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CORR Insights®: What Are the Long-term Results of MUTARS® Modular Endoprotheses for Reconstruction of Tumor Resection of the Distal Femur and Proximal Tibia?

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Where Are We Now?

In the last four decades, tremendous progress has been made in the way physicians treat musculoskeletal tumors. We have seen a greater emphasis on patient-centered outcome parameters [1], as opposed to an isolated focus on patient survival. As limb salvage has become a safe option for most patients, a greater focus on patient function and implant survival naturally becomes more important.

The introduction of modular systems for prosthetic reconstruction after tumor resection has facilitated surgical management of patients who undergo limb-salvage surgery. The fact that the patients undergoing tumor resections with large post-resection reconstructions often are young and active results in the implants getting exposed to high mechanical stresses. Several problems complicate prosthetic reconstructions after oncological resections about the knee; broadly, these can be grouped

into problems of soft-tissue coverage and extensor mechanism, anchorage, structural implant integrity (such as corrosion, fatigue fracture), infection, and growth-related problems in the skeletally immature patient. Each of these complications may cause failure of limb salvage.

An expert panel of the International Society of Limb Salvage (ISOLS) recently proposed a classification system for such complications [5]. The study by Bus et al. [3] focuses on both the complication and long-term performance of the modular MUTARS® prosthetic implant design. The study also describes the applicability and reliability of this implant design. However, with other authors reporting failure rates between 25% [7] and 88% [2] at 10 years for megaprotheses (modular or custom made) around the knee, it is clear that results of such implant designs are far from satisfactory. Direct comparisons among the few available implant designs remain difficult and incomplete. Apart from overall implant survival, few

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parameters are standardized and uniform among those series. The series are heterogeneous in terms of basic implant characteristics (fixed versus rotating hinge, and custom made versus off-the-shelf modular systems, among others). Most series include few patients accumulated during a long period of time, and in fact, only one study of which I am aware included more than 20 patients per year [8]. Finally, the extent of the resections and reconstructions is often insufficiently described. For example, a supracondylar resection of the distal femur may not be comparable to a large resection including the femoral isthmus in terms of implant anchorage or stresses on intra-prosthetic Morse-taper connections [6].

Where Do We Need To Go?

The data provided by Bus et al. [3] indicates that the MUTARS® system appears comparable to other systems in terms of implant survival. Owing to heterogeneity among tumor patients in terms of tumor biology, demographic parameters or extent of the defect, there is a need for large series with standardized description of these parameters. However, tools for a more detailed description of postresection defects and prosthetic reconstruction options must be developed and refined to allow

further research and hence progress in this field. The ISOLS classification of failure of limb-salvage [5] is based on a consensus of an expert panel, and should assist in the measurement of implant related complications and survival. Functional outcome scores such as the Musculoskeletal Tumor Society Score as proposed by Enneking et al. [4] may need to be refined to address specific questions such as the function of the extensor mechanism.

How Do We Get There?

Musculoskeletal tumors around the knee are rare, and so pooling of data from multiple centers appears essential. Since data pooling is infrequent, the best way to foster such collaboration is perhaps through initiatives from global or regional musculoskeletal tumor societies. Public and private funding bodies should focus more on multicenter research programs than on the analysis of small heterogeneous cohorts.

Further research should focus on establishing robust classification systems allowing for a standardized description of postresection defects, which should include bony as well as soft tissue defects. Oncological aspects such as neoadjuvant or adjuvant treatment modalities need to be taken into account in evaluating such implant systems. In order to be clinically

relevant, such classification systems should preferably be based on important outcome parameters rather than consist of an arbitrary selection of solely preoperative factors. Finally, comparisons of large cohorts based on a uniform demographic, pre and postoperative parameters will allow not only to improve surgical decision-making and implant design, but also prevent failure of limb-salvage.

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