

Surgical consideration for benign bone tumors

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Abstract

Background: The surgical management of symptomatic benign bone tumor has been described in various manners in medical literature. However, there are few published reports on the presentation and surgical management of benign bone tumors in black African patients.

Objectives: To determine the pattern of presentation of benign bone tumors and evaluate the common indications for surgery in a Nigerian Orthopedic Center.

Materials and Methods: This is a prospective study of 67 patients, surgically treated for benign bone tumors, over a three-year period, at the National Orthopedic Hospital, Lagos, Nigeria.

Results: The common histological types include, osteochondroma, giant cell tumor, and the simple bone cyst. These tumors have varying anatomic locations, but are more commonly located around the knee joint. In this series, most of the patients have presented with an active or aggressive stage of the disease. The most common indication for surgery is painful swelling; other indications include a pathological fracture, restricted range of movement, and peripheral nerve compression. The surgical procedures performed are simple excision, curettage, and stabilization; and 1-stage and 2-stage wide resection with reconstruction. Patients with significant bone defects have autologous bone grafting or methylmethacrylate cement application. Further stabilization is achieved with intramedullary or compression plate and screw fixation. Amputation has only been necessary in one patient with a huge aneurysmal bone cyst. At the average follow-up period of 28.6 months, five patients showed recurrence. All were with a histological diagnosis of giant cell tumor.

Conclusions: The mode of presentation of benign bone tumors in this group of black African patients is heterogenous, demanding various surgical options. Limb sparing is a largely feasible option, but the recurrence rate is particularly higher for giant cell tumors. Increase in the number of patients presenting with giant cell tumors raises the possibility of an increase in the incidence of this condition in the black African population. Larger multicenter studies in the black African population may shed more light on the actual incidence of giant cell tumors and other bone tumors in this group of patients.

Key words: Surgery in benign bone tumours, black African tumours, giant cell tumours, osteochondroma

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Introduction

Benign bone tumors represent a diverse group of neoplasms occurring in the bony skeleton. These tumors have been reported to have different patterns of clinical presentation and aggressiveness, hence the worldwide variability in modes of surgical treatment.^[1-6]

The actual incidence of benign bone tumors is still shrouded in controversy; this is because many patients

are asymptomatic, and the tumors remain largely undetectable.^[7-11] Previous reports have revealed that some benign bone tumors [e.g., non-ossifying fibroma] have a high incidence in childhood, but are rare after skeletal maturity, suggesting that there must be some spontaneous resolution.^[12] The diagnoses of many non-aggressive tumors are made when radiographs are taken

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for other conditions, because tumors in the latent stage rarely require surgical treatment. Surgical consideration is important for confirmation of diagnosis [where this is doubtful], management of complications [e.g., pathological fractures, growth disturbances, restricted movement], and in the control of aggressive lesions.^[13,14]

Reports on the presentation and surgical treatment of benign bone tumors in the Black African patients are scanty. We carried out this study to highlight the mode of presentation, surgical options, and outcome of the treatment for benign bone tumors, in patients presenting at a tertiary musculoskeletal center.

Materials and Methods

A prospective study was performed in patients surgically managed for benign bone tumors, between January 2003 and July 2005, at the National Orthopedic Hospital, Lagos. All the procedures were performed by the same team of surgeons and informed consent was obtained from the patients before participation in the study. In each case, the neoplastic lesion was resected following the widely approved oncological principles. These entailed preoperative planning based on plain radiographs, in a majority of the patients. A wide resection with a fringe of normal tissue was obtained for all aggressive lesions.

Bio-data including age, sex, presenting complaint, anatomic location of the lesion, stage of disease, diagnosis, and surgical options were recorded on a proforma. The follow-up period was calculated from the day of operation and the average follow-up period was 28.6 months.

Results

Patients

A total of 67 patients [mean age of 26.4 years] were treated for benign bone tumors, surgically [Figure 1]. There was a slight male preponderance with a male to female ratio of 1.6: 1.

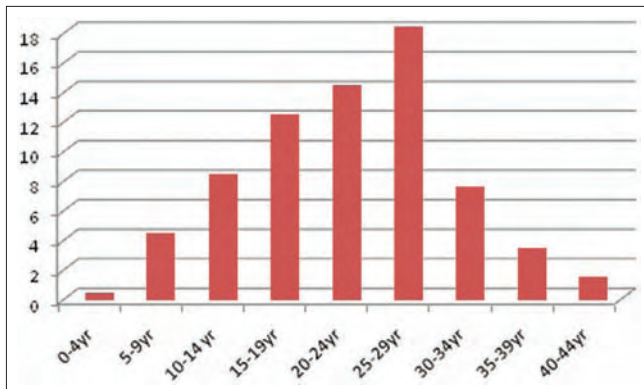


Figure 1: Age distribution

The common indications for surgery included, painful swelling [62.7%], cosmetic problems [16.4%], restricted movements [10.5%], nerve compression [6.0%], and pathological fractures [4.5%] [Figure 2].

Anatomic location

A large number of patients presented with tumors located around the knee joint, that is, distal femur [28.6%] and proximal tibia [20.6%]. A large percentage of the tumors occurred around the wrist joint [15.9%] and around the ankle [14.3%] [Figure 3].

Histological type

Osteochondroma was the histological diagnosis in 33 patients [49.2%], while giant cell tumor and simple bone cyst were the histological diagnoses in 28.4 and 7.0% of the patients. Benign bone tumors such as non-ossifying fibroma, aneurysmal bone cyst, enchondroma, benign fibrous histiocytoma, and chondromyxoid fibroma were also recorded in some patients [Figure 4].

Surgical options

One stage resection and reconstruction for aggressive tumors was undertaken in 17.9% of the patients [Figure 5]. However, for large and aggressive tumors amenable to limb salvage, the procedures were conducted in two stages. The resection of such a lesion was undertaken as the first stage of the procedure [Figure 6,7,8]. Next, stabilization using a compression plate and screw or an intramedullary nail was performed in 10.5%, as the second stage of surgery [Table 1].

Table 1: Surgical options

Stage 1 resection and reconstruction	12	17.9%
Stage 2 resection and reconstruction	7	10.5%
Resection or excision only	24	35.8%
Curretage and bone grafting	10	14.9%
Curretage and bone cement application	5	7.5%
Curretage, plates/screws fixation, and bone cement application	8	11.9%
Above-knee amputation	1	1.5%

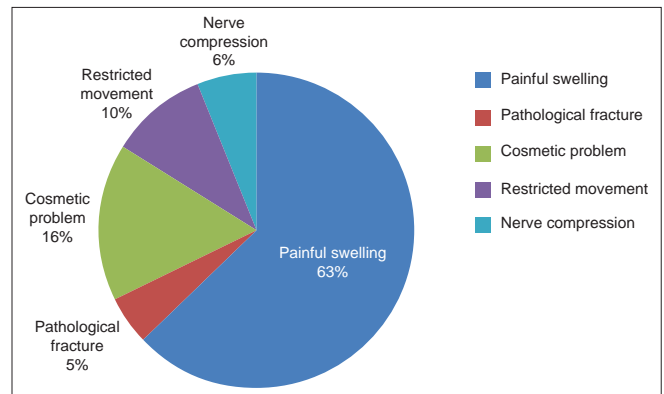


Figure 2: Common indications for surgery

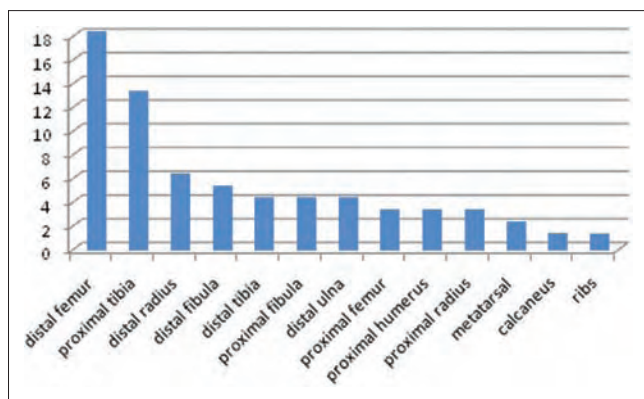


Figure 3: Anatomic location

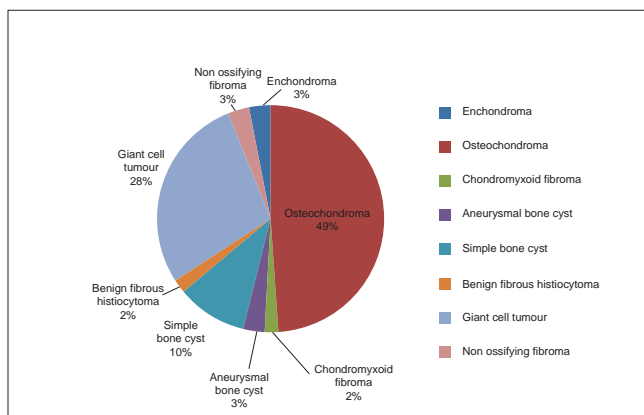


Figure 4: Histological types



Figure 5: Aneurysmal bone cysts proximal humerus. Pre- and postoperative radiographs



Figure 6: Huge aneurysmal bone cyst left tibia



Figure 7: Giant cell tumor of proximal radius

Surgical options in patients with active and moderate-size tumors [5-10 cm] included curettage or simple excision in conjunction with cancellous bone grafting or methylmethacrylate cement application. Limb salvage was impossible in one patient with a large aneurysmal bone cyst encasing the popliteal vessels and the tibia nerve [Figure 6]. This patient was offered an above-knee amputation.

Complications included significant limb length discrepancies

in 10.5%, deep postoperative infection in 4.5%, and nerve injury in 2.9%. There was recurrence in five patients, all with the diagnosis of giant cell tumor. This represented 27.8% of all recorded giant cell tumors.

Discussion

Benign bone tumors present as varied clinical and pathological entities, and the diagnoses can be a source of



Figure 8: Non-ossifying fibroma of femur, presenting with pathological fracture

great anxiety for the patients, relatives, and the attending physician.^[3,11,15,16] The age range for the patients in this study further confirms the belief that benign bone tumors are predominantly a disease of the younger population.^[8,10,11,16] The anatomic locations and the recorded diagnoses in these patients were similar to the previously reported patterns in medical literature.^[7-10,15] This study recorded many large benign bone tumors, suggesting a delay in presentation at the tertiary healthcare center. The illness behavior of population groups, poor socioeconomic condition, and inadequacy of the healthcare facilities have been adduced as reasons for treatment delays in patients with bone tumors.^[17,18] Further studies on the referral pattern for patients with bone tumors, and evaluation of reasons for delay in presentation at the tertiary musculoskeletal centers among Nigerian patients, will be necessary. Although previous workers have identified giant cell tumors in approximately 14-20% of the benign bone tumor series,^[8,9,10,19,20,21,22,23] this hospital-based study recorded a larger proportion of patients surgically treated for giant cell tumors. This apparent high incidence may be attributable to the compelling need to seek surgical intervention on account of the large size of giant cell tumors. Larger multicenter studies in the black African population may shed more light on the actual incidence of giant cell tumors and other bone tumors in this group of patients.

Most of the lesions requiring surgery were located in the long bones, that is, femur, tibia, radius, fibula, and humerus. The anatomic location and the tumor size posed serious challenges in treatment planning. Hence, various surgical options such as stage one or stage two resection and reconstruction were adopted.

The single stage resection and reconstruction entails complete resection of the tumor with a 2.5 cm margin, free fibula grafting, and fixation with plate and screws at the same sitting. Where the tumor margin is extensive, the operations are conducted in two stages, in order to reduce

intraoperative blood loss and to achieve a good resection margin. Cancellous bone grafting after curettage is also a common procedure. This procedure is offered to patients with small-sized giant cell tumors and bone cysts.

The use of bone cement in conjunction with plate and screws was offered to patients with a significant bone defect, after a wide resection. Capanna *et al.*, and Trieb *et al.*, had previously reported reduction in recurrence rate following a wide resection, for giant cell tumor.^[24,25] There was no major complication directly related to the use of bone cement in patients recorded in this study. Carmargo *et al.*, reported no significant deleterious effects with cement usage in aggressive benign tumors after a long-term follow-up.^[15] The average cost of a pack of methylmetacrylate cement was 100 USD, which was expensive for many patients in this series. Controversy still rages on about the management of large aneurysmal bone cysts. Aneurysmal bone cysts are mysterious in their clinical characteristics and pathomorphology. Several theories, including that of secondary hemorrhagic events in pre-existing neoplasms have been adduced. The management of this condition is also fraught with great challenges, both in diagnosis and surgical treatment. Recurrence rate as high as 20% has been reported from various centers.^[26-28]

This study reported an above-knee amputation in a young patient with a huge aneurysmal bone cyst of the proximal tibia. This was performed after proper evaluation of the available facilities for reduction of intraoperative blood loss and the extent of postoperative morbidity. This may well mean that amputation may be the last resort in circumstances where endoprosthetic reconstruction is not affordable. Recurrence occurred in five patients with giant cell tumor; this further confirmed the propensity for recurrence of giant cell tumor of bone after surgical resection.^[20,21,24,25]

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