



INSTITUTIONAL STUDY OF LIMB SALVAGE SURGERY WITH MODULAR AND CUSTOM MADE PROSTHESIS AFTER RESECTION OF DISTAL FEMUR AND PROXIMAL TIBIAL TUMOURS

Oncology

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ABSTRACT

40 patients admitted in Kidwai Memorial Institute Of Oncology , Bengaluru between 2009 to 2016 and underwent distal femoral or proximal Tibial resection with endoprosthesis reconstruction for benign and malignant bone tumors were studied retrospectively. 24 were males and 16 were female patients belonging to the age group between 16 years and 42 years. After complete staging. patients underwent surgery for osteosarcoma or aggressive GCT with modular prosthesis in 22 patients and custom made prosthesis used in 18 patients for the Endoprosthesis reconstruction. Patients were followed up for a mean of 18 months and assessed for functional outcome. Complications included superficial and deep seated infections, fractures and local recurrences. Limb sparing surgery after distal femoral and proximal tibial resections using modular and custom made prosthesis have similar results and have shown to be a safe and reliable technique of reconstructing a large bony defect, providing good functional and oncologic outcomes in most patients.. There were no differences noted in the rate of postoperative complications although modular prosthesis is advantageous allowing necessary intraoperative changes and eliminates the waiting period as in the custom made prosthesis which is more cost effective comparatively.

KEYWORDS

Prosthesis, custom made, modular, giant cell tumor, osteosarcoma.

INTRODUCTION

Ralph C Marcove and Kenneth C Francis introduced limb sparing resection in 1970 for management of bone tumours initially for osteosarcoma of distal femur. The distal and the proximal tibia are a common site for primary and metastatic bone tumours and thus, a common site where limb saving surgery is done. Historically most patients with malignancies were treated with amputation which resulted in unfavourable functional and psychological outcomes¹. With the advances in the imaging and surgical technique and the use of effective induction chemotherapy in aggressive bone tumours such as osteosarcoma causing significant downstaging of the tumour, limb sparing surgery which offers better functional, psychological and cosmetic outcome is possible and is more commonly practiced with major improvements in survival². Many recent studies have demonstrated a low risk of local recurrence (<5%) following limb-sparing surgery of osteosarcomas³⁻⁷. Eckardt et al reported their experience at the University of California at Los Angeles with osteosarcoma for the period 1972–84. Seventy-eight of 116 patients (67%) were treated by a limb-sparing procedure and the local recurrence rate was 8%⁸. Malawer et al. reported a 6% local recurrence rate following limb-sparing resections⁹. These favourable results have established limb saving surgery as the standard at present for carefully selected patients with osteosarcoma. Most studies have concluded disease free survival rates are the same as those patients who have undergone amputation. Patients who underwent limb sparing surgery have a better health related quality of life than patients who underwent amputation. Endoprosthesis can be custom made or modular. Custom made prosthesis are alloy of high strength and low weight. The modular prosthesis are off the shelf allowing reconstruction to be performed without delay, providing advantage over the custom designed implants. The functional results are excellent, and patient satisfaction is high. The prosthesis has an excellent long-term survival rate, is reliable, and presents minimal problems of breakage or dysfunction. The system is assembled intraoperatively and eliminates waiting time otherwise needed for custom-made devices. Another major advantage is it allows for intraoperative variation. Range of motion is from 0 to 120 degrees. Most patients enjoy a normal lifestyle, with limitations on running. It increases the longevity of the

prosthesis¹⁰. Endoprosthesis reconstruction provides immediate stability and allows early mobilization and weightbearing. For custom made prostheses the preoperative design and manufacturing processes requires 4 to 6 weeks; this causes a significant delay in the timing of resections. A second drawback of custom-made prostheses is the difficulty in determining the actual length and width of the resected bone on the basis of imaging modalities alone¹¹.

AIM

To assess the functional outcome in patients who underwent distal femoral or proximal tibial resection and end prosthetic reconstruction with comparison between modular and custom made prosthesis.

DESIGN – RETROSPECTIVE STUDY

MATERIALS AND METHODS

40 patients admitted in Kidwai Memorial Institute Of Oncology , Bengaluru between 2009 to 2016 and underwent distal femoral or proximal Tibial resection with endoprosthesis reconstruction for benign and malignant bone tumors were studied retrospectively. Of the 40 patients 24 were males and 16 were female patients. The patients belonged to the age group between 16 years and 42 years. All patients underwent complete staging. Most of the patients underwent surgery for osteosarcoma or aggressive GCT. Either modular prosthesis or custom made prosthesis was used for the Endoprosthesis reconstruction. Of the 40 patients 22 patients underwent reconstruction with modular prosthesis whereas custom made prosthesis was used for the rest 18 patients. Patients were followed up for a mean of 18 months and assessed for functional outcome. Complications included superficial and deep seated infections, fractures and local recurrences.

DISCUSSION

In our institutional study, 40 consecutive patients from 2009 to 2016 who underwent endoprosthesis reconstruction after resection of the distal femur or proximal tibia were studied retrospectively. Of the 40 patients 24 (60%) were males and 16(40%) were female patients. (Figure 1)



DISTRIBUTION AMONG MALES AND FEMALES

Figure 1. Distribution among males and females.

The patients belonged to the age group between 16 years and 42 years. Complete staging studies were done before surgery for all patients. Imaging studies included plain radiography, computed tomography (CT), and magnetic resonance imaging (MRI) of the entire thigh, knee, and leg. Particular attention was given to tumor extent through the distal femur, the anatomic location and extent of cortical breach, and magnitude of soft tissue extension and its relation to the popliteal vessels. All patients were carefully selected for limb salvage surgery after complete assessment for resectability. Endoprosthetic reconstruction was performed with modular prosthesis for 22(55%) patients and with custom made prosthesis in 18 (45%) patients. (Figure 2)

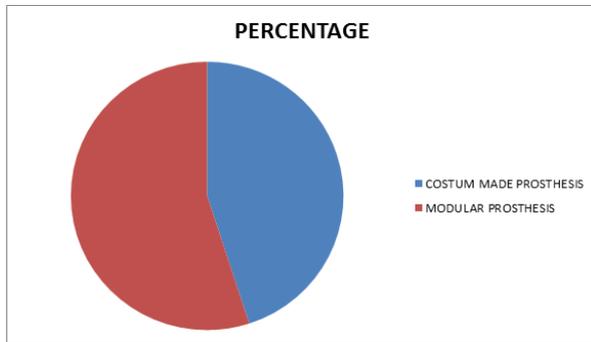
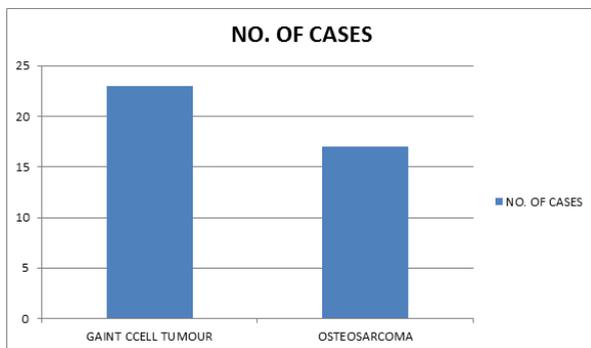


Figure 2: Distribution of custom made and modular prosthesis

23(57.5%) patients were operated for aggressive giant cell tumour and 17(42.5%) patients underwent surgery for osteosarcoma. (Figure 3)



INDICATIONS FOR RESECTION AND RECONSTRUCTION

Figure 3: Distribution of cases- Giant cell tumor/Osteosarcoma

26(65%) lesions involved distal femur and 14(35%) lesions involved proximal tibia. 9(52.9%) patients of osteosarcoma were operated after induction chemotherapy and downstaging of the tumour. All patients were followed up for a mean of 18 months. Patients were assessed for functional outcome at their follow up visits. Functional outcome was assessed with respect to pain, function, emotional status and use of supports. 34(85%) patients were able to carry out the activities of daily living with mild restriction of which modular prosthesis were used in 18(52.9%) patients and custom made prosthesis were used for 16(46.1%) patients. 2(5%) patients complained of modest intermittent non disabling pain. 2(5%) patients used crutch support for

walking. 6(15%) patients experienced post operative complications of which superficial infection was the commonest and 1 patient required wound debridement for deep seated infection, 2(5%) patients required removal and replacement of prosthesis due to deep seated infections causing exposure of prosthesis, 1(2.5%) patient required replacement of the prosthesis due to traumatic fracture of tibia inferior to the prosthesis and 1(2.5%) patient required resection with removal and replacement of prosthesis for local recurrence. Of patients experiencing complications 4 patients had modular prosthesis and 2 patients had custom made prosthesis.



Figure 4: Tibial Gct And Prosthetic Reconstruction



Figure 5: Tibial Osteosarcoma And Reconstruction

CONCLUSION

Limb sparing surgery after distal femoral and proximal tibial resections using modular and custom made prosthesis have similar results with reference to functional outcome. There were no differences noted in the rate of postoperative complications. Distal femur and proximal tibial endoprosthetic reconstruction has shown to be a safe and reliable technique of reconstructing a large bony defect, providing good functional and oncologic outcomes in most patients.

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