Dynamic Ulnar Deviation Deformity of Wrist Due to Post Infective/Posttraumatic Contracture of Isolated Musculotendinous unit—A Report of Two Unusual Cases

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Introduction

Deformities at wrist are commonly attended in an orthopedic outpatient department. The causes in young rotate around epiphyseal plate growth disturbances, which may be congenital as in madelung deformity or acquired after infection, trauma or tumor. Shortening of extensor carpi ulnaris (ECU) musculotendinous unit as sequelae of infection or flexor carpi ulnaris (FCU) musculotendinous unit as sequelae of trauma leading to a dynamic wrist deformity has not been reported in literature yet.

Case report

Case 1 A 15 years old male presented with c/o deformity (ulnar deviation) of left wrist for last 6 years. Patient was apparently all right 6 years back when he suffered trauma to dorso ulnar aspect of left upper forearm followed by development of an abscess, which was incised and drained by a local practitioner. Patient started developing ulnar deviation at left wrist which kept on progressively increasing (it has been static for last 1 year). Patient had

some functional disability as a result of this deformity, in particular, in picking up objects and holding glass (glass holding requires radial deviation at wrist). However the power grip (in ulnar deviation of hand) was normal. There was no complaint of any numbness or weakness.

On local examination a 5 cm×2 cm scar was seen on dorso-ulnar aspect of upper 1/3rd of left forearm (i.e. the site of previous I&D) (Fig. 1a). There was fixed ulnar deviation deformity of left wrist—45° (Fig. 1b). The range of supination and pronation was full. Range of motion of elbow was full and painless. Dorsiflexion and palmar flexion were 80° and 90° respectively. No radial deviation was possible. Ulnar deviation ranged from 45° to 60° with wrist in neutral dorsi/palmar flexion. On attempt at active ulnar deviation and dorsiflexion by the patient contraction of ECU muscle belly could be felt. Ulnar lengths measured from olecranon tip to ulnar styloid and radial lengths from radial head to radial styloid were bilaterally symmetrical and hence normal.

Ulnar deviation deformity at wrist manifested itself completely on palmar flexion but disappeared on dorsiflexion (60° ulnar deviation deformity on palmar flexion and no ulnar deviation deformity on dorsiflexion) (Fig. 1c and d). ECU tendon got taut and became prominent on attempted radial deviation (Fig. 1e).

This is a fixed length phenomenon suggestive of shortened ECU. No neurovascular deficit was found. X-rays of bilateral wrist and left elbow with forearm were normal. A provisional diagnosis of left ECU contracture with dynamic ulnar deviation deformity of left wrist was made.

Written informed consent was taken from the patient and his parents for surgery and they were also informed that this case will be considered for publication in some scientific journal including electronic publication on the internet.

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Fig. 1 **a** Scar on dorso ulnar aspect of upper forearm in Case 1. **b** Ulnar deviation deformity at wrist. **c** Ulnar deviation deformity manifests on palmar flexion. **d** Ulnar deviation deformity disappears

on dorsiflexion. **e** Taut extensor carpi ulnaris (ECU) tendon. **f** Z plasty done. **g** Deformity corrected

Patient was managed by Z plasty of ECU tendon. 8 cm long incision was made on dorso ulnar aspect of distal third of forearm. Subcutaneous tissue was cleanly incised. On forced radial deviation ECU tendon became prominent. The sheath was opened and lengthening of ECU tendon was done by Z plasty so as to achieve complete correction of deformity (repair of ECU tendon was done with wrist in maximum possible radial deviation). Minimal secondary contracture of dorsoulnar wrist capsule was found. There was no scarring in the sheath/capsule as the pathology was located proximally at the level of muscle belly. Tendon sheath was repaired. Incision was closed in layers (Fig. 1f). Below elbow cast was applied with full radial deviation and 15° of palmar flexion. Postoperative course was uneventful.

On follow up at 4 weeks, incision was healed; deformity was fully corrected (Fig. 1g). There was mild stiffness in wrist (restriction in terminal wrist movements), which improved on physiotherapy (wrist mobilization exercises).

Case 2 A 18 years old male presented with deformity (ulnar deviation and mild flexion) of left wrist for last 2 years. Patient was apparently all right 2 years back when he sustained trauma by fall from stairs on outstretched left hand. Following this the patient developed swelling over wrist and forearm, which subsided over next 4–5 days. Patient did not avail any medical consultation at that time. He, however started developing progressively increasing ulnar deviation and flexion deformity left wrist. Patient had some functional disability, in particular, in picking up objects and holding

glass (which requires radial deviation and extension at wrist). However the power grip was normal. There was no complaint of any numbness or weakness.

On local examination 5° of flexion and 30° of ulnar deviation deformity (in 5° flexion) was seen. The ulnar deviation deformity disappeared on full palmar flexion and reappeared on reversing to 5° flexion (Fig. 2a, b and c). Skin puckering was seen at the level of wrist in the region of FCU tendon. FCU tendon stood prominent on forced radial deviation and dorsiflexion. The range of motion at elbow including supination and pronation was full and painless. Active dorsiflexion was not possible. Palmar flexion ranged between 5° and 90°. No radial deviation was possible. Ulnar deviation ranged from 30 to 60° with wrist in 5° palmar flexion. Ulnar lengths measured from olecranon tip to ulnar styloid and radial lengths from radial head to radial styloid were bilaterally symmetrical and hence normal.

Ulnar deviation deformity at wrist manifested itself completely on attempted dorsiflexion but disappeared on palmar flexion. This is a fixed length phenomenon suggestive of shortened FCU musculotendinous unit. Contraction of FCU belly could be felt on asking the patient to attempt ulnar deviation actively. No neurovascular deficit was found. X-ray bilateral wrist and left elbow with forearm were normal. A provisional diagnosis of left FCU contracture with dynamic ulnar deviation and flexion deformity of left wrist was made. Coincidentally patient also had tinea vesicolour (hypo

Fig. 2 **a** Ulnar deviation deformity at wrist with pen pointing to the taut flexor carpi ulnaris tendon (FCU) in Case 2. **b** Ulnar deviation deformity disappears on palmarflexion. **c** Ulnar deviation deformity manifests on dorsiflexion. **d** FCU tendon visualized, scarring and adhesions present. **e** Z plasty being done

pigmented lesions over dorsum of hand and forearm) for which he received medical management as advised by the dermatologist.

Written informed consent was taken from the patient and his parents for surgery and they were also informed that this case will be considered for publication in some scientific journal including electronic publication on the internet.

The patient was managed by Z plasty of FCU tendon and gentle wrist mobilization under general anesthesia followed by below elbow cast application in 30° dorsiflexion and 20° radial deviation. Intraoperatively scarring around FCU tendon sheath and wrist capsular contracture on volar ulnar aspect was found which were gently released (previous trauma at this site might be responsible for marked scarring and adhesions in the sheath and possibly also contributed to capsular scarring and contracture). (Fig. 2d and e.) Postoperative course was uneventful.

On follow up at 3 weeks incision was healed & deformity corrected.

Some wrist stiffness was there. The patient was subsequently kept on intermittent wrist mobilization exercises and night splintage in below elbow brace extending till metacarpophalangeal joints in 30° dorsiflexion & 20° radial deviation for 3 weeks after which it was discarded. There was no recurrence of deformity on intermediate term follow up.

Discussion

Shortening of ECU as sequelae of infection or of FCU as sequela of trauma leading to a wrist deformity has not been reported in the literature to the best of our knowledge.

The extensor carpi ulnaris muscle is medial to extensor digiti minimi. It originates from the lateral epicondyle and its tendon inserts into the medial side of the base of metacarpal V. It extends and adducts the wrist and is innervated by the posterior interosseus nerve.

Shortening of extensor carpi ulnaris tendon will lead to ulnar deviation deformity of wrist (dynamic) with deformity completely manifesting itself in full palmarflexion and decreasing/disappearing on dorsiflexion as seen in the present case. This is a fixed length phenomenon due to shortened ECU tendon.

The flexor carpi ulnaris muscle is medial to flexor digitorum superficialis. It originates from the medial epicondyle (humeral head) & aponeurosis from medial margin of the olecranon, proximal 2/3rd of posterior border of ulna and deep antebrachial fascia (ulnar head); and its tendon inserts into the medial side of the base of metacarpal V. Its tendon has got muscle fibers till insertion. It flexes and adducts the wrist and is innervated by the ulnar nerve.

Shortening of flexor carpi ulnaris tendon will lead to ulnar deviation deformity of wrist (dynamic) with deformity completely manifesting itself in full dorsiflexion and decreasing/disappearing on palmarflexion. This is a fixed length phenomenon due to shortened FCU tendon. The deformity at wrist was not affected by position of elbow in either case probably because the muscle was scarred and tethered at the site of previous trauma/infection, which was below the level of the elbow in both the cases.

This phenomenon similar to Ober's sign seen in iliotibial band contractures in hip, the degree of ulnar deviation deformity with wrist in neutral (dorsi/palmer flexion) may

give a rough quantification of deformity which may serve as a guide during tendon lengthening preventing over lengthening (which may lead to slacking and severe weakness (mild weakness of course accompanies any tendon lengthening procedure) or under lengthening (under correction of deformity) [1].

Jain V et al. presented six cases, who had a contracture of the long flexor tendons of the fingers and exhibited Volkmann's sign due to a chronic abscess or cysticercosis in the belly of the flexor digitorum profundus. All of them were treated conservatively, with full functional recovery in all the cases and with no recurrence [2]. This series also demonstrated fixed length phenomenon due to contracture of musculotendinous units of non ischemic etiology but coronal plane wrist deformity as seen in our case was not described.

In both these cases deformity (needing surgical management) might not have developed if the primary treating physician advised for wrist range of motion exercises and kept the patient under follow up/recognized developing contracture at an early stage and advised suitable physiotherapy in the form of stretching exercises/suitable splintage (in a position opposite to the tendency of the deforming forces i.e. slight radial deviation and palmar flexion in the first case and slight radial deviation and dorsiflexion in the second case).

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