Case Report

Resection of osteoid osteoma of distal tibia using the intraoperative isotopic scan

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Abstract

Osteoid osteomas are small-sized benign painful bony tumors. The authors report the case of an osteoid osteoma located in the distal third of the tibia, treated by the surgical excision of the nidus using the intraoperatively isotopic marking which allows reducing the incision size and the bony resection.

Key words: Bone scan, isotopic identification, osteoid osteoma

Introduction

Osteoid osteoma (OO) is a benign tumor (usually 1–2 cm in diameter).[1] It represents 12% of benign bone tumors and 2–3% of primary bone tumors.[2] Osteoid osteoma usually occurs in the long bones of the legs and arms; it is characterized by continuous pain that does not depend on the patient's level of physical activity. This pain is extreme by night and is usually relieved by use of non steroidal anti-inflammatory drugs (NSAIDs) i.e. aspirin.[1] The typical radiological appearance is of a bone forming lesion with a central nidus surrounded by sclerotic bone.[3] However, the diagnosis can be difficult when the nidus is not clearly visible, in case of a deep location or obscure anatomical sites as in a vertebra.[4] Bone scan and computed tomography (CT) scan are the two most important tests for the diagnosis of osteoid osteoma.[5] Indeed, bone scan is very important not only for initial diagnosis, with a sensitivity of about 100%, but also for the treatment by intraoperative detection favoring a precise and complete nidus resection.[6] We report the case of a patient treated by resection of the osteoid osteoma localized in the distal tibia by intraoperative isotope detection.

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Case Report

A 29-year-old man presented with a 1-year history of pain in left ankle, with nocturnal exacerbation, which was relieved by the use of acetylsalicylic acid or anti-inflammatory drugs. The clinical examination indicated tenderness of the medial face of the left ankle without swelling. Plain radiographs showed a lytic area, homogeneous, smaller than 1 cm, associated with a perifocal dense bone reaction evoking osteoid osteoma of the distal third of left tibia [Figure 1].

The CT confirmed a hypodensity associated with peripheral sclerosis, located at the distal third of the left tibia, near to the tibio-talar joint [Figures 2 and 3].

The bone scan showed uptake of radiotracer in the lower third of left leg [Figure 4], confirming the diagnosis of osteoid osteoma. Due to its deep location, near to the tibio-talar joint, and small size of the lesion with important peripheral sclerosis as shown in the scan [Figure 3], it was

Figure 1: Anteroposterior radiograph of ankle joint showing an osteoid osteoma of the distal third of left tibia (black arrow)

decided to perform an intraoperative isotope detection and to guide the surgical excision. We used a gamma probe counter, which is a scintillation counter used for isotope detection. It is equipped with a collimator connected to the electronics box by a flexible cable of 3.5 m [Figure 5]. The results are displayed digitally in counts per second (cps). The gamma probe counter has the advantage of being in contact with the uptake seat and being oriented to the higher counting rate. This will be displayed later with sound, demonstrating the localization of osteoid osteoma. Three hours before surgery, the patient received intravenously a marked molecule, dihydroxymethylphosphonate (HMDP) which is a bone matrix tracer. In the operating room, we were able to guide the surgical resection through the radiodetection displayed on the electronic box. The patient was taken in decubitus position under spinal anesthesia; the surgical approach was guided by a percutaneous tracking with the probe. After incision and bone access, the osteoid osteoma location was confirmed by probe counting that indicated a major mounting point located in the posterior and interior distal quarter of left tibia. Recording series, inch by inch in the four cardinal directions, allowed mapping the radiolabeling around the optimal point of fixation [Table 1]. We performed an excision of a bone window of 1 cm / 2 cm around the hyperfixant seat; we recognized the absence of abnormal signal on the residual bone. The postoperative course was uneventful, marked by absence of pain after 24 hours of the surgical procedure. Then, the patient was immobilized by plaster cast for 3 weeks. Pathological examination confirmed the diagnosis of osteoid osteoma with the presence of the nidus. After 24 months, the patient was asymptomatic, and the bone scan performed did not indicate any recurrence of osteoid osteoma.

Discussion

Osteoid osteomas mostly affect children and young adults

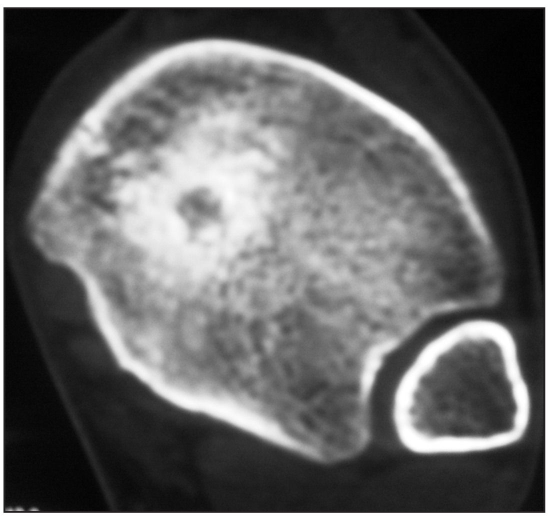

Figure 2: CT of left ankle showing hypodensity with peripheral sclerosis

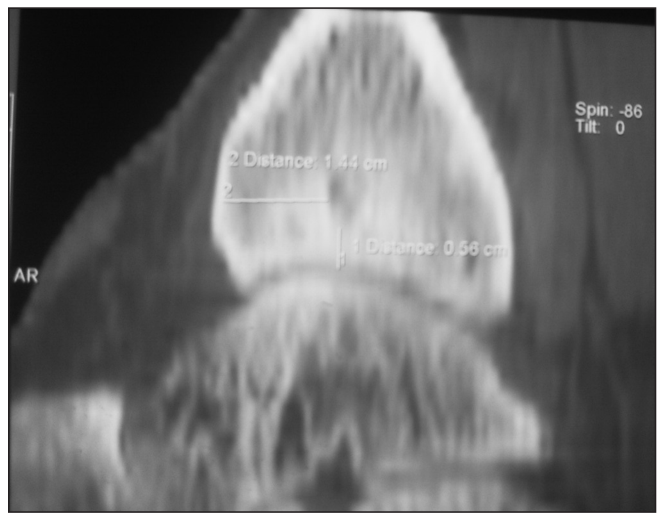

Figure 3: CT of left ankle showing the localization of the osteoid osteoma to tibio-talar joint

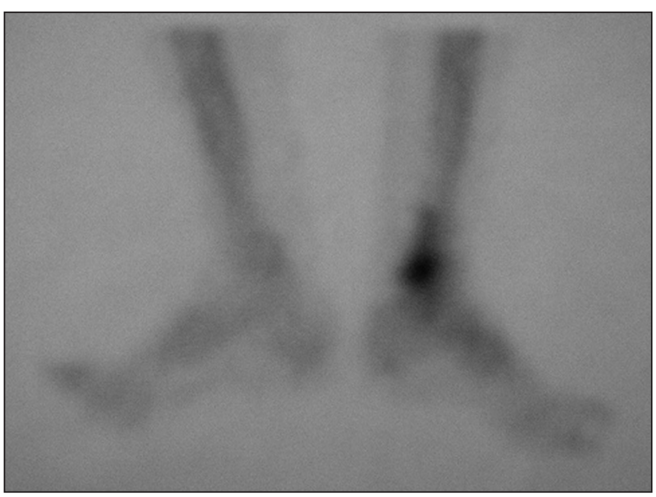

Figure 4: The bone scan showing uptake of radiotracer in the lower third of left leg

Figure 5: Gamma probe counter

Table 1: Intraoperative scintigraphy data

	Normal bone (percutaneous)	Optimal point of fixation (percutaneous)	Normal bone (in direct contact)	Optimal point of fixation (in direct contact)
Counts per second	7012	11,007	18,902	24,219

and are often diagnosed by simple X-ray or CT scan. But sometimes, these lesions are only visible on bone scan.[6] There are three fundamentally different approaches of treatment: conservative medical treatment, conventional surgical treatment and percutaneous destruction of the nidus using several methods like percutaneous sclerosis with ethanol, radiofrequencies, laser photocoagulation or thermocoagulation.[1] The osteoid osteoma may sometimes regress spontaneously; however, this outcome is uncertain and requires several years of observation.[4] However, most patients cannot tolerate the pain, and therefore abuse NSAIDs which entrains gastrointestinal effects.[4] A successful surgical treatment depends on the complete destruction of the nidus and it is not necessary to remove all the sclerotic bone reaction.[7] A very limited resection may leave in place a portion of the nidus and may lead to a recurrence, contrary to a wide excision that may cause a fracture or a growth disorder.[8] The use of intraoperative detection means is sometimes indispensable, especially because it is a small lesion or located on a surface where a minimal surgical procedure is preferred for functional or cosmetic reasons (e.g. osteoid osteoma of cranium).[6] The CT technique for guidance of radiofrequency ablation (RFA) is mostly used nowadays as a percutaneous treatment of osteoid osteoma with good results.[7] Indeed, we observed in a lot of recent studies that rate of recurrence after RFA is less than 10%.[9,10] But patients are predominantly children or young adults and the radiation dose may be harmful for them. Also, a study published by Cantwell has shown that the use of low radiation in CT technique for guidance of RFA has a low sensitivity to the location of OO, and thus causes incomplete ablation.[11] Furthermore, the nidus should be clearly identified on the CT, the peripheral sclerosis should not be significant to allow the trocar to reach the nidus and the size of the lesion should be small enough to ensure complete removal. In addition, the sensitivity of CT is less than that of bone scan in OO. A study published in French showed that the recurrence rate of the CT guidance for RFA was estimated to be 20%.[3] Other studies have shown some disadvantages of this technique like the lack of histological verification sometimes[1] or even some complications such as thermal burns of the skin and bone infarct.[12] Moreover, the bone scan gives an idea of the lesion activity in contrast to CT.[7] The intraoperative isotopic identification technique is very sensitive,[13-21] beneficial for the patient, thus sparing a greater resection by the "traditional" methods and facilitating a rapid recovery of activity; also, it is without radiation effects or complications and usually provides a material for histological confirmation. It is very useful where RFA is difficult or dangerous as sometimes in the spine, when the OO is located less than 1 cm away from vital structure[13] or when it is near to vascular or neural structures. This technique was described for the first time in 1980 by Rinsky *et al*. Later, it was reported in the literature as short series[14-19] or sporadic cases.[2,5,20-24] This technique requires an efficient collaboration between isotopologist and orthopedic surgeon. Its benefits are several in this pathology. It can guide the lesion excision by locating a deep lesion even though the bone surface is normal; it detects the nidus even when it is difficult to identify it in case of important peripheral bone reaction. It confirms the radical nature of resection, the only guarantee of healing, while limiting the extent of resection, avoiding a bone graft or the placement of implants in case of location on weight-bearing joint. The gamma probe should be perpendicular to the bone surface during the full procedure for excellent detection of the radioactivity, and therefore an efficient detection of the nidus. In this special case, it was very much possible to use the CT guided RFA, for its many advantages, but we chose the gamma probe technique because it represents an important tool for the surgeon to treat this pathology efficiently, with little morbidity and without complications.

Intraoperative isotopic identification is a highly reliable tool for resection of osteoid osteoma. It allows precise localization, and thus, optimal resection. It is particularly indicated in case of a small size intracortical osteoid osteomas.

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