

## Prospective Study of Results of Different Filling Methods of Bone Defect in Giant Cell Tumours

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**Abstract:** Giant Cell Tumour (GCT) is the most common bone tumour which the orthopaedic surgeon deals with. It is slow growing locally malignant tumour but for some reasons its detection is quite late therefore; it is often diagnosed only in intermediate grade or Grade-III. Patient presents with mild pain near the metaphysis with little diffuse swelling often deceives the clinicians specially the GP's and practitioner of the rural areas. This results in bigger cavities often breaking the cortex or eating upon the joint cartilage. This possesses the great difficulty in treatment. Problem of filling the large cavities and dilemma of treating the increased incidence of recurrence of such cases, the present paper, the author has applied different methods for filling of the cavities and has observed the outcome.

**Keywords:** Giant Cell Tumour, Bone Defect, Filling Materials, Recurrence

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### I. Introduction

GCT, the most common bone tumour, with the incidence of 5% of all bone tumours and 20% of all benign bone tumours, is entirely under the orthopaedician's domain for treatment, except, rare metastasis to the lungs. The tumour is locally aggressive of uncertain histogenesis, characterised by slow growth, mild pain and little diffuse swelling delays the diagnosis. Histologically it is characterised by mononuclear stromal cells with many multi nucleated special types of giant cells. Cooper & Travers (1888) gave the name and Blood Good (1912) describes its nature and treatment. In 1940 Jaff et al, gave the most of the details known till date. Most commonly it is found in the age group of 20-40 years, after epiphyseal fusion of equal incidence in both sexes and at metaphysio- epiphysio location. The treatment is essentially surgical and does not involve radiotherapy and chemotherapy. It possess great responsibility on the orthopaedic surgeons for early detection and comprehensive treatment. Though no bone is immune but the incidence around knee is 50%. Thus, the orthopaedic surgeon is faced with the problem of unusual site. Most of them are difficult to approach and in-operable. Secondly, because of being its less troublesome, slow growth eating the bone internally but presenting on the surface with little diffuse swelling its early detection even with the modern investigations eludes the clinicians especially the general practitioners. It needs only increased level of awareness and suspicion of the lesion whenever there is pain in metaphysis area with diffuse swelling which is somewhat tender, because only with plain x-ray the diagnosis can be made with fair amount of certainty.

### II. Material & Methods

Since 2000, all together 48 cases of GCT mainly situated around the knee and wrist has been operated and followed up. The diagnosis was made essentially by plain x-ray confirmed by FNAC. MRI study has been done in many cases (not all because of the economic reasons) and also because of not very essential for the decision making purpose. MRI was done when there were large lesions and when it was suspected that the tumour might have crossed the limits of the bone and might have eaten upon the cartilage and entered the joint. Plain x-ray chest was routinely done. Histopathological study of the specimen was routinely done. The usual line of treatment has been meticulous curettage and cauterization followed by bone grafting. The source of bone graft has been fibula (contralateral), iliac crest and commercially available bone grafts like G-Bone. Large bone defects have been filled either with bone cements or combination of bone cement and bone grafts. In case of lesions of the lower end of radius especially when the tumour is large and broken the cortical boundaries or eroded the joint cartilage, the entire mass with margin of bone and tissues were removed and the area was reconstructed with the upper end of fibula. The method of cauterization has been mainly with carbolic acid and in few cases with liquid nitrogen. In 2 cases the entire end of the bone was resected out (in case of tibia and femur)

and the bone defect was filled by Illizarov's method of bone transport and reconstruction arthrodesis. In 1 case, custom made mega prosthesis for grade-III lesion of lower end of femur was done.

Follow up period of the study was 2-8 years. Usual mode of follow-up was plain x-ray, history and clinical examination.

### III. Results

Total 48 patients were operated, 2 of the patients were lost follow up after discharge. There has been no mortality. Out of 48, 26 were male and 22 were females. The age varied from 19-42 years with mean age of 32 years. Out of 48 cases, 20 were of upper end of tibia, 16 of lower end of femur, 8 of lower end of radius, one each of upper end of humerus and upper end of fibula and two were of metacarpals.

Method of treatment used was:

1. Curettage and bone grafting – 32
2. Curettage and bone cement – 6
3. Curettage, bone graft & bone cement – 5
4. Arthrodesis and bone transport by Illizarov – 2
5. Excision of fibula – 1
6. Resection and Arthrodesis -1
7. Custom made replacement Arthroplasty – 1

There was recurrence in 3 cases, one lower end of radius and two upper end of tibia. The recurrence of lower end of radius was treated by excision of the lower part of the radius and reconstructed with the upper end of fibula. While recurrence of tibia was treated by curettage and bone graft. The follow up of the treatment of the recurrence was 2 years. The overall good results were found in 35 cases while satisfactory results were in 5 cases, poor results were in 3 cases, while 3 cases recurred after 2 years. 2 cases were lost for follow up. Histologically, the most common lesion was of intermediate grade which was 36 out of 45 cases (no histological report found in 3 cases).

### IV. Discussion

As discussed earlier the treatment goal in GCT is the local control of tumour, maintenance of function and minimising the recurrence. One of the most important part is curettage as perfect as possible. The bony surface, forming innumerable depression and locules, were difficult to approach by limited opening, therefore, it is suggested that a wider window should be made and with the help of head lamp, dental mirror, curettes of all sizes. High speed burr curettage should be extended to near perfection. Cauterization further extends the curettage by causing local surface necrosis to every nooks and corners. Special attention should be given to the under surface of the hanging bone and remote corners. Liquid nitrogen though better was used only in 2 cases because of unavailability, difficult handling and reported in different literature for fear of causing fracture and nerve injuries. Carbolic acid proved to be the handiest, cheaper, easy to apply with cure rate approaching that of liquid nitrogen. When the cavity was big, longest possible fibula was harvested and grafted after longitudinally splitting it. This works like strut graft while smaller pieces of cancellous bone graft from the iliac crest fills the cavity nicely. The graft must be impacted well for early and better incorporation. However, if still more grafts were needed commercially available bone graft like G-Bone was used and give good results. This was the usual mode of filling the cavity with uniformly good results. In 6 cases, after thorough curettage and drying the cavity thoroughly, bone cement was used to fill the cavity with stated advantage of early return of function, no donor site morbidity, early detection of recurrence and the possibility of exothermic reaction further extending the curettage by killing the tumour cells. Still due to disadvantages of bone cement such as not being biological, higher risk of bed infection, limited life span (GCT occurs in early age group), possibility of loose packing, possibility of fracture of bone-cement interface and preventing blood supply to the cartilaginous part resulting in possible necrosis of cartilage makes it not as popular as autogenous bone graft. However this is definitely a good alternative. In 5 cases, first a layer of cancellous bone graft was laid over the exposed cartilage and then bone cement was applied. Because of shorter period of follow up it is not possible to conclude whether there is any significant difference between the two procedure using bone cement.

In 2 cases, the bone defect was managed by bone transport by Illizarov's method aiming at arthrodesis of the knee. However in author's opinion this does not seem to be good choice unless it is the only choice. This procedure takes very long time because usual gap of more than 8-10 cm, causes difficulty even after docking for arthrodesis. The long regenerate took further long time to strengthen. In one case it is deformed and bent after weight bearing was allowed and removal of Illizarov's construct. In another case, the regenerate got fractured. Custom made mega prosthesis was used in one case of grade-III GCT of lower femur. It has given good early result till date. Longer follow up is needed to know the different complications like fractures and failures of implant. For upper end of tibia it is evidently not as good option as of femur because of difficulty of reconstructing the extensor mechanism of knee function as it is difficult to maintain the attachment of ligamentum patellae to the prosthesis.

Excision of the lower end of radius, and restoration of wrist function by using upper part of fibula was done in 2 cases out of 8 cases of GCT of lower radius. It gave good results, but 1 case fractured due to fall after 2 years. The mode of fixation of fibular graft was bevelling the corresponding 1.5 inches of fibula and radius and fixing it with 2 lag screw principles and supplementing it with cancellous bone graft. In some of the series, in such procedure, plates have been used to fix the fibula with radius has been done. Excision of tumour when located in disposable bone like fibula was done in one case with good results. In 3 cases of recurrence were treated by re-curettage and bone grafting. Short term follow up till date has not shown any recurrence or metastasis in the lungs. Very extensive surgery of resection and arthrodesis (Turnoplasty) was done in 1 case but in view of the experiences of curettage and bone graft giving good result such cumbersome procedure has lost support.

### V. Conclusion

In view of above discussion and results meticulous extended curettage, cauterization and autologous bone graft remains the treatment of choice. Even in cases of recurrence this procedure gives good result but a large series is needed to give final opinion about this. Custom made mega prosthesis should be reserved for the cases in which the tumour has broken the cortical boundaries and spread in the soft tissue with or without metastasis. When using bone cement as a filler one should be assured that there is no defect in the articular surface, as the cement could extrude and cause damage to the joint. Above all general awareness should be

**Figures**





**Figure 1:** case of GCT of upper end of tibia

**Figure 2:** Post operative radiograph of curettage and bone grafting with contralateral fibula

**Figure 3& 4:** Post operative radiograph of lower end of femur with bone graft and cement

**Figure 5:** Post operative radiograph of upper end of tibia with curettage and bone cement

**Figure 6:** GCT of upper end of tibia

**Figure 7:** Post operative radiograph of resection of bone and Illizarov's construct in situ

**Figure 8:** 3 months follow up radiograph showing regenerate

**Figure 9:** one of the case showing bending of upper end of tibia and fibula after removal of Illizarov's construct

**Figure 10:** 8 months post operative radiograph showing fracture of regenerate after removal of Illizarov's construct

**Figure 11:** Grade-III GCT of lower femur treated with custom made mega prosthesis

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