

Periprosthetic fracture caused by stress shielding after implantation of a femoral condyle endoprosthesis in a transfemoral amputee—a case report

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Abstract

A femoral condyle endoprosthesis (FCE) was implanted in a 48-year-old transfemorally amputated woman with the intention of making the amputation stump fully endbearing (Figure 1). The implant was a customized endoprosthesis of titanium alloy (Scandinavian Customized Prosthesis AS, Trondheim, Norway), based on experience of the Unique Customized Femoral Stem (Aamodt et al. 1999). Cross-sectional CT images were used to retrieve the inner cortical contours of the femoral diaphysis, and the stem was designed to fit closely within the femoral canal (Aamodt et al. 1999). The stem was fully coated with a dual layer of titanium and hydroxyapatite. During implantation, a small fissure occurred at the anterior aspect of the distal part of the femur, which was secured with 2 cerclage wires. There were no other peroperative or postoperative complications. After 6 weeks of unloading, the patient received a new artificial limb with a prosthetic socket that allowed endbearing. At the 12-month follow-up, the patient was using a knee disarticulation socket that terminated below the groin and the tuber ischiadicum. Radiographs showed improved alignment of the amputated leg (Figure 2) and the patient reported only minor stump pain, even with full endbearing. The skin was normal, probably because of the large bearing surface of the artificial condyle (Jensen 1996).

Conclusion

In retrospect, the risk factors associated with stress shielding are consistent with the high degree of bone loss observed in this patient. After removal of the implant, radiographs showed evidence of bone regeneration in the distal femur. This may have been caused by removal of the stress-bypassing component, and the re-introduction of some axial load to the distal femur. This is a unique patient case with failure probably caused by extreme stress shielding after implantation of an experimental implant. This should also be a warning when developing new implants, as it shows that stress shielding can actually have serious consequences if the bone loss is severe enough.



Figure 2. Femoral alignment before and after insertion of the FCE.