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The Saddle prosthesis in periacetabular tumours

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Abstract The Saddle endoprosthesis provides a means of establishing a stable and mobile articulation between the femur and a partially resected pelvis. Six patients with malignant or aggressive benign bone tumours underwent resection and replacement with custom-made Saddle endoprosthesis. Wide margin was achieved in four cases and marginal margin in two. Follow-up ranged from 24 to 41 months. All the six patients were then alive, five being disease-free. One patient developed deep infection and local recurrence necessitating removal of the prosthesis. The functional results were either excellent or good in five patients.

Résumé L'endoprothèse Saddle offre la possibilité d'installer une articulation mobile et stable entre le fémur et le bassin partiellement resequé. Six patients souffrant de tumeurs osseuses malignes et agressives ont subi une opération de re-section et de remplacement avec une telle prothèse faite sur mesure. Une résection large marge a été obtenue dans quatre cas et une résection marginale dans deux cas. Le suivi s'est effectué pendant 24 à 41 mois. Les six patients sont vivants, cinq indemnes de maladie. Un patient a développé une infection profonde avec récidive locale et la prothèse a été retirée. Les résultats fonctionnels étaient soit excellents soit bons dans cinq cas.

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Introduction

Limb salvage surgery for malignant and for benign but aggressive neoplasms has become an established alternative to amputation [8, 9]. This can be attributed to improvements in modern chemotherapy for sarcomas together with simultaneous advances in surgical technique and biomechanical engineering. The improved patient survival has presented the orthopaedic surgeon with the challenge of maintaining for longer and longer periods the function and integrity of the involved limb after tumour excision. In the management of pelvic bone tumours the Saddle prosthesis provides a means of establishing a stable and mobile articulation between the femur and a partially resected pelvis. We present our experience with custom-made Saddle prostheses in six patients with periacetabular tumours.

Patients and methods

Between 1997 and 1998 six patients underwent resection of periacetabular tumours and replacement with a custom Saddle endoprosthesis. The age of the patients ranged from 27 to 55 years with a mean of 37 years. Of the six cases three were men and three were women. Four patients had a chondrosarcoma, one had an osteosarcoma and one a giant cell tumour. In five patients the extent of the tumour was assessed by a CT scan and in one by an MRI. Two patients also had digital subtraction angiography. A closed needle biopsy was done in four patients while two were referred to us after open biopsy performed elsewhere. The staging of the tumours was IB in four, IIB in one and stage 3 in the giant cell tumour, according to the Enneking Staging System for malignant and benign tumours [2]. The margin of resection was minimal in two, while a wide margin was achieved in four. The type of pelvic resection was type II + IIIA (periacetabulum plus pubis and ischium) in five, while it was type IIA (periacetabulum) in one according to the Musculoskeletal Tumour Society classification of pelvic resections [3]. The follow-up ranged from 24 to 41 months with a mean of 30 months. The clinical details and the results of the six patients who underwent custom-made Saddle prosthetic replacement are shown in Table 1.

Table 1 Details of six patients who had Saddle prosthetic replacement (*NED* no evidence of disease, *AWD* alive with disease)

Case no.	Age (years)	Sex	Site of tumour	Histological diagnosis	Stage[a]	Margin of resection	Complication	Oncological result	Functional result	Follow-up (months)
1	29	M	Pubic rami + periacetabulum	Chondrosarcoma	IB	Marginal	–	NED	Excellent	41
2	45	M	Pubic rami + periacetabulum	Chondrosarcoma	IB	Wide	–	NED	Excellent	32
3	35	F	Superior pubic rami + periacetabulum	Chondrosarcoma	IB	Wide	Local recurrence + infection	AWD	Poor	30
4	55	F	Pubis + periacetabulum	Chondrosarcoma	IB	Marginal	Vascular thrombosis + infection	NED	Good	26
5	27	F	Pubic rami + periacetabulum	Osteosarcoma	IIB	Wide	–	NED	Good	26
6	30	M	Periacetabulum	Giant cell tumour	3	Wide	–	NED	Excellent	24

[a] Musculoskeletal Tumour Society Staging System (Enneking) [7]

Fig. 1 Pre-operative radiograph of case no. 1. Chondrosarcoma arising from the superior pubic ramus extending to the acetabular region

Results

At follow-up five of the six patients were alive without any evidence of disease, and one was alive but with disease. One patient developed a superficial femoral artery thrombosis post-operatively and this required re-exploration of the wound and femoral thrombectomy. Fortunately this procedure did not compromise either salvage of the limb or the functional result. Two patients developed infection, which was superficial in one and resolved with antibiotics. Another patient developed a deep infection, which persisted despite drainage and debridement. After a further 14 months a local recurrence appeared and the prosthesis was removed. None of the patients developed the loosening which had been a major problem with the Mark I Saddle prosthesis. The functional results were analysed by the 30-point rating system of evaluation of the Musculoskeletal Tumour Society [4]. The results were excellent in three patients, good in two and poor in one (Figs. 1, 2).

Discussion

Skeletal reconstruction after pelvic tumour resection presents a difficult problem for the orthopaedic surgeon. The options include a flail hip, an ileofemoral or an ischiofemoral arthrodesis, allografts or an endoprosthesis.

There are many accounts in the literature which report good results using Saddle prostheses for pelvic tumours

Fig. 2 Radiograph of same patient as in Fig. 1 at 2-year follow-up

[1, 5, 6, 7, 10, 11, 12]. Windhager et al. [12] observed that the best results were found when the bone defect had been 'reconstructed' with a custom prosthesis. His results were poor with allografts or when no reconstruction of the bone defect had been made. He reported nine deaths within 15 months in a series of 21 patients. In our series no deaths have occurred so far but our follow-up is only 2 years. Renard et al. [7] assessed 15 patients with the use of Saddle prosthesis for periacetabular tumours and noted that osteoporosis, extensive involvement of the iliac wing by tumour, and insufficient soft-tissue quality affected the functional results. The functional results in our series are either excellent or good in five out of six cases. Two patients were walking independently while three were walking with a cane. All patients were satisfied with the salvage of their limb.

Saddle prosthesis is a good option for skeletal reconstruction in limb salvage after excision of periacetabular tumours. Our observations show that the best results are achieved when an adequate ilium is available close to the sacroiliac joint and with which the Saddle can articulate, and when good soft tissue cover can be provided by preserving the glutei and iliopsoas muscles.

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