Centralization of soft tissue sarcoma

Status in Sweden in 1982

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We analyzed the management of all the patients with soft tissue sarcoma located in the trunk and extremities in Sweden in 1982. The total fraction of patients referred to musculoskeletal tumor centers for definitive treatment was 0.6. In more than four fifths of the patients operated on at the centers, surgery was performed with a wide or radical margin compared with one fifth of the patients treated at other hospitals.

In our center specifically, 10 patients with soft tissue lesions that turned out to be benign were referred per every unoperated on sarcoma patient. The treatment of soft tissue sarcomas outside tumor centers is less than optimal, and centralization is associated with substantially increased referral of patients with benign tumors to catch the majority of soft tissue sarcomas in the virgin state. Information to peripheral hospitals about indications for referral of patients with soft tissue lesions has been effective in our region.

Soft tissue sarcomas are rare, and optimal treatment requires close cooperation between surgeon, radiologist, cytologist, pathologist, oncologist, and radiotherapist. For the best result, the patient should be referred before any surgery (Stener 1978, Simon 1982, Berlin et al. 1987).

Apart from an earlier study of soft tissue sarcoma in southern Sweden covering the period 1964 through 1978 (Rydholm 1983), we have found no analysis in the literature of the referral pattern and treatment of *all* the patients within a defined area. Therefore, we analyzed the management of all the patients with soft tissue sarcomas in the trunk and extremities in Sweden in 1982. For our musculoskeletal tumor center, we also recorded the number of patients with soft tissue tumors – whether benign or malignant – referred for evaluation before surgery.

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Patients and methods

Sweden, with 8.3 million inhabitants, has six regional oncologic centers. From the registry in each region, all the patients with a diagnosis of soft tissue sarcoma in the trunk or extremities during 1982 were identified. Of these 119 patients, 16 had metastases diagnosed at the same time as the primary tumor, 4 had strictly dermal sarcomas, and 5 were for various reasons not operated on. These 25 patients were excluded, and thus 94 patients remained for analysis. The mean age of the 94 patients was 59 (1–88) years. Forty-seven patients were males (Table 3). Pertinent data were collected from the medical records and pathology reports, which were available in all the cases. The classification of the surgical margins – intralesional, marginal (shelling out), wide, and radical (Enneking et al. 1980) – was based on surgical notes and pathology reports. Seventy-five patients had highly malignant tumors: Grades III and IV on a four-grade scale (Angervall 1981, Markhede et al. 1982). Sixty-one tumors were deep and 52 tumors were larger than 5 cm in the longest diameter.

In addition, for our center (covering 1.5 million inhabitants), the hospital records were culled of

Table 1. Referral pattern related to tumor size (< 5 cm <) and depth

Site	No.	Size	Before surgery	After surgery	Not referred	Total
Deep	61	small	9	6	7	22
		large	23	4	12	39
Superficial	33	small	2	8	10	20
		large	2	2	9	13
Total	94		36	20	38	94

Table 2. Surgical margin related to place of treatment

Surgical margin	Tumor center	Other hospitals
Marginal or less	9[a]	30
Wide or radical	48[b]	8
Total	56	38

[a] One of these patients was refered after marginal surgery and was not reoperated on.
[b] Nineteen of these patients were referred after marginal surgery and were reoperated on.

all the patients referred for evaluation of soft-tissue lesions, later proven to be benign.

Results

Thirty-eight of 94 patients had their diagnosis and treatment at peripheral hospitals, and 56 were referred for treatment to the centers – 36 before any surgery and 20 after a marginal excision or an incisional biopsy. Thus, the overall fraction of patients referred to a center was 0.6 and the fraction of patients referred before surgery was 0.4. More large and/or deep tumors were referred before surgery (Table 1). More than four fifths of the patients operated on at the centers had a wide or radical margin, versus only one fifth of the patients who were not referred (Table 2). Five of the nine marginally operated on patients at the centers also had radiotherapy compared with 6 of the 30 patients operated on outside the centers with a marginal or less margin.

Specifically for our region, 7 out of 12 patents with subcutaneous sarcomas were referred, 2 of whom before surgery. All 10 patients with deep-seated sarcomas were referred, 2 after surgery (a marginal excision and an open biopsy, respectively) at peripheral hospitals. Thus, a total of four fifths of all the patients with soft tissue sarcomas of the trunk and extremities in the region were referred to us. During the same period, 102 patients with trunk and extremity tumors, later proven to be benign, were referred to us for evaluation before surgery.

Discussion

One essential aim in the treatment of soft tissue sarcoma is local control. The local recurrence rate is higher after a marginal than after a wide or radical excision. To either decrease the risk of local recurrence and/or the morbidity after surgery, "conservative surgery" has been combined with preoperative or postoperative radiotherapy (Lindberg et al. 1981, Suit et al. 1981). In 1982, 30 patients were treated by marginal or less than marginal surgery at peripheral hospitals. Only 6 of these patients also received postoperative radiotherapy. Such combination therapy requires close preoperative cooperation between the surgeon, radiologist, and radiotherapist. Certainly this was not possible at the majority of the peripheral hospitals. The preponderance of a marginal excision as definitive treatment at non-specialized hospitals has been documented earlier (Kindblom et al. 1975, Rantakokko and Ekfors 1979, Rydholm 1983).

Our findings suggest that one way to improve the prognosis is to refer the patients to musculoskeletal tumor centers for treatment. The patients should be referred before any surgery because an incisional biopsy performed by a surgeon not responsible for the definitive treatment may complicate later surgery (Simon 1982). Also, a marginal excision for diagnosis is unsuitable, especially for deep tumors, since the possibility is lost to localize the tumor by radiographic examinations, essential for planning definitive surgery. Another reason for referral before surgery is that

the majority of patients with sarcomas in the extremities can be treated by primary, local, function-preserving surgery, based on clinical diagnosis or aspiration cytology without open biopsy. By this concept, introduced by Stener (1978), the amputation rate can be kept around 10 per cent and the local recurrence rate around 10 per cent without any adjunctive therapy. This was recently shown in a consecutive series of 113 patients referred with deep extremity sarcomas before any surgery to the musculoskeletal tumor centers in Gothenburg and Lund (Berlin et al. 1987).

Several centers have reported that most of their

Table 3. 94 patients with soft tissue sarcomas in the trunk and extremities diagnosed in Sweden in 1982

A	B	C	D	E	F	G	H
1	72	M	3	D	–	V	W
2	45	F	3	D	–	V	W
3	39	M	3	D	–	V	W
4	26	M	3	D	–	V	W
5	61	M	4	D	–	V	W
6	50	F	3	D	–	V	W
7	84	F	3	D	–	V	W
8	76	M	3	D	–	V	W
9	81	F	3	D	–	V	*M*
10	60	F	4	D	–	S	W
11	30	F	2	D	–	S	W
12	63	F	3	D	–	S	W
13	57	M	4	D	–	S	W
14	26	F	3	D	–	S	W
15	75	F	2	D	–	S	W
16	61	M	3	D	+	V	W
17	35	M	3	D	+	V	W
18	61	F	3	D	+	V	W
19	12	F	3	D	+	V	W
20	58	M	4	D	+	V	W
21	51	F	3	D	+	V	W
22	49	M	2	D	+	V	W
23	80	F	4	D	+	V	W
24	70	F	4	D	+	V	W
25	74	M	4	D	+	V	W
26	85	M	4	D	+	V	W
27	38	M	3	D	+	V	W
28	37	M	3	D	+	V	W
29	62	M	4	D	+	V	W
30	56	F	4	D	+	V	W
31	62	M	3	D	+	V	W
32	64	M	3	D	+	V	W
33	53	F	2	D	+	V	M
34	78	M	4	D	+	V	*M*
35	77	F	4	D	+	V	*M*
36	72	F	1	D	+	V	M
37	24	F	2	D	+	V	M
38	64	F	3	D	+	V	W
39	69	M	4	D	+	S	W
40	50	F	3	D	+	S	W
41	61	F	4	D	+	S	W
42	58	F	3	D	+	S	*M*
43	77	M	3	S	–	V	W
44	77	M	3	S	–	V	W
45	62	M	3	S	–	S	W
46	35	F	3	S	–	S	W
47	64	F	3	S	–	S	*M*
48	12	M	1	S	–	S	W
49	45	M	3	S	–	S	W
50	76	M	3	S	–	S	W
51	59	F	3	S	–	S	W
52	38	M	4	S	–	S	W
53	57	M	3	S	+	V	W
54	64	M	2	S	+	V	*M*
55	67	F	4	S	+	S	W
56	62	M	4	S	+	S	W
57	1	F	4	D	–	N	M
58	57	M	2	D	–	N	M
59	77	F	2	D	–	N	M
60	77	F	4	D	–	N	M
61	68	M	4	D	–	N	M
62	58	M	3	D	–	N	M
63	41	F	1	D	–	N	M
64	75	F	3	D	+	N	M
65	74	M	4	D	+	N	M
66	87	F	2	D	+	N	*M*
67	75	F	4	D	+	N	M
68	85	F	4	D	+	N	*M*
69	86	M	4	D	+	N	M
70	83	M	4	D	+	N	M
71	81	F	4	D	+	N	*M*
72	13	M	4	D	+	N	*M*
73	60	M	3	D	+	N	*M*
74	64	F	3	D	+	N	M
75	66	M	2	D	+	N	W
76	45	M	1	S	–	N	M
77	77	F	3	S	–	N	M
78	48	F	1	S	–	N	M
79	52	M	4	S	–	N	M
80	22	F	3	S	–	N	M
81	46	F	1	S	–	N	M
82	84	F	4	S	–	N	M
83	63	F	4	S	–	N	W
84	39	M	2	S	–	N	W
85	86	F	4	S	–	N	W
86	61	M	4	S	+	N	W
87	55	M	3	S	+	N	W
88	29	M	3	S	+	N	M
89	84	F	3	S	+	N	M
90	67	M	2	S	+	N	M
91	84	F	4	S	+	N	M
92	51	M	1	S	+	N	M
93	88	M	4	S	+	N	M
94	76	M	3	S	+	N	M

A Case number (southern region in italics).
B Age
C Sex
D Histologic malignancygrade (1–4)
E Depth; D deep, S superficial
F Size; +> 5 cm, −< 5 cm
G Referral; V to center with virgin tumor, S after biopsy or marginal excision, N not referred
H Margin at definitive surgery; M marginal or less (radiotherapy in italics), W wide or radical

Case 42 referred after marginal excision, not reoperated, no radiotherapy.

patients were referred to them after surgery (Shiu et al. 1975, Abbas et al. 1981, Markhede et al. 1982). This did not apply to Sweden during 1982. To further increase the fraction of patients with soft-tissue sarcomas referred before surgery, we have recommended referral of all the patients with deep tumors and/or tumors larger than 5 cm, as well as all other patients with tumors suspected of being malignant. This recommendation was also adopted at the Scandinavian Sarcoma Group Meeting in Helsinki, Finland, in 1985. Based on epidemiologic studies of sarcomas and benign soft-tissue tumors, it was estimated that with these guidelines more than four fifths of all the patients with soft tissue sarcomas would be referred before surgery (Rydholm 1983). Our findings confirm this estimation; four fifths of the patients had large or deep-seated tumors (Table 2).

For our region where a high fraction of patients were referred to the center, only 2 out of 10 patients with deep-seated tumors were referred after surgery. By contrast, only 2 our of 12 superficial sarcomas were referred before surgery. During the same year, 102 patients with tumors, later shown to be benign, were referred for evaluation. These patients were examined clinically and by aspiration cytology on an outpatient basis; the majority were referred back to the original hospital. We believe that this "overreferral" of 10:1 is the price that musculoskeletal tumor centers have to pay in order to catch the vast majority of the deep-seated sarcomas untouched, i.e., the tumors where referral before surgery is most important.

Our recommendations have proven effective. During the years 1983–1985, 30 out of 35 patients with deep-seated soft tissue sarcomas in the extremities were referred before surgery in our region (Rydholm et al. 1988).

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