

Brachial plexus Examination Concept Learning

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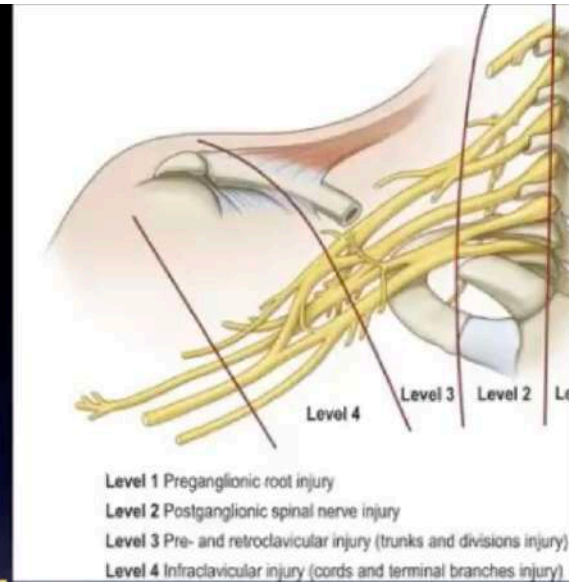




Brachial plexus



Brachial plexus - 5 Unforgettable facts



- It is formed by **anterior ramii** of **C5 - C6 - C7 - C8 - T1**
- It is divided into **Root , Trunk , Division, Cord** and **Branches**
- There are three Trunks - **Upper , Middle and Lower Trunk**
- There are two division - **Anterior and Posterior Division**
- There are three cords - **Lateral , Medial , Posterior**

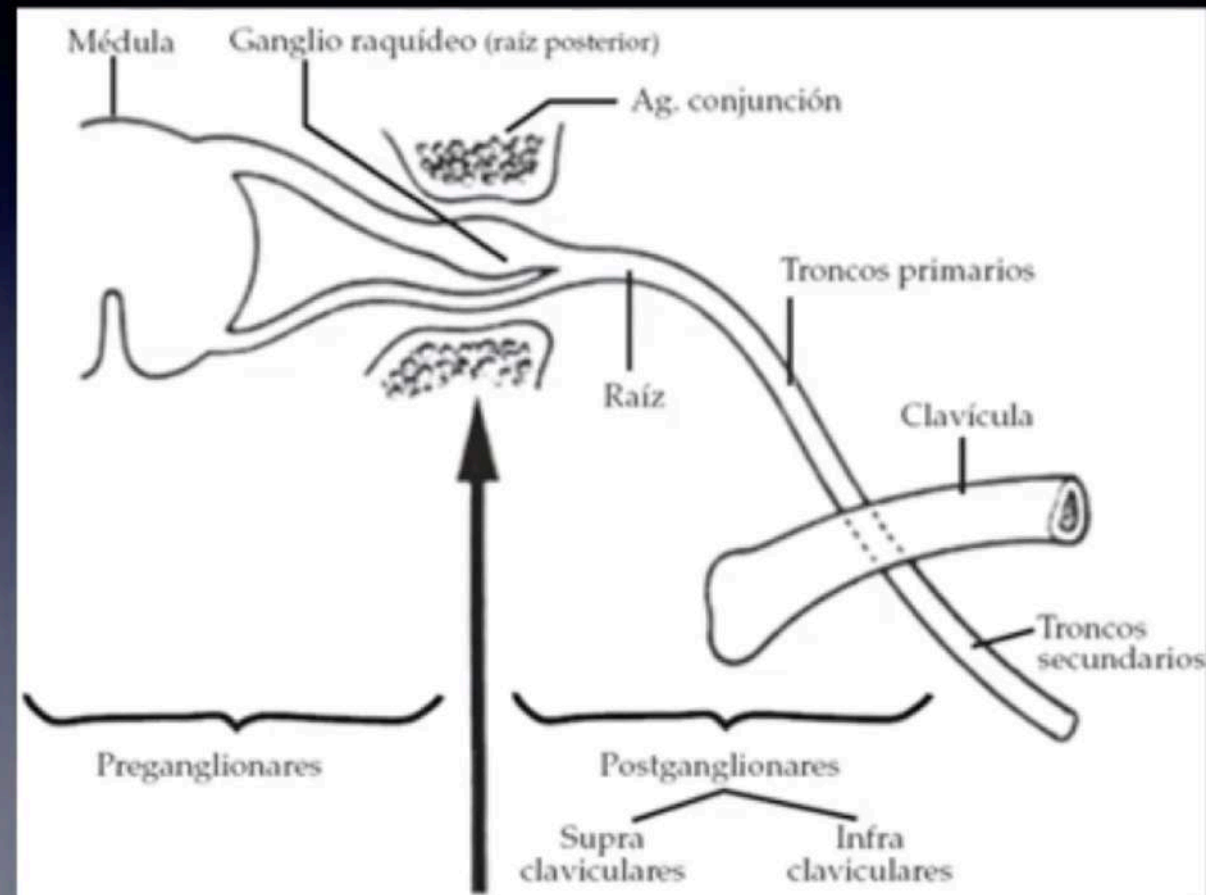
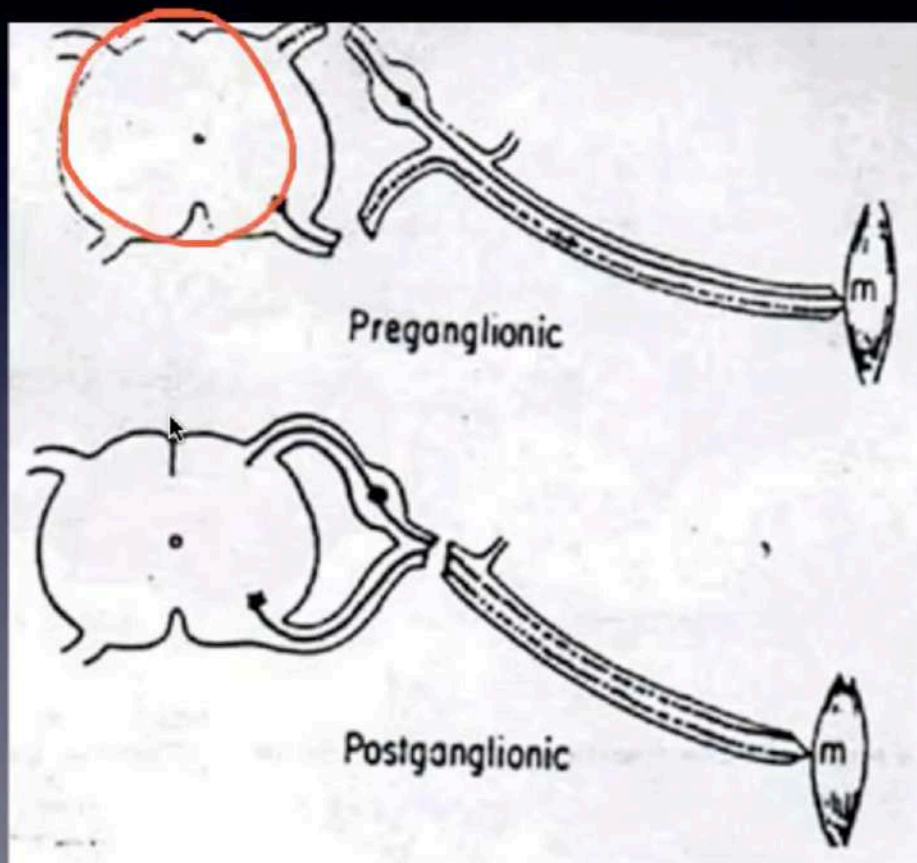
Why Anterior ramii ?

Understand the
Preganglionic part of Brachial plexus web

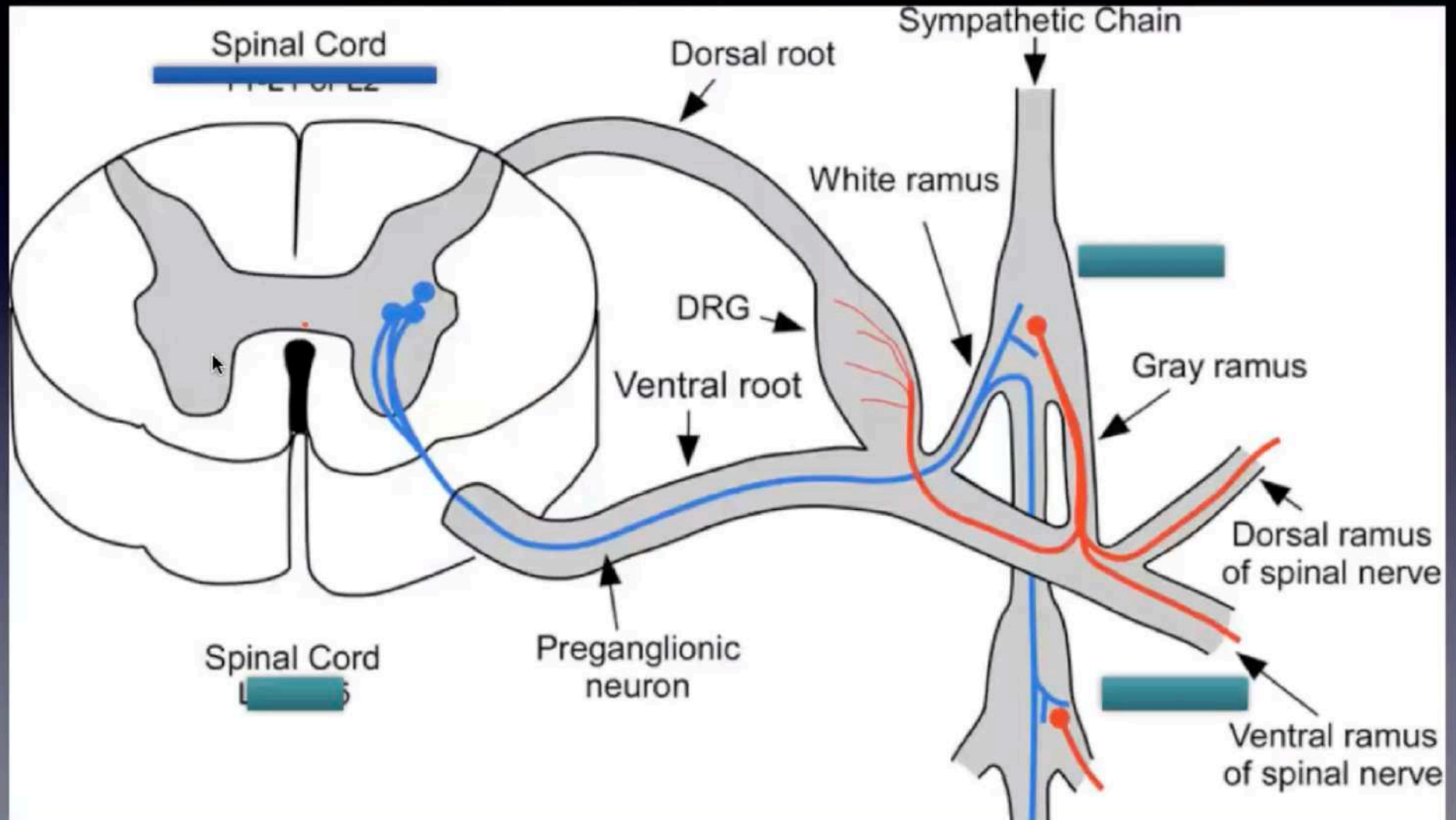
Preganglionic part of Brachial plexus

Sign of pre ganglion lesion

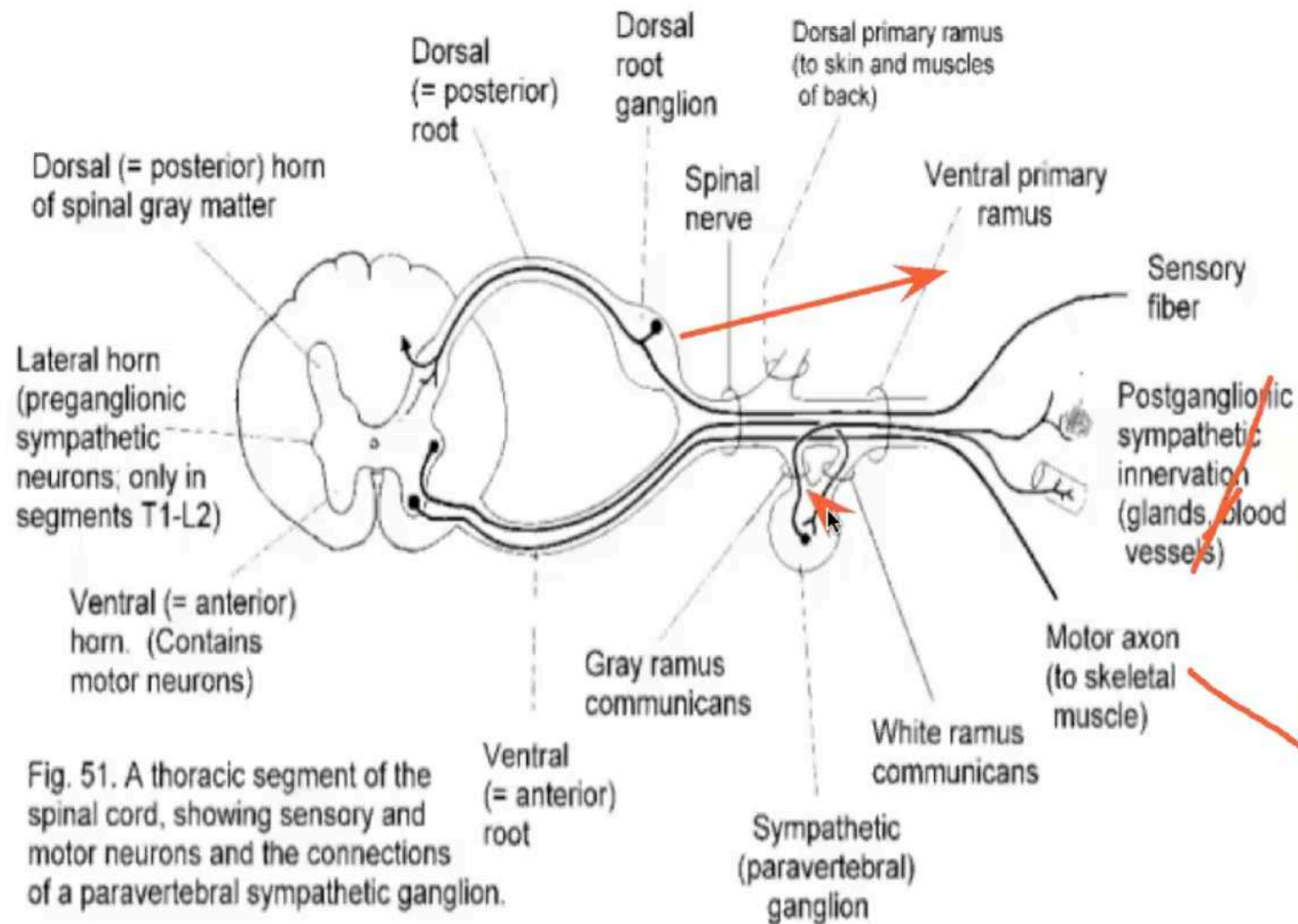
From simple to ultra clear concept

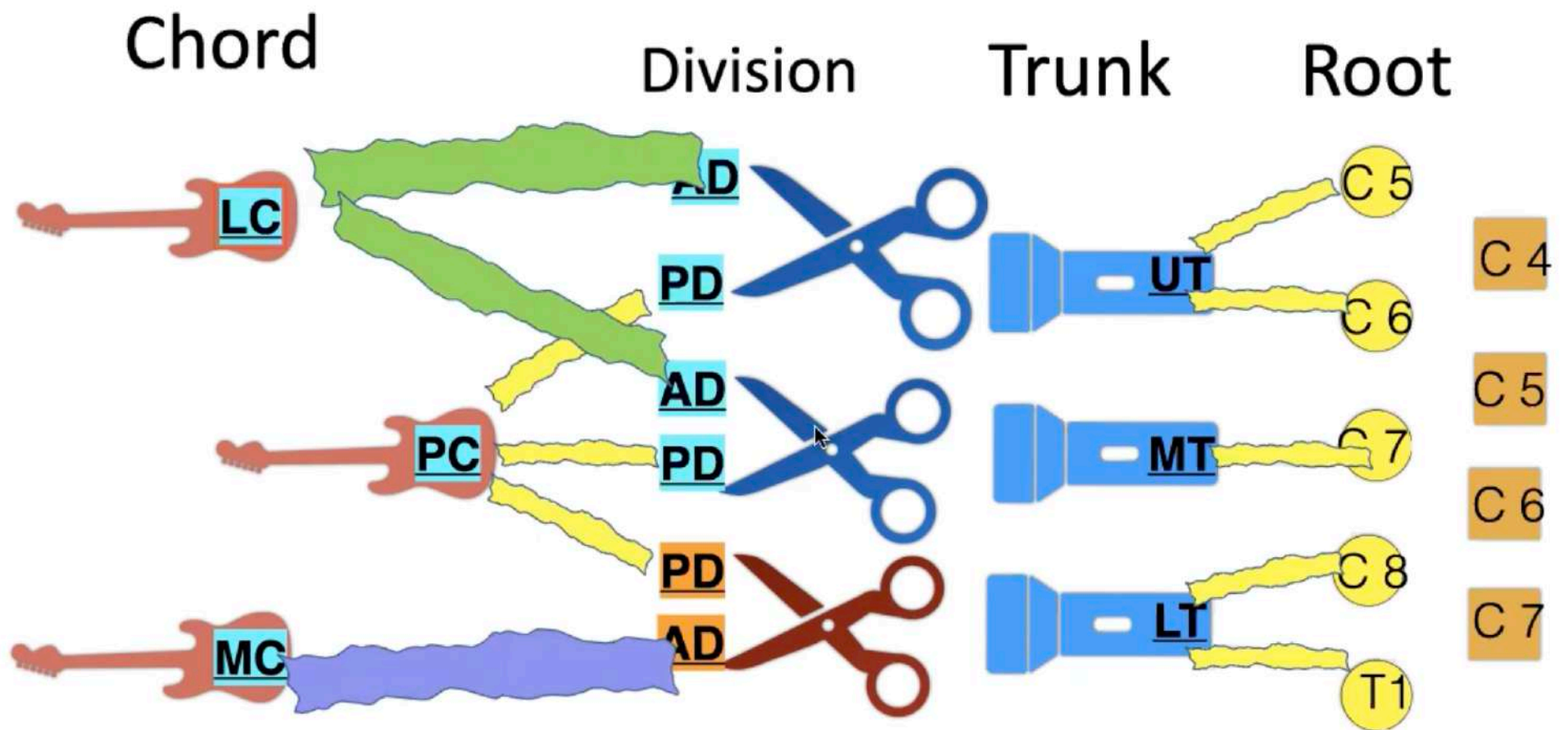


Ultrafine



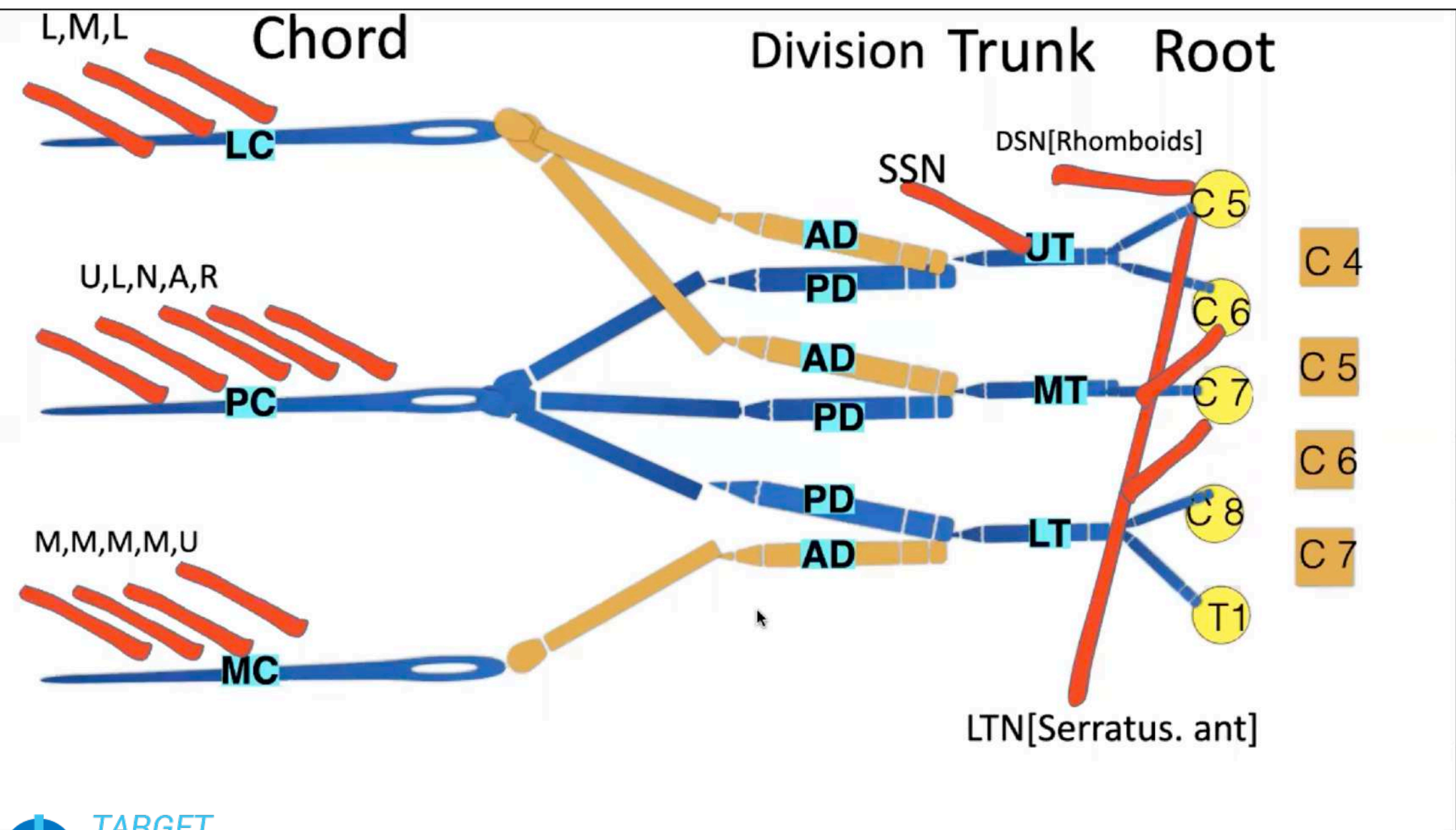
Cross section view



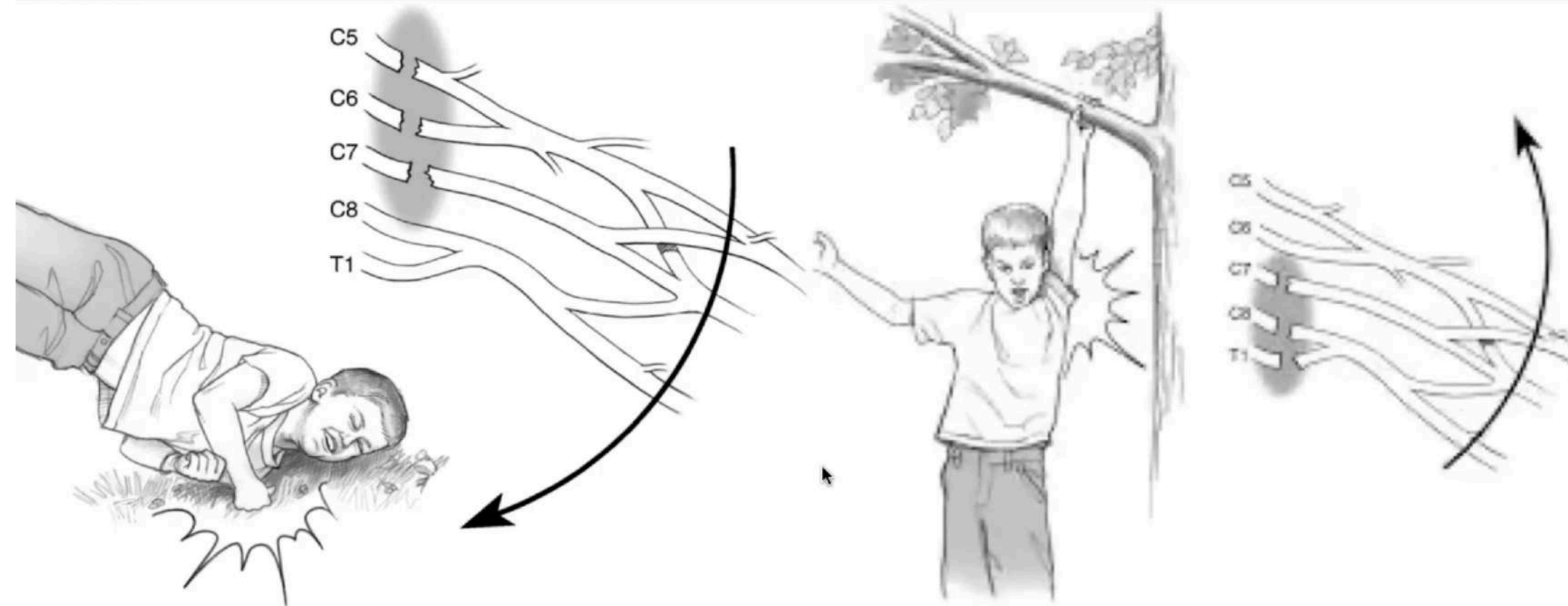


Lets try ourself again





Mechanism of Brachial plexus injury



What is more important

- **Assessment of Severity of injury**
 - Repeated Individual sensory and muscle charting
- **Assessment of Level of injury**
 - Myotome & Dermatome
- Testing First branch of Root ,Trunk and different Cords

Severity of Brachial plexus injury

Avulsion → Worst injury

Complete rupture → Early intervention for primary repair

Partial rupture → Incomplete recovery

Attenuated → Spontaneous recovery **But how much**

Normal



Attenuated means



- **Grade 1** - Neuropraxia - segment demyelination
 - Axonotmesis - Axon injured

Grade 2

Covering are not injured



Good recovery

Grade 3

Innermost Endoneurium covering injured



Moderate recovery

Grade 4

Innermost [Endo] and middle [perineurium] covering are injured



Nonfunctional recovery

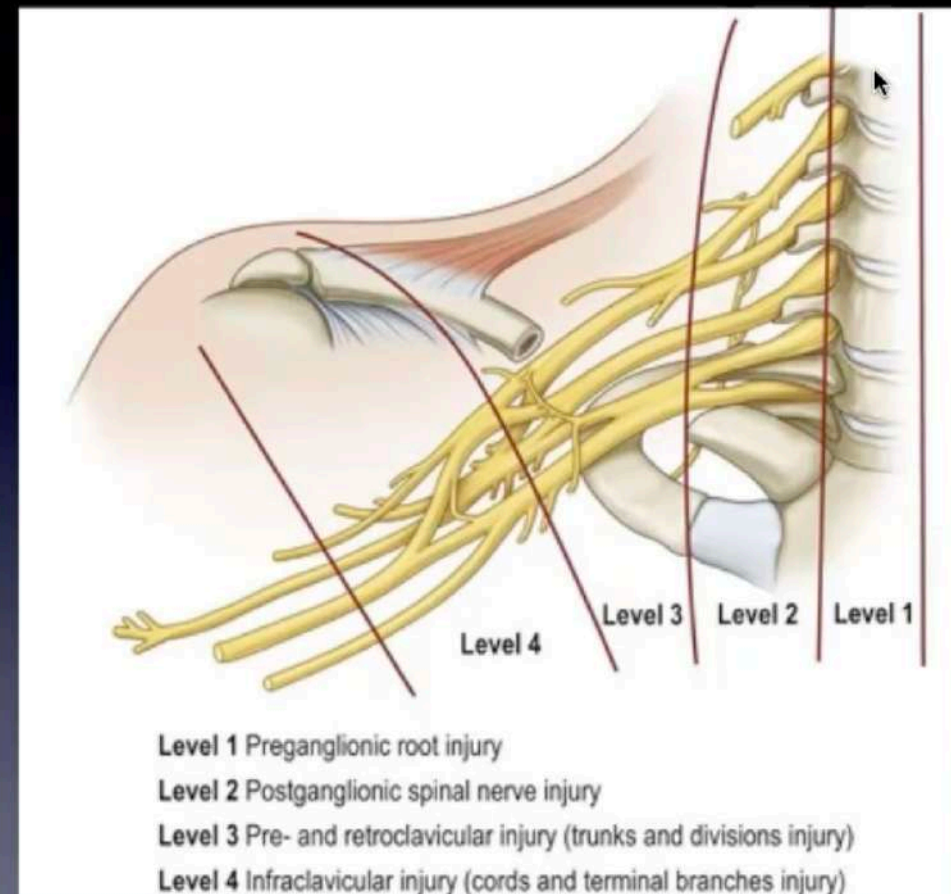
TIP

Order of injury is always from inside to outside

are Axon
Endoneurium
Perineurium and
in last epineurium as in axonotmesis

Level of injury

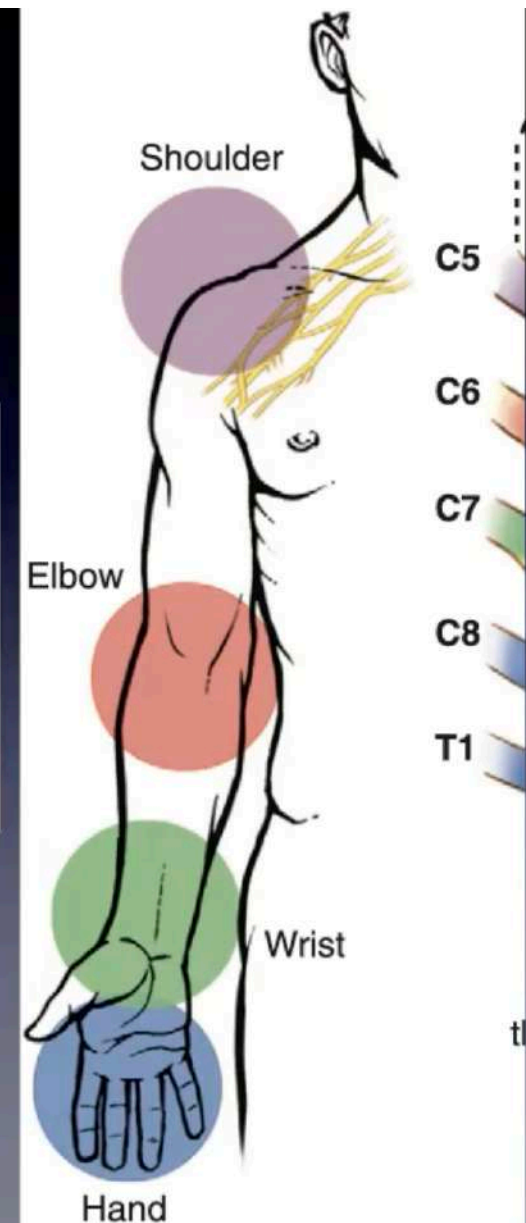
- Level 1 / 2 - Pre ganglionic / post ganglionic
- Level 3 / 4 -Supra / Infraclavicular
- Upper / lower / pan - both in level 1, 2 & 3



Myotome - General rule -

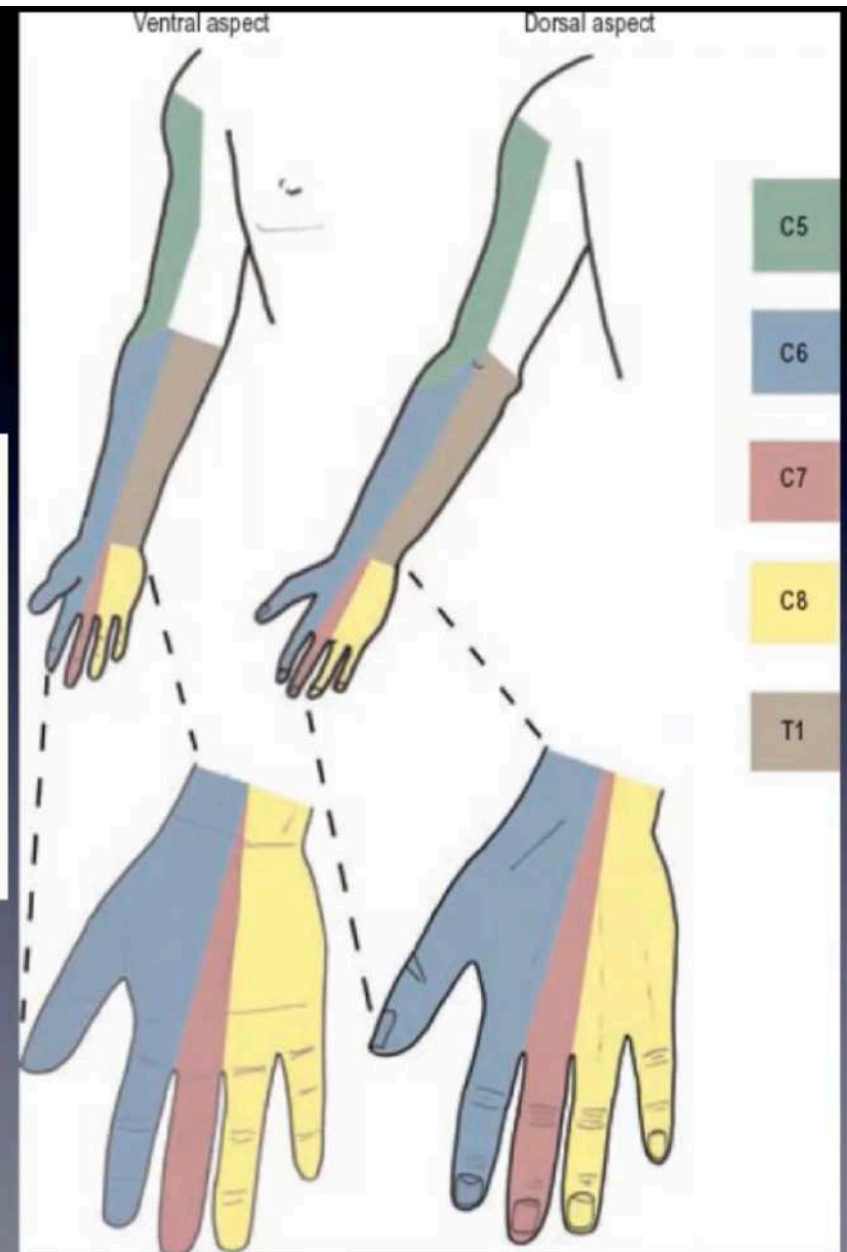
Upper roots - Innervate proximal region- shoulder and elbow
lower root - innervate Distal region - Hand and wrist

Root value	Gross functions involved
C5C6	Shoulder abduction and elbow flexion
C7	Triceps +/-wrist extensor
C8T1	Hand function
C5 to T1	Flail upper limb



Dermatome

Root value	Key sensory area
C5	Skin over the deltoid
C6	Thumb and index finger
C7	Middle finger
C8	Ulnar two fingers but particularly little finger
T1	Medial forearm
T2	Inner arm



Principle for Brachial Plexus Examination

Walk through Brachial plexus from medial to lateral

Level 1

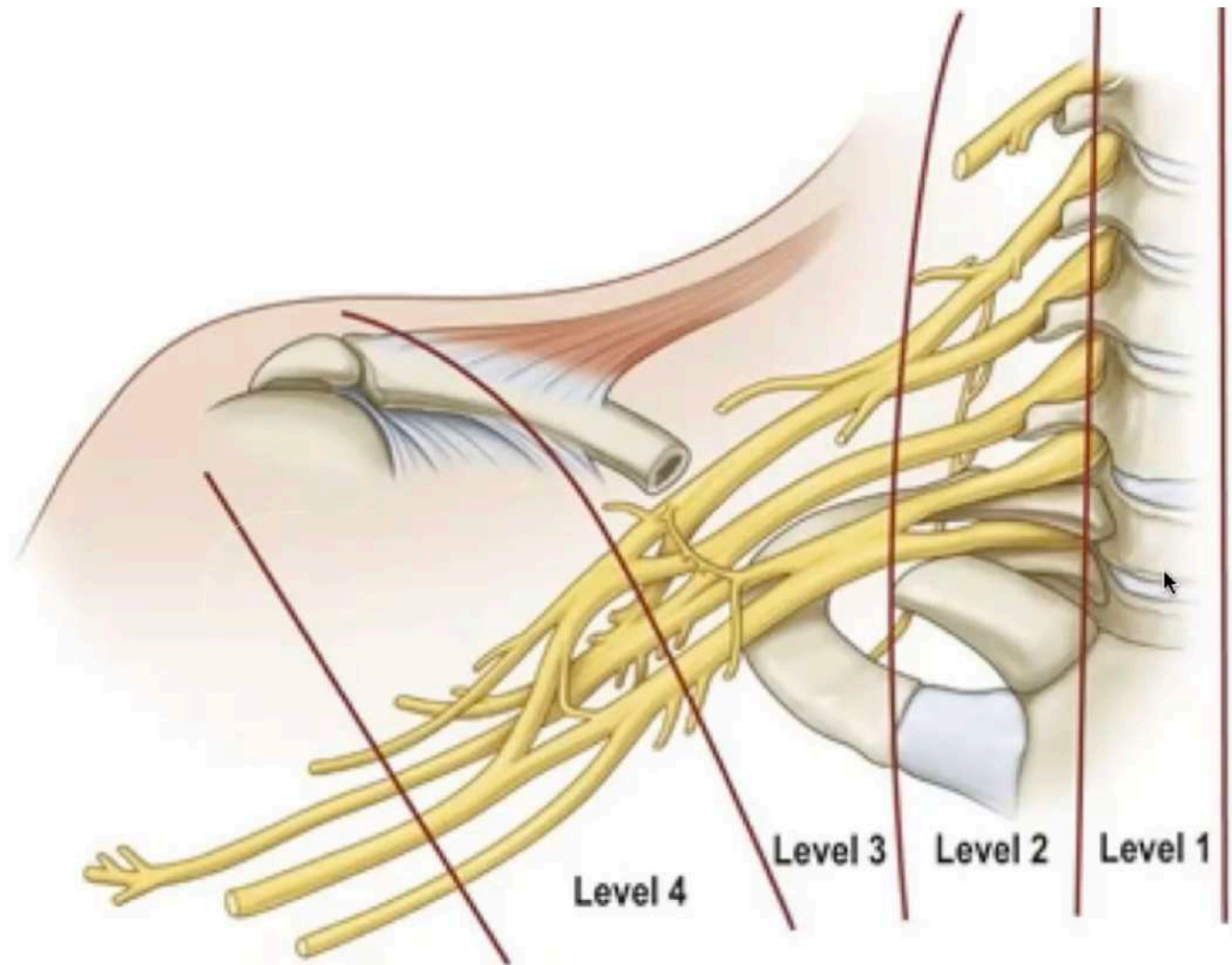
Level 2

Level 3

Level 4

Check the **first branch originating in that level** - for any weakness that suggest Injury at that level

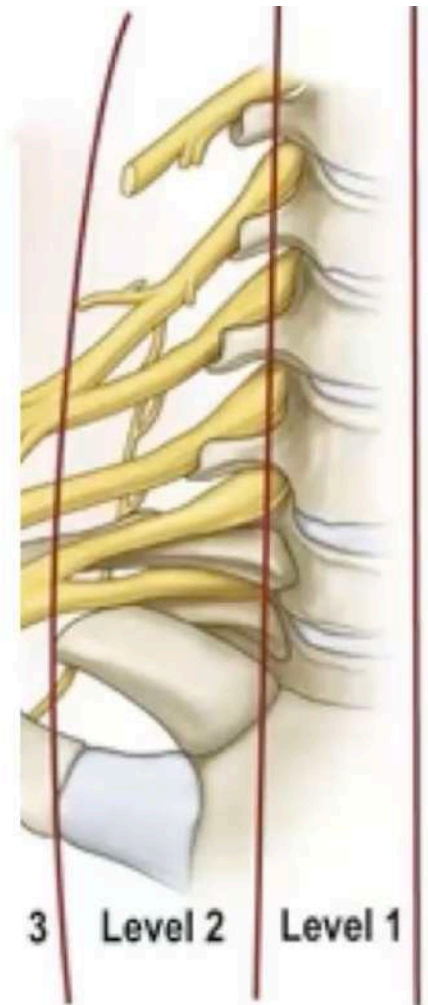
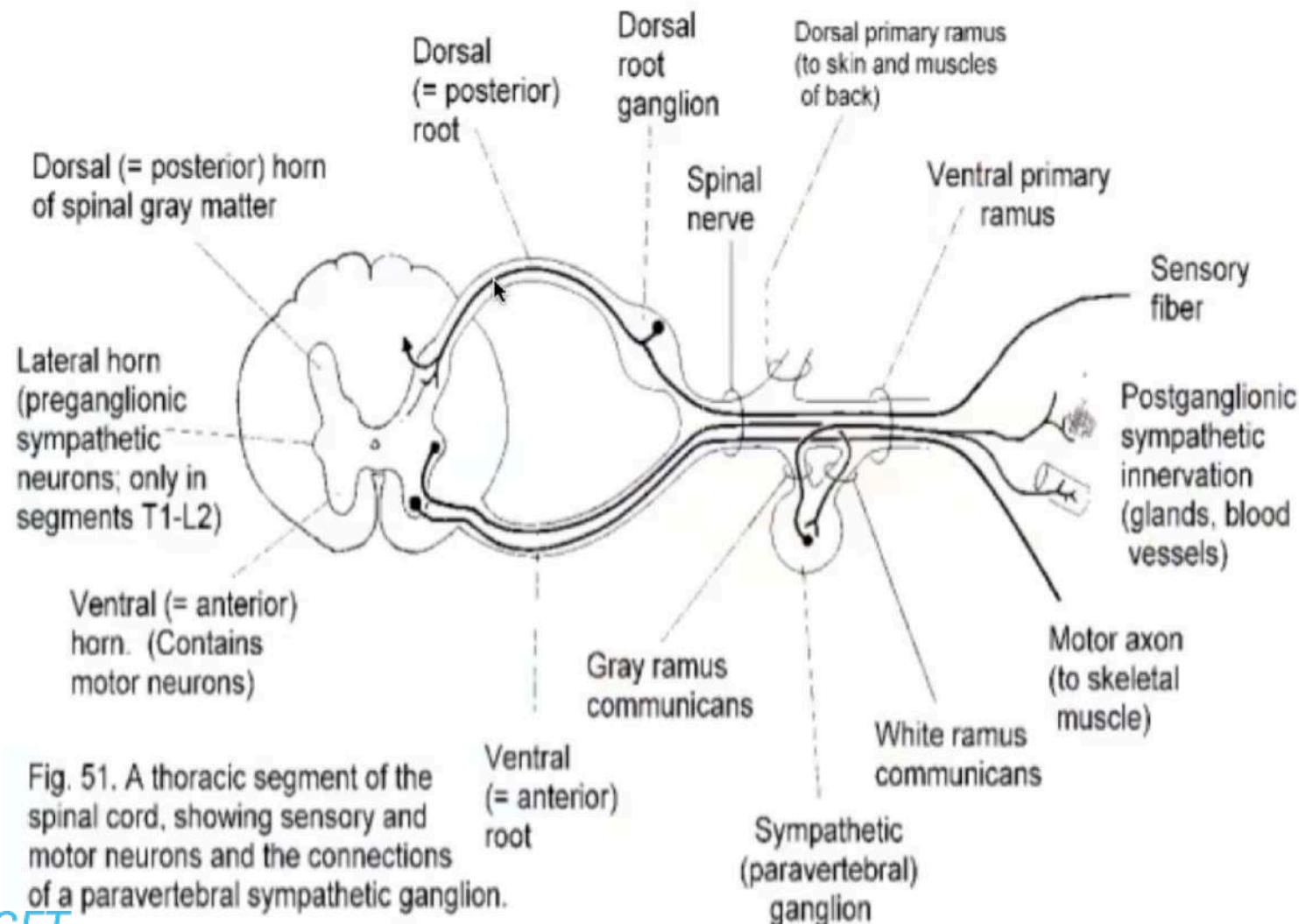
Level 1- [Root] Preganglionic



Level 1 Preganglionic root injury

Level 2 Postganglionic spinal nerve injury

Level 1- [Root] Preganglionic



Sign of preganglionic lesion

Dorsal ramii - Back of neck muscle wasted

Sympathetic ganglion - Horner syndrome

Horner sign ?

Rhomboids Muscle

Serrates Anterior Muscle



Winging of scapula

What is winging ?

Phrenic nerve palsy - chest x ray

chest Xray?

Tinel's sign - Absent

Trapezius Muscle is supplied Cranial nerve [SAN] and **not by spinal nerve**

Horner syndrome

Miosis

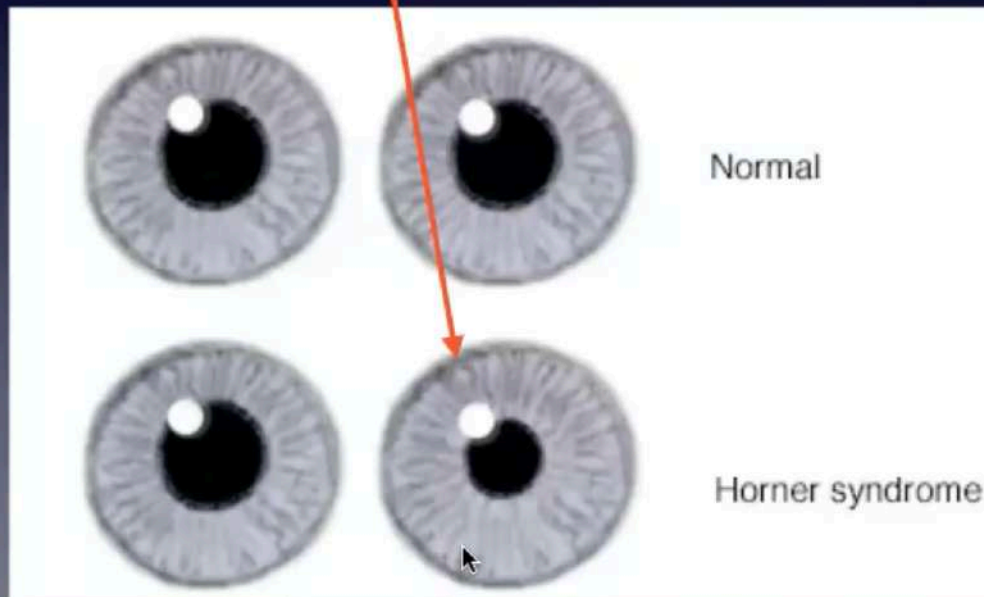
Anhidrosis

Ptosis

Enophthalmos

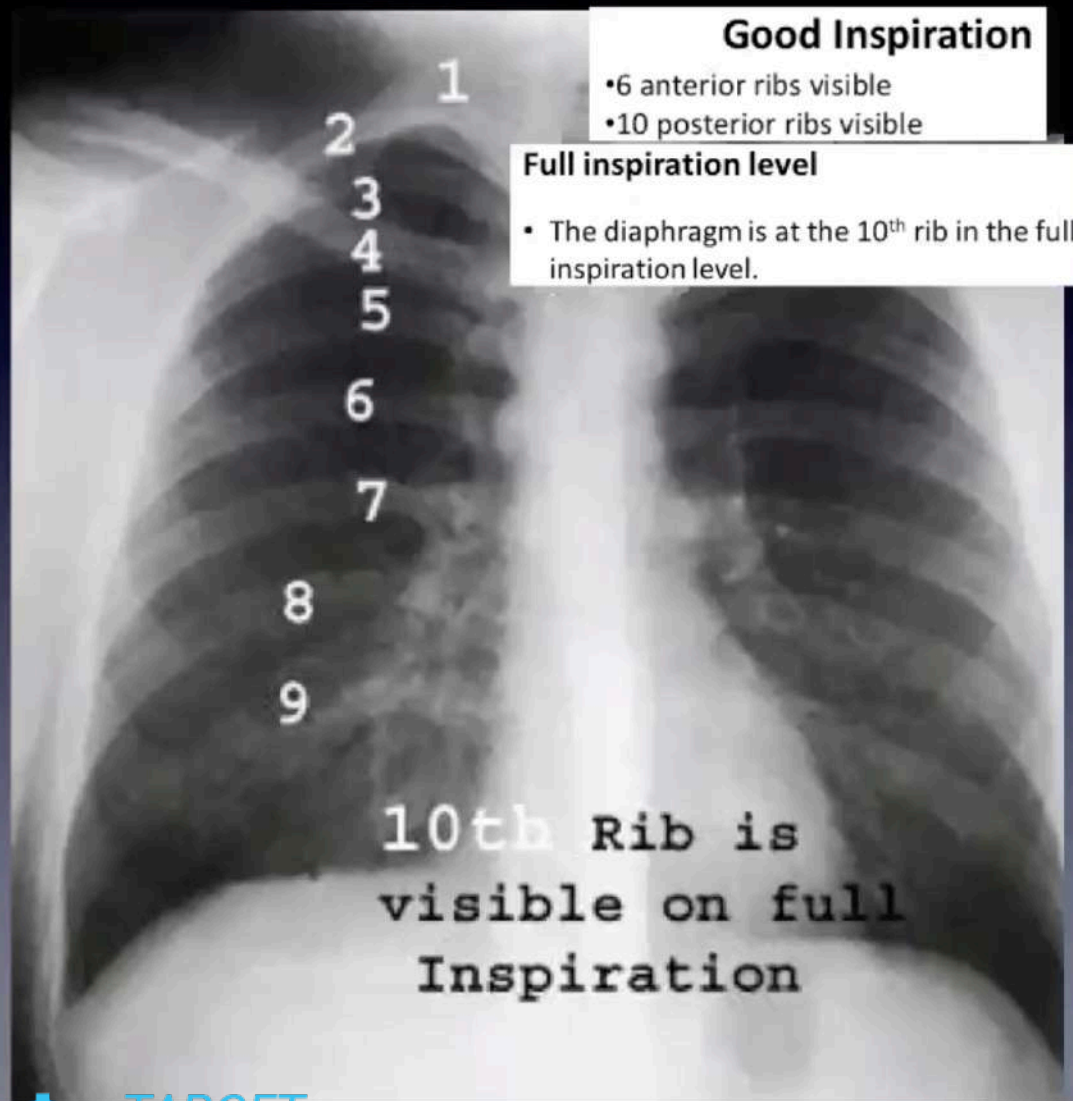
Absence of sweating in the injured territory of nerve[face]

Sunken eye



what are sign of preganglionic lesion ?

Normal Chest Xray - Full inspiration

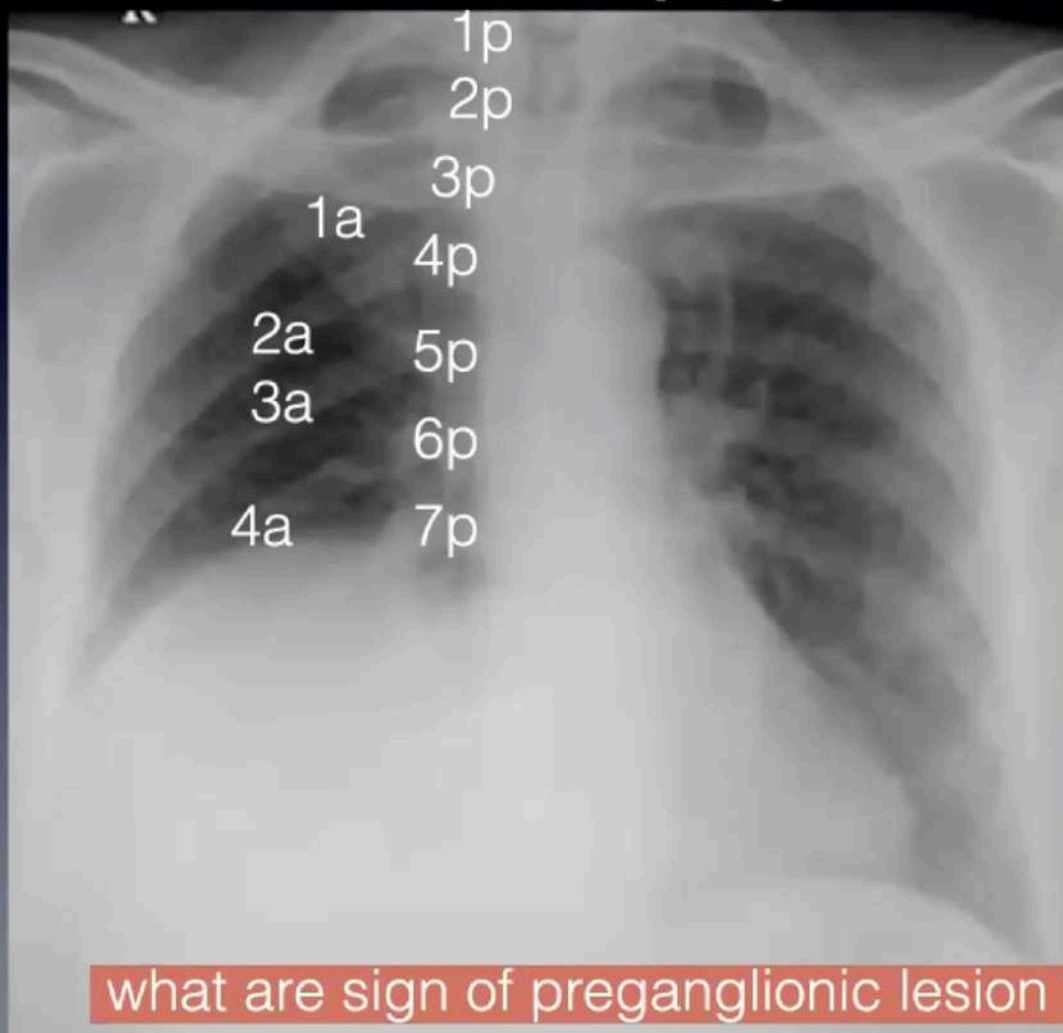


Normal Chest Xray - Full Expiration



Chest Xray - Full inspiration

Phrenic nerve palsy- Elevated or high diaphragm



what are sign of preganglionic lesion ?

Elevated Hemidiaphragm

Diminished lung volume
(e.g. atelectasis)

Phrenic nerve paralysis

Eventration of the diaphragm

Subphrenic abscess

Hepatomegaly or splenomegaly

Winging of scapula -

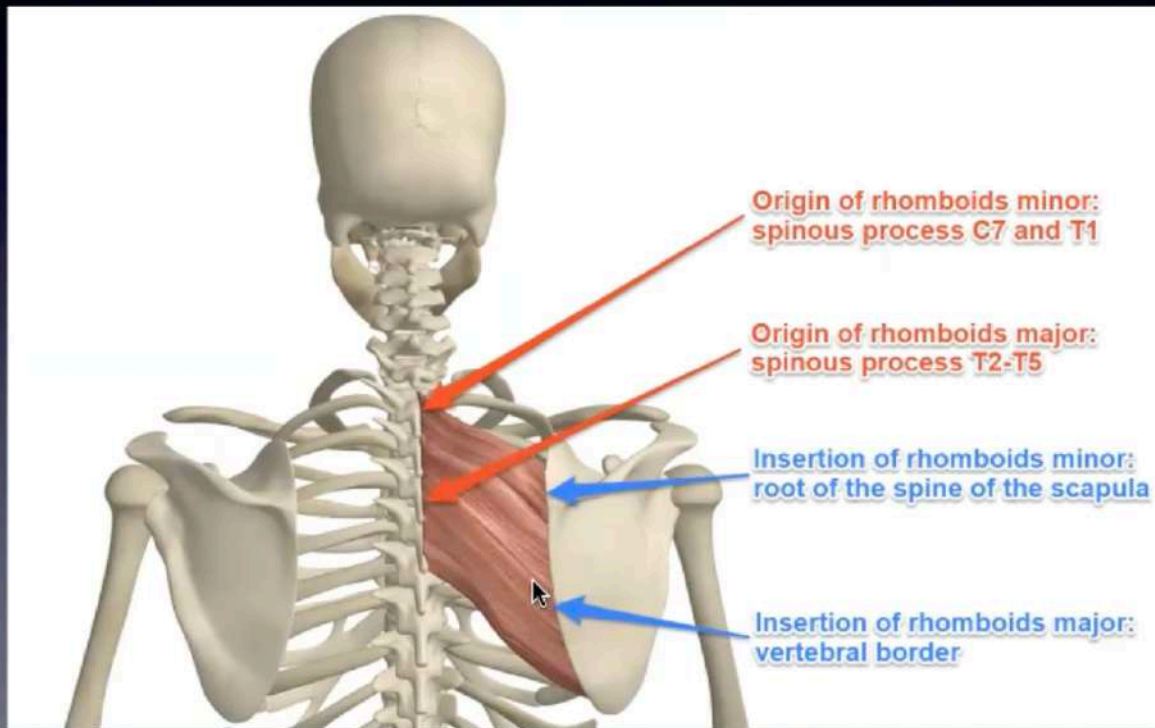
Defined by medial border / corner of scapula

- **Medial scapular winging** - prominence of medial border scapula close to spine [medially]
- **Lateral scapular winging** - prominence of medial border of scapula away from spine [laterally]

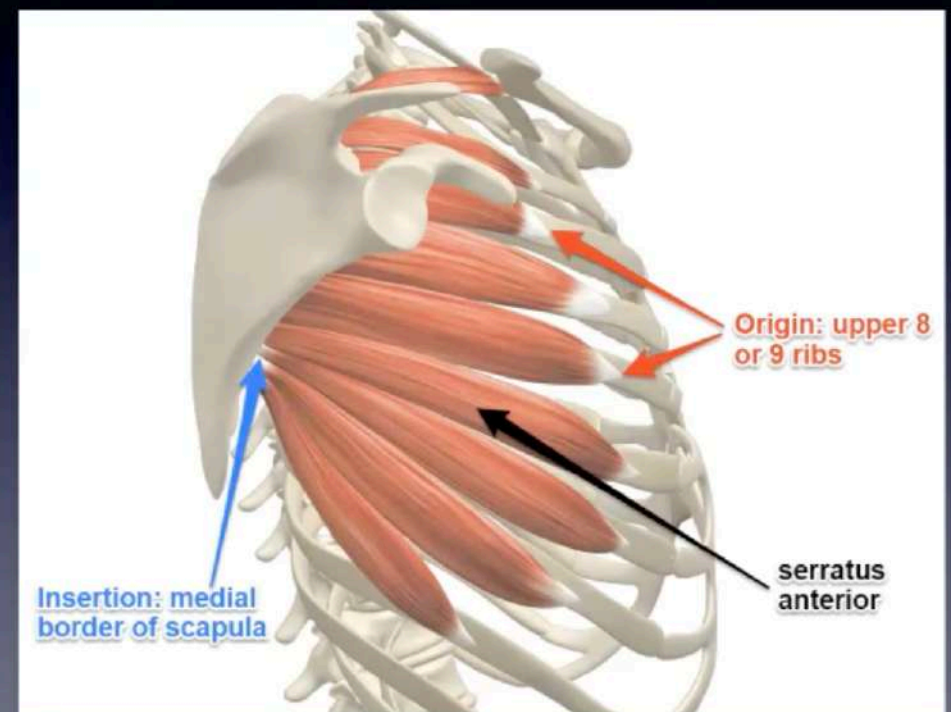


what are sign of preganglionic lesion ?

Sign of preganglionic lesion

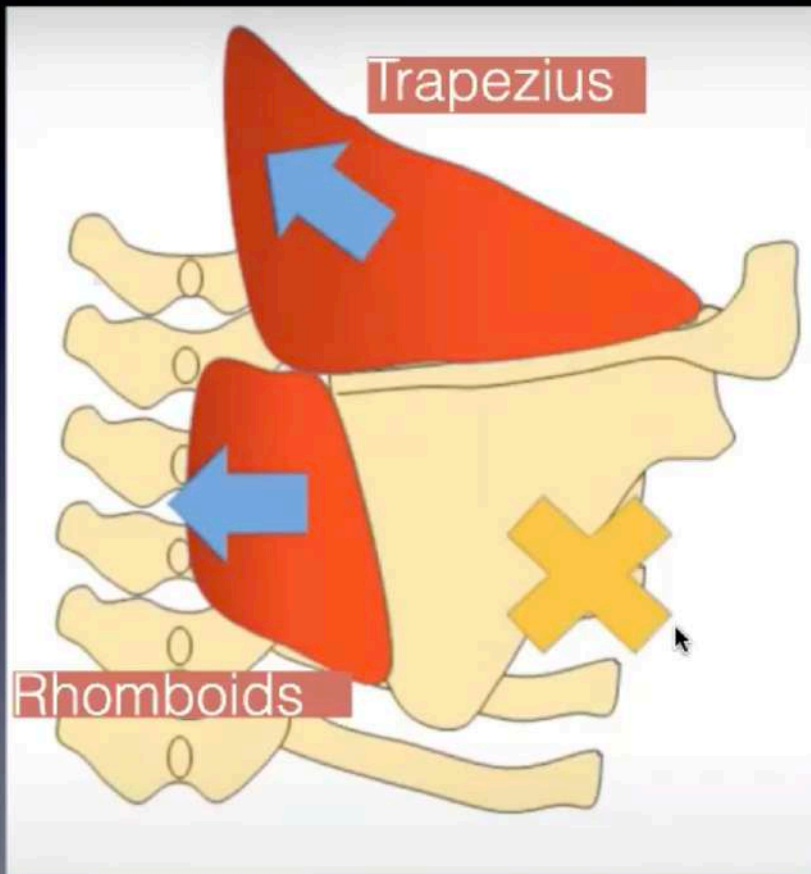


Rhomboid Muscle

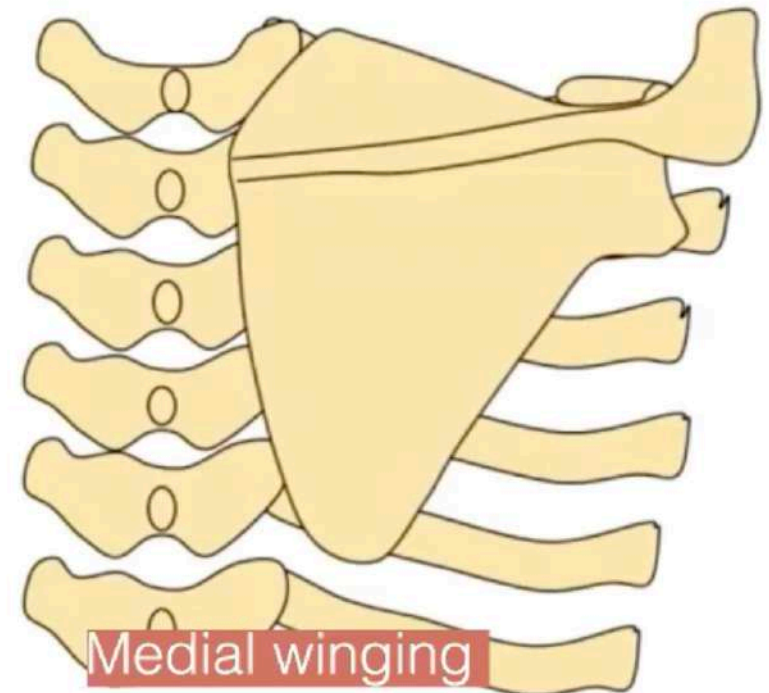


Serratus anterior muscle

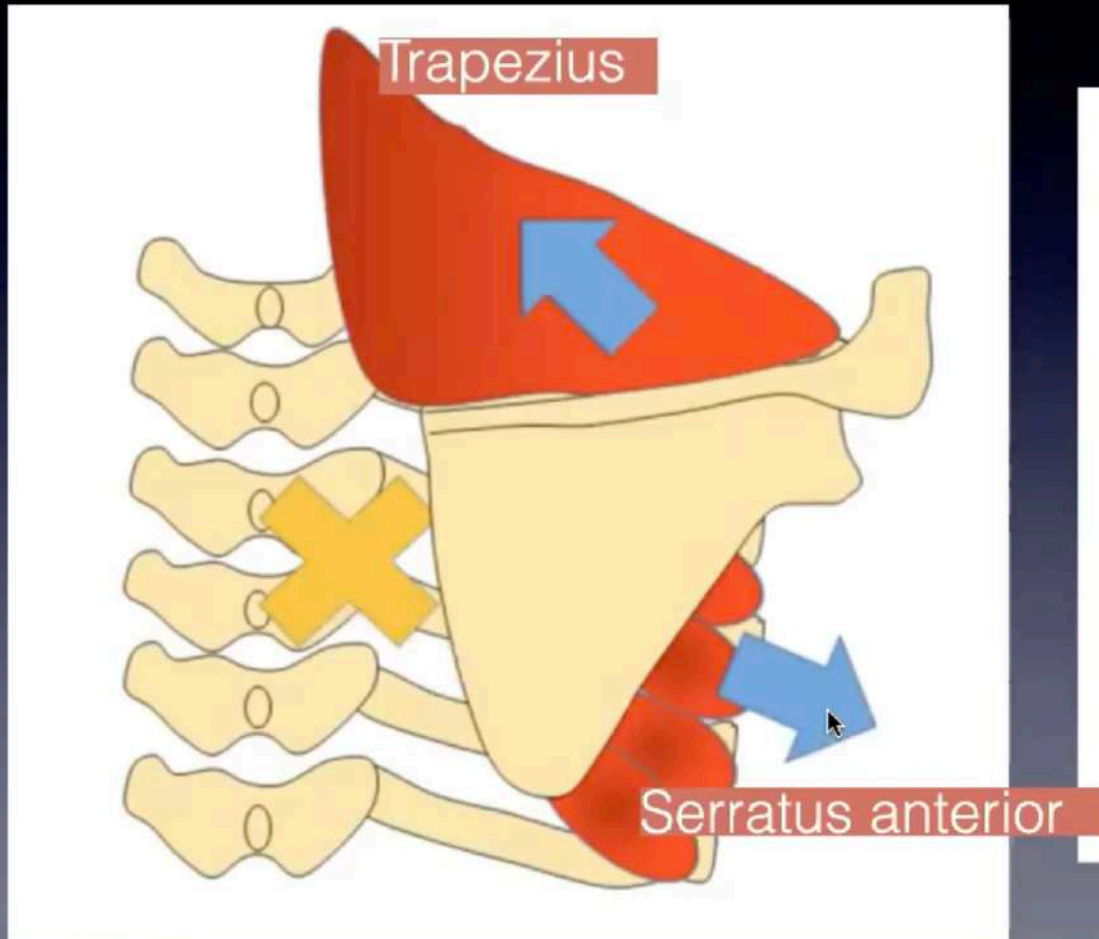
**Sign of preganglionic
lesion**



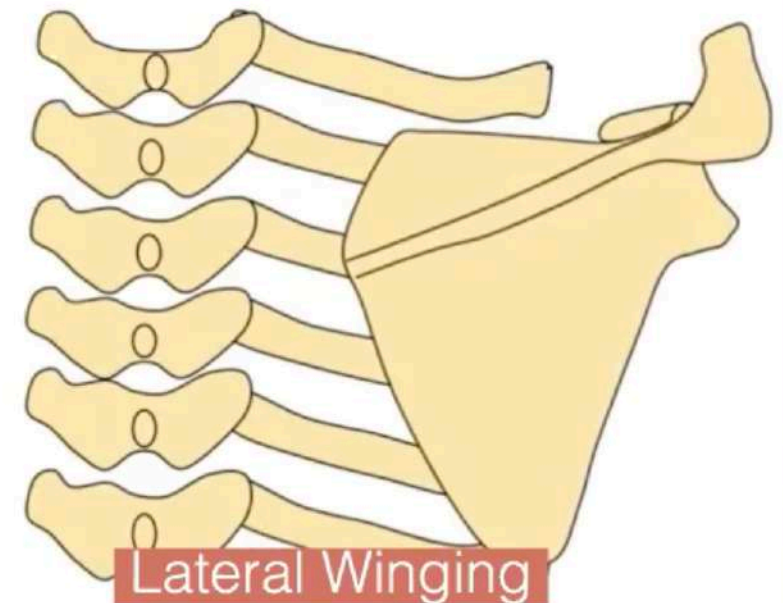
Serratus Weakness



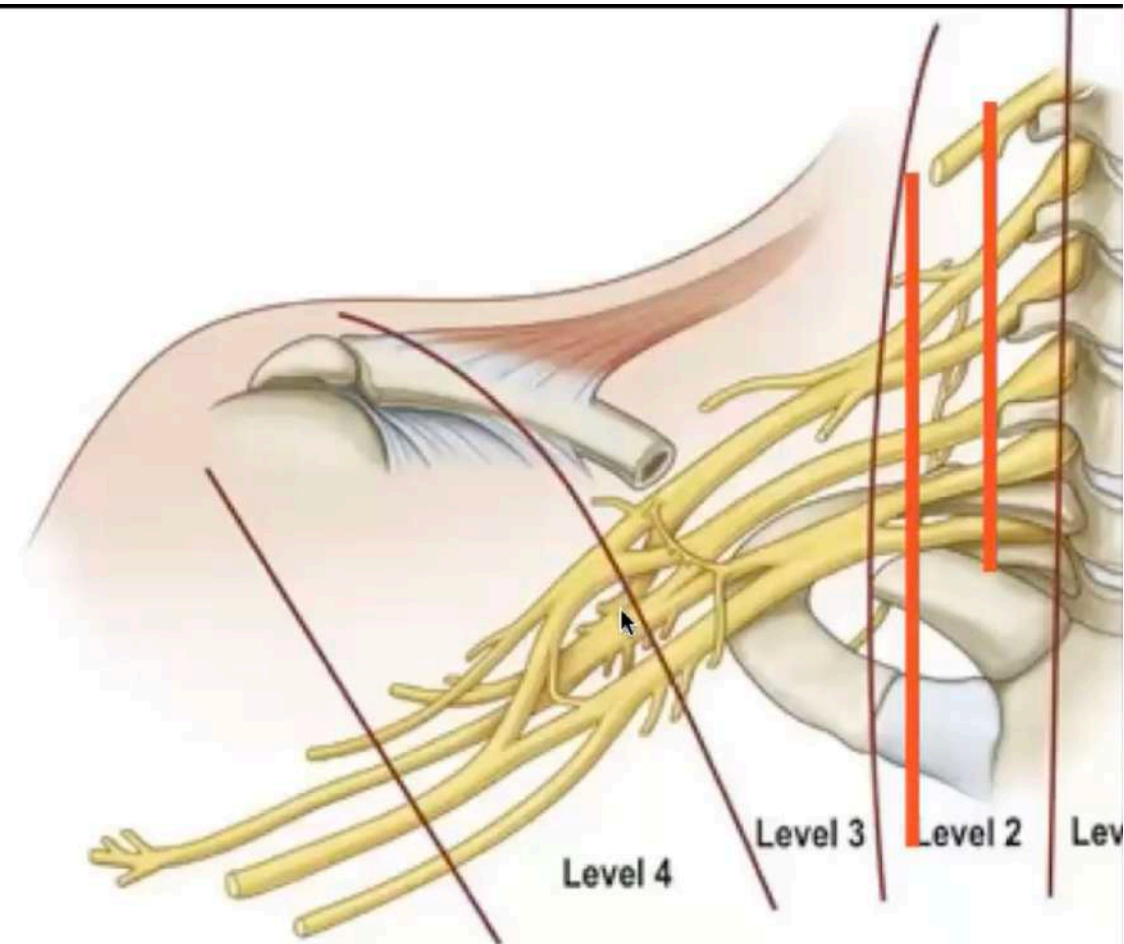
what are sign of preganglionic lesion ?



Rhomboids Weakness



Level 2 Post ganglionic Spinal nerve



Level 1 Preganglionic root injury

Level 2 Postganglionic spinal nerve injury

Level 3 Pre- and retroclavicular injury (trunks and divisions injury)

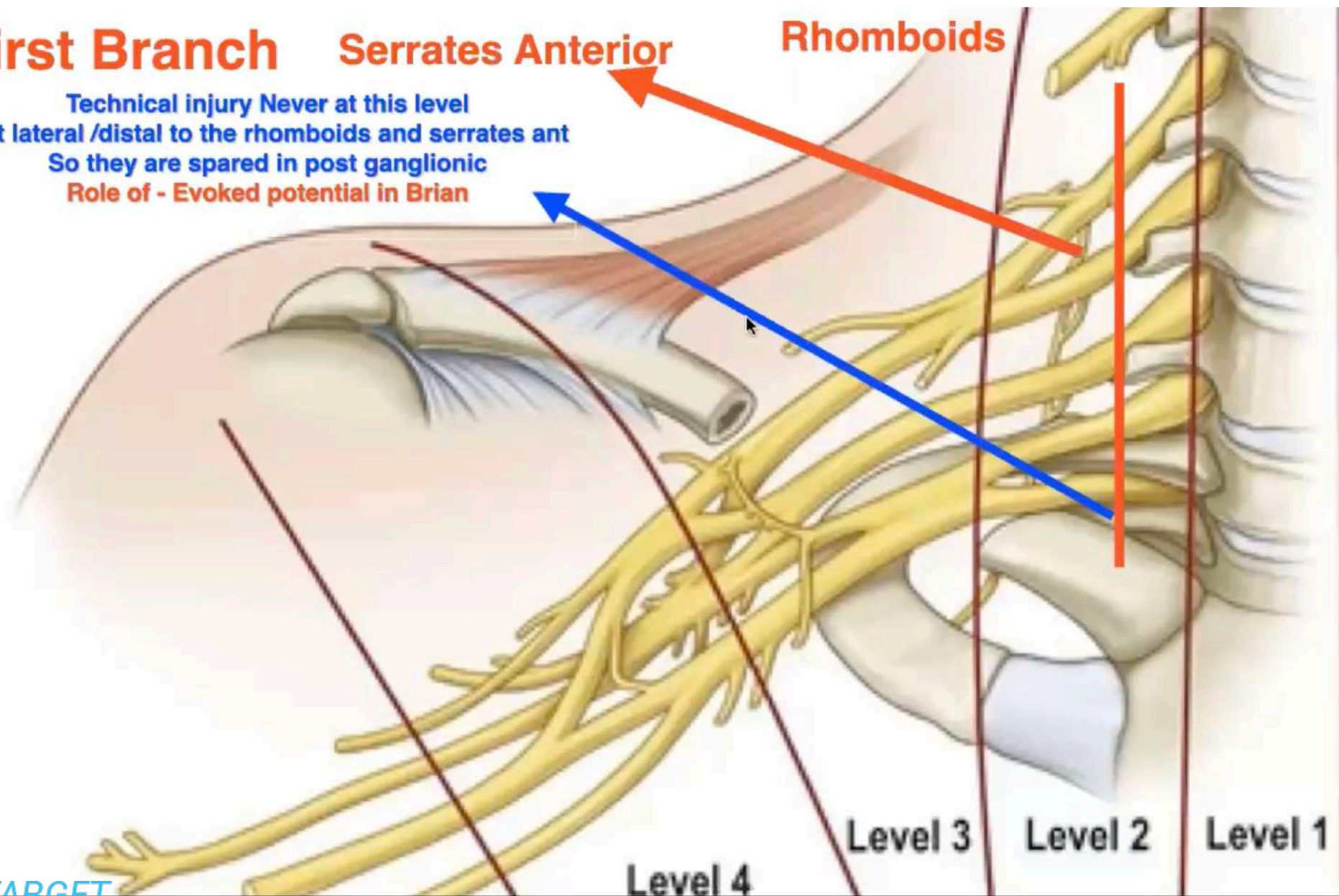
Level 4 Infraclavicular injury (cords and terminal branches injury)

First Branch

Serrates Anterior

Rhomboids

Technical injury Never at this level
but lateral /distal to the rhomboids and serrates ant
So they are spared in post ganglionic
Role of - Evoked potential in Brian



Difference between Pre and Post ganglionic

Assessment of brachial plexus injury

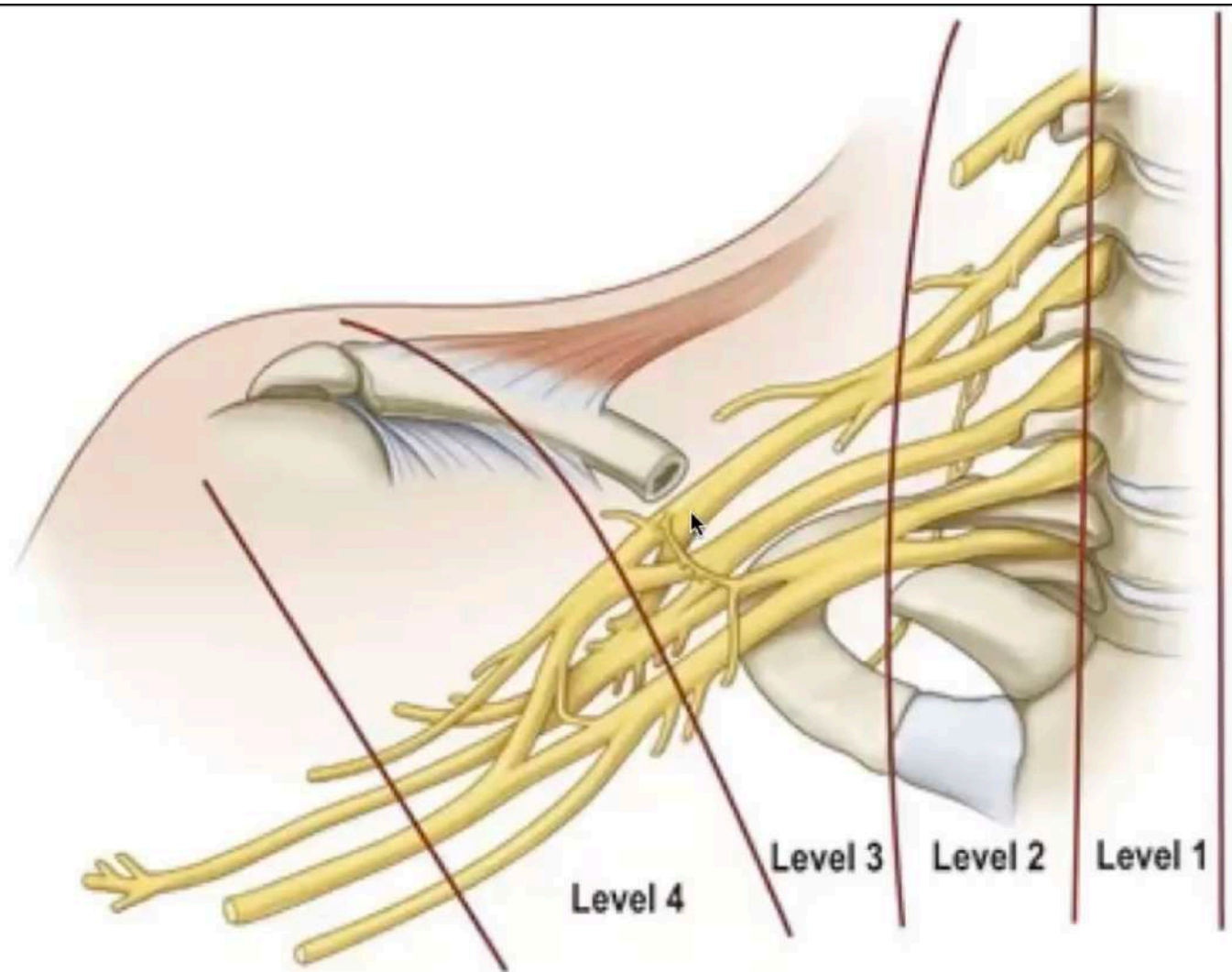
In preganglionic lesion

- Horner's syndrome --- present
- Unable to elevate scapula

In postganglionic lesion

- Horner's syndrome ---- absent
- Able to elevate scapula
- Tinel's sign --- present in the later stages

Level 3 Trunk / Division



Level 1 Preganglionic root injury

Level 2 Postganglionic spinal nerve injury

First Branch

Supra spinatous

Infra spinatous

Intact Level 1

Level 3

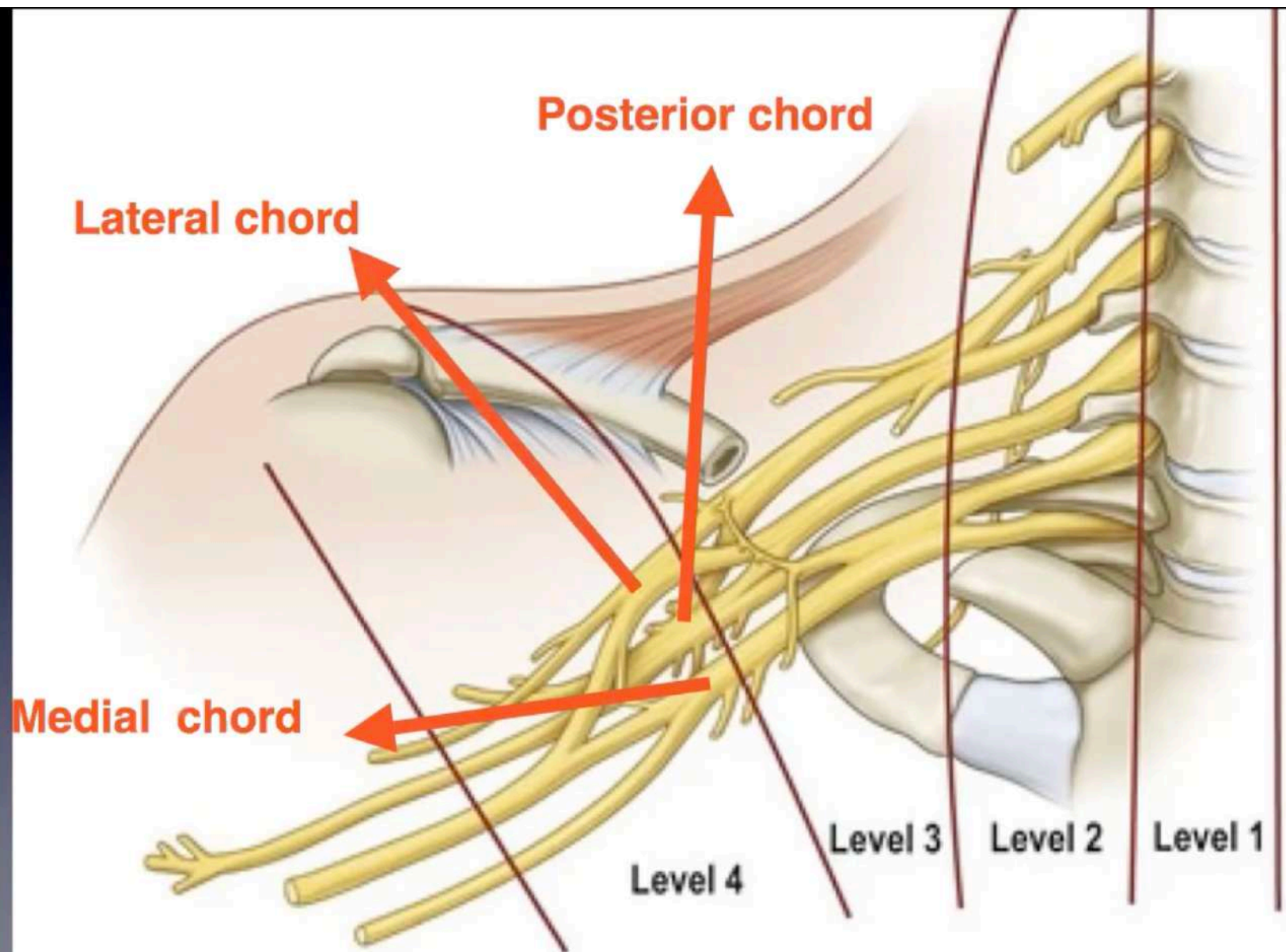
Level 2

Level 1

Level 4

Level 4

Lateral chord
Posterior chord
Medial chord

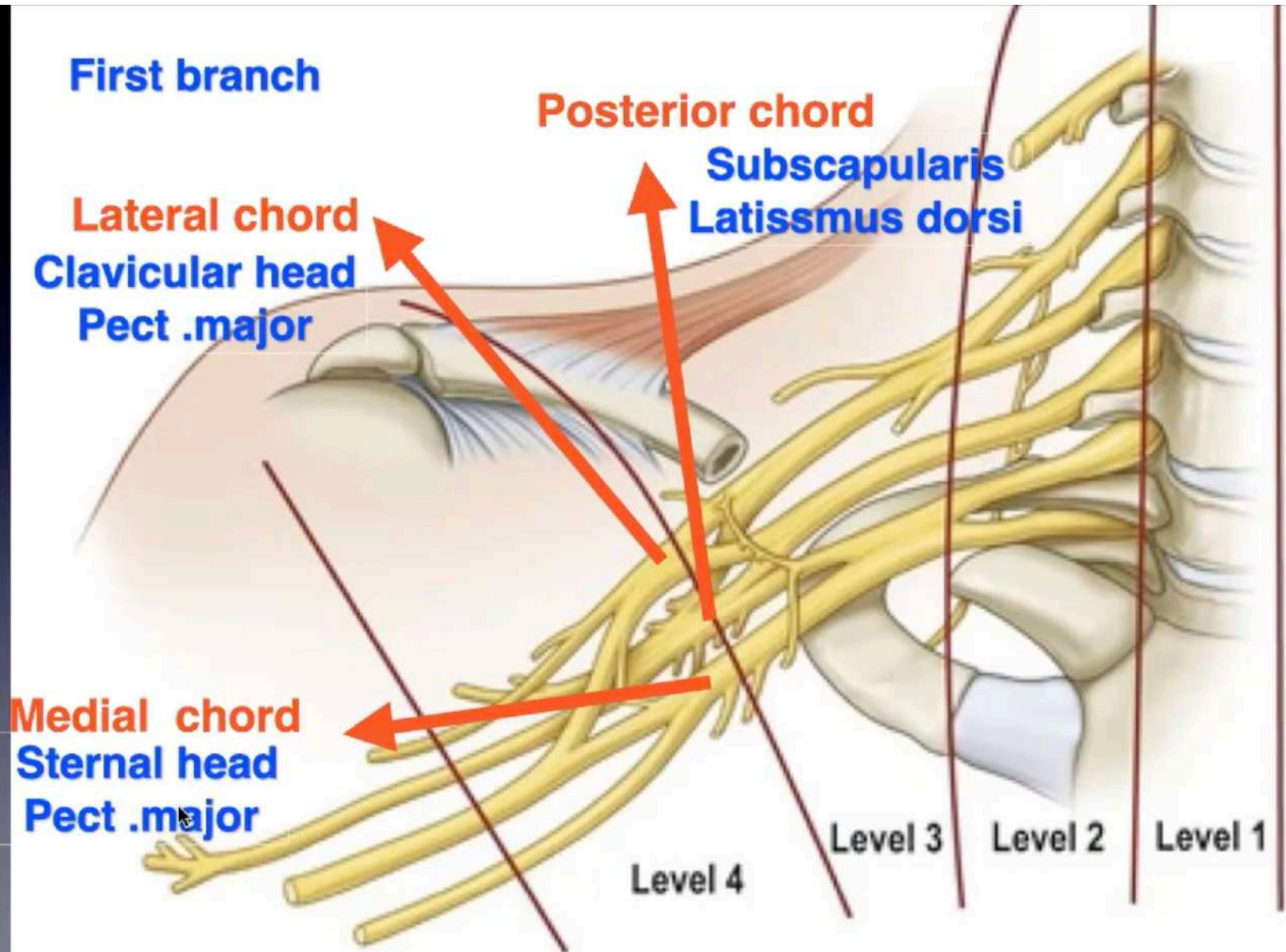


Level 4

Lateral chord

Posterior chord

Medial chord



Level 5

MCN

Median

Ulnar

Radial

Radial
Axillary Nerve

MCN

Median

Ulnar

Level 4

Level 3

Level 2

Level 1

Individual muscle testing of Brachial plexus

Muscle charting is active process

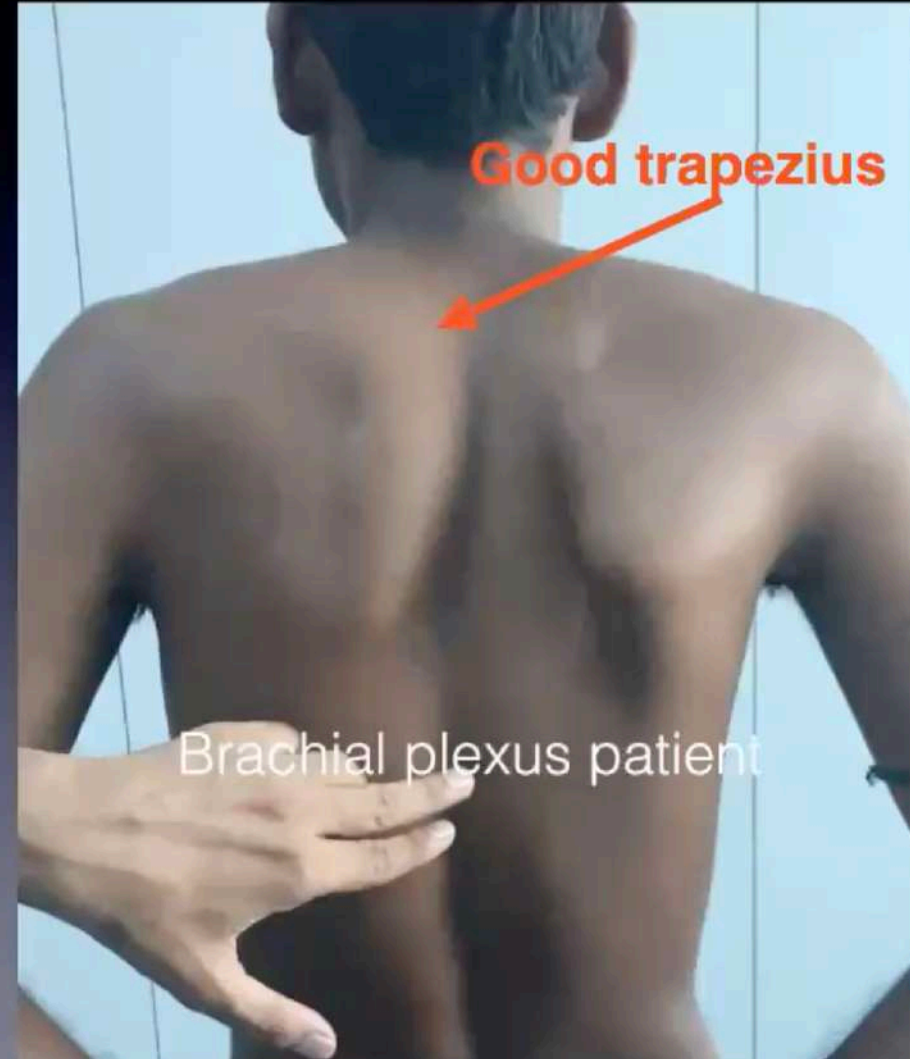
- **Look**- for muscle contraction and movement of limb
- **Feel** - for contracted muscle /Tendon
- **Move** - to test resistance

Standing from the back

Trapezius[spinal accessory nerve] - can you shrug your shoulders



Normal patient

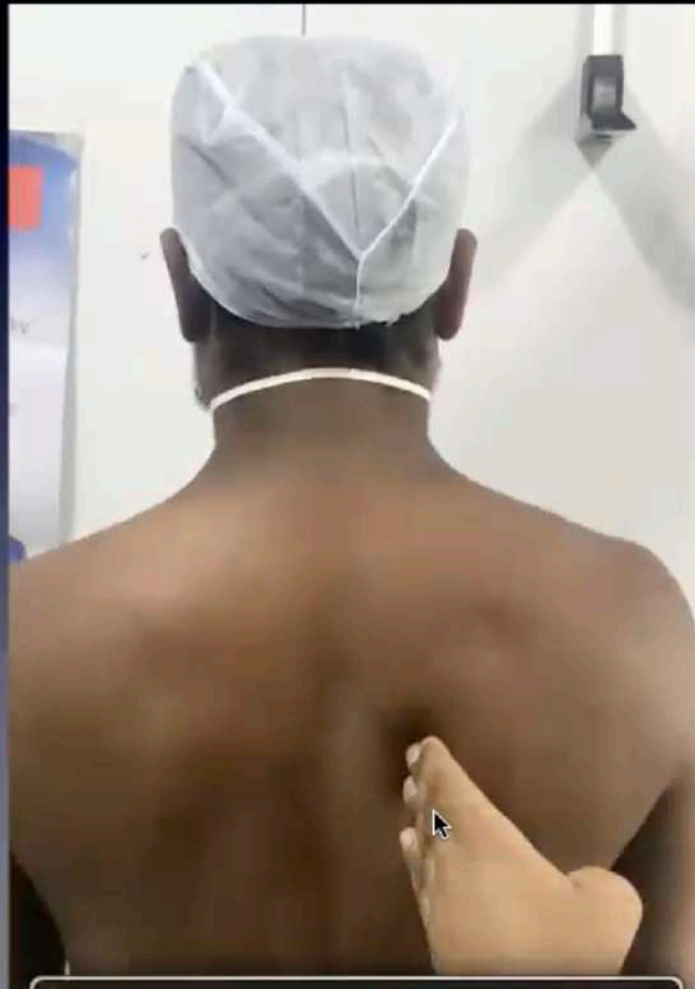


Brachial plexus patient

Standing from the back

Rhomboids - Dorsal scapular nerve C4, C5

Push your shoulder blades together



Standing from the back
Serratus anterior- Long Thoracic nerve [C567]
Classic - Wall press test



Standing from the back

Serratus anterior- Long Thoracic nerve [C567]

In BPI patient - Arm should be supported by examiner or rest it on table and ask patient to push shoulder forward as to open the door



Standing from back

Supra spinatous

Test shoulder abduction in scapular plane with thumb pointing downwards



Infraspinatus

Test **external rotation** with shoulder in **adduction** and elbow flexed

Teres minor

Test **external rotation** with shoulder in **abduction** and elbow flexed



Infraspinatus - weak
Wasting supra and
infra spinatus region

Standing from front

Pectoralis major - clavicular C56 and sternal head C78T1

Clavicular head - feel for muscle contraction and ask the patient to touch the opposite shoulder



Standing from back
Latissmus dorsi- C678

While Arm is supported in flexed position and ask patient to push down and examiner will feel for muscle contraction

Ask patient to do cough and Feel for muscle contraction



Standing from back
Deltoid [Axillary] C56

Extend , abduct , flex the shoulder for posterior , middle and anterior fibers respectively



Subscapularis - Upper and lower subscapularis - C567

Belly press sign - Ask the patient to bring elbow forward while pressing the belly .
A flexed wrist relative to normal side indicate positive sign



Biceps , Triceps



Terminal branches

Radial nerve Wrist extension , finger extension

Median nerve Intrinsic function of hand

Ulnar nerve

Hand - Intrinsic function

Finger abduction , adduction
Thumb opposition



Method of Brachial plexus examination

• History

- Age, Limb involved, Dominance of hand, Profession
- Duration of injury, Mode of injury ,
- Head injury and its treatment , Associated fracture and its treatment
- Co - morbidities

Inspection

Exposed part - Back neck chest, limb

- Front , Side and Back - Compare from normal side
- Look for Neck posture
- Sign of Horner syndrome - Ptosis ,Miosis, Anhidrosis, Enophthalmos
- Wasting of Shoulder ,arm, Forearm , Intrinsic muscle of hand
- Sign of insensate hand - trophic ulcer
- Associated injury

Inspection - side

- Comment on Resting posture of limb - start proximally and go distally
- Atrophy of Deltoid muscle bulk
- Inferior Subluxation of shoulder
- Sulcus sign - Gap between acromion and humeral head

Right wrist is supported by normal hand



Inspection

Wasting of supra and infra spinatous region

Prominent acromian,
coracoid ,spine of scapula

Healed scar



Palpation

Identify any Tender region in affected limb



Movement

Check for any stiffness in shoulder joint , elbow , wrist and fingers
and note
for fixed deformity
measure the range of movement

Motor examination

Bulk
Tone
power
Reflex



Sensation

- Dermatome
- Tinel's sign

Lastly - Check for Radial pulsation

Complete diagnosis includes

- Age
- Duration and site
- Level of injury
- Severity of injury
- Recovery status
- Complete /Incomplete
- Associated injury
- Vascular injury status

Definitive Diagnosis

- the case of **3 month old**
- 19 year old Gagan is student of class 12th and resident of Bihar is
- **Post traumatic** , Post Head injury , **post ganglionic**
- **Right side** ,**partial** , **upper** brachial plexus injury [**C5 C6**] with
- **partial recovery** in wrist , hand and elbow extension
- **with absent** shoulder and elbow flexion
- **with hypoesthesia** in shoulder and arm region with
- Normal palpable **distal pulses** with
- **shaft clavicle fracture, rib fracture** with status malunion clavicle **with strong Tinel**

Thank You