Intraosseous Lipomas: Plain Radiography and Multidetector Computed Tomography Imaging Features in Three Cases

İntraosseoz Lipomlar: Üç Olgunun Düz Radyografi ve Çok Kesitli Bilgisayarlı Tomografi Görüntüleme Özellikleri

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ABSTRACT Intraosseous lipomas are rare primary benign tumors of the bone. Their radiologic appearance can vary due to the degree of involution and necrosis, both on radiographs and computed tomography (CT) scans. Radiographically, these lesions may mimic other benign lesions such as fibrous dysplasia, aneurysmal bone cysts, simple cysts, bone infarcts, and chondroid tumors. Visualizing fat within these lesions helps in diagnosis. Magnetic resonance (MR) imaging and CT can be diagnostic whereas radiographs can be ambiguous, especially if there is necrosis within the lesion. In this report, we aimed to discuss the imaging features of intraosseous lipomas in plain radiographs and multidetector computed tomography (MDCT) scans in three patients, and to review the pertinent literature about this rare benign osseous pathology.

Key Words: Lipoma; intraosseous; tomography, X-ray computed

ÖZET İntraosseoz lipomlar nadir rastlanan primer benign kemik tümörleridir. Bu tümörlerin radyolojik görünümleri, hem düz radyografi incelemelerinde hem de bilgisayarlı tomografi (BT) görüntülerinde, barındırdıkları involüsyon ve nekroz derecesine bağlı olarak değişiklikler gösterebilir. Bu lezyonlar, radyografik olarak fibröz displazi, anevrizmal kemik kisti, basit kist, kemik infarktı ve kondroid tümör gibi diğer benign lezyonları taklit edebilirler. Lezyon içinde görülen yağ içeriği tanıya yardımcıdır. Özellikle lezyon içinde nekroz bulunduğunda, radyografiler tanısal açıdan belirsiz olabilmesine karşın manyetik rezonans görüntüleme ve BT tanısal olabilmektedir. Biz bu yazıda, üç hastada saptadığımız intraosseoz lipom olgularının düz radyografi ve çok kesitli bilgisayarlı tomografi (ÇKBT) görüntüleme özelliklerini tartışmayı ve bu nadir benign osseoz patoloji hakkındaki geçerli literatür bilgilerini gözden geçirmeyi amaçladık.

Anahtar Kelimeler: Lipom; intraosseoz; bilgisayarlı tomografi

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Intraosseous lipoma is a rare benign bone tumor which originates from mature lipocytes.[1] It accounts for approximately 0.1% of all bone tumors.[1] Some authors declared that intraosseous lipomas were more frequent, however since these tumors are often asymptomatic, they usually remain latent. However, with increasing use of computerized tomography (CT) and magnetic resonance (MR) imaging, intraosseous lipomas can be more accurately diagnosed.[1,2] We present plain radiography and multidetector computed tomography (MDCT) imaging features of three patients

with intraosseous lipoma, and review the pertinent radiology literature.

CASE REPORT

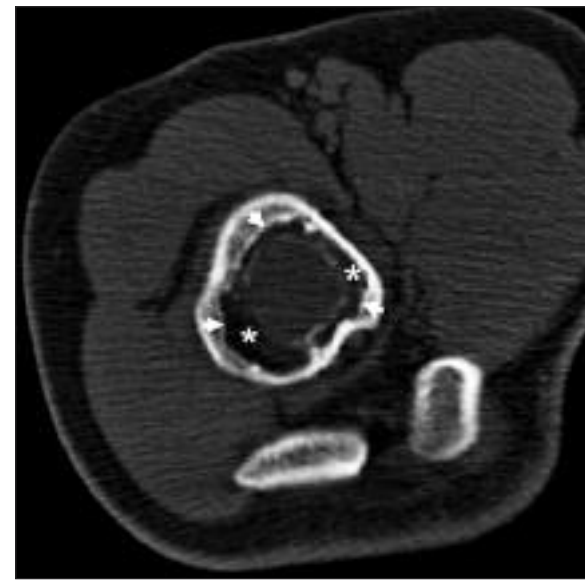
This case report consisted of three men who were 33, 39 and 41 years old, who admitted to our radiology department with right hip, right shoulder and left cruris pain, respectively. On physical examination of these three patients, both active and passive movements were normal and there was no apparent soft tissue abnormality. We obtained informed consent of all patients before the radiologic examination. Plain X-rays and MDCT scan were performed for the evaluation of the symptomatic part of the extremity in all of the patients. The lesions were in the proximal femoral epiphysis, proximal humeral metaphysis and distal tibial metaphysis, respectively.

Plain radiographs showed well-demarcated lucent lesions in all patients. Their borders were slightly sclerotic without any cortical expansion or evidence of cortical erosion. The adjacent fat planes were well preserved and no soft tissue mass was identified (Figures 1, 2). In the lesion located in the femoral epiphysis, there were multiple sclerotic septations. In all of the patients, intraosseous lipoma was considered in the differential diagnoses. For further evaluation, MDCT examination was performed in all patients.

MDCT scans demonstrated low attenuation of fat (<–60 to –100 HU), expansile remodeling of the intramedullary canal, fat necrosis, cyst formation, calcification, and reactive new bone formation in all of the patients. In the third patient with the lesion located in the distal part of the tibia, mild cortical expansion was seen. According to these findings, the lesions were classified. One of them was Milgram stage 3 and the other two lesions were Milgram stage 2 (Figures 1-3).

In all of the patients, the diagnoses of intraosseous lipoma in different Milgram stages were established on the basis of characteristic radiologic findings. Plain X-ray findings were non-spesific. MDCT scans demonstrated the low attenuation of fat, necrotic-cystic component and, expansile remodeling of the intramedullary canal. Patients were followed up with plain radiography in every six months for two years, and no significant radiologic change was determined. An analgesic therapy was planned to reduce pain in each of the patients.

a

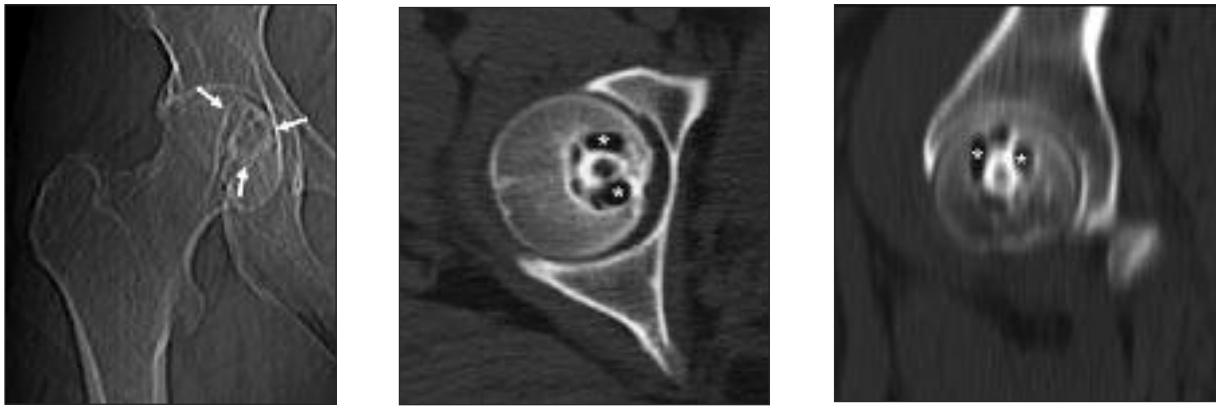


b

FIGURE 1: Stage 2 intraosseous lipoma of the humerus in a 39-year-old man. (a) Anteroposterior radiograph of the shoulder shows a radiolucent lesion with sclerotic margins (arrows) in the proximal metaphysis of the right humerus. (b) Axial CT image of the right shoulder shows the humeral lesion with a hypodense center (20 HU, compatible with the fat necrosis) and a thin sclerotic rim (arrowheads). Peripheral area of the lesion is clearly hypodense (-84 HU) which shows the fat content (*).

DISCUSSION

Altough intraosseous lipoma is the most frequent lipogenic lesion of bone, intraosseous lipoma is a



a b c

FIGURE 2: Stage 3 intraosseous lipoma in the right femoral epiphysis of a 33-year-old man. (a) CT scotography shows a radiolucent lesion with sclerotic margins (arrows). Septations and central rim of sclerosis causing a bull's-eye appearance is also seen. (b) Axial and (c) sagittal CT scan through the femoral head show fat density (-81 HU) in the periphery of the lesion (*). Ossific septations and thin rim are seen in the central part of the lesion.

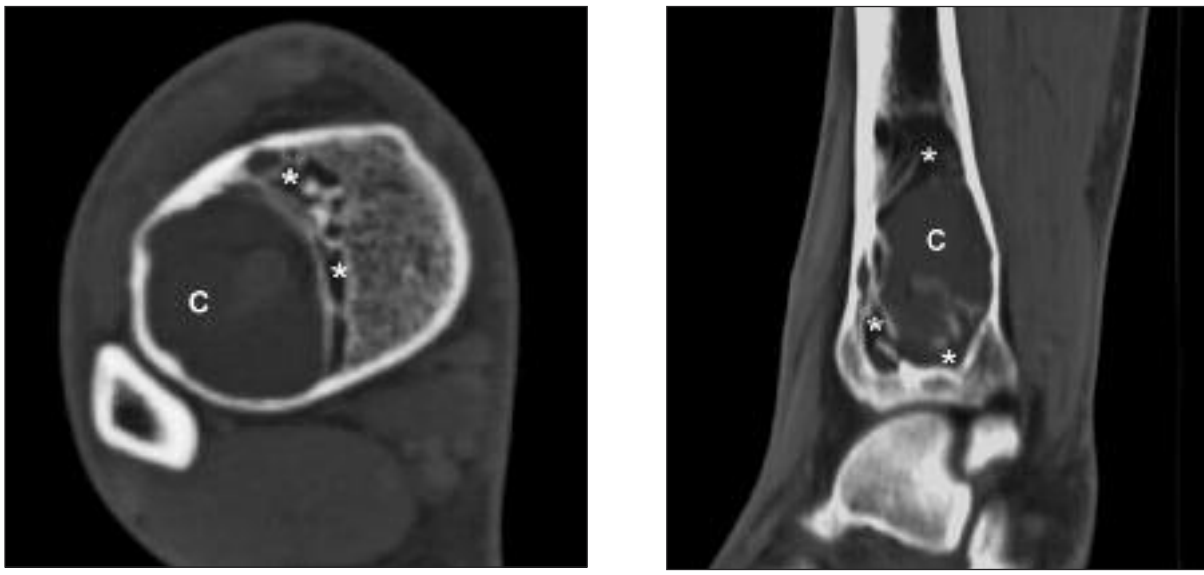


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FIGURE 3: Stage 2 intraosseous lipoma of the tibia in a 41-year-old man. (a) Axial and (b) oblique sagittal CT images show low attenuation of lesion with sclerotic margins. In the lesion, fat attenuation (-85 HU) in the periferal portion (*) and fluid attenuation (C) in the central portion are seen.

rare benign bone tumor. However, Milgram and Murphey et al stated that intraoseous lipomas were more frequent than they are thought to be.[2-4] Milgram noted that this false appearance of rarity was due to the unusual predisposition of these lesions to undergo spontaneous necrosis and thus the appearence to be largely necrotic or calcified fat with varying degrees of cystic degeneration.[2,3] In this stage they are frequently misdiagnosed as bone infarcts. According to Murphey et al there are three reasons responsible for this false rarity.[4] First, its radiographic manifestations are nonspecific and can be confused with those of other entities. Second, its typically benign radiographic appearance frequently precludes further imaging with CT or MR imaging that would delineate the fatty consistency of the lesion. Finally, the histopathologic features of intraosseous lipoma can be difficult to interpret if not correlated with available radiologic studies: Fat in the lesion may be pathologically indistinguishable from normal fat in yellow marrow, and, if ischemic changes are present, it may

be difficult to distinguish osteonecrosis from intraosseous lipoma.

The exact nature of intraosseous lipoma remains controversial. It has either been regarded as a true neoplasm or the pathology has been attributed to degenerative phenomena related to trauma, infection or vascular compromise.[5] About half of the patients with an intraosseous lipoma present with no symptoms and the tumor is found incidentally.[2] However, in symptomatic patients, signs associated with the tumors are not specific. Pain, swelling, and tenderness are the most frequent symptoms.[3] Pathologic fracture and a palpable mass are rare clinical manifestations.[4]

Intraosseous lipomas have been reported to occur throughout the skeleton. Frequent locations include the intertrochanteric region of the proximal femur (34% of cases), calcaneus (8%), ilium (8%) (particularly adjacent to the sacroiliac joint), tibia (13%), fibula (10%), humerus (5%), and ribs (5%).[2,3,6] Long bone lesions typically occur in the metaphysis but diaphyseal involvement is not uncommon.[4] Murphey et al. stated that epiphyseal involvement was unusual but controversially, Lewin et al. declared that in long bones, lipomas occur more frequently in metaphyseal and epiphyseal locations rather than diaphyseal.[4,5] In our cases, one lesion was located in the epiphysis and other two were located in the metaphyses.

Milgram divided intraosseous lipomas into three stages.[2,3] In stage 1, lesions contain viable fat without necrosis and cause trabecular resorption. Stage 2 lesions demonstrate viable fat and fat necrosis, as well as regions of dystrophic calcification. Finally, stage 3 intraosseous lipomas demonstrate involutional changes with extensive fat necrosis, cyst formation, calcification, and reactive new bone formation.

The radiographic features of intraosseous lipomas often parallel to those of the histologic stages of the lesions. The stage 1 lesions are lucent and represent viable, non-necrotic fat with resorption of bony trabeculae. Stage 2 lesions have lucent areas which consist of viable fat and radiodense areas that consist of fat necrosis and dystrophic calcification. Stage 2 lesions can be expansile. Stage 3 lesions reflect resorption of normal bone, but they are more radiodense than stage 1 or 2 lesions. The radiodensity is a result of calcification and extensive fat necrosis.[2] Radiologically, the differential diagnosis of intraosseous lipomas includes fibrous dysplasia, aneurysmal bone cysts, simple bone cysts, bone infarcts, chondroid tumors, and liposclerosing myxofibrous tumors.[7,8]

Intraosseous lipoma containing only fat can be easily differentiated from other primary osseous lesions on MR imaging or CT, because both modalities offer the ability to document the intrinsic lesional fat tissue.[2,3,6,9-12] CT demonstrates the low attenuation of fat (–60 to –100 HU) and, if present, expansile remodeling of the intramedullary canal, fat necrosis and cystic appearance.[2,3,6,9-12] The lesion may be easily differentiated from surrounding normal fatty marrow by a peripheral ossific rim or capsule that separates the lesion from the normal surrounding bone; this finding is best seen on long axis imaging planes. Expansile remodeling of bone and a thin hyperdense margin secondary to peripheral ossification or capsule are helpful differentiating features.[10]

Treatment of intraosseous lipomas is often not indicated for asymptomatic lesions or those discovered incidentally. Symptomatic lipomas may be treated with curettage and bone graft placement. Recurrence and malignant transformation are rare.[2,3]

In conclusion, radiographically, these lesions may mimic other bone lesions. The unique radiologic feature of these lesions is the presence of fat, which corresponds to adipose tissue pathologically. The identification of fat is best performed with CT or MR imaging. Imaging often, additionally demonstrates nonlipomatous components such as fat necrosis, calcification and cyst formation.

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