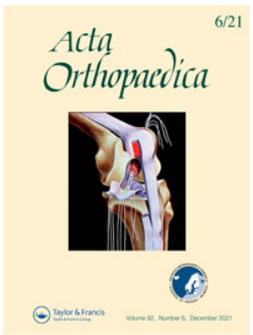

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TREATMENT OF SOFT-TISSUE SARCOMA SHOULD BE CENTRALISED

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New concepts regarding surgical margins and new modalities of preoperative examination make centralized care advantageous for patients with soft-tissue sarcomas. This study describes how the organizational level of surgical service and surgical technique have changed with time in southern Sweden.

After reviewing all cases of soft-tissue sarcoma in the trunk and extremities registered during 1964–81, 261 patients remained for analysis. The material was divided into patients treated within or outside the Orthopaedic Oncology Group (OOG) for southern Sweden, which started in 1970. Patients treated by the OOG were separated into patients referred before and after surgery. In 1964–69, one-third (25/73) of the patients had a wide or compartmental excision at final surgery of the primary tumour compared with two-thirds (126/188) in 1970/81. Further, four-fifths (111/142) of the patients treated by the OOG finally had wide or compartmental excisions, whereas only one-third (15/46) of the patients treated outside the OOG over the same time period had obtained this type of surgery. When recorded, the tentative pre-operative diagnosis was a benign lesion in more than one-half of the patients treated outside the OOG. In two-thirds of the patients referred before surgery the biopsy and treatment, a wide or compartmental excision, were combined into one surgical procedure. Over the years the number of patients referred increased. During 1980–81, 35 of 38 patients with soft-tissue sarcomas were referred to the OOG: 11 before any biopsy, 14 after a malignant cytodiagnosis and 10 following marginal excisions.

Key words: aspiration cytology; diagnosis; orthopaedic oncology group; referral pattern; soft-tissue sarcoma; surgical procedure

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Soft-tissue sarcomas are rare tumours constituting less than 1 per cent of all malignancies. An optimal treatment requires close co-operation between different specialists for the pre-operative investigations, such as cytodiagnosis, angiography and computed tomography, the planning and performance of surgery, the histologic examination and the management of adjuvant therapy. Thus, there has been a trend to centralize the management of patients with soft-tissue sarcomas. In 1970, the Orthopaedic Oncology Group (OOG) for southern Sweden started at the University Hospital in Lund, Sweden, with representatives from orthopaedic surgery, clinical pathology, clinical cytology, diagnostic radiology, and oncology. Patients from the southern region of Sweden (1.3 million inhabitants) with suspected or histopathologically proved musculoskeletal sarcoma can be referred to this group. The treatment programme was primary radical surgery, preferably local, which is more easily accomplished if surgical biopsy, especially marginal excision, has not been done. Preoperative radiotherapy was not used, and post-

operative radiotherapy was used only for cases with inadequate surgery when re-operation was not indicated.

In recent years, different surgical procedures have been defined and classified according to the type of surgical margin, and the prognostic influence of the different types of surgical margins have been verified (Enneking et al. 1981, Markhede et al. 1982). The purpose of our study was to analyse the methods used in the diagnosis and treatment of all soft-tissue sarcomas in a defined population and to analyse any changes in these methods over time and with the organizational level of the surgical service.

The surgical treatment was classified in terms of the surgical margin that was finally obtained. The change in the number of patients not referred and referred before or after surgery (referral pattern) to the OOG, and the different types of surgical margins obtained within these groups were analysed. Also the tentative pre-operative diagnosis and the type of diagnostic surgical procedure used to obtain material for microscopic examination, including the use of aspiration cytology, were studied.

PATIENTS AND METHODS

Reporting to the Swedish National Cancer registry is estimated to be close to 100 per cent *(Cancer incidence in Sweden 1982)*. All reports on soft-tissue sarcomas from the four southernmost counties (population 1.3 million) during 1964 through 1979 were studied. For the years 1980 and 1981, all diagnoses of soft-tissue sarcoma were obtained from the Departments of Pathology in the region. The histologic material was re-examined and malignancy-grading performed (four-grade scale). Excluded were sarcomas confined to the dermis, viscera, retroperitoneum, head and neck, and also dermatofibrosarcoma protuberans, Kaposis' sarcoma and sarcoma arising after radiation therapy for cancer, and three cases where histologic material was not available for review. Following analysis of the medical records, available for all patients, a further 50 patients were excluded, 20 because of metastasis at diagnosis and 30 patients who had no surgery, an incisional biopsy only or a partial excision because the tumour was deemed impossible to remove or because the patient was too weak. Excluded also were five patients who primarily consulted the Orthopaedic Department in Lund during 1970–81.

The study population then comprised 261 patients (153 males and 108 females). Their mean age was 55 years (range 2–88 years). Sixty tumours were low-grade (I and II) and 201 were high-grade (III and IV).

Ninety-six tumours were subcutaneous with or without attachment to the deep fascia (superficial muscle fascia) and 161 were subfascial, intra-or extramuscular. In four cases the depth could not be classified from existing data. Size was recorded from pathology reports or in some cases from angiograms or clinical notes. Only the longest diameter (cm) of the tumour was used. From the case records, the following were also noted: year of diagnosis, the patient's domicile (county), the tentative pre-operative diagnosis, the results from aspiration cytology, the type of surgical procedure for the primary tumour, the use of chemo- or radiotherapy, and whether the patient had been referred before or after surgery, or not at all, to the Orthopaedic Oncology Group. Patients referred soon after the primary surgery were classified as "referred after surgery" while patients referred first following local recurrence were classified as "not referred".

Surgery was classified in retrospect from surgical notes and pathology reports as either incisional biopsy, partial excision (incomplete, piecemeal, debulking), marginal (shelling out), wide or compartmental excision. Excisions were classified as marginal where the tumoural pseudocapsule formed all or part of the specimen's periphery. Wide excisions were procedures where the tumour was removed *en bloc* including a margin, all around, of uninvolved tissue. For a subcutaneous sarcoma, a wide margin required inclusion of the deep fascia. Excisions of subfascial intra-compartmental tumours with a "radical margin" according to the definitions of Enneking et al. (1980) were called compartmental excisions. For intramuscular tumours, complete myectomies were also called compartmental excisions even if they did not include the total compartment as it has been defined by Enneking et al. (1980). We did not define a "radical margin" superior to the wide margin for subcutaneous tumours and for subfascial but extra-compartmental tumours as did Enneking and co-workers. Amputations were classified according to the surgical margin obtained.

The cases between 1964 and 1978 will be separately analysed concerning descriptive epidemiology and prognostic factors (manuscript in preparation).

RESULTS

Of the 261 patients, 73 were treated during 1964–69 and 188 during 1970–81. Of these 188 patients, 46 were not referred to the OOG, 64 were referred after surgery and 78 before surgery.

The last surgical procedure for the primary tumour was marginal in 110 patients, wide in 100

Table 1. Type of last surgical procedure for the primary tumour during 1964–69 and 1970–81. n = *261*

Surgical procedure	1964–69	1970–81
Marginal excision	48	62
Wide or compartmental excision	25	126
Total	73	188

Table 2. Type of last surgical procedure for the primary tumour in patients referred before or after surgery and in patients not referred, 1970–81. n = *188*

Surgical procedure	Patients referred	Patients not referred
Marginal excision	31	31
Wide or compartmental excision	111	15
Total	142	46

and compartmental in 51 patients. A total of 411 surgical procedures had been performed. Amputations were performed for 28 primary tumours, 15 of these in the 142 patients treated by the OOG. Twenty-four were major amputations and four were minor (three digital and one transmetatarsal). The amputation was compartmental in 12 patients, wide in 15 and marginal in one patient. The number of amputations was uniformly distributed over the years.

The final surgical margin obtained for the primary tumour was a marginal excision in two-thirds (48/73) of the patients treated between 1964 and 1969 compared with one-third (62/188) in 1970–81 (Table 1). For patients not referred to the OOG from 1970 through 1981, the final surgical procedure was still a marginal excision in two-thirds (31/46) as compared with one-fifth (31/142) for referred patients (Table 2). The fraction of marginal excisions was the same for patients referred before (15/78) and after surgery (16/64), whereas compartmental excision was performed in 33/78 (0.4) of the patients referred before surgery as compared with 10/64 (0.15) in the patients referred after surgery. However, there was a significant difference in the depth and size of the tumour between patients referred before and after surgery. Thus, 68/78 (0.9) of the tumours in patients referred before surgery were subfascial tumours compared with 33/64 (0.5) in the patients referred after surgery ($P = 0.002$). In the patients referred before surgery, the mean size was 8.8 cm (range 1–30) compared with 5.8 cm (range 1–17) in the patients referred after surgery ($P = 0.0008$).

The first surgical procedure was a wide or compartmental excision in 55/78 (0.7) of the patients referred before surgery compared with 10/183 (0.05) for the patients referred after surgery or not referred (Table 3). The diagnostic procedure was a marginal excision in 139/183 (0.8) of the tumours diagnosed outside the OOG (Table 3).

The number of surgical procedures for the primary tumour was 86/78 (1.1) in patients referred before surgery as compared with 199/119 (1.7) for patients not referred and 126/64 (2.0) in patients referred after surgery. Radiotherapy for the primary tumour was given in 12 patients following marginal surgery and in seven following wide excision. Chemotherapy was administered in three patients following marginal surgery and in 16 following wide or compartmental surgery – all were patients treated after 1976.

The pre-operative presumed diagnosis when noted in the medical records for patients referred before surgery was malignancy in 62/70 (0.9) as compared with 40/107 (0.4) for patients not re-

Table 3. Type of first surgical procedure in patients referred before surgery and in patients referred after surgery or not referred. n = *261*

Surgical procedure	Patients referred before surgery	Patients referred after surgery or not referred
Incisional biopsy	5	34
Marginal excision	18	139
Wide or compartmental excision	55	10
Total	78	183

Table 4. Pre-operative diagnosis in patients referred before surgery and in patients referred after surgery or not referred. n = *261*

Pre-operative diagnosis	Patients referred before surgery	Patients referred after surgery or not referred
Malignancy	62	40
Lipoma	2	27
Other benign lesion	6	40
No recorded diagnosis	8	76
Total	78	183

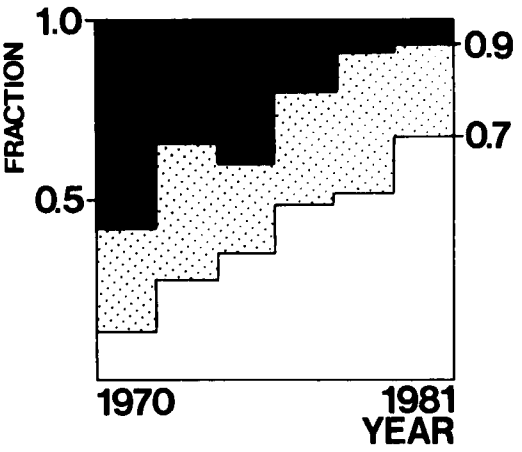

Figure 1. Referral pattern in 188 patients with soft-tissue sarcoma during 1970–1981 (2-year periods). ■ *patients not referred;* ⊡ *referred after surgery;* □ *referred before surgery.*

ferred or referred after surgery. Lipoma was the most common falsely benign, pre-operative diagnosis (Table 4).

Aspiration cytology was performed at hospitals outside the OOG in 51 patients. The cytodiagnoses are analysed (Table 5) for the periods 1970–75 and 1976–81, illustrating the increased diagnostic reliability. Two of the four patients with a falsely benign cytodiagnosis were referred, one before surgery and one after a marginal excision. In the remaining two patients, a marginal excision was performed.

Table 5. Results of aspiration cytology performed at hospitals outside the OOG during the periods 1970–75 and 1976–81

Cytodiagnosis	1970–75	1976–81
Malignant	10	25
Falsely benign	3	1
Inconclusive	7	5
Total	20	31

Table 6. Number of malignant cytodiagnoses at aspiration cytology performed at hospital outside the OOG during two time periods. In parentheses, the total number of patients

Period	Patients referred before surgery	Patients referred after surgery or not referred
1970–75	– (22)	10 (62)
1976–81	21 (56)	4 (48)

There was an increase of patients referred before surgery from one-quarter (22/84) during 1970/75 to one-half (56/104) during 1976–81. This increase was mainly due to patients referred after a malignant cytodiagnosis at hospitals outside the OOG (Table 6).

The referral pattern was analysed for 2-year periods from the start of the OOG in 1970, and illustrates the increasing fraction of patients referred both before and after surgery (Figure 1). During 1980–81, 35/38 patients were referred, 10 after a marginal excision, 14 after a malignant cytodiagnosis and 11 before any biopsy. The referral pattern was separately analysed for two subpopulations, where Area 1 is the county in which Lund is situated (0.7 million inhabitants) and Area 2 the three more distant counties of the region (0.6 million inhabitants). The change in referral pattern was the same except for a 5-year delay in Area 2 (Figure 2).

DISCUSSION

Sarcoma should be considered in the evaluation of a soft-tissue lesion. The rareness of soft-tissue sarcoma, more than likely, explains the benign

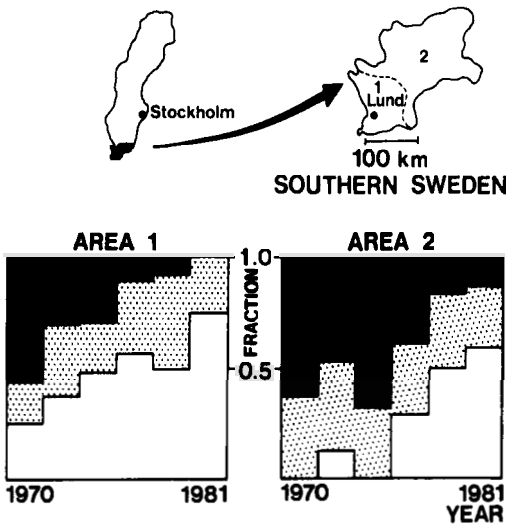

Figure 2. Referral pattern in 188 patients with soft tissue sarcoma from two different areas in southern Sweden during 1970–1981 (2-year periods). ■ *patients not referred;* ⊡ *referred after surgery;* □ *referred before surgery.*

tentative pre-operative diagnosis in more than one-half of the sarcomas diagnosed outside the OOG.

Material for microscopic examination can be obtained by fine needle (0.7–0.8 mm) aspiration biopsy, thick-needle biopsy, incisional biopsy or excisional biopsy. Excisional biopsy is often performed as a marginal excision, shelling out, but can be made with larger surgical margins. In selected cases, an excisional biopsy can be made with surgical margins adequate for a sarcoma combining diagnostic and therapeutic measures (Stener 1979). Except for small superficial tumours, a marginal excision is unsuitable for diagnosis of a sarcoma, for tumour-cell dissemination in the wound hematoma may complicate later radical surgery. This risk is also to be considered when an incisional biopsy is to be performed. The majority of the sarcomas treated outside the OOG were diagnosed by a marginal excision, whereas most tumours diagnosed by the OOG had one surgical procedure combining diagnosis and therapy. However, it should be noted that a greater fraction of tumours diagnosed outside the OOG during the period 1970–81 were smaller and more superficial than the average.

Low-grade sarcomas seldom metastasize, but they pose a local surgical problem. In contrast, high-grade sarcomas have a high potential for metastasis, with a 5-year survival rate between 50 and 60 per cent (Simon & Enneking 1976, Markhede et al. 1982). A significantly better prognosis has been reported for patients treated with surgical procedures with low potential for local recurrence (Cantin et al. 1968, Markhede et al. 1982). Because soft-tissue sarcomas often are macroscopically, but not microscopically, encapsulated, the surgeon is tempted to shell them out. However, such a marginal excision is followed by local recurrence in 40–90 per cent (Cantin et al. 1968). Adequate surgery means that the tumour is removed *en bloc*, including an intact layer of healthy tissue surrounding the tumour – in our study classified as wide or compartmental excisions. About two-thirds of the patients treated outside the OOG had a marginal excision as the final procedure for the primary tumour. In each of two other population-based Scandinavian series, one including all cases of liposarcoma diagnosed in Sweden from 1958 through 1966 (Kindblom et al. 1975) and one in Finland, encompassing soft-tissue sarcomas in the extremities, from 1960 through 1969 (Rantokokko & Ekfors 1979), two-thirds of the patients were also treated by a marginal excision. The treatment outside the OOG was the same when compared between the periods 1964–69 and 1970–81. In contrast four-fifths of the cases treated by the OOG had a wide or compartmental excision.

As was the case in most other published series on soft-tissue sarcomas, the surgical margins obtained were classified retrospectively. The compartmental excisions were carefully described and were usually easy to classify. By combining the information in the surgical and pathology reports, it was seldom difficult to differentiate between marginal and wide excisions. In some doubtful cases the lower class of surgical margin was chosen, but, of course, some cases will be wrongly classified.

The fact that the tumours primarily treated by the OOG had an average number of surgical pro-

cedures of 1.1 compared with 1.7 for patients not referred is explained by our principle to combine, whenever possible, biopsy and treatment according to Stener (1979). Thus, primary local radical surgery without previous histologic verification is justified when the expected loss of function is reasonable. Incisional biopsy was made in less than one-tenth of the patients primarily treated within the OOG. The risk of excising a benign tumour with an unnecessarily large margin was accepted. With this approach the transverse surgical margin can be kept less extensive compared with the requirements of Enneking et al. (1980) as documented by Markhede et al. (1982). More function is thus preserved. We have systematically used aspiration cytology in the preoperative evaluation, and by this have excluded some patients with benign lesions, mimicking a sarcoma, from surgery with unnecessarily extensive margins.

The role of aspiration cytology in the preoperative evaluation of soft-tissue tumours is controversial (Rosenberg & Glafstein 1981). In an earlier report, a good correlation was found between cytologic and histologic diagnosis in 178 patients with soft-tissue tumours, and the conclusion was that the method is a valuable complement to other pre-operative examinations (Åkerman et al. 1980). The increase of patients referred before surgery in the last 5 years is mainly due to patients being referred after a cytodiagnosis suggesting malignancy. Probably a marginal excision was avoided in many of these patients. The increased number of patients referred before surgery in later years is paralleled by an increased number of patients with benign tumours referred for consultation before surgery. Thus, during the 2-year period 1980–81, 95 patients with benign lesions were referred prior to any surgery because of suspected malignancy.

The fraction of wide or compartmental excisions obtained at the final surgery was the same for patients referred before or after surgery. However, patients referred after surgery had smaller and more superficial tumours, which often could be re-operated with a wider margin.

There are two reasons why patients preferably should be seen by a specialized group before any surgery: 1) In the case of an untouched tumour, the interpretations of clinical findings and radiograms are more reliable (Simon & Enneking 1976) and 2) the wound haematoma after an incisional biopsy or a marginal excision may contaminate previously unengaged tissue spaces and may thus complicate further surgery or increase the necessary loss of function.

Treatment protocols with less extensive (non-radical) surgery supported by pre- or postoperative radio- and chemotherapy have been reported (Suit et al. 1975, 1981), but there are different opinions regarding cure rate and loss of function with such programmes. Actually, in a recent report the quality of life was no better for patients treated with "limited surgery", supported by radio- and chemotherapy when compared with patients who had major amputations and chemotherapy only (Sugerbaker et al. 1982). Our goal has been complete surgical extirpation of the primary tumour. Preoperative radiotherapy has not been used and postoperative radiotherapy has been reserved for cases with inadequate surgery when re-operation was not indicated. Because distant metastases are common in high-grade sarcomas even after radical excision of the primary tumour, adjuvant chemotherapy (CY-VA-DIC) was given in some cases during the late 1970's. In 1981, a Scandinavian randomized prospective study of adjuvant adriamycin treatment (Scandinavian sarcoma group trial 1981) was started. This protocol aims at radical surgery as well.

REFERENCES

Åkerman, M., Idvall, I. & Rydholm, A. (1980) Cytodiagnosis of soft tissue tumors and tumor-like conditions by means of fine needle aspiration biopsy. *Arch. Orthop. Traumat. Surg.* **96**, 61–67.

Cantin, J., McNeer, G. P., Chu, F. C. & Booher, R. J. (1968) The problem of local recurrence after treatment of soft tissue sarcoma. *Ann. Surg.* **168**, 47–53.

Enneking, W. F., Spanier, S. S. & Goodman, M. A. (1980) A system for the surgical staging of musculoskeletal sarcoma. *Clin. Orthop.* **153**, 105–120.

Enneking, W. F., Spanier, S. S. & Malawer, M. M. (1981) The effect of the anatomic setting on the results of surgical procedures for soft parts sarcoma of the thigh. *Cancer* **47**, 1005–1022.

Kindblom, L.-G., Angervall, L. & Svendsen, P. (1975) Liposarcoma. A clinicopathologic, radiographic and prognostic study. *Acta Path. Microbiol.*, Suppl. 253.

Markhede, G., Angervall, L. & Stener, B. (1982) A multivariate analysis of the prognosis after surgical treatment of malignant soft tissue tumors. *Cancer* **49**, 1721–1733.

Rantakokko, V. & Ekfors, T. O. (1979) Sarcomas of the soft tissues in the extremities and limb girdles. *Acta Chir. Scand.* **145**, 385–394.

Rosenberg, S. A. & Glafstein, E. J. (1981) Perspectives on the role of surgery and radiation therapy in the treatment of soft tissue sarcomas of the extremities. *Semin. Oncol.* **8**, 190–200.

Simon, M. A. & Enneking,, W. F. (1976) The management of soft tissue sarcomas of the extremities. *J. Bone Joint Surg.* **58**-A, 317–327.

Stener, B. (1979) Surgical treatment of soft tissue tumors. In: *Advances in medical oncology, research and education.* (Ed. Kumar, S.), Vol. 10, pp. 147–156. Pergamon Press, Oxford,

Sugerbaker, P. H., Barofsky, J., Rosenberg, S. A. & Gianola, F. J. (1982) Quality of life assessment of patients in extremity sarcoma clinical trials. *Surgery* **91**, 17–23.

Suit, H. D. & Russell, W. D. (1975) Radiation therapy of soft tissue sarcomas. *Cancer* **36**, 759–764.

Suit, H. D., Proppe, K. H., Mankin, H. J. & Woods, W. C. (1981) Pre-operative radiation therapy for sarcoma of soft tissue. *Cancer* **47**, 2269–2274.

Cancer incidence in Sweden 1978. National Board of Health and Welfare, The Cancer Registry. Stockholm 1982.

Scandinavian sarcoma group trial, SSG: I/81 1981. Oncology Center, Lund.

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