

Tendon Transfer Around the Shoulder in Obstetric Brachial Plexus Paralysis

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Introduction

The three main causes of shoulder deformity due to obstetric brachial plexus palsy are Cross innervations (caused by misdirection of regenerated axons), muscular imbalance (caused by muscle paresis or earlier recovery), and growth.

Muscle Co-contraction may occur over the whole extremity with the most frequent being deltoid / teres major, deltoid / biceps and biceps / triceps.

The main types of Co-contractions between shoulder abductors (supraspinatus, infraspinatus, and deltoid) and adductors (mainly, pectoralis major and teres major). This will result in limitation of shoulder elevation, and shoulder adduction contracture (or internal rotation).

The most suitable age for brachial plexus injuries tendons transfer ranged between two to four years. However we observed missed cases that have not operated at the suitable age and presented above the age of four Years.

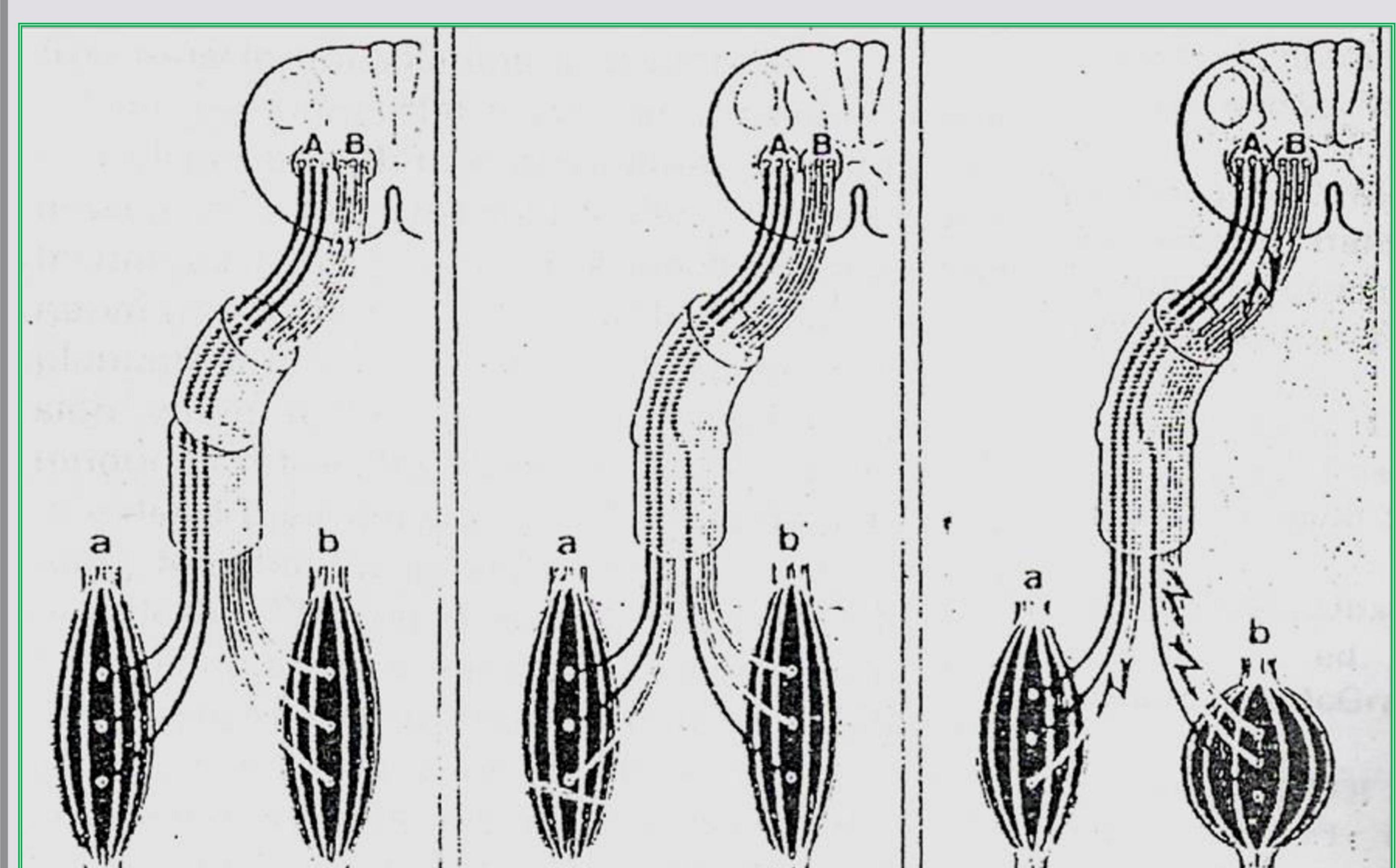


Fig. 1

Pathophysiology of muscle co-contraction after regeneration of brachial plexus injuries (from Schliack and Memmenthaler 1987.)

Purpose

The purpose of this study was to determine whether or not tendon transfer for pediatric brachial plexus injuries could be performed in children above the age of 4 years.

Method

Between December 2008 and October 2012, twelve Patient with age range between (4 -7) years who suffered from brachial plexus injuries and managed by tendons transfer were included in this study.

Initial clinical assessment revealed loss of shoulder external rotation and abduction. Radiological evaluation of the glenohumeral joint for containment and deformity was also performed pre-operatively.

Preoperative evaluation

CT scan to assess degree of glenohumeral joint deformity (fig 3)

Indications

- Internal rotation contracture,
- External rotation weakness of the shoulder
- Minimal glenohumeral deformity
- Functional impairment above the shoulder in external rotation



Fig. 2A

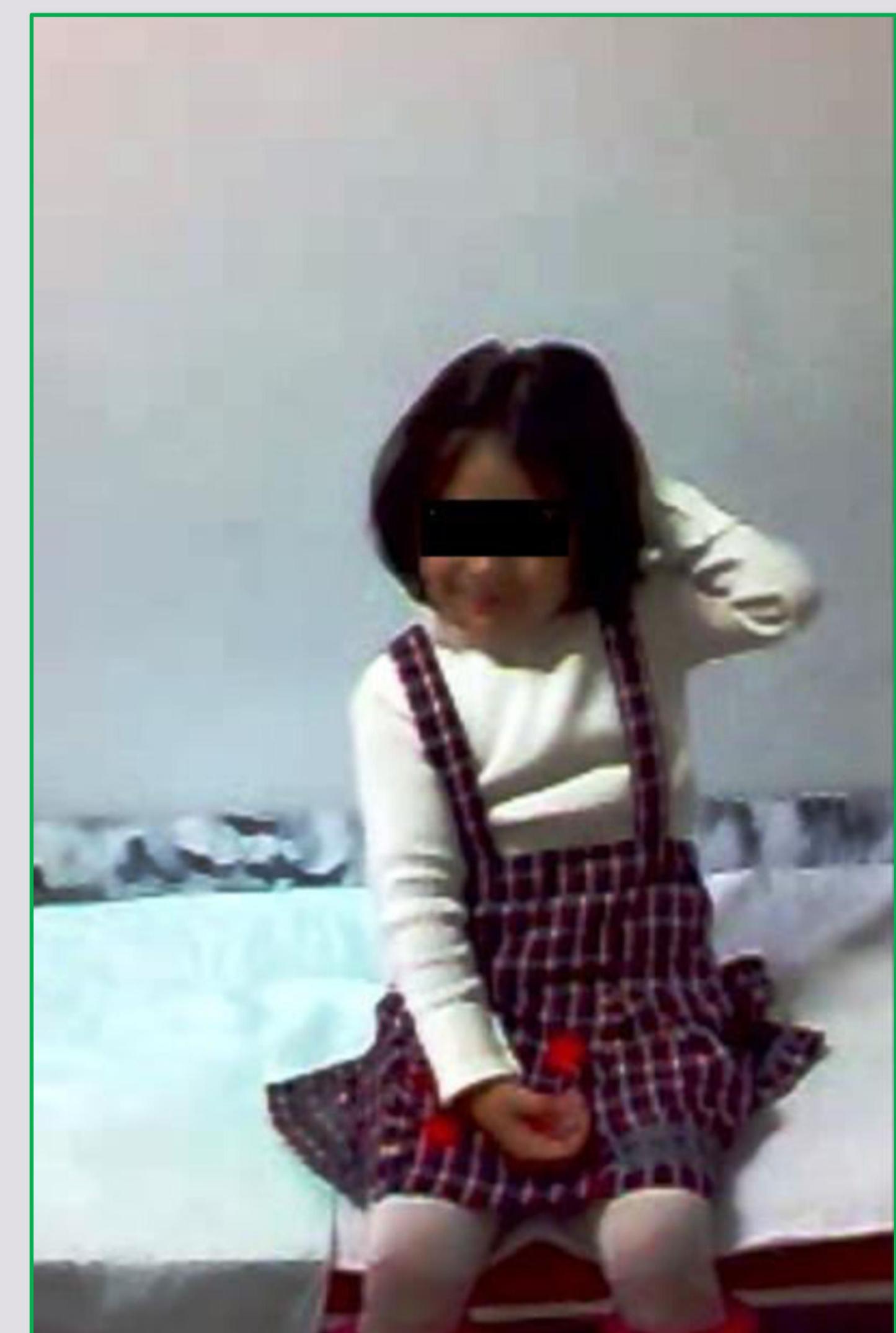


Fig. 2B

Four year old patient with obstetric plexus injuries.

Fig 2A: preoperative evaluation with limited external rotation.
Fig 2B: Three months with improved external rotation post latissimus dorsi tendon transfer.

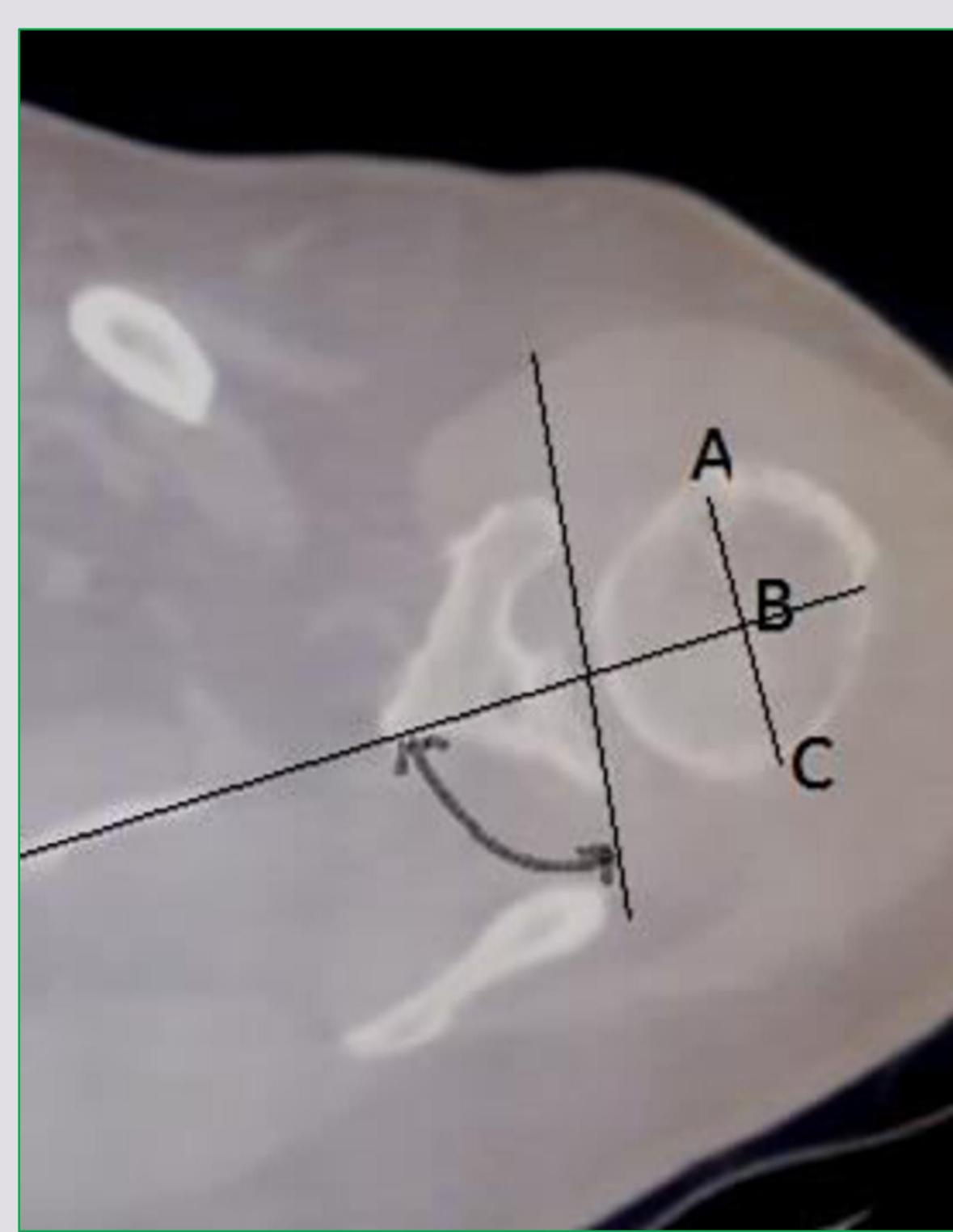
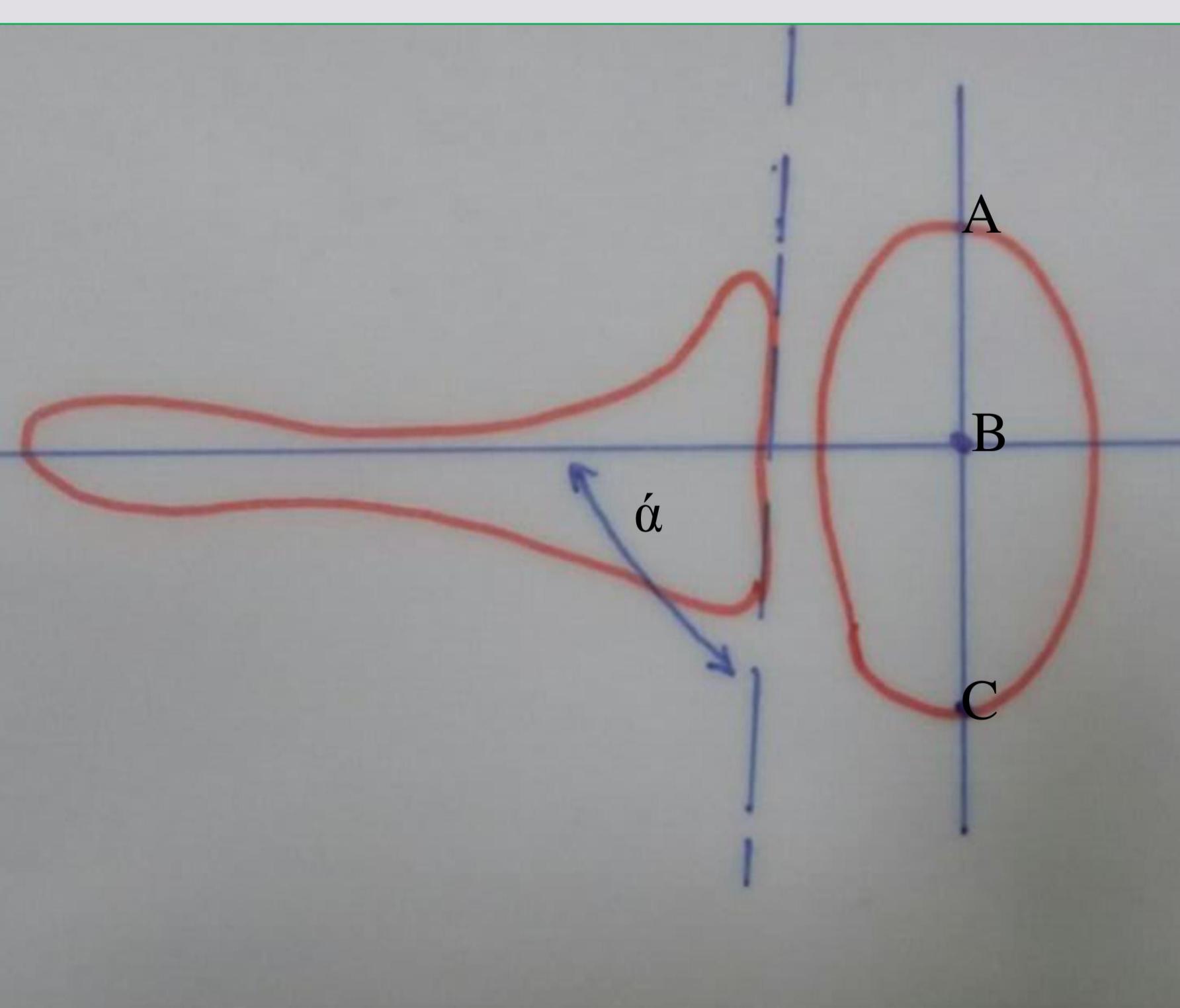


Fig. 3B

Fig 3 A&B showed method of preoperative planning in CT scan.
 α angle normally more than 78 degree , tendon transfer indicated if α angle ranged between (78 to 90 degree)



Fig. 4A



Fig. 4B

seven year old patient with obstetric plexus injuries.

Fig 4A: preoperative evaluation with limited abduction.
Fig 4B: Three months with improved abduction post tres major tendon transfer.

Operative technique

Incisions: Axillary anterior lengthening, Posterior tendon transfers.

Use anterior musculotendinous lengthening of pectoralis major for adduction and internal rotation contracture with palpable intraoperative tightness

- Use posterior exposure and release of conjoint latissimus dorsi and teres major tendons.

- Mobilize latissimus and teres while protecting neurovascular pedicle.

- Expose rotator cuff insertion in greater tuberosity in posterior -deltoid/triceps interval.

- Protect subdeltoid axillary nerve.

- Assess subscapularis contracture.

- If humeral scapular excursion is limited, then lengthen subscapularis

- Assess glenohumeral joint stability.

- If necessary, perform posterior capsular reefing.

- Insert latissimus and teres subdeltoid into greater tuberosity and supraspinatus and infraspinatus tendons.

- Reassess axillary nerve to be certain no compression

Postoperative care

- Immobilize in forward flexion, abduction, and external rotation for 4 to 6 weeks.

- Begin passive and active range-of-motion exercises. . When out of cast, motion is almost immediately improved.

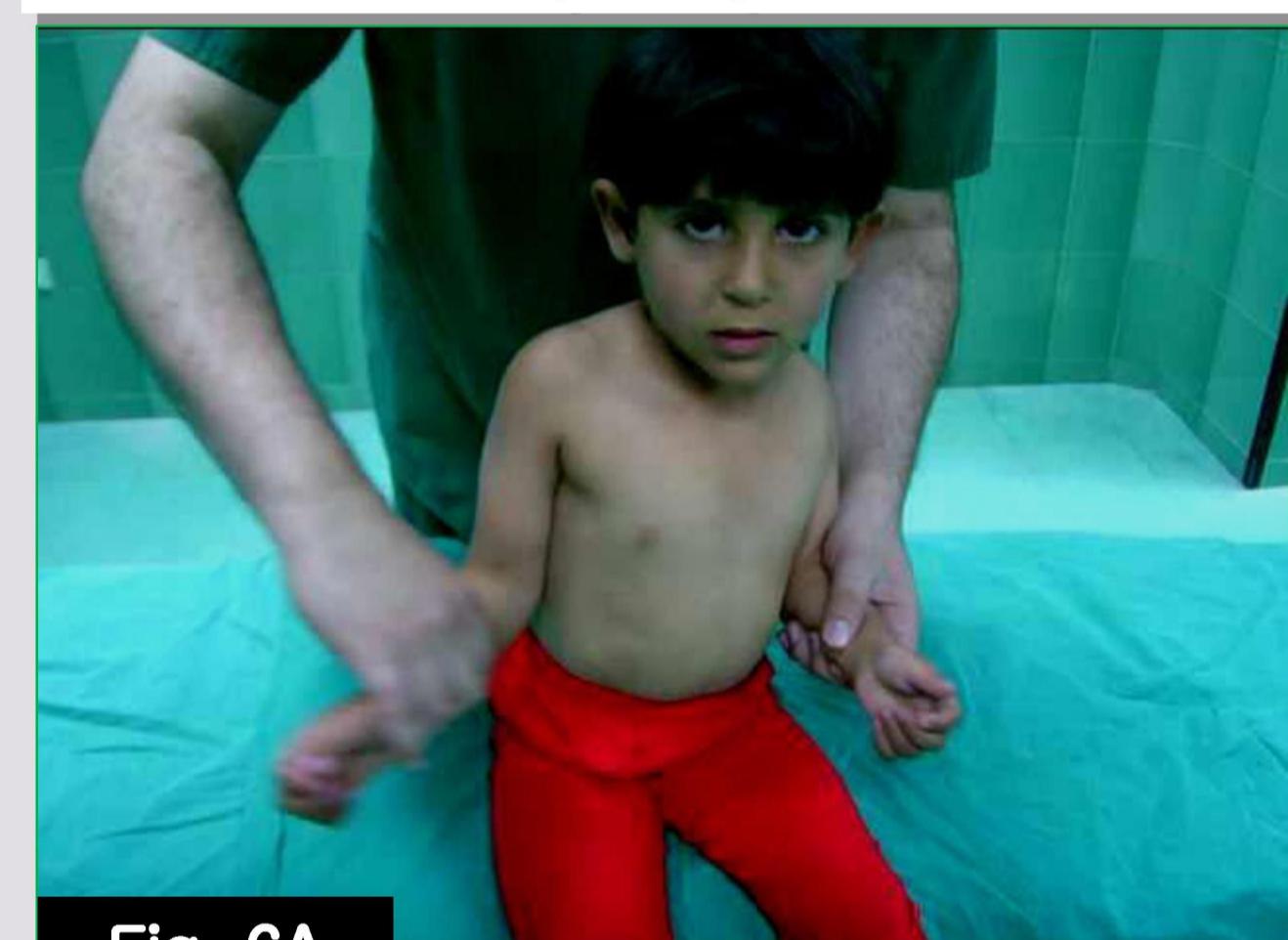


Fig. 6A

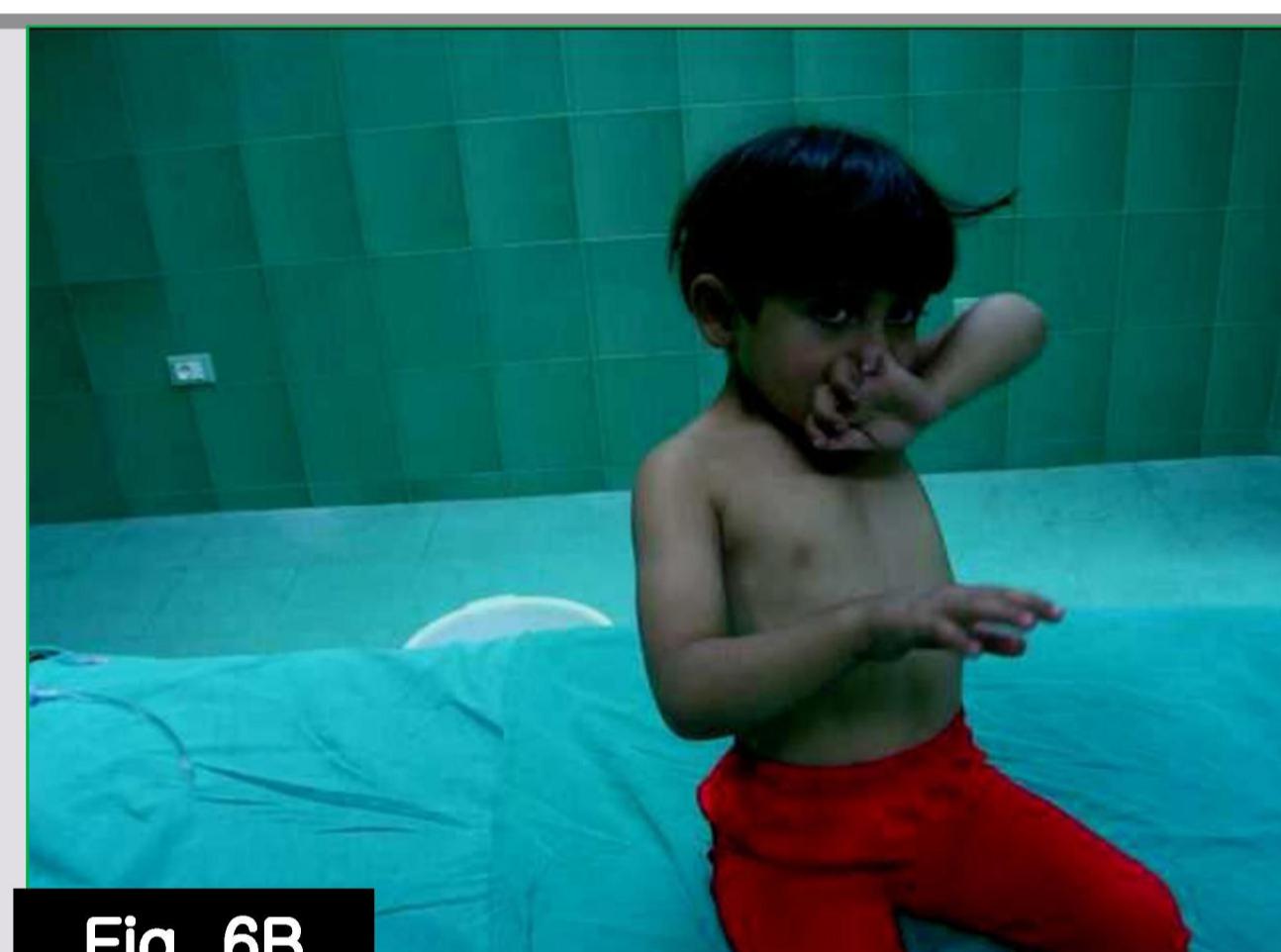


Fig. 6B



Fig. 6C



Fig. 6D



Fig. 6E



Fig. 6F

(FIG 6A) and 6B showed limitation of external rotation and abduction respectively.

(Fig 6 C & D & E & F) showed steps of subscapularis release , and pedicle teres major or latissimus dorsi muscle tendon transfer to infraspinatus muscle .

Tips and PEARLS

- Shoulder CT scan used to assess joint.
- Marked glenohumeral deformity is a contraindication to transfer.
- Assess pectoralis major, subscapularis, biceps tightness, and reducibility of the joint intraoperatively.



Fig. 5A



Fig. 5B

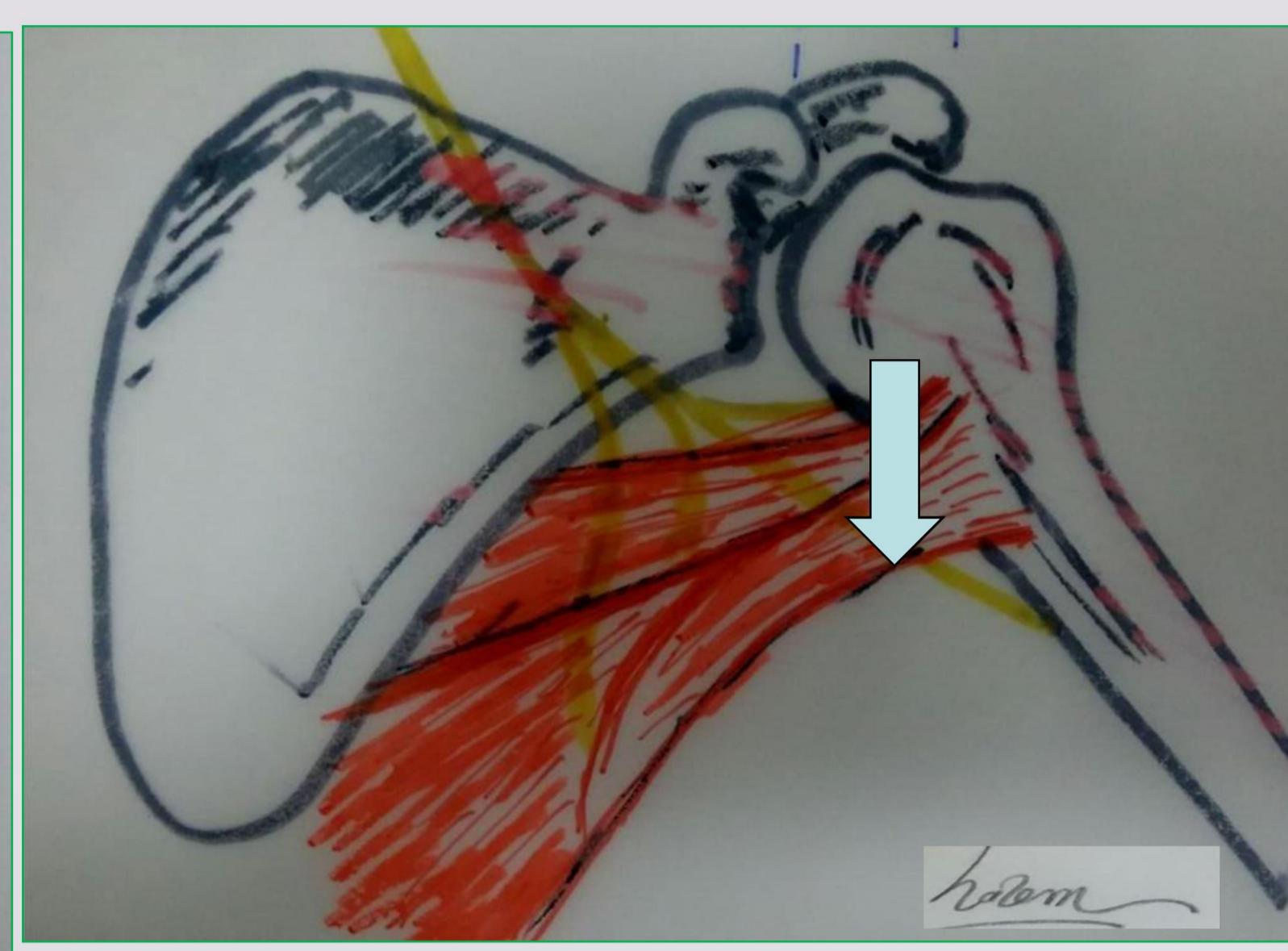


Fig. 5C

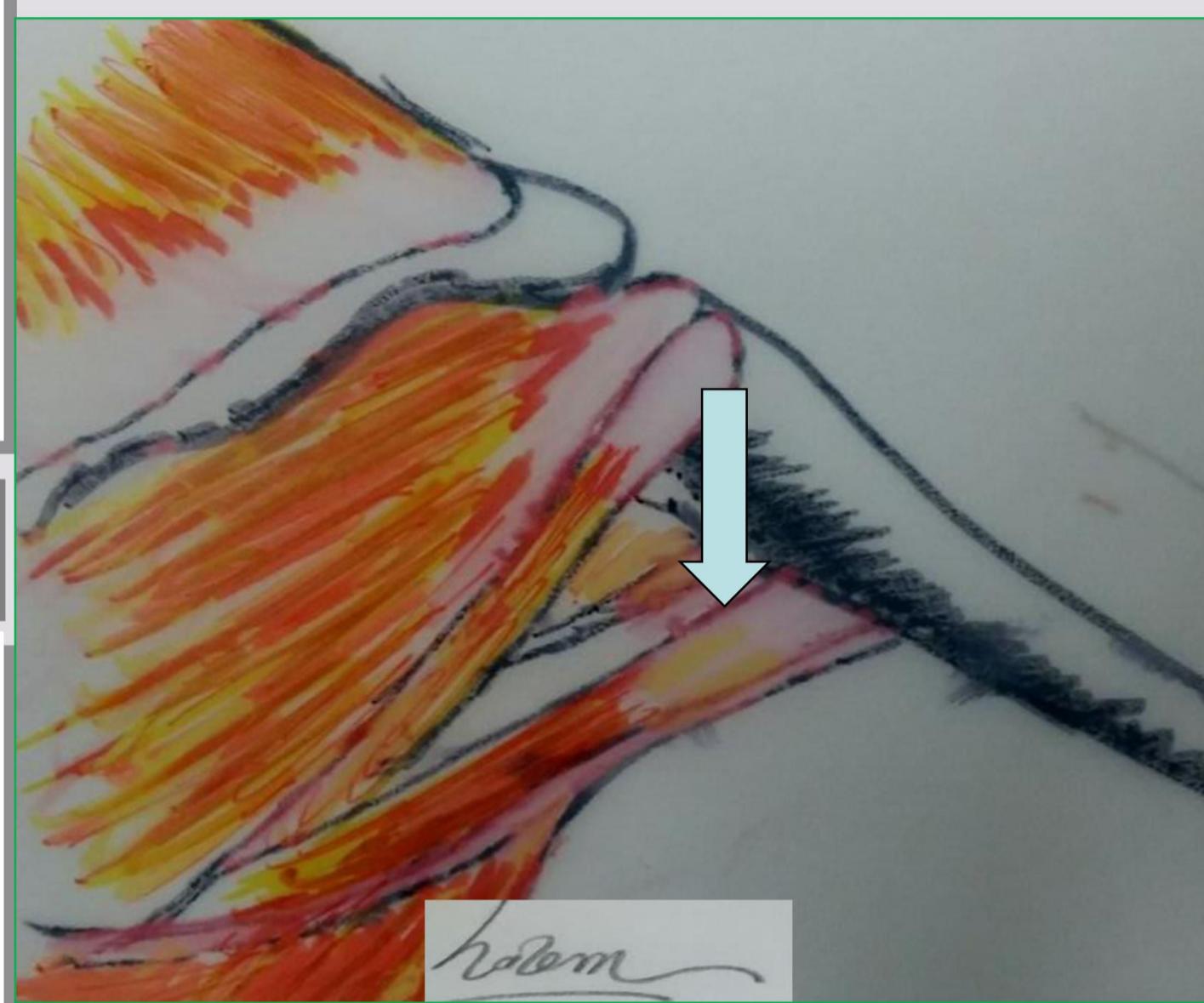


Fig. 5D



Fig. 5E

Illustrated diagram showing steps of subscapularis release (FIG 5 A), and pedicle teres major or latissimus dorsi muscle tendon transfer (FIG 5 B & C & D) to infraspinatus muscle FIG 5 E)

Table 1 PREOPERATIVE SHOULDER ABDUCTION & EXTERNAL ROTATION VALUES

PATIENT NUMBER	SHOULDER ABDUCTION	SHOULDER EXTERNER ROTATION	HAND
3 PT	Less than 30	Less than 20	Hand not reached the back of the neck
4 pt	Between 30-45	Between 20-30	Hand reached the back of the neck difficulty
5 pt	Between 45-60	Between 30-45	Hand reached the back of the neck difficulty

Table 2 POSTOPERATIVE SHOULDER ABDUCTION & EXTERNAL ROTATION VALUES

PATIENT NUMBER	SHOULDER ABDUCTION	SHOULDER EXTERNER ROTATION	HAND
3 PT	Between 30-45	more than 20	Hand reached the back of the neck
4 pt	Between 45-60	Between 30-50	Hand reached the back of neck easily
5 pt	Between 60-90	Between 50-70	Hand reached the back of the neck easily

Result

Patients demonstrated improvement of function and Mallet score without any post-operative complications. Moreover, adduction improved from 30° to 60°, abduction from 15° - 45°. In addition to the general improvement of the quality of life which was clear.

Conclusion

Tendon transfer may be used as a treatment modality for pediatric brachial Plexus injuries in patients above the age of 4 years provided that there is good glenohumeral containment without any deformities. Satisfactory results may especially be observed in external rotation and abduction.