The goal of the operation is limb-sparing resection of tumors arising from the proximal tibia with adequate surgical margins and local tumor control. Implantation of a constrained tumor prosthesis with an alloplastic reconstruction of the extensor mechanism to restore painless joint function and loading capacity of the extremity. Primary bone and soft tissue sarcomas. Benign or semimalignant aggressive lesions. Metastatic disease (radiation resistance and/or good prognosis). Poor physical status. Extensive metastatic disease with life expectancy < 6 months. Tumor penetration through the skin. Local infection or recalcitrant osteomyelitis. Poor therapeutic compliance. Large popliteal extraosseous tumor masses with infiltration of neurovascular structures. A single incision is made from the anteromedial aspect of the distal femur to the distal one third of the medial lower leg. Preparation of large medial and lateral fasciocutaneous flaps. The popliteal vessels are explored through a medial approach by releasing the pes anserinus and semimembranosus tendon, mobilizing the medial gastrocnemius muscle and detaching the soleus muscle from the tibial margo medialis. The anterior tibial artery and vein are ligated. If the knee joint is free of tumor, circumferential dissection of the knee capsule is performed and the patellar ligament is
dissected. An osteotomy of the tibia shaft is performed with safety margins according to preoperative planning. In order to obtain adequate surgical margins, in some cases an en bloc resection of the tibiofibular joint becomes necessary. Therefore, the peroneal nerve is exposed. Parts of the M. tibialis anterior, a portion of the M. soleus and the entire M. popliteus are left on the resected tibial bone. After implantation of the prosthesis and coupling of the femoral and tibial component, the extensor mechanism is reconstructed using an allograft. It is passed transversely through the distal end of the quadriceps tendon looping the proximal margin of the patella. Both ends are passed distally through a subsynovial tunnel and are fixed under adequate pretension in a metal block of the tibial component. The detached hamstrings and remaining ligaments can be fixed on preformed eyes of the prosthesis. A medial gastrocnemius muscle flap is used to provide soft tissue coverage of the tibial component. Immobilization and elevation of the extremity for 5 days, then flap conditioning. Mobilization in a hinged knee brace locked in extension for 6 weeks without weight bearing. During this time active flexion with a stepwise progress, isometric quadriceps training. Then beginning of straight leg raising exercises, stepwise unlocking of the brace with 30° every 2 weeks. Weight-bearing is increased by 10 kg/week. Thrombosis prophylaxis until full weight-bearing. At follow-up, patients are monitored for local recurrence and metastases using history, physical examination and radiographic studies. Between 1988 and 2009, endoprosthetic replacement and allograft reconstruction of the extensor mechanism after resection of tibial bone tumors was performed in 17 consecutive patients (9 females and 8 males) with a mean age of 31.1 years (range 11-65 years). There were no local recurrences. Until now, 5 patients have died of tumor disease. One or more operative revisions were necessary in 53.9% of the patients. According to Kaplan-Meier survival analysis, the implant survival at 5 years was 53.6% and 35.7% at 10 years, respectively. In 2 cases, a distal transfemoral amputation had to be performed due to deep infection. There were 3 cases of tibial stem revision due to implant failure and aseptic loosening, respectively. In 3 patients, the hinge of the prosthesis had to be revised. Impaired wound healing occurred in 2 cases. Peroneal nerve palsy was observed in 3 patients with recovery in only one. The mean Oxford knee score for 9 of the 12 living patients was 30.7 ± 7.5 (24-36). No patient had a clinically relevant extension lag. The mean range of motion at the last follow-up was 90.2° ± 26.7 (range 35-130°). All patients were well satisfied with their postoperative outcomes.