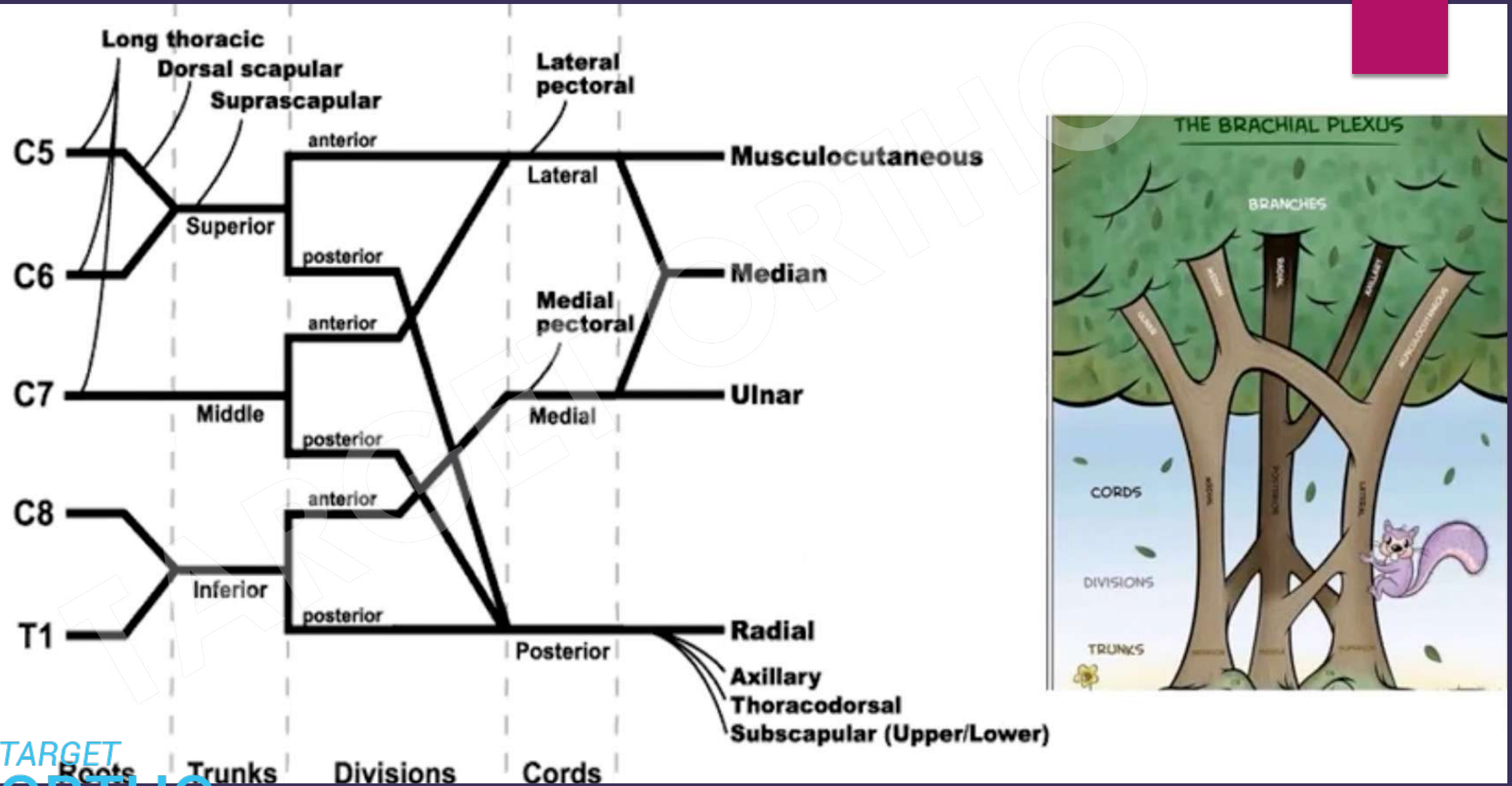
OBSTETRIC BRACHIAL PLEXUS PALSY (OBPP)

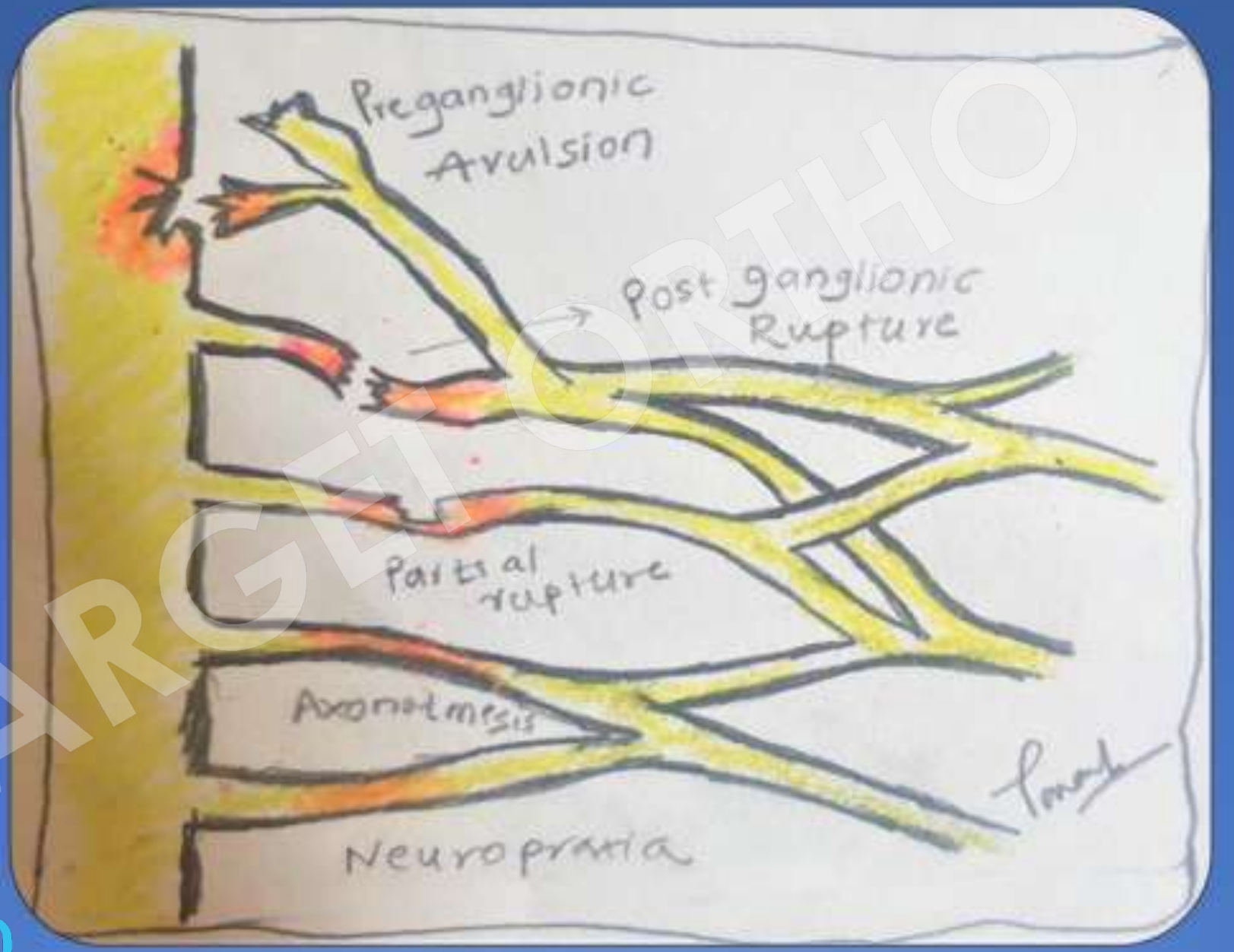
Dr. Shalin Shah

- Etiology
- History
- Differential Diagnosis
- Examination
- Investigation
- Treatment

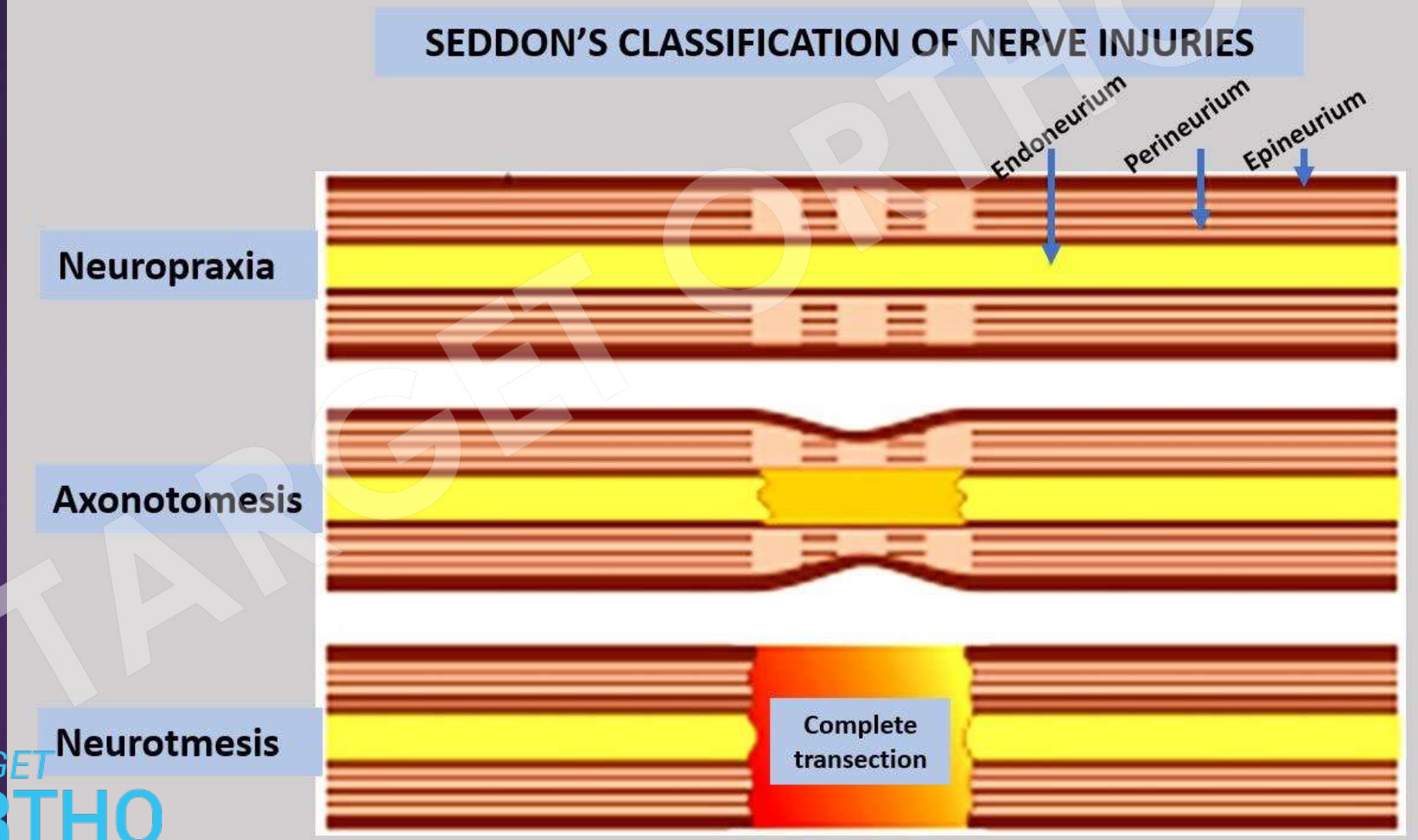
Etiology

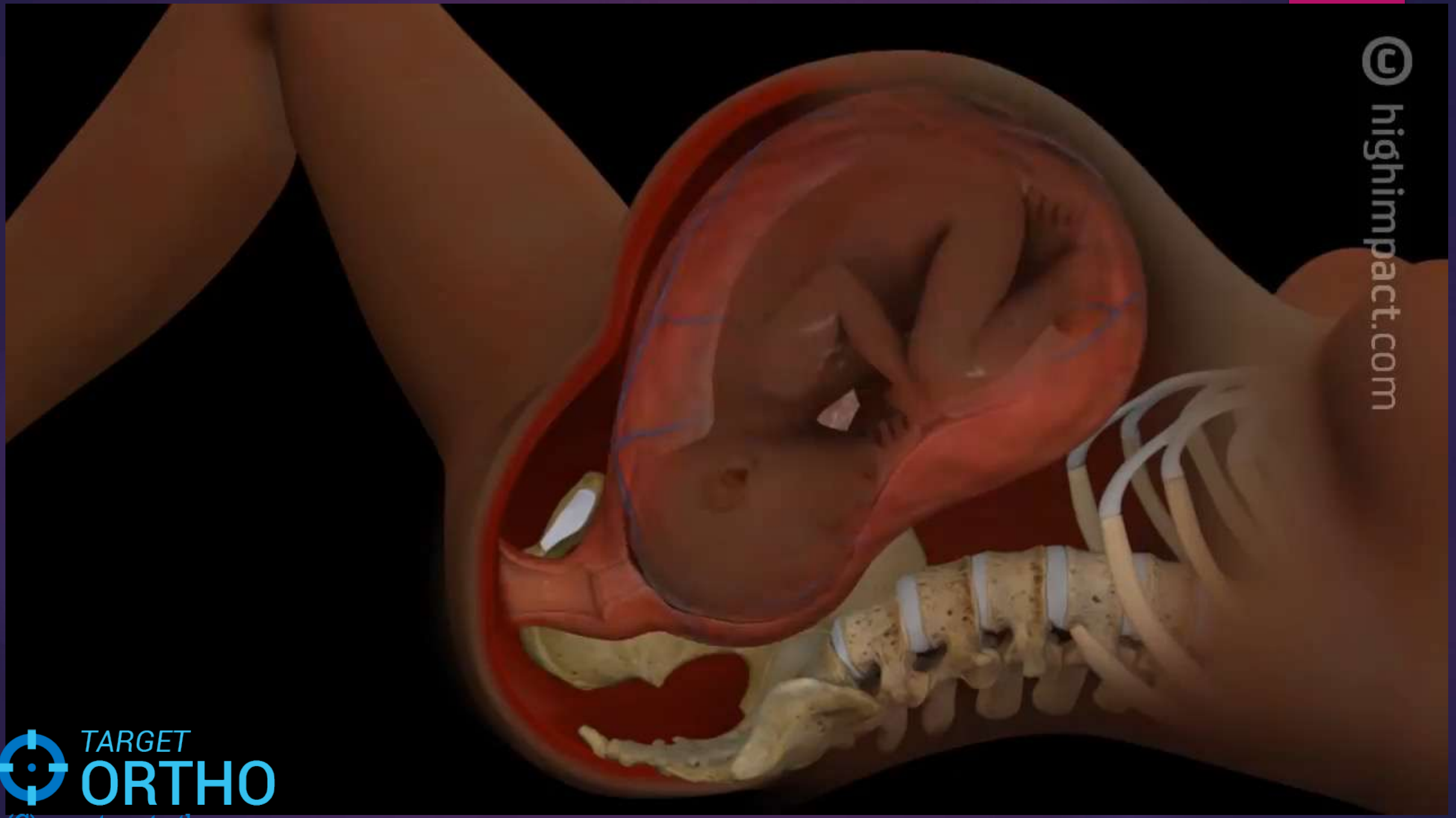


Erb's	Klumpke
C5,6	C8,T1
Shoulder function affected, Internally rotated, Loss of abduction	Shoulder spared
Wrist spared/ Loss of extension	Loss of wrist-Finger flexion
Waiter's tip position	Beggar's hand position
Forearm pronated	Forearm supinated
Loss of Moro	Moro spared



Seddon's Classification



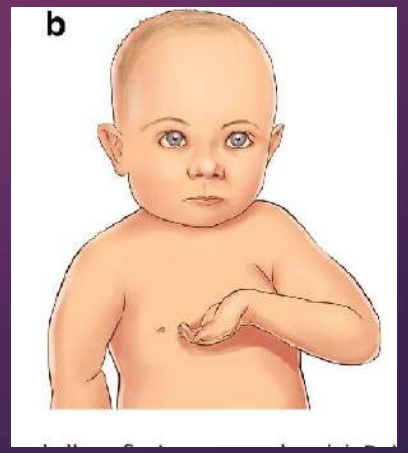


MECHANISM OF INJURY

Stretch

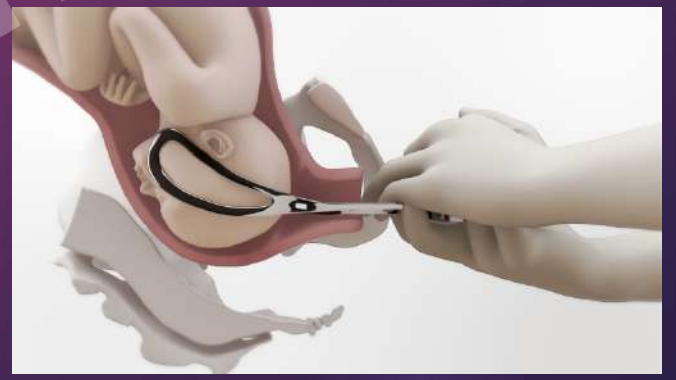
Vertex delivery : Upper plexus (Erb)

Breech delivery: lower plexus (Klumpke)



PREDISPOSING FACTORS (History)

- Large baby (birth weight > 4 kg)
- Shoulder dystocia
- Instrumental delivery (Forceps> Vacuum)
- Maternal diabetes
- Primigravida
- Previous child with OBPP



Differential Diagnosis

- **PSEUDO PARALYSIS**
  - *Acute osteomyelitis*
  - *Septic arthritis*
  - *Humeral fractures & traumatic epiphysolysis*
  - *Clavicle fractures*
- **Hemi/Mono plegia**
- **Spinal cord tumours**
- **Post infectious plexopathy**
  (Parsonage turner type-result in flaccid paralysis of muscles innervated by the involved nerves)

PAIN

Regression

Examination

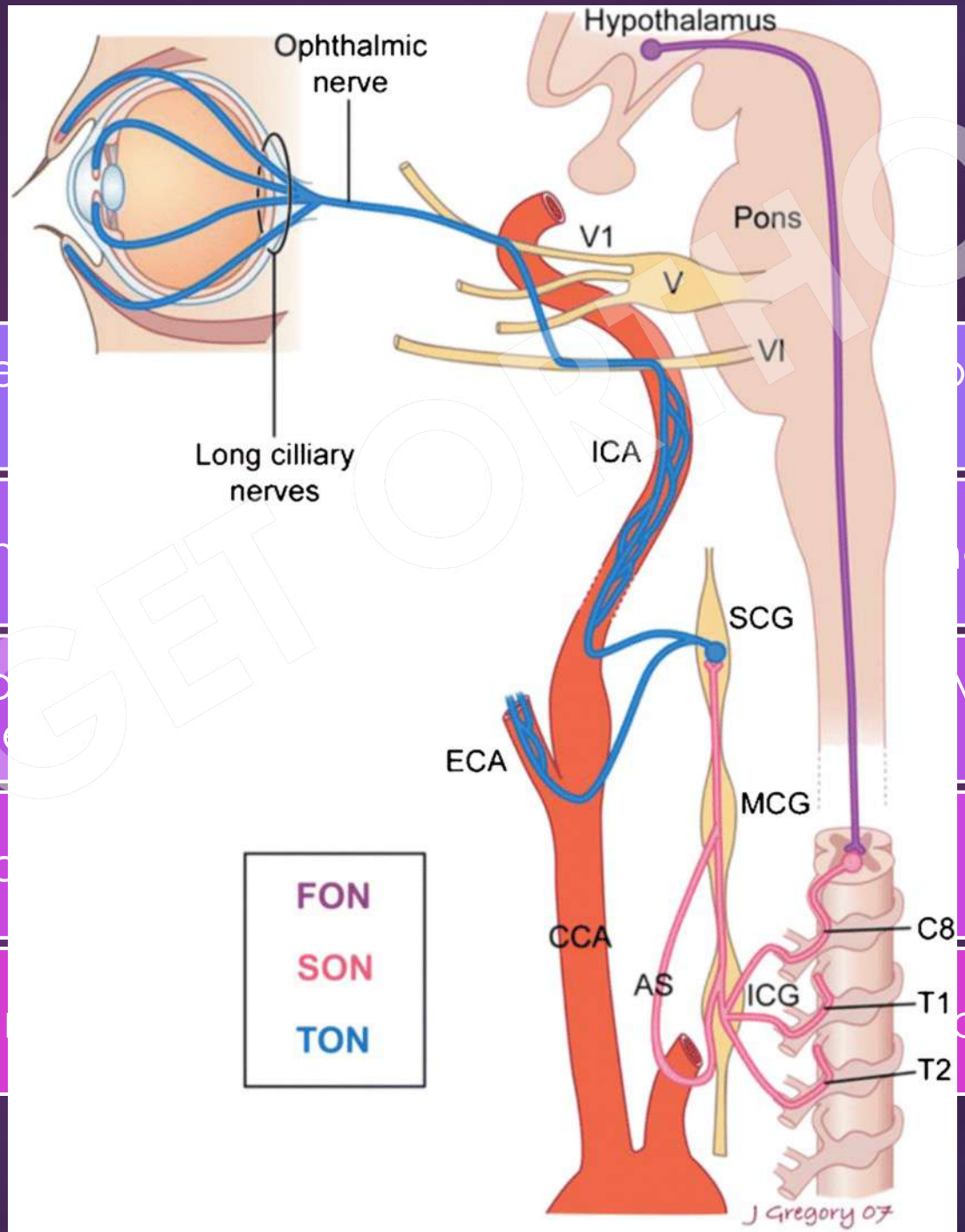
This pathway is a thre… …thalamus in the brainstem,

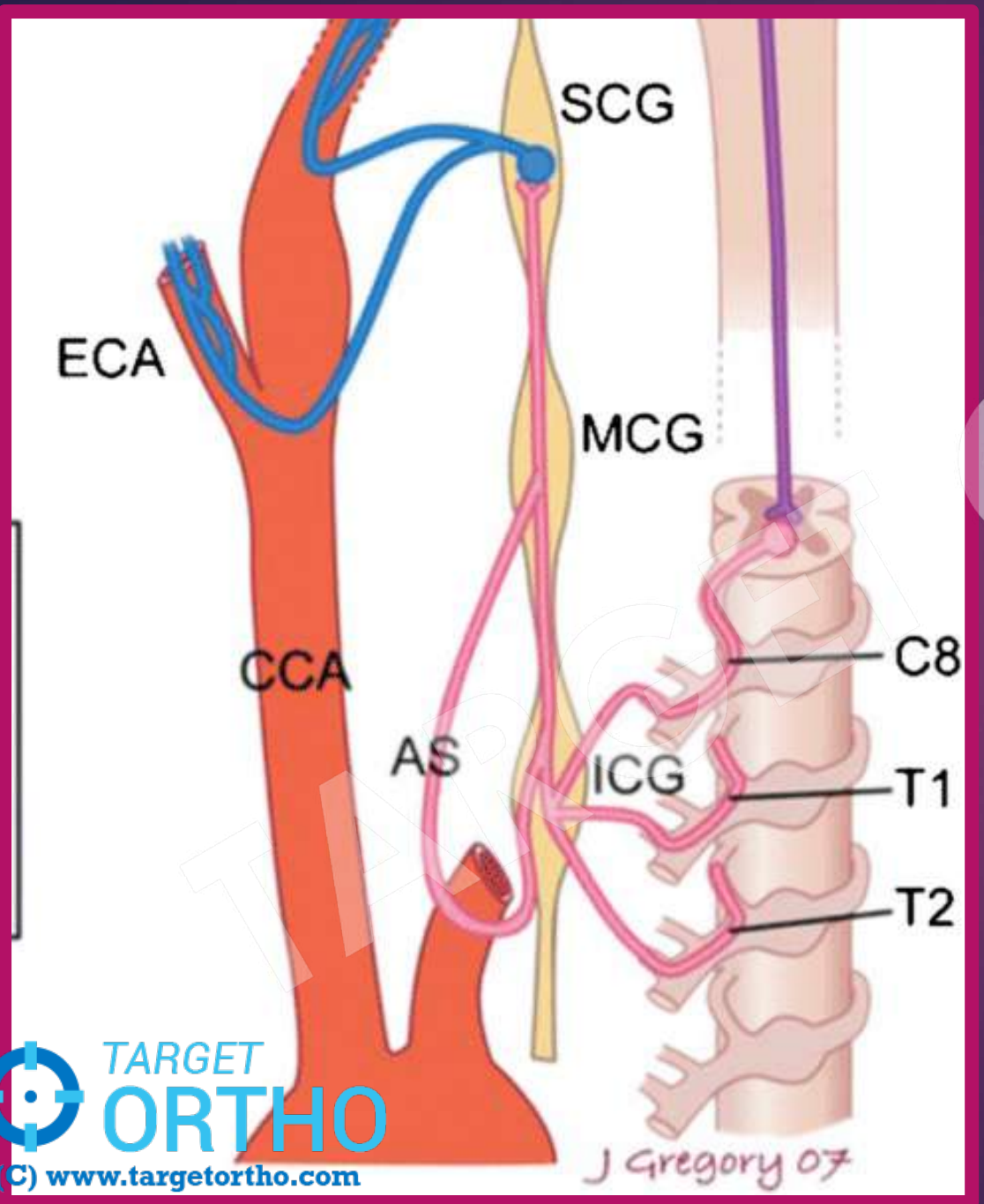
travels down the spin… …oracic levels,

then traverses the up… …veling with the carotid artery into th…

traversing the orbit to…

it also branches to in… …ction





- Second-order neurons originate in the ciliospinal center of Budge–Waller, a spinal nucleus extending from C8 to T2.
- Exit as paraspinal sympathetic plexus.
- Draping over the apex of the lung before
- Pass through the stellate ganglion and up the carotid sheath, synapsing in the superior cervical ganglion at the level of the carotid bifurcation.
- Pancoast tumor,
- Trauma,
- Cervical spine surgery or thyroid surgery, can be an iatrogenic cause

CLASSIFICATION: **NARAKAS** (anatomic plexus involvement)

- **C 5-6**
  - weakness of shoulder abductors,external rotators,elbow flexors and wrist extensors
- **C 5,6,7**
  - (Group1 + lack of elbow extension & weak shoulder adductors)
- **C 5,6,7,8 T1**
  - Panplexus lesions
- **C 5,6,7,8 T1 Horner's Syndrome**
  - Panplexus lesions with Horner

Table 5 Narakas Classification of Obstetrical Brachial Plexus Palsy

	Clinical picture	*Pathology grades (Sunderland 1951)*	*Recovery*
Type I	C5–C6	1 & 2	Complete or almost in 1–8 weeks
Type II	C5–C6	Mixed 2 & 3	Elbow flexion: 1–4 weeks Elbow extension: 1–8 weeks
	C7	Mixed 1 & 2	Limited shoulder: 6–30 weeks
Type III	C5–C6	4 or 5	Poor shoulder: 10–40 weeks Elbow flexion: 16–40 weeks
	C7	2 or 3	Elbow extension: 16–20 weeks Wrist: 40–60 weeks
	C8–T1 (No Horner's sign)	1	Hand complete: 1–3 weeks
Type IV	C5–C7	4 and/or 5	Poor shoulder: 10–40 weeks Elbow flexion: 16–40 weeks
	C8	Mixed 2–3	Elbow extension incomplete, poor: 20–60 weeks or nil
	T1 (Temporary Horner's sign)	1 and 2	Wrist: 40–60 weeks Hand complete: 20–60 weeks
Type V	C5–C7	5 or avulsed	Shoulder and elbow as above
	C7		
	C8	3 or avulsed	Wrist poor or only extension: poor flexion or none
	T1	2 and 3	
	C8–T1 (Horner's sign usually present)	Avulsed	Very poor hand with no or weak flexors and extensors; no intrinsics

Sick Kids Active Movement Scale (AMS)

Observation	Muscle grade
Gravity eliminated	
No contraction	0
Contraction, no motion	1
Motion ≤1/2 range	2
Motion >1/2 range	3
Full motion	4
Against gravity	
Motion ≤1/2 range	5
Motion >1/2 range	6
Full motion	7

CC Curtis, 2000; HSC Active movement scale

Infant

- **C 5-6** → Shoulder Dystocia
- **C 5,6,7** → Shoulder Dystocia, Wrist drop
- **C 5,6,7,8 T1** → Flail Limb
- **C 5,6,7,8 T1 Horner's Syndrome** → Flail Limb with Horners

Infant

- **C 5-6** → Shoulder Dystocia
- **C 5,6,7** → Shoulder Dystocia, Wrist drop

Recovery of Biceps
COOKIE TEST

- **C 5,6,7,8 T1** → Flail Limb
- **C 5,6,7,8 T1 Horner's Syndrome** → Flail Limb with Horners

Infant

- **C 5-6** → Shoulder Dystocia
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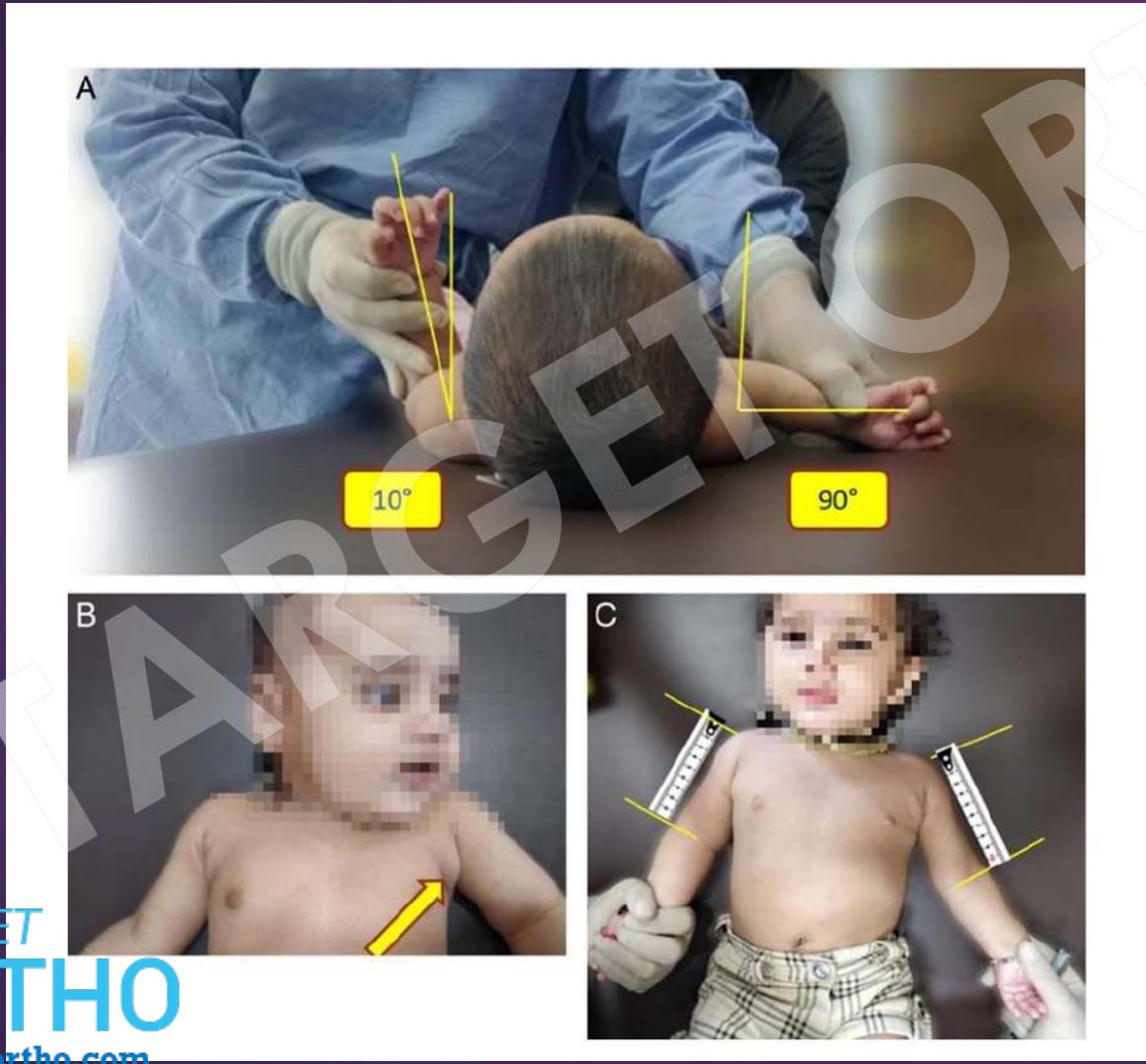
EARLY NERVE SURGERY

Cookie test

Signs of shoulder dislocation



Clinical diagnosis of infantile. Shoulder subluxation in BPBI
Shah et al
JPO 2023

TARGET ORTHO

TARGET
ORTHO

Exercise for Passive Stretch

- Shoulder : Abduction ER
- Elbow : Flexion Extension
- Forearm: Supination; Pronation
- Wrist: DF PF

POOR PROGNOSTIC INDICATORS

- Whole arm type (Erb-Duchenne-Klumpke)
- Horner's Sign
- Paralysis of phrenic nerve
- Lack of recovery of biceps by 3 months
- HSC AMS score < 35

NATURAL HISTORY

- Brachial plexus injury

↓

- Recovery phase
(Upto 9- 18 months of age)

↓

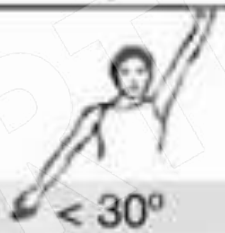
- Sequelae

Toddler/ Adolescent

- >1.5 Years

- Shoulder
- Elbow
- Forearm
- Wrist
- Finger, CMC

Shoulder

	1	2	3
Abduction			
	< 30°	30° a 90°	> 90°
External rotation			
	0°	< 20°	> 20°
Hand on back of neck			
	Impossible	Difficult	Easy
Hand on back			
	Impossible	S 1	T 12
Hand in mouth			
	Clarinet sign	Small clarinet	

Elbow

- Flexion Contractures

Forearm

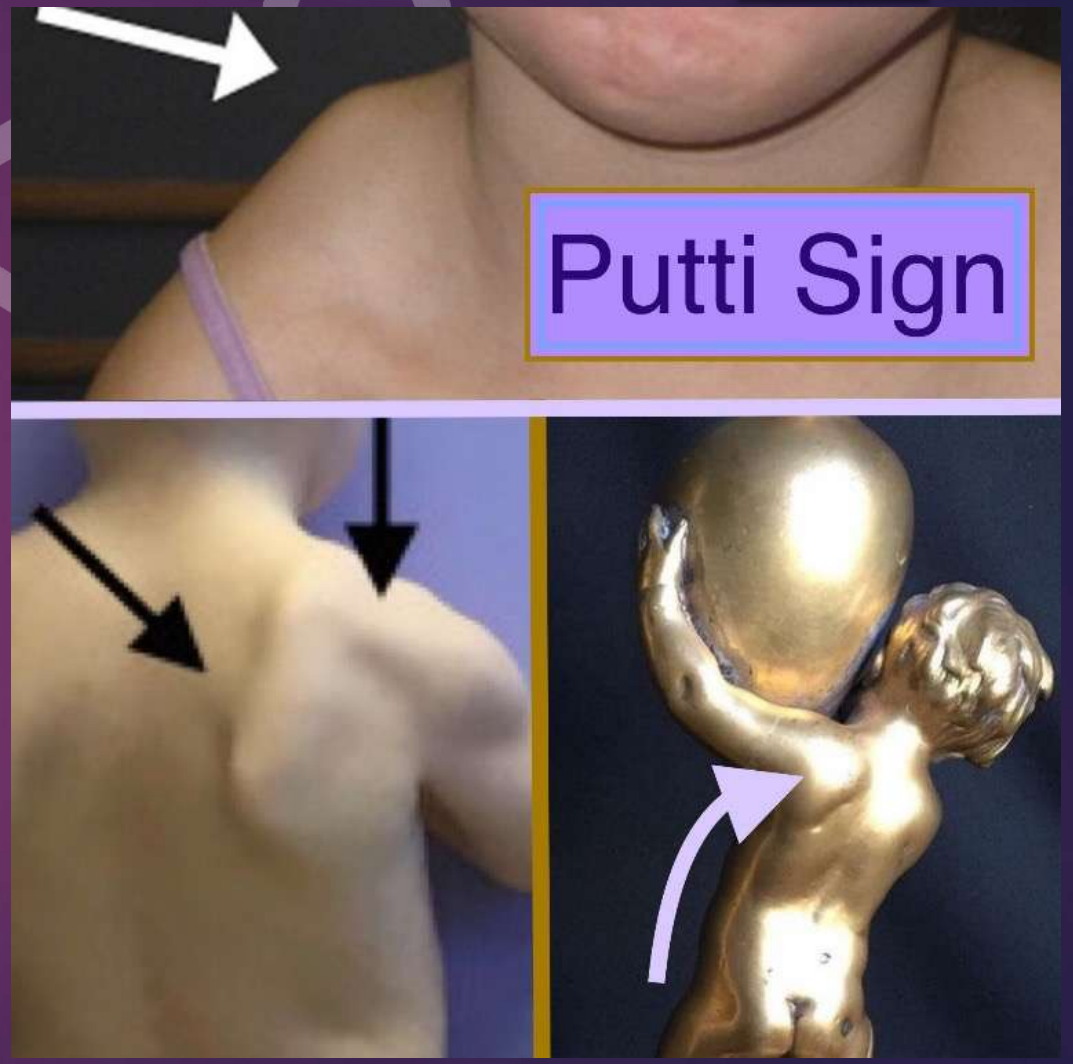
- Supination Contracture

Clinical case: **a** Pre- and **b** post-operative positions

Wrist

SIGNS IN OBPP

- **Putti Sign**
  - The superomedial angle of scapula elevates when passively rotating the shoulder in the direction opposite to that of the contracted muscle when the arm is in adduction.



Zancolli Sign

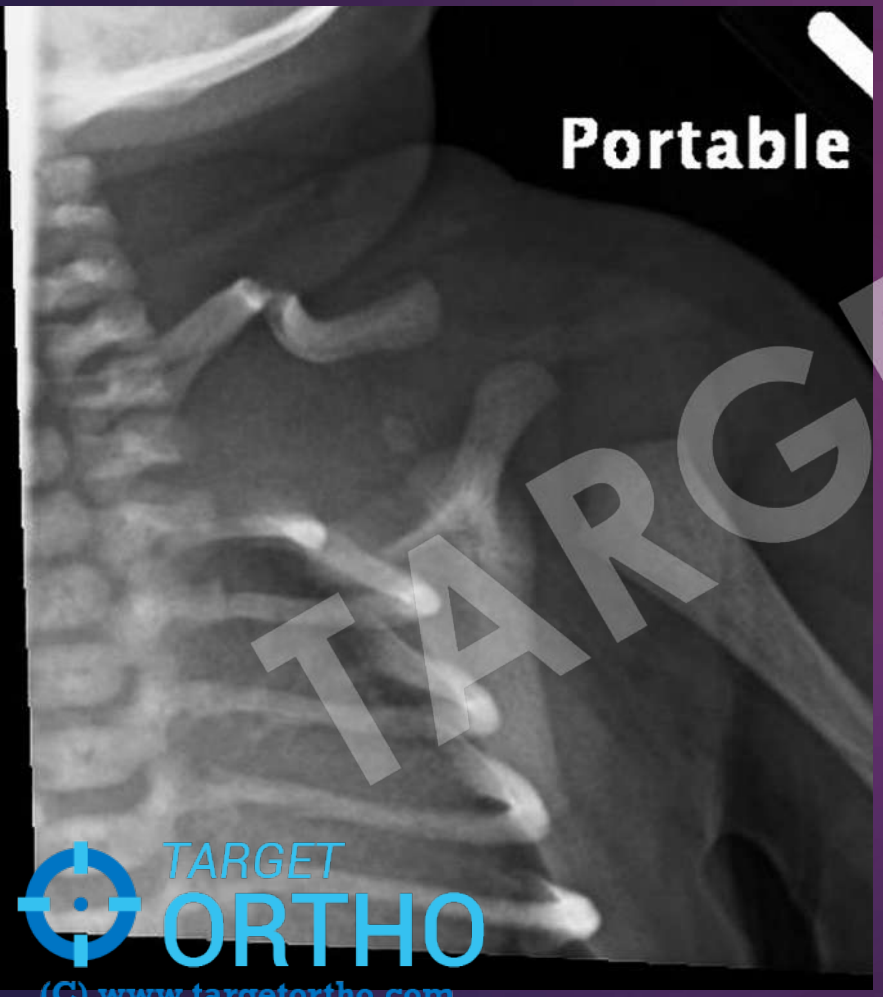
- When the hand of the patient is placed over the lumbar region the superomedial angle of the scapula is elevated
- Adduction and internal rotation of the shoulder
- Seen in abduction and external rotation contracture (Subgroup II A)

- **Trumpet sign**
  - When patient is asked to take his hand to his mouth his shoulder involuntarily abducts and elevates
  - Co-contraction between elbow flexors and shoulder abductors
  - If arm to body angle < 40°: mild cross innervation
  - If angle > 80° : sever cross innervation

Investigation

- Radiographs

Clavicle or humerus fractures



- Radiographs

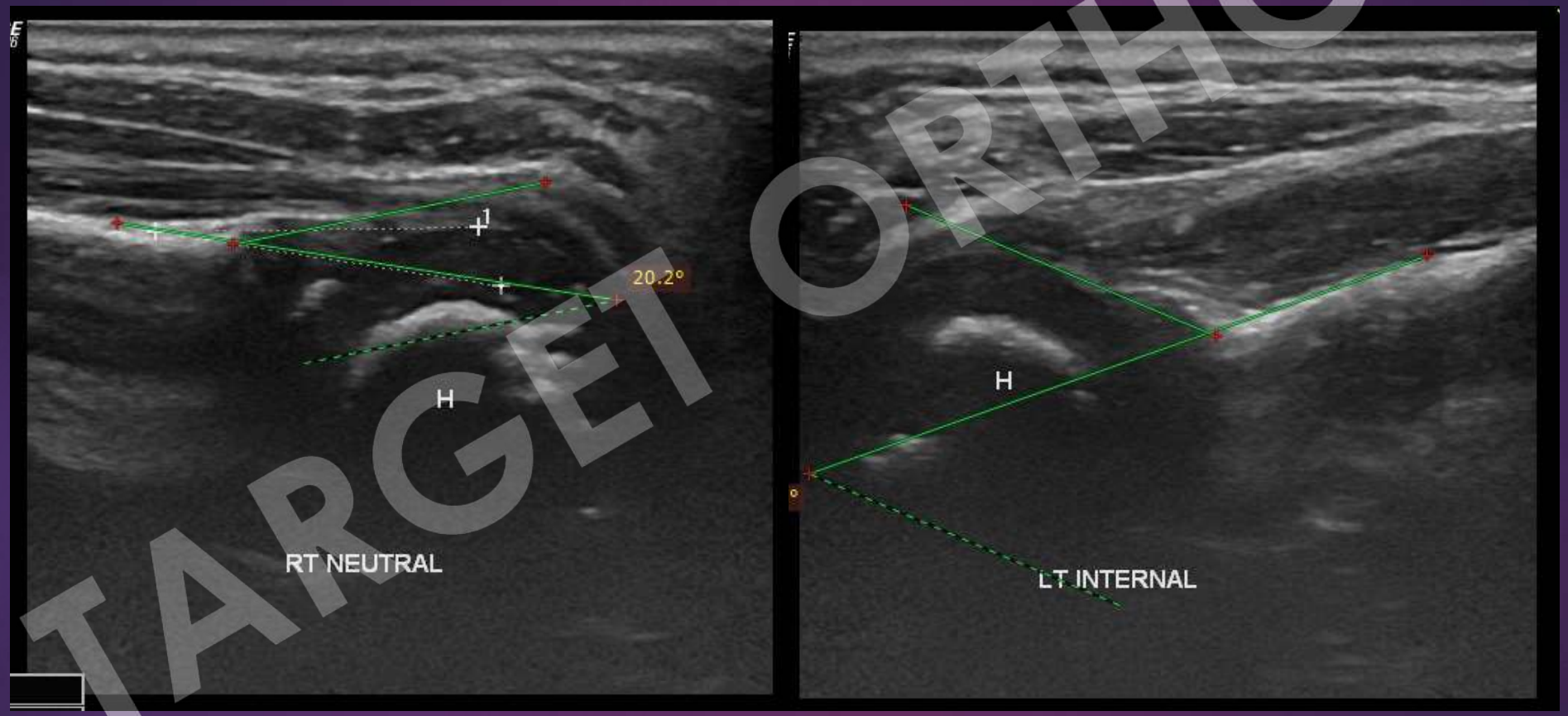
Diaphragm paralysis

- Ultrasound

To rule out infections in suspected cases

- Ultrasound

allows for assessment of joint subluxation or dislocation

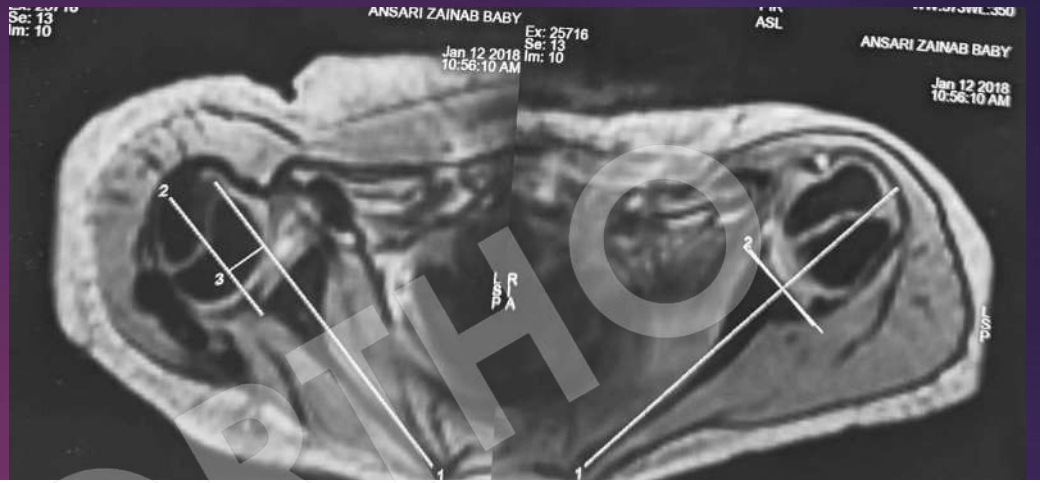


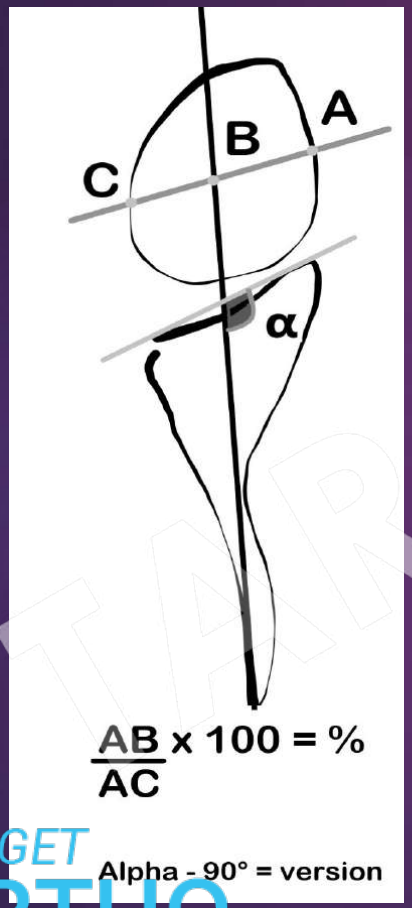
Adam D. Hunter
Kavka Franklin
Philip M. Hughes

The ultrasound diagnosis of posterior shoulder dislocation associated with Erb's palsy

MRI

MRI/CT Axial imaging

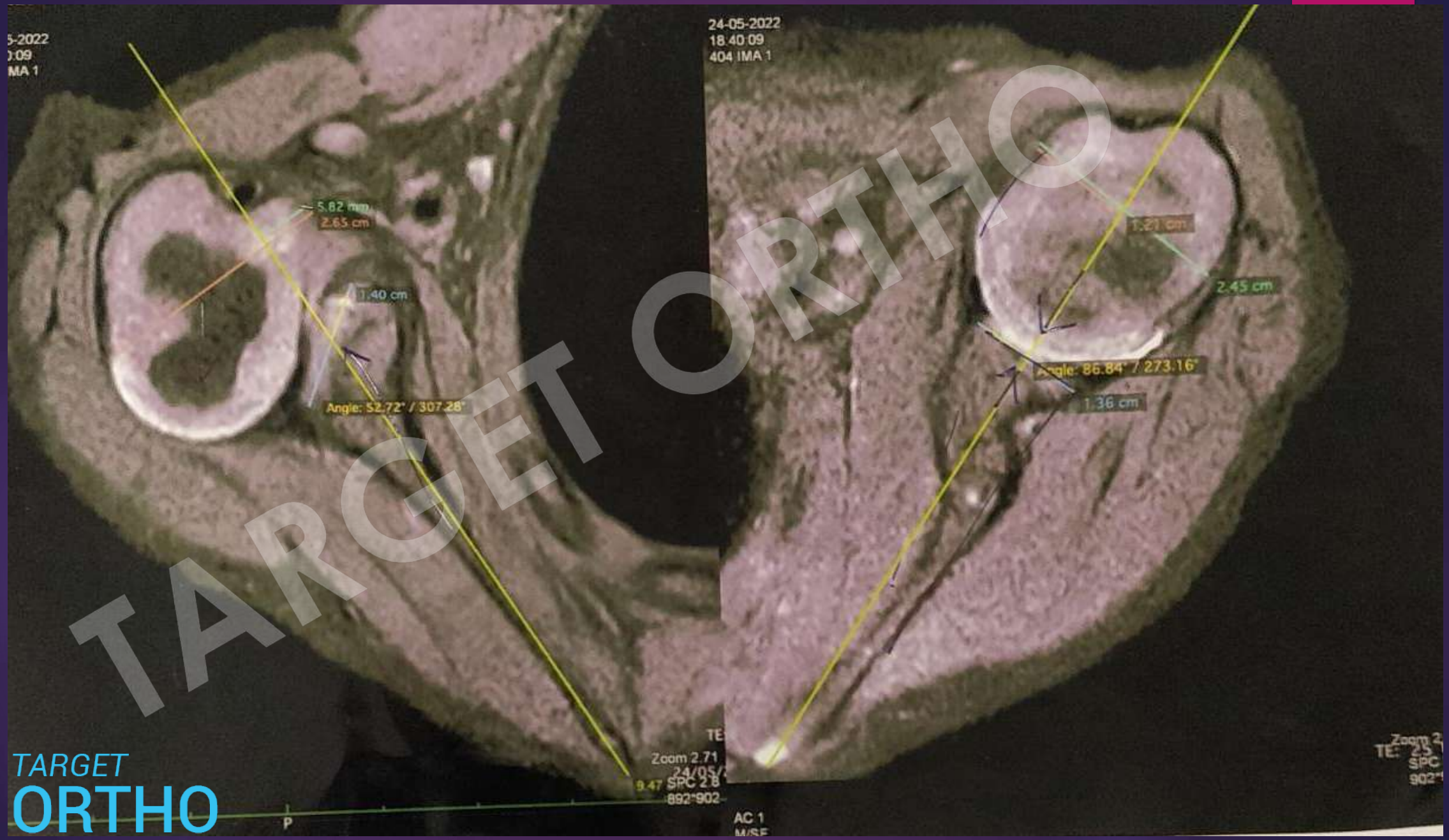




Glenoid assessment deformity criteria according to Waters et al.

CLASSIFICATION	DESCRIPTION
Type I (normal)	Less than a 5-degree difference in retroversion compared with that on the normal, contralateral side
Type II (minimum deformity)	More than a 5-degree difference in retroversion compared with that on the normal side, with no posterior subluxation of the humeral head
Type III (moderate deformity)	Posterior subluxation of the humeral head, defined as less than 35 per cent of the head anterior to the bisecting line
Type IV (severe deformity)	False glenoid
Type V	Severe flattening of the humeral head and glenoid, with progressive or complete posterior dislocation of the head
Type VI	Dislocation of the glenohumeral joint in infancy
Type VII	Growth arrest of the proximal aspect of the humerus

Waters T et al. (1998) J. Bone Joint Surg. Am 98: 669



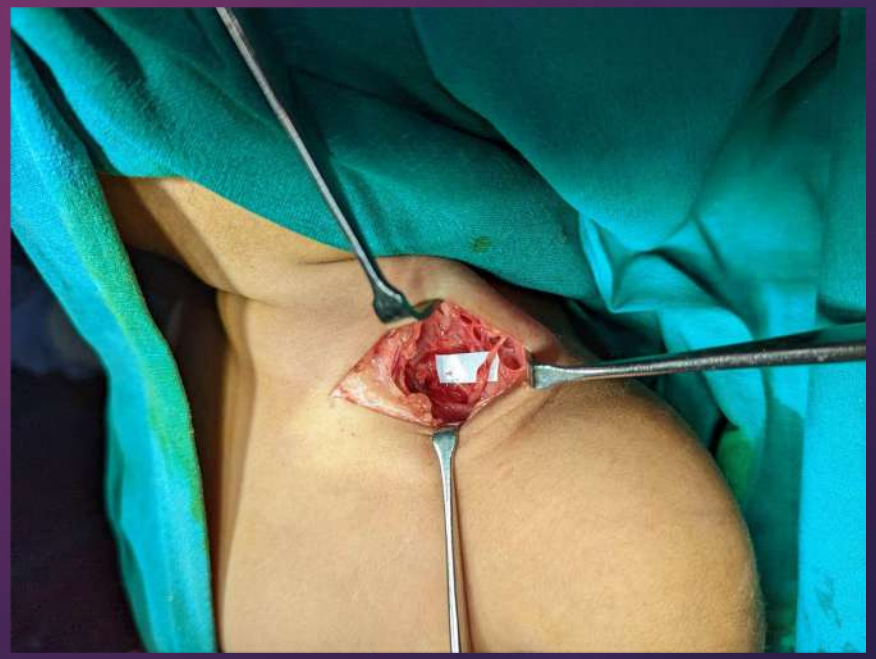
EMG/NCS study

- By a specialist
- To know level of affection, Cocontractions and recovery if any.

TREATMENT

BRACHIAL PLEXUS EXPLORATION

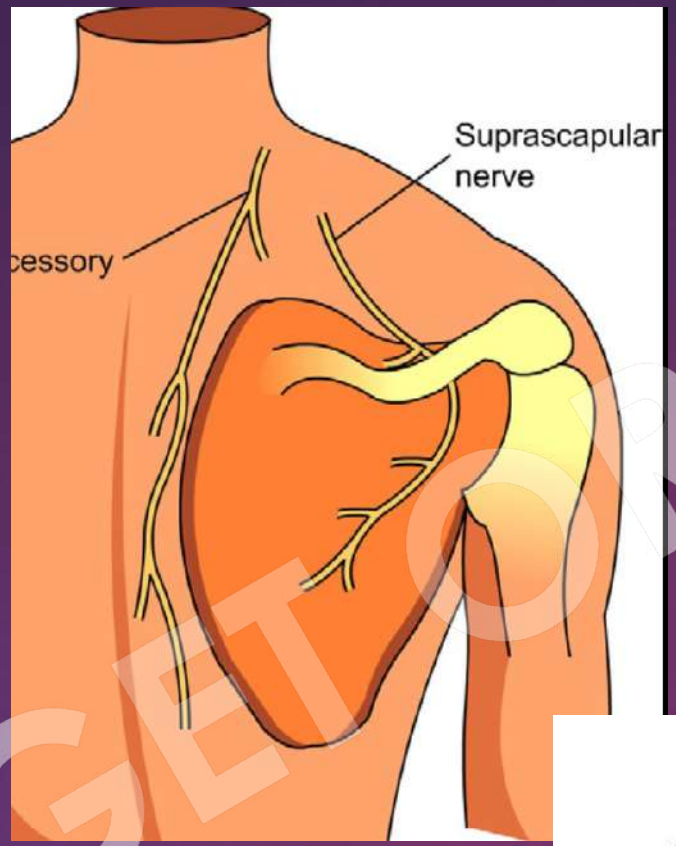
- Between 4-6 months
- Indications
  - Absence of biceps recovery by 3-9 months of age
  - Total plexopathy with Horners syndrome

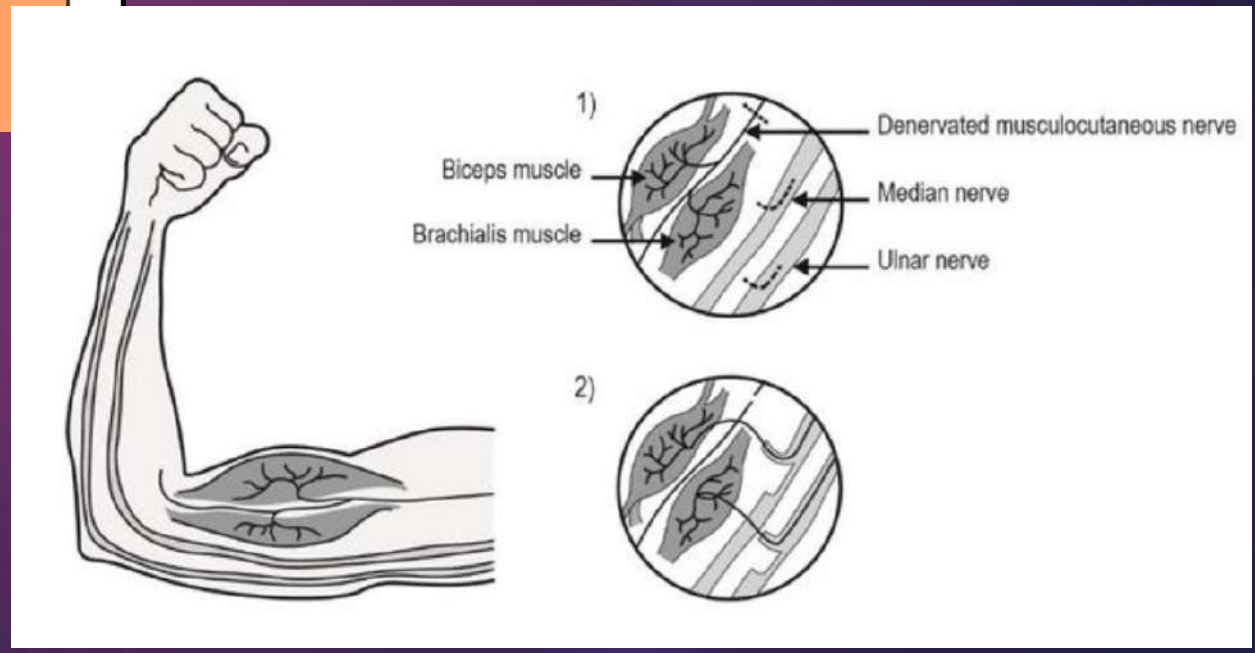


Transfers:

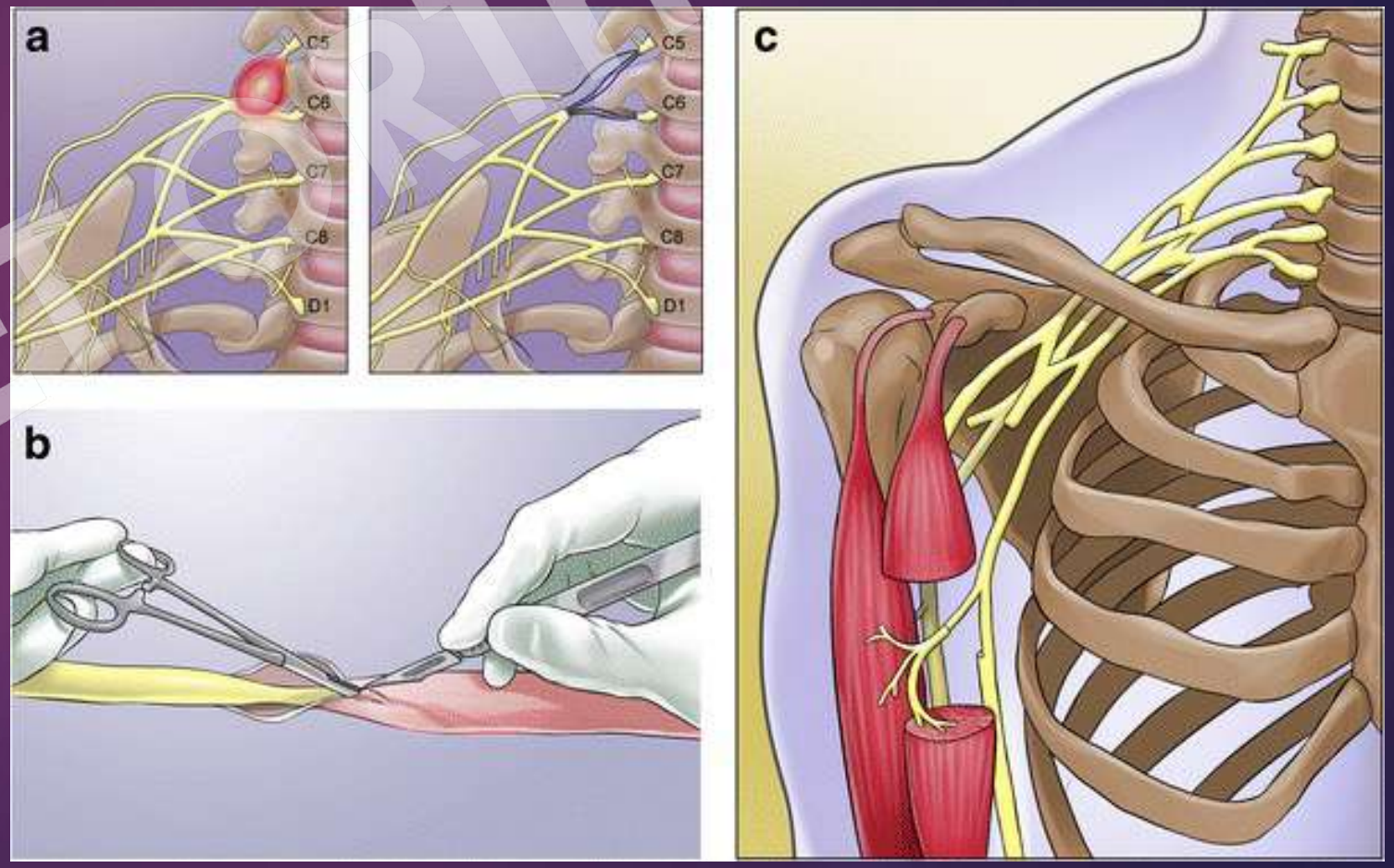
Distal nerve transfer:

- Oberlin;
- SAN to Suprascapular





Nerve Grafting



- **LATER TREATMENT**
  - If motor recovery is not adequate to maintain muscle balance
    - early contracture release
    - Muscle transfer to external rotators

RESIDUAL DEFORMITIES

- RESIDUAL DEFORMITIES OF THE SHOULDER HAVE BEEN CLASSIFIED BY ZANCOLLI INTO SEVERAL TYPES

CLASSIFICATION OF SHOULDER SEQUELAE IN TYPE I

Group	Sub Group	Joint congruency	Muscle Contracture	Scapular Elevation Sign	Presentation Sequelae types
I – Shoulder contracture (82%)	1. Internal rotation adduction contracture	IA-with JC IB-without JC	Subscapularis and teres major. Latissimus dorsi. Pectoralis major	Positive in Abd, ER	I-II-III-IV
	2. External rotation abduction contracture	2A-with JC 2B-without JC	Intraspinatus and teres minor	Positive in ADD-IR (Zancolli sign)	I-II-III-IV

Group	Sub Group	Joint congruency	Muscle Contracture	Scapular Elevation Sign	Presentation Sequelae types
I – Shoulder contracture (82%)	3. Internal external rotation contracture		Muscles involved in subgroups 1 and 2 above	Positive in ADD-IR and ADD-ER	I-II-III-IV
	4. Abduction contracture		Supraspinatus	Positive in ADD	I

Group	Sub Group	Joint congruency	Muscle Contracture	Scapular Elevation Sign	Presentation Sequelae types
I – Shoulder contracture (82%)	5. Very weak abduction (less than 30° active)		a..External rotation contracture b. Internal rotation contracture + external rotation paralysis	Positive in ADD-IR and ADD-ER	I-II-III-IV
II- Flaccid paralysis			No	Negative	I-II

Outcome in Adolescents

MANAGEMENT

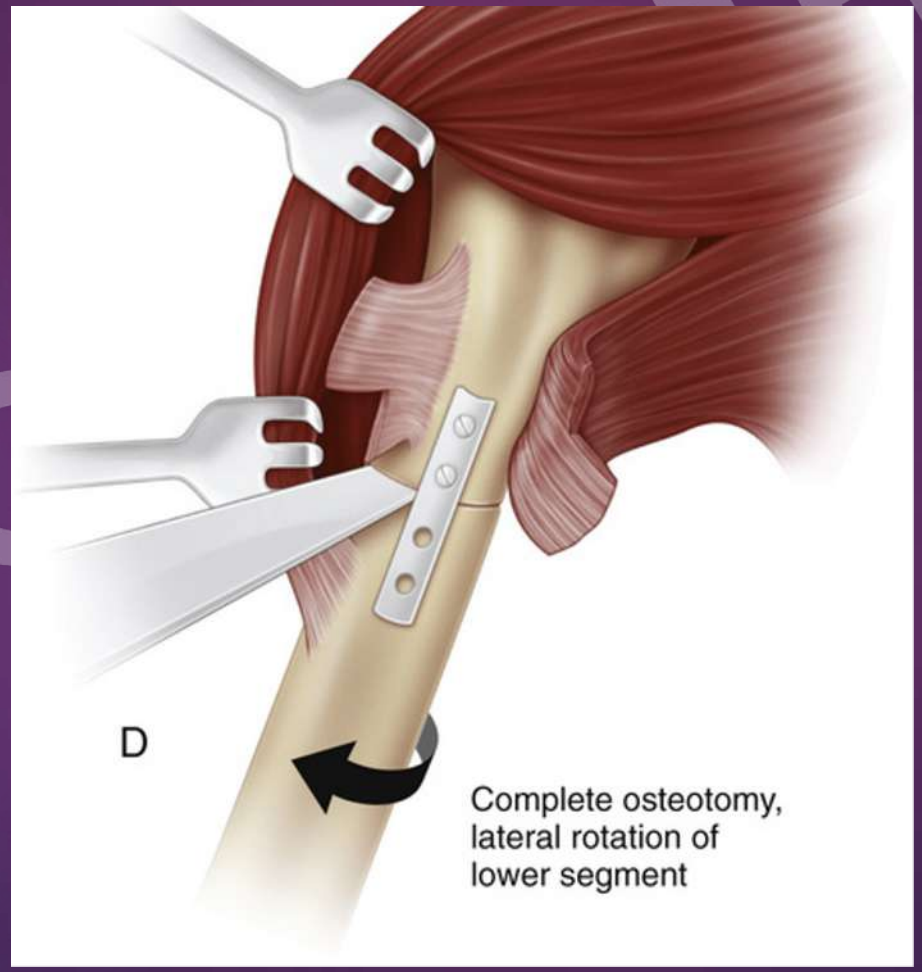
- **Selection of the shoulder procedure depends on**
  - congruency of the shoulder
  - Residual plasticity
  - Strength of the active muscles
  - Condition of the hand
- **If the joint is congruous, plastic with remodeling potential- soft tissue procedures are indicated**
- **If bony deformity has occurred – bony procedures limited to changing the position of the limb to improve appearance or function**

Operations for Internal rotation& adduction contracture..

- Fairbank- release of tight subscapularis, upper portion of pectoralis major & ant capsule of shoulder
- L'Episcopo – lengthening of adductors+transfer of Teres major to an external rotator position
- Procedures by Zancolli,Ingram,Hoffer,Carlioz and Brahmi, Shah et al …

- Bony procedures

Rotational osteotomy are done in the presence of joint deformity



ELBOW RESIDUAL DEFORMITIES

- Commonly in elbow ,flexion contracture is seen
- Muscle imbalance with flexor overpull + joint deformity makes flexion contracture difficult to treat
- Diligent night time splinting decreases the deformity
- Ant dislocation of the radial head seen in plexopathy that involves C7,C8 to a greater degree than C5-C6
- Attempts to stretch out shortened biceps and contracted joint may result in ant dislocation of radial head

FOREARM DEFORMITIES

- Position of neutral to slight pronation is preferable
- Unacceptable pronation –corrected by lengthening or rerouting the pronator teres
- Unacceptable supination (passive pronation present)- addressed by Zancolli's technique-Z lengthening & rerouting the biceps tendon
- Bony torsional deformity-corrected by rotational osteotomy

WRIST DEFORMITIES

- **Tendon transfers**
- wrist drop
- pronator teres to ECRB
- loss of finger extension
- FCR or FCU to EDC 2-5
- thumb abduction
- EIP to abductor pollicis brevis

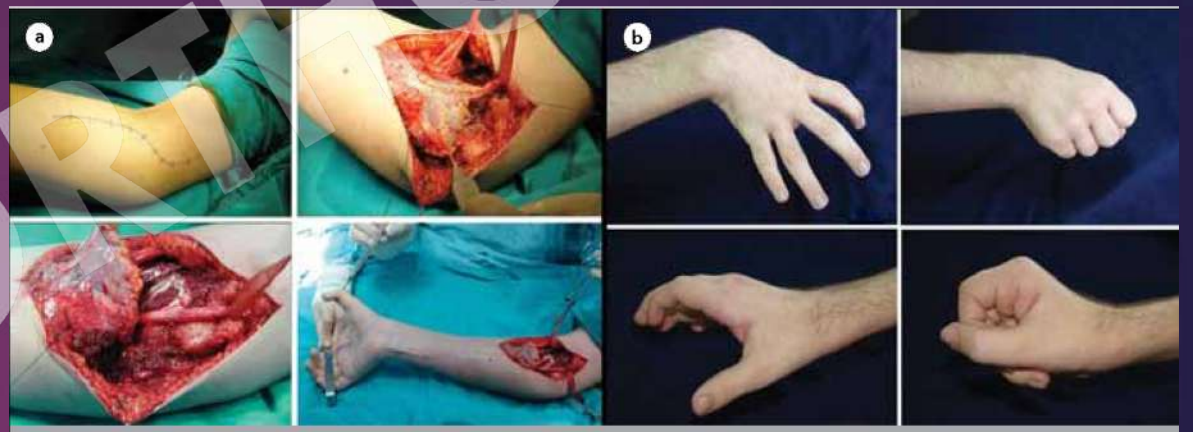


Figure 7. a. Flexor/Pronator Slide: Surgical technique b)Flexor/Pronator Slide: Sample Case: Preoperative (upper row) and postoperative (lower row) views of a patient with spasticity in the wrist and fingers

Figure 8. Green transfer: The FCU tendon is exposed with an incision on the volar ulnar side of the distal forearm. The FCU tendon is released from insertion on the pisiform bone. The ECRB and ECRL tendons are exposed with a second incision on the dorsal aspect of the wrist. A subcutaneous

THANK YOU