



LIMB SALVAGE WITH CUSTOM MEGA PROSTHESIS IN OSTEOSARCOMA OF PROXIMAL TIBIA

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Abstract : Introduction Until recent years limb tumours were treated by amputation resulting in loss of function and psychological burden to patients. With advent of neoadjuvant chemotherapy the scenario has changed. Custom made mega endoprosthesis can be used for limb salvage after excision of tumor. It has advantages like stability, restoration of functional limb and early rehabilitation. Now it has become the method for limb salvage in treating bone tumors around knee treated by excision. Aim To evaluate a patient with osteosarcoma of left proximal tibia treated by neoadjuvant chemotherapy followed by tumor excision and limb salvage with custom mega prosthesis(CMP). Materials and methods . 19 year old male patient was diagnosed as a case of osteosarcoma of left proximal tibia. Management included tumor staging(Enneking), histopathological verification (biopsy), neoadjuvant chemotherapy, determination of anatomical-mechanical defect, soft tissue status, radiological evaluation of the reference measures of femur and tibia for creation of CMP. The patient underwent tumor excision and custom mega prosthesis reconstruction of lower limb. With 14 months follow up the patient has 120 knee flexion and no prosthesis related complications. Result Excision of tumour and reconstruction of knee with CMP gives back a functional limb for the patient. Conclusion The goal is to achieve anatomical joint restitution and adequate restoration of limb biomechanics. Such an effect can only be achieved by CMP produced upon the exact three dimensional model of patient's bone.

Keyword : Custom mega prosthesis, Limb salvage, neoadjuvant chemotherapy

INTRODUCTION

Until recent years limb tumors were treated by amputation resulting in loss of function and psychological burden to patients. With the advent of neoadjuvant chemotherapy and custom made mega endoprosthesis which has advantages like stability, restoration of functional limb and early rehabilitation, the scenario has changed(1). Now it has become the method for limb salvage in bone tumors around knee treated by excision. Remarkable advances in implant

technology, surgical reconstructive technique and adoption of neoadjuvant chemotherapy protocols provides a new option for the surgeons who diagnose and treat bone tumors. Megaendoprosthesis allows restoration of function and provides subjective patient satisfaction. A success in limb salvage approach depends upon understanding of tumor biology and assessment of tumor aggressiveness, advances in reconstructive techniques and the development of effective chemotherapy protocols for primary and secondary bone tumors (2). Metal prosthesis fixed with polymethylmethacrylate (PMMA) cement is a successful modality of treatment to improve the quality of life. Nevertheless, possible complications of reconstructive surgery, in general, such as infection, joint stiffness or contracture, instability of components and mechanical weakness of prosthesis may compromise the outcome(3). Patients with newly diagnosed bone tumor, that requires resection, are often young and are expected to live with the prosthesis for many years. Megaendoprosthesis provides numerous advantages, one of them being the possibility that a patient soon, returns to daily activities with the full weight bearing.

MATERIALS AND METHODS

Case Report:

A 19-year-old male patient came to our out-patient department with pain and progressive swelling around left knee for 1 month. The pain was insidious in onset and progressive in nature, continuous, throbbing in character and increased pain intensity at night. There was no history of trauma to the affected knee or leg. X-rays of left knee with leg in anteroposterior and lateral projections were carried out, which showed an osteoblastic lesion in the epiphysio-metaphyseal region of proximal tibia. An open biopsy was taken from the swelling which confirmed the diagnosis of osteosarcoma – Fibroblastic type. Magnetic resonance imaging (MRI) of left knee with leg was carried out for accurate tumor delineation, which showed cortical destruction and extra osseous extent of the tumor. There was no involvement of joint space and neurovascular structures around the knee. The patient was screened for metastasis with Computerised Tomography of the chest, ultrasonography of the

abdomen and pelvis and there was no obvious evidence of any secondaries. The tumor was in Stage II B (High grade extracompartmental without metastasis) according to Enneking staging system for malignant tumors(7). The patient was started on neoadjuvant chemotherapy with Cisplatin, Adriamycin and Ifosfamide. He completed 3 cycles preoperatively and was planned for another 3 cycles postoperatively. The patient was planned for wide excision of the tumor and custom made prosthesis application. Xray and MRI were used to estimate the size of the prosthesis to be used. Anaesthetist fitness was obtained.

Resection and reconstruction:

Wide excision of the tumor was done through medial approach and reconstruction was done using custom made prostheses with polymethyl methacrylate cementation. It was a specially designed stainless steel endoprosthesis based on the exact anatomical model of the patient. The extensor mechanism was repaired by suturing of the patellar tendon to the holes provided in the prosthesis. Post-operative X-rays were taken. Patient was allowed to walk with the help of walker on the 3rd post-operative day. On the 15th post-operative day sutures were removed and the patient was administered 3 cycles of neoadjuvant chemotherapy with Cisplatin, Adriamycin and Ifosfamide. Knee bending was started after 6 weeks. On follow up after 3 months, patient was walking with a good range of flexion, without any support. There was no evidence of skin necrosis or infection. With 14 months follow up the patient has 120° of knee flexion. There is no implant loosening or periprosthetic fracture.

Table 1 : Patient Demographics

Age	Tumour	Side	Biopsy	Resection	Prosthesis
19/ Sex	Osteosarcoma - proximal tibia	Left	Open	Wide	Proximal tibia CMP

(CMP- Custom Mega Prosthesis)

Pre operative evaluation:

Figure 1 : X ray AP view showing osteoblastic lesion



Figure 2 : X ray Lateral view showing osteoblastic lesion



Figure 3 : CT Coronal view showing cortical breach



Figure 4 : MRI Coronal view showing extraosseous extension of tumor.



Figure 5 : MRI Axial view

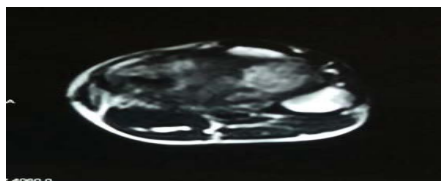


Figure 6: Post operative X ray AP view



Figure 7: Intra-operative image after tumor excision



Figure 8: Intra-operative image after CMP application



Figure 9: 14 months follow up X ray Lateral view

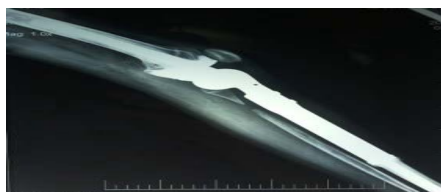


Figure 10 : 14 months follow up X ray AP view



Figure 11 : 14 months follow up – Full knee extension



Figure 12: 14 months follow up – 120 knee flexion



Figure 13 : Functional rehabilitation of the patient



DISCUSSION

Megaendoprosthetic reconstruction as a method for the treatment of bone tumors has numerous advantages. It allows immediate stability, and early rehabilitation with immediate full weight bearing. The importance of anatomical joint restitution and adequate restoration of limb biomechanics is vital(4). This can only be achieved by custom made endoprosthesis produced upon the exact three dimensional model of a patient's bone. Complications such as infection, deep venous thrombosis, delayed wound healing and dehiscence, periprosthetic fractures, fractures of implants and implant loosening usually occur in the first 6 months postoperatively and so proper post operative care and follow up is essential(5). Biau et al(6) reported 91 patients with bone tumors in the region of the knee treated with endoprosthesis (not custom made implants) and in 36 patients, endoprosthesis for various reasons had to be removed. Malawer and Chou in the study with 82 patients reported 67% ten year survival of megandoprosthesis(8). Mittermayer et al(9) in a study with 251 patient treated with Kotz endoprosthesis (Howmedica, New Jersey) reported 76% success after ten years. Gosheger et al(10) in a study on 250 patients treated with

endoprosthesis (not custom made implants) reported five year survival rate of 68.5%, with 8% of aseptic prosthesis loosening. The extent of tumor excision and reconstruction must be weighed against the chance of recurrence. Preservation of uninvolved normal soft tissue is important for functionality of the limb. Minimising the operating time is important in preventing infection. Anatomical joint restitution especially restoration of Quadriceps mechanism is vital for restoration of limb biomechanics. Advanced technology in implant designing and diagnostic methods helps in perfect reconstruction of the limb. Computer-assisted techniques are now available for measuring the anatomical size for prosthesis designing.

CONCLUSION

With neo adjuvant chemotherapy , more patients can now have CMP as an option. The longevity of CMP must be ensured by good quality of prosthesis, proper surgical procedure and post operative care. Successful mega endoprosthetic reconstruction requires good teamwork of orthopaedic surgeons, radiologists, oncologists, pathologists and physiotherapists.

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