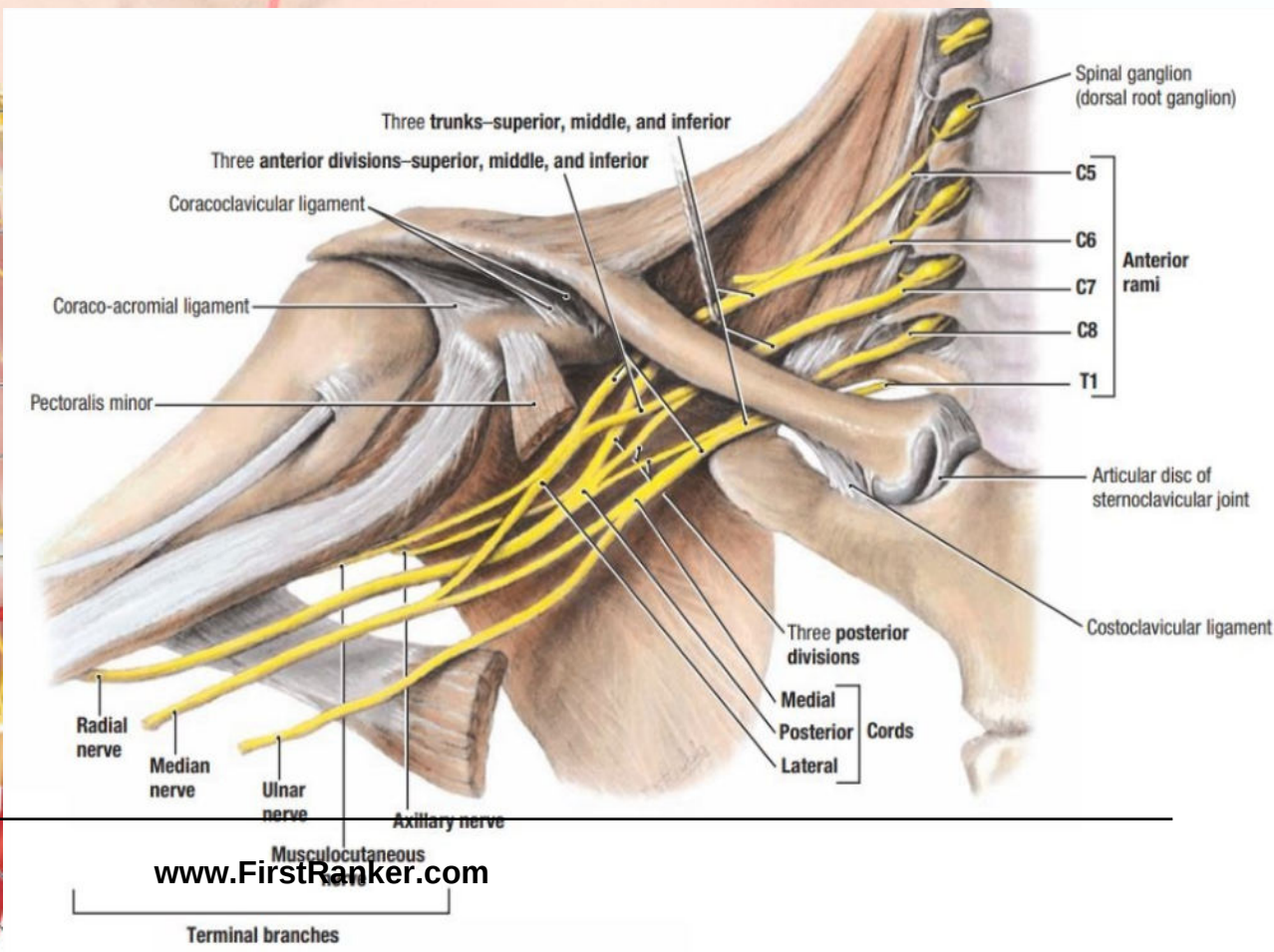
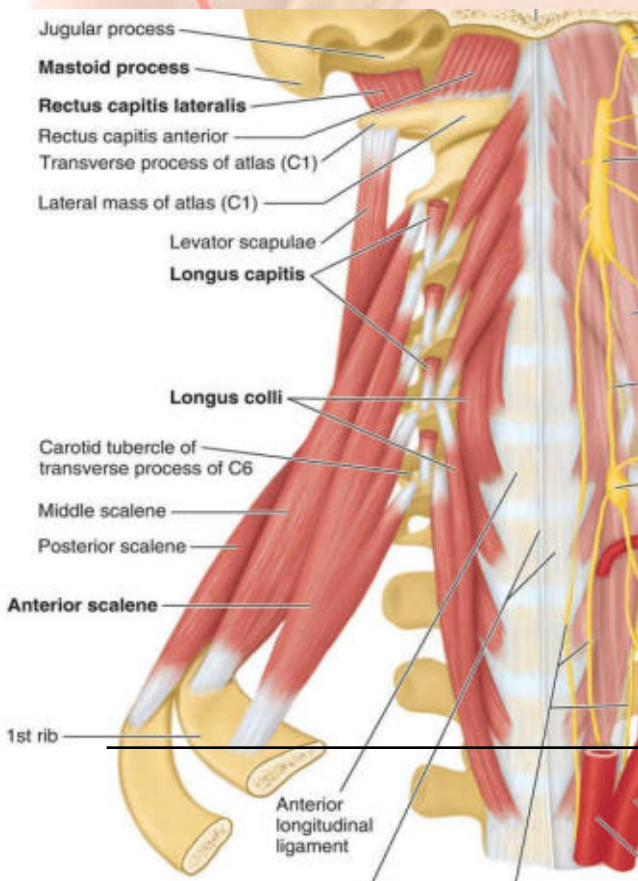


Brachial plexus is a network (plexus) of nerves (formed by the **ventral rami of the lower four cervical nerves and first thoracic nerve (C5, C6, C7, C8, and T1)**).

This **plexus** extends from the spinal cord, through the cervicoaxillary canal in the neck, over the first rib, and into the armpit.

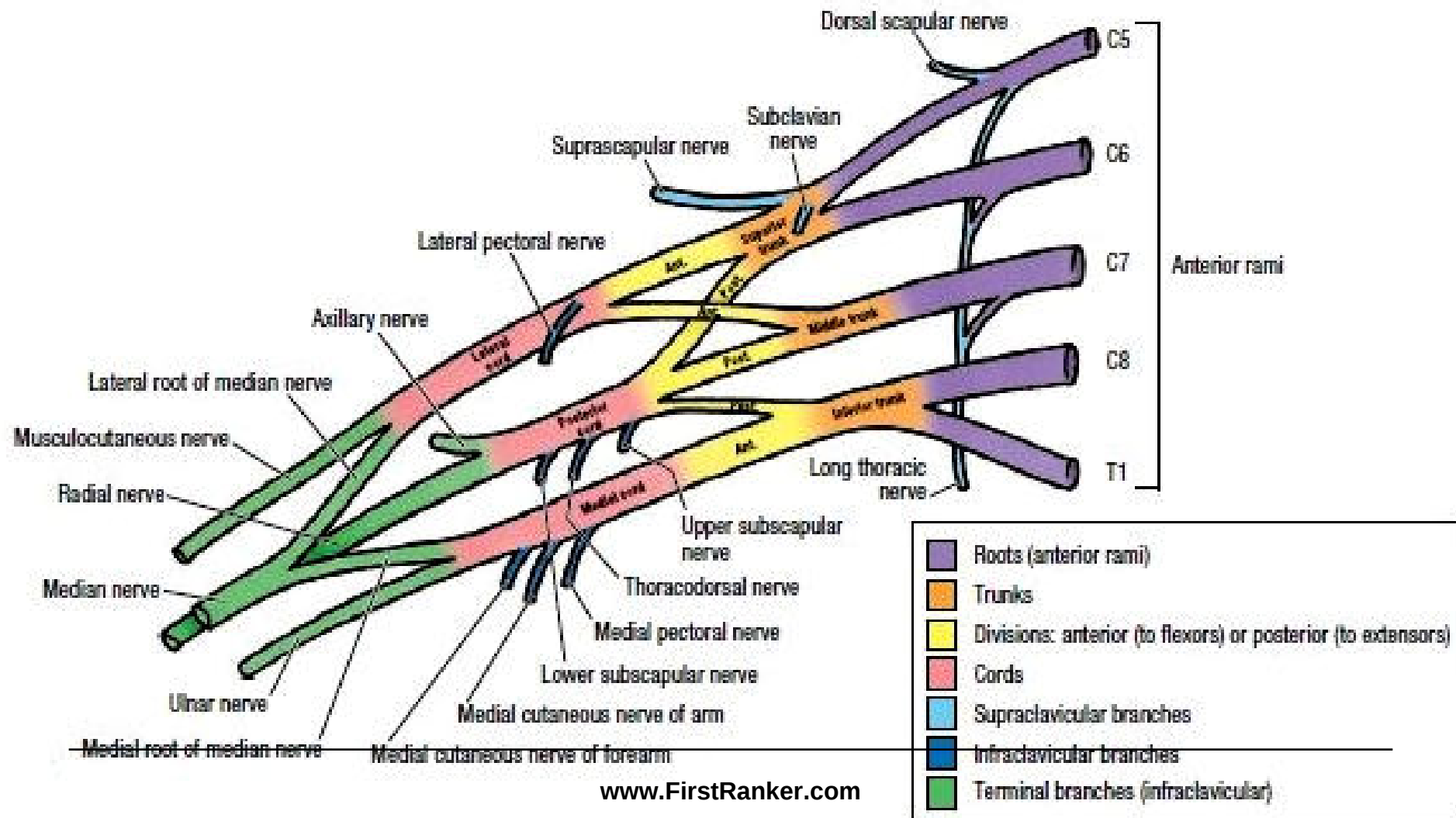


The brachial plexus is divided into 5 parts;

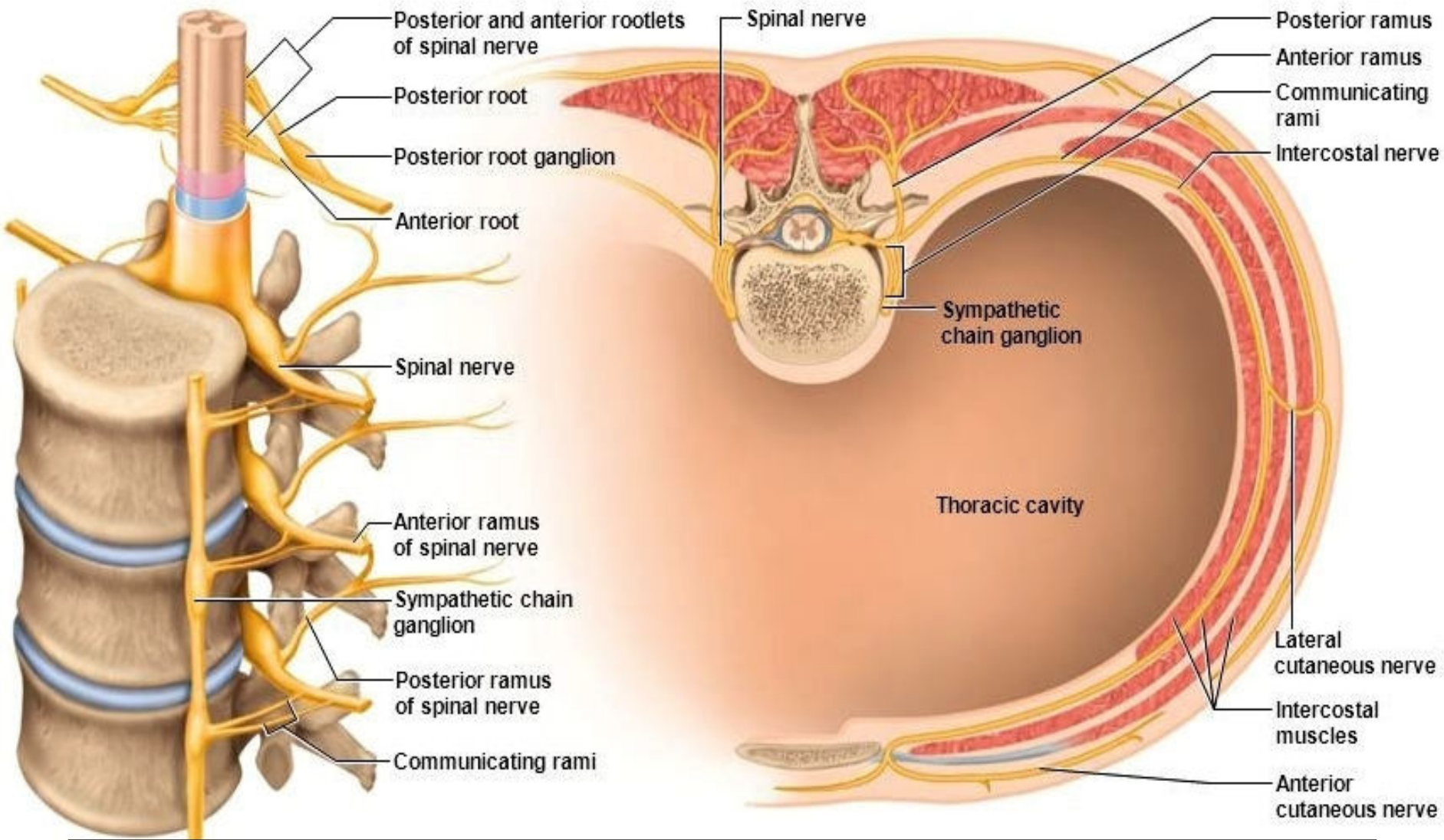
www.FirstRanker.com

Roots – Trunks – Divisions – Cords – Branches

(mnemonic for this is **Rajasthan Tourism Development Corporation**).

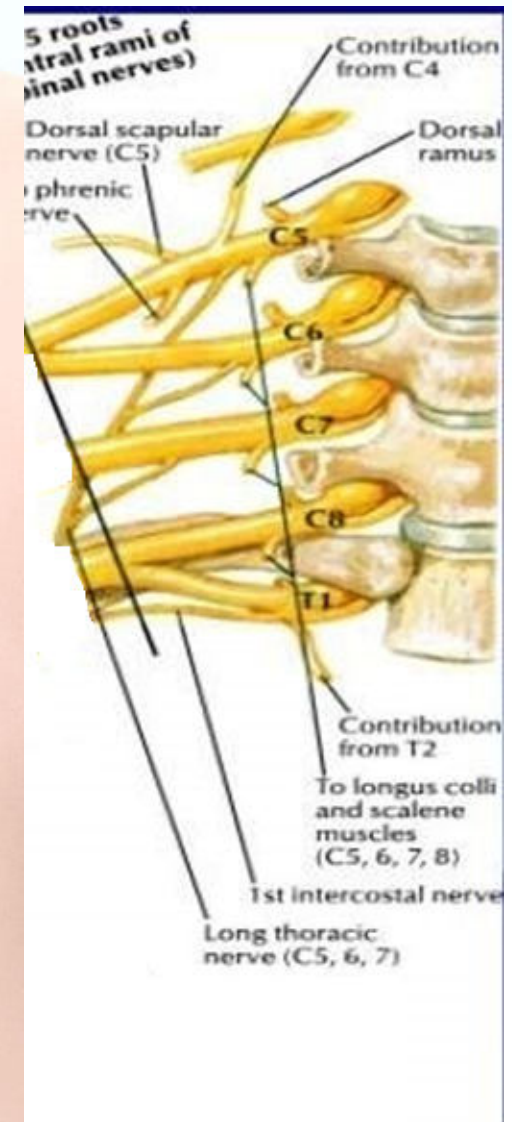


Rami of Spinal Nerves



(a) Anterolateral view

The ventral rami of spinal nerves C5 to T1 are referred to as the "roots" of the plexus. The roots emerge from the transverse processes of the cervical vertebrae immediately posterior to the vertebral artery.



Superior trunk:

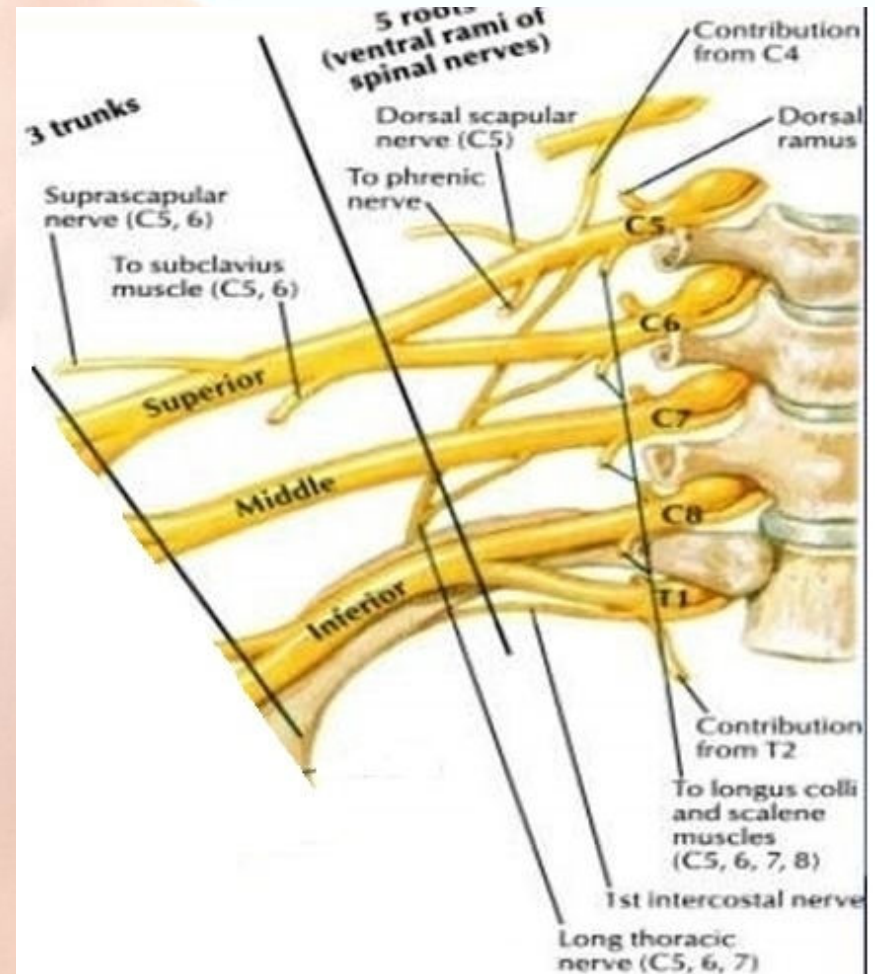
A combination of C5 and C6 roots.

- **Middle trunk:**

A continuation of C7

- **Inferior trunk:**

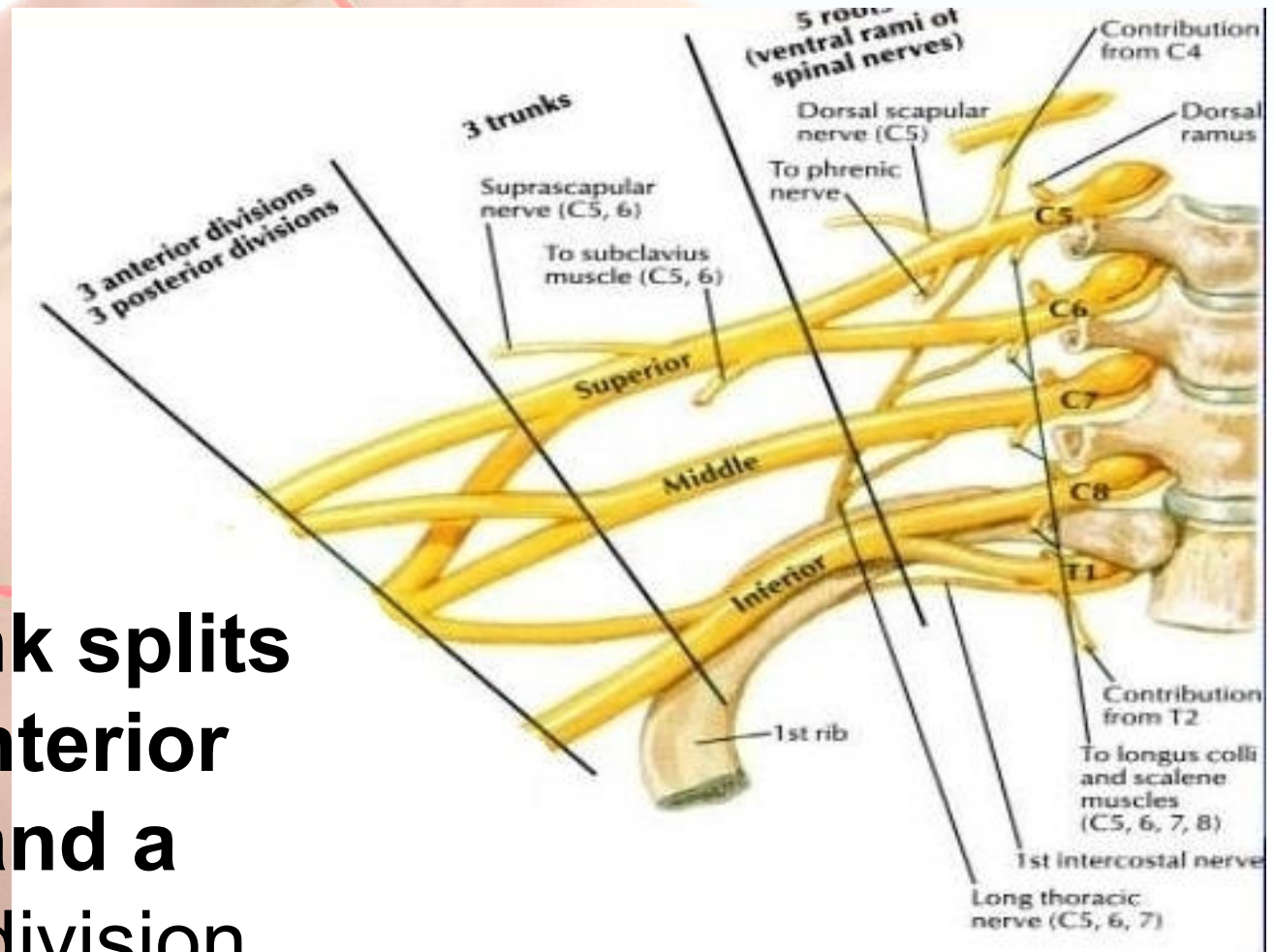
A combination of C8 and T1 roots.



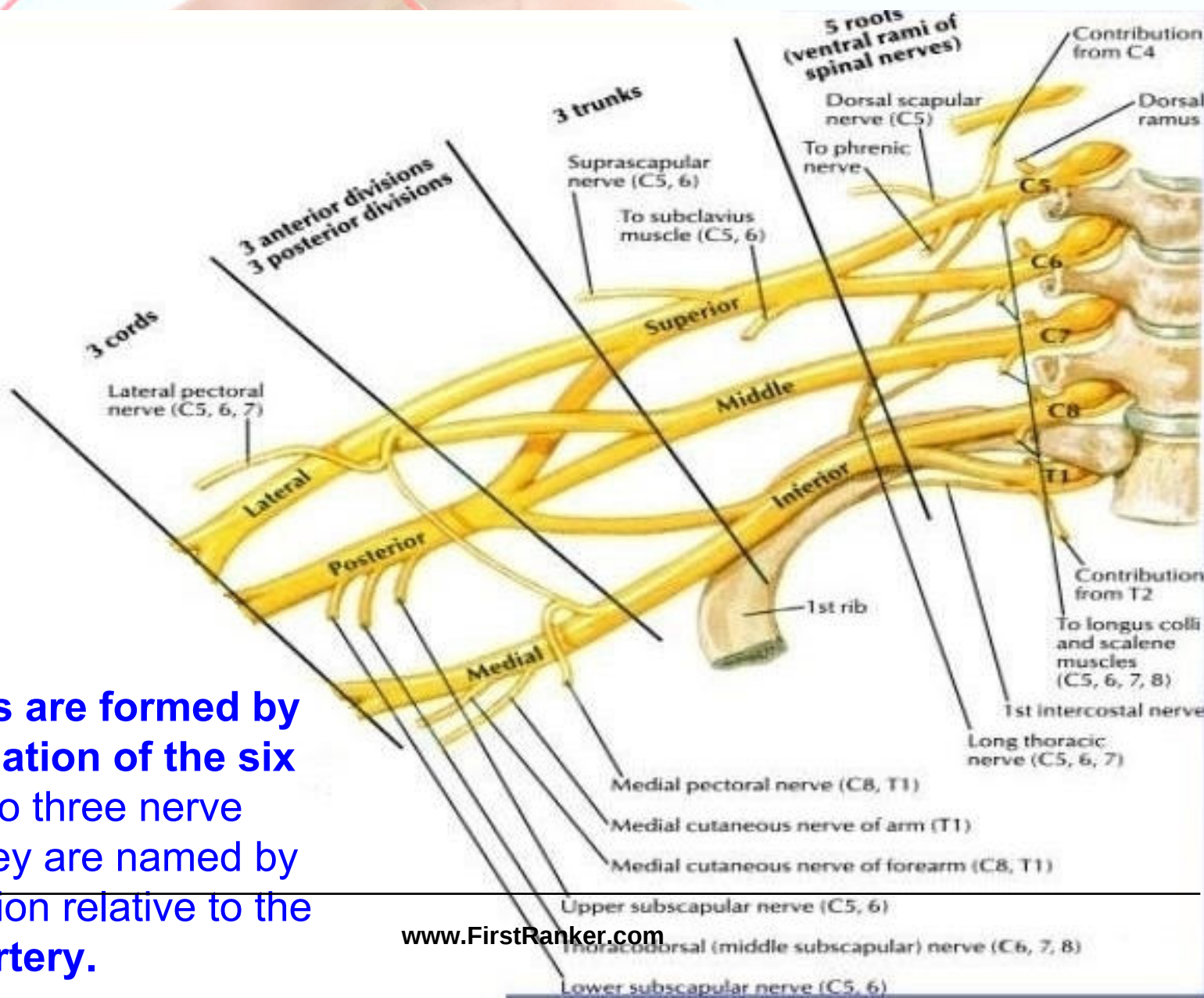
Brachial Plexus ---- Roots, Trunks, Divisions

www.FirstRanker.com

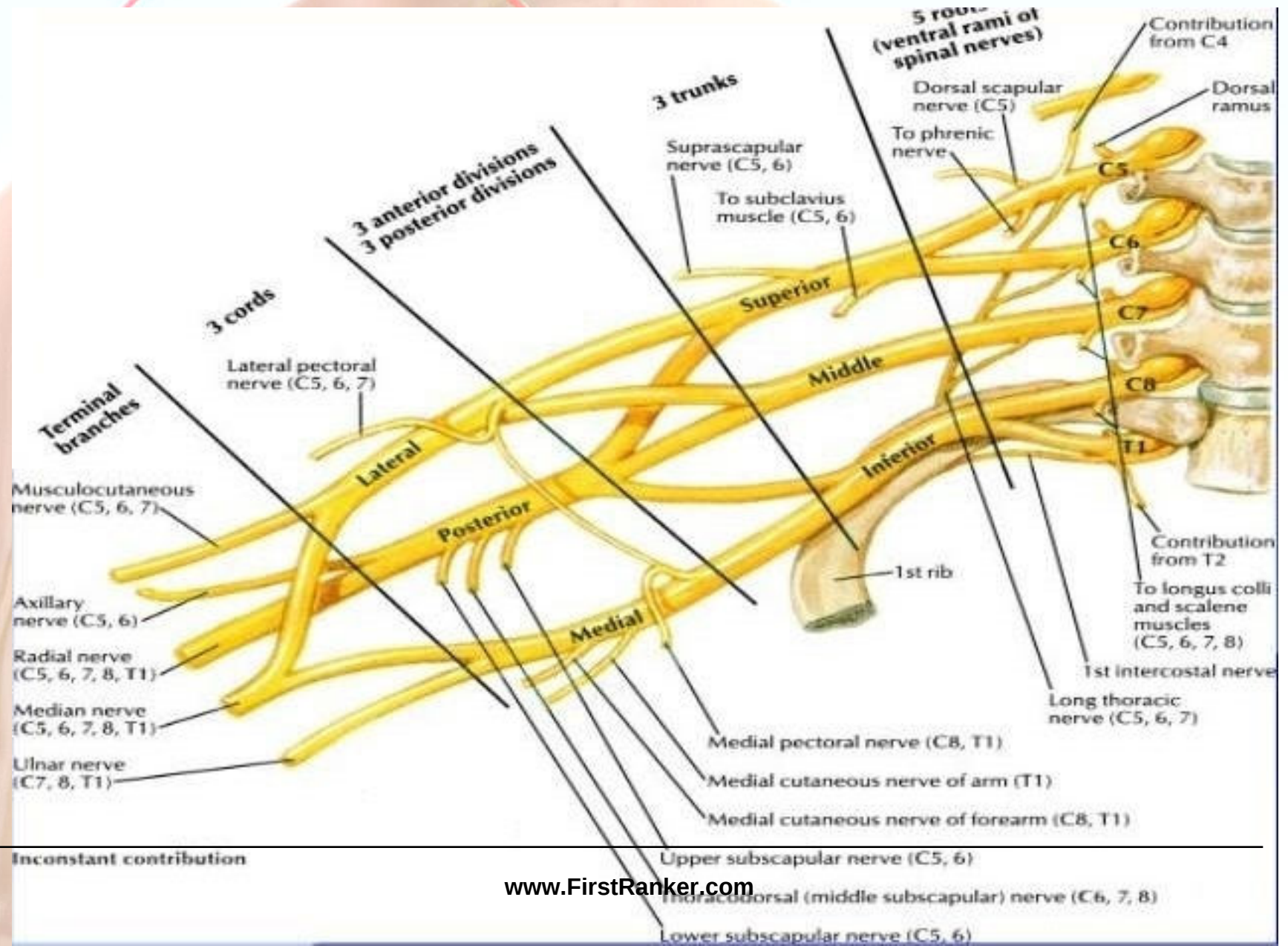
www.FirstRanker.com

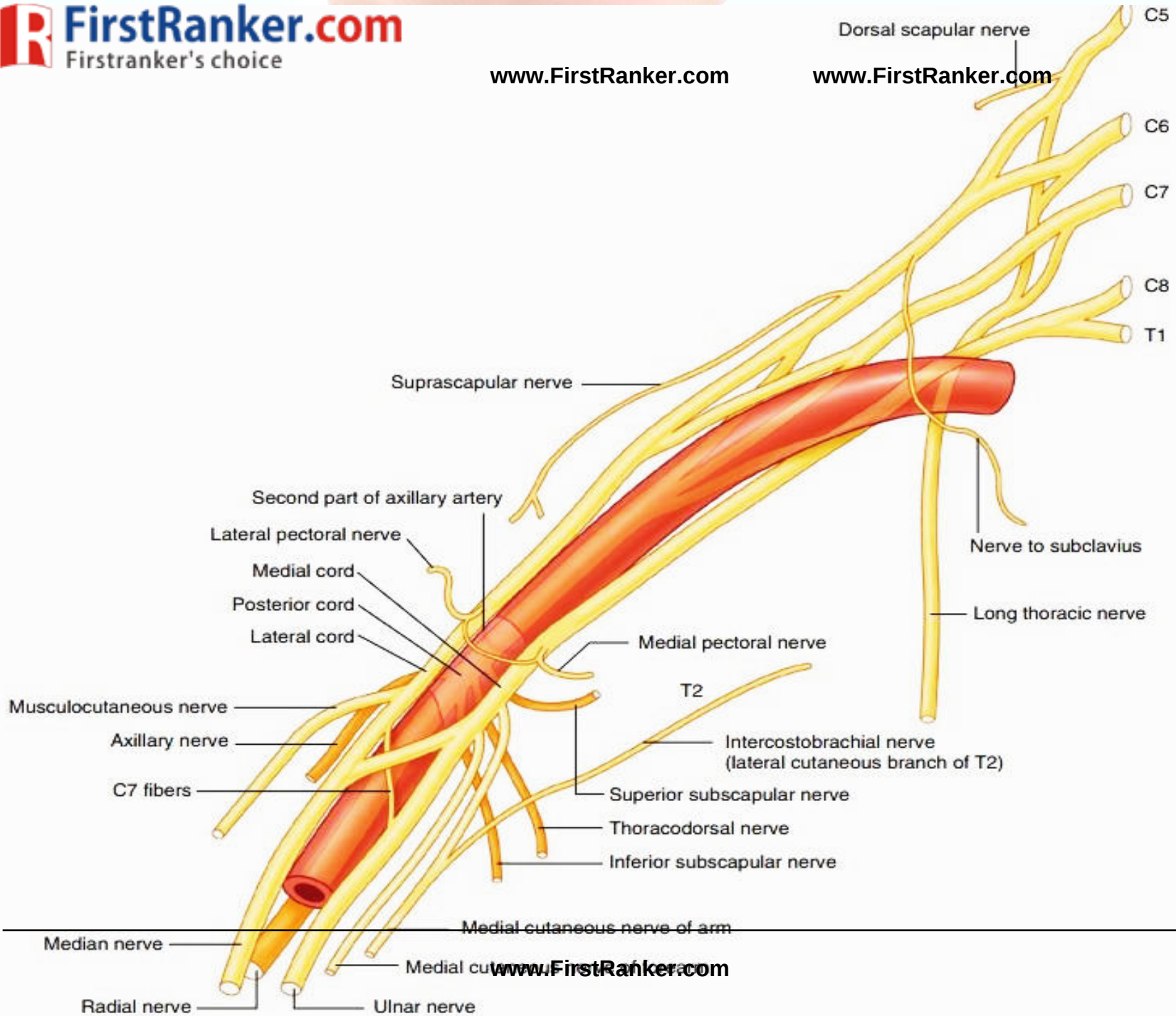


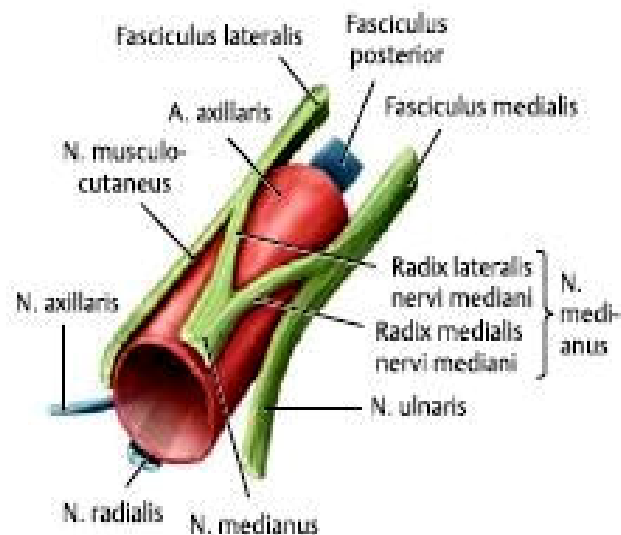
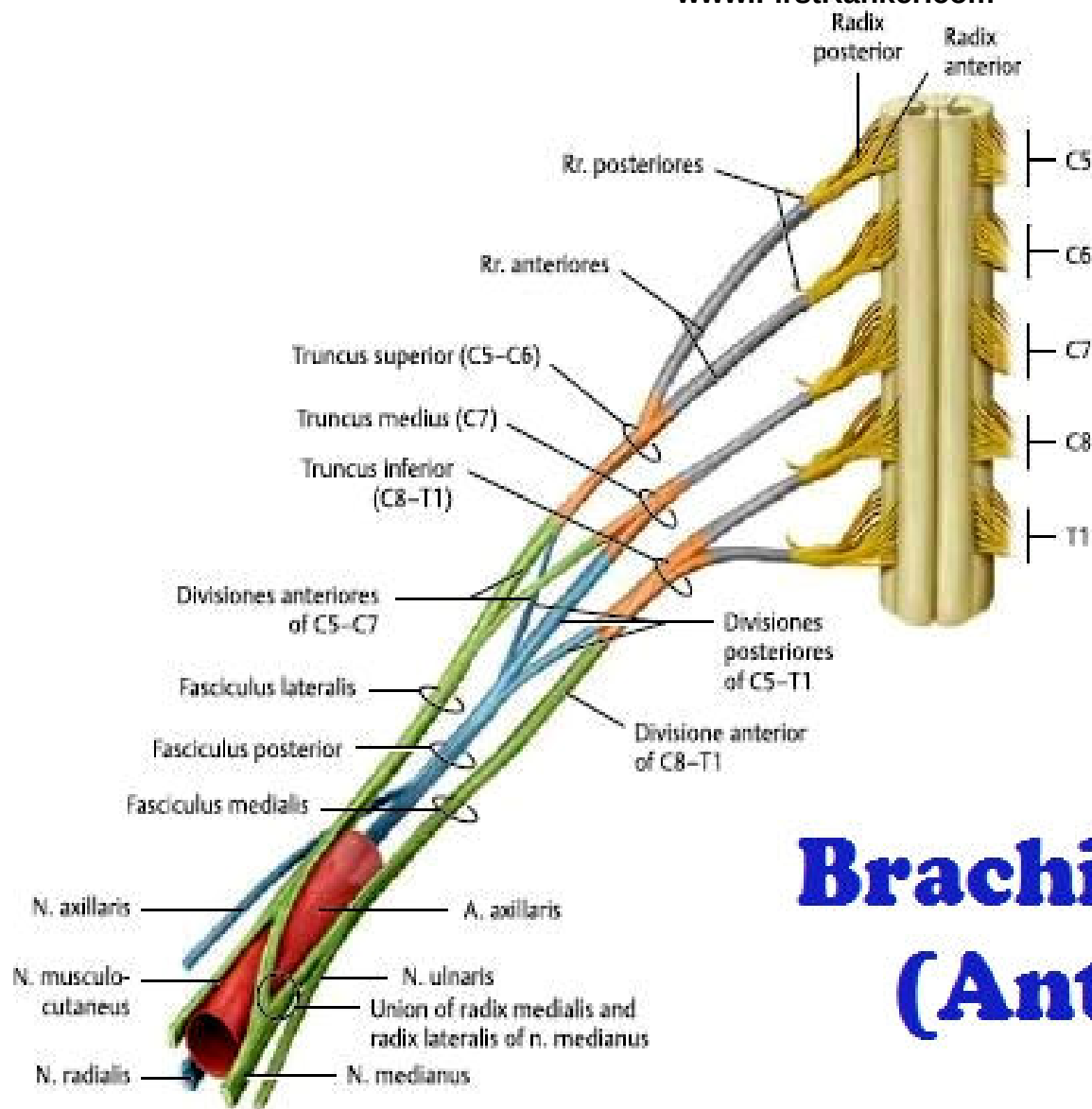
Each trunk splits into an anterior division and a posterior division.



The cords are formed by recombination of the six divisions to three nerve fibres. They are named by their position relative to the axillary artery.

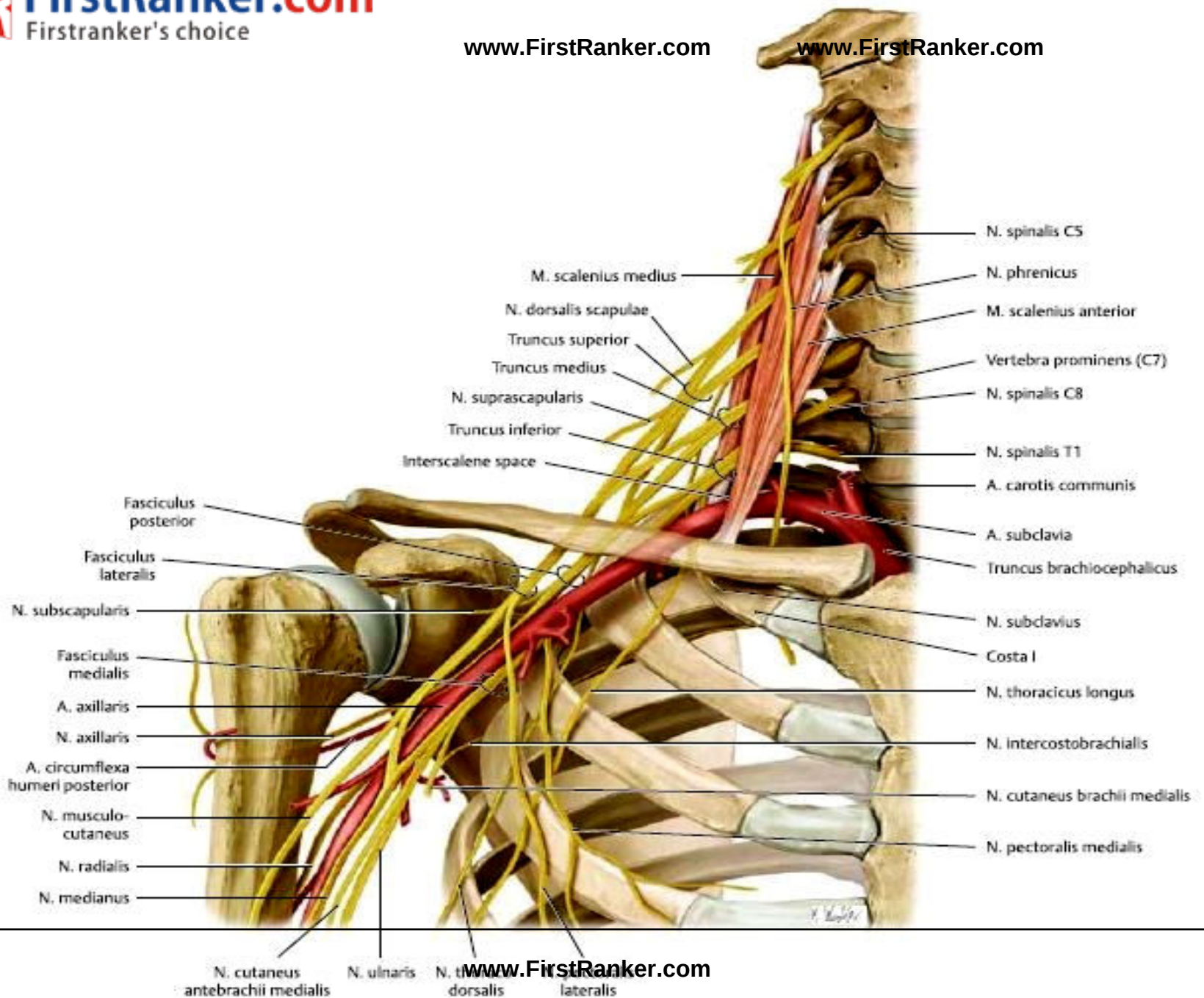






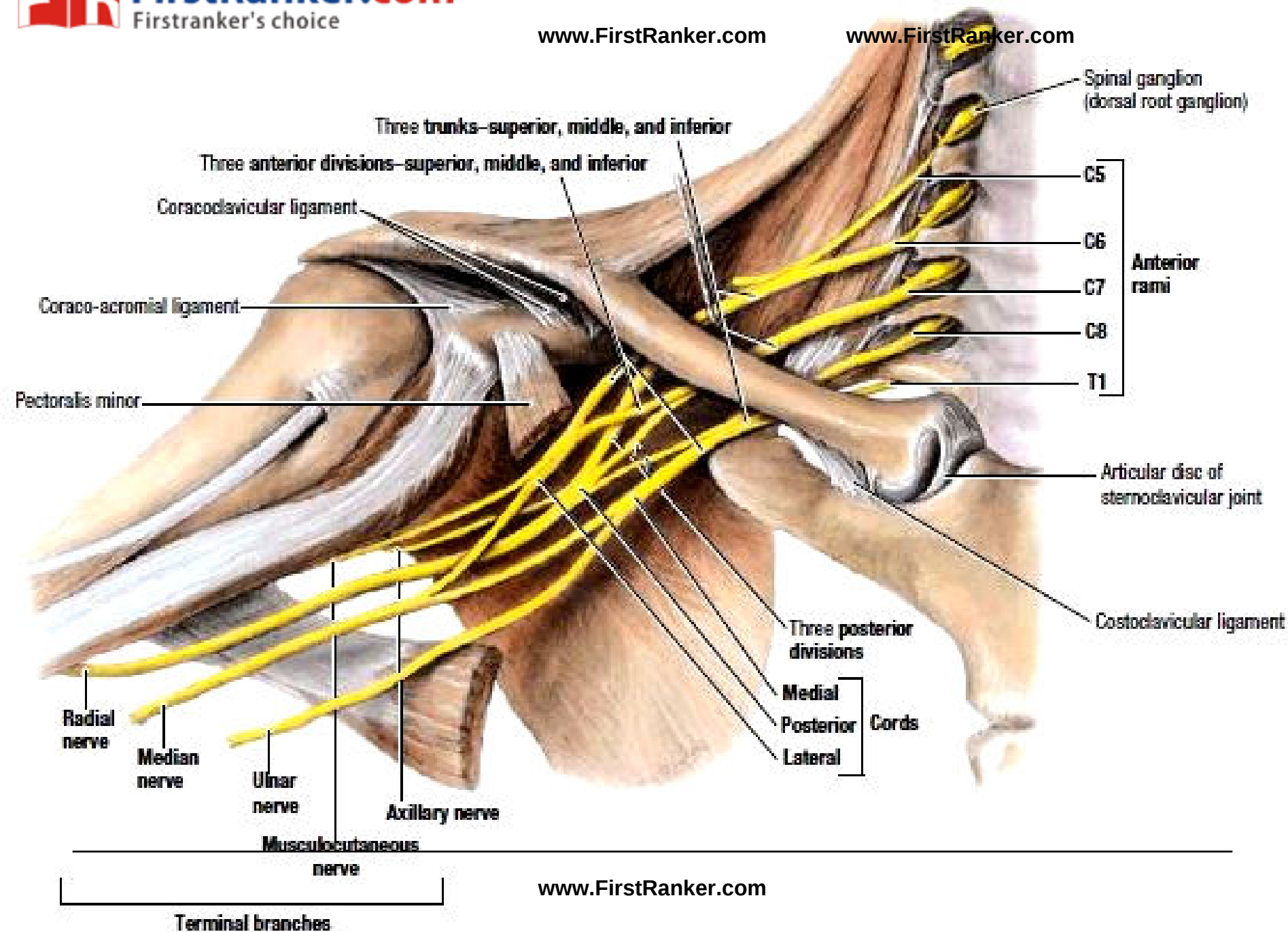
B Division of fasciculi into terminal branches.

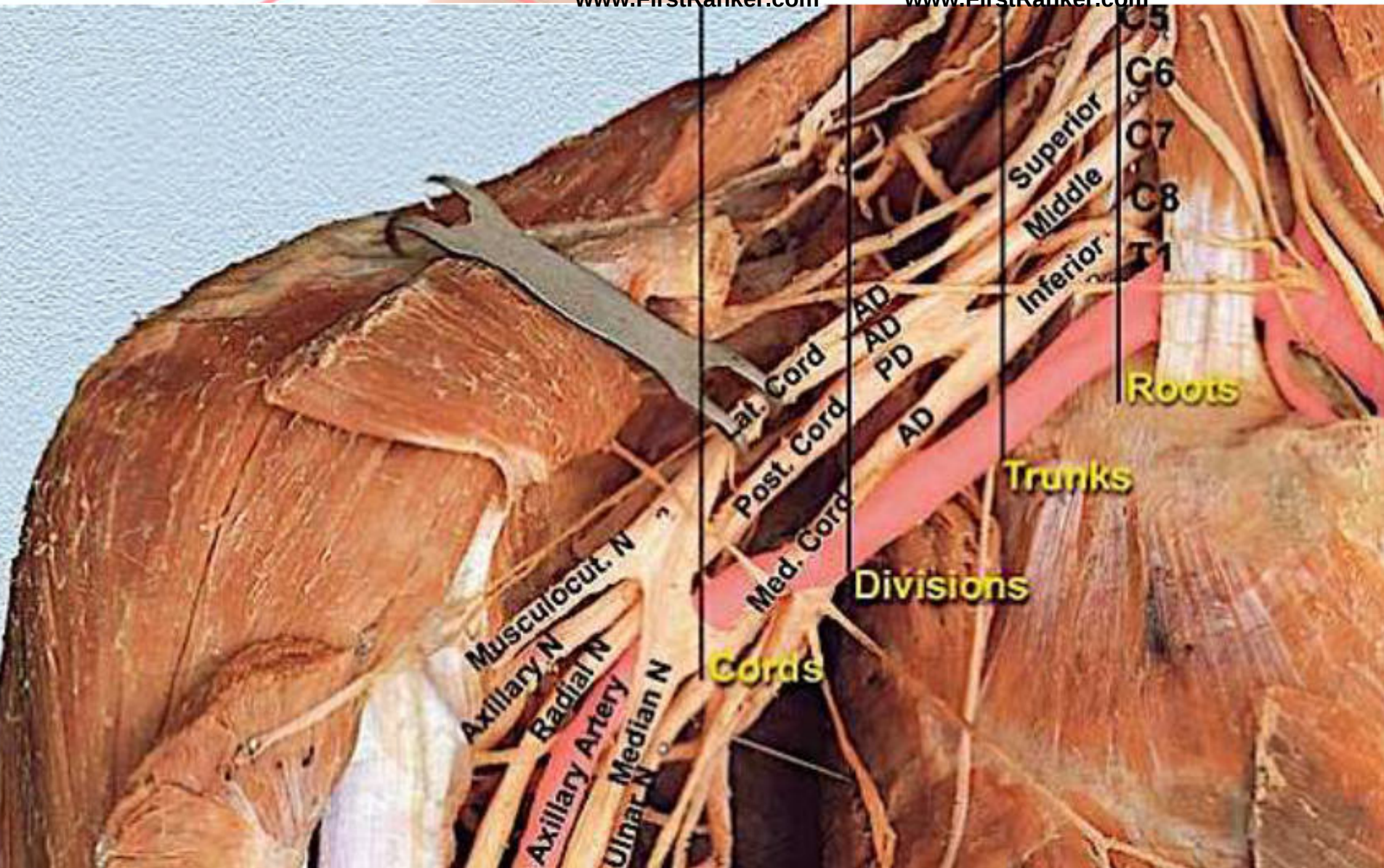
Brachial plexus (Ant View)



Location

- **Roots** – Behind scalenus anterior, emerge between scalene muscles
- **Trunks** -cross lower part of posterior triangle of neck
- **Divisions** - behind clavicle
- **Cords** - arranged around 2nd part of Axillary artery in axilla.
- Supraclavicular part - roots and trunks
- Infraclavicular part – cord and branches





Supraclavicular

From the roots:

1. Dorsal scapular Nv (C5) – Rhomboideus Maj & minor
2. Br to join Phrenic Nv
3. Long thoracic Nv (C5-C7) – Serratus anterior.
4. Muscular branches to Longus colli & Scalenii.

From the trunk:

1. Nv to subclavius
2. Suprascapular nv (C5-C6)- Supra & Infra spinatus.

Infraclavicular

Infraclavicular branches :

From the **lateral cord** (*Three branches*)

- (i) Lateral pectoral;
- (ii) Musculo-cutaneous;
- (iii) Lateral root of median nerve;

From the **medial cord** (*Five branches*)

- (i) Medial pectoral;
- (ii) Medial cutaneous nerve of the fore arm;
- (iii) Medial cutaneous nerve of the arm;
- (iv) Ulnar nerve (C₇, C₈, T₁);
- (v) Medial root of median nerve;

From the **posterior cord** (*Five branches*)

- (i) Upper subscapular nerve (C₅, C₆);
- (ii) Thoraco-dorsal nerve (C₆, C₇, C₈);
- (iii) Lower subscapular nerve (C₅, C₆);
- (iv) Axillary nerve (C₅, C₆);
- (v) Radial nerve (C₅, C₆, C₇, C₈, T₁)

1. Lateral Pectoral Nv (C5-C7) – Supplies **Pectoralis Maj & minor**
2. Musculo cutaneous Nv (C5-C7) – Supplies **Choracobrachialis, Biceps brachi (both head) and medial part of Brachialis.**
3. Lateral root of Median Nv (C5-C7).

Medial Cord branches: (M₄U)

1. Medial Pectoral Nv (C5-C7) – Supplies **Pectoralis Maj & minor**
2. Medial cutaneous Nv of forearm
3. Medial cutaneous Nv of arm
4. Medial root of Median Nv (C8-T1).
5. Ulnar Nv (C8-T1) .

Postreior Cord branches: (ULMAR)

1. Upper subscapular Nv (C5-C6) – **Upper part of subscapularis.**
2. Lower subscapular Nv (C5-C6) – **Lower part of subscapularis & Teres major.**
3. Middle subscapular (Thoracodorsal) Nv – **Latissimus dorsi.**
4. Axillary Nv (C5-C6) – Supplies **Deltoid and Teres minor**
5. Radial Nv (C5,C6,C7,C8 & T1) – **Triceps, Anconeus, Brachioradialis and all the extensors of forearm** in posterior compartment.

Dorsal scapular
Origin: C5 root
Spinal segment: C5



Function: motor
Rhomboid major, rhomboid minor

Long thoracic
Origin: C5 to C7 roots
Spinal segments: C5 to C7



Function: motor
Serratus anterior

Suprascapular
Origin: Superior trunk
Spinal segments: C5, C6



Function: motor
Supraspinatus, infraspinatus

Nerve to subclavius
Origin: Superior trunk
Spinal segments: C5, C6



Function: motor
Subclavius

Lateral pectoral
Origin: Lateral cord
Spinal segments: C5 to C7



Function: motor
Pectoralis major

Musculocutaneous
Origin: Lateral cord
Spinal segments: C5 to C7



Function: motor
All muscles in the anterior compartment of the arm
Function: sensory
Skin on lateral side of forearm

Medial pectoral
Origin: Medial cord
Spinal segments: C8, T1
(also receives contributions from spinal segments C5 to C7 through a communication with the lateral pectoral nerve)



Function: motor
Pectoralis major, pectoralis minor

Medial cutaneous of arm
Origin: Medial cord
Spinal segments: C8, T1



Function: sensory
Skin on medial side of distal one-third of arm

Branch

Medial cutaneous of forearm
Origin: Medial cord
Spinal segments: C8, T1



Function: sensory
Skin on medial side of forearm

Median
Origin: Medial and lateral cords
Spinal segments: (C5), C6 to T1



Function: motor
All muscles in the anterior compartment of the forearm (except flexor carpi ulnaris and medial half of flexor digitorum profundus), three thenar muscles of the thumb and two lateral lumbrical muscles
Function: sensory
Skin over the palmar surface of the lateral three and one-half digits and over the lateral side of the palm and middle of the wrist

Ulnar
Origin: Medial cord
Spinal segments: (C7), C8, T1



Function: motor
All intrinsic muscles of the hand (except three thenar muscles and two lateral lumbricals); also flexor carpi ulnaris and the medial half of flexor digitorum profundus in the forearm
Function: sensory
Skin over the palmar surface of the medial one and one-half digits and associated palm and wrist, and skin over the dorsal surface of the medial one and one-half digits

Superior subscapular
Origin: Posterior cord
Spinal segments: C5, C6



Function: motor
Subscapularis

Thoracodorsal
Origin: Posterior cord
Spinal segments: C6 to C8



Function: motor
Latissimus dorsi

Inferior subscapular
Origin: Posterior cord
Spinal segments: C5, C6



Function: motor
Subscapularis, teres major

Axillary
Origin: Posterior cord
Spinal segments: C5, C6



Function: motor
Deltoid, teres minor
Function: sensory
Skin over upper lateral part of arm

Radial
Origin: Posterior cord
Spinal segments: C5 to C8, (T1)

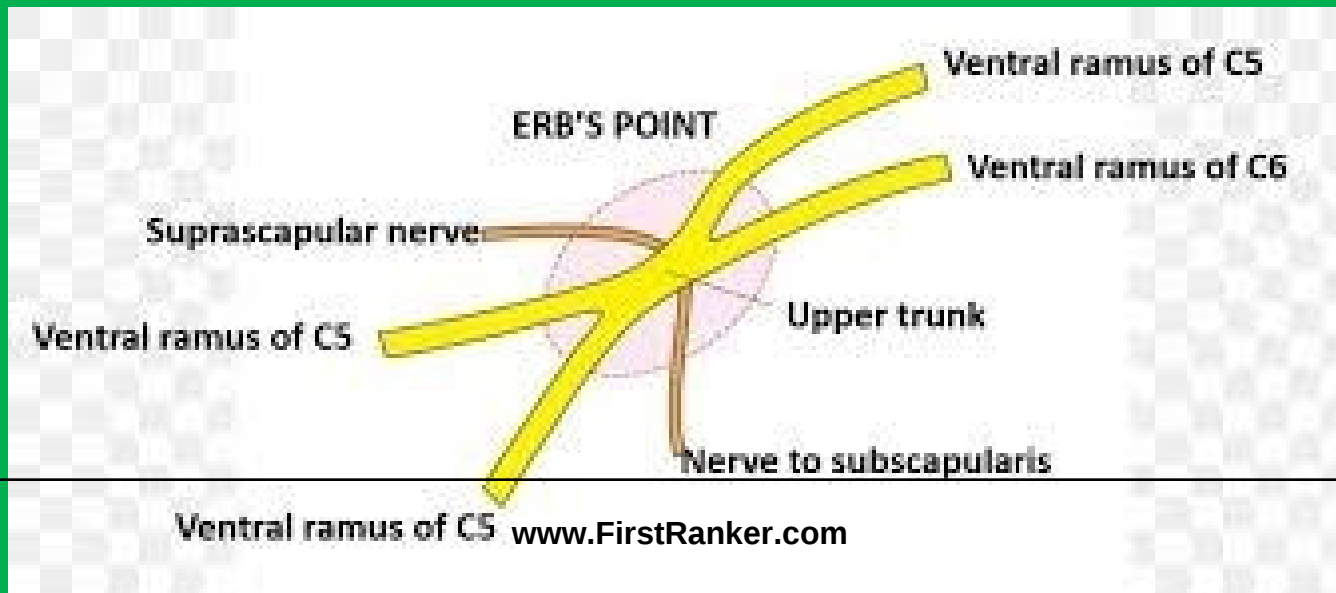


Function: motor
All muscles in the posterior compartments of arm and forearm
Function: sensory
Skin on the posterior aspects of the arm and forearm, the lower lateral surface of the arm, and the dorsal lateral surface of the hand

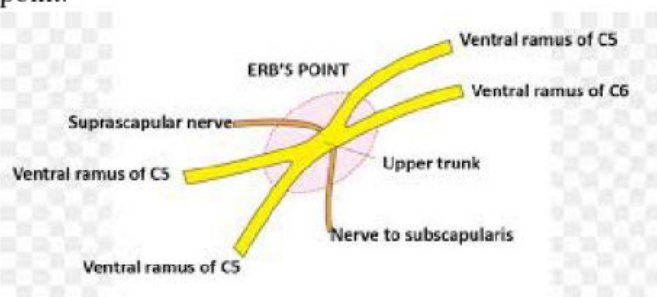
➤ Derived from the upper trunk (C5,C6) at Erb's point (The nerve point of the neck, also known as Erb's point is a site at the upper trunk of the brachial plexus located 2–3 cm above the clavicle. It is named for Wilhelm Heinrich Erb. Taken together, there are six types of nerves that meet at this point).

➤ Supplies

1. Supraspinatus
2. Infraspinatus
3. Articular rami to shoulder and Acromioclavular joint.



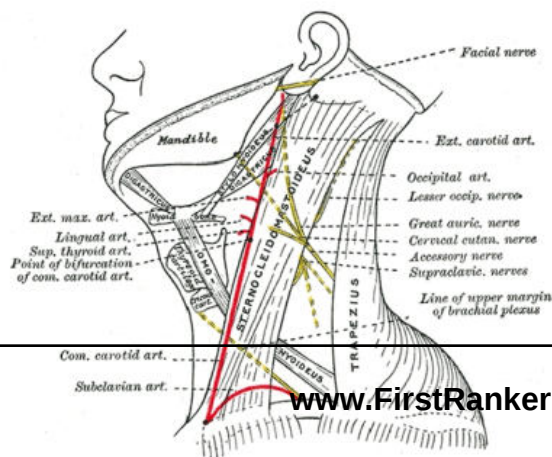
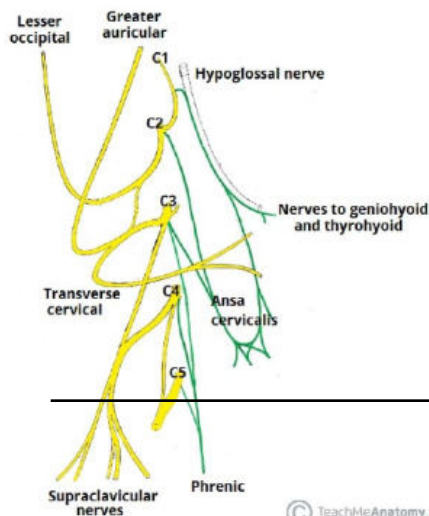
Erb's point is a site at the upper trunk of the brachial plexus located 2–3 cm above the clavicle. It is named for Wilhelm Heinrich Erb. Taken together, there are six types of nerves that meet at this point.



❖ **Erb's point** is the auscultation location for heart sounds and heart murmurs located at the third intercostal space and the left lower sternal border.

❖ **Erb's point** is also a term used in head and neck surgery to describe the point on the posterior border of the sternocleidomastoid muscle where the four superficial branches of the cervical plexus—the greater auricular, lesser occipital, transverse cervical, and supraclavicular nerves—emerge from behind the muscle. **Punctum nervosum**, also known as **Erb's point** or the **nerve point of the neck**, is a point half way along the posterior border of the sternocleidomastoid muscle from which all cutaneous branches of the cervical plexus converge and become superficial.

Homonyms of Erb's Point



Cause of injury

- Forceful separation of head from shoulder e.g. during birth
- fall on shoulder.
- Nerve roots involved - C5, C6

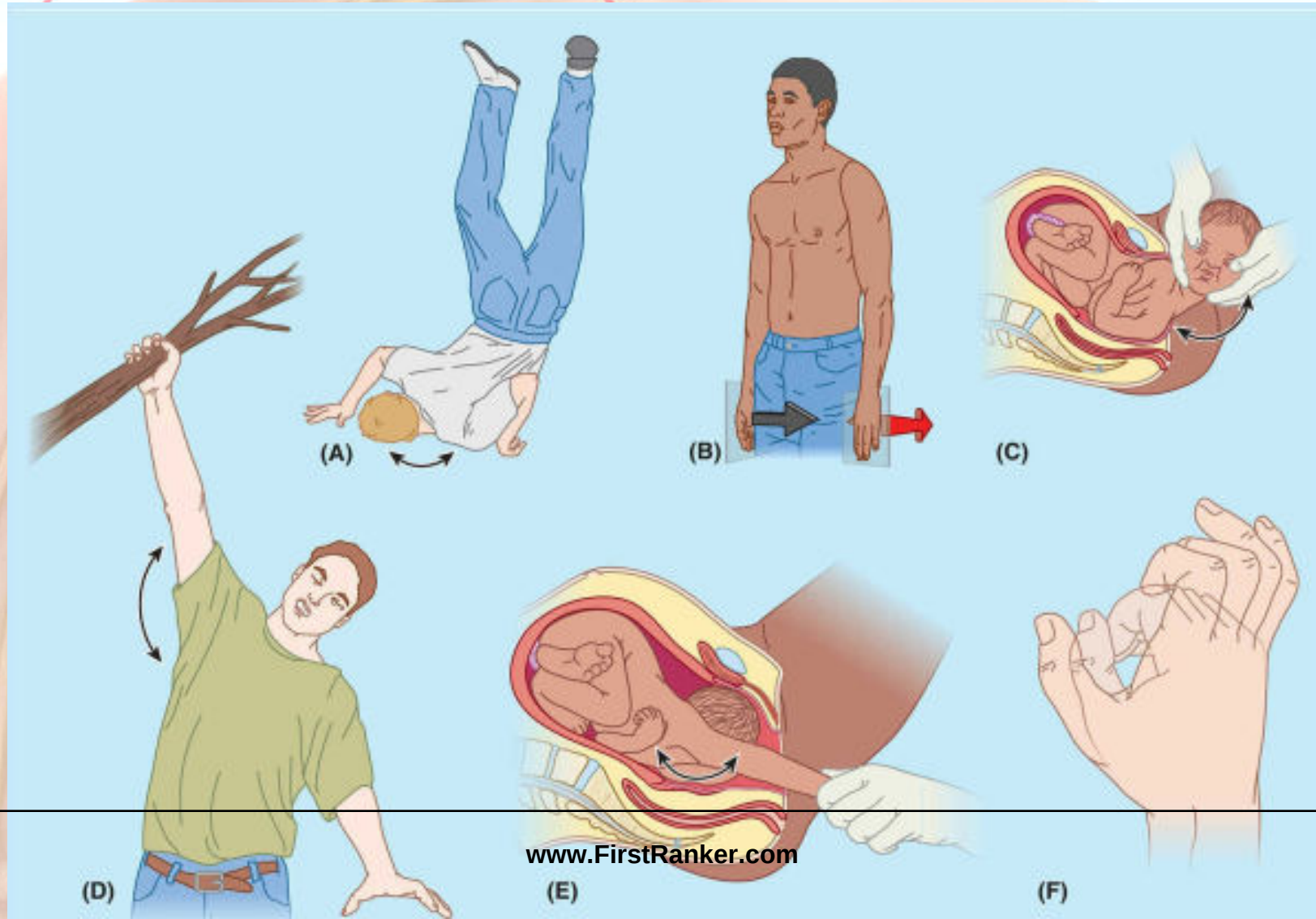
Position of limb-

- Arm hangs by side - **Adducted** - (no abduction)
- **Medially rotated** - (no lateral rotation)
- **Extension at elbow** - (no flexion)
- Forearm is **pronated**.- (no supination)

POLICEMAN'S TIP OR WAITER TIP HAND

Erb's palsy or Duchenne-Erb paralysis involves the C5 and C6 roots of the brachial plexus -- affects the strength of **deltoid, biceps, brachialis, infraspinatus, supraspinatus**, and serratus anterior muscles. Also involved are the **rhomboids, levator scapulae**, and **supinator** muscles.

FirstRanker.com to brachial plexus. **A.** Note the excessive increase in the angle between the head and left shoulder. **B.** The waiter's tip position (left upper limb). **C.** Observe the excessive increase in the angle between the head and left shoulder during delivery of the fetus. **D and E.** Excessive increases in the angle between the trunk and the right upper limb. **F.** A claw hand (person is attempting to assume lightly shaded "fist" position).



 **FirstRanker.com** FirstRanker's choice
www.FirstRanker.com

result of injuries to the superior parts of the brachial plexus (**Erb Duchenne palsy**), paralysis of the muscles of the shoulder and arm supplied by the C5 and C6 spinal nerves. The suprascapular nerve, the nerve to the subclavius, and the musculocutaneous and axillary nerves all possess nerve fibers derived from the C5 and 6 roots and will therefore be functionless. The following muscles will consequently be paralyzed: the **supraspinatus** (abductor of the shoulder) and **infraspinatus** (lateral rotator of the shoulder) because of the **suprascapular nerve**; the **subclavius** (depresses the clavicle) because of its nerve; the **coracobrachialis** (flexes the shoulder), **biceps brachii** (supinator of the forearm, flexor of the elbow, weak flexor of the shoulder), and the **greater part of the brachialis** (flexor of the elbow) because of the **musculocutaneous nerve**; and the **deltoid** (abductor of the shoulder) and the **teres minor** (lateral rotator of the shoulder) because of the **axillary nerve**. As a result, the limb will hang limply by the side, medially rotated by the unopposed sternocostal part of the pectoralis major; adducted because of loss of the supraspinatus and deltoid; the forearm will be pronated because of loss of the action of the biceps. The position of the upper limb in this condition has been likened to that of a porter or waiter hinting for a tip and so is often referred to as **“waiter’s tip posture”**. In addition, sensation will be lost over the lower half of the deltoid and down the lateral side of the forearm.

The usual clinical appearance is an upper limb with an adducted shoulder, medially rotated arm, and extended elbow. The lateral aspect of the forearm also experiences some loss of sensation. A superior brachial plexus injury may produce muscle spasms and severe disability in hikers (**backpacker’s palsy**) who carry heavy backpacks for long periods.

www.FirstRanker.com

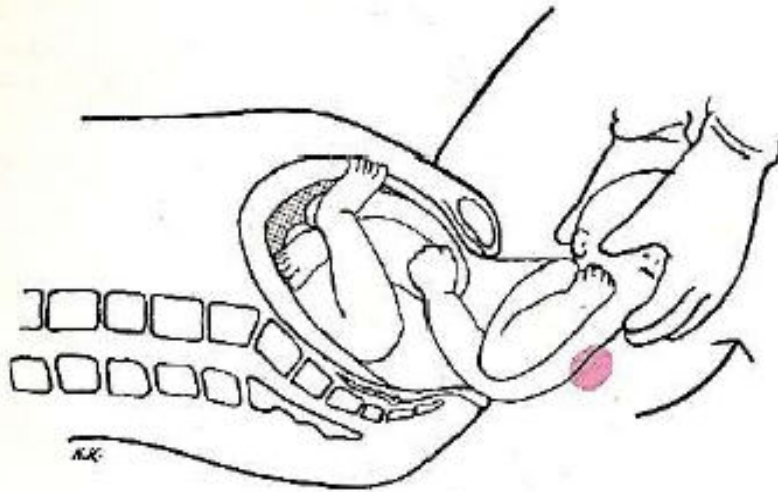
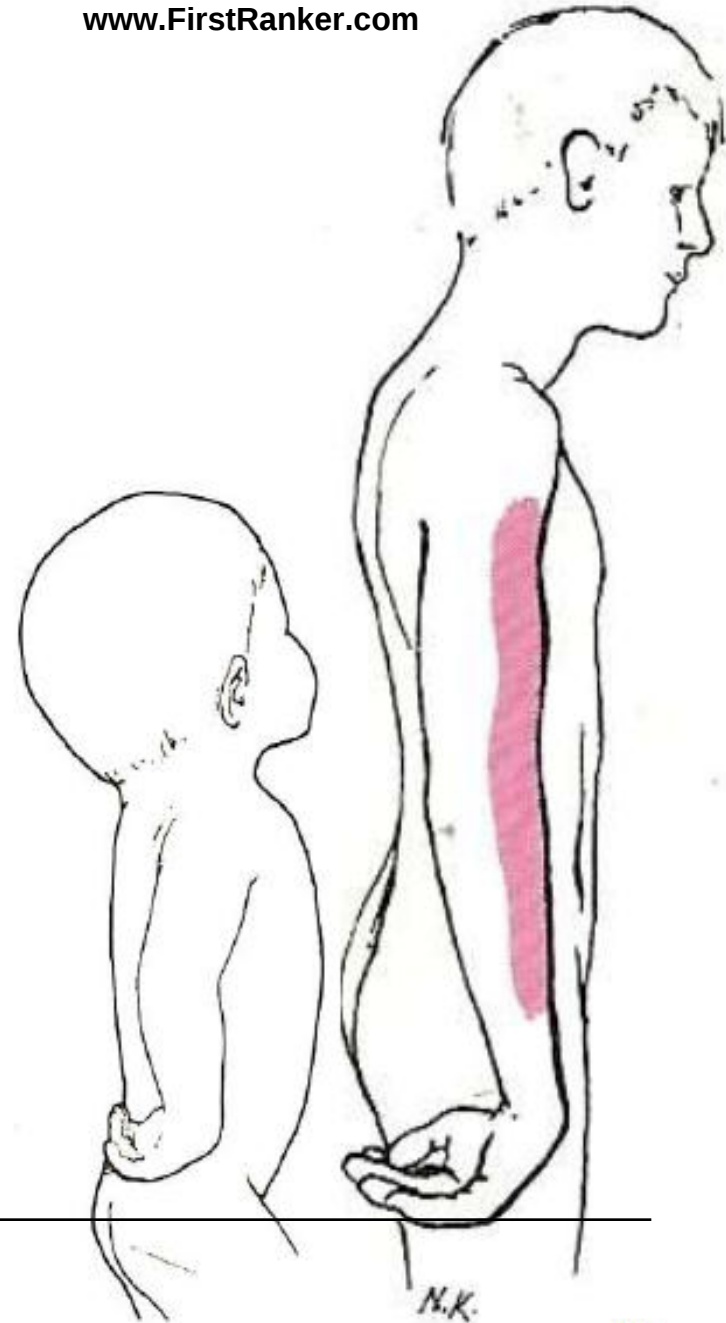


Figure 6-25. The superior part of the brachial plexus may be injured by violent stretching of the neck during delivery of a baby.





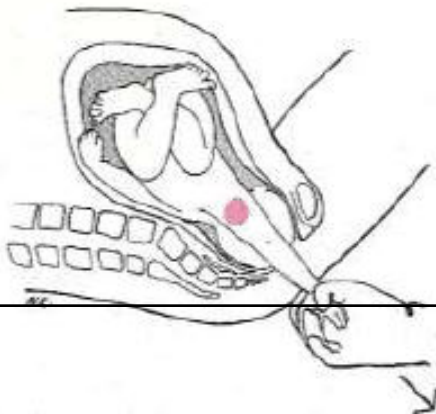
LOWER TRUNK PALSIES: Klumpke's palsy

Site of Injury

- Lower trunk (C 8, T1).
- Medial Cord involved (ulnar, medial cut N of Arm and forearm)

Cause of injury

- Birth injury (**klumpke' s paralysis**)
- Cervical rib
- Undue abduction of arm while holding something with hands during fall from height.



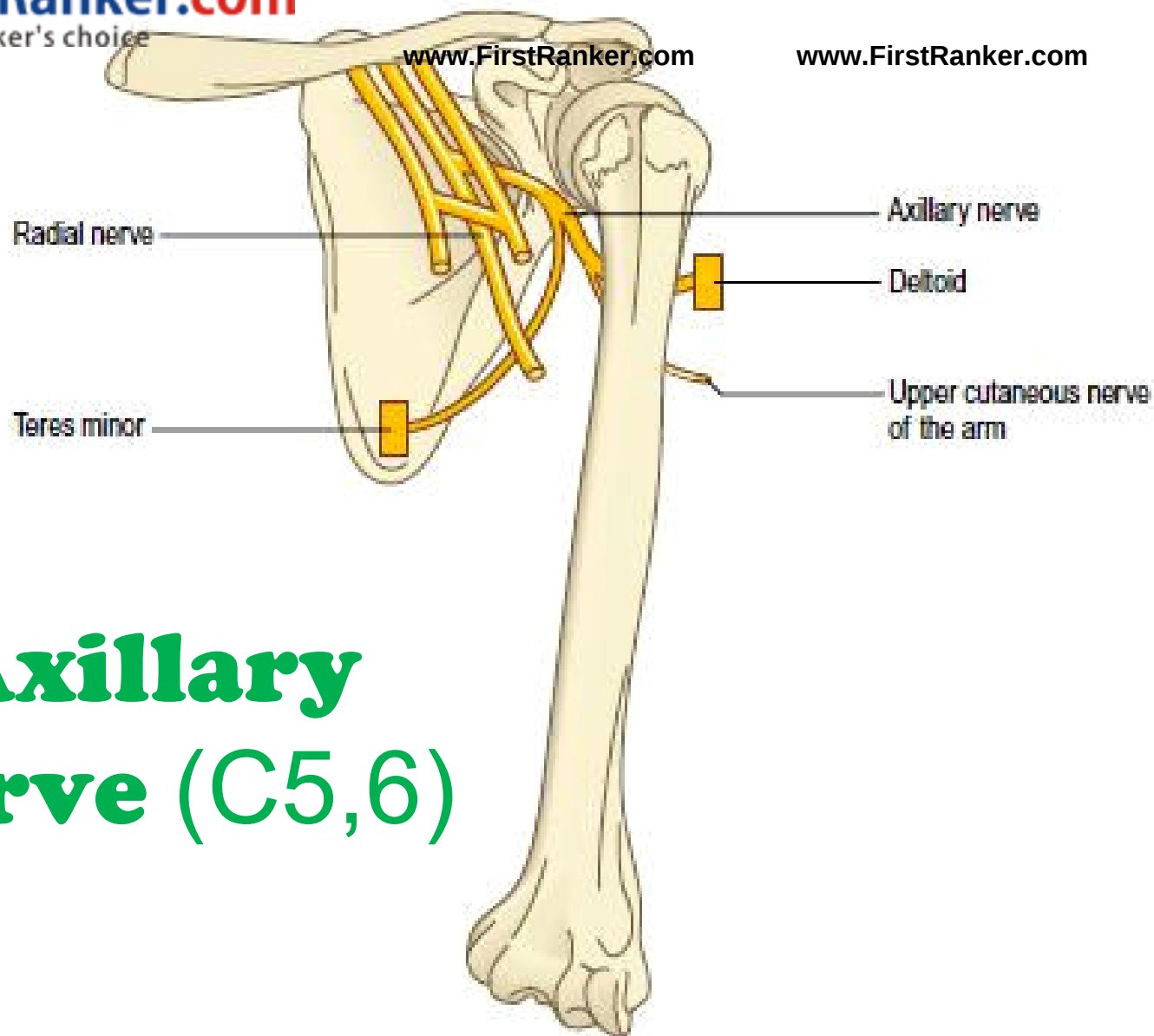
- Ulnar N paralysis of Intrinsic muscle of hand, ulnar flexors of wrist and fingers

Symptom and Sign

- **Claw hand** (medial two fingers more affected)



- due to unopposed action of long flexors fingers and extensors
- paralysis of all interossei and medial two lumbricals.
- Sensory loss on ulnar side of hand and forearm

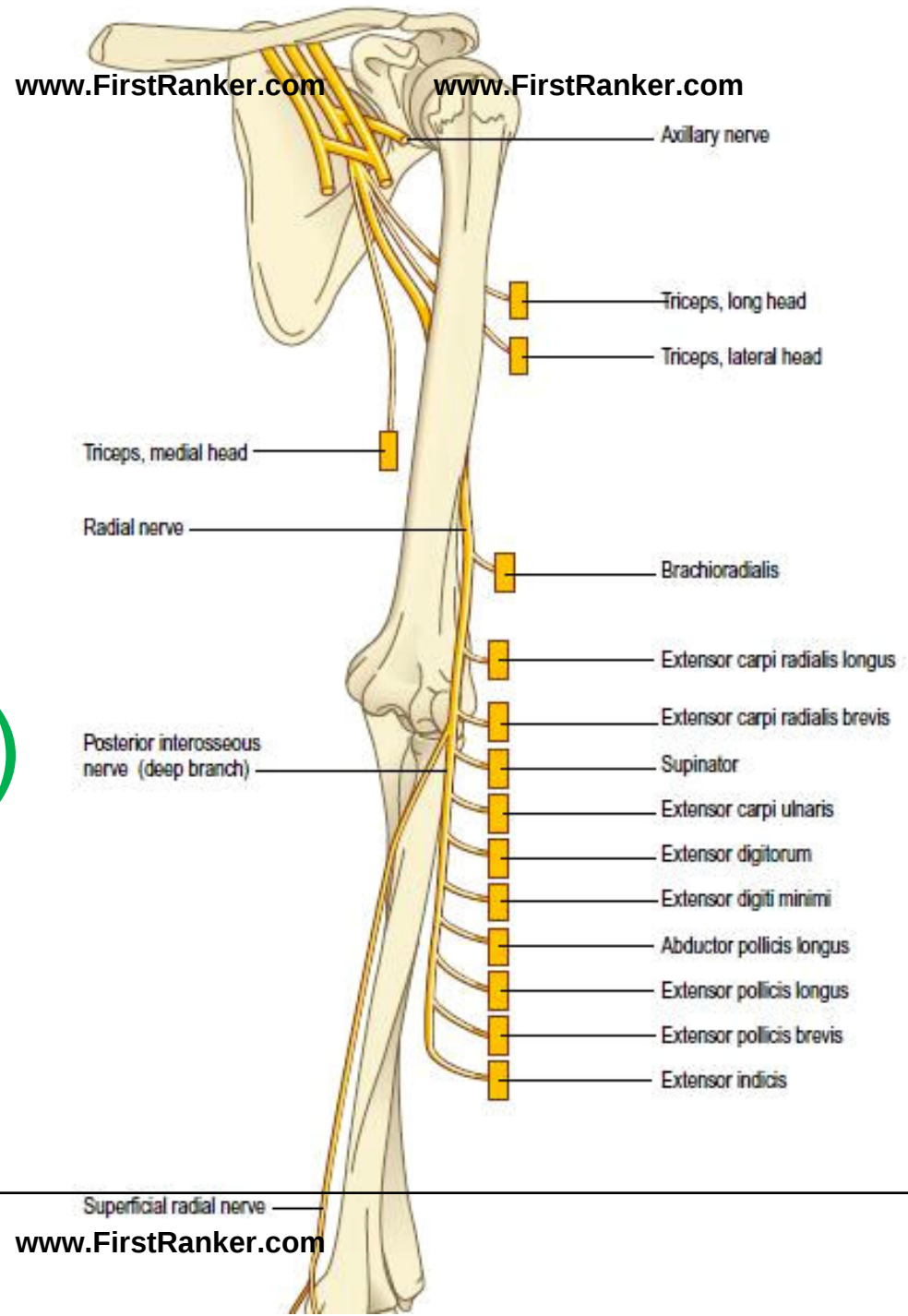


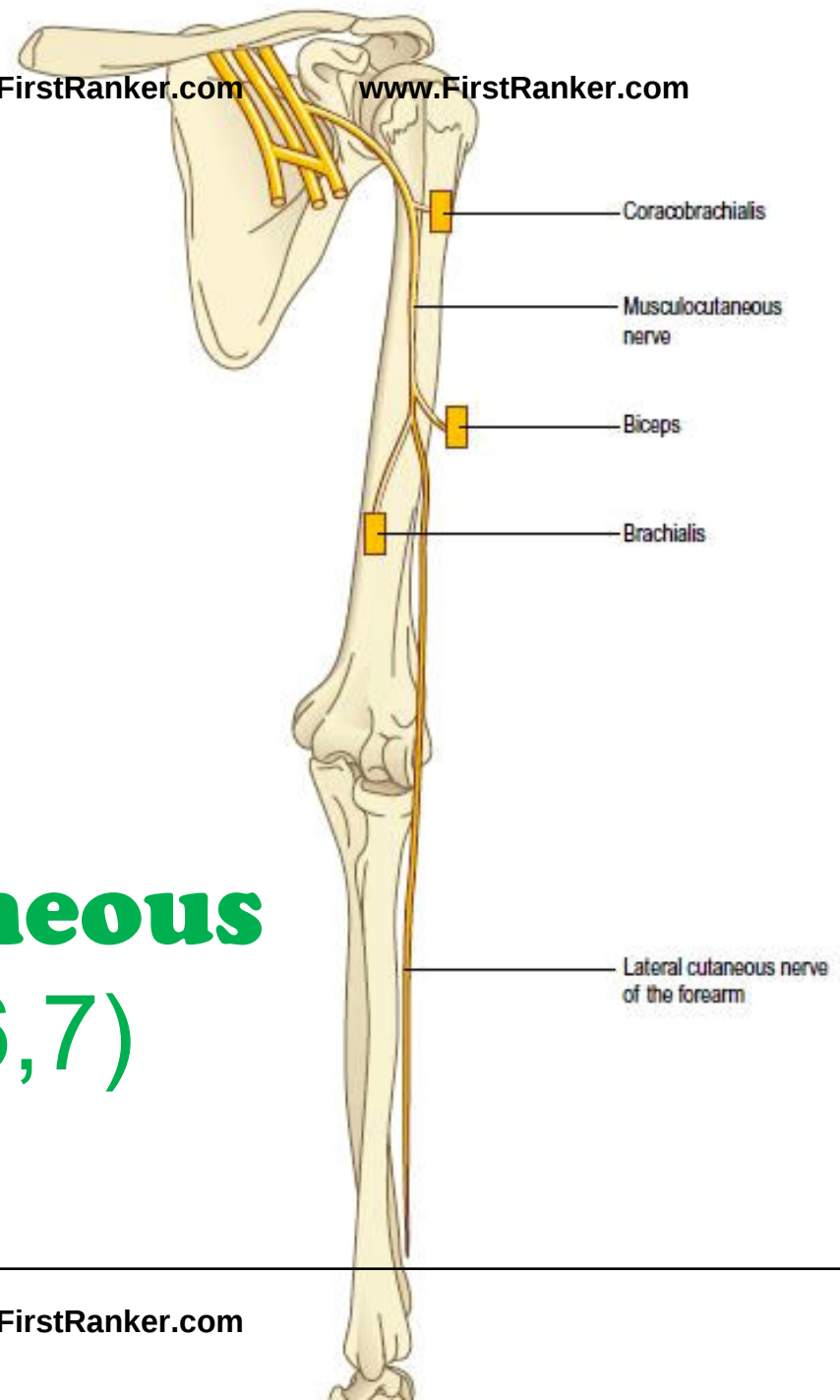
Axillary Nerve (C5,6)

Fig. 18.3 Motor and sensory branches of the axillary nerve. (From *Aids to the Examination of the Peripheral Nervous System*, 4th ed. 2000. Saunders, London. With permission of Guarantors of Brain.)

Radial Nerve

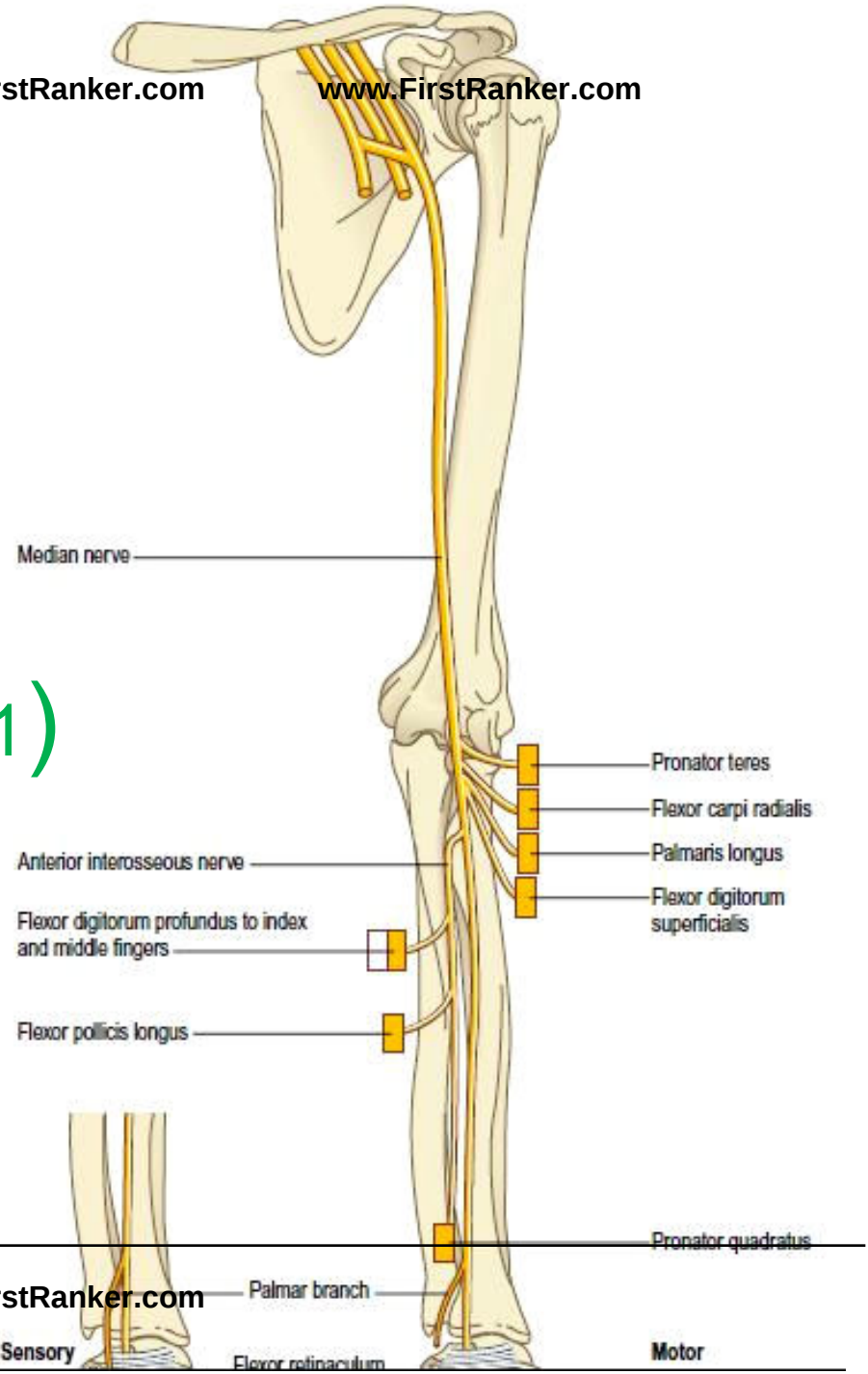
(C5,6,7,8 & T1)



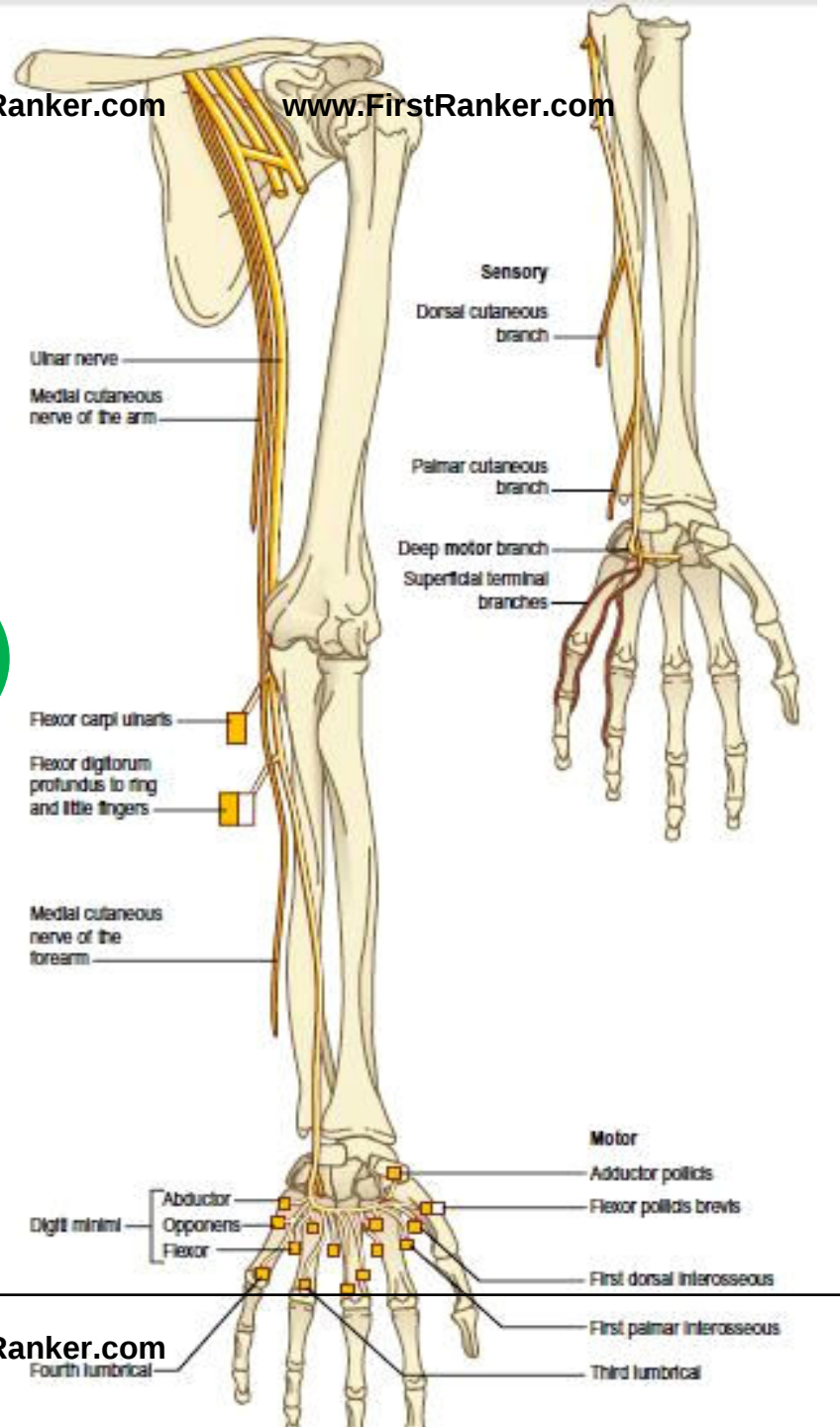


Musculocutaneous Nerve (C5,6,7)

Median Nerve (C_{6,7,8} & T₁)



Ulnar Nerve (C8 and T1)



ANATOMIC VARIATIONS

- ▶ The plexus may include anterior rami from C4 or T2 and these are designated as
 - ▶ Pre fixed- C4 added
 - ▶ Post fixed- T2 added.
- ▶ The connective tissue sheath that invests the plexus especially in the axillary region has a convoluted and septated structure that can lead to non uniform distribution of local anaesthetics .

Anesthetic implications

- ▶ *BRACHIAL PLEXUS BLOCK-*
- ▶ *Techniques-*
- ▶ Interscalene Brachial Plexus Block
- ▶ Supraclavicular(Subclavian)Brachial Plexus Block
- ▶ Infraclavicular Brachial Plexus Block
- ▶ Axillary Brachial Plexus Block

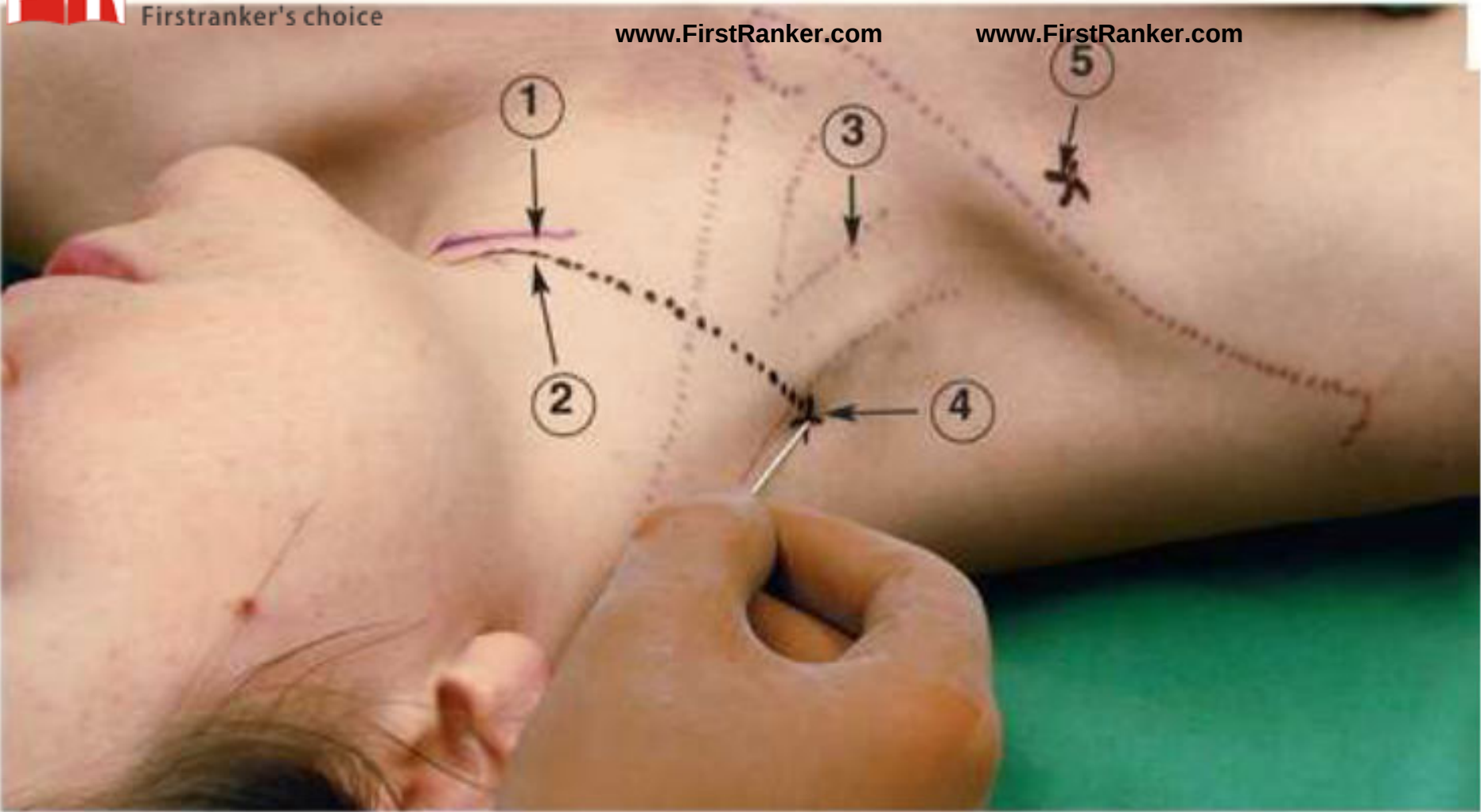


Fig. 11: Interscalene nerve block: Modification according to G. Meier

- | | |
|-------------------------------|--|
| 1. Cricoid | 4. Puncture site for anterior access |
| 2. Superior thyroid notch | 5. Vertical, infraclavicular puncture site |
| 3. Sternocleidomastoid muscle | |

Supraclavicular Block

www.FirstRanker.com

www.FirstRanker.com



Infraclavicular Block

www.FirstRanker.com

www.FirstRanker.com



www.FirstRanker.com

Axillary block

