

Short Term Outcomes of Tumor Resection and Reconstruction by Megaprosthesis Around Knee: An Analysis with Review of Literature

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Abstract

In this modern era, limb reconstructive surgeries have become a standardized procedure for malignant tumours of lower limbs. We performed limb salvage surgeries for tumour around the knee with en-bloc resection and subsequent reconstruction with a mega prosthesis. A total of six cases of malignant and locally aggressive tumours around the knee were operated on from 2017 to 2018, with resection and mega prosthetic reconstruction. Interpretation of functional outcome after surgery was performed with musculoskeletal tumour society score (MSTS). Complications like infection, local recurrence of tumour, implant failure and distant metastases were evaluated during each follow up. Postoperatively, one patient developed superficial infection; the rest cases were uneventful. Patients were regularly followed for one year, and none of them developed any sign of deep infection, local recurrence of tumours, implant failure or distant metastases. At the beginning of treatment, the average MSTS score was 8.83, which showed a significant increment to 25.83 after 12 months of follow up. Albeit few cases were operated on, we draw this inference from our short term experience that mega prosthesis acts as a boon to orthopaedic surgeons in musculoskeletal tumour management, thereby uplifting the quality of life of patients.

Keywords: Limb salvage surgery; Osteosarcoma; Giant cell tumour; Megaprosthesis.

Introduction

Limb rescue procedure, at present an acknowledged bone tumour treatment strategy, has customarily been a troublesome issue for orthopaedic surgeons. Limb salvage procedure incorporates the entirety of the careful methods intended to achieve expulsion of a harmful tumour and recreation of the appendage with a worthy oncologic, practical, and corrective outcome. Nowadays, limb rescue strategies are routinely practised in around 90% of cases of musculoskeletal tumours involving appendages¹. This sensational change came to fruition as the aftereffect of three significant advancements, for instance, effective chemotherapy, improved exactness of imaging procedures, and advances in the reconstructive surgical procedure. Right now, the three generally well-known choices for reconstruction are utilizing an endoprosthesis, allograft-prosthetic composite and biological reconstruction via vascularised graft². Every one of these techniques has its short and long haul favourable circumstances and impediments. Reproduction with a particular handcrafted oncological endoprosthesis (Megaprosthesis) has become a typical method these days. This procedure provides a challenging and useful appendage leading to immediate weight-bearing and permitting early inception of a postoperative recovery program³. In this way, expanding quantities of patients experience mega prosthesis recreation after resectioning a dangerous bone

tumour and some other nonmalignant conditions. In this narration, we like to share our experience while tackling such elephantine assignments with a mega prosthesis's assistance.

Material and Method

A total of 6 patients, four being male and 2 of them female, were operated on by resectioning tumour and reconstruction with cemented RESTOR modular resection prosthesis system (ADLERTM) between 2017 and 2018. The median age of patients was 50 (33-67). Each patient had undergone investigation on tumour profile assessment like routine blood workup, radiograph of the involved area, pre-anaesthetic check-up, PET scan for distant metastases, HRCT thorax and MRI of the involved extremity. After doing all non-invasive investigations, patients undergo core needle biopsy from the lesion following the biopsy's mandatory principles. The determination was osteosarcoma involving the distal femur in 4 patients and giant cell tumour (GCT) affecting the proximal tibia in one patient and distal femur in the other. Tumours were categorized according to the Enneking grading system⁴. According to the oncology department's standard protocol, a Neoadjuvant chemotherapy regime was received by patients with osteosarcoma. Neoadjuvant denosumab was given to those having giant cell tumor⁵. The careful approach was performed by the general standards of limb rescue procedure under antibiotic coverage, and the resection length was decided preoperatively by radiographic and other imaging techniques. We routinely performed a gastrocnemius flap in the proximal tibia resection and reconstruction to cover the prosthesis and obliterate the dead space. Postoperatively intravenous antibiotics were continued for 72 hours, and a standard regime of thromboprophylaxis was followed. Patients were made to do the ROM



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Figure 1: (a) preoperative and (b) postoperative radiograph of patient with GCT and reconstruction with megaprosthesis of proximal tibia.



Figure 2: (a) preoperative and (b) postoperative radiograph of patient with GCT and reconstruction with megaprosthesis of distal femur.

exercises using a continuous passive motion machine and were allowed weight-bearing with assistance from postoperative day 2. Patients were regularly followed at 3rd week, 6th week, 3rd month, 6th month, and latest follow up at one year. At every follow-up, the patient's surgical site and general condition were analyzed for any signs of infection. Standard radiographs were taken to look for any implant loosening and local recurrence of the tumour. Functional outcomes were analyzed using the musculoskeletal tumour society scoring system (MSTS) for knee^{6, 7}. The patient's score was calculated preoperatively and postoperatively at the 3rd month and one year.

Results

Out of six patients, one patient with proximal tibia GCT resection and reconstruction developed superficial surgical site infection, which was managed by continuing intravenous antibiotics for two weeks and delayed weight-bearing. Rest other cases were uneventful. None of the patients showed any sign of deep infection, implant migration or loosening, distant metastases and local recurrence of tumour after one year of follow up (table 1). Preoperative and postoperative radiograph of a patient with GCT and reconstruction with the mega prosthesis are shown in figure 1 and figure 2. Functionally all patients performed well, which was evident from the exponential increment of their average, MSTS scoring from 8.83 preoperatively to 23 at 3rd month and 25.83 and 1 year follow up (table 2). After one year of follows up of resection of GCT from distal femur and reconstruction with the mega prosthesis, patient with extension and flexion of knee joint shown in figure 3.



Figure 3: (a) Extension (b) Flexion at knee, photograph of patient with GCT and reconstruction with megaprosthesis of distal femur.

Discussion

Traditionally, in the seventies and eighties, malignant tumour involving extremities were answered by an amputation with terrible endurance rates. With the advancement of increasingly viable chemotherapeutic agents, imaging modalities, and treatment protocols, survival rates have improved. This permitted the surgeons and oncologist to move their focus to limb safeguarding¹. Different remaking alternatives are accessible for the recreation of the distal femur and proximal tibia following tumour extraction that incorporates mega prosthesis, extracorporeal irradiation autograft and resection arthrodesis⁸. The upsides of the mega prosthesis, around knee remaking, permit the patients to do quick weight-bearing, allowing maintenance of joint versatility and helps in early come back to exercises⁹. Right now, patients with post-employable mega prosthesis showed great practical result with significant to phenomenal MSTS score. However, the mega prosthesis has the confinement of long haul endurance and significant expenses. Our

Table 1: Complication at postoperative period, at three months and one year follow up.

Complication	Postoperative	Three months Follow-up	One year Follow-up
Superficial infection	1	None	None
Deep infection	None	None	None
Implant failure	None	None	None
Local recurrence	None	None	None
Metastases	None	None	None

Table 2: Musculo society tumour score at preoperative, three months follow-up and one-year follow-up.

Musculosociety Tumor Score(MSTS)			
S. no	Preoperatively	Three months follow-up	One year follow-up
1	15	27	27
2	4	17	23
3	1	23	27
4	16	21	21
5	12	27	27
6	5	23	30
Average score	8.83	23	25.83

patients with post-employable mega prosthesis showed great useful result with impressive MSTS score in this examination.

The essential utilization of neoadjuvant chemotherapy in the case of osteosarcoma has been documented¹⁰. Our patients with osteosarcoma received the same belief that it will help eradicate micro-metastases and consolidate the tumour.

Giant cell tumour is accountable for 20 per cent of benign tumour from 2nd to 4th decade of life. Treatment modalities of such tumour largely depend upon the aggressive nature and bone destruction caused by the tumor¹¹. Resection of such highly aggressive tumours and reconstruction with mega prosthesis has been described to have a better outcome in many studies. Following the same logic, we operated two of our case with GCT with en-bloc resection and reconstruction with a mega prosthesis after denosumab administration.

Superficial and deep infections, aseptic loosening, periprosthetic fracture and local recurrence of the tumour are some dreaded complications that a surgeon may encounter after such heroic attempts of limb-sparing surgeries¹². Our study had one case of superficial wound infection, which was managed by increasing parenteral antibiotics duration. Fortunately, up till the last follow up, we have not seen the demonic faces of other aforementioned complications. However, it is irrelevant to compare complication rates from other studies as very few cases had been operated on, and longer follow-ups are still pending.

Conclusion

Reconstruction with mega prosthesis is now becoming a pragmatic approach after resection of tumour around the knee. Although our study is conducted at a single-centre, very few cases were incorporated, and longer follow-ups are yet to come. Still, the functional outputs on MSTS scale in our study are reciprocating results from other literature. However, the hope of further improvement is still present in this field, which will be more beneficial to patients.

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