sciendo Romanian Journal of Orthopaedic Surgery and Traumatology, Volume 2, Issue 1, January-June 2019. pp:18-22
doi:10.2478/rojost-2019-0004

CASE REPORT

GCT of knee treated with modular prosthesis-case presentation

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Abstract

The GCT is an aggressive benign tumor with metastatic potential, most often within the lungs in 2-3% of the patients. It makes about 5% of total bone tumors and about 15% of total benign bone tumors.

The maximum incidence occurs between 30 and 40 years old, most frequently affecting the long bones epiphysis (distal femur, proximal tibia, and distal radius).

We report the case of a 50-year-old female, with no previous medical history, admitted in the emergency department (ED) for significant pain and functional impairment of the left knee. Clinical examination and imaging tests established the diagnosis of distal femoral tumor.

The patient underwent surgical segmental resection of the tumor within oncological limits and subsequent arthroplasty with cemented modular tumoral prosthesis was performed.

Even if the GCT is a benign tumor, it has an aggressive behavior and malignancy potential with an important impact on quality of life. Due to localization, this type of tumor can quickly manifest clinically, which allows an early diagnosis and a less invasive surgical technique.

Keywords: GCT, resection, tumoral prosthesis, aseptic loosening

Introduction

The GCT has a long history, being described for the first time by Cooper in 1818 [1]. Then Nelaton and Virchow researched its aggressiveness and malignancy rates [3,4]. However, it was only in 1940 that it was established as an individual entity, with a differential diagnosis as compared to aneurismal bone cyst, chondroblastoma, and non-ossifying fibroma [5].

The GCT is an aggressive benign tumor with metastatic potential, most often within the lungs in 2-3% of the patients [6]. It makes about 5% of total bone tumors and about 15% of total benign bone tumors [2].

The maximum incidence occurs between 30 and 40 years old, most frequently affecting the long bones epiphysis (distal femur, proximal tibia, and distal radius).

Case report

We report the case of a 50-year-old female, with no previous medical history, admitted in the emergency department (ED) for significant

pain and functional impairment of the left knee. Clinical examination and imaging tests established the diagnosis of distal femoral tumor (Fig. 1).

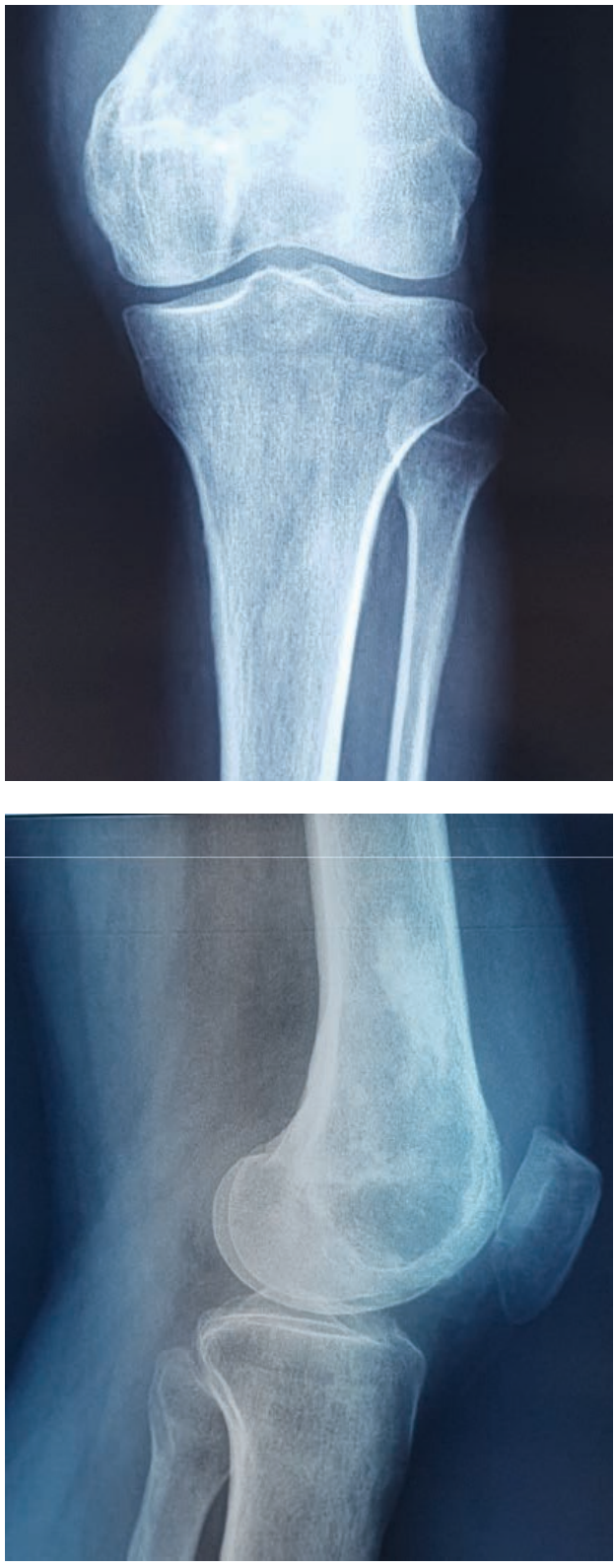

Fig. 1 Preoperatively X-ray view AP, LL aspects

A biopsy was performed, which confirmed the diagnosis of GCT stage IV Enneking. The immunohistochemistry test revealed nuclear proliferative index (Ki-67) 65% (Fig. 2).

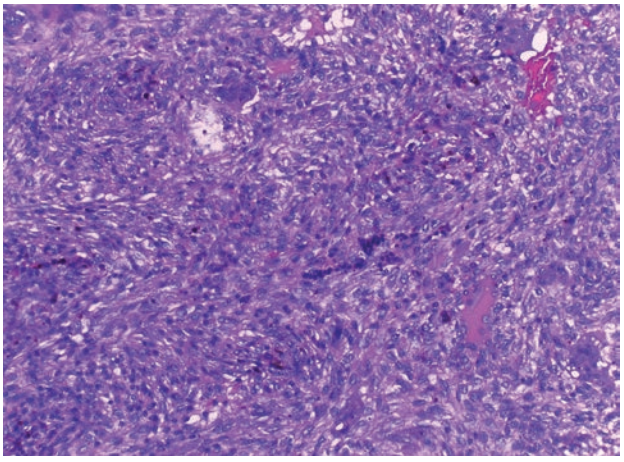

Fig. 2 High power magnification showed mild atypia of the mononuclear cells, some mitotic figures, hemosiderin deposition and a focal lymphocytic inflammatory aggregate

The patient underwent surgical segmental resection of the tumor within oncological limits and subsequent arthroplasty with cemented modular tumoral prosthesis was performed (Fig. 3).

Fig. 3 Postoperatively X-ray view AP, LL aspects

Postoperative evolution was uneventful until three months later when the patient presented to the ED for pain and limited range of motion on the left knee. An X-ray exam was performed revealing a periarticular soft tissue calcification and a surgical debridement was performed with postoperatively early passive range of motion.

At three years postoperatively, the patient was admitted to our ED with pain in the left knee (Fig. 4). Imaging and lab tests were performed which revealed aseptic loosening of femoral stem and a femoral stem revision surgery was also performed (Fig. 5).

Discussion

Though the GCT is considered a benign tumor, due to the malignancy risk and high relapse potential, it can be considered a borderline tumor. Taking into account the high incidence in young patients, the treatment will be curative and must ensure functional results.

Fig. 4 Preoperatively X-ray AP view

Fig. 5 Postoperatively X-ray AP view

One of the most frequent classifications is the Ennecking classification, which takes into consideration radiology aspects, as well as histopathology aspects. According to this classification, the staging of the GCT is the following:

Stage I: Latent tumor

– confined totally by bone, asymptomatic, inactive on bone scan, histologically benign;

Stage II: Active tumor

– expanded cortex without breakthrough, symptomatic, pathological fracture possible, active on bone scan, histologically benign;

Stage III: Aggressive tumor

– cortical perforation with soft tissue mass, may metastasize, intense activity on bone scan, histologically benign;

Stage IV: Sarcomatous lesions [7].

Fletcher described sarcomatous degeneration of the GCT [8] as having a 1% incidence in the cases of patients who

undertook radiotherapy.

The surgical treatment of the GCT must be thoroughly adapted to the Ennecking classification due to local relapse potential.

Dahlin et al. [9] reported in their studies a 60% recurrence rate in patients treated by curettage and bone graft, recommending a more invasive local approach. Instead, using cement filling and cauterizing the cavity shows an important drop in recurrence rate [10], of up to 50%.

The occurrence of pathological bone fractures secondary to the GCT can be encountered in approximately 20-30% of the cases [11] and can be associated with an inferior functional result and with high risk of local relapse [12].

Other prognosis factors to consider in evaluating a GCT are the distance to the articular surface and the size of the tumor. Surgical indications must be adjusted considering these parameters, as Chen et al. described a 40% incidence of complications in patients treated by curettage and filling, if the subchondral bone was affected [13].

In this context, Ward and Li recommend a wide resection and reconstruction of the knee articulation when more than 50% of articular surface is affected [14].

Reconstruction with tumor prosthesis is a viable therapeutic option in periarticular tumors as it ensures good functional results [15]. The tumor prosthesis can be cemented or uncemented. In the case of the cemented ones, complications may occur, such as aseptic loosening, mechanical breakage, infections, at a higher rate than in the case of uncemented ones [16].

One of the rare but highly impactful complications in uncemented prosthesis patients is metallosis, which consists in the spreading of metallic debris within the adjacent soft tissue [17]. Metallosis may generate pain and functional impotence, affecting the patients' quality of life, requiring, in some cases, revision of prosthetic components. A metallosis diagnosis can occur in the presence of the following radiological aspects:

1. periprosthetic soft tissue amorphous densities, referred as "cloud sign"
2. the "metal-line sign", a thin rim of linear increased density in the suprapatellar pouch region
3. the "bubble sign" a curvilinear radiodensity that outlines the joint space [18].

Conclusions

Even if the GCT is a benign tumor, it has an aggressive behavior and malignancy potential with an important impact on quality of life. Due to the localization, this type of tumor can quickly manifest clinically, which allows early diagnosis and a less invasive surgical technique. Resection and reconstruction technique with modular prosthesis is a viable option for patients but also this type of surgery can lead to early complication like periarticular soft tissue calcification and aseptic loosening of the stem.

Conflict of Interest statements

Authors state no conflict of interest.

Informed Consent and Human and Animal Rights statements

Informed consent has been obtained from all individuals included in this study.

Authorization for the use of human subjects

Ethical approval: The research related to human use complies with all the relevant national regulations, institutional policies, is in accordance with the tenets of the Helsinki Declaration, and has been approved by the authors' institutional review board or equivalent commite

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