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ORIGINAL ARTICLE

Local recurrence after curettage treatment of giant cell tumors in peripheral bones: Retrospective study by the GSF-GETO (French Sarcoma and Bone Tumor Study Groups)

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KEYWORDS
Giant cell tumor;
Benign bone tumor;
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Summary
Background: Curettage is a well-established treatment modality for giant cell tumors of bone. The purpose of this retrospective study by the French Sarcoma and Bone Tumor Study Groups (GSF-GETO) was to analyze various tumor-specific and surgery-specific factors that could influence the rate of local recurrence.
Patients and method: Data was collected from patients with giant cells tumors of the appendicular skeletal who were treated by intralesional curettage. The hazard ratio for tumor recurrence was calculated for the different variables collected and a multifactorial analysis carried out.
Results: One hundred and ninety-three surgical procedures were included from nine centers. One hundred and seventy-one (89%) were primary tumors and 22 had been referred after one or more recurrences. The mean follow-up was 6 years and 11 months. The distal femur and proximal tibia were the most common locations: 42.5 and 34.2% of cases, respectively. The bone defect after curettage was filled in 176 cases (91.2%) and left empty in 16 cases. Local adjuvant treatment (phenol, alcohol, cryotherapy or combination treatment) was used in 39 cases (20.2%) and systemic adjuvant treatment used in 24 cases (calcitonin 11 and zoledronic

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acid 13). Local recurrence occurred in 71 cases (36.8%). Risk factors for local recurrence were an empty defect, a defect filled with autograft, and patients treated before 2005. Multivariate analysis showed that the only risk factors for local recurrence were a surgical procedure before 2005 (odds ratio 3.6 (95% CI: 1.2, 7.9) $P = 0.017$) and a bone defect filled with autograft (odds ratio 3.9 [95% CI: 1.3, 11.6] $P = 0.013$)

Conclusion: Neither tumor-specific nor surgery-specific factors such as adjuvant treatment were found to be as risk factors for local recurrence after curettage of giant cell tumors in the appendicular skeleton. As recently reported, high-quality local curettage is probably the most effective technique to prevent local recurrence. The current study suggests that two factors associated with more recent management of these tumors in France, high-speed burring and centralization to skilled surgical teams, can improve the quality of curettage.

Level of evidence: 4, retrospective cohort study.

Introduction

Giant cell tumors in bone make up 5% of all primary bone tumors. Their location, progression and osteolytic nature quickly lead to a disabling functional impact, especially since younger patients are typically affected.

Intralesional curettage is the preferred treatment to maintain function [1], but it has a high risk of local recurrence (12.5 to 45%) [2—6]. For this reason, many local adjuvant treatments have been used, including phenol [2,4,6—8], alcohol [4,9] and cryotherapy [6,10—12]; however, their effectiveness is debatable. Similarly, filling of the curettage defect with polymethylmetacrylate cement is favored by many surgeons as a way to limit local recurrence, but this stated benefit is also debated [13]. More recently, results of treatment with systemic anti-osteoclastic agents have been published [14] or are being evaluated [15—17].

Because of the wide range of practices, a study was initiated with the GSF-GETO (French Sarcoma Group and French Bone Tumor Study Group). The goal of this study was to evaluate various tumor-specific and surgery-specific factors and identify which ones have an effect on local recurrence after treatment by curettage of giant cell tumors of the appendicular skeleton.

Materials and patients

This was a retrospective, multicenter study within GSF-GETO surgical teams. Cases were included if surgical treatment by curettage had been performed on a giant cell tumor of bone confirmed histologically, either as a primary treatment or upon recurrence when the patient had been referred after a single or multiple local procedures. This analysis only comprised the first procedure performed by the team; if a recurrence was treated by the same team, only the first procedure was taken into consideration. Resections were excluded.

Tumors located in the axial skeleton (spine, sacrum, pelvis) were excluded. The primary outcome was the occurrence of a recurrence confirmed by histology. The follow-up was calculated relative to the surgical procedure at inclusion on the primary tumor or on the recurrence if the patient had been referred.

Tumor-specific variables

The patient's epidemiological data, primary or recurrent nature of the tumor and location on the appendicular skeleton were recorded. Tumor locations with less than 10 cases were grouped together for the statistical analysis. The size of the tumor was recorded relative to the width of the bone on an A/P X-ray view (± 0.5 bone width at the level of the largest diameter).

Surgery-specific variables

The participating center where the patient had been treated and the surgeon's experience (Junior, Senior) were noted. All patients were treated by curettage (inclusion criterion). The use of a local chemical adjuvant treatment was determined based on the surgery report. If the defect left by curettage was subsequently filled, the type of material was recorded: polymethylmetacrylate (PMMA) cement, autograft, allograft (chips or structural) or bone substitute. In some cases, multiple materials were used to fill the defect, but an insufficient number of cases existed to perform a statistical analysis for each grouping. As a consequence, if cement was used, the case was considered a PMMA treatment; if an autograft or an allograft bone substitute was used, the case was considered an allograft chip treatment. And finally, some patients were treated with a systemic adjuvant.

Statistical analysis

Categorical and ordinal data were described by the frequency of observations. The mean and standard deviation were calculated for the age and follow-up data. Student's *t*-test was used to compare quantitative variables and the Chi^2 test used with qualitative variables. If a variable revealed a significant risk ($P < 0.1$), a stepwise multivariate regression analysis was performed. A 0.05 threshold was used for significant findings and the odds ratio was calculated. All of the statistical tests were performed on IBM SPSS Statistics 19 software.