BRACHIAL PLEXUS

myelinated noodles

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Learning Objectives

1. Describe the anatomy of the brachial plexus and correlate this with important landmarks.

2. Identify common and important traumatic injuries of the brachial plexus based on their imaging appearance and location.

3. Recognize the imaging features of common and important non-traumatic brachial plexus lesions.
The brachial plexus (BP) is composed of the ventral rami of the C5-T1 spinal nerves which further divide into roots, trunks, divisions, cords, and branches as they course by certain landmarks.

**What is the Brachial Plexus?**

The brachial plexus (BP) is composed of the ventral rami of the C5-T1 spinal nerves which further divide into roots, trunks, divisions, cords, and branches as they course by certain landmarks.

**1.2%**

prevalence of brachial plexus injuries (BPI) among adults and 0.40% among infants

**9 out of 10**

BPIs occur in adult males, most commonly secondary to motor vehicle accidents.

MRI is the imaging modality of choice when it comes to diagnosing BPIs. This modality often supplements electromyography (EMG) and nerve conduction studies. CT myelography is sometimes performed when MRI images are difficult to interpret.
The Brachial Plexus (BP) is commonly divided into roots (C5-T1), trunks, divisions, cords, and branches. A handy mnemonic for this is:

**Radiology Techs Drink Cold Barium (or Beer)**

**Roots Trunks Divisions Cords Branches**
Anatomy of the Brachial Plexus

Typically

C5-T1

NERVE ROOTS

C7 is the lonely one

FORMS THE MIDDLE TRUNK BY ITSELF

C5 and C6 hook up to form the upper trunk

C8 and T1 hook up to form the lower trunk
Anatomy of the Brachial Plexus

C8 and T1 hook up to form the lower trunk

C7 nerve root/middle trunk schwannoma

C7 is the lonely one forms the middle trunk by itself

C5 and C6 hook up to form the upper trunk

C8 and T1 hook up to form the lower trunk

Case: John Doe rID: 30213
The roots/trunks pass through the scalene triangle which is located between the anterior and middle scalene muscles and is a potential site of compression.
Trunks to divisions (video)

It's like the division sign!
Trunks to divisions (video)

It's like the division sign!
Cords on sagittal MRI

- Lateral
- Posterior
- Artery
- Medial

Clavicle
L A P M
Cords of brachial plexus
SCA
SCV
Cords on sagittal MRI (video)

This is one way to remember the names and orientation of the cords of the brachial plexus

- Three pronged cord
- LAMP
- Counterclockwise orientation on standard sagittal MRI
Formation of pseudomeningocele after a traumatic avulsion of the brachial plexus is a well-known entity. CT myelography, conventional MRI, and MR neurography are the imaging modalities of choice to detect nerve discontinuity. On the images, multiple cystic lesions with CSF signal intensity are seen along multiple nerve roots suggesting post-traumatic pseudomeningoceles secondary to nerve root avulsion.

Although pseudomeningoceles are a great marker for avulsion, careful examination of each root is critical to prevent unnecessary operation on that cervical nerve root.
Erb's palsy often involves injury to the union point (Erb point) of C5 and C6 nerve roots thus resulting in denervation of deltoid, biceps brachii, and brachialis muscles.

Klumpke's palsy involves injury to the lower trunk of the brachial plexus, specifically C8 and T1. This lesion affects the median and ulnar nerves manifesting as the characteristic "claw hand".
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Wilhelm Kaiser II, emperor of Germany who played a major role in World War I, is believed to have suffered from Erb's palsy due to birth trauma during breech delivery.
Look at the muscles
then think back
Peripheral nerve sheath tumors in the BP include schwannomas, benign neurofibromas, and malignant peripheral nerve sheath tumors.

The image on the left shows a prominent oval circumscribed lesion in the right supraclavicular fossa contiguous with the distal C6 nerve root, consistent with a peripheral nerve sheath tumor.

Numerous additional neurogenic tumors are seen sporadically along the cervical and thoracic nerves, consistent with neurofibromas in this patient with NF1.

The image above depicts an elongated lesion along the right C7 nerve root and a circumscribed mass more distally in the right brachial plexus. Biopsy confirmed the diagnosis of schwannoma. The patient was suspected to have NF2.
Metastases

The Medial cord is a common site for brachial plexus involvement in Metastatic breast cancer, likely due to its relative proximity to the path of axillary venolymphatic drainage.
Radiation induced plexopathy

Nerves are drawn in rather than pushed away from the area of scarring/radiation
Cervical rib

These can be hard to spot, but important to look for!
Take home points

- The brachial plexus is typically composed of the C5-T1 nerve roots.
- The elements of the brachial plexus include roots, trunks, divisions, cords, and branches.
- The roots/trunks course through the scalene triangle which is in between the anterior and middle scalene muscles.
- Recognize traumatic injuries including avulsion and traction.
- Recognize non-traumatic injuries including nerve sheath tumors, malignancy, and post-treatment changes.
References


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