Case Report

Traumatic Dorsoradial Trapezium-Metacarpal Joint Dislocation

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Abstract
A trapezium-metacarpal joint dislocation is a rare pathology reported in <1% of all hand injuries. Due to the rarity of this type of injury, no clear standard of treatment exists. Various treatment approaches are reported in the relevant literature, mainly consisting of anterior and posterior dislocation of the trapezium-metacarpal joint. In this case, a 38-year-old patient was treated for dorsoradial trapezium-metacarpal joint dislocation through open reduction with ligamentous reconstruction. Gradual improvement of the patient’s thumb mobility was observed following several physiotherapy sessions.

Introduction
A trapezium-metacarpal joint dislocation is usually associated with a fracture of the trapezoid or Bennett’s fracture [1]. The latter, which could be associated with dislocation, is an intra-articular fracture of the base of the first metacarpal, resulting in a dislocation of the first carpometacarpal joint. However, in rare instances, this loss of action is merely caused by the joint’s dislocation rather than its fracture. The trapezium-metacarpal joint is stable, making
its dislocation a rare event that occurs in <1% of all hand-related injuries [2, 3]. Optimal treatment strategies for this type of dislocation are debated, and the literature concerning this subject is rather scarce due to the rarity of its occurrence [3]. The dislocation often occurs in the dorsal direction [4]. Nevertheless, dorsoradial dislocation is a rarely reported pathology. This article presents a case report of the treatment of a trapezium-metacarpal joint dislocation with lateral displacement of the first metacarpal caused by a motorcycle accident trauma.

Case Report

Our patient is a 38-year-old man who was admitted to the hospital following a motorcycle accident. The patient initially presented to the emergency room (ER), where he was found to have a wound over the first web space, extending volarly, associated with numbness of the thumb. The wound was sutured in the ER, and the ER physician recommended follow-up with an orthopedic surgeon after reviewing the X-rays done in the ER (Fig. 1). The patient was discharged home. However, three weeks later, the patient presented to the orthopedic surgeon and was found to have a dorsoradial trapezium-metacarpal joint dislocation with his thumb blocked in abduction and retropulsion with irreducible flexion contracture of the interphalangeal joint (Fig. 2). The radiological assessment revealed a dorsoradial dislocation of the trapezium-metacarpal joint with a pseudoarticulation of the scaphoid and the first metacarpal on X-ray (Fig. 1), CT scan (Fig. 3a), and CT with 3D reconstruction (Fig. 3b).

An open reduction with ligamentoplasty and K-wire fixation was done. It was decided to use part of the existing wound, under nerve block, over the first web space with dorsal extension, for fear of contamination over the volar aspect, in order to harvest the abductor pollicis longus (APL) tendon. The extensor pollicis longus and brevis and the abductor pollicis were identified and dissected. The dorsal ligament complex and anterior volar oblique were torn, and the capsular tear was found but the articular cartilage was intact. The APL tendon graft was harvested for ligamentoplasty. Starting with the first metacarpal base tunnel dorsolaterally, the anteromedial APL tendon was passed through, and then a tunnel in the trapezium was made with subsequent passing of the APL tendon through it and fixed with an anchor for reconstitution of the volar oblique ligament (Fig. 4). Then, the tendon was taken to the original point at the medial aspect of the first metacarpal bone and fixed with an anchor, therefore making the dorsoradial ligament. The remaining part of the APL tendon was inserted in the second metacarpal to reconstruct the intermetacarpal ligament. The capsule was sutured. Adequate reduction was checked under fluoroscopy. Fixation with a total of three K-wires and three anchors was done (Fig. 5). Using the previous wound over the first web space volar aspect, the ulnar digital nerve was explored and found to have a laceration requiring suturing under the microscope. A dressing and a cast were placed for a period of four weeks.

After four weeks, the K-wires were removed in the operation room (Fig. 6), and the patient started physiotherapy sessions after which he gradually started to regain his thumb’s mobility (Fig. 7), in terms of full range of motion, with a fully recovered grip and thumb pinching ability.

Discussion

The trapezium-metacarpal joint allows for proper mobility of arches of the hand. It is a biconcave saddle joint [5] that is very stable due to several factors including native anatomy of the biconcave-convex articular surfaces [6], ligaments, and the joint capsule. The joint
stability is attributed to the anterior oblique, radial, and ulnar collateral ligaments, oblique posterior and intermetacarpal ligaments, and the dorsoradial ligament complex [4] which is presumed by recent studies to be the most important one. The integrity of the ligaments is essential in order to maintain the stability of the joint. A trapezium-metacarpal joint dislocation is caused by direct injury to the ligaments resulting in an instability of the joint [6]. The mechanism behind dorsal dislocation is axial load with thumb flexion and adduction. The mechanism behind dorsoradial dislocation is unknown but presumed to be axial load with thumb extension causing dorsoradial dislocation [7]. In this case, the mechanism may be a lateral load in the thumb and adduction.

Cardozo et al. [2] reported the treatment process of a patient with dorsal deformity of the trapezium-metacarpal joint. The injury occurred without fracture. Closed reduction maneuvers were applied. Hand protection was required for a period of six weeks and physiotherapy was advised. Good functional results were obtained after the six weeks' period. The same approach was employed by Bosmans et al. [3] in two different patients, and satisfactory results were reported in both cases. Similarly, Labronici et al. [4] employed two closed reduction treatments in two injured patients. In one case, K-wires were used for stabilization, whereas in the other case, a cast was placed. The reported results show the effectiveness of both approaches. Another approach was employed by Snow et al. [8] who performed open reduction of their patient’s injured left thumb. Percutaneous pins were employed for stabilization of the joint. Lahiji et al. [1] also employed the open reduction treatment approach in five out of six patients suffering from a dislocation. The treatment consisted of an open reduction followed by a cast for six weeks. All patients were reported to have an almost normal range of motion after the treatment. For the sixth patient, who had closed reduction treatment followed by a cast, satisfactory results were also reported. It should be noted that all treatments were applied on the same day as the injury.

No surgical intervention is often used as a treatment approach for a dislocation. However, this is a rather controversial approach as it has been reported in some studies that open reduction is a preferable method of treatment based on the comparative results. Simonian et al. [9] conducted a comparative study of the different treatment approaches. The first group of patients was treated with closed reduction with pinning, whereas the second group of patients underwent ligamentous reconstruction. Three out of eight patients in the first group required revision surgery. Consequently, it was concluded that the ligament reconstruction approach presented better results. Fotiadis et al. [10] also argued that open reduction with ligament repair is the better option for the treatment of a dislocation. Their patient initially underwent close reduction treatment after which the dislocation was reduced and the joint was found to be unstable. Hence, ligament repair was performed, and satisfactory results were reported. Watt and Hooper [11] attempted to specify the optimal approach to be used in closed reduction treatment. Their comparison showed that closed reduction accompanied by pinning and cast caused no pain or instability among patients, whereas closed reduction followed by only a cast was found to cause instability and pain in some instances. These studies show that while closed reduction with pinning and a cast can result in a satisfactory solution for the dislocation, open reduction is the optimal treatment for a dislocation.

Open reduction with ligamentoplasty, K-wire fixation, followed by a cast was employed for the treatment of the patient in this case study. Hence, early open ligament reconstruction is recommended, with emphasis on the importance of restoring the dorsoradial and anterior oblique ligament functions, which provide an essential role in the stability of the joint. Gradual improvement following physiotherapy sessions was observed, with satisfactory range of motion results in the thumb, gripping, and thumb pinching abilities almost back to normal.
Conclusion

Based on previously reported cases of trapezium-metacarpal joint dislocation, it is still difficult to determine the optimal treatment or strategy for this isolated injury due to the scarcity of the reported cases and the variety of effective treatments. However, it can be concluded, based on previous findings and this current case, that an open reduction with ligament reconstruction is found to provide satisfactory results, with emphasis on the fact that, when operatively treated, a better outcome for the patient can be achieved when compared to any other conservative modalities.

Statement of Ethics

Full consent from the patient was obtained for publishing this article and images.

Disclosure Statement

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Fig. 1. X-ray image of the left hand in the emergency room showing a dorsoradial dislocation of the trapezium-metacarpal joint.

Fig. 2. Dorsoradial trapezium-metacarpal joint dislocation.
Fig. 3. a CT scan of the left hand, coronal and axial views, showing a dorsoradial trapezium-metacarpal dislocation. b CT scan with 3D reconstruction of the left hand showing a dorsoradial trapezium-metacarpal dislocation.

Fig. 4. Diagram. 1: first, APL graft in tunnel through first metacarpal base. 2: second, APL graft taken anterior to posterior through trapezium creating volar oblique ligament. 3: third, APL taken back to base of first metacarpal bone creating dorsoradial ligament. 4: fourth, part of APL taken to create intermetacarpal ligament. APL, abductor pollicis longus; M1, first metacarpal bone; M2, second metacarpal bone.
Fig. 5. Fluoroscopic images after fixation using 3 K-wires and 3 anchors.

Fig. 6. Four weeks postoperatively after removal of K-wires.

Fig. 7. Thumb extension and adduction 3 months postoperatively.