

**CNS – UPPER LIMB**  
**STEPS OF EXAMINATION**

**(1) APPROACH THE PATIENT**

- Read the instructions carefully for clues
- Approach the right hand side of the patient, shake hands, introduce yourself
- Ask permission to examine him
- Ask the patient to sit upright on the edge of the bed facing you with the upper limbs adequately exposed

**(2) GENERAL INSPECTION**

STEPS	POSSIBLE FINDINGS
1. Scan the <b>bedside</b> .	➤ Walking stick
2. Scan the <b>patient</b> .	<ul style="list-style-type: none"> <li>➤ Nutritional status: under/average built or overweight</li> <li>➤ Abnormal facies: Sad, immobile, unblinking facies (Parkinson’s disease), facial wasting (muscular dystrophy), facial asymmetry (hemiplegia), Horner’s syndrome (syringomyelia, Pancoast’s syndrome)</li> <li>➤ Abnormal movement or posture: rest or intention tremors, dystonia, choreoathetosis, hemiballismus, myoclonic jerks, tics, pyramidal posture...<i>see theoretical notes for description, types, features and causes of abnormal movements</i></li> <li>➤ Abnormal facial movements: hemifacial spasm, facial myokymia, blepharospasm, oro-facial dyskinesia</li> <li>➤ Nystagmus (cerebellar syndrome)</li> <li>➤ Scar or deformity underlying an ulnar nerve palsy</li> <li>➤ Peroneal wasting (Charcot-Marie-Tooth disease)</li> <li>➤ Pes cavus (Friedreich’s ataxia, Charcot-Marie-Tooth disease)</li> </ul>
3. Examine the <b>eyes</b>	<ul style="list-style-type: none"> <li>➤ Nystagmus (cerebellar syndrome)</li> <li>➤ Horner’s syndrome (syringomyelia, Pancoast’s syndrome)</li> </ul>
4. Examine the <b>hands</b> : tell the patient “outstretch your hands like this (dorsum facing upwards)”... then “like this (palms facing upwards)”... demonstrate. Feel the radial pulse for AF	<ul style="list-style-type: none"> <li>➤ wasted hands (MND, Charcot-Marie-Tooth disease, syringomyelia)</li> <li>➤ AF → consider thromboembolic complications</li> </ul>

**(3) INSPECTION OF THE UPPER LIMB**

Steps		Possible findings
<p><b>Scan</b> the upper limb from the shoulder down to the upper arm, lower arm and hands. Compare right with left</p>		<ul style="list-style-type: none"> <li>➤ <b>Muscle bulk:</b> wasting or hypertrophy</li> <li>➤ <b>Fasciculations:</b> irregular twitches under the skin overlying muscle at rest; represent contraction of a motor unit. They occur in LMNL; usually in wasted muscles (nearly always indicate MND). Flicking the skin over wasted muscle may elicit fasciculations. Non-pathological fasciculations occasionally occurs after vigorous exercise in healthy people.</li> </ul>
<b>Pronator drift test</b>	<p>1. Tell the patient “hold your arms outstretched in front of you, like this (palms facing upwards), and maintain this position”.</p>	<ul style="list-style-type: none"> <li>➤ <b>Winging of scapula</b> (lifts off the chest wall) → indicates weakness of the serratus anterior muscle (long thoracic nerve; C5-C7).</li> <li>➤ <b>Passive abduction of the little finger</b> (myelopathy hand sign) → indicates either a pyramidal lesion or ulnar nerve palsy (sensory testing should distinguish). As the lesion becomes more severe, adjacent fingers also passively abduct. This sign is common in, but not specific for, cervical pyramidal lesions.</li> <li>➤ <b>Involuntary movements</b> (e.g. intention tremor in cerebellar disease → the arm oscillates several times before coming to rest)</li> </ul>
	<p>2. Tell the patient “keep your arms up and do not let me push them down”. Press the patient’s wrist downward and then suddenly release it.</p>	<ul style="list-style-type: none"> <li>➤ <b>Overshoot</b> (rebound phenomenon): in case of cerebellar disease, the arm will fly past the starting point without reflex arrest.</li> </ul>
	<p>3. Tell the patient “now close your eyes”.</p>	<ul style="list-style-type: none"> <li>➤ <b>Arm pronates and fall downwards</b> → indicates subtle UMN Weakness</li> <li>➤ <b>Fingers continuously move up and down</b> (sensory wandering / pseudoathetosis) → indicates deficit of joint position sense due to lesion of peripheral nerves, posterior column, or parietal lobe (parietal drift).</li> <li>➤ <b>Arm drifts upward</b> → indicates cerebellar lesion</li> </ul>

**(4) TONE**

Steps	Possible findings
<ol style="list-style-type: none"> <li>1. Tell the patient “Let your legs go loose and let me move them for you”</li> <li>2. Hold the patient’s hand as if shaking hands, using your other hand to support the patient’s elbow. Flex and extend the <b>wrist</b> in rolling wave fashion (to elicit cog-wheel rigidity of Parkinson’s disease).</li> <li>3. Then <b>pronate and supinate</b> the patient’s forearm, and flex and extend his <b>elbow</b> and <b>shoulder</b> in an irregular and unexpected fashion (to elicit lead-pipe rigidity and clasp-knife spasticity).</li> </ol>	<ul style="list-style-type: none"> <li>➤ Normally there is light resistance through whole range of movements.</li> <li>➤ <i>See theoretical notes for abnormalities of the tone</i></li> </ul>

**(5) POWER**

Steps	Possible findings
Tell the patient “I am going to test the strength of some of your muscles”. Fix the joint proximal to the group of muscles you are testing. Give the patient a space to show his power before resisting him and look at the muscle contracts. Compare right with left	Describe any weakness in terms of the medical research council (MRC) scale from 5 (normal) down to 0 (no visible muscle contraction)... <i>see theoretical notes for the MRC scale for power grading</i>
1. <b>Shoulder abduction:</b> tell the patient “Hold your arms up, like this (chicken wings). Now keep them up and don’t let me push them down”.	Action by the deltoids (supplied by the axillary nerve; <b>C5</b> ). N.B: Lifting the arm from the side to 90 degrees tests the supraspinatus muscle (supplied by the suprascapular nerve; C5)
2. <b>Shoulder adduction:</b> tell the patient “Now take them in towards you, like this and push my hands”	Action by the pectoral muscles mainly pectoralis major and latissimus dorsi (supplied by multiple nerves mainly medial and lateral pectoral nerves; <b>C6,7,8</b> )
3. <b>Elbow flexion:</b> tell the patient “Bend your arm, like this. Pull it towards you and don’t let me straighten it”	Action by the biceps (supplied by the musculocutaneous nerve; <b>C5,6</b> )
4. <b>Elbow extension:</b> tell the patient “Now straighten your arm and push my hand”	Action by the triceps (supplied by the <b>radial nerve</b> ; C6, <b>C7,8</b> )
5. <b>Wrist flexion:</b> tell the patient “Clench your fists and bend your hand up towards you, like this. Push my hand”	Action by the flexor carpi radialis&ulnaris (supplied by the median and the ulnar; <b>C7</b> )
6. <b>Wrist extension:</b> tell the patient “Now push the other way”	Action by the extensor carpi radialis&ulnaris (supplied by the posterior interosseous nerve from the <b>radial nerve</b> ; <b>C7</b> ).
7. <b>Finger extension:</b> tell the patient “Straighten your fingers, like this (palm down) and don’t let me bend them” (fix the patient’s wrist with your left hand and push against the fingers with the ulnar surface of your right hand)	Action by the extensor digitorum (supplied by the posterior interosseous from the <b>radial nerve</b> ; <b>C7,8</b> ).
8. <b>Finger flexion:</b> tell the patient “Grip my fingers tightly (offer two fingers)”	Action by the flexor digitorum profundus, flexor digitorum superficialis, flexor pollicis longus, flexor pollicis brevis and lumbricals (supplied by the median and the ulnar nerves; <b>C8, T1</b> ).
9. <b>Finger abduction:</b> tell the patient “Spread your fingers wide apart like this and don’t let me push them together”	Action by the <b>dorsal interossei</b> (supplied by the <b>ulnar nerve</b> ; <b>T1</b> ).
10. <b>Finger adduction:</b> tell the patient “Hold this piece of paper between your fingers and don’t let me pull it out”	Action by the <b>palmar interossei</b> (supplied by the <b>ulnar nerve</b> ; <b>T1</b> ).
11. <b>Thumb abduction:</b> tell the patient “Straighten your hand, like this (palm upwards) and point your thumb towards the ceiling, like this. Now keep it there and don’t let me push it down”	Action by the abductor pollicis brevis (supplied by the <b>median nerve</b> : C8, <b>T1</b> ).
12. <b>Thumb opposition:</b> tell the patient “Touch the tip of your little finger with the tip of your thumb, like this and don’t let me pull them apart”	Action by the opponens pollicis (supplied by the <b>median nerve</b> ; <b>T1</b> ).

**N.B.** you may wish to skip testing the power in fingers and thumb unless specific mononeuropathy or radiculopathy is suspected or neurological examination of the hand is requested in the instructions.

See theoretical notes for:

- Features and causes of the different patterns of weakness
- Clinical approach to weakness
- Motor root values in the upper limb
- Examples of mononeuropathies and radiculopathies in the upper limb

**(6) REFLEXES**

Steps	Possible findings
<p>Explain to the patient. place the patient supine on the bed in a comfortable relaxed position. Use a long tendon hammer; flex your wrist and let the hammer fall with its own weight onto the muscle. Compare right with left. If the reflex appears to be absent, ask the patient to clench his teeth as you swing the hammer (reinforcement).</p>	<p>Grade the response from 0 (absent) up to 4+ (clonus)... <i>see theoretical notes for reflexes grading</i></p>
<p>1. <b>Biceps reflex:</b> place the patient's hands on his abdomen (with the arms semiflexed and semipronated). Place your index finger on the biceps tendon. Swing the hammer on to your finger while watching the biceps muscle.</p>	<p>Reflex arc through the musculocutaneous nerve; <b>C5,6</b></p>
<p>2. <b>Supinator reflex:</b> place your index finger on the radial tuberosity. Swing the hammer on to your finger while watching the brachioradialis muscle</p>	<p>Reflex arc through the <b>radial nerve</b>; <b>C5,6</b></p>
<p>3. <b>Triceps reflex:</b> draw the patient's arm across the chest, flexing the elbow to a right angle. Swing the hammer directly on to the triceps tendon (just above the olecranon) while watching the triceps muscle.</p>	<p>Reflex arc through the <b>radial nerve</b>; <b>C7</b></p>
<p>4. <b>Finger reflex:</b> rest the patient hand on the bed in partial supination with the fingers slightly flexed. Place the palmar surface of your middle and index fingers across the palmar surface of the patient's proximal phalanges. Tap the back of your own fingers with the hammer. Observe for flexion of the patient fingers (FDP and FDS).</p>	<p>Reflex arc through the median and ulnar nerves; <b>C8</b></p>
<p>5. <b>Hoffman's reflex:</b> Hold the patient's wrist (with your left hand) in the horizontal pronated position with the fingers and wrist relaxed. Place the ulnar surface of your right index finger under the palmar surface of the DIP joint of the patient's middle finger. Using your right thumb flick the patient's finger downwards.</p>	<p>Normally no reflex occurs unless the patient is under emotional tension. In <b>UMNL</b>, the patient's thumb undergoes a quick flexion-adduction-opposition movement while the other fingers move in flexion-adduction. This response is labelled as a positive Hoffmann's sign.</p>
<p>5. <b>Abdominal reflexes:</b> the patient should be supine and relaxed. Using an orange stick lightly scratch the abdominal wall towards the umbilicus in the four quadrants of the stomach.</p>	<ul style="list-style-type: none"> <li>➤ Normal response is contraction of the recti with the umbilicus moving away from the direction of the scratch.</li> <li>➤ Afferent: segmental sensory nerves</li> <li>➤ Efferent: segmental motor nerves</li> <li>➤ Roots: <b>T8,9</b> above the umbilicus, and <b>T11,12</b> below the umbilicus</li> <li>➤ Abdominal reflexes are absent in <b>UMNL</b> above their spinal level, and in <b>LMNL</b> affecting T8-12.</li> <li>➤ It is often impossible to elicit abdominal reflexes in anxious patients, elderly, obese, multiparous women, and those who have had abdominal surgery</li> </ul>

**N.B.** you may wish to skip testing the finger reflex and Hoffman's reflex unless specific mononeuropathy or radiculopathy is suspected or neurological examination of the hand is requested in the instructions.

*See theoretical notes for abnormal tendon reflexes, and the root values for reflexes*

**(7) COORDINATION**

Steps	Possible findings
<p>1. <b>Finger-nose test:</b> hold your index finger out an arm's length in front of the patient and tell the patient "Touch my finger with your index finger; now touch your nose; repeat faster". Consider repeating the test while the patient's eyes are closed to test for sensory ataxia. Compare right with left. Expect the right side to be slightly better in right handed persons</p>	<ul style="list-style-type: none"> <li>➤ <b>Dyssynergia or incoordination</b> (cerebellar upper limb ataxia): movements are imprecise in force and direction.</li> <li>➤ <b>Dysmetria:</b> movements are imprecise in distance. The finger overshoots its target (past pointing) or it stops before the target.</li> <li>➤ <b>Intention tremor</b> → the patient develops a tremor as his finger approaches its target</li> <li>➤ <b>Sensory ataxia:</b> in case of deficit of joint position sense, the original movements are accurate but when repeated with the eyes closed are substantially worse</li> </ul>
<p>2. <b>Rapid alternate movements:</b> tell the patient "repeatedly tap the palm of one hand alternately with the palm and then the back of the other hand as quickly as possible" (demonstrate). Alternatively, tell the patient "Twist your hand as if opening a door or unscrewing a light bulb" (demonstrate by flexing your elbows at right angles and then pronating and supinating your forearms as rapidly as possible). Always compare right with left. Expect the right side to be slightly better in right handed persons</p>	<ul style="list-style-type: none"> <li>➤ <b>Dysdiadochokinesia:</b> disorganization of the movement – cerebellar sign</li> <li>➤ <b>Dysrhythmia:</b> inability to keep a rhythm - cerebellar sign</li> </ul>
<p>3. <b>Rapid repeated movements:</b> tell the patient "rapidly bring thumb and index finger together" (demonstrate). Alternatively, tell the patient "rapidly touch the thumb with each finger in turn" (demonstrate). Compare right with left. Expect the right side to be slightly better in right handed persons</p>	<ul style="list-style-type: none"> <li>➤ <b>Bradykinesia</b> (slowed movements or break up easily – extrapyramidal sign)</li> </ul>

**N.B.** do not assess coordination if power < 3 (inability to move against gravity), and tell the examiner that coordination cannot be assessed due to weakness

*See theoretical notes for types of ataxia and causes of ataxia*

**(8) SENSATION**

Steps	Possible findings
<p>1. <b>Pin prick:</b></p> <ul style="list-style-type: none"> <li>➤ <b>Demonstrate</b> the stimuli to the patient by testing on the sternum (use each end of the hat pin): explain to the patient “this is sharp...and this is blunt...now I’m going to test the sensation in your legs and I want you to close your eyes and say “Sharp” if it feels sharp, and “blunt” if it feels blunt”.</li> <li>➤ <b>Start distally and move proximally</b> testing over each dermatome (and each main nerve): Skin over the first dorsal interosseous → Palmar surface of distal phalanx of index finger → Palmar surface of distal phalanx of middle finger → Palmar surface of distal phalanx of little finger → Inner aspect of forearm → Outer aspect of forearm → Outer aspect of proximal part of upper arm → Inner aspect of proximal part of upper arm. Repeat in the other side then compare right with left.</li> <li>➤ <b>Map out the boundaries</b> of any area of reduced, absent or increased sensation; starting from the area of altered sensation and moving towards normal to find the edges, noting any difference between the two sides.</li> <li>➤ If a stocking sensory loss is present, <b>demonstrate that the sensory loss is present right round the limb.</b></li> <li>➤ If compression of the cord is suspected, then <b>demonstrate a sensory level.</b></li> </ul>	<ul style="list-style-type: none"> <li>➤ Reduced sensation over the first dorsal interosseous → <b>radial nerve</b> or C6 lesion</li> <li>➤ Reduced sensation over palmar surface of distal phalanx of index finger → <b>median nerve</b> or C6 lesion</li> <li>➤ Reduced sensation over Palmar surface of distal phalanx of middle finger → median nerve or <b>C7</b> lesion</li> <li>➤ Reduced sensation over palmar surface of distal phalanx of little finger → <b>ulnar nerve</b> or <b>C8</b> lesion</li> <li>➤ Reduced sensation over inner aspect of forearm → <b>T1</b> lesion</li> <li>➤ Reduced sensation over outer aspect of forearm → <b>C6</b> lesion</li> <li>➤ Reduced sensation over outer aspect of proximal part of upper arm → <b>C5</b> lesion</li> </ul>
<p>2. <b>Light touch:</b></p> <ul style="list-style-type: none"> <li>➤ <b>Demonstrate</b> “I am going to touch you with this piece of cotton wool and I want you to close your eyes and say (Yes) every time you feel it”. Avoid dragging it across the skin or tickling the patient. Time the stimuli irregularly to check the patient reliability.</li> <li>➤ <b>Start distally and move proximally</b> testing the upper limb in the same sequence as for pin prick</li> </ul>	<ul style="list-style-type: none"> <li>➤ Reduced sensation over inner aspect of proximal part of upper arm → <b>T2</b> lesion</li> <li>➤ <i>See theoretical notes for sensory root values (dermatomes) in the upper limb</i></li> </ul>
<p>3. <b>Joint position sense:</b></p> <ul style="list-style-type: none"> <li>➤ <b>Demonstrate:</b> fix the proximal phalanx of the patient’s <b>index</b> finger with one of your hands. Hold the lateral aspects of the distal phalanx of the patient’s index finger between the thumb and index finger of your other hand. Ensure that your thumb and index finger are at 90 degrees to the intended direction of movement. Tell the patient “I’m going to move your finger up and down; this is up (move finger up)..., and this is down (move finger down)..now close your eyes and tell me whether I am moving your finger up or down”.</li> <li>➤ <b>Start with the DIP joint of the index finger.</b> If impaired, move to more proximal joints (DIP → PIP → MCP → wrist → elbow → shoulder).</li> </ul>	
<p>4. <b>Vibration sense:</b></p> <ul style="list-style-type: none"> <li>➤ <b>Demonstrate:</b> use a 128 Hz tuning fork. Make the fork vibrate and place it on the sternum. Ask the patient “Do you feel it vibrating (buzzing)?”</li> <li>➤ Tell the patient “Close your eyes”. Make the fork vibrate silently and place it on the the DIP joint of the <b>index</b> finger and ask the patient “Can you feel it now?” If patient cannot feel the vibration, move to more proximal joints (DIP → PIP → MCP → radial styloid → olecranon → acromion).</li> </ul>	<p><b>N.B.</b> vibration sense is commonly reduced or absent in elderly patients</p>

*See theoretical notes for modalities and tracts of sensation, patterns, causes and approach to sensory loss*

**(9) Additional signs:** according to diagnosis, e.g.

- Look for cataract and scar for pacemaker, palpate for local spinal tenderness, and examine for sensory level
- Tell the examiner that you would normally extend your examination to examine the lower limb and cranial nerves and would ask about swallowing (Dystrophia myotonica), bladder symptoms, test the anal tone (spinal cord syndrome), and to dipstick urine for DM.

**(10) Thank the patient and cover him (her)**

### THEORETICAL NOTES

**DESCRIPTION, TYPES, FEATURES AND CAUSES OF ABNORMAL MOVEMENTS:** See Ch. 6 CNS Lower Limb

**ABNORMALITIES OF THE TONE:** See Ch. 6 CNS Lower Limb

**THE MEDICAL RESEARCH COUNCIL (MRC) SCALE FOR POWER GRADING:** See Ch. 6 CNS Lower Limb

**FEATURES AND CAUSES OF THE DIFFERENT PATTERNS OF WEAKNESS:** See Ch. 6 CNS Lower Limb

**CLINICAL APPROACH TO WEAKNESS:** See Ch. 6 CNS Lower Limb

#### **MOTOR ROOT VALUES IN THE UPPER LIMB**

<b>Root value</b>	<b>Muscle action</b>
C5	Shoulder abduction
C5,6,7	Shoulder adduction
C5,6	Elbow flexion
C7,8	Elbow extension
C6	Pronation, supination
C7	Wrist flexion and extension, finger flexion and extension
T1	Thumb opposition and splaying of fingers

N.B. all muscles on the back of upper limb (triceps, wrist and finger extensors) are innervated by C7

**EXAMPLES OF MONONEUROPATHIES AND RADICULOPATHIES IN THE UPPER LIMB**

<b>Lesion</b>	<b>Features</b>
<b>Median nerve palsy</b>	<ul style="list-style-type: none"> <li>➤ Wasting of the thenar eminence</li> <li>➤ Weakness of opposition, abduction and flexion of the thumb</li> <li>➤ Sensory loss over the palmar aspect of the lateral 3½ fingers</li> </ul>
<b>Ulnar nerve palsy</b>	<ul style="list-style-type: none"> <li>➤ Generalized muscle wasting and weakness sparing the LOAF (→ wasting of the hypothenar eminence and first dorsal interosseous, and guttering of the dorsum of the hand)</li> <li>➤ Ulnar claw hand (hyperextension at the MCP joints with flexion of the IP joints in the fourth and fifth fingers)</li> <li>➤ Sensory loss over the medial 1½ fingers</li> </ul>
<b>T1 root lesion</b>	<ul style="list-style-type: none"> <li>➤ Wasting of all small muscles of the hand.</li> <li>➤ Sensory changes are confined to the medial forearm</li> </ul>
<b>Radial nerve palsy</b>	<ul style="list-style-type: none"> <li>➤ Weakness of fingers and wrist extension and probably brachioradialis &amp; supinator (if damage occurs at the middle third of humerus). Paralysis may involve the triceps (if damage occurs at the axilla) → loss of elbow extension.</li> <li>➤ If the wrist is passively extended the patient is able to straighten his fingers at the IP joints due to the action of interossei and lumbricals, but is unable to extend the MCP joints</li> <li>➤ There appears to be a weakness in abduction and adduction of the fingers, but this is not present when the hand is kept flat on a table and the fingers are extended</li> <li>➤ Wrist-drop, and weak grip (due to missing synergistic effect of an extended wrist)</li> <li>➤ Sensory loss over the first dorsal interosseous (at the anatomical snuff box)</li> <li>➤ Loss of supinator reflex (triceps reflex may also be lost if lesion above spiral groove).</li> <li>➤ If there is no sensory loss whatsoever, in a patient with symptoms of progressive radial nerve palsy, then a lesion of the posterior interosseous nerve (the main, purely motor, branch of the radial nerve) may be suspected and surgical exploration is considered.</li> </ul>
<b>Bilateral wasting of small muscles of the hand</b>	<ul style="list-style-type: none"> <li>➤ With distal sensory loss → peripheral neuropathy</li> <li>➤ Without sensory loss → MND</li> </ul>
<b>C5 root lesion</b>	<ul style="list-style-type: none"> <li>➤ Weakness of shoulder abduction and external rotation and elbow flexion</li> <li>➤ Loss of biceps reflex</li> <li>➤ Sensory loss over the outer aspect of upper arm</li> </ul>
<b>C6 root lesion</b>	<ul style="list-style-type: none"> <li>➤ Weakness of elbow flexion, Pronation</li> <li>➤ Loss of supinator reflex</li> <li>➤ Sensory loss over the lateral aspect of forearm and thumb</li> </ul>
<b>C7 root lesion (compare to radial nerve)</b>	<ul style="list-style-type: none"> <li>➤ Weakness of elbow and wrist extension</li> <li>➤ Loss of triceps reflex</li> <li>➤ Sensory loss over the middle finger</li> </ul>
<b>C8 root lesion</b>	<ul style="list-style-type: none"> <li>➤ Weakness of finger flexion</li> <li>➤ Loss of finger reflex</li> <li>➤ Sensory loss over the medial aspect of forearm</li> </ul>
<b>Axillary nerve palsy</b>	<ul style="list-style-type: none"> <li>➤ Weakness of shoulder abduction (deltoid)</li> <li>➤ Sensory loss over small patch on lateral part of shoulder</li> </ul>

**REFLEXES GRADING:** See Ch. 6 CNS Lower Limb

**ABNORMAL TENDON REFLEXES:** See Ch. 6 CNS Lower Limb

**THE ROOT VALUES FOR REFLEXES:** See Ch. 6 CNS Lower Limb

**TYPES AND CAUSES OF ATAXIA:** See Ch. 6 CNS Lower Limb

**MODALITIES AND TRACTS OF SENSATION:** See Ch. 6 CNS Lower Limb

**PATTERNS AND CAUSES OF SENSORY LOSS:** See Ch. 6 CNS Lower Limb

**CLINICAL APPROACH TO SENSORY LOSS:** See Ch. 6 CNS Lower Limb

**THE SENSORY ROOT VALUES (DERMATOMES) IN THE UPPER LIMB**

Root value	Dermatome
<b>C3</b>	The root of neck
<b>C4</b>	Tip of shoulder
<b>C5</b>	Lateral aspect of upper arm
<b>C6</b>	Lateral aspect of forearm and hand including the thumb
<b>C7</b>	Middle finger
<b>C8</b>	Medial aspect of the hand including the little finger
<b>T1</b>	Medial aspect of forearm
<b>T2</b>	Medial aspect of the upper arm
<b>T3</b>	Axilla

**BRACHIAL PLEXUS** (C5,6,7,8,T1): Gives rise to 3 cords (posterior, medial, and lateral), which give rise to the 3 main nerves of the upper limb (radial, ulnar, and median)

**RADIAL NERVE** (C5,6,7,8):

- Radial nerve is the main continuation of the **posterior** cord → supplies the extensors in the **back** of upper limb
- Motor to the “**BEST**” extensors of the upper limb (**B**rachioradialis, **E**xtensors of wrist and fingers, **S**upinator, **T**riceps)
- The axillary nerve (C5,6) is the smaller terminal branch, and supplies both the deltoid and teres major muscle
- The radial nerve gives off two branches at the elbow:
- Superficial radial (entirely sensory)
- Posterior interosseous (entirely muscular)
- In contrast to median and ulnar nerves: the radial nerve has C5 root and has **no** Thoracic roots, supplies **no** muscles in the hand, and **no** complete finger; whereas ulnar and median nerves supply no muscles in the upper arm
- Radial nerve palsy:
  - **Weakness of fingers and wrist extension** and probably **brachioradialis & supinator** (if damage occurs at the middle third of humerus). Paralysis may involve the **triceps** (if damage occurs at the axilla) → loss of elbow extension.
  - If the wrist is passively extended the patient is able to straighten his fingers at the IP joints due to the action of interossei and lumbricals, but is unable to extend the MCP joints
  - There appears to be a weakness in abduction and adduction of the fingers, but this is not present when the hand is kept flat on a table and the fingers are extended
  - wrist-drop, and weak grip (due to missing synergistic effect of an extended wrist)
  - Sensory loss over the first dorsal interosseous (the anatomical snuff box)
  - Loss of supinator reflex (triceps reflex may also be lost if lesion above spiral groove).
  - If there is no sensory loss whatsoever, in a patient with symptoms of progressive radial nerve palsy, then a lesion of the posterior interosseous nerve (the main, purely motor, branch of the radial nerve) may be suspected and surgical exploration is considered.

**MEDIAN NERVE** (C6,7,8,T1):

- Median nerve arises from the **lateral** and medial cords → supplies **lateral** 2 lumbricals and **lateral** 3½ fingers
- Motor to “**LOAF**”: **L**ateral 2 lumbricals, **O**pponens pollicis, **A**bductor pollicis, **F**lexor pollicis brevis & **F**orearm flexors except flexor carpi ulnaris & ulnar ½ of flexor digitorum profundus
- Median nerve palsy:
  - **wasting of the thenar eminence**
  - weakness of **opposition**, **abduction** and **flexion** of the thumb
  - sensory loss over the palmar aspect of the **lateral 3½ fingers**

**ULNAR NERVE** (C7,8,T1):

- Ulnar nerve is the main continuation of the **medial** cord → supplies **medial** 2 lumbricals and **medial** 1½ fingers

- Motor to “**MAFIA**”: **M**edial 2 lumbricals, **A**dductor pollicis, **F**lexor carpi ulnaris & ulnar ½ of **F**lexor digitorum profundus, **I**nterosseus, **A**bductor & flexor digiti minimi
- Ulnar nerve palsy:
  - Generalized wasting and weakness of the muscle of the hand **sparing the thenar eminence** (i.e. wasting of the hypothenar eminence and first dorsal interosseous, and guttering of the dorsum of the hand)
  - Ulnar claw hand (hyperextension at the MCP joints with flexion of the IP joints in the fourth and fifth fingers)
  - Sensory loss over the **medial 1½ fingers**