

## Rate of Recurrence of Internal Rotation Contracture after Latissimus Dorsi Transfer and Subscapularis Sliding in Obstetric Brachial Plexus Palsy

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### Abstract

**Background:** Internal rotation contracture is the most common complication of obstetric brachial plexus palsy, tendon transfer is used to treat limited shoulder abduction and external rotation.

**Aim of Study:** In our study we observe the incidence of recurrence of internal rotation contracture after latissimus dorsi transfer and Subscapularis sliding.

**Patients and Methods:** We conducted a randomized trial study over 20 patients with internal rotation contracture due to obstetric brachial plexus palsy. From 2015 to 2017 in Abo El Resh Hospital. We done subscapularis sliding combined with latissimus dorsi transfer for. The mean age at the time of operation was 2 years. We used modified gilbert score to assess shoulder function pre and postoperative.

**Results:** All patient after surgery shows marked improvement of shoulder abduction and external rotation. We had recurrence of internal rotation contracture in 4 patients.

**Conclusion:** After subscapularis sliding with latissimus dorsi transfer it is preferable to keep in close follow-up of the patient and continuous physiotherapy to prevent recurrence of internal rotation contracture.

**Key Words:** *Obstetric brachial plexus palsy – Internal rotation contracture – Latissimus dorsi.*

### Introduction

**OBSTETRIC** brachial plexus injury is due to traction over brachial plexus nerves during delivery or traction [1].

Despite of modern techniques in delivery incidence of brachial plexus injury still notable. The most common type in pediatric injury is upper brachial plexus injury [2].

Fortunately, most of pediatric plexus injury especially upper trunk injury recover spontaneous. But the incidence of recovery depend on the type and location of injury [3].

Internal rotation contracture is the most common complication in upper trunk injury [4]. And many operations are described to treat internal rotation which include soft tissue release [5].

One of the complication after treating internal rotation contractures is recurrence of internal rotation contracture.

In this randomized trial we rate of the recurrence after subscapularis sliding and latissimus dorsi transfer. The assessment of the shoulder function is done by modified gilbert score.

### Patients and Methods

We treated 20 patients age between 1.5 year to 10 years with unilateral incomplete brachial plexus injury. From 2015 to 2017 in Abo El Resh Hospital. All patient had the following inclusion criteria which is 1.5-10 years of age with internal rotation contracture (less than 20° passive external rotation of the shoulder in adducted position) with minimum active abduction of 30°.

Active triceps grade 3 according to MRC motor power scale.

In infants less than 2 years should have impending or true dislocation of gleno-humeral joint diagnosed by clinical examination in the form of severe internal rotation contracture and the presence of anterior skin crease to be candidate for transfer.

We treated these patients by subscapularis sliding and latissimus dorsi transfer.

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We evaluated the patient in the following manner:

All patients were examined upon the entry to the hospital, before and after surgery, at 2, 3,4,5,6 months and 2 years after surgery.

Patients were assessed as follow:

- Assess the passive external rotation in abduction and adduction.
- Presence of abduction contracture, external rotation contracture.
- Active global abduction.
- Active external rotation.

Classification was done by Ghani modification of gilbert score for infant younger than 6 years and modified mallet score for 6 years and older children.

And the average postoperative follow-up is 20 months. The data collected included age, sex, type of lesions, pre- and postoperative recording of active and passive shoulder abduction and external rotation and the external rotation contracture by modified mallet score.

*Surgical technique:*

Patient after being anaesthetized, was lied in lateral decubitus while the affected side being up. At the start of this surgery, assessment of the passive range of movement (PROM) around the shoulder joint is so essential. Any internal rotators contracture is to be considered. A curvilinear incision from the inferior angle of scapula the posterior of lateral border of acromion was done. Subcutaneous dissection was done by diathermy, identification of the fascia of latissimus dorsi was done by dissecting scissor dissection was continued anterior to the lateral border of latissimus dorsi muscle and neurovascular bundle of the latissimus dorsi was identified and protected. The anterior border of the latissimus was retracted posteriorly and deeper dissection was carried out to expose the anterior surface of the scapula and subscapularis muscle. With a towel clip the inferior angle of the scapula was held. The subscapularis muscle was incised from its origin by diathermy along the medial border of scapula and sliding was done by periosteal elevator and passive external rotation was assessed after sliding.

Conjoint tendon was identified release of Teres major part from latissimus dorsi was done by blunt dissection. Axillary connection was identified and excised. Shoulder was brought in abduction and internal rotation to approximate the insertion of both tendons in the bicapital groove (latissimus

insertion in the floor) and graft of the latissimus dorsi tendon was harvested.

After that, the arm adjusted in 90° abduction, 90° external rotation, then the posterior fibers of the deltoid was elevated. The supra and infra spinatous tendon was identified and with right angle a tunnel was created below them the harvested latissimus dorsi tendon was delivered to create loop around supra and infra spinatous tendon fixation of graft was done by non-absorbable suture. Subcutaneous and skin closure was done. Shoulder Spica was done in 90° external rotation 60° abduction.

Patient was dismissed from the hospital 2 days after the surgery. 1<sup>st</sup> follow-up was after 2 weeks to check the cast wound and take the measurement of abduction brace.

2nd follow-up was at 1.5-month post-operative for cast removal and the patient was instructed to do physiotherapy and to wear the abduction brace at bed time. Then Follow-up was done every month for 2 years. (Figs. 1,2).



Fig. (1): Subscapularis sliding.



Fig. (2): Neurovascular bundle of latissimus dorsi.

## Results

We operated on 20 patients From 2015 to 2017 in Abo El Resh Hospital, a prospective randomized study was performed to treat the OBBP internal rotation contraction with limited shoulder abduction.

Patients undergoing subscapularis sliding and latissimus dorsi transfer.

All patients' parents were satisfied with the final outcome and felt there had been improvement of function and appearance of their children. There was significant improvement of shoulder abduction in all patients from mean 74 degree preoperatively to mean 125 degree post-operatively with the difference between preoperative and postoperative shoulder abduction is statistically significant.

There was significant improvement of active external rotation from mean 12 degree preoperatively to mean 88 degree postoperatively, and marked improvement of the preoperative passive external rotation from mean 4 degree to mean 88 degree post operatively with the difference between preoperative and postoperative external rotation is statistically significant (Table 1).

Table (1): Patients improvement.

	Shoulder abduction	Passive external rotation	Active external rotation
Mean preoperative	74	-4	12
Mean postoperative	125	88	88
<i>p</i> -value	0.001	0.001	0.012

*Change in range of motion:*

There was marked improvement of shoulder abduction from 75 degree preoperative to 123 degree postoperative with the difference between preoperative and postoperative shoulder abduction is statistically significant.

There was marked improvement of active external rotation from 10 degree preoperative to 84.5 degree postoperative, and significant improvement of the preoperative passive external rotation from -5 degree to 85 degree postoperative with the difference between pre and postoperative external rotation is statistically significant (Table 2).

Table (2): Measures of shoulder abduction and external rotation.

	Shoulder abduction	Passive external rotation	Active external rotation
Mean preoperative	75	-5.75	10
Mean postoperative	123.6	85.91	88.5
<i>p</i> -value	0.001	0.001	0.012

There were 4 patients who had recurrence of internal rotation contracture 3 patient had reoperated and one had humeral neck fracture had rotational osteotomy.

**Discussion**

In our study, we discuss the benefit of single tendon transfer with subscapularis sliding and the function improvement and the incidence of complication.

We operated on 20 patients. All patients underwent subscapularis sliding. And latissimus dorsi transfer. The patients were followed-up for 2 years post operatively. This is considered moderate size sample but with short follow-up period compared to other studies. In Gilbert series, he operated on 1486 patients and the follow-up for 10 years [3]. Al-Qattan operated on 12 patients and the follow-up was for 4 years [6]. Abdel Ghani, operated on 63 patients and the follow-up was for 19 months [7]. Amador operated on 24 patients and the follow-up was 2 years [8]. Al-Anani, operated on 50 patients and the follow-up was 4 years [9]. Kirkos, operated on 10 patients and follow-up was 30 years. Terzis, operated on 197 patients and the follow-up was 7.5 years [10].

We used Ghani modification of Gilbert score for patients younger than 6 years and modified mallet score for patients older than 6 years. Abdel Ghani, used modified gilbert score in his study [8]. Al-Qattan, Al-Anani, Kirkos and Terzis used modified mallet score [6,9]. Amador, used gilbert score to assess shoulder function [8]. The main defect in modified Gilbert score is that it does not assess external rotation contracture. But in our study, we assessed shoulder abduction and external rotation in every patient regardless of the scoring method.

We found that there was no relation between the age of the patient and the improvement of the shoulder range of motion after tendon transfer, this may be because most of our patients were younger than 5 years. Pearl noticed that a remodeling of the glenohumeral joint does occur at all ages, but the most impressive remodeling of the glenohumeral anatomy has been reported to occur in younger children [11]. Al-Qattan reported that best result for muscle transfer occurred in young patients with no secondary deformity [12]. Al-Anani, reported that tendon transfer has best result under the age of 5 years [6].

In our study, we had four patient who had recurrence of the internal rotation contracture. We found that the main cause of the recurrence is patients noncompliance with night splint and physiotherapy and other causes is occurrence of fracture during physiotherapy that obligate the patient to immobilization for 2 months.

Al-Qattan, reported that in his series two of the 12 patients had recurrence of the internal rotation contracture deformity, and relates it to parents' noncompliance with the wear of the night splints and did not attend post-operative physiotherapy regularly [12]. Phipps and Hoffer, reported that they experienced three recurrences in 35 cases, and they related the recurrence of the deformity to various factors such as recurrence of the internal rotation contracture mainly in the subscapularis after sliding, gradual contracture of the Teres major muscle, and a part of the inferior glenohumeral angle contracture [13].

In our study after subscapularis sliding and tendon transfer there was loss of some internal rotation degrees but not to disabling limit.

Peter Waters noticed that in appropriately selected patients, latissimus dorsi and Teres major tendon transfers to the rotator cuff combined with musculotendinous lengthening and open glenohumeral joint reduction not only improve upper extremity function but also remodel the glenohumeral dysplasia present in the majority of patients and the improvement in external rotation was not on the expense of internal rotation [14]. Abdel-Ghani, noticed that complete release of internal rotation contracture after subscapularis release, lead to loss of some degree of internal rotation and the loss of internal rotation was less in single latissimus dorsi tendon transfer than combined Teres major and latissimus dorsi transfer [7]. Kam-bhampati [15] observed that 10-degree loss in internal rotation after subscapularis sliding, but more loss of internal rotation up to 42 degree after arthroscopic tenotomy of the subscapularis tendon. Bertelli, reported about 20-degree loss of internal rotation.

#### Conclusion:

Subscapularis sliding and tendon transfer give significant improvement of the shoulder function in patients with internal rotation contracture. Our result show high incidence of internal rotation contracture after SSS and LD transfer in case of patient non compliance with physiotherapy and night splint after the operation.

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## نسبة ارتجاع التيبس للداخل بعد نقل العضلة الظهرية العريضة وزحزحة العضلة أسفل لوح الكتف فى حالات ملخ الولادة

التيبس للداخل من أشهر مضاعفات ملخ الولادة ونقل الاوتار من الوسائل المستخدمة لعلاج نقص ارتفاع الكتف والالتفاف إلى الخارج. الهدف من البحث: ملاحظة نسبة حدوث ارتجاع التيبس للداخل بعد نقلالعضلة الظهرية العريضة وزحزحة العضلة أسفل لوح الكتف. وسائل وطرق البحث: قمنا بإجراء الدراسة على ٢٠ مريض ملخ ولادة يعانى من تيبس للداخل وقمنا بإجراء نقل للعضلة الظهرية العريضة وزحزحة العضلة تحت لوح الكتف وكان متوسط عمر المرضى سنتين واستخدمنا معادلة جلبير لقياس وظيفة الكتف. نتائج البحث: تحسن كبير فى رفع الكتف والالتفاف للخارج وحدث ارتجاع للتيبس للداخل فى ٤ مرضى. وأن بعد نقل العضلة الظهرية الكبيرة وزحزحة العضلة تحت لوح الكتف يفضل المتابعة القريبة للمرضى والعلاج الطبيعى المستمر لمنع حدوث ارتجاع التيبس للداخل.