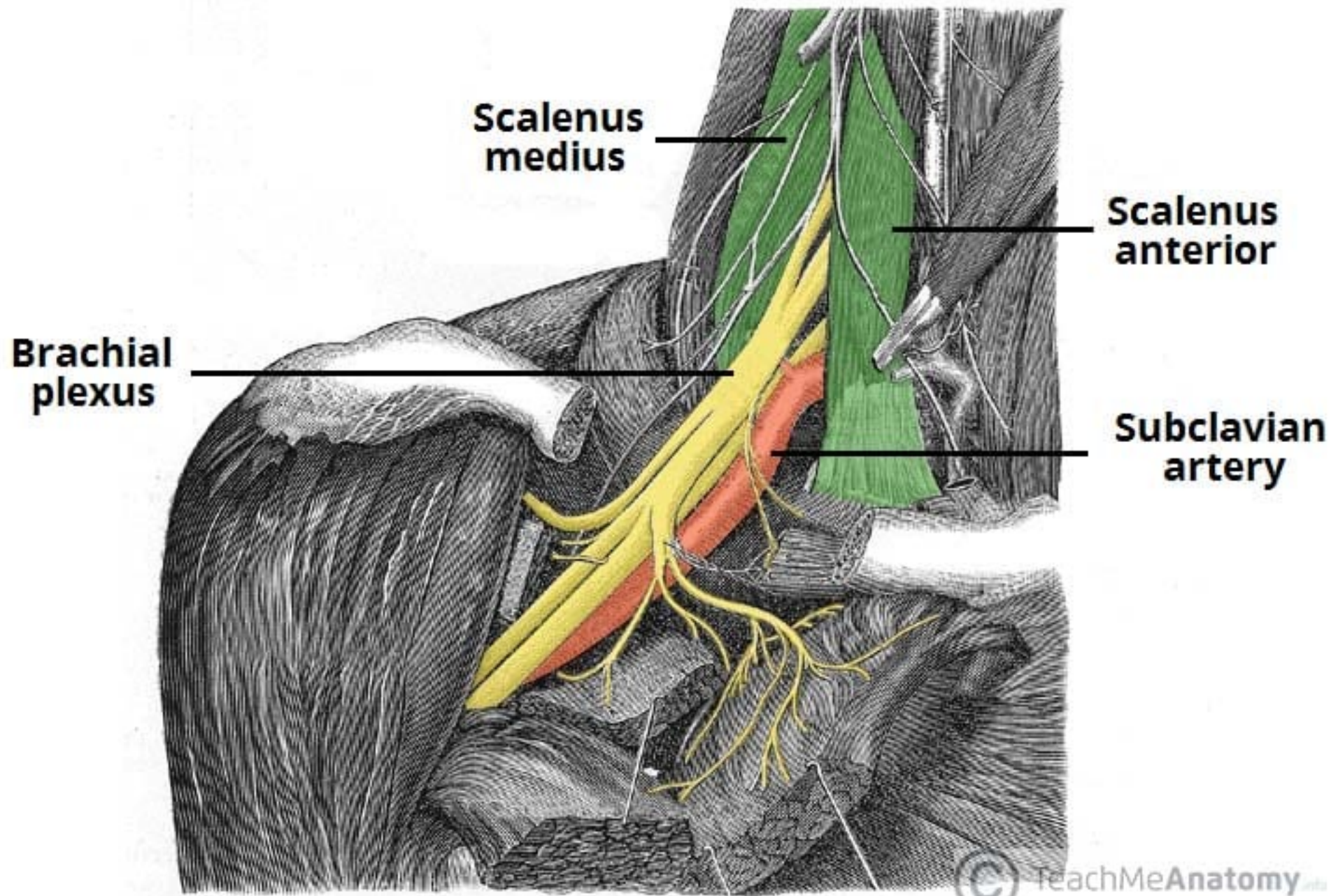


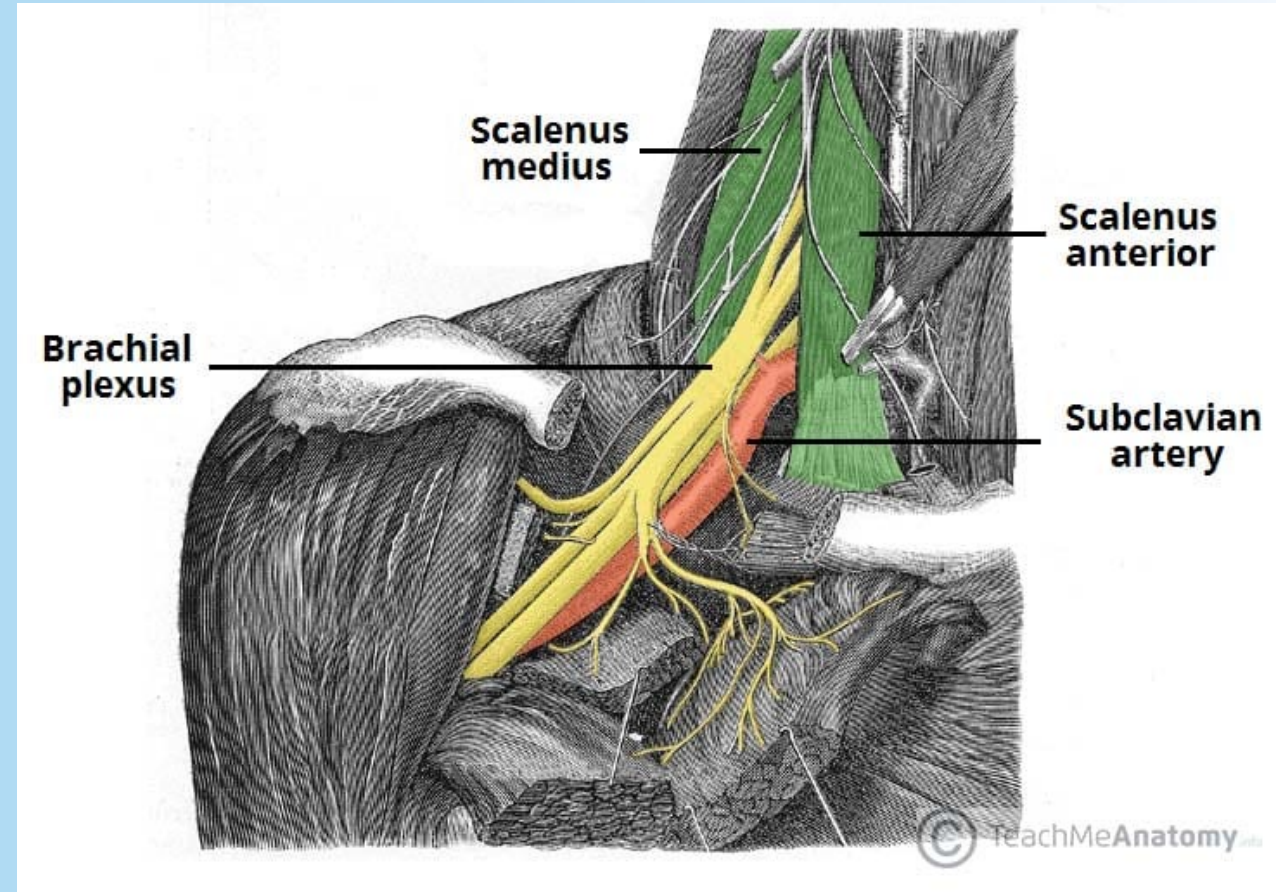
Nerve supply of upper limb

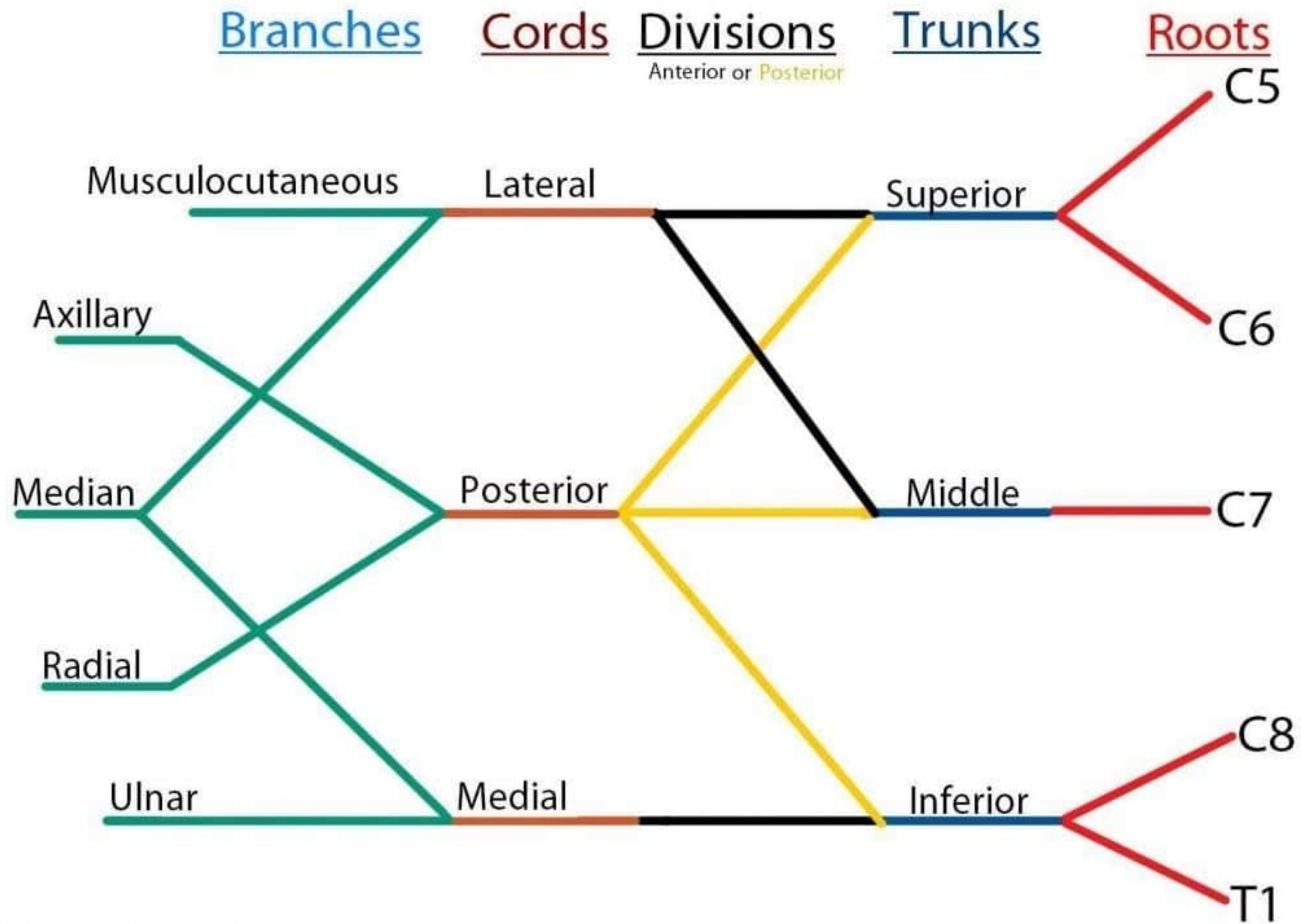
By Ola Amland

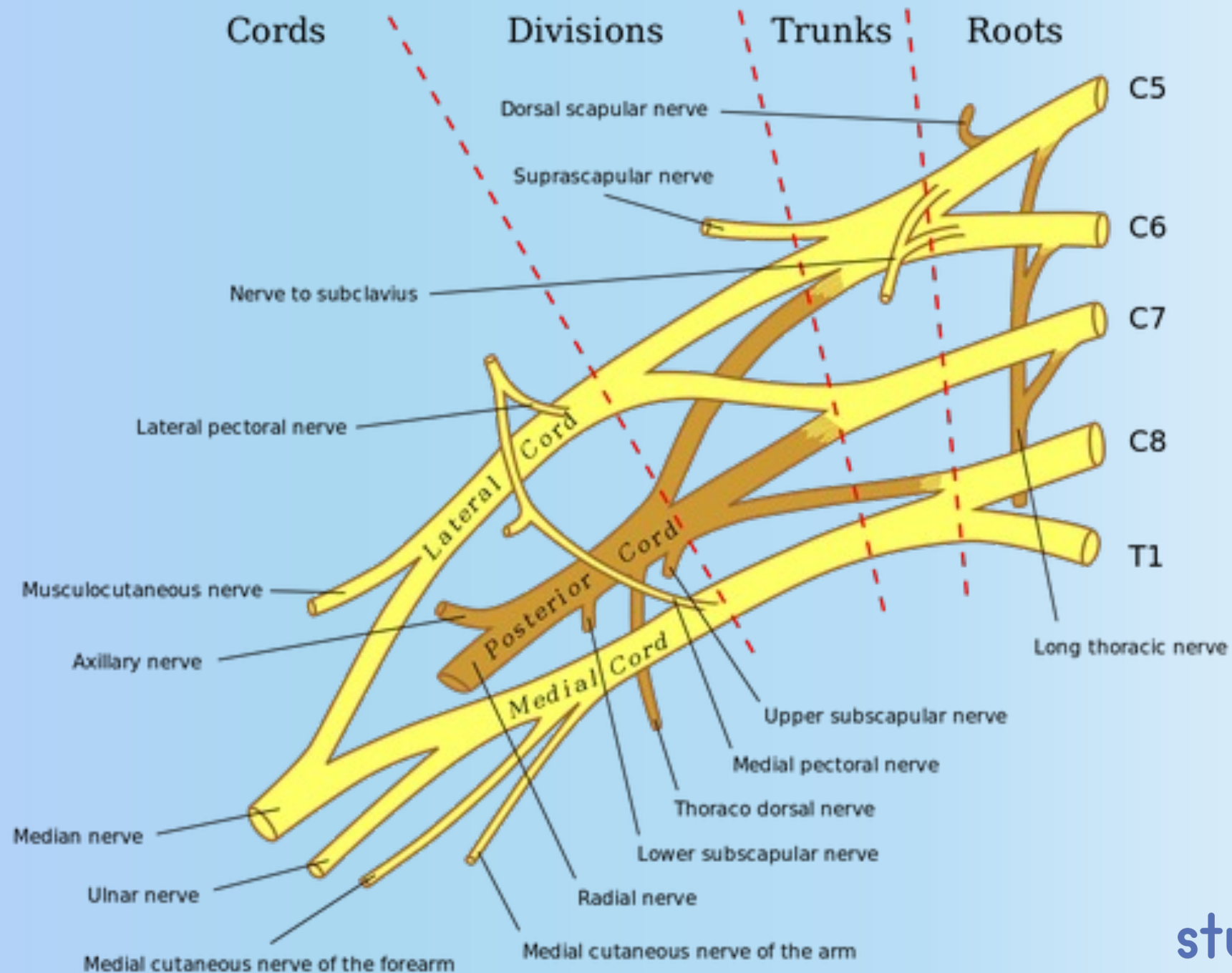


Scalene triangle

- Brachial plexus
- Subclavian artery (third part)







Nerves from roots of brachial plexus

Long thoracic nerve C5-7

- Innervates: Serratus anterior
- Protracts the scapula, fixes the scapula to the thoracic wall, and assists in abduction of the shoulder above 90°

Dorsal scapular nerve C5

- Innervates: Levator scapulae m.
Rhomboid major
Rhomboid minor

Nerves from trunks of brachial plexus

Subclavian nerve C5-6

- **Innervates:** Subclavius muscle

Suprascapular nerve C4-6

- **Innervates:**

Supraspinatus

- Abduction of arm 0-15°

Infraspinatus

Externally rotates humerus

Pectoral nerves

Lateral pectoral nerve

- Arises from lateral cord
- Supplies pectoralis major!
 - Flexes, adducts, and internally rotates the humerus

Medial pectoral nerve

- Arises from medial cord
- Supplies pectoralis major and minor!
- Pectoralis minor: Stabilizes scapula

Nerve (associated nerve root)	Muscle(s) and function
Axillary nerve (C5-C6)	Deltoid: 15-90 degrees of shoulder abduction Teres minor: Lateral rotation of arm
Musculocutaneous nerve (C5-C7)	Biceps: Elbow flexion and forearm supination Coracobrachialis: Elbow flexion and adduction of arm Brachialis*: Elbow flexion
Median nerve (C5-T1)	Pronator teres: Pronation of forearm Flexor carpi radialis: Radial flexion of wrist Palmaris longus: Flexion of wrist Flexor digitorum superficialis: Flexion of fingers Flexor pollicis longus ^a : Flexion of terminal phalanx of thumb Flexor pollicis brevis*: Flexion at proximal phalanx of thumb Flexor digitorum profundus I & II ^a : Flexion terminal phalanx of 2,3 fingers Pronator quadratus ^a : Pronation of forearm Abductor pollicis brevis: Abduction of thumb metacarpal Opponens pollicis: Opposition of thumb metacarpal Lumbricals I & II: Flexion of MCP joints and extension of interphalangeal joints

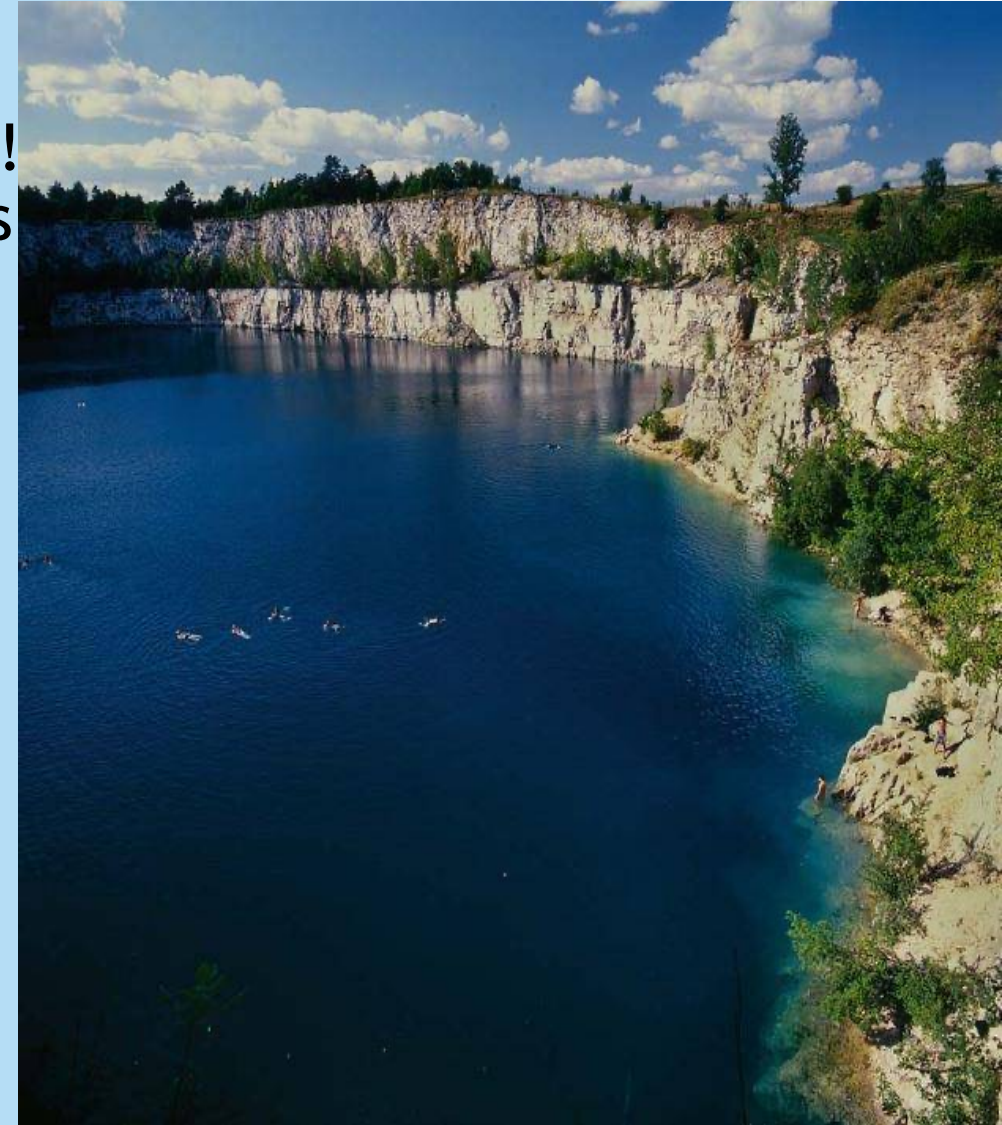
Ulnar nerve (C7-T1)	Flexor carpi ulnaris: Ulnar flexion of wrist Flexor digitorum profundus: Flexion of hand and fingers Abductor digiti minimi: Abduction of 5th digit Opponens digiti minimi: Opposition of 5th digit Flexor digiti minimi: Flexion of 5th digit Lumbricals III & IV: Flexion of MCP joints and extension of interphalangeal joints Interosseous muscles: Abduction and adduction of fingers Adductor pollicis: Adduction of MCP joint of thumb Flexor pollicis brevis**: Flexion at proximal phalanx of thumb
Radial nerve (C5-C8)	Triceps: Extension of forearm Anconeus: Extension of forearm Brachialis*: Flexion of elbow Brachioradialis: Flexion of elbow Extensor carpi radialis longus: Radial extension of wrist Supinator: Supination of forearm Extensor carpi radialis brevis: Radial extension at the wrist Extensor digitorum: Extensor of MCP joint of 2nd-5th digits Extensor digiti minimi: Extension of MCP joint of 5th digit Extensor carpi ulnaris: Ulnar extension of wrist Abductor pollicis longus: Abduction of MCP of thumb Extensor pollicis longus: Extensor of thumb Extensor pollicis brevis: Extensor of thumb Extensor indicis: Extension of 2nd finger

Busy day! Lets meet our first patient

Marek, 25, Lover of adrenaline and zakrzówek!
He decided to jump from a cliff to show all his friends how cool he is. He loses his balance and lands with his elbow first!

We find a supracondylar fracture of the humerus on X-ray

Now has problems making a fist →



Busy day! Lets meet our first patient

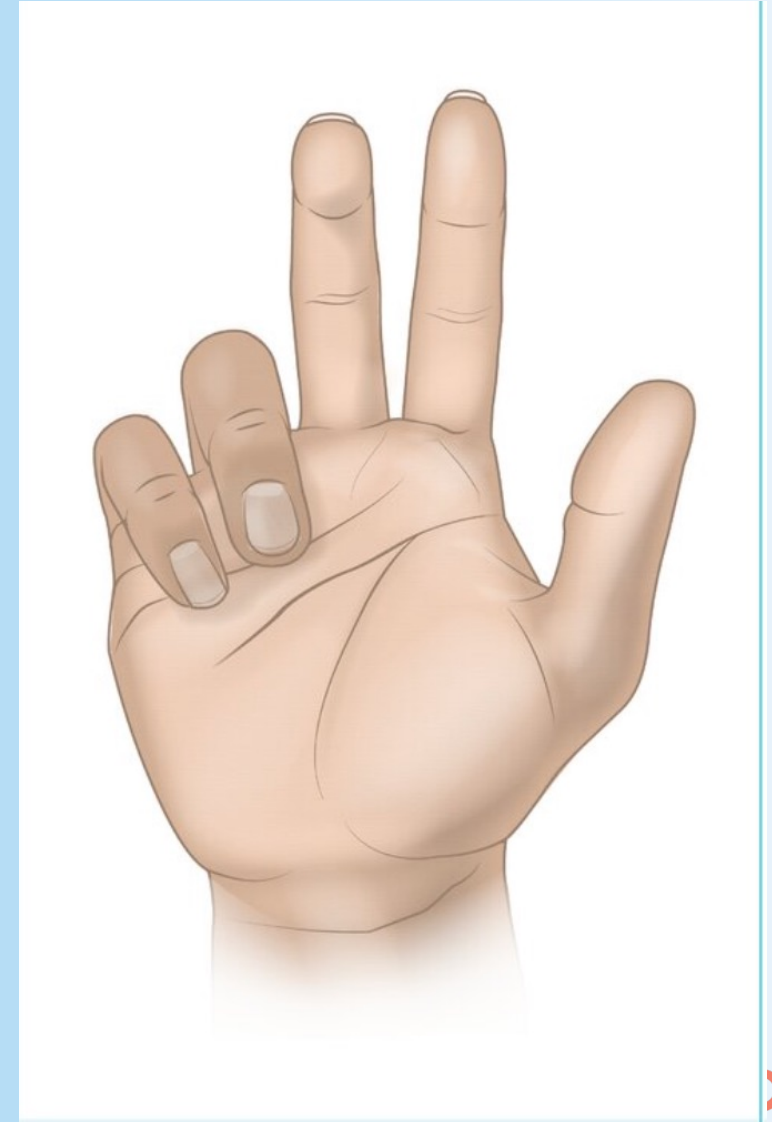
Marek, 25, Lover of adrenaline and zakrzówek!
He decided to jump from a cliff to show all his friends how cool he is. He loses his balance and lands with his elbow first!

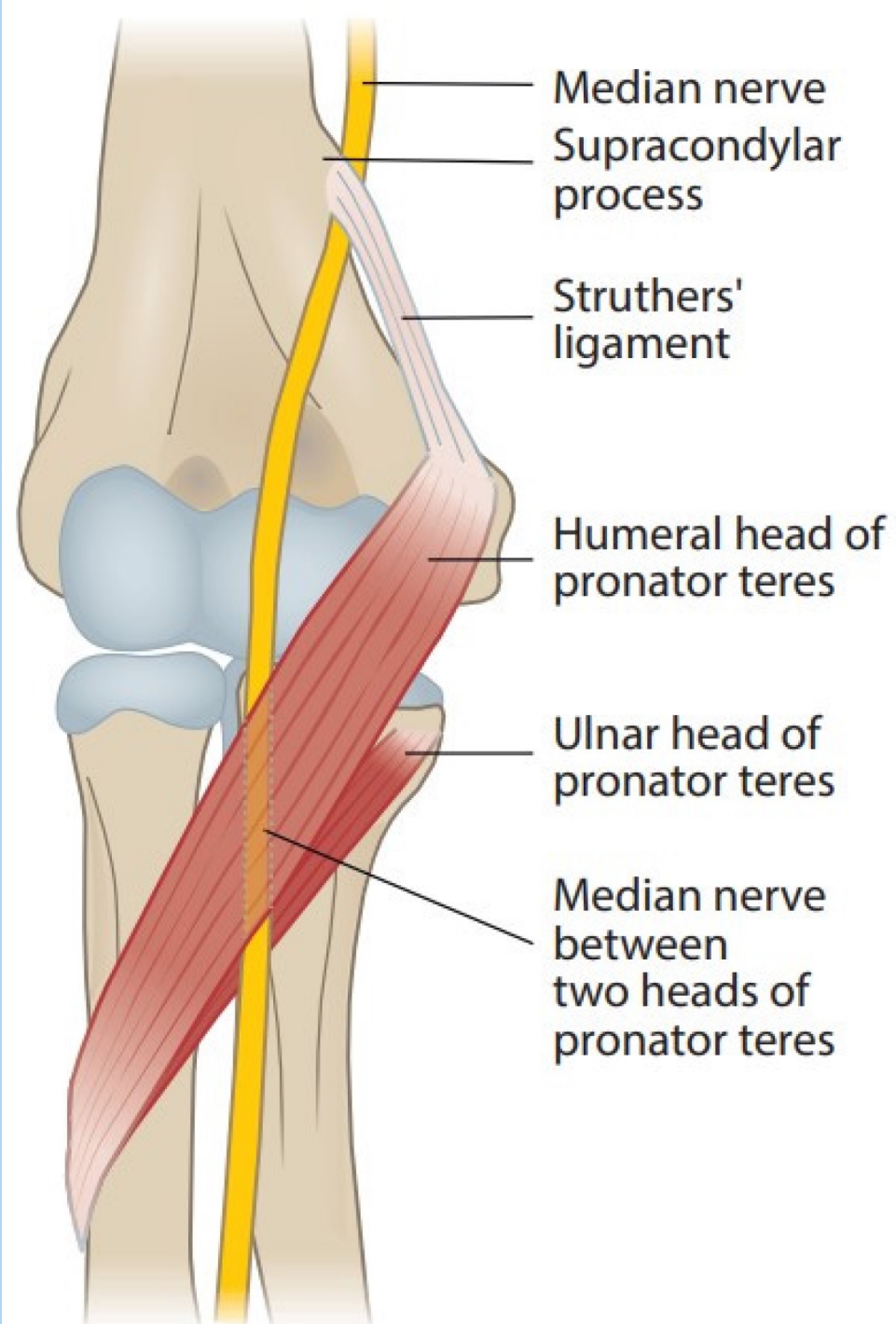
We find a supracondylar fracture of the humerus on X-ray

Now has problems making a fist →

What famous person also makes this hand?

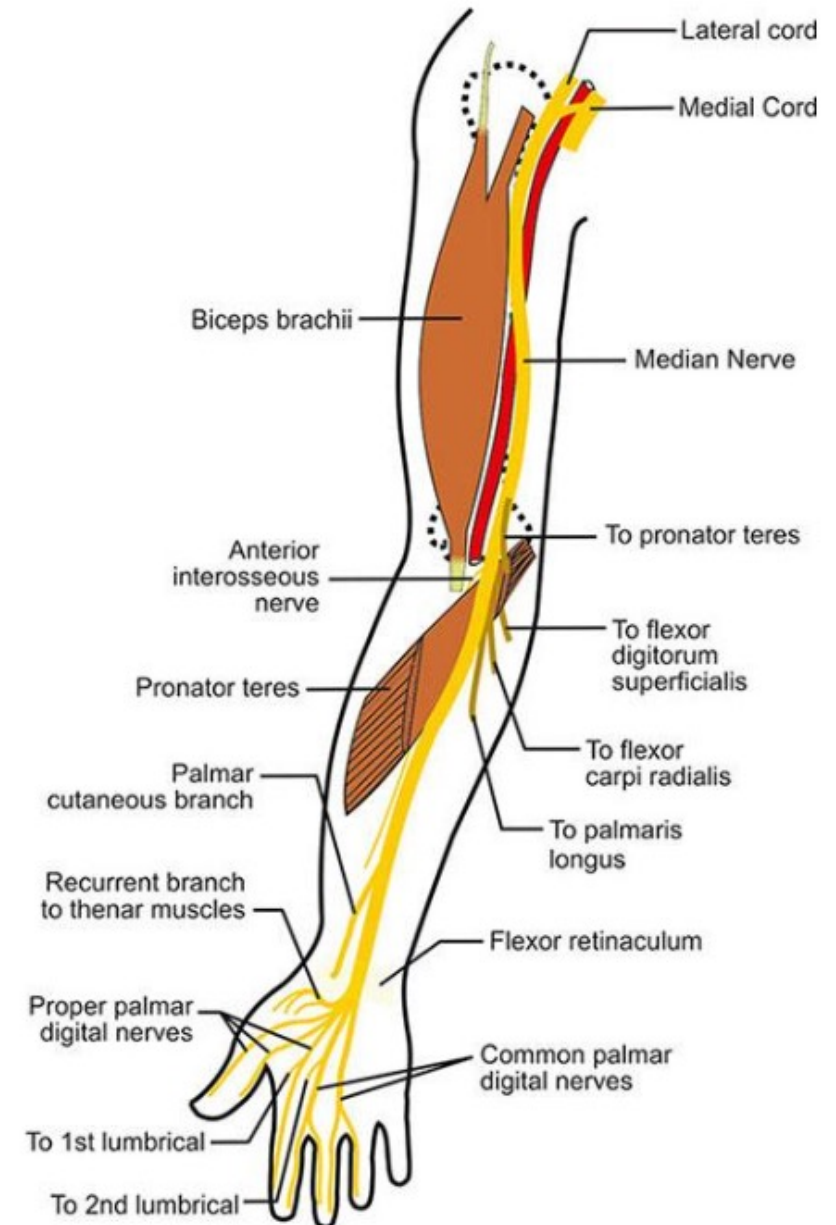
- A. Yoda
- B. The pope
- C. GG





Median nerve landmarks

1. Medial and lateral cords of brachial plexus C5-T1
2. Lateral to supracondylar process
3. Cubital fossa, medial to biceps brachii tendon
4. Enters wrist through carpal tunnel



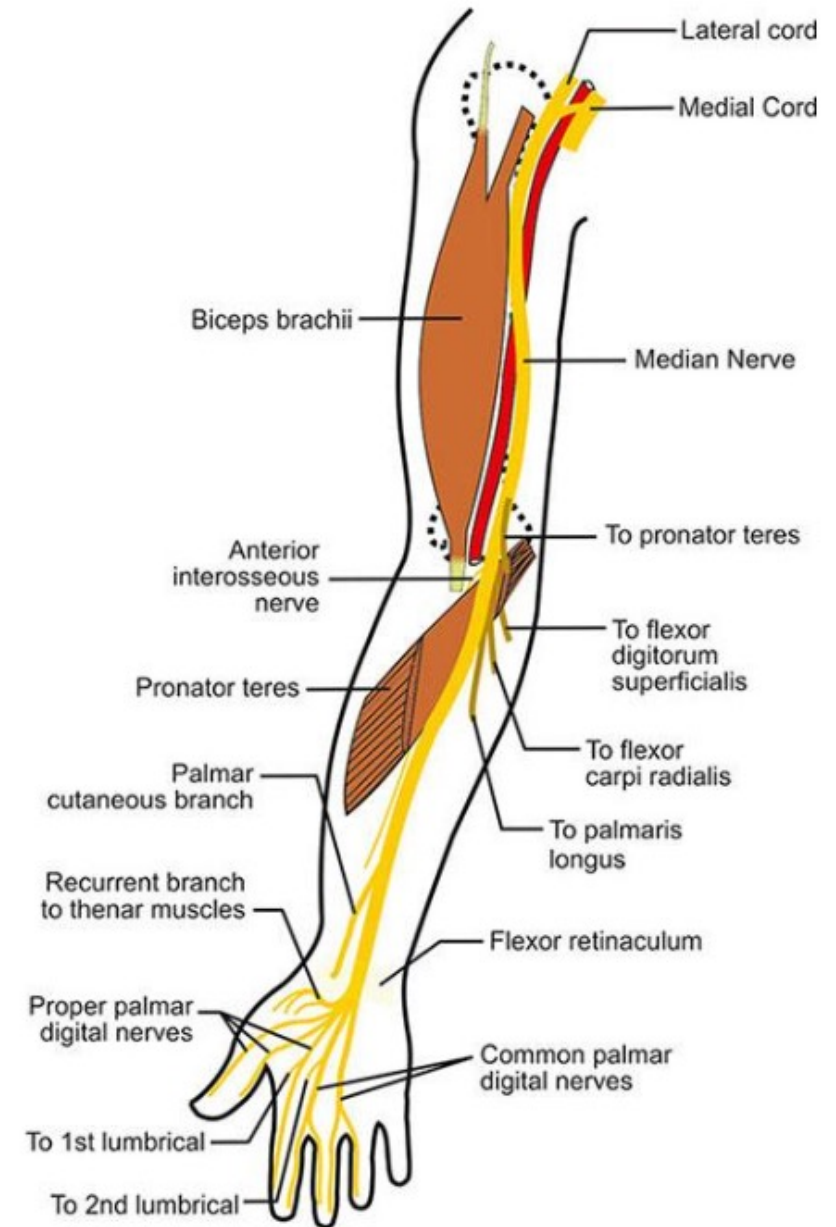
Median nerve

Innervates:

1. Flexor carpi radialis
2. Palmaris longus
3. Pronator quadratus
4. Pronator teres
5. Digital flexors

Main movement: Wrist flexion and abduction, Forearm pronation, Thumb flexion and opposition and flexion of digits 2 and 3

Sensory: Skin over anterolateral surface of hand



Busy day! Lets meet our first patient

Marek, 25, Lover of adrenaline and zakrzówek!
He decided to jump from a cliff to show all his friends how cool he is. He loses his balance and lands with his elbow first!

We find a supracondylar fracture of the humerus on X-ray

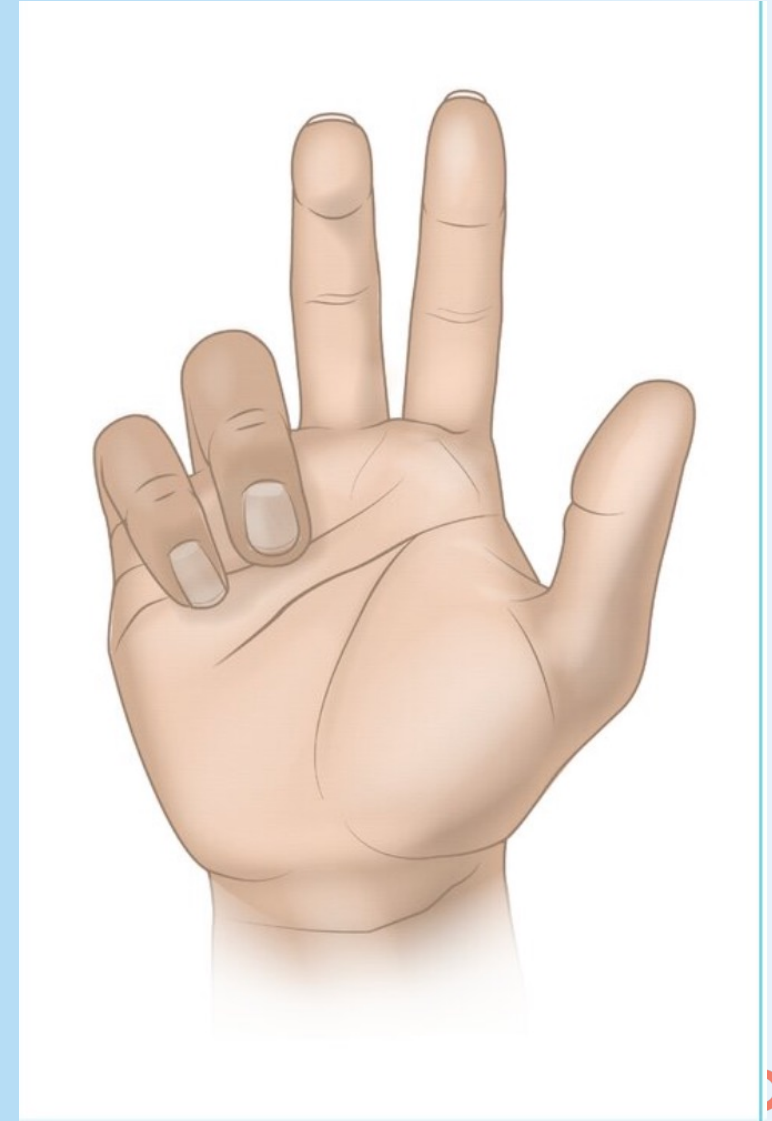
Now has problems making a fist →

What famous person also makes this hand?

A. Yoda

B. The pope

C. GG

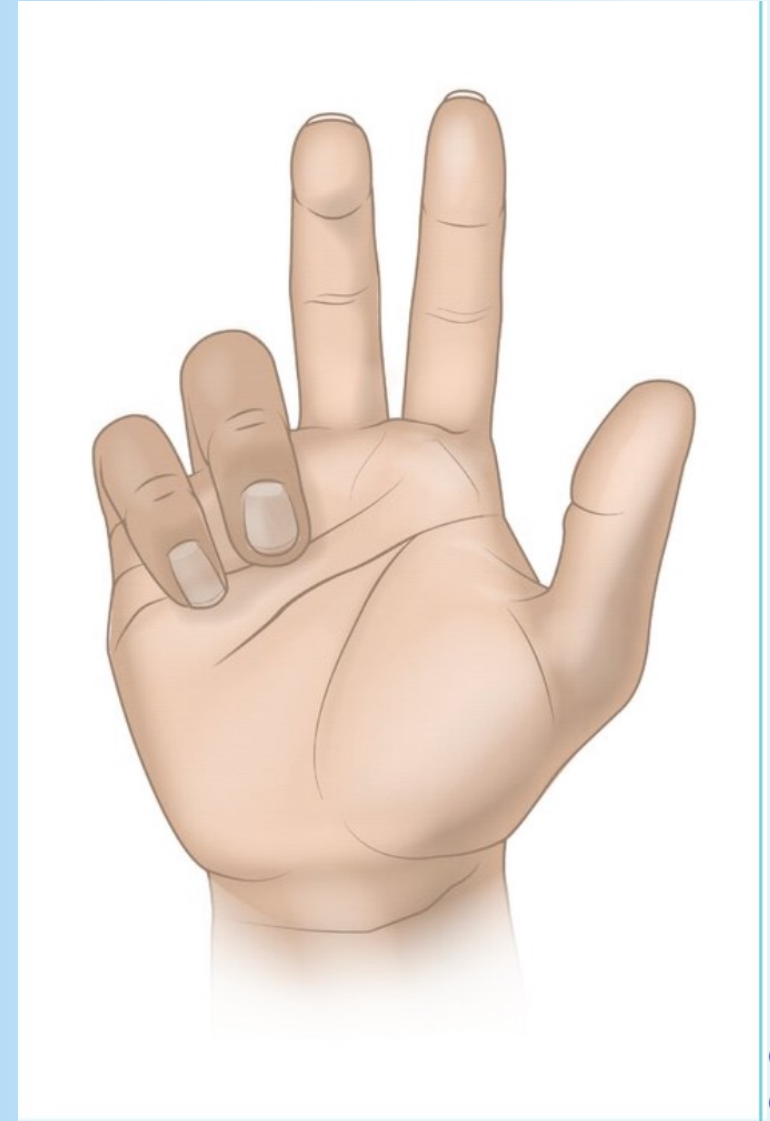


Busy day! Lets meet our first patient

Marek, 25, Loves adrenaline and zakrzówek
supracondylar fracture after an accident

Now has problems making a fist →

***Proximal median nerve compression.
Impossible for the patient to flex thumb,
and 2. and 3rd digits. Called «Popes blessing»
or «Hand of Benediction»***



The medical students demise

Peter, 1st year MD, presents to you with weakness when gripping and a tingling sensation accompanied by some pain.

Limited to the first 3 digits, and a little in the 4th digit. Only in the right hand.

The past 3 weeks he has had histology, biochemistry and now is getting ready for his anatomy test. He loves taking notes, and carries his ipad and pen everywhere he goes. He is anxious, sleep deprived and tells you about vivid dreams of aminoacids



The medical students demise

Peter, 1st year MD, presents to you with weakness when gripping and a tingling sensation accompanied by some pain.

Limited to the first 3 digits, and a little in the 4th digit. Only in the right hand.

The past 3 weeks he has had histology, biochemistry and now is getting ready for his anatomy test. He **loves** taking notes, and carries his ipad and pen everywhere he goes. He is anxious, sleep deprived and tells you about vivid dreams of aminoacids

What do you recommend him to do?

- A. Stop taking notes
- B. Take even more notes, no pain no gain
- C. Maybe its time for a christmas break



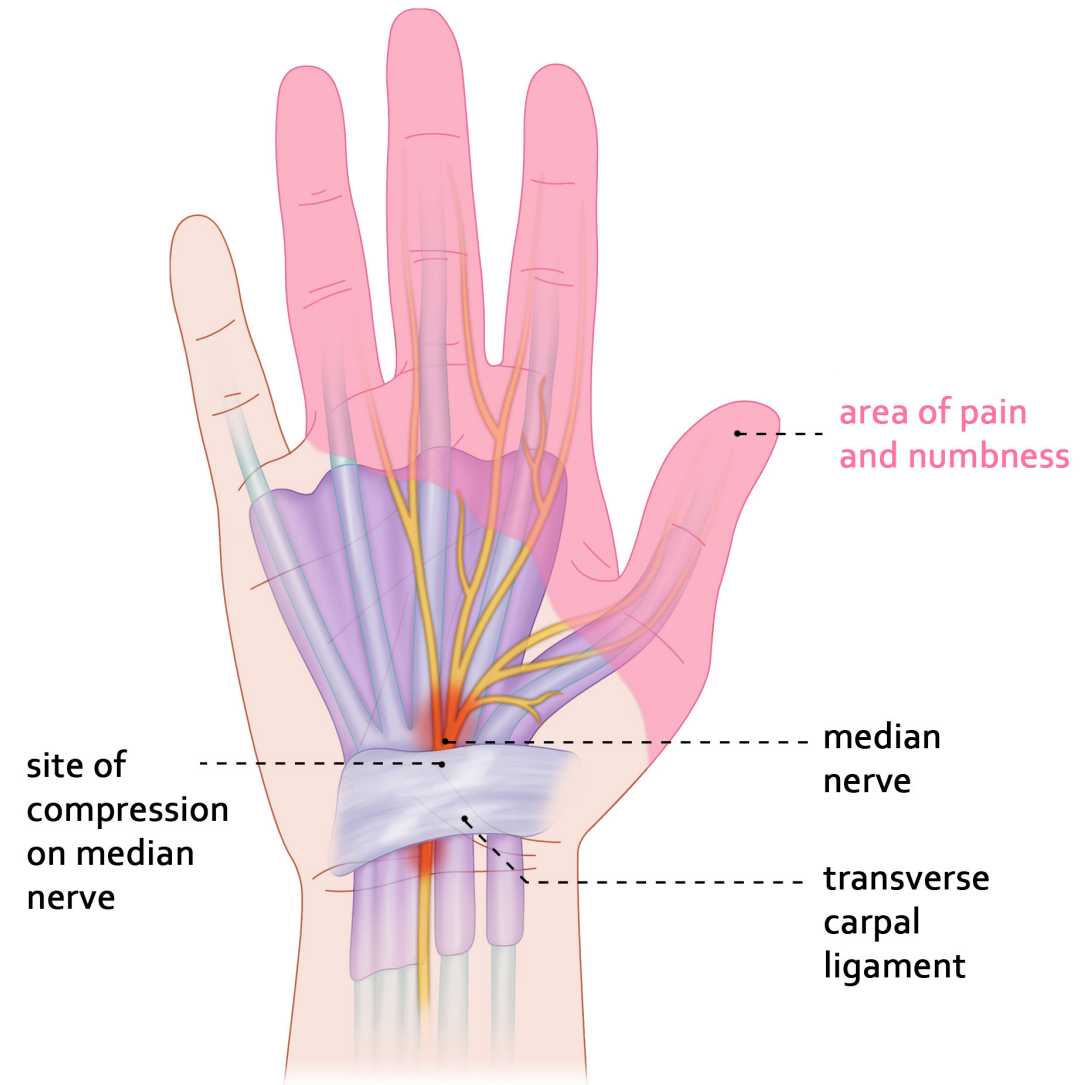
Carpal tunnel syndrome

Compression of median nerve
(*distal median nerve lesion*)

Paresthesia (numbness, burning,
tingling)

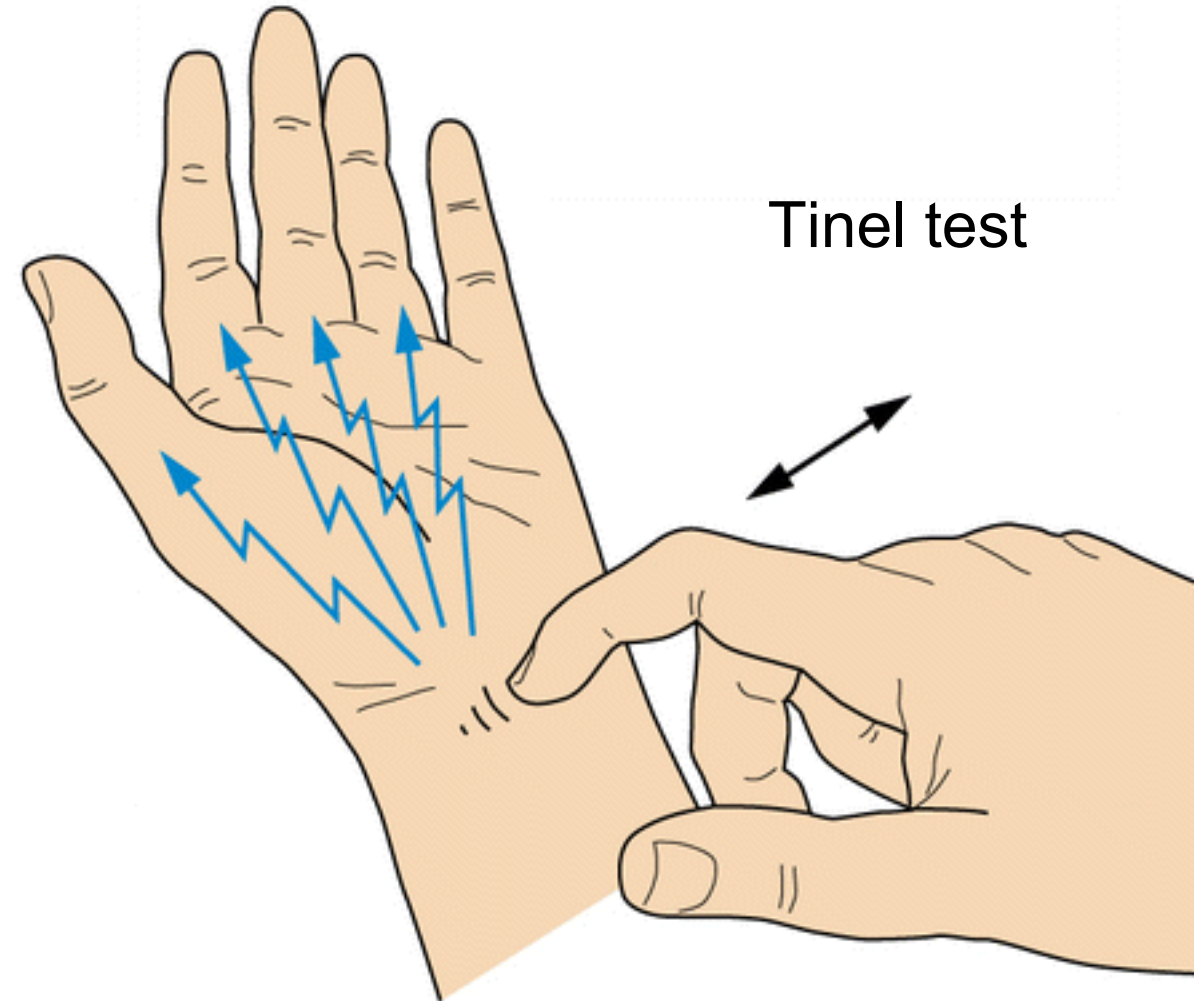
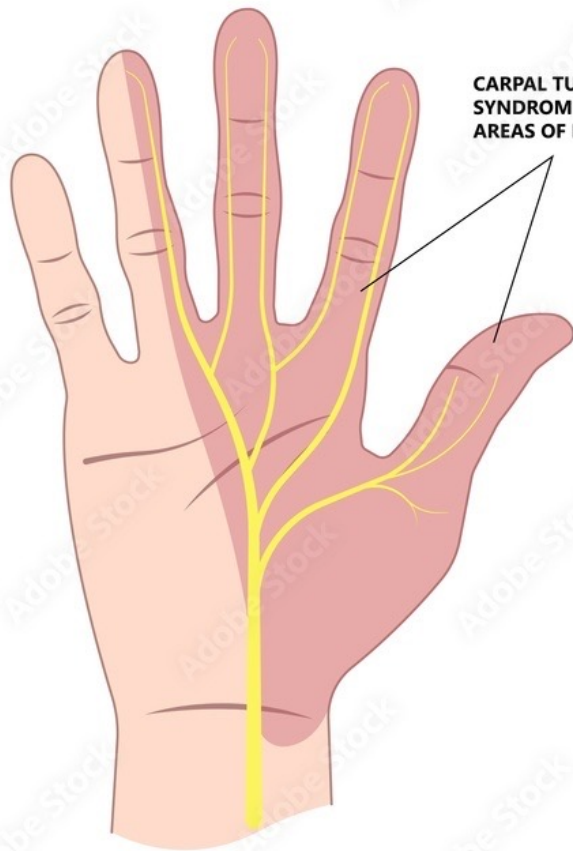
Does not feature hand of benediction

*How can we prove that in fact is
carpal tunnel syndrome?*



Carpal Tunnel Syndrome

Tests for carpal tunnel syndrome



The medical students demise

Peter presents to you with weakness when gripping and «pins and needles» feeling accompanied by some diffuse pain. Limited to the first 3 digits, and a little in the 4th digit. Only in the right hand.

The past 3 weeks he has had histology, biochemistry and now is getting ready for his anatomy test. He loves taking notes, and carries his ipad and pen everywhere he goes. He is anxious, sleep deprived and tells you about vivid dreams of aminoacids

What do you recommend him to do?

- A. Stop taking notes
- B. Take even more notes, no pain no gain
- C. *Maybe its time for a christmas break*



The medical students demise

Peter presents to you with weakness when gripping and «pins and needles» feeling accompanied by some diffuse pain. Limited to the first 3 digits, and a little in the 4th digit. Only in the right hand.

The past 3 weeks he has had histology, biochemistry and now is getting ready for his anatomy test. He loves taking notes, and carries his ipad and pen everywhere he goes. He is anxious, sleep deprived and tells you about vivid dreams of aminoacids

Compression of median nerve in the carpal tunnel, due to overuse of muscles causing inflammation of the transverse carpal ligament.

Called carpal tunnel syndrome

This is a distal median nerve lesion

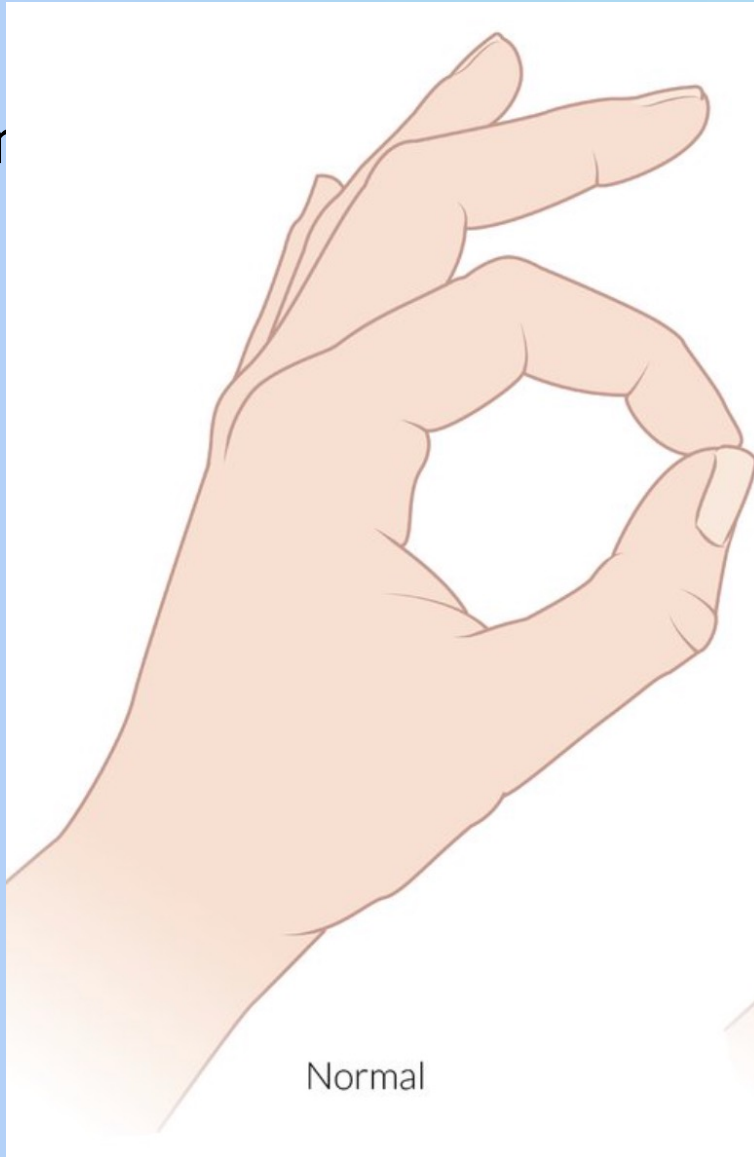


Patient number 3!

She is coming to your worried because she cant make the «ok» sign with her fingers suddenly!

Patient number 3!

Cant r



Patient number 3!

She is coming to your worried because she cant make the «ok» sign with her fingers suddenly!

What is the treatment?

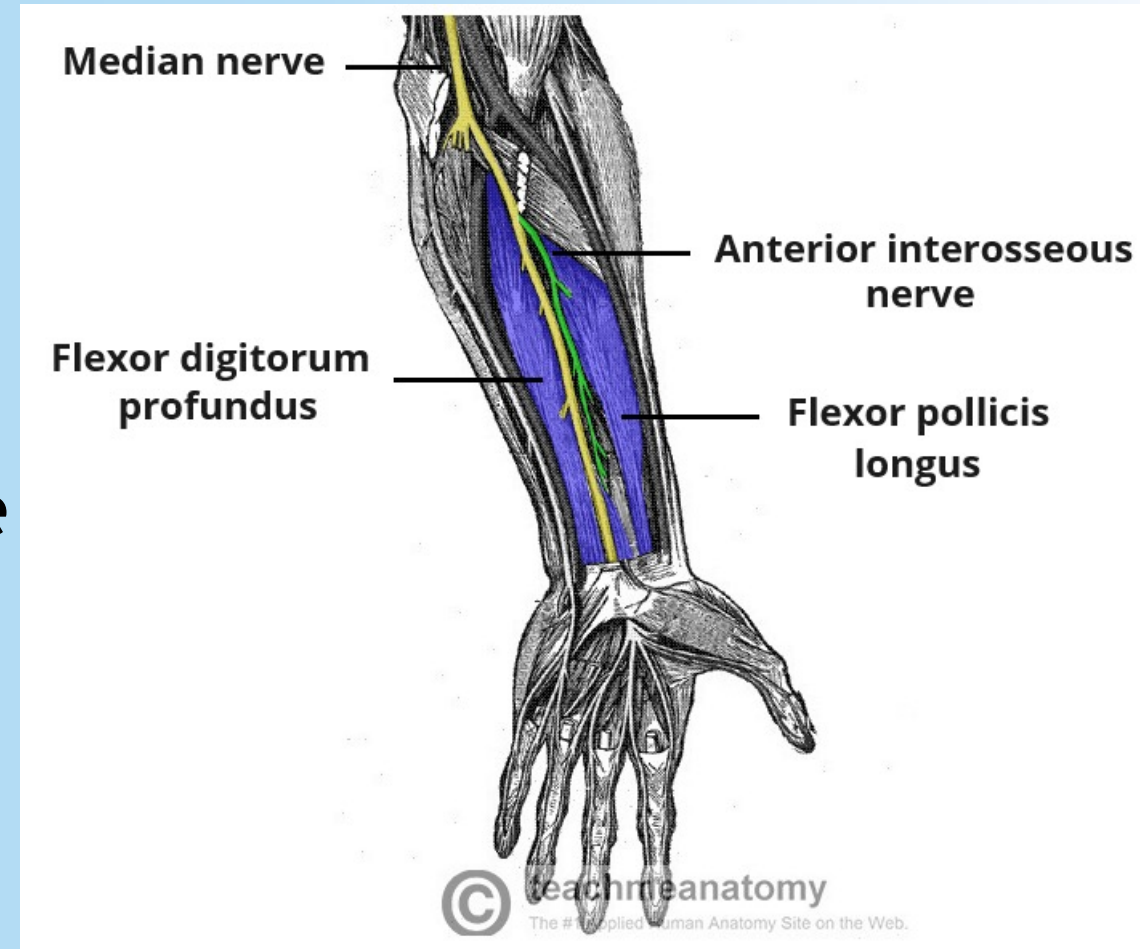
- A. Ask her to stop making Ok signs
- B. Operate her immediately
- C. Im a first grader?

Anterior interosseous nerve

Innervates:

1. Pronator quadratus
2. Flexor pollicis longus
3. Flexor digitorum profundus (lateral)

Pure motor branch of median nerve



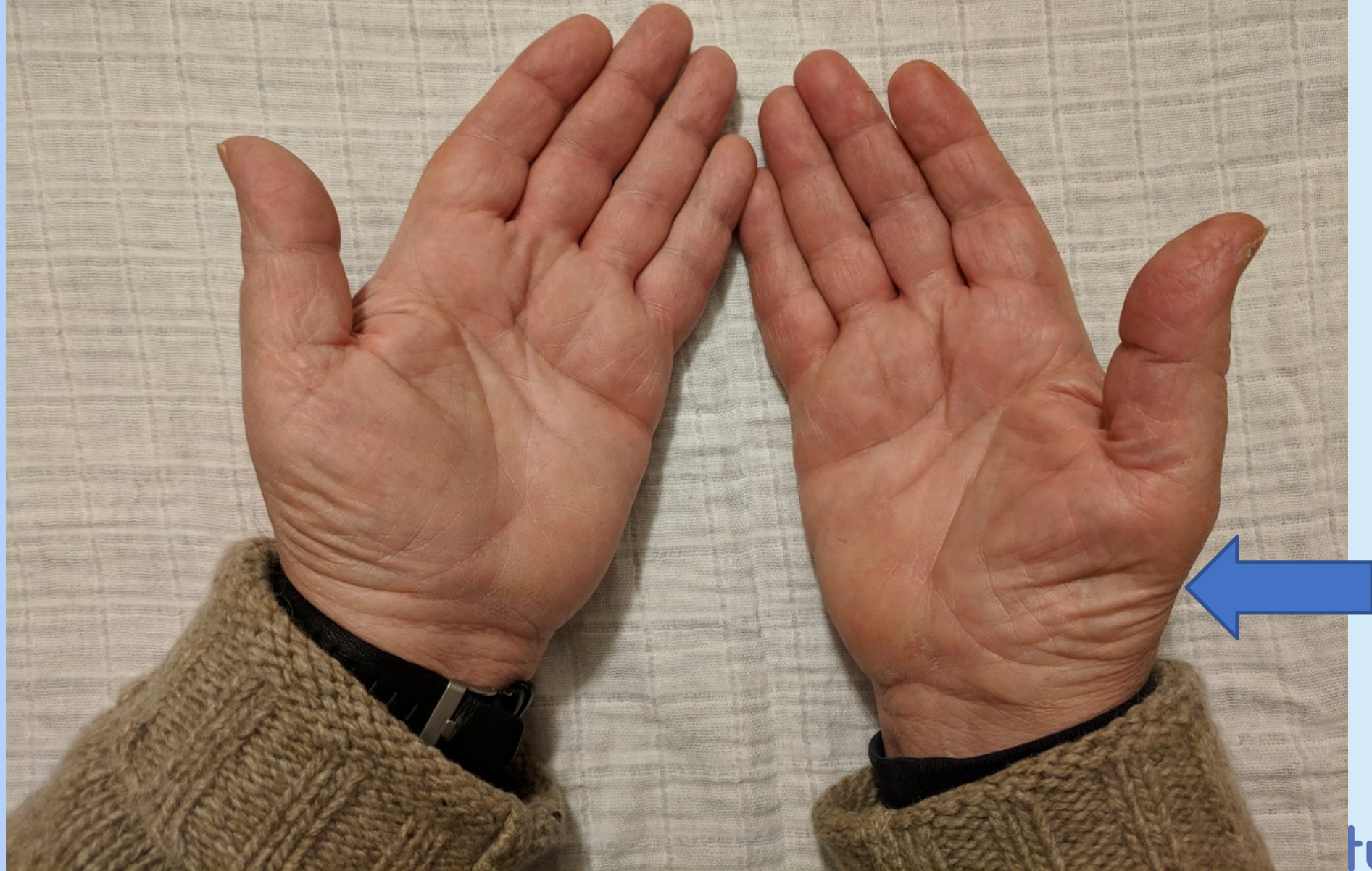
Patient number 3!

She is coming to your worried because she cant make the «ok» sign with her fingers suddenly!

What is the treatment?

- A. Ask her to stop making Ok signs
- B. Operate her immediately
- C. *Im a first grader?*

Atrophy of thenar muscles



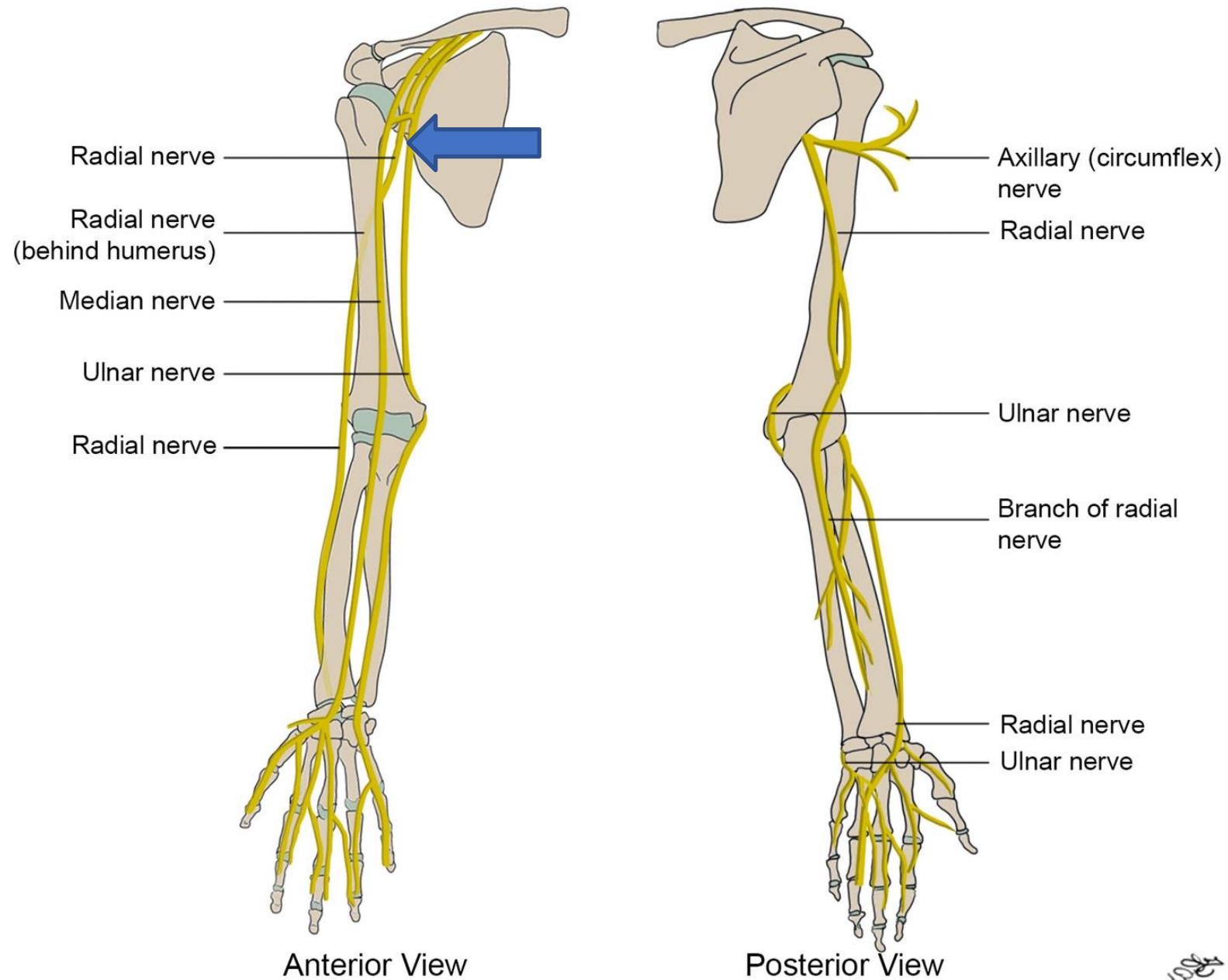
The party lion from Katowice

Tomasz, has been out partying all night and fell asleep on a chair at a narch at westerplatte. When he wakes up he is numb and is totally unable to extend his wrist!

What has happened???



Nerves of the Upper Extremities



Radial nerve landmarks

1. Posterior chord of brachial plexus C5-T1
2. Radial groove of humerus, between lateral and medial heads of triceps
3. Passes anterior to lateral epicondyle
4. Passes through cubital fossa and divides into deep (motor) and superficial branch (sensory)



Radial nerve motor innervation



1. Arm: Triceps brachii, Anconeus

2. Forearm:

Superficial extensors (3): Brachioradialis

Extensor carpi radialis longus + brevis

Deep extensors: Extensor digitorum

Extensor digiti minimi

Extensor carpi ulnaris

Supinator

Abductor pollicis longus

Extensor pollicis longus + brevis

Via posterior
interosseous
nerve!

The party lion from Katowice

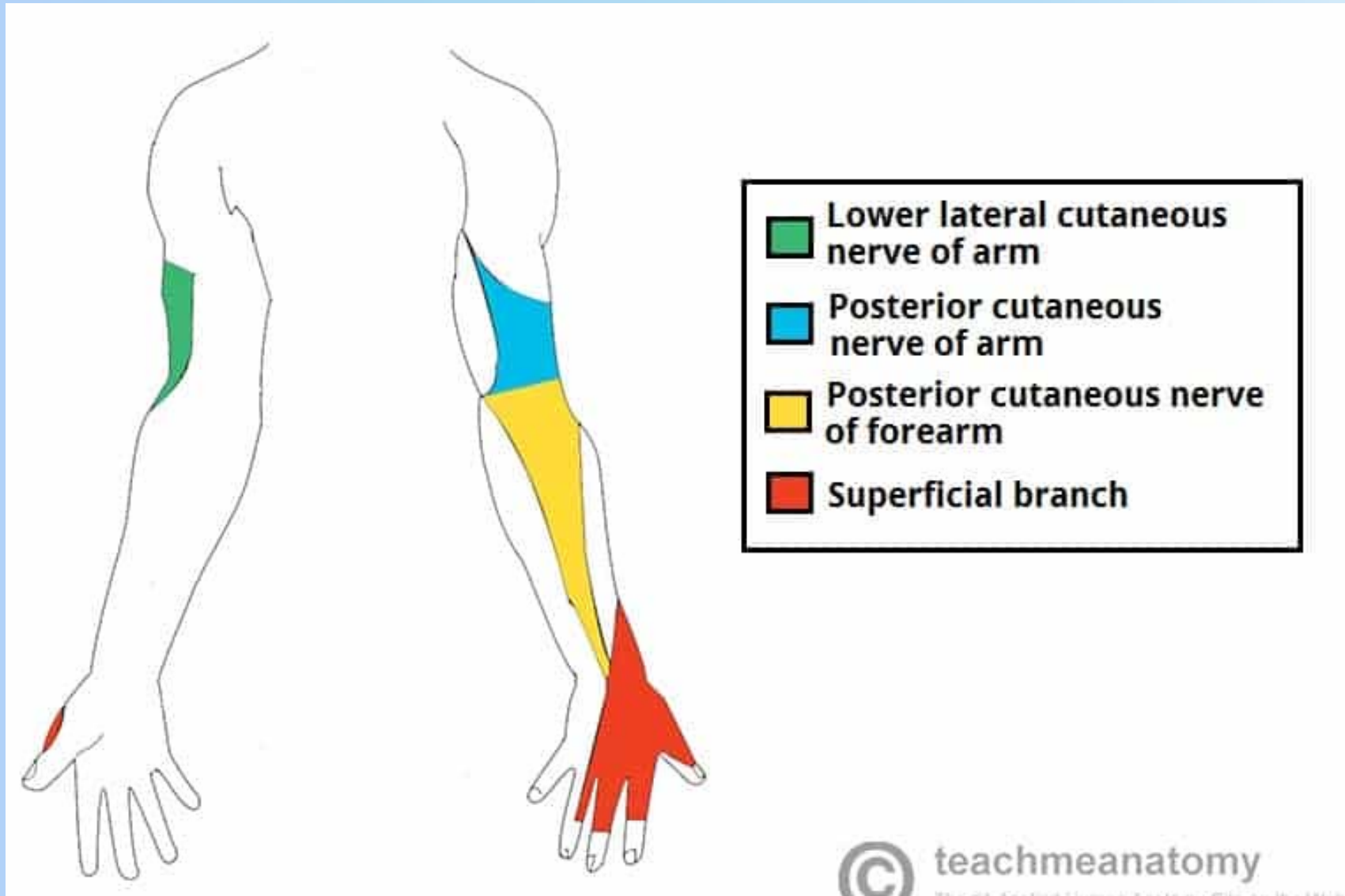
Tomasz, has been out partying all night and fell asleep on a chair at a narsj. When he wakes up he is numb and is totally unable to flex his wrist!
What has happened???

Radial nerve compression!

High yield: Mid-shaft fracture of humerus also gives radial nerve compression



Radial nerve sensory innervation



Symptoms of Radial Nerve Injury

At the axilla:

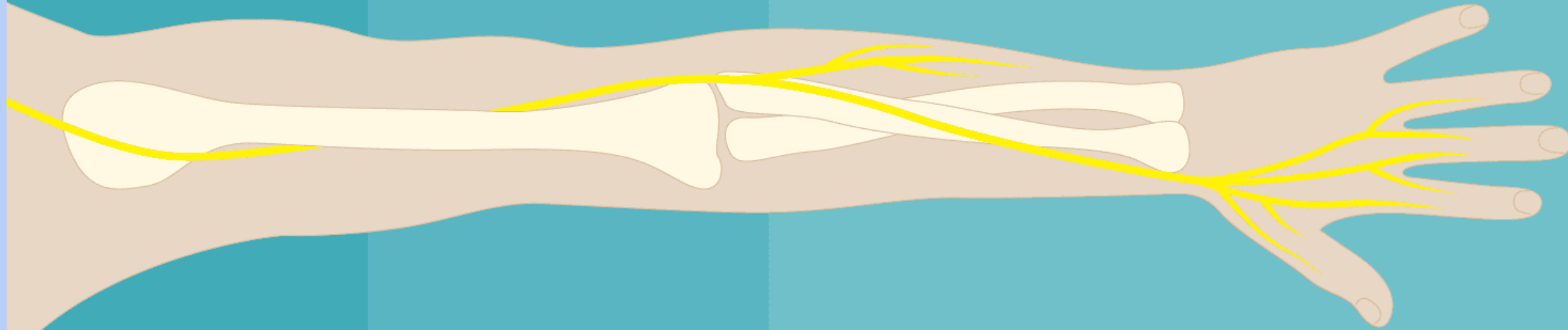
- weakness
- tingling and numbness from the back of the arm to the hand

To the spiral groove:

- weakening of the brachioradialis muscle of the forearm
- interferes with a person's ability to bend the wrist back and straighten the fingers

To the posterior interosseous nerve:

- muscle weakness
- inability to extend one's fingers



The local cyclist

Patient walks into your office with pain in his elbow and numbness and weakness in his fingers. He is a semi-professional cyclist for Copernicycle and trains hard for Tour De Krakow, but after a dislocation of his elbow he has so much discomfort that he cannot train!

He presents to you with this hand at rest.



The local cyclist

Patient walks into your office with pain in his elbow and numbness in his fingers. He is a semi-professional cyclist and every year he trains extremely hard for Tour De Krakow, but now he has so much discomfort that he cannot train!

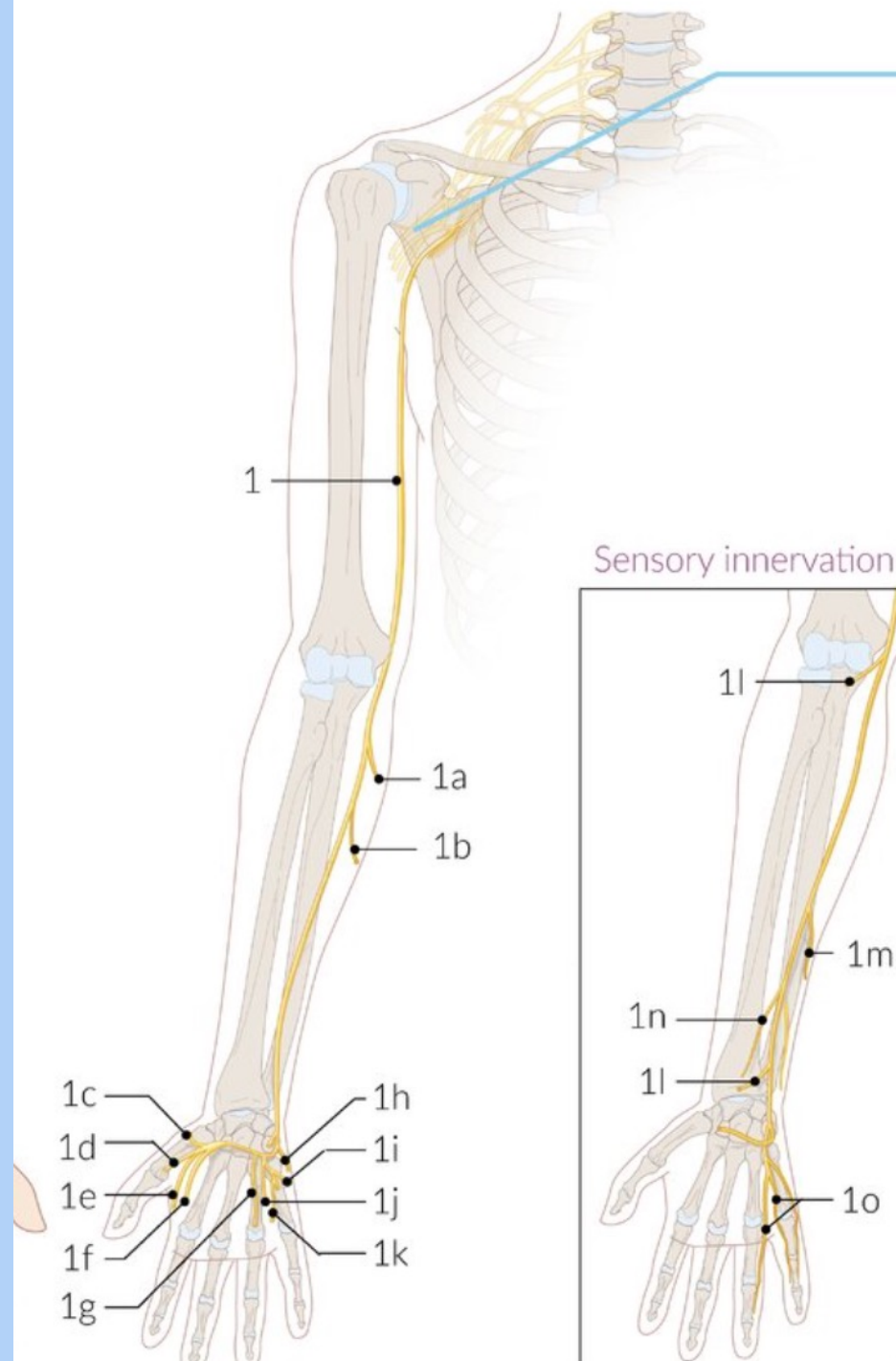
He presents to you with this hand at rest.

What is going on?

- A. Seems fine to me
- B. He's just making a pistol with his fingers, everything is fine
- C. Ulnar nerve compression?



Derived from the medial cord of the brachial plexus



1 Ulnar nerve

- 1a Flexor carpi ulnaris muscle
- 1b Flexor digitorum profundus muscle (digits III–V)
- 1c Adductor pollicis muscle
- 1d Flexor pollicis brevis muscle, deep head
- 1e Dorsal interosseous muscles I–IV
- 1f Palmar interosseous muscles I–III
- 1g Lumbrical muscles III and IV
- 1h Abductor digiti minimi muscle
- 1i Flexor digiti minimi brevis muscle
- 1j Opponens digiti minimi muscle
- 1k Palmaris brevis muscle
- 1l Articular branches
- 1m Dorsal branches of ulnar nerve
- 1n Palmar branches of ulnar nerve
- 1o Palmar digital nerves

- Sensory innervation
- Motor innervation

Ulnar pathway

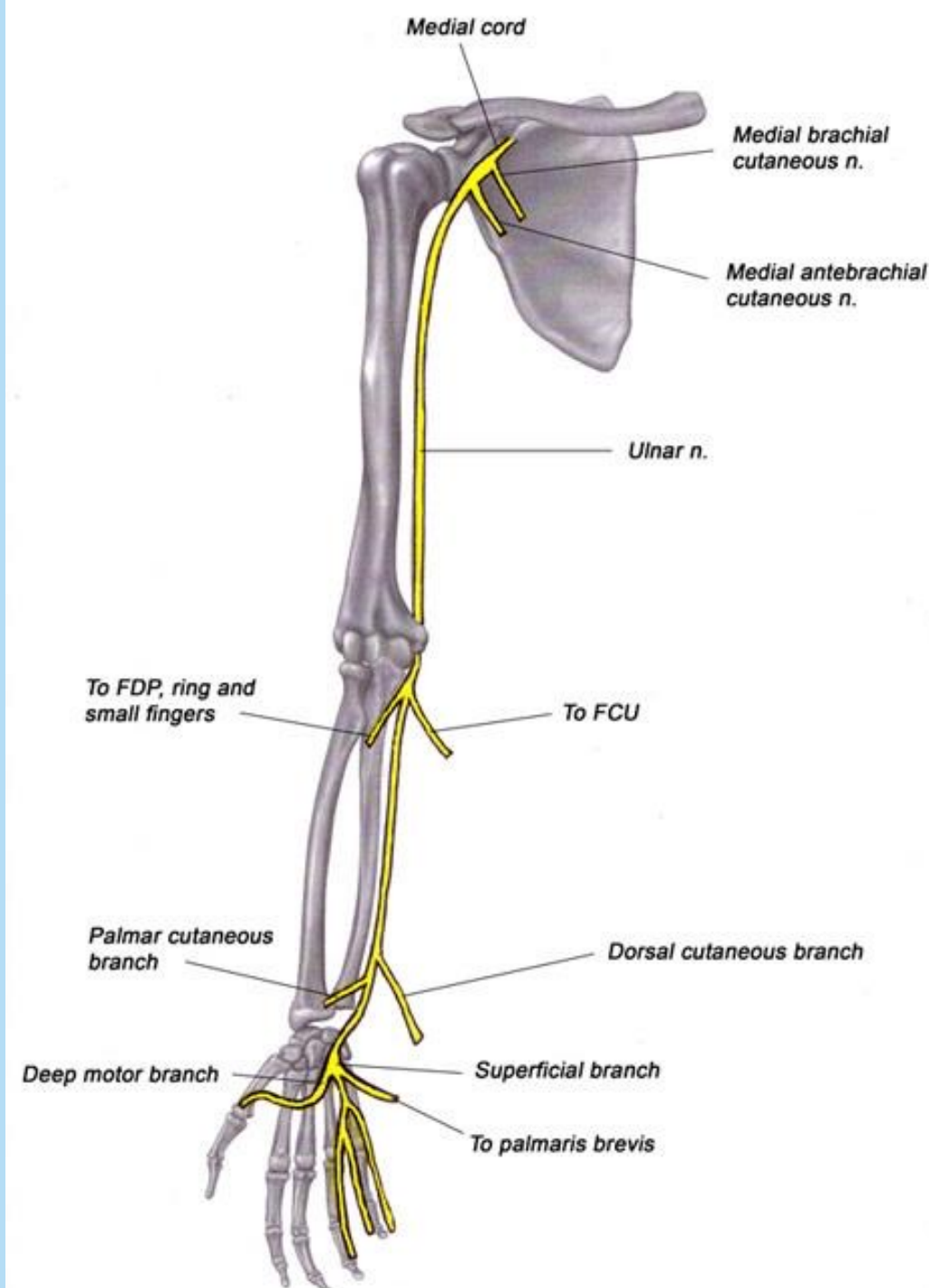
Behind medial epicondyle of the humerus
(*In cubital tunnel*)

Enters palm through *Guyon canal*

Deep motor branch and superficial branch

High yield: Superficial innervates palmaris brevis!

*High yield: Fracture of medial epicondyle
-> Ulnar nerve lesion*



Ulnar nerve motor **Innervation**

Hand:

Hypothenar muscles (Little finger m.):

Abductor digiti minimi

Flexor digiti minimi brevis

Opponens digiti minimi

Palmar muscles:

Lumbricals (medial 2)

Interossei muscles:

Palmar (3) - **AD**ducts fingers

Dorsal (4) - **AB**ducts fingers

Hand:

Thenar muscles (Thumb muscles):

Adductor pollicis

Deep head of flexor pollicis brevis

Other: Palmaris brevis (superficial ulnar)

Forearm - Flexor carpi ulnaris

Flexor digitorum Profundus



Distal interphalangeal joints

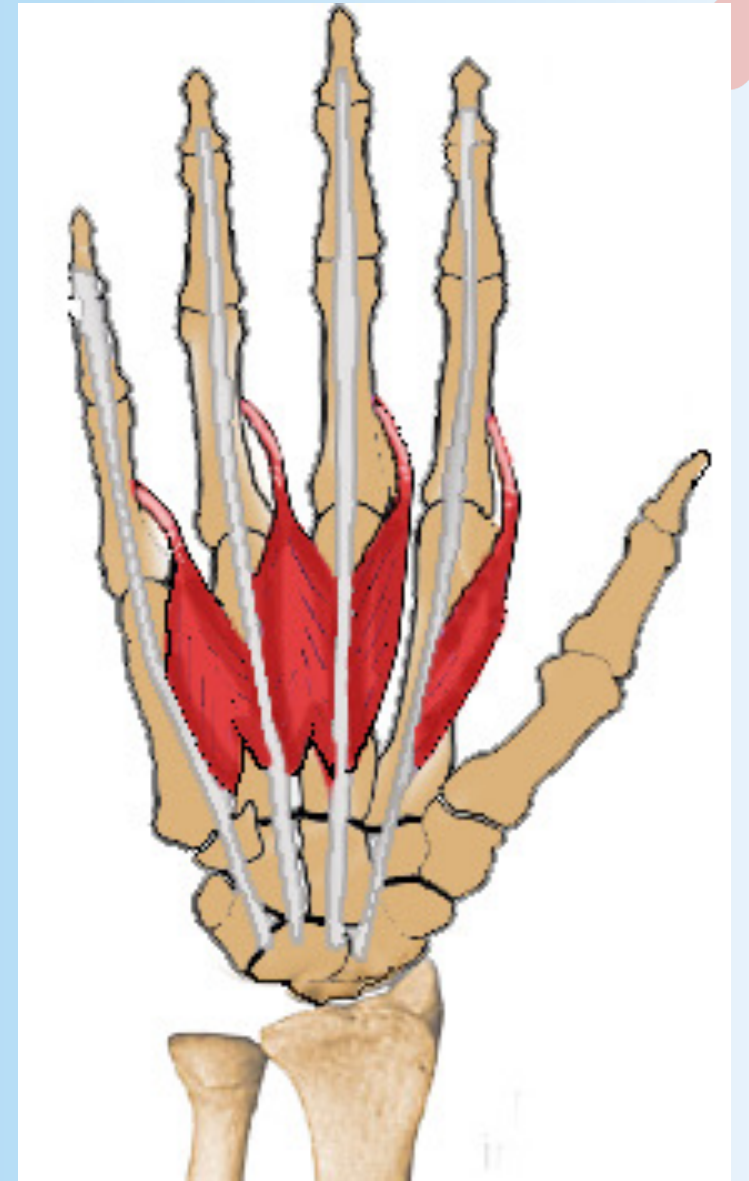
Proximal interphalangeal joints

Metacarpophalangeal joints

First carpometacarpal joint

Lumbricals

- Flexes MCP
- Extends PIP and DIP
- **Median nerve:** Lumbricals 1 and 2
- **Ulnar nerve:** Lumbricals 3 and 4



The local cyclist

Patient walks into your office with pain in his elbow and numbness in his fingers. He is a semi-professional cyclist and every year he trains extremely hard for Tour De Krakow, but now he has so much discomfort that he cannot train!

He presents to you with this hand at rest.

What is going on?

- A. Seems fine to me
- B. He's just making a pistol with his fingers, everything is fine
- C. *Ulnar nerve compression!***



The local cyclist

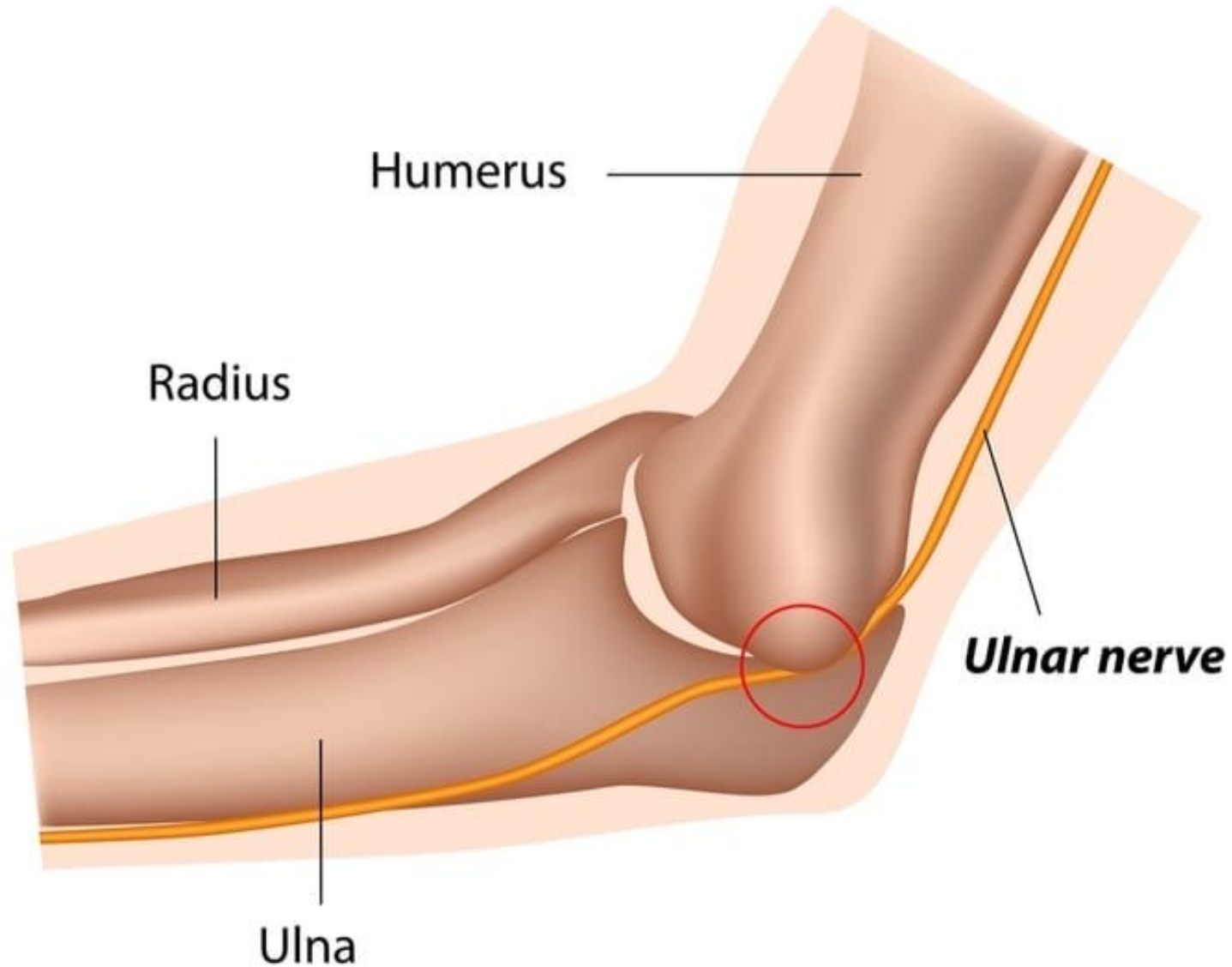
Patient walks into your office with this hand at rest.

Cubital tunnel syndrome (entrapment of the ulnar nerve) Because of dislocation of his elbow

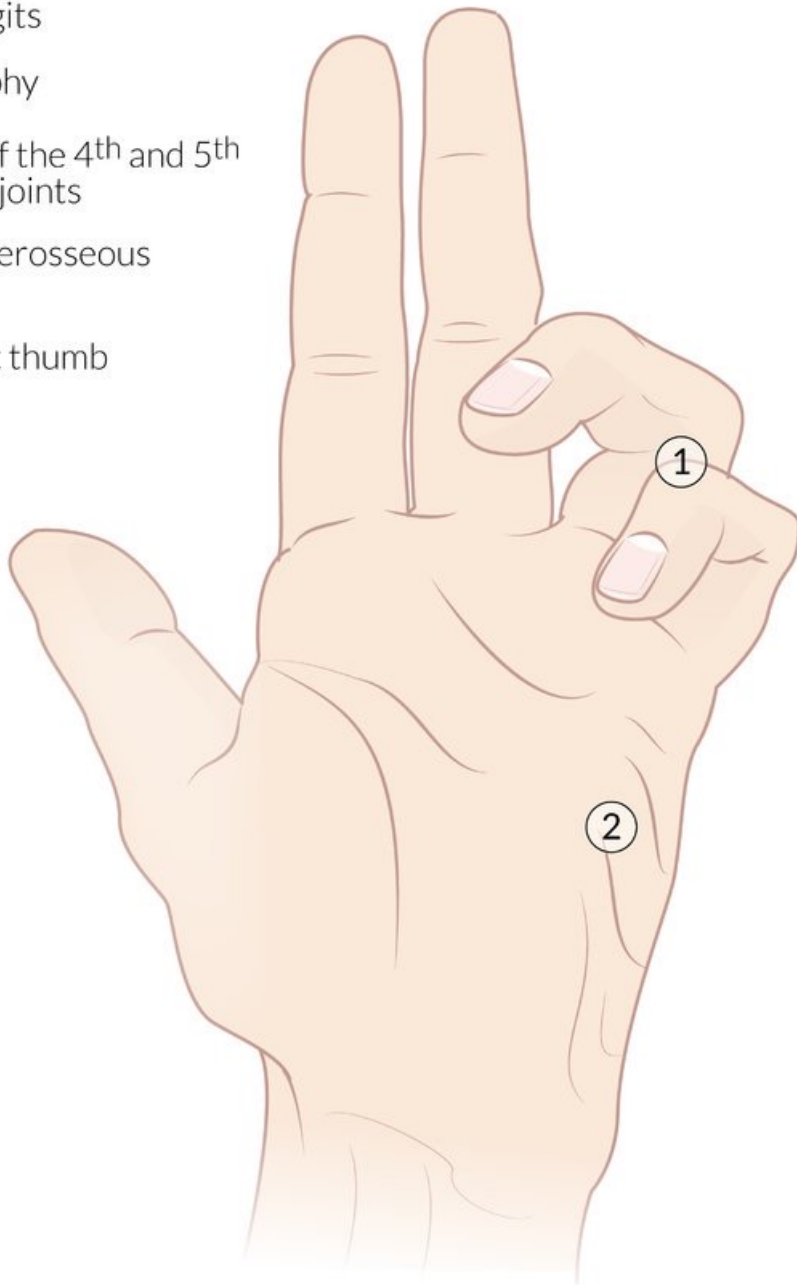
Ulnar claw hand, flexed proximal and distal interphalangeal joint (PIP, DIP) and extension of metacarpophalangeal joint (MCP), Caused by lesion to ulnar nerve



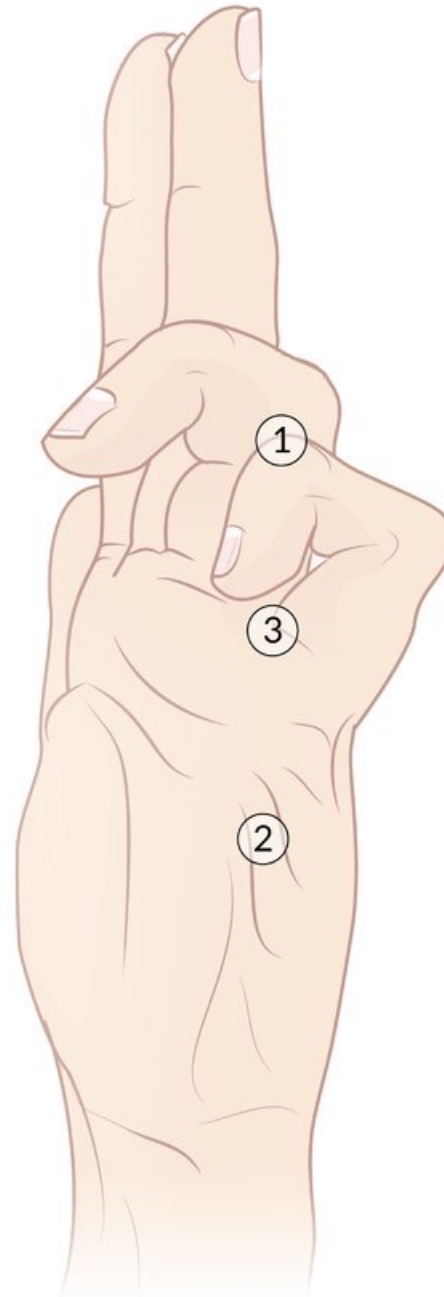
Ulnar Nerve Impingement



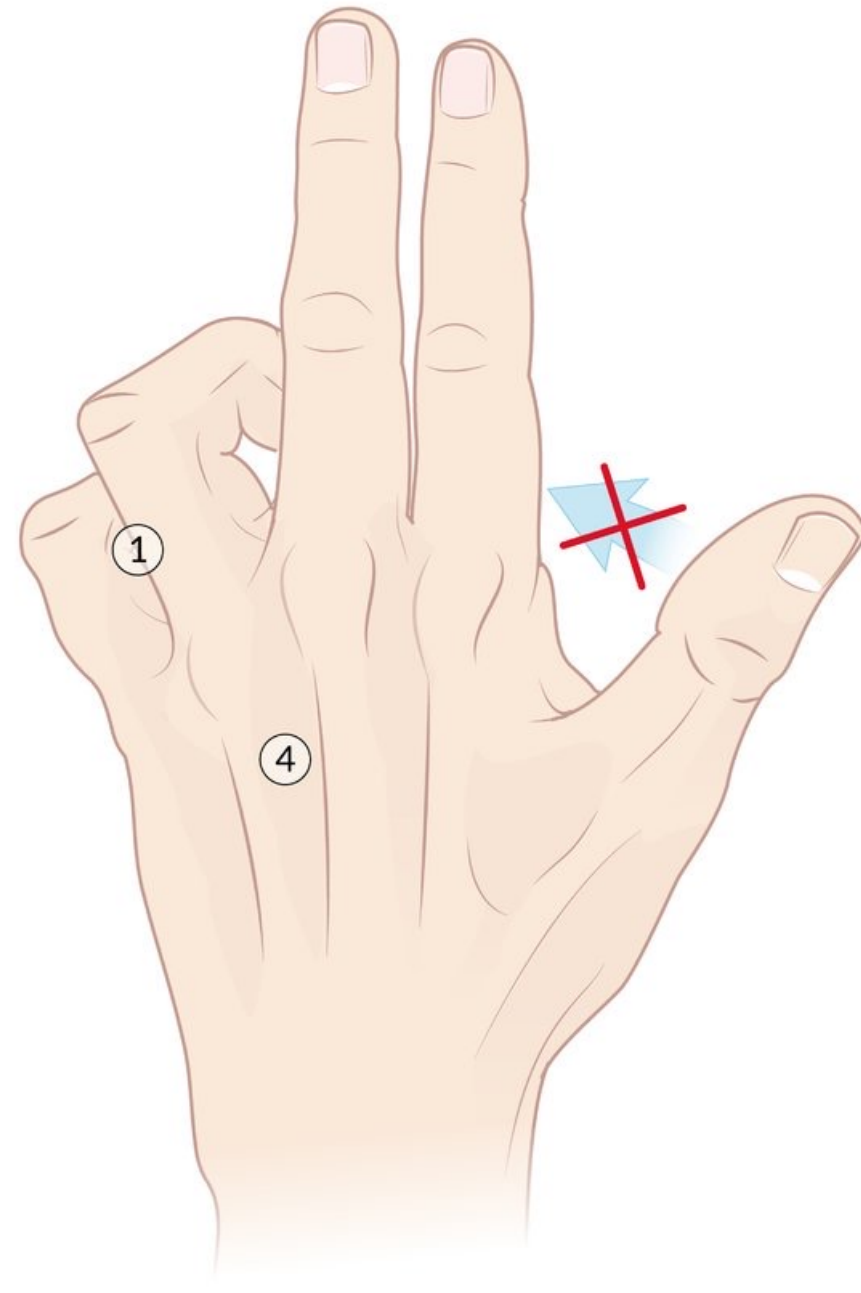
- ① Flexion of PIP and DIP at the 4th and 5th digits
- ② Hypothenar atrophy
- ③ Hyperextension of the 4th and 5th digits at the MCP joints
- ④ Atrophy of the interosseous muscles
- ✗ Inability to adduct thumb



Frontal view



Ulnar lateral view



Dorsal view

Distal median nerve lesions (below A1 nerve origin)



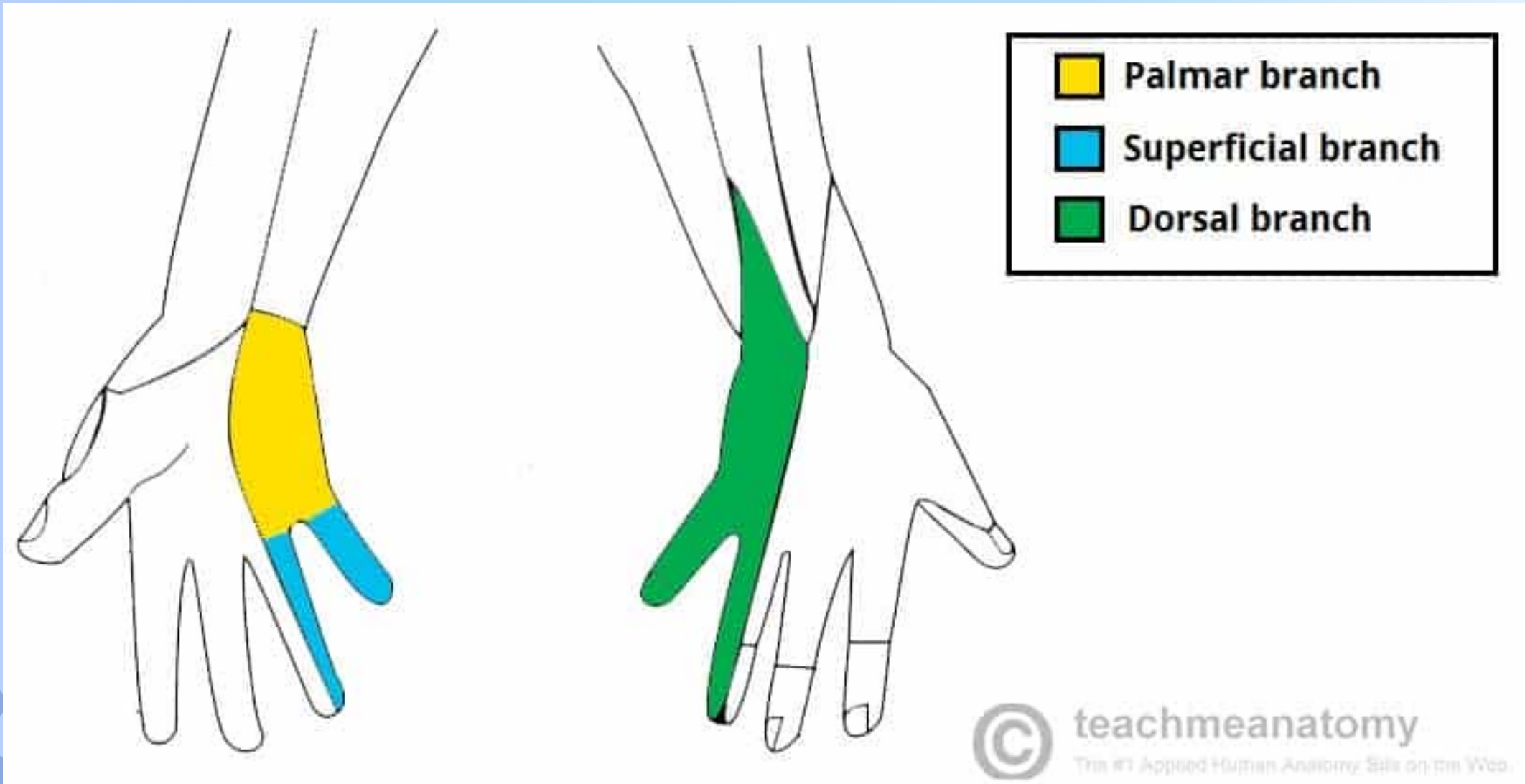
Median claw
When patient tries to extend fingers



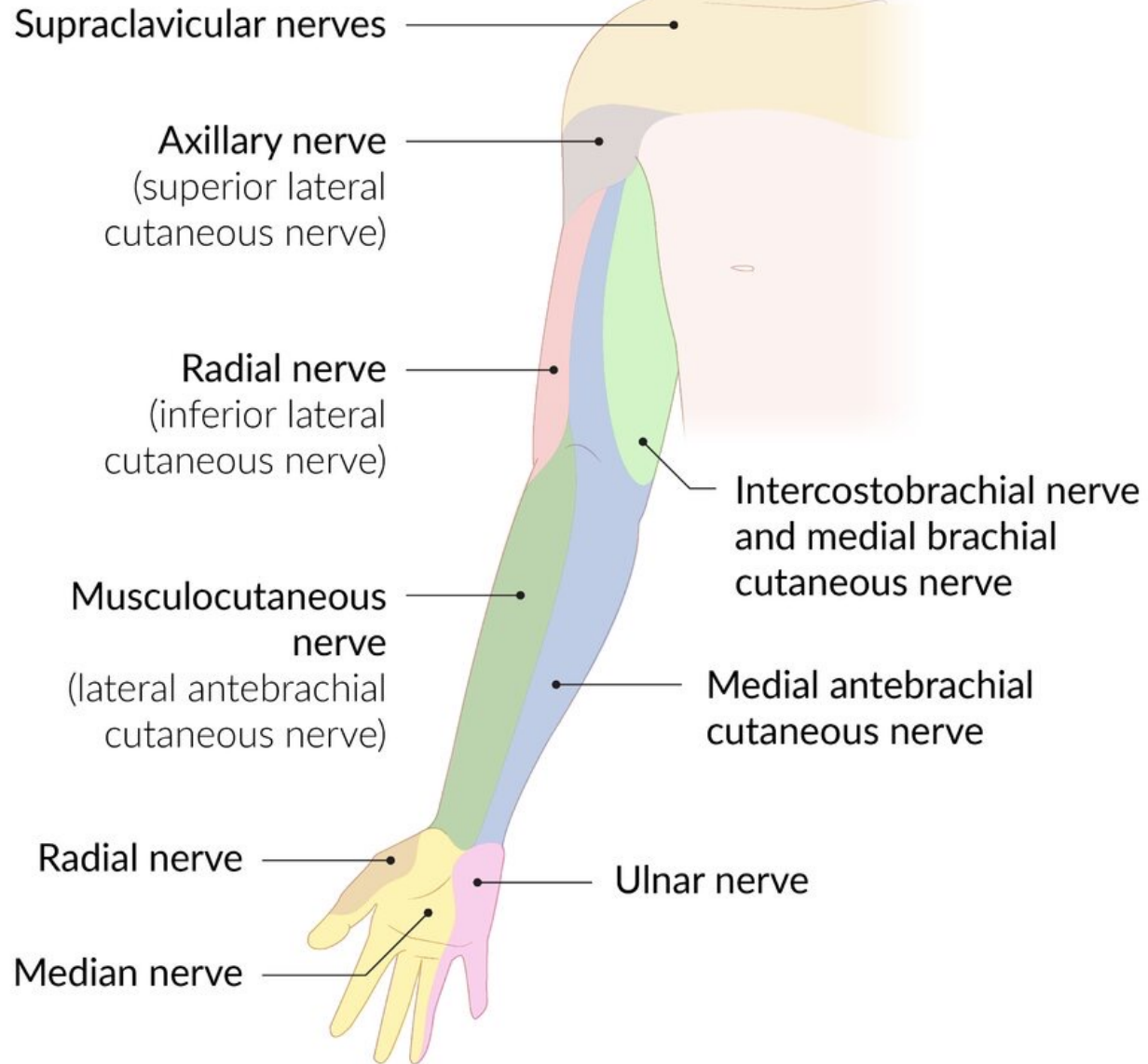
High yield: Froment sign



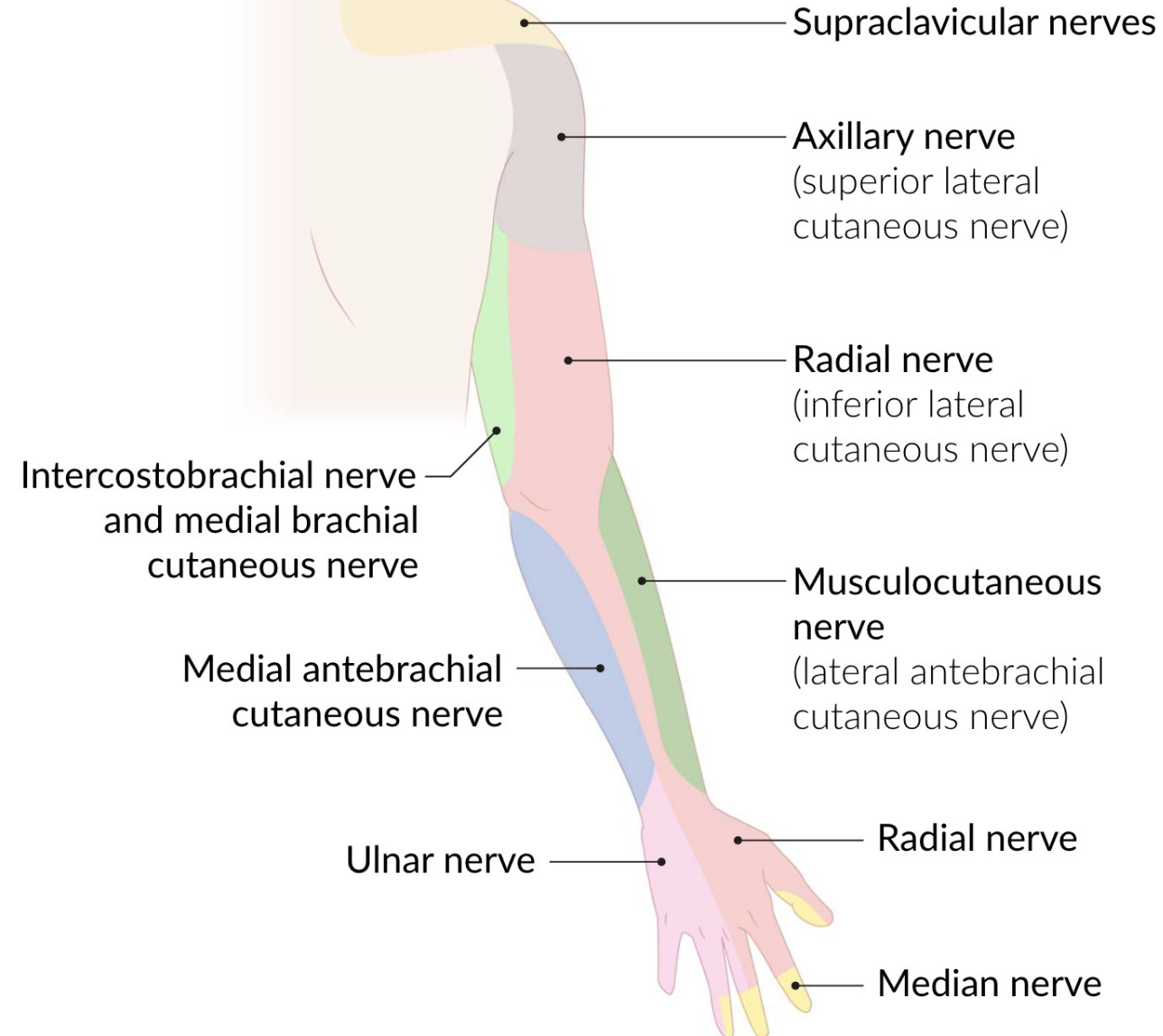
Ulnar sensory innervation



Anterior view



Posterior view



High yield about fractures

Fracture Location	Commonly Affected Nerve	Key Deficits
Proximal humerus/surgical neck	Axillary nerve	Weak deltoid/teres minor, regimental badge sensory loss
Mid-shaft	Radial nerve	Wrist drop, posterior arm/hand sensory loss
Distal humerus/supracondylar	Median nerve	Weak finger/thumb flexion, lateral hand sensory loss
Medial epicondyle	Ulnar nerve	Claw hand, medial hand sensory loss

Axillary nerve

Innervates: Deltoid and teres minor

Main movement: Abduction of arm 15-90 degrees

Sensory: Skin over shoulder

High yield: Surgical neck of humerus fracture? Probably axillary nerve

Musculocutaneous nerve C5-C7

Innervates: 1. Biceps brachii
2. Brachialis
3. Coracobrachialis

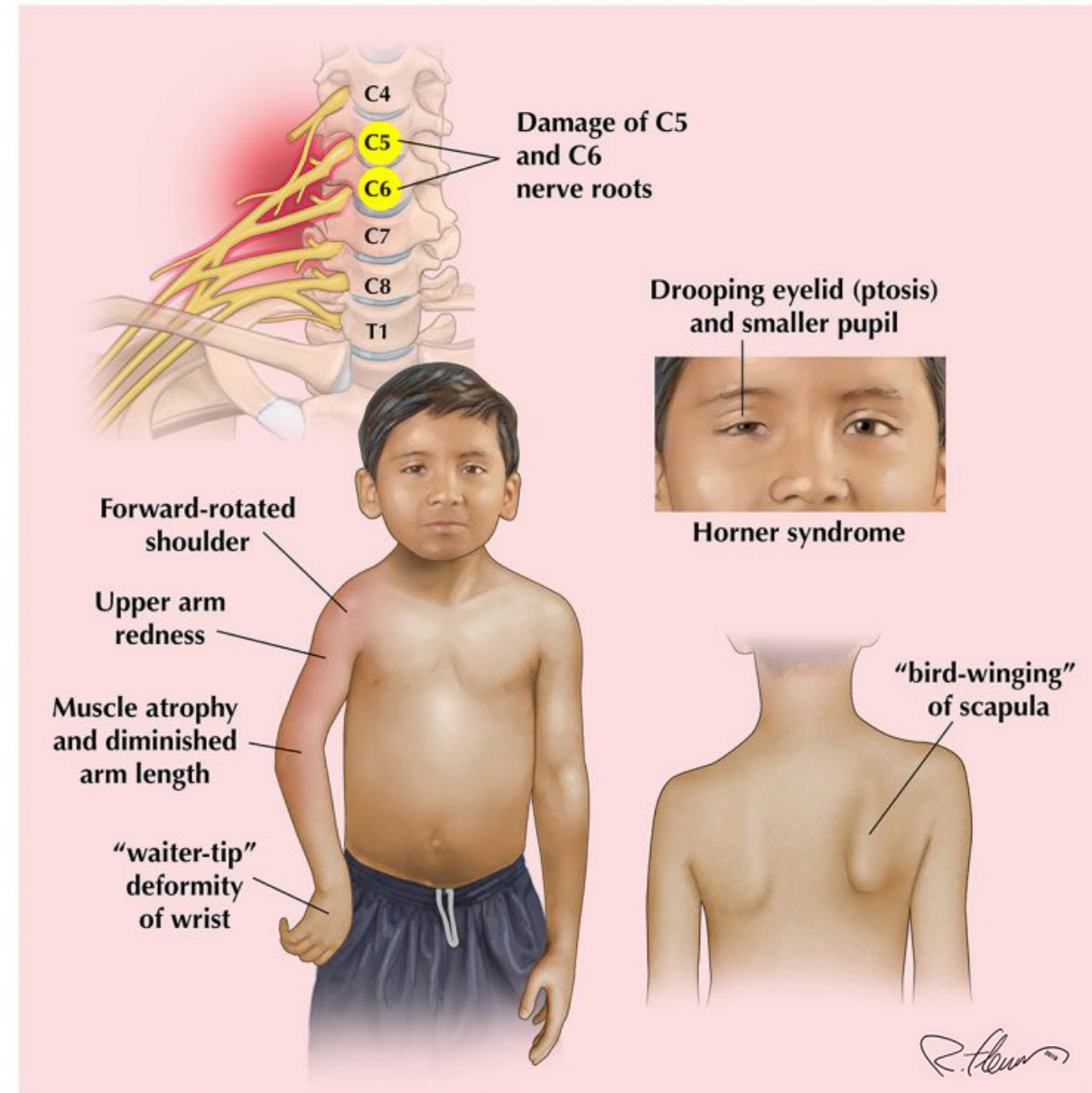
Main movement: Elbow flexion

Sensory: Lateral cutaneous nerve of forearm (Lateral forearm)

High yield: Strongest supinator muscle is the biceps brachii

Erb-Duchenne palsy

- Usually due to problems during birth
- Damage to upper part of brachial plexus
- Internal rotation of arm of the affected side
- «Waiter-tip» deformity



Erb's palsy

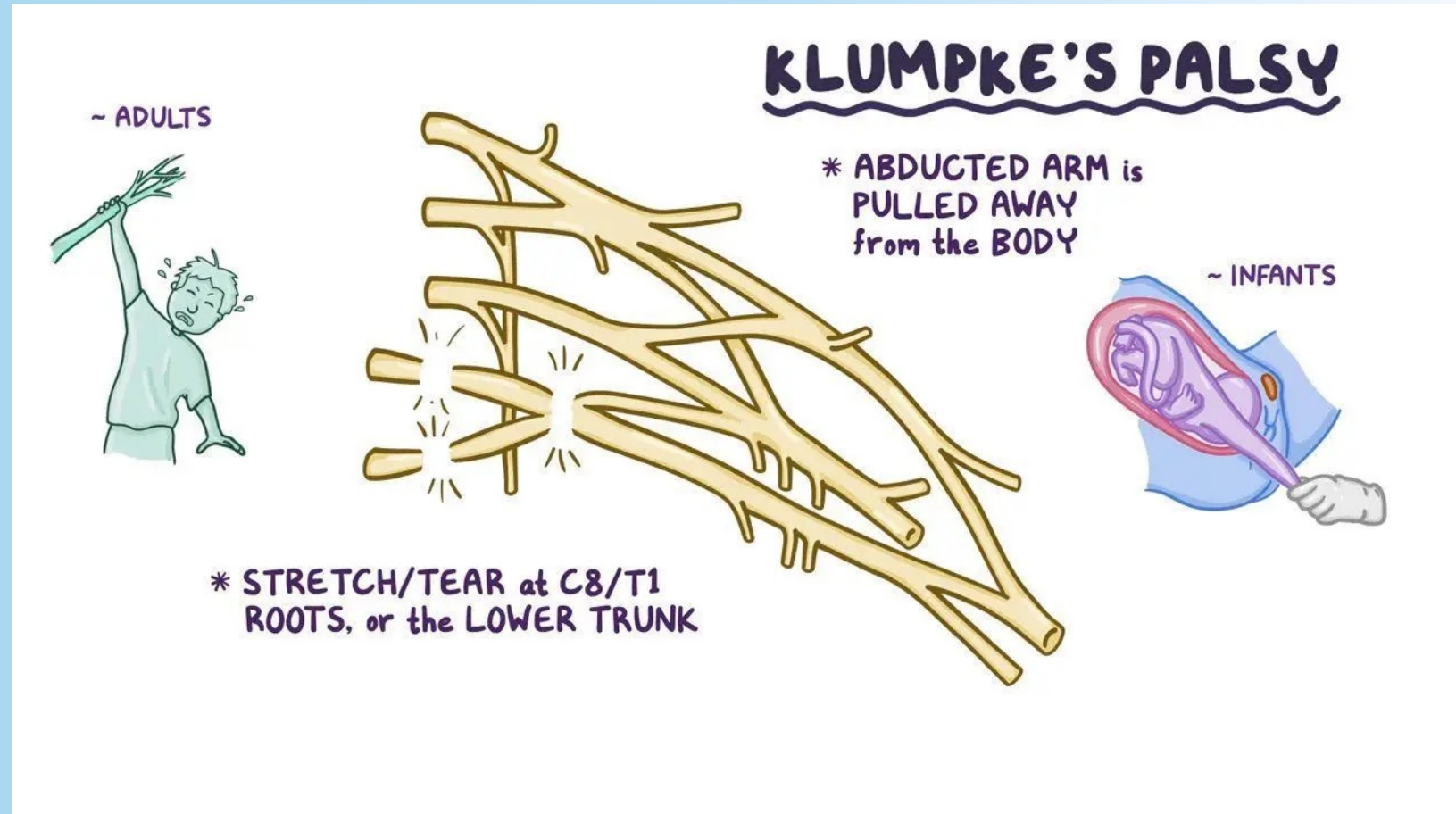
Klumpke's palsy

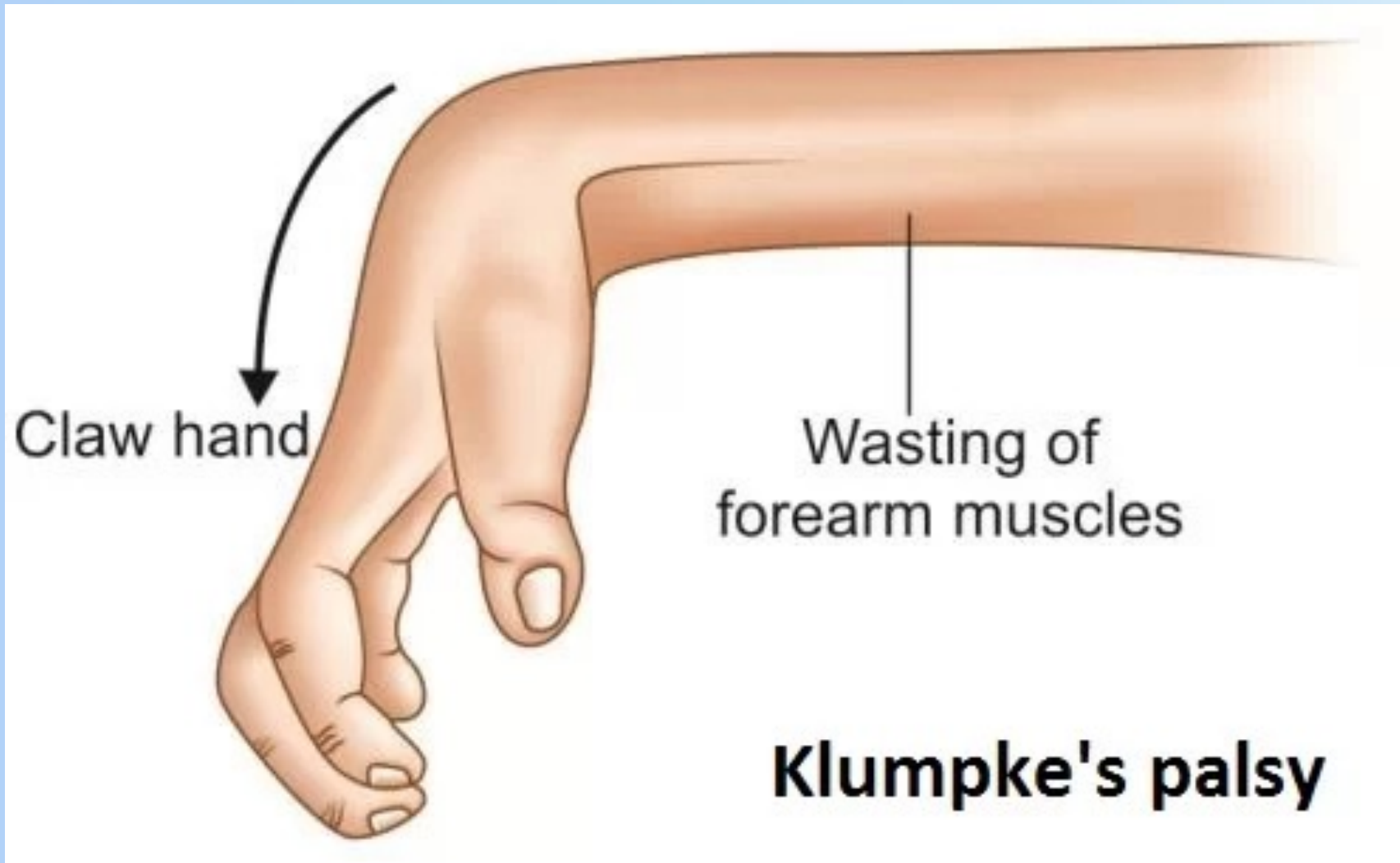
Due to stretch/tear injury

Lower part of brachial plexus C8-T1

Atrophy of forearm and hand muscles

«Claw hand»





Wooclap!!



 [Copy participation link](#)



1

Go to wooclap.com

2

Enter the event code in the top banner

Event code

XBDMKR