Joint Diseases and Related Surgery

Jt Dis Relat Surg
2024;35(3):699-705

CASE REPORT

Chronic dislocations of the fourth and fifth carpometacarpal joints with successful treatment by ligament repair: A case report and literature review

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ABSTRACT

Dislocations of the fourth and fifth carpometacarpal joints (CMCJs) are rare and often misdiagnosed via radiography. Moreover, treatment strategies have not yet been standardized. Herein, we report a case of chronic dislocations of the fourth and fifth CMCJs with delayed diagnosis and successful treatment via ligament repair. A 29-year-old male patient who was initially diagnosed with contusion at another center following a fall on the stairs was referred to our hospital one month later due to persistent pain and swelling. Fourth and fifth CMCJ dislocations were diagnosed using radiography and computed tomography. Closed reduction attempts were unsuccessful, prompting open reduction. The operative findings included rupture of the dorsal carpometacarpal ligament and hamate cartilage injury. Using two mini anchors, the fourth and fifth dorsal carpometacarpal ligaments were repaired, and Kirschner-wire (K-wire) pinning was performed. The K-wire was extracted after four weeks. At the eight-month follow-up, the only remaining symptom was mild discomfort, and the range of motion and grip strength was fully recovered. Our findings highlight the difficulties in diagnosing CMCJ dislocation and suggest ligament repair as a treatment option for chronic cases of CMCJ dislocation.

Keywords: Carpometacarpal joint dislocation, chronic, diagnosis, ligament repair, open reduction, treatment, ulnar carpometacarpal.

Dislocation of one or more carpometacarpal joints (CMCJs) is rare, accounting for less than 1% of hand trauma cases, excluding those of the thumb.[1] Typically, CMCJ dislocations are associated with fractures,[2,3] and only 11 cases of fourth and fifth CMCJ dislocations without fractures have been reported.[4-11] In addition, no cases of chronic dislocation of the fourth and fifth CMJs have been previously reported. Misdiagnosis and delayed diagnosis of this type of injury contribute to poorer clinical outcomes.[12] Treatment for single and acute CMCJ dislocation usually involves reduction with or without percutaneous pinning.[13-16] In chronic cases, reduction followed by pinning is often required;[17,18] however, a standardized treatment approach has not yet been established. In this report, we presented a case of chronic dislocations of the fourth and fifth CMCJs with delayed diagnosis.

Received: March 08, 2024
Accepted: June 19, 2024
Published online: August 14, 2024

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Citation: Kono H, Saito M, Sato N, Ochiai S, Ichikawa J, Wako M, et al. Chronic dislocations of the fourth and fifth carpometacarpal joints with successful treatment by ligament repair: A case report and literature review. Jt Dis Relat Surg 2024;35(3):699-705. doi: 10.52312/jdrs.2024.1724.

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CASE REPORT

A 29-year-old right-handed male patient fell down the stairs after intoxication. At a different clinic, the patient was initially diagnosed with contusion without dislocation or fracture. However, since the pain and swelling persisted for one month, the patient was referred to our hospital. Physical

examination revealed tenderness and swelling in the right fourth and fifth CMCJs. The patient retained almost full range of motion in the ring and little fingers, movement was painful, and full grip was impossible. Neurological symptoms were not observed. Radiographs performed in the previous clinic (Figure 1) indicated loss of normal CMCJ parallel zigzag lines, asymmetry, overlap, and ulnar offset, suggesting fourth and fifth CMCJ dislocations. Computed tomography (CT) confirmed fourth (Figures 2a, b) and fifth (Figures 2a, b) CMCJ dislocations without fractures. Closed reduction was initially performed under general anesthesia but was unsuccessful. Subsequently, open reduction was performed. A dorsal incision was made and expanded, and the dorsal carpometacarpal ligaments were identified (Figure 3a). Cartilage injury on the articular surface of the hamate was observed, and soft tissue intruding into the joint hindered reduction. Notably, reduction was easily achieved after removing the soft tissue; however, maintaining the reduced position was difficult. Two mini-anchors were inserted into the hamate bone, and the fourth and fifth dorsal carpometacarpal ligaments were

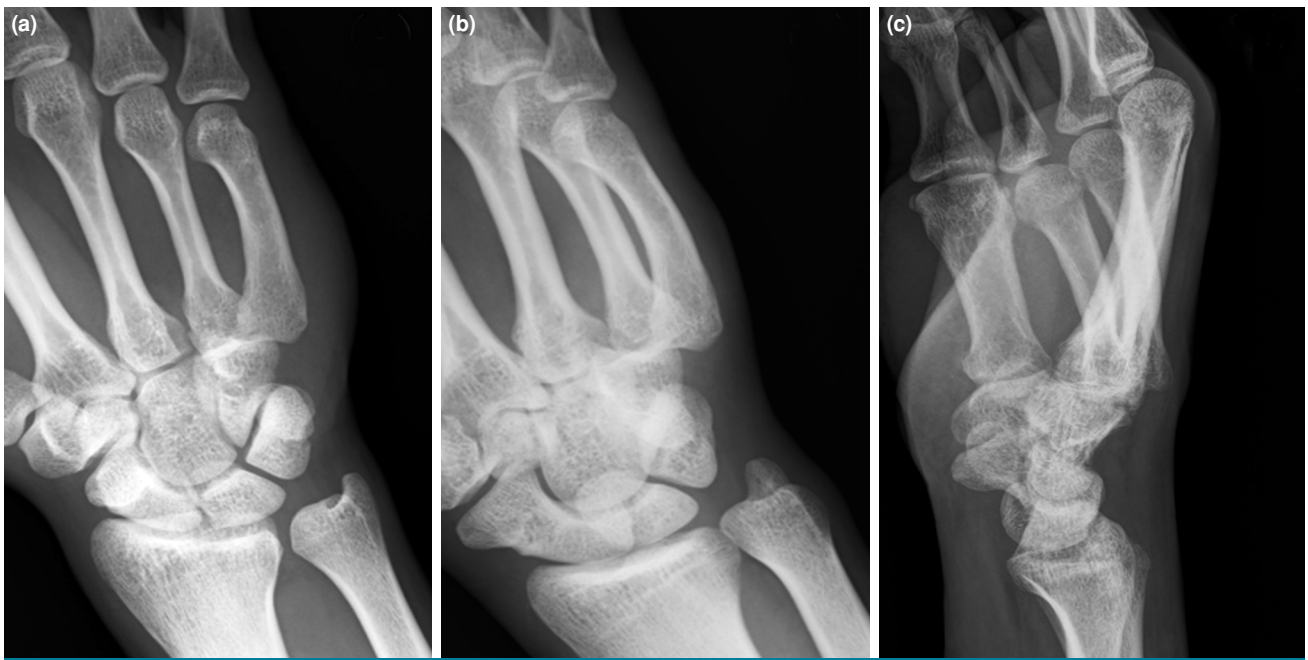


FIGURE 1. (a) Anteroposterior-, **(b)** oblique-, and **(c)** lateral-view radiographs taken at the time of injury.

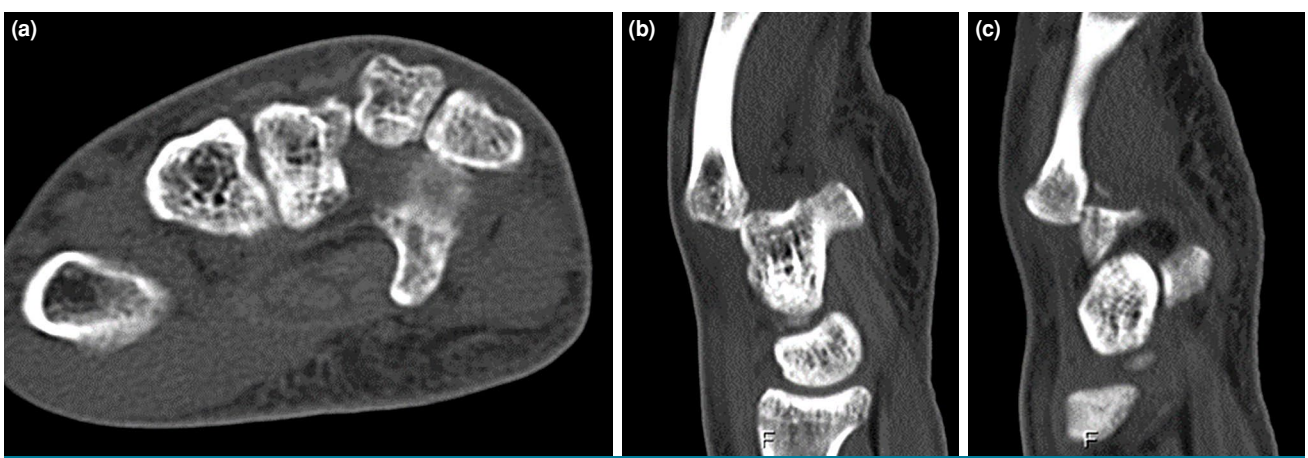


FIGURE 2. (a) Axial view and sagittal view of the **(b)** fourth and **(c)** fifth carpometacarpal joints on computed tomography.

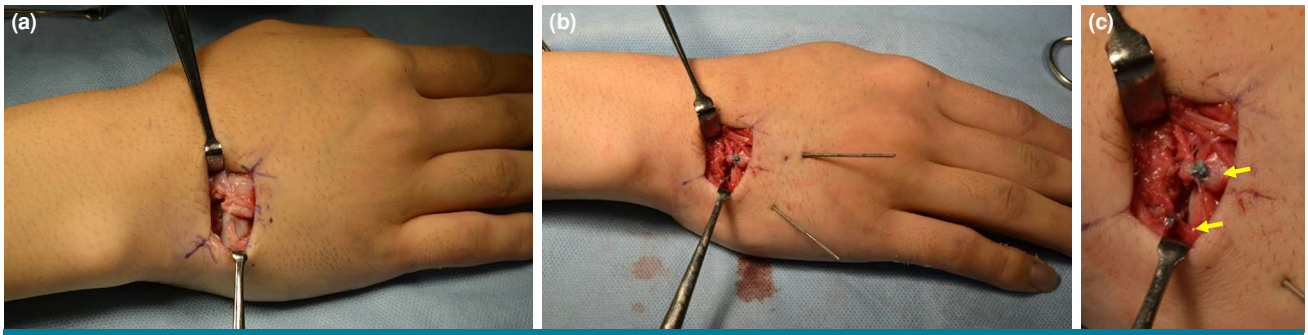


FIGURE 3. Intraoperative findings of **(a)** a ruptured dorsal ligament in the carpometacarpal joint. **(b, c)** Images demonstrate the ruptured dorsal ligament (yellow arrow) sutured using an anchor.

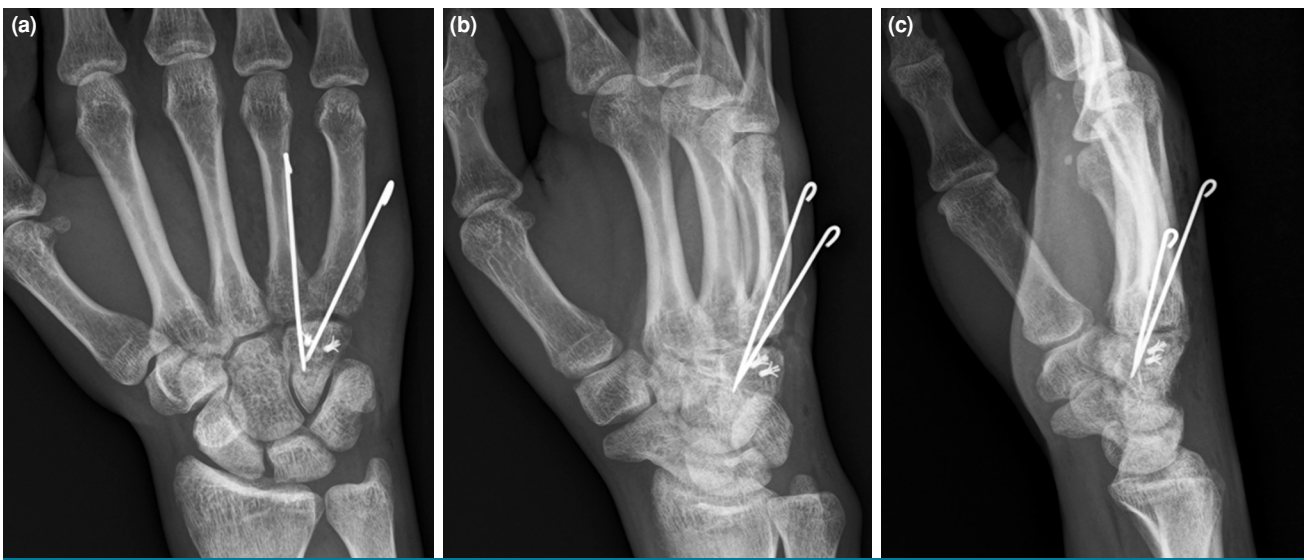


FIGURE 4. Postoperative **(a)** anteroposterior-, **(b)** oblique-, and **(c)** lateral-view radiographs demonstrate the fourth and fifth carpometacarpal joints fixed with a K-wire.

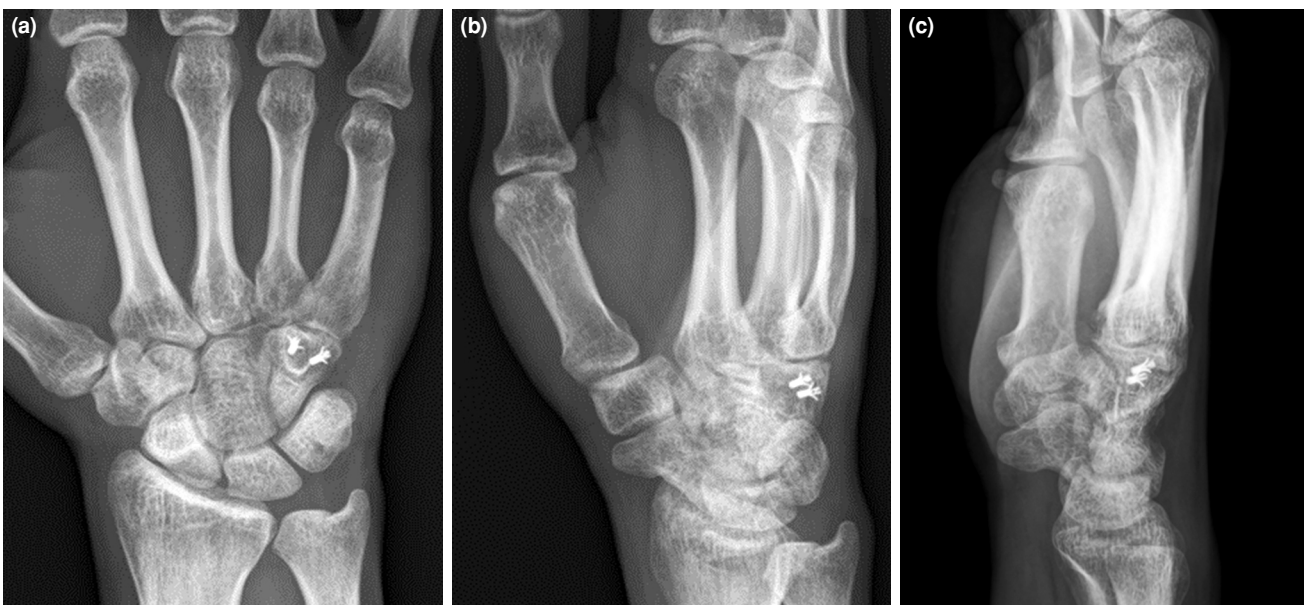


FIGURE 5. (a) Anteroposterior-, **(b)** oblique-, and **(c)** lateral-view radiographs taken eight months after the operation confirm the absence of dislocation and osteoarthritis.

TABLE I
Summary of 11 cases of dislocation of fourth and fifth carpometacarpal joints

Case	Sex/Age (Years)	Type of accident	Interval between injury and treatment (Days)	Type of treatment	Follow-up period (Weeks)	Result
1	M/24	Fist blow 3 Car accident 1	Same day (within 8 h)	CR + splint	24-36	Re-dislocation (–) Functional impairment (–)
2	M/27					
3	M/36					
4	M/65					
5	M/26	Fist blow	4	OR + pinning	6	
6	M/31	Fall from a height	Same day	CR + cast	6	
7	M/24	Car accident	10	OR + pinning	Not listed	Not listed
8	M/65	Fall down	1	OR + pinning	12	ROM full Grip full
9	M/40	Accidents caused by suction water pump	Same day	OR + pinning	24	Functional impairment (–)
10	M/20	Fist blow	Same day	CR + cast	4	Pain (–) ROM full
11	M/50	3 m fall	Same day	CR + splint	104	Pain (–) Arthrodesis (–) Grip full

CR: Closed reduction; OR: Open reduction; ROM: Range of motion.

sutured (Figure 3b). Kirschner-wire (K-wire) pinning was performed between the fourth and fifth CMCJs and the hamate (Figures 4a-c). Postoperatively, a splint was applied on the volar side for one week, and the K-wire was removed after four weeks, at which point rehabilitation of the CMCJ was initiated. Eight months postoperatively, the only remaining symptom was mild discomfort; the patient had normal grip strength and no limitations to range of motion. Radiography indicated no redislocation (Figure 5a-c), and the QuickDASH (shortened disabilities of the arm, shoulder, and hand questionnaire) score was 0.

DISCUSSION

Carpometacarpal joint dislocation is rare and is usually associated with fracture. Although 11 reports of fresh fourth and fifth CMCJ dislocations had adequate clinical information, none of these cases were chronic. The case discussed herein involves chronic CMCJ dislocation.

Injury to the CMCJ commonly results from fracture dislocations, as axial pressure applied to the metacarpal bone causes dislocation with fracture of the base of the metacarpal or carpal bones.[2,3,19] Therefore, CMCJ dislocation without fracture is considered rare.[19] Details of the 11 reported cases of fresh fourth and fifth CMCJ dislocations are presented in Table I.[4-11] The most common cause of injury was a blow to the fist (five patients); the mean age was 37 years, and all the patients were male. In addition, treatment was initiated within two days in nine patients. The causes of isolated chronic CMCJ dislocation[8,13-15,17,18,20] were similar (including fist blows and falls). The trends were similar among patients with fourth and fifth CMCJ dislocations and those with chronic single dislocations. Regarding the direction of dislocation, 10 of the 11 cases were dorsal, including all cases involving chronic single CMCJ dislocations.[14,16,21] Moreover, an interesting case of divergent dislocation of the fourth dorsal and fifth palmar sides has been reported.[22]

The presence or absence of local findings around the CMCJ should be confirmed during diagnosis. In cases of severe trauma, such findings can be easily missed when focusing on major fractures, such as those involving the pelvis, spine, femur, chest, or abdominal organ damage, often leading to misdiagnosis or delayed diagnosis. Therefore, caution is warranted.[1,23] Pain appears to be the most important local finding, as it was persistent in the present case and in cases that went untreated for three months.[17,18] Therefore, CMCJ dislocation should be considered in patients with persistent pain. Plain radiography and local examination are important. Characteristic radiographic findings of fourth and fifth CMCJ dislocations include loss of parallelism, asymmetry, overlap, and ulnar offset.[12] Notably, all of these findings were observed in the

present case. Additional frontal and oblique lateral images are recommended to avoid misdiagnosis.[23] Furthermore, we believe that comparing the healthy and injured hands is also effective for identifying slight differences. However, dislocations and slight fractures can easily be detected with three-dimensional CT (axial, coronal, and sagittal).

In previous reports, closed reduction was performed in seven of the 11 fourth and fifth CMCJ dislocation patients; (Table I) however, open reduction was required for all patients who were operated on several days after the injury. In addition, splints or casts are usually used to retain reduction in fourth and fifth CMCJ dislocations. In contrast, K-wire fixation is used to retain reduction in both fresh and chronic single CMCJ dislocations. There is a risk of secondary dislocation without K-wire fixation; therefore, frequent radiographic examinations are recommended, particularly for approximately two weeks after reduction. In other reports, K-wire removal was performed after approximately six weeks, similar to the present case.[17,18] Regarding the method of fixation, the transverse K-wire passed from the fifth and fourth metacarpal into the third metacarpal is not strong enough to fix the CMCJ, and we believe that fixation through the metacarpal to the hamate, as in this case, is more rigid. Although there is a risk of secondary osteoarthritis due to the repeated penetration of the articular surface with a K-wire,[24,25] minimizing the number of procedures that penetrate the joint surface is preferable. Joints should thus be immobilized to promote repair of the repaired ligaments and cartilage and prevent secondary osteoarthritis and cartilage damage. In addition, dorsal percutaneous pinning carries the risk of nerve and tendon injury, and previous reports have recommended nerve identification and protection.[26] In open reductions, as in this case, it is possible to prevent injury by identifying and protecting the extensor tendons and the dorsal ulnar nerve. In closed reductions, a small skin incision at the pin insertion site only and blunt dissection instead of percutaneous pinning may be alternative methods.

Ligament repair is not generally performed for new or chronic cases. Ligament repair was used in this case since the fourth and fifth CMCJs generally have a range of motion of 10° to 15° and 25° to 30°, respectively, and have a larger range of motion[27] and a greater attachment area of the dorsal carpometacarpal ligaments than the second and third CMCJs. Notably, these anatomical features are small and prone to dorsal dislocation.[14,27] In this case, instability remained after intraoperative repositioning, with findings of easy redislocation. Although the fourth and fifth CMCJs do not move as complexly as the thumb CMCJ, which has a range of motion of 90° palmar abduction and 60° radial abduction, the redislocation and remaining instability resulted in functional disability with decreased grip strength (46% of the healthy side), decreased joint range of motion (10° to 20° extension limitation of proximal interphalangeal joint), and back-hand pain during reciprocal motion.[18] Therefore, we considered it necessary to increase stability as much as possible and treated the patient with reference to previous reports of thumb CM joints with similar characteristics.[28-30] These reports obtained good results with ligament repair or arthrodesis for patients with residual instability after repositioning. In this case, unlike fresh dislocation, the ligaments were sutured with scar tissue since the joint was easily dislocated even after repositioning. This approach allows for a stronger anatomic position and prevents redislocation compared to K-wire fixation alone. Ligament repair using suture anchors should be considered a treatment option to prevent functional impairment.

Finally, osteoarthritis in the fifth CMCJ results in a significant functional decline;[31] cartilage injury on the articular surface of the hamate was observed in this case, which may have contributed to osteoarthritis development. We believe that ligament repair for stronger and more stable joints is required to prevent the progression of osteoarthritis.

In addition, for the previously reported cases, the average follow-up for patients with fourth and fifth CMCJ dislocations was 26 weeks (4 to 36 weeks).[4-11] Although no redislocation or functional impairment was observed, the long-term prognoses were unclear owing to the short follow-up period. In contrast, for chronic cases of a single CMCJ dislocation, the average follow-up time was 19 weeks (15 to 24 weeks). Although no decrease in grip strength or residual pain was observed, osteoarthritis due to CMCJ dislocation was reported,[16] and long-term follow-up is considered necessary.

In conclusion, we report an extremely rare case of chronic fourth and fifth CMCJ dislocations successfully treated via ligament repair. To avoid delayed diagnosis or misdiagnosis, the cause, local findings, and characteristic radiographic findings should be considered. Currently, there is no standardized treatment for chronic cases; however, based on the anatomical features of the fourth and

fifth CMCJs, K-wire fixation is needed, and ligament repair may be preferable to prevent redislocation or chronic dislocation.

Acknowledgements: The authors thank Ms. Kahori Sano, Azusa Sakamoto, and Sachiko Ichimura for their secretarial assistance.

Patient Consent for Publication: A written informed consent was obtained from patient.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions: Conception and design: H.K., M.S., N.S., J.I., T.H.; Provision of study materials or patients: H.K., M.S., N.S., S.O., T.H.; Data collection and analysis: H.K., M.S., N.S., T.H.; Manuscript writing: H.K., J.I. All the authors read and approved the final manuscript.

Conflict of Interest: The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding: The authors received no financial support for the research and/or authorship of this article.

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