

TECHNICAL NOTE

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Reconstruction of the hip abductors after resection of the proximal femur

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Abstract Three patients with malignant bone tumors of the proximal femur underwent implantation of an endoprosthesis with reconstruction of the joint capsule and hip abductors using artificial mesh.

Résumé 3 patients opérés pour tumeur maligne de l'extrémité proximale du fémur ont eu l'implantation d'une endo-prothèse avec reconstruction de la capsule articulaire et des abducteurs par un filet synthétique.

Introduction

Limb salvage procedures for musculoskeletal tumors near a joint often necessitate an extended soft-tissue resection. Excision of tumors including hip abductors often leads to hip dislocation [3, 7, 10] and functional insufficiency of the hip abductors [12]. Since 1996, we have used polypropylene (Marlex) mesh [9] and nonabsorbable polyester thread (Ethibone) for reconstruction of the hip abductors and joint capsules.

Patients and methods

Three patients with malignant bone tumors of the proximal femur underwent tumor resection at our hospital (Table 1). All the tumors were resected with an adequate (wide) margin. The follow-up time ranged from 12 to 24 months. All patients were alive at the last follow-up. Functional outcome was evaluated according to the criteria of Enneking et al. [4].

Surgical technique

The tumor, including the insertion of the gluteus medius muscle, is resected. Marlex mesh is sutured to the peripheral area of the joint capsule or anchored to the bone around the acetabulum (Case 3). A Kotz prosthesis [10] is implanted and the Marlex mesh is tight-

ened around the prosthesis by nonabsorbable sutures using Ethibond (Figs. 1 and 2). All the muscles around the hip joint are anatomically fixed to the mesh-prosthesis complex. Using this procedure dead space can also be eradicated.

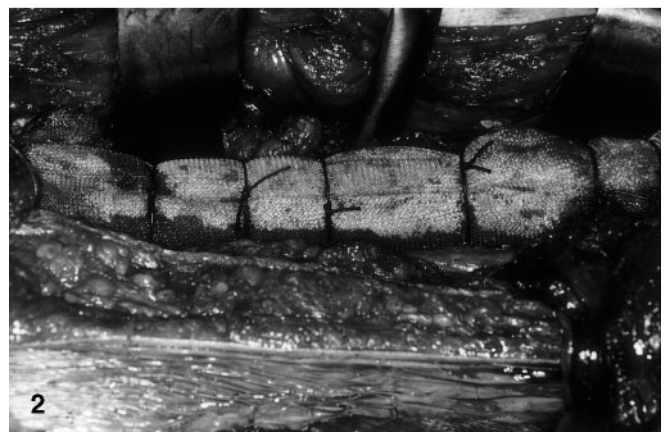


Fig. 1 Intraoperative photograph. Prosthesis is implanted and covered by the Marlex mesh

Fig. 2 Intraoperative photograph. The Marlex mesh is tightened around the prosthesis by nonabsorbable sutures with the Ethibond

Table 1 Patients' characteristics

Patient	Age/Sex	Diagnosis	Function (6 months after surgery)						
			Pain	Function	Emotional	Supports	Walking	Gait	Total
			acceptance			ability			
1	65/male	Malignant lymphoma	5	4	3	5	4	3	24 (80%)
2	72/female	Solitary myeloma	5	4	4	5	4	3	25 (83%)
3	60/male	Malignant fibrous histiocytoma	5	3	3	4	4	3	22 (73%)

Results

There were no hip dislocations or other complications. On manual muscle testing the abductors worked against gravity in all three patients. Two patients walked without any support. The average score on functional evaluation was 79% (Table 1).

During follow-up, one patient (Case 3) underwent biopsy of the proximal thigh because a local relapse was suspected. There were no histological findings of local relapse. The fibers of the mesh were completely surrounded by fibrous tissue. There were a few small round cells that suggested some inflammatory reaction.

Discussion

There have been three reports on stabilization of the hip joint after implantation of proximal femur prosthesis following tumor resection including the hip abductors. The concept underlying these reports was similar; covering the prosthesis with biological or artificial materials and fixing the soft tissue to the material-prosthesis complex for stabilization of the hip joint. Shinjo et al. [11] used Dacron polyester fabric and a satisfactory result was obtained. Taira et al. [12] grafted dried fascia lata for the same purpose; however, this material was probably an allograft and this method carries immunological and infective risks. Trevia tube was used by Hillmann et al. [5].

We selected Marlex mesh, which is made of polypropylene. Marlex has an exceptional tensile strength compared to that of other artificial fabrics used in the medical fields; the tensile strength of the monofilament is 50,000–150,000 pounds per square inch [8]. When Marlex mesh remains in the body, it serves as a scaffold into which fibroblastic tissue migrates [9]. Rejection of the material is not a problem with either Dacron or Marlex [1]. In our histological specimen, there were few inflammatory cells, but connective tissue infiltrates and homogeneous granulation tissue can be induced around the mesh. From these histologic findings, the incidence of infection appears to be low [1].

For fixation of Marlex mesh to the prosthesis, we used polyethylene thread (Ethibond). Greenwald et al. [6] examined 10 types of suture materials and found only Ethibond did not change strength, strain, and toughness over time in vivo. Ethibond may be the most suitable thread for tightening the Marlex mesh around the prosthesis.

If the capsule was totally resected, we used Mitek anchor (GII) to anchor the mesh to the bone. Mitek anchor is made of titanium alloy (Ti6Al4V) and is useful for connecting soft tissue to bone. Its tensile strength is reported to be very high and the Mitek GII anchor fails (pulled out of bone) less often than other anchors [3].

Our reconstruction procedure can create a stable hip joint, even if the insertion site of the abductor muscles has been resected. Finally, we must stress that this report is not to be considered the end result of study but a preliminary report noting the availability of an artificial material for reconstructive surgery after tumor resection.

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