

# Lower Limb Sensory & Motor Examination

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This exam is split into both a sensory and motor examination. It's unlikely you'll get both, but you might as well learn it. For the motor examination- the main parts are: Tone, Power, Reflexes and Coordination. For the sensory exam- Sensation and Proprioception.

You get 2 mins outside the station to read the vignette (piece of info). You don't need to memorise the patient's name or age; a copy of the vignette is also inside the station. Use the time to calm yourself; run through exactly what you want to do; and what you might need.

## Intro:

- WIPER
  - **W**ash Hands
  - **I**ntroduce Yourself
  - **P**atient Details/ **P**ermission/ **P**ain
  - **E**xposure- Legs exposed- but can wear underwear.
  - **R**eposition- flat on bed for exam.

An example intro:

Hello, my name is \_\_\_\_\_, and I am a 3<sup>rd</sup> year medical student from King's. Today I've been asked to examine your legs and assess their general conditions by asking you to do a few things for me. Is that ok? I will be talking aloud to my colleague during this, but if you have any questions, please feel free to ask me.

## Inspection:

- Medications (may show vascular risk factors, or previous history), Mobility Aids (may show extent of disability from previous history), Monitoring Equipment, (Oxygen).
- General Patient Inspection- Face (contorted in pain?)
- Asymmetries, Amputations, Abnormalities?
- Inspection of Legs: **SWIFT**
  - **S**cars- signs of causes for symptoms; or surgeries e.g. vein harvesting
  - **W**asting- Lower Motor Neurone (LMN) sign
  - **I**nvolutionary Movements- e.g. chorea
  - **F**asciculations- LMN sign, small muscle group innervated by single lower motor neurone.
  - **T**remors (more for upper limb examination).

## Gait:

- Ask the patient to stand and then perform a few different tests:
  - Normal walking (from one side of room to the other- important to predetermine what level of support they require to walk)
  - When they turn to walk back- instead ask them to walk like they're on a tight-rope (heel to toe)
  - Ask them to turn around and walk on their tip-toes.
  - Turn back and walk on their heels.
- There are different types of gait that are signs of different conditions. Though this is covered more in the gait and cerebellar exam, it's still good to know in this one too.
  - **Ataxic**- Broad-based & unsteady= drunk; either cerebellar or sensory ataxia. If the patient has Sensory ataxia, they may watch their feet to compensate for the loss of proprioception of lower limb. With a cerebellar lesion, they may veer to one side
  - **Parkinsonian**- Shuffling, hurried gait, stooped posture, reduced arm swing.
  - **High stepping**- Caused by foot drop. Will not be able to walk on their heels.
  - **Waddling**- Shoulders side to side; legs lifted by trunk movement. Caused by proximal weakness- e.g. myopathy.

- **Hemiparetic**- One leg is stiff, swings round in arc fashion.
- **Spastic Paraparesis**- Bilateral stiffness of legs
- **Romberg's Sign:**
  - Ask patient to stand with feet together, and eyes closed. Stand close with arms out to stop them falling down, whilst observing the patient.
  - A positive Romberg's Test is where the patient falls or sways without correction and need your support. This is a sign of sensory ataxia (loss of coordination caused by lack of sensory input).

Tone:

- Ask the patient to relax fully
- Leg roll- roll the whole lower limb and watch the foot as it should flop slightly independently of the leg. Hypertonia will not have this independent movement of the foot. Hypotonia would have far more independent movement of the foot than normal.
- Leg lift- lift leg briskly lift leg off the bed at the knee joint – the heel should remain in contact with the bed. Hypertonia can be determined if the heel leaves the bed.
- Ankle clonus- in healthy people, one may notice that there are a few 'beats'- involuntary ankle dorsiflexion and plantarflexion. For it to be considered pathological, there must be >5 beats, and it is a sign of an Upper Motor Neurone (UMN) lesion.

Power:

It is advisable to memorise the MRC grading of power for the examination. This shows the examiner you know exactly what you're talking about. It is advisable to see many patients and check their notes as to what the neurologist has said about their strength, so you can get an idea for what each section means.

Grade	Signs
0	No movement
1	Flicker/trace of movement
2	Active movement with gravity eliminated
3	Active movement against gravity (can they lift their arm?)
4	Active movement against gravity and resistance
5	Full power

When doing power, communication is key. It is useful to say short sentences that do not confuse the patient. For example, if you want to test knee flexion, you should say "Pull your leg in", as you're holding it, and try and stop the patient from pulling their leg in. For hip abduction, you can say "Push your legs to the side," and you can push to test their strength.

- Test strength for all planes of movement of the hips, knees, ankle and big toe. It is important to learn the myotomes for each as well.
- Hips: Flexion- L1/2; Extension- L5/S1; Abduction- L4/5; Adduction- L2/3.
- Knees: Flexion- S1; Extension- L3/4
- Ankles: Dorsiflexion- L4; Plantar-flexion- S1/2; Inversion- L4; Eversion- L5/S1
- Toe: Flexion- S1/2; Extension- L5

Reflexes:

There are 3 reflexes that need to be tested: Knee Jerk (Patellar) Reflex, Ankle Jerk Reflex and the Plantar Reflex. If you cannot elicit a reflex, you can use the reinforcement manoeuvre, which involves the patient clenching their teeth and holding their hands together in front of their chest. Be honest if you can't elicit the reflex after this as well, it may well be that the patient has areflexia (no reflexes). Hyperreflexia (increased reflexes) are characteristic of an UMN lesion. Hyporeflexia (decreased reflexes) are characteristic of an LMN lesion.

**Patellar Reflex:**

- Strike hammer gently using wrist flick motion onto patellar tendon (palpate first) and should see the characteristic kicking out. This is accentuated with hyperreflexia and potentially absent with hyporeflexia.
- This tests L3/4 myotomes.

**Ankle Jerk Reflex:**

- Ask patient to relax and say that you will reposition their leg for them. Hold the sole of the foot and dorsiflex it and strike the Achilles tendon. Normally should feel a distinct plantar flexion movement of the ankle.
- This tests the L5/S1 myotomes.

**Plantar (Babinski) Reflex:**

- Keep patient still, and using a blunt object (white part of neurotip works best), place on patient's sole of foot. Normal reaction is for toes to flex downwards.
- Abnormal is the Babinski's Reflex- the toes extend upwards. This is normal for neonates, but in adults is found with UMN lesion.

Sensation:

Common points for testing sensation of each dermatome are highlighted by the black dots (for L4 and L5 either the medial and lateral aspects of the leg can be used respectively of the areas on the dorsum of the foot highlighted in the above diagram). Ensure you test these points when assessing light touch and pain. You should compare the right and left sides as you work down the limb. If

you find the patient has reduced sensation in a number of dermatomes distally then test for a stocking distribution loss of sensation (see diagram below).

For VIBRATION sensation, use a 128Hz tuning fork. 'Twang' the fork then place it on the most distal bony prominence as in the above picture and ask the patient whether they can feel the vibration. To confirm this, ask the patient to tell you when they stop feeling the vibration; you should then stop the vibration by holding the legs of the fork. If the patient cannot feel vibration at the most distal bony prominence then move to the next most proximal bony prominence (approximately near the MCP joint, then the ankle, then the knee).

Use the neurotips to test for PAIN sensation. They are blunt and so will not cut the patient. Nb. in the exam, if the examiner says you can skip this after you have picked up a "NEW/ CLEAN" neurotip, then move on, its not a trick. Nonetheless ask them for what the findings are for that.

**Sensation**

Dorsal column:  
**Light touch**  
**Vibration (128Hz)**  
 Proprioception

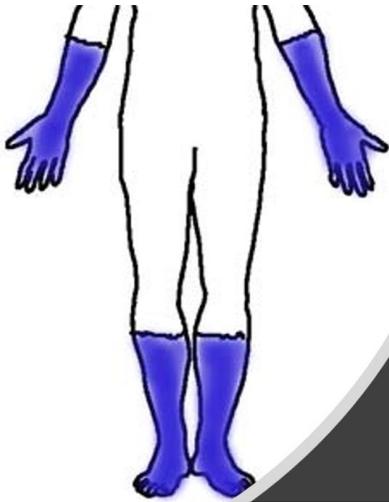
Spinothalamic:  
**Pain**  
**Temperature**

R vs L  
 ?Symmetrical ?Stocking



Proprioception:

Start at the most distal joint. First tell the patient to look. Explain that you will move their toe up or down and then ask them which direction you have moved the toe, up or down. Now get the patient to close their eyes and do as just stated. repeat this 2-3 times. If they are unable to tell the difference, move to the next most proximal joint and repeat.



### Glove and "Stocking" distribution

Symmetrical distal/peripheral sensory neuropathy, usually 2<sup>o</sup> diabetes.



## Differentials: LL Neuro Exam

### UMN#

Unilateral UMN#:

- Stroke (ich or h/rhagic)
- SOL (tumour, abscess)
- MS

Bilateral UMN#:

- MS
- MND (normal sensation)
- Myelopathy/spinal cord lesion (cervical disc prolapse, #, Ca.)

### Cerebellar# : 'MAVIS'

MS, Alcohol, Vascular, inherited, SOL

### LMN#

Unilateral LMN#:

- Radiculopathy (e.g. disc herniation, spondylosis)
- Peripheral nerve palsy (e.g. **common peroneal**= foot drop + loss sensation 1<sup>st</sup> dorsal web space; lateral cutaneous)

Bilateral LMN# + ↓sensation distally = 'ABCDE'

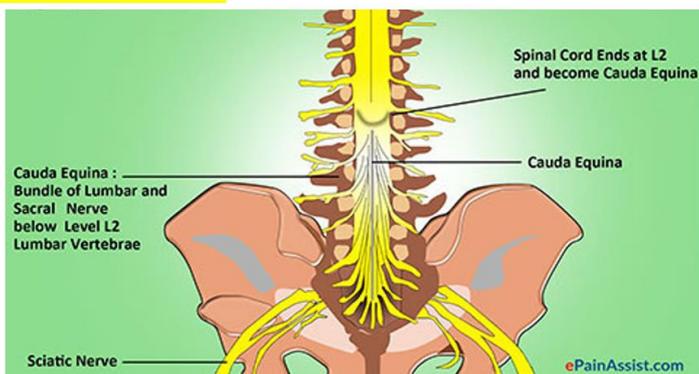
- **Alcohol**, **B12**/thiamine defic.,
- Charcot-marie-tooth,
- **Diabetes**, drugs,
- Every **vasculitis** (SLE, RA, PAN)

### CAUDA EQUINA SYNDROME!

## Cauda Equina syndrome= NEUROSURGICAL EMERGENCY [MEMORISE]

### LOWER BACK PAIN + ...

1. **Micturition:** retention/difficulty OR incontinence
2. **Faecal:** incontinence, ↓anal tone
3. **Motor#** B/L: @knee & below; progressive &/or severe
4. **Sensory#:** "SADDLE" anaesthesia; B/L Sciatica



**Cauda equina.** The nerves that compose the cauda equina innervate the pelvic organs and lower limbs to include motor innervation of the hips, knees, ankles, feet, internal anal sphincter and external anal sphincter. In addition, the cauda equina extends to sensory innervation of the perineum and, partially, parasympathetic innervation of the bladder.

## Presenting:

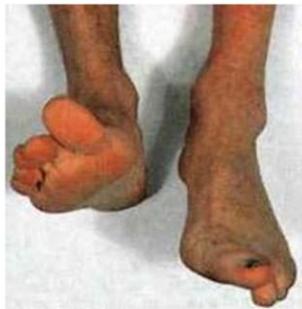
= sell your Dx

≠ mention everything you found

- I performed a ... Examination on this ...y/o gentleman/lady
- From the end of the bed...
- On general inspection of the patient...
- On examination my main positive findings were... (mention weakness or any major sensory# first as this gives the best picture of what is going on, tone/reflexes etc. alone do not give that)
- Importantly tone was ... and reflexes were .... on the left/right
- My findings are in keeping with a picture of a UMN/LMN lesion
- My top differential is...
- I would also be considering...
- To complete my assessment of the patient, I would elicit a full history, review the patient's observations and examine the remainder of the patient's neurology including the upper limbs and cranial nerves

## Case 1

- 37y/o gentlemen, #Left fibula 3m, was in plaster cast
- O/E Left: Weakness dorsiflexion @ankle 2/5, loss sensation 1<sup>st</sup> dorsal web space
- Remainder: normal



Dx: Left Common Peroneal nerve palsy. The patient had a leg-foot orthosis at the bedside, on inspection the left foot was plantar flexed. On examination the main findings were of weakness on dorsiflexion at the left ankle to 2/5 on the MRC grading scale; there was also reduced sensation at the 1<sup>st</sup> dorsal web space. this would be in keeping with a diagnosis of a common peroneal nerve palsy, this is further supported by the recent history of a left fibula # and plaster cast which are likely to have been causative factors in this 37y/o

## Case 2

- 50y/o lady
- Hemiplegic gait on right (flx hip, circumduction of leg, foot drop)
- Right: Tone ↑, Power 4/5, Reflexes ↑, coordination normal
- Left: normal



Dx: Left sided stroke. This is supported by the fact she is mainly wt. bearing on the left leg, there is no muscle wasting. Has a hemiplegic gait, weakness on the right sided associated with increased tone and reflexes ipsilaterally in keeping with an UMN lesion. Differentials: SOL-? tumour. To complete assessment want to examine upper limbs looking for right sided weakness, cranial nerves for hemianopia or facial drooping.

## Case 3

- 57y/o
- Loss sensation B/L to soft touch & pain up to the mid-shin
- Vibration sensed at: ankle (right) and knee (left)
- Proprioception present at ankle (not distally)
- Ulcer: not painful, red base



Dx: Diabetic peripheral neuropathy. Charcot deformity of the feet on inspection and increased body habitus. Well defined, punched out, painless ulcer on the ball of left foot with an erythematous base is suggestive of a neuropathic ulcer. O/E the patient also had reduced sensation bilaterally to the mid-shin/ in a stocking distribution to the mid shin. To complete my assessment I would elicit a history looking for any symptoms of or known diagnosis of diabetes, as well as diet and lifestyle which maybe increase the risk of diabetes, alongside inquiring about alcohol (peripheral neuropathy risk factor) and smoking (vascular risk factor). I would examine peripheral vasculature & take a BM glucose reading.