

Soft-tissue masses of the locomotor system

A guide to the clinical diagnosis of malignancy

In a consecutive series of 280 patients with virgin soft-tissue lesions who were referred to the Orthopedic Oncology Center in Lund because of suspected malignancy, 53 had lesions that proved to be sarcoma, 10 metastatic carcinoma, and 217 benign tumors or tumorlike conditions. Lipoma was the most common benign tumor. Deep site, size exceeding 5 cm, patients aged over 50 years, and tumor located proximally in the extremities increased the probability of sarcoma to 50 per cent.

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Soft-tissue sarcomas are often clinically misdiagnosed as benign neoplasms, posttraumatic and inflammatory lesions, etc, causing a diagnostic delay or resulting in a marginal excision (Rydholm 1983). Early recognition and adequate surgery improve the prognosis for patients with soft-tissue sarcoma. A small size means a better prognosis, and a wide or radical excision is better than a marginal one (Enneking et al. 1981, Markhede et al. 1982, Rydholm 1983). If a marginal excision has been performed, it may be difficult at a later procedure to extend this into an unquestionably safe margin. Such enlarged secondary procedures also may cause unnecessary loss of function.

To estimate how well simple clinical data could be used to predict malignancy in soft-tissue masses, a consecutive series of patients referred for suspected malignancy to the Orthopedic Oncology Group of southern Sweden were analyzed.

Patients and methods

In Sweden musculoskeletal tumors have been concentrated by referral to orthopedic oncology groups at university hospitals with regional cancer registers. The catchment area of the Orthopedic Oncology Center in Lund is southern Sweden, with 1.4 million inhabitants, and during a 5-year period (1974-78)

280 patients had been referred because of a suspected soft-tissue sarcoma. During this period, 98 soft-tissue sarcomas, in all stages, were diagnosed in southern Sweden (regional cancer register). Of these, 53 had been referred to the Center before biopsy or excision and are included in this study. Another 20 soft-tissue sarcomas were simultaneously treated at the Center after incisional biopsy or inadequate excision at other hospitals and are not included in our study. The base material of 280 patients showed an equal sex distribution and side of lesion. The median age was 50 (1-96) years.

In 250 patients complete data could be collected from clinical records and from cytology and pathology reports, which included age, sex, duration of symptoms, side, location, size, and depth. Location was recorded as in Tables 1 and 2. Location was further subdivided into lateral, medial, frontal, and dorsal aspects including interjacent sites and central position, thus creating nine alternatives. Size of the longest axis was recorded in centimeters, and if noted transverse diameters were also recorded. Depth of the tumor was divided into subcutaneous and deep classes. The palpatory findings were also classified as soft, firm, or hard.

Additional investigations, besides physical findings, included aspiration cytology (Åkerman et al. 1985) in 222 patients, angiography in 53, but only two patients were examined by computed tomography at this time. Surgery of some type was performed on 107 tumors with histopathologic confirmation, whereas 173 lesions were unverified by histopathologic examination. The diagnosis in 143 unoperated patients was based on clinical data, cyto-diagnosis, and follow-up. Additionally, 30 lesions

were considered benign without cytodiagnosis. Unoperated traumatic and inflammatory lesions were followed until they had regressed in size; however, all the other unoperated lesions were followed clinically for 5 years or more, and not one of them was subsequently diagnosed as a malignant tumor. Analysis of variance was used for the computerized analysis of significances.

Results

Among the differential diagnoses, sarcoma was the most common one followed by lipoma, traumatic and inflammatory lesions (cysts, synovitis, ganglions, and bursas), and lastly other benign tumors (Table 1). In 30 cases, no definitive diagnosis could be arrived at. One fourth of the lesions were malignant (Table 2.) This rate was higher in the pelvic girdle and thigh ($P = 0.007$) and lower in the elbow and hand. Sarcomas were more common in the hip and thigh, lipomas in the shoulder and trunk, ruptures in the lower leg, inflammatory lesions around the knee, and fibrous lesions in the hand (Table 1).

When the anatomic locations were specified as central (neck and trunk), proximal (shoulder girdle, upper arm, pelvic girdle and thigh), or distal (elbow, forearm, hand, knee, lower leg, and foot), malignancy was more common proximally as were also lipomas, whereas the

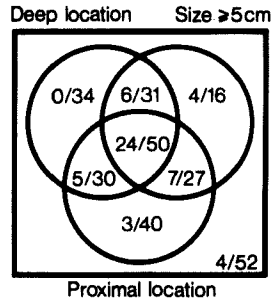


Figure 1. Probability of sarcoma based on depth, size, and location in a consecutive series of soft-tissue masses referred before surgery to the Orthopedic Oncology Center in Lund.

other lesions were equally distributed proximally and distally, with the lowest figures for central locations in all groups (Table 2).

Sarcomas and deep lipomas were larger than other lesions (Table 1). When the measured sizes were transformed into a shape index by dividing the length of the mass by its breadth, the average index was 1.4 (1.2 – 1.5) \pm 0.48 in 151 lesions where dimensions had been adequately indicated. There was no significant difference, however, between diagnostic categories. Five of the 33 sarcomas with information on palpatory findings were soft as compared with 34 of 38 lipomas. Except for lipomas, consistency was not a discriminating factor. One half (145 of 280) of the tumors were deep. Depth correlated with size: subcutaneous tumors were smallest and deep tumors were largest, which also means that sarcomas and deep lipomas as groups will present with the largest size. One half of deep, large (> 5 cm), and proximally located masses were sarcomas com-

Table 1. Soft-tissue masses seen at the Orthopedic Oncology Center in Lund. Size, length of longest axis, cm. Fractions in parentheses. $N = 250$.

Diagnosis	Number	Most common site	Mean size (cm)
Sarcoma	53 (0.21)	Hip or thigh (0.35)	9.3
Lipoma, deep	24 (0.10)	Hip or thigh (0.40)	9.2
Lipoma, superficial	18 (0.07)	Shoulder or trunk (0.41)	4.9
Traumatic	39 (0.16)	Lower leg (0.38)	3.9
Inflammatory	33 (0.13)	Knee (0.58)	3.1
Angiomatous	20 (0.08)	Upper arm (0.18)	4.8
Neurinoma	13 (0.05)	Forearm (0.14)	3.4
Fibrosis	11 (0.04)	Hand (0.25)	2.8
Carcinomas	10 (0.04)	Hip (0.19)	5.1
Infections	8 (0.03)	Foot (0.17)	3.9
Other	21 (0.08)	Foot (0.17)	3.3

Sarcomas and deep lipomas were larger ($P < 0.005$).

Table 2. Soft-tissue masses in patients referred before any surgery to the Orthopedic Oncology Center in Lund. Fractions in parentheses. $N = 250$.

Diagnosis	Central	Proximal	Distal	Total
Malignancies	4(0.19)	44(0.37)	15(0.16)	63(0.23)
Lipomas	8	27	7	42
Other neoplasms	7	30	28	65
Traumatic	1	21	17	39
Inflammatory	1	11	29	41
Total	21	133	96	250

Central = Trunk and neck.

Proximal = Shoulder girdle and upper arm and pelvic girdle and thigh.

Distal = Elbow, forearm, hand and knee, lower leg and foot.

pared with less than one tenth of small, distal masses, irrespective of depth. In 34 deep, small, distal masses, the most common diagnoses were ganglions (11 cases) posttraumatic conditions (7 cases), and deep lipomas (3 cases) (Figure 1).

In all, lesions were more common medially on the upper arm, anteriorly on the forearm, anteriomedially on the thigh, and posteriorly on the lower leg, but on the trunk the posterior location was twice as common as the anterior one.

The average history of symptoms was 14 (\pm 24) months without a significant relationship to malignancy. The fraction of sarcomas was 12/134 below age 50 years compared with 41/146 in the older patients.

Discussion

The yearly incidence of soft-tissue sarcoma in Sweden is about 20 per million compared with 3 per million for the most common skeletal sarcoma, i.e., osteosarcoma, whereas the incidence of benign soft-tissue tumors can be estimated at 3,000 per million (Larsson & Lorentzon 1974, Rydholm 1983). Most patients with skeletal sarcoma have a palpable tumor and pain leading to a radiographic examination, which usually clearly indicates malignancy. By contrast, most patients with soft-tissue sarcoma have no pain and conventional radiography is not informative. Because soft-tissue sarcomas are also rare compared with benign lesions, it is easy to understand that they often are misinterpreted. At the same time early recognition and referral before biopsy to an orthopedic oncology center is mandatory for a better prognosis.

The series analyzed by us is selective from one important point of view: It does not contain all cases of soft-tissue masses in our region, but only the cases referred because of suspected malignancy. Obviously, a lot of typical lesions well known to most clinicians are excluded; viz., bunions on the foot, ganglions on the wrist and ankle, subcutaneous lipomas, and all epidermal tumors including warts, nevi, callos-

Table 3. Location of malignancy of 250 soft-tissue masses in patients referred to the Orthopedic Oncology Center in Lund because of a suspected malignancy

Location	Number	Fraction malignant
Trunk	20	0.19
Shoulder	26	0.19
Upper arm	22	0.18
Elbow	10	0.10
Forearm	14	0.29
Hand	8	0.13
Pelvic girdle	22	0.52
Thigh	64	0.38
Knee	24	0.21
Lower leg	28	0.14
Foot	12	0.17
Total	250	0.25

ities, and the like. The figures given here therefore must be understood in the sense that when the nature of the lesion seems questionable and referral is contemplated, then, what is the probability of malignancy of the lesion in question?

Similar aspects have to be taken into consideration also when evaluating other studies with this broad approach. Kirschner & Wünsch (1981) described 7,189 soft-tissue tumors from one pathology department during a 4-year period comprising 3.25 per cent of all specimens studied. They found 97.5 per cent of the tumors were benign, 2.4 per cent malignant, and 0.2 per cent unspecified. Among the benign masses, lipoma accounted for 27 per cent, ganglion 14, hemangioma 14, and dermatofibroma 12 per cent. In contrast to our series, Kirschner & Wünsch did not include cases lacking a histopathologic diagnosis, and they had a much higher proportion of subcutaneous and cutaneous lesions. The overall incidence of malignancy was 2.5 per cent in their series compared with 25 per cent in ours, which illustrates the different selections. Kirschner & Wünsch also found that the percentage of malignancy increased with age. Similarly, Myhre-Jensen (1981) analyzed a series of 1,331 histopathologically diagnosed benign soft-tissue tumours over a 7-year period from one pathology department. Half of the tumors were lipomas. Few tumors were larger than 5 cm, and the majority of these were lipomas.

The size of the lesion varied significantly with location, but this can be explained simply by the relative difference in the surrounding tissues. It is much more difficult to identify a tumor of a certain size within a large muscle. Tumors in the upper arm were almost twice as large as in the forearm, and in the thigh they were twice as large as in the lower leg, whereas in the knee and elbow regions, they were comparatively small. The longitudinal location was important, with a higher percentage of malignancy in proximal tumors as opposed to central and distal ones. Malignant tumors were more common on that aspect of the extremity where the neurovascular bundle was located, i.e., the inside of the upper arm, the anterior side of the forearm, the anteromedial aspect of the thigh, and the back of the calf. We have no explanation of this.

Based on epidemiologic studies on sarcoma and lipoma, we have recommended earlier that all deep soft-tissue lesions and all lesions larger than 5 cm should be referred to an orthopedic oncology center before any surgery is performed (Rydholm 1983). Our present findings support this recommendation. In addition, proximal location and high age further increase the risk of malignancy. In our series, one of four examined masses was malignant, and one half of *all* patients with soft-tissue sarcomas diagnosed in our region between 1974 and 1978 were referred to us before any surgery had been performed. During 1980 and 1981, nine tenths of all patients with a soft-tissue sarcoma in our region were referred to us;

and seven tenths of these were referred before any surgery. With our recommendation as regards size and depth of soft-tissue masses, an additional increase to an 85 per cent referral level before surgery would result in about 15 patients with benign tumors for each sarcoma patient (Rydholm 1983).

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