# Osteochondral Injury of the Hallux in Beach Soccer Players

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# Osteochondral Injury of the Hallux in Beach Soccer Players

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## ABSTRACT

***Background:*** **Injury to the metatarsophalangeal or interphalangeal joints of the hallux is an unusual clinical problem.** ***Materials and Methods:*** **This investigation represents a retrospective case series accumulated over a twenty year period of ninety-three beach soccer players who were treated for an osteochondral injury of the hallux metatarsophalangeal or interphalangeal joints of their dominant (kicking) foot.** ***Results:*** **Eighty-one patients underwent surgical excision of an avascular osteochondral fragment that had been identified by both plain radiography and magnetic resonance imaging. All but two patients were able to return to participation with either minimal or no pain. Two patients progressed to hallux rigidus and metatarsophalangeal joint arthritis.** ***Conclusion:*** **This retrospective case series describes a sports-related injury of the hallux metatarsophalangeal or interphalangeal joints that is likely produced by hyper-flexion or hyperextension. This descriptive case series might well characterize heretofore unexplained post-traumatic pain and swelling involving the hallux.**

## INTRODUCTION

Barefoot beach soccer is played by thousands of participants in South America. The observation of a clinical syndrome characterized by progressive pain and swelling in the dominant (kicking side) hallux metatarsophalangeal (MTP) or interphalangeal (ITP) joints of barefoot beach soccer players led to this investigation (Figure 1).

Clanton has suggested that a hyperextension injury of the hallux metatarsophalangeal joint can impart a vascular insult that leads to painful swelling of this joint in runners.[1] Other authors have suggested hyperextension as the mechanism of "turf toe" and other chronic painful sports-related arthropathies of the hallux MTP.[2−4,7]

Anatomically, Shereff and Kummer[5] and Vega and Resnick[6] have demonstrated that the vascular supply of the first metatarsal head arises from the medial plantar and dorsal metatarsal arteries. The base of the proximal phalanx and the dorsal joint capsule receive their blood supply primarily from the lateral plantar artery. The association of a peripheral blood supply and the potential for a disruptive repetitive injury in the plane of motion of the hallux has suggested repetitive hyperflexion or hyperextension as one possible mechanism for the development of injury to this relatively simple joint complex.

## MATERIALS AND METHODS

Between 1986 and 2006, 93 barefoot beach soccer players presented to a single orthopaedic foot and ankle surgeon (AA) with complaints of an insidious onset of progressive painful swelling in the hallux MTP or IP joints of their dominant (kicking) foot. There were 86 males and seven females. The average age of the subjects was 31 (range, 14 to 67) years of age. None of the patients remembered a specific inciting traumatic event or could clearly pinpoint the temporal onset of symptoms. Physical examination universally demonstrated localized swelling and tenderness with decreased painful motion of the involved metatarsophalangeal or interphalangeal joints.

All of the patients had radiographic evidence of a marginal, often sclerotic, bony fragment within the involved symptomatic MTP or IP joint (Figure 2A) Magnetic resonance imaging universally revealed sclerosis of the free bony fragment (Figure 2B) The specific locations of the lesions are listed in Figure 3.

All of the subjects were initially treated non-operatively with a period of rest and oral non-steroidal anti-inflammatory medications. This was followed with joint taping and various forms of physical therapy. Surgery was advised for those patients in whom the pain was of sufficient magnitude to

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preclude them from participating in their sport. Eighty-one of the 93 patients agreed to undergo exploration of the involved hallux joint.

**Surgery**

Surgery involved a linear dorsal incision directly overlying the lesion of the involved hallux MTP or IP joint. A loose bony fragment, corresponding to the radiographic lesion, was identified in the symptomatic joint of all of the patients (Figure 4)

Drill holes and debridement to bleeding bone at the base of the lesion was performed in all of the patients who underwent surgery. Following excision of the osteochondral fragment, the joint arthrotomy was repaired with simple sutures. Postoperative management consisted of a simple soft compression dressing. Patients were allowed to bear weight with a standard commercial postoperative shoe. They were instructed in passive range-of-motion exercises as soon as the pain level permitted, with return to normal daily activities as tolerated.

**Fig. 1:** This young male beach soccer player presented with a several month history of pain in the interphalangeal joint of hallux in his dominant (kicking) foot.


**Materials**

① - 19 feet - 20%
② - 33 feet - 32%
③ - 12 feet - 10%
④ - 1 foot - 1%
⑤ - 20 feet - 19%
⑥ - 18 feet - 18%

**Fig. 3:** The location of the clinical lesions.

**Histology**

Histologic examination was performed on each specimen. The microscopic findings in all of the specimens demonstrated fragments of avascular bone surrounded by inflammatory cells and attempts at new bone formation (Figure 5)

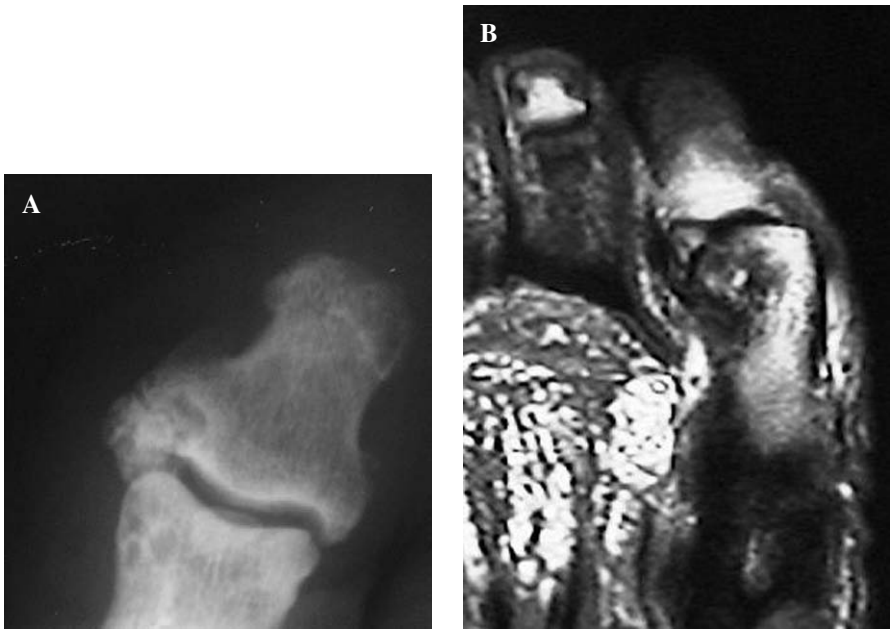


**Fig. 2:** **A**, Radiograph of a typical marginal osteochondral lesion within the hallux MTP or ITP joints. **B**, MRI revealed a free bony fragment with radiographic evidence of avascular necrosis.

**Fig. 4:** Photograph taken at surgery.

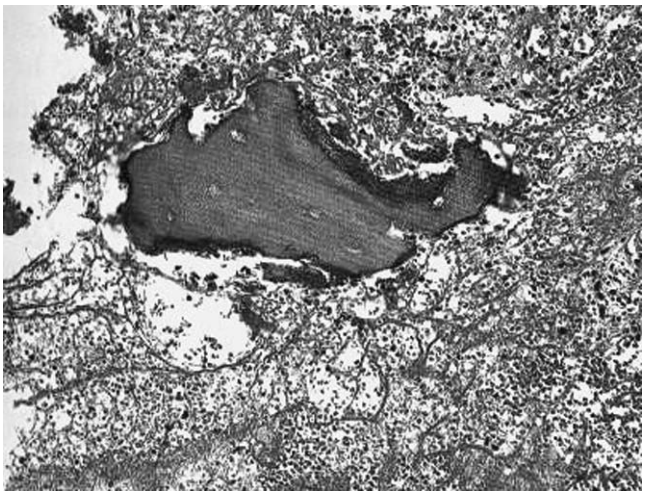

**Fig. 5:** Histology of removed bony fragment demonstrating an avascular segment of bone surrounded by inflammatory cells and new bone formation.

These observations are consistent with a traumatic injury that disrupted the terminal blood supply.

## RESULTS

All of the patients returned for an interview and examination at a minimum one year following surgery. Seventy-five of the 81 patients (92.6%) undergoing surgery described either no, or minimal pain at a minimum of 1-year followup. Eleven (13.6%) described residual discomfort, but were able to return to participation at their pre-injury level. Seventy-nine of 81 patients returned to participating in barefoot beach soccer at between 90 and 120 days following surgery. Two patients were not able to return to participation due to hallux rigidus and MTP arthritis.

## DISCUSSION

On the surface, this retrospective case series appears to simply characterize an injury peculiar to a sport with limited worldwide interest. When the data is more carefully evaluated, the pathomechanics of this injury may provide an excellent model for the development of sports or injury related progressive arthropathy of the hallux MTP or IP joints. Clanton[1] and others[2–4,7] have postulated hyperextension as the inciting cause of sport-related pathology of the hallux MTP. The mechanism of kicking a soccer ball involves striking the ball with the instep. Approximately half of the lesions of the patients in this case series occurred on that lateral side of the hallux. The observation of identical histology in both medial and lateral lesions suggests that direct trauma is an unlikely causative factor. Depending on the position of the toe at the time of the application of the hyperextension or hyperflexion force, an acute fracture or repetitive stress fracture might disrupt the blood supply to a marginal bony fragment. When loaded in another prepositioned orientation, the repetitive loading might simply lead to traumatic arthropathy.

This case series, supported by histologic evidence, supports repetitive hyperextension or hyperflexion as the causative agent for the development of sports or repetitive injury-related pathology of the hallux MTP or IP joints. Depending on the application of the stress, the end result might be acute fracture or stress fracture at the lateral or medial margins of the joints. When a symptomatic bony fragment is identified within the MTP or IP joints of the hallux, it appears that simple excision predictably relieves symptoms in affected individuals.

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