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Osteoid osteoma: the results of surgical treatment

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Abstract Between 1987 and 1999 we diagnosed and treated 110 patients with osteoid osteoma. Sixty patients were younger than 20 years. One hundred and four patients had characteristic pain at night. The mean duration of symptoms before surgery was 16 months. One hundred and four symptomatic patients were treated operatively with either wide resection or curettage. Ninety-one patients had immediate and complete relief of pain. The average follow-up was 2.5 years.

Résumé Entre 1987 et 1999 nous avons traités 110 malades souffrant d'un ostéome osteoide. 60 malades étaient âgés de moins de 20 ans. 104 malades avaient la douleur nocturne caractéristique. La durée moyenne de symptômes avant la chirurgie était de 16 mois. 104 malades symptomatiques ont été opérés avec résection large ou curetage. 91 malades ont eu un soulagement immédiat et complet des douleurs. La moyenne de suivi était de 2.5 années.

Introduction

Osteoid osteoma is a small benign bone lesion with limited growth potential. Tumours measuring more than 1.5 cm are unusual. Their small size is the main distinction between osteoid osteoma and osteoblastoma as these two tumours have the same histological appearance. Thus lesions more than 2 cm in diameter are considered as osteoblastoma [4, 12, 14]. Night pain is characteristic and is relieved by non-steroidal anti-inflammatory drugs (NSAIDs), and examples which do not cause pain are very rare [8, 11].

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This benign lesion consists of a small, vascular, friable, oval nidus of osteoblastic tissue which is surrounded by sclerotic bone. Prostaglandins produced by the tumour result in a chronic inflammatory response in the surrounding tissues which is demonstrated by a periosteal reaction and synovitis. These regress spontaneously after removal of the nidus [9, 17].

Osteoid osteoma has been treated traditionally by excision either by wide resection, or by removal of the nidus using curettes and burrs after opening the overlying cortex. Percutaneous ablation of the tumour by CT-guided core-drill excision [1, 3], as well as destruction of the nidus by thermocoagulation [6], radiofrequency [13] or laser [7] have recently been developed as alternative treatments.

Materials and methods

Between September 1987 and February 1999, 110 patients with osteoid osteoma were managed at our hospital. The details of gender, age range and site are given in Table 1 and Fig. 1. Characteristic night pain was present in 104 patients (95%), but in six the usual symptoms of osteoid osteoma were absent. Significant pain relief after use of a non-steroidal anti-inflammatory agent or salicylates was reported by 102 of the symptomatic patients although it provided complete relief in only 75. In two of the symptomatic patients salicylates did not relieve pain and the majority required continuous medication. The mean duration of symptoms before surgery was 16 months (range, 1 month to 6 years).

The diagnosis and operative techniques were based on the clinical findings routinely supported by plain radiographs, technetium 99m bone scanning and thin-section (1–1.5 mm) computed tomogra-

Table 1 The relationship of age and gender

Age range (years)	Male	Female	Total
0–9	6	4	10
10–19	31	19	50
20–29	18	9	27
30–39	10	6	16
40–49	4	3	7
Total	69	41	110

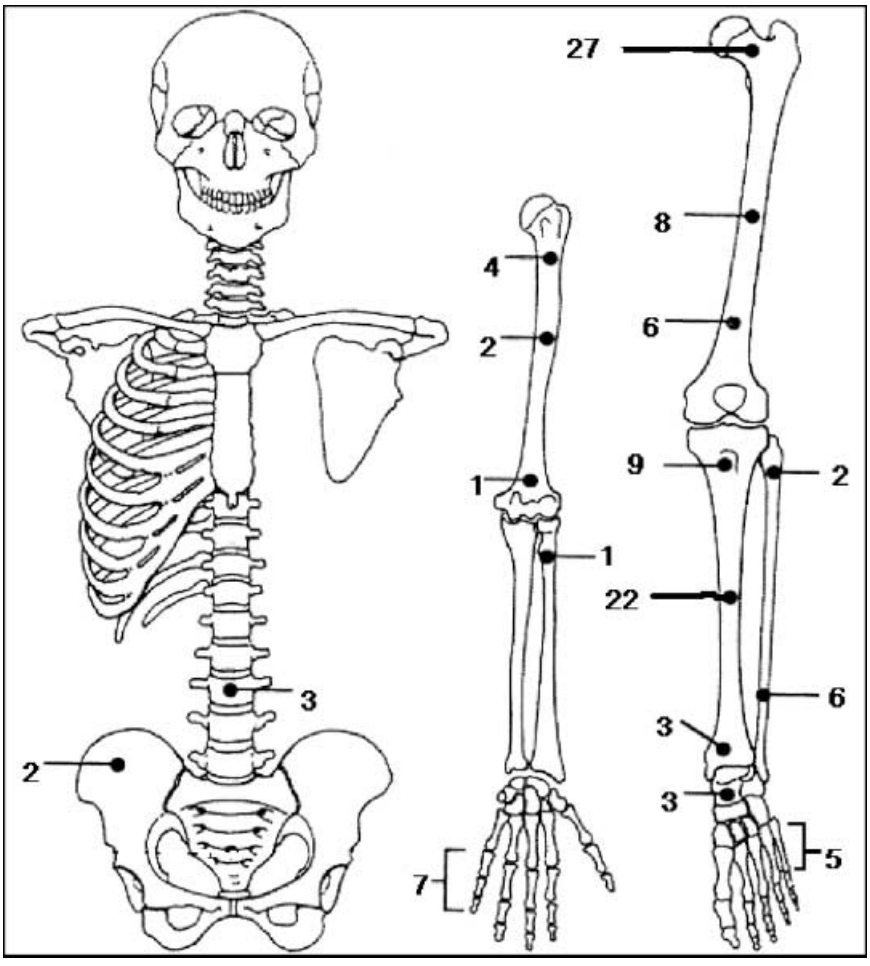

Fig. 1 Localisation of the lesions (indicated by *numbers*)

Fig. 2 An anteroposterior hip radiograph in a patient 14 years of age with night pain responding to NSAIDs, demonstrating a suspicious nidus and increased cortical thickness at the level of the lesser trochanter

Fig. 3 Computed tomography shows a classic osteoid osteoma

phy (CT; Figs. 2, 3). Magnetic resonance imaging (MRI; Fig. 4a,b) was performed in seven patients and although of diagnostic benefit in five, it was actually misleading in the other two. A nidus was demonstrated preoperatively in 94 of the110 patients by these techniques, but in 16 we were unable to demonstrate any nidus. It is of interest that the osteoid osteoma in the proximal tibia of a 36-year-old woman contained three separate niduses, and that a second nidus was identified in the right tibia of a 35-year-old woman some 23 months after a nidus had been removed from her left tibia.

We performed 105 primary operations on 104 patients (bilateral in one patient). The remaining six asymptomatic patients were not treated.

Fig. 4 The nidus and inflammatory response in the surrounding tissues are evident on the coronal T2-weighted (**a**) and transverse T1-weighted (**b**) MRIs

We used the technique of opening the overlying cortex and intralesional excision of the nidus in 80 patients. In 24 who had femoral neck or talar involvement we preferred a limited block resection and grafting.

Histological confirmation was obtained from the excised material. Frozen section examination during surgery was never required. Intra-operative radiography was used when a block resection was to be performed. Neither internal fixation nor any external support was used post-operatively. Gradual mobilisation and full weight-bearing was resumed after 1–3 weeks.

All our patients were followed up for an average of 2.5 years (range, 1–8 years).

Surgical technique. The exact location of the lesions, as well as the exact distance from a landmark such as a joint or a tuberosity were determined before operation by a CT scan. The surgical approach must expose the bone in close relation to the nidus. When in doubt intra-operative radiographs were obtained. After elevating the periosteum or synovium, the bone over the lesion was usually found to be elevated and slightly roughened with the nidus located beneath the apex of this fusiform cortical deformation. Bleeding from a small vessel may indicate the place of the nidus under the cortex. The sclerotic bone covering the nidus was removed by drilling and the reddish lesion which contrasts with the white surrounding bone is revealed. Removal of the reactive cortical bone should be done carefully so as to avoid destroying or missing a very small nidus. After exposure the nidus is curetted from its bed and the walls of the cavity are either 'burred' or curetted 1–2 mm in all directions.

After removal of the nidus, in spongy bones like the talus or femoral neck, we used bone grafting in order to encourage early bone consolidation and mobilisation. In 20 patients, an autograft from the contralateral ilium was used while allograft bone chips were preferred in the other four.

Results

Ninety-one patients had immediate and complete relief of pain after surgery, while eight complained of some pain until the second post-operative day. In three patients pain continued because of incomplete nidus removal and a second operation was needed after an average of 1 month. In these the diagnosis of osteoid osteoma was confirmed after the second operation. In two patients, although there was complete relief of pain after surgery, recurrent pain necessitated re-operation after 2 months. The nidus was then identified and excised. Histological confirmation (in five patients after the second operation) was obtained in all patients with the pre-operative diagnosis of osteoid osteoma and this suggests excellent diagnostic accuracy.

Only the patient who had three separate niduses excised at the same time from the proximal tibia required a plaster cast for 6 weeks in order to avoid the risk of fracture.

For osteoid osteomas in the femoral neck or talus we preferred a limited block resection and bone grafting. These patients began active exercises the day after the operation and they were mobilised partial weight-bearing on the second post-operative day. After 4 weeks all of them could tolerate full weight-bearing, the grafts incorporated in an average of 2 months. The patients resumed normal function after 4–6 weeks. The average time in hospital was 5 days.

Discussion

The treatment of osteoid osteoma is to find and then remove all of the nidus [4, 12, 14]. When the nidus has been removed the patient is immediately relieved of pain. Therefore this operative management is preferred to conservative treatment which may involve consumption of NSAIDs for from 1 to 3 years [5]. All of the thickened bone around the osteoid osteoma need not be removed and the resulting defect heals spontaneously once the entire nidus has been removed [5, 16].

Wide block resection of the nidus has several disadvantages. It is difficult to know how much bone to remove, and it may necessitate using grafts and internal fixation, and post-operative immobilisation [10]. However, at operation it may be difficult to localise the nidus in areas such as the femoral neck and talus. At these sites we prefer a limited block resection with bone grafting in order to produce early bone consolidation. In our 110 patients, neither internal fixation nor external support was needed as the exact site of the nidus was determined before operation by CT and radiographs. Thus during the

operation only minimal cortical bone had to be removed to allow total excision of the nidus.

We do not believe that other methods to localise a nidus such as pre-operative injection of technetium 99 m methylene diphosphonate and intra-operative probing, or injecting tetracycline pre-operatively and examining the specimen under ultraviolet light are necessary [2, 15]. However, the exact anterior, posterior, medial or lateral localisation of the lesion must be determined by pre-operative CT scanning. Knowledge of the exact distance of a lesion from an anatomical landmark, that can be determined intra-operatively, greatly facilitates finding the nidus.

Percutaneous removal of the nidus which has recently been introduced has become a popular technique in the treatment of osteoid osteoma. Core-drill excision under CT guidance, radiofrequency ablation, interstitial laser photocoagulation or ethanol injection can also be used. These techniques have the advantage of using a thinner drill and result in few complications. This can also be done as an outpatient procedure or only needs a short stay in hospital. However, from the reported data and upon the use of percutaneous techniques histological confirmation was obtained in only about 40% of the patients and the rate of success differs from 80% to 94% [1, 3, 6, 7, 13]. In our series we have a 95% success rate and in other similar series in which the nidus was excised at operation the success rate ranges from 95% to 100% [5, 16]. It seems therefore that the percutaneous method is slightly less effective than open operation. Another disadvantage of percutaneous removal is the lack of histological confirmation although this is not crucial as a definite diagnosis can be made on clinical grounds reinforced by appropriate imaging.

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