ABSTRACT

Objectives: To evaluate the long-term clinical and radiological results from patients who underwent surgical treatment of chondroblastoma, between 2003 and 2009, by the same surgical team, using the same operative technique. Methods: A retrospective study was conducted on 12 patients with histological diagnoses of chondroblastoma, who were attended between 2003 and 2009 at the Pius XII Foundation (Barretos Cancer Hospital, Barretos, State of São Paulo). These patients underwent surgical treatment with intralesional resection of the tumor, adjuvant electrocauterization and replacement with methyl methacrylate (11 cases) or an autologous graft from the iliac crest (one case). The preoperative evaluation included physical examination, plain radiographs of the site, magnetic resonance imaging, computed axial tomography and bone scintigraphy. The patients were assessed clinically and radiologically according to a predefined protocol, with a series of plain radiographs, and a functional assessment in accordance with the Enneking functional score. Results: The average age at the time of diagnosis was 14 years and 4 months. The most frequent location affected was the distal femoral epiphysis (75%), followed by the proximal tibial epiphysis (16.6%) and the calcaneus (8.4%). There was higher prevalence among the female patients than among the male patients (3:1). In three cases, preoperative biopsy was necessary. During the follow-up, there was no evidence of local tumor recurrence, and all the patients presented an excellent functional result from the surgical technique used, with Enneking scores ranging from 20 to 30. Conclusion: Surgical treatment of chondroblastoma, using intralesional resection, adjuvant electrocauterization and replacement with methyl methacrylate or bone graft produced good results.

Keywords — Chondroblastoma; Neoplasms; Retrospective Studies

INTRODUCTION

Bone chondroblastoma is an infrequent benign lesion with a potential for aggressiveness through local growth. It corresponds to 1-2% of cases of primary neoplasia and 9% of all benign bone tumors\(^1\,2\).

Neoplastic transformation of cells from the epiphysis or from secondary ossification centers is considered to be the histogenetic origin of these lesions. Like giant cell bone tumors, chondroblastomas have a predilection for the epiphysis and apophysis of long tubular bones. They are much less frequent in the small bones of the hand or foot, or in the pelvis. Their peak incidence is in the second decade of life, in contrast with giant cell tumors, which only exceptionally affect children and adolescents\(^3\,4\).

Malignant transformation of chondroblastomas has been described\(^5\,9\).
The differential diagnosis for chondroblastomas includes giant cell tumors, chondromyxoid fibroma, aneurysmatic bone cysts and clear cell chondrosarcoma\(^{(10)}\). The radiological appearance consists of an eccentric lesion on long bones, sometimes totally radiolucent and sometimes trabeculated, with areas of calcification. The margins are almost always well delimited and clear, with sclerotic rims. The growth plate is still open in the great majority of cases\(^{(10)}\).

The treatment of choice is surgical, which requires special care and may be complicated because of the proximity of the joint and the close relationship with the growth plate. The postsurgical recurrence rate is between 8 and 35% and is also influenced by the biological activity of the lesion\(^{(4,11-14)}\).

In very rare cases, metastases can occur, mainly in the lungs. In extremely rare cases, these metastases may cause death\(^{(15)}\).

The aim of this study was to gather together the long-term results from patients who underwent surgical treatment for chondroblastoma, between 2003 and 2009, by the same surgical team and using the same operative technique.

**METHODS**

In this study, 12 patients with histological diagnoses of chondroblastoma who were attended at Barretos Cancer Hospital, Pius XII Foundation, Barretos, SP, between 2003 and 2009, were evaluated.

The patients were studied retrospectively. The preoperative analysis consisted of a physical examination, simple radiography (Figure 1), bone scintigraphy and local computed tomography or magnetic resonance imaging (Figure 2). Three patients underwent preoperative biopsy.

The biological activity was indicated by the meaning of the clinical and radiological stage of the benign tumors, in accordance with the Enneking classification\(^{(15)}\).

The patients underwent surgical treatment of the chondroblastoma, which involved intralesional resection of the tumor, curettage, electrocauterization and volume replacement (Figure 3). In 11 cases, the lesions were replaced by methyl methacrylate and in one case, by an autologous bone graft from the iliac crest.

Simple radiographs were obtained during the immediate postoperative period (Figure 4) and every six months thereafter over the first two years. After this time, the radiological control became yearly. In cases of irregularities seen on the radiographs, magnetic resonance imaging was requested to complement the diagnosis.

The functional assessment on the patients after the operation was based on the MSTS Enneking score\(^{(16)}\).

The following data on the patients is presented in Table 1: location, age, sex, length of time with symptoms, Enneking classification, growth plate open or closed, surgical treatment, Enneking functional assessment and results later on (Table 1).
RESULTS

All the patients included in the study were followed up for a minimum of one year. Their mean age was 14 years and 4 months (range: 12 years and 2 months to 17 years and 2 months). The incidence among males, in relation to females, was 3:1, and 100% of the lesions were diagnosed during the second decade of life. The most frequent location was the epiphysis of the distal femur (75%), followed by the epiphysis of the proximal tibia (16.6%) and one case on the calcaneus (8.4%).

Regarding the clinical and radiological stages, 75% of the cases were in stage B2 (active benign) and 25% were in stage B3 (aggressive benign).

Bone scintigraphy was performed on all patients and showed a monostotic lesion, with low uptake of the radiopharmaceutical in the bone involved. None of the patients presented local recurrence with the surgical technique used, and the volume replacement was achieved using methyl methacrylate or an autologous bone graft from the iliac crest.

During the follow-up period, none of the skeletally immature cases presented premature closure of the growth plate or angular deviation of the affected limb.

In 25% of the cases, there was an association with fibrous cortical bone defects, shown by the simple radiographs obtained during the preoperative assessment.

In all the cases involved in this study, the evaluation using the Enneking functional score attained between 20 and 30 points (excellent) (Table 1).

DISCUSSION

Chondroblastomas are rare benign tumors and there are only a few published retrospective studies in the literature. The present study demonstrates the experience of a single service during the clinical and radiological follow-up after surgical treatment of chondroblastoma.

Table 1 – Data on the patients involved in this study.

| Patient | Site           | Age/sex | Symptoms    | Activity | Treatment            | MSTS-Enneking | Postoperative |
|---------|----------------|---------|-------------|----------|-----------------------|---------------|--------------|
| 1       | Calcaneus      | 13y/F   | Pain/edema  | B3**     | Curettage/graft       | Excellent     | Consolidation|
| 2       | Distal femur   | 17y/M   | Pain/edema  | B2       | Curettage/cement      | Excellent     | No recurrence|
| 3*      | Distal femur   | 12y/M   | Pain/edema  | B2       | Curettage/cement      | Excellent     | No recurrence|
| 4       | Distal femur   | 16y/M   | Pain        | B2       | Curettage/cement      | Excellent     | No recurrence|
| 5       | Distal femur   | 13y/M   | Pain        | B2       | Curettage/cement      | Excellent     | No recurrence|
| 6*      | Distal femur   | 14y/M   | Pain        | B2       | Curettage/cement      | Excellent     | No recurrence|
| 7       | Distal femur   | 16y/M   | Pain        | B2       | Curettage/cement      | Excellent     | No recurrence|
| 8       | Distal femur   | 13y/F   | Pain        | B3**     | Curettage/cement      | Excellent     | No recurrence|
| 9       | Proximal tibia | 12y/F   | Pain        | B2       | Curettage/cement      | Excellent     | No recurrence|
| 10      | Proximal tibia | 16y/M   | Pain        | B2**     | Curettage/cement      | Excellent     | No recurrence|
| 11*     | Distal femur   | 14y/M   | Pain        | B3       | Curettage/cement      | Excellent     | No recurrence|
| 12      | Distal femur   | 12y/M   | Pain        | B2       | Curettage/cement      | Excellent     | No recurrence|

* Patients with an association between chondroblastoma and fibrous cortical bone defect.
** Patients who underwent prior biopsy.
In all of our cases, the age at which the tumor affected the patient was in the second decade of life, and there was a predilection for occurrences among males. These findings were similar to the data in the literature (17-19). Chondroblastomas can occur in any bone with endochondral ossification (11). Most studies have indicated that the most frequent sites are the proximal epiphysis of the bones and joints of the musculoskeletal system. Clin Orthop Relat Res. 1993; (286):241-6.

The typical location and the radiological appearance of the biological activity of the lesion are important in determining the differential diagnoses of the lesion (1). The cystic lesions, which were well defined and presented sclerotic rims, were subjected to resection without previous biopsies. The lesions with a radiological appearance of biological activity outside of the patterns described above were subjected to prior biopsy (three cases), given that malignant tumors such as low-grade osteosarcoma and chondrosarcoma have been described at these sites, albeit rarely (11).

The most frequent symptom presented by the patients was joint pain, followed by joint effusion. The mean duration of symptoms was 35 months (range: 3-90 months), and the patients were mainly referred for evaluation of osteolytic lesions, presenting fibrous cortical bone defect, which culminated in delayed diagnosis. The frequency of growth disorders has been reported to be 7-50% (15,21). During our follow-up, we did not observe any growth disorders and/or angular deviations in the limbs.

The local recurrence rate reported in the literature is between 8 and 35%. In our cases, using intralesional resection followed by adjuvant treatment with electrocauterization and replacement with methyl methacrylate (11 cases) or autologous bone graft from the iliac crest (one case), we did not observe any clinical or radiological signs of local recurrence during the follow-up.

CONCLUSION

Surgical treatment of chondroblastoma, with intralesional resection, adjutant treatment using electrocauterization and replacement with methyl methacrylate or autologous bone graft from the iliac crest, is a safe method that produces good long-term functional results and presents a low rate of local recurrence.

We draw attention to the possibility of an association between chondroblastoma and fibrous cortical bone defect, which in some cases may lead to delayed diagnosis.

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