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# AMA Guides & California Code of Regulations P&S Report Checklist ✓

[L.C. 139.2 (J)-(2)&(3), (k)-(5), 4060(b)(1), 4062 (d)(2), 4068, **4620**, 8 CCR WCAB 10606 & 8 CCR 9785]

## AMA Brachial Plexus Impairments vs. Thoracic Outlet Syndrome

***"Entrapment/compression neuropathies are rated when an objective verifiable diagnosis is present, supported by positive clinical findings and loss of function." -*** AMA Guides, page 493

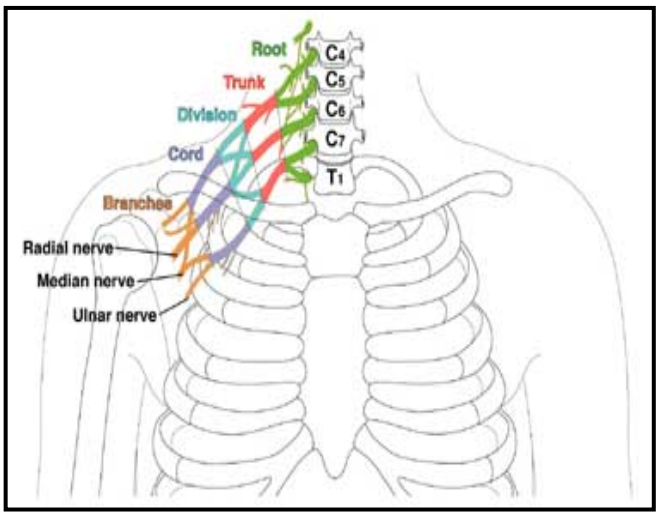
**Q**: ***Without objective clinical findings or symptoms, can a diagnosis of thoracic outlet syndrome, based on one ancillary test, be the only support for an impairment rating using Table 16-14?***

## Principles of Assessment - Upper Limb

http://www.google.com/url?sa=t&ct=res&cd=6&url=http%3A%2F%2Ffaculty.ccri.edu%2Flmfrolich%2FMy%2520lectures%2Fupper%2520limb%2520ppt.ppt&ei=SyVFRbq8M5v2ggPJteG7BA&usg=__3lUWFLKeKMSTgP_yfejMTLK5JJk=&sig2=wDlKMuWrHQLl06EPM0lo8Q

## Peripheral Nerve Disorders: Brachial Plexus

**AMA Guides, page 493: -. Entrapment/compression neuropathies are rated when an objective verifiable diagnosis is present, supported by positive clinical findings and loss of function**

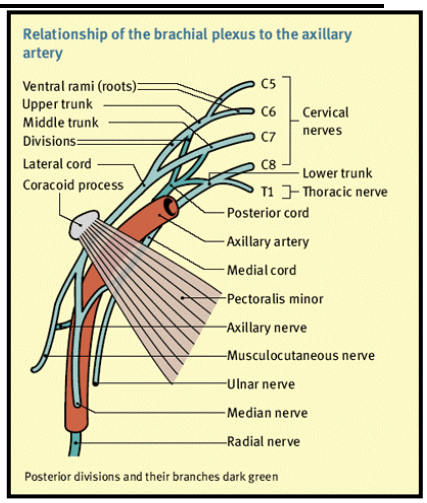



**What is the brachial plexus?**
(See Figure 16-50, AMA Guides, pg. 490.)
The brachial plexus (BRAY-key-el PLEK-sis) is a network of nerves that provides movement and feeling to the shoulder, arm and hand. The nerve fibers (a plexus) runs from the spine, through the neck, the axilla (armpit region) and into the arm. The nerves supporting the arm exit the spinal column high in the neck; those that support the hand and fingers exit lower in the neck. This nerve complex is composed of four cervical **nerve roots** (C5-C8) and the first thoracic **nerve root** (T1). These **roots** combine to form three **trunks**. C5-C6 form the **upper trunk**, C7 continues as the **middle trunk** and C8-T1 form the **lower trunk**. Each trunk splits into a **division**. Half the **divisions** globally supply flexor muscles (that lift and bend the arm). The others supply the extensor muscles (that straighten the arm and bring it down

## How it happens (Etiology)

### Brachial Plexus & Peripheral Nerve Disorder (PND) – AMA Guides, pg. 489

The brachial plexus is a network of nerves that conducts signals from the spine to the shoulder, arm and hand. Brachial plexus injuries are caused by damage to those nerves. The nerves to the arm, hand and fingers exit the spinal cord between the bones (vertebrae) of the neck and travel into the arm below the collarbone (clavicle). The nerves to the arm exit high in the neck; those that go to the hand and fingers exit lower in the neck, just above the chest. These nerves branch and join near where the neck joins the shoulder, in an area called the brachial plexus.




**The common mechanism for these injuries is violent distraction of the entire forequarter from the rest of the body. There are four types of nerve injuries to the brachial plexus:**

1. Avulsion Injuries. The nerve is torn from its attachment to the spinal cord (the most serious).
2. Rupture Injuries. The nerve is torn, but not at the spinal cord.
3. Neuroma Injuries. These injuries result from scar tissue that forms and puts pressure on the nerve.
4. **Stretch Injuries.** These injuries, known as neurapraxia (new-rah-PRAK-see-ah) are the most common. **The nerve is damaged but not torn. Normally, these injuries heal on their own, usually within three months.**

**The position of the arm at the time of injury affects the levels involved.** When the arm is abducted, the force is directed in line with C7. An **upper plexus injury (C5-C6)** usually predominates if the arm is at the side because the first rib acts as a fulcrum to direct the traction forces preferentially in line with the upper plexus [Middle Trunk-C7]. A **lower plexus lesion (C8-T1)** predominates when the arm is raised because the coracoid acts as a fulcrum in a similar fashion. Lower plexus lesions may be more common, in part, because of the well-formed transverse radicular ligaments that help resist traction forces at C5, C6 and C7. C8 and T1 lack these ligaments. *(Brachial Plexus Injuries, Traumatic, Christopher Chaput, MD & Robert Probe, MD)*

**The cardinal signs of brachial plexus avulsions/ruptures are: (1)** A weakness in the arm, (2) Diminished reflexes, (3) Corresponding sensory deficits.

## Symptoms Brachial Plexus

Symptoms may include a limp or paralyzed arm, lack of muscle control in the arm, hand, or wrist, and lack of feeling or sensation in the arm or hand. **Total brachial plexus paralysis is manifested by flail arm, paralysis of all muscles of the hand, and no sensibility.** A lack of spontaneous movements of the affected extremity and differences in reflex responses help to distinguish the type of injury.

**C5-C6 Upper Trunk Nerve Roots:** Upper Trunk Paralysis is known as **Erb-Duchenne Palsy**. The arm hangs in adduction and internal rotation with the elbow in extension and the forearm in pronation.

1. Motor Strength: The biceps, deltoid, brachialis, supraspinatus, infraspinatus and rhomboid muscles are paralyzed; the triceps, pectoralis major and extensor carpi radialis brevis and longus muscles are weak. Most finger movements are intact;
2. Sensory Deficits: Sensory deficit in the C5 and C6 dermatomes is present (AMA guides, Figure 16-49, page 490).
3. Diminished Reflexes: Biceps reflex is absent

**C7 Middle Trunk Nerve Root:** *Injuries are rare, except as a result of intrascalene anesthetic block. Middle Trunk (C7) injuries are often associated with coexisting upper or lower trunk injury.*

**C8-T1 Lower Trunk Nerve Roots:** Lower trunk paralysis is known as Dejerine-Klumpke Palsy.

1. Motor Strength: This is manifested by paralysis of all intrinsic muscles of the hand; weakness of the flexor carpi ulnaris and flexor digitorum profundus of the little finger; Horner syndrome (ptosis, myosis, enophthalmos) if the T1 root is avulsed from the spinal cord.
2. Sensory Deficits: Sensory deficits of the C8 & T1 dermatomes. (AMA guides, Figure 16-49, page 490)
3. Diminished Reflexes: None

## When & How are injuries to the brachial plexus rated?

**A permanent neurologic impairment is any anatomic, physiological or functional abnormality or loss that remains after maximum medical improvement (MMI).** Impairment rating criteria for neurologic impairments include an assessment of the ability to perform activities of daily living. These limitations may involve physical performance (e.g., lifting, finger dexterity). AMA Guides, pg. 306

In order to give an impairment rating, objective, reproducible physical findings or objective abnormalities on needle electrodiagnostic testing have to be present in the clinical examination. Complaints of pain, loss of sensation or loss of strength in the defined pathway of a nerve, without objective evidence of an injury to the peripheral nervous system (PNS), do not receive any impairment. AMA Disability Evaluation, page 482. **All diagnostic tests must be correlated with the clinical history and physical examination, before a diagnosis is reached**. AMA Disability Evaluation, pg. 448.

Evaluating the peripheral nervous system requires documentation of the extent of loss of function due to sensory deficit, pain, or discomfort; loss of muscular strength and control of specific muscles or groups of muscles; and alteration of autonomic nervous system (ANS) control. Documentation of these deficiencies should include descriptions of the abnormal finding on examinations of the spinal root(s), portion of the plexus, and/or peripheral nerve(s) that are involved. The mechanism or cause of the abnormality assists in determining the impairment duration and probable prognosis. Ancillary testing by neuroimaging (CT scans, MRIs, radiographs) and physiologic (EMG, nerve conduction velocity [NCV], and evoked responses tests may assist in reaching conclusions. AMA Guides, pg. 344 & 345

**Table 16-14 provides maximum upper extremity impairment values resulting from unilateral sensory or motor deficits of the brachial plexus, or to *combined* deficits. A brachial plexus-related impairment is determined according to the method described in Section 16.5b.**

If there is partial recovery, individual muscles are graded according to Table 16-11. This value is multiplied by the maximum upper extremity impairment for the nerve innervating the muscle listed in Table 16-15. Results from all the muscles are combined using the Combined Values Chart, p. 604, and the total upper extremity impairment converted to whole person impairment, Table 16-3. Figure 16-47 is a useful diagram that demonstrates the motor innervation of all muscles in the upper extremity by spinal roots, peripheral nerve and anatomical proximal-distal location in the upper extremity.

Tables 16-10 & 16-11 provide the maximum upper extremity impairment due to unilateral sensory or motor deficits of individual spinal roots C5 through T1. Once the sensory deficit or pain is estimated according to Table **16-10** and motor deficit according to **16-11**, these percent deficits in the upper extremity are multiplied by the respective maximum sensory and/or motor impairments of the spinal nerve in question, **Table 16-15**. The sensory and motor impairments are combined for the total upper extremity impairment, which is then converted to whole person impairment.

**In order to receive a permanent impairment, the complaints of pain and loss of sensation have to be consistent, reproducible, and in the defined anatomic pathway of the spinal nerve, brachial plexus or major peripheral nerve that is diseased**. AMA 5th Ed, Impairment Determination Method, pg 481

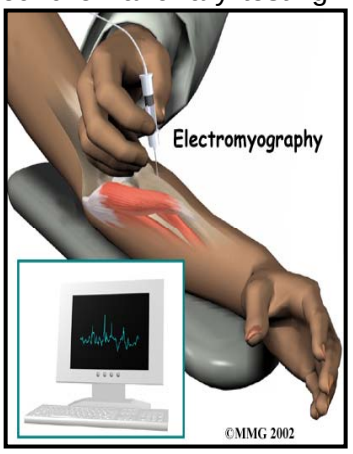
*"The pathology that affects the PNS produces signs and symptoms in the extremities that are specific to the level of area of injury." Only unequivocal and permanent sensory deficits are given permanent impairment ratings. Lesions of an individual nerve produce symptoms and signs in the distribution of the involved nerve." AMA 5th Ed – Section 16.3 pgs 445, 446 & Section 16.5, pg 480 & AMA Disability Evaluation, pg. 481*

## How are injuries to the brachial plexus documented?

## (Neurological Evaluation)

## Description of Clinical Studies, Neurological Tests & Diagnosis

**A detailed neurologic examination enables the physician to identify the location of nervous system impairment. The purpose of ancillary testing is to assess the severity and location of the lesion and confirm the underlying pathology.** It is important to remember that an abnormality found on ancillary testing (anatomic or physiologic) is an impairment but is not necessarily assigned an impairment rating if functions needed for activities of daily living are not affected. The nervous system is able to compensate for a variety of lesions due to its plasticity and redundancy, sometimes resulting in limited representation on the neurologic examination.




Except in the most obvious cases, where motor, sensory and reflex changes are unequivocal, definable and consistent, the task of delineating the presence and extent of a suspected abnormality is heavily dependent on electrodiagnostic procedures. **Electromyography (EMG) and nerve conduction studies (NCS) provide objective evidence of nerve injury. They are used to evaluate the physiologic function of the spinal cord nerve roots and peripheral nerves.** (1) Electromyography demonstrates objective evidence of denervation in conditions affecting motor nerves. (2) Nerve conduction studies reveal abnormalities in conditions causing significant axonal loss or demyelination of the peripheral nerves.

- ✓ **Myelogram:** During a myelogram, a special dye that absorbs X-rays is injected into the spinal fluid. The resulting **X-ray** picture shows whether the spinal nerves are injured at the spinal cord level.
- ✓ **Electromyogram (EMG or electromyography)** This test measures how quickly nerves are carrying electrical signals to the muscles. A thin-needled electrode is inserted into the muscles that appear to be affected by a nerve injury. An instrument records the electrical activity in the muscle at rest and as the muscle moves (contracts).

| Table 5.6 - Clinical Evaluation & Diagnostic Tests For Neuromuscular Disorders (Tulio E. Bertorini, MD) Compression Site and Typical Clinical and Nerve Conduction Features of Common Compression Neuropathies | | | |
|---|---|---|---|
| **Syndrome** | **Entrapment Site** | **Typical Clinical Features** | **Classical EMG/Nerve Conduction Studies Findings** |
| Thoracic Outlet Syndrome (Brachial Plexus) | Thoracic Outlet | Sensory impairment over the ulnar side of the entire arm and hand, motor deficits in the hyper- and hypo-muscles | Prolonged F wave, abnormal ulnar sensory NCS, low median compound muscle action potential, abnormal medial antebrachial NCS |
| **CMAP = compound muscle action potential, EMG = electromyography, NCS = nerve conduction study, NCV = nerve conduction velocity** | | | |

*Quantitative sensory tests* are portable tests, easily conducted in the clinician's office, which provide a quantitative assessment of sensation. These tests can provide information about nerve fibers not examined by nerve conduction studies. . **For Entrapment Neuropathies, 'slowing of conduction' is the chief finding of The Nerve Conduction Studies**. - – AMA Disability Evaluation, page 466

## Conclusion:

In order to give an impairment rating, objective, reproducible physical findings or objective abnormalities on needle electrodiagnostic testing have to be present in the clinical examination. Complaints of pain, loss of sensation or loss of strength in the defined pathway of a nerve, without objective evidence of an injury to the peripheral nervous system (PNS), do not receive any impairment. AMA Disability Evaluation, page 482.

**In order to receive a permanent impairment, the complaints of pain and loss of sensation have to be consistent, reproducible, and in the defined anatomic pathway of the spinal nerve, brachial plexus or major peripheral nerve that is diseased. AMA 5th Ed, Impairment Determination Method, pg 481**

*"The pathology that affects the PNS produces signs and symptoms in the extremities that are specific to the level of area of injury." Only unequivocal and permanent sensory deficits are given permanent impairment ratings. Lesions of an individual nerve produce symptoms and signs in the distribution of the involved nerve. AMA 5th Ed – Section 16.3 pgs 445, 446 & Section 16.5, pg 480 & AMA Disability Evaluation, pg. 481*

1. **Electrodiagnostic tests can be necessary to localize neurologic lesions affecting the peripheral nerves. The simple determination of a diagnosis is not sufficient to assess the level of impairment or disability. Electrodiagnostic Testing is necessary in order to document the degree of neurologic deficit.** AMA Disability Evaluation, pgs .442 - 445. AMA Guides, pg.480.

2. To qualify as a medical legal expert in workers' compensation, the physician must have additional training and experience in workers compensation law so that the physician can apply the compensation law to the facts and medical issues being analyzed. Unless the physician actually applies workers' compensation law [including proper application of the AMA Guides Rating Criteria Standards] so that the opinion has relevance and value regarding proof on the issues, the physician is not acting as a medical-legal expert.

## Bibliography:

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AMA Disability Evaluation, (1st & 2nd Editions) Gunnar BJ Anderson, MD, USA
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# A P&S Report Checklist ✓: Upper Extremities Peripheral Nerve Disorders (PND) Brachial Plexus

To Rate Impairment, Neuropathy needs to be present On The Date Of Examination For The MMI/P&S Report.

**Entrapment/compression neuropathies are rated when an objective verifiable diagnosis is present,** supported by positive clinical findings and loss of function. AMA 5th Ed., 493

| AMA Guides Clinical & Rating Criteria (Substantial Medical Evidence Standards) | Yes ✓ | No ✓ | Reported Medical Findings Med Rpt., pgs. |
|---|---|---|---|
| **Upper Extremities PND:** Upper extremity impairments due to sensory deficits or pain resulting from peripheral nerve disorders are determined according to the grade of severity in diminution or loss of function and the relative maximum upper extremity impairment value of the nerve structure involved, as shown in the classification (a) and procedural (b) steps described in Table 16-10 and the impairment determination method detailed in Section 16.5b. Table 16-10 is to be used for pain that is due to nerve injury or disease that has been documented with objective physical findings and/or Electrodiagnostic abnormalities. AMA 5th Ed, pg 482: | | | |
| 1. **Nerve Conduction Velocity Test** (Nerve Conduction Study) measures how quickly electrical impulses move along a nerve. It is often done at the same time as an electromyogram, in order to exclude or detect muscle disorders. | | | |
| 1.1. Results of Sensory NCS? | | | |
| 1.2. Results of Motor NCS? | | | |
| 1.3. Were motor and sensory latencies, conduction velocities, H reflex & F wave properly evaluated? | | | |
| 1.4. Decreased Amplitudes? | | | |
| 1.5. Has physician tested all the muscles of the upper extremities, tested sensation and reflexes? | | | |
| 2. **Electromyogram (EMG)** is a test that measures the electrical activity of a muscle. It detects any signs of blocking or slowing down of responses to nerve stimulation. The test provides information about the muscle itself and shows how well it receives stimulation from the nerve. A nerve conduction velocity (NCV) test is often done at the same time as an EMG. | | | |
| 2.1. Degree of nerve involvement identified as per the electrodiagnostic studies? | | | |
| 2.2. Do the EMG studies confirm motor function of a specific muscle or group of muscles? AMA 5th Ed, pg 484 | | | |
| 2.3. Does the EMG provide objective evidence to support the symptoms and findings; confirmation of nerve injury? | | | |
| 3. Are symptoms related to PND permanent impairment present? (Weakness, sensory abnormalities and pain.) | | | |
| 4. Has physician established an accurate diagnosis by confirming the presence (absence) of specific pathology and symptoms with the use of appropriate neurological testing? | | | |
| 5. Diagnosis confirmed by electrodiagnostic studies (needle & cutaneous) as well as sensory and motor nerve conduction studies conducted by a Board Certified Neurologist? | | | |
| 6. As per clinical/records history, are prior symptoms and complaints corresponding to the part of the nervous system that is presumed to be affected by the particular vocational injury? | | | |
| 7. Is the contralateral asymptomatic or symptomatic? | | | |
| 8. Have both the Nerve Conduction Studies / EMG tests ruled out other pathologic nerve compression? | | | |
| 8.1. Alternatively, are the studies indicative of non-vocational underlying polyneuropathy? | | | |
| 9. Clinical Neurological Evaluation and ancillary clinical testing have been correlated to the electromyographic studies? (Results from multiple provocative tests reproduce symptoms.) | | | |

## A P&S Report Checklist ✓: Upper Extremities Peripheral Nerve Disorders (PND) Brachial Plexus

| AMA Guides Clinical & Rating Criteria (Substantial Medical Evidence Standards) | Yes ✓ | No ✓ | Reported Medical Findings Med Rpt., pgs. |
|---|---|---|---|
| 9.1. Is the Impairment rating only based on a single diagnostic/ancillary test? | | | |
| 9.2. Evaluating physician explains how the rating was derived? | | | |
| 9.3. List tables, figures used and refers to AMA 5th Ed., page numbers? | | | |
| 10. **LC § 4663 Causation Apportionment -** Physician addresses the probability that 'evoked' responses are the result of a non-vocational disease processes; e.g., due to a disease affecting the spinal cord, degenerative disc disease, motor neuron disease, genetically determined disorders or polyneuropathy. | | | |
| 10.1. Evaluator apportions to pre-existing/predisposing or associated conditions? | | | |
| 10.2. Tumors, compression or irradiation have been also considered as causation? | | | |
| 10.3. Diabetes or Thyroid? | | | |
| 10.4. Congenital cervical rib? | | | |
| 10.5. Impingement from carrying a heavy shoulder bag or bad posture? | | | |
| 10.6. Additional Causes: http://www.thebodyworker.com/thoracicoutletsyndrome.htm | | | |
| **Symptoms Brachial Plexus:** Symptoms may include a limp arm, lack of muscle control in the arm, hand or wrist and lack of feeling or sensation in the arm or hand. Total brachial plexus paralysis is manifested by flail arm, paralysis of all muscles of the hand, and no sensibility. Sudorific function is intact when the lesion is preganglionic. A lack of spontaneous movements of the affected extremity and differences in reflex responses help to distinguish the type of injury. Patient with a brachial plexus injury will usually present with arm internally rotated, abducted and wrist somewhat flexed, depending on level of lesion. Scapular winging is a common problem of all brachial plexus injuries due to impairment of the long thoracic nerve. Phrenic nerve damage can also occur in brachial plexus injury. | | | |
| 11. **Testing Standards**: AMA 5th Ed, pg. 10, 307, 493 & AMA Disability Evaluation page 459 Are any of the following findings for individual with Brachial Plexus injuries present: | | | |
| 11.1. Arm Internally Rotated, abducted? | | | |
| 11.2. Flexed Wrist (Depends on lesion level)? | | | |
| 11.3. Scapular winging (long thoracic nerve damage)? | | | |
| 11.4. Soft Tissue or Joint Contractures? | | | |
| 11.5. Frozen Shoulder? | | | |
| 11.6. Dislocated Shoulder or Elbow? | | | |
| 11.7. Tested Area has met required standards? | | | |
| **C5-C6 Upper Trunk Nerve Roots:** Upper Trunk Paralysis is know as Erb-Duchenne Palsy. | | | |
| 12. Is the arm hanging in adduction and internal rotation with the elbow in extension and the forearm in pronation? | | | |
| 13. **Motor Strength:** The biceps, deltoid, brachialis, supraspinatus, infraspinatus and rhomboid muscles are paralyzed; the triceps, pectoralis major and extensor carpi radialis brevis and longus muscles are weak. Most finger movements are intact. **Muscles To Test:** | | | |
| 13.1. C5 –Supraspinatus, Infraspinatus, Shoulder Abduction (Deltoid), Elbow Flexion (Biceps)? | | | |
| 13.2. C6 – Elbow Flexion (Biceps), supinator, wrist extensors? | | | |
| 13.3. C7 – Elbow Extension (Triceps), wrist flexors? | | | |

## A P&S Report Checklist ✓: Upper Extremities Peripheral Nerve Disorders (PND) Brachial Plexus

| AMA Guides Clinical & Rating Criteria (Substantial Medical Evidence Standards) | Yes ✓ | No ✓ | Reported Medical Findings Med Rpt., pgs. |
|---|---|---|---|
| 13.4. C8 – Ulnar deviation, thumb extension, finger flexion and abduction? | | | |
| 13.5. T1 medial aspect of the upper arm? | | | |
| 13.6. Does the physician localize and grade the magnitude of the decreased strength for each affected muscle? | | | |
| 13.7. Has physician identified the nerves innervating all the muscle groups examined, describing which are weak and which are not? | | | |
| 14. **Sensory Deficits**: (AMA, Figure 16-49, page 490) Sensory deficit in the C5 and C6 dermatomes is present in: | | | |
| 14.2. C4 Shoulder Tip? | | | |
| 14.3. C5 Deltoid area, anterior aspect of the entire arm to base of thumb? | | | |
| 14.4. C6 Anterior Arm, radial side of the hand to thumb and index finger? | | | |
| 14.5. C7 Lateral Arm & forearm to index, long and ring fingers? | | | |
| 14.6. C8 Little Finger? | | | |
| 14.7. T1 medial aspect of the upper arm? | | | |
| 15. **Reflexes**: | | | |
| 15.1. C5 Biceps (Brachioradialis) | | | |
| 15.2. C6 Biceps (Brachioradialis) | | | |
| 15.3. C7 Triceps | | | |
| 16. **C7 Middle Trunk Nerve Root:** Injuries are rare, except as a result of intrascalene anesthetic block. Middle Trunk (C7) injuries are often associated with coexisting upper or lower trunk injury. | | | |
| **17. C8-T1 Lower Trunk Nerve Roots:** Lower trunk paralysis is known as Dejerine-Klumpke Palsy. | | | |
| 17.1. **Motor Strength:** (Horner syndrome (ptosis, myosis, enophthalmos) if the T1 root is avulsed from the spinal cord.) | | | |
| 17.2. Paralysis of all intrinsic muscles of the hand? | | | |
| 17.3. Loss of opposition of thumb? | | | |
| 17.4. Weakness of the flexor carpi ulnaris and flexor digitorum profundus of the little finger? | | | |
| 17.5. Clawing of fingers 3 & 4: Loss of following finger movements: abduction and adduction of M.P. joints; flexion at M.P. & extension of I.P. joints? | | | |
| 17.6. Loss of abduction & adduction of M.P joints of fingers? | | | |
| 17.7. Thumb - abducted and extended? | | | |
| 17.8. Loss of adduction of thumb? | | | |
| 17.9. Loss of flexion of D.I.P. joints of fingers 4 & 5? | | | |
| 17.10. Very weak flexion of P.I.P.& D.I.P. joints? | | | |
| 18. **Sensory Deficits:** Sensory deficits of the C8 & T1 dermatomes. | | | |
| 18.1. Diminished sensation ulnar and dorsal aspect of palm and of ulnar 1 1/2 digits? | | | |
| 18.2. Thenar branch of Median nerve? | | | |
| 19. Deep branch of Ulnar & Median ? | | | |