Transtrapezial Peritrapezoidal Transcapital Axial Radial Fracture Dislocation of the Carpus

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Abstract We report a unique pattern of an axial radial fracture dislocation of the carpus. The fracture dislocation line runs transtrapezial peritrapezoidal transcapital transmetacarpal III/IV. Open reduction and internal fixation was performed 11 days after the accident. The result at 9 months is moderate, with a range of motion of 63% and strength of 46% compared to the opposite side.

Keywords Transtrapezial · Peritrapezoidal · Transcapital · Axial radial fracture dislocation · Carpus

Introduction

Various patterns of axial radial (AR) or axial ulnar (AU) fracture dislocations are described already [2, 6, 9]. In the clinical examination, you can typically find an enlarged gap

between the metacarpals, through which the dislocation runs. The fracture line in this case runs transtrapezial peritrapezoidal transcapital transmetacarpal III/IV with a dorsal–radial dislocation pattern, which has not been described yet.

Case Report

A 46-year-old woman sustained a closed hyperextension/compression injury of her left nondominant wrist when she fell down on her left hand during alpine skiing while still holding the ski stick in her hand. The first clinical examination and plain radiographs by the family doctor did not reveal the diagnosis. Only a magnetic resonance imaging investigation after a delay of 11 days finally made the diagnosis and the patient got referred to our clinic. In the clinical examination, there was no enlarged intermetacarpal gap and the patient did not show any additional neurovascular or musculotendinous injury. Plain radiographs (Fig. 1) and computed tomography (CT) scan (Fig. 2) revealed the dorsal-dislocated unit of the first three metacarpals including the half of the trapezium, the trapezoideum, and the distal dorsal part of the capitatum. The trapezium was fractured through the body with a crushed proximal part, articulating with the scaphoid and trapezoideum. The capitatum showed a distal transverse fracture course.

Because there were no additional lesions, we chose an isolated dorsal approach. After reposition, we fixed the capitatum with two lag screws and secured the position with an additional transverse K-wire through the metacarpals II–V. Thereafter, the carpus was stable in an anatomical

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Figure 1 Anteroposterior and lateral plain radiographs show the transtrapezial peritrapezoidal transcapital axial fracture (*line*) with dorsal dislocation (*arrow*).

position and the trapezium did not need any further fixation. The wrist was put in a cast. After 1 month, the patient was request to remove the cast daily and to perform flexion and extension exercise for the wrist. After 2 months, the K-wire was then removed and physical therapy was started.

The patient was evaluated clinically and radiographically 9 months after the injury. She reported moderate pain at full wrist extension and still is unable to go biking. The active range of wrist motion was 55° extension and 40° flexion (opposite side 80/70). Strength of the finger flexors (measured with a Jamar dynamometer, Asimov Engineering,

Los Angeles, CA, USA) was 12 kp (opposite side 26 kp). Radiographs showed normal alignment of the carpus and consolidation of all fractured bones (Fig. 3).

Discussion

Axial dislocations of the carpus are very rare and mostly caused by severe crush and open injuries to the hand [1–3]. First, Garcia-Elias et al. [2] described in 1989 a classification for these injuries pattern where three main groups were

Figure 2 CT scans showing the fracture of the trapezium (*T*) and capitatum (*C*) with its dorsal dislocation.

Figure 3 Postoperative X-rays after 9 months showing normal alignment of the carpus with consolidation of the fractured trapezium and capitatum.

differentiated: an AU disruption type where the radial carpal column stays in anatomical position and the ulnar column displaces ulnary and proximally. In AR disruption type, the ulnar column stays in anatomical position and the radial column displaces proximally and radially. In a combined axial radial ulnar type, both columns are unstable and are displaced to their corresponding side [2]. In the literature, there are approximately 72 reported cases of axial dislocations of the carpus. About 57% ($n=40$) were axial radial dislocations. Most of them ($n=36$) are transtrapezial or peritrapezial. A minority ($n=5$) are transscaphoidal [4, 6–8].

The postoperative outcome depends mainly on associated soft tissue injury. The delay of operative treatment seems not to be important. Excellent and good results can be expected in around 60% of the cases [2].

Among alpine skiing, carpal injuries are rare and make up only 2.2% of all hand injuries [5]. Our case is a low energy, closed injury without any additional neurovascular or tendomuscular lesions. Because of this isolated dorsal–radial dislocation, there was no apparent enlarged intermetacarpal gap seen in the clinical examination. This

might have delayed the diagnosis. The fracture and dislocation pattern is an axial radial disruption with a fracture running transtrapezial peritrapezoidal transcapital transmetacarpal III/IV which has, to our knowledge, not been described before. Nine months postoperatively, the patient showed a range of motion of 63% and strength of 46% compared to the opposite side. She complains about pain in maximal wrist extension and is slightly disturbed during her daily life and work as a housewife. She is still not yet able to go biking.

The present case shows that even a low energy trauma can cause a complex closed axial carpal dislocation in absence of any additional neurovascular or tendomuscular lesions. In this isolated dorsal–radial direction of dislocation, there is no obvious enlarged intermetacarpal gap visible. Careful clinical and radiological examination is essential for a correct and immediate treatment. In our case, the physiotherapy of the wrist should have been started earlier after the operation. Despite anatomical reposition and fixation, a delay of the treatment as well as a delay of physiotherapy may have a negative impact of the result.

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