

Cystic Lesion of the Calcaneus. Intraosseous Lipoma

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We report 2 cases of intraosseous lipoma in the calcaneus of a 38 year old man, complaining about heel pain and a 27 year old woman with no pain. Plain radiographs showed a well-defined cystic lesion in the calcaneus with sclerotic margins. Computed tomography (CT) detected a well-defined, low-density lesion with attenuation values equal to adipose tissue. Magnetic resonance (MR) findings show similar signal intensity with subcutaneous adipose tissue on T1-weighted and T2-weighted images, and STIR-T2 imaging showing low signal intensity with complete suppression indicating the presence of normal fat. As a result, at first intraosseous lipomas could only be identified pathologically, but now it is easy to perform radiological diagnosis using MR.

Key words: Bone neoplasm. Intraosseous lipoma. Computed tomography. Magnetic resonance imaging.

Lesión quística en calcáneo. Lipoma intraóseo

Presentamos 2 casos de lipoma intraóseo de calcáneo, en un varón de 38 años con dolor en talón y una mujer de 27 años sin dolor en talón. La radiografías simples mostraban una lesión quística en el calcáneo, bien definida y con márgenes esclerosos. La tomografía computarizada mostró una lesión de baja densidad bien delimitada con valores de atenuación idénticos al tejido adiposo. Los hallazgos en la resonancia magnética mostraron en las imágenes T1 y T2 potenciadas una intensidad de señal similar al tejido graso subcutáneo, y en T2-STIR una señal de baja intensidad con supresión completa que indica la presencia de grasa normal. Hasta hace poco, los lipomas intraóseos sólo se podían

diagnosticar con anatomía patológica, pero ahora es fácil realizar el diagnóstico radiológico con resonancia magnética.

Palabras clave: Neoplasia ósea. Lipoma intraóseo. Tomografía computarizada. Resonancia magnética.

Introduction

Benign lipomas can affect bone (intraosseous lipoma, paraostal lipoma, and mixofibrous liposclerosing lipoma, or sclerosing fibrolipoma), the joint and the tendon sheath (simple lipoma and lipoma arborescens), and other soft tissues of the locomotor apparatus.¹ Intraosseous lipoma (IL), which is extremely infrequent, constitute 0.1% of all of the primary bone tumors, except myeloma. IL is localized in the metaphysis of long bones of the lower extremities (60%), especially femur, tibia and fibula, and the rest in the calcaneus (8%), humerus, mandible, sacrum, and ribs.¹⁻⁵ Since the first description of the intraosseous lipoma of the calcaneus (CIL) in 1954 by Child,⁶ not even 200 cases have been published. The largest series published to date inform of 66 and 35 patients.^{5,7} CIL is a rare primary tumor of bone, its benign, and formed by mature adipose tissue. It does not show gender or age predilection. It can present as heel pain or be asymptomatic and be discovered as an incidental radiological finding.

Clinical Cases

We present 2 patients with a cystic lesion in the calcaneus, visible on simple x-rays.

Case 1

Thirty-eight year-old male, without any medical nor family history of interest. He refers that 2 years ago he developed mechanical pain in the left heel, self-limited and lasting several days. In the past week, and with no previous trauma, he presented a new episode of acute and limiting mechanical pain on the heel, impeding him to walk and

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stand that limits personal and professional activities. On physical examination there is pain upon deep palpation of the internal side and the base of the left heel, without arthritis, skin atrophy or limitation upon active, or passive movement of the foot and ankle. The hematological, biochemical, and bone metabolism analytic evaluation did not show any abnormal results. In the radiologic study we found a well-defined cystic lesion with sclerotic borders in the calcaneus, with a central calcification in its interior. A computed tomography (CT) confirmed a radiolucent lesion, of fat density, sclerotic borders with central calcification (Figure 1).

Case 2

Twenty-seven year-old female, with a history of a left ankle strain. She refers 6 months with mechanical polyarthralgia that affects shoulders, hands, hips, and knees, without heel pain or accompanying arthritis, probably related to work activities that required physical strength. Upon physical examination there were no abnormal signs. The hematologic, biochemical, and bone metabolism analysis did not show any abnormal signs. Simple radiographs of the affected joints and left ankle showed a cystic lesion in the calcaneus, well defined and sclerotic borders. A magnetic resonance (MR) was carried out, confirmed by a TSE T1 sequence a well-defined, hyperintense, and homogeneous lesion, with thin septae, which in the fat-suppression sequence completely suppresses the symptoms (Figures 2 and 3).

With the diagnosis of CIL, the patient from case 1 was treated with initial 48-hour rest, discharge heel-pads, and paracetamol 1 g/6 h for 1 week, with an asymptomatic

return to his daily activities. The patient from case 2 was treated with paracetamol 1 g/8 h for 1 week and the recommendation for a general strengthening exercise program.

Discussion

IL has an unknown etiology. Three theories have been considered: a traumatic origin and later fat degeneration, infections, or osseous fat infarction with metaplasia and, finally, at the present moment most authors think that IL is a primary tumor of marrow fat. It represents 0.1% of primary bone tumors. Without gender distinction, it can appear at any age, with predilection for the fourth decade. It affects long bones, most frequently in the lower extremity than in the upper one (6:1) and in the femoral metaphysis or epiphysis (34%), tibia (13%), fibula (10%), and humerus (5%). The rest occur in the calcaneus (8%), skull, jaw, and ribs (5%).^{1-5,7,8} Multifocal injuries are very rare and usually correspond to lipomatosis and hiperlipoproteinemia.^{9,10} The clinical presentation of IL is variable and depends on the location and aggressiveness of the injury. Approximately two thirds of the patients are symptomatic, with located pain after days or years of evolution and swelling of soft tissue.^{1,7} The most frequent symptom is the affection of the calcaneus and is related to standing or exercise.¹¹ When asymptomatic, most of the injuries are incidental radiological findings. Its macroscopic pathological anatomy displays a size of 2-15 cm, on average 5-6 cm. It is lobulated, soft, and yellow in content, with an oily surface upon cutting, surrounded by a fine capsule, divided by fibrous septae that can contain a calcified center. Microscopically, the IL is formed by

Figure 1. A: simple lateral left foot x-ray. Cystic, well-defined radiolucent lesion on the calcaneus, with sclerotic borders and central calcification. B: case 1. Axial computed tomography with a ewindow for bone. Cystic lesion on the calcaneus, with sclerotic borders, well defined, with negative Hounsfield units, identifying its fatty composition and a central calcification.

Figure 2. Case 2. Simple lateral radiograph of the left foot. A radiolucent cystic, well defined lesion on the calcaneus with sclerotic borders can be seen.

thinned bony mature adipocytes, and trabeculated. Frequently fat necrosis with dystrophic calcification is observed, corresponding to the central calcification in the simple x-ray.¹⁻⁵ The classification of Milgram¹² divides lipomas in 3 groups: stage 1, contains mature lipocytes without necrosis; stage 2, partial fat necrosis and focal calcification but still containing mature lipocytes; and involutive stage 3, changes with extensive fat necrosis, variable degrees of cyst formation, calcification, and formation of reactive bone. Radiologically, IL is

characterized by a cystic, radiolucent lesion of thin sclerotic, and well defined borders.^{4-5,12,13} In the long bones, the injury can appear as expansive but without periosteal reaction nor cortical destruction in the epiphysis, or metaphysis. In short tubular bones, it shows a geographic pattern with a sclerotic ring. In the calcaneus, the lesion is seen as a radiolucent cystic image, of sclerotic defined borders, frequently accompanied by a central calcification, called a bull's eye image.¹⁴ Most of calcaneus lipomas are located in trigonus and femur, in the intertrochanteric zone, between the greater trabecular groups, in the same site than the simple cysts. Although they are not specific, these lesions with a central calcification in the calcaneus and femur are practically diagnostic.^{1,4} The classification of Milgram¹² divides lipomas in 3 groups: stage 1 radiolucent, pure areas, well defined, with remodeling of the bone lesion (Figure 2; case 2); stage 2 radiolucent, well defined areas and central calcifications with fat necrosis (Figure 1; case 1); and stage 3, bony reabsorption and new areas of dystrophic calcification in the external margins of the injury. The study of lesions with CT or MR, due to its capacity to identify the fat component of the lesion, has been proposed to avoid a biopsy of the lesion in order to confirm the diagnosis by pathological anatomy. In CT, the fat lesions are confirmed when presenting between -40 and -110 Hounsfield units (HU; also called CT numbers) (Figure 1B).^{15,16} In MR, the images harnessed in T1, T2, and STIR (short-tau inversion recovery), the increase of intensity of signal in T1 (Figure 3A), shortening of the signal in T2, and the complete suppression in STIR

Figure 3. A: case 2. Sagittal magnetic resonance in T1 (TR/TE 346/17). Sagittal TSE T1 in which a well defined, hyperintense and homogeneous lesion is observed with thin septae in its interior, without any nodules or other characteristics (arrow). B: case 2. Sagittal magnetic resonance potentiated in T2 STIR (TR/TE 3651/100). In the fat suppression sequence (T2 TSE STIR), complete suppression of the lesion is seen, with no heterogeneous or hyperintense areas in its interior (arrow), confirming its lipomatous composition.

sequence (Figure 3B), similar to subcutaneous and intramarrow fat, allows the confirmation of normal fat existence.^{17,18} In addition, CT and MR will help the differential diagnosis and the exclusion of malignant processes. In the bone gammagraphy pathological radionuclide uptake¹⁹ does not take place. The differential diagnosis must include fibrous bone infarct, dysplasia, chondromixoid simple bone cyst, enchondroma, fibroma, aneurysmatic bone cyst, and other injuries like pseudocyst, osteoid osteoma, chondrosarcoma, liposarcoma, and eosinophilic granuloma. CT and MR are necessary to confirm the fatty nature of the injury, the calcifications, and the bony margins of the lesion. The bone gammagraphy has a minor role in the exclusion of other processes.^{1-4,7,17,19} Three lipomas deserve special mention: first, parosteal lipoma that affects long bones, femur, and radius, like a mass of cortical mature fat adhered to the external part of the bone, associated to hyperostosis or the periostitis; second, sclerosing fibrolipoma, that usually is lodged in the intertrochanteric region of femur, representing a fibrous variant of dysplasia; and finally, arborescent lipoma, a rare injury that affects the synovial membrane producing synovial thickening by focal fat deposits, associated to arthrosis and rheumatoid arthritis, in the suprapatellar bursae of knee.^{1,3} There is not much data of the study and treatment of IL due to his LF of appearance. The treatment most frequently used consists of debridement of the injury through an ample bone window, with later filling of the defect with autologous, bone hydroxiapatite, or polymethylmetacrylate cement. At the moment, only expectant observation of the lesion is recommended, reserving surgery for the very symptomatic injuries or those with recent fractures or risk of fracture, allowing for the anatomopathologic confirmation of the lesion.^{1,3,7,17} The natural history of IL is similar to that of soft tissue lipoma. IL will show slow intraosseous growth and it is possible that occasionally it will be symptomatic. In spite of it, there are few cases of malignant transformation of preexisting bone lipoma in femur and tibia, but never in calcaneus.²⁰ It has been reported that this second neoplasia, diagnosed as fibrosarcoma, malignant fibrous histiocytoma, and liposarcoma, can appear on the reactive border of the necrotic bone marrow, as occurs more frequently in bone infarctions. In summary, the CIL is very infrequent benign tumor-like lesion that can appear with pain, of one ankle or both,

or can be asymptomatic and be discovered as a radiological finding in simple x-rays. To reach a diagnosis it is usually enough to have a simple x-ray and CT or MR for confirmation of its fatty nature; it does not require a biopsy. It has a good prognosis, usually it improves with rest and analgesia. On occasions, depending on the degree of bone affection and its location in load-bearing extremities, autologous bone transplantation, or cementation can be necessary.

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