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RADIATION TREATMENT OF GIANT-CELL TUMOUR OF BONE (OSTEOCLASTOMA)

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Abstract

Ten patients with giant cell tumours of the bone were treated by radiation therapy. Indications were non-radical primary surgery in 8 cases and recurring lesions in 2. Tumour doses ranged from 23 to 75 Gy delivered with supervoltage equipment in 8 cases. There were 3 recurrences after radiation therapy, all occurring in patients with tumour doses less than 39 Gy; 2 of these had received orthovoltage therapy and 2 died later from lung metastases. Modern supervoltage irradiation is probably as effective as surgery which is nevertheless recommended in operable cases.

Key words: Bone neoplasm; giant cell tumour, therapeutic radiology.

The clinical behaviour of giant-cell tumours of bone, or osteoclastomas, is unpredictable. The tumours must therefore be regarded as potentially malignant (8), and planning of the optimal treatment presents a challenge which is complicated further by the rarity of the disease—in Western countries about 4 per cent of all bone tumours (2).

Surgery is currently considered the treatment of choice, while the exact role of radiation therapy is controversial. Its efficacy has been questioned and its use discouraged for fear of inducing a malignant transformation (5, 6). However, as BELL et coll. (3) pointed out, most of the surveys in the literature concern treatment with orthovoltage equipment. Results with modern high voltage therapy seem to be considerably better, but reports are as yet few (3, 4).

Material and Methods

During the period from 1962 to 1983 a total of 30 patients with roentgenologically and histologically confirmed giant-cell tumours of bone were seen at the orthopaedic-oncologic centre of Rigshospitalet, Copenhagen. The lesions were graded histologically as recommended by JAFFE et coll. (7). Ten patients received radiation therapy with curative intent. Radiation fields were generally planned with a margin of 5 cm from the radiologically evident lesion. In the spine, a margin of one vertebral body was used. The treatment was usually delivered in one daily fraction, 5 times a week. After radiation, outpatient follow-up continued at joint orthopaedic-oncologic conferences.

Results

All ten patients received their radiation therapy after surgery believed to have been non-radical. The clinical courses are summarized in the Table. Two patients received irradiation for recurring lesions. The lesions were located in the vertebral column in 3 cases, in the pelvis including the sacral bone in 3, and in the extremities in 4 cases. Mean follow-up after irradiation was 7.6 years (range 2–15.8 years). Tumour doses ranged from 23 to 75 Gy. Two cases (Nos 8 and 10) received orthovoltage roentgen treatment with 23 and 24 Gy, respectively. Following the treatment, 3 patients had a local recurrence after 2 to 21 months; they had all received low tumour doses (23–30 Gy). Two of these patients died later on from lung metastases. Only one patient had any side effects attributable to the treatment. This was a 22-year-old woman who had been castrated by radiation treatment of a large lesion in the sacral bone. There were no cases of pathologic fractures and no postirradiation sarcomas.

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Table

Patient data

Case No.	Age and sex	Location of tumour	Histologic grade	Surgery	Radiation therapy	Follow-up
1	42 M	Vertebra Th3	I	Laminectomy	^{60}Co, 45 Gy/23 fr.	Persisting paraplegia, 13 years, NED
2	47 F	Vertebra Th12	I	Decompression, followed by removal of the vertebral body	^{60}Co, 75 Gy/25 fr. (2 series, mid-way pause)	4 years, NED
3	62 M	Left femur	II	Hemipelvectomy	^{60}Co, 50 Gy/28 fr.	7 years, NED
4	22 F	Sacrum	I	Curettage	Lin. acc. 6 MV, 52 Gy/20 fr.	Menostasia, 12 years, NED
5	32 M	Vertebra Th11	I	Resection (not radical)	^{60}Co, 43 Gy/19 fr.	9 years, NED
6	39 M	Right humerus	II	Curettage	^{60}Co, 30 Gy/20 fr.	Recurrence (grade III) 9 months after irradiation; died 3 years later from lung metastases
7	23 F	Right ilium	II	Curettage	Lin. acc. 6 MV	2 years, NED
8	37 F	Femur	II	Curettage	Roentgen rays 400 kV, 23 Gy/38 fr.	Recurrence (grade II) 21 months after irradiation; died 8 years later from lung metastases
9	35 F	Left pubic bone	II	Curettage	–	Recurrence 5½ years after primary surgery
				Recurrence: Curettage again + alloplasty	^{60}Co, 48 Gy/16 fr.	Irradiation was given preoperatively 27 months with no further recurrences
10	35 M	Femur	II	Curettage	–	Recurrence 11 months after primary surgery
				First recurrence: Curettage	Roentgen rays, 250 kV, 24 Gy/24 fr.	Second recurrence 2 months after irradiation; after 4 years with repeated recurrences, an amputation was performed; 15 years 9 months with no further recurrences

Discussion

Radiation treatment was widely used 3 to 4 decades ago for giant-cell tumours of bone (GCT), but currently it is as a rule restricted to inoperable or not radically operated cases (3, 4, 5). This attitude is due to three factors; the local recurrence-rate, the risk of inducing a malignant transformation in the GCT, and the danger of inducing a secondary malignancy (2, 5, 6, 9).

In their review of the literature, BELL et coll. (3) found recurrence rates ranging from 20 to 94 per cent after radiation therapy with or without surgery. However, details of the irradiation were lacking in many cases, and the majority of the patients had been treated with orthovoltage equipment. They had only one recurrence among their own 15 patients treated with ^{60}Co or a linear accelerator and doses of 32 to 50 Gy. This was in a patient with a pelvic tumour extending into the soft tissues; retrospectively, the radiation field was found to be insufficient. It is noteworthy that in the present material no recurrences were seen following irradiation with supervoltage equipment and tumour doses exceeding 40 Gy, while the three recurrences all had received less than 30 Gy with orthovoltage equipment.

Malignant transformation of GCT may in many cases represent the natural course of the disease since it occurs after surgery alone as well as after radiation therapy. A sampling error may be part of the explanation, the GCT having areas with a higher malignancy grade than those examined histologically ('primary malignancy' (11)). However, cases with an increasing grade of malignancy with each recurrence have also been described (2): 'evolutionary malignancy' (11). Moreover, metastases from histologically benign GCTs have been reported in several instances (5, 10, 13). It is thus not always possible to distinguish with certainty between the intrinsic (=primary + evolutionary) malignancy of GCTs and the development of true post irradiation sarcomas according to the criteria of CAHAN and associates (quoted in ref. 12). Overthovoltage therapy seems to increase the incidence of evolutionary malignancy (5, 9), but both risks are probably considerably reduced with modern supervoltage radiation therapy (3, 4, 12). No post-irradiation sacomas were encountered in the present series, but the follow-up is too short in this context since the average latent period is about 13 to 16 years and may be as long as 40 years (1, 12).

In conclusion, while radiation therapy with modern equipment and standards may prove to be as effective as surgery in obtaining local control of GCT, larger materials with a sufficient long-term follow-up are necessary to determine the relative risk of possible late side effects, notably the incidence of secondary malignancies. Surgical treatment must be recommended in all operable lesions.

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