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Lower Limb Salvage Surgery: King Hussein Medical Center Experience

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Abstract **Original Research Article**

Background: Lower Limb salvage represents a challenge for orthopedic surgeons through a procedure designed to remove bony and soft tissue Tumors without amputation. The primary goal is to restore and maintain stability and functional capability as much as possible. ***Purpose:*** Examining the results of lower limb salvage procedures using Endoprosthesis and biological reconstruction**.** ***Methodology:*** we retrospectively analyzed 30 patients that had underwent lower limb salvage procedures by using Endoprosthesis and biological reconstruction procedures between 2011 – 2021 to study the post-operative follow up (ranged from 3 Months – 10 years). The patients were examined for complications, oncological and functional outcomes. The Tumors included 12 patients with distal Femur osteosarcoma, 6 patients with Proximal Tibia osteosarcoma, 6 patients with distal Femur Ewing sarcoma, 2 patients with Distal Femur chondrosarcoma, 1 patient with proximal Femur chondrosarcoma, 2 patients with distal Femur Giant Cell Tumor, 1 patient with Proximal Femur Metastasis. ***Results:*** Local recurrences occurred in two cases and systemic metastasis in seven patients. 12 patients died and 18 remained disease free.

Diagnosis	Numbers
distal Femur osteosarcoma	12 patients
Proximal Tibia osteosarcoma	6 patients
distal Femur Ewing sarcoma	6 patients
Distal Femur chondrosarcoma	2 patients
proximal Femur chondrosarcoma	1 patient
Distal Femur Giant Cell Tumor	2patients
Proximal Femur Metastasis.	1 patient

The 5 year Kaplan-Meier survival rate was 44.6%. The Average Musculoskeletal Tumor society (MSTS) Functional score was 60% in all patients. ***Conclusion:*** Lower Limb Salvage Procedures using Endoprosthesis and biological reconstruction techniques improved the oncological and functional outcomes.

Keywords: Lower Limb Salvage, Endoprosthesis autologous Fibular grafts, bone tumors.

INTRODUCTION

Lower Limb Salvage for bone Tumors represent a challenge for orthopedic surgeons especially with the increasing numbers of bone Tumor patients, nevertheless its mandatory to improve our knowledge, skills in using the most up to date implants and techniques to improve the oncological and functional outcomes of the patients reconstruction techniques following bone tumor resection including bone allografts, autologous Fibular grafts and Endoprosthesis, it is of up most importance to be familiar with the different reconstruction methods in order to achieve better results regarding morbidity and mortality. Since 2002 orthopedic Surgeons at Jordanian Royal Medical Services started using the different Endoprosthesis systems post bone tumor resection for reconstruction.

We conducted this retrospective analysis to examine the results of various reconstruction methods for 30 Lower Limb bone tumor patients operated upon between 2011 and 2021 to study the post-operative follow up (range 3 Months – 10 years). The patients were examined for complications, oncological and functional outcomes.

METHODS

We analyzed 30 patients with bone tumors that underwent tumor resection and Endoprosthsis reconstruction during the period between 2011 – 2021. There were 18 women and 12 men with the mean age of 25 (range 14 – 66 years). There were (27) primary malignant tumors and 2 aggressive benign tumors, and 1 metastasis (primary was breast).

24 patients received chemotherapy. Clinical evaluation and laboratory work up, MRI, CT scanning and bone scans were performed as part of tumor workup including the pre-op planning regarding safety margain bone resection of 4 cm, CT angiogram was done when tumor was found to be in close proximity to neurovascular bundles.

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During the surgery the excicion of the biopsy tract was done through a long medial Lower Limb approach (2 cm safety margains).

Lower Limb bracing was done for the patients for 6 weeks, after which functional excercises for the lower limb included weight bearing and range of motion. All patients were evaluated according to MSTS scoring system during their follow up.

As for the Endoprosthesis design the lower limb modular resection systems used were from Stryker.

RESULTS

Follow up was done in outpatient clinic (range 3 months – 10 years) patients were examined for complications, oncological and functional outcomes. Out of the 30 patients that underwent bone tumor resection with Endoprosthesis and biological reconstruction there were 12 deaths and 18 survivals at their 5th year follow up.

Some of the patients developed early complications such as wound infections and wound dehiscence that were treated and results by survivorship analysis showed that at 72 months 80% of patients remained free of revision surgeries.

Wound infection was seen in 4 patients and treated with debridement, dressings or staged revision. Temporary common peroneal nerve pulsy was observed in 3 cases all of which recovered after 3 months of surgery.

Local recurrence occured in 2 patients and systemic metastasis in 7 patients. The 2 patients with local recurrence were treated by re excision, 1 of them had no evidence of disease while the other patient died after 1 year of the first surgery.

The 7 patients with systemic metastasis died from either lung metastasis or declining therapy so there were 18 survivors at their individual 5 year follow up and the 5 year Kaplan-Meier survival rate was 44.6%. The Average Musculoskeletal Tumor society (MSTS) Functional score was 60% in all patients. The final active range of motion averaged 100 degrees. Only 2 patients had less than 90 degrees of flextion.

DISCUSSION

Endoprosthesis and biological reconstruction methods were able to achieve a limb survival rate of 100% in the long term survivors and approximately of 94% in the survivors and non survivors together. Early complications delaying chemotherapy occurred in 4 patients, 1 patient had wound dehiscence that underwent excision and closure allowing the patient to start chemotherapy after 4 weeks of the primary surgery. 2 patients had wound infection and were treated by dressings, antibiotics and debridements delaying the chemotherapy for a period of 4 weeks.

The Kaplan-Meier survivorship analysis showed that in our patients with up to 5 year follow up, the durability and survival of the Endoprosthesis was evident in 15 patients out the 18 long term survivors, 80% at their individual 5 year follow up. One of our patients, a 21 year old female, presented to our clinic 3 months ago with a broken Tibia Endoprosthesis stem after 10 years of her primary proximal Tibia Ewing sarcoma resection and Endoprosthesis reconstruction she had 4 cm shortening in her affected limb and so extraction of the old Endoprosthesis was perforemed and intraoperatively extensive metallosis was encountered that had to be excised before implanting the new proximal Tibia and distal Femur Endoprosthesis and after taking out more bone(more resection lengths) from both the Femur and the Tibia due to the quality of bone and the well-fixed stems inside both canals.

We found higher loosening rates in patients due to their age (younger patients) plus their daily life style demands and in patients with large reconstruction

work due to larger bone resections, and the end result regarding their range of motion was found to be less satisfactory.

Recovery depends on the amount of bony and soft tissue resected; crutches, canes and braces facilitate weight bearing post-surgery within the first 6 weeks allowing satisfactory limb function.

CONCLUSION

We believe that tumor resection followed by Endoprosthesis and biological reconstruction is the treatment of choice for lower limb bone tumors making limb salvage more successful by improving oncological and functional outcomes.

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