CHAPTER **39**

CALCANEAL INTRAOSSEOUS LIPOMA TREATED WITH EXTERNAL FIXATION: Case Report and Review of the Literature

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INTRODUCTION

Intraosseous lipoma (IOL) is a rare benign bone tumor. This benign neoplasm has been reported to occur in the calcaneus as well as the proximal femur (1-3). In the past, the relative absence of symptoms and radiographic similarity to a bone cyst has accounted for under-diagnosis of IOL (4, 5). The case presented in this article was diagnosed with the help of magnetic resonance imaging (MRI) and histopathologic analysis, after which the patient was treated by means of curettage and packing with a bone graft substitute (Trinity). The purpose of this article is to increase awareness among clinicians of the existence of this unusual lesion and the benefits of the use of external fixation on a patient with a high risk of calcaneal fracture.

Although calcaneal IOL accounts for a small portion of cases in the huge differential diagnosis chart for foot pain, it should be kept in mind as a possible diagnosis in unresolved cases. Most patients respond to nonsurgical treatments. But if this is not the case, surgical treatment is indicated.

INTRODUCTION

IOLs are benign tumors derived from mature lipocytes mostly seen at the metaphysis of the long bones in men (2, 6). Foot and heel pain are the common symptoms of calcaneal IOL (6). Nonsurgical options such as nonsteroidal anti-inflammatory drugs, cold compression, use of nonweight-bearing devices such as a cane, use of a silicone sole plate, and preventive measures for pathological fractures are the most commonly used treatment modalities for this condition. Surgery is indicated in the presence of pain resistant to conservative treatment methods, impending or pathological fractures, and when a histopathological differential diagnosis is required for aneurismal bone cyst, giant cell tumor, pseudo cyst formation, or unicameral bone cyst. Although surgical treatment with curettage and autogenous bone grafting has been reported, only a small case series has been reported so far (7). In this study, we present one calcaneal IOL patient treated with curettage, autogenous bone grafting, and Ilizarov external fixator.

CASE REPORT

A 23-year-old male presented with a report of a dull, aching pain in his right heel of 2 years duration. The pain was noted to increase after strenuous walking, prolonged standing, or other rigorous activities involving the right foot, and had been increasing steadily over the past 3-4 months. The patient stated that the pain was persistent, but worse at the end of the day. The pain was ranked 7 on a scale of 0 to 10, where 0 = no pain, and 10 = severe pain. There was associated swelling observed in the right foot.

Upon gross examination, we noted that the patient walked with an antalgic gait. A small, palpable, fluent, soft-tissue mass was noted on the right medial arch below the medial malleolus, which was compatible with a possible superficial soft tissue lipoma. There were no scars, sinuses, or venous prominences overlying the affected area, and the right ankle and subtalar joint motions were normal. There was pain on palpation to the right heel and ankle. There was no past medical history that would increase the likelihood of bone infarction, such as corticosteroid use, infection, previous irradiation, lipid storage disease, collagen-vascular disease, or lympho-proliferative disorder.

Plain radiographs revealed the presence of a well-circumscribed radio-mixed lesion with a thin sclerotic rim, interspersed with trabeculations in the antero-inferior portion of the left calcaneus underlying the subtalar joint (Figure 1).

A preoperative MRI scan of the right foot revealed the presence of a 2.30 x 2.0 cm circumscribed mass in the neck

Figure 1. A well-circumscribed radio-mixed lesion with a thin sclerotic rim, interspersed with trabeculations.

Figure 2. Lateral T1-weighted MRI of the right foot revealed the presence of a 2.30 x 2.0 cm circumscribed mass in the neck and body of calcaneous with predominantly fat signal on all pulse sequence.

Figure 3. Transverse T1-weighted MRI.

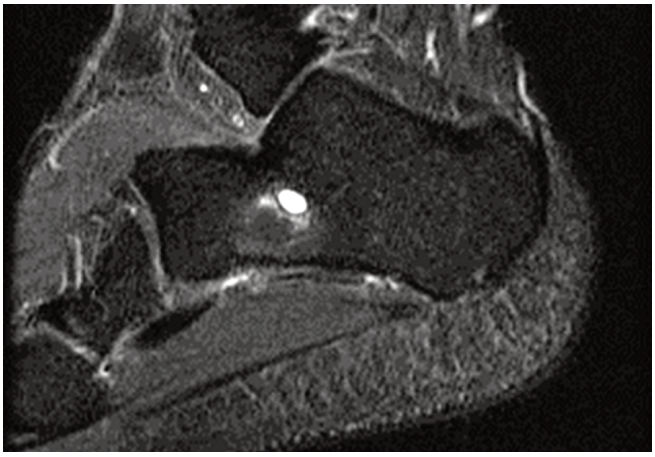
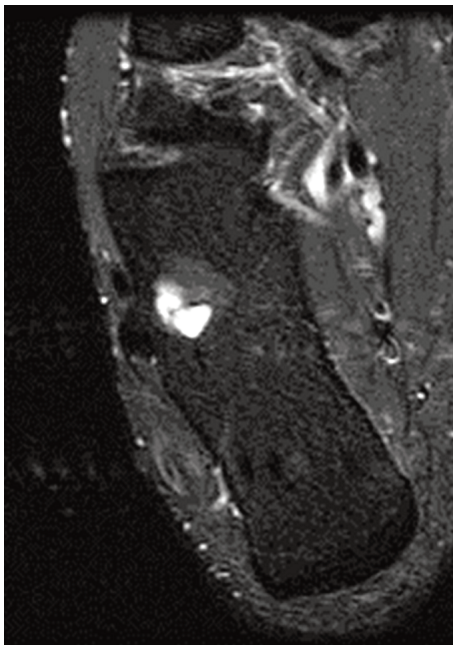


Figure 4. The T2-weighted MRI shows an eccentric component of fluid signal within the lateral aspect of the mass.

and body of the calcaneous with a predominantly fat signal on all pulse sequences (Figures 2, 3). The T2-weighted MRI showed an eccentric component of fluid signal within the lateral aspect of the mass. The appearance of the mass is compatible with an IOL. There is prominent fatty tissue seen in the plantar medial aspect of the right hindfoot, which most likely represents a prominent lobule of subcutaneous fat (Figures 4, 5). It was at this point that the surgical option was discussed with the patient and he agreed to undergo surgical correction of his condition.

Based on the clinical and diagnostic image findings, IOL was diagnosed and operative decompression of the cyst was subsequently undertaken. Prior to the operation, the lesion was localized fluoroscopically and its localization was marked on the skin. Under tourniquet control, a straight lateral skin incision was performed over the lesion and the periosteum was incised longitudinally. The lesion and a portion of the adjacent normal tissue were exposed at one end of the lesion using a 1 cm × 1 cm rectangular cortical window, after which the cortex overlying the cyst was exposed on the inferior and lateral aspects. Using an oscillating saw and osteotome, the lesion was totally curetted out with angled curettes through the window.

When the cyst was decorticated, greasy, yellow intraosseous lipoma was identified and evacuated from the osseous cavity. The soft tissue contents of the intraosseous



Figur 5. T2-weighted image.

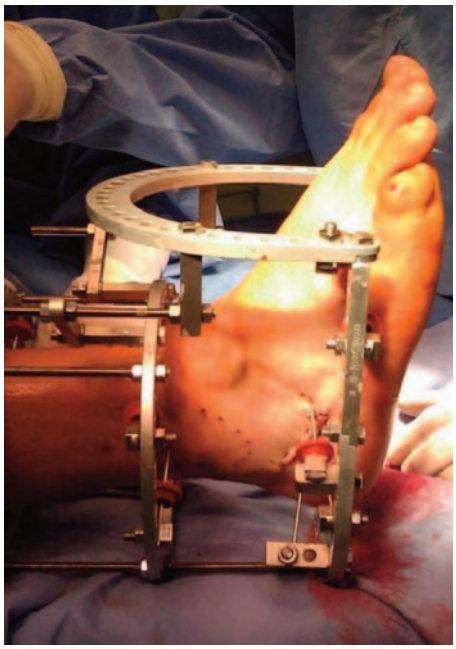


Figure 6. Application of the Ilizarov ring external fixator.

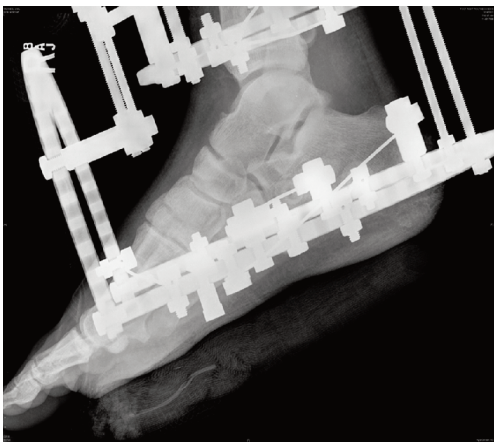


Figure 7. Lateral view of the Ilizarov frame.

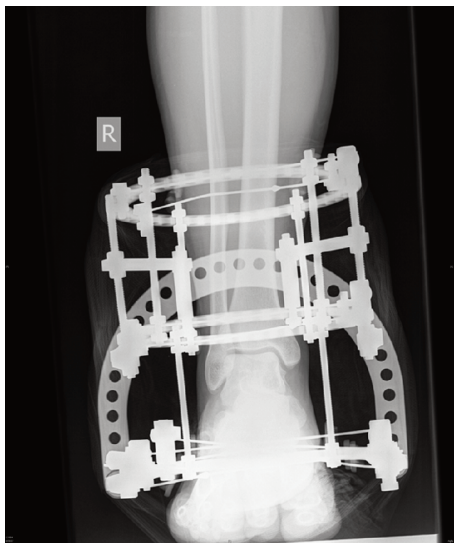


Figure 8. Radiographic view of frame placement.

cyst were removed along with the greasy fluid, and the entire specimen was sent for histopathologic diagnosis. The cavity of the calcaneus was lavaged with normal saline before cancellous allograft bone (Trinity) was used to pack the cavity. After filling the cavity, the wound was closed in anatomic layers and a sterile dressing was applied, followed by application of an Ilizarov ring external fixator for the initial postoperative period of weight-bearing ambulation (Figures 6-8).

Subsequent histopathologic analysis revealed fragments of bone, which include a few fragments of necrotic bone and fibroadipose tissue demonstrating foci of fat necrosis and necrosis of other soft tissue-types. The morphology suggests a possible fracture site or tendon avulsion. There is no evidence of neoplasm. These findings were consistent with the diagnosis of IOL.

The patient's heel pain subsided almost immediately after the operation, with the exception of surgical wound pain, which subsided in a normal fashion. Postoperative images were taken as part of the postoperative evaluation. A postoperative MRI scan of the right foot done 3 months after surgery revealed the resection of the previously described intra-osseous fatty mass in the neck and body of the calcaneous. Intermediate signal intensity tissue now fills this region of the calcaneous, and there was no calcaneal fracture identified (Figures 9-12).

Two weeks following suture removal, the patient was mobilized with partial weightbearing for 3 weeks, followed by weightbearing as tolerated for the following postoperative weeks. Clinical and radiological examinations were done on the first postoperative day, at 6 weeks, 12 weeks and every other month thereafter, until radiological confirmation of graft consolidation (Figures 13,14).

RESULTS

Milgram's (19) classification system is used for staging the lesions: stage 1, the lesion is a solid lipoma composed of viable fat cells; stage 2, part of the lesion is necrotized, forming focal calcification; and stage 3, most of the tumor tissue has died, with variable degrees of cyst formation, calcification, and reactive new bone formation. Histopathologic analysis of our fragments of bone, which included a few fragments of necrotic bone and fibroadipose tissue shows foci of fat necrosis and necrosis of other soft tissue-types. The morphology suggests a possible fracture site or tendon avulsion. There is no evidence of neoplasm. These findings were consistent with the diagnosis of a stage 2 IOL.

The need for surgical treatment is controversial. Curettage with bone grafting is the treatment of choice when surgical intervention is needed. Most lipomas, however, can be managed conservatively. Some surgeons feel that in asymptomatic cases with no signs of an impending pathologic fracture or suspicion of malignancy, nonoperative treatment with clinical and radiological follow-up is a wise approach. Malignant transformation is rare. While some surgeons think that biopsy is unnecessary because radiological features are characteristic, others believe that the lesion must be diagnosed histologically. However, reports stating that biopsy is required usually predate the common and efficient use of MRI, when an accurate radiological diagnosis was almost impossible.

We believe that pain alone is not an indication for surgical intervention or any other invasive treatment, including biopsy. The cause of pain in a patient with IOLs

Figure 9. T1-weighted postoperative image shows consolidation of the graft and solid bone union.

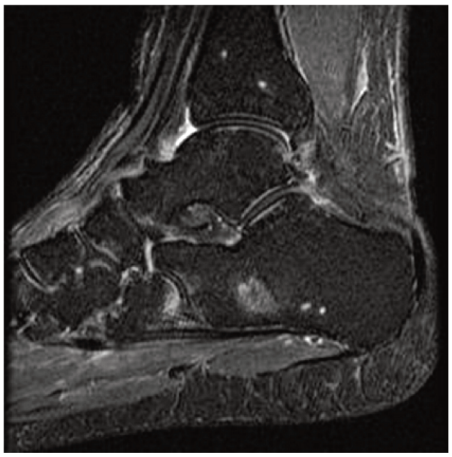


Figure 10. T1-weighted image, posterior view.

Figure 11. T2-weighted image, lateral view.

Figure 12. T2-weighted image.

Figure 13. Full ankle motion at 8 months postoperative.

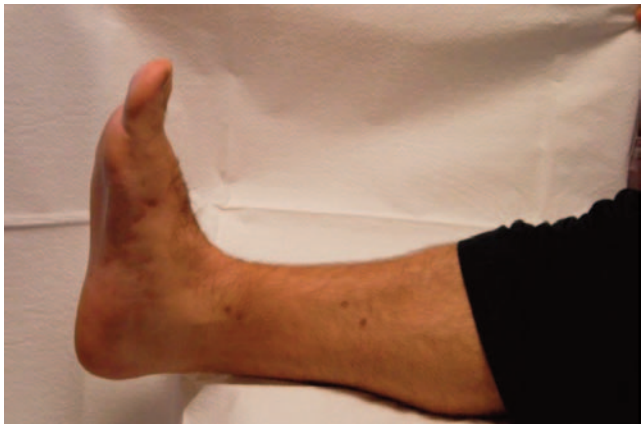


Figure 14. Full subtalar joint motion.

is unclear, but it may be mechanical due to expansile remodeling of bone, or it may be related to the ischemic changes that frequently accompany these lesions. It is also possible that the pain is referable to nearby joint disease and that the intraosseous lesion is incidentally discovered. It was reported that symptoms may recur after surgical treatment or resolve spontaneously with conservative treatment, thus suggesting that many IOLs are incidental findings and that patients may have another, unidentified cause of symptoms. Microtrabecular fracture in areas of weakened bone following episodes of minor trauma may be a cause of pain. Areas of diffuse increased signal were observed on MRI within the lipoma in some series, which may represent a stress response.

Asymptomatic IOLs of the calcaneous should not be operated on, since the tumor always occurs in the region of Ward's triangle, which is a nonweight-bearing area. In fact, in healthy individuals it is a region with bone paucity. A pathological fracture seems to be unlikely and has not been previously reported in the calcaneus.

Small cysts that are not located in the pressure-bearing trabecular area of the calcaneus are usually asymptomatic and can be treated conservatively. A critical-size cyst has been defined as an IOL extending the full breadth of the calcaneus laterally to medially in the coronal plane, and occupying at least 30% of the length of the calcaneus anteroposterior. Because the presence of a pathological fracture through a calcaneal cyst makes the operative procedure more complex and healing less predictable, the authors believe that large symptomatic calcaneal cysts should be managed surgically to reduce morbidity.

The decision to operate on a calcaneal cyst should be based on its size and location, the provisional diagnosis, associated symptoms, and the activity level and health of the patient. Although IOL is a benign lesion, Milgram (8) described 4 cases of IOLs that underwent malignant transformation, and liposarcomas and malignant fibrous histiocytomas have also been found adjacent to benign lipomas.

Treatment of IOLs is still controversial. Hirata et al (9) suggested that surgical treatment is not necessary owing to the potential for spontaneous regression and very low rate of malignant transformation. But according to Weinfeld et al, (10) curettage and grafting are the best choice for treatment. Schneider stated that the need for surgical treatment relies on the risk of malignant transformation (11). Bertram reported a 33% rate of accidental diagnosis among 54 patients and surgery was only required when the patient was clinically symptomatic (12). Gonzalez's conclusion was similar to Bertram and stated that the majority of calcaneal intraosseous lipomas are seen in Ward's triangle (7). According to Mollin et al (13) curettage and grafting are good choices for permanent treatment and can be performed if the patient is symptomatic. In the present study, we operated only on a symptomatic patient. He was resistant to conservative treatment for the last 3–6 months. He was operated on due to the pain, incapacity to perform any sport activity, and to prevent a pathological fracture. Our patient started weightbearing just after surgery thanks to the external fixator. He recovered with full benefit after nine months, and increased his sport activities without having any complaints. Since IOL is an uncommon tumor of bone, there is a need to familiarize physicians with the radiological features of this lesion for the correct diagnosis and treatment.

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