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 lattissimus 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 palsy. 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 20º passive external rotation of the shoulder in adducted position) with minimum active abduction of 30º.

Active triceps grade 3 according to MRC motor power scale.

In infants less than 2 years should have impeding 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.
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 rota-
  tion 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 inci-
sion from the inferior angle of scapula the posterior
of lateral border of acromion was done. Subcuta-
neous dissection was done by diathermy, identifi-
cation of the fascia of lattismus dorsi was done by
dissecting scissor dissection was continued anterior
to the lateral border of lattismus dorsi muscle and
neurovascular bundle of the lattismus dorsi was
identified and protected. The anterior border of
the lattismus 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 periostal
elevator and passive external rotation was assessed
after sliding.

Conjoint tendon was identified release of Teres
major part from lattismus 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 bicipital groove (lattismus
ingression in the floor) and graft of the lattismus
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
spinatus tendon was identified and with right
angle a tunnel was created below them the har-
vested latissimus dorsi tendon was delivered to
create loop around supra and infra spinatus 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. 1st 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).

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 lattissimus 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>
<thead>
<tr>
<th></th>
<th>Shoulder abduction</th>
<th>Passive external rotation</th>
<th>Active external rotation</th>
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<tbody>
<tr>
<td>Mean preoperative</td>
<td>74</td>
<td>–4</td>
<td>12</td>
</tr>
<tr>
<td>Mean postoperative</td>
<td>125</td>
<td>88</td>
<td>88</td>
</tr>
<tr>
<td>p-value</td>
<td>0.001</td>
<td>0.001</td>
<td>0.012</td>
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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>
<thead>
<tr>
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<th>Shoulder abduction</th>
<th>Passive external rotation</th>
<th>Active external rotation</th>
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</thead>
<tbody>
<tr>
<td>Mean preoperative</td>
<td>75</td>
<td>–5.75</td>
<td>10</td>
</tr>
<tr>
<td>Mean postoperative</td>
<td>123.6</td>
<td>85.91</td>
<td>88.5</td>
</tr>
<tr>
<td>p-value</td>
<td>0.001</td>
<td>0.001</td>
<td>0.012</td>
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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]. Kambhampati [18] 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.

**References**

نسبة ارتفاعت التببس للداخل بعد نقل العضلة الظهارية العريضة ورجمحة العضلة أسفل لوح الكتف في حالات مرض الولادة

التببس للداخل من أشهر مضاعفات مرض الولادة ونقل الأمهات من الوسائل المستخدمة لعلاج نقص ارتفاع الكتف والالتفاف إلى الخارج.

الهدف من البحث: ملاحظة نسبة حدوث ارتفاعت التببس للداخل بعد نقل عضلة الظهارية العريضة ورجمحة العضلة أسفل لوح الكتف.

وسائل وطرق البحث: قمنا بإجراء الدراسة على 20 مريض مرض الولادة يعاني من تببس للداخل وقمنا بإجراء نقل عضلة الظهارية العريضة ورجمحة العضلة تحت لوح الكتف وكان متوسط عمر المرضى ستين واستخدمنا معايدة جلبريل لقياس وظيفة الكتف.

نتائج البحث: تحسن كبير في رفع الكتف والالتفاف للخارج وحدود ارتفاعت التببس للداخل في 4 مرضى. وأن بعد نقل العضلة الظهارية الكبيرة ورجمحة العضلة تحت لوح الكتف يفضل المتابعة المقربة للمرضى والعلاج الطبيعي المستمر لمنع حدوث ارتفاعات التببس للداخل.