Functional Outcome Following Modular Endoprosthesis Reconstruction Surgery in Primary Bone Tumor of the Lower Limb

by

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M.D. (U.S.M.)

Dissertation Submitted In Partial Fulfillment Of The Requirement

For The Degree Of Master Of Medicine

(ORTHOPAEDICS)

UNIVERSITI SAINS MALAYSIA

SCHOOL OF MEDICAL SCIENCES

2008

DISCLAIMER

I hereby certify that the work in this dissertation is my own except for the quotations and summaries which have been duly acknowledged.

Dated: 27th May 2008 .....

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ACKNOWLEDGEMENT

My sincere thanks to my supervisor , Associate Professor Dr. Wan Faisham Nu'man and co-supervisor Professor Dr Zulmi Wan, Orthopaedics Oncology Reconstructive Unit (OORU) in Department of Orthopaedics , Hospital Universiti Sains Malaysia, Kubang Kerian for his support, guidance and invaluable advice in the preparation of this dissertation and throughout the completion of my study.

Also my special thanks and appreciation to Associate Professor Dr Mohd Imran Yusuf, Head of Department of Orthopaedic , HUSM, all consultants, lecturers, colleagues and all the staff at the Department of Orthopaedic, HUSM.

My sincere gratitude to Dato' Dr Suresh Chopra, Head of Department of Orthopaedic, Hospital Alor Star, his encouragement and being the role model for me. Also my sincere gratitude to all consultants, specialists, colleagues and all the staffs at the Department of Orthopaedic, Hospital Alor Star.

Special thanks to Dr Sarimah and Dr Kamarul Imran who had never failed to guide me on the statistical analysis of this study.

For both of my parents, Abdul Rahim b Md Shariff and Wan Enshah bt Wan Abdullah, thank you so much for believing in me and praying for my success in the program.

To my beloved wife, Dr Hanina Idris, thank you for the constant support, understanding and sacrifices and last but not least, to all my children, Nabilah Hanim, Nazril Hisham, Naim Hafiz and Nureen Husna, far away in Sg.Petani, Kedah, forgive me for the valuable time loss seeing all of you growing up and without whom I could never completed my study.

LIST OF ABBREVIATION

HUSM – Hospital Universiti Sains Malaysia

MSTS – Musculoskeletal Tumor Society

LSS – Limb Salvage Surgery

OS – Osteosarcoma

GCT – Giant Cell Tumor

DF endo – Distal femur endoproosthesis

PT endo – Proximal Tibia endoprosthesis

ROM – Range of movement

ISOLS - International Symposium on Limb Salvage

TESS - Toronto Extremity Salvage Score

GMRS – Global Modular Replacement System

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ABSTRACT

Introduction: Wide resection in Limb Salvage Surgery for primary bone tumors results in segmental osseous defect. The optimum method for reconstruction distal femur and proximal tibia remained controversial. Options include the use of autografts, allografts, custom-made megaprostheses and modular endoprostheses. Endoprosthesis allows early rehabilitation with a good long term functional outcome result. . The aim of this study is to evaluate the functional outcome of patient in modular endoprosthetic reconstructions surgery in the treatment of primary bone tumors of distal femur and proximal tibia of the lower limb, by using Musculoskeletal Tumor Society scoring system.

Methods: Fifty four consecutive patients with primary bone tumor of distal femur and proximal tibia were selected and reviewed to determine the functional outcome after wide resection endoprosthesis reconstruction surgery by using Musculoskeletal Tumor Society scoring system.

Results: There were 34 (63%) cases of distal femur and 20 (37%) cases of proximal tibia bone tumor. The Primary osteosarcoma are 33 (61.1%) and stage III GCT are 20 (37%). The mean age is 26.6±10.61. There were 12 (22.2%) patients who had metastasis to the lung. The mean MSTS score for both DF and PT endoprosthesis was 21.13 (70.43%), MSTS score for DF was 21.94 (73.13%) and PT was 19.75 (65.83%) group into good to excellent result. The infection rate was 13% (7 cases) and high in PT endoprosthesis

group. The early revision rate of endoprosthesis replacement was 11.1% (6 cases) mainly due to infection (3 cases). Infection and at site of endoprosthesis were the cause of early failure.

Conclusion: Endoprosthesis replacement for primary bone tumors had good to excellence MSTS score. There were no different in functional outcome after distal femur endoprosthesis and proximal tibia endoprosthesis. The cause of early failure in our center following endoprosthesis surgery is infection and the location of endoprosthesis replacement which is a proximal tibia.

ABSTRAK

Pengenalan: Pembedahan Penyelamatan Anggota dalam pembuangan tisu luas di dalam kanser tulang primer akan menyebabkan kehilangan pada segmen tulang. Cara optima untuk membentuk semula pada tulang hujung femur dan pangkal tibia masih lagi kontroversi. Terdapat beberapa cara untuk membentuk semula tulang yang dipotong iaitu "autografts", "allografts", "custom-made megaprosthesis" dan "modular endoprosthesis". Penggunaan "endoprosthesis" ini dapat membolehkan pesakit menjalani proses rehabilitasi dengan cepat dan memberi keputusan fungsi yang terbaik kepada pesakit kanser tulang. Tujuan kajian ini di jalankan adalah untuk menilaikan semula kebolehan pesakit selepas pembedahan "endoprosthesis" dalam kanser tulang primer di hujung tulang femur dan pangkal tulang tibia dengan menggunakan sistem markah MSTS.

Metodology: Lima puluh empat pesakit berturut-turut dalam kanser hujung tulang femur dan pangkal tulang tibia telah dipilih untuk dinilai semula dalam kebolehan fungsi selepas pembedahan "endoprosthesis" dengan menggunakan sistem markah MSTS.

Keputusan: Didapati 34 pesakit (63%) mengalami kanser hujung tulang femur dan 20 pesakit (37%) mengalami kanser pada pangkal tulang tibia. Kanser tulang osteosarkoma primer adalah 33 kes (61.1%) dan peringkat III GCT adalah 20 kes (37%). Purata umur pesakit adalah 26.6±10.61. Dua belas pesakit mengalami pembiakan kanser ke paru-paru. Pemjumlahan purata MSTS pada kedua-dua hujung femur dan pangkal tibia adalah 21.13 (70.43%), markah MSTS pada hujung femur adalah 21.94(73.13%), markah MSTS pada

pangkal tibia adalah 19.75(65.83%). Ini menunjukkan keputusan yang baik ke terbaik di dalam pembedahan "endoprosthesis" ini. Paras jangkitan kuman adalah 13%(7 kes) dan jangkitan adalah tinggi pada tulang pangkal tibia. Paras pembedahan "endoprosthesis" semula pada peringkat awal adalah 11.1% (6kes). Majoriti pembedahan semula ini adalah disebabkan oleh infeksi.

Kesimpulan: Pembedahan "endoprosthesis" dalam kanser tulang primer adalah baik ke sangat baik pada markah MSTS. Didapati tiada perbezaan yang signifikan dalam markah MSTS pada hujung tulang femur dan pangkal tulang tibia. Punca utama kegagalan pada pembedahan "endoprosthesis" ini adalah infeksi dan kedudukan "endoprosthesis" tersebut..

Chapter 1:
Introduction

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The distal femur and the proximal tibia is the most common location for bony tumor lesions. In the 1970s, the primary treatment for these lesions was amputation. With advances in radiation treatment, chemotherapy and endoprosthesis, limb salvage became an option in the early 1980s. Although there appears to be a higher incidence of local recurrence with limb salvage, the overall patient survival is similar to that for amputation. The development of new operative techniques, better patient selection and improved prosthetic design have improved the functional outcome of L.S.S.

The optimum method for reconstruction of the lower limb after resection of the femur or tibia is controversial. Options include the use of autografts, allografts, custom-made megaprostheses and modular endoprostheses. Endoprosthesis allows early ambulation rehabilitation with a good long term functional outcome result.(Zeegen, Aponte-Tinao et al. 2004)

Improvements in the treatment of primary bone neoplasms have led to an increase in the long-term survival of the patients. Many of them are young and are expected to lead active lives, placing greater demands on their implants, whilst those with metastatic disease are anticipated to have poor bone quality, possibly placing a greater load on the endoprosthesis. Accordingly, durability of the implant is important in reducing the likelihood of revision.

The aim of this study is to evaluate the functional outcome of patient in modular endoprosthetic reconstructions surgery in the treatment of primary bone tumors of distal

femur and proximal tibia of the lower limb, by using Musculoskeletal Tumor Society scoring system. We also will determine the cause of early failure following wide resection endoprosthesis reconstruction surgery.

Chapter 2:
Literature Review

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2.1 Overview of Bone Tumor

Surgical procedures for limb salvage have been performed for more than a century for primary bone sarcomas of low or moderate grade. In the past decade, advances in adjuvant and neoadjuvant treatment, in diagnostic imaging, and in the surgical techniques for reconstruction of limbs have led to serious consideration of limb-salvage surgery for most patients who have osteosarcoma, the most common high-grade sarcoma of bone.

Bone tumors are a rare and heterogeneous group of tumors. Although bone comprise 75% of the average body weight, these neoplasms represent less than 1% of all adult and 15% of pediatric malignancies. The annual incidence in the United States, which remains relatively constant, is approximately 2500 bone tumors.(Malewar 2001) Because these lesions are so rare, few pathologists have sufficient experience to deal comfortably with their diagnosis. This is further compounded by the steady evolution in the classification of bone tumors, which is based on their biological behavior, ultrastructure, and results of immunohistochemical and cytogenetic studies.

2.1.1 Biology Behavior of Tumor

Tumors arising in bone and soft tissues have characteristic patterns of biological behavior because of their common mesenchymal origin and anatomical environment. Those unique patterns form the basis of the staging system and current treatment strategies. Histologically, sarcomas