RESECTION OF A PERI-ACETABULAR CHONDROSARCOMA AND RECONSTRUCTION OF THE PELVIS

A CASE REPORT

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We report a patient with a peri-acetabular chondrosarcoma which was treated by resection of part of the pelvis and the femoral head. This was followed by replacement with a custom-made titanium alloy pelvic portion and a conventional total hip prosthesis. The operation was carried out in two stages, and yielded a good functional and cosmetic result.

Chondrosarcoma of the pelvis often places the surgeon on the horns of a dilemma: whether to perform a mutilating hemi-pelvectomy or to do a more conservative resection, implanting a prosthesis and saving the limb. The latter is difficult but can be justified when a good functional result is expected.

CASE REPORT

A Caucasian male, aged 31 years, and weighing 91 kg, first complained of pain in the left hip in June 1979. In September 1980 he consulted a general surgeon because of pain in the left hip and knee, limp, and instability of the limb. A radiograph showed an osteolytic area in the superior ischium and the iliac bone (Fig. 1); the ESR, leucocyte count and standard blood chemistry were all normal, and the patient was referred to the orthopaedic department.

Tomograms of the lesion showed a definite lytic zone; a technetium scan showed an increased uptake only at the lytic area. Tomography of the chest showed no pulmonary metastases. Further diagnostic procedures and treatment were performed in close collaboration with the division of surgical oncology.

In November 1980 an open biopsy was performed, from which a diagnosis of chondrosarcoma Grade II was made. At a meeting held at the Royal National Orthopaedic Hospital, Stanmore, it was decided that an

attempt at resection and reconstruction was justified, the procedure to be carried out in two stages. Because of the risk of infection, selective gastro-intestinal decontamination was instituted by means of clindamycin and gentamicin. From measurements of the radiographs a Delrin 150 obturator (Du Pont de Nemours) was made.

Fig. 1

Peri-acetabular chondrosarcoma of the left hemi-pelvis.

First operation. On 3rd February 1981 a resection was performed. The head of the femur and the acetabulum, as well as part of the pubic ramus, ischium and ilium were removed. No tumour mass could be felt extending outside the bone. The biopsy scar was excised, as well as part of the psoas and gluteus medius muscles. No major vessels or nerves were damaged during this procedure. A cast was taken of the cut surface of the ilium with intramedullary guide wires in position to indicate the direction of fixation of the definitive prosthesis.

The Delrin obturator was fitted using Newman's pins, one in the ischium, one in the pubis and four in the ilium. The gaps between the obturator and the ilium and ischium were filled with acrylic cement.

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Fig. 2

Fig. 3

Figure 2—The Delrin obturator has been fixed with bone cement and Newman's pins, and the temporary Müller hip prosthesis inserted. Figure 3—The definitive acetabular prosthesis, the Stanmore femoral component and the high density polyethylene cup.

A Müller 54 mm cup was cemented into the acetabular fossa of the obturator and this anchored the Newman's pins. A long-necked Harris prosthesis with a 32 mm diameter head was fitted into the femoral shaft without cement. The hip was reduced and appeared to be stable with a full range of movement. Balanced traction with suspension was applied to the leg. A radiograph showed the obturator and the hip prosthesis to be in the correct position (Fig. 2). There were no postoperative complications.

Interval procedures. Histological studies of the resected specimen confirmed the biopsy diagnosis of a Grade II chondrosarcoma. There were no signs of perforation of the cortices and no malignant cells were found in the biopsy scar tissue. The resected bone was cleaned of soft tissue; by means of a dental impression moulding technique, a plaster of Paris reproduction was obtained. With the aid of the radiographic measurements and the two casts, the definitive prosthesis (Fig. 3) was made by the Department of Biomedical Engineering at Stanmore. The body of the prosthesis was made of titanium alloy 125, while the anchoring rods were made of titanium alloy 318 (Imperial Metals Industry, Birmingham, England).

Second operation. On 25th March, seven weeks after the first operation, the second stage was carried out. The prosthetic hip and the Delrin obturator were removed

and the titanium alloy pelvic prosthesis fitted. Adequate fixation in the ischium and ilium was achieved using Simplex C bone cement (Howmedica). Stable fixation of the prosthesis to the pubis was not possible because of movement of the pubo-ischial fragment. A high-density polyethylene Stanmore cup with an outside diameter of 53 mm and an inside diameter of 32 mm, and a new long-necked cobalt chrome Harris femoral prosthesis with a 32 mm diameter head were fitted using Simplex PRO bone cement. A Harris prosthesis was used instead of the Stanmore model shown in Figure 3 because of the large size of the femur and the need for a larger femoral neck plateau.

After-care. A postoperative radiograph showed that the prosthesis was in good position (Fig. 4). The suspension traction was continued and cephadrine was given for two weeks. Four weeks after the second operation the patient was allowed to sit in a chair; two weeks later he started walking with the aid of crutches; his legs were equal in length.

In June 1984, when this paper was being prepared, the patient was pain-free and walked with one crutch but taking full weight on both legs (although he had been advised to use two crutches in order to protect the prosthesis). He had resumed his job as a supermarket manager. Active hip movements on the affected side were: flexion 110°; adduction 30°; abduction 10°; lateral

Fig. 4

Radiograph of the pelvis one month after the second operation.

rotation 20°; medial rotation 20°; the Trendelenburg test was positive. The stability of the prosthesis was examined with the aid of a video-amplifier, but there was no suggestion of movement between the pelvic prosthesis and the bony pelvis, and there were no clinical signs of loosening. The radiograph is seen in Figure 5. Nor were there any signs of local recurrence or metastasis; a total body scan was negative.

DISCUSSION

The technical problems raised by an adequate resection of a peri-acetabular tumour have been extensively discussed by Steel (1978). The extent of involvement of the soft tissues in the pelvis is of great importance in evaluating the possibility of resection.

With regard to reconstruction it should be borne in mind that repair of the continuity of the pelvic ring is not essential for a good functional result. Enneking and Dunham (1978), Steel (1978), Zatsepin (1981) and Nilsson *et al.* (1982) preferred resection of the involved part of the pelvis and a reconstructive procedure in which the femur was put in contact with the remaining part of the pelvis. The aim of the procedure is arthrodesis, although a pseudarthrosis is acceptable. The advantage of this concept is that, from a mechanical point of view, the results are long-lasting and full weight-bearing is possible. The disadvantage, however, is the inevitable discrepancy in leg length with a less than satisfactory functional and cosmetic result. A good cosmetic and functional result is best achieved by reconstruction of the normal anatomy. The prospect of a short leg with a substantial limp may lead a patient to refuse a limb-saving procedure.

Johnson (1978) described a procedure in which the osseous gap was filled with cement in combination with a total hip replacement. The two-stage procedure we performed has advantages: we can see if the tumour has been completely excised at the first stage; a cast of the resected specimen can be made, without which the design

Fig. 5

Radiograph of the prosthesis three years after the second operation; the appearance is virtually unchanged.

and construction of a pelvic prosthesis poses considerable problems; and major disruption of the pelvic ring and leg length discrepancy can be prevented by inserting a temporary prosthesis.

Rigid fixation of the definitive prosthesis to all remaining portions of the hemi-pelvis was not attempted in this case. We preferred to aim at stable fixation of the prosthesis to the cranial section of the hemi-pelvis, and a more mobile attachment to the caudal section. It was felt that this reduced the risk of undesirable stress of the fixation to the remaining part of the ilium. Since disruption of the pelvic ring will inevitably lead to movement of the remaining bony components, our patient was advised to use crutches in order to limit excessive stress and so enhance the durability of the prosthesis. Finally, if excessive loosening of the prosthesis should occur, one of the reconstructive procedures mentioned previously can still be undertaken.

Our patient has been followed up for more than three years since the final operation was performed. So far there have been no signs of local recurrence, metastases, infection or clinical loosening of the prosthesis. This justifies the conclusion that a limb-saving procedure, inserting a prosthesis after performing a partial hemi-pelvicectomy, is capable of providing good functional and cosmetic results.

REFERENCES

- Enneking WF, Dunham WK. Resection and reconstruction for primary neoplasms involving the innominate bone. *J Bone Joint Surg [Am]* 1978;60-A:731-46.
- Johnson JTH. Reconstruction of the pelvic ring following tumour-resection. *J Bone Joint Surg [Am]* 1978;60-A:747-51.
- Nilsson U, Kreicbergs A, Olsson E, Stark A. Function after pelvic tumour resection involving the acetabular ring. *Int Orthop* 1982;6:27-33.
- Steel HH. Partial or complete resection of the hemi-pelvis: an alternative to hindquarter amputation for peri-acetabular chondrosarcoma of the pelvis. *J Bone Joint Surg [Am]* 1978;60-A:719-30.
- Zatsepin ST. Conservative operation for pelvic bone tumours. *Int Orthop* 1981;4:259-68.