

Research Article

Total knee arthroplasty with Mesh technique in management of juxta-articular giant cell tumor around the knee

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ABSTRACT

Background: Giant Cell Tumors (GCT) of bone are aggressive and potentially malignant lesions. Still it is one of difficult and challenging problem because there are no absolute clinical, radiographic or histological parameters that accurately predict the propensity of any single lesion to recur or metastasize. Eighty per cent of the GCT have a benign course, with a local recurrence rate of 10-50%; about 10% of GCT undergo malignant transformation through their recurrences. The main aim of the management of GCT is to eliminate the tumor and still save the joint function. We present our experience with long stem prosthetic total knee arthroplasty for juxta articular giant cell tumors around the knee.

Methods: Fourteen patients of juxta articular giant cell tumor around the knee were treated in our institute during the period 2008 to 2014 underwent resection and replacement by long stem arthroplasty with mesh were analyzed in this study. Patients were evaluated depending upon pain (Visual analogue score), range of movement, infection, pathological fracture and recurrence of tumor.

Results: Excellent results were obtained in all 12 patients (85.71%) and 2 patients had good (14.29%) results in case of TKR with mesh in this study.

Conclusions: Total knee arthroplasty with mesh is effective in achieving the desired goals of reconstruction with good functional results, least complications in selected patients and no recurrence.

Keywords: GCT, TKR, Mesh

INTRODUCTION

Giant Cell Tumors (GCT) of bone are aggressive and potentially malignant lesions. Still it is one of difficult and challenging problem because there are no absolute clinical, radiographic or histological parameters that accurately predict the propensity of any single lesion to recur or metastasize.¹ The reported incidence of GCT in the Oriental and Asian population is higher than that in the Caucasian population and may account for 20% of all skeletal neoplasms.² Third and fourth decade is most common age group which is affected with this tumor. The ends of long bones of skeletally mature individuals are

involved in more than 80% of cases and 75% of them occur around the knee joint.³ Eighty per cent of the GCT have a benign course, with a local recurrence rate of 10-50%; about 10% of GCT undergo malignant transformation through their recurrences and 1-4% give pulmonary metastases even with presence of benign histology.^{4,5}

The main aim of the management of GCT is to eliminate the tumor and still save the joint function.¹ Wide resection is the treatment of choice, especially in cases such as pathological fractures, recurrences and tumors which are high-grade or frankly malignant tumors.^{1,6}

Large resection at weight bearing major joints is pose a reconstruction problem. Due to en bloc resection major bone gaps are created & they can only be reconstructed with different bone grafts, fusion or custom arthroplasty. Progress in biomedical engineering along with better surgical techniques has improved overall 10-year prosthetic survival rate after endoprosthetic replacement from 20% to 80% in the past three decades.⁷⁻⁹

Here we present our experience with long stem prosthetic arthroplasty with mesh for juxta articular giant cell tumors around the knee. Use of mesh in our series has proved to be a good option for reconstruction of juxta articular bone gaps during arthroplasty.

METHODS

Fourteen patients of juxta articular giant cell tumor around the knee were treated in our institute during the period 2008 to 2014. Six out of fourteen patients in enneking stage 2 and eight in stage 3 underwent resection and replacement by long stem arthroplasty with mesh were analyzed in this study. There were 8 males and 6 females (ratio of 1.33:1). The mean age group of patient was 37.95 years (23-64 years). Patient came with complains of swelling around knee (Figure 1), fracture around knee. All the patients underwent 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. On X-ray findings (Figure 2), showed a lytic lesion, with sharp, well defined margins and extensive subchondral bone lysis. On MRI, GCT shows low intensity on T1 and heterogeneous high intensity on T2 weighted images. Therefore intramedullary tumor is best seen on T1W, while its extrasosseous portion is best appreciated on T2W images.

Diagnosis was established by histological investigation either by FNAC or open biopsy. Distal femur was involved in 4 patients and proximal tibia in 10 patients. Among the 14 patients, 4 patients came with pathological fracture at the time of diagnosis. Enneking classification was done of these patients.¹⁰

Out of these fourteen patients six patients were found to be in stage 2, of which 2 was having secondary recurrent lesions after primary surgery and eight in stage 3.

The postoperative pain assessment was done with the help of visual analogue scale which is the scoring system in which the pain in the patient is assessed with the help of facial expression.

The scale is from 0-10 with the pain increasing, with increase in the pain score.



Figure 1: Pre-operative clinically showing swelling.



Figure 2: Antero-posterior and lateral x-rays of a GCT of proximal tibia showing a lytic lesion, with sharp, well defined margins and extensive subchondral bone lysis.

Prosthesis

Long stem total knee prosthesis.

Surgical mesh.

Surgical technique

After taking proper consent, patient was taken in operation theater. As there was large tumor in upper end of tibia or femur condyles. 1st the tumor excised and en bloc. The remnant void was washed thoroughly with normal saline and H₂O₂. Then whole cavity was prepared with phenol 5%. Graft taken from iliac crest placed with mesh is placed in proximal tibia or femur condyle en

bloc. Cementing is done after preparing tibia or femoral part for TKR, before placing the implants. Now steps to prepare tibia and femur to place implants.

An incision is made in the middle and front of the knee with the knee positioned in 20 degree flexion. The medial side of the knee is then exposed by removing the anteromedial knee capsule. The leg is then extended and the patella is everted, then the lateral patellofemoral plicae is removed with mayo scissors. The knee is once again flexed and the medial meniscus and anterior cruciate ligament are removed using mayo scissors and a rongeur. After proper femoral preparation, a 3x8 drill bit used to create femoral canal opening. Now a femoral jig is used & multiple cuts are made to insert femoral prosthesis. Now for tibial preparation, the ankle is positioned and secured against the lower portion of the leg proximal to the malleolus. The tibia resection guide is secured with pins after it is positioned and centered on the proximal tibia. The medial/lateral adjustment screw that is placed at the ankle is used to align the resection guide parallel with the tibia. The stylus is attached to the crosshead and the crosshead knob is turned to raise or lower it until the level resection is indicated by the stylus. Pins are then used to fix the crosshead to the proximal tibia. To check alignment to the ankle an alignment rod is used. An appropriate size saw blade is then used for the tibial resection. A tibial trial handle is attached to the trial base which is placed against the proximal tibial surface and alignment is confirmed. The keel punch on the keel punch handle is hammered into place using the mallet till the punch is fully seated. When the punch is seated the keel punch handle is removed which leaves the tibial trial base and stem in place for trial reduction. Now came the finishing step of the TKR. With the knee flexed, using the mallet and femoral impactor the appropriate femoral trial is placed on the distal femur. The tibial trial insert is then snapped into place on the trial base. The knee is then put through a series of motions to confirm normal movement and alignment. The trial components are then removed after the correct fit is confirmed. The joint is then irrigated with a pulse lavage. The graft is packed in void left by removal of tumor. Cement is then properly applied in between surgical Mesh placed and prostheses. The impactor and mallet is used to insert the femoral implant and tibial base. We did not replace the patellae. The tibial polyethylene insert is seated and locked into place on the metal tibial base. The cement is hardened with the leg placed in 35 degrees of flexion. The wound is thoroughly irrigated. The tourniquet is then removed and the bleeding is stopped using electrocautery. A closed negative suction drain palced. The wound is then closed in layers and a compressive dressing is placed on the knee.

RESULTS

The minimum follow-up was 18 months and the maximum follow-up was 60 months with an average of 65 months. Functional results were analyzed.



Figure 3: Post-operative X-ray anterior posterior and lateral view of knee showing TKR components with mesh.



Figure 4: Post-operative, clinically showing sutures removed with no swelling.



Figure 5: Post-operative, clinically showing patient on weight bearing physiotherapy after 1 month of surgery.

Patients were evaluated depending upon:

- Pain (Visual analogue score)
- Range of movement
- Infection
- Pathological fracture
- Recurrence of tumor

Table 1: Visual analogue scale.

Sr. No. of patients	Sex/age	Day 1	Day 5	Day 10
1	M/40	7	3	0
2	M/37	8	4	0
3	F/39	8	3	0
4	M/23	9	5	0
5	M/43	6	3	0
6	M/37	7	4	0
7	M/42	7	3	0
8	F/36	8	4	0
9	F/30	7	3	0
10	F/32	6	3	0
11	M/64	9	4	0
12	F/28	7	3	0
13	M/35	8	3	0
14	M/44	8	4	0

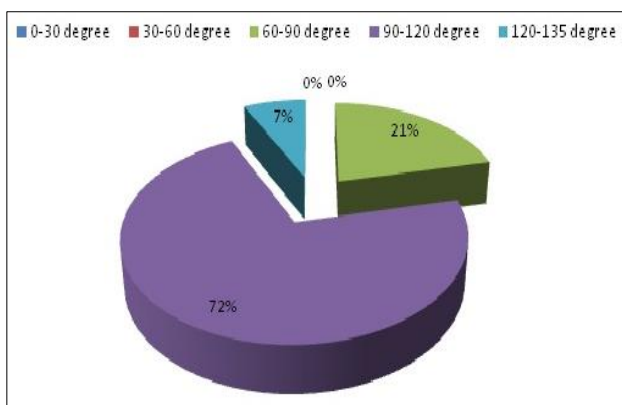


Figure 6: Showing range of motion at 1 month follow up.

Table 2: Complications.

Complications	No. of patients
Infection	2
Pathological fracture	3
Implant failure	0
Recurrence of tumor	0

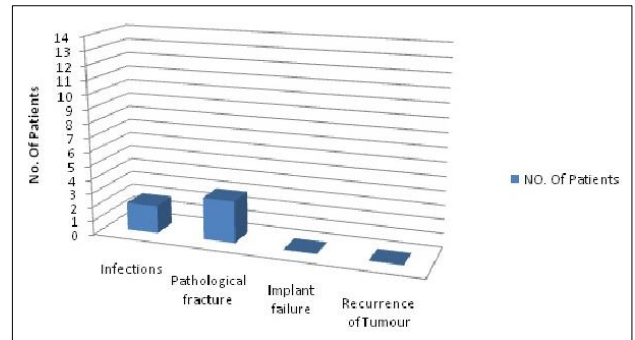


Figure 7: Showing complications.

Excellent results were obtained in all 12 patients (85.71%) and 2 patients had good (14.29%) results in case of TKR with mesh in this study (Figure 3 and 7).

DISCUSSION

The main purpose of this study was to determine the efficacy of TKR with mesh in the treatment of giant cell tumor around knee to provide a good option for reconstruction of juxta articular bone gaps. Fourteen consecutive patients with giant cell tumor around knee were treated with TKR with mesh with a long term follow up.

Since several decades surgeons have used various modalities in the treatment of giant cell tumors of bone: curettage, curettage and cytotoxic agents such as phenol, zinc chloride, alcohol and H₂O₂, curettage and a physical adjuvant (polymethyl methacrylate and cryosurgery, primary resection, radiation therapy, and embolization, which is practiced in unresectable tumors. In a classic study from the Memorial Sloan-Kettering Hospital, Hutter et al.²⁵ reported that recurrence rates in giant cell tumors treated by curettage alone were higher than those in tumors treated by resection or curettage in combination with physical adjuvants.

The problem of selecting the proper treatment in GCT is complicated by the failure of its histological and radiological appearance to indicate its biologic behavior.^{11,13}

Pathological fracture was seen in 03 (21.42%) of our patients, commonly in lower end of femur (4 cases or 28.57%). Similar observations were made by Campanacci¹¹ and Turcotte.¹⁶ It's presence, however did not affect the final functional outcome in our study (P = 0.564). Fifty one percent of our patients presented to us with first recurrence, following a primary procedure done outside. Recurrence was considered to be present when there was progressive lysis of more than 5 mm at cement-bone or graft-host interface or if there was an absence of a sclerotic rim at the above said interface.¹⁴

Limited information is available about the risks of recurrence following curettage and bone cementing in Grade II and III GCTs of the long bone.¹⁵

Conrad et al. reported five recurrences in 17 cases following curettage and bone cementing.¹⁷ In a multicentre study of 187 patients, Capanna et al. reported 17% recurrence rate.¹⁸

The Yu et al.,¹² reported recurrence rate of the patients treated for recurrence with secondary curettage as 46% (n=6/13). Recurrence rate of patients referred for the treatment of GCT recurrence was much higher than that for primary cases in their report. Our study had 25% recurrence (n=2/8) rate in patients who were treated for recurrence with secondary curettage and cementing.

Though the majority of recurrences usually occur within the first two years, late recurrences are known and long-term surveillance is recommended in these patients.^{19,20}

Marcove et al.^{12,21-24} reported their results with treating giant cell tumor by curettage, cryosurgery, and bone grafting or packing the cavity with polymethylmethacrylate. They summarized the experience with two patient groups.²⁴ A 36% recurrence rate was observed in the first group (25 patients).

CONCLUSION

Total knee arthroplasty with mesh is effective in achieving the desired goals of reconstruction with good functional results, least complications in selected patients and no recurrence.

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