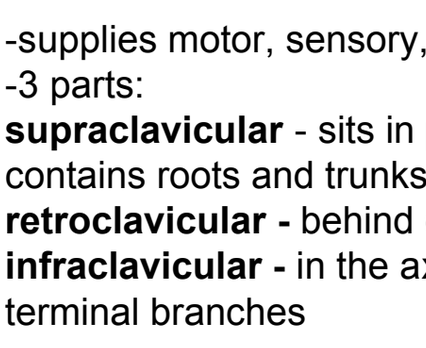
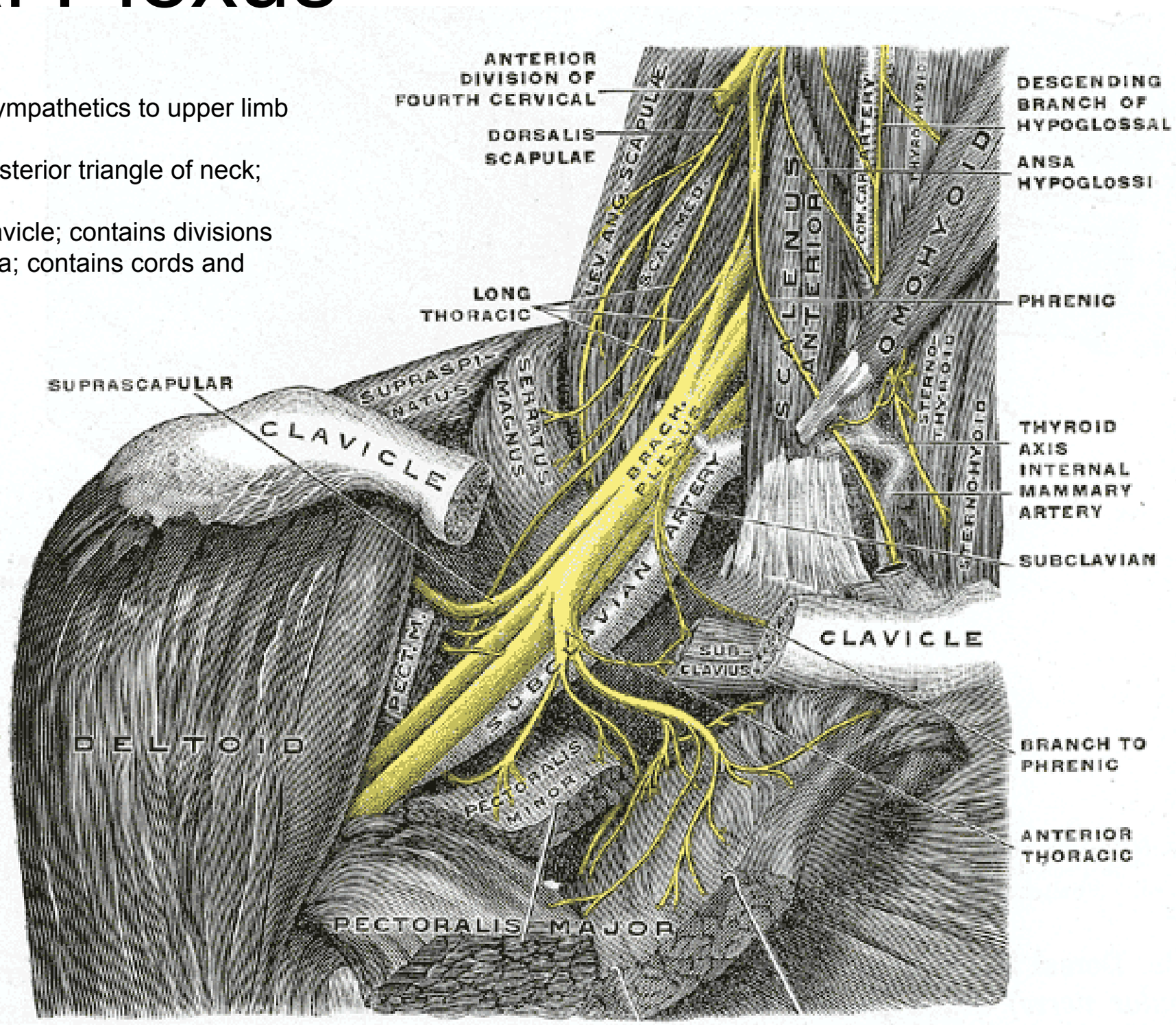
Peripheral Nerve Anatomy

Oct. 4th, 2010

Brachial Plexus

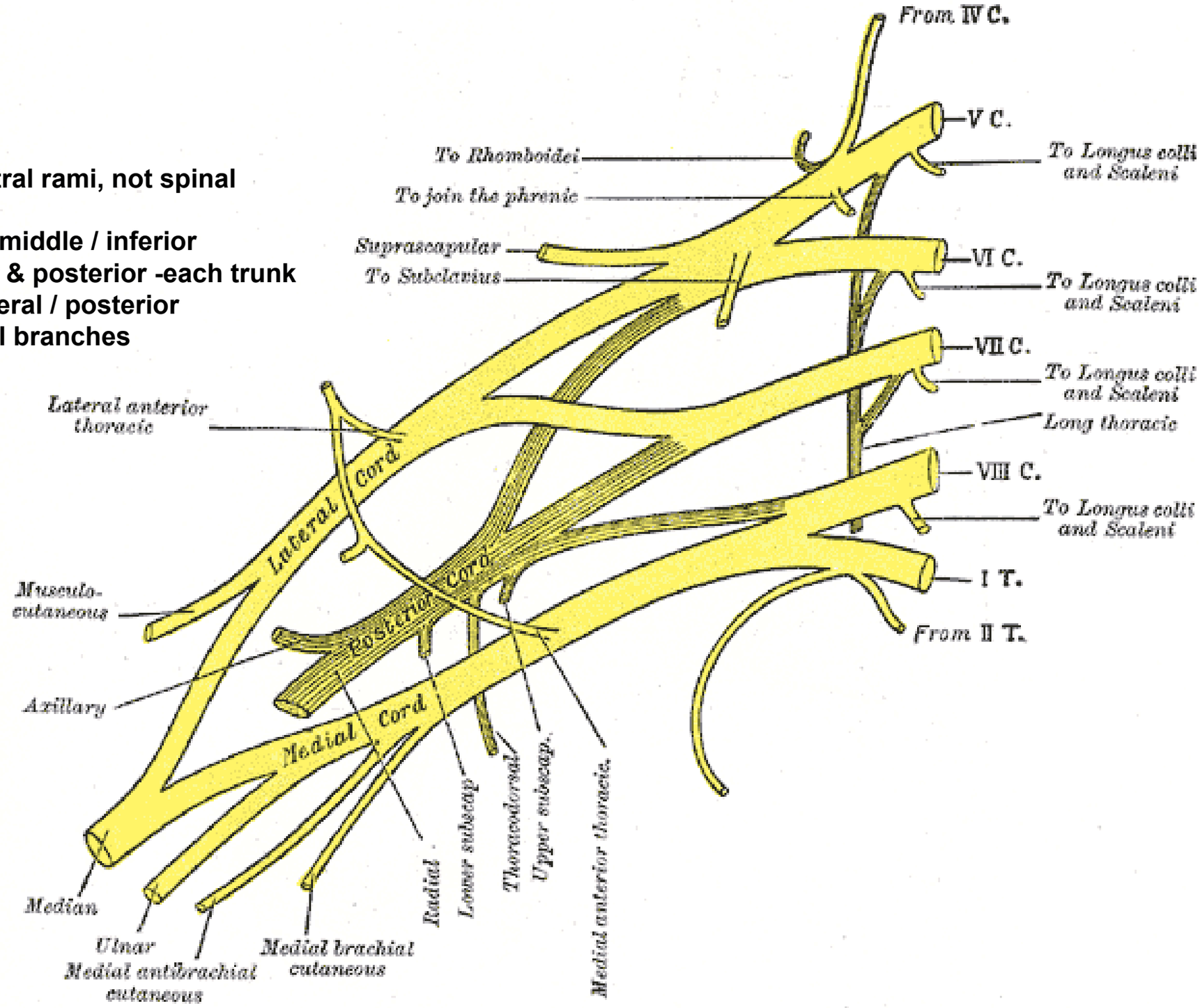
-supplies motor, sensory, sympathetics to upper limb
-3 parts:
supraclavicular - sits in posterior triangle of neck; contains roots and trunks
retroclavicular - behind clavicle; contains divisions
infraclavicular - in the axilla; contains cords and terminal branches





Brachial Plexus

Roots - C5-T1 (ventral rami, not spinal roots)
Trunks - superior / middle / inferior
Divisions - anterior & posterior -each trunk
Cords - medial / lateral / posterior
Branches - terminal branches



Brachial Plexus
Branches I - Supraclavicular

I) Supraclavicular:

From roots - (two)

1. dorsal scapular n (C5) - rhomboid, levator scapulae
2. long thoracic n (C5,6,7) - serratus anterior

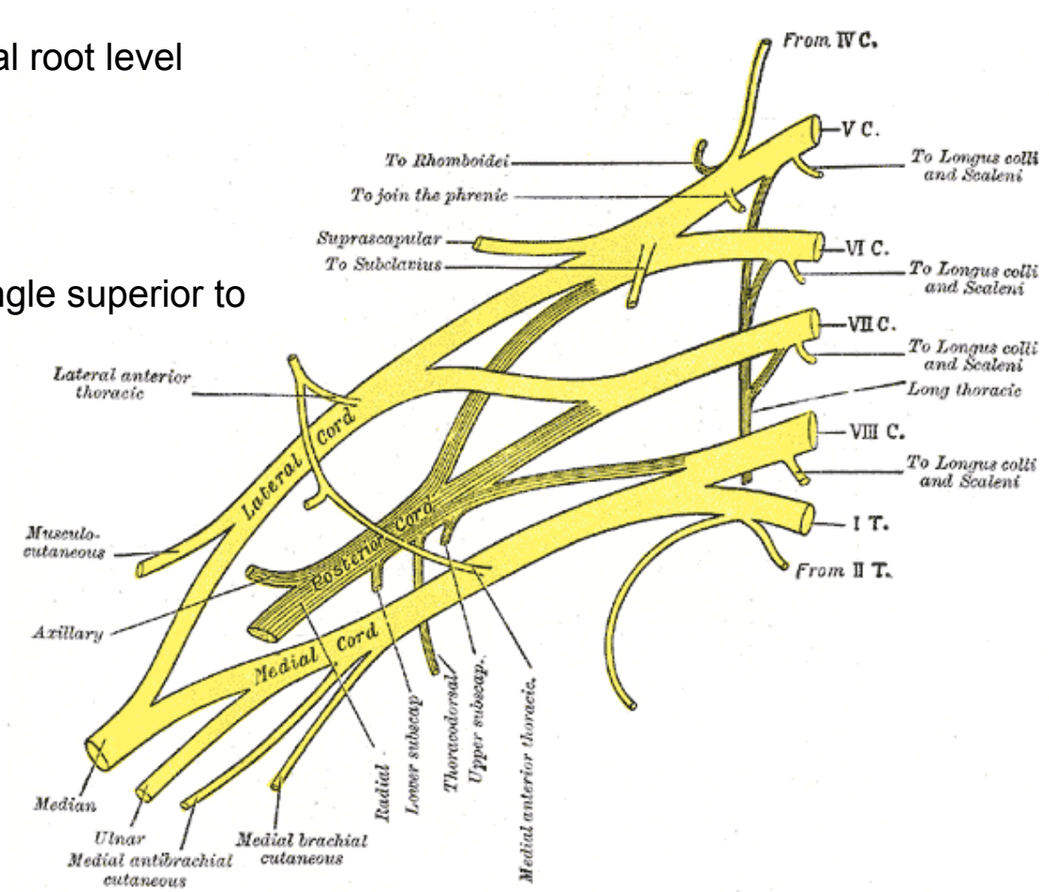
From trunks - (two)

1. n to subclavius (C5,6) - may come off distal root level
2. suprascapular n (C5,6)

    -from superior trunk

    -supraspinatus, infraspinatus

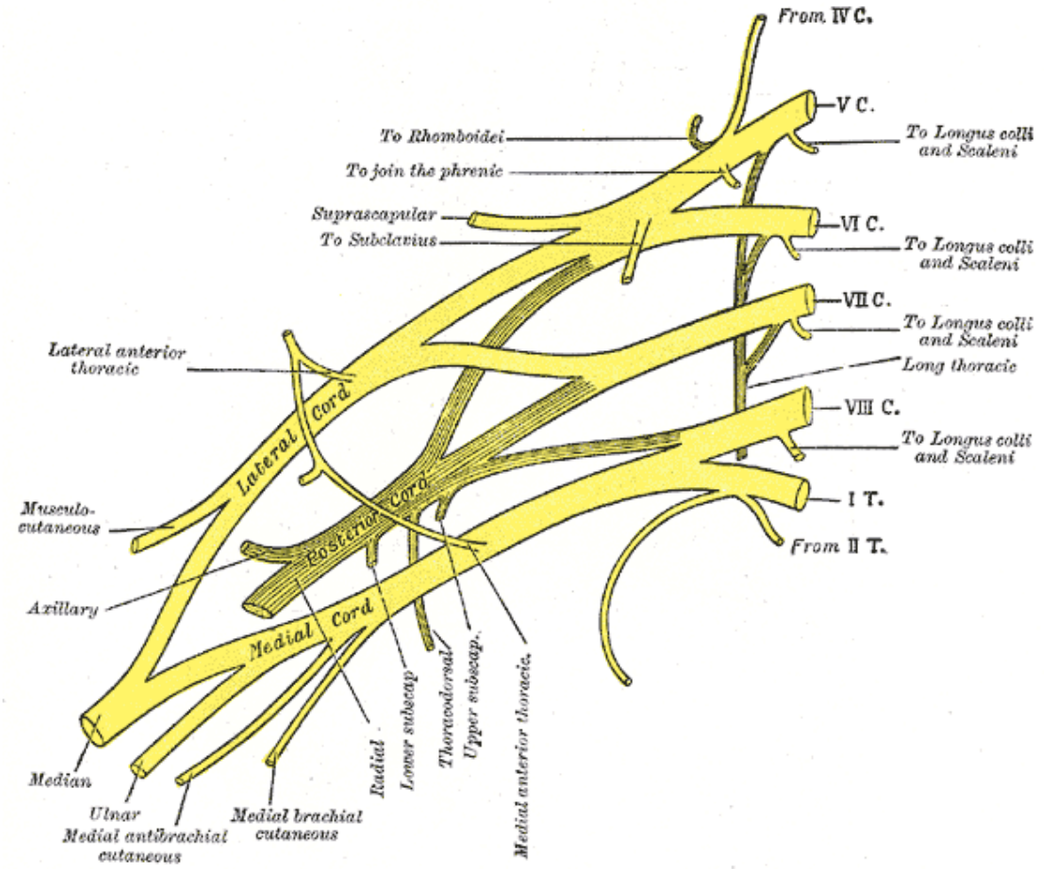
    -this n passes across posterior triangle superior to the BP, then thru suprascapular notch



Brachial Plexus
Branches II - Retroclavicular

II) Retroclavicular:

Divisions - NO BRANCHES!

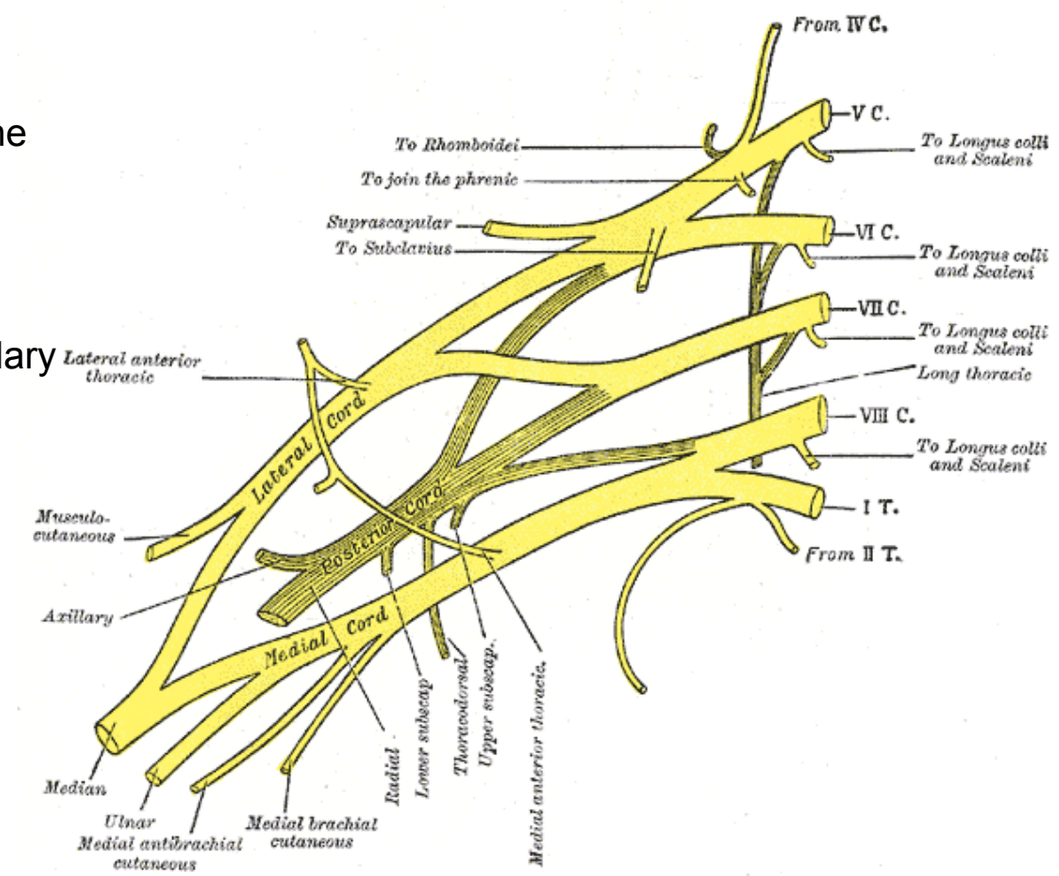


Brachial Plexus
Branches III - Infraclavicular

III) Infraclavicular: (*indicates terminal branch)

Lateral Cord - (three branches)

1. lateral pectoral n (C5,6,7) - p.major, p.minor
2. musculocutaneous* (C5,6,7)
   - corachobrachialis, biceps, brachialis
   - becomes superficial just proximal to the elbow joint
   -as lateral cutaneous n of forearm
3. lateral root of median nerve
   - joins medial root just lateral to the axillary artery
   -supplies:
   flexors of forearm (except flexor carpi ulnaris)
   5 hand m's
   skin on radial palmar surface

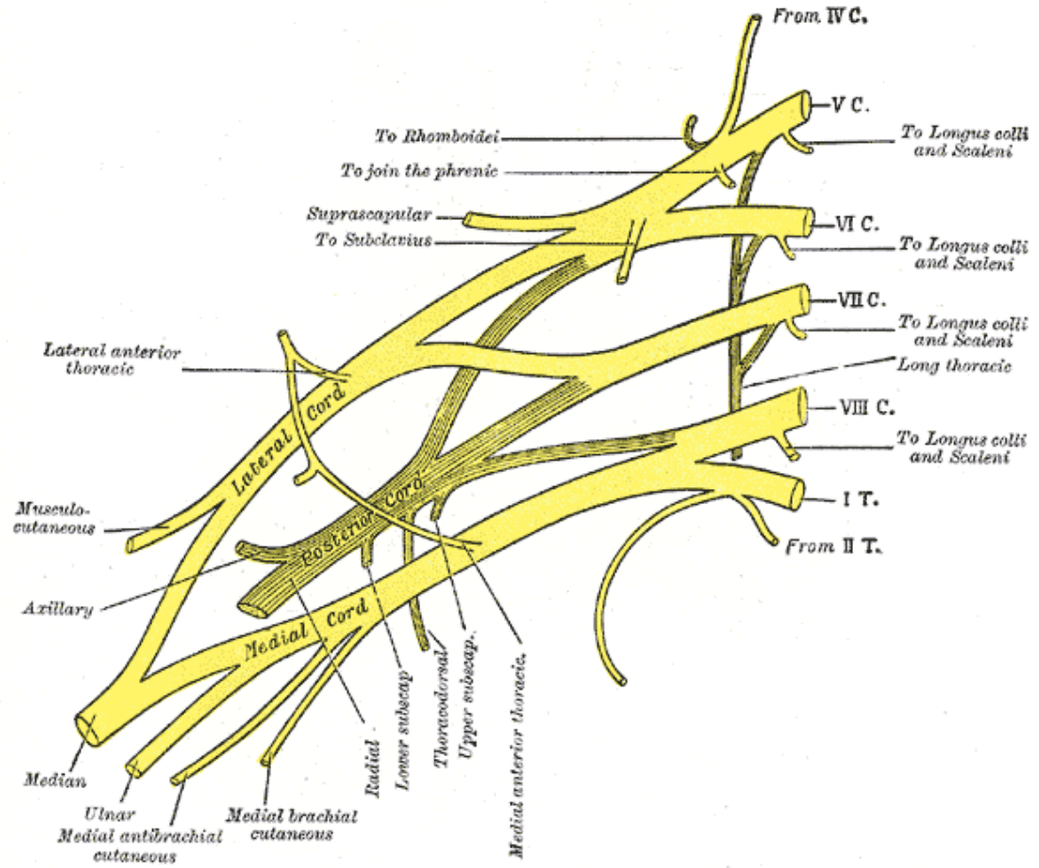


Brachial Plexus
Branches III - Infraclavicular

III) Infraclavicular: (*indicates terminal branch)

Medial Cord - (five branches)

1. medial pectoral n (C8,T1)
   - p.major, p.minor
2. medial cutaneous n of arm
3. medial cutaneous n of forearm
4. ulnar nerve (C7,8,T1)
   - 1 ½ m's of forearm
   most small m's of hand
   skin on ulnar side of hand
5. medial root of median nerve

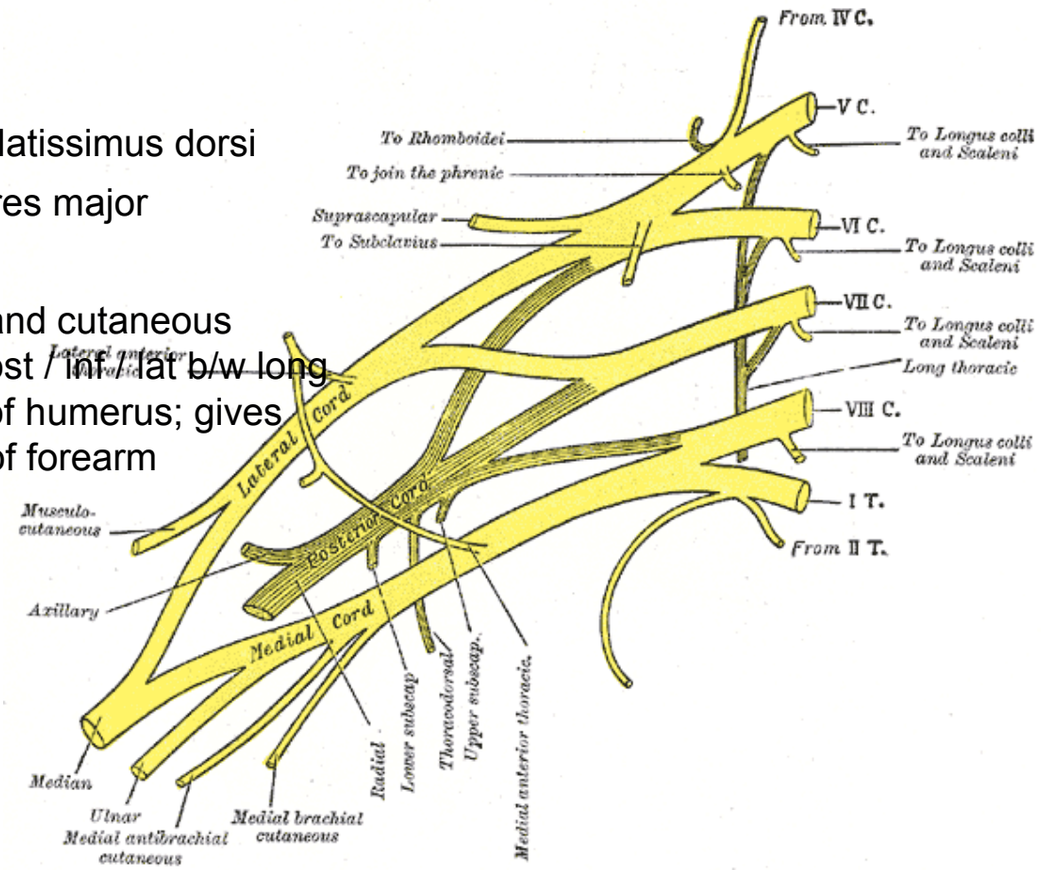


Brachial Plexus
Branches III - Infraclavicular

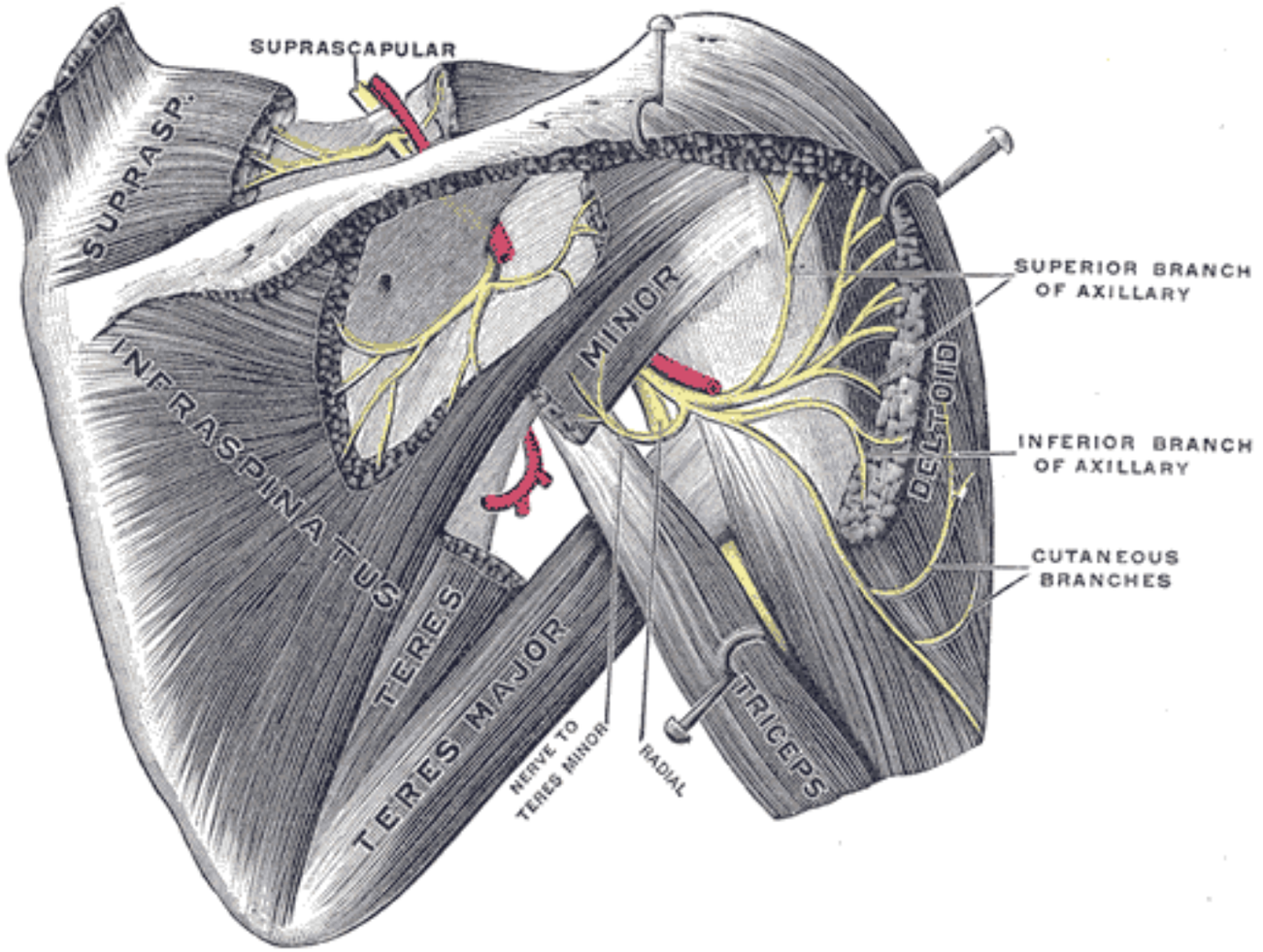
III) Infraclavicular: (*indicates terminal branch)

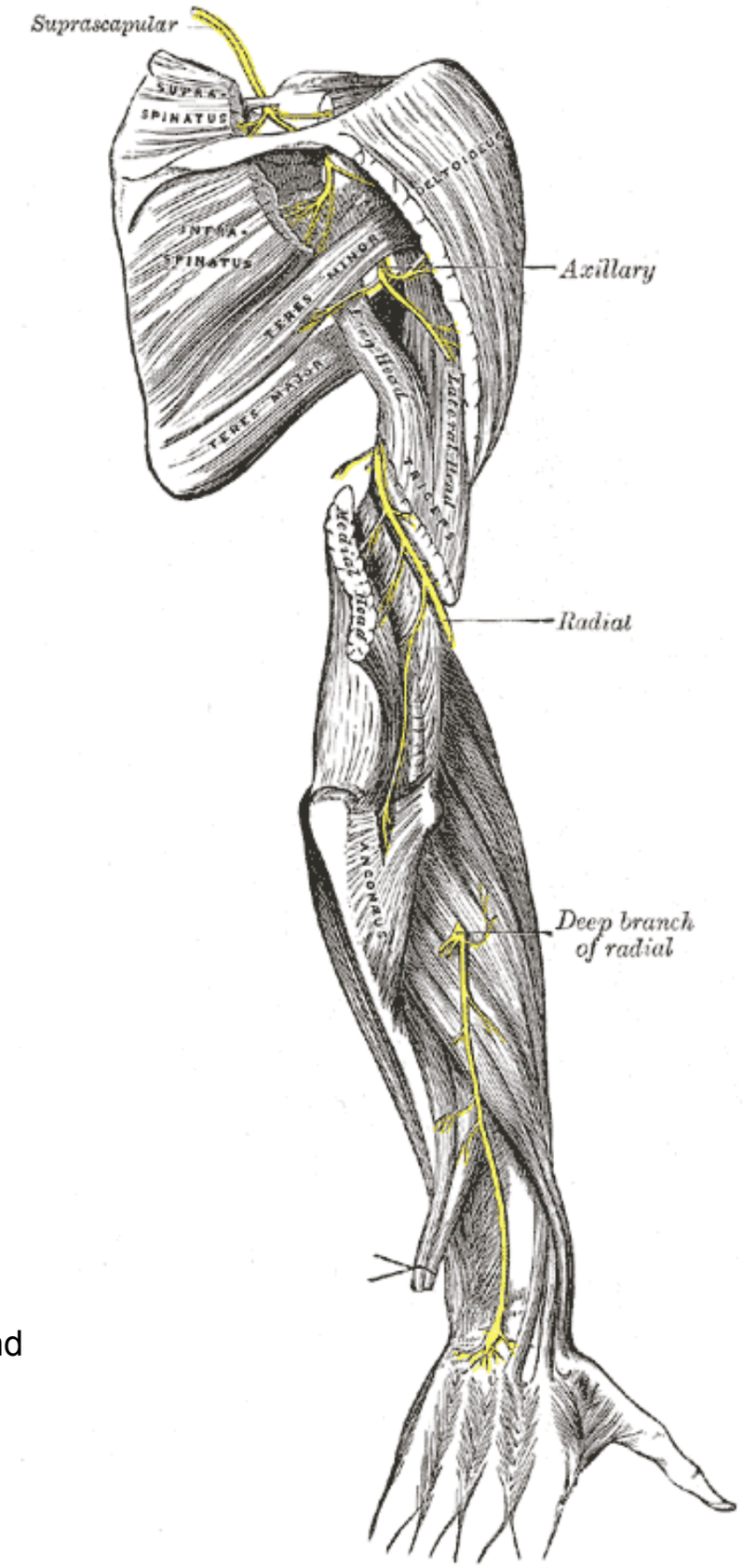
Posterior Cord - (five branches)

1. upper subscapular n (C5,6) - subscapularis m
2. Middle subscapular/thoracodorsal n (C6,7,8) - latissimus dorsi
3. lower subscapular n (C5,6) - subscapularis, teres major
4. axillary n* (C5,6) - deltoid, teres minor
5. radial n* (C5-T1) - extensor m's of upper limb and cutaneous sensation to extensor region; leaves axilla, runs post / inf / lat b/w long and medial heads of triceps, enters radial groove of humerus; gives branches to triceps, brachioradialis, extensor m's of forearm



Axillary Nerve (C5,6)





-deltoid, teres minor
-passes through **quadrangular space**
(bounded by surgical neck of humerus laterally, long head of triceps medially, teres minor and subscapularis superiorly, and teres major inferiorly)
with posterior circumflex humeral artery
-around the surgical neck of the humerus to supply m's
-end as the upper lateral cutaneous n of the arm

Musculocutaneous Nerve (C5,6)

Supplies arm flexors:

coracobrachialis

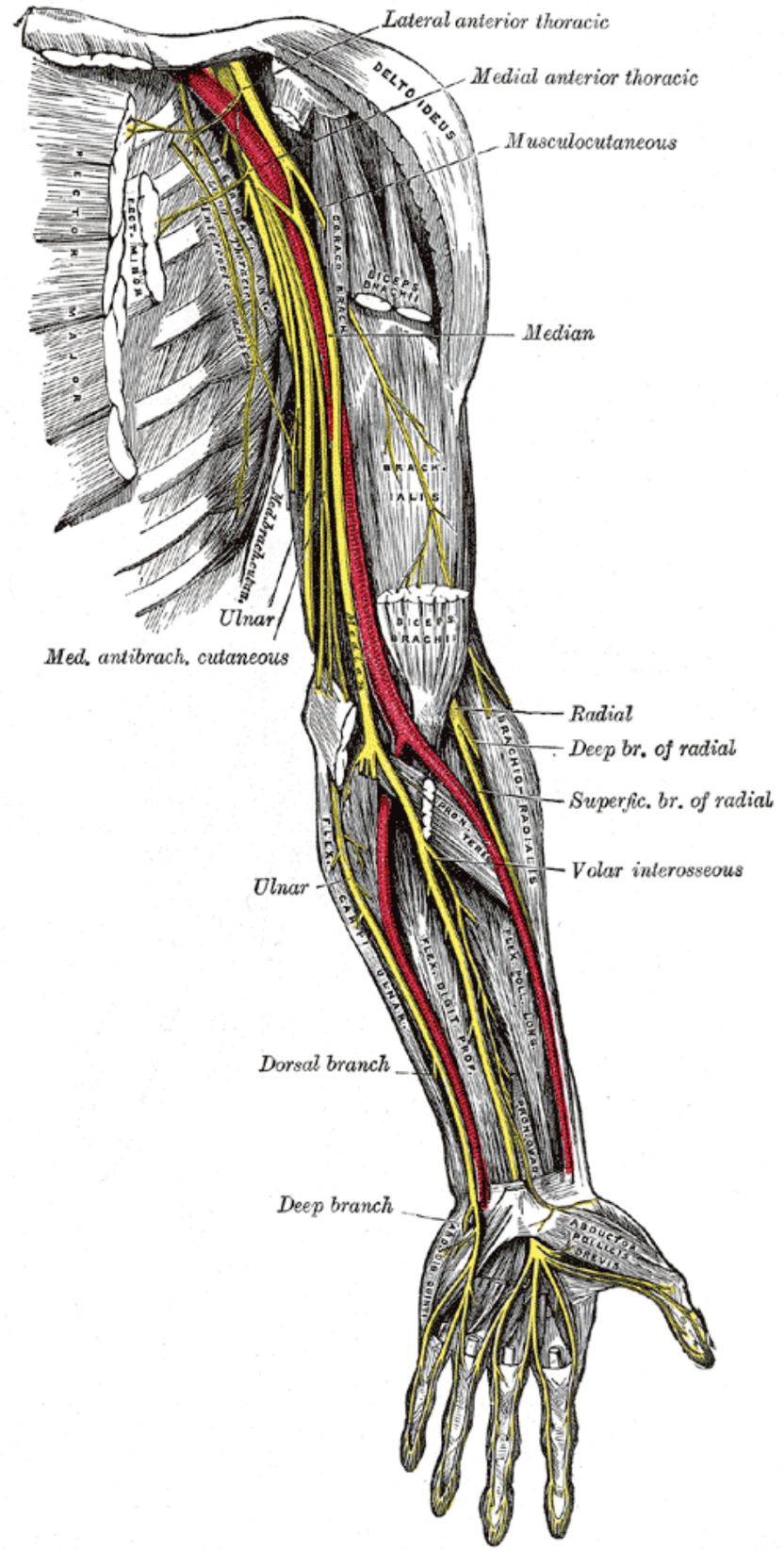
biceps

brachialis

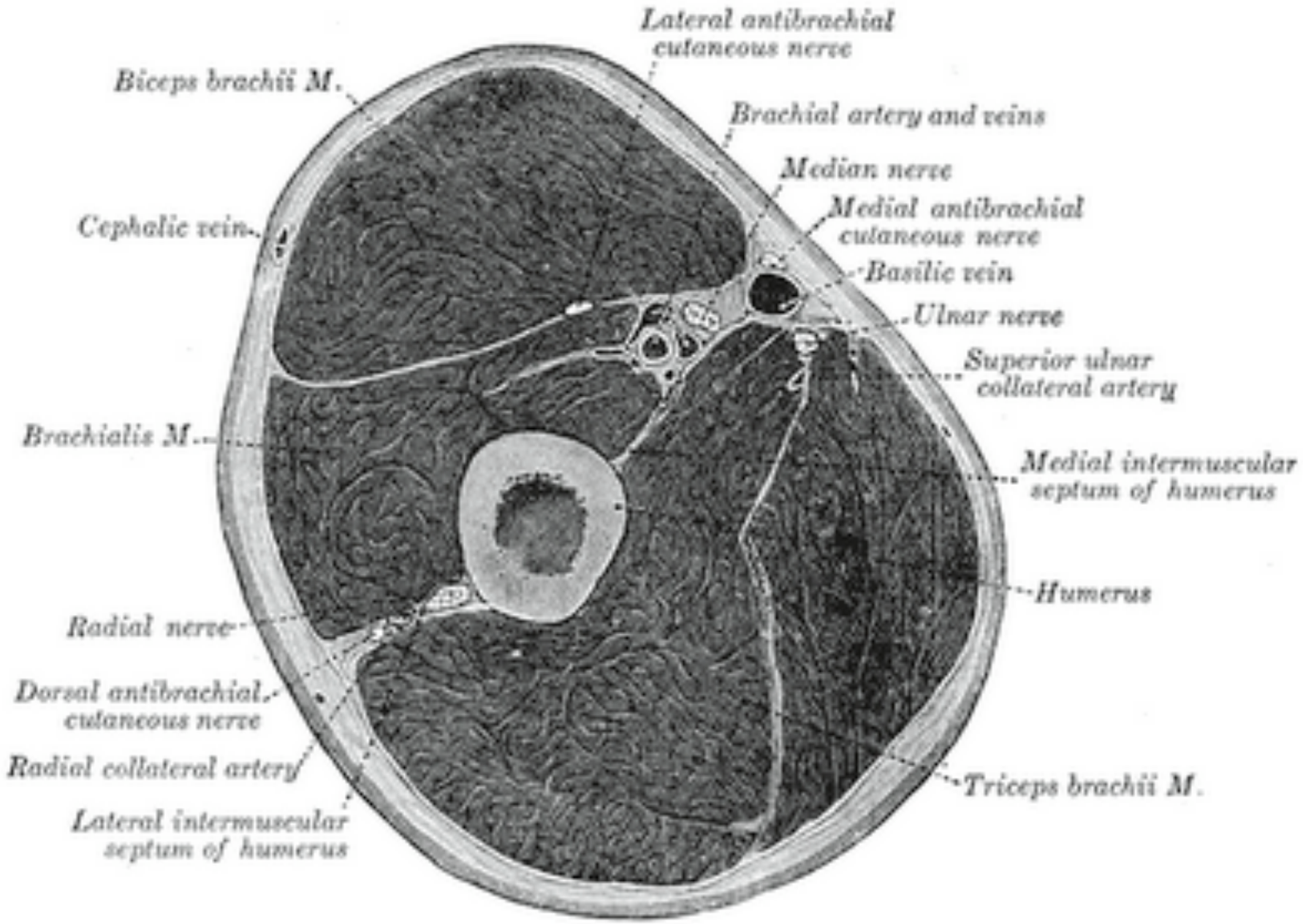
lateral cutaneous nerve of the forearm

-terminal branch

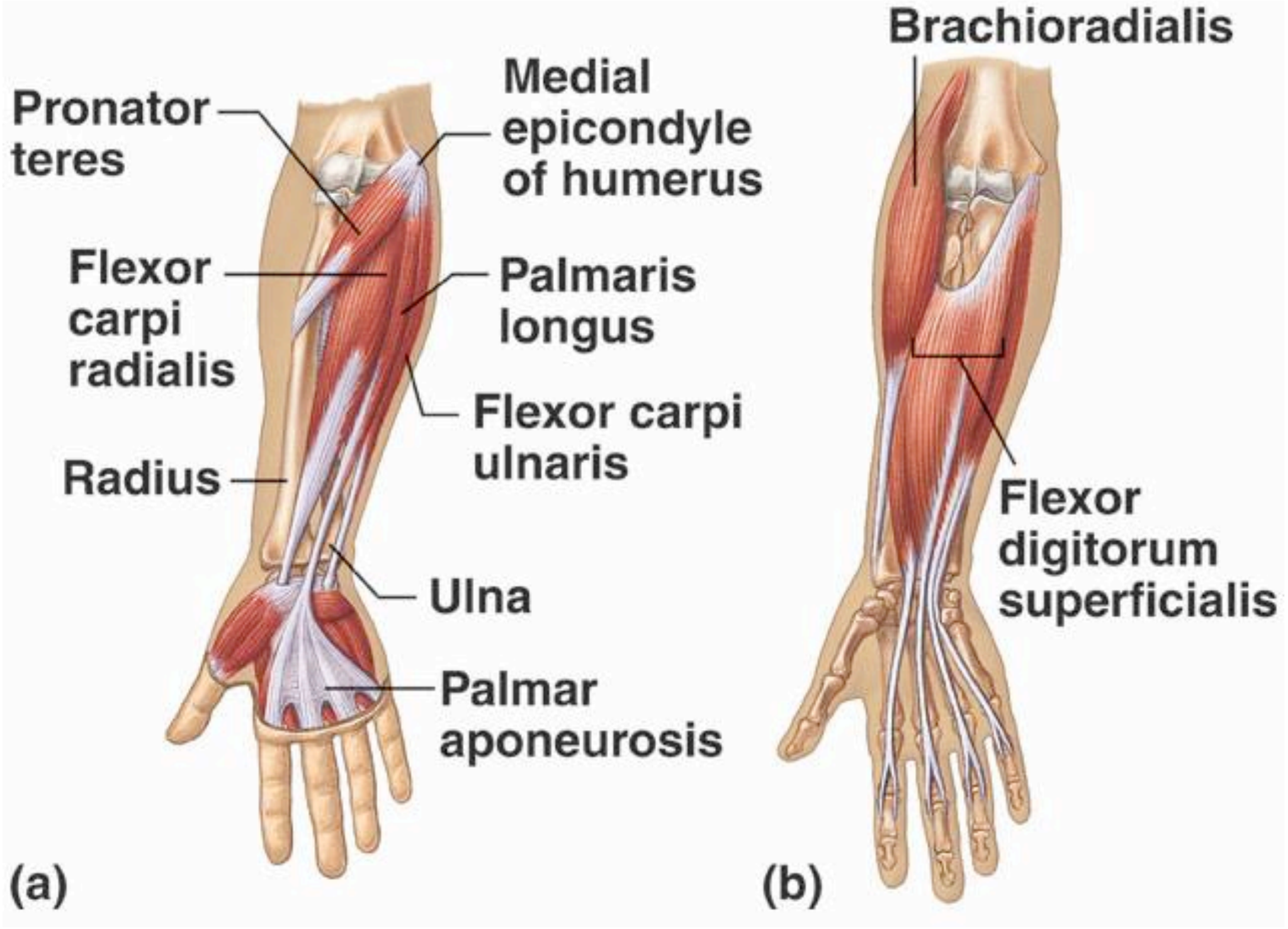
-supplies cutaneous sensation to radial aspect



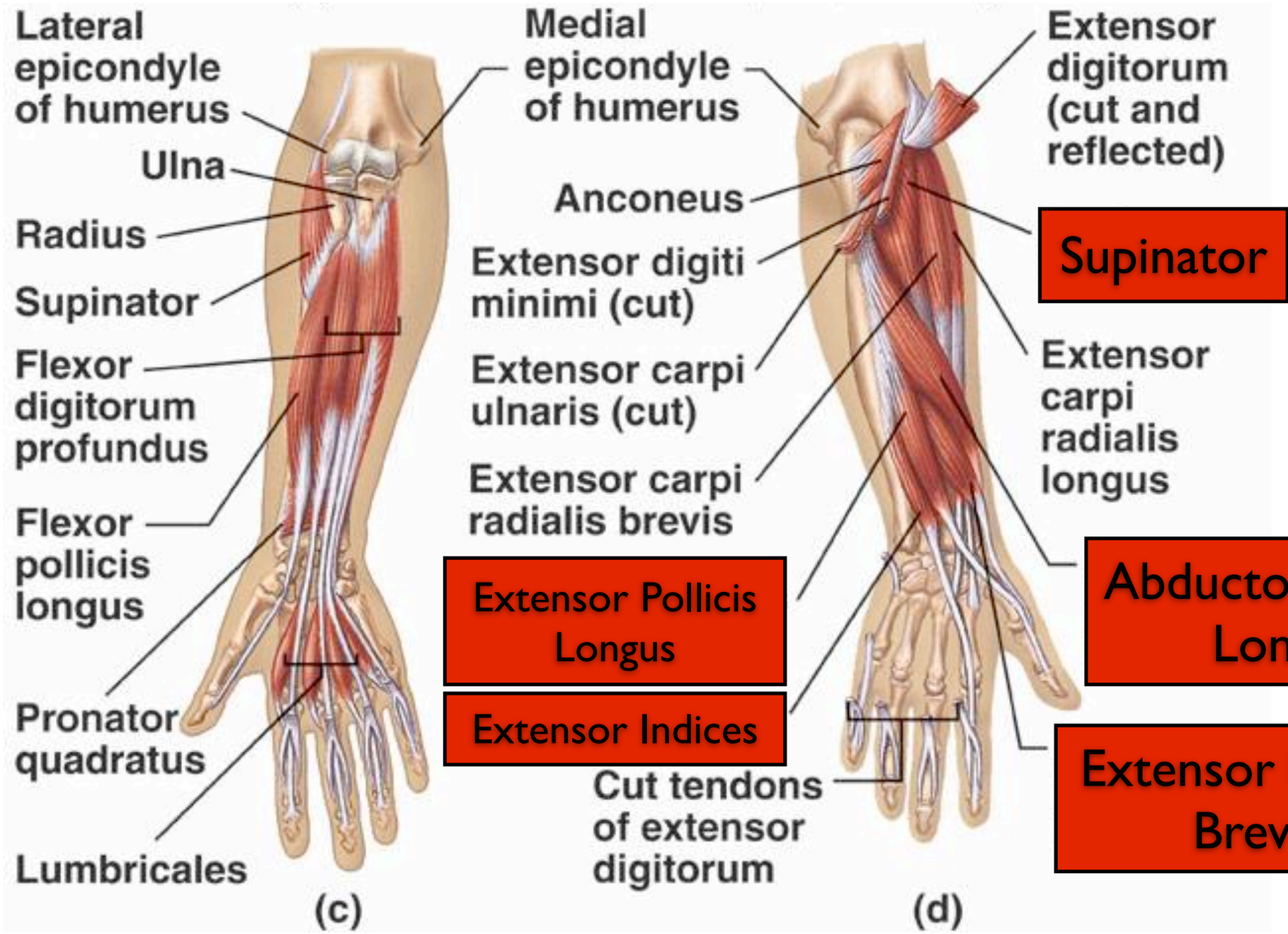
Cross Section of the Arm



Superficial and Intermediate Compartments of The Forearm



Deep and Extensor Compartments of The Forearm



Radial Nerve (C5-C8)

radial n* (C5-T1)

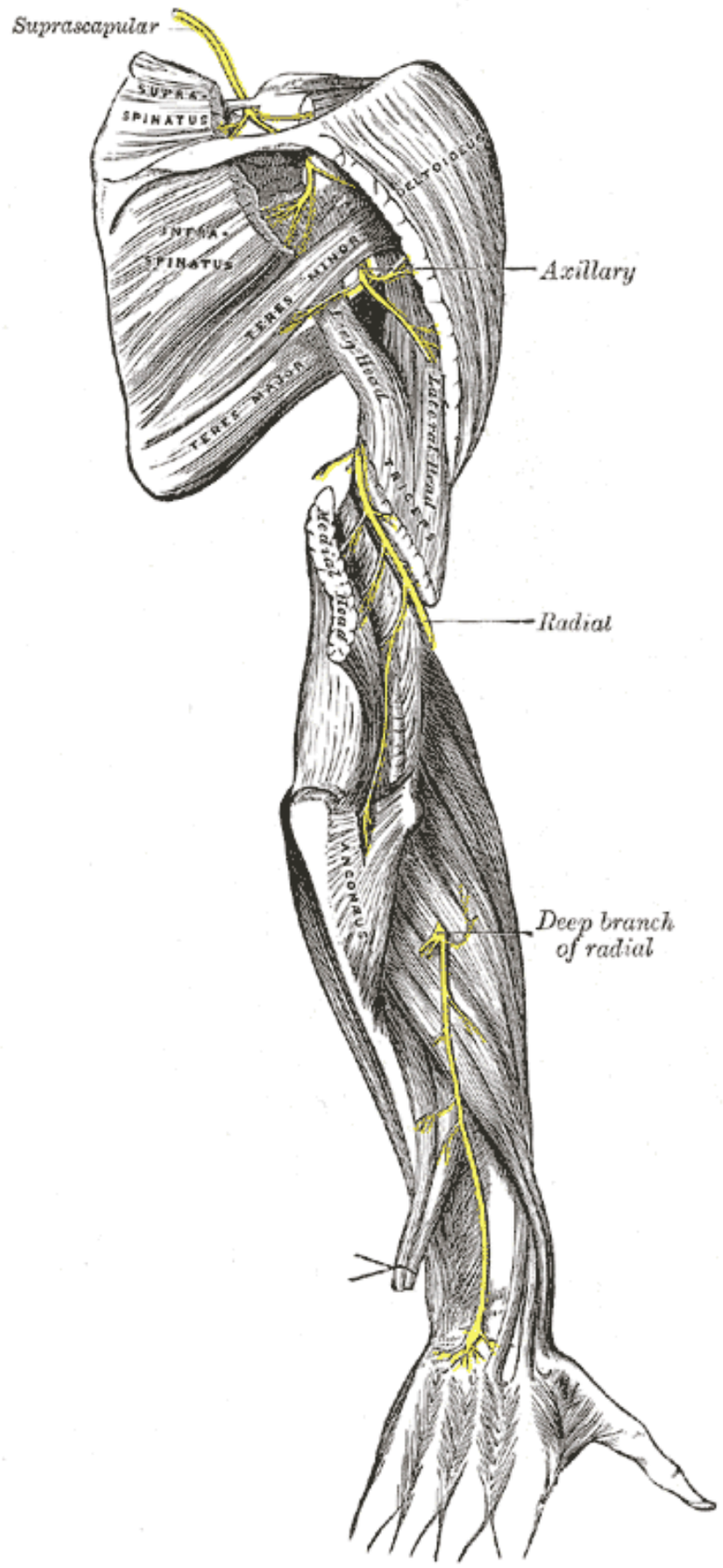
-extensor m's of upper limb

-cutaneous sensation to extensor region

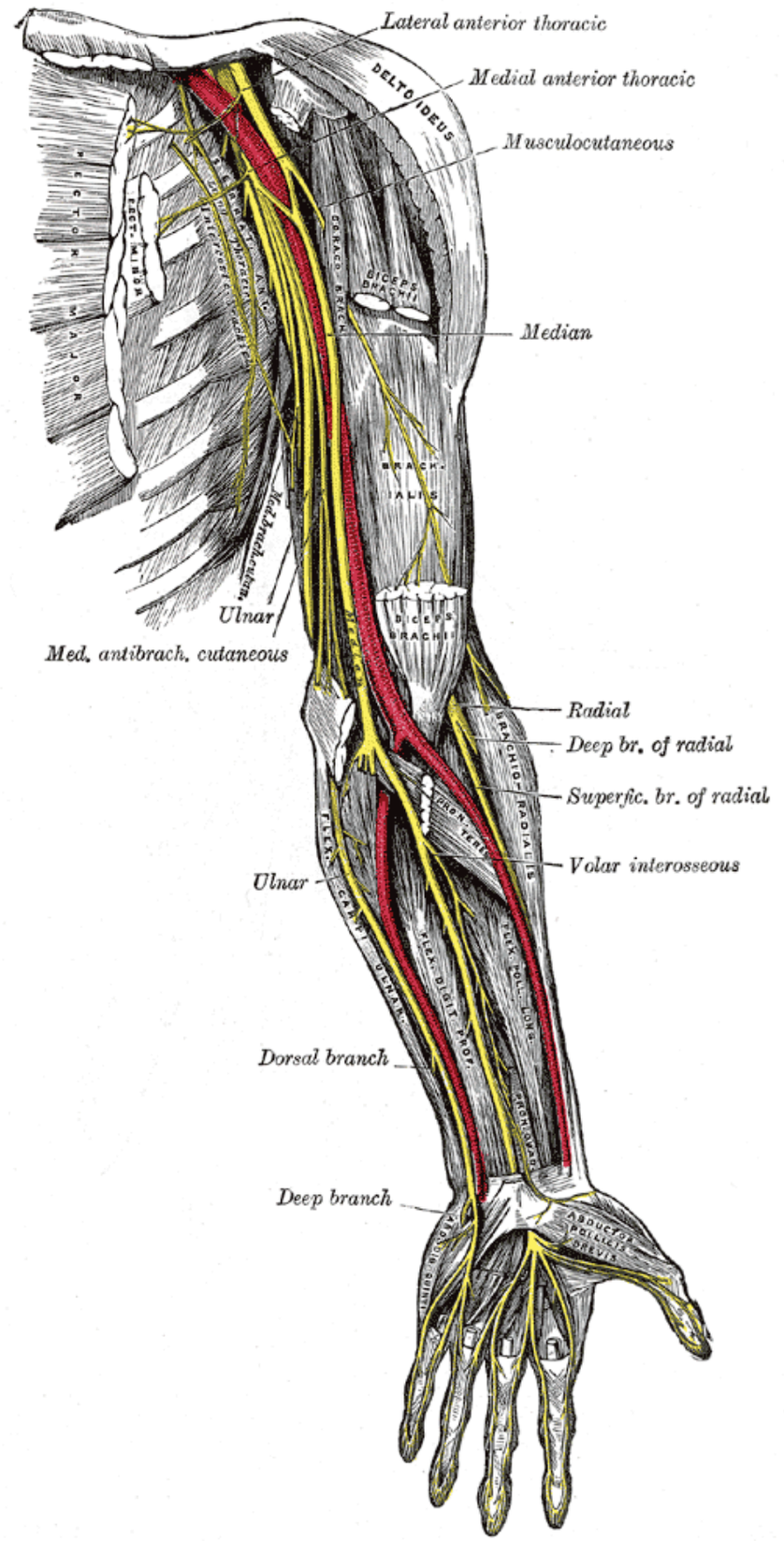
-leaves axilla, runs post / inf / lat b/w long and medial heads of triceps

-enters radial groove of humerus

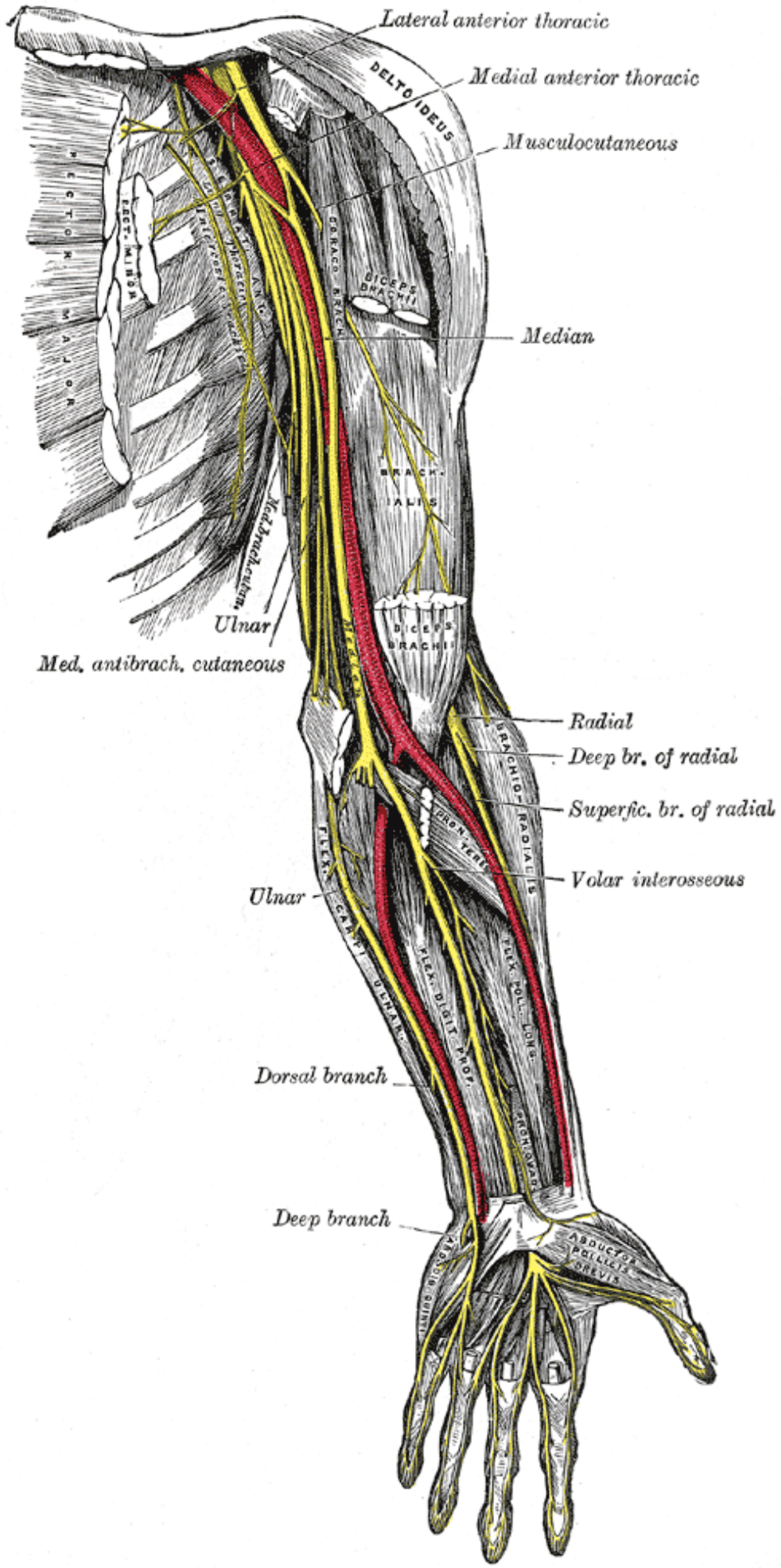
-gives branches to triceps, brachioradialis, extensor m's of forearm

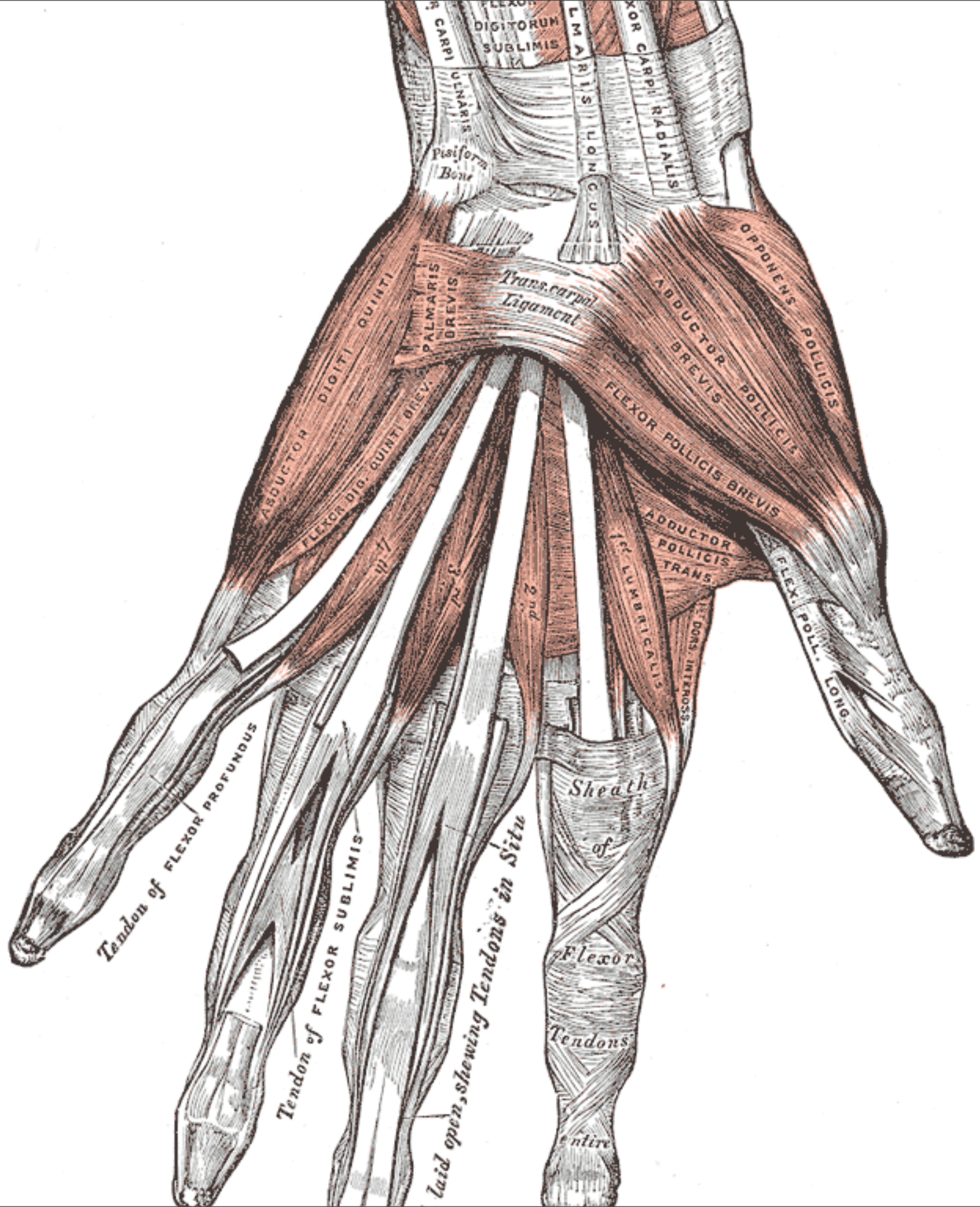


Median Nerve



Ulnar Nerve


Lateral anterior thoracic
Medial anterior thoracic
Musculocutaneous
Median
Radial
Deep br. of radial
Superfic. br. of radial
Volar interosseous
Ulnar
Dorsal branch
Deep branch
Ulnar
Med. antibrach. cutaneous
DELTOIDEUS
PECTORALIS MAJOR
CORACO-BRACH.
BICEPS BRACHII
BRACHIALIS
BRACHIO-RADIALIS
PRONATOR
FLEX. CARPI ULNARIS
FLEX. DIGIT. PROF.
FLEX. POLL. LONG.
SUPINATOR
ABDUCTOR POLLICIS BREVIS


CARPI
DIGITORUM
SUBLIMIS
ULNARIS
Pisiform Bone
PALMARIS LONGUS
CARPI RADIALIS
Trans.carpal Ligament
OPPONENS POLLICIS
ABDUCTOR BREVIS POLLICIS
FLEXOR POLLICIS BREVIS
ABDUCTOR POLLICIS TRANS.
ABDUCTOR DIGITI QUINTI
PALMARIS BREVIS
FLEXOR DIG. QUINTI BREV.
1st LUMBRICALIS
DORS. INTEROSS.
EXT. POLL. LONG.
Tendon of FLEXOR PROFUNDUS
Tendon of FLEXOR SUBLIMIS
Sheath of Flexor Tendons
entire
laid open, shewing Tendons in Situ

How to Distinguish Between:

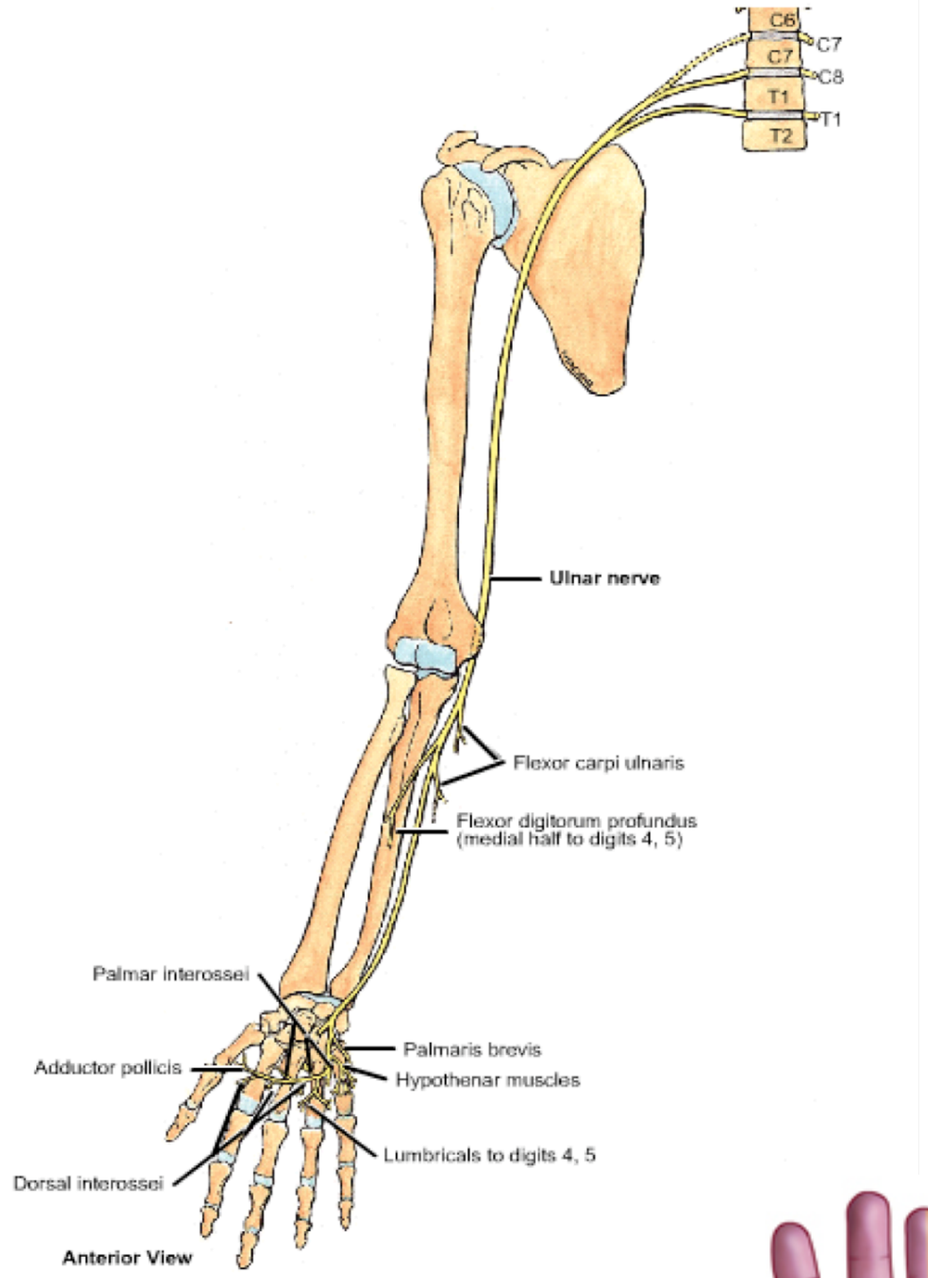
C6 vs median neuropathy

C7 vs radial neuropathy

C8 vs ulnar neuropathy

Ulnar Neuropathy

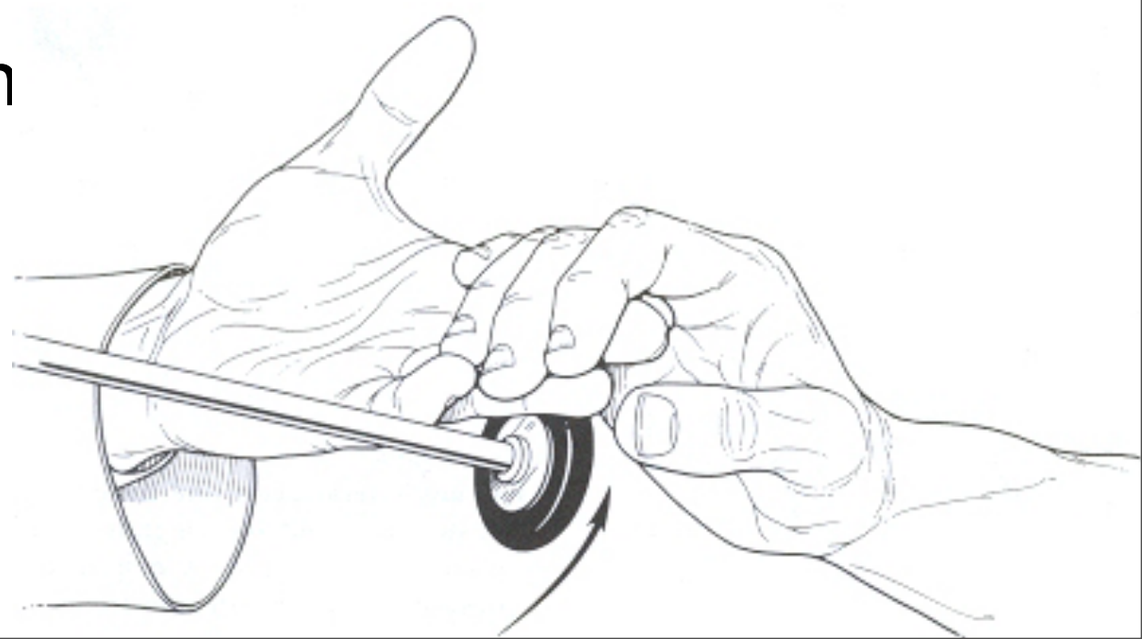
- Ulnar Nerve
- Weakness and wasting
  - Flexor carpi ulnaris
  - Flexor digitorum profundus D4,5
  - Abductor digiti minimi
  - Dorsal interossei
  - Palmar interossei
  - Adductor pollicis
  - 3rd and 4th lumbricals (flex MCP, ext PIP & DIP)
  - Deep head of flexor pollicis brevis
- Sensory
  - D5 and medial aspect of D4 (dorsal and ventral
  - Distal to the wrist
- Other
  - No reflex to test for ulnar nerve
    - Tinel's sign at the elbow



C8 Muscles Beyond Ulnar Distribution

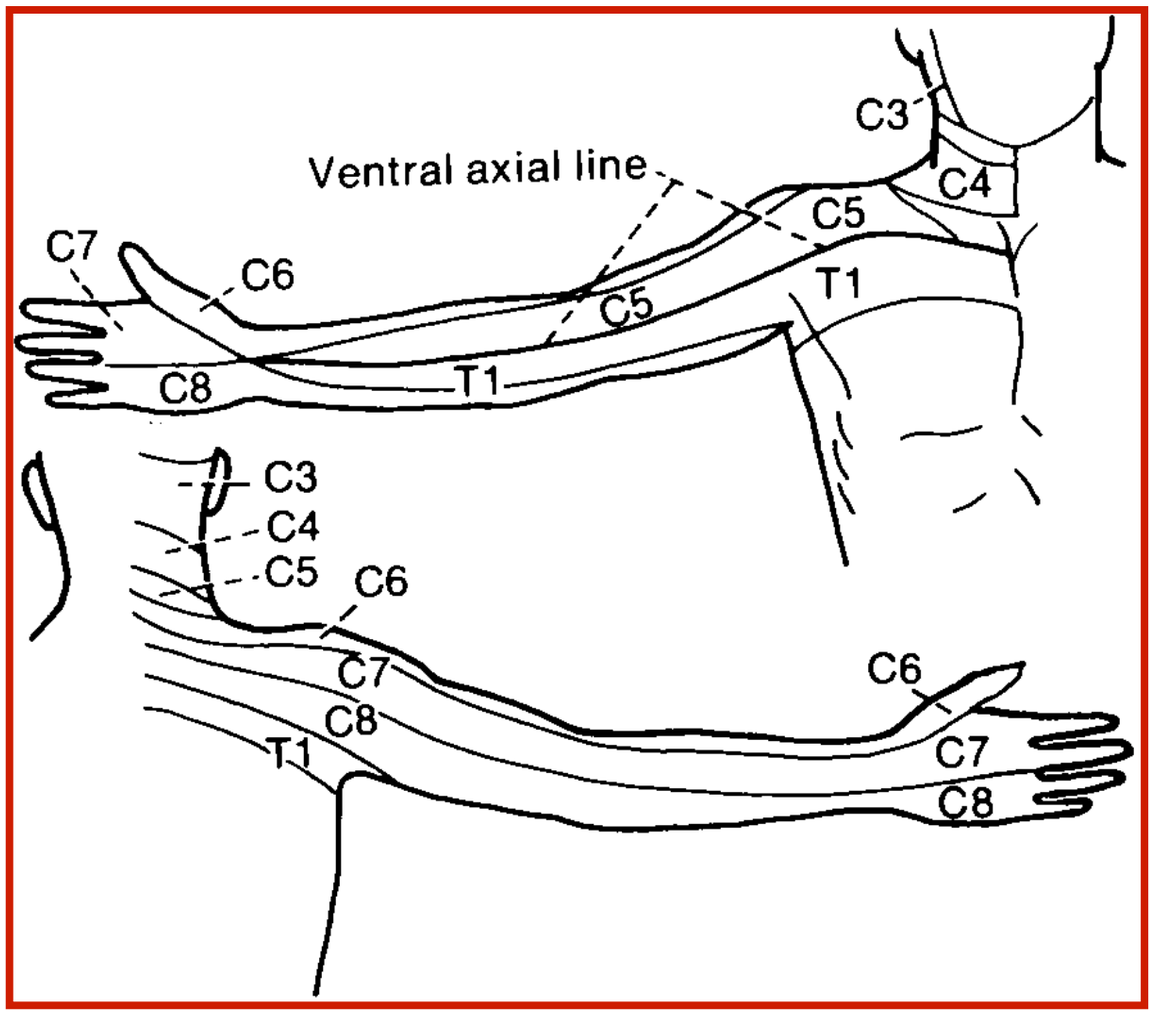
- Flexor pollicis longus (median)
- Flexor digitorum profundus D 2 & 3 (median)
- Pronator quadratus (median)
- Extensor pollicis brevis & longus (radial)
- Abductor pollicis brevis (median

Reflex: Loss of finger flexor – C8



C8 Sensation Beyond Ulnar Distribution

- Minor – No splitting of D4
- Major – Sensory loss proximal to the wrist



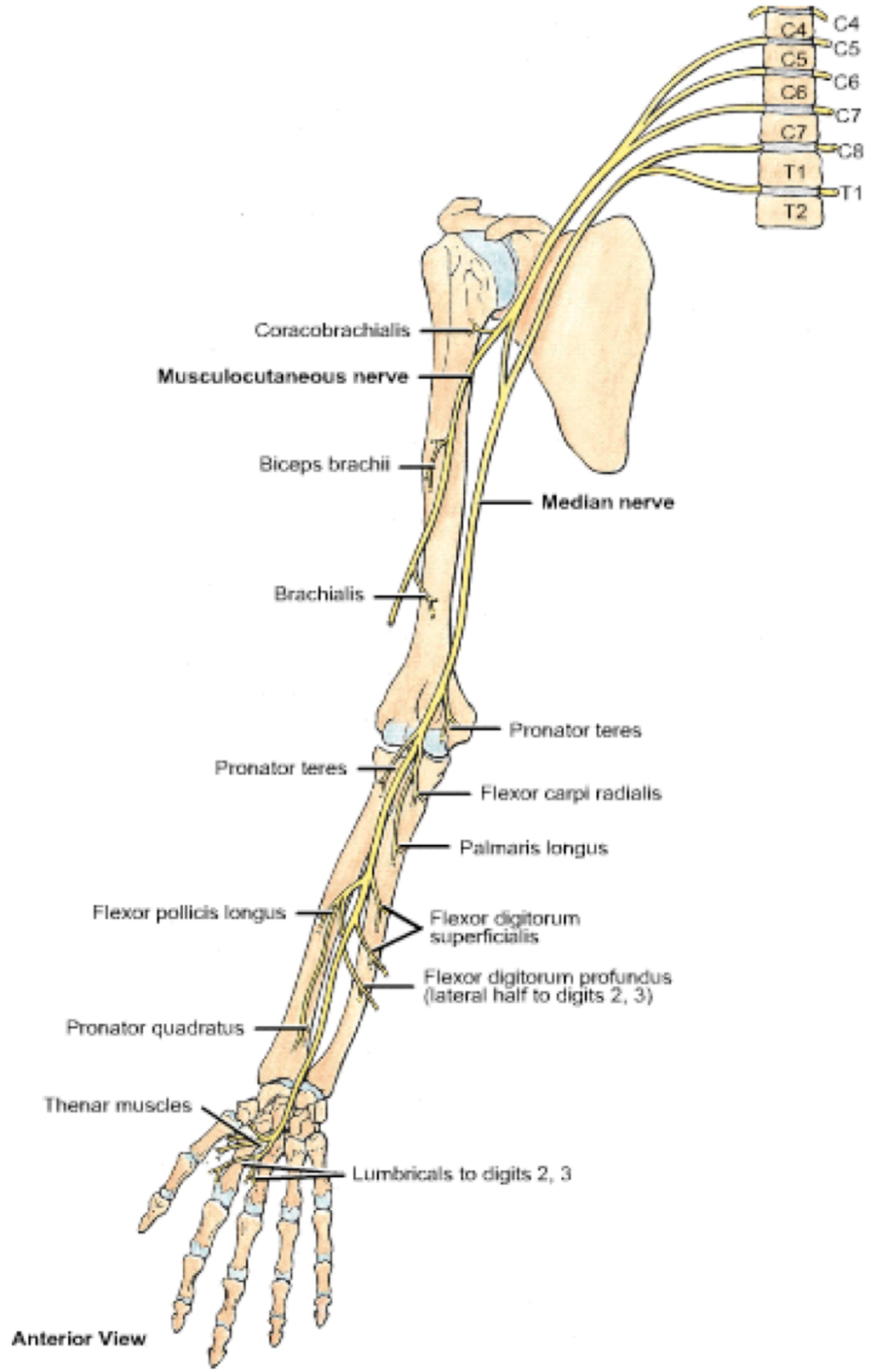
Median Neuropathy vs C6

Median Nerve

Weakness and wasting

- Pronator Teres
- Flexor Carpi Radialis
- Palmaris Longis
- Flexor digitorum superficialis
- **AIN**
  - FPL
  - FDP 1 & 2
  - Pronator Quadratus

- Lumbricals 1 & 2
- Opponens pollicis
- Abductor pollicis brevis
- (FPB - superficial head)



Median Sensory

D1, 2, 3 and medial aspect of D4

Other

-loss of finger flexor reflex (median/C8)

-Tinel's sign at the wrist

C6 Muscles beyond Median Nerve Distribution

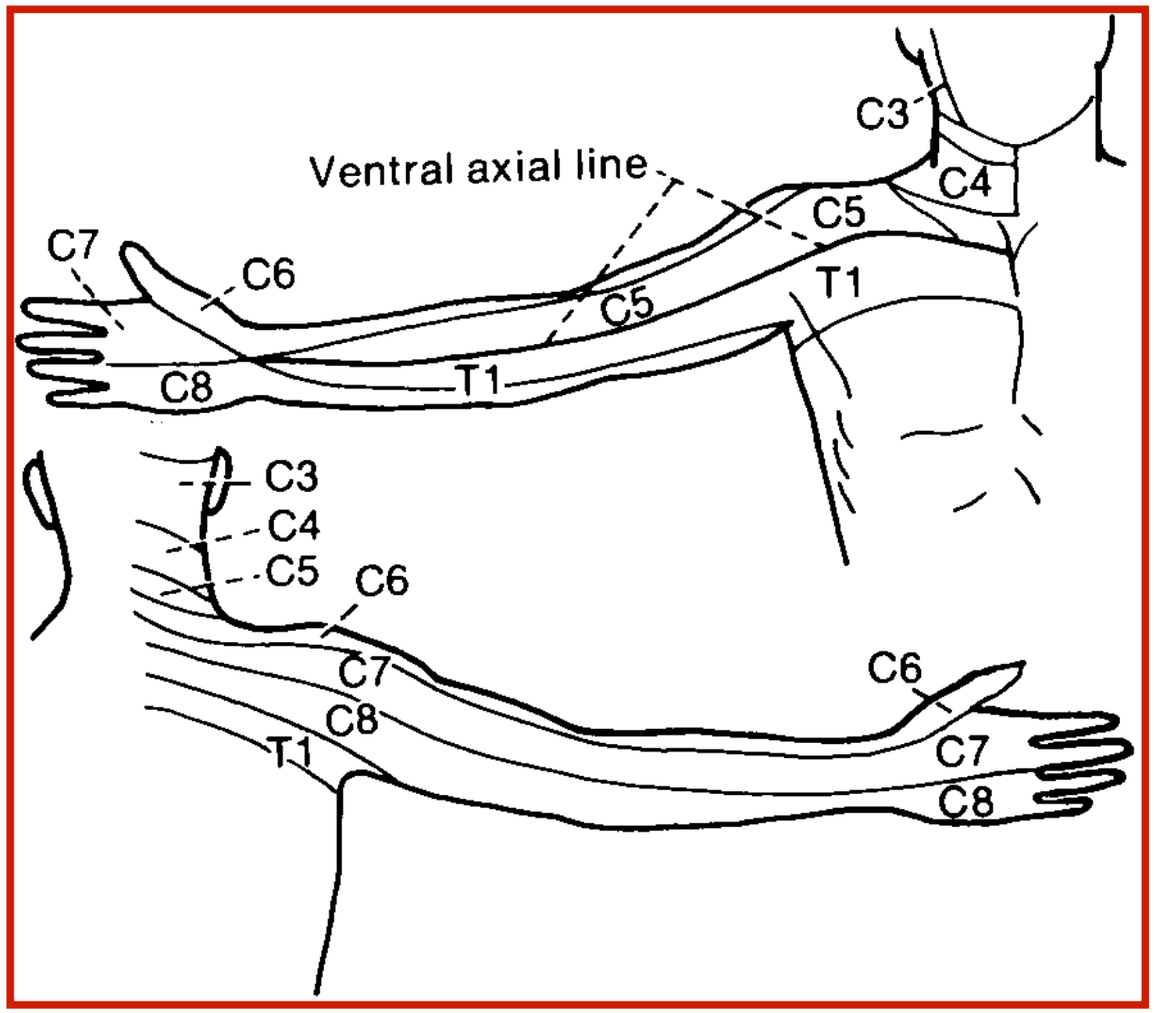
- Biceps
- Brachioradialis
- Supinator
- Extensor carpi radialis

To a Lesser Extent

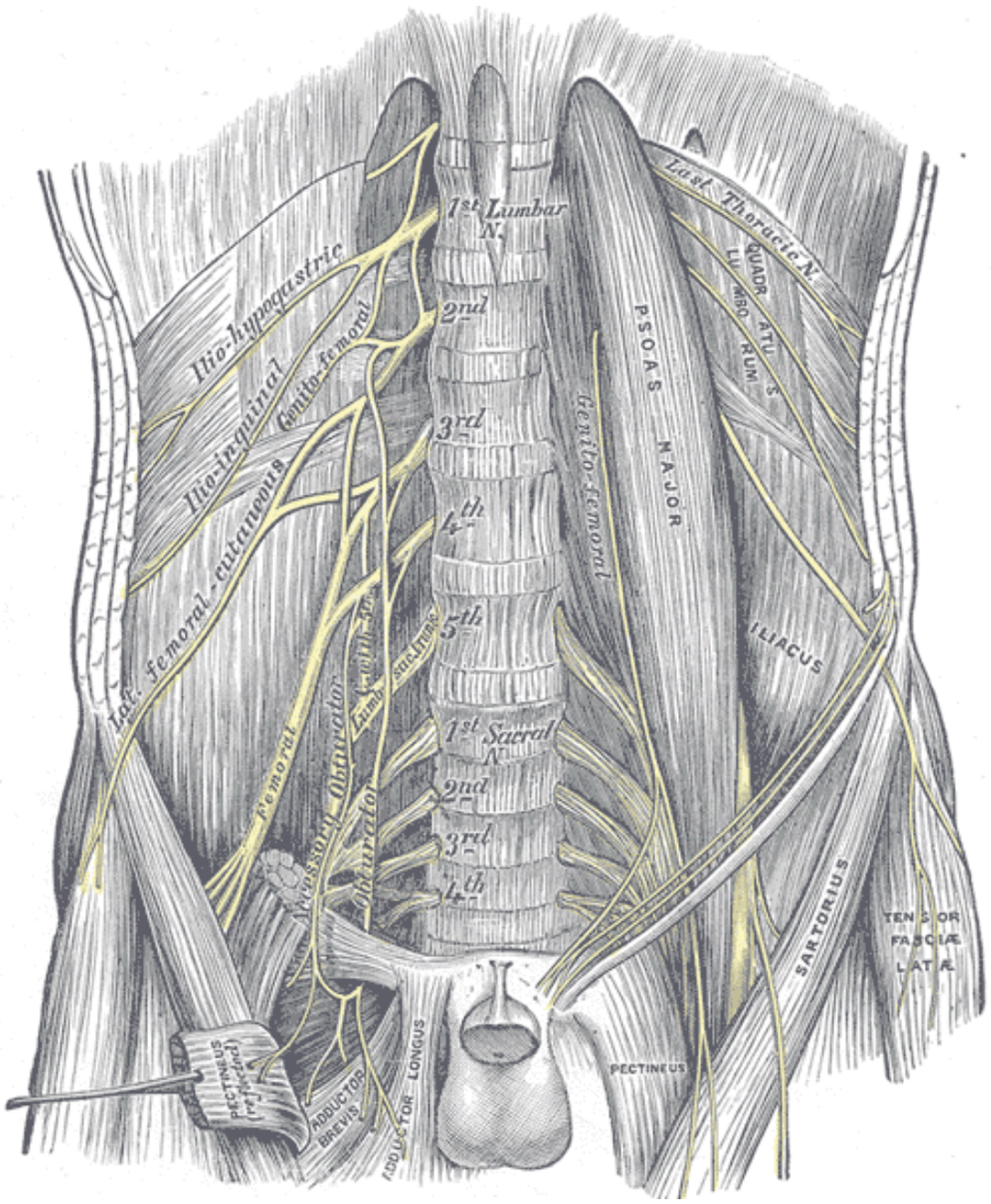
- Serratus Anterior
- Supraspinatus
- Infraspinatus
- Deltoid
- Teres Major
- Teres Minor
- Pectoralis Major
- Latissimus
- EDC
- EIP

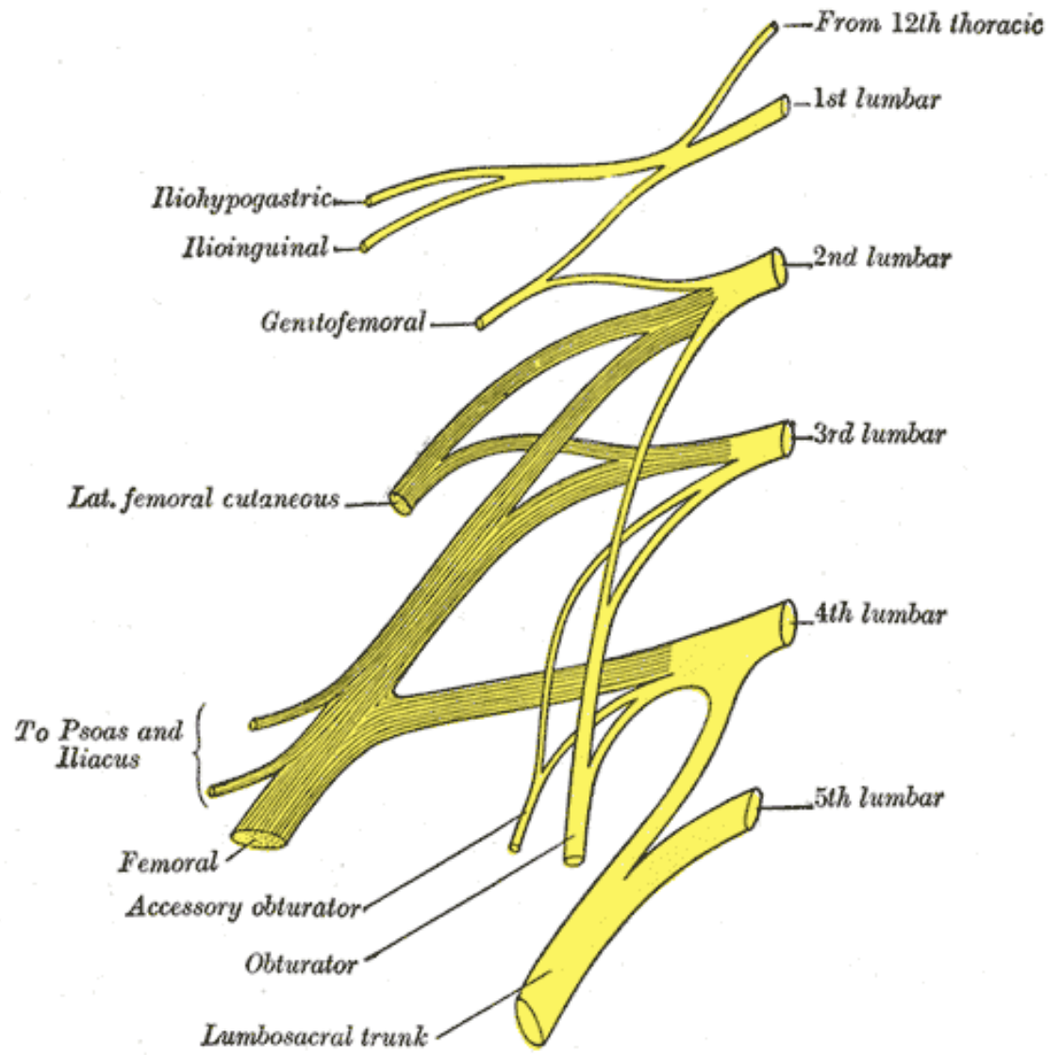
C6 Muscles beyond Median Nerve Distribution

- Minor – No splitting of D4
- Major – Sensory loss proximal to the wrist

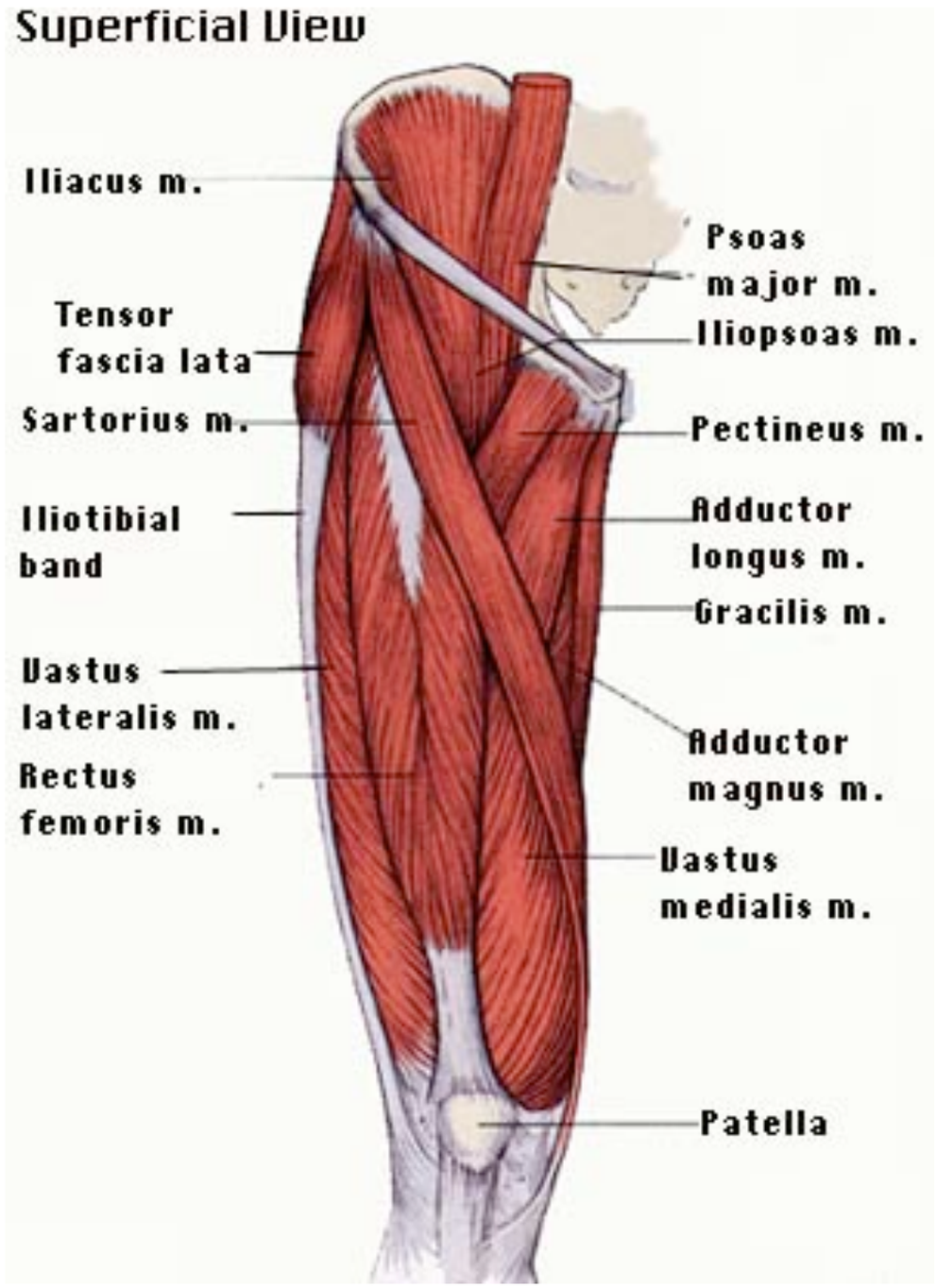


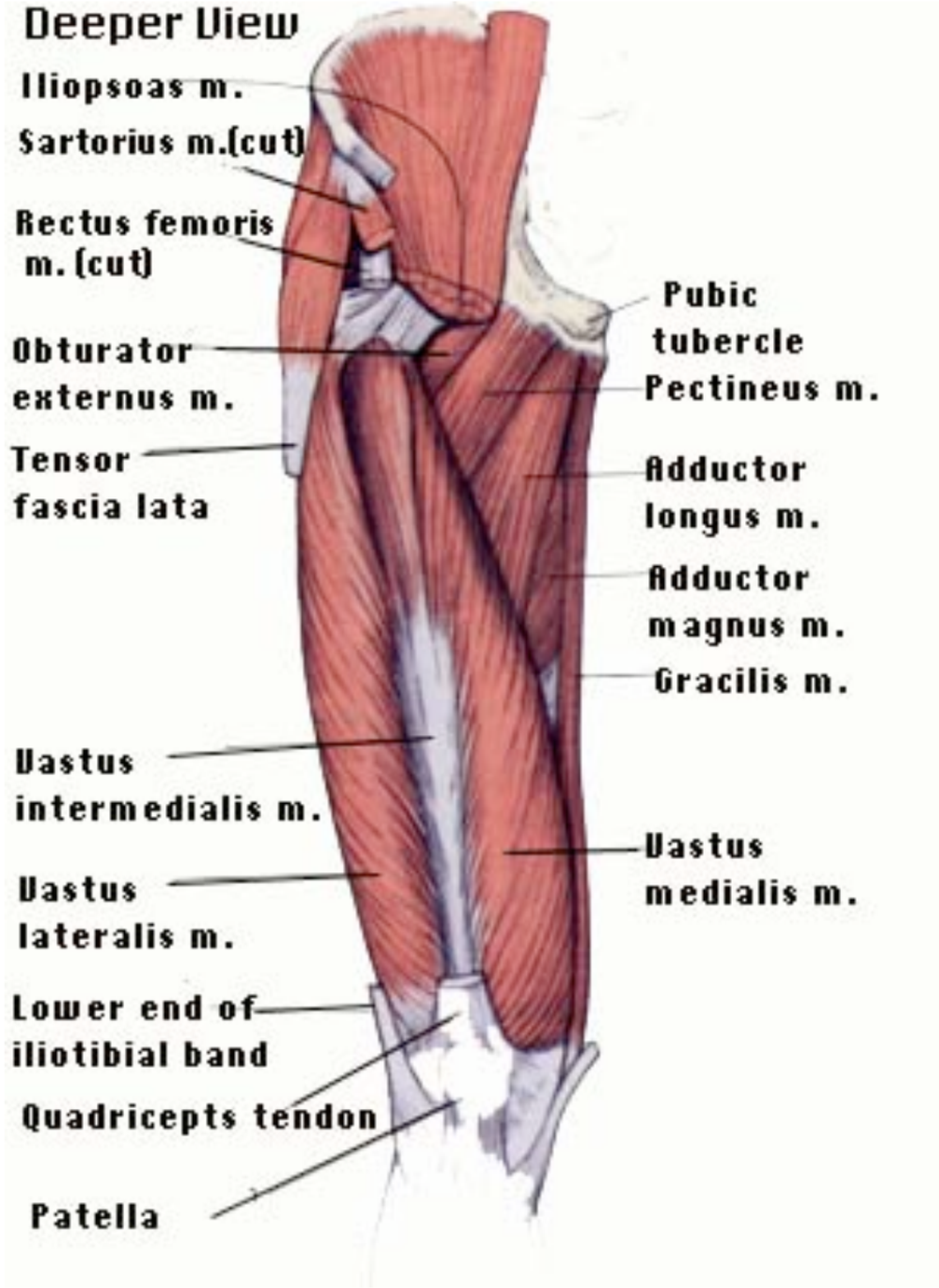
Lumbosacral Plexus





Muscles of Anterior Thigh





Lumbar Plexus

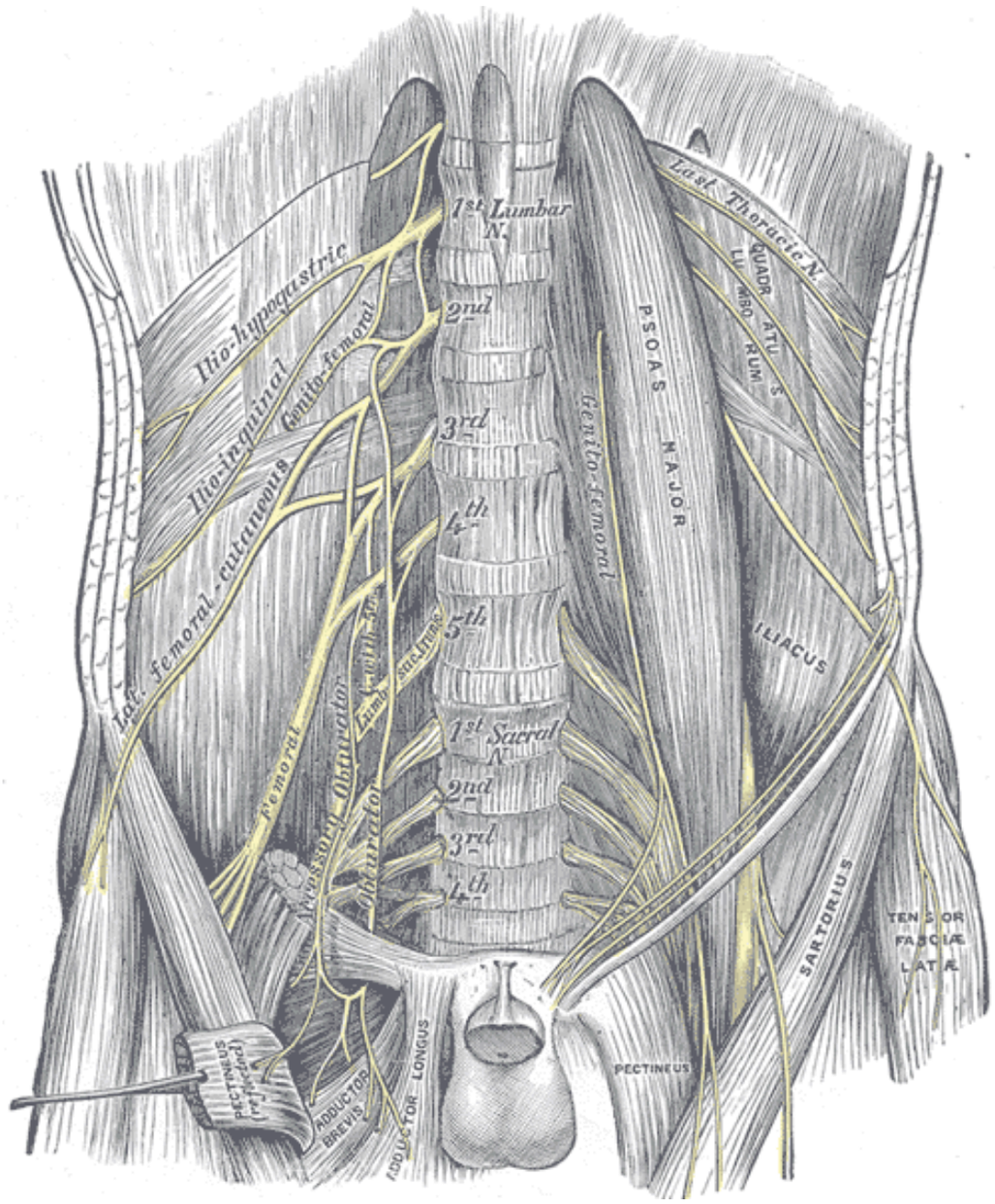
I. Lumbar Plexus

-**formed by ventral rami L1-L3 and superior part of L4, +/- T12**
-forms within and passes through psoas m, anterior to TPs of lumbar vertebrae
-all 5 levels in L-spine receive grey rami communicantes from symp chain
-largest and most important branches of lumbar plexus =

1. obturator n.

2. femoral n

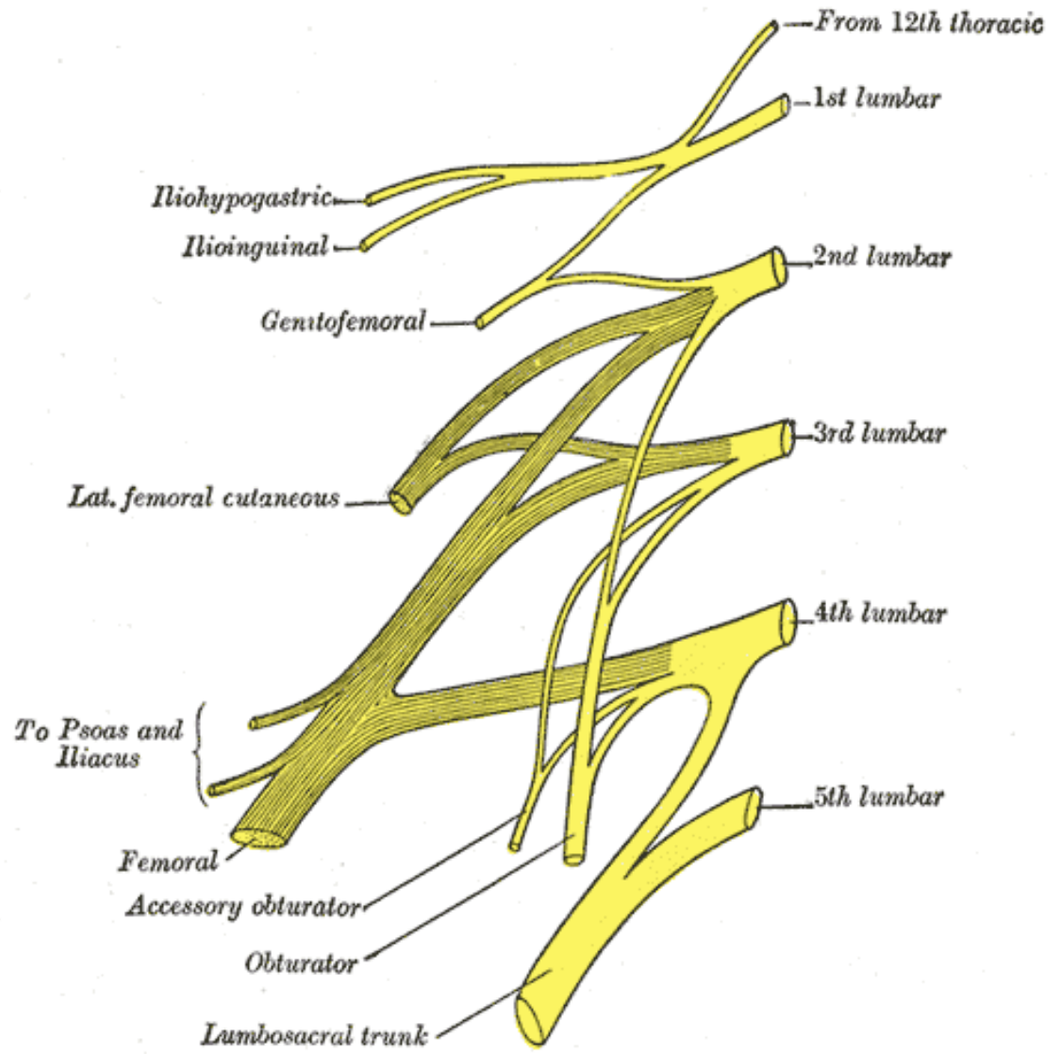
(which derive from the same SC levels, L2-L4)



Lumbar Plexus

6 Branches

1. Ilioinguinal (medial) and
2. Iliohypogastric (lateral) - L1
3. Genitofemoral - L1, L2
4. Lateral Femoral Cutaneous nerve - L2 +/- L3
5. Obturator nerve - L2-L4
6. Femoral nerve - L2-L4



Lumbar Plexus

6 Branches

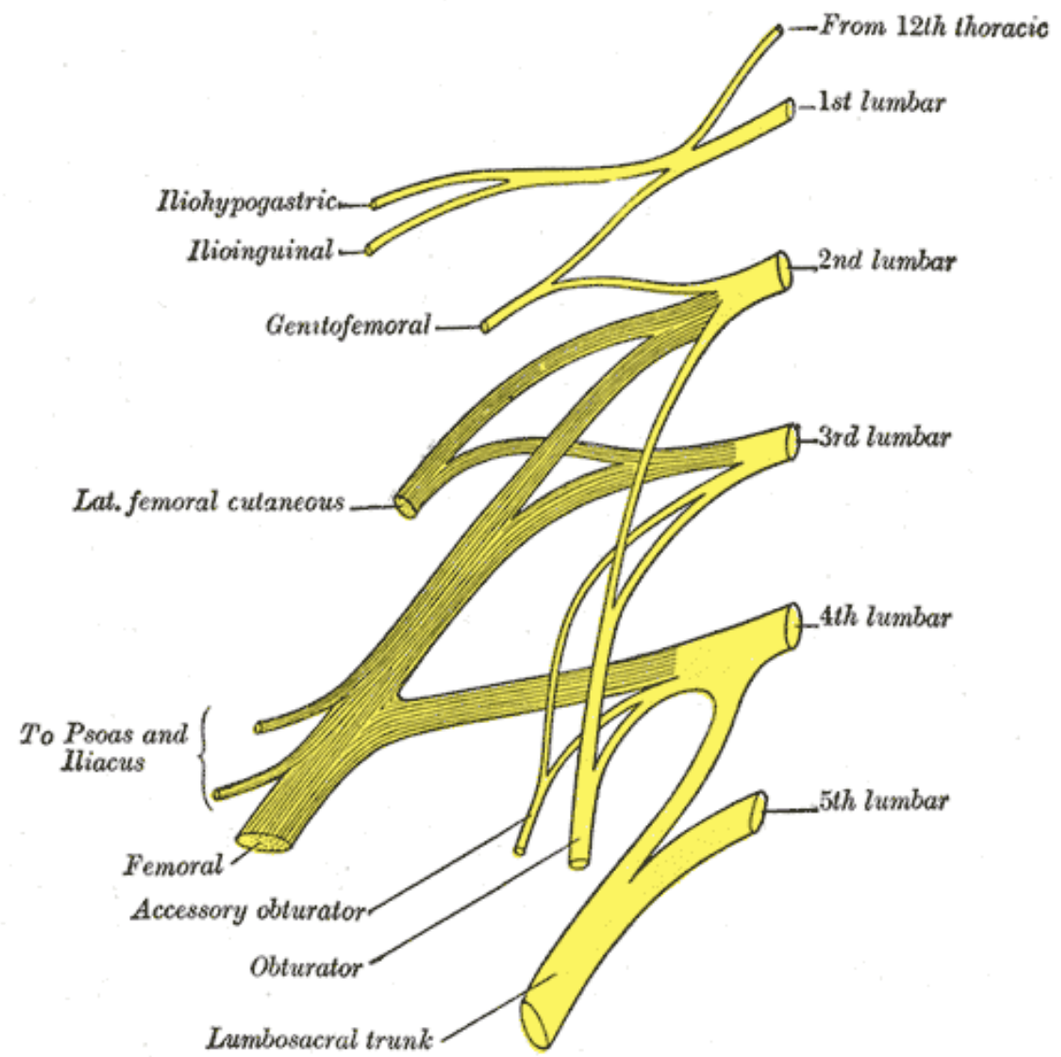
1. Ilioinguinal (medial) and
2. Iliohypogastric (lateral) - L1

-both from L1, often via a common stem

-pass inferolateral, anterior to quadratus lumborum

-supply the skin of inguinal region / groin / scrotum or labium majorus / suprapubic region (ilioinguinal) and hypogastric / gluteal region (iliohypogastric), with branches to abdo m's

-iliohypogastric is at risk in appendectomy



Lumbar Plexus

6 Branches

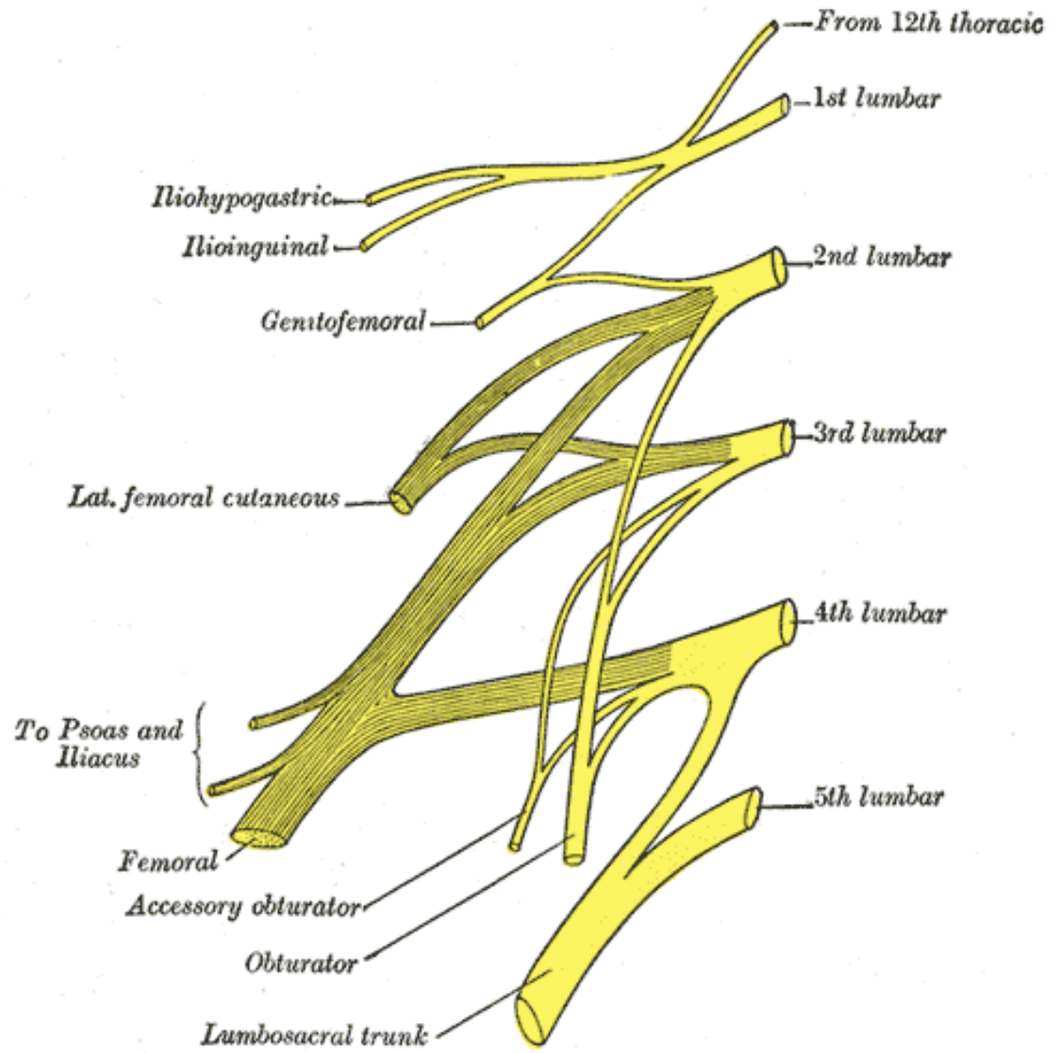
3. Genitofemoral - L1, L2

= most medial branch from L1; also receives contributions from L2

-runs inferior in psoas m

-divides into genital (medial) and femoral (lateral) branches

(*ilioinguinal and genital branch of GF nerve pass through inguinal canal)



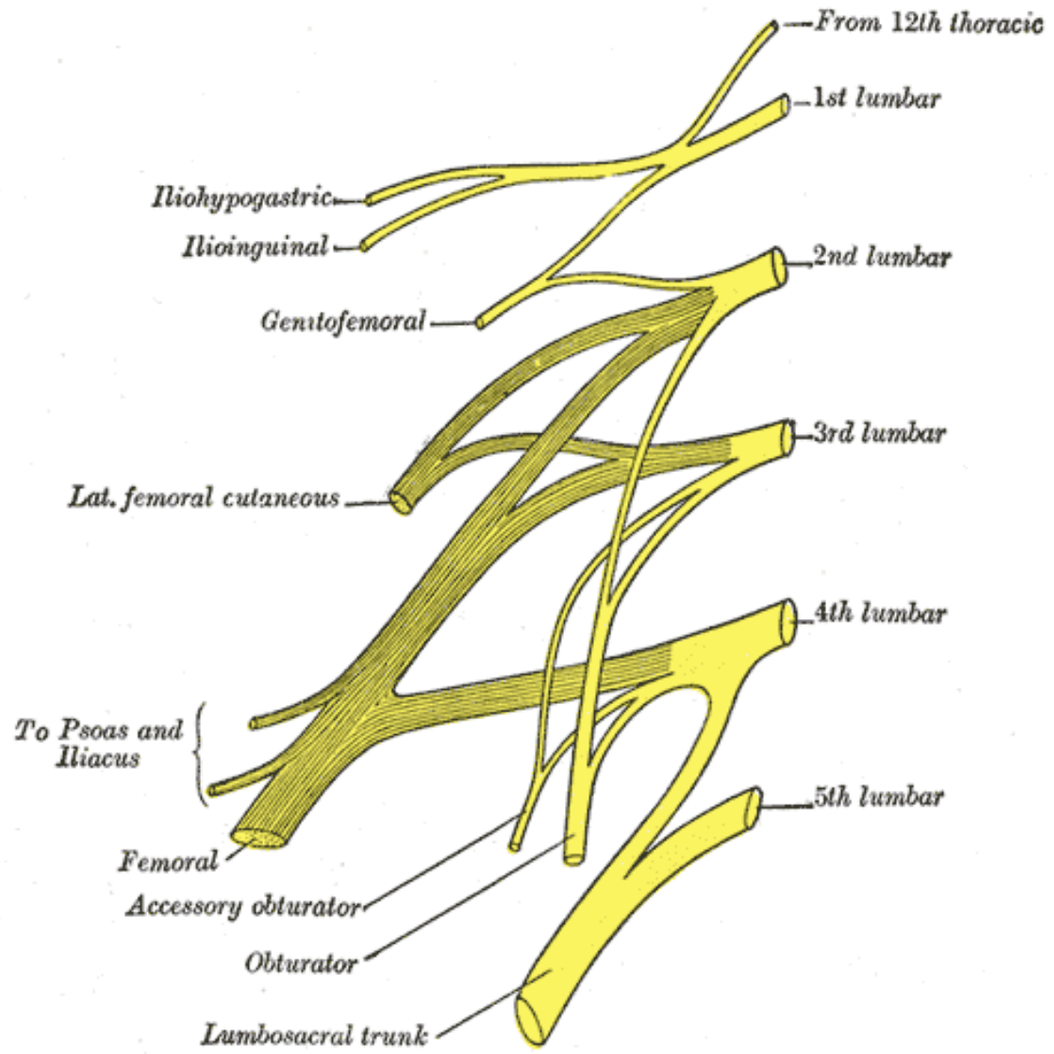
Lumbar Plexus

6 Branches

4. Lateral Femoral Cutaneous nerve - L2 +/- L3

-passes through psoas, emerges superior to iliac crest, runs inferolateral on iliacus m and enters thigh posterior to or through the inguinal ligament, just medial to ASIS

-supplies skin of ant and lat thigh



Lumbar Plexus

6 Branches

5. Obturator nerve - L2-L4

-arises from L2-4 and descends through psoas m

-leaves medial border of psoas at brim of pelvis

-crosses S-I joint, lateral to internal iliac vessels and ureter

-into extraperitoneal fat on ala of the sacrum

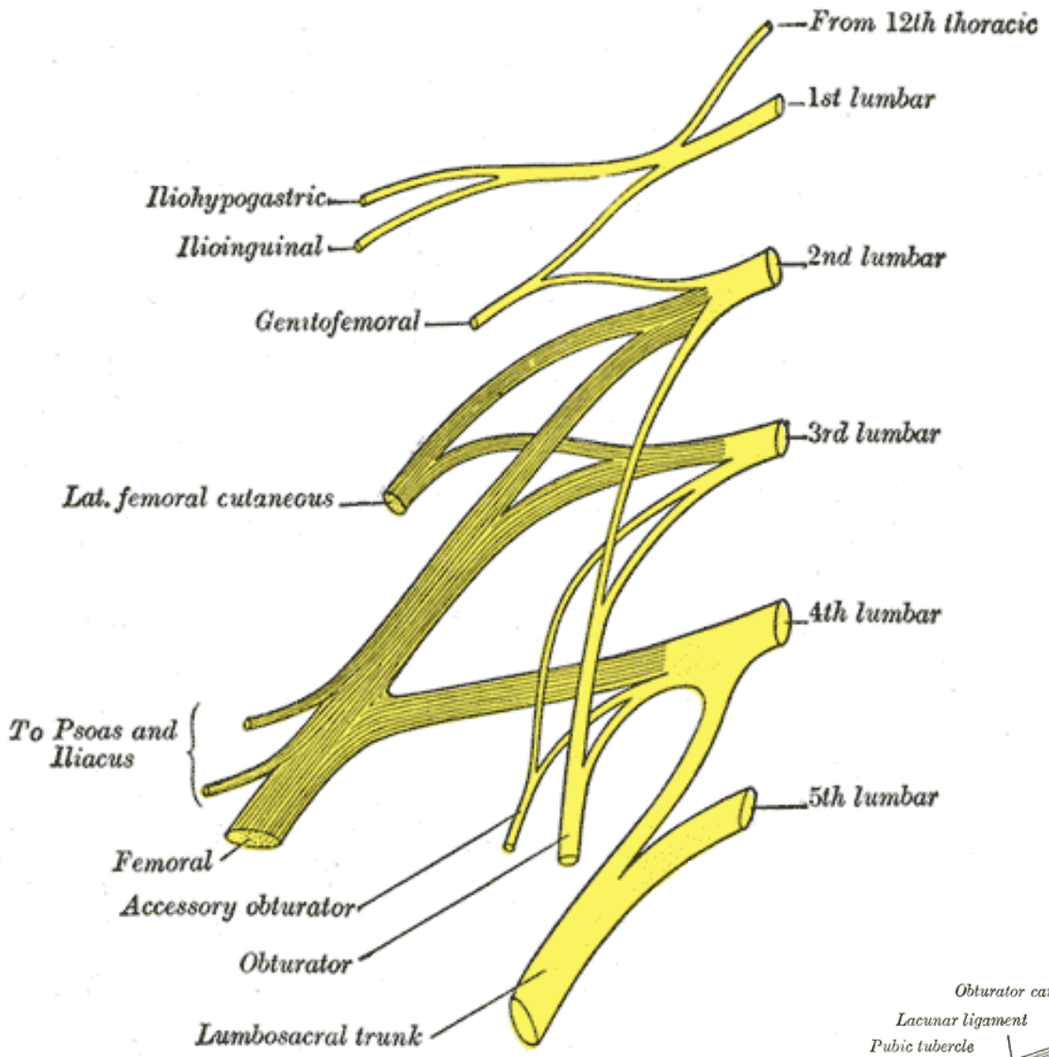
-leaves pelvis by passing through obturator foramen into thigh

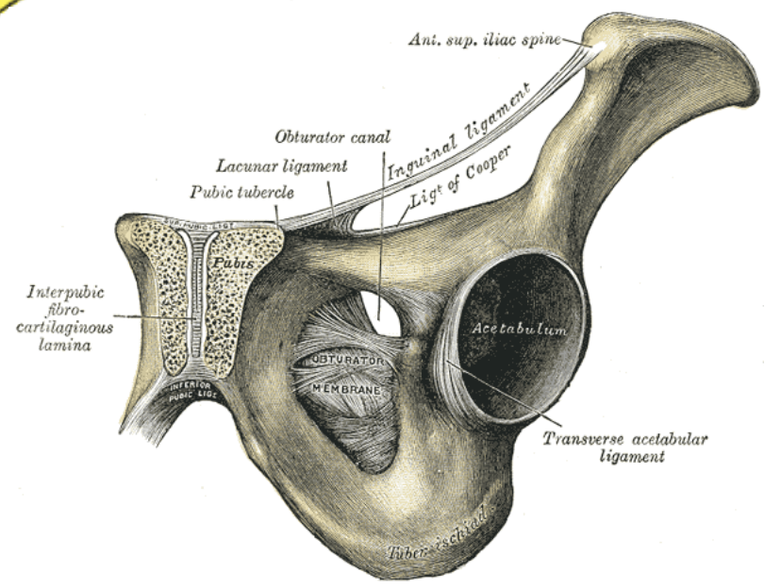
-there, it divides into anterior and posterior divisions

-anterior division supplies the adductor longus and brevis, gracilis, and the pectineus

-posterior division supplies the obturator externus and adductor magnus

-in effect, the adductors are all supplied by the obturator nerveosus part of the adductor magnus





Lumbar Plexus

6 Branches

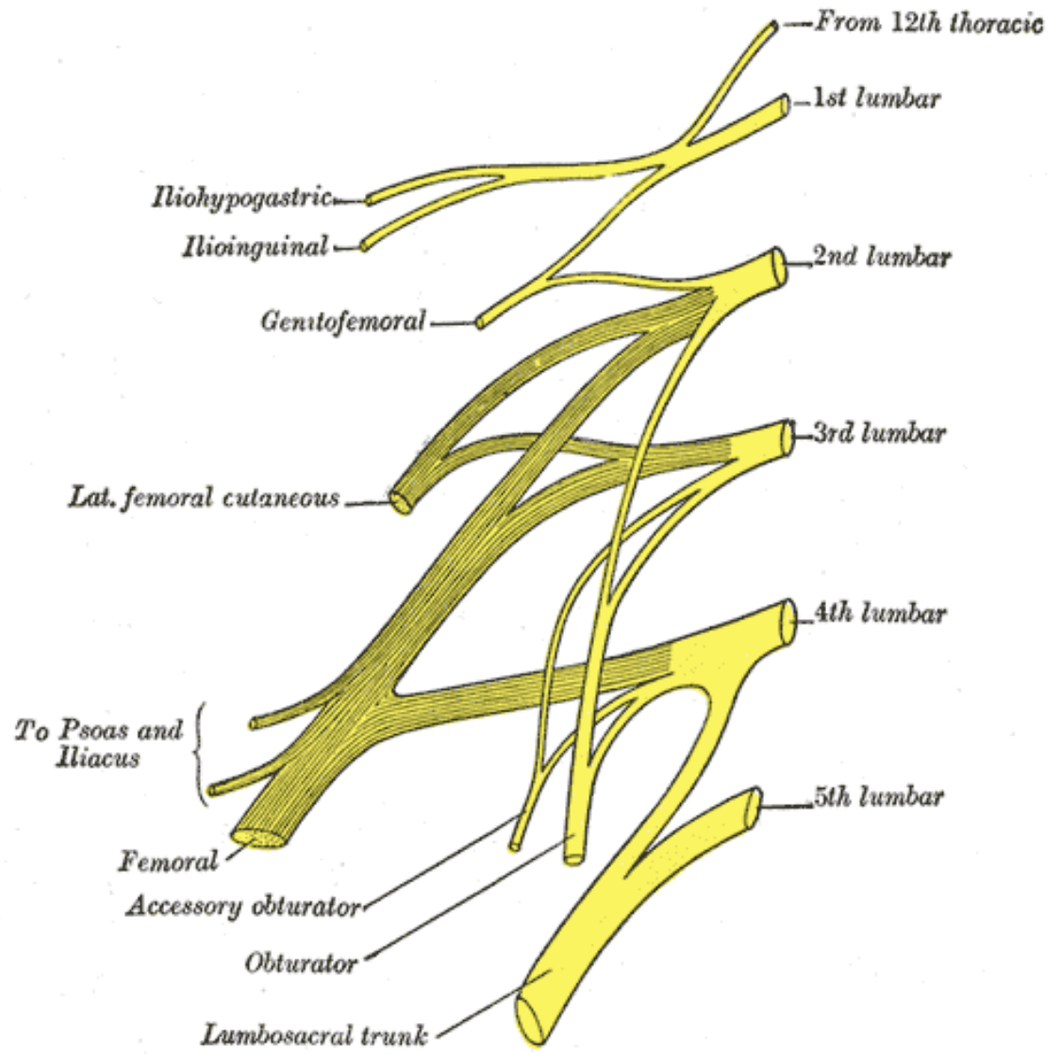
6. Femoral nerve - L2-L4

-arises from L2-L4-courses retroperitoneally through the psoas muscle, runs inferolaterally within it to emerge between psoas and iliacus, just superior to inguinal ligament

-then runs distally in groove between the iliacus and psoas muscles, innervating the iliacus muscle-then courses deep to the inguinal ligament just lateral and adjacent to the femoral artery but separated from it by the iliopsoas fascia (i.e. not in femoral sheath)

-after passing under the inguinal ligament, it branches into its many motor and sensory branches

-in addition to iliacus, it supplies psoas, sartorius, quadriceps femoris (rectus femoris, vastus lateralis, intermedius, & medialis), and gives rise to the saphenous nerve and the anteromedial and medial cutaneous nerves of the thigh

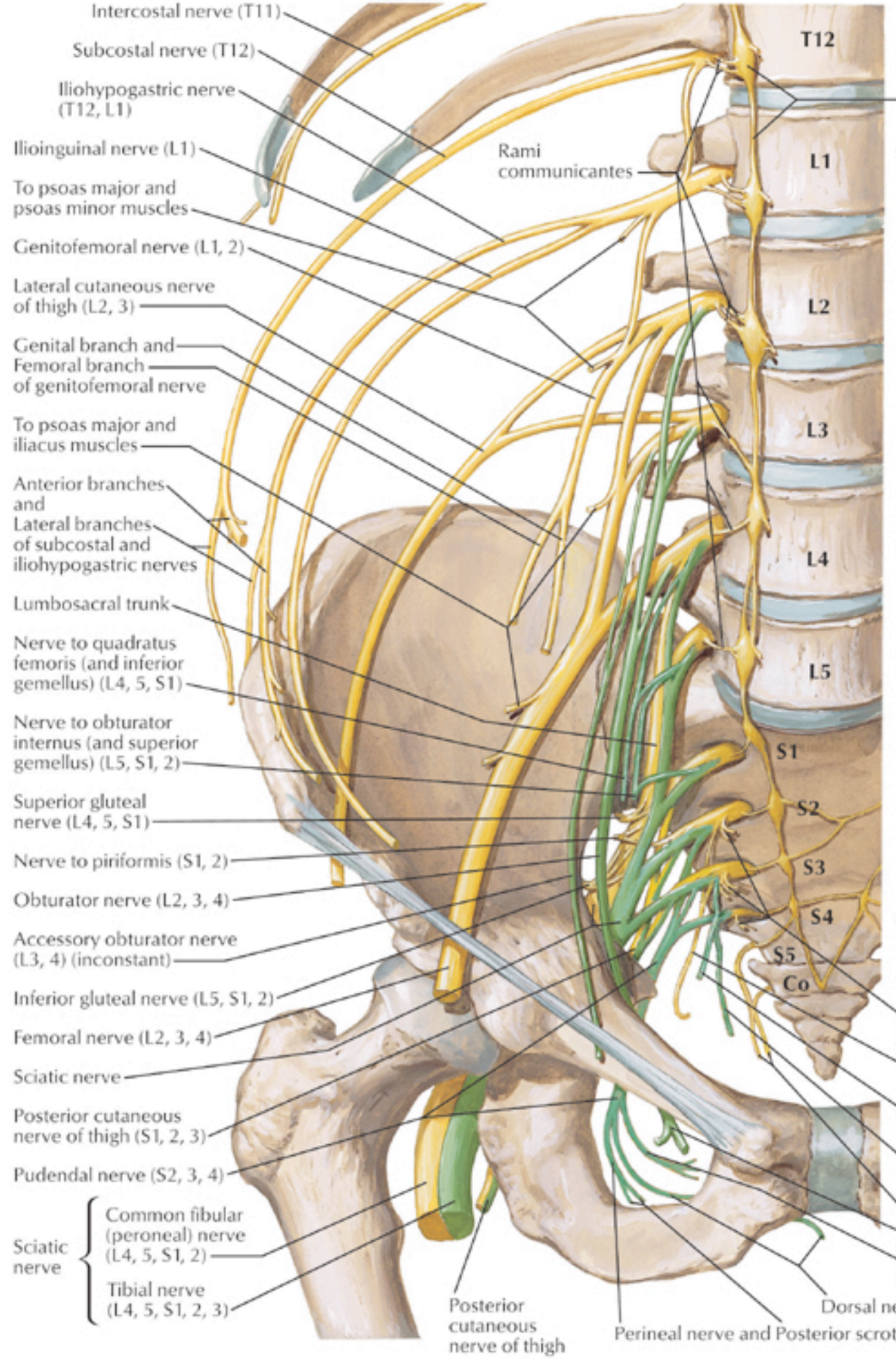


Sacral Plexus

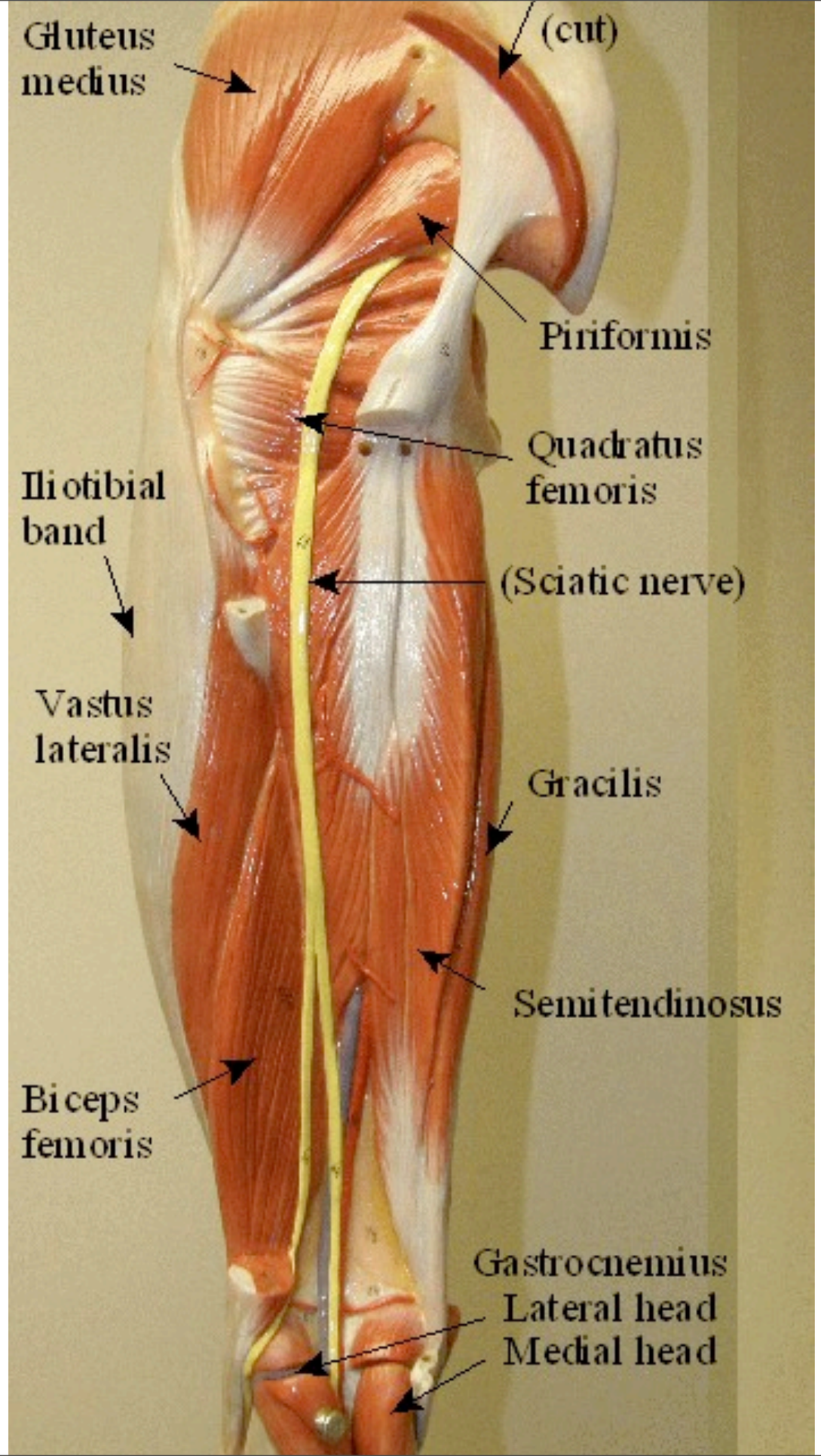
II. Sacral Plexus

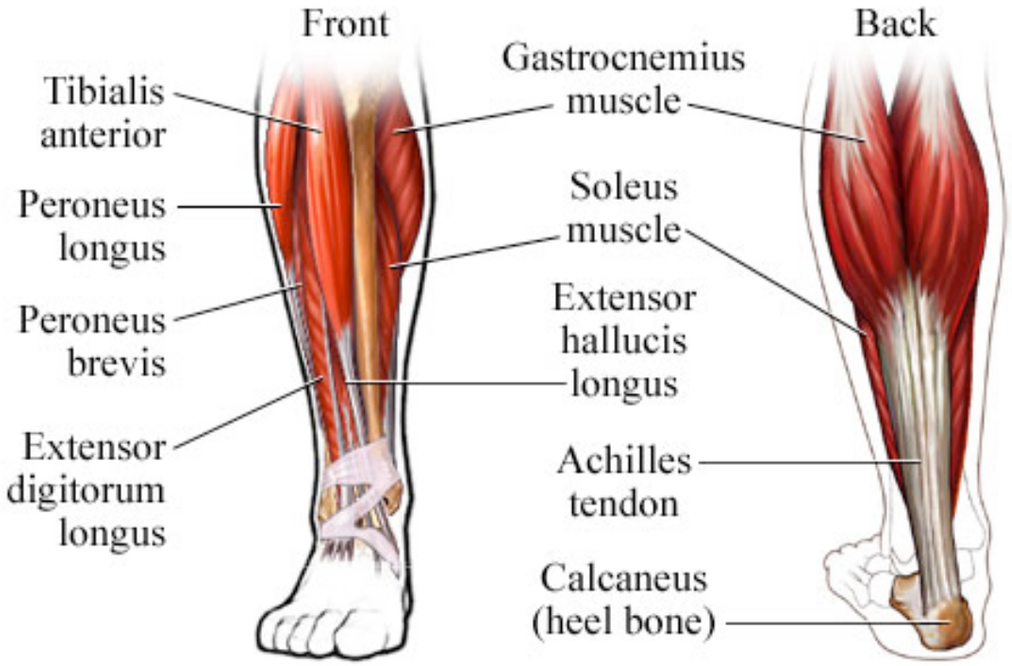
-located in pelvis, close to anterior surface of piriformis, outside parietal pelvic fascia
-formed by **lumbosacral trunk** and ventral rami of S1-S3, + descending part of S4
-**lumbosacral trunk = inferior division of L4 ventral ramus + L5**
-all branches of sacral plexus leave pelvis via the **greater sciatic notch**
-except:

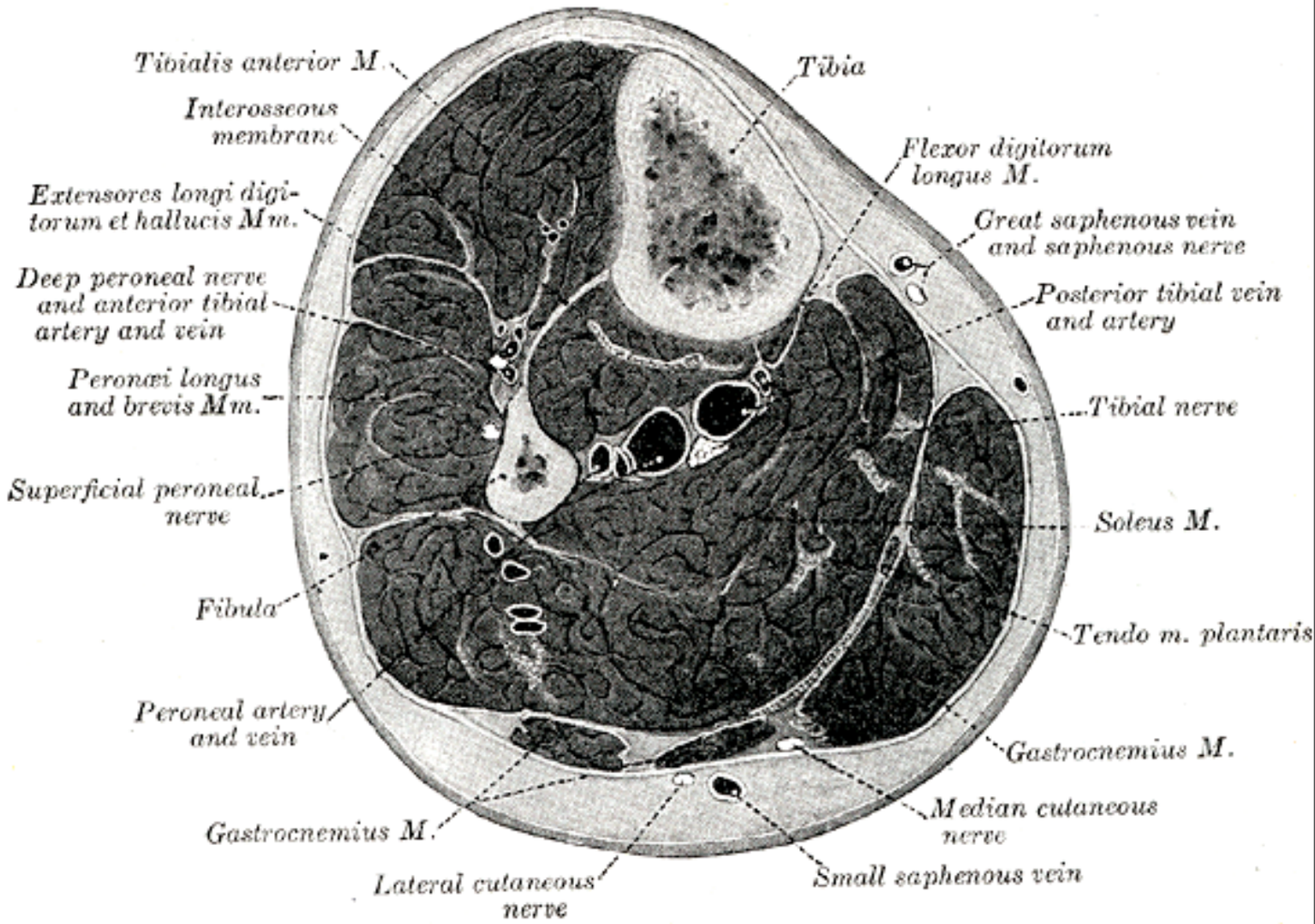
nerves to piriformis (S2)
cutaneous nerves (S2,S3)
nerves to pelvic diaphragm (levator ani, external sphincter (pudendal n), perineal nerve)



Sciatic Nerve







Anterior - dorsiflexion, inversion

Lateral - plantarflexion, eversion

Posterior - plantarflexion

How to Distinguish

L4 vs femoral neuropathy

L5 vs peroneal neuropathy

L5 vs Peroneal Nerve

- Common peroneal nerve
  - Motor
    - Ankle dorsiflexion
    - Ankle eversion
    - Great toe extension
    - Small toe extensors
  - Sensory
    - Dorsum of foot, 1st interspace, lateral lower leg below the knee
    - ?Tinel's at the fibular head

L5 vs Peroneal Nerve

- L5 radiculopathy
    - Above findings plus:
        - **Ankle inversion**, knee flexion, hip abduction weakness
        - Sensory may extend above the knee
        - Straight leg raise positive