



Bilateral carpal pilon-type fractures due to clenched fist trauma: a case report

Ole Reigstad^{1,2^}, Trygve Holm-Glad^{2,3^}, Johanne Korslund^{2,3^}, Rasmus Thorkildsen^{2,3^},
Magne Røkkum^{2,3}

¹Orthopedic Department, Martina Hansens Hospital, Baerum, Norway; ²Institute of Clinical Medicine, University of Oslo, Oslo, Norway; ³Division of Orthopaedic Surgery, Oslo University Hospital, Oslo, Norway

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Correspondence to: Ole Reigstad, PhD, MD. Orthopedic Department, Martina Hansens Hospital, Box 13, N-1342 Gjøttum Norway.
Email: ole.reigstad@gmail.com.

Background: Multiple carpal fractures or fracture dislocations can be devastating to the wrist. Despite anatomical reduction and ligament reconstruction, reduced function and arthrosis is often observed. Simple fractures without ligament injuries often fare well if anatomy is restored and the fracture heals.

Case Description: A 17-year-old autistic man presented with pilon-type bilateral fractures of the carpals after crashing his bicycle in a car with clenched fists around his bicycle handlebars. He had a displaced scaphoid, minimal displaced capitate and an undisplaced hamate fracture on the left side and an undisplaced scaphoid and displaced two-part capitate fracture on the right side. The fractures were reduced and stable fixation with screws performed. He was immobilized for 2 weeks and allowed early active motion. At 8 weeks the fractures had healed, and he obtained good function. At final follow-up after 6 months his nearest of kin reported excellent function, he had returned to his preinjury activity level. Range of motion and grip-strength was excellent and symmetrical. Radiographs and CT scans revealed healed fractures in anatomical position, no sign of ligament injuries, carpal instability or arthrosis.

Conclusions: Multiple carpal fractures are not necessarily prone to reduced wrist function, pain and arthrosis, even in bilateral cases. If the ligaments are intact, stable fixation obtained and early mobilization obtained the fractures reduced and stable fixation obtained excellent hand and wrist function can be obtained.

Keywords: Case report; carpal fracture; scaphoid; wrist; bilateral

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Introduction

High energy fractures and fracture-dislocations in the wrist are devastating, often leading to pain, reduced function and arthrosis. The injury pattern of perilunate fracture-dislocations is well known described by Mayfield (1). The

sagittal disruption of the carpal stability and integrity through fractures and/or ligament ruptures can ultimately destroy the wrist (2), undiagnosed, late or poorly treated injuries have a bad prognosis (3,4). Pilon (hammer) fracture patterns of the hand are described in the distal radius, 4th

[^] ORCID: Ole Reigstad, 0000-0002-1927-5122; Trygve Holm-Glad, 0000-0002-4642-9107; Johanne Korslund, 0000-0001-6047-5460; Rasmus Thorkildsen, 0000-0002-5902-5419.

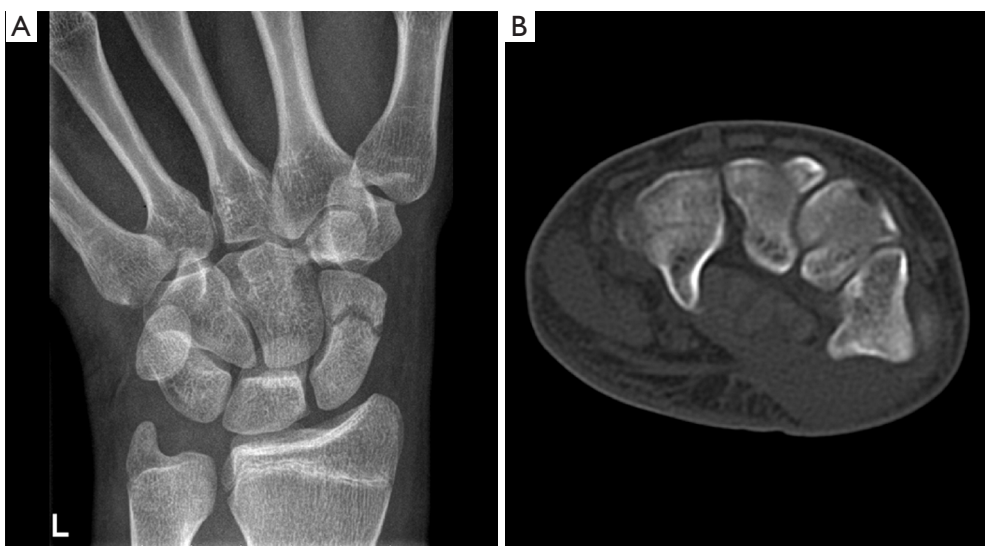


Figure 1 Left side. (A) Front, pronated wrist radiograph, scaphoid and capitate fracture. (B) CT coronal, hamate corpus fracture.

and 5th carpometacarpal (CMC) joint as well as proximal interphalangeal (PIP) joints, where the periarticular bone on one side of the joint fractures due to a direct force (“hammer blow”) from the adjacent bone (5). Except for scaphoid fractures and dorsal triquetral flake injuries, carpal fractures are rare (6), but important to acknowledge and treat, the vast majority being intraarticular and prone to arthrosis, pain and reduced function (2). We present a bilateral case with multiple carpal bone fractures. The authors are level 3 or 4 surgeons according to Tang and Giddins (7). We present the following case in accordance with the CARE

reporting checklist (available at <https://aoj.amegroups.com/article/view/10.21037/aoj-22-25/rc>).

Case presentation

A right-handed 17-year-old autistic boy crashed with a car during bicycling, impacting the side of the car with both hands around the bicycle handlebars. The speed at the impact was difficult to assess. The car had a speed of around 15 km/t. The boy complained of pain and reduced motion in both wrists and hands. Bilateral wrist radiographs (four projections) and CT scans revealed left-sided displaced (>1 mm) distal scaphoid fracture, undisplaced transverse capitate and hamate corpus fracture involving the hamulus (*Figure 1A,1B*), and right-sided undisplaced scaphoid and displaced (>1 mm) intraarticular 3-part capitate fracture (*Figure 2*). For bilateral injuries to the wrist, carpus or hand, we strive to achieve a stable situation allowing the patient to care for themselves as soon as possible, a patient with uncertain compliance strengthened this decision.

In the left wrist, a small volar approach over the distal part of the flexor carpi radialis tendon was performed. The scaphoid fracture was anatomically repositioned and a cannulated 3.0 mm headless compression screw (HCS®, Depuy-Synthes, Raynham, USA) was inserted retrograde from the scaphoid tubercle. Via a dorsal approach between the 3rd and 4th extensor compartments, a 3.0 mm HCS screw was introduced retrograde longitudinally in the undisplaced capitate fracture. The hamate fracture was stabilized

Highlight box

Key Findings

- A bilateral carpal fracture case was operated with stable fixation of the scaphoid, capitate (both sides) and hamate (left side) and allowed early mobilization.

What is known and what is new?

- Carpal fracture-dislocation are devastating injuries to the wrist, especially when bilateral. Even in cases with anatomic reduction and ligament reconstruction patients commonly experience reduced wrist function.
- Excluding ligamentous injuries allowed stable fixation and early mobilization with excellent resultant wrist function.

What is the implication and what should change now?

- Cases of pure fractures should be excluded from more common perilunate fracture dislocations. Fractures should be anatomically reduced, operated and started early mobilization.



Figure 2 Right side. Front supinated wrist radiograph. Undisplaced scaphoid fracture, 3-part capitate fracture.

with a 1.5 mm cortex screw (Compact Hand[®], Depuy-Synthes, Raynham, USA) from dorsal to the volar tip of the hamulus. The ligaments available from the dorsal wrist was inspected and tested under fluoroscopy during wrist motion combined with compression and distraction. The ligaments were stable. On the right side, a percutan guidewire was introduced retrograde in the scaphoid tubercle through the scaphoid to the proximal pole and a 3 mm HCS[®] screw used for fixation. Via a dorsal approach, the capitate fracture was reduced and fixed with two 3 mm HCS[®] screws. As on the left side the ligaments were tested and found to be stable. No signs of ulnar injuries were observed. Both wrists were immobilized in dorsal plaster of Paris casts for 17 days, after which sutures were removed and the patient was allowed early wrist motion limited by pain. After 8 weeks, the fractures were clinically considered healed (no tenderness on compression or palpation) confirmed by radiographs (no visible fracture lines). CT scans at 3- and 6-month demonstrated bridging trabeculae on sagittal and coronal scaphoid CT reconstructions (as defined by Dias *et al.*) (8). Total wrist active range of motion [total AROM = flexion (75°) + extension (75°) + radial deviation (25°) + ulnar deviation (55°)] was 230° bilaterally, and grip strength measured with a JAMAR hand dynamometer (J.A. Preston Corp, Clifton, NJ) was 22 and 21 kg on the left and right side. He was allowed unrestricted activities. At 6 months the patient demonstrated symmetrical, excellent AROM = 250° (flexion = 80°, extension = 85°, radial deviation = 35° and

ulnar deviation = 55°) and forearm (200°, pronation = 100° and supination = 100°) rotation as well as grip-strength (32 kg bilateral). No sign of instability, incongruence or arthrosis was seen clinically or radiologically on radiographs or CT scans (Figure 3A,3B).

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient's nearest of kin for publication of this case report and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.

Patient perspective

The patient has a serious autism disorder and is attended by his family. According to his parents, the patient's function quickly returned. Attention, appetite and activities, including bicycling had returned to his preinjury activity level after 3 months and no behavior of consistent pain was seen. They had not observed any complaints nor seen limitations in his wrist or hand function.

Discussion

Bilateral pilon type fractures in the carpal bones (except in the ulnar CMC joints) have not been described before, nor have we found unilateral cases in the literature.

A complex carpal injury limited to fractures where anatomy was restored and early mobilization initiated provided excellent function in our patient, comparable to the results after uncomplicated operatively treated acute scaphoid fractures (9). Interpreting this injury as a more common perilunate fracture-dislocation would include internal fixation of presumed ligament injuries, prolonged immobilization/rehabilitation and reduced wrist function (10). Even after shorter follow-up, patients demonstrate complex recovery, residual problems and degenerative changes on radiographs (11). Similar results after 4–5 carpometacarpal-hamate fracture-dislocations are described. These injuries are pilon-type. Poorly reduced or persistent displaced fractures fare poor, while anatomically reduced fractures fare well, demonstrating high satisfaction and good function (12).

Conclusions

Well-treated fractures in the carpal bones are tolerated and



Figure 3 Frontal radiographs. (A) Left side shows fractures in the scaphoid, capitate and hamate healed in anatomical positions. (B) Right side. Fractures in scaphoid and capitate healed in anatomical position. No signs of instability, ligamentous injury, incongruity wear or secondary arthrosis on either side. The patient has excellent function.

give excellent wrist function. Ligament injuries and poorly reduced fractures are prone to reduced function, pain and arthrosis.

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Footnote

Reporting Checklist: The authors have completed the CARE reporting checklist. Available at <https://aoj.amegroups.com/article/view/10.21037/aoj-22-25/rc>

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Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient's nearest of kin for publication of this case report and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.

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