



# *Brachial Plexus Injury*

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# History

- A somatic nerve plexus formed by inter-communications among the ventral rami (roots) of the lower 4 cervical nerves (C5-C8) and the first thoracic nerve (T1).
- The plexus is responsible for the motor innervation of all of the muscles of the upper extremity, with the exception of the trapezius and levator scapula.

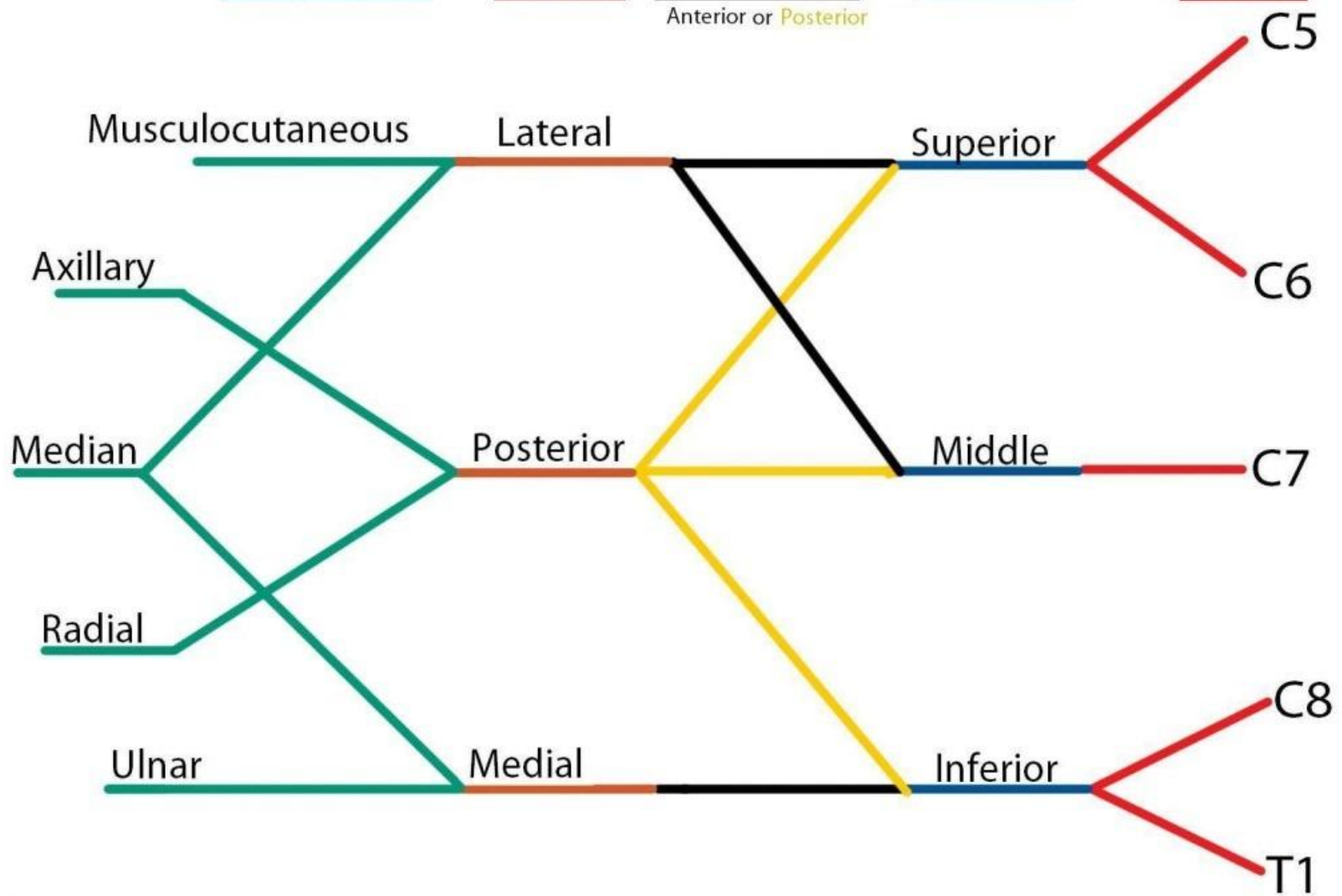
Branches

Cords

Divisions  
Anterior or Posterior

Trunks

Roots



- A prefixed brachial plexus (cephalic or high) occurs when the C4 ventral ramus contributes to the brachial plexus; contributions to the plexus usually come from the C4-C8.
- A post fixed brachial plexus (caudal or low) occurs when the T2 ventral ramus contributes to the brachial plexus; contributions to the plexus usually come from C6-T2.

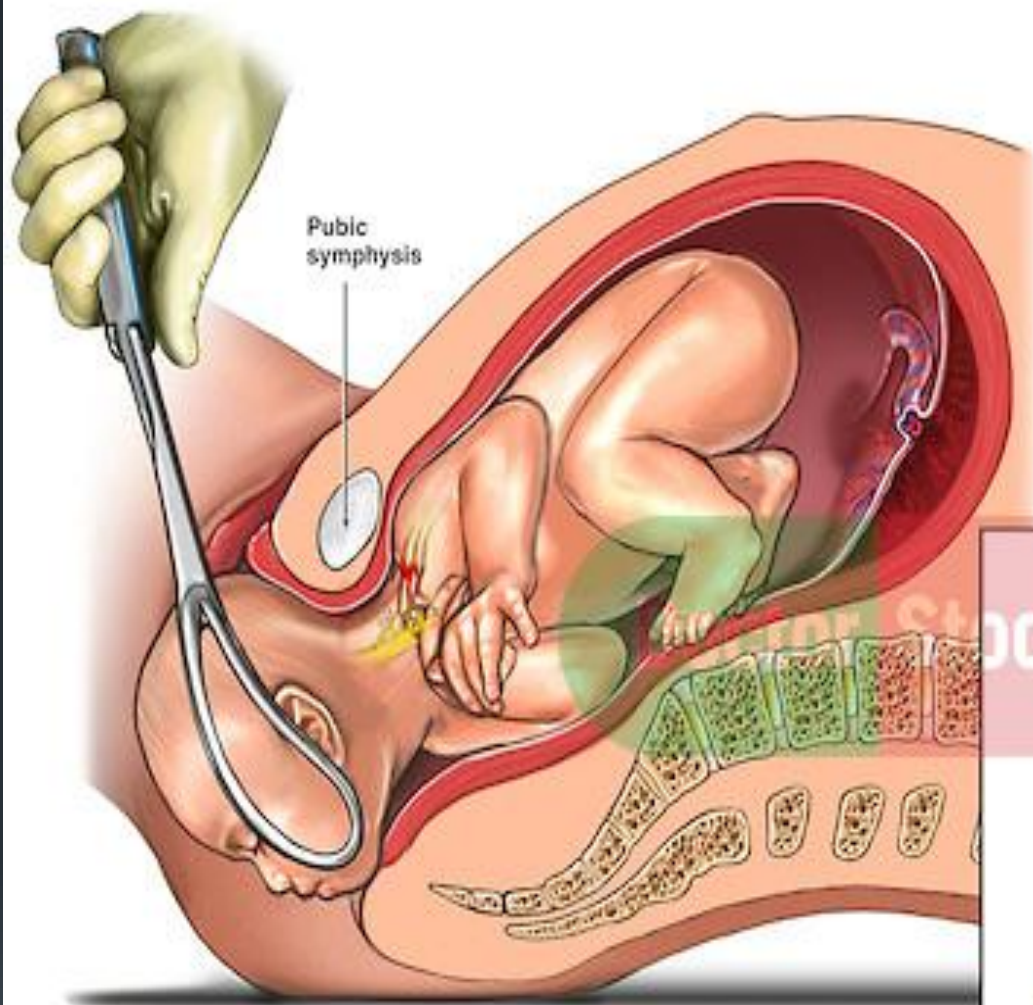
# Definition



- Obstetric brachial plexus injury (OBPI) causes partial or total paralysis of the upper limb because of trauma to the brachial plexus during delivery

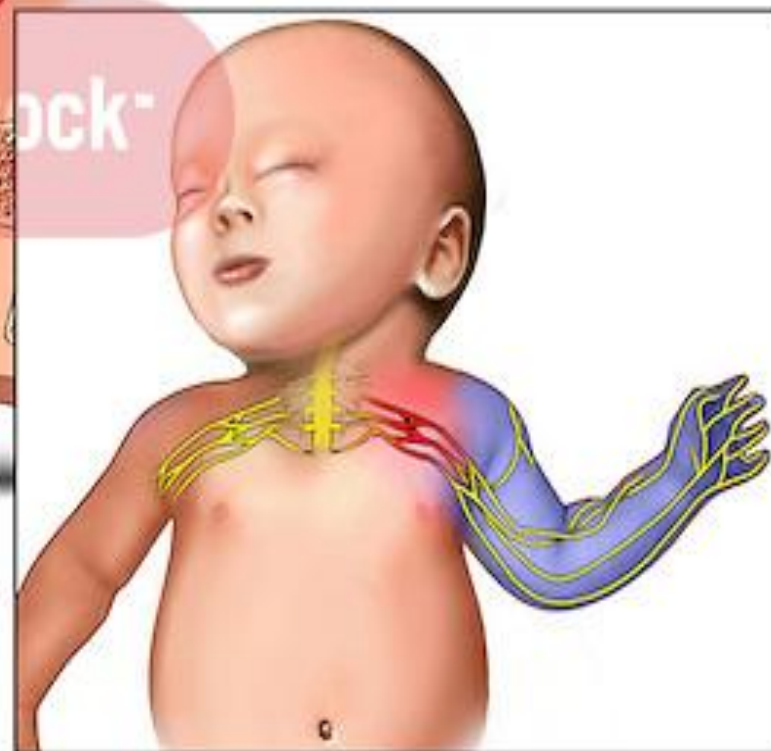
# Path-physiology

- stretched in utero or in the descent of the fetus



The baby is presenting in the birth canal with the aid of forceps. The left shoulder of the infant is trapped behind the mother's pubic symphysis. The brachial plexus is stretched and damaged (dystocia).

The damage to the brachial plexus in the left shoulder causes deinnervation of the newborn infant's left arm.



# Risk factor

- Large birth weight
- Maternal diabetes
- Second stage of labor that lasts more than 60 minutes
- Assisted delivery (e.g., use of mid/low forceps, vacuum extraction)
- Forceful downward traction on the head during delivery
- Intrauterine torticollis
- Shoulder dystocia



# Types of nerve lesions:

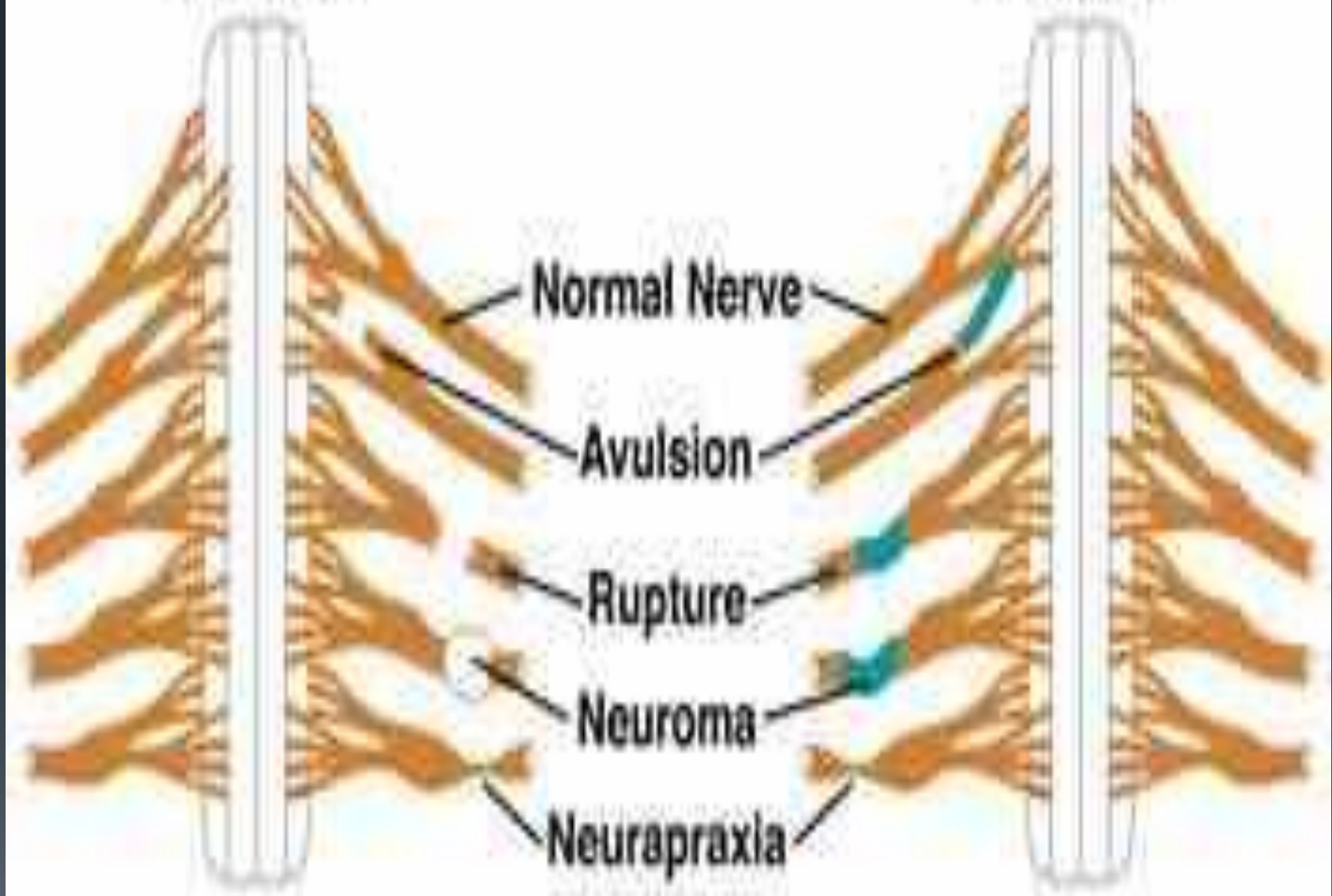
- Neuropraxia
- Axenotmesis
- Neurotmesis

Table 1. Adaptation of Seddon's Classification of Nerve Injury<sup>4</sup>

	<b>Neuropraxia</b>	<b>Axonotmesis</b>	<b>Neurotmesis</b>
<b>Motor loss</b>	Complete	Complete	Complete
<b>Sensory loss</b>	Partial sparing	Complete	Complete
<b>Autonomic function</b>	Spared	Absent	Absent
<b>Nerve conduction distal to injury</b>	Present	Absent	Absent
<b>Fibrillation on EMG*</b>	Absent	Present	Present
<b>Recovery</b>	Rapid, Complete	1mm per day, good	1mm per day, always incomplete

# Injuries

# Repairs



# Type according to injury occurrence

- Upper trunk lesion C5,C6 (Erb's palsy) will hold the affected upper extremity internally rotated at the shoulder, pronated at the forearm, and flexed at the wrist.
- This classic posture is often referred to as a "waiter's tip hand."
- The involved upper extremity will have decreased spontaneous movement and the Moro reflex will be absent,

- This type commonly occur during difficult labor due to over weight of baby mostly in mother who had D.M during pregnancy

# Clinical features : ASYMMETRICAL

1. Sensory loss (coin shape ) upper , lateral
2. Biceps reflex absent or decreased
3. Grasp reflex > present
4. Moro reflex > asymmetrical
5. Winging scapula
6. Diaphragmatic paralysis ???
7. cyanosis at birth

# Affected muscle

shoulder	Elbow	Radio-ulnar	Wrist	Finger
Abduction	flexor	supinator	extension	extension
Flexion				
E.R				

# Tight muscle

Shoulder	Elbow	Radio-ulnar	Wrist	Finger
Adduction	Extension	Pronator	Flexor	Flexor
Extension				
I.R				

*the lower trunk ( Klumpke)* C8, T1 is involved

1. absent grasp reflex, the hand may be held in an intrinsic minus position
2. involved extremity may have a flaccid paralysis.
3. Respiratory distress may also be seen when there is an associated injury to the phrenic nerve, although this is rare.
4. The child may also present with a Horner's syndrome if there has been injury to the sympathetic chain.

Anatomically the sympathetic chain lies in close proximity to the lowest roots of the brachial plexus, making it susceptible to injury.

- The clinical triad of Horner's syndrome consists of miosis, ptosis, and anhydrosis. The upper eyelid ptosis is most readily detected





**177** Erb's palsy.



**178** Klumpke palsy.

- Whole has winged scapula indicates injury to the long thoracic nerve (C5, C6, and C7). Injury to the C7 root in isolation may result in an elbow-flexed posture

## ■ **Associated injuries**

- The pediatrician must perform a careful examination of the infant to look for associated injuries.
- The most common associated (not causative) injuries include the following:
  - Clavicular and humeral fractures
  - Torticollis
  - Cephalohematoma
  - Facial nerve palsy
  - Diaphragmatic paralysis

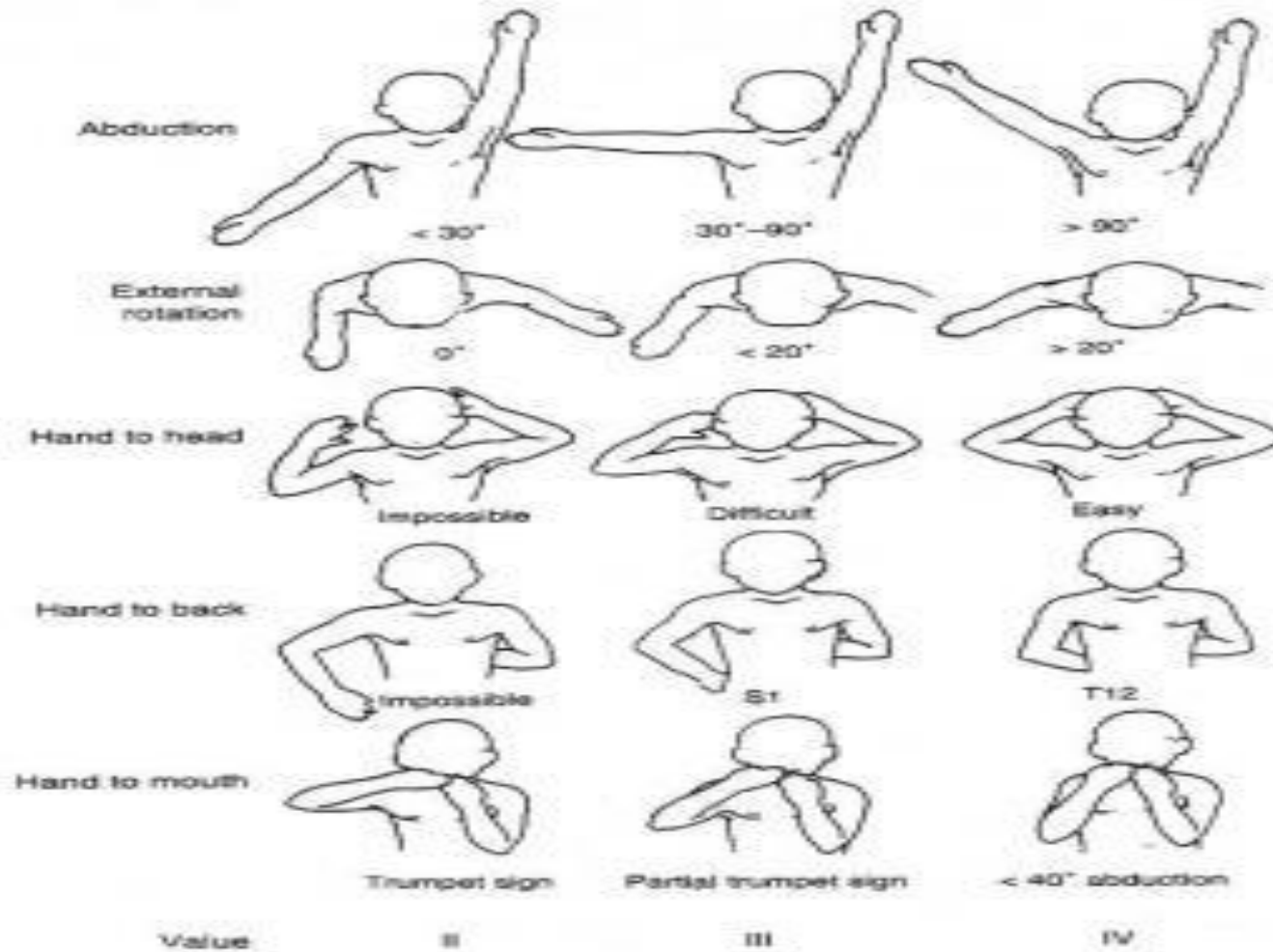
# Diagnosis

- Electrophysiological evaluation Electromyography (EMG): and nerve conduction velocity
- The clinical evaluation; children are first evaluated between birth and 6 weeks of age with a physical therapist starting at 3 - 4 weeks ,then at 6 weeks of age.
- Follow-up evaluations occur at three-month intervals

Motor evaluation by

1. Medical Research Council scale,
2. The Active Movement Scale,
3. Mallet scale are other commonly
4. Research Council Grading System
5. functional muscle group activities
6. Sensory and reflex examinations.

# Mallet classification



# Active muscle scale

With gravity elimination

0=No contraction

1=Contraction no motion

2=<50% of motion

3=.50% of motion

4=Full motion

With gravity

5=<50% of motion

6=>50% of motion

7=Full rang

# Management



- The majority of patients with brachial plexus palsy at birth will recover from neurologic deficit.
- Those who do not recover during 3-6month period will require surgical intervention.


# Evaluation

- History (obstructed, personal, medical history, investigation, family history).
- Informal evaluation (breathing, has Horner syndrome).
- Comparison bet 2 hand (edema, scar, movement, muscle wasting).
- Posture assessment



# Physical evaluation

- Formal evaluation:
- muscle test if  $<3$  y uses functional test (complete function, sub or zero), on other hand if child  $>3$  use the MT
- Muscles tone.
- Range of motion (flexibility test) for all the joint include shoulder internal rotators (subscapularis), pronator and wrist and finger flexors.
- Reflex testing according the age of the infant (e.g. Moro reflex, placing reaction, neck righting reaction and grasp reflex).
- Sensory test to detect any sensory disturbance, which interferes with the treatment progress.

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- Activities of daily living (feeding, washing and grooming) with the affected extremity.
  - Muscle tightness
  - Long drawling measurement
  - Round measurement


# PT . Treatment


- Massage effleurage ( longitudinal and transverse)

And spiral do for 5 min or hyperemia

Aim of it:

- Improve circulation
- Decrease the skin resistance

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- Electrical stimulation
  - Facilitation to stimulate the joint capsule and muscle contraction
    1. Approximation
    2. Taping
    3. Squeezing
    4. Quick stretch
    5. brief ice application

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- Stretch
  - Use the bio-feed back to increase the muscle strength and facilitate , when child has 6 y
  - Tonic vibrate if the frequency = 30-50 it is inhibitor but if it bet to 80 -120 that is facilitate
  - Hand function exercise
  - Weight bearing exercise
  - Extensor thrust
  - Posture correction



**THANKS**