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Extensor reconstruction of the knee after proximal tibial resection using fibular transposition with suturing of the patellar ligament to the biceps femoris tendon

Hiroyuki Kawashima, Akira Ogose, Tetsuo Hotta, Takashi Ariizumi, Naoto Endo

Division of Orthopedic Surgery, Niigata University Graduate School of Medical and Dental Sciences

Background: Tumor maga-endoprostheses are an attractive option with good functional outcome for reconstruction after en bloc resection of the proximal tibia with the tumor specimen. However, since tendinous tissue dose not grow naturally to metal, controversy remains regarding reconstruction techniques for the extensor mechanism. Several synthetic devices, such as nonabsorbable tapes, tubes, sutures, cerclage wires, and transplants, such as autograft and allograft from the sartorius or biceps tendons and gastrocnemius flaps have been used. Successful and reliable attachment of the soft tissue has been a significant advance that improved functional outcomes, though there are no current consensus as to the best method of reconstruction of the extensor mechanism of the knee.

Purpose: The purpose of this study is to demonstrate the outcome of fibular transposition with suturing of the patellar ligament to the biceps femoris tendon for reconstruction of the extensor mechanism of the knee after proximal tibial resection.

Patients and Methods: We retrospectively reviewed seven consecutive patients who underwent resection of proximal tibia with prosthetic reconstruction and reconstruction of the extensor with fibular transposition between 1997 and 2014. The fixed-hinge Kotz Modular Femur-Tibia Reconstruction system (HMRS; Howmedica Modular Resection System, Stryker, UK) was used in six patients, and the rotating-hinge Global Modular Replacement System (GMRS) was used in the latest case. There were five female and two male patients with a mean age of 47.4 years (range, 17-76 years). The diagnosis of all cases were confirmed by core needle biopsy to minimize the resection of soft tissue. The diagnosis include three primary bone sarcomas, two metastatic carcinomas, one metastatic soft tissue sarcoma and one giant cell tumor. A follow-up evaluation included both passive and active range of motion (ROM), extensor lag, the Musculo-skeletal Tumor Society (MSTS) score, and complications. In all cases except the patient with GCT, we planned a resection area consisting of soft tissue and muscle in order to obtain a wide surgical margin. After resection of the proximal tibia and insertion of the endoprosthesis, the proximal fibula was prepared for medial transposition. The bicep femoris tendon was exposed proximally for approximately 3-5 cm from distal attachment for the fibular head and sharply cut. Soft tissues were detached from the proximal third of the fibula including the peroneal nerve, and hemi-cortical cutting of proximal-lateral aspect of fibula was performed by bone saw with particular caution not to cut the periosteum of medial aspect. After medial transposition of the proximal fibula, the biceps femoris tendon was directly sutured to residual stump of the patellar ligament. No flap reconstruction and skin graft was necessary for wound closure. Postoperatively all patients were immobilized in the knee joint for 6 weeks, and then an intensive physical therapy program for muscle strengthening and knee range of motion begins.

Results: One patient had an above-the-knee amputation due to skip metastases at 14 month postoperatively, and

developed lung metastases and expired. Six patients were followed up for 75 months (range, 9 to 153 months) and had no complications. In the six patients, extensor lag had a mean of 10° (range, 0 to 40°). Active flexion had a mean of 100.8° (range, 85 to 110°) and MSTS scores had a mean of 77 % (range, 67 to 90 %). All patients were able to ambulate without crutches at the latest follow-up. At final follow-up, no implants demonstrated evidence of loosening or breakage.

Conclusions: Extensor lag was significantly less compared to other technique. No complications were observed in six patients. Utilization of fibular transposition and end-to-end suture of patellar ligament and biceps femoris tendon is a simple reliable and successful method for extensor reconstruction after the proximal tibial resection.