

**LIMB SALVAGE SURGERY**

# The Saddle Prosthesis in Limb Salvage Surgery for Periacetabular Tumours

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Management of pelvic bone tumours has posed a challenging problem to the orthopaedic surgeon. The saddle endoprosthesis provides a means of establishing a stable and mobile articulation between the femur and a partially resected pelvis. Between May 1997 and October 1998, 6 patients underwent resection of periacetabular tumours and custom made saddle endoprosthetic replacement. Wide margin was achieved in 4 cases and marginal resection in two cases. The follow-up ranged from 12 to 28 months. All the 6 patients are alive, five being disease free. One patient developed deep infection and local recurrence and the prosthesis was removed. The functional results were either excellent or good in 5 cases (83%). Saddle endoprosthesis is an excellent reconstructive option in limb salvage surgery for periacetabular tumours.

**INTRODUCTION**

Limb salvage surgery for malignant and aggressive benign neoplasms has become an established alternative to amputation. This can be attributed to improvement in modern chemotherapy for sarcomas and simultaneous advances in surgical technique and biomechanical engineering. The improved patient survival has presented the orthopaedic surgeon with the challenge of maintaining the function and integrity of the involved limb after tumour excision for further longer periods.

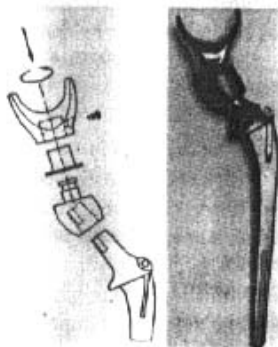
Management of pelvic bone tumours has posed a challenging problem to the orthopaedic surgeon. Until about 2 decades ago, the standard treatment for pelvic tumours was hindquarter amputation which resulted in mutilation, major functional loss and psychological trauma. Wide excision of the tumour with preservation of lower extremity came into vogue when Enneking (1966, 1978), Steel (1978) reported same local control rate as in external hemipelvectomy (hindquarter amputation) and named the procedure as internal hemipelvectomy. However the lack of skeletal continuity was a major handicap with this procedure leaving the patient with a flail, short-

ened limb. This led to the search for endoprosthesis which could restore functional skeletal continuity after pelvic resections. We present our experience with saddle prosthesis in 6 patients with periacetabular tumours.

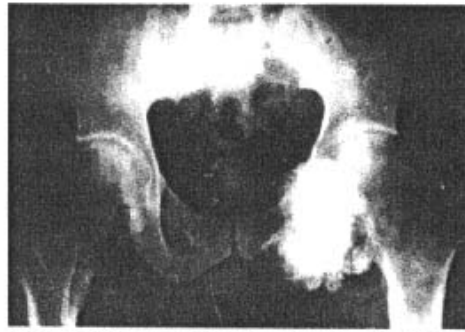
**THE SADDLE PROSTHESIS**

The saddle prosthesis was originally designed to treat patients with extensive loss of acetabular bone from any cause and was inserted in cases of failed, aseptic and infected total hip arthroplasties. Neider *E et al* in 1990 reported their 12 to 74 months results of their mark I Saddle prosthesis for gross loss of pelvic bone stock in 76 patients with failed hip arthroplasties. Based on this experience they designed and developed a mark II model which has freedom of axial rotation of the saddle.

The saddle prosthesis provides a means of establishing a stable and mobile articulation between the femur and a partially resected pelvis in which there is no possibility of inserting a conventional hip arthroplasty implant. It consists of a saddle shaped chrome-cobalt surface which articulates with the iliac bone. This saddle is continuous with a socket into which the head of the femoral



**Fig. 1: Saddle prosthesis mark II endo model**



**Fig. 2 (a) Pre-operative x-ray showing chondrosarcoma arising from the superior ramus of pubis extending to the acetabular region**



**Fig. 2 (b) : CT Scan showing involvement of both pubic rami on the left side.**



**Fig. 2 (c) : Digital subtraction angiogram showing displacement of the vessels by the tumour.**



**Fig. 2 (d) Post operative X ray showing the resection of the tumour and the saddle prosthesis in situ.**

component articulates. Figure 1 shows the mark II saddle prosthesis.

#### MATERIALS AND METHODS

Between May 1997 and October 1998 six patients underwent resection of periacetabular tumours and custom saddle endoprosthetic replacement. Age of the patients ranged from 27 to 55 with a mean of 36.8. Of the 6 cases, 3 were men and 3 were women. Four patients had chondrosarcoma, 1 patient had osteosarcoma and 1 had giant cell tumour. The extent of the tumour was assessed by CT Scan in 5 and MRI in 1, while 2 patients had digital subtraction angiography in addition. Closed needle biopsy was done in 4 cases while 2 patients were referred after open biopsy performed elsewhere. The staging of the tumour was IB in 4 cases, II B in 1 case and Stage 3 in 1 case with GCT, according to the Enneking Staging System for malignant and benign tumours. A stainless steel prosthesis was used in 4 cases, and titanium alloy prosthesis was used in two cases. The margin of resection was marginal in 2 cases while wide margin was achieved in four cases. The type of pelvic resection was Type II + III A (periacetabulum + pubis and ischium) in five cases while it was type II A (periacetabulum) in one case, according to the Musculoskeletal Tumour Society classification of pelvic resections. The follow-up ranged from 12 to 28 months with a mean follow-up of 16 months.

#### RESULTS

Out of the six patients, five are alive without any evidence of disease and one patient is alive with disease. One patient developed superficial femoral artery thrombosis, which required re-exploration of the wound and femoral thrombectomy.

The procedure did not compromise the limb salvage or functional result in this patient. Two patients developed infection, which was superficial in one, and resolved with antibiotics. One patient, however, developed deep infection which persisted inspite of drainage and debridement. After 14 months the same patient developed local recurrence and the prosthesis was removed. None of the patients developed loosening which was a major problem reported with the mark I Saddle prosthesis. The functional results were analysed by the 30 point rating system of evaluation of the Musculoskeletal Tumour Society. The results were 'Excellent' in 3 cases (50 %) 'Good' in 2 cases (33 %) and 'Poor' in 1 case (17 %).

#### DISCUSSION

Skeletal reconstruction after pelvic tumour resection presents a difficult problem for the orthopaedic surgeon. The options include a flail hip, an iliofemoral or an ischiofemoral arthrodesis and an endoprosthesis. Internal hemipelvectomy without restoring skeletal continuity requires the use of both orthosis and axillary crutches for mobility which most of the patients resent. Ilio-femoral or an ischiofemoral arthrodesis results in a stiff hip with some shortening.

Nieder (1990) and Windhager (1996) both reported good results with saddle prosthesis for pelvic tumours. Windhager observed that the best results were found if the bony defect had been reconstructed with a custom-prosthesis. The results were poor with allografts or when no reconstruction of the bone defect was done.

Carter SR (1990) in a review of 34 cases of hindquarter amputation, reported 13 deaths in the first year. Windhager (1996) reported 9 deaths



**Fig. 2 (e) 2 years  
Follow up X ray  
showing no evidence  
of loosening.**

within 15 months in a series of 21 cases. In our series there has been no death so far, with a minimum follow-up of one year. The functional results are either excellent or good in 5 out of 6 cases (83%). Two patients were walking independently while three were walking with a stick. All patients were satisfied with the salvage of the limb.

Saddle prosthesis is an excellent reconstructive option in the limb salvage surgery for periacetabular tumours.

#### **ILLUSTRATIVE CASE**

A 29 year old man presented with pain and swelling of the left hip of 3 months duration. The swelling was gradually increasing in size. He was a known case of multiple exostosis. On examination there was a bony hard swelling 10cm X 8 cm over the anterior aspect of the hip and pubic region. X ray showed a lesion arising from the superior ramus of pubis extending to the periacetabular region. A CT Scan and angiogram were done. A marginal resection (Type II and III A ) of periacetabulum and pubic bone and saddle endoprosthetic replacement were done in May 97. At 3 months follow-up the patient was walking well with support. At 2 years follow-up there was no evidence of loosening and the patient was satisfied with the result.

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