

Technical note

Insertion of the patella tendon after prosthetic replacement of the proximal tibia

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We describe the technique and the results of a method to reconstruct the patellar tendon insertion to a tumor prosthesis by wrapping an artificial mesh around

the prosthesis, followed by suturing the patellar tendon and a gastrocnemius flap to the mesh.

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It is difficult to obtain a fixation between the patellar tendon and a tibial endoprosthesis. We present our experiences with the implantation of a polypropylene (Marlex) mesh (Parrish et al 1978) around the prosthesis to provide an insertion site for the patellar tendon and other soft tissues in 3 patients with tibial sarcoma.

The operation (Figure 1)

1) After resection of the tumor, the medial transition site between the medial gastrocnemius muscle belly and Achilles' tendon is dissected.

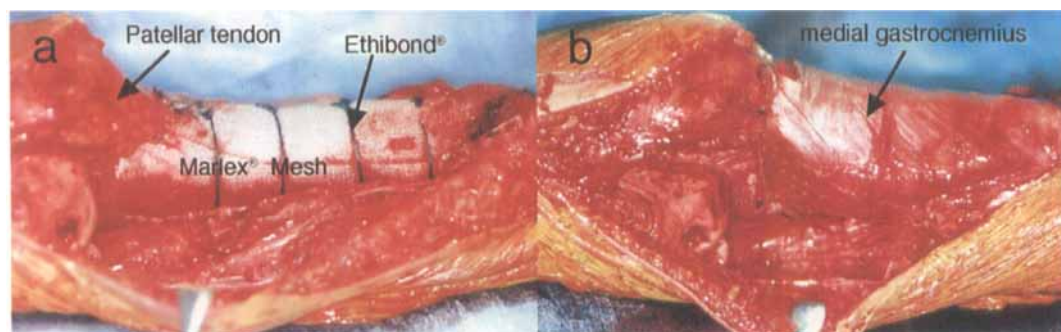
2) Polypropylene mesh (Marlex mesh) is folded in 2 layers and rolled and wrapped around the tibial part of the prosthesis. The mesh is fixed tightly to the prosthesis using several non-absorbable threads (Ethibond).

3) The patellar tendon is sutured at the anatomical site on the mesh.

4) The medial gastrocnemius muscle is sutured to the mesh covering the suture site of the patellar tendon.

5) The knee is immobilized with a plaster slab for 3 weeks. Thereafter knee motion is allowed

Figure 1. Intraoperative findings.



A. Marlex mesh wrapped around the prosthesis. The mesh is fixed to the prosthesis by several non-absorbable threads. The patella tendon is sutured to the mesh.

B. The transpositioned gastrocnemius muscle is sutured to the mesh to cover the insertion of the patella tendon and the prosthesis.

Patient data. All patients had tumors of the proximal tibia

Case no.	Age	Diagnosis	Chemo-therapy	Grade ^b	Follow-up mos	Knee ROM (°)			Functional evaluation ^a						
						Extension passive	Flexion active	Pain	Function	Emotional acceptance	Supports ability	Walking	Gait	Total	
1	11	Osteosarcoma	+	IIB	24	0	0	95	5	3	5	3	4	4	24
2	19	Osteosarcoma	+	IIB	20	0	0	85	5	3	4	3	4	3	22
3	55	Adamantinoma	–	IIB	30	0	–5	80	5	3	5	3	4	3	23

^aEnneking et al. 1993, ^bEnneking et al. 1980

and partial weight bearing starts 6 weeks after surgery. In case 1, a continuous passive movement machine was used after 3 weeks' immobilization. At the start of walking, a knee brace is used. In all cases, straight leg raising was allowed 4 weeks after surgery.

Case reports

3 patients with tibial sarcoma underwent tumor resection, including reinsertion of the patella tendon (Table). Patients 1 and 3 had no complications. Patient 2 required an orthosis for drop-foot because of damage to the common peroneal nerve, which recovered completely after 6 months. All patients could extend their knees almost completely, although some resistance against extension. The extension lag was 0, 0, and 5 degrees, respectively (Figure 2).

Discussion

In the modified Kotz (Howmedica modular resection) system, the patellar tendon is fixed to the prosthesis, which is made of vitallium, by fastening it to a polyethylene plate with screws. However, the tendon often becomes detached from the prosthesis. Moreover, there is little soft tissue covering the anterior surface of the prosthesis, so infection easily develops if skin problems occur (Malawer and Price 1984). Malawer and Price (1984) and Mascard et al. (1998) reported their results with gastrocnemius transposition flaps in conjunction with large segmental resections and prosthetic replacements for primary bone sarcomas of the proximal tibia. Their method reduced postoperative problems. Petschnig et al. (1995) ventralized and medialized the proximal fibula and the medial gastrocnemius head to reconstruct

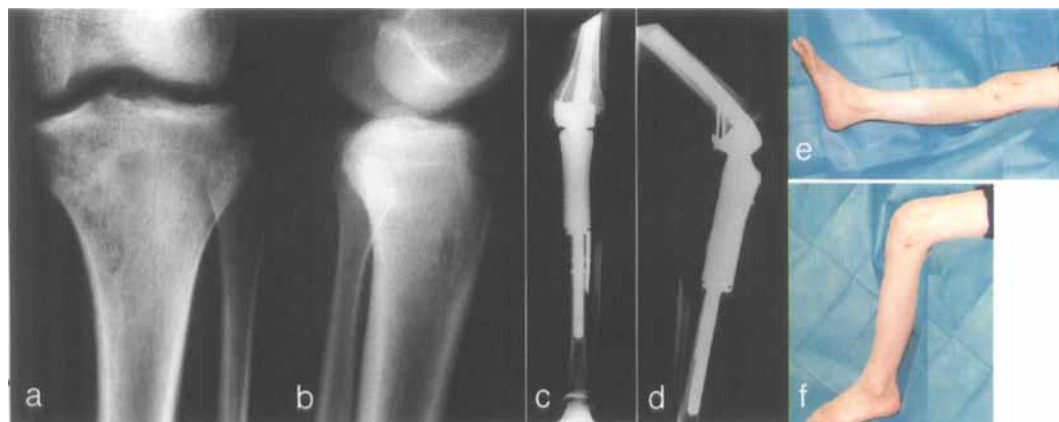


Figure 2. Case 2. A 19-year-old woman with osteosarcoma of the proximal left tibia. After resection of the tumor with a wide margin, a proximal tibial prosthesis was inserted. Range of knee motion between 0 and 85°. The extension lag was 0°. The patient can walk independently without external support.

the extensor apparatus after resection and endoprosthetic replacement of the proximal tibia. The best extensor muscle strength achieved after reconstruction was about 20% of that in the non-operated knee (Petschnig et al. 1995).

Although the gastrocnemius transposition is easy, in some cases, there are few suture sites between the transposed muscle and surrounding soft tissues. Moreover, the strength of the knee extensor produced by suture between the patella tendon and gastrocnemius muscle is often insufficient. By implantation of an artificial mesh to cover the prosthesis, the soft tissue, especially the patella tendon and the muscle can easily be fixed (Shinjo 1993). Hillmann et al. (1995) reported good function, by covering the prosthesis with polyethylene terephthalate mesh (Treviera tube), by suturing patella tendon to the mesh, and by using a gastrocnemius flap.

In patient 1, the range of knee flexion was the largest perhaps because continuous passive motion (CPM) exercise was begun 3 weeks following surgery.

After transposition of the gastrocnemius to the anterior site of the prosthesis, skin closure sometimes becomes difficult due to the increased soft tissue volume. In such a case, mesh skin graft can be used to cover the gastrocnemius muscles.

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