GIANT-CELL TUMOURS WITH FRACTURE AT DIAGNOSIS

CURETTAGE AND ACRYLIC CEMENTING IN TEN CASES

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Between 1971 and 1991 we treated 98 patients with giant-cell tumours, 15 of whom presented with a pathological fracture. They were most common around the knee (12). Nine fractures were intra-articular. The tumours were treated by curettage and acrylic cementing (10), excision and endoprosthesis (1), excision and allograft (1), curettage and autologous graft (2) or by resection of the fibular head (1).

Four patients had local recurrence, three of whom were cured by repeat curettage and cementing. Pathological fracture through a giant-cell tumour is not a contraindication to treatment by curettage and acrylic cementing.

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Between 4% and 32% of giant-cell tumours of bone present with pathological fractures (Goldenberg, Campbell and Bonfiglio 1970; Larsson, Lorentzon and Boquist 1975; McInerney and Middlemiss 1978; Sung et al 1982; Komiya et al 1986; McDonald et al 1986; Campanacci et al 1987; Szendrői 1990). A combined study of the European Musculoskeletal Oncology Society and the American Musculoskeletal Tumor Society disclosed a 12% fracture incidence at diagnosis in 677 cases (Miller et al 1990). Few studies, however, have addressed the treatment and clinical course of such patients.

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We report 15 cases of giant-cell tumour with pathological fracture, ten of which were treated by curettage and acrylic cementing.

PATIENTS AND METHODS

Patients with a diagnosis of giant-cell tumour were collected from two musculoskeletal tumour centres, the University Hospital, Lund and the Karolinska Hospital, Stockholm. From 1971 to 1991, a total of 98 patients had been diagnosed, 15 of whom had presented with a pathological fracture (Table I). Three of these (cases 1, 2 and 6) have been reported previously (Persson and Wouters 1976; Persson et al 1984; Pettersson, Rydholm and Persson 1986).

In the total series, the male to female ratio was 32 to 66 and in the fracture group it was 6 to 9. The patients with fractures were older (median age 31 years; range 18 to 66) than the others (median age 22 years; range 12 to 68).

Twelve fractures occurred around the knee (distal femur, 7; proximal tibia, 4; proximal fibula, 1), two were in the distal radius and one in the distal tibia. Nine fractures were intra-articular. Six fractures were undisplaced and nine were displaced.

The giant-cell tumours with fractures were all grade II or III according to the system of Campanacci et al (1987). In four cases there was cortical erosion, in four subperiosteal cortical breach and in seven extraosseous extension. There was no remaining subchondral bone in eight patients, four showed a bone rim of less than 5 mm and three of more than 5 mm. There was a wide variation in tumour volume as assessed by radiography depending on the bone involved (median 235 cm³; range 30 to 420). The tumour occupied 50% of the bone width in two patients, 75% in eight and the entire width in two. There was additional bulging in three. The diagnosis was based on radiographs and fine-needle biopsy in 12 patients and on open biopsy in three.

In ten of the cases with fracture, the tumour was curetted and the cavity filled with polymethylmethacrylate (Fig. 1) with supplementary screw fixation in two cases. The technique, as described by Persson et al (1984), included removal of a thin layer of bone around the lesion with a high-speed burr, lavage and hydrogen peroxide irrigation. The cement contained radio-opaque barium and gentamicin. In six cases, closed reduction of the fracture and cast immobilisation for two to six weeks preceded curettage and

Fig. 1a

Fig. 1b

Fig. 1c

Fig. 1d

Fig. 1e

Fig. 1f

Case 9. Figures 1a and 1b – Giant-cell tumour in the lateral condyle of a 22-year-old woman who sustained a pathological fracture while dancing. Figures 1c and 1d – Closed reduction and stabilisation in a plaster for six weeks. Figures 1e and 1f – Most recent review, two years after treatment by curettage and cementing. The patient had a normal range of motion in the knee and was asymptomatic.

Table 1. Details of 15 patients with giant-cell tumours with pathological fracture at the time of diagnosis

Case	Age/ sex	Location*	Size (cm)	Volume (cm ³)	Size/bone ratio (1 to 4)	Subchondral thickness (mm)	Fracture						Follow-up (mth)	MSTS rating†
							Extension	Site	Displacement	Intra- or extra- articular	Reconstruction	Recurrence		
1	28/F	Femur, d	10x6x6	360	3	0	Extrasosseous	Medial condyle	Yes	Extra	PMMA		246	Excellent
2	59/M	Tibia, p	11x7x5	243	3	0	Cortical breach	Lateral condyle	No	Intra	PMMA	Local and pulmonary	143	Fair
3	41/F	Femur, d	7x6x4	168	3	< 5	Cortical breach	Medial condyle	No	Intra	PMMA		54	Excellent
4	52/F	Radius, d	3x3x5	45	> 4	0	Extrasosseous	Volar, diaphyseal	No	Extra	PMMA	Local	46	Good
5	29/F	Femur, d	8x8x6	384	3	> 5	Erosion	Intracondylar	No	Extra	PMMA		57	Excellent
6	36/F	Radius, d	5x3x2	30	> 4	0	Erosion	Diaphyseal	Yes	Intra	PMMA		25	Good
7	30/M	Femur, d	10x7x6	420	3	< 5	Extrasosseous	Medial condyle	Yes	Intra	PMMA		37	Good
8	19/F	Tibia, d	6x3x3	54	2	0	Extrasosseous	Medial malleolus	Yes	Intra	PMMA and screw		14	Excellent
9	22/F	Femur, d	5x4x4	80	3	> 5	Erosion	Lateral condyle	Yes	Extra	PMMA		26	Excellent
10	38/M	Tibia, p	8x7x7	392	4	0	Extrasosseous	Tibial tuberosity	Yes	Intra	PMMA, bone graft and screw		30	Good
11	66/F	Tibia, p	7x7x5	243	4	> 5	Extrasosseous	Diaphyseal	Yes	Extra	Bone graft	Local	247	Good
12	31/M	Tibia, p	5x4x3	60	2	< 5	Extrasosseous	Lateral condyle	No	Intra	Bone graft	Local	86	Excellent
13	18/M	Fibula, p	6x2x3	36	5	0	Erosion	Fibular head	No	Extra	Resection		45	Excellent
14	40/M	Femur, d	7x6x4	168	3	0	Cortical breach	Intracondylar	Yes	Intra	Endoprosthesis		53	Good
15	24/F	Femur, d	8x6x6	288	3	< 5	Cortical breach	Intracondylar	Yes	Intra	Allograft		37	Good

* d, distal; p, proximal
† Enneking (1987)

Fig. 2

Case 15. Giant-cell tumour in the lateral condyle of a 24-year-old man. The intra-articular pathological fracture was associated with massive bone destruction. Reconstruction with an allograft was performed.

cementing. Four patients were treated by primary cementing; two were treated postoperatively with a cast and two without. Postoperative radiography showed that there was no intra-articular cement in any case.

In two cases with comminuted fractures and massive bone destruction (case 15, Fig. 2), primary resection was performed followed by reconstruction, one with an allograft and the other with an endoprosthesis (case 14). In one case the fibular head was resected and in two others bone grafting was performed after curettage.

RESULTS

Curettage and cementing (10 cases). There was one case of inadequate curettage (case 6), evident on the postoperative radiographs, which required reoperation two weeks later. There was one subcutaneous infection (case 10) which healed after three weeks. Two patients had local recurrence of the tumour within the first year. One of these occurred eight months after treatment of a lesion of the distal radius. Curettage and cementing were repeated and the patient was free from disease at four years. The other recurrence was in the proximal tibia at 12 months and was treated by a second curettage and cementing. Four months later there was a further recurrence with aggressive growth into the soft tissues and an above-knee amputation was performed. A year later pulmonary metastases were diagnosed and resected and three months after that a metastasis in the chest scar was excised. Nine years after the last operation the patient was without evidence of disease.

Other treatment (5 cases). The two patients treated primarily by curettage and bone grafting (cases 11 and 12) had local recurrences after nine months and five years, respectively. They were treated by curettage and cementing and are both free from disease, at 21 and 22 years respectively.

Outcome. After a median follow-up of 46 months (14 to 267) from the time of fracture, all the patients were reviewed radiographically and functionally (Enneking 1987). Seven were rated excellent and seven good. The amputee (case 2) was rated fair.

Joint motion and stability were normal in eight patients. One patient (case 6) complained of moderate pain and another (case 7) had a 10° varus deformity of the knee. Mild osteoarthritis was seen in two patients, 19 and 20 years after curettage and cementing.

DISCUSSION

Our experience suggests that treatment of pathological fractures in giant-cell tumours by curettage and cementing gives a result as good as *en-bloc* resection and reconstruction, both in respect of the local recurrence rate and joint function.

Curettage and acrylic cementing for pathological fracture was first described by Wouters (1974) and later by Persson and Wouters (1976) and Persson et al (1984). Wuisman et al (1989) treated a pathological fracture of the proximal humerus in this way but at a second operation, three months later, the cement was removed and autogenous bone chips were inserted. In the series of Pals and Wilkins (1992) five of ten patients presented with a fracture, four of which were intra-articular. All were treated by open reduction and cementing followed by the application of allograft bone chips to the hardened cement. After a minimum of two years there had been no local recurrences.

Huber and Gerber (1990) recommended that pathological fracture in grade-I and grade-II tumours should undergo closed treatment until the fracture is healed, followed by curettage. Others have advocated immediate curettage and autogenous bone grafting of the cavity with additional external fixation or a cast if necessary (Kuner 1989). In grade-III tumours immediate open biopsy and wide excision have been advised (Eckardt and Grogan 1986; Huber and Gerber 1990).

A pathological fracture may release tumour cells into the surrounding soft tissues and joint (McInerney and Middlemiss 1978). Seeding of the tumour into synovial membrane is extremely rare (Huber and Gerber 1990). Campanacci et al (1987) found minute tumour nodules in the synovial membrane in only one patient in a series of 29 giant-cell tumours with pathological fractures. Cooper, Beabout and Dahlin (1984) found giant-cell tumour in the synovium of the ankle after a distal tibial fracture and in the soft tissues around a fractured tumour of the distal femur.

We report a low risk of local recurrence after curettage

Table II. Local recurrence rates in several series of giant cell tumours

Author	Without fracture	With fracture
Larsson et al (1975)	15/37	7/16
McInerney and Middlemiss (1978)	13/34	6/23
Komiya et al (1986)	5/24	1/5
McDonald et al (1986)	29/122	2/24
Campanacci et al (1987)	50/298	1/19
Rock (1990)	157/596	17/81
Pals and Wilkins (1992)	0/5	0/5

and cementing. Only two of our ten patients required reoperation, a local recurrence rate similar to that reported in several series (Goldenberg et al 1970; Sung et al 1982; McDonald et al 1986; Campanacci et al 1987).

If recurrence does occur after conservative treatment of a giant-cell tumour with fracture, some authors recommend *en-bloc* resection and reconstruction by allografting, arthrodesis (Wilson 1972) or prosthetic replacement (Burrows, Wilson and Scales 1975; Sim et al 1980; Eckardt and Grogan 1986; Huber and Gerber 1990). We treated our four recurrences by further curettage and cementing with good results in three. One patient with an aggressive metastasising tumour, however, required amputation.

Some reports suggest that there is a lower recurrence rate in giant-cell tumour with fracture at diagnosis than in those without (Larsson et al 1975; McInerney and Middlemiss 1978; McDonald et al 1986; Rock 1990), but others have failed to demonstrate any correlation (Komiya et al 1986; Campanacci et al 1987) (Table II). McDonald et al (1986) suggested that surgeons were more inclined to do extensive surgery for lesions with pathological fractures and that fear of tumour contamination of the adjacent tissues led to more radical procedures (Wilson 1972; Burrows et al 1975; Campbell and Akbarnia 1975; Larsson et al 1975; Sim et al 1980; Sung et al 1982; Cooper et al 1984; Kattapuram, Philips and Mankin 1986; Murray and Schlafly 1986; Rock 1990). We believe that there are no good reasons for treating giant-cell tumour with fracture more aggressively.

The advantages of curettage and cementing are the achievement of immediate stability and early mobilisation, early detection of local recurrence (Pettersson et al 1986), and the possibility of other surgical options. Whether the operation should be done immediately or postponed until the fracture has healed cannot be deduced from our study.

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