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## Osteoclastoma of bone: Role of extended curettage with allogenic bone grafting

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### Abstract

**Background:** Mesenchymal stromal cells are origin for benign tumor osteoclastoma of bone. Different location of presentations with varied manifestations is a unique feature of osteoclastoma. Extended curettage of the lesion and supplementary allogenic bone grafting in selected cases is widely used treatment regimen. Selection of cases is important for successful outcome using this as a treatment protocol. Our study with 30 cases aims in selection of cases for successful outcome with this treatment protocol.

**Materials and Methods:** Biopsy proven (core and open biopsy) 30 cases of osteoclastoma are selected. The cases are evaluated clinically, radiographically, CT & MRI scan and by histology. Campanacci grading and Enneking staging was used in the study. Chi square tests, Mann Whitney test and ANOVA were used for statistical analysis. Tumors with cortical breach which is confined to one surface and cortical breach less than one third of circumference were managed by extended curettage and bone grafting.

**Results:** The average age of presentation was 25 years. Distal femur is the commonest site (16 cases) followed by upper end of tibia (12 cases) and 2 cases are from distal radius. Pathological fractures were seen in 2 cases. 4 tumors had less than 5 mm of subchondral bone free of tumor. The average follow up period was 18.6 months (range 2-84). 4 cases of recurrence were seen in a grade III recurrent distal femur lesion (3) and proximal tibia group (1) in the intralesional curettage group.

**Conclusion:** Extended curettage with allogenic bone grafting is a reliable method with good functional outcome with less complications than other methods (enbloc excision) whenever we stick on to principles of tumor surgery with proven guidelines of case selection. Recurrence can always be treated with recurettage.

**Keywords:** Osteoclastoma, MRI, extended curettage, allogenic bone grafting, wide resectio

### Introduction

Histologically osteoclastoma is a neoplasm of undifferentiated mesenchymal stromal cells with abundant giant cells. Osteoclastoma is a locally aggressive tumor. Radiographically it is seen as an eccentric lytic lesion at the ends of long bones. It is most common in third decade of life i.e. after physeal plate closure. It has a tendency towards local recurrence and occasionally malignant change. Jaffe and associates in 1940 proved these tumors as a benign aggressive lesion. Irrespective to radiological appearance and histological appearance osteoclastoma has an unpredictable behavior which makes treatment a challenge in these lesions.

Local control of the disease with protecting the function of the limb remains the main concept of treating osteoclastoma. Extended Curettage is the preferred treatment for most cases of osteoclastoma. Curettage has been the preferred treatment for most cases of osteoclastoma. Many earlier studies had shown very high (25-50%) local recurrence rates after curettage and bone grafting [4]. Increased recurrence rates are seen with curettage alone led many to use adjuvants. Extended curettage through the use of power burrs and local adjuvants have improved outcome with reduced recurrence rates (10-20%). Phenol, liquid nitrogen, bone cement, hydrogen peroxide, zinc chloride, cauterization of the wall of cavity and more recently, argon beam cauterization has been employed as local adjuvants. Chemical or physical agents function by inducing an additional circumferential area of necrosis to "extend" the curettage.

We present the outcome of osteoclastoma of the bone treated by extended curettage and allogenic bone grafting since 2014 to highlight the usefulness of CT scan and MRI scan in selecting cases for extended curettage and grafting and the choice of the surgical approach.

### Materials and Methods

Patients attending to Nizam's Institute of Medical Sciences, Hyderabad, in Orthopaedics OPD who were evaluated are included in the study after taking proper consent. 30 patients treated by us during 2014-2018 constituted the clinical material for this study. 28 of our cases were around the knee joint. Most of our patients (22 cases) were in the third decade. There were 12 males and 18 females. Apart from routine investigations such as Hb%, TLC, DLC, ESR, S. Calcium, S. Alkaline phosphatase, X-ray of the lesion and X-ray chest, all patients were subjected to CT scan and latest MRI scan. All patients underwent parathormone hormone analysis to rule out hyperparathyroidism. Diagnosis was established by CT-guided core biopsy and in few cases by open biopsy.

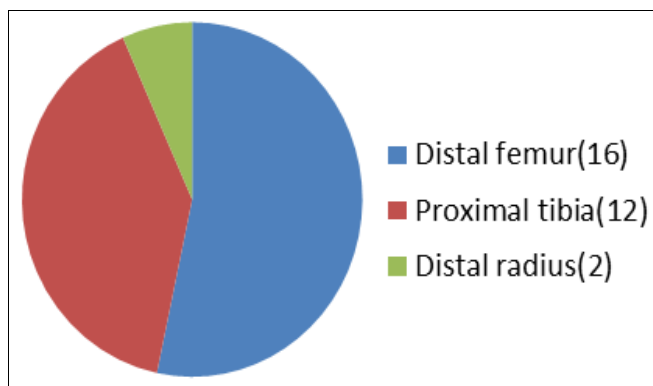


Fig 1: Total number of cases with site of lesion (30)

Spinal lesions were excluded from study. All data was recorded on a prefixed proforma. Site of lesion, (epiphyseal, epiphyseo-metaphyseal, metaphyseal or diaphyseal) was carefully evaluated. Size of radiolucent area were recorded as occupying less than one half, one-half and more than one-half diameter of bone in A-P view. Thickness of the subchondral bone at adjacent articular surfaces was measured radiologically and recorded as more than 5 mm, 5 mm or less or zero [1]. Campanacci [5] grading was used for cortical breach. Grade I tumor had a well marginated border of a thin rim of mature bone and the cortex was intact or slightly thinned but not deformed. Grade II tumor had relatively well defined margins but no radio-opaque rim. Grade III tumors had fuzzy borders. Enneking [6] staging was used preoperatively. Stage I is defined as a latent (inactive) lesion that is asymptomatic, intracompartmental and histologically benign. Stage II has been defined as active, symptomatic and intracompartmental. Stage III is an aggressive lesion that is extra compartmental.

The cases which on CT and MRI scan showed cortical breach restricted to one surface [Figure 2] and cortical breach less than one-third of its circumference, were treated by extended curettage and grafting. All cases belonging to Campanacci Grade 1 and 2 as well as cases belonging to Grade 3 which fit the above criteria were treated by extended curettage and grafting. Thirty primary lesions were treated by extended curettage and allogenic bone graft which is obtained from the femoral heads retrieved from intracapsular fracture patients who required hemiarthroplasty or THR. Bone graft was used

to fill up the resultant cavity in all the cases. Present study is about these 30 cases of osteoclastoma which underwent extended curettage and bone grafting.

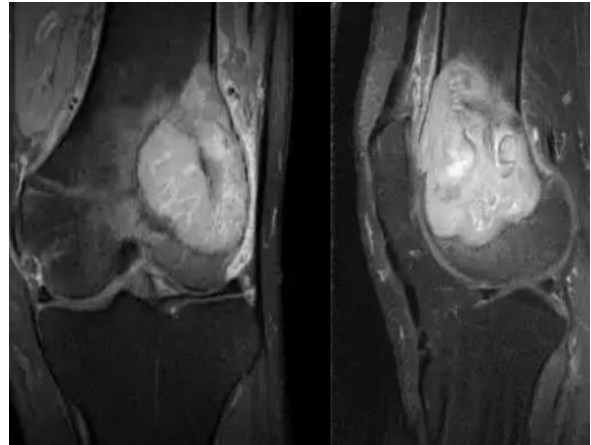


Fig 2: osteoclastoma of distal femur

For extended curettage, the lesion was approached through a site of cortical breach. In a lesion of lower femur and upper tibia, if the break in the cortex was in the posterior aspect [Figure 2], posterior approach, isolating popliteal vessels and tibial nerve was preferred. In our series we went through posterior approach in 2 cases of distal femur and 2 cases of upper tibia. In the rest of the cases of lower femur and upper tibia, the approach was anteromedial or anterolateral depending upon the cortical breach in the CT and MRI scan. After exposure, the site of the cortical breach was identified by palpation. The tumor is dark brown in colour with a well circumscribed capsule and a circumferential area of 1 cm × 1 cm beyond the margin of the cortical breach is marked using a cautery. With a small osteotome and nibbler the cortex is broken and the entire lesion where there is soft tissue extension is removed with a spoon, taking care not to spill the tumor. The cavity is widened until whole of the lesion is exposed and thorough curettage is done with scoops of varying sizes and ring curette. All the crevices are inspected with a dental mirror and bony bridges are broken to visualize the tumor using head loop and the cavity is washed several times with hydrogen peroxide which is taken in form of soaked mops and saline. Extended curettage was done when at least 2 mm of subarticular bone was free of the tumor with no soft tissue spillage as assessed on a recent MRI. Extended curettage was done using a high speed (70000 rpm) dental burr. Surgeon must spend majority of time in curettage. The cavity was cauterized with phenol and then tightly filled with bone graft. If subchondral bone is weak, we used fibular strut grafts along with allogenic cancellous graft to provide support to the joint. Internal fixation is also used in large cavities after bone grafting to provide early mobilization. The limb is protected with slab support during follow up. The cases were followed up at six-week intervals until six months and then at three-month intervals till one year and then at six-month intervals.

X-rays were taken at every visit after every six weeks. Functional evaluation was done by Enneking's system. This system is applicable in evaluating limb salvage surgeries. This evaluates pain, function and emotional acceptance, besides dexterity as a measure of upper limb functions and walking ability, gait as a measure of lower limb functions.



Fig 3: Pre op and post op radiographs



Fig 4: Pre op and post op radiographs

## Results

The age of the patient at diagnosis ranged from 16 to 50 years, 27 cases were in 3<sup>rd</sup> decade of life and 3 patients were 4<sup>th</sup> decade. The male: female ratio was 1:1.5. The commonest site was distal femur followed by upper end tibia. Few were seen in distal end radius, lower end tibia and proximal femur. Follow-up of patients post operatively was 4 years. In patients treated by extended curettage and grafting, functional evaluation was done after four months according to Enneking's method that takes into consideration range of movement of the joint, pain, stability, deformity, muscle strength, functional activity and subjective opinion. Epiphyseo-metaphyseal was the commonest location. In 19 cases, tumors occupied more than half the width of bone on A-P radiographs, while the rest 11 had sizes less than half width of bone. 12 lesions had subchondral tumor free bone of less than 5 mm, while in 3 lesions the tumor had extended right up to articular cartilage. 15 cases were far away from articular cartilage with more than 5 mm of uninvolved subchondral bone.

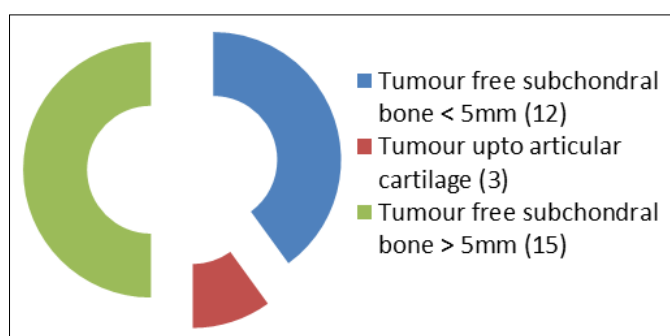


Fig 5: tumor distribution

Of the 30 primary cases treated by extended curettage and bone grafting, 26 patients have no recurrence till date and 4 had recurrence. None of the patients had recurrence during first one and half years. None of the patients in Campanacci grade 1 or Enneking class 1 had recurrence. 2 patients presented with pain and soft tissue swelling during follow-up of 2 years. Radiographs revealed peripheral lysis of graft and core biopsy done again showed recurrence of the tumor. 3

cases belonged to Stage 3 of Campanacci's grading system and one cases belonged to Stage 2. 2 such recurrent case in the lower femur was treated by a custom prosthesis. One case of upper tibia underwent resection arthrodesis. One more case went for custom made prosthesis. No case in the curettage group had lung metastasis. All the patients without recurrence are walking unassisted with fair ROM around the joint.

## Discussion

Lack of a definite treatment protocol in treating osteoclastoma has resulted from a highly variable presentation of this ubiquitous bone lesion. Lack of studies and follow up results from South East Asia has further aggravated the problem with a deficient data on outcome of osteoclastoma in Asian population. The mean age of presentation was 26.8 years (16-50). Presentation was commonest in third decade. This is in accordance with previous studies [1, 2, 3, 10]. Male-female ratio in our study was 1:1.5. Campanacci reported an equal sex ratio for GCT. The criteria for case selection management based on radiological classification with use of CT and MRI are very important preoperative assessment workup needed for successful outcome of cases. In this study we are suggesting some guidelines based on the CT and MRI findings for helping the surgeon to decide whether a particular case is to be treated by curettage or does it require resection.

According to Schajowicz [1, 2], curettage alone is an inadequate oncologic procedure for osteoclastoma but associated with better functional outcome compared to en bloc excision. Treatment is a balance between oncological adequacy and functional utility of the limb. Extended curettage with bone grafting is the modality of treatment in the series. The CT scan and MRI has significant role in the management of osteoclastoma as it helps in:

- classification of tumor
- Guided core biopsy
- Knowing the site of cortical break and the resultant soft tissue extension
- Deciding the surgical approach
- Preoperative assessment of distance of tumor from the joint line and noting dimensions of the tumor for planning of a cortical window during the surgery.

We performed curettage in cases where the break in cortex was confined to only one surface and the break did not exceed one-third circumference of bone. Pathological fracture is not a contraindication for extended curettage and bone grafting. Approaching the tumor from the site of cortical breach results in complete clearance of the tumor as well as avoids soft tissue spillage. This preoperative planning of surgical approach is very important to avoid residual tumor post operatively. The higher incidence of recurrence after curettage and bone grafting reported earlier is partly also because of the defective approach. If a tumor around the knee joint even if the break in the cortex is posteromedial, the lesion is approached from the lateral side. This inevitably leads to failure to clear the area of soft tissue extension on postero medial side. Moreover, there is a contamination of the soft tissue during surgery on the lateral side. This may be the reason for a higher rate of second recurrence in the cases which presented to us with first recurrence [11].

## The important steps in surgical procedure for extended curettage and bone grafting include

- Previous scar incorporation in the incision
- Clean dissection

- Large cortical window
- The use of high speed burr
- Usage of head loops and dental mirrors for visualization
- Use of adjuvants like hydrogen peroxide, phenol, cement can reduce recurrence rates effectively.
- Use of mechanical burr and process of exteriorization is known to reduce recurrence rate

The mean follow up score at the last follow up was 23.5. Extended Curettage had better functional outcome when compared to wide excision. Joint salvage is known to improve function. Wide excision was associated with more complication rates than extended curettage and bone grafting.

### Conclusion

Extended curettage with allogenic bone grafting is a reliable method with good functional outcome with less complications than other methods (enbloc excision) whenever we stick on to principles of tumor surgery with proven guidelines of case selection. Recurrence can always be treated with recurettage.

**Conflict of Interests:** The authors have no benefits in any form, did not receive any grant or financial aid relating to this study.

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