

Giant Cell Tumor Treatment by Curettage and Bone Cement in Proximal End of Tibia

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Abstract

Background: Surgical treatment stills the most effective treatment for a giant cell tumor of bone (GCTB). The aim of the present study was to evaluate the outcomes of surgical treatment of giant cell tumor in proximal end of tibia by curettage and bone cement. **Patients and methods:** This clinical trial study was conducted on 18 patients underwent surgical treatment of giant cell tumor in proximal end of tibia by curettage and bone cement at orthopedic department, Zagazig University Hospitals. Their age was ranged from 22 to 41 years. Two thirds (66.7%) of the studied group were females and one third (33.3%) of them were males (2:1). After completion of the investigations, staging of the tumor was recorded using Campanacci's radiological grading method. Postoperative follow up was done to assess the functional outcome and to detect the presence of complications. **Results:** The present study showed that, 83.3% had companaccis grade I and grade II (16.7%). 88.8% underwent cement and hydrogen peroxide and 11.2% underwent cement, hydrogen peroxide and internal fixation. Regarding MSTs, only 33.3% of them had intermediate pain, all patients had enthused emotional acceptance and 66.7% had unlimited walking ability and 22.2% had intermediate gait. Post operative follow up showed the recurrence rate was zero (0.0%) after a follow up time (11.2 ± 1.04) months ranged from 9 to 12 months. There was only 11.1% of patients had superficial infection. **Conclusion:** Surgical treatment of a giant cell tumor of bone using Cement filling after extended curettage is provide a good oncological outcome and joint preservation. Curettage with adjuvants is a feasible first choice treatment option for GCTB with Cement filling does not increase the recurrence rate.

Keywords: Curettage, GCTB, VAS, adjuvants, Cement filling

INTRODUCTION

Surgical treatment is the treatment of choice for GCT. Depending on the involvement of the articular surfaces, the tumor can be removed either by resection or with curettage, with or without local adjuvants. Surgical outcomes are optimal when the tumor is removed to tumor-free margins, with minimal surgical morbidity and an acceptable functional outcome (1). So when developing a treatment protocol for giant cell tumor of bone, a surgeon must decide whether to perform an intralesional excision or enbloc resection, whether to use adjuvant therapy to eradicate residual

microscopic disease and what material to be used to fill the resultant defect in the bone (2).

Compared to enbloc resection, curettage presents higher recurrence rates (12–65%), but less morbidity and functional impairment for the patients (3). Curettage can be performed alone (simple curettage) or combined with local adjuvants (extended curettage). Curettage alone has the worst recurrence rates (mean: 42%; range: 21–65%) (4).

Various physical and chemical agents have been used to control the microscopic disease remaining in the walls after a good curettage. Cryosurgery (Liquid nitrogen), phenol, hydrogen peroxide, alcohol, electrocautery, bone cement, and the argon plasma cautery have been used as adjuvants (5). Cryosurgery is recommended as a physical adjuvant to curettage in the treatment of giant cell tumor of the bone. It extends the margin of a simple curettage or resection curettage and makes it biologically equivalent to that of a wide resection. Compared with other techniques, cryosurgery with composite fixation not only preserves joint function but also significantly decreases the rate of local tumor recurrence (6).

Following resection of a segment of bone, the specimen is carefully measured in order to select the best-fitting prosthetic components. Trial components are provided to enable a rapid comparison with the specimen, as well as to perform trial reductions prior to selection and assembly of the final prosthesis. The selection of the stem diameter is dependent upon the anatomy of the canal, which is sequentially reamed in order to accommodate the largest-diameter stem possible (7).

Therefore, this study was to evaluate the outcomes of surgical treatment of giant cell tumor in proximal end of tibia by curettage and bone cement.

PATIENTS AND METHODS

This clinical study was carried out on 18 patients with giant cell tumor of proximal end of tibia were included in this study. The included study populations were adult patients with giant cell tumor of proximal end of tibia who were admitted to Orthopedic Department, Zagazig University hospitals from January 2020 to March 2021 treated by curettage and bone cement.

Inclusion criteria:

Patients were diagnosed with giant cell tumor of proximal end of tibia using radiological and laboratory examinations, including X-ray, MRI and histopathology. Age of patients were ranged from 20 years to 50 years. Patients without pathological fractures. Lesion not reach the articular surface of the knee joint. Campanacci radiological grade (I) and grade (II).

Exclusion criteria:

Grade III GCTs in association with severely damaged bone structure and soft tissue extension. Pathological fracture. Intra-articular lesion. Patients with other comorbid conditions not fit for any surgical procedure and recurrent cases were excluded.

Clinical assessment:

All the patients suspected of having giant cell tumor at proximal end of tibia were subjected to history, physical examination and investigations for staging of the bone tumor. Prebiopsy investigations were performed including Plain X ray, CT scan on the tumor, CT scan on the chest, MRI, and laboratory tests. Closed percutaneous tissue core biopsy (CT guided) was done in all cases.

After completion of the investigations, staging of the tumor was recorded using Campanacci's radiological grading method as follows: Grade I: tumors were intraosseous lesions. Grade II: tumors were intraosseous lesions without loss of cortical continuity and with a thin cortex. Grade III: tumors were extra osseous lesions that broke through the cortex and extended into soft tissue.

Operative procedure:

The twelve (12) patients have giant cell tumor in medial condyle of proximal tibia which opened by medial approach and other six (6) patients have giant cell tumor in the lateral condyle of proximal tibia which opened by Anterolateral approach. Sub fascial drains were placed which exit in-line with the incision and the fascio-cutaneous flaps were pulled and closed. The limb was kept elevated and in full extension using a posterior splint.

Postoperative Care and follow up:

The suction drain was removed at the 24-hour drainage was reduced to less than 50cc. The sutures were removed 2 weeks post-operatively. The period of follow up ranged from 6 to 12 months. Follow up is done to assess the functional outcome and to detect the presence of complications.

Statistical analysis:

The collected data were coded, processed and analyzed using the SPSS version 22 for Windows® (IBM SPSS Inc, Chicago, IL, USA). Data were tested for normal distribution using the Shapiro Walk test. Qualitative data were represented as frequencies and relative percentages. Chi square test (χ^2) to calculate difference between two or more groups of qualitative variables. Quantitative data were expressed as mean \pm SD (Standard deviation). Independent samples t-test was used to compare between two independent groups of normally distributed variables (parametric data). P value < 0.05 was considered significant.

RESULTS

The present study showed that, the age of the studied group was (30.39 ± 6.4) years ranged from 22 to 41 years, half of the group (50.0%) had age less than 28 years and the other half were equal or more than 28 years (**Figure 1**). Most of the studied group (83.3%) had companaccis grade I and grade II (16.7%) (**Figure 2**).

Concerning reconstruction type, most of the studied group (88.8%) underwent cement & hydrogen peroxide and (11.2%) underwent cement, hydrogen peroxide & internal fixation (**Figure 3**). Regarding MSTs among the studied group, only 33.3% of them had intermediate pain, all patients had enthused emotional acceptance and 66.7% had unlimited walking ability and 22.2% had intermediate gait (**Figure 4**).

Concerning post operative follow up, the recurrence rate was zero (0.0%) after a follow up time (11.2 ± 1.04) months ranged from 9 to 12 months (Table 1). Regarding complications, there was only 11.1% of patients had superficial infection (**Figure 5**).

A case of Female patient 29 years old, complaining from painful left knee 4 months duration. Tender left proximal tibia with painful limitation of knee movements. Plain X-Rays done showing osteolytic lesion affecting the medial tibial condyle, reaching to the subchondral bone. Closed core biopsy was done and histopathological examination confirmed the diagnosis of giant cell tumor. Operative Extended curettage was done after making a cortical window with Application of hydrogen peroxide as an adjuvant was done. After all the tumor had been removed; two K-wires were placed into the cavity then filled it with bone cement and Closure of the wound in layers after application of a suction drain. The patient's functional score was 96% after 12 months follow up (**Figure 6**).

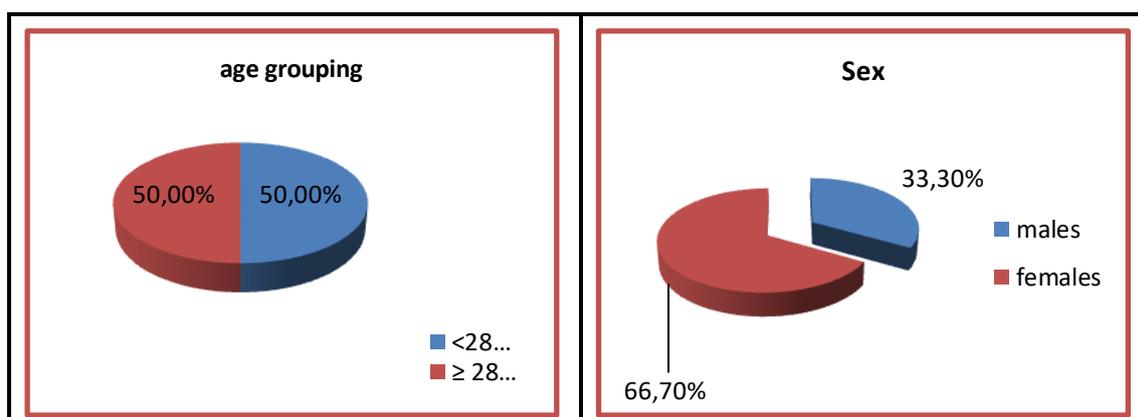


Figure (1): Pie chart for age and sex distribution among the studied group

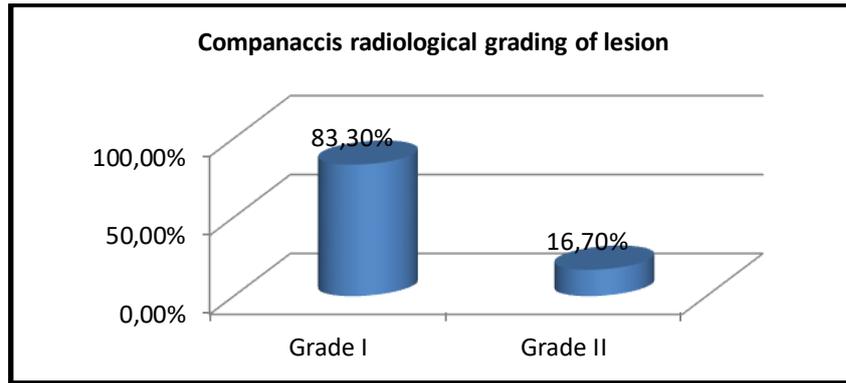


Figure (2): Bar chart for companacci radiological grading of lesion among the studied group

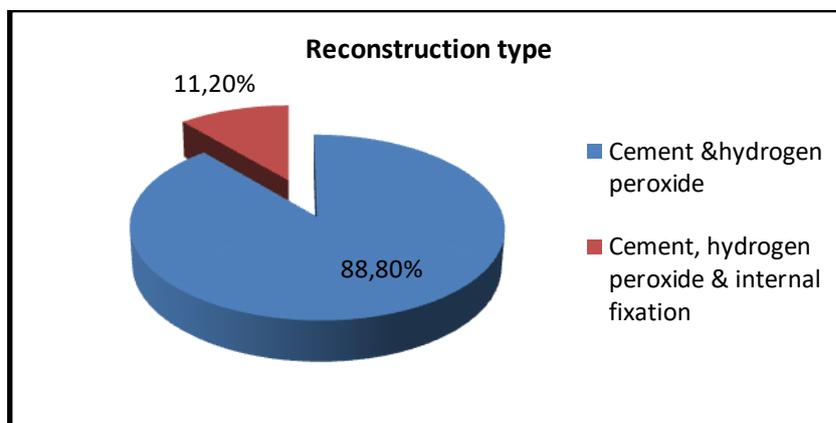


Figure (3): Pie chart for reconstruction type among the studied group

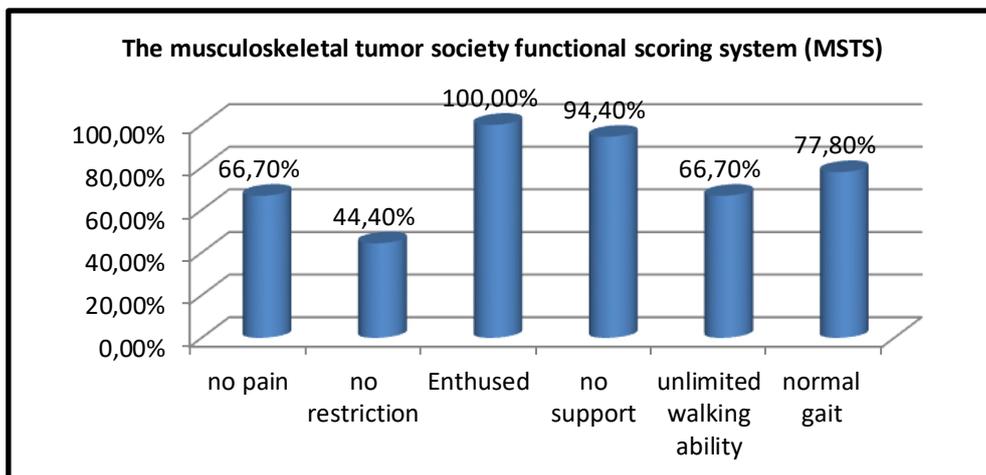
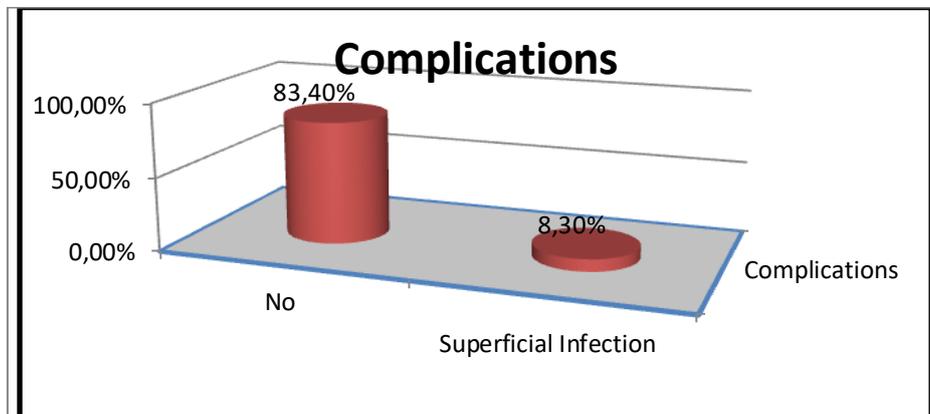
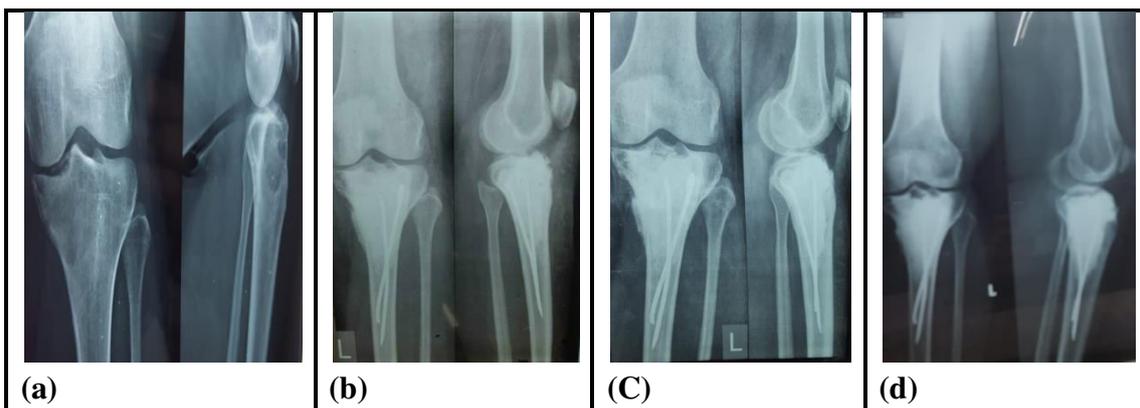


Figure (4): Bar chart for the musculoskeletal tumor society functional scoring system (MSTS) among the studied group.

Table (1): Time of follow up and recurrence rate among the studied group:

Variable	The studied group(18)
Time of follow up(months): mean \pm SD (Range) median	11.2\pm1.04 (9-12) 11.5
Recurrence rate Yes No	0.0 (0.0%) 18 (100.0%)

**Figure(5):** Bar chart for complications among the studied group**Figure (6):** A case of Female patient 29 years old, complaining from painful left knee 4months duration.Tender left proximal tibia with painful limitation of knee movements. Plain X-Rays done showing osteolytic lesion, (a) Pre-operative x-ray AP and Lateral, (b)The immediate post-operative x-rayAP and Lateral, (c) 4 months follow up x-ray AP and lateral and (d) 1year follow up x-ray AP and lateral.

DISCUSSION:

This clinical trial study was conducted on 18 patients underwent surgical treatment of giant cell tumor in proximal end of tibia by curettage and bone cement at orthopedic department, Zagazig University Hospitals. Their age was ranged from 22 to 41 years. The aim of the present study was to evaluate the outcomes of surgical treatment of giant cell tumor in proximal end of tibia by curettage and bone cement.

Our attainable results were in agree with a study by **Kafchitsas et al.,(3)** included 24 female (63%) and 14 male patients (37%). The average patient age at the time of presentation of the first tumor was 28 years (range 13-56 years): 24 of the patients (63%) were younger than 30 years of age, 5 of the patients (13%) were in the third decade of life, 6 patients (16%) were in the fourth decade and only three patients (8%) were older than 40 years of age at the time of the initial presentation. The GCTs were graded using the grading system described by Campanacci. None of the patients had tumor with extraosseus extension (Grade III).

Another study conducted by **Gao et al., (2014)** advocated adjuvant using; Aggressive curettage and bone grafting was performed in 34 cases (52.3%), and aggressive curettage with bone cement was performed in 31 cases (47.7%). The overall recurrence rate after the aggressive intralesional procedures was 35.3% with bone grafting and 12.9% when bone cement was used as an adjuvant filling. The recurrence rate following aggressive curettage and bone grafting was higher than that following aggressive curettage with cement ($p = 0.038$). The Musculoskeletal Tumor Society (MSTS) score for bone graft patients was 91.1%, which was significantly lower than that for patients treated with bone cement (94.7%).

Our study is in agreement with **He, et al., (9)** included 93 patients, who were divided into the extended curettage (EC) group and segmental resection (SR) group. The EC group included 69 patients (37 men and 32 women), with the mean age of 36.3 years. The number of involved femur, tibia, and patella were 36, 32, and 1, respectively, and the average length of the lesion was 5.6 cm. The preoperative Campanacci grades were I, II, and III in 7, 33, and 29 cases, respectively. There were 57 primary cases and 12 recurrent cases. There were 18 preoperative pathological fractures. The SR group included 24 patients, with the mean age of 34.9 (range, 17–52) years. In this group, 11 femurs, 7 tibias, and 6 fibulas were examined. The average length of the lesion was 7.2 cm. All cases were of Campanacci grade III. There were 15 primary cases and 9 recurrent cases. There were 14 cases of preoperative pathological fracture and two cases of pulmonary metastasis.

Regarding MSTS score in our study was concur with **Araki et al.(10)** evaluated an average MSTS score of 29 points (range, 23 to 30 points). The lowest MSTS score (23 points) was observed in the patient who eventually underwent total knee arthroplasty for symptomatic progression of osteoarthritis to Kellgren-Lawrence (KL) grade 3, with MSTS scoring having occurred prior to the arthroplasty procedure.

Also, **He, et al.,(9)** reported VAS was used for pain evaluation; six cases (6.5%) of recurrence occurred within 18 months after surgery. There were five recurrence cases in the EC group, including three cases in the femur and two cases in the tibia, of which one was far from the articular surface and the four were around to the articular surface. There was only one recurrence in the SR group, of which the patient had distal femoral recurrence.

Simillary, **Araki et al.(10)** was in consistent with the current study where they retrospectively evaluated 19 patients who underwent curettage and augmentation with calcium phosphate cement (CPC) for primary GCTB. The median age at the time of the index procedure was 39 years (range, 20 to 63 years). The Campanacci classification was grade I in 3 patients, grade II in 12 patients, and grade III in 4 patients. The study population included 12 women and 7 men. The median follow-up was 131 months (range, 66 to 205months). They close results regarding recurrence rate as their oncological assessment revealed that 17 patients were free of oncological disease.

Thus we recommend the use of extensive curettage with hydrogen peroxide as adjuvant for patients with GCTB at the proximal end of tibia.

CONCLUSION:

Surgical treatment of a giant cell tumor of bone using Cement filling after extended curettage is provide a good oncological outcome and joint preservation. Curettage with adjuvants is a feasible first choice treatment option for GCTB with Cement filling does not increase the recurrence rate.

Further trials with longer follow-ups and comparison of hydrogen peroxide with other adjuvant and comparing extended curettage with other methods. Further multicentric prospective studies are required to confirm our findings.

No Conflict of interest.

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