DIAGNOSIS OF OSTEOID OSTEOMA USING COMPUTED TOMOGRAPHY

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Osteoid osteoma is a benign lesion of bone generally diagnosed using conventional radiography or conventional tomography. Computed tomography can be used in difficult cases to localize a clinically suspected lesion. In this report we present two patients in whom an osteoid osteoma was detected using computed tomographic scanning; in an additional patient computed tomography failed to localize a lesion, probably because the slice thickness was too great. Because the nidus of the lesion is small-generally several millimeters in diameter-accurate CT localization requires that narrowly collimated, closely spaced sections be obtained.

KEY WORDS:
Bone neoplasms, diagnosis; Bone neoplasms, computed tomography; Osteoid osteoma, computed tomography

Osteoid osteoma is a benign lesion of bone that is often difficult to diagnose radiographically. We present three patients in whom computed tomography (CT) was used to localize a clinically suspected lesion. The importance of proper CT technique is emphasized.

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CASE REPORTS

Case *1*

A 15-year-old male presented with a history of left knee pain, relieved by ibuprofen (Motrin). Conventional radiography through the area of the left hip showed no abnormalities; a bone scan demonstrated increased uptake in the region of the left acetabulum. Conventional tomography was equivocal. Computed tomography on a third-generation scanner using contiguous l-cm thick slices demonstrated no abnormalities. Angiography revealed a vascular lesion in the superior aspect of the ischium, adjacent to the inferomedial aspect of the acetabulum (Figure 1). At surgery an osteoid osteoma was excised.

Case 2

A 26-year-old man presented with gradual onset of left knee pain of 1 year's duration, ameliorated by aspirin. Conventional radiography resulted in normal findings, and conventional tomography showed equivocal findings. Radionuclide bone scan revealed increased uptake in the left medial femoral condyle (Figure 2*A*). Initial CT examination was performed on a General Electric 8800 CT/T scanner, using contiguously spaced l-cm thick slices. These failed to demonstrate a characteristic abnormality (Figure 2*B*). Subsequent CT scanning was performed using 5-mm thick slices, spaced 3-mm apart. These scans demonstrated a 2- to 3-mm radiolucent lesion, with an ossified center (Figure 2C). Surgery was performed, and an osteoid osteoma removed.

Case 3

A 19-year-old male presented with pain in the left hip. Conventional radiography revealed a radiolucent lesion consistent with osteoid osteoma in the

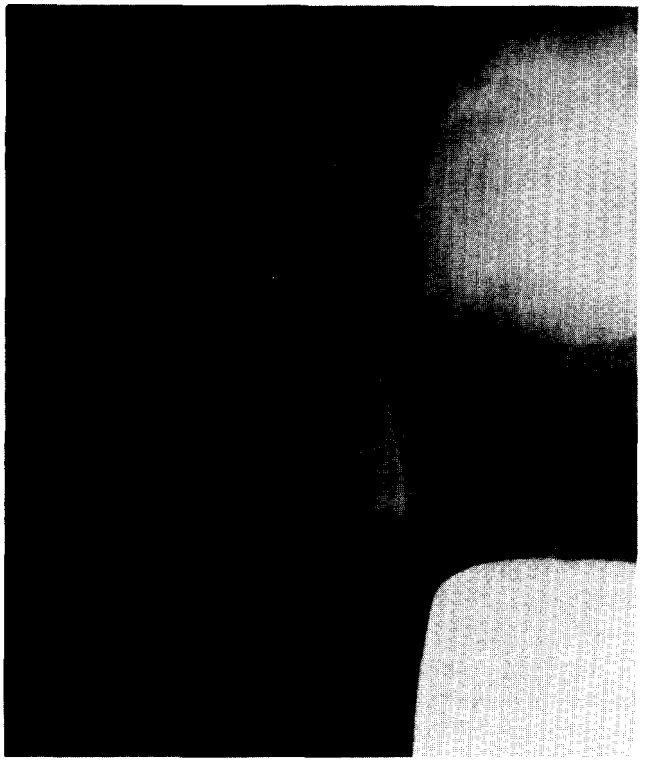

FIGURE 1. Late arterial phase of selective hypogastric artery angiogram reveals hypervascular lesion in ischium [arrows).

lesser trocanter of the femur. To define the extent of the lesion presurgically, CT examination was performed on a General Electric 8800 CT/T scanner. The 5-mm thick slices spaced at 3-mm intervals revealed the presence of a 6-mm radiolucent lesion in the lesser trocanter of the femur. The patient refused surgical intervention and is being treated successfully with aspirin for presumed osteoid osteoma.

DISCUSSION

Osteoid osteoma is a benign neoplasm of bone originally described by Jaffe in 1935 (1). The lesion is usually found in adolescents or young adults, with a preponderance in males. It may affect any portion of the skeleton, although there is a predilection for the long bones, with at least half of the lesions appearing in the femur or tibia (2). Clinical presentation is typically that of bone pain, worse during the night and relieved by aspirin. Treatment consists of complete excision (3). Pathologically, the lesion consists of a central nidus, rarely greater than 1 cm in diameter, consisting of branching partially mineralized osteoid trabeculae, with intervening vas-

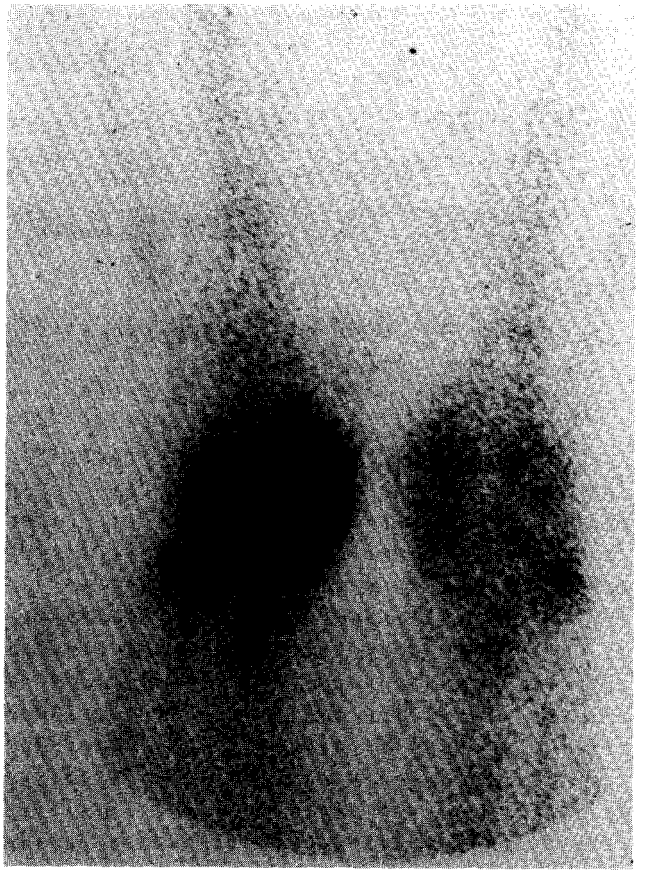

FIGURE 2A. Posterior view from technetium ^{99}M right mentoposterior bone scan shows markedly increased uptake in **medial condyle left femur.**

FIGURE 2B. A **l-cm thick CT** section **through femoral condyles fails to demonstrate radiolucent lesion although slight sclerosis seen medially on the left.**

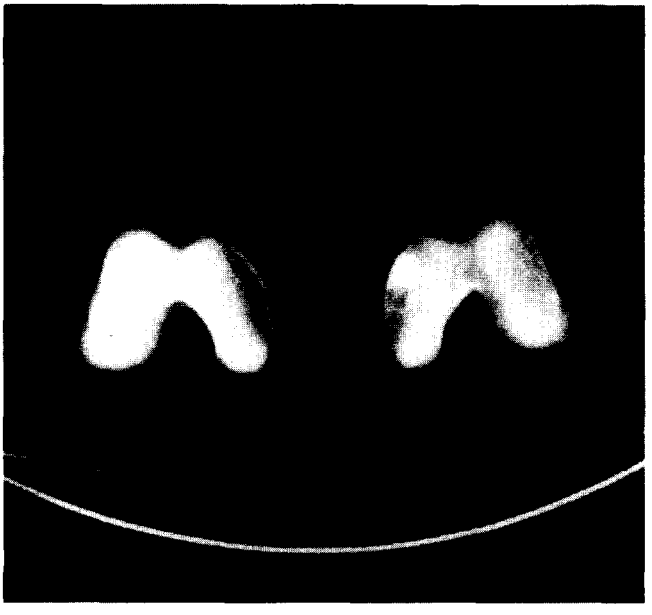

FIGURE 2C. A 5-mm thick magnified, targeted reconstruction section through left femoral condyle clearly demonstrates osteoid osteoma with characteristic nidus (ossified central portion, lucent periphery) surrounded by sclerosis [arrowheads).

cular connective tissue. This may be surrounded by densely sclerotic normal bone (4).

The roentgenographic findings reflect the histology. The lesion consists of a central, radiolucent nidus, rarely exceeding 1 cm in greatest dimension. Occasionally the central portion of this nidus may be calcified. If cortically located, the nidus is usually surrounded by an area of reactive sclerosis, which typically greatly exceeds the size of the nidus itself. The actual nidus may in fact be obscured by the sclerosis on conventional radiography. The sclerosis is diminished or absent in medullary or periarticular lesions (5). Surgical cure requires complete removal of the nidus; hence, accurate localization is crucial in management of these patients.

When conventional radiography is nondiagnostic, conventional tomography is often performed. In one study, however, conventional tomography added significant new information in only 7 of 17 patients (6). Radionuclide bone scans are very sensitive in detecting osteoid osteoma (7), although they lack specificity. The intraoperative use of this technique, aiding in the surgical removal of the lesion has been reported (8). Osteoid osteomas are highly vascular, and the hypervascular nidus can usually be demonstrated on angiography (2).

There are several reports of the CT appearance of osteoid osteoma in the literature (6, 9, 10). In these cases, the central nidus was clearly visible on CT, even in cases where it was missed on conventional radiography. In two cases, needle localization using CT was performed (9, 10).

The cases reported here point out the value of CT examination in the detection and accurate localization of osteoid osteoma. In two cases, the radiolucent nidus was easily demonstrable using CT; in one of the two patients (case 2) the lesion was not definitively identified using either conventional radiography or conventional tomography. However, it is essential that narrow slice thickness and close slice spacing be employed, as the nidus is most often less than a centimeter in size and routine contiguous l-cm thick slices are inadequate for demonstration of these small lesions. In case 2, initial 1-cm thick contiguous scans failed to demonstrate the lesion. Subsequent 5-mm thick slices spaced at 3-mm intervals demonstrated an osteoid osteoma, with a nidus diameter of approximately 6 to 7 mm. We suspect that the lesion in case 1, missed using contiguous l-cm thick sections, would have been detected with thinner, more closely spaced scans. Targeted reconstruction, which increases resolution of bony lesions, also proved quite useful, and we recommend its use on those machines suitably equipped. We did not employ intravenous contrast administration in our cases, as it was not necessary for diagnosis. However, the lesions are quite vascular, and one would expect marked enhancement following intravenous administration of iodinated contrast material.

In conclusion, we consider CT an excellent imaging technique for the diagnosis and localization of osteoid osteoma. In cases of suspected osteoid osteoma, we recommend CT examination if conventional radiographs are nondiagnostic. It is important, however, that optimum techniques be used, particularly narrow collimation and close slice spacing, so that the typically small nidus can be imaged.

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