Case Report

Isolated palmar dislocation of the trapezoid associated with distal radius fracture in a patient with major trauma: A case report and literature review

Yu Chang a, Fa-Chuan Kuan b,c,d,e, Wei-Ren Su b,c, Kai-Lan Hsu b,c,d,e,*

a Department of Surgery, National Cheng Kung University Hospital, College of Medicine, National Cheng Kung University, Tainan, Taiwan
b Department of Orthopaedic Surgery, National Cheng Kung University Hospital, College of Medicine, National Cheng Kung University, Tainan, Taiwan
c Skeleton Materials and Bio-compatibility Core Lab, Research Center of Clinical Medicine, National Cheng Kung University Hospital, College of Medicine, National Cheng Kung, Taiwan
d Department of Biomedical Engineering, National Cheng Kung University, Tainan, Taiwan
e Division of Traumatology, National Cheng Kung University Hospital, College of Medicine, National Cheng Kung University, Tainan, Taiwan

A R T I C L E   I N F O

Keywords:
Trapezoid
Dislocation
Carpometacarpal
Cascade lines

A B S T R A C T

Trapezoid dislocation is infrequent, and palmar trapezoid dislocation is even more rare. This uncommon injury is associated with high-energy trauma and is often combined with other distracting injuries that may lead to misdiagnosis or delayed diagnosis. We present a case of isolated palmar dislocation of the trapezoid in a 49-year-old man with major trauma following a motor vehicle accident. We identified the dislocation by radiograph and performed open reduction and internal fixation (ORIF) after primary management of his major trauma. The patient recovered with satisfactory hand and wrist function. We share our experience and review the pitfalls in diagnosis and treatment for this rare injury.

Introduction

Trapezoid dislocation is an unusual event resulting from direct or indirect high-energy trauma. Dorsal trapezoid dislocations are more prevalent than palmar trapezoid dislocations because of anatomical position and the fact that palmar ligaments are stronger [1,2]. Only approximately 30% of trapezoid dislocations are palmar; the rest are dorsal [1]. Most trapezoid dislocations occur concomitantly with other carpal or carpometacarpal (CMC) fractures or dislocations. Isolated palmar dislocation of the trapezoid is extremely rare. Identifying trapezoid dislocation on plain radiographs is difficult, and with coexisting injuries that are more obvious or severe, this uncommon injury may be overlooked [3].

We report the case of a 49-year-old man presenting with isolated palmar dislocation of the trapezoid associated with distal radius fracture. The fracture was treated with open reduction and pinning as soon as the patient’s condition was stable, following primary management of his major trauma. At 5-month postoperative follow-up, the patient had recovered with good functional outcomes.

* Corresponding author at: Department of Orthopaedics, National Cheng Kung University Hospital, College of Medicine, National Cheng Kung University, 138 Sheng-Li Road, Tainan 70428, Taiwan.
E-mail address: dulendulen@gmail.com (K.-L. Hsu).
Case report

A 49-year-old man was sent to our emergency department after a motor vehicle accident. He had multiple traumatic injury over 4 limbs and blunt injury to the abdomen. While focusing on his left hand, he had difficulty moving his right wrist and index finger due to pain. The radiographs showed a left distal radius fracture with distal radioulnar joint dislocation and subtle migration of the left trapezoid (Fig. 1A). Due to the patient’s unstable hemodynamic status, exploratory laparotomy was arranged to stop bleeding. Following surgery, open reduction and internal fixation (ORIF) for his multiple fracture was performed and external skeleton fixation was applied to the left wrist. Due to a lesion over the trapezoid, the external fixator was secured to the patient’s third metacarpal (Fig. 1B). The palmar dislocation of the trapezoid and the dorsal dislocation of the second metacarpal was postoperatively confirmed.

Fig. 1. (A) Anterior-posterior view of the wrist. The white arrows indicate the metacarpal cascade lines and the red arrow indicates the abnormality of the second metacarpal. The orange dotted line shows the curve of the metacarpal head. The shortening of the second metacarpal was not obvious. (B) Oblique view of the wrist after external skeletal fixation. (C) Computed tomography (CT) scan of the wrist confirming palmar dislocation. (D) Proximal dislocation of the index metacarpal base to the space left by the trapezoid dislocation. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)
by radiograph and computed tomography (CT) findings (Fig. 1C, D).

On the seventh day of hospitalization, we performed ORIF for the left distal radial fracture with a plate and fixed the distal radial ulnar joint with a Kirschner wire as we removed the primary external skeletal fixation. As for the trapezoid and the second metacarpal dislocation, a horizontal incision on the dorsal aspect of the wrist was made. With the wrist in slight dorsiflexion, the trapezoid and the second metacarpal were reduced with a “clunk” sensation using longitudinal traction on the index finger and dorsal manipulation on the trapezoid body. Stabilization of the trapezoid and the second metacarpal was performed with 4 Kirschner wires (Fig. 2A, B). At 2 weeks postoperation, a radiograph confirmed reduction of the trapezoid and the second metacarpal. The patient remained splinted for 6 weeks, after which the wires were removed. He then began rehabilitative active and passive hand and wrist motions. At 5-month follow-up, the patient was able to bend to 80° on his second CMC joint and to 110° on his other fingers with much improved hand and wrist function (Fig. 2C, D).

Fig. 2. (A) Oblique view of the wrist 2 days postoperation (B) Anterior-posterior view of the wrist 5 months postoperation with good alignment of the distal radius and carpal bones. (C) Flexion and (D) extension of the finger 5 months postoperation.
Discussion

The trapezoid is normally firmly situated similar to a wedge between 4 bones, articulating with the scaphoid proximally, the trapezium laterally, the capitate medially, and the second metacarpal distally. The trapezoid is the “keystone” of the proximal palmar arch, which is attached to its neighboring carpal bones by strong ligaments [4,5]. Dislocation of the trapezoid is rare due to its stability and secure position. When the trapezoid is injured, there is a 70% chance of ipsilateral arm injury, which is often associated with injuries to the carpal bone and metacarpal base [6]. The palmar surface of this wedge-shaped bone is approximately half the size of the dorsal surface. Palmar ligaments, the primary restraining structure, are much thicker and stronger than dorsal ligaments. Therefore, palmar dislocation is exceptionally rare [2,5].

The exact mechanism of palmar trapezoid dislocation is unclear. Charles et al. [2] proposed that hyperextension of the distal pole of the scaphoid, with the base of the second metacarpal retaining the trapezoid dorsally, is the only mechanical situation where the trapezoid could dislocate through the strong palmar ligaments. Proximal dislocation of the index metacarpal base into the gap left by the trapezoid may occur as well as additional dorsal subluxation [1,4].

Trapezoid dislocation is easily missed diagnosed due to the presence of other injuries and difficulty of recognition on plain radiographs. Presence of second metacarpal shortening is not obvious on plain radiographs. The “metacarpal cascade lines” are effective in diagnosing dislocations of the CMC joints [4,7]. Abnormal metacarpal cascade lines in the presented case indicated dislocation over the second CMC joint. CT scans may be beneficial when the radiographic diagnosis is uncertain [3,8,9] because they can confirm the direction of the dislocation and a surgical decision can be made.

Although dorsal dislocations can be treated by closed reduction [5], this is difficult for palmar dislocations. Because of the shape of the trapezoid and its relation to other bones, palmar trapezoid dislocations, such as in the presented case, require open reduction. Additional Kirschner wire fixation has achieved favorable clinical results. Trapezoid excision is an option but would result in proximal migration of the second metacarpal, leading to function loss and degenerative changes. Previous reports indicate that complications, such as avascular necrosis and midcarpal degenerative changes, are rare [2,4].

In conclusion, we report a case of palmar dislocation of the trapezoid in a patient with severe trauma treated with ORIF, achieving satisfactory outcomes. Awareness of carpal dislocation should be present when evaluating patients with high-energy traumatic injuries to the hand. The metacarpal cascade lines are useful for diagnosing CMC joint dislocations, and CT scans can help determine dislocation direction and confirm the diagnosis. Treatment requires ORIF, with most patients having a good prognosis.

Declaration of competing interest

All the authors declare no conflict of interest regarding the publication of this article.

Acknowledgement

1. This manuscript was edited by Wallace Academic Editing
2. We are grateful to Skeleton Materials and Bio-compatibility Core Lab, Research Center of Clinical Medicine, National Cheng Kung University Hospital, for the assistance of this study

References

[1] T.R. Koenig, O.C. West, Palmar dislocation of the trapezoid, Skelet. Radiol. 32 (2) (2003) 95–98.
[2] M.L. Goodman, G.B. Shankman, Palmar dislocation of the trapezoid—a case report, The Journal of Hand Surgery. 8 (5 Pt 1) (1983) 606–609.
[3] A. Wright, R. Umaar, Dorsal dislocation of the trapezoid with carpo-metacarpal dislocations: a case report and a description of the “missing carpal sign” on radiographs, The Journal of Emergency Medicine. 47 (4) (2014) e95–e97.
[4] D.F. Cardozo, G.V. Plata, J.A. Casas, N.S. Rodriguez, Acute dislocation of the metacarpal-trapezoid joint, Clin Orthop Surg. 8 (2) (2016) 223–227.
[5] M.A. Meyn Jr., A.M. Roth, Isolated dislocation of the trapezoid bone, The Journal of Hand Surgery. 5 (6) (1980) 602–604.
[6] M. Taylor, D. Shakespeare, Trapezoid dislocation with a Galeazzi fracture, Acta Orthop. Belg. 64 (3) (1998) 328–330.
[7] P.D. Hodgson, D.J. Shewring, The ‘metacarpal cascade lines’: use in the diagnosis of dislocations of the carpometacarpal joints, J. Hand Surg. Eur. Vol. 32 (3) (2007) 277–281.
[8] R.P. Calfee, L. White, A. Patel, P.J. Stern, Palmar dislocation of the trapezoid with coronal shearing fracture: case report, The Journal of Hand Surgery. 33 (9) (2008) 1482–1485.
[9] M.H. Ting, J.D. Tompson, E.T. Ek, Isolated dislocation of the trapezoid, Hand Surg. 17 (3) (2012) 391–393.