CASE REPORT

Dynamic Tendon Transfer for the Treatment of Palmar Midcarpal Instability: A Case Report

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ABSTRACT

Midcarpal instability (MCI) means dysfunction of the MC joint and the radiocarpal joint. Palmar MCI (PMCI) is the most common of these MCIs characterized by tilting of the proximal carpal row in a palmar direction. Symptomatic PMCI in a 37-year female patient was corrected transferring the extensor carpi radialis brevis tendon to the hamate bone with good outcome.

Key words: Midcarpal instability, partial wrist fusions, soft tissue reconstruction, tendon transfer

INTRODUCTION

Midcarpal instability (MCI) means dysfunction of the MC and the radiocarpal joints. This complex group of disorders is classified into four subtypes: Palmar, dorsal, combined, and extrinsic. Palmar MCI (PMCI) is the most common form of non-dissociative carpal instability characterized by tilting of the proximal carpal row in a palmar direction and its diagnosis can be difficult and high index of suspicion is necessary.

Conservative treatment is recommended as the initial management in pre-symptomatic patients (no symptoms of instability but able to perform voluntary catch-up clunk). Surgical options for symptomatic and resistant cases include arthroscopic thermal shrinkage, soft tissue reconstruction, partial wrist fusions, and tenodesis stabilization. Extensor carpi radialis brevis (ECRB) transfer to the hamate bone is a novel procedure that provides reliable restoration of the carpal stability with good outcome and few complications for select patients with symptomatic MCI who do not respond to conservative treatment.

CASE REPORT

Symptomatic (pain and functional impairment) wrist PMCI in a 37-year female was treated with a new surgical technique previously described by Ritt and Groot[1] utilizing an ECRB transposition because no improvement was obtained after 6 months of conservative treatment including nonsteroidal anti-inflammatory medication, modification of daily activities and work, and splinting.

Clinical features

Included lax ulnar column, wrist pain aggravated by passive hand supination partially alleviated by manually supporting the pisostyloid interval [Figure 1a], increased pisostyloid distance and volar sagging of the wrist [Figure 1b], and a resisted pronation confrontation test positive [Figure 1c].[2]

Plain X-ray

Lateral (LAT) and anteroposterior (AP) views of the left wrist of the patient showing flexion of the proximal carpal row and the distal scaphoid is projected as a ring and the posterior apex of the lunate is rotated distally. The dorsal capitolunate (CL) angle and the scapholunate (SL) angle are 30° and 45°, respectively [Figure 2].

Operative technique

Under general anesthesia or regional axillary anesthesia, a short longitudinal dorsal incision (4–5 cm) is centered over the distal carpal row to reach the insertion of the ECRB on

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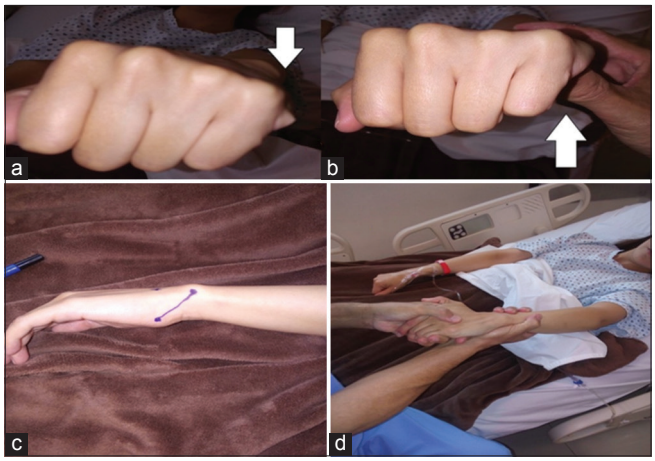

Figure 1: (a) Carpal supination of her left wrist at rest. The carpal supination can be easily reduced using the thumb pushing pisiform bone upward. (b) Increased distance between ulnar styloid and pisiform indicating volar sagging of the proximal carpal row. (c) Resisted pronation confrontation test. When the ulnar column of the affected wrist is manually stabilized, the patient feels stronger and less painful on resisted pronation action

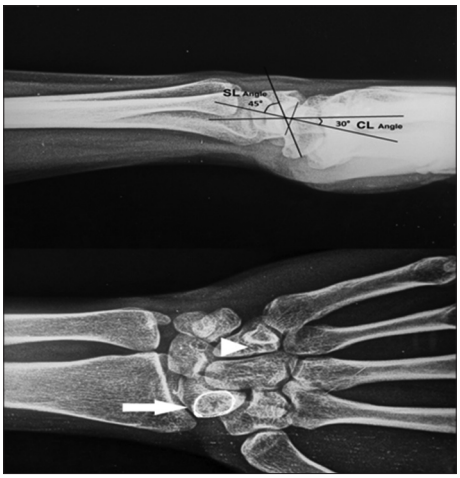

Figure 2: Lateral (LAT) and anteroposterior (AP) radiograph of the left wrist: LAT radiograph: Dorsal capitolunate angulation of 30° and a scapholunate angle of 45° (within the normal range). AP radiograph: The proximal carpal row is flexed and the distal scaphoid is projected as a ring (arrow) and the posterior apex of the lunate is rotated distally (arrowhead)

the base of the third metacarpal and the dorsal region of the hamate bone (new insertion).

The ECRB tendon is detached from the base of the third metacarpal and transposed, palmar to the extensor digitorum communis tendons, to the dorsal aspect of the hamate [Figure 2] where it is attached using a bone interference screw. The capsule is repaired and imbricated using nonabsorbable sutures to cover the ECRB insertion [Figure 3]. Finally, the skin is closed and a volar splint is applied allowing early active

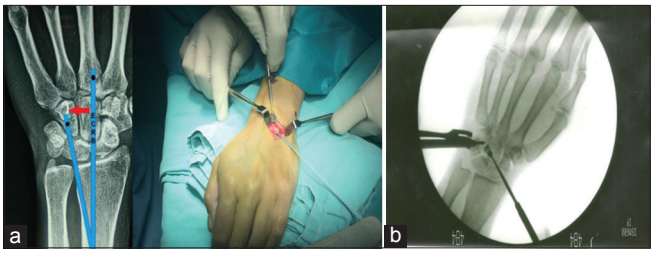

Figure 3: Operative technique: (a) The ECRB insertion is identified and transferred palmarly to the extensor digitorum communis tendons toward the hamate. (b) The transposed tendon is attached to the hamate using a bone interference screw

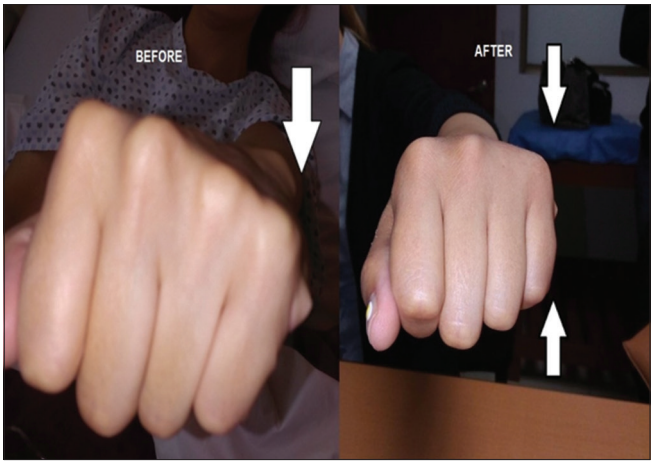

Figure 4: After the operation: Clinical examination showed negative midcarpal shift test, ulnar column laxity, and carpal supination

exercise of the fingers, including the metacarpophalangeal joints. Two weeks postoperatively, the splint is removed and a rehabilitation program is initiated.

RESULTS

Four months later, the patient was totally pain free and returned to her original work. Clinical examination showed negative ulnar column laxity, carpal supination, and resisted pronation test did not provoke pain [Figure 4].

DISCUSSION

The first description of MCI as an entity was in 1934.[3] In 1993, this wrist instability pattern was renamed as PMCI to distinguish it from the dorsal instability.[4] At present, the most useful classification defined the different types of dynamic MCI as palmar, dorsal, combined, and extrinsic. PMCI is the most common of non-dissociative carpal instability.

In a normal wrist with ulnar deviation, the distal row shift from volar to dorsal when the proximal row rotates from flexion to

Table 1: Hargreaves grading system for PMCI

Grade	Description	Surgical treatment options
Grade 0: Pre-symptomatic	No symptoms of instability but able to perform voluntary catch-up clunk. Patient at risk of symptoms	No treatment
Grade 1: Dynamic	Symptoms of giving way. Symptoms reproduced with a positive midcarpal shift test. No voluntary clunk or sag	Soft tissue stabilization or arthroscopic capsular shrinkage
Grade 2: Voluntary dynamic	Symptomatic giving way with voluntary subluxation (ulnar sag sign or voluntarily performed catch-up clunk).	Soft tissue stabilization or arthroscopic capsular shrinkage
Grade 3: Static reducible	VISI deformity on lateral X-ray at rest. Deformity easily reducible on manipulation.	Soft tissue stabilization or bone procedure
Grade 4: Static irreducible	Fixed VISI deformity on lateral X-ray. Not easily reducible. Locked	Bone procedure

VISI: volar intercalated segmental instability, PMCI: Palmar midcarpal instability

extension. With laxity, attenuation, or traumatic disruption of these ligaments, the coupled rotation of the carpus is no longer present. The diagnosis frequently is based on the history, physical examination, and radiographic studies.

Pathophysiology

In patients with a painful MC clunk, dysfunction of the ligaments causes a loss of normal joint reactive forces between the proximal and distal rows. These ligaments include the arcuate, triquetrohamate, CL, and radiotriquetral ligaments.[5] Ligament incompetence and the failure of proprioceptive control together play a combined role in the causation of PMCI.[6]

The previous studies have clarified the role of muscles in the stabilization of ligament-deficient wrists.[7] According to these studies, isometric contraction of some forearm muscles induces MC supination (i.e., the abductor pollicis longus, extensor carpi radialis longus, ECRB, and flexor carpi ulnaris), whereas other muscles induce MC pronation (i.e., the extensor carpi ulnaris). The transfer of the ECRB implies the reinforcement of the MC pronator muscle group to correct the carpal supination presented in PMCI stabilizing wrist ulnar-sided ligament deficiency.

Imaging

Plain X-rays are generally normal, except when static volar intercalated segment instability (VISI) deformity has occurred. If a VISI deformity is presented, it may be caused by PMCI, but it is important to exclude other more common causes such as lunotriquetral (LT) ligament rupture.

In the PMCI, AP and LAT radiographic views demonstrate a volar angulation of the lunate (VISI pattern).[8] The term mild VISI deformity is confusing because a full or true VISI deformity, associated with rupture of the LT ligament, typically results in a reduction of the SL. On the LAT projection, the lunate and scaphoid are flexed and the CL is increased. On the AP projection, the flexed scaphoid produces a ring sign and the lunate is projected as a wedge or sector because the narrow posterior margin is tipped distally on flexion [Figure 2]. SL widening in MCI is not associated with a SL tear.[9]

Grading

When conservative treatment is not successful in controlling pain and instability in patients with PMCI, surgical options should be considered.

A modification of carpal instability classification[10] [Table 1] allows the grading of both the more minor and severe ends of the spectrum of PMCI.

According this classification, the ECRB transfer technique to correct PMCI is indicated in patients with grades 1–3 (dynamic, voluntary dynamic, and static reducible).

ECRB transfer to the ulnar side of the wrist is an easy surgical technique that in theory addresses the symptomatic PMCI in a dynamic way with the advantage that it does not limit wrist motion postoperatively although further biomechanical and clinical studies are required.

CONCLUSION

Palmar midcarpal instability (PMCI) is an uncommon but significant cause of chronic ulnar wrist pain. Although additional research is necessary, this preliminary report suggests that the extensor carpi radialis brevis tendon transfer to the hamate bone provides restoration of the palmar midcarpal stability with good outcome and few complications.

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