



Surgical treatment of osteblastoma : A report of 20 cases

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Osteblastoma is a locally aggressive osteoblastic lesion of bone with rare malignant transformation. We retrospectively evaluated 20 patients who were diagnosed and surgically treated for osteblastoma in our institution. Their mean age was 22.5 years (range : 10 to 34). The most frequent location was in the posterior elements of the spine, followed by the long bones of the extremities and the talus. Intralesional curettage was the most common modality of treatment ; it was used in 11 patients, with a 13% recurrence rate. This series demonstrates that osteblastoma may be locally aggressive and may recur after removal. Although it is usually treated successfully with curettage, wide excision should be considered along with careful follow-up over the long term owing to the possibility of recurrence or malignant transformation.

Keywords : osteblastoma ; benign bone tumours ; differential diagnosis ; surgical treatment.

INTRODUCTION

Osteblastoma and osteoid osteoma are well-known benign osteoblastic lesions of bone (16). They have similar histological features and probably correspond to different expressions of one pathologic process (5,12). They have come to be distinguished in terms of size, site and degree of ossification (1,4,25). Several authors define the lesion as osteblastoma when its longest axis is longer than 1.5 cm (20,24). The term "benign osteblastoma" has also been used for this tumour ; it was proposed

independently by Jaffe and by Lichtenstein to define a vascular osteoid and bone-forming tumour containing numerous osteoblasts which occurred principally in the vertebral column (12). Osteoblastoma is a rare tumour which accounts for approximately 3.5% of all benign neoplasms of bone and for less than 1% of all bone tumours. The average age of incidence is between 15 and 20 years, and most patients are diagnosed before the age of 30 (8,12,25). Although osteoblastoma tends to occur in the axial skeleton, particularly in the posterior elements of the vertebral column, it has been reported in a variety of skeletal locations including the scapula, ulna and scaphoid (23,26,27).

Osteoblastomas have a tendency to increase in size, and their radiological appearance is variable (3,21). Most osteoblastomas are well contained,

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but occasionally they may extend into the soft tissue (5). The development of imaging techniques has increased the physician's ability to detect soft tissue expansion in osteoblastoma (21). In the differential diagnosis, the most important condition to be ruled out is osteoblastoma-like osteosarcoma (2,9). A recent study found immunohistochemical analysis of cyclooxygenase-2 to be useful in the differential diagnosis of osteoblastoma and osteosarcoma, because this enzyme was more reliably expressed in osteoblastoma cells (10).

The curative treatment for patients with osteoblastoma is surgery. The lesion can be removed with intralesional curettage or wide resection, depending on the clinical situation, location within the bone and suspicion of malignancy (8,21). Recurrence rates vary with the surgical approach, and wide resection is associated with lower recurrence rates (7,11,14). The purpose of this retrospective study was to analyse the clinical findings, radiological findings, and treatment results in 20 patients with osteoblastoma.

PATIENTS AND METHODS

During the period from March 1986 to December 2006, 22 patients at the authors' institutions were diagnosed with osteoblastoma. Of these patients, one did not have surgery, 21 underwent surgery and one was lost to follow-up after surgery, leaving 20 patients for analysis. Diagnoses were confirmed with histological examination of the excised lesion in all patients. Data obtained for each patient included age, gender, symptoms at presentation, skeletal location of the tumour, radiological features, diagnosis and treatment. The characteristics of the patients are summarised in table I.

Plain radiographs were available for all patients. In 12 patients, computerised tomography (CT) and in 7 patients magnetic resonance imaging (MRI) was done as part of the diagnostic workup. The average duration of follow-up was 50.6 months (range : 20 to 192). One patient (Patient 9) had undergone intralesional curettage before being referred to our institution, and presented recurrence.

Intralesional curettage followed by bone grafting of the cavity was the most common surgical procedure. If the stability was not acceptable, such as in the removal of multiple posterior elements in the spine or in the extensive resection of a long bone, fixation with an

implant was performed. For example, in Patient 13, after wide excision of the tumour, the distal fibula was reconstructed with a nonvascularised autograft from the patient's contralateral fibula, which was stabilised with a plate and screws (fig 1).

RESULTS

Of the 20 patients treated surgically for osteoblastoma who continued in follow-up, seven were female and 13 were male, with an average age of 22.5 years (range : 10 to 34). The spine was the most common location followed by the femur and talus. The most common presenting symptom was pain, present in all patients, followed by a tender mass in four patients. Pain was radicular in nature in two of six patients with vertebral involvement. Pathological fracture and paraesthesia were presenting complaints in one patient each. The mean period of follow-up was 50.6 months (range : 20 to 192).

Intralesional curettage was the preferred mode of treatment, used in 11 patients, and wide resection was used in three patients. Six patients with involvement of posterior elements of the spine underwent marginal excision. In the curettage group, the cavity was filled with bone graft in seven patients (five autograft, two allograft), with cement in one patient and with bone graft plus cement in one patient. Simple curettage without bone graft or cement was used in two patients (table I).

Recurrence was observed in three patients (table I). A 29-year-old male who underwent curettage at another center was referred to our institution within the first year after surgery and was treated with intralesional curettage and autogenous bone grafting (Patient 9, table I). In the second patient (Patient 1), recurrence was observed 10 months after facet excision for L2 posterior element involvement. Surgery for the recurrent tumour was not accepted by the patient and she was thereafter lost to follow-up. The third patient with a recurrent lesion was a 30-year-old female who had originally presented with pathological fracture of the humerus (Patient 16). Curettage with bone autograft was performed for the initial lesion, and 12 months later non-union and recurrence of the

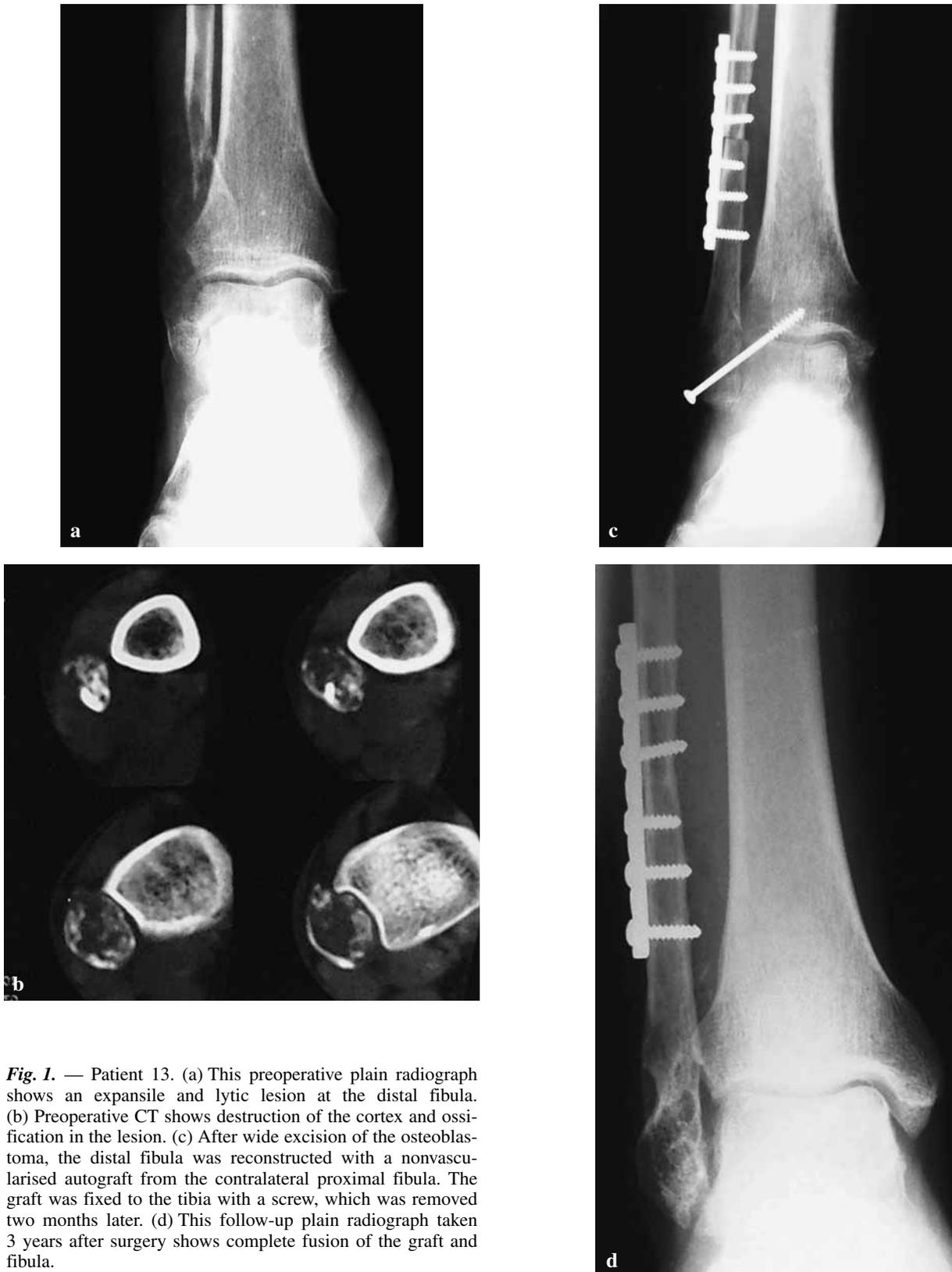


Fig. 1. — Patient 13. (a) This preoperative plain radiograph shows an expansile and lytic lesion at the distal fibula. (b) Preoperative CT shows destruction of the cortex and ossification in the lesion. (c) After wide excision of the osteoblastoma, the distal fibula was reconstructed with a nonvascularised autograft from the contralateral proximal fibula. The graft was fixed to the tibia with a screw, which was removed two months later. (d) This follow-up plain radiograph taken 3 years after surgery shows complete fusion of the graft and fibula.

Table I. — Demographic and clinical details of 20 patients with osteoblastoma

No	Age	Sex	Complaint	Radiology	Location	Primary treatment	Reconstruction	Recurrence/treatment	Complication	Follow-up
1	24	F	Pain	CT	L2	Facetectomy	Posterior instrumentation	No surgery		26
2	34	F	Pain, paraesthesia	CT	L2	Laminectomy	Posterior instrumentation			45
3	24	M	Pain	CT	L5	Laminectomy	Posterior instrumentation			22
4	16	M	Pain	CT	T11	Laminectomy	-			32
5	29	M	Pain	MRI	L3	Laminectomy	Posterior instrumentation			41
6	17	F	Pain	CT	C5	Laminectomy	-			63
7	15	F	Pain	CT, MRI	Acetabulum	Curettage	Autograft-cement			20
8	20	M	Pain	CT, MRI	Acetabulum	Curettage	Autograft			26
9	29	M	Pain	CT, MRI	Femoral neck	Curettage	Autograft	Curettage, autograft	Myositis ossificans	45
10	25	F	Pain		Femoral neck	Curettage	Autograft			30
11	18	M	Pain		Distal femur	Curettage	Cement			67
12	16	M	Pain, mass	CT, MRI	Fibula	Resection	-		Transient peroneal nerve palsy	54
13	20	M	Pain	CT	Distal fibula	Resection	Fibular autograft			192
14	22	F	Pain, mass		Tibia	Curettage				28
15	22	M	Pain	CT	Proximal tibia	Curettage	Allograft			33
16	30	F	Pain, pathologic fracture		Humerus	Curettage	Autograft	Excision, autograft	Pseudoarthrosis & limitation of range of motion	156
17	10	M	Pain		Talus	Curettage	Allograft			44
18	33	M	Pain, mass	CT, MRI	Talus	Curettage	-			29
19	27	M	Pain		Talus	Curettage	Autograft			43
20	22	M	Pain, mass	MRI	Metatarsal	Resection	Autograft			36

CT : computerized tomography
MRI : magnetic resonance imaging

tumour were observed. The patient then underwent repeat surgery with wide excision and structural autogenous fibular grafting with internal fixation. She was followed up for a further 10 years with no sign of recurrence. The overall complication rate was 15% (three patients, table I). The complications were limitation in the range of motion (Patient 16, passive flexion and abduction at the shoulder joint limited to 80°); transient superficial peroneal nerve palsy (Patient 12, following proximal fibular resection, resolved in 6 months) and myositis ossificans (Patient 9, gluteal region, after treatment for recurrent lesion). The overall recurrence rate in our series was 10% for patients whose initial surgery was performed at our institution.

DISCUSSION

The cases of osteoblastoma in this series account for 1.7% of the benign bone tumours diagnosed in our department during the same period, which is slightly lower than the 3-4% of all benign bone tumours reported in the literature (8,13). The female-to-male ratio in our series (7 to 13) is consistent with previous findings, in which osteoblastoma has occurred roughly twice as frequently among males (8). Similar to previous studies, the average age was around 20 years (22.5 years in our patients) and the majority of patients (87% in our study) were diagnosed before age 30 (21,24,25).

Osteoblastomas generally grow slowly with few symptoms, but aggressive lesions may cause severe symptoms such as soft tissue oedema, joint stiffness and contracture (5). Pain is the most common presenting symptom, as was the case in our series. Spinal involvement may cause deformity (21). Lesions may also be discovered incidentally (7,21,25). Spinal deformity or incidental lesions were not encountered in our series.

Osteoblastoma tends to occur in the axial skeleton, particularly in the posterior elements, with lesions there accounting for 40% of the total, followed by those in the long bones of the lower extremity, which account for 20% (16). The proportions in our series, which were 6/20 for spinal lesions and 8/20 for lesions in long bones of the lower extremity, are in agreement with the litera-

ture (4,12,25). Other locations in our series such as the talus and metatarsus have also been reported in other studies (5,25).

Imaging techniques generally show osteoblastomas as being osteolytic tumours; however, due to osteoid and bone components, osseous type mineralisation may be seen (5). Several authors have argued that osteoblastoma has no characteristic radiographic appearance, but a number of radiographic features have been found helpful in making the diagnosis (6,11,25). The lesions are usually well circumscribed, central to slightly eccentric in long bones, rounded or ovoid, and expansile (7,14). A shell of reactive bone separating the tumour from the underlying bone has been reported to occur in nearly half of the patients (16).

CT and MRI are often useful to show the extent of the tumour and its relation to local anatomy, particularly for tumours in the spine, where routine radiographs may be difficult to interpret. In an imaging study of osteoblastoma, Youssef *et al* (28) concluded that while CT is more useful in diagnosing osteoid osteomas, MRI can be reserved for equivocal cases. We obtained CT and/or MRI in more than two-thirds of our patients. MRI showed soft tissue and surrounding bone oedema in all of our patients and provided valuable information about the neighbouring anatomical structures, and thereby helped in the planning for effective tumour removal. However, since no MRI features characteristic of osteoblastoma have been described, CT demonstrating the osteoblastic nature of the lesion is still more commonly preferred, as was the case in our series (28).

In the differential diagnosis of osteoblastoma, the following should be considered: osteoid osteoma, osteosarcoma, Brodie's abscess, aneurysmal bone cyst and giant cell tumour (5). Osteoblastoma lesions are by definition larger than those of osteoid osteoma, and a central nidus is usually not present in osteoblastoma (19). The bone formation is usually of a benign type and of a solid type in contrast to the aggressive periosteal reaction seen in osteosarcoma. The reactive bone surrounding osteoblastoma has been reported to be less when the lesion is in the cancellous bone of the spine, ilium or talus compared to lesions in the cortex of bones such as

the metacarpals or the femur (16). Brodie's abscess resembles osteoblastoma, but in the former, bone-type radiodensities are not visible within the lesion (5). For aneurysmal bone cyst and osteoblastoma, the spine is a common site of involvement, and a blown-out bone may be seen on imaging in both conditions (5). Histopathological investigation is then needed for the diagnosis. Around the epiphyses of long bones, osteoblastoma resembles giant cell tumour radiologically, but in contrast to giant cell tumour, peritumoral sclerosis is generally seen in osteoblastoma (5). A small percentage (<1%) of osteoblastomas have been reported to undergo malignant transformation (18,22). Consistent with this, no malignant transformations or metastases to the lungs were encountered in our series.

The basic microscopic pattern in osteoblastoma is one of numerous osteoblasts producing osteoid and woven bone, and is virtually the same as in osteoid osteoma (20,21). Osteoblastoma is distinguished by its aggressive characteristics, its extension into soft tissue and its size (3). A longest-axis length of at least 1.5 cm is accepted by some authors as part of the definition of osteoblastoma (17,25). Histologically, it is not always easy to distinguish osteoblastoma from rare lesions such as osteoblastoma-like osteosarcoma. In this context it has been reported that expression of cyclooxygenase 2 is more prominent in osteoblastoma cells (10). For the diagnosis of osteoblastoma in our department, histological examination combined with clinical and radiological features, including a criterion of 1.5 cm or more for the length of the tumour's longest axis are used, and these are the basis of the study reported here.

Most benign tumours of bone can be successfully treated with intralesional curettage alone. Use of a burr can aid in extending the curettage, particularly in areas that are difficult to access. We prefer to use cautery in difficult-to-reach areas, because the generated heat may help to destroy tumour cells. Curettage can be followed by bone grafting or bone cementing. In aggressive lesions marginal or wide resection is necessary (5). Radiotherapy should be used only when complete removal of the tumour is impossible and the tumour continues to

grow, with the risks of radiotherapy, including post-radiation sarcoma, being kept in mind (15,21,22).

Recurrence rates of up to 21% following first-time surgical treatment of osteoblastoma have been reported (7,11,14). Wide resection has lower recurrence rates when compared with intralesional procedures (7,11,14). In our series, there were no recurrences in the patients who were treated with wide resection of the tumour. Recurrence was observed in one of six patients who underwent marginal excision, and in two of 11 patients who underwent intralesional curettage. The overall recurrence rate in our series was 10%, which is comparable to other studies (7,11,14).

In conclusion, in the treatment of patients with osteoblastoma, wide resection should be considered whenever it is anatomically possible. However, although intralesional curettage appears to be associated with higher rates of tumour recurrence, it can also be effective. Postoperatively, patients require long term follow-up due to the possibility of tumour recurrence and malignant transformation.

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