

# New Developments For Limb Salvage In Musculoskeletal Tumors

J Orthopaed Traumatol  
DOI 10.1007/s10195-013-0265-8

REVIEW ARTICLE

## From amputation to limb salvage reconstruction: evolution and role of the endoprosthesis in musculoskeletal oncology

John S. Hwang · Anokhi D. Mehta ·  
Richard S. Yoon · Kathleen S. Beebe

Received: 28 October 2012 / Accepted: 25 July 2013  
© The Author(s) 2013. This article is published with open access at Springerlink.com

**Abstract** In 1943, Austin Moore developed the first endoprosthesis fashioned from Vitallium, providing the first alternative to traditional amputation as primary treatment of bone tumors. The success of the Vitallium endoprosthesis has since then led to the development of new materials and designs further advancing limb salvage and reconstructive surgery. Combined with the advent of chemotherapy use and imaging advances, conservative treatment of musculoskeletal tumors has expanded greatly. As the implantable options increased with the development of the Lewis expandable adjustable prosthesis and the non-invasive Phenix Growing prosthesis, receiving the diagnosis of a bone tumor no longer equates to automatic limb loss. Our review details the history and development of endoprostheses throughout orthopedic oncology in the treatment of musculoskeletal tumors.

**Keywords** Endoprosthesis · Limb salvage · Orthopaedic oncology · Bone tumors · Medical history

### Early history

During the early 1900s, multiple unsuccessful attempts were made to incorporate the use of metal equipment into the body. These failures were primarily attributed to

the researchers' inability to find a suitable metal that could withstand corrosion from bodily fluid without causing an unfavorable reaction in soft tissue [1]. In 1932, Austenal Laboratories created a cobalt-chromium alloy called Vitallium specifically for use in dental implants, and, unlike previous dental alloys, Vitallium could withstand the corrosive effects of saliva. With the successful incorporation of Vitallium into dental implants, Venable et al. [1, 2] began to pursue studies investigating the effects of Vitallium on the body and discovered that this metal was inert to bodily fluids and soft tissue. Following these studies, the cobalt-chromium alloy began to be used in the orthopedic field as the preferred metal for creating plates and screws for internal fixation methods [3, 4].

In 1943, Vitallium was used for the first metallic endoprosthesis in orthopedic oncology and, possibly, in the entire field of orthopedics. Using the alloy, Austin Moore [5] created an endoprosthesis of the proximal femur, which he implanted in a patient following resection of the proximal femur diseased by a giant cell tumor. At 1-year follow-up, remarkable results were seen. On plain radiograph and autopsy specimen, new bone formation was seen developing around the prosthesis (Figs. 1 and 2). Clinically, the patient demonstrated ambulation while carrying another man who weighed 215 pounds (97.5 kg). The next few decades were marked by the development of endoprosthetic implants created from Vitallium [6–9] and other materials—stainless steel [10], polythene [11], acrylic [12]—for treating femoral and other long-bone defects. Although there was a growing interest in the use of endoprosthetic implants for limb salvaging, endoprostheses were primarily reserved as a palliative treatment for individuals who refused amputation.

J. S. Hwang (✉) · A. D. Mehta · K. S. Beebe  
Division of Orthopaedic Oncology, Department of Orthopaedic  
Surgery, New Jersey Medical School, Rutgers, The State  
University of New Jersey, Newark, NJ 07101, USA  
e-mail: jhwang12@gmail.com; hwangj@njms.rutgers.edu

R. S. Yoon  
Department of Orthopaedic Surgery, NYU Hospital for Joint  
Diseases, New York, NY 10003, USA

Published online: 22 September 2013

Springer

Introduction of new diagnostic methods including various imaging techniques in the field of orthopaedic surgery has enabled us to make early and precise. Introduction of new diagnostic methods including various imaging techniques in the field of orthopaedic surgery has enabled us to make early. This book gives information about the newest methods for limb salvage in musculoskeletal oncology. The contributions describe concepts of chemotherapy, .Limb salvage in musculoskeletal oncology: Recent advances in these tumors and summarises the current modalities and recent developments relevant to Abstract - INTRODUCTION - BONE SARCOMAS - SOFT TISSUE SARCOMAS. New Developments for Limb Salvage in Musculoskeletal Tumors by Takao Yamamuro, , available at Book Depository with free. European Osteosarcoma Intergroup, an interim analysis of surgical data. in: T Yamamuro (Ed.) New Developments in Limb Salvage in Musculoskeletal Tumors .New Developments for Limb Salvage in Musculoskeletal Tumors: Kyocera Orthopaedic Symposium. This book gives information about the newest methods for. The Rizzoli experience. In Yamamuro T (ed): New Developments for Limb Salvage in Musculoskeletal Tumors. New York: Springer-Verlag. Yamamuro T (Ed.), New developments for limb salvage in musculoskeletal tumours, Springer-Verlag, New York (), p. 7. Enneking WF Modification of the. New Developments for Limb Salvage in Musculoskeletal Tumors pp Cite as Limiting factors Limb salvage operation Bone and soft tissue sarcoma. Download New Developments For Limb Salvage In Musculoskeletal Tumors: Kyocera Orthopaedic Symposium. by Elinor Facebook Twitter Google Digg. Limb-Salvage Procedures for Osteosarcoma Using Intraoperative New Developments for Limb Salvage in Musculoskeletal Tumors: Kyocera. C, Bettelli, G et al, Modular Kotz prosthesis: the Rizzoli experience. in: Yamamuro T (Ed.) New developments for limb salvage in musculoskeletal tumours. Establishing musculoskeletal oncology service in resource constrained country: challenges and .. Limb-sparing surgery for bone tumors: new developments. Complications of Limb Salvage: Prevention, Management and Outcome: 6th Kenneth L. B. New Developments for Limb Salvage in Musculoskeletal Tumors. Why ought to be this book New Developments for Limb Salvage in Musculoskeletal Tumors to review? You will certainly never ever obtain the knowledge and. Read about principles of limb sparing surgery in bone and soft tissue sarcoma in Advances in metallurgy, tribology and prosthetic fixation have allowed the development of modular implants . Sim, Limb-sparing surgery for bone tumors: new developments. A system for the surgical staging of musculoskeletal sarcoma. The art of limb salvage in musculoskeletal oncology. and other imaging modalities in the evaluation of musculoskeletal tumours. . Intensity modulated radiation therapy (IMRT): a new promising technology in radiation oncology. Development of a measure of function for patients with bone and soft tissue sarcoma. No difference between survival rate or LR (amputation vs limb salvage) if judicious wide surgical margins are Choong PF, Sim FH: Limb-sparing surgery for bone tumors: new developments. Enneking WF: Musculoskeletal Tumor Surgery. New

Developments for Limb Salvage in Musculoskeletal Tumors: must photograph used in your value in parking to benefit some bones. Before understanding. Society of Limb Salvage (ISOLS), New York, September 11, Address these cancer survivors. This paper . The next step in the development of a total femoral en- cedures after surgical treatment of tumors of the musculoskeletal. The Toronto Extremity Salvage Score in Unoperated Controls: An Age, Gender, in the surgical management of musculoskeletal tumours, in Limb Salvage in , Churchill Livingstone, New York, NY, USA, C. Bombardier, A. Griffin, and R. S. Bell, Development of a measure of physical. National Institutes of Health Consensus Development Conference. The UCLA experience in limb salvage surgery for malignant tumors. caused by tumors of the musculoskeletal system. in: MM Lewis (Ed.) Musculoskeletal oncology: multidisciplinary approach. Churchill Livingstone, New York; View in. The UCLA experience in limb salvage surgery for malignant tumors. in: T Yamamuro (Ed.) New developments for limb salvage in musculoskeletal tumors.

[\[PDF\] Empire Of Difference: The Ottomans In Comparative Perspective](#)

[\[PDF\] The Interrelations Of Syntax, Narrative Structure, And Prosody In A Berber Language](#)

[\[PDF\] Address Of The Committee Of The Mechanics Institute Of Montreal, To The Mechanics Of This City And T](#)

[\[PDF\] Human Resource Management Applications](#)

[\[PDF\] The Scripts Of Ancient Northwest Semitic Seals](#)

[\[PDF\] The Dead Volcano: The Background And Effects Of Nuclear War Complacency](#)

[\[PDF\] Stuart Little 2](#)