

# Bilateral Trans-Scaphoid Perilunate Fracture Dislocation

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Bilateral trans-scaphoid perilunate fracture dislocations are uncommon and have been rarely reported in the literature. Furthermore, it is more difficult to manage in the case of Fenton's syndrome (scaphocapitate fracture syndrome, trans-scaphoid trans-capitate fracture dislocation). These injuries occur after a high-energy trauma caused by fall from height or vehicular accidents. These fracture dislocation patterns have very few reported cases in the literature and little information as to the diagnosis, management, and surgical approach for treatment. We present a case of scaphocapitate fracture syndrome on the right hand and trans-scaphoid trans-triquetral perilunate injury on the left hand at the same time.

**Keywords:** Scaphoid, Perilunate, Fracture-dislocation, Open reduction and internal fixation

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## INTRODUCTION

The wrist represents a complex anatomic region in the human extremity and a highly functional and intricate structural joint. Most perilunate injuries result from a staged disruption of the ligamentous structures. Forces may be directed through the carpal bones themselves resulting in a fracture<sup>1</sup>.

Early anatomic reduction of any carpal malalignment is of the utmost importance. Unfortunately, even with optimal

treatment, outcomes after perilunate injuries are frequently poor. Generalized wrist stiffness, diminished grip strength, and post-traumatic arthritis commonly develop.

Scaphoid fractures are frequent in everyday practice. But associated fractures of the scaphoid and capitate with 90° – 180° rotation of the head of the capitate are rare wrist injuries. This carpal bone injury has been defined by Fenton and Rosen since 1950. The Fenton syndrome should be recognized especially in great external force. The diagnosis of simultaneous scaphoid and capitate fractures at the time of

the injury is necessary to lead to adequate treatment and a satisfactory clinical result<sup>2</sup>.

We present a case of scapho-capitate fracture syndrome on the right hand, trans-scaphoid trans-triquetral perilunate injury on the left hand at the same time.

## CASE REPORT

A 20-year-old, right hand dominant male was involved in a high-speed motorcycle accident. He lost consciousness after the collision and showed severely confused mentality for several weeks. When he presented to the emergency department, there was severe deformity on his right hand with the protrusion of distal radius which was disarticulated from carpal bones and penetrated skin to volar side. The lateral view image revealed that lunate bone along with proximal fragment was in alignment with distal radius articular margin, while perilunate bones were dorsally displaced. A proximal pole of capitate showed 22° translation (Fig. 1A, B).

Because it was an open fracture dislocation, he underwent the emergent surgery. We approached through the open wound to get reduction of scaphoid fracture by joystick method and the scaphoid fragment was fixed using 3.0 headless compression screw (HCS, DePuySynthes, West Chester, PA, USA). Then we incised dorsally with extensor retinaculum dissection. The displaced capitate was reduced

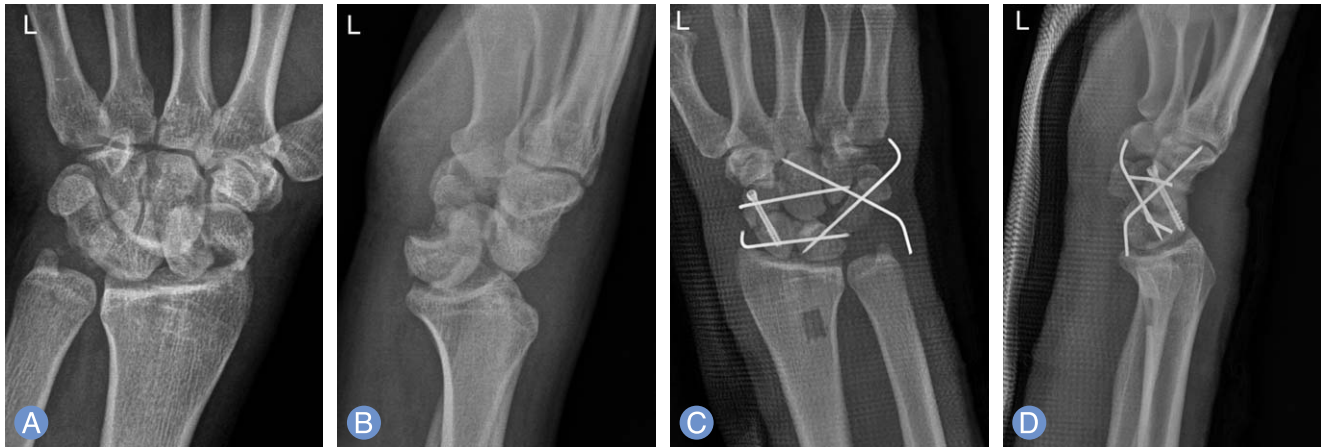
by guide pins, and fixed with 3.0 HCS. The dislocated lunate bone was reduced and carpal bones were fixed using Kirchner wires (Fig. 1C, D). The wrist was immobilized in a thumb-spica splint for 8 weeks. After 3 weeks from the surgery, the patient still showed confused mentality, and he complained of the left wrist pain. The roentgenograms images revealed dorsal perilunate dislocation associated with scaphoid and triquetral fractures (Fig. 2A, B). The surgery was performed *via* volar approach. The fractured scaphoid was grafted with ipsilateral distal radius bone and fixed by 3.0 HCS. Other carpal bones were fixed with Kirchner wires (Fig. 2C, D). The left wrist also immobilized in a thumb-spica splint for 8 weeks.

One year after the accident, the patient did not complain of wrists pain, but radiographs showed nonunion of the right scaphoid. The surgery was performed by volar approach again and we decided to remove HCS of the scaphoid. The fracture ends were freshened and grafted by corticocancellous bone of ipsilateral distal radius, which filled the screw hole, and fixed with another 3.0 HCS. We could find the early arthritic change of the mid-carpal joint, because it happened by high energy with severe open wound, which led to chondral injury (Fig. 3). Postoperatively, the wrist was again protected in a short arm cast for 6 weeks.

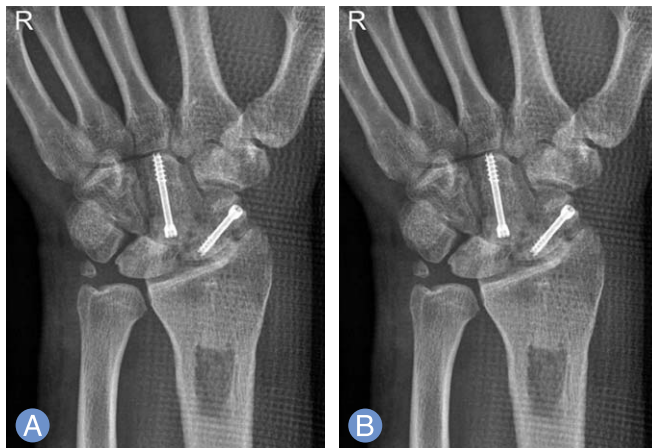
After 23 months later from the accident, the patient had pain-free wrists with 0° of extension, 20° of flexion, 70° of pronation, 90° of supination and 70 pounds of hand grip



Fig. 1. (A, B) Displaced fracture of the scaphoid and the capitate with perilunate dislocation of the carpus. There is a mid-waist scaphoid fracture, linear hamate fracture and a proximal pole capitate fracture with 22° translation of the proximal capitate fragment. (C, D) Postoperative X-ray image of the right wrist.



**Fig. 2.** (A, B) The roentgenograms images reveals dorsal perilunate dislocation associated with scaphoid and triquetrum fractures of the left wrist. (C, D) Postoperative X-ray image of the left wrist.



**Fig. 3.** (A, B) Postoperative X-ray images of the right wrist after bone graft with screw change. We could find the early arthritic change of the mid-carpal joint.

power on right with union and no evidence of osteonecrosis of the proximal pole of the scaphoid and the head of the capitate. The left wrist showed 60° of extension, 30° of flexion, 45° of pronation, 80° of supination and 120 pounds of hand grip power with complete union (Fig. 4). He returned to his work.

## DISCUSSION

There have been only 6 reports of bilateral scaphoid fractures without dislocation and 3 cases of bilateral scaphoid fractures associated with perilunate dislocation in the international literature<sup>3-5</sup>. Saxena et al.<sup>4</sup> reported the excellent outcome by closed reduction and cast application. Kaneko et al.<sup>3</sup> and Barros et al.<sup>5</sup>



**Fig. 4.** (A-D) 23 months later from the accident.

performed open reduction and internal fixation, the result was also excellent. Only approximately 50 cases Fenton syndrome (scaphocapitate fracture syndrome) have been reported since 1956 and there are few cases of triquetral fractures association with trans-scaphoid perilunate fracture-dislocations<sup>6,7</sup>. The key to diagnose these injuries of the wrist is the lateral X-ray. Normally the axis of radius, the lunate, the capitate and the third metacarpal should fall in a straight line with the wrist in neutral position and the half-moon shaped profile of lunate articulates with the cup of distal radius proximally and with the rounded proximal capitate distally. Bain and colleagues note that computed tomography scan may be useful to better characterize carpal bone injuries<sup>4,8</sup>.

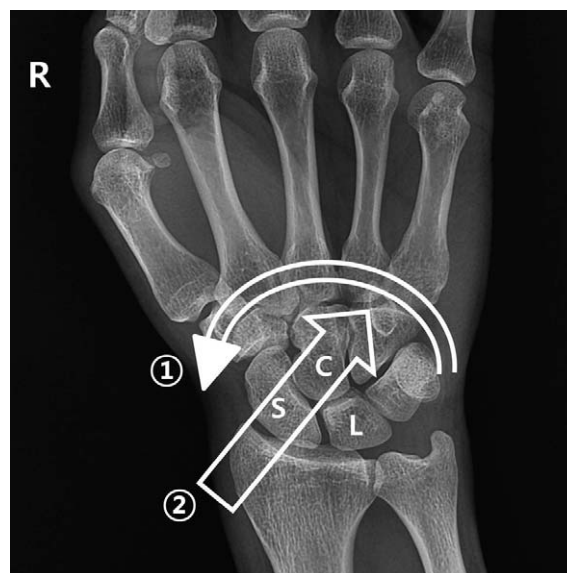
Kumar and Thomas<sup>6</sup> reported a case of scaphocapitate fracture syndrome, the patient suffered from the non-union of scaphoid, and avascular necrosis of the scaphoid and the lunate led to arthrodesis of the wrist. In the report by Kumar and Thomas<sup>6</sup>, the authors recommended internal fixation with primary bone graft to achieve anatomical reduction and enhance bone healing, the both wrists of our patient also underwent bone graft because there was high energy injury with severe open wound on the right wrist and the ignored scaphoid fracture on the left wrist. We also recommend bone graft for scaphoid fracture with comminution, open fracture, or non-union of the neglected scaphoid fracture<sup>6</sup>.

Because it happened by high energy with severe open wound, which led to chondral injury, we could find the early arthritic change of the mid-carpal joint on the right wrist. Mechanism of injury, age, gender, occupation, limb dominance and anatomical reduction state after surgery might be factors for post traumatic arthritis<sup>9</sup>. The patient would complain of the wrist pain by arthritic change, and we need to observe him carefully.

According to Fenton, following a collision in a position of dorsiflexion and radial deviation of the wrist, force is transmitted from the radial styloid process to the scaphoid and then to the capitate causing fracture of both bones and the rotation of capitate occurs in the axis which is perpendicular to the palm. Stein and Seigel suggested that acute dorsiflexion causes the scaphoid fracture and in maximum dor-

siflexion the dorsal lip of the radius strikes the neck of the capitate causing it to fracture. According to Stein et al. the axis of rotation is transverse to the palm<sup>10</sup>. In this study, the capitate of the patient translated to the ulnar side with the fracture of radial styloid process. As the Fenton reported, it means that the force is transmitted from the styloid process and the axis of the rotation is perpendicular to the palm. We thought that the patient turned the steering wheel to the left side with hitting the break in a position of dorsiflexion and radial deviation of the right wrist wearing steering cover, which led to bilateral scaphoid fracture (Fig. 5). Through this case, we can assume the Fenton's theory for scaphocapitate fracture syndrome and the theory of Mayfield for the trans-scaphoid perilunate trans-triquetral injury<sup>7,9</sup>. As Mayfield reported, initial hyperextension caused fracture of the waist of the scaphoid and failure of the radial ligamentous structures. The resulting ulnar deviation and intercarpal supination caused the injury to progress through the soft tissue structures on the distal aspect of the lunate. Further ulnar deviation probably caused impingement of the triquetral on the ulnar styloid with subsequent fracture<sup>7</sup>.

We could assume the mechanism of the injury, and that primary bone graft for scaphoid in Fenton syndrome or



**Fig. 5.** Transmission of the energy with radial deviation of the right wrist ① Turning steering wheel to radial side ② The energy transmission. S, scaphoid; C, capitate; L, lunate.



trans-scaphoid trans-triquetral perilunate injury would be the treatment of choice. We could not find the left wrist injury until 3 weeks later. More considerable examination should be needed for the patients with confused mentality. We hope that it could be a help to treat these uncommon wrist injuries.

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# 양측성 주상골 경유 월상골 주위 골절 탈구

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양측의 주상골 경유 월상골 주위 탈구와 골절탈구는 매우 드문 경우로, 저자들은 오직 3개의 증례 보고만을 문헌에서 찾을 수 있었다. 더구나 주상유두골절증후군과 삼각골 경유 주상골 손목 손상은 더욱 심각한 문제를 일으킬 뿐만 아니라 몹시 드물다. 이러한 손상은 교통사고나 낙상 등의 고 에너지의 외상에 의해 일어나며, 진단과 치료, 수술적 접근 방법에 대한 문헌은 널리 알려져 있지 않다. 저자들은 교통사고로 수상한 20세 남자에서 발생한 우측의 주상유두골절증후군과 좌측의 삼각골 경유 주상골 손목 손상 1예를 경험하였기에 보고한다.

**색인단어:** 주상골, 월상골 주위, 골절-탈구, 관혈적 정복술과 내고정술

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