



## Management of pelvic Giant Cell Tumours involving the acetabular bone

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**The purpose of this study was to establish the optimal surgical treatment in patients with a Giant Cell Tumour (GCT) involving the acetabular bone.**

**The surgical outcome in 10 patients with GCT involving the acetabular bone was reviewed. Patients were divided into two groups : group 1 in which 5 patients were primarily treated by curettage, and group 2, in which 5 patients were treated by resection and pelvic reconstruction.**

**In group 1, local recurrence occurred in two cases. The functional outcome was excellent or good in 4, and poor in one case. There were no recurrences in group 2, in which the functional outcome was excellent or good in 4 and poor in one patient.**

**The optimal surgical treatment modality should be based upon the tumour extension. Tumours located primarily in the ischiopubic region and not extending proximally beyond the supra-acetabular line can be adequately treated by extended curettage while those with further proximal extension are better treated by en-bloc resection. However, the possible complications of the different methods of pelvic reconstruction should always be considered.**

**Keywords :** bone tumors ; curettage ; resection ; pelvic reconstruction ; supra-acetabular line.

### INTRODUCTION

Treatment of Giant Cell Tumours (GCT) of the pelvis is particularly challenging, owing to the difficult anatomical location and the locally aggressive nature of the lesion, added to the relatively long time usually required to achieve the diagnosis.

Although the sacrum is the fourth most common location of giant-cell tumours in the skeleton (following the distal end of the femur, the proximal part of the tibia and the distal end of the radius), the pelvic bone is an uncommon site accounting for only 1.5 to 6.1% of such lesions (1,4,8,11,13-15).

Sometimes the tumour is well defined with absent or minimal soft tissue involvement. In such cases the surgical treatment follows the same criteria as for lesions located at the knee ; extensive curettage and methylmethacrylate packing. Other times, especially when the lesion involves the majority of the acetabular area as well as the surrounding soft tissue, the optimal treatment is still controversial (9). Review of the literature shows that various treatment modalities have been applied to the treatment of giant-cell tumours of the innominate bone : radiation therapy with or without

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additional chemotherapy (3,9), arterial occlusion (16), intralesional resection and radiation therapy (9,13), intralesional resection with or without application of a local adjuvant (liquid nitrogen, phenol, PMMA) (8,9,10,12,13) and wide resection (8,9,12,13). However, none of these reported studies defined the ideal treatment.

This series represents the authors' experience with the surgical management of giant-cell tumours of the pelvic bone, aiming to define the best treatment modality when the tumour involves the acetabular area.

## MATERIALS AND METHODS

In the database of our institution, 29 cases (4.7%) of the whole series of giant cell tumours were located in the pelvis; three cases were however excluded from this study because they were very old cases with insufficient data, three were referred to Rizzoli Institute for consultation and were treated elsewhere and another three were primarily treated by radiation.

Of the remaining 20, six had tumours involving the sacroiliac joint and were treated with the same management protocol as sacral giant-cell tumours: arterial embolisation and curettage followed by radiation therapy (9,16). Another four cases were located in the ischiopubic region without any involvement of the acetabular area and were therefore treated with curettage as well.

We focused the present study on ten patients with involvement of the acetabular region in which the treatment was questioned between curettage or resection (table I). There were seven male and three female patients with a mean age of 33.8 years (range, 22 to 48 years). Pain was the main complaint in all patients while a palpable swelling was only noted in one patient who had a tumour in the ischium with a large soft tissue extension. The average duration of symptoms was six months (range, 2 to 15 months).

According to the classification system of Enneking and Dunham (7), as modified by Sanjay *et al* (13), two were truly acetabular (Region II), while the remaining eight tumours were in the ischiopubic region with extension into the acetabular region (Regions II, III). All tumours presented with radiographic sign of aggressiveness and were staged grade III according to the grading system of the Musculoskeletal Tumor Society (5) guided by the radiographic picture as described by Campanacci (2). An accurate measurement of the vertical extension of the tumour in reference to the supra-acetab-

ular line (fig 1) was performed in all cases by reviewing all the available preoperative radiographs, computed tomographic scans, and magnetic resonance-imaging scans. The supra-acetabular index (SAI) in centimetres was given a (+) value when the proximal tumoral extent was above the supra-acetabular line while it was given a (-) value for those lesions not extending proximally beyond this line.

Patients were divided into two groups:

**Group 1** included 5 patients who were treated by curettage without pelvic reconstruction. The supra-acetabular index of this group ranged from -4.0 to +4.4 cm.

**Group 2** included 5 patients who were treated by resection and pelvic reconstruction. The supra-acetabular index ranged from +1.5 to +3.0 cm in this group.

## Surgical Technique

The patient was placed in a semilateral position when a resection was planned; when a curettage was planned, the patient was placed in a supine position with both legs abducted and flexed, each on a separate support (gynaecological position) and the leg of the operated side was draped completely free. The utilitarian incision, described by Enneking (6) was used. The incision begins at the top of the iliac wing contour and extends along the iliac crest to the anterior superior iliac spine; it then divides into two limbs: one extends along the inguinal ligament to the symphysis pubis until the ischial tuberosity, and the other, when needed, runs distally over the anterior aspect of the upper one-third of the thigh and curves laterally towards the gluteus maximus insertion.

**In group 1**, patients were surgically treated with extended curettage, i.e. the lesion was approached through the soft tissue extension which was excised, showing the underlying tumour involving the ischium and the acetabular area. After gross removal of the tumour tissue, first with large curettes then with smaller ones, a high-speed burr was used to complete the tumour removal; phenol and ethanol were then used as adjuvants. Finally, polymethylmethacrylate (PMMA) was used to fill the cavity particularly in the retro-acetabular defect (11,13).

**In group 2**, a wide resection of the lesion was undertaken in all patients. In three cases, the resection resulted in contamination of the operative field owing to the soft tissue extension of the tumour, as during the extraction of the mass the soft part opened and was secondarily closed before completion of the resection. Pelvic reconstruction was needed in all patients of this group. Reconstructive

Table I. — Data on the patients treated by curettage or resection for giant cell tumour in the acetabular region of the pelvic bone

Case	Age/ Sex	Location	SAI	Treatment	Adjuvant Treatment	Margins	Follow-up (months)	Recurrence	Other Complications
1	22/F	Ischium, acetabulum	-3.5	Curettage	Phenol	Intralesional	71	No	None
2	38/M	Ischium, acetabulum	-4.0	Curettage	Phenol	Intralesional	83	No	None
3	26/M	Ischium, acetabulum	-1.5	Curettage	Phenol	Intralesional	104	No	None
4	39/M	Ischium, acetabulum	+0.7	Curettage	Phenol, PMMA	Intralesional	89	Yes, at 8 months	Wound dehiscence
5	48/F	Acetabulum	+4.4	Curettage	Phenol, PMMA RT (post- recurrence)	Intralesional	160	Yes, at 10 months	Femoral neck fracture (post- RT)
6	40/M	Ischium, acetabulum	+1.5	Resection + Allograft recon- struction	None	Wide Contaminated	73	No	None
7	29/M	Ischium, acetabulum	+2.0	Resection + Allograft recon- struction	None	Wide	156	No	Fracture of the allograft, Loosening of prosthesis
8	30/M	Ischium, acetabulum	+2.3	Resection + Iliofemoral coaptation	None	Wide Contaminated	102	No	LLD 10 cm
9	33/F	Acetabulum	+3.0	Resection + Allograft recon- struction	None	Wide Contaminated	70	No	Loosening of acetabular cup
10	33/M	Ischium, acetabulum	+3.0	Resection + Allograft recon- struction	Phenol	Wide	109	No	Loosening of acetabular cup, deep infection

SAI = Supra-acetabular index (cm), RT = Radiation Therapy, LLD = Limb length discrepancy.

procedures included hemipelvic allograft and total hip replacement in four patients and an iliofemoral coaptation in the remaining patient.

All the patients were followed in our institution following the current protocol for benign aggressive bone tumours : every 4 months in the first year, every six months the second and third year then every 12 months until needed according to the type of reconstruction. Usually the patients were checked with radiographs of the pelvis (CT or MRI only) and a chest CT scan ; CT or MRI scans were taken only in cases in which recurrence was suspected.

## RESULTS

**In group (1) :** The average follow-up period of this group was 8.4 years (range, 5 to 13.3 years).

Local recurrence occurred in two cases (with supra-acetabular indices of +0.7 and +4.4 cm). Both recurrences occurred during the first year of follow-up (Patients 4 and 5). In patient 4, the follow-up CT scan showed a nodule of recurrence adjacent to the bone right proximally to the acetabular area. The nodule was resected and no further recurrences were detected after 6.7 years of follow-up. In patient 5, the CT scan done 10 months after surgery showed four different areas of recurrence in both the iliac and ischial parts of the acetabulum (fig 2A,B,C). The polymethylmethacrylate and the augmenting cancellous screws were removed and extended curettage was done followed by the application of phenol and alcohol. The cavity was cemented and external beam irradiation was used as



**Fig. 1.** — A diagram showing the supra-acetabular line used as a reference line for the vertical extension of the giant-cell tumours of the innominate bone.

an adjuvant therapy. One year later, the patient sustained an ipsilateral fracture of the femoral neck, and a cemented total hip replacement was carried out. No further recurrences were detected after the second curettage, however, the patient complained of pain and marked instability of the operated hip and at follow-up (12.5 years) a poor outcome was registered. Overall, the functional outcome was graded as excellent in 2 cases, good in 2, and poor in one case in Group 1.

**In group (2) :** The average follow-up period was 8.5 years (range, 5.8 to 13 years). Local recurrence did not occur in any of the patients of this group. However, complications of the reconstructive procedure occurred in three patients (Patients 7, 9, and 10). In patient 7, fracture of the allograft with loosening of both components of the replacement prosthesis occurred 6.2 years after surgery. The patient underwent a subsequent intervention during which an acetabular reinforcement ring and a cemented femoral stem were inserted. Cancellous allograft was inserted at the fracture site and radiological union was seen 6 months following surgery ; however the final functional result was graded as poor due to the partial loosening of the femoral stem. In patient 9, superficial wound sloughing occurred and debridement was carried out. Five years following surgery, the plain radiographs showed loosening of

the acetabular cup with progressive osteolysis of the allograft used to reconstruct the acetabular roof. Reconstruction with an acetabular reinforcement ring and cancellous allograft inserted behind the ring was performed ; the patient is well and with good functional results at follow-up, 13 years after the index procedure.

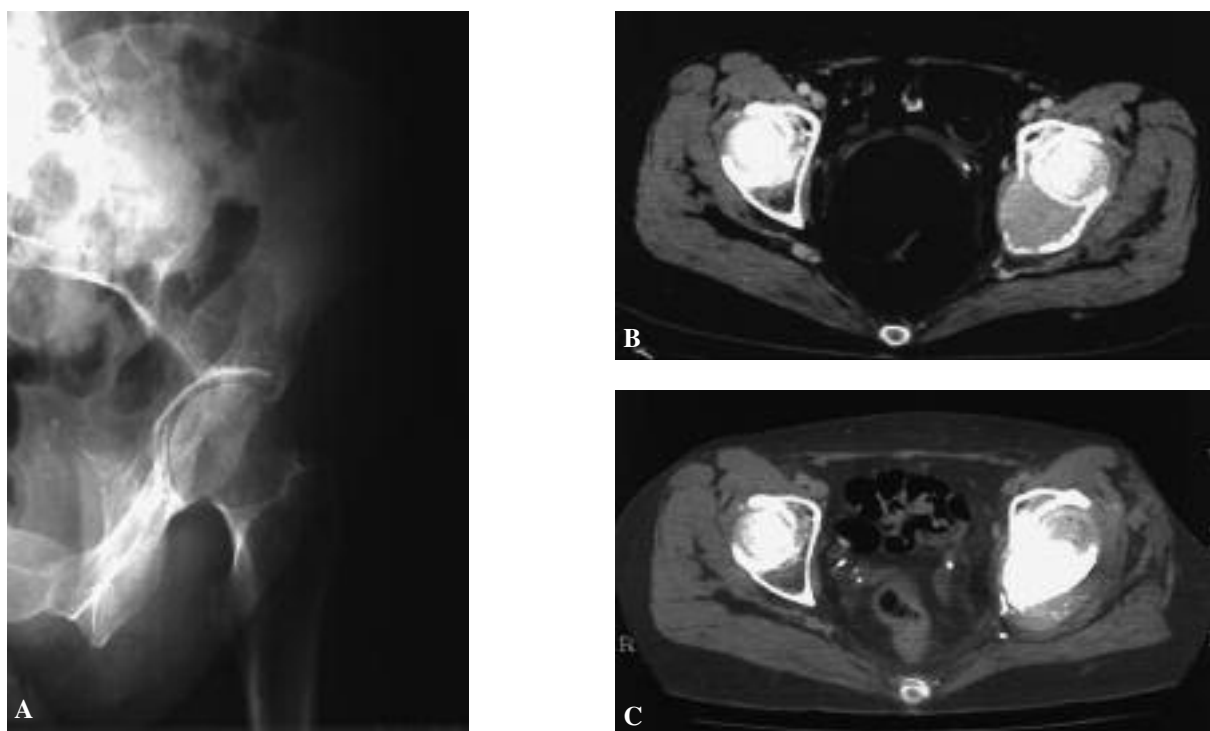
Revision of the acetabular cup was performed 4 years following surgery in patient 10. Deep wound infection then occurred following the revision surgery, which necessitated removal of the allograft and metal implants and insertion of an antibiotic-impregnated cement spacer (augmented by 2 Steimann pins). When the infection resolved, the cement spacer was removed and a saddle prosthesis was inserted with a good final functional result. Overall, the functional outcome was graded as excellent in 1 case, good in 3, and poor in one case in Group 2.

Pulmonary metastasis was not detected in any of the patients in this study and none of them had a multicentric presentation of the giant-cell tumour.

## DISCUSSION

Giant-cell tumours of bone are benign lesions characterised by an unpredictable potential for growth and a high tendency to local recurrence. Although previous studies have shown a female predominance which seems to be even more pronounced for GCTs located in the pelvic bone (79-86%), the current study showed a predilection for male patients (1,8,11,12,13). A higher incidence of these lesions in the third and fourth decades of life had also been reported (1,4,14). In previous studies, the mean age at presentation of giant-cell tumours of the pelvic bone ranged from 28.7 to 36.2 years (8, 9,12,13). In our study, the mean age was 31.4 years, and 78.5% of the patients were in the third or fourth decade of life.

The ischium was the most commonly involved bone in this study (eight of ten cases), and all these lesions had an extension along the posterior column to the acetabular region. Those lesions are particularly difficult to treat due to the limited accessibility to this region. It is even more difficult to gain wide exposure of the acetabular region for thorough



**Fig. 2A-C.** — (A) Pelvic radiograph of a 48-year-old woman (Patient 5) showing a giant-cell tumour in the acetabular region (Region II). (B) CT scan showing the extension of the lesion in the acetabular region. (C) The computed tomographic scan done 10 months after surgery (curettage and filling of the cavity with PMMA) showed a local recurrence in both the iliac and ischial parts of the acetabulum.

curettage, especially when the lesion involves both the ischial and acetabular regions where the vertical limb of the incision is placed medially to gain access to the ischium.

In a recent study by Leggon *et al* (9), a review of the literature on pelvic giant-cell tumour cases treated with radiation therapy showed an incidence of 44% of local recurrence and 12% of radiation-induced sarcoma. Therefore, the treatment of giant-cell tumours of the pelvis should be essentially surgical. The choice of treatment should be individualized to allow for the least possible morbidity without compromising the oncological outcome.

In this study, local recurrence occurred in two cases treated with curettage, with supra-acetabular indices of +0.7 and +4.4 cm. In both cases, phenol was used as an adjuvant and polymethylmethacrylate was inserted. Local recurrence did not occur in any of the remaining patients of group 1 (with supra-acetabular indices range of -3.0 to -1.5 cm).

The observed recurrence can be attributed to the limited accessibility to the proximal part of the tumour cavity, which did not allow for proper curettage of the entire lesion in these cases. In the other group of patients (Group 2) with supra-acetabular indices of +1.5 to +3.0 cm, a wide resection and pelvic reconstruction was performed in all cases. There were no local recurrences in this group of patients, however the incidence of complications of the pelvic reconstructive procedures was very high (three of five patients).

Therefore, we believe that the choice of the method of treatment should be based upon the location and proximal extent of the lesion.

## CONCLUSION

Extended curettage yields excellent functional and oncological results in those lesions not extending proximally beyond the supra-acetabular line,

whereas en-bloc resection provides the best local control in lesions with further proximal extent *i.e.* beyond the supra-acetabular line. However, the possible complications of the different methods of pelvic reconstruction should always be considered.

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