

Calcaneal Intraosseous Lipoma treated with External Fixation: A case report and review of the literature

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A case report is presented of an intraosseous lipoma. Diagnosis was made with the help of Magnetic Resonance Imaging and histopathologic analysis, after which the patient was treated by means of curettage and packing with bone graft substitute. Surgical, histologic features and a staging classification for intraosseous lipoma are presented in this case report. This article also discusses the use of external fixation in a patient with high risk of calcaneal fracture and to promote early weight bearing and early recovery. Although calcaneal intraosseous lipoma accounts for a small portion of cases in the huge differential diagnosis chart for foot pain such as plantar fasciitis, retrocalcaneal bursitis, gout and stress fracture, it should be kept in mind as a possible diagnosis in cases of unresolved pain to the heel.

Key Words: Intraosseous lipoma, external fixation, heel pain, bone tumor.

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Intraosseous lipomas are rare benign bone tumors. This benign neoplasm has been reported to occur in the calcaneus as well as the proximal femur.^{1,6,7} In the past, the relative absence of symptoms and radiographic similarity to a bone cyst has accounted for under diagnosis of intraosseous lipoma.^{2,3} Intraosseous lipomas are derived from mature lipocytes mostly seen at the metaphysis of the long bones in men.^{5,6} Foot and heel pain are the common symptoms of calcaneal intraosseous lipoma.⁵

Non-surgical options such as NSAIDs, cold compression, use of non-weight bearing devices such as cane, use of 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 as a treatment choice, only small case series have been reported thus far.¹⁰ In this study, we present one calcaneal intraosseous lipoma in a patient treated with curettage, autogenous bone grafting and Ilizarov external fixator.

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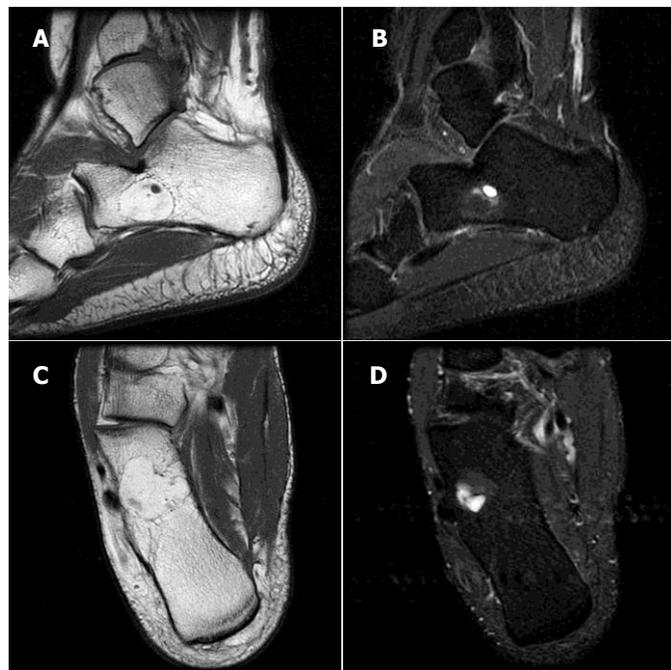
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Figures 1A and 1B Lateral plain x-rays (A) and antero-posterior views (B) with well-circumscribed bone lesion.

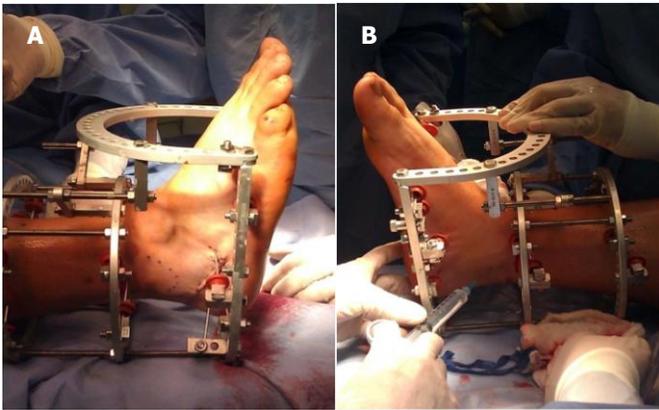


Figures 2A, 2B, 2C and 2D T1/T2 sagittal images shows fluid signal within the lateral aspect of the mass. (A and B) T1/T2 coronal images with well demarcated mass in the calcaneus. (C and D)

Case Report

A 23 year-old male presents with the complaint of a dull, aching pain in his right heel of 2 years of duration. The pain was noted to increase after strenuous walking, long time of standing or other rigorous activities involving the right foot. The pain has been increasing steadily over the 3-4 months period. Patient stated the pain is persistent and worse at the end of the day. The pain is ranked (7 out of 10) on pain scale with 0 no pain, and 10 severe pain. There is associated swelling observed of the right foot.

On gross examination, the patient walked with an antalgic gait. There is a small soft tissue palpable fluent mass on the right medial arch below the medial malleolus compatible with a possible superficial soft tissue lipoma. No scars, sinuses or venous prominences overlying the affected area, and the right ankle and subtalar joint motions were normal.

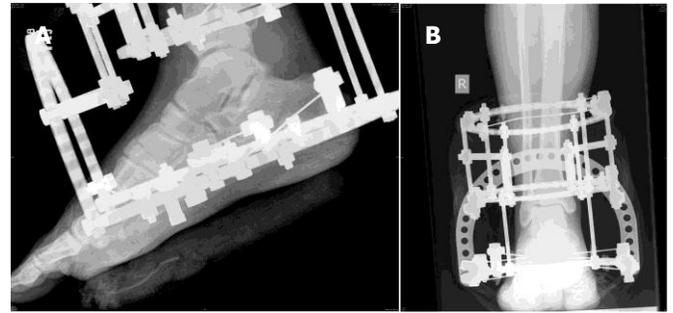


Figures 3A and 3B Ring External Fixation system applied after the excised the bone tumor.

There is pain on palpation to the right heel and ankle. There is 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 lymphoproliferative disorder.

Diagnosis

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. (Figs.1A and 1B) A preoperative magnetic resonance imaging (MRI) scan of the Right foot reveals the presence of a 2.3 x 2.0 cm circumscribed mass to the neck and body of the calcaneus. Predominant fat signal is seen on all pulse sequences. There is an eccentric component of fluid signal within the lateral aspect of the mass. (Figs. 2A, 2B, 2C and 2D) The appearance of the mass is compatible with an intraosseous lipoma. There is prominent fatty tissue seen in the plantar, medial aspect of the right hindfoot most likely represents a prominent lobule of subcutaneous fat. It is at this point that the surgical option was discussed with the patient and he agreed to undergo surgical approach of his condition.



Figures 4A and 4B Lateral and A-P views of Post-Op X-Rays evaluation.

Surgical Approach

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

As the cyst is decorticated, a greasy-yellow intraosseous lipoma is identified and evacuated from the osseous cavity. The soft tissue contents of the intraosseous cyst were removed along with the greasy fluid and the entire specimen is sent for histopathologic diagnosis. The cavity of the calcaneus is lavaged with normal saline before cancellous allograft bone is used to pack the cavity. After filling the cavity, the wound is closed in anatomic layers and a sterile dressing applied, followed by application of an Ilizarov ring external fixator for the initial postoperative period to allow for weight-bearing ambulation. (Figs. 3A and 3B) Postoperative radiographs show the orientation of the external fixator to allow for early amputation after surgery. (Figs. 4A and 4B)



Figures 5A, 5B, 5C and 5D MRI shows T1/T2 sagittal views. (A and B) T1/T2 axial views of 12weeks MRI follow up evaluation shows bone graft uptake and reduced size of the bone cavity without fluid signal. (C and D)

Subsequent histopathologic analysis reveals fragments of bone which include a few fragments of necrotic bone and fibroadipose tissue which 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 are consistent with the diagnosis of intraosseous lipoma. The patient's heel pain subsided almost immediately after the operation, with the exception of surgical wound pain, which subsided in normal fashion.

A postoperative magnetic resonance imaging (MRI) scan of the right] foot is done 3 months after surgery once the fixator is removed. This reveals the resection of the previously described intra-osseous fatty mass in the neck and body of the calcaneus. Intermediate signal intensity tissue now fills this region of the calcaneus. There is no calcaneal fracture identified. (Figs. 5A, 5B, 5C and 5D)



Figures 6A, 6B, 6C and 6D Clinical examinations at 12weeks post-op, without External Fixation. There is now good and adequate ankle range of motion.

Two weeks following suture removal, the patient is mobilized with instructions for partial weight bearing in the following 3 weeks, followed thereafter by weight bearing as tolerated. Clinical and radiological examinations are performed on the first postoperative day, at 6weeks, at 12weeks and every other month thereafter, until there is radiological confirmation of graft consolidation. (Figs. 6A, 6B, 6C and 6D)

Discussion

Milgram's classification system is used for staging the lesions: In stage 1, the lesion is a solid lipoma composed of viable fat cells; in stage 2, part of the lesion is necrotized, forming focal calcification; and in stage 3, most of the tumor tissue has died, with variable degrees of cyst formation, calcification, and reactive new bone formation.¹⁹

Histopathologic analysis of our (specimen) reveals fragments of bone which include a few fragments of necrotic bone and fibroadipose tissue showing 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 stage 2 intraosseous lipoma.

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 that a non-operative treatment with clinical and radiological follow-up is indicated. 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 the patient with intraosseous lipomas is unclear, but it may be mechanical due to expansile remodeling of bone. It may be related to the ischemic changes that frequently accompany these lesions. It is also possible that the pain is referable from nearby joint disease and that the an intraosseous lesion is incidentally discovered. It is reported that symptoms may recur after surgical treatment or resolve spontaneously on conservative treatment, thus suggesting that many intraosseous lipomas 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 one 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 intraosseous lipomas of the calcaneus should not require surgical intervention, since the tumor always occurred in the region of Ward's triangle, which is a non weight-bearing region. 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 intraosseous lipoma 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. Since 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 intraosseous lipoma is a benign lesion, Milgram¹⁹ described four cases of intraosseous lipoma that underwent malignant transformation. Liposarcoma and malignant fibrous histiocytoma have also been found adjacent to benign lipomas.

Treatment of intraosseous lipomas is still controversial. Hirata, et al.,³⁰ suggested that surgical treatment is not necessary owing to the potential for spontaneous regression and very low rate of malignant transformation. However, according to Weinfeld, et al.,²¹ curettage and grafting is the best choice of treatment. Schneider stated that the need for surgical treatment relies on the risk of malignant transformation.²³ Bertram reported a 33% rate of accidental diagnosis among 54 patients and surgery was only required when the patient was clinically symptomatic.²⁴

Gonzalez's conclusion was similar to Bertram and stated that the majority of calcaneal intraosseous lipomas are seen in Ward's triangle.¹⁰ According to Mollin, et al.,²⁸ curettage and grafting is a good choice for permanent treatment and can be performed if the patient is symptomatic. In the present case report, we operated on a symptomatic patient. He was resistant to conservative treatment for the previous 3 to 6 months. He underwent surgery due to the pain, incapacity to perform any sport activity and a suspicion for risk of pathological fracture due to his athletic ability.

Our patient started weight bearing just after surgery with an external fixator. He recovered with full benefit after nine months, and increased his sport activities without any complaint. Since intraosseous lipoma is an uncommon bone tumor, there is a need to familiarize physicians with the radiographic and MRI features of this lesion for the correct diagnosis and treatment.

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