Technical note

Stump lengthening after hip disarticulation using a modular endoprosthesis in 5 patients

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ABSTRACT – To reduce the disability after hip disarticulation, we developed a special surgical procedure in patients having a proximal femoral tumor with a large tumor involving the sciatic nerve or neoplasms involving the tibia and femur. The hip was disarticulated, but we preserved a musculocutaneous flap. A modular endoprosthesis was then placed in the acetabulum or, in case of an extraarticular resection of the hip joint, it was placed in the iliac bone. A trevira tube was used for reconstruction of the joint capsule and fixation of soft tissues. We performed this procedure in 5 patients who had a good functional outcome.

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Technique

Depending on the extent of the tumor or the previous operational scar, we preseved a ventral/medial flap. The flap should be sufficiently large to cover a long stump. The adductor muscles, rectus femoris muscle and, in some cases, the long head of the biceps femoris muscle were preserved. The vascular supply comes via the femoral artery and femoral vein; the profunda femoral vessels can be ligated. The neural innervation derives from branches of the femoral and obturator nerves. The hip was then disarticulated and the femur and lower extremity were resected. We used a modular proximal femur replacement (Mutars, Implantcast Corp.) having a special rounded end-piece, with a large load-bearing surface (Figure 2). This device is made of titanium-aluminum-vanadium to minimize weight which facilitates muscle control of the stump. The prosthesis was inserted into the acetabulum, with a bipolar cup. To prevent dislocation, we used a trevira tube for capsular reconstruction. This tube was fixed to the remaining capsule and to the whole endoprosthesis with non-absorbable sutures (Figure 1). In case no. 5, an extraarticular resection of the hip joint was necessary. In this case, the endoprosthesis was attached to the remaining iliac bone and the trevira tube was fixed to the bone, using Mitek Super Anchor. The remaining muscles were then reattached to the endoprosthesis. The refixation of the ileopsoas muscle and the gluteal muscles is needed for good postoperative function. A well-perfused muscle flap should cover the end-piece of the endoprosthesis and reduce pressure on the skin (Figure 3).

Patients and results

Between February 1998 and October 1999, 5 patients underwent a hip disarticulation with a continuous stump-lengthening procedure, using a modular endoprosthesis (Table).

All patients could wear an above-knee prosthesis 3 months after surgery. None had severe blisters, horny skin or other problems in the distal load-bearing zone of the end-piece after use of a prosthesis. In all patients, the stump gradually diminished in size in the first 6 months after the opera-

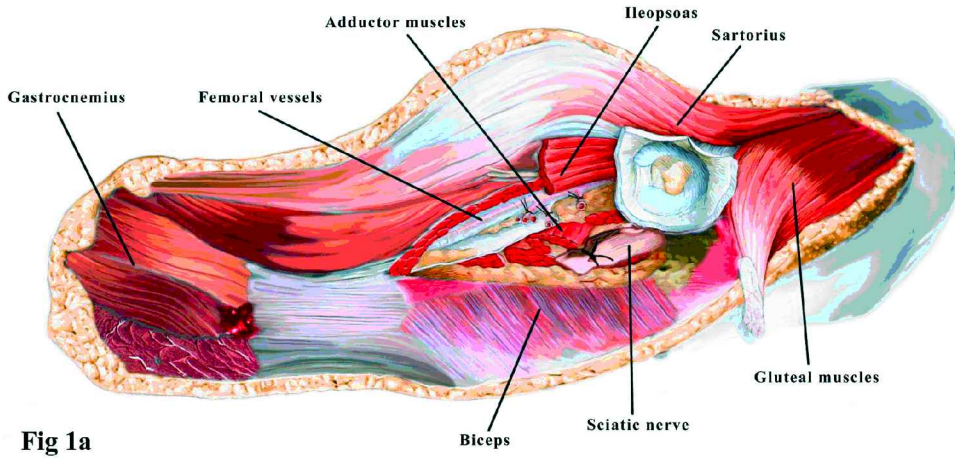


Fig 1a

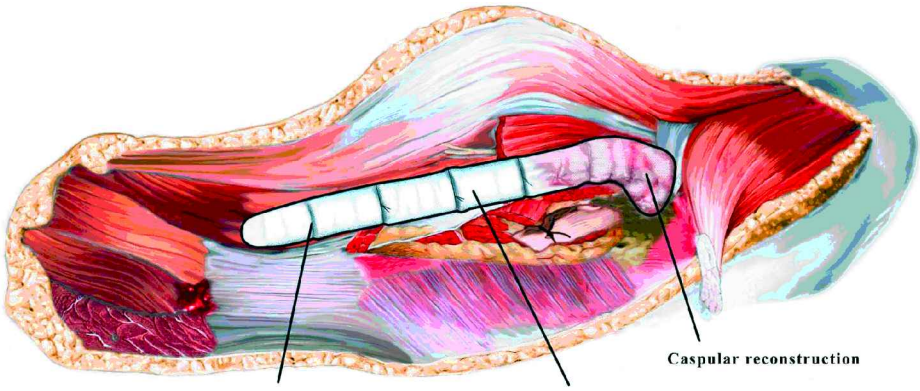


Fig 1b

Figure 1. Depending on the size of the tumor or scar of previous intralesional operations, we preserved a ventral/medial flap (a). A trevira tube was used for reattachment of the remaining capsule and remaining muscles (b).

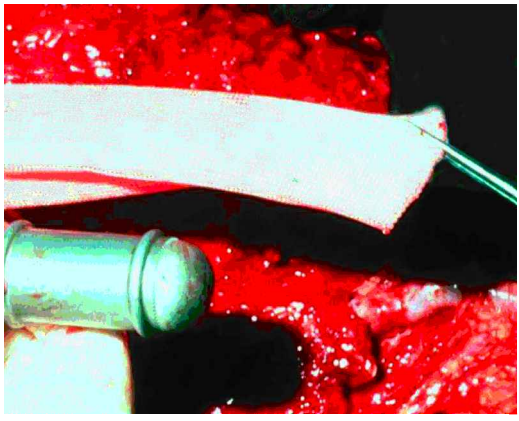


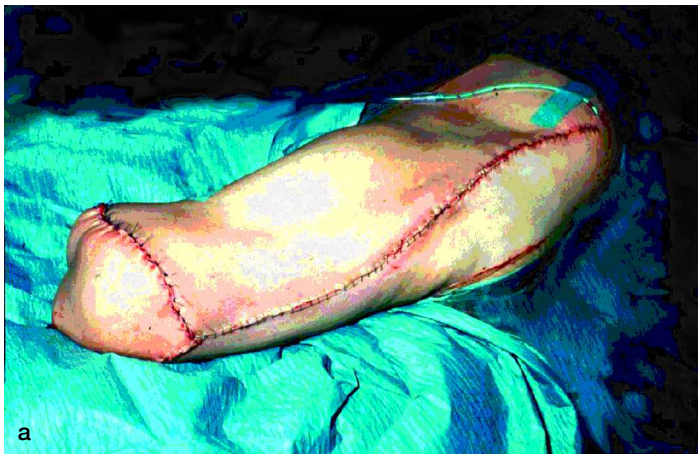
Figure 2. A special rounded end-piece with a large load-bearing surface is used to avoid pressure on the soft tissue.

tion which required adjustments of the prosthesis socket.

The radiographic follow-up showed good articulation of the bipolar cup in 4 patients. In the patient with an extraarticular resection of the hip joint, the endoprosthesis subluxated without any symptoms (Figure 3).

Discussion

Hip disarticulation surgery causes a major loss of function (Nowroozi et al. 1983, Denes and Till 1997). All such patients use crutches with or without a prosthesis for ambulation (Gillis 1968, Michaut et al. 1975, Endean et al. 1991). Ours



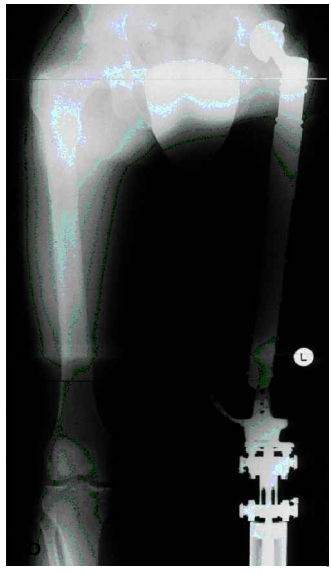


Figure 3. The distal end-piece should be covered with a well-perfused muscle flap (a). The radiographic follow-up (including the exoprosthesis) shows a hip subluxation, which caused no symptoms (b) in case no. 5 (extraarticular resection of a multicentric hemangioendothelioma).

Patients data and functional results

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	31	Intralesional nailing of the femur and tibia for an arthrodesis because of leiomyosarcoma of the femur	Intra-articular	25 AWD	23	90°	20°	5	1	4	1	4	2	17
2	23	Fibrosarcoma with large tumor and involvement of the sciatic nerve	Intra-articular	19 DOD	27	45°	0°	3	0	2	1	2	1	9
3	18	Infected endoprosthesis with induration of the entire lower extremity	Intra-articular	23 NED	31	80°	30°	5	5	5	2	4	2	23
4	59	Malignant fibrous histiocytoma with large tumor and involvement of the sciatic nerve	Intra-articular	14 NED	25	50°	30°	4	2	4	1	3	2	16
5	33	Hemangioendothelioma with lesions of the femur, tibia, and anterosuperior iliac spine	Extra-articular	7 NED	41	50°	20°	5	3	5	2	4	2	21

A Case no.
B Age
C Diagnosis/Indication
D Resection
E Follow-up, mo
F Stump length, cm
G Hip flexion
H Hip abduction
I Pain
J Function
K Emotional acceptance
L Supports
M Walking ability
N Gait
O Total

AWD alive with disease, DOD died of disease, NED no evidence of disease, I-N Functional evaluation, MSTS-score (Enneking et al. 1993)

underwent stump lengthening with a modular endoprosthesis fitted with an above-knee prosthesis and they could walk without crutches for short distances. They used a single crutch or cane for longer walks.

Stump lengthening of the preserved proximal femur after high above-knee amputation with the Ilizarov technique has been reported by several authors (Eldridge et al. 1990, Park et al. 1997, Horesh et al. 1998). Other authors (Zweymüller 1978, Persson and Broome 1994) have implanted endoprostheses in the distal part of the stump to lengthen it.

Another method was described by Berlemont

and Mestdagh (1988), who avoided hip disarticulation in 2 patients. They had suffered from septic arthritis of the hip in combination with neurological and atrophic lesions of the lower limb sufficient to justify hip disarticulation. After knee disarticulation, they resected the upper half of the femur, leaving only the distal half of the femur. Therefore the thigh could be partly preserved, using the large posterior musculo-cutaneous flap, including the triceps surae. The flap provided a good cover for an endbearing myoplasty of the preserved distal half of the femur.

Mohler et al. (2000) reported 10 patients who had primary or revision transfemoral or transtibial amputations of the lower extremity because of high-grade sarcomas. The transferred segments consisted of 1 proximal tibia and 6 distal tibia autografts, 2 femoral allografts, 1 autograft talar dome and first metatarsal, and 1 with a patellar cap of a supracondylar amputation. Another purpose of the augmentation was to lengthen the amputations. Augmentation was performed when adequate tumor excision, including the affected bone, could be donewith preservation of adequate soft tissue for closure over the augmentation. Augmentation increased bone length by 42%.

No benefits in any form have been or will be received from a commercial party related directly or indirectly to the subject of this article.

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