Brachial Plexopathy, an overview

Learning Objectives:
The brachial plexus is the network of nerves that originate from cervical and upper thoracic nerve roots and eventually terminate as the named nerves that innervate the muscles and skin of the arm. Brachial plexopathies are not common in most practices, but a detailed knowledge of this plexus is important for distinguishing between brachial plexopathies, radiculopathies and mononeuropathies. It is impossible to write a paper on brachial plexopathies without addressing cervical radiculopathies and root avulsions as well.

In this paper will review brachial plexus anatomy, clinical features of brachial plexopathies, differential diagnosis, specific nerve conduction techniques, appropriate protocols and case studies. The reader will gain insight to this uncommon nerve problem as well as the importance of the nerve conduction studies used to confirm the diagnosis of plexopathies.

Anatomy of the Brachial Plexus:
To assess the brachial plexus by localizing the lesion at the correct level, as well as the severity of the injury requires knowledge of the anatomy. An injury involves any condition that impairs the function of the brachial plexus. The plexus is derived of five roots, three trunks, two divisions, three cords, and five branches/nerves.

Spinal roots join to form the spinal nerve. There are dorsal and ventral roots that emerge and carry motor and sensory fibers. Motor (efferent) carries messages from the brain and spinal cord to the peripheral nerves. Sensory (afferent) carries messages from the peripheral to the spinal cord or both. A small ganglion containing cell bodies of sensory fibers lies on each posterior root. They join and form the spinal nerve that exits from the spinal canal through the intervertebral foramina.

After passing through the foramina the spinal nerve branches into two different divisions called the anterior and posterior rami. The posterior rami supplies the posterior part of the skin and paraspinal muscles. The anterior rami supply the skin of the anterior lateral portion of the trunk and the extremities.

The anterior rami of C5-T1 supply the muscles of the upper limb. Roots combine to form three trunks, the upper, middle and lower trunk. Each trunk has an anterior and posterior division. From there, separation is made into the lateral, medial or posterior cord, and eventually the peripheral nerves.
There are two nerves that come directly from roots proximal to the plexus, the long thoracic and dorsal scapular nerves. The long thoracic nerve emerges directly from the C5-C7 roots and innervates the serratus anterior muscle. The dorsal scapular nerve emerges from C5 and supplies the rhomboid muscle.

For ease, we use the DeMyer 5-3-3-5 method of drawing the brachial plexus. It is simple, quick and covers 80% of what we need for immediate recall. Refer to the following drawing often while studying this text.

There are 5 distinct regions that include Roots, Trunks, Divisions, Cords and Branches (or nerves). A common mnemonic to remember these fiber interconnections is “Randy Travis Drinks Cold Beer.” Of course, some of us have been around longer than Randy Travis has been famous. A mnemonic that spans the course of time is “Read The Damn Cadaver Book.”
Forming the plexus:

- The upper trunk is formed by the C5-C6 nerve roots. The upper trunk divides:
  - The anterior division proceeds to the lateral cord and finally, the
    - Outer branch of the median nerve
      - Both motor and sensory fibers. The motor fibers innervate the pronator teres and flexor carpi radialis (with fibers from C7, middle trunk) while the sensory fibers continue to the lateral portion of the hand, and
    - Musculocutaneous nerve
      - Both motor and sensory fibers. Motor fibers innervate the biceps, coracobrachialis, and brachialis muscles. The sensory branch, called the lateral antebrachial cutaneous nerve supplies the skin over the lateral aspect of the forearm.
    - The posterior division proceeds to the posterior cord and branches to the:
      - Axillary nerve
        - Both motor and sensory fibers. Motor fibers innervate the deltoïd muscle while sensory fibers innervate sensation over the deltoïd region, and
      - Radial nerve
        - Both motor and sensory fibers. Motor fibers innervate the brachioradialis and extensor carpi radialis (longus and brevis) with some contributions to the triceps and supinator. Sensory fibers continue to the lateral dorsum of the hand.
    - Also exiting the upper trunk is the suprascapular nerve
      - A motor nerve innervating the supraspinatus and infraspinatus muscles in the scapular region.
  - The middle trunk is formed entirely from the C7 root. Sometimes called the “Axis of Symmetry,” because C7 runs directly into its cord while C5-C6 unites and C8-T1 unites.
    - The posterior division goes directly to the posterior cord which,
      - Becomes the axillary nerve (although all fibers supplying the axillary nerve come from the upper trunk),
      - Radial nerve,
        - Motor fibers innervate most of the triceps, and portions of the extensor digitorum communis and extensor indicis proprius among as well as the rest of the extensor muscles in the forearm. The muscles in the forearm are innervated after the radial nerve splits and the motor branch becomes the posterior interosseous nerve.
        - Thoracodorsal nerve, innervating a portion of the latissimus dorsi and
        - Subscapular nerve which innervates a portion of the teres major.
The anterior division proceeds to the lateral cord
  - Outer branch of the median nerve
    - Innervating sensory fibers to the middle finger.
  - The lower trunk is formed by the C8-T1 nerve roots. The lower trunk divides:
    - The anterior division continues to the medial cord and finally, the
      - Ulnar nerve
        - Both motor and sensory fibers. The motor fibers innervate the flexor carpi ulnaris in the forearm and the abductor digiti minimi, first dorsal interosseous and the deep head of the flexor pollicis brevis muscles in the hand. Sensory fibers innervate the fourth and fifth digit of the hand.
          - The dorsal ulnar cutaneous nerve branches from the ulnar nerve proximal to the wrist and innervates sensation to the medial dorsum of the hand.
        - Inner branch of the median nerve
          - Motor fibers to the abductor pollicis brevis, the superficial head of the flexor pollicis brevis and the opponens pollicis.
    - The posterior division of the lower trunk proceeds to the posterior cord
      - Radial nerve
        - Innervates the additional portions of the radial/posterior interosseous muscles not supplied from C7 and middle trunk
    - Additionally, the medial antebrachial cutaneous branches from the medial cord and innervates sensation to the medial forearm.

Injuries and diseases can affect the plexus and cause damage. Upper trunk plexopathies can be caused by a birth trauma, radiation therapy, and neuralgic amyotrophy.

Middle trunk plexopathy is rare and usually caused by injury.

Lower trunk plexopathy is usually caused by trauma, a Pancoast tumor, Dejerine-Klumpke, CABG (associated with a jugular vein), and metastatic disease.
The brachial plexus is a complex structure. The diagnosis of a root lesion depends on abnormalities confined to a single root level without affecting higher or lower limb levels.

Of note, while the above discussion demonstrates the most common appearance of the brachial plexus there are several variants. In fact the “Illustrated Encyclopedia of Human Anatomic Variation: Opus III: Nervous System,” notes 29 variations. The most common are the “prefixed plexus” and the “postfixed plexus.” When the spinal nerve contributions are shifted up one level (C4 nerve root contributes to the upper trunk) we call it a “prefixed plexus.” In cases where the C5 nerve root contributes minimally, the C7 root contributes to the upper trunk while the lower trunk receives fibers from the T2 nerve root is called a “post-fixed plexus.”

**Clinical features of Brachial Plexopathies:**

Brachial plexopathies cause motor and sensory disturbances in the shoulder, arm or both. While both motor and sensory dysfunctions co-exist, it is common for disproportionate degrees of one or the other. Sensory loss is often inconsistent while pain ranges from mild to severe and from transient to persistent. Severe, unrelenting pain is common in avulsion injuries, but is less pronounced in conditions such as neurogenic thoracic outlet syndrome.

Brachial plexus lesions are often classified by etiology (i.e. traumatic or non-traumatic plexopathies)

Traumatic injuries are the most common cause of brachial plexus lesions. They are a result of automobile, motorcycle, bicycle accidents, penetrating knife, or gunshot wounds. Most Traumatic plexopathies are the result of traction and stretch injuries. Severe traction injuries may result in damage to the roots as well as the plexus.

Root avulsions are when the nerve roots are torn and axons are damaged beyond repair. They often occur in combination with brachial plexus injuries. The most common roots affected in root avulsions are C8/T1.

Nontraumatic plexopathies include neuralgic amyotrophy (sometimes called Parsonage-Turner syndrome or idiopathic brachial plexopathy), hereditary brachial plexopathy, neoplastic or radiation induced brachial plexopathy and neurogenic thoracic outlet syndrome to mention a few

Another method of classifying brachial plexopathies is based on clinical and electrodiagnostic findings and our preferred method. Following is a review of what one might see with lesions affecting various trunks and cords of the brachial plexus.
**Upper trunk plexopathies**

These are the most common brachial plexopathies. Weakness occurs in nearly all muscles with C5-6 innervation including the deltoid and biceps brachii (the patient has difficulty lifting their arms). Sensory loss occurs in the lateral arm, lateral forearm, lateral hand, and thumb.

The EMG/NCS will be used to rule out a C5-6 radiculopathy and other mononeuropathies. In the case of the upper trunk, the median (thumb and index finger), radial and lateral antebrachial cutaneous sensory nerves will show reduced amplitudes particularly when compared to the unaffected arm. The median (to the middle and ring finger), ulnar and medial antebrachial cutaneous nerves would be normal in upper trunk plexopathies. Sensory nerve conduction studies would be normal in C5-6 radiculopathies and avulsion injuries. Routine motor nerve conduction studies of the median and ulnar nerves are not particularly useful in distinguishing upper trunk or C5-6 radiculopathies, but MNC’s would be absent in avulsion injuries to C5-6. Musculocutaneous and axillary motor nerve studies would show decreased CMAP amplitude as compared to the unaffected side.

An extensive needle EMG should be performed to ensure abnormalities are restricted to muscles innervated by the upper trunk, with sparing of muscles innervated by the middle and lower trunks.

**Middle trunk plexopathies**

Isolated middle trunk plexopathies are rare. Sign and symptoms resemble those of a C7 radiculopathy. Weakness occurs in the elbow, wrist and finger extensors. Sensory loss occurs in the posterior forearm and the dorsal and palmar aspect of the middle finger.

The median sensory response to the middle finger will be reduced as compared to the unaffected side. Radial motor conduction study will have reduced amplitude. The remaining nerve conduction studies will be unaffected. It can be difficult to distinguish a lesion involving the middle trunk for one involving the posterior cord as there are no nerve branches arising directly from the middle trunk.

Needle EMG abnormalities would include all radial innervated muscles and C7 median forearm innervated muscles.
Lower trunk plexopathies

Lower trunk plexopathies present with symptoms similar to C8-T1 radiculopathies, medial cord plexopathies and even ulnar neuropathies. Weakness is evident in all median and ulnar innervated hand muscles as well as radial innervated distal forearm and wrist muscles. The involvements of radial C8 muscles (lower trunk, posterior cord) help localize the lesion to the lower trunk by excluding the medial cord. Sensory disturbance is seen in the medial aspect of the arm, forearm and hand in a larger distribution than an ulnar neuropathy.

Sensory nerve conduction studies of the ulnar and medial antebrachial cutaneous nerves reveal reduced amplitudes while all median sensory nerves remaining normal. There would be decreased CMAP amplitude in both ulnar and median motor NCS, but this might be true in severe a severe C8-T1 radiculopathy as well.

An extensive needle EMG should be performed to ensure abnormalities are restricted to muscles innervated by the lower trunk. In a lower trunk plexopathy the lower paraspinal muscles will not show denervation, but a C8-T1 radiculopathy would show changes in the paraspinals.

Posterior cord plexopathies

Posterior cord plexopathies, like middle trunk plexopathies, are uncommon. The radial, axillary, upper and lower subscapular and thoracodorsal nerves are derived from the posterior cord. Symptoms of posterior cord lesions include weakness of shoulder abduction and adduction, wrist drop and finger drop, and arm extension weakness. Sensory loss is evident in the lateral arm, posterior arm, forearm, and radial dorsal hand.

The sensory conduction study of the radial nerve would show low amplitude especially compared to the unaffected side. The lateral antebrachial cutaneous nerve would be normal. Motor study to the radial innervated extensor indicis proprius would be expected to show reduced amplitude.

A needle EMG would show denervation in muscles innervated by the posterior cord. Included in the list would be latissimus dorsi, deltoid and radial innervated muscles.

Lateral cord plexopathies

Patients with lateral cord plexopathies experience weakness of shoulder flexion and abduction, elbow, arm pronation and wrist flexion. Sensory loss can be found in lateral forearm, lateral hand, and first three fingers.

Sensory nerve conduction studies to the median innervated first three digits and the lateral antebrachial cutaneous innervated lateral forearm should show reduced amplitude.
as compared to the unaffected side. The radial innervated thumb would be preserved in lateral cord lesions (posterior cord), but would be involved if the lesion were in the upper trunk. The motor fibers of the median and ulnar nerves originate from C8-T1, lower trunk and medial cord thus would be unaffected in lateral cord lesions. Motor nerve conduction study of the musculocutaneous nerve to the biceps would show reduced amplitude as compared to the unaffected side.

A needle EMG would show denervation in muscles innervated by the lateral cord, including biceps (C5-C6, upper trunk, lateral cord, and musculocutaneous n.), pronator teres and flexor carpi radialis (C6-C7, upper/middle trunk, lateral cord, and median n.) muscles. Muscles unaffected in lateral cord lesions include deltoid (C5-C6, upper trunk, posterior cord and axillary n.), triceps (C7, middle trunk, posterior cord and radial n.), infra- and supraspinatus (C5-C6, upper trunk, and suprascapular n.).

**Medial Cord Plexopathies**

Findings of medial cord lesions are the same as lower trunk lesions with one notable exception: the radial MNC. Remember, the C8 motor fibers of the radial nerve go thru the lower trunk then the posterior cord while C8 and T1 motor fibers of the median and ulnar nerves also transverse the lower trunk, but these go thru the medial cord. Therefore only median and ulnar innervated muscles will be affected in medial cord lesions.

Sensory nerve conduction studies of the ulnar and medial antebrachial cutaneous nerves reveal reduced amplitudes while all median sensory nerve remains normal. There would be decreased CMAP amplitude in both ulnar and median motor NCS, but this would be true in lower trunk lesions as well. Motor nerve conduction study of the radial nerve to the extensor indicis proprius would be symmetrical, side-to-side.

An extensive needle EMG should be performed to ensure abnormalities are restricted to muscles innervated by the medial cord. Again, one would expect the radial innervated muscles in the distal forearm to be preserved in medial cord lesions, but abnormal in lower trunk lesions.

**Differential Diagnosis:**

*Cervical radiculopathies* – while cervical radiculopathy may be the most important piece in differential diagnosis it is really quite easy to make the differential. If the sensory nerve conduction are normal look to cervical radiculopathy (i.e. pre-ganglionic). If the sensory nerve conduction are abnormal consider brachial plexus (or other post-ganglionic) causes.
Mononeuropathy – The most common mononeuropathies in the upper extremities are median neuropathy at the wrist and ulnar neuropathy at the elbow.

There is a relationship of the motor and sensory findings in median neuropathies. The motor and sensory fibers to the hand join at the end of the brachial plexus, so in median neuropathies the sensory and motor abnormalities correspond. If the lesion is in the upper/middle trunk or the lateral cord, median sensory will be affected, but median motor fibers will be spared. Likewise in lower trunk and medial cord lesions the median motor fibers will show changes, but the sensory fibers will be unaffected.

Similarly, in lower trunk and medial cord lesions, sensation to the medial forearm is affected. In ulnar neuropathies the medial antebrachial cutaneous nerve is spared and no such sensory abnormalities are apparent. In addition, lower trunk/medial cord lesions affect the median motor fibers, but an ulnar neuropathy does not.

Radial nerve lesions at the spiral groove affect both motor and sensory fibers distally. Lesions of the posterior cord would also include abnormalities of both the motor and sensory portions since the radial nerve is essentially an extension of the posterior cord. Upper and middle trunk plexopathies would show changes in the sensory NCS, but spare the MNC fibers. Contrasting, lesions in the lower trunk will show MNC abnormalities (distally, i.e. EIP), but the sensory fibers would be spared.

All the NCS findings should be considered in combination. For instance, we wrote the median motor fibers are affected in lower trunk/medial cord lesions while the median sensory fibers would be spared. Certainly, if there was a lower trunk/medial cord lesions ulnar motor and sensory fibers would be abnormal. Look for the combinations.

Nerve Conduction Studies:

The numbers are locations of lesions then look below for the corresponding nerve conduction studies. The normal and abnormal comments are general patterns, not hard and fast rules.
1. Upper trunk before the suprascapular exits –
   a. Patterns of Abnormal Sensory NCS
      i. Lateral antebrachial cutaneous
      ii. Radial
         1. may be only mildly abnormal or even normal because some fibers come from the middle trunk
      iii. Median (dig I and dig II)
         1. Dig I most likely abnormal, digit II gets some fibers from the middle trunk.
         2. Dig III would be normal as it receives all sensory fibers from the middle trunk
   b. Patterns of Normal Sensory NCS
      i. Ulnar
      ii. Medial antebrachial cutaneous
   c. Patterns of Abnormal Motor NCS
      i. Supraspinatus/Infraspinatus
         1. Motor NCS to these muscles can be a challenge. It may be better to have your physician confirm inclusion of these muscles with needle EMG
      ii. Musculocutaneous
         1. You may forgo this MNC exam and perform the LABC, because the LABC is the sensory extension of the musculocutaneous nerve.
      iii. Axillary
   d. Patterns of Normal Motor NCS
      i. Median, motor fibers from C8 and T1
      ii. Ulnar, motor fibers from C8 and T1
   e. Patterns of F-waves of the median and ulnar nerves would normal
   f. Patterns of Abnormal Needle EMG
      i. Muscles affected are deltoïd, biceps, brachioradialis, supraspinatus, and infraspinatus
      ii. Muscles partially affected are the pronator teres (C6-7) and triceps (C6-C7-C8)
   g. Patterns of Normal Needle EMG
      i. Rhomboids exit the C5 root above this lesion
      ii. Additional muscles from unaffected portions

2. Upper trunk after the suprascapular exits –
   a. Patterns of Abnormal Sensory NCS
      i. Lateral antebrachial cutaneous
      ii. Radial
         1. may be only mildly abnormal or even normal because some fibers come from the middle trunk
      iii. Median (dig I and dig II)
         1. Dig I most likely abnormal, digit II gets some fibers from the middle trunk.
         2. Dig III would be normal as it receives all sensory fibers from the middle trunk
b. Patterns of Normal Sensory NCS
   i. Ulnar
   ii. Medial antebrachial cutaneous

c. Patterns of Abnormal Motor NCS
   i. Musculocutaneous
      1. You may forgo this MNC exam and perform the LABC, because the LABC is the sensory extension of the musculocutaneous nerve.
   ii. Axillary

d. Patterns of Normal Motor NCS
   i. Median, motor fibers from C8 and T1
   ii. Ulnar, motor fibers from C8 and T1
   iii. Supraspinatus/Infraspinatus

e. Patterns of F-waves of the median and ulnar nerves would normal

f. Patterns of Abnormal Needle EMG
   i. Muscles affected are deltoid, biceps and brachioradialis,
   ii. Muscles partially affected are the pronator teres (C6-7) and triceps (C6-C7-C8)

g. Patterns of Normal Needle EMG
   i. Supraspinatus and Infraspinatus
   ii. Additional muscles from other segments

3. Middle trunk
   a. Patterns of Abnormal Sensory NCS
      i. Median nerve to Digit III
      ii. Radial
         1. may or may not be abnormal because some fibers come from the upper trunk

   b. Patterns of Normal Sensory NCS
      i. Median to digit I and digit II
      ii. Ulnar
      iii. Lateral antebrachial cutaneous
      iv. Medial antebrachial cutaneous

   c. Patterns of Abnormal Motor NCS
      i. All motor NCS should be normal

d. Patterns of Normal Motor NCS
   i. All motor NCS should be normal

   e. Patterns of F-waves of the median and ulnar nerves would normal

f. Patterns of Abnormal Needle EMG
   i. Triceps, flexor carpi radialis, and pronator teres muscles.

g. Patterns of Normal Needle EMG
   i. Additional muscles from other segments

4. Lower trunk
   a. Patterns of Abnormal Sensory NCS
      i. Ulnar
      ii. Medial antebrachial cutaneous

   b. Patterns of Normal Sensory NCS
      i. Median
ii. Radial
iii. Lateral antebrachial cutaneous
c. Patterns of Abnormal Motor NCS
   i. Median (varying degrees)
   ii. Ulnar (varying degrees)
d. Patterns of Normal Motor NCS
   i. Radial, musculocutaneous and axillary
e. Patterns of F-waves of the median and ulnar nerves may have varying degrees of prolonged f-wave latency
f. Patterns of Abnormal Needle EMG
   i. All ulnar nerve innervated muscles (flexor carpi ulnaris, flexor digitorum profundis, lumbrical muscles, opponens digiti minimi, flexor digiti minimi, abductor digiti minimi, interossei, adductor pollicis), in addition to median C8-T1 muscles (abductor pollicis brevis, flexor pollicis longus, flexor digitorum profundus), and radial C8 innervated muscles (extensor indicis proprius and extensor pollicis brevis).
g. Patterns of Normal Needle EMG
   i. Pronator teres, triceps, biceps and C8-T1 paraspinals are normal.

5. Lateral cord
   a. Patterns of Abnormal Sensory NCS
      i. Lateral antebrachial cutaneous
      ii. Median to digit I and digit II
   b. Patterns of Normal Sensory NCS
      i. Radial
      ii. Ulnar
      iii. Medial antebrachial cutaneous
c. Patterns of Abnormal Motor NCS
   i. Musculocutaneous
d. Patterns of Normal Motor NCS
   i. Median, motor fibers from C8 and T1
   ii. Ulnar, motor fibers from C8 and T1
   iii. Axillary (posterior cord)
   iv. Supraspinatus/Infraspinatus
e. Patterns of F-waves of the median and ulnar nerves would normal
f. Patterns of Abnormal Needle EMG
   i. Pronator teres, flexor carpi radialis, and biceps
g. Patterns of Normal Needle EMG
   i. Additional muscles from other segments

6. Posterior cord
   a. Patterns of Abnormal Sensory NCS
      i. Radial
   b. Patterns of Normal Sensory NCS
      i. Median
      ii. Ulnar
      iii. Lateral antebrachial cutaneous
      iv. Medial antebrachial cutaneous
c. Patterns of Abnormal Motor NCS
   i. Radial

d. Patterns of Normal Motor NCS
   i. Median
   ii. Ulnar

e. Patterns of F-waves of the median and ulnar nerves would normal

f. Patterns of Abnormal Needle EMG
   i. Deltoid, triceps, brachioradialis, extensor carpi radialis longus, extensor indicis proprius, and other radial innervated muscles

g. Patterns of Normal Needle EMG
   i. Additional muscles from other segments

7. Medial cord before the medial antebrachial cutaneous nerve exits
   a. Patterns of Abnormal Sensory NCS
      i. Ulnar
      ii. Medial antebrachial cutaneous
   b. Patterns of Normal Sensory NCS
      i. Median
      ii. Radial
      iii. Lateral antebrachial cutaneous
   c. Patterns of Abnormal Motor NCS
      i. Median (varying degrees)
      ii. Ulnar (varying degrees)
   d. Patterns of Normal Motor NCS
      i. Radial, musculocutaneous and axillary
   e. Patterns of F-waves of the median and ulnar nerves may have varying degrees of prolonged f-wave latency

f. Patterns of Abnormal Needle EMG
   i. Ulnar and median nerve innervated muscles

g. Patterns of Normal Needle EMG
   i. C8 radial innervated muscles are preserved

8. Medial cord after the medial antebrachial cutaneous nerve exits
   a. Patterns of Abnormal Sensory NCS
      i. Ulnar
   b. Patterns of Normal Sensory NCS
      i. Medial antebrachial cutaneous
      ii. Median
      iii. Radial
      iv. Lateral antebrachial cutaneous
   c. Patterns of Abnormal Motor NCS
      i. Median (varying degrees)
      ii. Ulnar (varying degrees)
   d. Patterns of Normal Motor NCS
      i. Radial, musculocutaneous and axillary
   e. Patterns of F-waves of the median and ulnar nerves may have varying degrees of prolonged f-wave latency
f. Patterns of Abnormal Needle EMG
   i. Ulnar and median nerve innervated muscles

g. Patterns of Normal Needle EMG
   i. C8 radial innervated muscles are preserved

Case Studies:

Case 1

For your convenience values outside the normal range are **bolded**. Normal values for this age are stated below the tables.

History: 20 year-old-man with a gunshot wound to the anterior neck and right shoulder. There is weakness of the biceps, deltoid and brachioradialis

Temperatures: Right arm: 33.5°C
               Left arm: 34 °C

Motor Nerve Conduction:

<table>
<thead>
<tr>
<th>Nerve and Site</th>
<th>Segment</th>
<th>Distance</th>
<th>Latency</th>
<th>Amplitude</th>
<th>Conduction Velocity</th>
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<tbody>
<tr>
<td><strong>Right Median</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wrist</td>
<td>Abductor pollicis brevis-Wrist</td>
<td>60 mm</td>
<td>3.2 ms</td>
<td>10.35 mV</td>
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<tr>
<td>Elbow</td>
<td>Wrist-Elbow</td>
<td>265 mm</td>
<td>7.8 ms</td>
<td>9.57 mV</td>
<td>57.6 m/s</td>
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<td><strong>Right Ulnar</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Wrist</td>
<td>ADM-Wrist</td>
<td>60 mm</td>
<td>2.4 ms</td>
<td>10.90 mV</td>
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<tr>
<td>Below elbow</td>
<td>Wrist-Below elbow</td>
<td>240 mm</td>
<td>6.4 ms</td>
<td>9.78 mV</td>
<td>60.0 m/s</td>
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<tr>
<td>Above elbow</td>
<td>Below elbow-Above elbow</td>
<td>125 mm</td>
<td>8.3 ms</td>
<td>9.74 mV</td>
<td>65.7 m/s</td>
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<td><strong>Right Musculocutaneous</strong></td>
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<tr>
<td>Supraclavicular</td>
<td></td>
<td>4.9 ms</td>
<td>1.29 mV</td>
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<td><strong>Left Musculocutaneous</strong></td>
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<tr>
<td>Supraclavicular</td>
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<td>4.9 ms</td>
<td>7.79 mV</td>
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<td><strong>Right Axillary</strong></td>
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<tr>
<td>Supraclavicular</td>
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<td>4.3 ms</td>
<td>0.78 mV</td>
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<td><strong>Left Axillary</strong></td>
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<tr>
<td>Supraclavicular</td>
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<td>3.9 ms</td>
<td>5.44 mV</td>
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Sensory Nerve Conduction:

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<th>Nerve and Site</th>
<th>Segment</th>
<th>Distance</th>
<th>Amplitude</th>
<th>Peak Latency</th>
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</thead>
<tbody>
<tr>
<td><strong>Right Median</strong></td>
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<tr>
<td>Digit II (index finger)</td>
<td>Wrist-Digit II (index finger)</td>
<td>130 mm</td>
<td>39.9 μV</td>
<td>2.7 ms</td>
</tr>
<tr>
<td><strong>Right Ulnar</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Digit V (little finger)</td>
<td>Wrist-Digit V (little finger)</td>
<td>110 mm</td>
<td>23.9 μV</td>
<td>2.0 ms</td>
</tr>
<tr>
<td><strong>Right Radial</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forearm</td>
<td>Anatomical snuff box-Forearm</td>
<td>100 mm</td>
<td>31.8 μV</td>
<td>1.9 ms</td>
</tr>
<tr>
<td><strong>Right Lateral antebrachial cutaneous</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elbow</td>
<td>Forearm-Elbow</td>
<td>100 mm</td>
<td>14.2 μV</td>
<td>2.3 ms</td>
</tr>
<tr>
<td><strong>Left Lateral antebrachial cutaneous</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elbow</td>
<td>Forearm-Elbow</td>
<td>100 mm</td>
<td>38.9 μV</td>
<td>1.9 ms</td>
</tr>
</tbody>
</table>
Normal values:
Median MNC DML: ≤ 4.2, Amp: ≥ 4, CV ≥ 49
Median SNC Peak Lat: ≤ 3.2, Amp: ≥ 12
Ulnar MNC DML: ≤ 3.8, Amp: ≥ 6, CV ≥ 49,
CV across elbow may slow ≤ 10
Ulnar SNC Peak Lat: ≤ 2.8, Amp: ≥ 10
LABC SNC Peak Lat: ≤ 2.7, Amp: ≥ 12

Musculocutaneous: Side-to-side comparison
Axillary: Side-to-side comparison

Needle highlights: the supraspinatus, deltoid and biceps were abnormal while the rhomboids, serratus anterior and cervical paraspinals were normal.

Discussion: the median to the index finger and the radial sensory nerves conduction studies were normal presumably due to more C7/middle trunk influence. If we had been successful recording a side-to-side MNC difference of the suprascapular over the supraspinatus we may have localized even better, but in this case the needle examination did this for us. The involvement of the supraspinatus on needle examination suggests a proximal lesion before the suprascapular nerve branch is given off. The sparing of the rhomboid and serratus anterior muscles with normal paraspinal exam indicates that there is no involvement of the C5/C6 spinal nerve roots.

**Case 2**

For your convenience values outside the normal range are **bolded**. Normal values for this age are stated below the tables.

History: This is an 18 year-old man was a victim of a gunshot wound to the left shoulder about 3 weeks ago. There is weakness in median and ulnar innervated muscles, but extensor muscles in the forearm are spared.

Temperatures: Right arm: 33°C
Left arm: 32.5°C
### Motor Nerve Conduction:

<table>
<thead>
<tr>
<th>Nerve and Site</th>
<th>Segment</th>
<th>Distance</th>
<th>Latency</th>
<th>Amplitude</th>
<th>Conduction Velocity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Left Median</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left Median</td>
<td>Rec: APB</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wrist</td>
<td>Abductor pollicis brevis-Wrist</td>
<td>60</td>
<td>NR</td>
<td>NR</td>
<td></td>
</tr>
<tr>
<td><strong>Left Ulnar</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left Ulnar</td>
<td>Rec: ADM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wrist</td>
<td>ADM-Wrist</td>
<td>60</td>
<td>3.9 ms</td>
<td>0.10 mV</td>
<td></td>
</tr>
<tr>
<td>Below elbow</td>
<td>Wrist-Below elbow</td>
<td>240</td>
<td>7.9 ms</td>
<td>0.08 mV</td>
<td>54.4 m/s</td>
</tr>
<tr>
<td>Above elbow</td>
<td>Below elbow-Above elbow</td>
<td>125</td>
<td>10.0 ms</td>
<td>0.07 mV</td>
<td>47.6 m/s</td>
</tr>
<tr>
<td><strong>Left Radial</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left Radial</td>
<td>Rec: EIP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forearm</td>
<td>Extensor indicis proprius-Forearm</td>
<td>100</td>
<td>2.7 ms</td>
<td>7.91 mV</td>
<td></td>
</tr>
<tr>
<td>Lateral brachium</td>
<td>Forearm-Lateral brachium</td>
<td>95</td>
<td>4.4 ms</td>
<td>7.93 mV</td>
<td>55.8 m/s</td>
</tr>
<tr>
<td>Spiral groove</td>
<td>Lateral brachium-Spiral groove</td>
<td>120</td>
<td>6.0 ms</td>
<td>7.88 mV</td>
<td>73.1 m/s</td>
</tr>
<tr>
<td><strong>Right Median</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right Median</td>
<td>Rec: APB</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wrist</td>
<td>Abductor pollicis brevis-Wrist</td>
<td>60</td>
<td>3.6 ms</td>
<td>8.49 mV</td>
<td></td>
</tr>
<tr>
<td>Elbow</td>
<td>Wrist-Elbow</td>
<td>245</td>
<td>8.2 ms</td>
<td>8.37 mV</td>
<td>53.2 m/s</td>
</tr>
<tr>
<td><strong>Right Ulnar</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right Ulnar</td>
<td>Rec: ADM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wrist</td>
<td>ADM-Wrist</td>
<td>60</td>
<td>2.8 ms</td>
<td>7.45 mV</td>
<td></td>
</tr>
<tr>
<td>Below elbow</td>
<td>Wrist-Below elbow</td>
<td>213</td>
<td>6.1 ms</td>
<td>7.40 mV</td>
<td>64.5 m/s</td>
</tr>
<tr>
<td>Above elbow</td>
<td>Below elbow-Above elbow</td>
<td>100</td>
<td>7.6 ms</td>
<td>7.37 mV</td>
<td>66.6 m/s</td>
</tr>
<tr>
<td><strong>Right Radial</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right Radial</td>
<td>Rec: EIP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forearm</td>
<td>Extensor indicis proprius-Forearm</td>
<td>100</td>
<td>2.5 ms</td>
<td>8.21 mV</td>
<td></td>
</tr>
</tbody>
</table>

### Sensory Nerve Conduction:

<table>
<thead>
<tr>
<th>Nerve and Site</th>
<th>Segment</th>
<th>Distance</th>
<th>Amplitude</th>
<th>Peak Latency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Left Median</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left Median</td>
<td>Rec: Wrist</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digit II (index finger)</td>
<td>Wrist-Digit II (index finger)</td>
<td>130</td>
<td>13.5 μV</td>
<td>3.2 ms</td>
</tr>
<tr>
<td><strong>Left Ulnar</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left Ulnar</td>
<td>Rec: Snuffbox</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digit V (little finger)</td>
<td>Wrist-Digit V (little finger)</td>
<td>110</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td><strong>Left Radial</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left Radial</td>
<td>Rec: Snuffbox</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forearm</td>
<td>Anatomical snuff box-Forearm</td>
<td>100</td>
<td>23.5 μV</td>
<td>2.2 ms</td>
</tr>
<tr>
<td><strong>Right Radial</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right Radial</td>
<td>Rec: Snuffbox</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forearm</td>
<td>Anatomical snuff box-Forearm</td>
<td>100</td>
<td>30.8 μV</td>
<td>2.1 ms</td>
</tr>
<tr>
<td><strong>Left Lateral antebrachial cutaneous</strong></td>
<td>Rec: Forearm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left Lateral antebrachial cutaneous</td>
<td>Rec: Forearm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elbow</td>
<td>Forearm-Elbow</td>
<td>100</td>
<td>12.5 μV</td>
<td>2.2 ms</td>
</tr>
<tr>
<td><strong>Right Lateral antebrachial cutaneous</strong></td>
<td>Rec: Forearm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right Lateral antebrachial cutaneous</td>
<td>Rec: Forearm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elbow</td>
<td>Forearm-Elbow</td>
<td>100</td>
<td>14.4 μV</td>
<td>2.2 ms</td>
</tr>
<tr>
<td><strong>Left Medial antebrachial cutaneous</strong></td>
<td>Rec: Forearm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left Medial antebrachial cutaneous</td>
<td>Rec: Forearm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elbow</td>
<td>Forearm-Elbow</td>
<td>100</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td><strong>Right Medial antebrachial cutaneous</strong></td>
<td>Rec: Forearm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right Medial antebrachial cutaneous</td>
<td>Rec: Forearm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elbow</td>
<td>Forearm-Elbow</td>
<td>100</td>
<td>20.4 μV</td>
<td>2.1 ms</td>
</tr>
<tr>
<td><strong>Right Median</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right Median</td>
<td>Rec: Wrist</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digit II (index finger)</td>
<td>Wrist-Digit II (index finger)</td>
<td>130</td>
<td>15.7 μV</td>
<td>3.0 ms</td>
</tr>
<tr>
<td><strong>Right Ulnar</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right Ulnar</td>
<td>Rec: Wrist</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digit V (little finger)</td>
<td>Wrist-Digit V (little finger)</td>
<td>110</td>
<td>10.2 μV</td>
<td>2.5 ms</td>
</tr>
</tbody>
</table>

Normal values:
- Median MNC DML: ≤ 4.2, Amp: ≥ 4, CV ≥ 49
- Ulnar MNC DML: ≤ 3.8, Amp: ≥ 6, CV ≥ 49,
  CV across elbow may slow ≤ 10
- Radial MNC: Side-to-side comparison
  Median SNC Peak Lat: ≤ 3.2, Amp: ≥ 12
  Ulnar SNC Peak Lat: ≤ 2.8, Amp: ≥ 10
  LABC SNC Peak Lat: ≤ 2.7, Amp: ≥ 12
  Radial SNC Peak Lat: ≤ 2.7, Amp: ≥ 15
  MABC SNC Peak Lat: ≤ 2.7, Amp: ≥ 10
Needle highlights: Median (excluding C7 innervated) and ulnar innervated muscles are abnormal. Radial innervated EIP muscle is normal.

Discussion: Anytime you see an affected median MNC, but spared median SNC consider a lower trunk or medial cord plexopathy (or profound C8/T1 radiculopathy). This is a medial cord injury before the MABC exits. The radial MNC and needle examination exclude the lower trunk and are our keys to localization.

Roots  Trunks  Cords  Branches/Nerves

C5  
C6  Upper  Lateral  Musculocutaneous
C7  Middle  Posterior
C8  Lower  Medial  Ulnar
T1

*Case 3*

For your convenience values outside the normal range are **bolded**. Normal values for this age are stated below the tables.

History: This is a 68 year-old underwent a series of radiation treatments for breast cancer now has spotty right arm weakness.

Temperatures:  
Right arm: 32°C  
Left arm: 33°C

**Motor Nerve Conduction:**

<table>
<thead>
<tr>
<th>Nerve and Site</th>
<th>Segment</th>
<th>Distance</th>
<th>Latency</th>
<th>Amplitude</th>
<th>Conduction Velocity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Right Median</strong></td>
<td>Rec: APB</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wrist</td>
<td>Abductor pollicis brevis-Wrist</td>
<td>60 mm</td>
<td>3.7 ms</td>
<td>7.35 mV</td>
<td></td>
</tr>
<tr>
<td>Elbow</td>
<td>Wrist-Elbow</td>
<td>225 mm</td>
<td>8.1 ms</td>
<td>6.57 mV</td>
<td>51.1 m/s</td>
</tr>
<tr>
<td><strong>Right Ulnar</strong></td>
<td>Rec: ADM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wrist</td>
<td>ADM-Wrist</td>
<td>60 mm</td>
<td>2.9 ms</td>
<td>9.98 mV</td>
<td></td>
</tr>
<tr>
<td>Below elbow</td>
<td>Wrist-Below elbow</td>
<td>210 mm</td>
<td>6.7 ms</td>
<td>8.72 mV</td>
<td>55.3 m/s</td>
</tr>
<tr>
<td>Above elbow</td>
<td>Below elbow-Above elbow</td>
<td>100 mm</td>
<td>8.8 ms</td>
<td>8.70 mV</td>
<td>52.6 m/s</td>
</tr>
</tbody>
</table>
Right Radial

<table>
<thead>
<tr>
<th>Rec: EIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forearm</td>
</tr>
<tr>
<td>Lateral brachium</td>
</tr>
<tr>
<td>Spiral groove</td>
</tr>
</tbody>
</table>

Left Radial

<table>
<thead>
<tr>
<th>Rec: EIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forearm</td>
</tr>
</tbody>
</table>

Sensory Nerve Conduction:

<table>
<thead>
<tr>
<th>Nerve and Site</th>
<th>Segment</th>
<th>Distance</th>
<th>Amplitude</th>
<th>Peak Latency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right Median</td>
<td>Rec: Wrist</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digit I (thumb)</td>
<td>Wrist-Digit I (thumb)</td>
<td>130 mm</td>
<td>18.3 μV</td>
<td>2.9 ms</td>
</tr>
<tr>
<td>Digit II (index finger)</td>
<td>Wrist-Digit II (index finger)</td>
<td>130 mm</td>
<td>21.7 μV</td>
<td>2.7 ms</td>
</tr>
<tr>
<td>Digit III (long finger)</td>
<td>Wrist-Digit III (long finger)</td>
<td>130 mm</td>
<td>4.6 μV</td>
<td>3.1 ms</td>
</tr>
<tr>
<td>Right Ulnar</td>
<td>Rec: Wrist</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digit V (little finger)</td>
<td>Wrist-Digit V (little finger)</td>
<td>110 mm</td>
<td>20.4 μV</td>
<td>2.6 ms</td>
</tr>
<tr>
<td>Right Radial</td>
<td>Rec: Snuffbox</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forearm</td>
<td>Anatomical snuff box-Forearm</td>
<td>100 mm</td>
<td>15.8 μV</td>
<td>2.5 ms</td>
</tr>
<tr>
<td>Left Radial</td>
<td>Rec: Snuffbox</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elbow</td>
<td>Forearm-Elbow</td>
<td>100 mm</td>
<td>17.2 μV</td>
<td>2.3 ms</td>
</tr>
</tbody>
</table>

Normal values:
- Median MNC DML: ≤ 4.2, Amp: ≥ 4, CV ≥ 49
- Ulnar MNC DML: ≤ 3.8, Amp: ≥ 6, CV ≥ 49,
  - CV across elbow may slow ≤ 10
- Radial MNC: Side-to-side comparison
- Median SNC Peak Lat: ≤ 3.2, Amp: ≥ 12
- Ulnar SNC Peak Lat: ≤ 2.8, Amp: ≥ 10
- Radial SNC Peak Lat: ≤ 2.7, Amp: ≥ 15

Needle highlights: Abnormalities are noted in the triceps, flexor carpi radialis and the pronator teres.

Discussion: This is a middle trunk plexopathy. The median sensory fibers to digit I and digit II originate primarily in C6 and upper trunk, but median sensory fibers to the long finger originate in C7 and the middle trunk. Radial sensory fibers arise from C5/C6 and some from C7 (demonstrated by the normal, but not overwhelmingly so, radial SNC, in this case) while radial motor fibers originate in C7 and C8 (EIP is C8 while triceps is C7).
Case 4

For your convenience values outside the normal range are bolded. Normal values for this age are stated below the tables.

History: 27 year-old man was unloading a scissor-lift (heavy equipment) from a flatbed truck when it shifted abruptly and fell on to his left head, neck and body, pinning him between lift and a nearby semi-truck. Evaluate left upper extremity weakness.

Temperatures

**Left arm: 33°C**

### Motor Nerve Conduction:

<table>
<thead>
<tr>
<th>Nerve and Site</th>
<th>Segment</th>
<th>Distance</th>
<th>Latency</th>
<th>Amplitude</th>
<th>Conduction Velocity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Left Median</strong></td>
<td>Rec: APB</td>
<td>Abductor pollicis brevis-Wrist</td>
<td>60 mm</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td><strong>Left Ulnar</strong></td>
<td>Rec: ADM</td>
<td>Wrist</td>
<td>60 mm</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td><strong>Left Radial</strong></td>
<td>Rec: EIP</td>
<td>ADM-Wrist</td>
<td>60 mm</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td><strong>Left Axillary</strong></td>
<td>Rec: Deltoid</td>
<td>EIP-Forearm</td>
<td></td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Supraclavicular fossa</td>
<td>Deltoid- Supraclavicular fossa</td>
<td></td>
<td></td>
<td>NR</td>
<td>NR</td>
</tr>
</tbody>
</table>

### Sensory Nerve Conduction:

<table>
<thead>
<tr>
<th>Nerve and Site</th>
<th>Segment</th>
<th>Distance</th>
<th>Amplitude</th>
<th>Peak Latency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Left Median</strong></td>
<td>Rec: Wrist</td>
<td>Digit II (index finger)</td>
<td>130 mm</td>
<td>13.48 µV</td>
</tr>
<tr>
<td><strong>Left Ulnar</strong></td>
<td>Rec: Wrist</td>
<td>Digit V (little finger)</td>
<td>110 mm</td>
<td>11.22 µV</td>
</tr>
<tr>
<td><strong>Left Radial</strong></td>
<td>Rec: Sniffbox</td>
<td>Anatomical snuff box-Forearm</td>
<td>100 mm</td>
<td>23.73 µV</td>
</tr>
<tr>
<td><strong>Left Lateral antibrachial cutaneous</strong></td>
<td>Rec: Forearm</td>
<td>Forearm</td>
<td>100 mm</td>
<td>14.80 µV</td>
</tr>
<tr>
<td><strong>Left Medial antibrachial cutaneous</strong></td>
<td>Rec: Forearm</td>
<td>Elbow</td>
<td>100 mm</td>
<td>10.77 µV</td>
</tr>
</tbody>
</table>

Normal values:
- Median MNC DML: ≤ 4.2, Amp: ≥ 4, CV ≥ 49
- Ulnar MNC DML: ≤ 3.8, Amp: ≥ 6, CV ≥ 49
- CV across elbow may slow ≤ 10
- Median SNC Peak Lat: ≤ 3.2, Amp: ≥ 12
- Ulnar SNC Peak Lat: ≤ 2.8, Amp: ≥ 10
- LABC SNC Peak Lat: ≤ 2.7, Amp: ≥ 12
- Radial SNC Peak Lat: ≤ 2.7, Amp: ≥ 15
- MABC SNC Peak Lat: ≤ 2.7, Amp: ≥ 10

Needle highlights: Increased insertional activity and abnormal spontaneous activity was seen in all muscles. No volitional activity could be generated in any muscle tested.

Discussion: This is the worst of the worst. Although it is not really a brachial plexus injury, root avulsions show preganglionic findings (normal SNC, abnormal MNC) in a patient that is unable to use his arm at all. This study represents the electrical findings of an acute left C5-8 nerve root avulsions. The
electrical activity indicates no motor sparing in any of the myotomes tested indicating a poor prognosis for spontaneous recovery.

<table>
<thead>
<tr>
<th>Roots</th>
<th>Trunks</th>
<th>Cords</th>
<th>Branches/Nerves</th>
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</thead>
<tbody>
<tr>
<td>C5</td>
<td>Upper</td>
<td>Lateral</td>
<td>Musculocutaneous</td>
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<tr>
<td>C6</td>
<td>Middle</td>
<td>Posterior</td>
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<tr>
<td>C7</td>
<td>Lower</td>
<td>Medial</td>
<td>Radial</td>
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<tr>
<td>C8</td>
<td></td>
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<td>Median</td>
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<tr>
<td>T1</td>
<td></td>
<td></td>
<td>Ulnar</td>
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</tbody>
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Bibliography


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