Anterior Release of Elbow Flexion Contractures in Children With Obstetrical Brachial Plexus Lesions

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Purpose A flexion contracture of the elbow is common in upper obstetric brachial plexus palsy. One less than 30° involves no major aesthetic or functional abnormalities, whereas for one greater than 30°, conservative treatment with serial splints produces variable results. We evaluated anterior release of the elbow with partial tenotomy of the anterior brachialis muscle and of the biceps, for their effect on elbow flexion contractures.

Methods We performed 10 anterior releases of the elbow with lengthening of the distal tendons of the biceps and the anterior brachialis muscle. All patients had upper obstetric brachial plexus palsies (C5-C6) and elbow flexion contractures of 35° or greater (range, 35° to 60°). The flexion strength of the elbow was 4 or higher on the British Medical Research Council scale, and the patients had no bone abnormalities in the elbow region.

Results After a mean follow-up period of 3 years, the mean gain in extension was 28° (range, 20° to 35°). All patients maintained flexion strength. Elbow extension was 2° less than obtained at surgery and was maintained during follow-up. All patients were satisfied or very satisfied, and none presented major complications, except hypertrophic scarring to a greater or lesser extent at the incision site.

Conclusions Anterior release of the elbow is a useful method for treating elbow flexion contractures of more than 35° and can reduce the deformity to bring it within functional range without compromising flexion. *(J Hand Surg 2012;37A:1660–1664.*

Type of study/level of evidence Therapeutic IV.

Key words Brachial plexus, joint contracture, joint deformities, joint release, nerve injury.

The incidence of obstetric brachial plexus palsy (OBPP) in industrialized countries ranges between 0.4 and 3.0 per 1,000 live births.[1–4] Most patients have a favorable course and achieve good functional recovery. However, the course of the most severe cases is affected by imbalances in the muscles involved and leads to contractures, particularly in the shoulder and elbow joints. One of the major sequelae in upper and middle trunk palsy is a deficit in elbow extension, which normally ranges between 10° and 20°[5] but may reach an extension deficit of 40° to 60°.[6]

The amount of elbow motion adequate to perform the sedentary daily activities is 30° to 130° extension-flexion.[7] However, if the elbow flexion contracture is greater than 30°, functional and aesthetic problems ensue. Elbow flexion deformity with internal rotation contracture of the shoulder gives the appearance of a short arm compared with the contralateral side.[8]

The use of orthoses in initial treatment has been described and has shown satisfactory results in compliant patients with motivated parents.[8–10] Static nighttime extension splints may prevent contracture in younger

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children, and articulated static progressive extension splints and plaster casts have been used in older children.[8]

The only published surgical experience is based on closed techniques with external fixation systems.[11] We propose an anterior approach to the elbow to explore the extra-articular structures that, in our opinion, are responsible for this condition, and release of these structures by means of a modified Manske technique.[12] This technique was initially designed for elbow flexion contractures resulting from spastic palsy and consists of division of the lacertus fibrosus and elimination of the adventitia of the biceps tendon to interrupt afferent nerve fibers without lengthening the tendon. A fractional lengthening is performed on the brachialis muscle by making 1 to 3 transverse incisions across the entire width of the fibrous aponeurosis and passively extending the elbow. We add a lengthening of the biceps with partial transverse tenotomies in the muscle–tendon junction in the most severe cases. We present the results of our experience with modified anterior release of the elbow in OBPP.

MATERIALS AND METHODS

Between May 2005 and November 2008, we performed anterior release of the elbow in flexion contractures greater than 35° in 10 patients (Table 1). There were 9 boys and 1 girl, and ages ranged between 10 and 13 years. All cases were the result of upper OBPP (C5 and C6), and 3 patients had undergone prior surgery (1 derotational humeral osteotomy and 2 latissimus dorsi muscle transposition). The same surgeon always measured elbow flexion-extension with a goniometer. The flexion strength of the elbow, evaluated using the criteria of the British Medical Research Council, was 4 or higher, and no patients had radiographic evidence of bone abnormalities in the elbow region. We used a satisfaction scale based on a visual analog score of 0 to 10: very satisfied (7.5–10), satisfied (5–7.4), somewhat dissatisfied (2.5–4.9), and completely dissatisfied (0–2.4).

All patients had received treatment at the rehabilitation department by stretching and night splinting. The indication for surgery was a flexion greater than 35°, with difficulty performing day-to-day activities and major aesthetic abnormalities. All parents of the children gave written informed consent.

Surgical technique

The operation begins with an incision in the anterior surface of the elbow, starting at the fold between the biceps brachii and the brachioradialis muscle in the

TABLE 1. Data From Case Series Study With Elbow Extension Deficit Preoperatively, Postoperatively, and at Follow-up

Patient	Age	Sex	Preoperative Strength	Preoperative Flexion	Preoperative Extension Deficit	Biceps Brachii Lengthening	Capsulotomy	Postoperative Extension Deficit	Final Flexion	Final Extension Deficit	Final Strength	Follow-up (y)
1	13	F	4+	145°	60°	Yes	Yes	25°	145°	25°	4+	2
2	12	M	4	135°	60°	Yes	Yes	20°	135°	25°	4	4
3	12	M	4+	140°	50°	Yes		15°	140°	20°	4+	3
4	11	M	4	140°	45°			20°	140°	20°	4	2
5	12	M	4+	145°	45°	Yes	Yes	15°	150°	15°	4+	3
6	11	M	4	140°	45°			10°	140°	15°	4	3
7	10	M	4	135°	40°			15°	135°	15°	4	3
8	10	M	4	135°	35°			15°	135°	15°	4	2
9	10	M	4+	150°	35°			10°	150°	10°	4+	5
10	10	M	4+	145°	35°			5°	145°	10°	4+	3