

Cerebral Palsy Tendon Transfers

Flexor Carpi Ulnaris to Extensor Carpi Radialis Brevis and Extensor Pollicis Longus Reroutement



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KEYWORDS

• Cerebral palsy • EPL tendon reroutement • FCU tendon transfer

KEY POINTS

- Children with spastic hemiplegic cerebral palsy may benefit from tendon transfer surgery if therapy is not successful in addressing functional and esthetic limitations.
- A position of wrist and thumb flexion is common and limits grasp and overall function. If the fingers can still be extended in a wrist neutral posture, the patient may be a good candidate for surgery.
- Transfer of the flexor carpi ulnaris to the extensor carpi radialis brevis is a commonly performed and reliable surgery to allow a neutral wrist posture and improved function and appearance.
- A thumb-in-palm deformity limits function including large object grasp and finger flexion and can be helped with an extensor pollicis longus reroutement along with a thenar release.

INTRODUCTION: NATURE OF THE PROBLEM

Cerebral palsy (CP), a static condition typically related to a perinatal cerebral insult, is the most common motor disability in childhood. Although the neurologic damage is nonprogressive, the motor disability and physical deformity often worsen over time as a result of abnormal muscle tone and firing patterns and growth leading to joint contractures, postural imbalance, and selective disuse.¹ Of children with CP, 81% have the spastic subtype that is characterized by varying degrees of muscular hypertonicity and is most amenable to surgical intervention.²

Common upper extremity manifestations include pronation of the forearm, flexion and ulnar deviation of the wrist, and adduction and flexion

of the thumb, causing a thumb-in-palm deformity (Fig. 1). The wrist and thumb deformities may impair both grasp and release as well as lateral pinch, leading to difficulties with daily activities and, if severe, difficulties with hygiene. Furthermore, esthetic concerns may affect the child's psyche, self-esteem, and social development.³

There are several well-accepted upper extremity surgeries that have been demonstrated to have a positive impact on both upper extremity function and appearance for children with CP.⁴ This article focuses on 2 such transfers: the flexor carpi ulnaris (FCU) to extensor carpi radialis brevis (ECRB) transfer^{5,6} (also known as the Green transfer) for the wrist and thenar release combined with rerouting of the extensor pollicis longus (EPL) tendon⁷⁻⁹ for the thumb.

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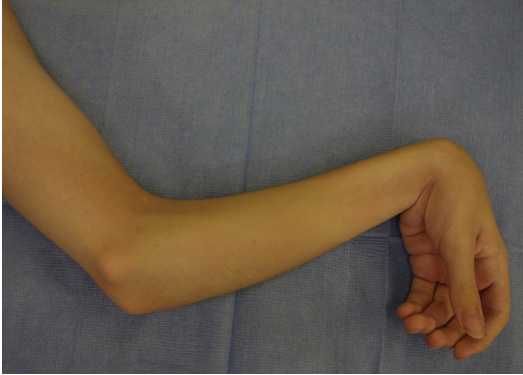


Fig. 1. Classic resting position in CP. The elbow is in flexion, the forearm in pronation, and the wrist is flexed. In this patient, with the wrist flexed, the thumb is in a reasonable resting position. The thumb is examined when the wrist is maximally flexed to determine if there is a thumb-in-palm deformity. (Courtesy of Charles A. Goldfarb, MD).

PREOPERATIVE PLANNING—FLEXOR CARPI ULNARIS TO EXTENSOR CARPI RADIALIS BREVIS TENDON TRANSFER

This transfer removes a deforming force (FCU) causing wrist flexion and ulnar deviation while concurrently augmenting the weaker dorsiflexion and supination forces.^{5,6,10}

Patient Selection

Careful patient selection helps to assure success and functional improvement. Numerous factors have been implicated in influencing the outcomes of the transfer: cognitive function, hand sensibility (stereognosis), patient age, caretaker involvement, degree of voluntary motor control, amount of attention paid to the extremity, and phasic muscle activity.

Type of Cerebral Palsy

Patients with spastic hemiplegia may gain the most from surgery, because the affected hand is primarily used to assist the normal hand in performing daily tasks. Incremental unilateral improvements can significantly enhance the child's bimanual capability and overall quality of life.¹¹

Grasp and release pattern is a critical factor affecting patient outcome. Patients resting in wrist flexion have a difficult timing making a tight fist; a surgery to extend the wrist to a neutral posture can help improve grasp. It is important to note, however, that some patients rely on the tenodesis effect and use wrist flexion to extend the fingers and "release." Therefore, during preoperative

assessment, the surgeon or therapist must assure that extending the wrist does not compromise the ability to open and close the fingers (Zancolli testing¹² of finger tightness with wrist extension). An FCU to extensor digitorum transfer may be considered in patients who cannot extend the fingers with the wrist in neutral, because it augments digital extension and is less likely to result in excessively strong wrist extension.¹³

The authors hesitate to perform the FCU-to-ECRB transfer when the wrist lacks 45° (or more) of extension with the fingers straight. In the younger patient, the finger flexors may be lengthened at the time of the tendon transfer surgery. In older patients, a wrist fusion with proximal row carpectomy (PRC) can provide a stable, functional wrist with improved finger motion through shortening the bony structure via the PRC.

Age

The importance of age is debated in the literature. Some argue that postponing surgery until the patient is mentally and physically mature limits complications resulting from future growth and unreliable adherence to postoperative care and therapy. One study¹⁴ reported complications, including extension deformity, supination deformity, and flexion recurrence, in 82% of children younger than 13 years compared with a 25% rate in the older children. Furthermore, the younger group comprised 75% (9/12) of the total population developing complications. Others maintain that surgery at a younger age, less than 8 years, allows more seamless utilization of the corrected hand, because children have not adapted to single-handedness or begun to ignore the disabled hand. Furthermore, early deformity correction may preempt the emergence of contractures and limit joint developmental anomalies,³ and greater skeletal flexibility may permit children to progress through physical therapy more easily than adults. Psychological factors should also be considered. Early surgical intervention, before school age, limits the social stigmatization and physical obstacles faced by these children. Despite the controversy, it is generally agreed that surgery should be deferred at least until children are old enough to understand the nature of surgery and participate in rehabilitation; this is generally reported as being at least 4 to 6 years of age.^{5,13-15}

Cognition and Motivation

Cognitive function and motivation are important prerequisites for the patient to participate in therapy and make functional use of the hand. Differing opinions exist as to the role of formal IQ testing.

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