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CT-guided percutaneous resection of osteoid osteoma

Osteoid osteoma is one of the most frequent benign osteogenic tumors in children and young adults. It is located in the lower limb (femur and tibia) in 50-60% of cases. Clinically, it is characterized by (preferentially) nocturnal pain that in most cases eases with anti-inflammatory drugs. Diagnosis is pretty straightforward by means of imaging techniques. X-rays tend to show a *nidus* of 6-10 mm in diameter surrounded by sclerosis. Histologically it is characterized by the presence of highly vascular connective tissue, fibrous bone trabeculae, osteoid substance and numerous osteoclasts and osteoblasts. Disappearance of pain has been reported following years of conservative treatment with aspirin or other antiinflammatory drugs, although most patients do not accept such a long-term treatment.

Treatment consists in the resection or complete destruction of the *nidus*. Since most osteoid osteomas are small, accurate intraoperative identification of the *nidus* can be challenging. In these cases, the surgeon may be forced to resect a significant amount of bone to guarantee full excision, which in the context of the long bones of the lower limb often results in the use of internal fixation and bone grafting if a large-scale resection is needed.

New percutaneous treatment alternatives have recently been developed, under computed tomography (CT) control: resection by means of trephines^{1,2}; percutaneous ethanol injection into the *nidus*; *nidus* destruction by means of radiofrequency electrodes^{3,4} and the use of the laser beam⁵. Advantages of percutaneous treatment are manifest: these are minimally invasive low-morbidity techniques that can

be performed as outpatient procedures and that make it possible to accurately control the location of the lesion.

CASE REPORT

This was a 9-year-old girl who, 4 months prior to consultation, developed pain and a limp in the right lower limb. Pain was moderate without pain-killers being required. Physical examination revealed pain and a some numbness at the level of the medial aspect of the proximal third of the right tibial shaft. Plain films (fig. 1) showed a periosteal reaction at the level of the medial tibial aspect. CT showed periosteal thickening, confirming the existence of a radiolucency that corresponded to the *nidus* of an osteoid osteoma.

With a presumptive diagnosis of osteoid osteoma, it was suggested to the girl's family that a resection of the lesion should be carried out percutaneously, with a 4 mm trephine and CT control, under local anesthesia and sedation (fig. 2).

At 24 hours the patient had no pain. The tibia was protected by means of a short leg cast for 3 weeks. The pathological study of the cylinder extracted confirmed the presence of an osteoid osteoma and its full resection. A 1-year post-op x-ray showed the complete of the perforation made. Six years later the patient had no discomfort.



Figure 1. Anteroposterior radiograph of both tibias. The right tibia shows the periosteal reaction.

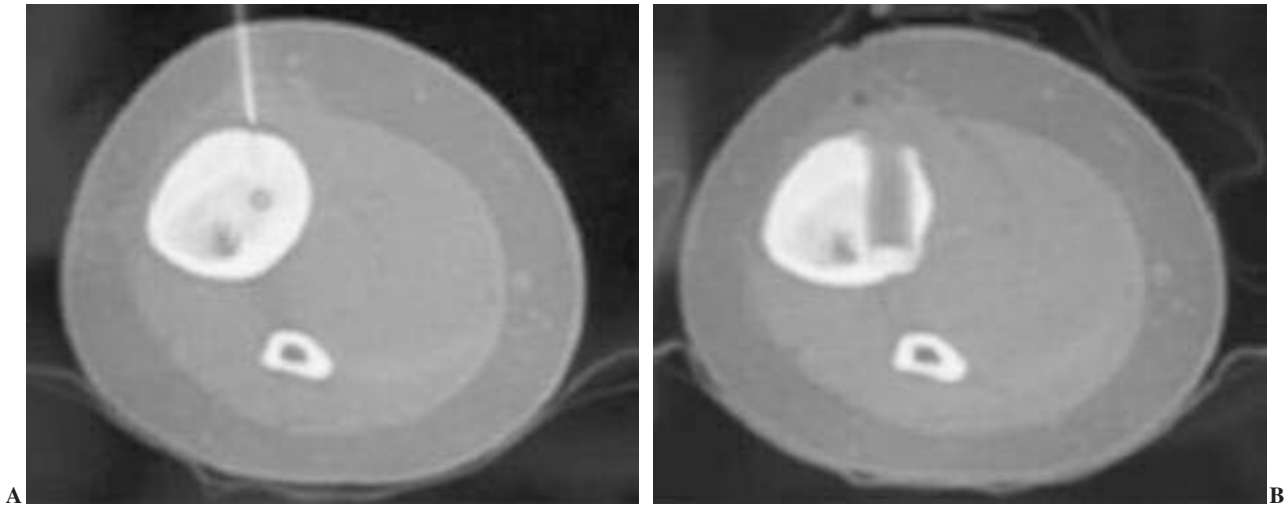


Figure 2. (A) Computed tomography (CT) showing the location of the nidus and the placement of a needle that depicts the route that will be used for resecting the nidus. (B) CT image following resection of the nidus with a trephine.

DISCUSSION

Osteoid osteoma is a benign tumor that can present diagnostic challenges. Some patients experience its symptoms long before they are diagnosed. Symptoms resolve following *nidus* ablation. A few years ago, new minimally invasive techniques have been introduced for *nidus* resection based on CT-aided techniques for identifying the *nidus*. In 2001, Buhler et al¹ reported the treatment of 17 patients where the *nidus* was resected under CT-control. For Erdtmann et al² the CT-guided percutaneous technique is simple to carry out, has a lower recurrence rate and requires a shorter stay in hospital, for which reason they consider it their first therapeutic option. *Nidus* resection with trephines permits a CT-aided intraoperative confirmation that a full resection has been achieved, so that if a residual lesion is left behind it can be addressed immediately. It also makes it possible to analyze the material and confirm, by means of a pathological study, the diagnosis and the resection.

Other authors have proposed an ethanol injection into the *nidus*, under CT control, aimed at sclerosing the *nidus*, or thermocoagulation by radiofrequency^{3,4}. The different published series that have used thermocoagulation show satisfactory results in 80-100% of cases. Lindner et al³ treated 58 patients with radiofrequency with good results in 95% of them; results were 100% satisfactory when the procedure was repeated. Portabella et al⁴ used this method to treat 12 patients and obtained complete pain relief in 9; of the remaining 3 patients, 2 improved when the procedure was repeated and a third one required open surgery.

Other Studies have recommended the use of laser to destroy the *nidus* under magnetic resonance (MR) control. In a study by Sequeiros et al⁵, the lesion was seen to recur

in only 1 of 6 patients; the other were discomfort-free at 3 months. It should be mentioned that at present percutaneous resection of the osteoid osteoma is not always indicated since there is not enough experience of its use at the level of the spine, for which reason we do not think it is advisable to perform this procedure in the vicinity of the spinal canal.

With CT-guided resection, the complications rate (infections, hemorrhages, etc.) can be brought down and the relapse rate is minimal (lower than 5-10%). Some authors, like Sans et al, who use trephine resection, caution about the potential incidence of skin necrosis, weakness fractures, hematomas and irritation of nerve trunks (24% of patients treated). The complication they observe most commonly is skin abrasion when an engine is used for the trephine, which also leads to skin necrosis and potential overinfection. In order to avoid this complication, the incision should be large enough to avoid the instrument from rubbing against the skin, and the engine should be a low-revolution one to avoid heating up the soft tissues. Other potential complications are long bone fractures following the excision of the lesion. These fractures can be avoided with partial weight-bearing of the limb for about 6 weeks.

In short, percutaneous treatment of osteoid osteoma is a scarcely aggressive, safe, straightforward and inexpensive alternative. It allows a speedy return to normal activities and helps prevent the potential complications of open surgery. The advantages of CT-guided trephine resection lie in the possibility to obtain a radiological and pathological confirmation of the total resection of the *nidus*. The advantages of other CT-guided techniques such as alcoholization or thermocoagulation reside in the fact that no bone needs to be resected, even if treatment of an osteoid osteoma can-

not be confirmed by means of a pathological analysis. Currently this set of minimally invasive procedures must be considered the techniques of choice for the treatment of osteoid osteoma.

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