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ORIGINAL ARTICLE

Arthroscopic release of shoulder contracture secondary to obstetric brachial plexus palsy: Retrospective study of 18 children with an average follow-up of 4.5 years

A. Breton[a,*], L. Mainard[b], M. De Gaspéri[a], S. Barbary[a], E. Maurice[c], G. Dautel[a]

[a] *Musculoskeletal Plastic and Reconstructive Surgery Department, Emile-Gallé Surgical Center, Nancy, France*
[b] *Paediatric Radiology Department, Brabois Children Hospital, Vandoeuvre-les-Nancy, France*
[c] *Hand Surgery Department, Aquitaine Hand Institute, Pessac, France*

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KEYWORDS
Arthroscopic release;
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Child

Summary
Introduction: Children affected by obstetric brachial plexus palsy have an internal rotation contracture of the shoulder and a deformed glenohumeral joint. In 2003, Pearl proposed doing an arthroscopic release of the shoulder to restore external rotation and allow the glenohumeral joint to remodel. The goal of the current study was to evaluate the active and passive shoulder external rotation range of motion and glenohumeral joint remodelling in children treated with arthroscopic-directed release.
Materials and methods: Between 2004 and 2010, 18 children with passive external rotation under 10° were treated with shoulder arthroscopy to release the anterior capsule and ligaments and perform a *subscapularis* tenotomy; no tendon transfer was performed. The average age was 4 years, 2 months. Nine children had an injury at C5C6, four had an injury at C5C6C7 and five had a complete injury. The average follow-up was 4.5 years. The clinical evaluation consisted of active and passive external rotation (ER) with elbow at the side, active internal rotation, and the modified Mallet score. One child who required an external rotation osteotomy of the proximal humerus was excluded from the clinical outcomes. An MRI was performed on both shoulders to assess glenoid retroversion, glenoid type, degree of posterior subluxation (measured by the percentage of humeral head anterior to the middle glenoid fossa) and humeral head hypoplasia.
Results: At the latest follow-up, passive ER was 58° on average and active ER was 42°. Eleven children had regained more than 30° of active ER. The average internal rotation had decreased

* Corresponding author. +33 06 98 05 68 16.
E-mail address: armelle.breton@yahoo.fr (A. Breton).

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after the release. The MRI assessment showed that the glenohumeral joint had remodelled in 66% of cases; the glenoid type had improved, the glenoid retroversion had diminished and the humeral head was recentred. Humeral head hypoplasia was found in 28% of cases.
Discussion and conclusion: Arthroscopic release of the shoulder results in more external rotation and allows for glenohumeral joint remodelling. Tendon transfer is not always necessary to restore active external rotation.
Level of evidence: Level IV — Retrospective study.

Introduction

Obstetric brachial plexus palsy occurs in France at a rate of about 1000 cases per year [1]. Loss of external rotation at the shoulder is the most common sequela. Imaging reveals glenoid dysplasia with humeral head hypoplasia and posterior subluxation, along with glenoid retroversion. This glenohumeral joint deformation is already apparent at 6 months of age [1,2]. To restore active and/or passive external rotation and encourage glenohumeral joint remodelling, procedures to lengthen the *subscapularis* and release the anterior capsule and ligament have been proposed, with or without *teres major* and *latissimus dorsi* tendon transfer [3—7]. Pearl [8] first suggested doing the release by arthroscopy.

The goal of the current study was to provide a clinical and radiological (MRI) evaluation of the outcome of arthroscopic shoulder release for the sequela of obstetric brachial plexus palsy with an average follow-up of 4.5 years. Shoulder external rotation and glenohumeral joint remodelling were of specific interest.

Materials and methods

Patients

This was a retrospective study. Between 2004 and 2010, eighteen children (five boys, 13 girls) presenting with passive external rotation (ER) with elbow at side of less than 10°, secondary to obstetric brachial plexus palsy, were treated by arthroscopy with anterior capsule and ligament release and *subscapularis* tenotomy, without tendon transfer. One child had a *subscapularis* detachment as described by Carlioz et Brahimi [9] and then two arthroscopic release procedures. The average age at the time of release was 4 years, 2 months (range 1 year to 11 years). Nine children had an injury at C5C6, four had an injury at C5C6C7 and five had a complete injury. All the children had biceps function that allowed for active elbow flexion. In one case, an external rotation osteotomy of the proximal humerus was performed 2 years after the arthroscopic release; this patient was excluded from the clinical results.

Surgical technique

Under general anaesthesia, the child was placed in lateral decubitus. A posterior incision was made first. The glenohumeral cavity was visualized with a 2.7 mm arthroscope. An anterior instrument portal was made and the arthroscopy pump attached to the cannula. The surgical assistant held the upper limb in neutral rotation, neutral antepulsion and 20° abduction.

A bipolar diathermy unit (VAPR®, DePuy Mitek, Raynham, MA, USA) was used to release the anterior capsule, cut the middle glenohumeral ligament and cut the intra-articular portion of the *subscapularis* until muscle fibres were visible. If the intraoperative passive external rotation was less than 45° after the anterior capsule and middle glenohumeral ligament were cut, the release was extended either upwards (by cutting the superior glenohumeral ligament, rotator interval and coracohumeral ligament) or downwards (by cutting the inferior glenohumeral ligament). A shoulder spica cast was put into place before the child awoke and used for 6 weeks. The shoulder was positioned in maximum external rotation and a few degrees of abduction.

Clinical evaluation

The preoperative clinical evaluation was based on medical records. The passive external rotation and internal rotation (IR) values were recorded. Because of the age of the children before the surgery, active external rotation was not available. The patients were seen again after an average of 4.5 years (range 1 to 7 years). The active and passive external rotation and internal rotation were evaluated with the Mallet score [1] and modified Mallet [10] functional score.

Imaging

Sixteen children had received a preoperative MRI: 15 bilateral and one unilateral. An MRI was performed on both shoulders of the 18 included patients at the follow-up. The same protocol was used and the same radiologist did the interpretation. Transverse cross-sectional cuts were made through the major axis of the glenoid on respiration-triggered T2-weighted fast spin echo (FSE) sequence and/or T2*-weighted gradient recalled echo (GRE), two-dimensional spoiled gradient echo (SPGR).

The following radiological criteria were analysed:

- Glenoid type [11] (Fig. 1):
  - centred concentric: humeral head curvature is centred over the glenoid cavity,
  - posterior concentric: glenoid trends towards increased retroversion; humeral head is centred over glenoid, but asymmetric; glenoid surface is irregular,