Journal of Research in
Orthopedic Science
August 2024. Volume 11. Number 3

Case Report

Concurrent PIP Joint Fracture-dislocation and Mallet Finger: A Case Report

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Citation Mazher FN, Ghanbari A, Yazdekhsti H. Concurrent PIP Joint Fracture-dislocation and Mallet Finger: A Case Report. Journal of Research in Orthopedic Science. 2024; 11(3):165-172. http://dx.doi.org/10.32598/JROSJ.11.3.1306.2

http://dx.doi.org/10.32598/JROSJ.11.3.1306.2

Article info:
Received: 18 Feb 2024
Revised: 23 Mar 2024
Accepted: 02 May 2024
Available Online: 01 Aug 2024

Keywords:
Proximal interphalangeal joint (PIPJ) fracture, Extension-block pinning, Mallet finger

ABSTRACT

Background: A mallet finger and a fracture or dislocation of the proximal interphalangeal joint (PIPJ) on the same finger are rare injuries, usually caused by direct axial trauma.

Case Presentation: In this report, we present two cases (a 27-year-old man and a 25-year-old woman) of PIPJ fracture/dislocation associated with a mallet finger. PIPJ dislocation/fracture was managed in one patient with open reduction internal fixation (ORIF) through the Shotgun approach and another with extension block pinning.

Conclusion Mallet finger fracture was managed in both patients with pinning. The results and outcomes of surgery were good in both patients.

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Introduction

Proximal interphalangeal joint (PIPJ) fractures and mallet finger injuries are both common as separate orthopedic and hand injuries [1-3]. Fracture or dislocation of the PIPJ usually happens due to an axial load, which leads to a fracture of the middle phalangeal bone at the dorsal or volar lip or both (pilon), followed by joint dislocation [4].

Early diagnosis and management of these injuries are crucial and can lead to improved outcomes [5]. Delays in treating these injuries can lead to repeated subluxation and chronic stiffness, arthritis, and pain [3, 5].

Restoring mobility and preventing stiffness and disability by creating a stable and coordinated joint with a protected range of motion (ROM) is the primary goal of treatment in these injuries [6, 7]. Various surgical methods depending on the extent of the damage, the degree of instability and the time from diagnosis to treatment for the treatment of these injuries, including extension block pinning [8], closed percutaneous pinning [9], dynamic external fixation devices [10-12], open reduction and internal fixation [13, 14], volar plate arthroplasty [15], and hemi-hamate [16, 17] replacement arthroplasty have been introduced to treat PIPJ injuries [18].

Co-occurrence of PIPJ fracture or dislocation and mallet finger deformity in the same finger is rare. They are usually seen as a result of axial-loaded direct trauma. Usually, patients come for treatment early due to the severe deformity and pain of the affected finger [19]. This report describes two PIPJ fracture/dislocation cases associated with a mallet finger.

Case Presentation

Case 1

A 25-year-old man, right-hand dominant, an employee, was referred to the medical center following direct trauma on the same day of injury. In the clinical evaluation, the patient reported pain, swelling in both proximal and distal interphalangeal (DIP) joints of the finger, tenderness, and limited ROM. The patient had no history of alcohol consumption, smoking, or comorbidities.

The injury was evaluated by x-ray. fracture dislocation of the PIPJ with a bony avulsion of the distal phalanx of the right ring finger was observed in the radiograph.

Simultaneous fracture/dislocation of PIPJ and mallet finger was confirmed. The patient was operated on under general anesthesia on the radiolucent operating table in a supine position with C-arm image intensifier control during the operation. A shotgun approach was applied. The impacted articular surface was elevated, and the structural bone graft harvested from the distal radius was fixed with three pins (Figure 1).

Postoperative control radiography was performed (Figure 2A). The patient was discharged from the hospital in good health the day after the surgery. The patient was followed up on every two weeks after discharge. Passive flexion was initiated after the fourth week postoperatively. The splint was removed after six weeks, and active movement of the DIPJ was started. At the end of 2 months of follow-up, with full flexion of the DIPJ, no pain or delay was observed. Radiological findings were normal (Figure 2B). According to the Crawford criteria [20], the outcome was excellent, and the patient had full extension of the DIPJ, full flexion, and no pain without instability.

Case 2

A 47-year-old woman, a housewife, suffered simultaneous injuries in both the proximal and distal finger joints after a direct trauma with a metal object on her right hand. Three days after the injury, the patient presented with pain and swelling in both the proximal and distal joints of the finger and limited movement. The patient had no history of alcohol consumption, smoking, or related diseases.

The injury was evaluated by x-ray. Simultaneous fracture/dislocation of PIPJ and mallet finger was confirmed (Figure 3A).

The patient was managed with closed reduction and percutaneous pinning under digital block anesthesia on the radiolucent operating table in a supine position with C-arm image intensifier control during the operation. The Ishiguro technique [21] was used for the DIP joint, and the Sugawa technique [22] was used for the PIPJ. A static finger splint was then applied in PIPJ flexion and DIPJ extension. The patient was discharged on the same day.

Postoperative control radiography was performed (Figure 3B). The patient was discharged from the hospital in good health the day after the surgery. The patient was followed up every two weeks after discharge. Six weeks after surgery, the pins were removed, and active mo-

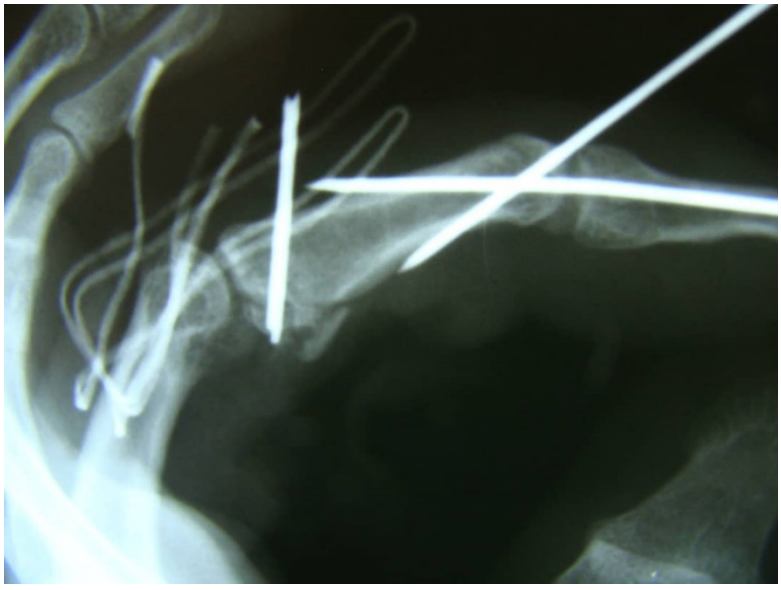

Figure 1. Postoperative radiographic finding

tion of the joint was initiated. At the end of 2 months of follow-up, with full flexion of the DIP joint and no pain, the patient was visited. Radiological findings were normal (Figure 3C). According to the Crawford criteria [20], the examination was excellent, and the patient had full extension of the DIP joint, full flexion, and no pain without instability (Figure 4). No complications or infections were observed. The patient remains disease-free 12 months after surgery. Also, no complications or limitations were recorded during the 12-month follow-up of the patients.

Discussion

Mallet finger and fracture or dislocation of the PIPJ simultaneously on the same finger is a rare injury, usually due to direct axial trauma [19, 23, 24]. Based on the studies, the incidence of all finger fractures and dislocations is estimated to be 67.9 and 11.3 per 100000 people per year, respectively [25].

The main mechanism in the simultaneous dislocations of the mallet finger and PIPJ is severe trauma that is inflicted vertically on the hand. It is associated with the dislocation of the PIPJ; however, the reverse condition has also been reported [26].

Since PIPJ fracture/dislocation associated with a mallet finger is rare, several aspects of this injury, including the best surgical procedure and outcomes, are not yet acknowledged [27, 28]. The number of available reports could be much higher. In the largest study, Nakago et al. [29] reported 16 cases of simultaneous fracture-dislocation of both DIPJ and PIPJ in one finger in three floors, including swan neck injury (a back piece of bone), base of the distal phalanx in the joint DIP, and the palmar part of the base of the middle phalanx in the PIPJ. Double hyperextension injury (parts of the palm in the DIP and PIPJ) and direct finger injuries (with dorsal and palmar bone fragments in the DIPJ) had been reported that treatment results were more satisfactory in PIP than in DIPJ. All patients were managed with the Ishiguro technique, open reduction, and splinting. Mishra et al. [30] reported two cases of simultaneous IP joint dislocations in two 21- and 28-year-old men, which showed that the mechanism of injury was a hyperextension type and occurred while playing cricket. One case was managed with closed reduction and splinting, and the other case was handled with open reduction and K-wire fixation.

One year after the injury, the residual swelling in the DIP joint was observed in both cases of IP joint dislocation. The flexion movement in the PIP and DIP joints was normal, but there was an extension delay of 15 degrees in the DIP joints. At the same time, the surgical methods in our two cases were associated with good clinical and functional outcomes 3 months after the surgery. Flexion and extension were normal, and swelling was not observed. Hussin et al. [19] reported a chronic PIPJ fracture/dislocation associated with a mallet finger in a 25-year-old man with painful swelling of the right ring finger that occurred in a motor vehicle accident. The duration of the injury until the surgery was almost three weeks. The patient was managed with open reduction under general anesthesia for PIP and mallet injury with a mallet splint. They reported that the DIP joint exten-

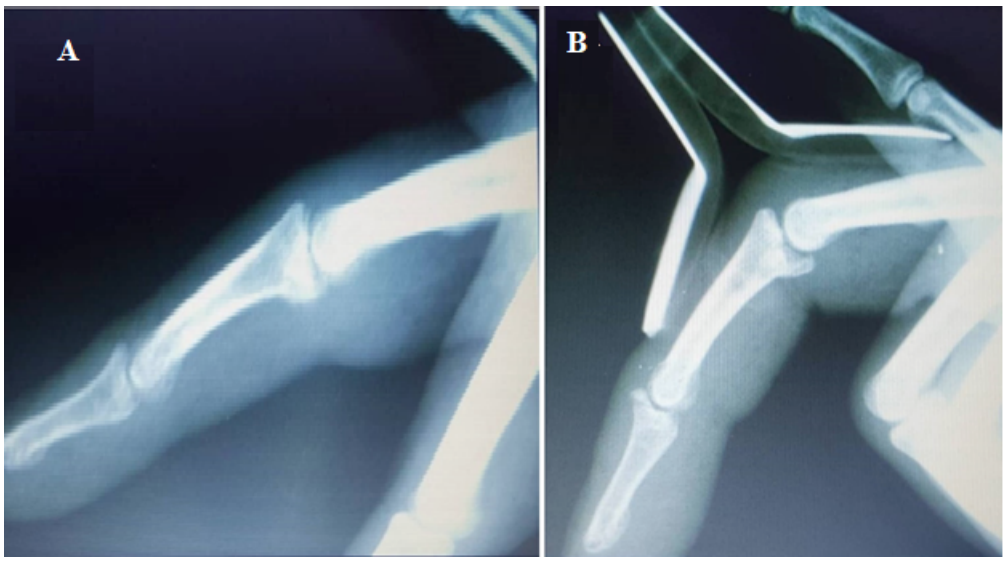

Figure 2. Treatment of case 1

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Note: Open reduction internal fixation (ORIF) was used for PIPJ. Radiographic findings are seen immediately after (A) and 6 weeks after surgery (B).

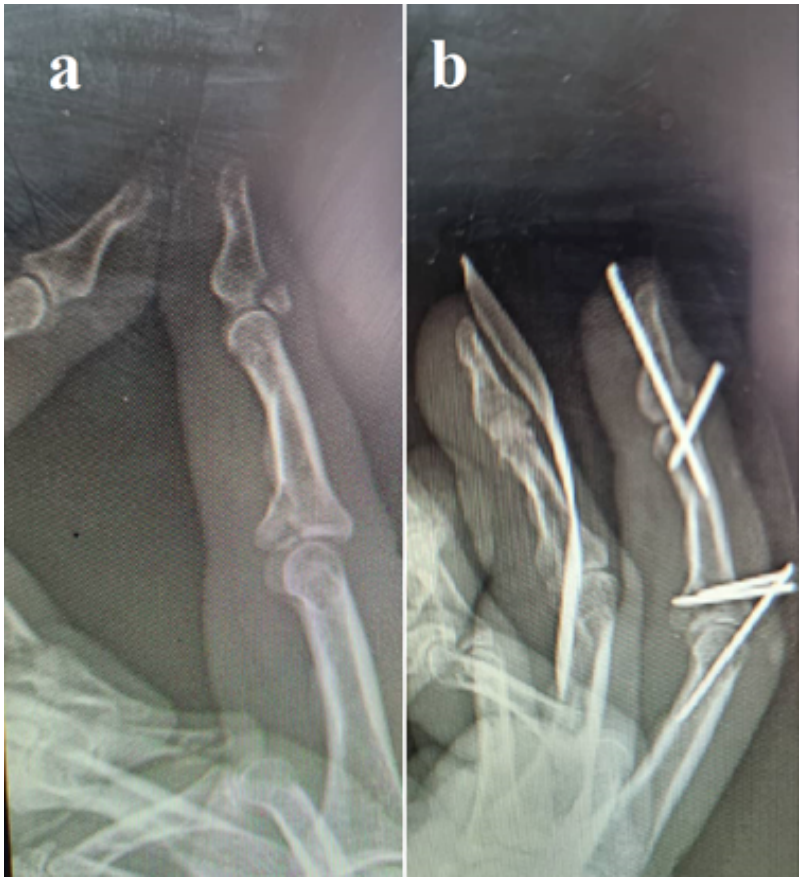

Figure 3. Treatment of case 2

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Note: The Ishiguro technique was used for the DIPJ, and the Sugawa technique was used for the PIPJ with EBP, showing (A) preoperative and (B) postoperative radiographic findings.

Figure 4. Postoperative radiograph (three months after surgery)

sion was normal with flexion three months after surgery, and the PIP joint was stable but stiff with 90-10 degree flexion, which was recommended for the patient. Nathan et al. [31] reported a case of a double dislocation of the little finger in a 44-year-old man, the mechanism of which was baseball, and he was managed with a splint with good results. Our case was treated with EBP, yielding good results and a normal ROM. According to recent studies, EBP is an effective and straightforward method for addressing unstable posterior PIP fracture-dislocation injuries, which result in satisfactory long-term outcomes [32, 33]. In another study, Andersen et al. [23] reported a case of a double dislocation in the little finger of a 17-year-old male, whose mechanism was exercise, and it was managed with a splint, yielding good results.

These injuries mostly cause high-energy injuries, and in most reported cases, they occur during sports activities such as volleyball, baseball, and football. In the two cases reported in this study, the injury mechanism was non-sports-related. In most cases, the injury occurs in the dominant hand. The injury occurred in the dominant hand in both cases reported in this study. Usually, this injury happens by chance in fingers with weak ligaments, and the environment lacks surrounding support [31, 34, 35]. To rule out the possible appearance on the radiograph and even clinically, until it is covered by severe swelling, it is necessary to perform real anteroposterior and lateral radiography sooner. In cases of chronic injuries, surgical treatment may be associated with poorer outcomes.

Literature review shows that a direct trauma mechanism causes PIPJ fracture/dislocation associated with a mallet finger and occurs in the dominant hand. Surgical treatment, especially ABP, can yield good clinical and functional results in these patients. However, the choice of treatment method depends on various factors, including the size of the fragment, the extent of damage, and its stability. Early diagnosis and treatment may lead to

better outcomes. a lateral x-ray can give the surgeon a clear image of the injury.

Limitations

The present study had limitations. The short follow-up period of patients after surgery was the most important weakness of this study. Results and functional consequences may vary in the long term.

Ethical Considerations

Compliance with ethical guidelines

Consent was obtained from the patients to publish this case report and accompanying images.

Funding

This research did not receive any grant from funding agencies in the public, commercial, or non-profit sectors.

Authors' contributions

Conceptualization: farid Najd Mazhar; Data curation: Hasan Yazdekhasti; Writing the original draft: Alireza Ghanbari.

Conflict of interest

The authors declared no conflict of interest.

Acknowledgments

The authors would like to thank all those who provided helpful comments, guidance, and support during this research.

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