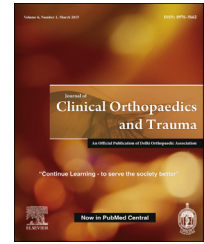


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## Case Report

# Isolated volar fracture-dislocation of the base of the second metacarpal bone by indirect injury



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## ABSTRACT

Isolated volar fracture-dislocation of the second carpometacarpal joint is extremely rare, and no case of indirect injury has been reported. We are presenting a case of indirect injury, treated by open reduction with volar approach. Three-dimensional computed tomography was helpful for confirming and making surgical plan for this injury.

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## 1. Introduction

Dislocations or fracture-dislocations of the carpometacarpal joint (CMCj) of the second metacarpal bone is rare, because of anatomically stable structure with irregular articulation and a strong ligamentous attachment to the adjacent bones.<sup>1</sup> In cases of isolated dislocation of second CMCj, they are usually dorsally dislocated without concomitant fracture. Isolated volar fracture-dislocation of second CMCj have been reported only 2 cases and both of them are assumed as direct injury.<sup>2,3</sup> In comparison, we present a case of isolated volar fracture-dislocation which caused by indirect injury.

## 2. Case report

A 55-year-old man sustained an injury to his left hand after slipping on rubble road. The palmar side of knuckle of the left

index finger was hyperextended during the injury. He was diagnosed contusion and sprain at a primary care clinic. Five days after the injury, he came to our hospital with complaining of painful, limited, finger motion and physical examination showed that his hand was swollen and bruised without gross deformity of the hand; neurovascular dysfunction was not noted. On radiological examination, proximal metaphyseal fracture of the second metacarpal bone was observed. The basal fragment was volarly displaced, but the shaft of the metacarpal bone was maintained in its proper anatomical position (Fig. 1). Three-dimensional computed tomography clearly showed the fracture-dislocation of the second CMCj (Fig. 2).

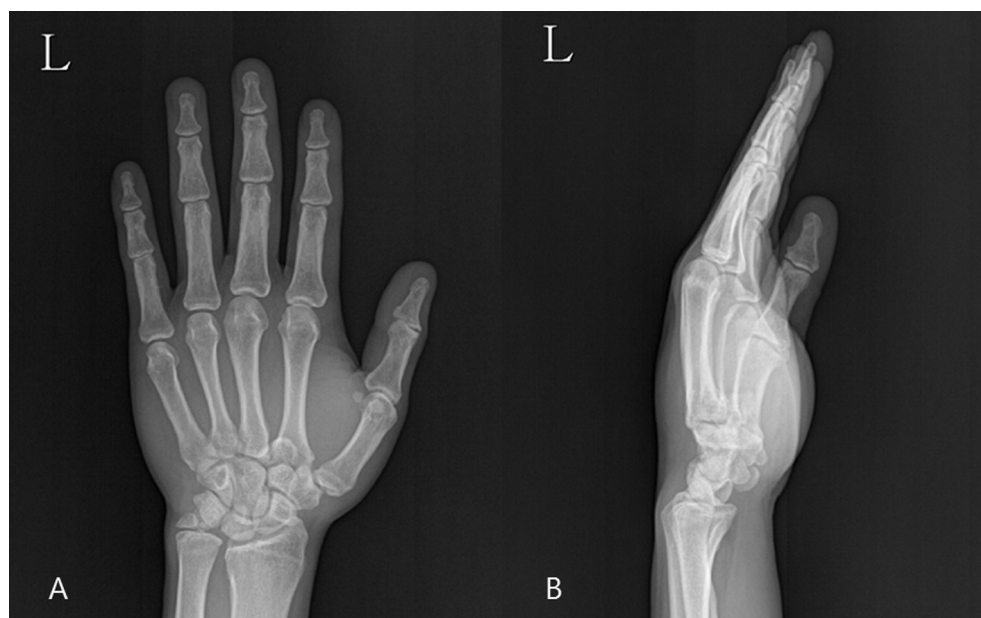
Under general anesthesia, a longitudinal interthenar incision about 4 cm in length was made. The capsule and attached ligaments around the second CMCj were torn; especially ulnar side of the CMCj ligament was almost all torn. The basal fragment was extruded into the carpal canal and rotated 60° on the axial plane (Fig. 3). Moreover, the fracture line was

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**Fig. 1** – Preoperative radiographs of the hand shows the fracture fragment at the base of the second metacarpal bone with proper alignment of the shaft of the metacarpal bones. **A.** Anteroposterior view, **B.** Lateral view.

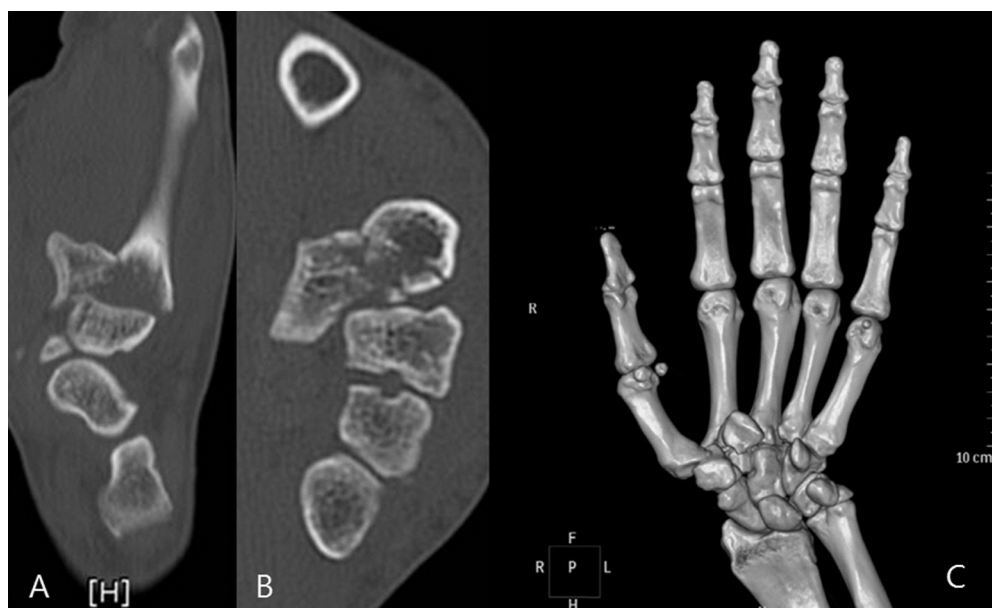
inclined, the ulnar condyle was approximately 1-cm thick, and the radial condyle was very thin. After derotation, the fracture-dislocated basal fragment was easily reduced, and fixed to the shaft with a 1.4-mm Kirschner wire. The wire was introduced through the basal fragment and passed across the dorsal cortex of the second metacarpal and retrieved through the dorsal skin (Fig. 4).

A short-arm splint was applied and active finger motion was encouraged after surgery. The splint was maintained for 2 weeks, and the hand was protected with a wrist brace for a

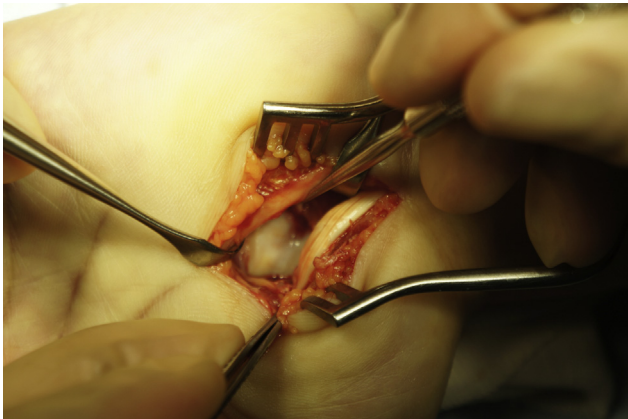
following month. The wire was removed after 4 weeks. Three months postoperatively, radiographs showed complete bone union. Six months after surgery, the patient had normal hand function without any pain.

### 3. Discussion

Isolated dislocations or fracture-dislocations of second metacarpal bone is rare injury, compared to dislocations or



**Fig. 2** – Computed tomography shows the volarly dislocated fracture fragment (**A.** Sagittal section, **B.** Axial section). **C.** Three-dimensional reconstruction clearly shows rotation of the fragment.



**Fig. 3 – The rotated basal fragment was found in the carpal canal.**

fracture-dislocations of CMCj of thumb or ulnar-side fingers.<sup>4</sup> In a previous report, only 16 cases among 826 CMCj dislocations were isolated injury of second metacarpal bone, and all of them were dorsally dislocated.<sup>5</sup> In comparison, only 2 others reported isolated volar fracture-dislocation or displaced fracture of second metacarpal bone.<sup>2,3</sup> These reports described direct injury as for injury mechanism and they supposed the injury mechanism should be direct injury with high energy because of anatomical structure which is stable and strongly bonded together around second CMCj. In comparison, the injury in this case was indirect and we

believe that leverage effect from the volar aspect of the second metacarpal head caused hyperextension, adduction, and axial shear around the second CMCj. The operative finding was that the ulnar side of the CMCj ligament was almost all torn, and the basal fragment was rotated and dislocated volarly.

On initial examination, the fracture-dislocation was not recognized and misdiagnosed as contusion and sprain. It might be caused of no gross deformity of the hand such as dorsal bony defect, and proper alignment of the shaft of the metacarpal bones on radiograph. Computed tomography was helpful for confirming the diagnosis. The protruded volarly dislocated fragment was assumed the cause of pain and limitation of motion of the index finger.

Since we found the dislocated fragment rotated on three-dimensional reconstruction of computed tomography, volar approach was planned in contrary to the previous reports which used dorsal approach. As we expected, the reduction during the operation was not simple without derotation of the fragment.

#### 4. Conclusion

In conclusion, this report suggests that this rare injury could happen indirectly by minor injury such as slipping down with outstretching hand, and in awareness of the potential for this injury, three-dimensional computed tomography might be essential for confirming diagnosis and making surgical plan.



**Fig. 4 – Postoperative radiographs. A. Plain radiographs showed acceptable reduction and fixation with a Kirschner's wire. B. Final follow-up radiographs showed proper relationship of the second carpometacarpal joint.**

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**Conflicts of interest**

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

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