Pomeranian J Life Sci 2026;72(1):48-50 doi: 10.21164/pomjlifesci.1190

Result of the treatment of complex wrist injury following high-energy trauma in a young patient: a case report

Bernard Piotuch[A] ✉, Ilya Kuryha[B]

Pomeranian Medical University in Szczecin, Department of General and Hand Surgery, Unii Lubelskiej 1, 71-252 Szczecin, Poland

[A] ORCID: 0000-0001-9337-8077; [B] ORCID: 0009-0004-9210-3986

✉ bernard.piotuch@gmail.com

ABSTRACT

High-energy fractures of the distal radius are characterized by serious displacement and the possibility of fractures of other bones of the hand, wrist and damage to the carpal ligaments. However, simultaneous fractures of the distal radius, the scaphoid and lunate bones are even rarer, and exceptionally rare are fractures of 4 different bones in the hand. In this article we report a case of complex wrist injury following high-energy trauma, that included: severely displaced distal radius and ulna fractures, with concomitant the scaphoid and base of the fifth metacarpal fractures. The patient was operated on and each fracture was fixed using different methods and implants. At a follow-up assessment at 4 months, the result of the treatment was good, which allowed the patient to return to work.

Keywords: complex wrist injury; distal radial fracture; distal ulna fracture; scaphoid fracture; operative treatment.

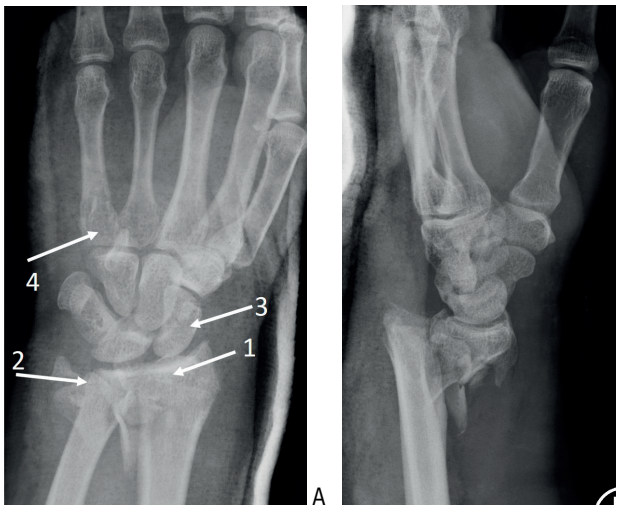
INTRODUCTION

Distal radial fractures (DRF) are the most common fractures within the upper limb in adults. Depending on the mechanism of the injury, there are low-energy fractures (falling on the hand from the height of the body) and high-energy fractures (falling on the hand from a height or from a moving vehicle). High-energy fractures are characterized by a greater degree of displacement of the distal radius and the possibility of fractures of other bones of the hand, wrist and damage to the carpal ligaments. However, simultaneous fractures of the distal radius and the scaphoid are rare: the prevalence of these injuries is about 0.5% [1, 2]. Simultaneous fractures of the distal radius, the scaphoid and lunate bones are even rarer, and exceptionally rare are fractures of 4 different bones in the hand and wrist [3, 4]. In the literature, one can find reports on single cases of such injuries, the treatment of which is not more difficult than each individual bones, but more time-consuming, burdened with a higher risk of complications and worse functional results [1, 2, 3, 4].

The paper presents a rare, high-energy injury to the wrist, in which except of comminuted DRF, 3 other, concomitant fractures occurred: comminuted distal ulna, scaphoid bone and fifth metacarpal fracture. To the authors best knowledge, such a complex injury has not been described so far.

CASE REPORT

A 45-year-old patient presented to the hospital emergency department after falling from an electric scooter he was driving at a speed of 45 km/h (from patient's report). On admission, the patient was conscious, in a stable condition, and complained of pain and swelling in the left wrist, left side of the chest and neck. He also had numerous abrasions of the skin of the limbs and face. Computed tomography scans of the head and a chest X-ray showed only a fracture of the V rib on the left side and fractures in the left wrist: comminuted, severely displaced distal radius and ulna, scaphoid and base of the fifth metacarpal fractures (Fig. 1). The patient was admitted to the hand surgery unit and next day was given surgery.



1 – comminuted distal radial fracture; 2 – comminuted distal ulna fracture; 3 – scaphoid fracture; base of the fifth metacarpal fracture

FIGURE 1. X-ray of the reported fracture: A. p-a view; B. lateral view

OPERATION

The operation was performed under brachial plexus block anesthesia and with a tourniquet. Prior to operation, the patient received standard antibiotic prophylaxis. After examining the patient under anesthesia, it was found on the operating table

that fractures of the distal radius and ulna, as well as base of the fifth metacarpal are unstable and need fixation. Distal radial fracture was approached via standard palmar Henry's incision in the distal forearm. After open reduction of the fracture, distal radius was stabilised with a titanium palmar plate (Hofer Inteos system). Next, distal ulna was approached via palmar-ulnar incision. Comminuted fracture was provisionally reduced and bone fragments were fixed with 3 K-wires and a loop of a fine wire (cerclage). Intraoperatively, a partial tear of the triangular fibrocartilage complex (TFCC) was found and repaired with sutures. Intraoperative examination of the distal radio-ulnar joint showed its good stability. Next 2 fractures were fixed percutaneously. Fracture of the waist of the scaphoid was fixed with cannulated headless screw (Aptus, Medartis), whereas base of the fifth metacarpal was reduced and stabilised with single K-wire. Figure 2 show the postoperative X-rays of the repaired wrist. Postoperative course was uneventful, except of moderate swelling of the operated hand and wrist. The patient was dismissed home in the third postoperative day.

FIGURE 2. Post-operative X-ray. Note perfect reduction and fixation of all fractures: A. p-a view; B. lateral view

At a follow-up examination at 4 months post-surgery, the patient had no wrist pain, wrist range of motion: extension 45° (69% of a healthy hand), flexion 30° (46%) and global grip strength of 19 kG (40%). An assessment of hand dexterity using the Disability of Arm, Shoulder and Hand questionnaire (DASH) showed a score of 32 (moderate impairment of function). Among the activities assessed in the questionnaire, the patient had the greatest problems with changing a light bulb in a pendant lamp, driving nails and playing tennis (score 4 in each item, range 0 – "no problem" to 5 – "not possible to perform"). The patient considered function his hand good an returned to his previous work as a custom officer.

DISCUSSION

Injuries to the extremities as a result of accidents while riding an electric scooter are moderately common [5, 6]. In Poland, the most common cause of DRF are falls from body height, and in the high-energy mechanism, falls during rollerblading, roller skating and cycling. Concomitant fractures of carpal bones are relatively rare, and fractures of the scaphoid concomitant distal radius were the most commonly described. Some authors believe that a sudden loss of balance while riding a scooter leads to the rider falling on an outstretched arm to avoid head injury, resulting in fractures of the wrist bones [5, 6]. These authors believe that due to this mechanism of injury, simultaneous fractures of the distal radius and other wrist bones are then quite common.

In the presented case, the scaphoid fracture was not a problem and it was fixed with a cannulated screw via percutaneous approach. In contrast, a multi-fragmental fracture of the distal ulna was a major problem. These fractures fairly common associate with DRF, but they are usually single-fragmented, or they are fractures of the ulnar styloid. In both versions, treatment is relatively simple: subcapital fractures are fixed with 1–2 intramedullary K-wires, whereas ulnar styloid fractures are usually left untreated [7, 8]. Comminuted fracture of the distal ulna in the presented case was a problem because it was unstable, and the fragmented bone fragments might not have united. This fracture was addressed with K-wire and additional cerclage fixation, what resulted in satisfactory recovery of the distal ulna anatomy and stability of the fracture (Fig. 2). Concomitant tear of the TFCC was repaired with direct suture via the same approach.

Li et al. reported a case of comminuted distal radius and lunate fracture combined with the scaphoid fracture in a patient who sustained crush injury to his right wrist. The posterior approach was used to reconstruct the lunate bone with polymethylmethacrylate cement and cannulated screws were used to fix the scaphoid and distal radius fractures. All fractured bones united and at 3 months after surgery, the movement of the right wrist joint was satisfactory. At the sixth month after surgery, the patient returned to the original work [1].

Verlinsky et al. reported results of the treatment of concomitant fractures of the distal radius and the scaphoid. Over a 15-year period 31 these injuries were identified. Distal radial fractures were treated operatively or conservatively. Twenty-two (71%) scaphoid fractures were fixed with cannulated screws, whereas 9 were treated conservatively. All DRF united, but 1 case of scaphoid nonunion was identified in the operative group. The authors conclude that operative management of scaphoid fractures resulted in a statistically significant reduction in time to motion (2-week reduction) and time to radiographic union (8-week reduction) [2].

The authors believe that presentation of such an exceptional injury may be interesting for hand and orthopaedic surgeons. We also believe that reported treatment modality can be considered optimal in such complex and difficult case.

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