Technical note

Cryosurgery in fibrous dysplasia

Good result of a multimodality protocol in 16 patients

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The indications for surgical treatment of fiber dysplasia are: chronic pain, increasing swelling and deformity, imminent fracture, the development of malignancy and cosmetic considerations (Feintuch 1973, De Smet et al. 1981, Yabut et al. 1988, Simpson et al. 1989).

To reduce the rate of local recurrence, we used cryosurgery as an adjuvant treatment to curettage, cementing and/or bone grafting in 16 patients with monostotic fibrous dysplasia for the last 11 years. The indication for the operation was pain or imminent fracture.

Technique and results

The technique always involves three steps:

The first step is fenestration and curettage. The bony walls are thoroughly curetted and burr-milled.

The next step is cryosurgery of the cavity. We usually use 1–3 cycles of freeze thaw, between –40 and –80 °C, but not tourniquet control routinely. We prefer 2 techniques for cryosurgery. In the first 11 patients, liquid nitrogen was poured into the cavity, as described by Marcove and Miller (1969). In the last 5 patients, specific probes immersed in a gel media conducted the cold to the cavity walls (Bickels et al. 1999, Meller et al. 1999).

The third step is reconstruction of the defect by autogenous bone grafting without cement in the distal radius, distal tibia, and iliac bones, or cement alone in the 13 other cases. An intramedullary nail was inserted in the humerus, radius, ulna, 3 tibias and 5 of 6 proximal femur bones, while a nail plate was used in the 6th proximal femur. In the iliac bone, a plate was used as a scaffold for the cement. The pubic rami had no internal fixation. An L- plate was used in the distal femur.

Between December 1989 and June 2000, we operated on 16 patients with clinically, radiologically and histologically proven monostotic fibrous dysplasia in the long and flat bones (Table). 14 patients were primary cases and 2 were referred with local recurrences.

The lesions were 3–5 cm or more in diameter with thinned cortices, most of them were geographic with no sclerotic rim on plain radiographs. All patients had pain and some had swelling, deformity and imminent fracture as an indication for surgery.

Of the 16 patients, 2 were in the preskeletal maturity phase at the time of surgery. 3 patients had upper limb lesions, 3 had pelvic lesions and 10 had lesions in weight-bearing bones.

After median 6 (1.5–11) years of follow-up, 1 patient (no. 15) had a local recurrence. He had a second operation 2 years after the first one and cryotherapy was used again. 3 years after the second operation, he had had no local recurrence, but had developed a crack fracture in the bone 6 months after the second operation. It was treated

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Demographic data of 16 monostotic fibrous dysplasia patients

No.	M/F	Age	Anatomic location	Cryo technique	Internal fixation Other procedures	Follow-up (years)	Local recurrence
1	M	18	Prox. humerus	Old	IM nail + cement	11	No
2	M	37	Prox. ulna	Old	IM nail + cement	8	No
3	M	21	Dist. radius	Old	IM nail + autogenous bone graft	10	No
4	F	17	Ileum	New	Plate, bone graft, cement	1.5	No
5	M	20	Pubic ramus	Old	Cement	8	No
6	M	20	Pubic ramus	Old	Cement	7	No
7	M	15	Prox. femur	Old	nail plate + cement	7.5	No
8	M	45	Prox. femur	Old	IM nail + cement	6.5	No
9	M	50	Prox. femur	New	IM nail + cement	4.5	No
10	F	54	Prox. femur	New	IM nail + cement	1.5	No
11	F	17	Prox. femur	New	IM nail + cement	1.5	No
12	F	26	Prox. femur	New	IM nail + cement	1.5	No
13	F	47	Dist. femur	Old	L-plates + cement	8	No
14	F	38	Prox. tibia	Old	IM nail + cement	4.5	No
15	M	21	Mid tibia	Old	IM nail + cement	4.5	Yes
16	F	15	Dist. tibia	Old	IM nail + autogenous bone graft	11	No

with a period of weight bearing and healed. However, this patient still uses a cane for walking.

Other complications included one skin "burn" (no. 13) that resolved spontaneously and one patient whose intramedullary nail was shortened because of protrusion (no. 10).

According to the American Musculoskeletal Tumor Society's (Enneking et al. 1993) evaluation system 15 of 16 patients had excellent functional results. They are entirely mobile with no walking aids (Figure).

Discussion and conclusion

The tendency of fibrous dysplasia to recur locally after curettage and bone grafting is well documented (Harris et al. 1962, Campanacci 1990, Guille et al. 1998). Stephenson et al. (1987) reported the results of treating 65 symptomatic fibrous dysplasia lesions. Poor results were reported in more than half of the patients less than 18 years of age treated without surgery or by curettage and autogenous bone grafting. When internal fixation was used, the number of poor results diminished to 14%. The results were better in patients over 18 years of age with lower extremity lesions.

Better results with the use of autogenous cortical and cancellous bone grafting to the neck of the femur were reported by Enneking and Gearen (1986). The best results have been reported in 22 proximal femur lesions treated with curettage, adjuvant phenol solution, deep frozen allogenic cortical graft, autogenous cancellous bone graft and mechanical stabilization (Shih et al. 1998). The last series points out the possible importance of adjuvant therapy with phenol to lower the local recurrence rate.

We attribute our low local recurrence rate to meticulous curettage techniques, the use of cement and cryosurgery. The cement is used to fill the cavity after cryosurgery and it also serves as a marker for a local recurrence because it is easier to detect it around cement than in bone. There were only minor and transient complications and 15 of 16 patients had an excellent functional result during the follow-up period. The bad reputation of cryosurgery in the early days was due to the high rate of fractures and infections from the severe unrecognized bone-weakening effect and soft tissue necrosis (Marcove and Miller 1969, Marcove 1982). The introduction of stable internal fixation to protect the weakened weight-bearing bones and the meticulous protection of the healthy tissues around the cryosurgery site largely resolved these complications (Bickels et al. 1999).

Case 14. Female, aged 38 at time of operation. A, B. Anterior and lateral preoperative radiographs of left proximal tibia with monostotic fibrous dysplasia lesion. C. Lateral radiograph taken at 4 years and 2 months after operation. No evidence of local recurrence.

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