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Case Series

Surgical management of giant cell tumor in adolescent by excision or curettage followed by fibular strut graft

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ABSTRACT

Giant cell tumour (GCT) in adolescent is a rare tumour. It commonly occurs in skeletally mature patients aged between 20-40 years. In adults it is seen in epiphyseal region. In patients with intact physis, it arises from the metaphysis. Giant cells are more common in females. It is more common in the ends of long bones of distal end of femur, proximal tibia, and distal radius. 14 cases of surgical management of GCT by excision or curettage in adolescent followed by fibular strut graft. 1 year follow up of all cases of GCT in adolescent treated with excision or curettage followed by fibular strut graft was done. Out of 14 patients, 12 patients did not develop any recurrence of GCT. 2 patient developed recurrence after 6 months. All the patients were able to attain good range of movements 2 months after surgery. GCT in adolescent surgically treated with excision or curettage followed by fibular graft had excellent results in terms of recovery of daily activities, wound healing. Chances of recurrence more in patients treated with curettage and bone grafting.

Keywords: Giant cell tumor, Excision, Curettage, Fibular strut graft

INTRODUCTION

Giant cell tumour (GCT) of bone is one of the commonest primary benign bone tumours. GCT of bone constitutes 20% of biopsy analyzed benign bone tumors. It affects young adults between the ages of 20 and 40 years, several authors have reported a slight predominance of women over men.[1,2]

These tumours frequently are more aggressive. Common sites are femur, tibia and distal radius. GCT of foot bones, hand and spinal involvement is rare. Any foot bone may be involved. Giant cell tumours of foot usually are solitary lesions, but 1% to 2% may be synchronously or metachronously multicentric. These tumours typically are benign. Foot GCTs are eccentrically located in the foot bones and usually about the subchondral bone of epiphysis, compressing cortex to a thin rim. Radiographically, the lesions are purely lytic. Foot lesions frequently expand and occupy mostly half of the bone or break through the cortex, but intra articular extension is rare. Treatment options of foot lesions depend on the stage of the disease and include curettage/extended curettage with adjuvants and filling the defect with bone cement or bone graft, resection arthrodesis, resection reconstruction and resection arthroplasty. In metastatic lesions, radiation or embolization and chemotherapy options are used.[3-5]

Usually benign, it can be locally aggressive with pseudo-metastasis to lungs and may occasionally undergo malignant transformation. The surgeon needs to strike a balance during treatment between reducing the incidence of local recurrence while preserving maximal function. Differing opinions pertaining to the use of adjuvants after curettage, the relative role of bone graft or cement to pack the defect and the management of recurrent lesions are some of the issues in the management of Giant cell tumour. To study the clinical and functional outcome of giant cell tumour in adolescent treated with excision or curettage followed by fibular graft.

CASE SERIES

Study was carried out at MNR Medical College and Hospital, Sangareddy. Where 14 patients were operated for giant cell tumour with fibular graft after confirmation through magnetic resonance imaging (MRI) and trucut biopsy from August 2017 to March 2020. They were followed up for a minimum period of 1 year and evaluated for clinical outcome and for recurrence using X-ray and MRI. Patient were followed up at monthly intervals in the first 6 months, there after once in every 2 months for the next 6 months.

Inclusion criteria

Patients with age group from 12 to 20 years, MRI and trucut biopsy confirmed patients, and patients with tumor present in the ends of long bones were included in the study.

Exclusion criteria

Patients with age group <10 years and >20 years, tumor with soft tissue extension, tumors other than at the ends of long bones like pelvis and sacrum, associated with a pathological fracture, previously operated patients with recurrence, and patient with existing functional loss of joint with neurological deficit were excluded from the study.

Detailed history was taken. Patient was initially evaluated with x-ray radiological picture of effected part. MRI scan and trucut biopsy done pre-operatively. Under general or spinal anesthesia following aseptic protocols, tourniquet applied without exsanguination. Incision taken and the tumor is exposed. Tumor extent is identified and tumor was excised or curettage done. Curettage is assisted by burring and hydrogen peroxide wash. Fibular strut graft was placed with or without iliac crest graft. Fibula graft was positioned with plates and screws, k-wires based on requirement. Wound was sutured in layers and wound dressing done. Patient was shifted to post op ward after the slab application.

GCT has a female predominance and female: male ratio of GCT is 1.5:1, associated pathologic fracture, normally present in 5% to 10% of all cases of GCT.

Out of the 14 patients, 8 patients treated with excision followed by fibular strut graft. 6 patients were treated with curettage, burring and hydrogen peroxide lavage followed by fibula graft and iliac crest graft. 2 patients treated with curettage followed by fibular graft developed recurrence of tumor after 6 months.

Patients were immobilised post-operatively in above-knee casts. The average period of immobilisation was 10 weeks (4-16 weeks). The patients were started on toe-touch weight-bearing at the time of plaster removal. The average time taken to start full weight-bearing was 18 weeks (12-22 weeks). Four patients regained a knee flexion of more than 90° while six patients had a knee flexion between 60º and 90º. The mean MSTS score of was 94%.

Recurrence is confirmed by MRI. All the patients attained good range of joint movements within 2 months of surgery.

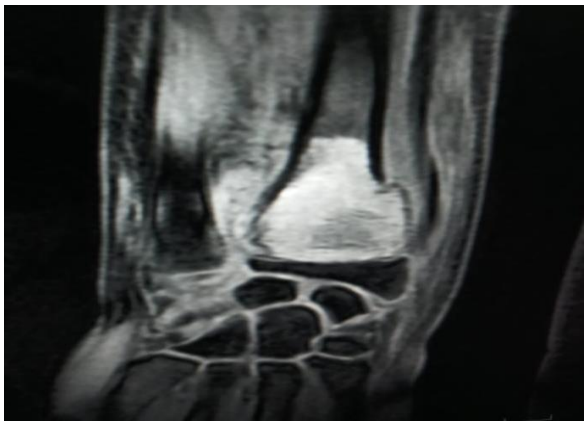

Figure 1: MRI of right wrist showing giant cell tumour in AP view.

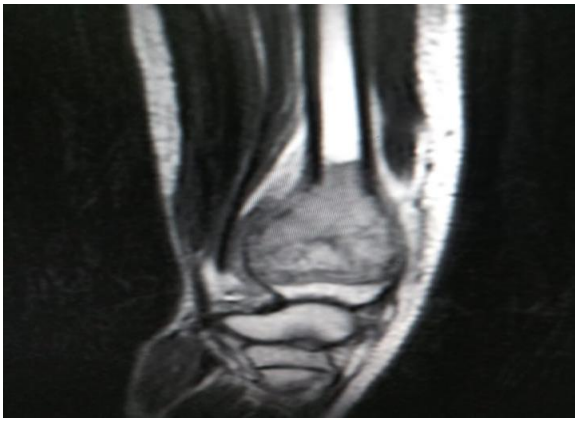

Figure 2: MRI of right wrist showing giant cell tumour in lateral view.

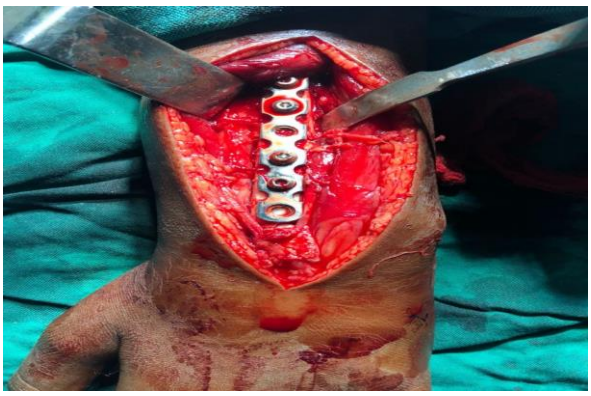

Figure 3: Intra operative pic after giant cell tumour excision and reconstruction with plating and fibular strut graft.

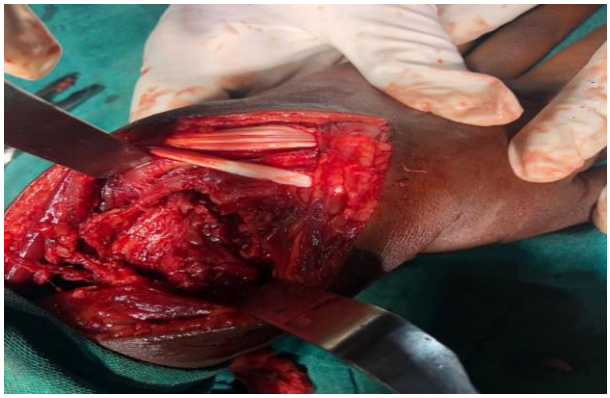

Figure 4: Intra operative pic of giant cell tumour.

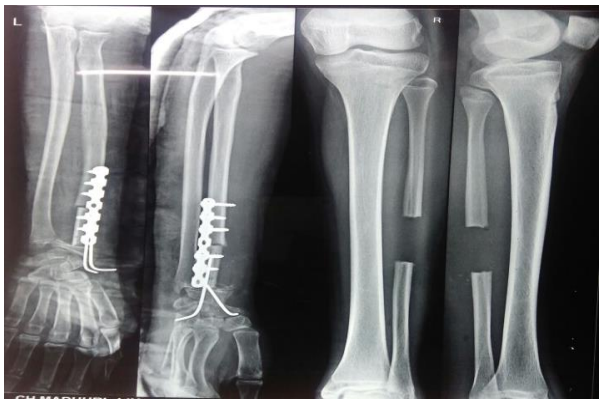

Figure 5: Post-op X-ray of giant cell tumour exicison and reconstruction with fibular strut graft and recon plating with k wires fixation.

Figure 6: 1 year follow up patient of giant cell tumour of left wrist, patient was having no functional deficit.

DISCUSSION

GCT is a rare primary bone tumour, classically involving the epiphyseal region, with a peak incidence in early to middle adulthood (20-40 years of age). Its incidence tapers off in the sixth decade and beyond.

GCT has a female predominance and female: male ratio of GCT is 1.5:1, associated pathologic fracture, normally present in 5% to 10% of all cases of GCT. GCT mainly develops from the epiphyseal region of long bones in skeletally mature patients, but it develops from metaphysis in patients with intact physeal plate. Few theories are there which suggest that the Giant cell develops in the metaphyseal region and grow into the epiphyseal region after the closure of the physis.

It rarely has a malignant transformation in 1-5% of cases, so prior biopsy is required for the confirmation of the diagnosis and to rule the malignant transformation. Recurrence is a possibility after surgical excision of tumour. Recurrence rate is higher after curettage. Follow up is required to detect the recurrence at the earliest. Evaluation of recurrence for malignant transformations to be done. In our patients treated with curettage and burring of the tumour, through hydrogen peroxide wash is done. Bone cement is not used for filling the defect in any case. Phenol or liquid nitrogen not used.

Tse et al had a recurrence rate of 4% (1 in 24) when zoledronic acid was used as an adjuvant compared to 30% in the group treated without zoledronic acid (6 of 20).[6] The surgical procedure was individualised for each case and varied from curettage with cementation or bone grafting to wide resection. The mean time to recurrence in the control group was 12 months. Gouin et al performed curettage of GCT in 24 patients, using no local adjuvant and filled the cavity with bone cement supplemented with internal fixation.[7] The curettage was supplemented with five doses of post-operative zoledronic acid. There were two recurrences at the end of two years with a third recurrence at the end of five years giving a total recurrence rate of 15%. Yu et al managed 16 cases of GCT of the distal femur with intralesional curettage and cementation supplemented with post-operative oral alendronate.[8] No recurrence was noted at the end of two years. Kundu et al treated 18 cases of GCT with three doses of zoledronic acid pre-operatively.[9]

Extended curettage was done two weeks after the last dose, and the cavity was filled with bone graft to eliminate the possible confounding effect of bone cement. They had only one recurrence in the study group (5%) as against four recurrences in the control group (21%). In our series of 10 cases of GCT followed-up for a minimum period of two years, there were no recurrences as confirmed using MRI scans (minimum: 2.5 years; maximum: 3.5 years).

The number and duration of zoledronic acid administered varied in the reported studies. We administered three doses of zoledronic acid at an interval of six weeks. The first dose was given pre-operatively, and two more doses were given after surgery to supplement our extended curettage with hydrogen peroxide. The time interval between administration of the pre-operative dose of zoledronic acid and surgery was 21 days. Nishisho et al advocated a three week waiting period between zoledronic acid and surgery based on in vivo and in vitro studies.[10] Six patients experienced a mild fever within 48 hours of administering

zoledronic acid. This is the only notable reaction to the administration of zoledronate. The rise in temperature was benign and settled with antipyretics.

The resected specimens were sent for histopathological examination. The percentage of necrosis of the giant cells in the resected specimens was documented. Pre-operative administration of zoledronic acid had produced more than 50% necrosis in the resected specimens compared to the biopsy tissue. This was consistent with the observations of Cheng et al who had a stromal cell necrosis of 54% and giant cell necrosis of 74% while using zoledronic acid.[11]

With the advent of denosumab, promising results had been shown in the management of inoperable or metastatic GCT. However, its superiority over zoledronic acid in conventional limb GCT had not been established.[12] High costs and long duration of treatment before surgery made it less cost-effective. Denosumab promoted new bone formation at the periphery of the tumour, which made the differentiation between normal and pathological tissue difficult during curettage. Neoplastic cells might be left behind the newly formed bone.[15] Denosumab had been associated with a higher incidence of grade 3-4 adverse reactions like osteonecrosis of jaw, hypocalcaemia, anaemia and arthralgia.[13]

The mean MSTS score of our series was 94% which is comparable to the results obtained by other surgeons using other modes of treatment. Saibaba et al had an MSTS score of 92% in their series of 36 patients managed with curettage and reconstruction using the sandwich technique.[14] Gao et al had a mean MSTS score of 94.7% in 31 patients managed with curettage and cementation.[15] The major limitations of the study included a short follow-up period, a small sample size and lack of a control group.

CONCLUSION

Functional outcome of GCT surgically managed with excision or curettage of the tumour and reconstruction of the defect with fibular strut graft gave good result. All the patients had excellent functional outcome post operatively within 2 months. 2 patients treated with curettage followed by fibular graft developed recurrence of tumour after 6 months. Post-operatively, the results are good in terms of patients return to normal physical activities, wound healing and infections.

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