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Open dislocation of great-toe interphalangeal joint: Is it easy to reduce? A Case Report

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Abstract— Irreducible dorsal dislocation of the interphalangeal joint of the great toe is extremely rare. Here, we report a case of a 27-year-old male patient with an open dorsal dislocation of the left great toe resulting from a twisting injury while playing football. After the affected site was washed with normal saline, manual closed reduction was performed, but it failed because of bony and soft tissue entrapment. Nevertheless, it was successfully managed by open reduction and internal fixation using Kirschner wire. In addition, the interposition of the joint capsule and hallux sesamoid was found and reduced. This case is the first to be reported in the Middle East and the first to be reported as open dislocation worldwide.

Keywords: Interphalangeal joint, Toe, Open dislocation, Metatarsophalangeal joint, forefoot injury, distal phalanx

Introduction

Dislocation of the first metatarsophalangeal joint is the most common forefoot injury, whereas dislocation of the interphalangeal joint is rare, especially dorsal dislocation. A trial of close reduction in the emergency room look easy, but it could be unsuccessful because of the interposition of sesamoid bone, joint capsule, or invaginated plantar plate. Hence, open exploration and reduction, maintained with Kirschner wire (K wire) fixation, is recommended, and theK wire is removed after 6 weeks to allow for mobilization [1]. Dislocation affecting the interphalangeal joint of the great toe mostly includes a volar dislocation of the distal phalanx, but it can be easily reduced by closed methods. Post-reduction management consists of buddy-taping to the second toe. Cases of dorsal dislocation are seldom reported worldwide in the English literature, and all these cases are closed dislocations of the interphalangeal joint [2].

This case report is the first to describe an open dorsal dislocation of the great toe interphalangeal joint globally as well as the first to provide a case of it occurring in the Middle East.

Case report

A 27-year-old young Saudi male, who had no any significant past medical illness, visited the emergency orthopedic clinic of King Fahad Hospital, Al Hofuf, Al Ahsa region in Saudi Arabia, after twisting his left great toe while playing football. He complained of pain in the left great toe and could not bear weight on it. His vital signs, including body temperature and respiratory rate, were stable on general examination. A 1 cm open wound was noted on the plantar aspect of the left great toe over the proximal phalanx. It is associated with great-toe deformity via external rotation and extension, with a palpable proximal condyle of the distal phalanx. Nonetheless, distal neurovascular status remained intact. The clinical features and physical examination suggested dorsal dislocation. X-ray confirmed the presence of dorsal dislocation of the interphalangeal joint of the left great toe (Figures 1 and 2).

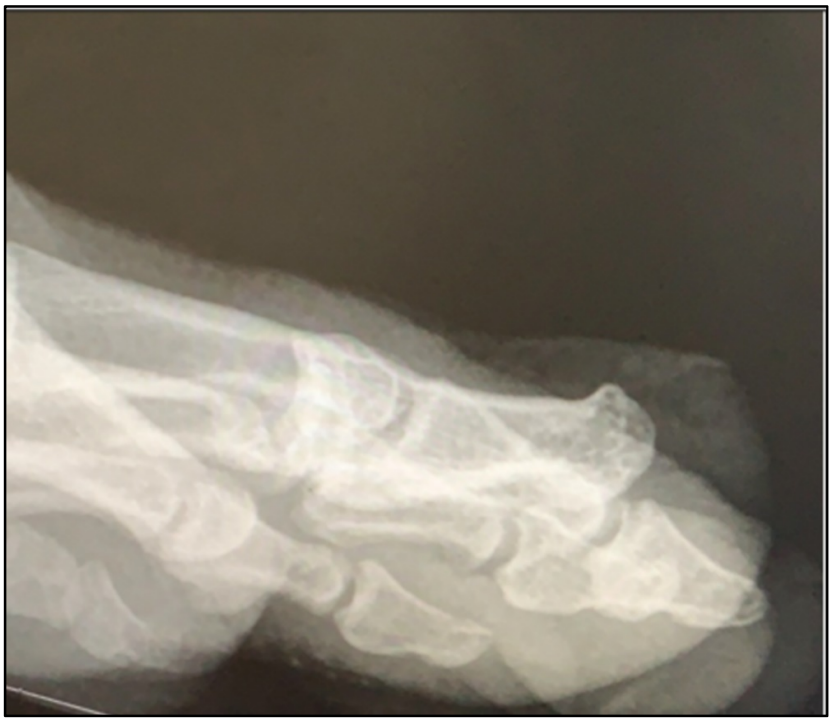

Figure 1: X-ray via lateral view shows the left foot showing dorsal dislocation of the great toe.

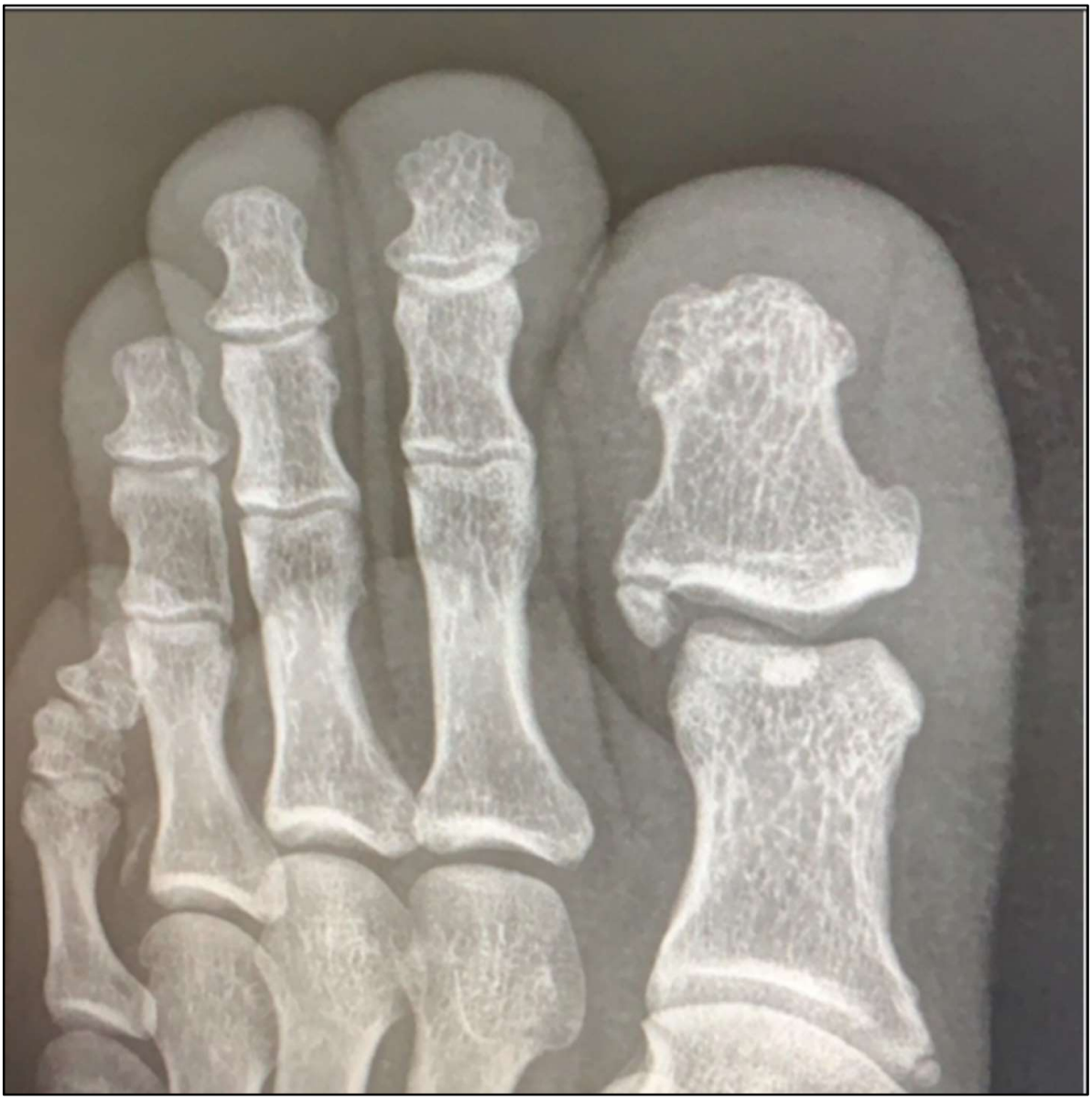

Figure 2: X-ray via anteroposterior view of the left foot shows sesamoid bones entrapped in the interphalangeal joint space.

Antitetanus and intravenous antibiotics with analgesics were then administered. The open wound was washed with normal saline as a recommended emergency management of any open wound. After giving the patient gradual doses of pethidine, we performed closed reduction, but after three attempts, the procedure remained unsuccessful. Thus, the orthopedics team planned for surgical open exploration and reduction with K-wire fixation. Patient consent was obtained. Under general anesthesia, we started with a plantar incision extending from the open wound. Upon exploration, a trial of open reduction was started with difficulty because of the interposition of the joint capsule, which was stretched by the proximal phalanx head (Figure 3). Subsequently, a medial dorsal approach was used for reduction. We then found fragments of sesamoid bones incarcerated in the intra-articular space, forming a barrier preventing joint reduction. These fragments were also seen under C-

arm imaging (Figure 4). Thus, we resected these fragments (Figure 5). Consequently, the reduction was smoothly performed by fixing with a single 1.2 mm K wire. C-arm imaging confirmed its position (Figure 6). Finally, we irrigated the wound and applied a below-knee backslab. Postoperatively, the patient was doing fine and was asymptomatic. Non-weight-bearing exercises were instructed, and the wire was planned to be removed 6 weeks after the surgery.

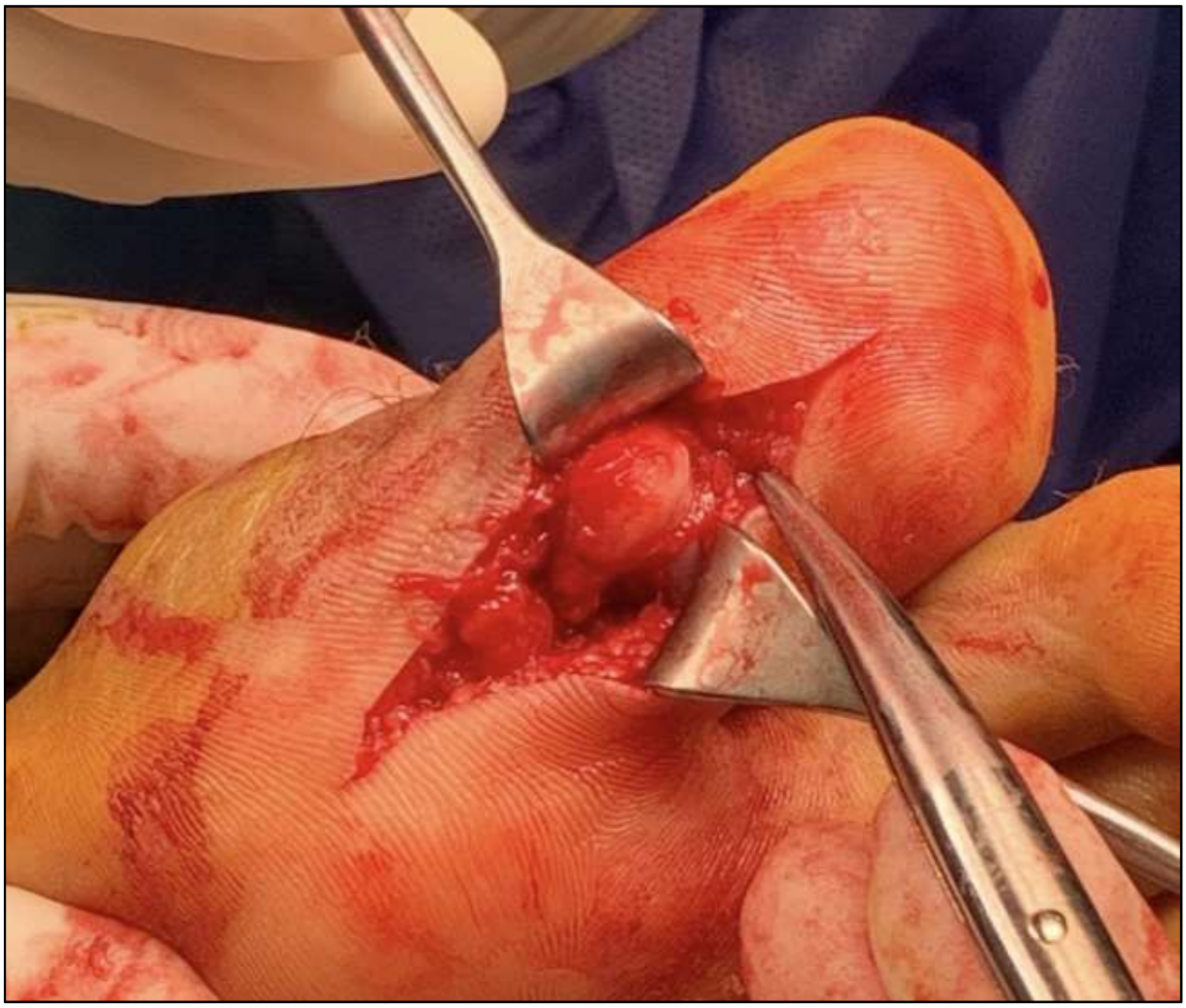

Figure 3: Intraoperative image of the buttonholing of distal condyle of the proximal phalanx exposed by extending the plantar aspect of the open wound at the left great toe.

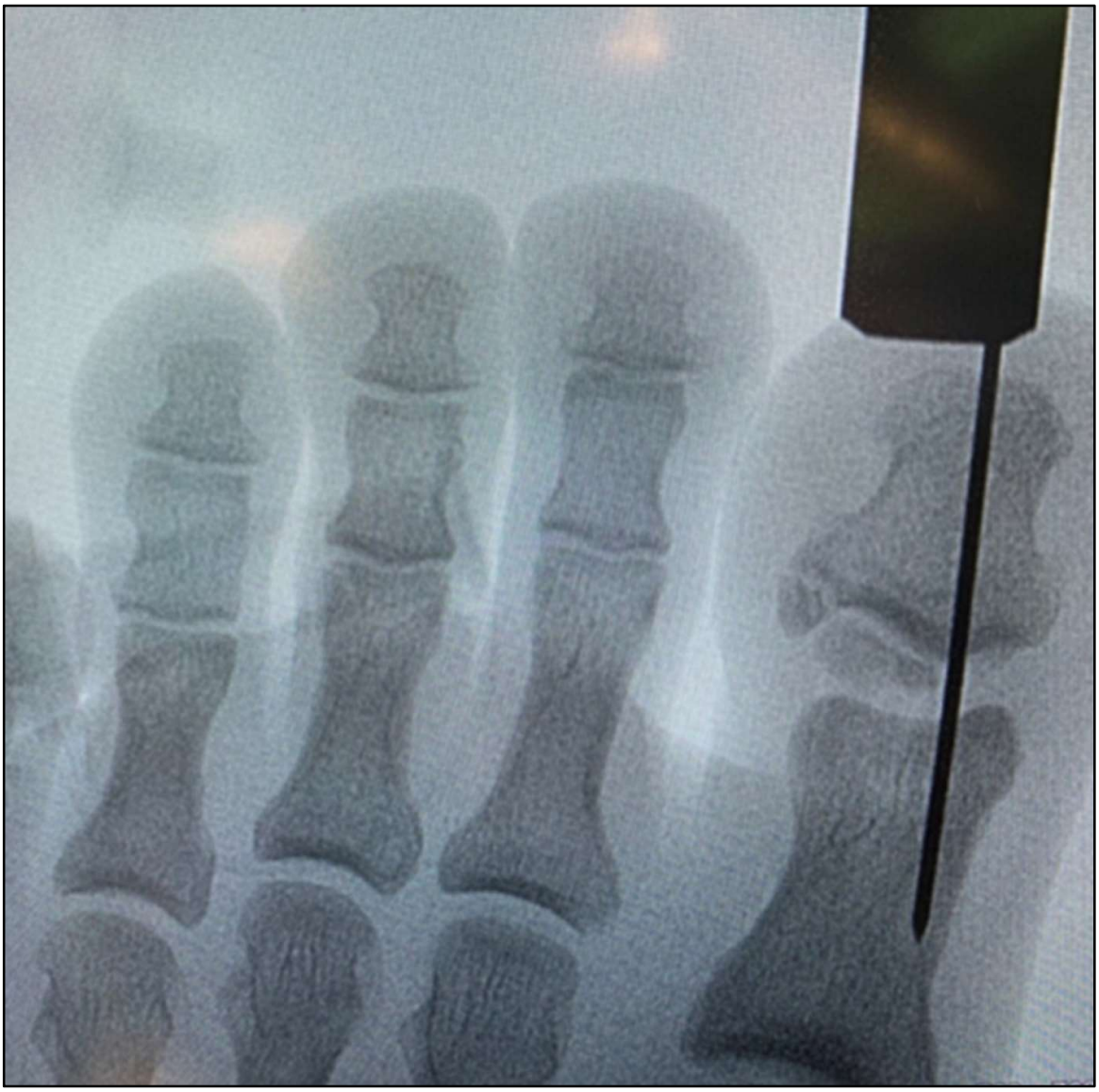

Figure 4: Intraoperative X-ray of the left foot shows bony fragments entrapped in the interphalangeal joint space, with K-wire in place percutaneously inserted to maintain the reduction.

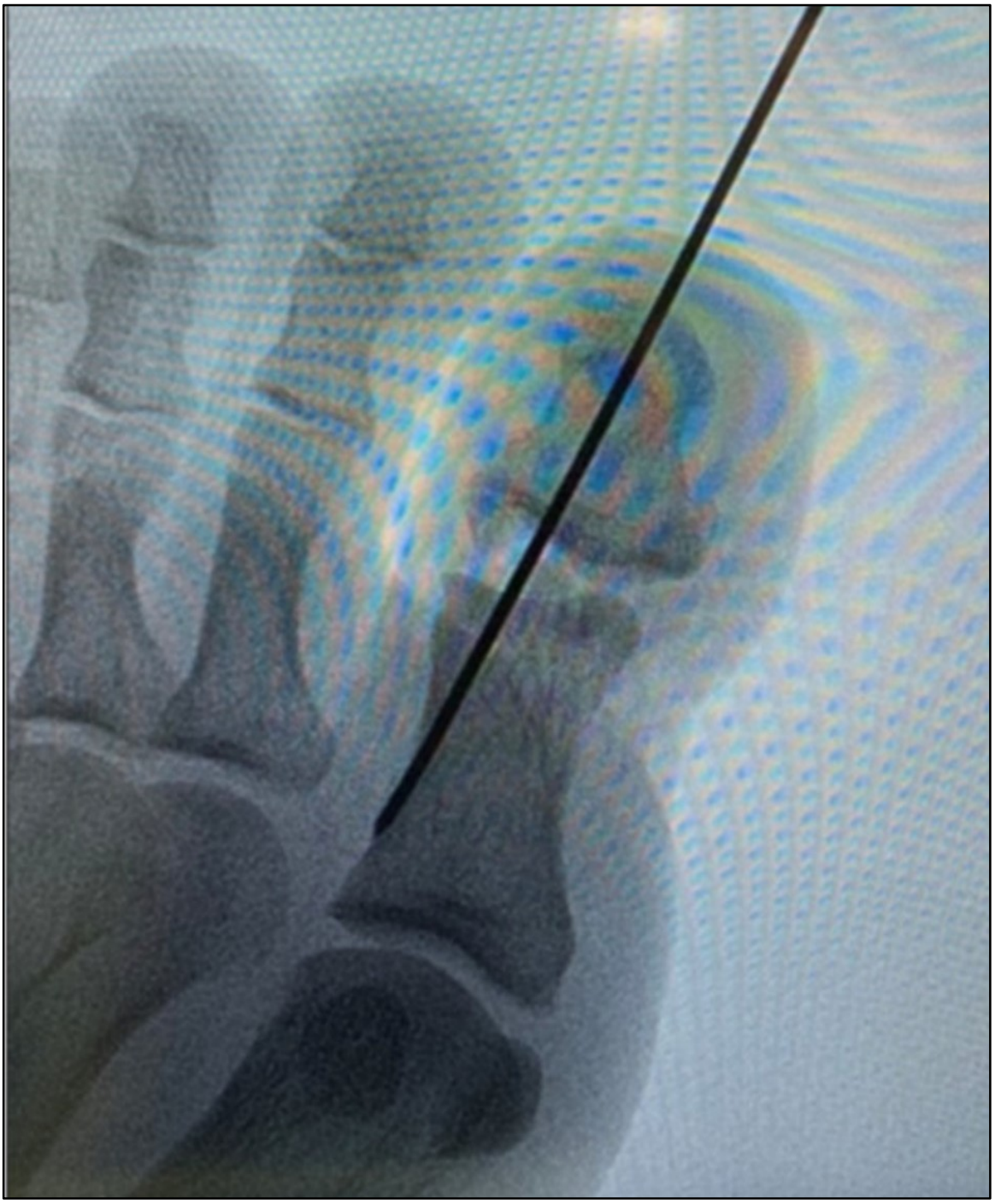

Figure 5: Intraoperative X-ray of the left great toe after removing the bony fragments. It shows a clear joint space, with K-wire in place percutaneously inserted to maintain the reduction.

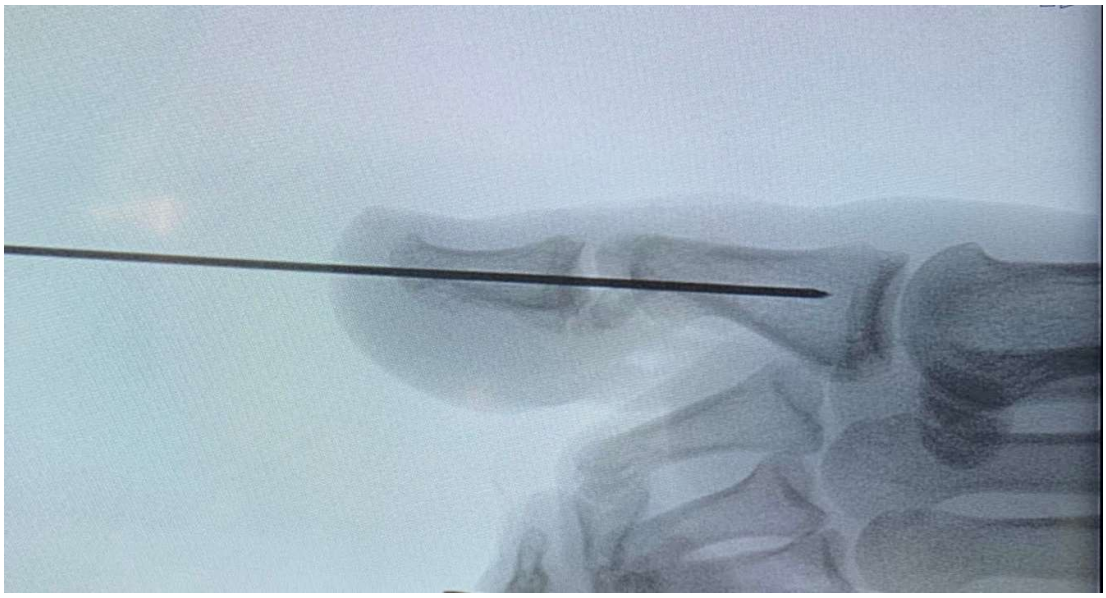

Figure 6: Intraoperative X-ray of the left great toe shows the K wire in proper position maintaining the alignment and reduction.

Discussion

The interphalangeal joint of the great toe has very straightforward anatomy [2]. Passively hyperextending this joint by more than 20° is prohibited because the joint capsule, collateral ligaments, extensor hallucis longus, flexor hallucis longus, and plantar accessory ligament maintain this joint.[1] In 1944, Muller first described in the LANCET journal a case of an interphalangeal joint dislocation caused by hyperextension or an acute axial load type injury [3].

Closed reduction is the first treatment choice for this condition [4]. The first step is to obtain hyper-dorsiflexion by dislocating the hallux dorsally [5]. According to the anatomy of the great toe's interphalangeal joint, the thick plantar plate is separate from the flexor hallucis longus tendon. Moreover, the sesamoid bone at the distal intercondylar area is present from the plantar plate dorsal to the tendon of the flexor hallucis longus and volar plate, making the sesamoid–plantar plate complex to move as a single unit. Therefore, reduction of interphalangeal joint dislocation is difficult, considering that the mobile sesamoid–plantar plate complex can easily move into the joint space. However, the plantar plate is connected to the proximal and distal phalanges by fibrous tissue, and as long as either of these connections remains intact, the plantar plate cannot be easily displaced into the joint space. When both connections are ruptured, easy displacement can happen [1].

Most adults have a sesamoid bone at the great toe's interphalangeal joint level. According to this observation and the position of the volar plate in the interphalangeal joint, Miki has classified irreducible dorsal dislocations of the great toe into two types. In Type I dislocation, the sesamoid–plantar plate complex is incarcerated into the joint, but it causes no major deformity, except for slight lengthening of the great toe. In Type II dislocation, the sesamoid–

plantar plate complex comes dorsal to the dislocated interphalangeal joint, and a hyperextension deformity of the distal phalanx is seen because the sesamoid bone overrides the head of the proximal phalanx [6]. Our patient exhibited Type II dislocation.

Each of these two types has different clinical and radiological features. The distal phalanx is positioned neutrally in Type I dislocation, with resistance to dorsiflexion or plantarflexion. Radiologically, the sesamoid bone can be visualized within the widened joint space, and the phalanges are coaxial. In Type II dislocation, the distal phalanx is hyperextended, with slight resistance to dorsiflexion, and the sesamoid bone is seen dorsal to the head of the proximal phalanx radiologically. Closed reduction is difficult in both types because the collateral ligaments are intact [1,6,7].

Our patient is under Type II classification. Open exploration with reduction was done through plantar, dorsal, and medial approaches; this procedure is well documented in the literature [1,2,6,8,9]. Next, the sesamoid bony fragments were resected. Traction on the toe was generated by proximal phalanx head buttonholing to release the tension on the joint capsule, and reduction was maintained by K-wire fixation.

Several studies reported various treatment options for interphalangeal joint dislocation. For example, Woon et al. and Özdemir et al. performed percutaneous reduction[10,11]. Other treatment options include bulky dressing [2], buddy splinting [12], and immobilization [6] in a short leg cast for up to 4 weeks. In 1981, a 54-year-old male patient with irreducible close dorsal dislocation was treated uneventfully by surgical open reduction through a dorsal approach, with the release of the incarcerated plantar plate [2]. This method is reportedly successful in subacute and chronic conditions [1].

Most previous reports used a dorsal surgical approach for treating this condition [1]. However, Crosby et al. demonstrated satisfactory results after performing an alternative technique under digital block anesthesia via a medial approach. This approach did not disrupt the extensor hallucis longus or the dorsal capsule [12]. It was also demonstrated by Wolfe et al. [13] Furthermore, Yasuda et al. reported two cases of dorsal dislocation of the great toe's interphalangeal joint with interposition of the plantar plate–sesamoid complex. Surgical treatment was done through a lateral approach in one case and a plantar approach in the other case [14].

In Saudi Arabia, the only reported case was the dorsal dislocation of a metatarsophalangeal joint with fractured fibular sesamoid bone in Riyadh in 1999; no reported case of dorsal dislocation of the great toe's interphalangeal joint was found even after an extensive search [15].

The dislocation of the interphalangeal joint of the great toe in our case was associated with volar plate rupture and sesamoid bony fragment incarceration in the joint space, but no any bone fracture was noted. This finding made reduction difficult. We perceived that the joint would be most easily explored through a plantar approach. However, such an approach was difficult because of the interposition of the joint capsule. We then approached through the dorsomedial aspect. Consequently, the sesamoid bony fragments were easily removed, and reduction through this open approach was successful.

Conclusion

Dorsal dislocation of the great toe's interphalangeal joint cannot be thought of as out of expectation in a case of injury, despite being a rare condition. A closed manual reduction of the great toe's interphalangeal joint in open fracture–dislocation case seemed to be easy. However, many barriers were noted, preventing closed manipulation. Considering the anatomical characteristics and the deforming structures that prevent proper reduction, surgical reduction and exploration are required to restore the alignment and function conservatively.

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