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Clinics In Diagnostic Imaging (21)

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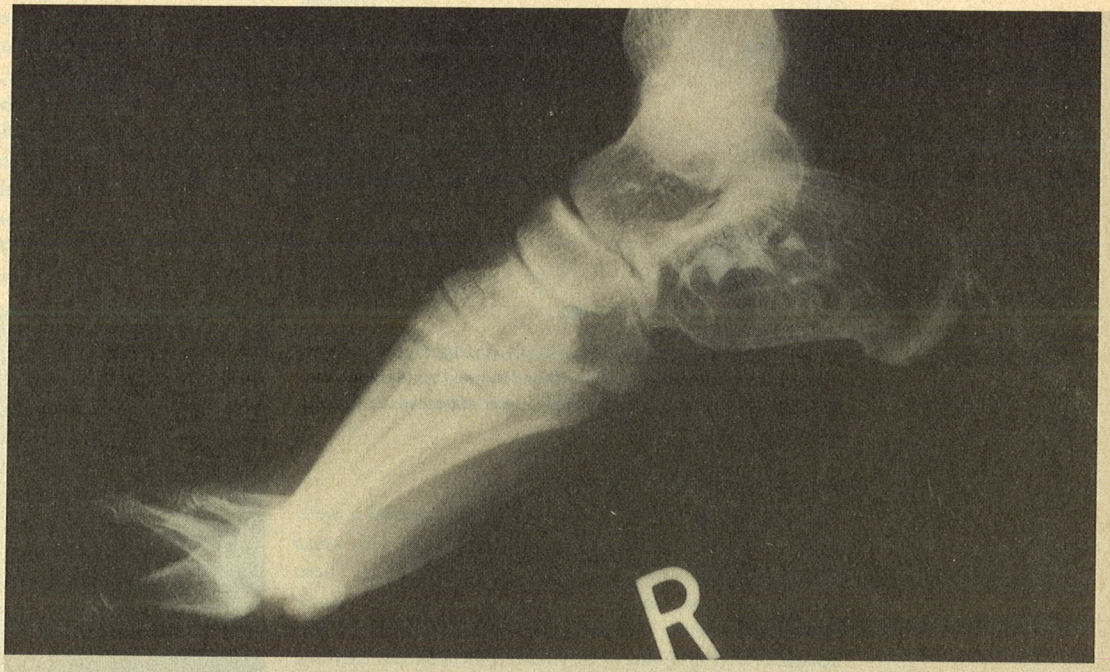

Fig 1 - Lateral radiograph of the right foot and ankle

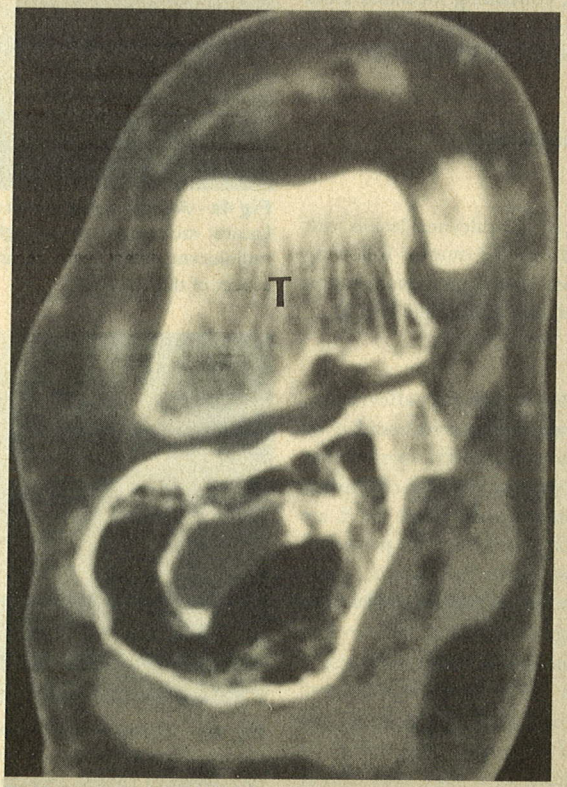

Fig 2 - Direct coronal CT of the right hindfoot, at the level of the subtalar joint. (T=talus)

CASE REPORT

A 50-year-old woman presented with a 6-week history of plantar and medial right foot pain, exacerbated by standing. Her only significant medical history was that of breast cancer 8 years previously. Physical examination of the right foot was normal, with no soft tissue mass, swelling or abnormal motion demonstrated. Plain radiographs (Fig 1), bone scintigraphy, and computed tomography (CT) (Fig 2) were performed. What do these show?

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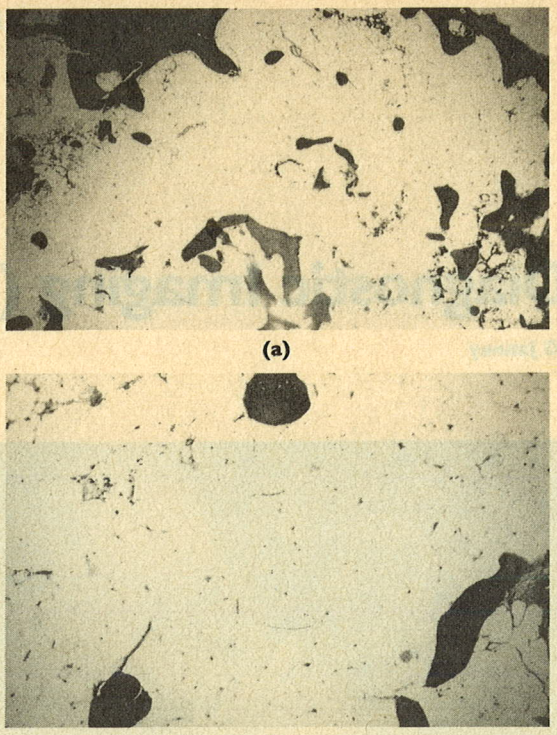

Fig 3 - Photomicrographs of curetted material. (a) Low power photomicrograph shows mature fat and thinned bone trabeculae with a peripheral bony rim. (b) High power appearance of viable mature fat.

IMAGE INTERPRETATION

Plain radiograph of the right foot demonstrated a well-defined, slightly radiolucent expanded lesion, with areas of central calcification, within the calcaneus (Fig 1). There was also a small plantar calcaneal spur identified. Bone scintigraphy, done to assess for additional lesions, was normal. CT (Fig 2) was performed in the axial and coronal planes, using both bony and soft tissue windows. There was an expanded septated calcaneal lesion, without cortical break or soft tissue extension, containing loculated areas of fat (black areas) which were well demarcated from fluid (grey areas). Chunky calcifications were also present.

DIAGNOSIS

Intraosseous lipoma of the calcaneum

CLINICAL COURSE

Biopsy, curettage, and packing of the calcaneal lesion with iliac crest bone graft were performed 3 months following the patient's initial presentation. Histological examination demonstrated bone, blood clot, and fatty tissue (Fig 3).

DISCUSSION

At least four types of lipomatous lesions may affect bone. *Soft tissue lipomas*, which may be intramuscular or intermuscular, arise in the extraosseous soft tissues but may either result in pressure effect upon or may directly invade bone[1]. Primary osseous lipomas, on the other hand, are relatively much rarer. *Parosteal lipomas* arise in the periosteal membrane, *intracortical lipoma* from the cortex, while *intraosseous lipomas* are intramedullary in origin[2]. Unlike these lesions, *liposarcomas* have malignant potential, the severity of which is based upon their histologic subtype[3]. Intraosseous lipomas can be distinguished from liposarcomas by the presence of mature adipose tissue and lack of cellular atypia. *Intraosseous lipomatosis*, a hamartomatous malformation, is a very rare slowly progressive systemic disorder, rather than a solitary lipomatous lesion[4].

The intraosseous lipoma is rare, with an incidence of less than 0.1 per 1000 of bone tumours[5]. However, many of these lesions may have been misclassified as infarcts[6]. The first case of intraosseous lipoma was described by Child in 1955, with Milgram having published the largest series of these lesions. Milgram classified intraosseous lipomas into three histological groups, depending on their degree of involution: group I lesions are those with viable lipocytes; group II lesions are transitional, consisting of some viable lipocytes and some areas of fat necrosis; group III lesions are those lacking viable lipocytes. Group III lesions may easily be confused with infarcts as they may contain only cystic spaces, necrotic fat, and/or reactive woven bone[5].

The intraosseous lipoma primarily involves the lower extremities, with occurrence in 80% of cases[7]. They are most commonly reported in the metaphysis of the long bones, especially the femur, and to a lesser extent in the calcaneus. In the calcaneus, these lesions are located between the anterior and middle thirds of the calcaneus, just plantar to the angle of Gissane. In 40% of cases, intraosseous lipoma are found incidentally[6,7]. In the remaining cases, pain is the most common presenting symptom, occurring in up to 50% of patients[6]. The presence of pain does not imply the presence of a pathological fracture. Patients

Fig 4a - Another patient with intraosseous lipoma. Lateral radiograph of the right ankle shows a well-defined radiolucent defect, with central calcification, in the anterior aspect of the calcaneus.

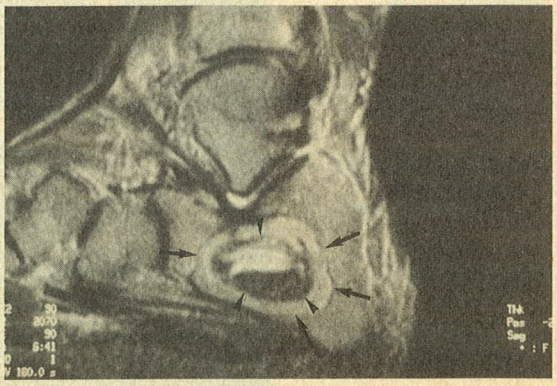

Fig 4b - TI-weighted (TR 450 msec, TE 10 msec) spin echo parasagittal MR image of the ankle shows a dark-rimmed (arrowheads) central area containing fluid/fluid levels of low (small asterisk) and intermediate (large asterisk) signal intensities, within the bright lipoma (arrows).

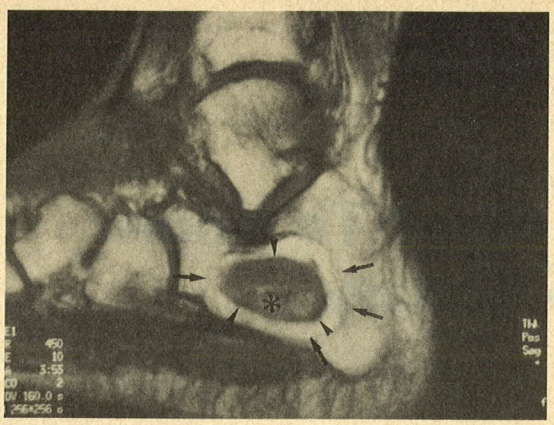

Fig 4c - Corresponding T2-weighted (TR 2070 msec, TE 90 msec) spin echo image. The long TR image demonstrates diminished signal intensity at the periphery of the lesion (arrows), identical to the signal characteristics of surrounding marrow fat. Areas of high and low signal, respectively, are present within the central fluid/fluid collection. The thin haemosiderin rim remains dark in this pulse sequence (arrowheads).

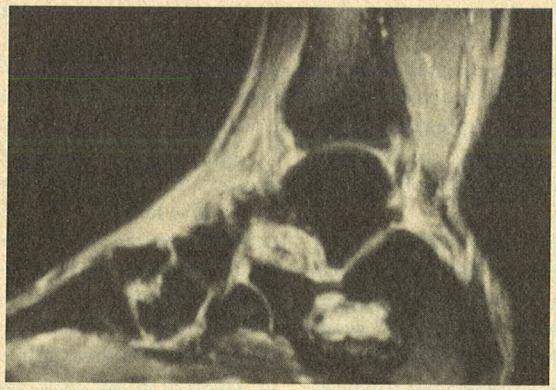

Fig 4d - Fat-suppression inversion recovery image (TR 2575 msec, TE 19 msec). The signal of the lipoma itself has disappeared, consistent with fat. Persistent high and low signal, respectively, is present within the central fluid/fluid collection.

usually present as middle-aged adults, with an average age of just under 40 years[7]. Males and females are equally affected.

The radiographic appearance of a well-circumscribed lytic lesion, with a central nidus of calcification and surrounding thin sclerotic rim, is diagnostic of an intraosseous lipoma[2]. However, only half of the cases will have this characteristic appearance[6]. Bony expansion, present in approximately 50% of cases, is the most common radiographic feature[2]. Calcification, visible in 35% of cases, tends to occur centrally within the intraosseous lipoma in contrast to its more peripheral location in infarcts[2]. Rarely, periosteal new bone formation has been described[2]. Incomplete bony septa are responsible for the loculated appearance of these lesions. The differential diagnosis for the radiographic appearance of the intraosseous lipoma of the calcaneus, in the absence of calcification, may include: aneurysmal bone cyst, giant cell tumour, unicameral bone cyst, the normal variant pseudocyst, and other rarer considerations[6].

Advanced imaging with bone scintigraphy, CT and/or magnetic resonance imaging (MRI) is reserved for the radiographically difficult case. The appearance of the intraosseous lipoma on bone scintigraphy is variable. Three phase examination may be normal[5]. Alternatively, increased activity at the periphery of the lesion may be identified on whole body scintigraphy[8]. This latter appearance may be seen in the setting of cystic lesions however, and is therefore not unique to the intraosseous lipoma. CT demonstrates a lytic lesion with negative Hounsfield units (H.U.), typically around -100 H.U. This is a nonspecific feature and may be seen in any lesion of fatty composition. CT is also useful in detecting pathological fracture and excluding an associated soft tissue mass.

On MRI, the intraosseous lipoma may be well-circumscribed or have ill-defined margins. The heterogeneity of the lesion is related to the degree of involution of the lipoma[9]. Those lesions with little or no myxomatous degeneration have a homogeneous appearance with signal characteristics identical to those of fat. They appear bright on short repetition time (TR)/short echo time (TE) spin echo sequences, intermediate on long TR/long TE spin echo sequences, and dark on fat-suppression sequences. A significant percentage of myxomatous degeneration and/or concurrent trauma at the site of the lesion may result in a heterogeneous appearance of the lesion on MRI(Fig 4a-d). In this example, the lesion has the typical signal characteristics associated with internal subacute haemorrhage: the lower fluid component is of intermediate signal intensity on Tl-weighted images and is dark on T2 and fat-suppressed images. The upper fluid component is dark on Tl-weighted and bright on T2 and fat-suppressed images, consistent with free fluid. The central fluid/fluid portions are surrounded by a thin rim which remains dark on all sequences, characteristic of haemosiderin deposition associated with subacute haemorrhage.

The primary role of MRI in intraosseous lipoma is to detect intralesional fat. Definitive identification of fat within the lesion may eliminate the need for biopsy[9]. However, the major limitation of MRI in these cases is the lack of contrast between the lesion and the surrounding normal marrow. As with CT, MRI is also able to detect the presence of a pathological fracture and/or soft tissue component. Curettage and packing of an intraosseous lipoma is indicated in the setting of a painful lesion[6,7]. The goal of surgery is to relieve pain and to prevent a pathological fracture, especially when the lesion is located in a weight-bearing bone[6]. Non-painful lesions may be treated conservatively as they may undergo spontaneous involution[5].

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ABSTRACT

A 50-year-old woman presented with plantar foot pain. Radiographs and computed tomography demonstrated an intraosseous lipoma of the calcaneum. Curettage and packing were performed. The imaging features, including the magnetic resonance appearances, of intraosseous lipomas are described.

Keywords: bone disease; bone neoplasm; calcaneum; intraosseous lipoma; lipoma.