Introduction: Modular Megaprostheses of the knee have been developed for alloarthroplastic reconstruction of large bone defects that are often to be found after resection of malignant tumors of the knee.

Increasing age and a higher level of mobility lead to an increasing incidence in revision arthroplasty after total knee replacement. In these cases, modular endoprosthetic systems of the knee can also be applied.

So far, the reconstruction of large defects in bone and soft tissue environments can be accomplished by the modern modular components of revision implants. The consecutive reconstruction of the extensor mechanism in extended revision has its own drawbacks and is often associated with significant functional limitations for the patient. Specially designed implants and methods are required to generate good functional results.

Materials and Methods: Between 1993 and 2001, 70 modular MML megaprostheses (produced by Co. ESKA, Luebeck, Germany) have been implanted by the Department of Orthopedics of Klinikum Rechts der Isar of the Technical University of Munich. In 52 cases a reconstruction of the distal part of the femur was used, in 11 cases a reconstruction of the proximal tibia was included and in 7 cases a total femur reconstruction was necessary. All 70 patients (41 women, 29 men) in the age of 12 to 92 years (50 ± 22 years) exclusively had an unilateral surgery (37 right, 33 left). 38 out of 70 patients were in included in this retrospective study. 29 out of 38 patients had surgery due to some kind of bone tumor (25 primary malignant bone tumors, 2 semi-malignant bone tumors, 1 metastases, 1 osteonecrosis), 9 out of 38 patients had surgery because of revision arthroplasty and therefore were also provided with a modular MML-prosthesis.

Results: On the one hand, an excellent functional outcome could be determined. At 7 years after surgery, an average of 32±13 points was achieved on the Oxford Knee Score. The outcome measurement using the functional scoring system of the American Knee Society (AKS score) showed similarly good results with 71±25 points out of 100. A minor deficit of only 2° in active extension could be observed after reconstruction of the extensor mechanism. Further means of examination included the SF-12 health survey, VAS, and, besides general demographic details, a examination of patella pain, created by the authors.

On the other hand, a high rate of complications, especially mechanical complications, could be observed. 31 out of 38 patients developed 63 late complications (>6 weeks after surgery) which needed revision surgery. In most cases (n=24) mechanical complications were responsible for revision surgery (axis n=10, cone failure n=7, inlay n=3, secondary rotational fault n=2, other n=2). Four early complications included one superficial wound infection and three peroneal nerve palsys.

Discussion: Endoprosthetic reconstruction after resection of bone tumors or large total knee revision surgery nowadays demand highest efforts on both the surgeon as well as the prosthesis.

In many times, large bone and soft tissue defects, resulting in a loss of stability, can be found in these operations. A functionally limiting lack of stability has to be compensated by special endoprosthetic reconstruction. This is achieved by a higher level of implant constraint. Therefore it may be necessary to chose semi- or fully-constrained implants in events like that, offering only a limited degree of freedom. In this study a fully constrained model with a limitation to one degree of freedom was used which allows compensation of a complete loss of intrinsic stability of the knee.

Increasing levels of constraint result in an increasing biomechanical load in the area of load transmission. This causes a higher stress on prosthetic coupling as well as on the area of load transmission, the bone-implant interface.

Especially younger patients, with an assumed higher level of activity, suffered mostly of mechanical complications once a fully constrained implant was used. The majority of revision surgery after implantation of a modular endoprosthesis was due to mechanical failure. With 67 revision surgeries in total, 59,7% of revision had to be accounted to mechanical complications (24 hinge failures, 12 aseptic loosening, 4 breakages of the stem). All aseptic losening occurred in cementless fixed diaphyseal stems. In conclusion, modular tumor endoprostheses allow individual reconstruction of large bone and soft tissue defects and good clinical results can be achieved. Then again a high rate of mechanical complications clearly shows the need for improvement of this system.


