

STUDY OF MANAGEMENT OF GIANT CELL TUMORS BY VARIOUS METHODS



Orthopaedics

KEYWORDS: Giant cell tumours, Histopathology reports, Curettage & bone grafting, Adjuvant treatment, Radiation therapy.

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ABSTRACT

Giant cell tumour has been recognized as a benign, locally aggressive neoplasm with the distinct characteristics of local recurrence, multicentricity, the capacity to metastasize in its benign form, and the possibility for malignant transformation. This study was conducted at Royal Hospital, Vijayawada. Among the 35 patients of Giant cell tumour involving long bones, (15 had involvement of distal end of femur, in 10 cases involvement of proximal tibia, 9 patients had involvement of distal end of radius and in one case proximal end humerus involved. In total of 35 patients, 46%(16) were males, 54%(19) were females. According to Campanacci3 radiographic grading, out of 35 patients 5 patients were grade1 (14.2%), 21 patients were grade 2(60%), 9 patients were grade 3 (25.7%). In our study of 35 cases, according to musculoskeletal tumour society rating system, 15 patients had excellent results, 10 patients had good results, 6 patients had fair results and 4 had poor results. Four out of 35 patients had a local recurrence of tumour at a mean of 18.25 months.

INTRODUCTION

Giant cell tumour has been recognized as a benign, locally aggressive neoplasm with the distinct characteristics of local recurrence, multicentricity, the capacity to metastasize in its benign form, and the possibility for malignant transformation. Giant cell tumours represents 5% of primary bone tumours and 21% of all benign tumours of bone. Since its recognition in 1940 (Jaffe)¹ as a separate and distinct entity in orthopaedic oncology, a large number of controversies surround this disease regarding management, because there are no absolute clinical, radiographic or histological parameters that accurately predict the tendency of the tumour to recur or metastasize (Eckardt & Grogan 1985).²

A variety of treatments like curettage, curettage and bone grafting, cryotherapy, application of phenol after curettage, radiation and embolisation of feeding vessels, insertion of methyl methacrylate cement in the cavity after curettage, distraction osteogenesis, insertion of hydroxyapatite after curettage, en bloc excision and allograft or prosthetic reconstruction. The common objective is to minimize the incidence of local recurrence while preserving bone architecture and joint function.

Curettage and packing the cavity with bone graft has recurrence rates between 27% to 55% have been reported in most of the studies by this method. The use of curettage, phenol, and cementation is accepted by most experts as the treatment for giant cell tumour of bone. In view of long term concerns with the use of polymethyl methacrylate as a filling agent, the present study was performed to evaluate whether similar results that is low recurrence rate could be obtained with the different modalities of treatment i.e., curettage, adjuvant therapy with phenol.

MATERIALS AND METHODS

This study was conducted at Royal Hospital, Vijayawada. The clinical material comprised of all the patients who attended the Orthopaedic out patient service of the department and the patients who were operated upon for the giant cell tumour.

Inclusion and Exclusion criteria:

The inclusion criteria were histologically confirmed giant cell tumour involving a bone that are treated with limb salvageable procedures like curettage and autologous bone graft, bone cementing, excision and reconstruction, excision and arthrodesis. All such patients who had definitive surgery elsewhere but were

followed by us for local recurrence, those who had amputations and patients with insufficient follow up data were excluded.

After admission and complete history, all patients were clinically examined in detail with special regard to the following points.

- Local examination of the swelling.
- Tenderness, effusion and limitation of movement in the contiguous joint.
- Regional draining lymphnodes.
- Secondary deposits especially in the chest.
- Functional derangement.

Investigations:

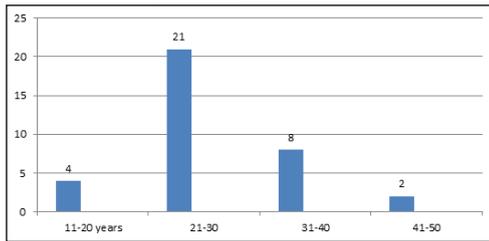
Plain radiographs were the most important radiological tools. All tumours were radiographed two planes, anteroposterior and lateral including the nearest joint. In all cases, the chest was radiographed to detect possible chest metastasis irrespective whether the symptoms were present or not. Computerized tomography scan was performed to the patients with doubtful metastasis and for tumours with pathological fractures. After radiographs, all routine blood investigations like complete hemogram, serology for HIV, HBsAg, blood grouping were performed.

All the cases were presumably diagnosed as giant cell tumour were subjected to open biopsy for histopathological confirmation of diagnosis. After confirmation of diagnosis by histology, all tumours were graded radiologically according to Campanacci radiographic grading.

OBSERVATION & ANALYSIS

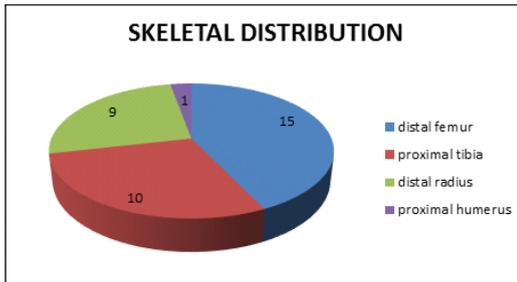
A total of 35 patients of proven Giant cell tumour underwent treatment at Royal Hospital, Vijayawada. Of the 35 patients, all patients had a tumour that involving long bone. Among the 35 patients of Giant cell tumour involving long bones, (15 had involvement of distal end of femur, in 10 cases involvement of proximal tibia, 9 patients had involvement of distal end of radius and in one case proximal end humerus involved lung metastases excluded by taking chest radiograph and in doubtful cases CT scan of chest.

All patients were skeletally mature at the time of presentation. The youngest patient was 18 years old and the oldest patient was 50 years old. The peak incidence is in the 21 to 30 years age group with mean age of presentation 26.5 years.



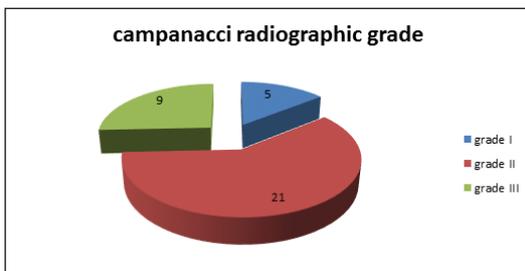
AGE INCIDENCE

In total of 35 patients, 46%(16) were males, 54%(19) were females a slight female predominance. The distribution of the tumour with respect to the site and origin is shown in the table. The maximum of number of cases occurred in the distal end of the femur, followed by proximal tibia, proximal femur, proximal humerus and distal tibia in order.

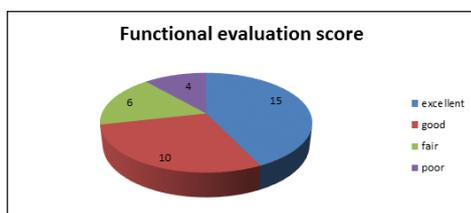


Of the 35 patients in the present study, in 80% the presenting complaint is pain (28) and in 20% the presenting complaint is swelling. There was a preceding history of associated trauma in 4 patients, the average duration of symptoms was 3.1 months with a range of 1 month to 6 months. None of our patients had fungating mass as presenting complaint. Clinically all patients had local tenderness with limitation of joint movement terminally in 24 patients. Four patients (11.4%) had a pathological fracture at the time of presentation.

According to Campanacci³ radiographic grading, out of 35 patients 5 patients were grade I (14.2%), 21 patients were grade II (60%), 9 patients were grade III (25.7%). The duration of mean clinical follow up was 16 months which ranged from 6 months to 26 months. According to radiographic evaluation score (by Shih et al)⁴ of the 31 patients who had no recurrence, Radiographic evaluation score at the last follow up. At the last follow up, The average bone graft incorporation score was 15.9 (range 9-18).



All the patients were assessed functionally at the recent follow up according to musculoskeletal tumour society rating system, 15 patients had excellent results, 10 patients had good results, 6 patients had fair results and 4 had poor results. The patients with pathological fracture at the time of presentation had a poor result functionally.



Four out of 35 patients had a local recurrence of tumour at a mean of 18.25 months. All the recurrences have occurred within 2 years after the index operation. Of the 4 recurrences, 3 were treated with a repeat modified extended curettage, use of chemical adjuvant hydrogen peroxide followed by filling the defect with autologous bone graft. One patient in whom fibular graft union did not occur was treated with re do grafting.

DISCUSSION

Giant cell tumour is one of the most obscure and intensely examined primary tumours of bone. Its histogenesis is uncertain, neither the histological grade nor the radiological grade predicts the clinical outcome of the tumour. So there are still many unanswered questions with regard to both its treatment and prognosis. The world health organization has classified giant cell tumour of bone as an aggressive, potentially malignant lesion which means that its evolution based on its histological features is unpredictable. The myriad ways in which this often aggressive tumour can manifest itself have prompted surgeons to perform radical, wide or intralesional procedures, sometimes coupled with radiation, adjuvant therapy, chemotherapy or cryosurgery. The common objective of all surgical procedures in the treatment of giant cell tumour of bone is to minimize the incidence of local recurrence by complete eradication of tumour while preserving normal bone architecture and the high likelihood of achieving good functioning limb.

In most benign aggressive bone tumours control can be achieved by wide surgical excision. Following en bloc excision, the rate of recurrence is between 0% and 5% in primary lesions. Because giant cell tumour is found in the epiphysis of long bone and often invades the subchondral bone, en-bloc resection usually requires sacrifice of the articular surface and a complex reconstruction procedure which can lead to complications, revision operation and decreased quality of life in the long term. Resection is usually performed in giant cell tumours found in the proximal fibula, distal ulna or in the wing of the ilium in which a reconstruction is not necessary or in a malignant type of giant cell tumours. En bloc resection of the tumour and reconstruction is advised there is extensive involvement of sites such as distal end radius, distal end femur, proximal end tibia, proximal end femur.

The surgical approach to giant cell tumours in the 19th and early 20th centuries and bone grafting with or without adjuvant treatment. Historically however curettage and bone grafting has been associated with high rate of recurrence and therefore different adjuvant have been introduced. These presumably remove the tumour cells which remain after curettage because of their thermal (liquid nitrogen, methyl methacrylate) or chemical (phenol, hydrogen peroxide, alcohol) effects [M. Szendroi, JBJS (Br) 2004.]⁵ although curettage with bone graft replacement may lead to a much higher rate of recurrence, this procedure allows joint preservation and superior post operative limb function.

The high risk of recurrence after bone grafting leads to the technique of intralesional curettage followed by packing of the defect with methyl methacrylate cement which was first described in 1969 by Vidal et al. It has been suggested that the free radicals and thermal effects of the polymerization reaction may cause as much as 2-3 mm of necrosis in cancellous bone. The advantages of use of poly methyl methacrylate include low cost, easy to use, lack of donor site morbidity, elimination of the risk of transmission of diseases associated with allograft bone, immediate structural stability. However in the long term it has some disadvantages such as the difficulty associated removal of acrylic material in the case of local recurrence or fracture through the cement, and the risk of long term osteoarthritis as the cement is placed in the proximity to articular cartilage due to biomechanical change in weight bearing areas (Wilkins et al 1987), and difficulty in future surgeries. If the involvement of distal end femur is very extensive spreading into the both condyles resection arthroplasty by customized prosthesis or arthrodesis can be done so as to eradicate the tumour and give a

functional limb to the patient with good function.

The tumour involving rare such as patella can be managed by curettage and acrylic bone cement if the patient comes at early stage .if the involvement of patella is gross then patellectomy and quadriceps repair should be done. We have shown that with meticulous removal of tumour tissue from site and with adjuvant therapy using hydrogenperoxide and good reconstruction with proper surgical techniques good functional results can be achieved with lowest rate of recurrence 11.5% as in our study. The 11.5% rate of local recurrence (4 patients out of 35) in our series is comparable with the results reported in literature. Our patients did not have the high rate of recurrence as reported in earlier studies of curettage and bone grafting. We attribute this improvement to extensive curettage of lesion, use of hydrogen peroxide as a chemical (which does not have high risk of bone and skin necrosis and fracture similar to liquid nitrogen and chemical burns, toxic effects associated with use of phenol.) We believe in the concept that the major factor in the success or failure in the management of giant cell tumours is related to how completely the tumour is removed. To achieve this large cortical windows are made to visualize the tumour fully anticipation that much less microscopic disease would be overlooked and the incidence of local recurrence would be reduced significantly.78% of our patient had excellent good functional results as per the musculoskeletal tumour society rating system.

In the management of local recurrence of giant cell tumours, repeated intralesional curettage, use of adjuvant therapy and reconstruction for the second third with recurrences is justified. based on this we have done repeat curettage ,adjuvant therapy with hydrogen peroxide and bone grafting in 3 out of 4 recurrences. In one case where the fibular strut graft went into non-union redo grafting was done. Recurrence of giant cell tumour is not fatal but can lead to disability and to a poor quality of life as a result of repeated and radical operation, loss of bone stock and secondary osteoarthritis of the joints. so the optimal treatment for giant cell tumour should include.

1. Careful and extensive curettage of the lesion and use of adjuvant to decrease the rate of recurrence
2. Reconstruction of the defect
3. Joint sparing surgery even in grade 3 tumours whenever it is possible and at revision surgeries
4. In case of proven malignancy resection according to oncological criteria.
5. Local Radiation therapy can be advised in unresectable ,incompletely removed and recurrent cases.

CONCLUSION

1. Giant cell tumour of bone is a tumour of mature skeleton, which has a pronounced anatomic predilection for the epiphyseal region of the major long bones.
2. It is an aggressive, potentially malignant lesion with a tendency for local recurrence after incomplete removal.
3. Treatment of giant cell tumour remains as a difficult and challenging management problem because there are no absolute clinical, radiological or histological parameters that accurately predict the tendency of any single lesion to recur or metastasize.
4. The ideal goal in the management of giant cell tumours of the bone is to eradicate the tumour completely and at the same time preserving the osseous anatomy and joint function.

5. The treatment of choice in most giant cell tumours of the bone is curettage and bone grafting. Adjuvant therapy is used to remove the tumour cells which remain after curettage. Radiation therapy may offer an alternate treatment option for inaccessible giant cell tumours, tumours of axial skeleton and who are not a candidate for surgery.

6. It is likely that the adequacy of the removal of the tumour is what that determines the risk of local recurrence.

7. Recurrence of giant cell tumour is not fatal ,but can lead to disability and to a poor quality of life as a result of repeated and radical operations, loss of bone stock and secondary osteoarthritis.

8. Because of relative rarity of the tumour and the special operative technique involved, it is recommended that giant cell tumour to be treated at higher centers because inadequate primary intervention by a non-specialist can lead to major technical challenges at an advanced stage of tumour.

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