of the hand faces up.
- Ask them to repeat this as quickly as possible
- Repeat for the right hand
 - o Note if this action is slow and clumsy (disdiadokokinesis)

REFLEXES

With all reflexes the limb must be totally relaxed. Hold the tendon hammer at the very end and 'bounce' it off the tendon. Watch the appropriate muscle for contraction – not just obvious movement. Compare left to right and note not only if the reflex is present or absent but if it is reduced or brisk. If a reflex is absent it may be possible to enhance it by reinforcement (i.e. asking patient to grit their teeth or interlock fingers and pull apart).

Biceps (C5/C6)

- Relax the arm across the abdomen
- Hold the arm at the elbow pressing the thumb over biceps tendon
- Strike your thumb with the tendon hammer

Triceps (C7/C8)

- Support the arm with the elbow flexed
- Strike directly onto the tendon above the elbow

Supinator (C5/C6)

- Relax arm across abdomen horizontally,
- Place finger or thumb over tendon (proximal from wrist, radial side)
- Strike finger/thumb with tendon hammer

SENSATION

Make sure you test over all the dermatomes of the upper limb. A logical way is to start testing over the shoulder and to move along the lateral aspect of the arm and up the medial side as this moves progressively from C4 to T2 dermatomes

Light Touch

Light touch is normally tested using a piece of cotton wool (however a light touch of the finger will suffice). It is important to touch and not to stroke as moving sensation, such as rubbing and scratching are conducted along pain pathways.

- First touch lightly onto the sternum with the cotton wool to provide the patient with a reference for normal sensation
- Ask the patient to close their eyes
- Touch lightly over each of the following areas:
 - o Superior tip of the shoulders (C4)
 - o lateral aspect of the upper arms (C5)
 - o lateral side of the thumb (C6)
 - o tip of the middle finger (C7)
 - o medial side of the little finger (C8)
 - o medial aspect of the lower arms (T1)
 - o medial aspect of upper arms (T2)
- Ask the patient to tell you when they feel a touch.
- Ask if it feels the same
- If you identify a reduction in sensation you can go back and test in more detail to map out the area of reduced sensation.

Pain

This is normally tested using a pin or 'neuro-tip.' A new one should be used for each patient and then disposed carefully in a sharps bin.

Follow the same process as for testing light touch.

Temperature

This can be tested in the same way as light touch and pain but is rarely done in none neurological specialities.

Vibration sense

- Strike the tuning fork and hold the flat end against the patients sternum so they feel the vibration
- Ask the patient to close their eyes
- Start on most distal bony prominence (DIP joint)
- Strike the tuning fork and place it on the patient.
- Using your spare hand stop the vibration
- Ask the patient to say when it stops.
 - o If vibration sense is normal end the test here
 - o If they can't feel it repeat the test moving proximally until they can (wrist, olecranon, acromion).

Proprioception

- Ask the patient to close their eyes.
- Hold the finger at the sides, distal to the DIP joint
- With the other hand stabilise the finger proximal to the tested joint to prevent movement
- Move the finger up and down at the joint, telling the patient which direction is which.

- Repeat in a random direction, asking the patient to say which direction the finger is moving.
- Test 3 times.
 - o If proprioception is normal end here.
 - o If they can't feel it, move proximally up the joints until they can (PIP, MCP, wrist, elbow, and shoulder).

Lower Limbs

The examination is repeated on the lower limbs

INSPECTION

See Upper Limb Examination

TONE

- Ask the patient to relax their leg.
- 'Roll' the leg from side to side and watch foot
 - o extra movement in decreased tone, less in rigidity
- Flex and extend the knee

Check for clonus

- Ensure the patient has no pain in their feet/ankles
- Ask the patient to relax their foot
- Hold the lower leg with one hand and flex and extend the ankle joint with the other
- Then suddenly dorsiflex the ankle and hold it in this position
- Clonus is a sustained rhythmic contraction of the gastrocnemius causing the foot to jerk back and forward
- Compare with the other leg

POWER

Power is measured in the same way as the arms. Test both left and right limb, directly comparing each side for each movement in turn. Let the patient perform each movement on their own and then attempt it with you resisting the movement. It is often easier to demonstrate the movement to the patient than try to explain it. **You should know which muscles and the nerve root you are testing with each movement.**

Hip

- Ask the patient to straighten their leg
- Then to raise it, with the leg straight, off of the bed
- Then to lower it, with the leg still straight, onto the bed

Knee

- Ask the patient to flex their hip and knee
- Secure the thigh with one hand
- Ask the patient to bend at the knee
- 'kick out' toward the end of the bed
- 'pull in', moving their heel toward the buttock

Ankle

- With the patient's leg flat on the bed, secure the leg proximal to the ankle.

- Ask the patient to dorsiflex the foot
- And plantarflex the foot

Toes

- Test the big toe, holding the rest of the foot secure with one hand
- ask them to flex it towards them and then extend it away from them

CO-ORDINATION

Heel-shin test

- Ask the patient to place left heel on right knee and
- Run the heel down their right shin
- When they reach the ankle they should lift the left foot into the air and replace it on the right knee
- Repeat this as quickly as possible
- It may be easier to perform this passively for them first rather than to describe it.
- Repeat on other side and compare

Toe tapping

- Ask the patient to repeatedly tap on the floor with the foot (or against your hand if lying down)
- Ask them to do this as quickly as possible
- Compare both sides

REFLEXES

With all reflexes the limb must be totally relaxed. Hold the tendon hammer at the very end and 'bounce' it off the tendon. Watch the appropriate muscle for contraction – not just obvious movement. Compare left to right and note not only if the reflex is present or absent but if it is reduced or brisk. If a reflex is absent it may be possible to enhance it by reinforcement (i.e. asking patient to grit their teeth or interlock fingers and pull apart).

Knee

- Support the patient's leg above the knee, with the knee flexed
- Strike directly on to the tendon, located just below the patella (L3/4)

Ankle

- With the patient's leg flat on the bed, laterally rotate the leg, flex the knee, and hold the foot dorsiflexed
- Strike directly onto the Achilles tendon (S1/2)

Plantar Response

- Ask the patient to relax and hold the ankle with one hand
 - o Warn the patient this may tickle.
- 'scratch' the sole of the foot with a tongue depressor or similar, starting at the lateral side of the heel, up the lateral side of the sole, then across the base of the toes.
 - o The normal response is to flex the toes and pull away
 - o Extension of the toes is known as the 'Babinski sign' and indicates UMN damage

SENSATION

Light Touch

See Upper Limb Examination for technique. You should cover the following dermatomes:

- Proximal anterior upper leg/thigh (L1)
- Proximal anterior upper leg, between thigh and knee (L2)
- Anterior surface of knee (L3)
- Medial aspect of lower leg (L4)
- Lateral aspect of lower leg (L5)
- Lateral side of foot/small toe (S1)
- Posterior vertical midline of leg (S2)

Pain

As for light touch

Vibration sense

See Upper Limb Examination for technique. Begin on the big toe of each foot.

Proprioception

See Upper Limb Examination for technique. Begin on the DIP of the big toe.

Completing the Examination

- Thank the patient
- For completion:
 - o Examine gait if not done so
 - o Examine balance
 - Romberg's test
 - Ask the patient to stand with their feet together and close their eyes
 - Without visual aid they may become unsteady (positive test)
 - o Consider cranial nerves
 - o Consider PR for anal tone (if appropriate)