

Nerve Conduction Workshop

Lateral and Medial Musocutaneous Nerve Structure

- The nerve penetrates the coracobrachialis muscle and passes obliquely between the biceps brachii and the brachialis, to the lateral side of the arm; a little above the elbow it pierces the deep fascia lateral to the tendon of the biceps brachii and is continued into the forearm as the lateral cutaneous nerve of the forearm.
- In its course through the arm it innervates the coracobrachialis, biceps brachii, and the greater part of the brachialis.
- The branch to the coracobrachialis is given off from the nerve close to its origin, and in some instances as a separate filament from the lateral cord of the plexus; it is derived from the seventh, cervical nerve.
- The branches to the biceps brachii and brachialis are given off after the musculocutaneous has pierced the coracobrachialis; that supplying the brachialis gives a filament to the elbow-plant.
- The nerve also sends a small branch to the bone, which enters the nutrient foramen with the accompanying artery.

Brachial Plexus

Suprascapular	<p>nerve (suprascapular, circumflex) C5, C6 (C4, C7)</p>
Infraclavicular	<p>nerve (axillary) C5, C6 (C4, C7)</p> <p>nerve (brachial) C5, C6 (C4, C7)</p> <p>nerve (radial) C5, C6 (C4, C7)</p> <p>nerve (median) C5, C6 (C4, C7)</p> <p>nerve (ulnar) C5, C6 (C4, C7)</p>
C5, C6	<p>nerve (axillary) C5, C6 (C4, C7)</p> <p>nerve (brachial) C5, C6 (C4, C7)</p> <p>nerve (radial) C5, C6 (C4, C7)</p> <p>nerve (median) C5, C6 (C4, C7)</p> <p>nerve (ulnar) C5, C6 (C4, C7)</p>
C5, C6, C7	<p>nerve (axillary) C5, C6 (C4, C7)</p> <p>nerve (brachial) C5, C6 (C4, C7)</p> <p>nerve (radial) C5, C6 (C4, C7)</p> <p>nerve (median) C5, C6 (C4, C7)</p> <p>nerve (ulnar) C5, C6 (C4, C7)</p>
C5, C6, C7, C8	<p>nerve (axillary) C5, C6 (C4, C7)</p> <p>nerve (brachial) C5, C6 (C4, C7)</p> <p>nerve (radial) C5, C6 (C4, C7)</p> <p>nerve (median) C5, C6 (C4, C7)</p> <p>nerve (ulnar) C5, C6 (C4, C7)</p>
Other	<p>nerve (axillary) C5, C6 (C4, C7)</p> <p>nerve (brachial) C5, C6 (C4, C7)</p> <p>nerve (radial) C5, C6 (C4, C7)</p> <p>nerve (median) C5, C6 (C4, C7)</p> <p>nerve (ulnar) C5, C6 (C4, C7)</p>

Medial Branch



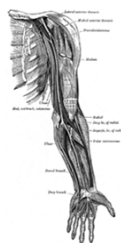
Injuries to the nerve

Although rare, the musculocutaneous nerve can be affected through compression due to hypertrophy or entrapment between the biceps aponeurosis and brachialis fascia or it may be injured through stretch as occurs in dislocations and sometimes in surgery. Isolated injury causes weakness of elbow flexion and supination of the forearm.

A discrete sensory disturbance is present on the radial side of the forearm. The biceps reflex is also affected.

The nerve is usually involved in an upper brachial plexus palsy. Injury can occur before entering the coracobrachialis due to dislocation or apparently due to stretch due to throwing injury.

Heavy backpacks can cause damage to the upper trunk of the brachial plexus – dysfunction can be severe and prolonged with similar injury as occurs with Erb's palsy from breech deliveries. Early detection is important – the combination of time, avoidance of wearing a backpack, and strengthening of the shoulder muscles will probably be effective.



Lateral Antebrachial Cutaneous Sensory Study

- May be abnormal in lesions of the medical cord or lower trunk of the brachial plexus
- Typically absent or very low in tru neurogenic thoracic outlet syndrome
 - Recording Sites:
 - G1 is placed 12 cm distal to the stimulator site on a line drawn between the stimulator site and the radial wrist
 - G2 is placed 3-4 cm distally
 - Stimulate at the Antecubital fossa: slightly lateral to the biceps tendon
 - Bilateral recordings are necessary to compare amplitude and distal latencies

Medial Antebrachial Cutaneous Sensory Study

- Recording Site:
 - Medial forearm
 - G1 is placed 12 cm distal to the stimulation site on a line drawn between the stimulation site and the ulnar wrist
 - G2 is placed 3-4 cm distally
 - Stimulation site
 - Medial elbow at the midpoint between the biceps and tendon and median epicondyle
 - Bilateral recordings are necessary to determine amplitude and distal latency differences

Superficial Peroneal

- The **superficial peroneal nerve** branches off from the sciatic nerve, or the common peroneal nerve, which ultimately winds around the head of the fibula, or shinbone, near the knee. The superficial peroneal nerve is connected to two muscles in the lower leg: the peroneus brevis and the peroneus longus.
- The superficial peroneal nerve follows the perimeter of the fascia, between the leg's anterior and lateral compartments. It pierces the fascia lata to emerge and then travels into the leg's subcutaneous tissues.
- Because the nerve powers the muscles that lift the toes and feet, damage to it may cause a severe condition known as 'foot drop'. Foot drop is characterized by pain and numbness in the shin and on top of the foot, as well as weakness during foot extension.

Superficial Peroneal



Superficial Peroneal Recording

- Recording site:
 - Lateral ankle:
 - G1 is placed between the tibialis anterior tendon and the lateral malleolus
 - G2 is placed 3-4 cm distally
 - Stimulation site:
 - Lateral calf.
 - 14 cm is the standard distance but shorter distances may be helpful

Saphenous

- The saphenous nerve is a cutaneous branch of the femoral nerve originating from the L2-L4 nerve roots. It descends anteroinferiorly through the femoral triangle, lateral to the femoral sheath, accompanying the femoral artery in the adductor canal, and then courses between the sartorius and gracilis muscles across the anterior thigh.

Saphenous Nerve Recording

- Recording Site
 - Medial/Anterior Ankle
 - G1 placed between the medial malleolus and tibialis anterior tendon
 - G2 is placed 3-4 cm distally
 - Stimulation Site:
 - Medial Calf: stimulator is placed in the groove between the tibia and the medial gastrocnemius muscle
 - Distance is 14 cm but a shorter distance may be used

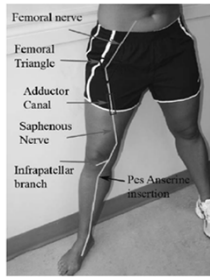


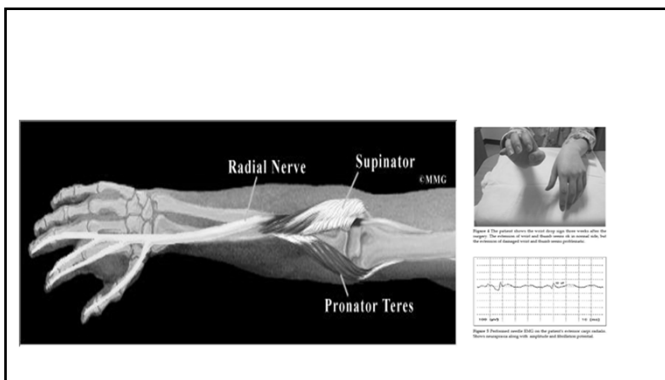
Figure 3
Anatomical course of the saphenous nerve
 Entrapment of the saphenous nerve at the adductor canal affecting the infrapatellar branch - a report on two cases Jason Post JGIM 2013, 27 (4):341-349

Radial Nerve Motor Stimulation

- Extensor indicis proprius (EIP) muscle
 - With hand pronated, G1 is placed two fingerbreths proximal to styloid
 - G2 is placed over the ulnar styloid
- Stimulation sites
 - Forearm, over the ulna, 4-6 cm proximal to the active recording electrode
 - Elbow: in the groove between the biceps and brachioradialis muscles
 - Below the Spiral groove: lateral mid arm between the biceps and the triceps muscles
 - Above the spiral groove posterior proximal arm over the humerus

Radial Nerve

- **radial nerve entrapment**
- Is caused by a tight supinator muscle that refers pain to the lateral epicondyle, making it feel like lateral epicondylitis.
- Symptoms are sharp or burning pain and possibly even tingling or numbness on the back of your hand, thumb, index and middle finger.
- Inability to lift the index finger



Medial and Lateral Plantar Motor Studies

- **Recording site**
 - **Medial Ankle:**
 - G1 is placed slightly proximal and posterior to the medial malleolus
 - G2 is placed 3-4 cm proximally
 - **Stimulation Sites:** Great toe, (medial plantar sensory)
 - Little toe (lateral plantar sensory)

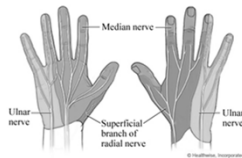
Medial and Lateral Plantar Motor studies

- Another technique is to stimulate at the bottom of the foot and record at the tibial nerve:



Median Versus Ulnar Lumbrical-Interossei Studies

- Recording Site:
 - Second Lumbrical and first palmar interosseous (same recording sites for both)
 - G1 placed slightly lateral to the midpoint of the third metacarpal
 - G2 placed distally over the metacarpal phalangeal joint of digit II
- Stimulation Sites:
 - Median nerve at the wrist
 - ulnar nerve at the wrist
 - Distance is 8-10 cm, the same distance must be used for both the median and ulnar studies

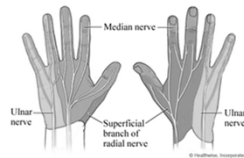


Median versus Ulnar-Palmar Mixed Nerve Studies

- Recording Site:
 - Median Nerve at the wrist
 - G1 placed over the middle of the wrist
 - G2 placed 3-4 cm proximally
 - Stimulation Site:
 - Median nerve in the palm 8 cm from the active recording electrode on a line drawn from the median wrist to the web space between the index and middle finger

Median versus Ulnar-Palmar Mixed Nerve Studies

- Recording Site:
 - Ulnar nerve at the wrist
 - G1 placed over the medial wrist adjacent to the flexor carpi ulnaris tendon
 - G2 placed 3-4 cm proximally
 - Stimulation Site
 - Ulnar nerve in the palm, 8 cm from the active electrode on a line drawn from the ulnar wrist to the web space between the ring and little fingers
 - Distance 8cm



Lateral Femoral Cutaneous Sensory Study

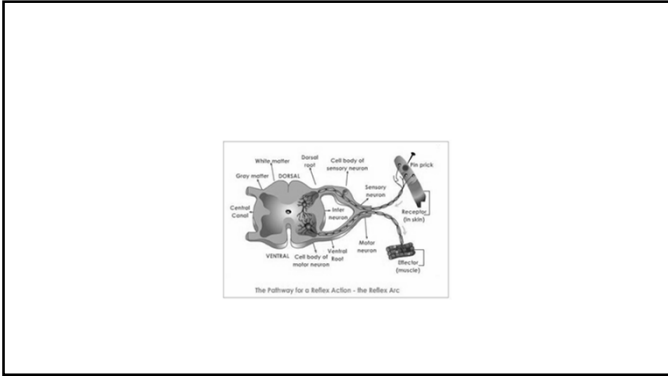
- Recording Site
 - Anterior Thigh
 - G1 is placed over anterior thigh, 12 cm distal to the stimulation site, on a line drawn directly from the anterior superior iliac spine to the lateral patella
 - G2 is placed 3-4 cm distally
 - Stimulation site Stimulator is placed in the inguinal area above the inguinal ligament, 1cm medial to the ASIS

Lateral Femoral Cutaneous nerve



Blink Reflex

- Recording Site
 - Bilateral orbicularis oculi muscles
 - For each side G1 is placed on the face over inferior eye socket, just lateral and inferior to the pupil at mid position
 - G2 placed over the lateral canthus of the eye
- Stimulation site: Supraorbital notch: medial superior eye socket over the supraorbital notch



Nerves per Diagnosis

- Temperature for all studies must be at least 33 in the lower extremity and 32 in the upper extremity
- Match Neurophysiologic distal latencies on the other side if amplitudes are low. Compare full arm if velocities are slow
- Motor
 - Median
 - Ulnar
- Sensory
 - Median
 - Ulnar
- Comparison of responses are low amplitude or slow
 - D5-M
- Comparison of responses are absent
 - Intermittent
- Neurophysiologic distal latencies on the other side if amplitudes are low. Compare full leg if velocities are slow
- Motor
 - Peroneal
 - Tibial
 - Peroneal to TA
- Sensory
 - Sural
 - Radial

-
- L5 Radiculopathy- compare distal latencies on the other side if amplitudes are low. Compare full leg if velocities are slow
- Motor
 - Peroneal
 - Tibial
- Sensory
 - Sural
- H Reflex
-
- Cervical Radiculopathy- compare distal latencies on the other side if amplitudes are low. Compare full arm if velocities are slow
- Motor
 - Median
 - Ulnar
- Sensory
 - Median
 - Ulnar
 - Radial
-

- Foot Drop compare distal latencies if amplitudes are low. Compare full leg if velocities are slow
- Motor
 - Peroneal
 - Tibial
 - Peroneal to TA
- Sensory
 - Sural
 - Superficial Peroneal
-
- Myopathy- compare distal latencies on the other side if amplitudes are low. Compare full leg if velocities are slow
- Motor
 - Peroneal
 - Median
- Sensory
 - Radial
 - Sural
- Rep Stim at APB with ten seconds of repair

- CSF- Make sure the patient is lying down. Both legs and one arm
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- Motor
 - Peroneal
 - Tibial
 - Median
 - Sural
-
- Sensory
 - Sural
 - Radial
-
- Other Neuropathy- compare distal latencies on the other side if amplitudes are low. Compare full arm if velocities are slow
- Motor
 - Median
 - Ulnar-ADM
 - Ulnar-FDI
- Sensory
 - Median
 - Sural
-
- Compartment Syndrome are low amplitude or slow
-
- Compartment Syndrome are absent

- Radial Neuropathy- compare distal latencies on the other side if amplitudes are low. Compare full arm if velocities are slow
- Motor
 - Radial
 - Median
 - Ulnar
- Sensory
 - Median
 - Ulnar
 - Radial
-
- Brachial Plexopathy- compare distal latencies on the other side if amplitudes are low. Compare full arm if velocities are slow
- Motor
 - Median
 - Ulnar-ADM
 - Ulnar-FDI
- Sensory
 - Median
 - Ulnar
 - Radial
 - LAC
 - MAC
