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RESEARCH ARTICLE

RESULTS OF MARGINAL EXCISION OF GIANT CELL TUMOR OF BONE AT UNCOMMON SITES WITH JOINT RECONSTRUCTION

Nital Gupta, Shafiq Hackla, Varinder Bhagat, Satvir Singh, Anil Gupta

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*Corresponding Author

Nital Gupta

Abstract

Giant cell tumor is a common benign tumor of long bone. The treatment modalities include simple curettage with bone grafting and use of adjuvants like liquid nitrogen, phenol etc. in grade 1 and 2 lesions. Grade 3 lesions extend outside the bone and require resection. The joint reconstruction remains a challenge in these young patients. We reported cases of Giant cell tumor of bones at uncommon sites with primary joint reconstruction with arthodesis or arthroplasty and reported good functional outcome in these patients.

Purpose: To study the outcome results of GCT with extensive lesion (grade 3) at uncommon sites treated by marginal resection and primary reconstruction of the joint with arthodesis or arthroplasty in rare sites for GCT.

Methods: 5 patients with giant cell tumor of bones at uncommon sites underwent wide excision of GCT and reconstruction of joint with arthodesis with autograft or arthroplasty in the prospective study. Functional outcome using MSTs score, complications and recurrence rate were noted for period of two years.

Results: The mean MSTs score was 30.2 at 2 years follow up. Three patients reported good functional outcome and two reported fair outcome. The functional outcome in terms of pain and joint mobility was good in all the patients. The two year recurrence rate was not reported in all the patients.

Conclusion: Treatment of GCT at uncommon sites with marginal excision and reconstruction of joint by using arthodesis or arthroplasty gives good functional outcome in terms of joint function, pain and recurrence of tumor.

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INTRODUCTION

Giant cell tumor also known as osteoclastoma accounts for 5% of neoplasm of the bone. It is a commonly benign tumor of the bone but can be malignant in 1- 2% of the cases. It occurs in 2nd to 4th decade of life and slightly more common in females. The tumor occurs in epiphysis of long bone and usually a solitary lesion. The common sites are distal femur, proximal tibia and distal radius. Rare sites are proximal femur, distal tibia, distal humerus, cuboid and talus. The tumor occurs after the fusion of epiphyseal plate and when longitudinal growth is halted. (1, 2)

The patient typically complains of progressive pain which is worse at night and aggravated by activity and relieved by rest. The patient may also presents with swelling, limitation of joint motion and sometimes with pathological fracture. Radiographically, GCT appears as expansile, eccentric, osteolytic lesion in the epiphysis of long bone and articular cartilage is usually spared. Multiple septa give soap bubble appearance to the lesion.

Microscopically, the tumor tissue is composed of multinucleated giant cells interspersed in spindle shaped stromal cells. The various treatment modalities for GCT include curettage and extended curettage. The recurrence rate after curettage is 25 to 50% and recurrence rate after extended curettage is 10%. *We hypothesises' that by doing marginal*

excision of lesion, we can bring the recurrence rate to minimum with primary marginal resection and joint reconstruction procedures like arthroplasty and arthodesis in grade 3 campanacci lesions.

The function of joint is compromised by the extended resection of the bone along with the lesion. The joint reconstruction remains a challenge to orthopaedic surgeon. We have treated the patients of GCT with marginal resection of healthy bone and joint reconstruction done with prosthesis or autograft supplemented with plates and wires.

Methods and materials

5 patients with giant cell tumor of bones at uncommon sites like proximal femur, distal tibia, distal humerus, talus and cuboid were treated in Govt. medical college & hospital, Jammu over last 3 years with marginal excision and reconstruction of the joint with the mean follow up of 2 years. The level of bone resection to be done was guided by radiological and intra-operative observations of the involved bone. The mean age of the patients was 21 years with youngest being 14 years old and oldest being 30 years of age. There were 3 males and 2 female patients. The history and clinical examination of the patient were supplemented with radiographs; CT scan and MRI scan to make presumptive diagnosis and extent of giant cell tumor. FNAC followed by histopathology of the lesion was done prior to surgery to confirm the diagnosis of GCT. Informed written consent for the procedure was taken and its risks and benefit were told to the patient in detail. Appropriate level of bone resection and the type of procedure alongwith implant used were decided before the procedure.

The patients with the GCT of proximal femur (campanacci grade 3) underwent marginal excision of 1 cm and reconstruction of the joint with prosthesis and bone cement. The proximal femur was reconstructed with the help of PMMA bone cement and then the bipolar hemiarthroplasty was done. The surrounding muscles and soft tissues were attached to proximal newly constructed femur. The post op outcome was evaluated with help of MSTTS score at baseline and at 6 months, 1 year and 2 years. (Fig. 1-3)



Fig 1 shows intraop prosthesis

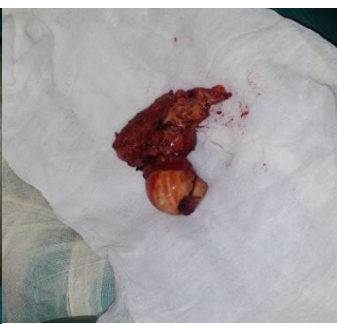


Fig 2 shows excised tumor with
femoral head



Fig 3 shows postop radiograph
long femoral stem

The patients with GCT of distal tibia underwent marginal excision as guided by radiological and intraoperative observations. The involved portion of the bone was excised. The joint was then reconstructed with help of autograft taken from contralateral fibula. The fibula was then slitted longitudinally. The arthodesis of remaining portion of tibia with the talus done with the help of fibular autograft and fixed with long plate in neutral position of ankle. Postoperatively, above knee slab for two weeks was applied and then changed to short leg cast until there was radiological evidence of bone union. (Fig.4-8)



Fig 4 clinical radiograph with tumor of distal tibia



Fig 5 NCCT of the tibia with tumor extension of distal metaphysis



Fig 6 intraop picture with excision of distal tibia



Fig 7 reconstruction with bone cement and plate application



Fig 8 postop radiograph

The patient with GCT of distal humerus underwent margin excision of the distal humerus and total elbow

arthroplasty was done (Fig.9-12).

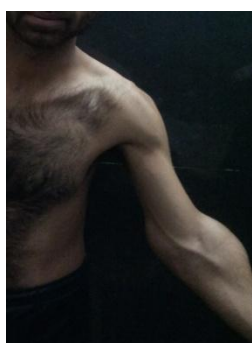


Fig 9 clinical picture depicting swelling of the distal humerus and elbow



Fig 10extensive destruction of lateral half of distal humerus



Fig 12 intraop picture



Fig 13 postop radiograph

Similarly, total excision of the cuboid and talus done and filled with tricortical bone graft taken from iliac crest. Stabilization of the arthodesis site done with the help of kirschner wire and tibio calcaneal steinmen pin respectively, which were removed when there was clinical and radiological signs of bone union. (Fig. 14 - 18)



Fig 14 showing GCT of cubiod



Fig 15 introp enucleation of cubiod



Fig 16 bone graft in situ



Fig 17 GCT of the talus



Fig 18 excision followed by stabilization with steinmen pin

The functional outcome was evaluated in terms of American musculoskeletal tumor society (MSTS) score at baseline and then at 6 months, 1 year and 2 years. MSTS score takes into account pain, mobility, stability, deformity, strength of the muscle, functional activity and emotional acceptance. Tumor staging done with campanacci grading system. Surgical complications like fracture, non Union, joint instability were noted. Recurrence rate of the bone tumor was noted at 2 years follow up.

RESULTS

The mean MSTS score at 2 years follow up was 30.2 The MSTS score was 26 in proximal femur GCT. Compensated Trendelenburg gait without cane was present. No fracture or recurrence noted at follow up. The MSTS score in distal tibia GCT was 29 at 2 years. Superficial wound infection was present in patient which was treated by local wound debridement and iv antibiotics. Union rate for arthodesis was 11 weeks. No local recurrence noted at follow up. MSTS score in distal humerus was 30. The patient reported no recurrence, bony fracture or joint instability of elbow. The MSTS score in talus was 29. Arthodesis site was painless and well healed at 6 months. No recurrence or distant metastasis noted at 2 years. The MSTS score in cuboid was 34. The arthodesis was well healed at 4 months and was painless.

DISCUSSION

Giant cell tumor is usually benign bone lesion which has high recurrence rate due to incomplete removal of tumor tissue done by curettage. (3, 4) The excision with margins of healthy bone often create large defect which can severely compromise joint functions in these young patients. Restoration of the joint after marginal excision remains a challenge in grade 3 Campanacci lesions that too at uncommon sites due to insufficient literature. We in our study have reconstructed the involved joints after wide excision to minimize the recurrence rate and providing stable functional joints.

GCT is usually benign lesion but locally aggressive tumor. GCT are multicentric in 1 to 2% of the cases and pulmonary metastasis occurs in approx. 3% of the patients. Some patients with pulmonary metastasis has progressive lesion that can lead to death despite the fact that the tumor is histologically benign. Mortality for the patients with pulmonary metastasis is about 15%. GCT is classified by Campanacci into three grades. Grade 1 includes intramedullary lesion confined to bone, grade 2 lesion is intramedullary lesion with thinned expanded cortex and grade 3 is tumor with cortical breakdown.

The treatment of giant cell tumor includes simple curettage which had high recurrence rate of 25 to 50% due to incomplete removal of tumor tissue. The extended curettage of the lesion which includes use of adjuvant like phenol, liquid nitrogen, electrocautery, argon beam laser and bone cement. The bony defect after curettage to be filled with autogenous or allogenic bone graft. (5,6) Bone graft substitutes and PMMA bone cement has been increasingly used now. The recurrence rate of 5 to 15% has been reported after the procedure. The curettage can be done in grade 1 and 2 lesions. (7-13)

The grade 3 lesions extends outside the bone and extended curettage has high chances of recurrence in these lesions. Primary resection of the lesion and supplemented with bone graft and arthrodesis or arthroplasty with bone cement is usually required. Different procedures like hemicondylar osteoarticular allograft or rotating hinge endoprosthesis in knee, primary resection and reconstruction with proximal fibular autograft (either as an arthrodesis or an arthroplasty) in distal radius have been done. Radiation or chemotherapy has been used in spine and pelvis. (14-19)

The risk of local recurrence and pulmonary metastasis require lifelong follow up and make it altogether more important to do marginal resection of giant cell tumor. The use of bone graft supplemented with plates and pins and use of arthroplasty gives satisfactory joint functions and also decreases the chances of local recurrence and pulmonary metastasis. (20-23)

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