Case Report

Open Reduction and Screw Fixation of a Diastatic Bipartite Hallux Sesamoid in Turf Toe Injury

A Case Report

Max Müller, Konstantin Genelin, Johannes Riecke, and Christian Deml

Abstract: *We present a case of a 25-year-old male professional soccer player who complained of severe pain over the first metatarsal head after opponent contact during a soccer game. Clinical findings showed swelling and tenderness. Initial radiographs showed a diastasis of a bipartite medial sesamoid between the fragments as compared to radiographs taken 4 years earlier of the same foot. A computed tomography scan was performed objectifying the widened interval and also showing an angulation of the proximal fragment. Open reduction and screw fixation were performed, leading to adequate positioning of the 2 bipartite fragments. The patient showed good clinical recovery and returned to the same performance level. Turf toe injury with diastasis of a medial bipartite sesamoid can be treated successfully with this operative technique.*

Levels of Evidence: *Level V: Case report*

Keywords: turf toe; screw fixation; bipartite sesamoid; athlete; sesamoid fracture

The purpose of sesamoid bones is to reduce friction of the tendon as well as increasing the lever arm of the flexor hallucis brevis (FHB) tendon and therefore augment push-off strength at the first metatarsophalangeal joint (MTP).[1] Furthermore, the plantar complex is most important for stability of the first MTP. The medial and lateral sesamoid are always existent. Different variants have been described, of which the bipartite medial sesamoid seems to be the most common variant (up to 14%).[2-5]

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Turf toe injury usually occurs in sports activities.[6,7] A commonly proposed injury mechanism is forced axial loading onto the dorsally extended first MTP joint. The force applied brings the great toe in hyperextension and may lead to an injury of the plantar capsular ligamentous complex. In most cases, the foot remains fixed to the ground depending on the surface of the field of play.[1]

Injuries of bipartite medial hallux sesamoids are rather rare injuries and are commonly misdiagnosed. Boney deformity such as fractures of a normally configured hallux sesamoid are easier to detect using radiographic imaging such as X-ray and computed tomography (CT) scan.

In this case report, we demonstrate the diagnosis and treatment of a turf-toe-type injury of a bipartite medial hallux sesamoid with diastasis and disruption of the plantar capsular ligamentous

DOI: 10.1177/19386400211029150. From the Department of Orthopaedics and Traumatology, Medical University of Innsbruck, Innsbruck, Austria (MM, KG, JR); Sanatorium Kettenbrücke Innsbruck, Innsbruck, Austria (CD). Address correspondence to: Max Müller, Department of Orthopaedics and Traumatology, Medical University of Innsbruck, Anichstraße 35, 6020 Innsbruck, Austria; e-mail: max.mueller@tirol-kliniken.at

complex. Open reduction and screw fixation were performed. The patient was asked for submission and publication of his data and agreed.

Case Report

A 25-year-old male professional soccer player presented at the Trauma Department of University Hospital Innsbruck 1 day after a soccer game with increasing pain at his left foot. He reported an injury at the area of the first metatarsal head during the game. Clinical findings showed swelling and tenderness of the entire forefoot with maximum pain plantar at the first metatarsophalangeal joint. The skin showed no damage and no ecchymosis. The patient had no prior trauma at this specified region.

Initial radiographs showed no bony deformity of the left foot, but clearly showed a large distance between the 2 bipartite fragments of the medial hallux sesamoid, so that a rupture of the plantar complex was suspected (Figure 1). Comparison to an X-ray of the same foot taken 4 years earlier confirmed the diagnosis. Additionally, a CT scan was performed showing the diastasis, the angulation of the proximal fragment, as well as soft tissue hematoma (Figure 2). Therefore, operative treatment was indicated by the treating surgeons, and further imaging such as magnetic resonance imaging (MRI) was not needed.

Operative treatment was performed 5 days after trauma. The patient was in a supine position. A medial-plantar skin incision was made. Little soft tissue preparation was needed to reach the capsule. The medial and plantar capsule appeared completely ruptured as well as the capsular soft tissue between the 2 bipartite fragments. Using sharp hooks and blunt Hohmann retractors, the medial sesamoid could be assessed. Due to the short interval between trauma and intervention, soft tissue was flexible and preparation could be performed using this approach. In order to fully reduce the diastasis between the 2 fragments and achieve the former anatomical relation, an open reduction was performed using a bone reduction forceps. In addition, prior to reduction the cortices of the 2 sides facing each other were prepared using a Luer bone rongeur to ablate the cortices in order to enhance healing. No bone graft was placed. Reduction was evaluated

Figure 1.

Left foot before (A) and after (B) trauma. A diastasis of the medial sesamoid is noticed in a dorsoplantar and lateral (C) view, suspicious for a ruptured plantar capsular ligamentous complex.

Figure 2.

CT scan shows the diastasis of the 2 fragments as well as the angulation of the proximal fragment.

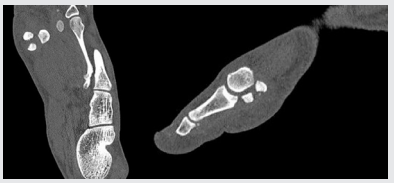

Figure 3.

(A) Postoperative anatomic position of the 2 fragments with screw fixation in dorsoplantar view. (B) and (C) Three years postoperative dorsoplantar and lateral view, no secondary diastasis, no material failure, advanced bony healing.

intraoperatively using an image intensifier. After primary fixation using one K-wire, one fully threaded, noncannulated 1.5 mm screw with a length of 14 mm was inserted from distal medial to proximal lateral for stabilization. Capsule and the medial ligament were restored from medial using 3.0 vicryl absorbable sutures; Donati skin sutures were performed with nonabsorbable sutures. No tourniquet was needed during the procedure. A lower limb cast was utilized right after the procedure. The incision was fully healed at 2 weeks after surgery and sutures removed.

Postoperatively a lower limb cast was used to immobilize the foot for 2 weeks. Partial weight bearing on the foot was limited to 20 kg for 4 weeks. During that time, the patient received antithrombotic therapy with low-molecular-weight heparin. Accompanying physical therapy including instructions on how to perform partial weight bearing was started immediately postoperative. Follow-up showed satisfying X-ray controls as well as pain-free mobilization with full weight bearing 6 weeks after surgery. The patient returned to sports such as running 8 weeks after trauma; soccer was possible 10 weeks after trauma. At 3-year follow-up the patient was still pain free at all times and playing professional soccer at the same level as before. X-ray showed advanced bony healing, no hardware failure, and correct articulation of the medial sesamoid, yet it seemed that a small area of less density between the 2 fragments is still present (Figure 3). Since the patient was completely pain free and playing professional soccer without any limitations plus the X-rays showed satisfying results suggesting rigid fixation, further imaging such as CT scan was not performed.

The American Orthopaedic Foot and Ankle Society Hallux Score (AOFAS) was assessed at 3-year follow-up, showing a score of 100. Furthermore, to assess the sports ability the Foot and Ankle Disability Index sports module was evaluated, showing a score of 136 (no disability).

Discussion

Fractures of the hallux sesamoid bones are usually diagnosed using X-ray or CT scans, additionally MRI if needed.[8,9]

However, injuries concerning the sesamoid bones, especially a bi-/multipartite variant, are not always bony deformities. Non–bony injuries of the first MTP can be difficult to diagnose. Since the sesamoids are closely related to the plantar capsular ligamentous complex, they can also give a hint in injury to this soft tissue complex. Great value lies in the detailed report of the trauma by the patient and a precise physical examination. In acute trauma, pain and local swelling are most likely present.

Next to identifying fractures, radiographic imaging can be useful to recognize a diastasis of a present bipartite medial sesamoid and therefore draw conclusions of present injury of the plantar capsular ligamentous complex.[1,10] Seeing a sesamoid interval greater than 2 mm on a dorsoplantar X-ray is highly suspicious for a complete rupture of the plantar complex. This may result in instability of the first MTP and decreased function of the sesamoid bones.[10] In addition, CT or MRI can provide further information whether or not concomitant bony damage is present.[4]

Due to the complexity and rareness, these injuries are often overseen. It can also be difficult to differentiate between a bony and soft tissue injury.[11] Delayed diagnosis and treatment can lead to poor results with persisting symptoms in athletes.[2,7,12] Treatment options range from conservative treatment with partial weight bearing and immobilization to operative treatment. Different operative treatment options for diastasis of a bipartite sesamoid are described. Early full or partial sesamoidectomy can be performed, or also in case of persisting symptoms after primary conservative treatment, secondary sesamoidectomy seems to be an alternative, bearing the risk of altered biomechanics and resulting in hallux valgus. Also, acute soft tissue repair with the meaning of capsule and ligament repair is described.[2]

In case of fracture, a conservative treatment can lead to prolonged pain and nonunion, requiring secondary operative treatment.[13] Furthermore, conservative treatment is associated with lower return to pre-injury level of sport rates.[14] On the operative side, sesamoidectomy is one possible treatment option suggesting good results and quick return to sports, yet medial sesamoidectomy can also lead to postoperative hallux valgus and altered biomechanics.[12-15] ORIF (open reduction with internal fixation) using screw fixation is also described in current literature, yet limited to fractures of the sesamoid or used for treating nonunions and not addressing bipartite sesamoid.[16] Blundell et al report an improved AOFAS score in their cohort after operative treatment using percutaneous screw fixation.[7]

In this presented case, however, no true fracture is present, yet in order to reach rigid fixation and anatomical articulation the bipartite sesamoid is treated as such. Since it is a matter of soft tissue injury and the 2 fragments of the bipartite sesamoid present no fracture surface, we believe that in such cases open reduction is necessary rather than performing percutaneous screw fixation as described for true fractures.[7]

Also, early operative treatment should be performed to achieve bony fusion and avoid complications of delayed surgery. Furthermore, for a professional soccer player, in our opinion, it is crucial to reestablish the former anatomical position of the medial sesamoid rather than performing a sesamoidectomy, which could lead to altered biomechanics and reduced push-off strength. In our case, a full return to pre-injury professional sport level was achieved within 10 weeks, which is comparable to the current literature of operatively treated fractures of the sesamoid.[14]

Conclusion

A diastasis of a bipartite sesamoid after trauma indicates a complete rupture of the plantar capsular ligamentous complex. To our knowledge, there is no recent recommendation how to treat separation of a medial bipartite sesamoid due to a turf toe injury. In order to avoid common problems of conservative treatment such as persistent symptoms and secondary operative treatment, this case was treated operatively as described above. Clinical and radiological follow-up showed good results. Therefore, this case shows an effective acute repair of the plantar capsular ligamentous complex including reduction and screw fixation of a diastasis of a bipartite medial sesamoid.

Declaration of Conflicting Interests

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Ethical Approval

Not applicable.

Informed Consent

The patient was asked for submission and publication of his data and he agreed.

Trial Registration

Not applicable.

ORCID iD

Max Müller https://orcid.org/0000-0001-8495-3543 FAS

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