

Local Recurrences of Giant Cell Tumor of Bones after Extended Surgical Curettage – A Retrospective Cohort Study

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Abstract

Introduction: Giant cell tumor of bone (GCTB) is a locally aggressive tumor well known for recurrence after surgical treatment. Local recurrence rate ranged from 10 to 25%. The objectives of this study are to find out the incidence of recurrence in GCT after extended surgical curettage, factors affecting recurrence, and also to find the best modality of treatment available for the recurred GCT.

Materials and Methods: It was a retrospective cohort study of 225 patients diagnosed and treated by extended surgical curettage in the Orthopaedic Department of a Tertiary Care Hospital in South India, between January 2003 and December 2017. Patients were followed up clinically and radiologically for diagnosis of recurrence. Factors affecting the recurrence were analyzed. These recurrent cases were further followed up. IBM SPSS v23 was used for data analysis such as age, gender, site of lesion and side, and material used to fill the defect after curettage. Descriptive statistics was elaborated in the form of means and standard deviations for continuous variables and frequencies and percentages for categorical variables. Fisher's exact test is used for comparison.

Results: Recurrence was found in 27 patients of 225 cases of GCTB treated by extended surgical curettage. These include 9 of 135 cases initially treated by extended curettage and bone cement and 18 of 88 cases initially treated by curettage and bone graft. Recurrence was found to be more common in males than females.

Conclusions: Local recurrence is significantly lower in patients treated by cementation following extended surgical curettage than bone graft which makes bone cement as a better filling material with regard to recurrence.

Keywords: Giant cell tumor, Curettage, Bone cement, Bone graft, South India.

Introduction

Giant cell tumor of bone (GCTB) was classified by the World Health Organization under osteoclastic giant cell-rich tumors of intermediate nature, which is locally aggressive and is rarely metastasizing [1]. GCTs form 20% of benign bone tumors and 5% of all primary bone tumors [2, 3]. Higher incidence is noted in Asians compared to the Western population [2]. High incidence of GCT was reported from South India [4, 5, 6]. GCT has been well known for recurrence after surgical treatment. Historically local recurrence rate ranged from 6 to 25% [2, 3, 7, 8]. Predictors for recurrence are not well defined. Histological grading does not help in predicting aggressiveness, hence, the chance of recurrence. Extend of soft tissue

involvement had found to have a correlation with the chance of recurrence [9, 10]. Reports suggest an improvement in the local control rate of these tumors with extended curettage techniques [11, 12, 13]. The principles of management remain the same even in recurrent tumors [14, 15].

This study focuses on finding the incidence of local recurrences of GCT in our institute in the past 17 years. In addition, the study also focuses on finding the best modality of treatment for GCTB in view of recurrence.

Materials and Methods

Retrospective cohort study was conducted in patients who attended the tumor clinic in our hospital between January 2003 and December 2017. All patients diagnosed and

treated as GCT by the Orthopedic Oncologist in our hospital and all patients diagnosed and treated by surgical curettage from outside, who attends our hospital's orthopedic oncology OP for further follow-up and treatment (n = 9) were included in the study. All patients who were lost for follow-up, all cases in which resection is used as the primary treatment modality, and cases of primary malignant GCT are excluded from the study.

From the records, 298 patients with GCTB were identified and followed up. In our institution, decision regarding surgical treatment is taken according to the computed tomography (CT)-based classification proposed by Puthoor and Puthiezath [16]. The patients in Classes I and II were selected for curettage and bone grafting. Patients with Class III lesions were treated by wide resection and reconstruction. Of 298 cases, 72 cases belonged to Class III for whom we did resection. They were excluded from the study. One case of primary malignant GCT was also excluded. Rest of the 225

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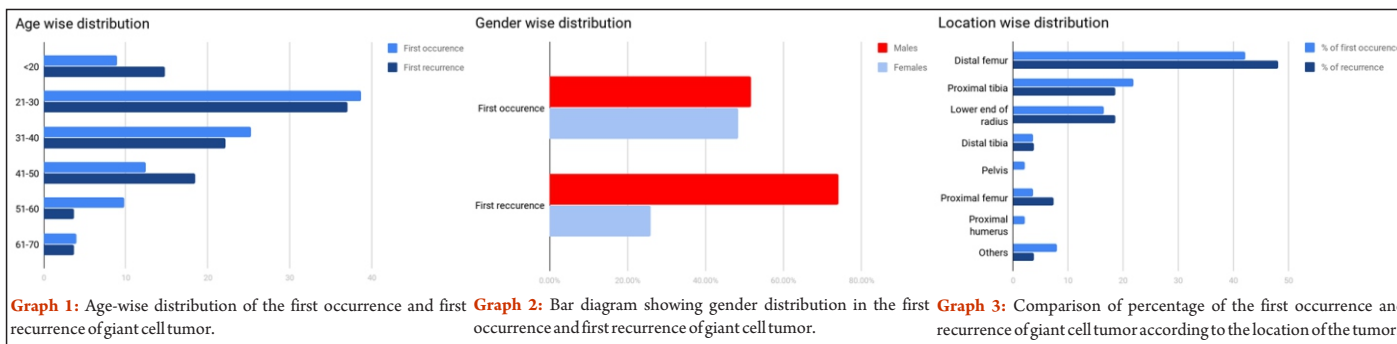
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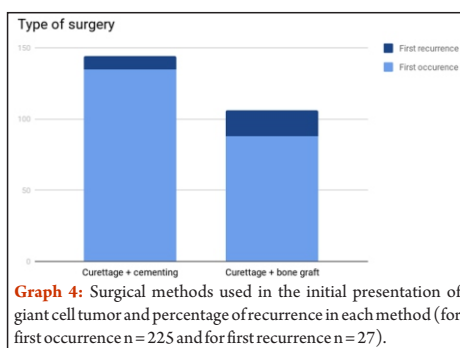
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Graph 1: Age-wise distribution of the first occurrence and first recurrence of giant cell tumor.

Graph 2: Bar diagram showing gender distribution in the first occurrence and first recurrence of giant cell tumor.

Graph 3: Comparison of percentage of the first occurrence and recurrence of giant cell tumor according to the location of the tumor.



Graph 4: Surgical methods used in the initial presentation of giant cell tumor and percentage of recurrence in each method (for first occurrence n = 225 and for first recurrence n = 27).

cases which fell to either Class II or Class I that were treated by extended surgical curettage during the study period is included in this study.

Method of extended curettage is as per guidelines proposed by Puthoor and Puthezhath [16] and Puthoor and Iype [17]. Lesion is approached through the area of cortical break followed by removal of soft tissue component en mass. After thorough curettage, we use electrocautery in spray mode. Then, we use 100% phenol to cauterize the raw bone so to char the surface. (Chemical cautery with 100% phenol is avoided in cases with multiple cortical breaks, as it may damage soft tissues). Excess phenol is then wiped off. The surface is further wiped with alcohol followed by hydrogen peroxide. We do not regularly use dental burr.

After extended curettage, in 135 cases, the defect was filled with bone cement. While in 88 cases, the defect was filled with bone graft. These include 18 cases where the lesion was confined to lateral condyle of femur which was treated with reverse fibular graft [18]. Two cases were treated by Sandwich technique which uses both cement and graft.

Diagnosing recurrence

We make a diagnosis of recurrence if only one of the three criteria is fulfilled.

1. Pain or swelling appearing in a previously asymptomatic operated area with local signs of inflammation and X-rays showing

radiolucency adjacent or within grafted area

2. Consecutive X-ray showing definite increase in the lytic area

3. CT-guided trucut biopsy showing recurrent lesion.

Suspicious lytic area in the X-ray or CT/magnetic resonance imaging (MRI) report of recurrence without clinical signs was not taken as recurrence (Fig. 1).

Following the above-mentioned criteria, we had 27 cases of recurrent GCT. Of 27 cases that recurred, 19 cases were treated by curettage and 8 cases were treated by resection.

Observations and Results

Of the 225 patients with GCTB treated by curettage and that were included in our study, the following observations were made. The primary lesion mostly occurred in 20–40 years of life. Incidence gradually decreases in the later decades of life. The mean age is 34.9 ± 13.09 years. Mean age of recurrent cases was found to be 32.5 ± 12.41 years. This indicates that chances of recurrence are more in younger patients (Graph 1).

Regarding gender, there is almost equal distribution in the primary cases we studied. However, in recurrent group, there is a marked male predominance (Graph 2). Regarding site, both initial and recurrent group have almost the same distribution except lower radius which has a relatively higher incidence (Graph 3).

A most significant finding in this study is the difference in recurrence with regard to the use of filling material. Of 132 cases treated by extended curettage and bone cementing, 9 cases recurred, i.e., 6% recurrence. Of 82 cases treated with extended curettage and bone graft, 18 cases recurred, i.e., 21% recurrences (Graph 4). Fisher's exact test ($P = 0.007$), the difference is statistically significant. Mean period of recurrence after the index surgery is 14.9 ± 8.49 months.

Second recurrence

Of the 27 cases that underwent surgery for recurrence from our institution, 5 patients presented with further recurrence. This includes 3 cases that had extended curettage as second surgery (Fig. 2) and 2 cases that had resection as second surgery. The values were compared using Fisher's exact test and P value was found to be 0.574 which is not statistically significant. The mean period to second recurrence was 16.2 ± 7.56 months.

Malignant transformation and pulmonary metastasis

Of 5 cases that recurred for the 2nd time, 2 cases showed malignant transformation on histopathology. Of this, one was a case treated with curettage and other with resection, following second recurrence. There were 2 cases of pulmonary metastasis in our series. Both of them were cases that recurred after curettage. Of that one case was initially treated from outside with curettage and subsequently underwent amputation from our institution, due to extensive soft tissue involvement beyond limb salvage. Second recurrent case was treated with resection and mega prosthetic replacement. Both cases subsequently developed multiple pulmonary metastases involving both lung fields and died 2 years and 5 years, respectively, after second surgery.

Discussion

We analyzed the hospital records to find the number of bone tumor cases surgically treated by the first author since 1988. It was found that GCTB far outnumber other tumors [16, 17, 18, 19]. This indicates a high prevalence of this tumor in the central part of Kerala, one of the five South Indian states.

Wide resection of the tumor-bearing bone is the best way to avoid recurrence in GCTB [20, 21]. In our series, 72 cases that belong to Class III [16], which was treated initially with

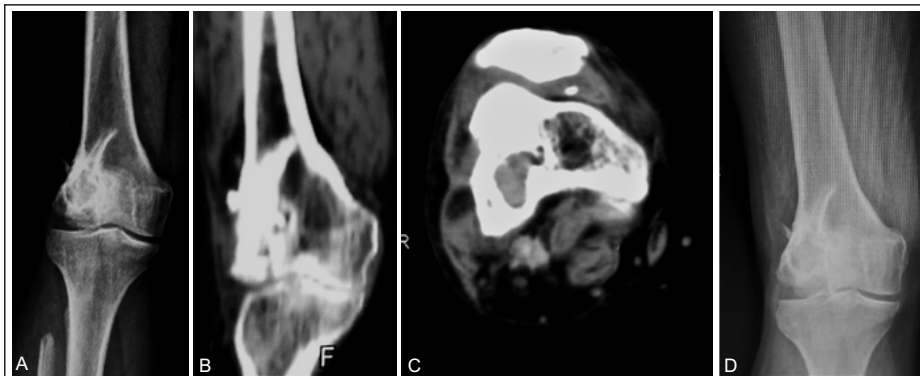


Figure 1: A 59-year-old male who underwent extended curettage and reconstruction with reverse fibular graft in 2012 for giant cell tumor (GCT) of lateral femoral condyle, presented with a computed tomography (CT) report of GCT recurrence in 2014 (CT done from another hospital) (a-c). Since clinical features were not suggestive of a recurrent lesion, we decided to observe. Even 5 years of observation, the lesion is radiologically stable and the patient is asymptomatic (d).

wide resection, only one case of lesion upper fibula, there was recurrence. Still wide resection is not accepted as a routine treatment of this condition [22]. Extended curettage is a well-accepted method in the treatment of GCTB, though all studies show recurrence of varying percentage [12, 13, 23]. In our study, of the 225 cases that were treated by extended curettage and followed up, 27 patients presented with recurrence. The rate of recurrence is 12%. As we have included 9 cases of GCT treated from outside,

recurrence rate in cases where the index surgery done from our institution will come down to 8.3%. Although there are reports of less number of recurrences in isolated studies, most studies show higher rates of recurrence. Relatively, low rate of recurrence in our series is attributable to the

1. Selection of cases for curettage as per the guidelines followed by Puthoor and Puthezhath and the method of extended curettage described by the same authors. Most of the other studies depend

Campanacci grading, for selection of cases for curettage, though the percentage of cases treated by curettage is similar to our study which is 75.5%

2. Use of 100% phenol to extend the curettage [16, 17]

3. Diagnosis of recurrence is done on clinical signs, symptoms, and serial radiographic evaluation rather than on a single image investigation. We had patients who came to our outpatient department with CT/MRI report of GCT recurrence but with no complaints of pain, swelling, or loss of function. With serial radiographs, there was no progressive area of radiolucency. On follow-up for more than 7 years, this patient has no complaints related to the operated area (Fig. 1). In our study, there is a marked difference in the percentage of recurrence with respect to the material used to fill the defect. Of 132 cases treated by bone cement, 9 cases recurred– 6% recurrence. Out of 82 cases treated bone graft, 18 cases recurred– 21% recurrence.

Using Fisher's exact test, the difference was found to be statistically significant ($P = 0.007$).

Sex of the patient was found to affect the chance recurrence as per our study. Recurrence is found to be more in male patients.

Second recurrence

Time of further recurrence after second surgery is not faster than first recurrence. This indicates, on recurrence, that GCTB does not become more aggressive (Fig. 2). In recurred cases, even with wide resection, further recurrences do occur, unlike the cases treated primarily by wide excision.

Literature shows the rate of malignant transformation in GCT to be <1% [24, 25, 26]. The incidence of malignant transformation in our study is 0.9% (2 of 225 cases). However, the incidence of benign GCT with pulmonary metastases in our study was 0.9% (2 of 225 cases), which is less than the incidence in the available literature, i.e., 2–3% [27, 28].

Conclusions

1. There is a high prevalence of GCTB in Kerala, South India
2. In this study, recurrence rate in GCT after extended curettage is 12%, with a mean period of 15 months
3. Although there was no sex predilection for primary cases of GCT, there was significant male predilection in the recurred case in our study (74%)
4. Cementation optimally limits recurrence in primary GCTB compared to bone grafting
5. Local recurrence of GCTB after curettage can generally be successfully treated with further curettage, as the lesion generally does not become more aggressive on recurrence
6. Malignant transformation and pulmonary metastasis are potential fatal complications of recurrent GCT.



Figure 2: Giant cell tumor of lateral femoral condyle of a 28-year-old male treated by extended curettage and reverse fibular graft in 2013 (a). Recurred after 18 months (b). Treated by extended curettage and cementing (c). Sustained fracture in 2017. Peroperatively, there was tumor tissue at the fracture site. Bone cement was removed. Further extended curettage and composite fixation done (d and e). X-ray in 2019 fracture consolidated, no evidence of recurrence and patient is asymptomatic (f).

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