Giant cell tumors with intraarticular fracture

Two-stage local excision, cryosurgery and cementation in 5 patients with distal femoral tumor followed for 2–4 years

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We describe a two-stage operation for intraarticular fracture through a giant cell tumor of the bone. The first stage aims at accurate reduction and fracture union, including curettage, open reduction and minimal internal fixation, autologous bone grafting and temporary bone cement filling. Following bone union, the second operation aims at tumor eradication, including meticulous recurettage, cryosurgery, cementing and stable internal fixation. We report our preliminary results in 5 patients, who were followed 2–4 years. All fractures united, there were no early complications or local recurrences and good function was achieved.

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Giant cell tumor (GCT) of the bone is occasionally complicated by a pathological and often an intraarticular fracture. A common solution for this complication is to resect the whole segment of involved bone with the adjacent joint and reconstruct with an allograft, an implant or arthrodesis (Enneking 1983, Capanna et al. 1990, Gitelis et al. 1993, Muscolo et al. 1993). Few reports of attempts to preserve the joint have been published (Marcove et al. 1978, Malawer and Dunham 1987, Gitelis et al. 1993, Meller 1993, Dreinhöfer et al. 1995). We describe our early experience and favorable results in 5 patients, using a new approach by a two-stage operation, the first for fracture reduction and union, the second for tumor eradication.

Patients and methods

We treated 4 men and 1 woman with classical benign GCT of the bone, grade II (Campanacci et al. 1987). Their ages were between 17 and 33 years and all had sedentary occupations. All lesions developed in the metaphyseal-epiphyseal area of the distal femur, occupying the major part of one condyle. The patients had closed intraarticular fractures following trivial traumas. 4 fractures occurred before biopsy. 1 fracture occurred in a locally recurrent tumor which was treated elsewhere 18 months prior to the fracture by simple curettage and allograft filling. 2 fractures were spiral, extending into the lower third of the femoral shaft, with relatively little displacement. 3 fractures were comminuted condylar, with substantial displacement and cartilage damage, 2 lateral and 1 medial. The follow-up time from the first operation ranged from 20 months to 48 months (Table 1).

First-stage operation for fracture reduction and union

The tumor cavity was grossly evacuated, using hand curettes. The fracture was accurately reduced and fixed with K-wires in 3 patients. Screws and L-plate were used in the 2 patients with a fracture extending higher up into the femoral shaft. Autologous bone grafts were meticulously placed in the fracture site and near the joint, at the subchondral area. Further tumor evacuation was performed with burr-drilling and the cavity was filled with cement. Postoperative management included mobilization of the knee for 1 week on a continuous passive motion machine, then nonweight-bearing with cast-bracing for 6–12 weeks. Partial weight bearing was allowed after an average of 3 months. Fracture union was evaluated by serial radiographs and the second operation was performed after 4–6 months, when the fracture had healed.

Second-stage operation for tumor eradication

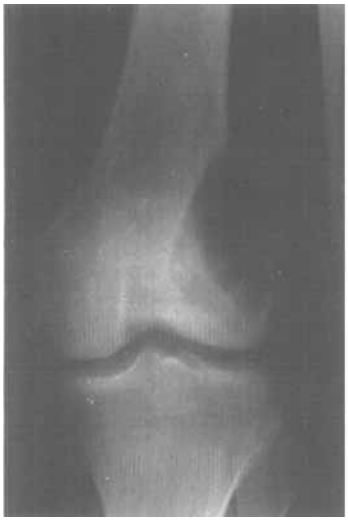
The internal fixation and cement were removed (except in 1 patient, where the K-wires were left in place), the tumor cavity was recuretted using hand curettes and high-power meticulous burr-drilling.

Table 1. Patient data

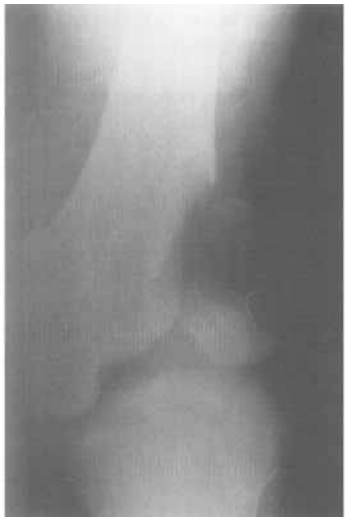
	Age	Sex	Occupation	Condyle[a]	Fracture type	Follow-up[b]	Working activity	Pain	Knee motion
1	17	m	student	l	comm. displ.	48	yes	no	0–120
2	26	m	bus driver	m	comm. displ.	36	yes	no	0–90
3	33	m	technician		long split distal 1/3 min. displ.	31	yes	no	0–120
4	32	f	newspaper deliverer	l	short split min. displ.	23	yes	no	0–120
5	28	f	housewife	l	comm. lat. displ.	20	yes	mild	0–60

[a] l lateral, m medial.
[b] months since the first operation.

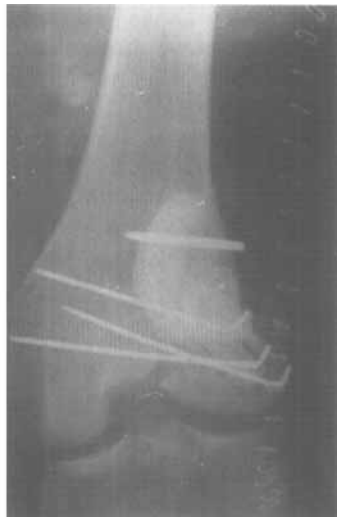
Case 1.



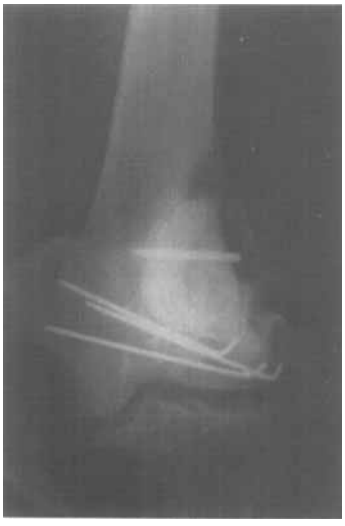
The left distal femur showing a GCT of the lateral condyle.



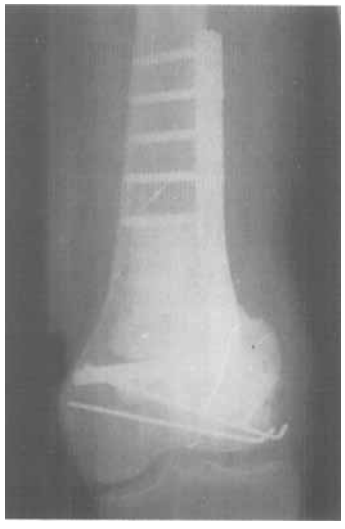
Oblique view showing an intraarticular fracture of the lateral condyle through a GCT (the patient fell, shortly after diagnosis of the tumor).



Immediately following the first-stage operation, showing the reduction of the fracture, fixation with 3 K-wires, subchondral bone graft and cement filling following simple curettage.



5 months later, just before the second-stage operation, showing union of the fracture. (Note the area of "calcification" along the lower border of the femur near the cement, which was suspected containing residual tumor.)



6 months following the second-stage operation: Reconstruction with an L-plate and cement, after recurettage and cryosurgery (the original K-wires were left in place).

Then cryosurgery with liquid nitrogen (open system, according to Marcove's principles) was used to eradicate the remaining tumor cells. The tumor area was reconstructed with cement and rigid internal fixation, using L-plates. Postoperative management at this stage was done according to the principles advocated by Marcove and Malawer, including antibiotics, physiotherapy and weight bearing after 6 weeks (Marcove et al. 1973, 1978, Malawer and Dunham 1987).

Results

All fractures united in good alignment (Figure). No early or late complications, such as infection, refracture, neurological or vascular deficit, occurred. The function was rated as excellent or good in all 5 patients, according to MSTS criteria (Enneking et al. 1993). 4 patients had no pain, were fully weight bearing, and resumed their preoperative daily activities, including work. Mobility was 0–120 degrees in 3 and 0–90 degrees in 1. The fifth patient, with the shortest follow-up of 20 months, has still mild pain but full weight bearing and mobility of 0–60 degrees (Table 1).

In cases 1 and 3, residual microscopic tumor was found at the second operation. The local recurrences were suspected on preoperative radiographs. However, no macroscopic local recurrence was found during the operation. There are no clinical or radiographic signs of recurrent tumor after the second operation in any of our patients.

Discussion

We propose a two-stage surgical procedure aimed at accurate reduction, union of the fracture and eradication of the tumor. The first operation aims at fracture reduction and healing, following gross curettage of the tumor and temporary cement filling. The second operation, following solid union, aims at tumor eradication, using previously described techniques of meticulous curettage by high-power burr-drilling, cryosurgery and cementation (Malawer and Dunham 1987, Meller 1993, Meller et al. 1996).

The incidence of local recurrence when using curettage and cement alone for GCT is still as high as 15–30% (Persson et al. 1984, Capanna et al. 1990). Advocates of cryosurgery report a significant decrease in the incidence of complications and of local recurrences (to a level of 5–10%) (Malawer and Dunham 1987, 1991, Meller 1993, Meller et al. 1996).

However, the use of cryotherapy for GCT is controversial. Opponents claim that it causes local bone necrosis, a high risk of fracture and infection, and it will disturb normal bone healing in case of a primary fracture (Marcove et al. 1973, Malawer and Dunham 1987, Capanna et al. 1990). Supporters of cryotherapy claim that it increases the surgical margin thereby lowering the incidence of local recurrence and that this outweighs the above-mentioned complications (Malawer and Dunham 1991, Meller 1993, Meller et al. 1996).

Dreinhöfer et al. (1995) treated 15 patients with GCT, presenting with a pathological fracture, 9 of whom were intraarticular. 4 of the 15 had a local recurrence. 10 patients were treated only with cement, 2 of whom had a local recurrence. 2 patients were treated by curettage and bone grafting, 1 with an endoprosthesis and 1 with an allograft, for 2 very comminuted fractures. We agree with Dreinhöfer et al. that curettage and cementation could give results as good as en bloc resection and reconstruction. However, their series is heterogeneous and too limited to conclude that curettage and cement alone are sufficient. Our series comprising 5 patients is also small and the follow-up is still short (20–48 months). However, our results so far, with good function, no local recurrence and no infections, encourage us to believe that conservative surgery should be used for GCT of bone, even when complicated by a pathological fracture and, that our proposed two-stage operation is effective.

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