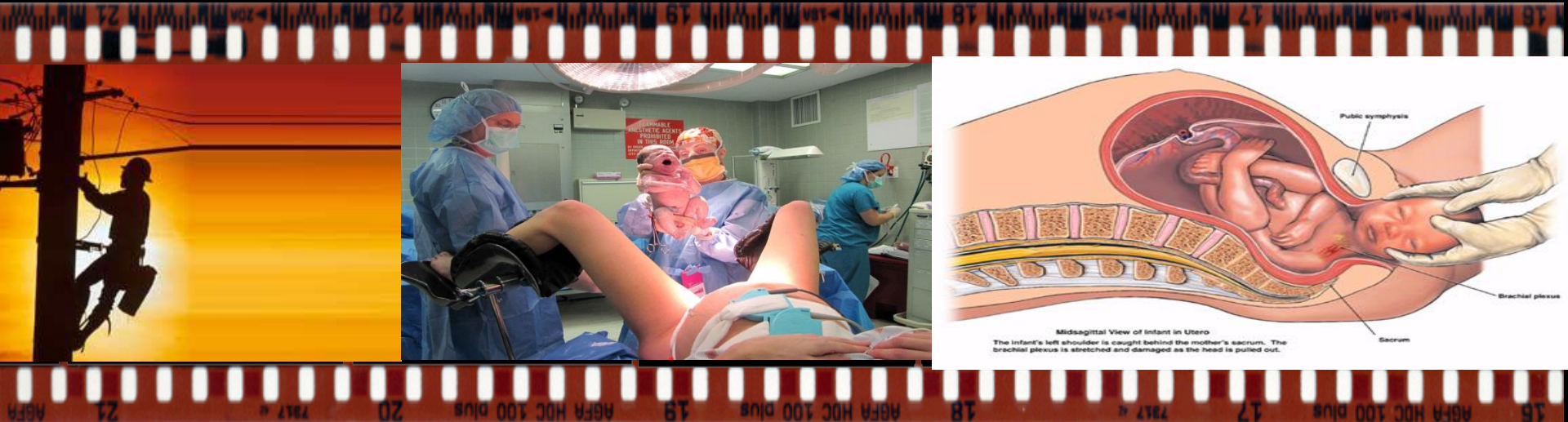
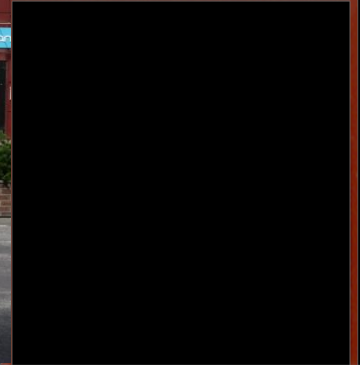


# CASE 1



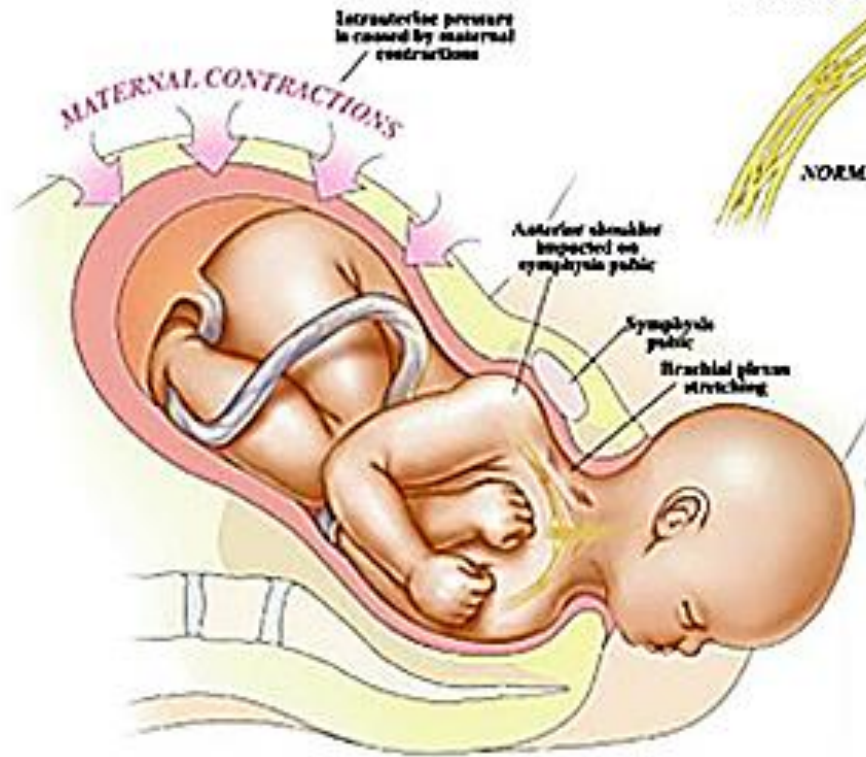
Mid-sagittal View of Infant in Utero  
The infant's left shoulder is caught behind the mother's sacrum. The brachial plexus is stretched and damaged as the head is pulled out.

# CASE 1





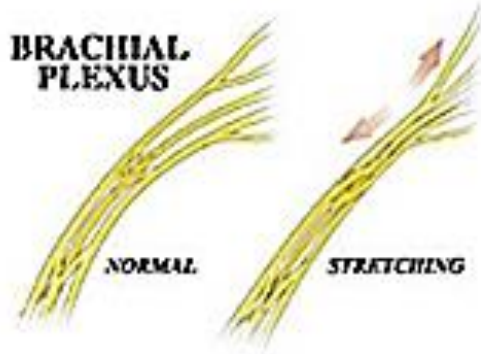
# SHOULDER DYSTOCIA



## BRACHIAL PLEXUS

NORMAL

STRETCHING



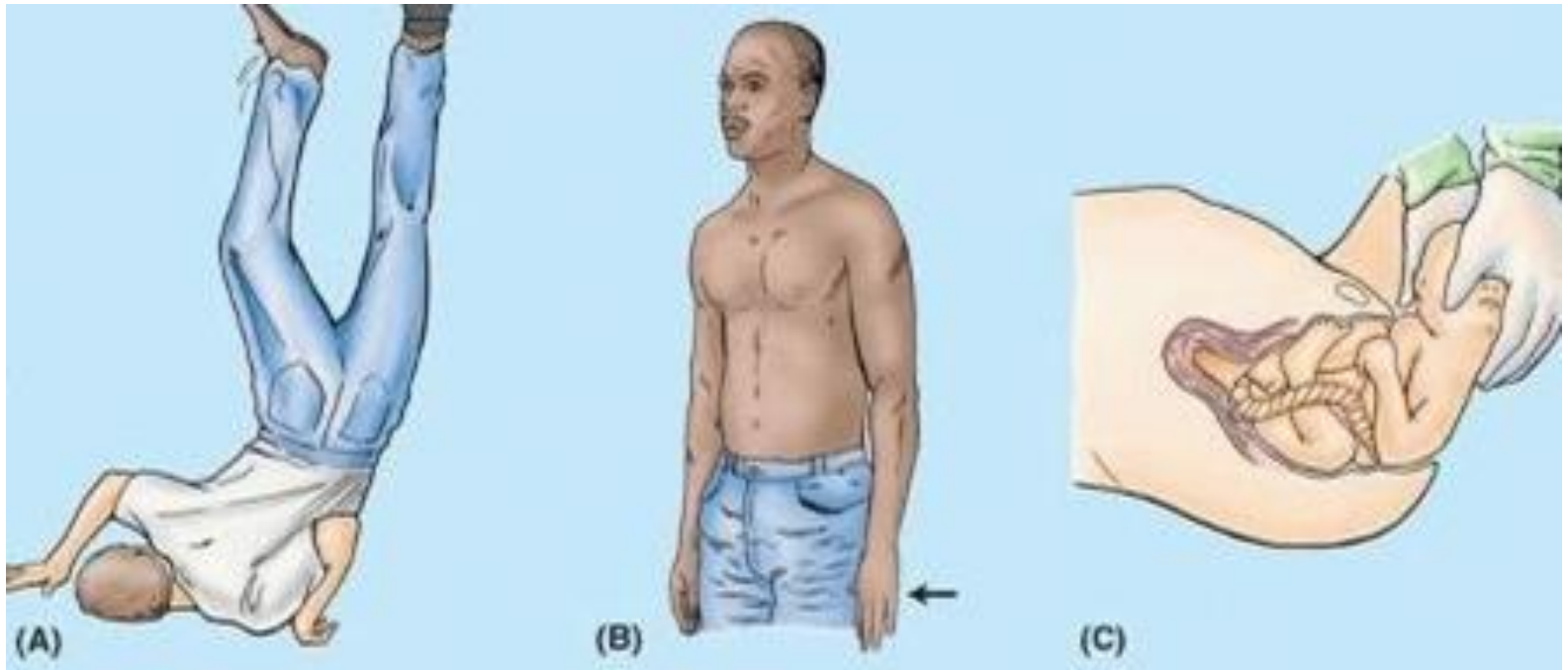
Dystocia

Waiter's tip sign

# Upper Lesions of the Brachial Plexus (Erb-Duchenne Palsy)

excessive displacement of the head to the opposite side  
depression of the shoulder on the same side

- in infants during a difficult delivery
- in adults after a blow to or fall on the shoulder



# Upper Lesions of the Brachial Plexus (Erb-Duchenne Palsy)

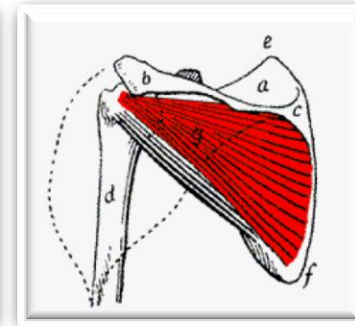
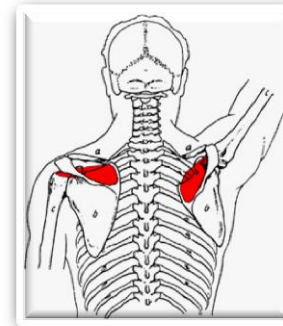
C5 and C6 roots

MEDIAL ROTATION  
PRONATION

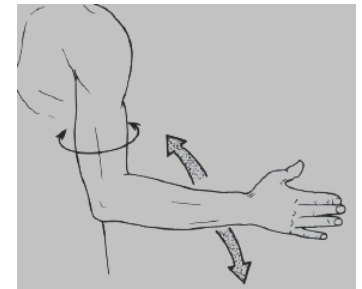


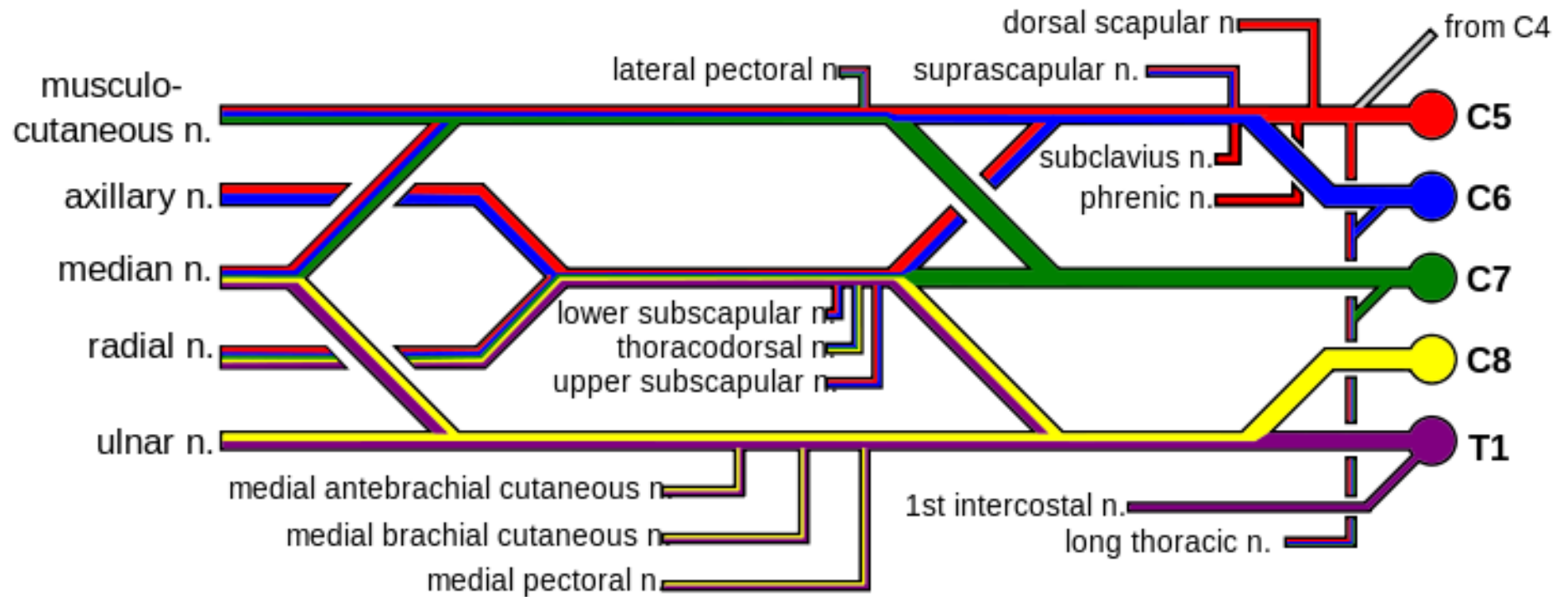
- **suprascapular nerve**
- **the nerve to the subclavius**
- **musculocutaneous nerve**
- **axillary nerve**

- 1. supraspinatus** abductor of the shoulder
- 2. infraspinatus** lateral rotator of the shoulder
- 3. subclavius** depresses the clavicle
- 4. biceps brachii** supinator of the forearm, flexor of the elbow, weak flexor of the shoulder
- 5. greater part of the brachialis** flexor of the elbow
- 6. coracobrachialis** flexor of the shoulder
- 7. deltoid** abductor of the shoulder
- 8. teres minor** lateral rotator of the shoulder



**SENSATION LOSS OVER THE LATERAL SIDE OF THE ARM**





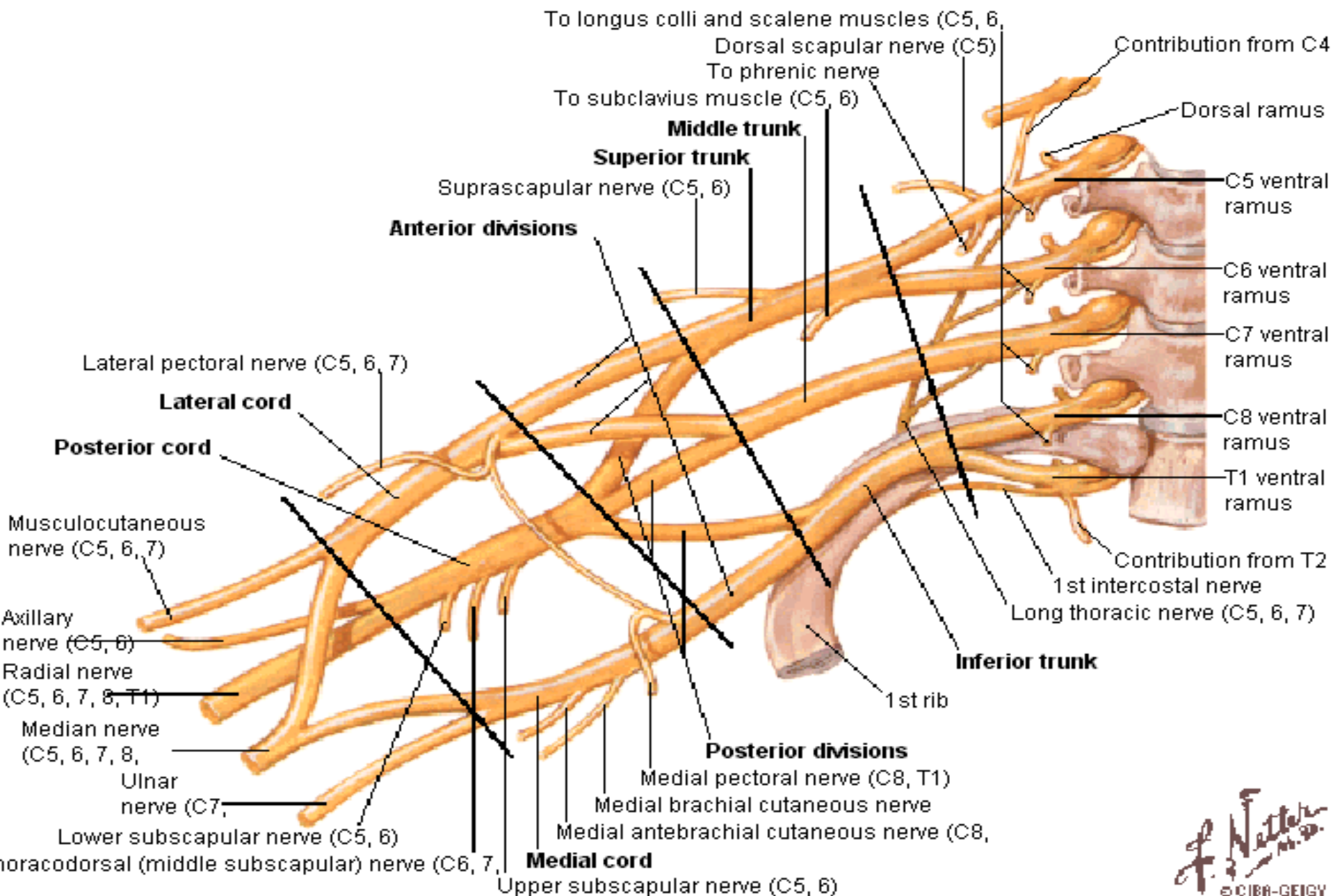
**Dorsal scapular nerve:** Levator scapulae, rhomboids (Retracts (adducts) and elevates scapula)

**Lateral pectoral nerve:** Pectoralis major (medial rotation, flexion and adduction of the arm)  
extension

Lattissimus dorsi= thoracodorsal nerve

# Brachial Plexus

## Schema





# Lower Lesions of the Brachial Plexus (Klumpke Palsy)



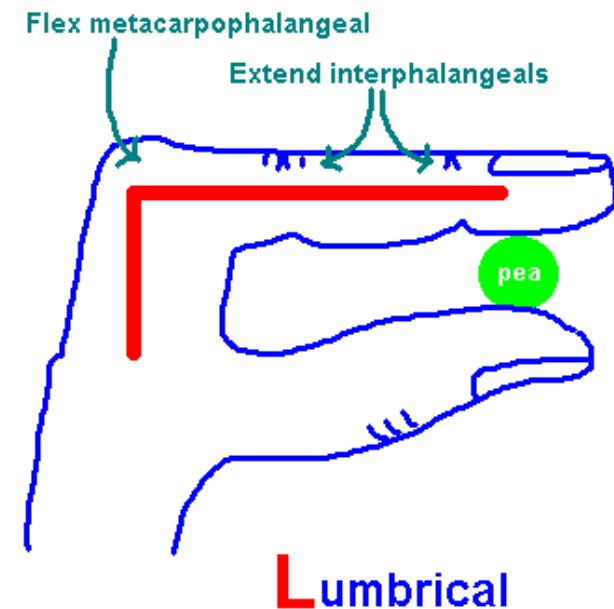
ulnar and median nerves

all the small muscles of the hand

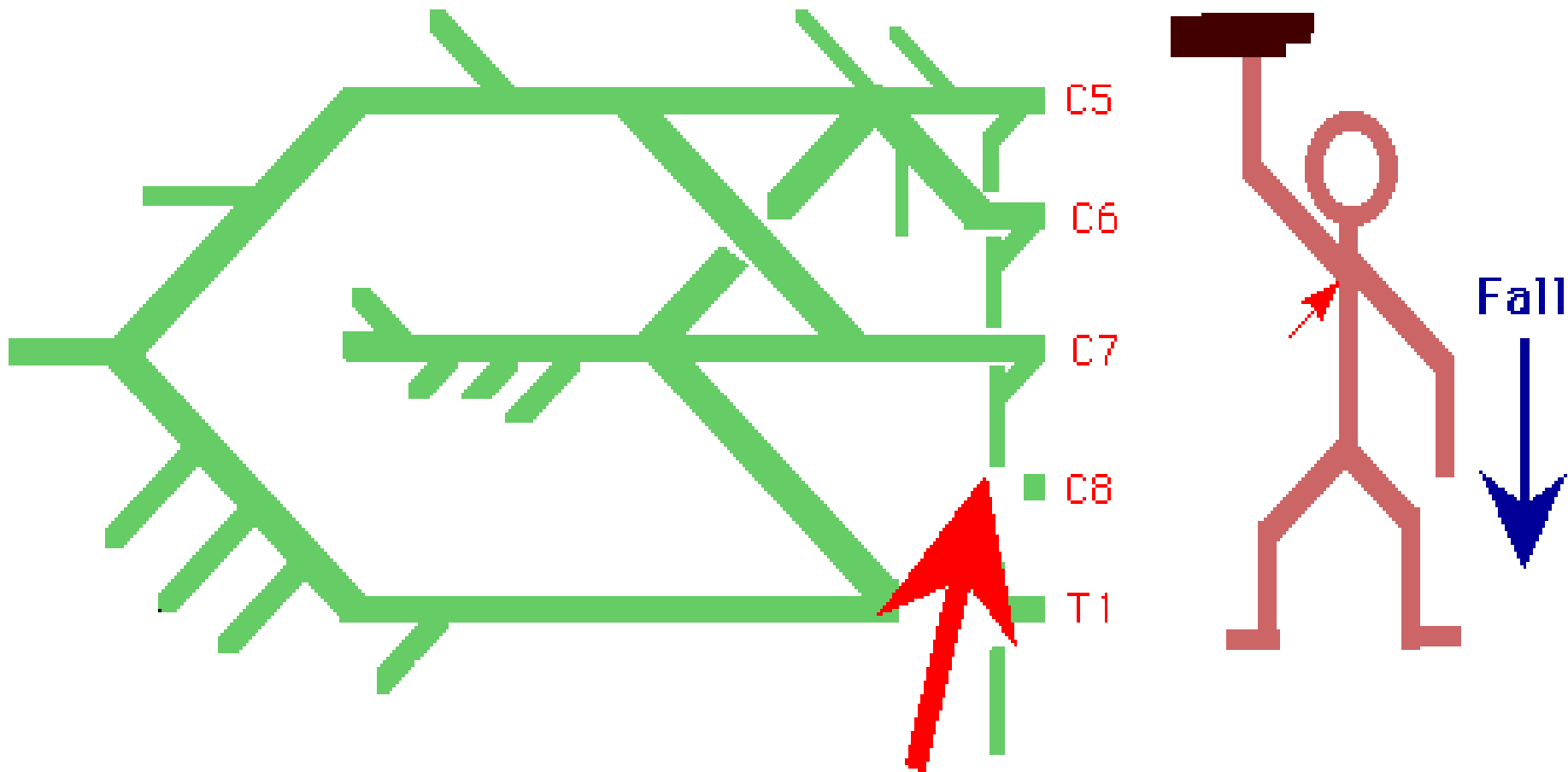
**Claw(ed) hand**

hyperextension of metacarpophalangeal joints

flexion of the interphalangeal joints



# Lower brachial plexus injury (Klumpke's palsy)



Deficits in a lower brachial plexus injury (Klumpke's palsy):

- paralysis of all the small muscles of the hand causing clawing
- loss of sensation along the medial aspect of the arm

# Lower Lesions of the Brachial Plexus (Klumpke Palsy)

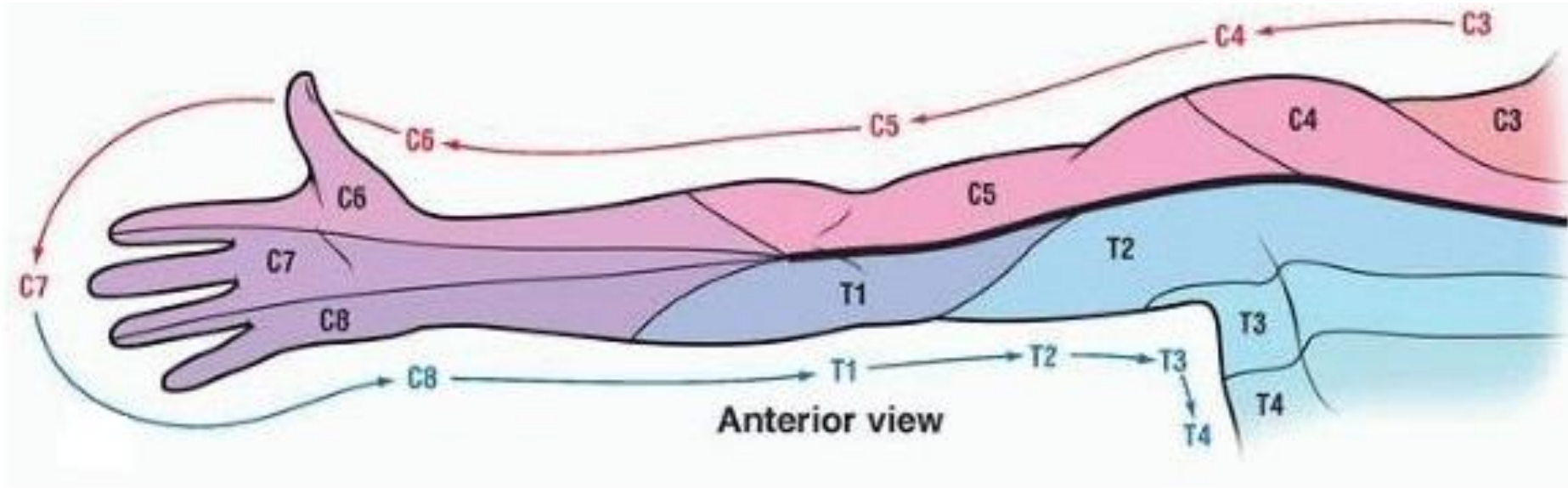
C8 and T1 roots

loss of sensation

along the medial side of the arm

8th cervical nerve damaged

+ medial side of the forearm, hand, and medial two fingers



Foerster (1933)

# MONONEUROPATHIES

The pattern of distribution of peripheral nerve involvement is very helpful in reaching a diagnosis.

Mononeuropathies, especially if an entrapment site, are often an isolated phenomenon, possibly related to pregnancy, DM, thyroid disease or occupation, but importantly may also occur as features of a more generalised disorder, such as hereditary neuropathy with liability to pressure palsies (HNPP) or amyloidosis.

Mononeuropathies occurring outside entrapment sites are more important to investigate fully, especially if vasculitis is suspected as this need careful evaluation for treatment. If the pattern suggests a single nerve or plexus lesion at an unusual site of compression or invasion, such as a radial nerve lesion compressed on a chair in a patient following an overnight binge, or invasion of the brachial plexus with breast malignancy, this is clearly important to detect.



PALSY

# Focal and multifocal neuropathies

**Entrapment neuropathy—for example, carpal tunnel syndrome (CTS), ulnar nerve at elbow**

Myxoedema, acromegaly

Amyloidosis

Diabetes

Hereditary neuropathy with liability to pressure palsies (HNPP A)

Vasculitis

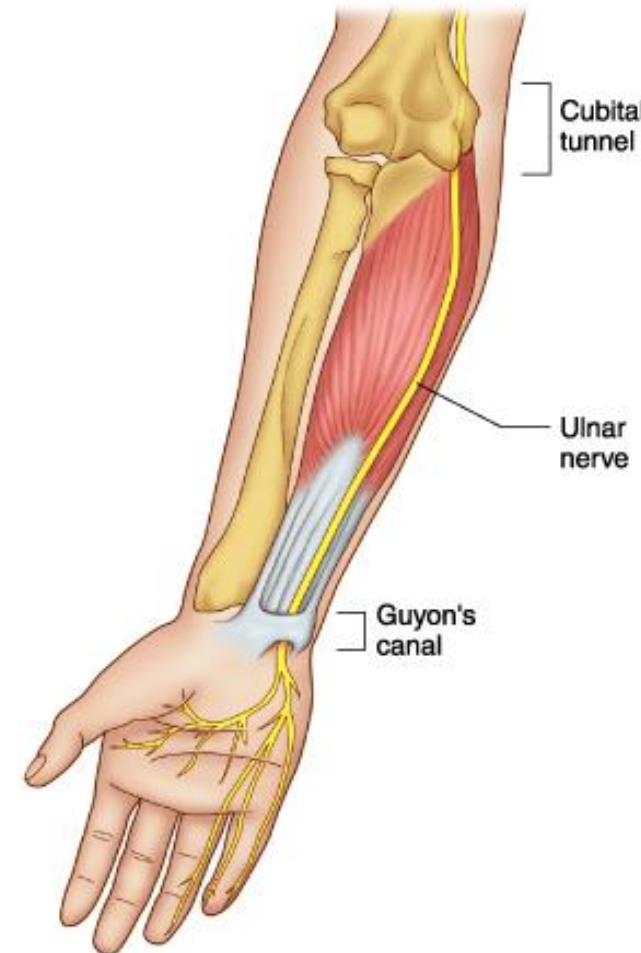
Multifocal motor neuropathy

# Entrapment neuropathies

occur when nerves chronically compressed or mechanically injured at specific locations.

**isolated peripheral nerve injuries occurring at specific locations where a nerve is mechanically constricted in a fibrous or fibro-osseous tunnel or deformed by a fibrous band.**

**In some instances the nerve is injured by chronic direct compression, and in other instances angulation or stretching forces cause mechanical damage to the nerve.**



**Angulation** and stretch injury are important mechanisms of nerve injury for ulnar neuropathies associated with gross deformity of the elbow joint (“**tardy ulnar palsy**”).



Recurrent compression of nerves by external forces may also cause focal nerve injuries such as ulnar neuropathy at the elbow and deep branch lesions of the ulnar nerve in the hand. Although these latter neuropathies do not satisfy the strict definition of “entrapment neuropathies”, they are often considered in a discussion of the topic.



# Long Thoracic Nerve Injuries

**serratus anterior**

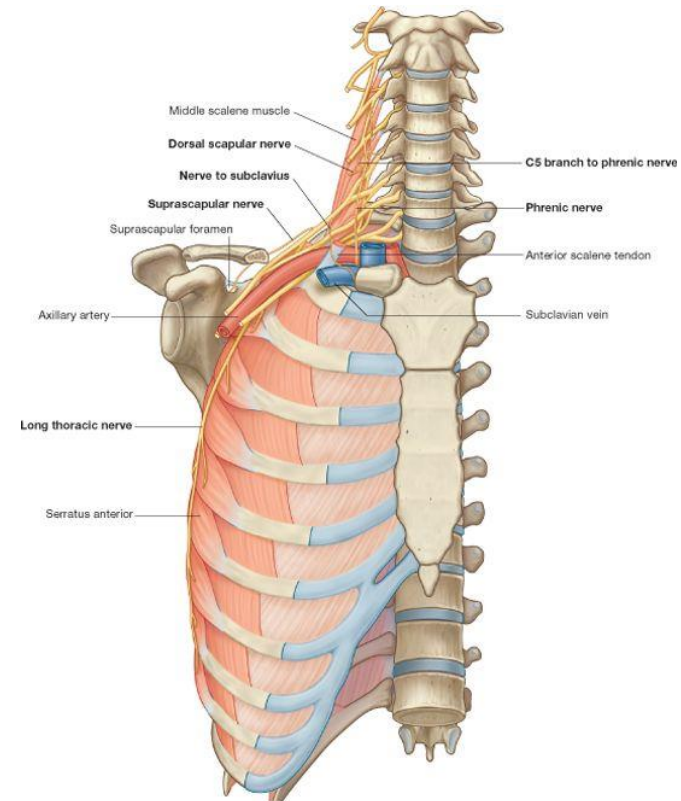
**C5, C6, C7**

**blows to or pressure on the posterior triangle of the neck during the surgical procedure of radical mastectomy**

- Difficulty in raising the arm above the head
- Inferior border of scapula not closely applied to the chest wall

Protrude posteriorly

## Winged scapula



## CASE 2

Here is the shoulder's x-ray of the patient!

# SYMPTOMS

loss of skin  
sensation over the  
lower half of the  
deltoid muscle.

What is your  
possible  
diagnosis?



# Axillary Nerve Injuries

posterior cord of the brachial plexus (C5 and 6)

pressure of a badly adjusted crutch pressing upward into the armpit

shoulder dislocations

**Quadrangular space**

fractures of the surgical neck of humerus

**deltoid and teres minor**

**Loss of skin sensation**

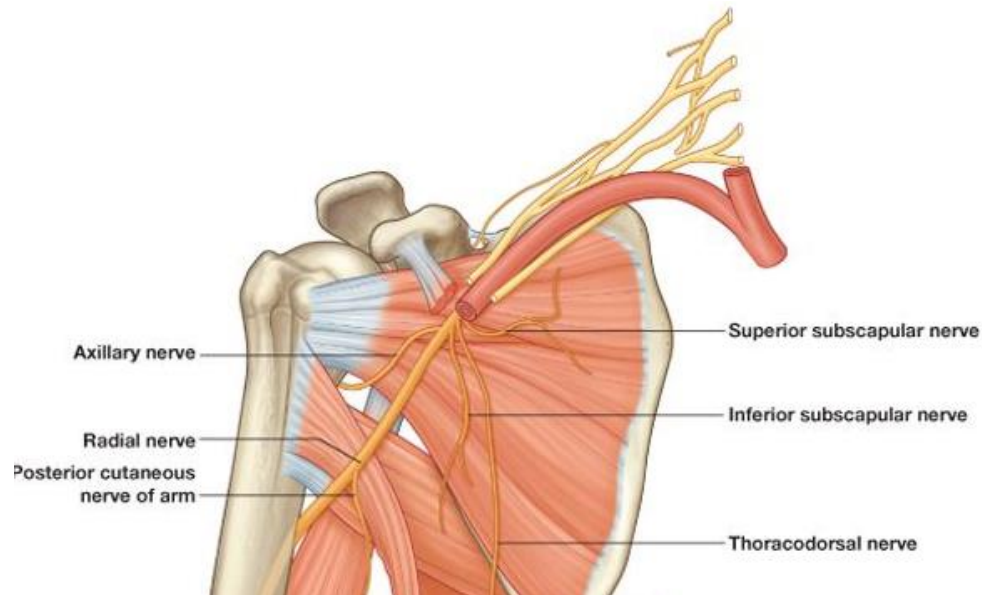
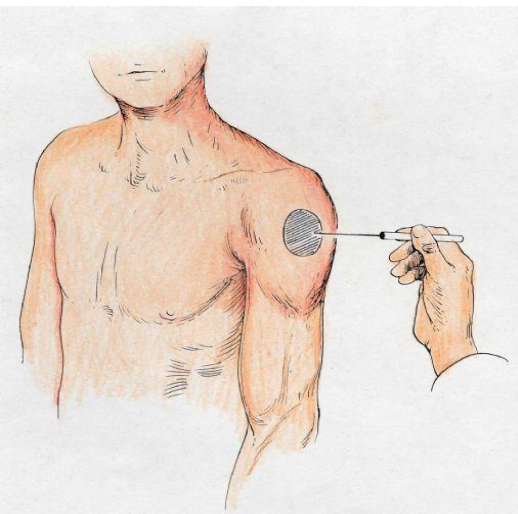
over the lower half of deltoid region (lateral part of the arm)

**Upper lateral cutaneous nerve of the arm**

Impaired abduction of the shoulder (the other one: Supraspinatus only)

Shoulder weakness

Difficulty lifting the arm above the head



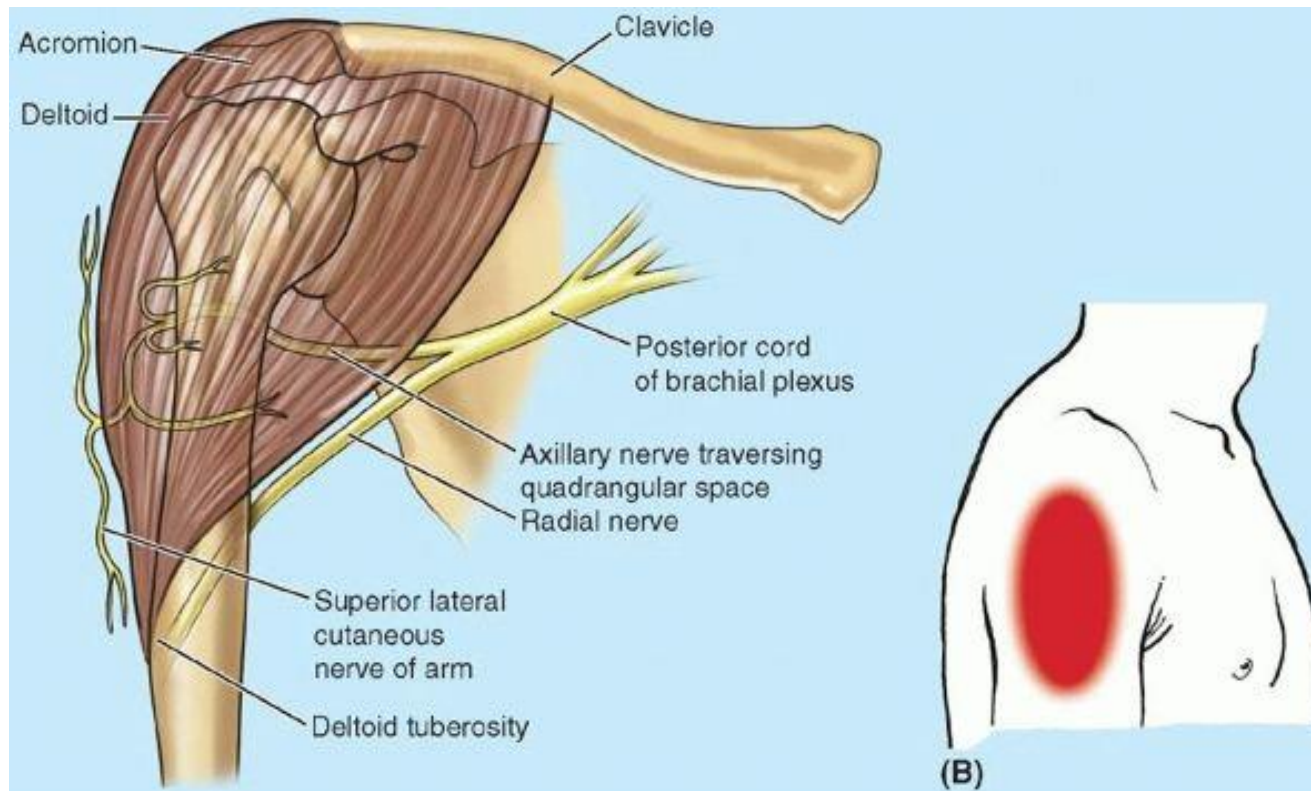
# Axillary Nerve Injuries

posterior cord of the brachial plexus (C5 and 6)

I.M. injections

Operations around the shoulder

runs transversely under cover of the deltoid  
at the level of the surgical neck of the humerus



**A NIGHT AT E.R.**

**You are taking the history from your patient.  
Here is what he says (his symptoms)**

**He says he was painting the ceiling and fell., suddenly. He has a terrible pain in his arm.**

**Here is what you find (his clinical findings)**

**Localized pain in his right forearm**

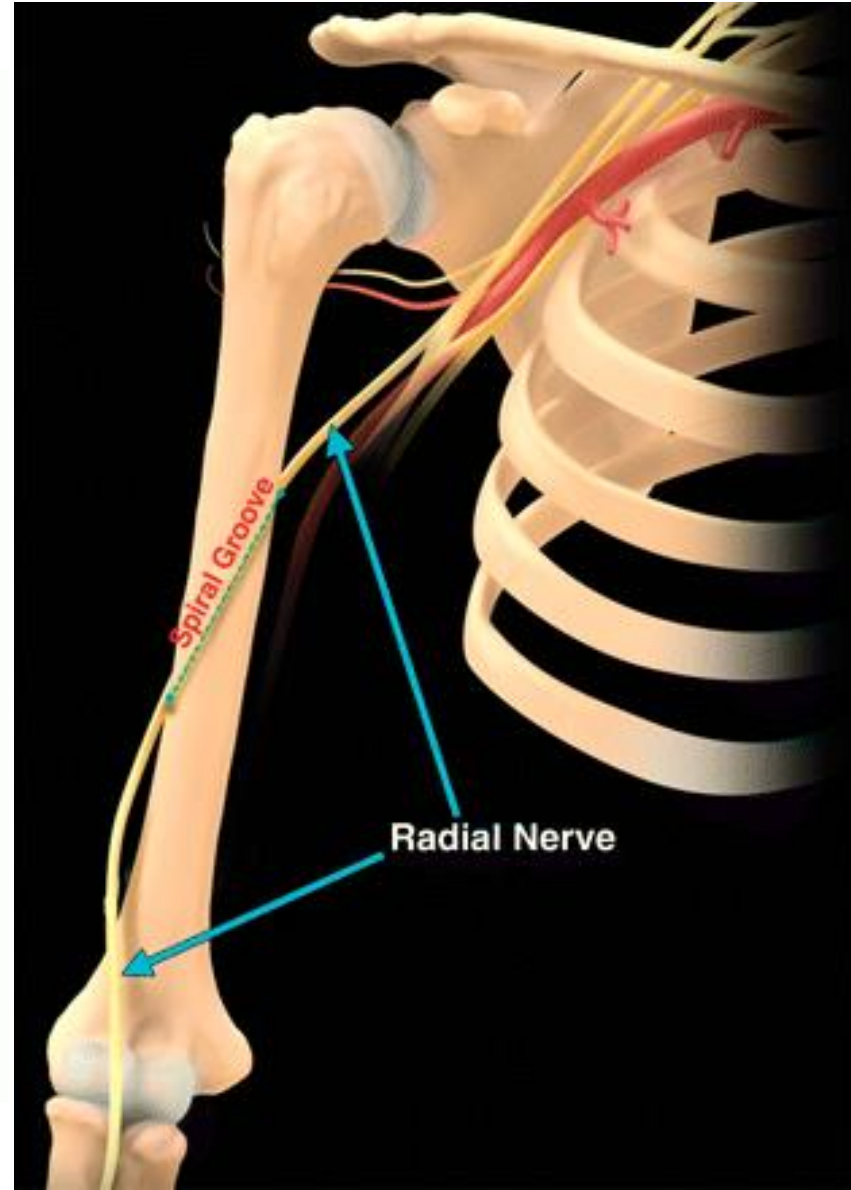
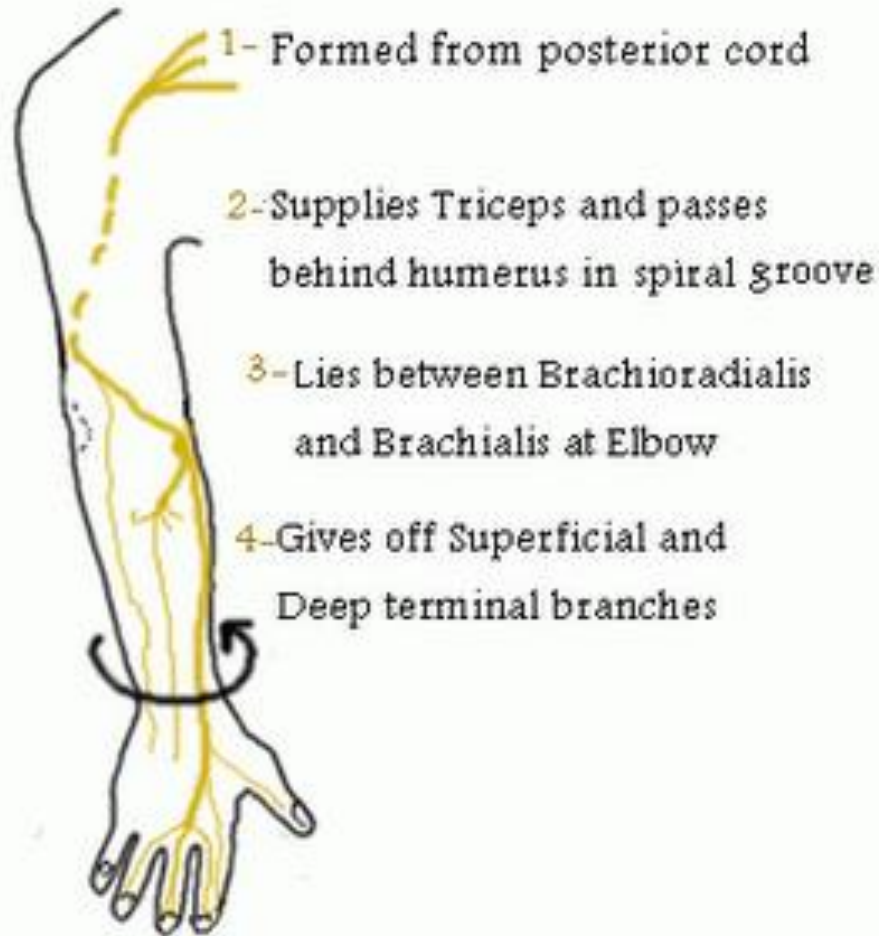
**No sensory loss**

**No wristdrop, the wrist can be extended.**

# Radial Nerve Injuries

commonly damaged in the axilla & in the spiral (radial) groove

## Radial Nerve



# Radial Nerve Injuries @ Axilla

pressure of the upper end of a badly fitting crutch  
drunk falling asleep with one arm over the back of a  
fractures and dislocations of the proximal end of the humerus

## Motor

**Triceps, anconeus, and long extensors of the wrist**

No extension of the elbow joint, wrist joint, and the fingers

**Wristdrop (flexion of the wrist)**



**Supination good brachioradialis, supinator down, but biceps brachii**

# Radial Nerve Injuries @ Axilla

## Sensory

A small loss of skin sensation

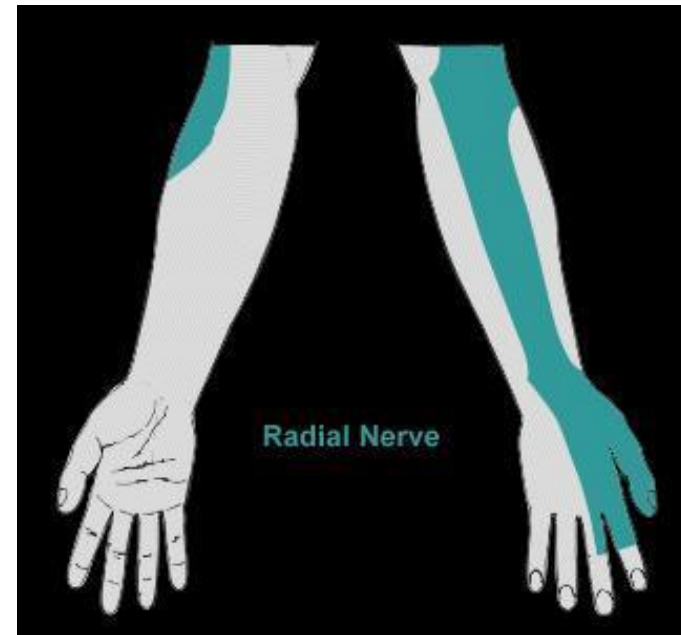
down the posterior surface of the lower part of the arm  
down a narrow strip on the back of the forearm

A variable area of sensory loss

on the lateral part of the dorsum of the hand  
on the dorsal surface of the roots of the lateral 3 ½ fingers

## Trophic Changes

Slight





# Radial Nerve Injuries @ Spiral Groove of Humerus

At the time of fracture of the shaft of the humerus

Following the formation of the callus

Pressure of the back of the arm on the edge of the operating table

**Prolonged application of a tourniquet to the arm in a person with a slender triceps temporary radial palsy**

Radial  
nerve  
entrapment



# Radial Nerve Injuries @ Spiral Groove of Humerus

most commonly @ distal part of the groove

## Motor

Inability to extend the wrist & fingers

## Wrist drop

## Sensory

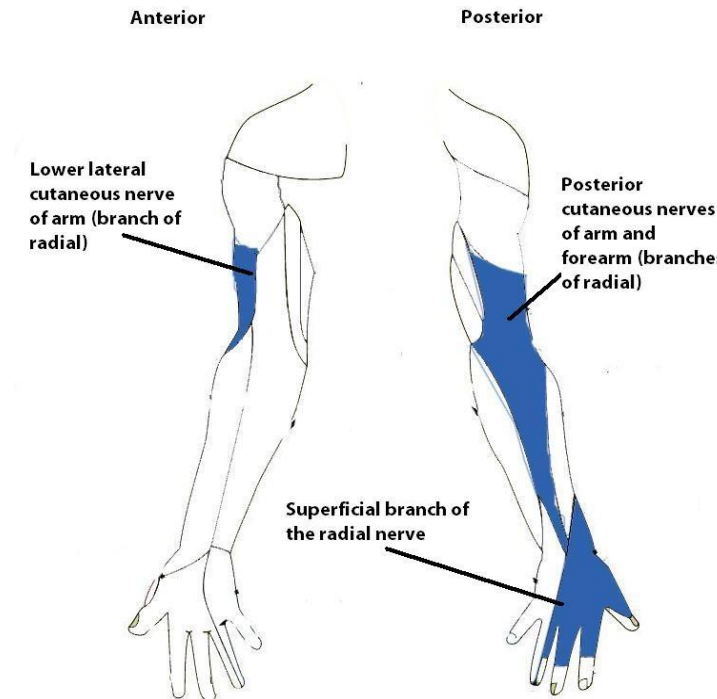
A variable small area of anesthesia

dorsal surface of the hand

dorsal surface of roots of lateral 3 ½ fingers

## Trophic changes

Very slight or absent



# Radial Tunnel

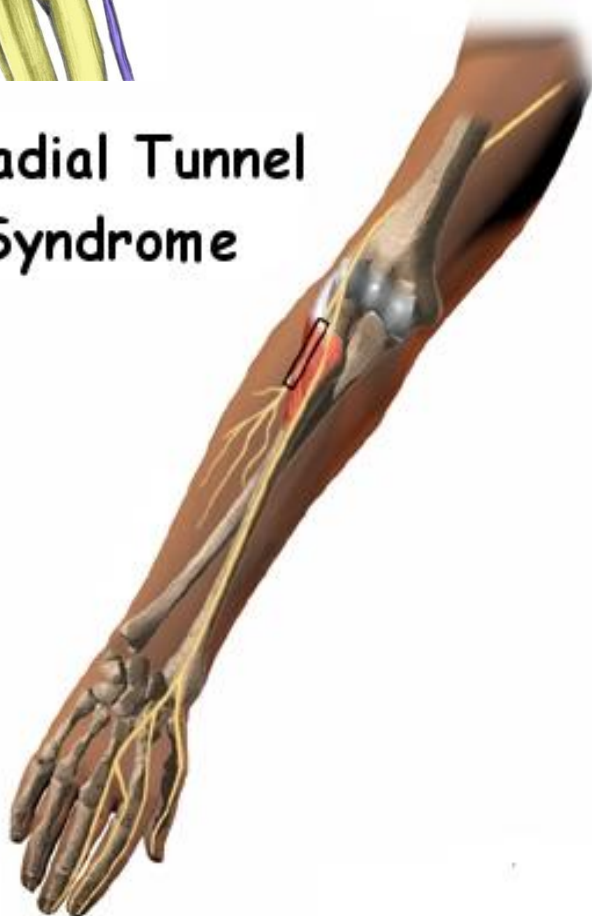
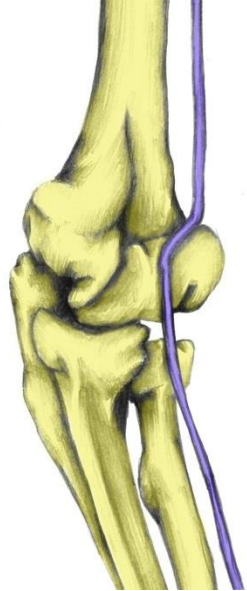
potential space located **anterior to the proximal radius**  
starting from the level of the humeroradial joint  
extending past the proximal edge of the supinator

*posterior interosseus nerve*

The **radial nerve** bifurcates into **deep** and **superficial branches** anterior to the lateral epicondyle of the humerus, between the brachialis and the brachioradialis, in the lateral border of the cubital fossa.

After passing through the two heads of the supinator muscle, the deep branch becomes the **posterior interosseous nerve**.

**Radial Tunnel Syndrome**



# Radial tunnel syndrome

## DIAGNOSIS

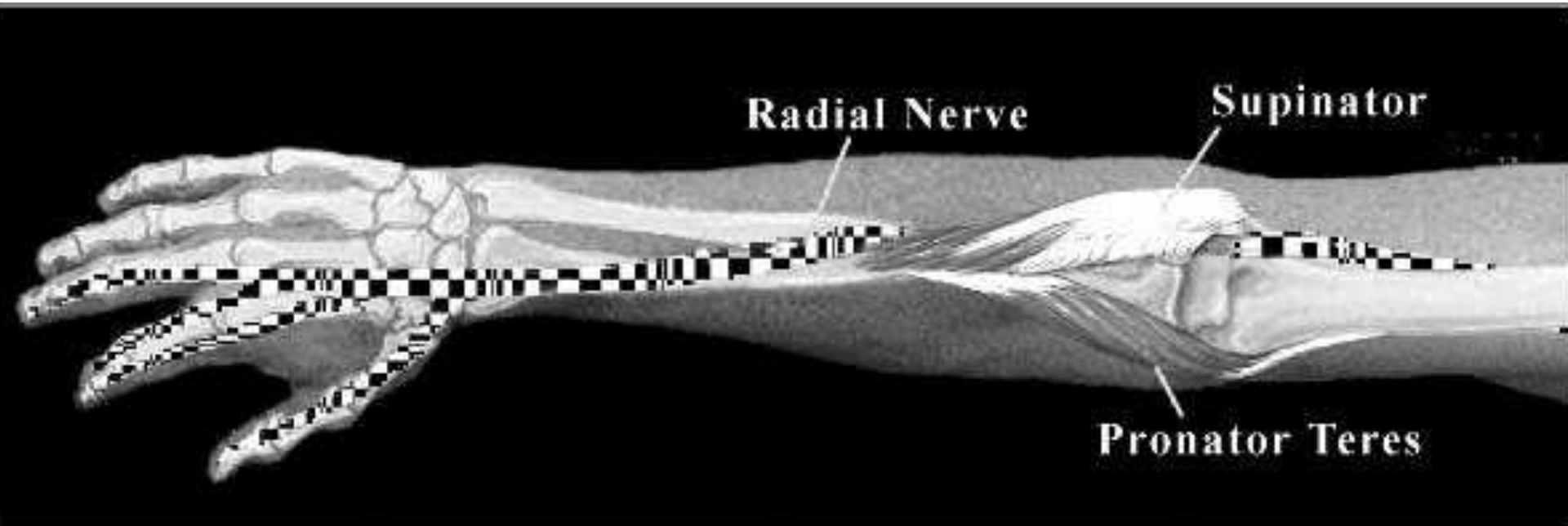


## ANATOMY

### Radial nerve

Lateral part of the elbow, radial tunnel below the supinator

Tenderness and pain @ lateral side of the elbow



# Tennis Elbow(Lateral epicondylitis)

sudden

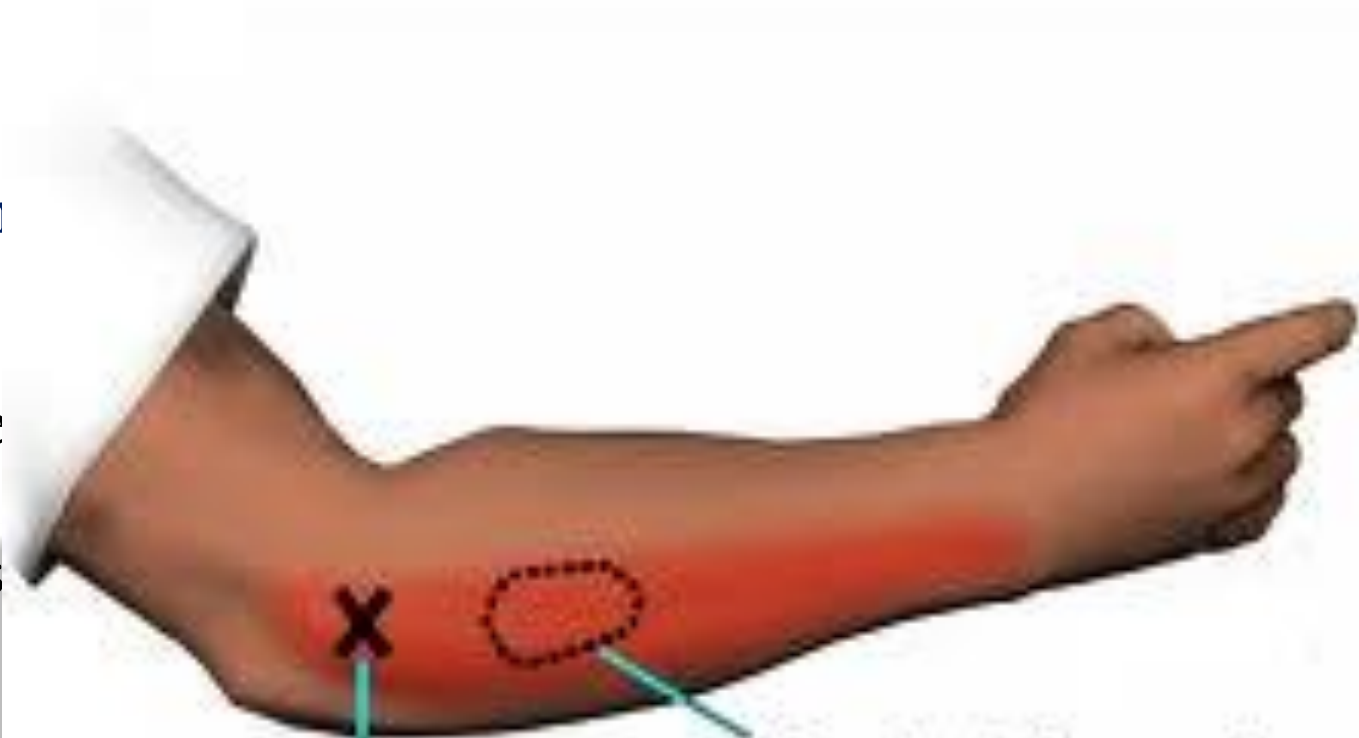
muscles

## Tenderness

Pain on  
weakened

In tennis  
attaches

In radial  
two inch  
goes into



**Tennis elbow  
tenderness**

**Radial tunnel  
tenderness**

tly a

on

ut  
erve

# Deep branch of the Radial Nerve Injuries

## Motor nerve

Extensor muscles @ posterior compartment of the forearm  
fractures of the proximal end of the radius  
dislocation of the radial head

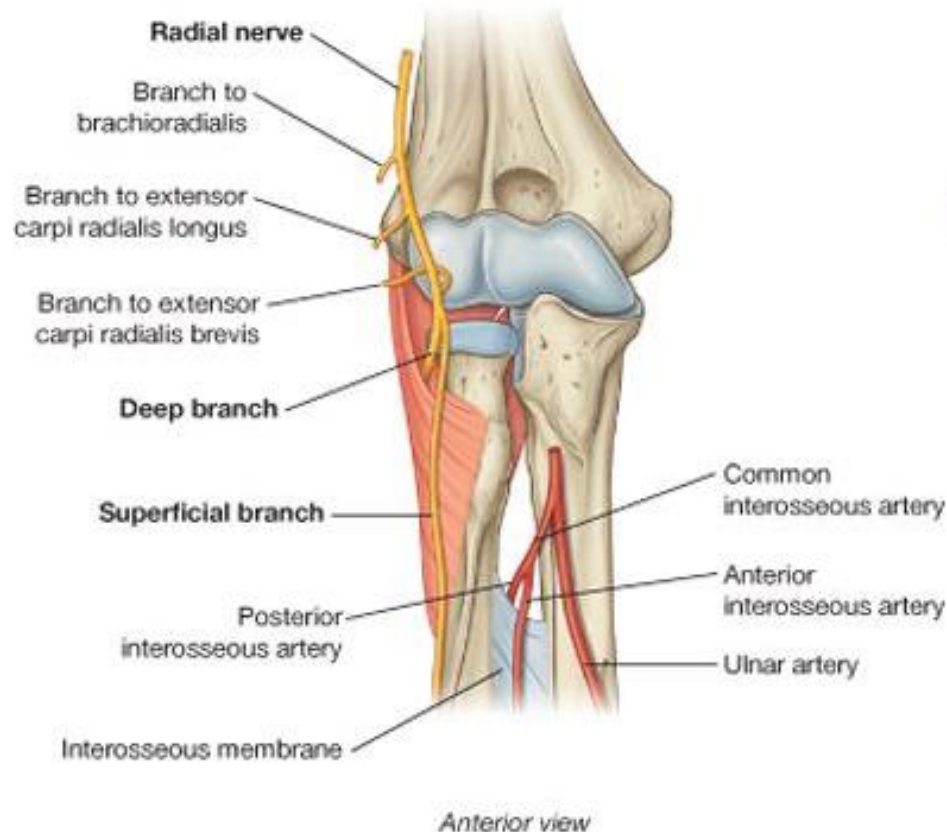
**Supinator**

**Intact**

**Extensor carpi radialis longus**

**No wrist drop**

**No sensory loss**

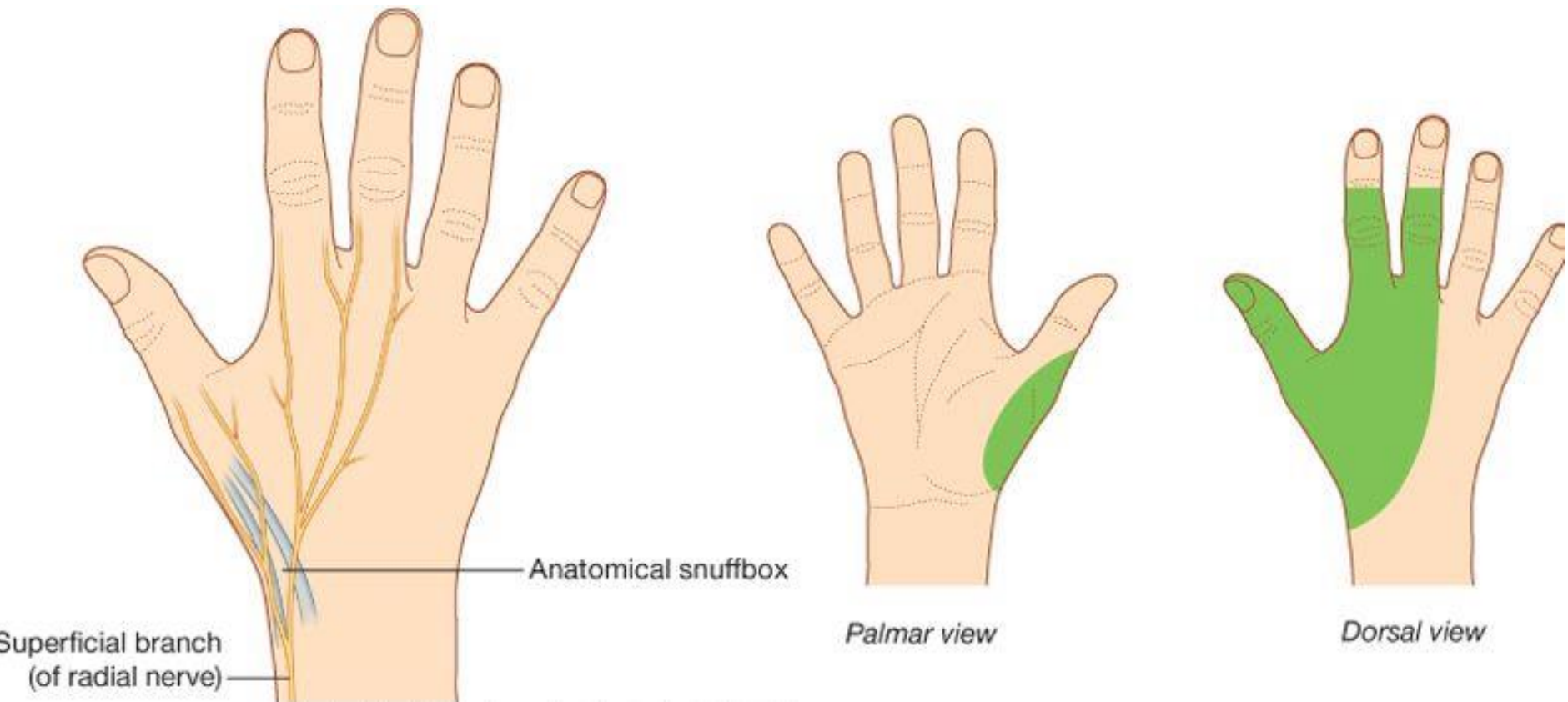


# Superficial Radial Nerve Injuries

a variable small area of anesthesia

over the dorsum of the hand

dorsal surface of the roots of the lateral 3 ½ fingers



# Musculocutaneous Nerve Injuries

Rarely injured (protected position)

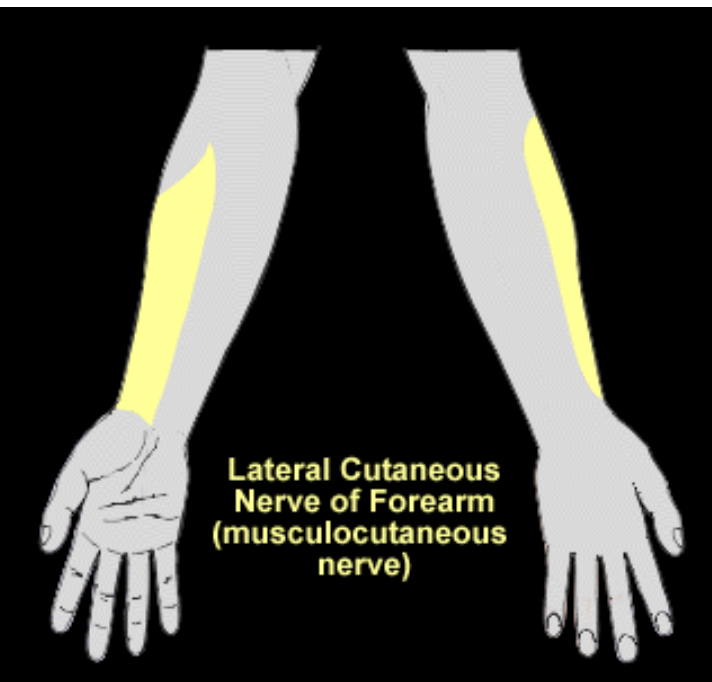
- Weak flexion @ shoulder joint

Flexion of the forearm @ elbow by remainder of brachialis + flexors of forearm

- Weak supination **supinator** radial nerve

- Sensory loss along the lateral side of the forearm

**lateral cutaneous nerve of the forearm**







# Injuries to the Median Nerve @ the Elbow

## Motor

pronator & flexor muscles of forearm (EXCEPT?)

thenar muscles

Forearm in supine position- Weak wrist flexion-accompanied by adduction

No flexion @ interphalangeal joints of index & middle fingers

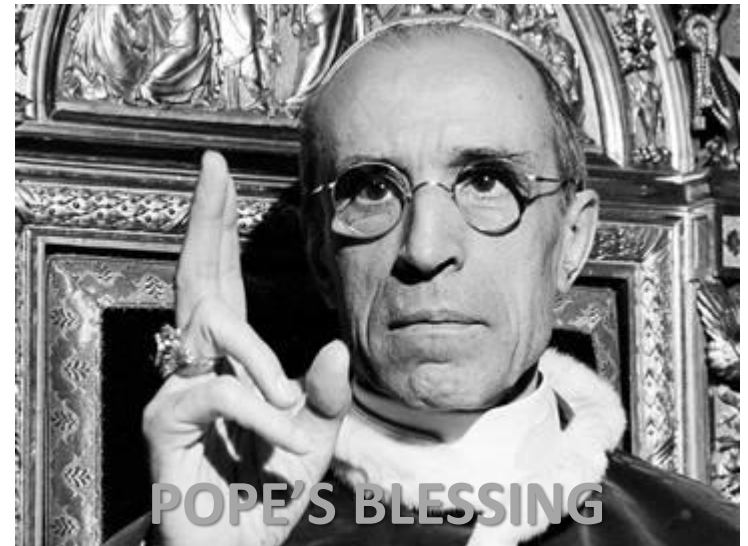
Weak flexion @ metacarpophalangeal joints -**interossei**-

FIST



Hand of benedicton

Middle & index fingers remain straight (extended)



POPE'S BLESSING

# Injuries to the Median Nerve @ the Elbow

## Motor

No Flexion of the terminal phalanx of the thumb

Thenar eminence flattened

Thumb laterally rotated & adducted

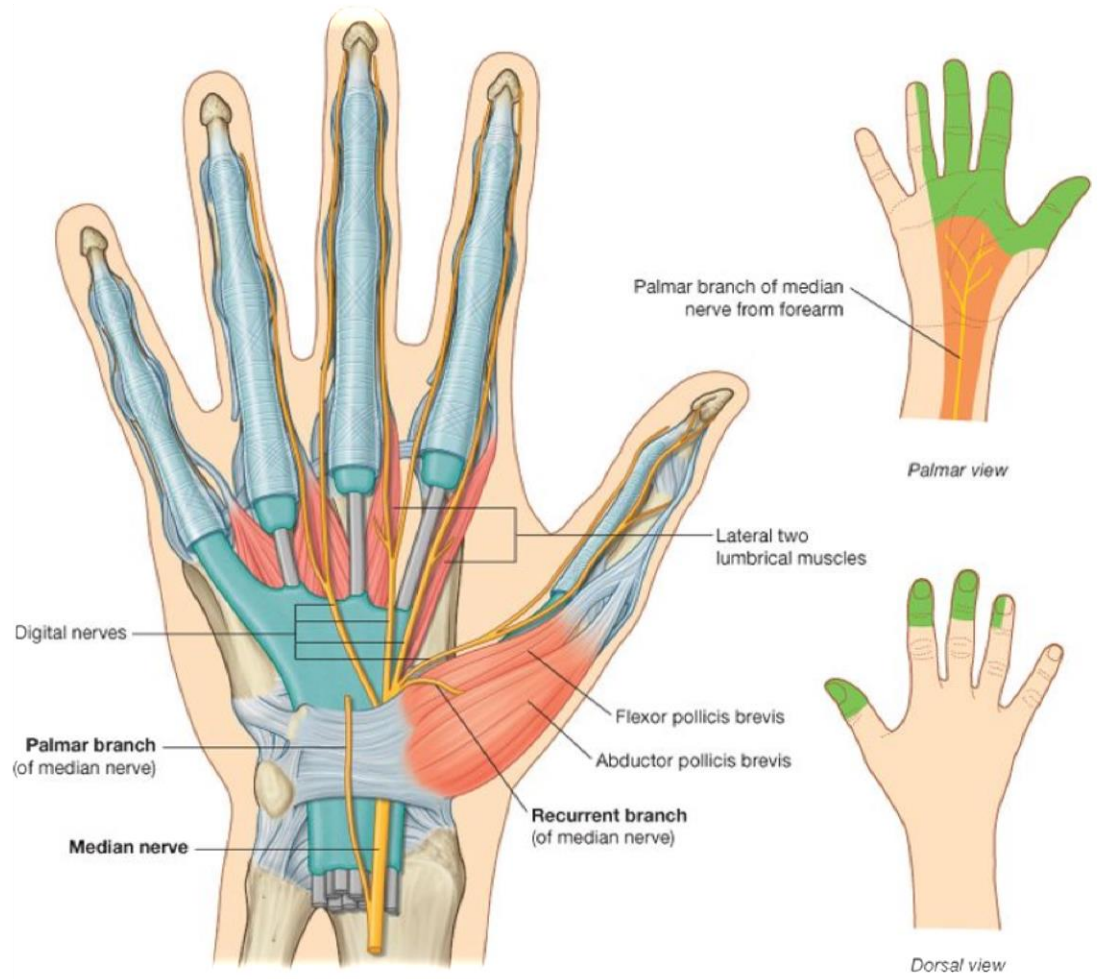
## APE HAND DEFORMITY



# Injuries to the Median Nerve @ the Elbow

## Sensory

**Lost skin sensation @ lateral half or less of the palm of the hand**  
**palmar aspect of lateral 3 1/2 fingers**  
**distal part of dorsal surfaces of lateral 3 1/2 fingers**



# Injuries to the Median Nerve @ the Elbow

## **Vasomotor changes**

Skin area affected warmer & drier

Arteriolar dilatation and absence of sweating / loss of sympathetic control

## **Trophic changes**

Chronic cases

*dry and scaly skin*

*nails crack easily*

*atrophy of the pulp of the fingers*

# Injuries to the Median Nerve @ the Wrist

## Motor

Thenar muscles & first two lumbricals

Thenar eminence flattened

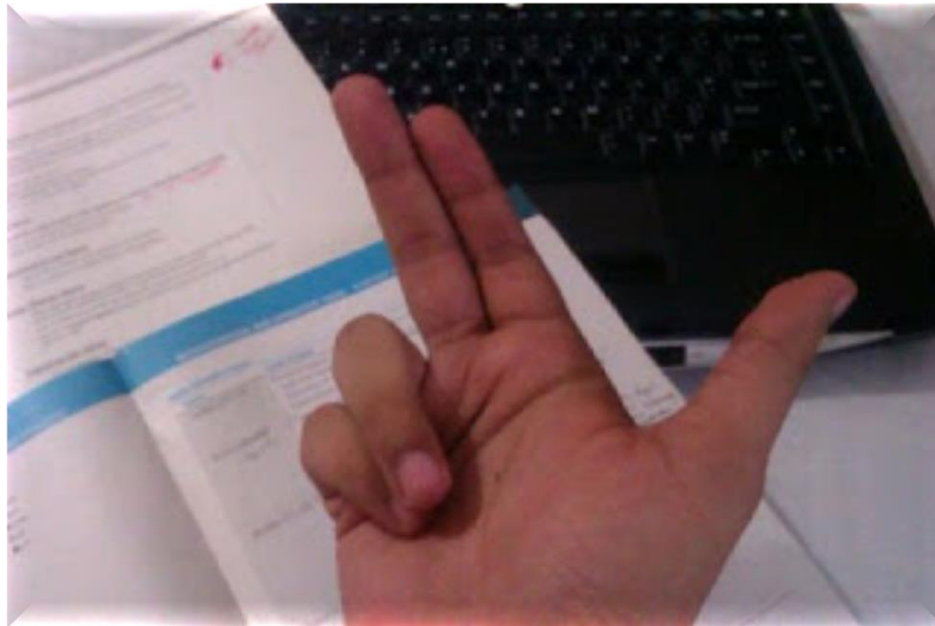
Thumb laterally rotated and adducted

Ape-like hand

No opposition of the thumb

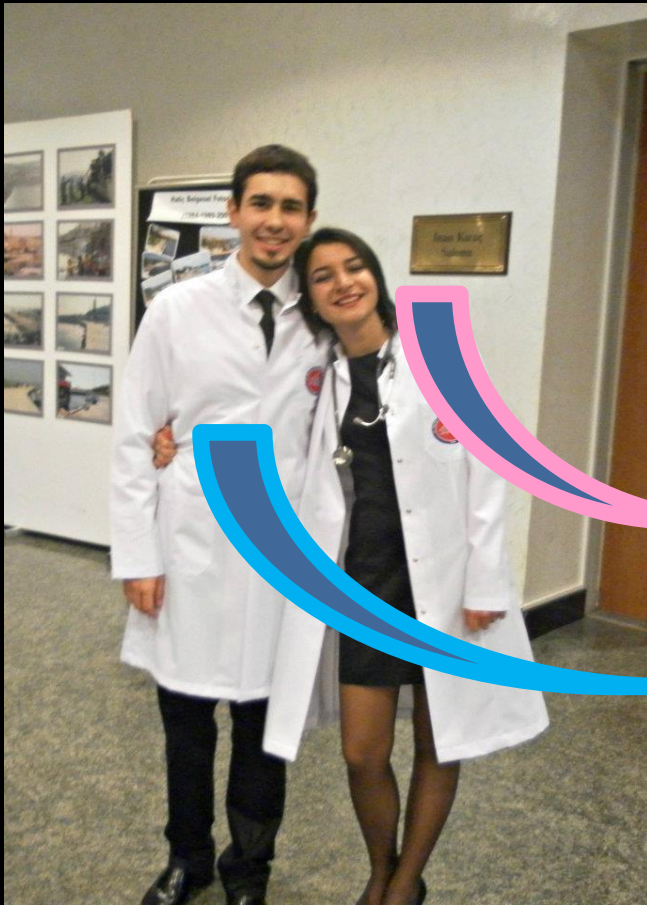
**MAKE A FIST, SLOWLY**

Index & middle fingers lag behind the ring & little fingers



# CASE 4

Dr. Eda, a gynecologist sends her patient , 25 years old pregnant female , a cashier at a mall in downtown @ the end of her first trimester to



Dr. Süleyman who is an internist

An expert from Dr. Eda's request of consultation letter for Dr. Süleyman

Free T<sub>4</sub> 0.4 ng/dl 0.8 – 2.4 ng/dl

**Hypothyroidism?**

# CASE 4

Dr. Süleyman examines the patient as a consulting internist,

Finds the following during his examination:

**Symptoms of depression**

**Increased sensitivity to cold**

**Poor muscle tone**

**Burning sensations in the thumb & index finger**



**The anxious patient asks:** What is wrong with me, doctor?

Dr. Süleyman replies with a tone of affection in his voice:

«You are pregnant and your thyroid gland does not work efficiently and plus you have .....X.....»

**What is X?**



Carpal tunnel syndrome (CTS) is a frequent diagnosis considered in such patients and is the most frequent entrapment neuropathy.

Approximately 1.6% of adults describe symptoms consistent with CTS.

Clinically, the syndrome consists of a burning pain or “pins and needles” along the distribution of the median nerve to the lateral three and a half fingers and weakness of the thenar muscles. It is produced by compression of the median nerve within the tunnel. The syndrome can often be treated effectively with splinting and avoidance of repetitive motions and awkward wrist positions; however, carpal tunnel release is ultimately performed in 25% to 50% of these patients.

[Solomon DH, Katz JN, Bohn R, Mogun H, Avorn J. Nonoccupational risk factors for carpal tunnel syndrome. J Gen Intern Med. 1999 May;14\(5\):310-4.](#)

Pregnancy [experience CTS due to hormonal changes \(high progesterone levels\) and water retention, which is common during pregnancy](#)

During hypothyroidism and pregnancy fluid is retained in tissues, which swells the [tenosynovium](#).

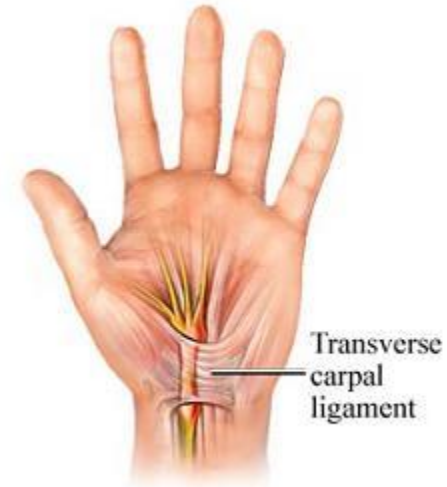
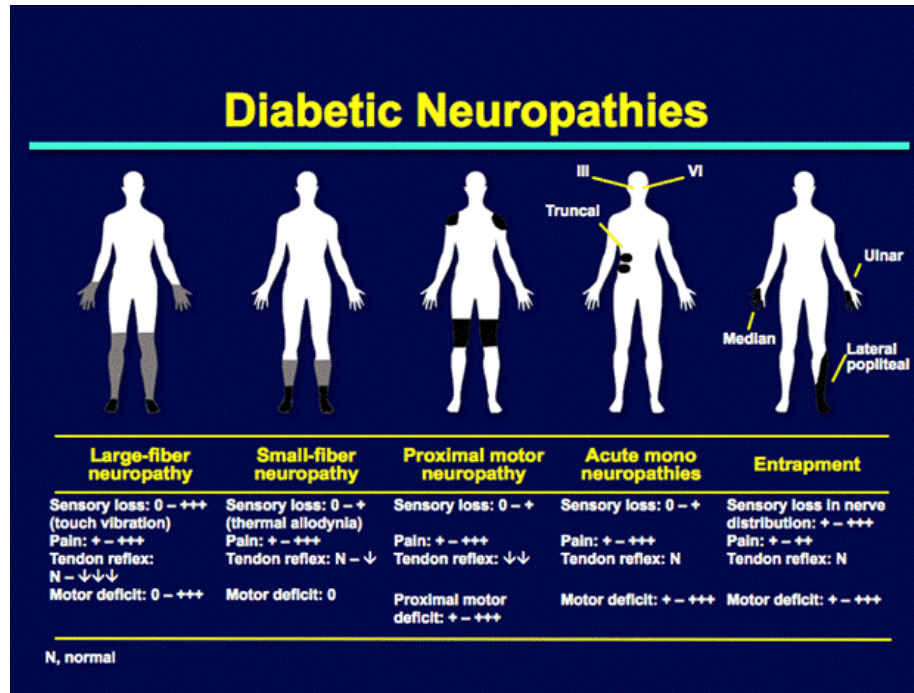
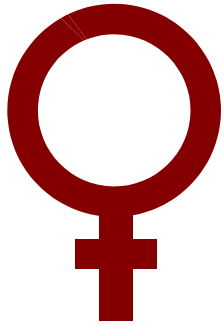
Obesity also increases the risk of CTS: individuals classified as obese (BMI > 29) are 2.5 times more likely than slender individuals (BMI < 20) to be diagnosed with CTS.

*CTS is also work-related, occupational disease and associated with overuse.*

[Bonfiglioli R, Venturi S, Graziosi F, Fiorentini C, Mattioli S. \[Carpal tunnel syndrome among supermarket cashiers\]. G Ital Med Lav Ergon. 2005 Jan-Mar;27\(1\):106-11. \[Article in Italian\]](#)

# Carpal Tunnel Syndrome

MOST COMMON PERIPHERAL NERVE INJURY IN THE UPPER LIMB

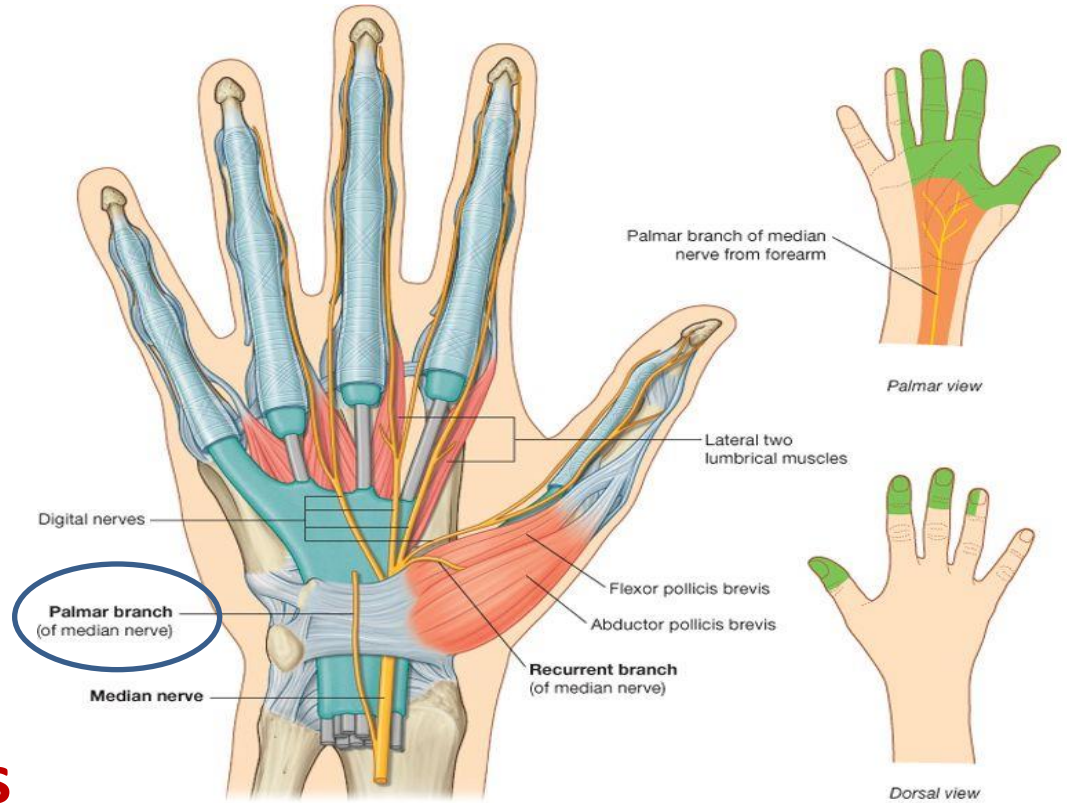


# Carpal Tunnel Syndrome

Burning pain or “pins and needles”

along the distribution of the median nerve

to the lateral 3 ½ fingers



**Weakness of thenar muscles**

**No paresthesia over the thenar eminence**

**palmar cutaneous branch of the median nerve**

# Ulnar Nerve Injuries

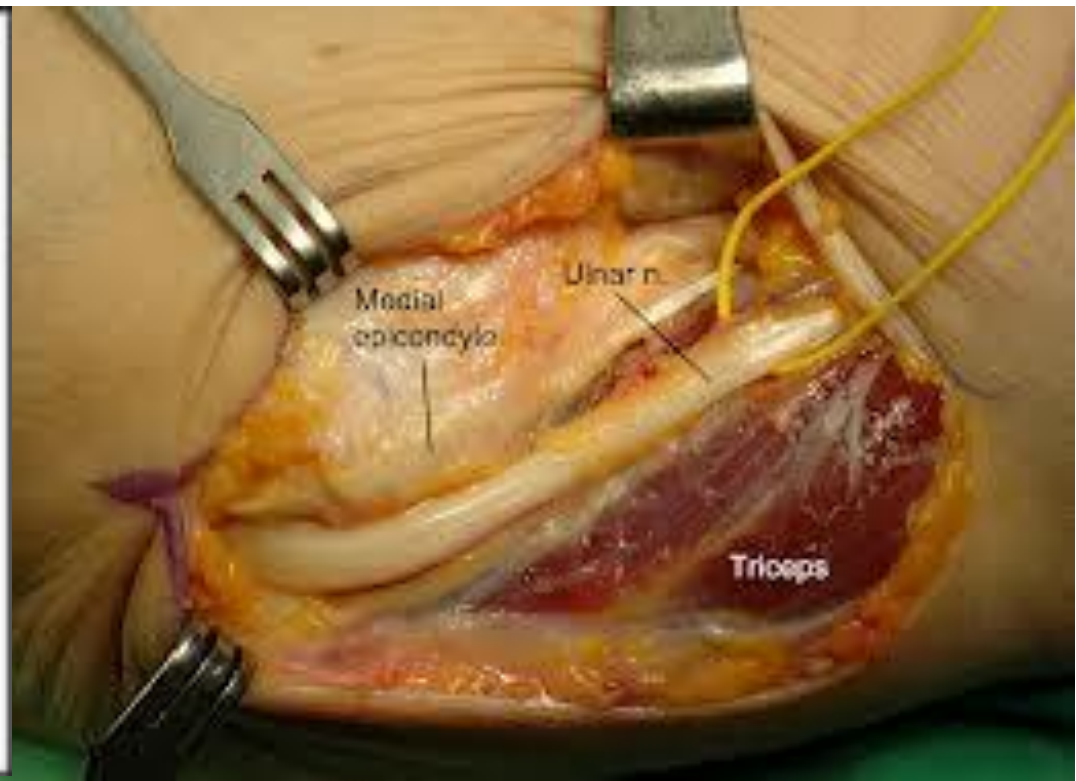
most commonly injured @

@ elbow

where it lies behind the medial epicondyle usually associated with fracture

@ wrist

where it lies with the ulnar artery in front of the flexor retinaculum.



# Injuries to the Ulnar Nerve @ the Elbow

## CUBITAL TUNNEL SYNDROME (2ND most common)

### Motor

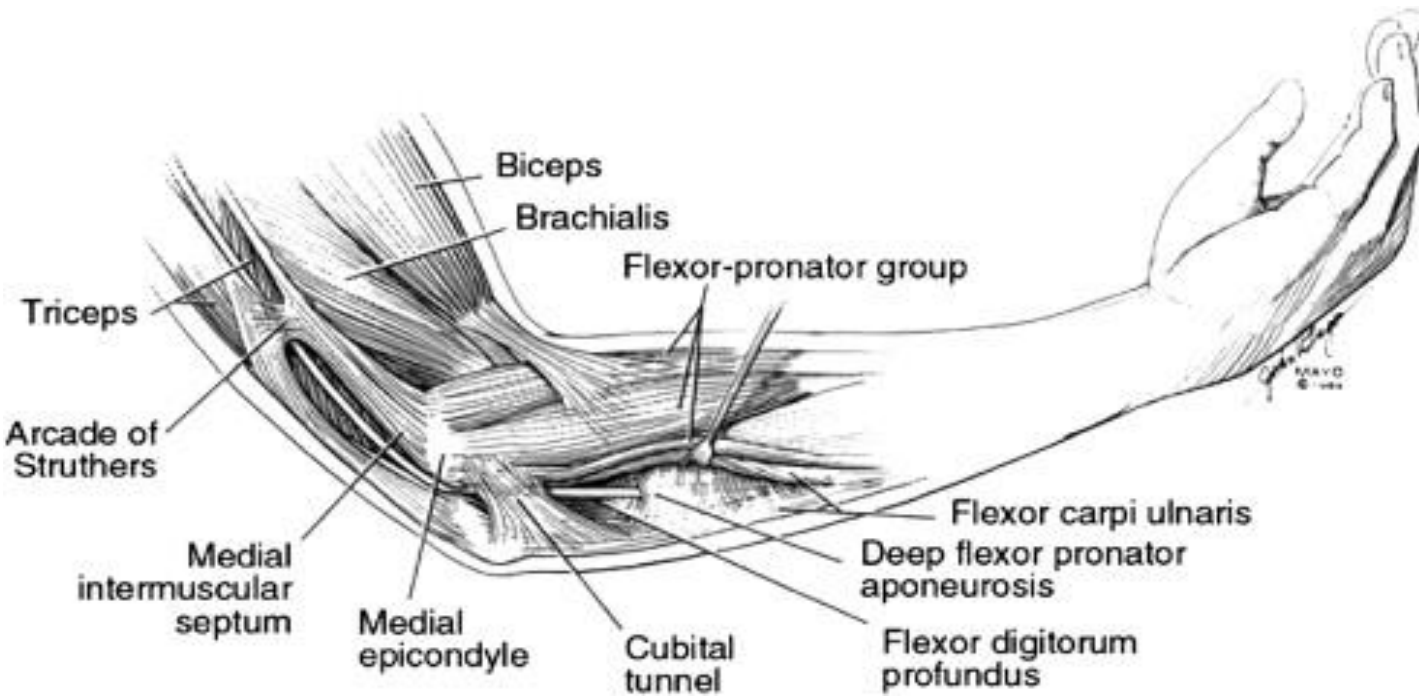
**Flexor carpi ulnaris & medial half of flexor digitorum profundus  
ring & little fingers**

**No flexion of the terminal phalanges of the ring & little fingers**

**Flexion of wrist = abduction paralysis of flexor carpi ulnaris**

medial border of the front of the forearm flattened/wasted

**All the small muscles of the hand paralyzed EXCEPT ?**



**fibro-osseous tunnel  
between the medial  
epicondyle and flexor  
carpi ulnaris**

# Injuries to the Ulnar Nerve @ the Elbow

## Motor

Extensor digitorum can abduct the fingers to a small extent when metacarpophalangeal joints are hyperextended

Impossible to **adduct the thumb** adductor pollicis paralyzed

### Froment's sign

Grip a piece of paper between the thumb and index fingers

Froment sign: The patient is asked to hold the paper between the thumb and index finger. (A) With the intact ulnar nerve, the patient is able to make use of the adductor pollicis. (B) When the ulnar nerve is deficient, the patient compensates for the denervated adductor by using the flexor pollicis longus (median nerve innervated).



# Injuries to the Ulnar Nerve @ the Elbow

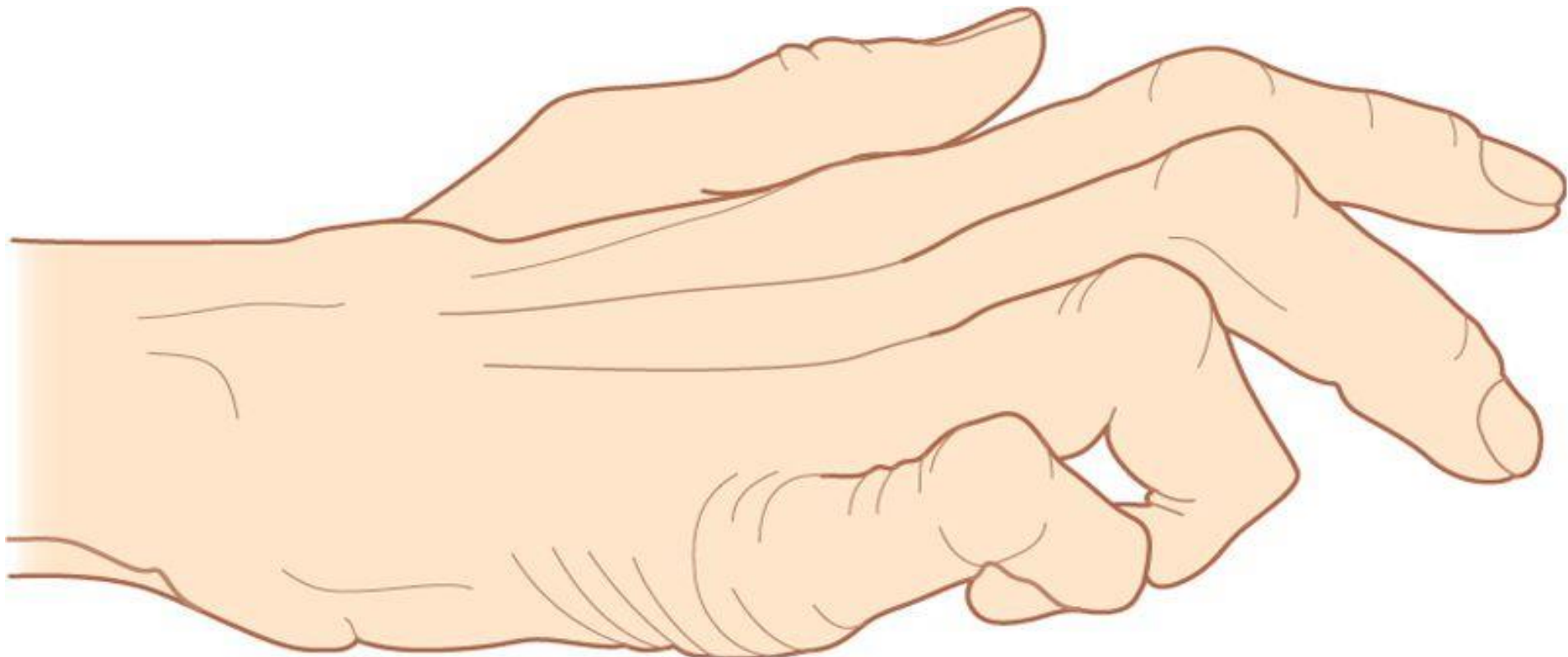
## Motor

**2 medial lumbricals & interossei** Hyperextended metacarpophalangeal joints

Flexed interphalangeal joints

fourth & fifth fingers

**“claw” deformity** **main en griffe**

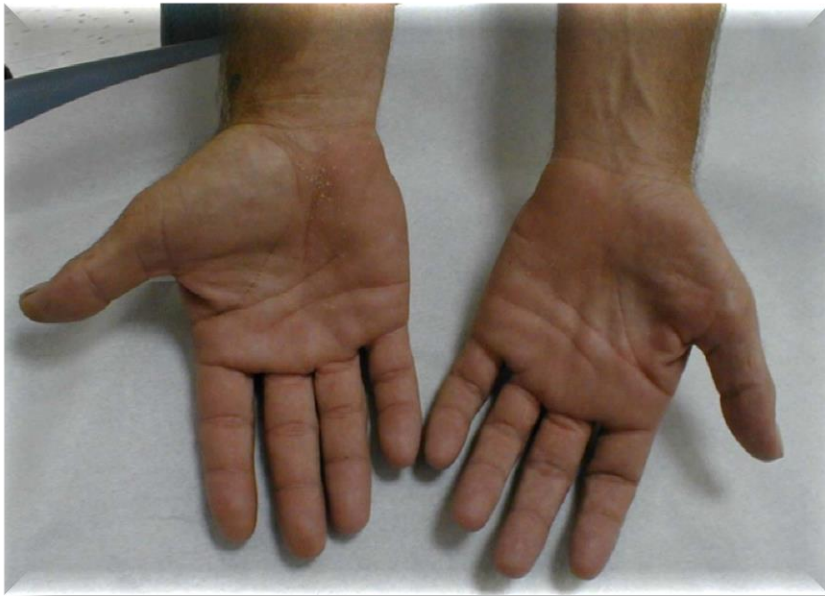


# Injuries to the Ulnar Nerve @ the Elbow

## Motor

Flattening of hypothenar eminence

Loss of the convex curve to the medial border of the hand



Hollowing between metacarpal bones @ dorsum of the hand

wasting of dorsal interossei



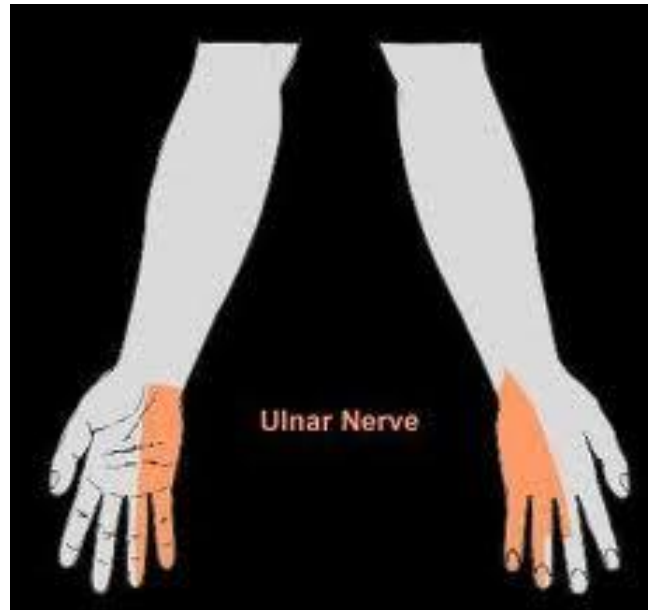
# Injuries to the Ulnar Nerve @ the Elbow

## Sensory

### Loss of skin sensation

anterior & posterior surfaces of medial 1/3 of the hand

medial 1 ½ fingers



### Vasomotor Changes

warmer and drier skin area

arteriolar dilatation and absence of sweating /loss of sympathetic control

# Injuries to the Ulnar Nerve @ the Wrist

## Motor

Small hand muscles paralyzed, wasted – EXCEPT 3 thenar @ first 2 lumbricals

## Claw hand

More obvious

Flexor digitorum profundus intact

Marked flexion of the terminal phalanges

## Ulnar paradox

Higher lesion

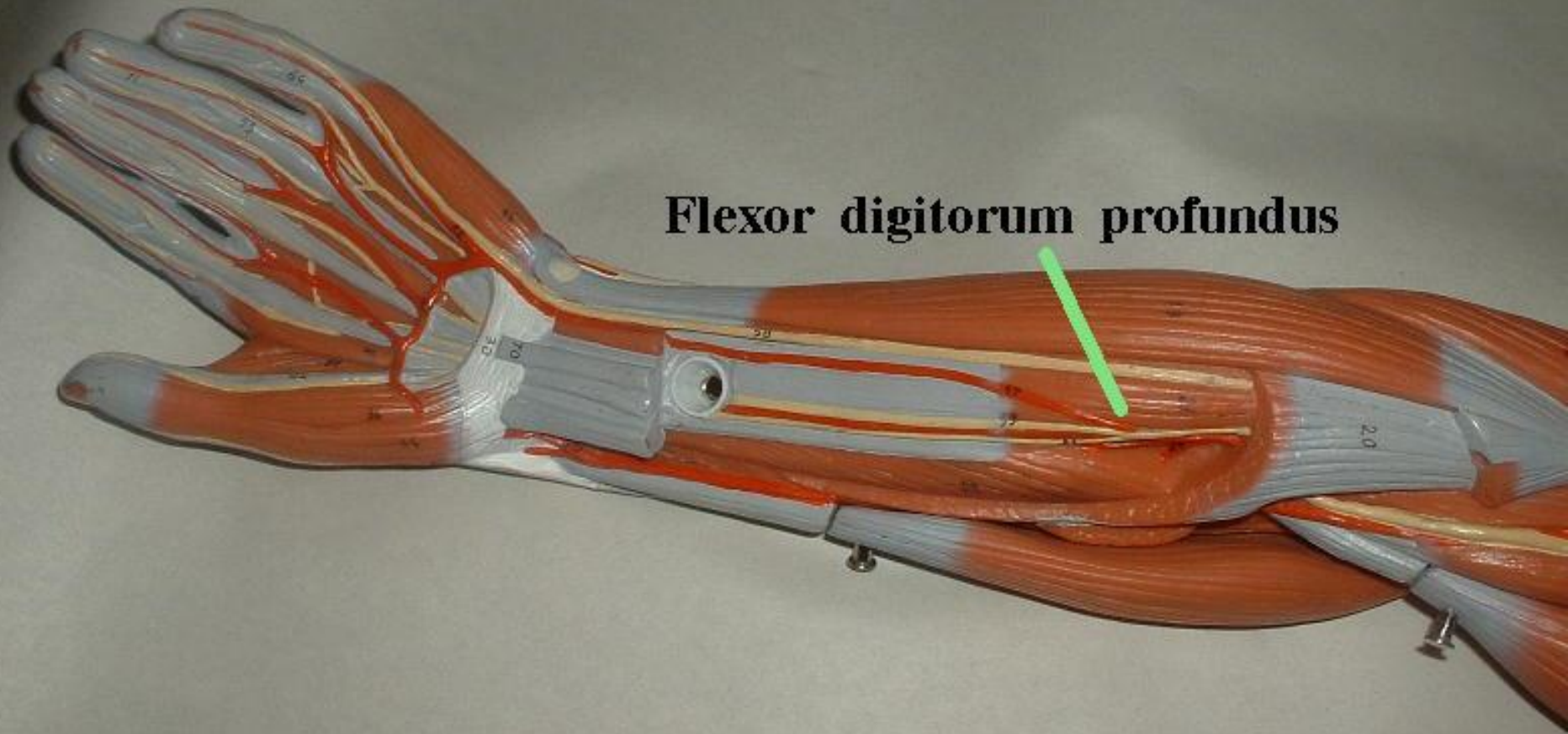
Less obvious claw deformity

More proximal injury

Less claw



**Flexor digitorum profundus**



# Injuries to the Ulnar Nerve @ the Wrist

## Sensory

Main ulnar nerve

Palmar cutaneous branch

*Posterior cutaneous branch*

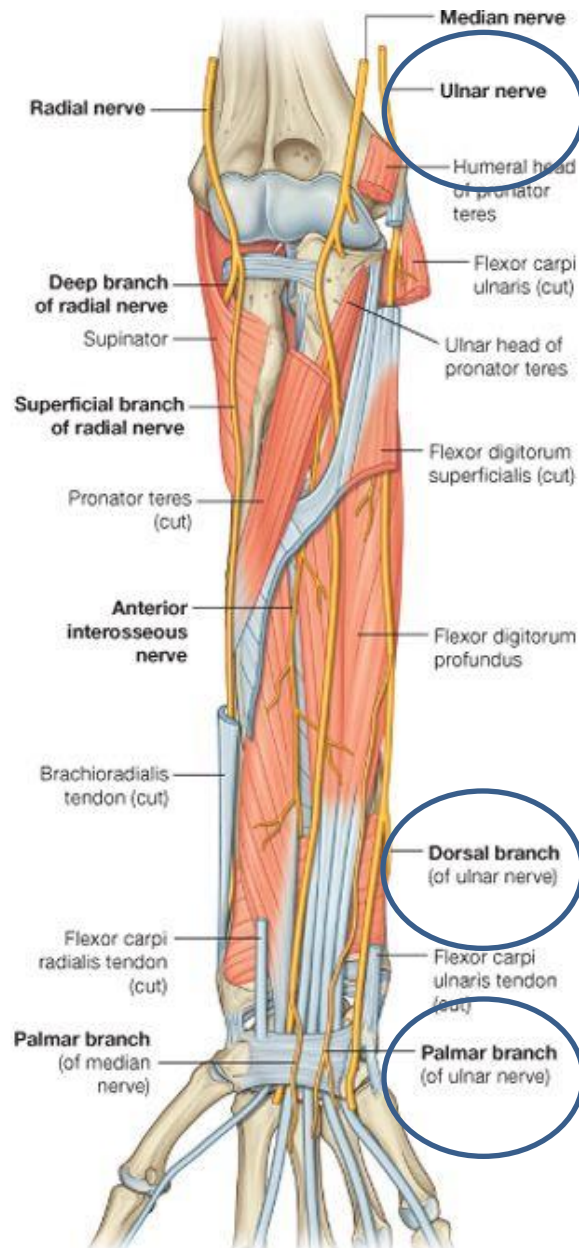
6.25 cm, 2 inch above the pisiform bone



palmar surface of the medial 1/3 hand

medial 1 ½ fingers

the dorsal aspects of the middle and distal phalanges of the same fingers



# Rotator Cuff Tendinitis



*stabilizing the shoulder joint*

**Subscapularis**  
**Supra-infra spinatus**  
**Teres MINOR**



Anterior



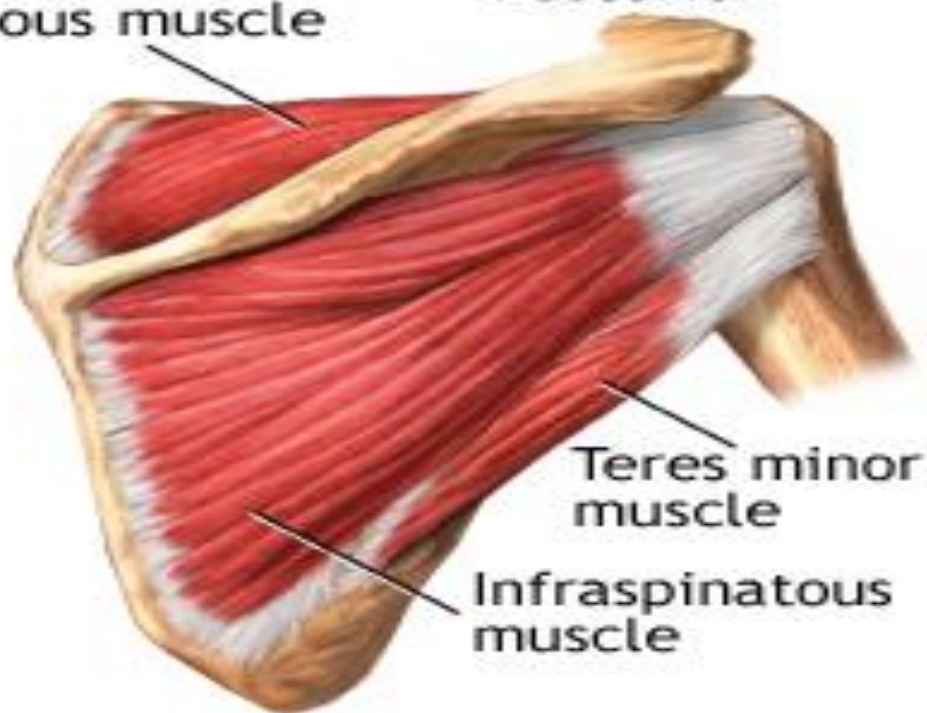
Posterior

Rotator cuff muscles

Supraspinatous muscle



Subscapularis muscle



Teres minor muscle

Infraspinatous muscle



# Rupture of the Supraspinatus Tendon

**advanced cases of rotator cuff tendinitis**

necrotic supraspinatus tendon

calcified or rupture

**Hold humeral head @ glenoid fossa at the beginning of abduction**

**No initiation of abduction of the arm, unless passively assisted for the first 15°**



# Anterior interosseous nerve syndrome



- **flexor pollicis longus**
- **flexor digitorum profundus**
- **pronator quadratus**

to index, sometimes middle fingers

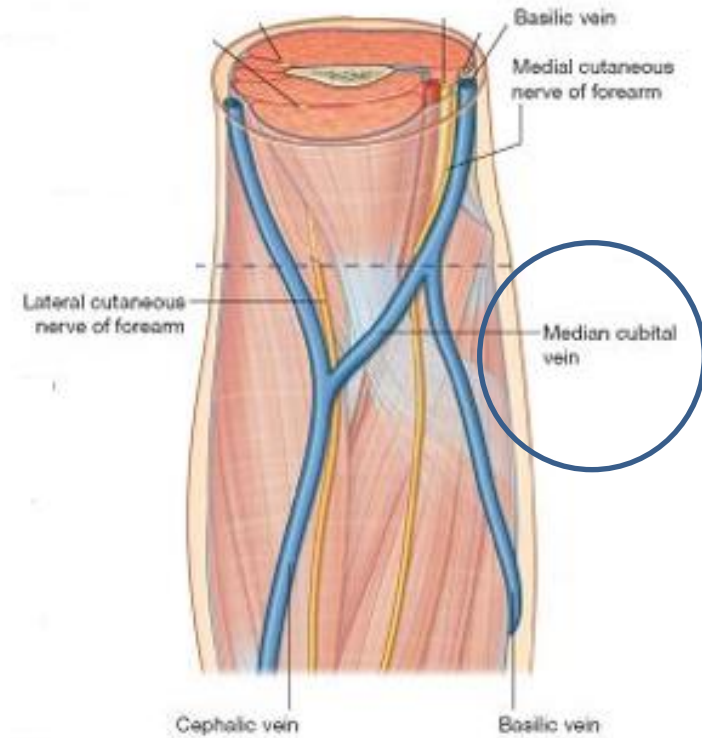
**Pinch deformity**

**Pronation**

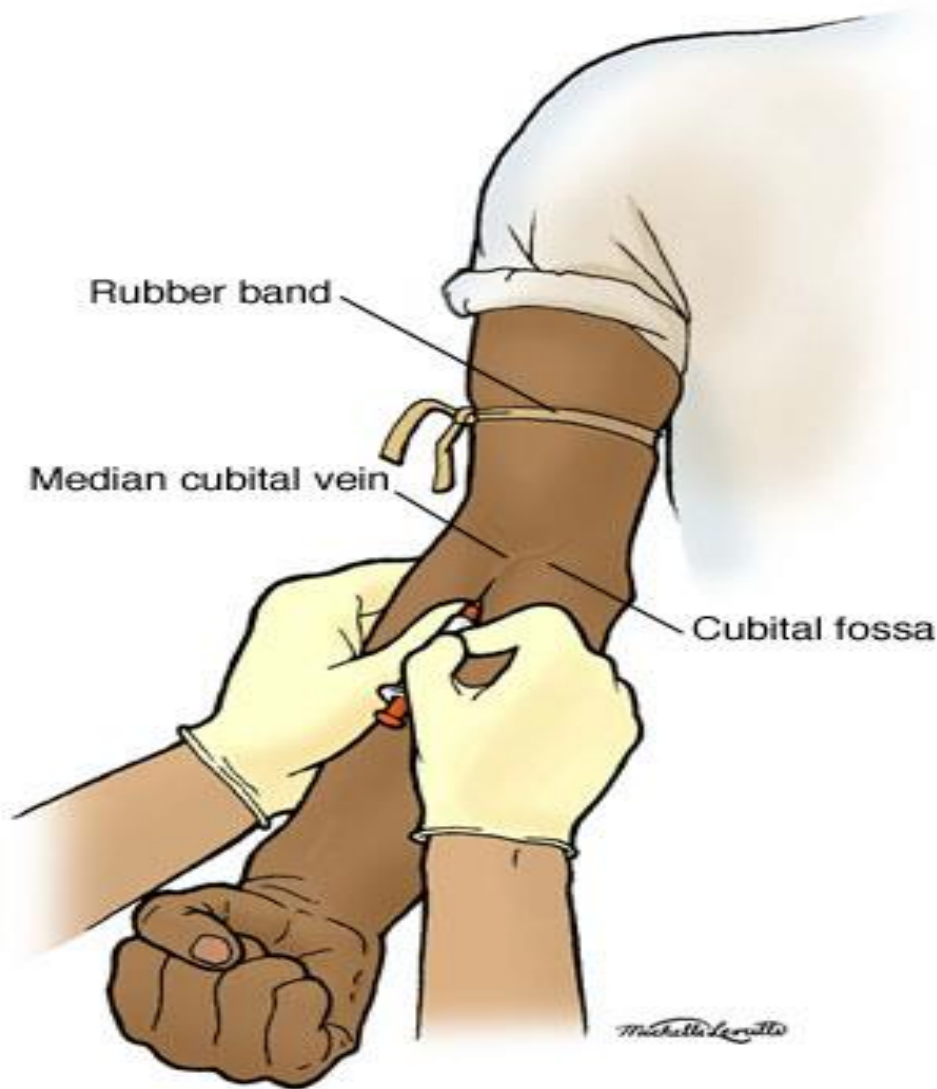


# Venipuncture

- obtaining blood for laboratory testing
- administering fluid and intravenous drugs



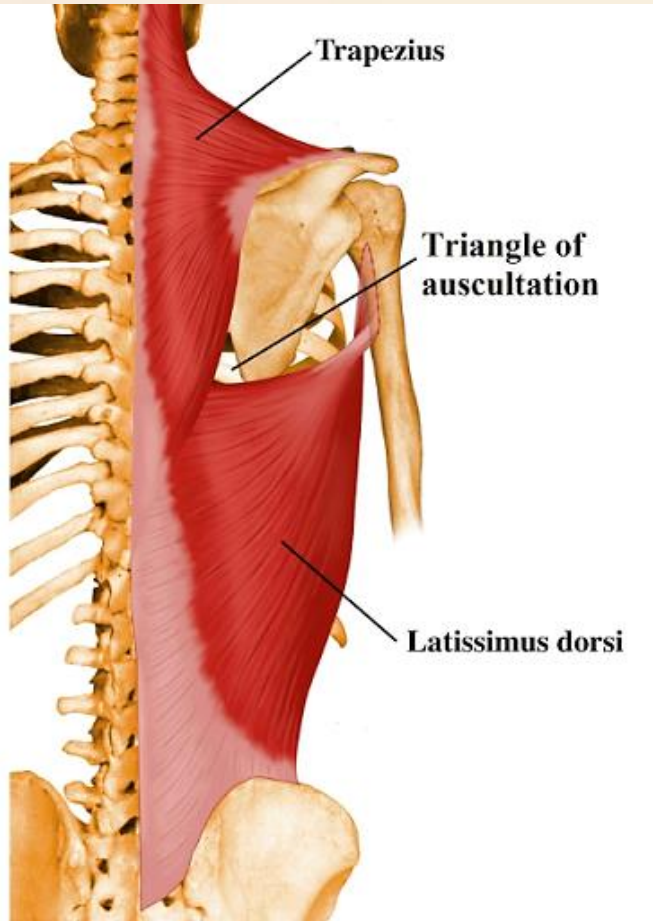
## Cephalic vein





OTHER

# Auscultatory Triangle



**latissimus dorsi**  
**trapezius**  
**medial border of scapula**

# STIFF NECK

## Levator scapulae

levator scapula which connects the neck and shoulder.

most usual complaint pain when trying to turn the head to the side where it hurts, often turning the body instead of the neck to look behind.

It is often associated with a headache but not always.

The most common causes for developing this kind of stiff neck are; turning the head to one side while typing, long phone calls without a headset, sleeping without proper pillow support with the neck tilted or rotated, sitting in a chair with armrests too high and exposure of the neck to a cold draft. There are other causes basically from shortening of this muscle as illustrated with using a cane that is too long. Activities such as vigorous tennis, swimming the crawl stroke and watching a tennis match rotating the head back and forth can also cause a stiff neck.

