RADIAL CLUB HAND WITH ABSENCE OF THE BICEPS MUSCLE TREATED BY CENTRALISATION OF THE ULNA AND TRICEPS TRANSFER

REPORT OF TWO CASES

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Two children with radial club hand and absence of the biceps muscle were treated by centralisation of the ulna into the carpus and triceps transfer. The two operations were performed only a short time apart so that the period between the procedures could be used to stretch the triceps and to enable the children to adapt to an altered position of the wrist and to mobility of the elbow at one step and following a single period of plaster immobilisation. It is very likely that function is better than it would have been had the condition remained untreated. Before operation the children had only a crude hook function of the hand against the forearm and could not bring the hand to the mouth. Even if function is not much improved, the improvement in appearance is considerable and is by itself sufficient to justify the procedures.

Congenital absence of the radius may occur with a variety of associated anomalies, including absence of the biceps muscle (Riordan 1955). This is a rare anomaly, and the consequent disability is very severe, for both appearance and function are poor. The purpose of this paper is to record experience with two children who had this combination of disabilities and who were treated by centralisation of the ulna into the carpus and transfer of the triceps to restore active flexion to the elbow. The two operations were performed a short time apart for reasons which will be discussed.

CASE REPORTS

Case 1—A boy was admitted on the first day of life with an imperforate anus, asymmetry of the skull and neck, bilateral absence of the radii with absence of the thumbs, and only three digits on the left hand and four on the right. On the left side there was no biceps muscle but a strong triceps: the range of movement at the elbow was from 0 to 45 degrees. On the right side the biceps was strong: the range of movement at the elbow was from 0 to 100 degrees. There was marked radial deviation of the left hand and moderate deviation of the right (Figs. 1 and 2). Radiographs showed absence of the left first rib and hypoplasia of the clavicle and the second and third ribs.

The hands were splinted in progressively corrected positions until the age of one year and eleven months, when the child was admitted for operation on the left wrist. The left ulna was centralised in the carpus by the technique to be described below. After the operation the arm was immobilised in an above-elbow plaster with the elbow flexed as much as possible—that is, approximately 70 degrees. Over the ensuing few weeks the elbow was flexed further. Three months after the wrist operation the triceps was transferred to the coronoid process.

At review four and a half years after the first operation there was an active range of movement at the elbow of from 10 to 90 degrees and a passive range of

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Fig. 1
Case 1—Hands before operation.

Fig. 2
Radiograph of the left arm before operation.
from 10 to 125 degrees. The wrist was of a satisfactory shape with about 5 degrees of radial deviation. There was passive ulnar deviation of 10 degrees and extension of 20 degrees (Figs. 3 and 4).

**Case 2**—A girl was brought at the age of three months with right radial club hand and right sternomastoid torticollis (Figs. 5 to 7). The wrist was deviated radially through 110 degrees, and there were only three digits. The middle and ring fingers were partly fused. Flexor and extensor power was present in all digits. The radial deformity of the wrist could be corrected passively by some 50 degrees; so there was a persistent 60 degrees’ radial deviation. The right elbow flexed passively through 40 degrees. There was no active flexion of the elbow but there was good power of extension. The right deltoid muscle was a little wasted and scapulo-humeral abduction was limited by 20 degrees compared with the left side. The right thoracic cage was smaller than the left and the fourth and fifth ribs were hypoplastic.

A padded spatula and later a moulded leather splint were applied so as progressively to correct the radial deviation of the hand.

At operation at the age of fifteen months the ulna was centralised into the carpus. The wrist was put in an above-elbow plaster with the elbow as much flexed as possible. Eight weeks later, triceps transfer was performed. At the same time the Kirschner wires were removed from the wrist. The plaster was finally removed five weeks after the second operation. The girl was immediately able to flex the elbow actively. At the age of two and a half years the fusion between the long and ring fingers was released by a dorsal flap and split skin grafts.

Four years after the centralisation operation the elbow flexed actively to a right angle (power 5) (Fig. 8) and passively to 130 degrees. It extended actively and passively to 20 degrees. The wrist remained in a satisfactory position (Fig. 9).

**TECHNIQUE OF OPERATIONS**

**Centralisation of the ulna**—Through a dorso-medial incision, the capsule of the wrist which overlies the lower end of the ulna is cleared from the surrounding tissues and is found completely to enclose the distal two centimetres of the ulna. The carpal bones are carefully dissected from the capsule and identified. The lunate and capitate bones are excised and the lower end of the ulna,
enclosed in an intact hood of capsule, is placed into the space thereby created. With the wrist held in some ulnar-deviation and a little dorsiflexion two Kirschner wires are passed proximally through two metacarpal heads and then up the shaft of the ulna. The tendons on the back of the wrist are carefully preserved, and if they are lax at the end of the operation they are shortened. The extensor carpi ulnaris is always identifiable and should be shortened. The wound is closed in layers and an above-elbow plaster is applied.

**DISCUSSION**

Sharrard (1971) stated that in cases of radial club hand "no correction should be undertaken if there is considerable limitation of flexion of the elbow. In this situation the radial deformity makes it possible for the...

**Triceps transfer**—In a bloodless field a lateral incision is made to expose the lower end of the triceps muscle and the anterior, lateral and posterior aspects of the upper end of the ulna. The triceps insertion is identified and a tongue of periosteum is dissected from the upper end of the ulna in continuity with the triceps tendon. The triceps is cleared proximally up to the mid-arm level. The ulnar nerve is identified and mobilised, and posterior capsulotomy of the elbow is performed. The triceps tendon and its periosteal prolongation are rolled into a tube and passed into a hole in the coronoid process of the ulna, where it is secured with a silk suture. The wound is closed in layers and an above-elbow plaster is applied with the elbow flexed 120 degrees.

**FIG. 6**

Case 2. Figure 6—The right arm at the age of 3 months. Note the redundant skin, the dimple and the surrounding erythema caused by pressure over the lower end of the ulna. Figure 7—The radiographic appearance of the right arm at the age of 3 months.

**FIG. 7**

**FIG. 8**

Case 2. Figure 8—The range of active flexion of the elbow four years after centralisation of the ulna into the carpus and triceps transfer. Figure 9—The position of the hand at the time of review.

**FIG. 9**
marring of appearance after pectoralis major and sternomastoid transfer makes these procedures unattractive. If the biceps muscle is absent in a child with radial club hand the brachialis and brachio-radialis are generally absent too, as was the case in the two children presented above. The triceps is always present.

Both the children described had anomalies of the thoracic cage, on the more severely affected side in Case 1 and on the affected side in Case 2. There was limited flexion at the elbow in both cases and it was convenient to use the period of plaster immobilisation after centralisation of the ulna to stretch the triceps mechanism by serial plaster changes and then to proceed with the elbow operation, rather than to distress the child and the parents by enforcing a second period of immobilisation at a later age. Furthermore, the patients can learn to adapt to an altered position of both wrist and elbow at one step.

The two patients described showed no sign of spontaneous improvement in the range of elbow flexion and at operation no biceps muscle was found (Riordan 1955). Thus these children differed from those mentioned by Lamb (1972) in whom elbow stiffness improved spontaneously and active elbow flexion occurred after the first year or two of life.

REFERENCES