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SIZE, SITE AND CLINICAL INCIDENCE OF LIPOMA

Factors in the Differential Diagnosis of Lipoma and Sarcoma

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All 428 patients who had a non-visceral lipoma histopathologically diagnosed during 1 year in a defined population (0.74 million inhabitants) were analysed retrospectively as regards the age, duration of symptoms, size, site (location and depth) and multiplicity of the lipomas. Solitary subcutaneous lipomas were uncommon in the hand, thigh, lower leg and foot, and four-fifths of them (264/338) were smaller than 5 cm. Multiple subcutaneous lipomas were found in 61 patients, most of them young males. Subfascial lipomas, with a mean size (6 cm) double that of solitary subcutaneous lipomas, were found in 13 patients. A subgroup of 192 lipomas (153 patients) was reexamined histologically and the tumours were classified as either simple lipoma or angiolipoma. Angiolipomas were significantly more common in patients with multiple lipomas.

To assess the reliability of a clinical diagnosis of lipoma as well as the proportion of clinically diagnosed lipomas not verified by histology, the records of patients seen in one department of surgery and in one health care centre were examined. Based on these data, the annual clinical incidence of lipoma (number of patients consulting a doctor for a lipoma, even if not histologically verified) was estimated to be 1/1000.

When the data for solitary lipomas were compared to those for soft-tissue sarcoma, it was found that patient age and duration of symptoms were of minor value in the clinical differential diagnosis. However, if a tumour were (a) larger than 5 cm, irrespective of depth and location, (b) located in the thigh, irrespective of depth and size, or (c) deep, irrespective of location and size, it was more likely to be a sarcoma. These findings can be used in selecting patients for referral to a tumour centre before surgery.

Key words: incidence; lipoma; sarcoma; site; size.

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Lipoma is the commonest soft-tissue tumour and may occur in almost any organ of the human body. The solitary subcutaneous lipoma alone accounts for one quarter to one half of all soft-tissue tumours (Stout 1953, Kirchner & Wünsch 1981, Myhre-Jensen 1981), whereas subfascial (intra- or extramuscular) lipomas have been considered to be rare (Bick 1936, Myhre-Jensen 1981). Angiolipomas and multiple subcutaneous lipomas have been described as separate entities (Howard & Helwig 1960, Berendes 1974) but are, in most reports, not separated from simple solitary lipomas.

In the work of the Orthopaedic Oncology Group for southern Sweden, it was found that many patients were referred for further surgery following the marginal excision (shelling out) of a sarcoma which had been clinically misinterpreted as a lipoma (Rydholm et al. 1983a). An incisional biopsy or a marginal excision of a soft-tissue sarcoma may complicate later, radical surgery (Stener 1979); hence these patients should be referred before any surgery. However, the great majority of soft-tissue lesions are benign and not all patients can be referred to a tumour centre for diagnosis and therapy. The finding of a soft

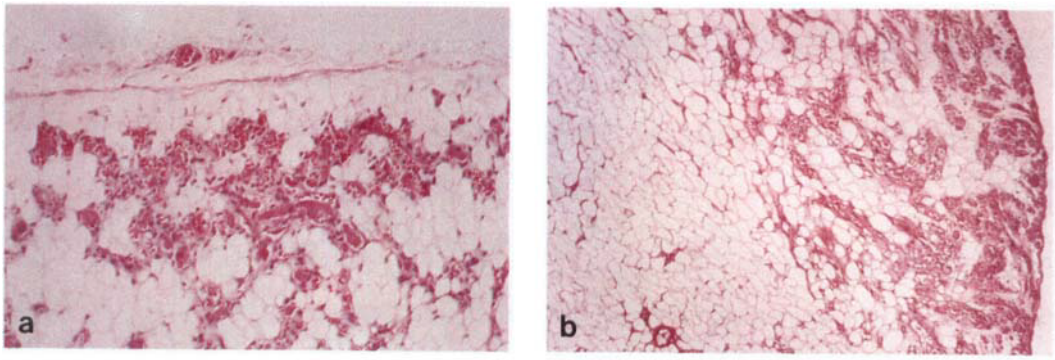

Figure 1. Architectural pattern in two angiolipomas. In both, the typical anastomosing capillaries are seen in small peripheral segments. Thrombi are common in the left figure, whereas fibrous tissue is seen in the right figure (H and E, A × 170, B × 225).

tumour speaks in favour of a lipoma but does not rule out a sarcoma. In a Swedish report on soft-tissue sarcomas, nearly one-half were described as "soft" or "fairly firm" (Jönsson 1938). In a recent *Current Concepts Review,* Simon (1982) stated: "The clinical evaluation of a primary soft-tissue tumour, unlike that of a bone tumour, is notoriously inaccurate".

To determine if such clinical variables as patient age, size and site of the lesion and duration of symptoms could be useful in the clinical differential diagnosis, we performed this retrospective study of histologically and clinically diagnosed lipomas.

MATERIAL AND METHODS

Operated case material

The southernmost county in Sweden (Malmöhus län), comprising 743,000 inhabitants, is served by four departments of pathology. From the diagnosis registers of all four departments, the pathology records were collected from all patients given a histological diagnosis of non-visceral lipoma in 1979. After the exclusion of four cases for whom the pathology record could not be found and of eight cases of locally recurrent lipomas first operated before 1979, 428 patients remained for study. Age, sex, tumour size and site (location and depth, either subcutaneous or subfascial) and duration of symptoms were recorded from the clinical and pathological notes. Size was defined as the longest diameter (cm) of the formalin-fixed lipoma as reported by the pathologist. A distinction was made between patients with one, two and multiple lipomas. In patients with multiple lipomas it was noted if the first operation was performed in 1979. The surgical reports were studied in cases in which a suspicion of subfascial lipoma was raised either from the pathologist's report or from the clinical information on the consultation form sent with the specimen. A lipoma was classified as being subfascial when the surgical report described it as such or when the histological sections demonstrated the infiltration of muscle.

A histologic reexamination of all 192 lipomas (153 patients) diagnosed at one of these pathology departments (Lund) was performed. A distinction was made between *simple lipomas* and *angiolipomas.* Simple lipomas were defined as tumours composed of fat cells and having a sharply demarcated border, usually defined by a thin capsule. Fibrous strands of varying thickness transversed the fat lobules. Small blood vessels were sparse, as a rule, though occasionally more prominent and engorged. They never showed the anastomosing pattern typical of angiolipomas, however. Angiolipomas were defined by the presence of a proliferation of anastomosing capillary vessels arranged haphazardly or in radiating bundles or repeating arcades (Figure 1). The endothelial cells were often slightly swollen and small thrombi were frequent. The vessels were invested with a delicate fibro-connective tissue sheath (Howard & Helwig 1960, Dixon et al. 1981). All tumours with even a small segment or sector of angiolipomatous structure were termed angiolipomas.

Clinical case material

To estimate the number of patients consulting a doctor for a lipoma, whether or not it was verified histologically (clinical incidence), data from one health care centre (Dalby) and one surgical department (Landskrona) within the county were analysed. In these departments diagnoses are computer-stored. The diagnosis code list is based on the WHO classification system, where there is a specific code for lipoma. The pre-

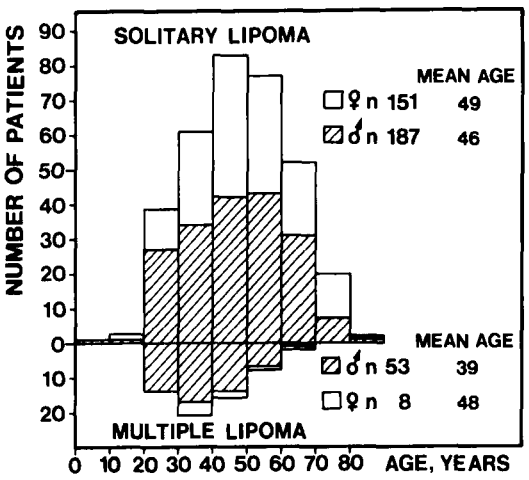

Figure 2. Age, sex distribution and mean age in 338 patients with solitary subcutaneous lipoma and 61 patients with multiple subcutaneous lipoma.

liminary clinical diagnosis, once coded, is not changed following the results of surgery. In Dalby, 58 patients over a 5-year period (1975–79) and in Landskrona, 63 patients over a 2-year period (1978–79) were registered with a clinical diagnosis of lipoma (patients with multiple tumours were not included). The medical records of these patients were analysed and they were divided into five groups according to their management and the results of the microscopic examination, if any (Table 4).

For statistical analysis, the chi-square test and an analysis of covariance were performed.

RESULTS

Operated case material

A solitary subcutaneous lipoma was found in 338 patients. The mean age of the 187 males was 46 years and of the 151 females, 49 years (Figure 2). There was no statistically significant difference with respect to age and sex. The mean (median) size was 3.9 (3.3) cm (range 1–20). Four-fifths (264/338) of the tumours were smaller than 5 cm and one-fifth (70/338) were between 5 and 10 cm. Only four tumours were larger than 10 cm. There was no significant sex difference regarding size, whereas a significant positive correlation ($P < 0.001$) was found between increasing age and tumour size. Younger patients had significantly more lipomas located on the lower arm ($P < 0.05$). Females had significantly more lipomas located in the shoulder region ($P < 0.025$) and thigh ($P < 0.05$), whereas males had significantly more lipomas located in the head and neck region ($P < 0.05$) and chest ($P < 0.05$) (Table 1). If the breast lipomas were regarded as chest tumours, however, there was no sex difference for this region. Notes on the duration of symptoms were

Table 1. Location and sex for solitary subcutaneous lipomas (338 patients)

Location	Male	Female	%
Head and neck*	41	16	17
Shoulder*	11	24	10.5
Upper arm	13	10	7
Lower arm	19	9	8
Hand	2	2	1
Chest*	26	9	10.5
Breast	–	7	2
Abdomen	27	21	14
Upper back	28	22	15
Lower back	6	5	3
Buttock, groin and hip	9	13	6.5
Thigh*	2	8	3
Lower leg and foot	3	5	2.5
Total	187	151	100

*Significant ($P < 0.05$) sex difference.

Table 2. Age, sex, location and size (longest diameter) for subfascial lipomas (13 patients)

Age	Sex	Location	Size (cm)
12	F	Shoulder	7
63	F	Shoulder[1]	5
74	F	Shoulder[1]	6
59	F	Upper arm[1]	10
72	F	Upper arm[1]	6
76	M	Upper arm[1]	6
45	F	Lower arm	5
59	F	Upper back[1]	6
59	F	Upper back[1]	4
69	M	Upper back[1]	8
50	M	Thigh	20
58	F	Thigh	28
55	F	Lower leg[1]	6

[1] Intramuscular

Table 3. Histological diagnosis after reexamination of 192 lipomas in 153 patients related to depth and multiplicity

Histological diagnosis	Subfascial	Subcutaneous		
		Solitary	Two	Multiple
Simple lipoma	11	98	4	25
Angiolipoma	–	15	4	35
Number of patients	11	113	4	25

found for 110 patients: 3 years or more in one-third, less than a year in one-half, and less than 3 months in one-fifth.

Multiple subcutaneous lipomas (three or more) were found in 61 patients (Figure 2) of whom 39 had their first operation during 1979. Males predominated (53/61, $P < 0.0001$), and the age difference between males with solitary subcutaneous lipoma (mean 46 years) and multiple lipoma (mean 39 years) was significant ($P < 0.002$). The data regarding size and location were incomplete but in the majority of patients with available information the tumours were smaller than 3 cm and often located on the chest, lower arm and thigh. In addition, 11 males (all younger than 44 years) and five females each had two lipomas.

Table 4. Management and results of microscopic examination (87 patients) in 121 patients with clinical diagnosis of "lipoma" at the health care centre in Dalby 1975–79, and the surgical department in Landskrona 1978–79

Management	Dalby	Landskrona
Clinical diagnosis only	20	4
Cytodiagnosis only[1]	8	–
Extirpation without histology	5	5
Extirpation with histology of lipoma	11	40
Extirpation with histology other than lipoma	14	14
Total	58	63

[1] In all cases consistent with a lipoma.

A subfascial lipoma was found in 13 patients (Table 2). The mean age (58 years) of these patients was significantly higher ($P < 0.01$) than that of patients with solitary subcutaneous lipoma. The mean (median) size was 9 (6) cm and was significantly larger ($P < 0.0001$) than that of solitary subcutaneous lipoma, even when adjusted for age.

On histological reexamination of 181 subcutaneous and 11 subfascial lipomas in 153 patients, no angiolipomas were found among the subfascial tumours. In patients with two or multiple lipomas the proportion of angiolipomas was significantly higher than in patients with solitary lipoma ($P < 0.0001$) (Table 3).

Clinical case material

The annual incidence of histologically verified solitary subcutaneous lipoma is 0.5/1000. For patients with multiple lipomas (first operated in 1979) the figure is 0.05/1000. To estimate the clinical incidence of lipoma, the data on the management of patients with clinically diagnosed lipomas, as shown in Table 4, were used. The following assumptions were made:

(1) The tumours diagnosed by clinical examination supported by cytodiagnosis or surgical findings but without histologic verification were lipomas.
(2) The proportion of lipomas was the same in cases diagnosed by clinical examination alone as in those in which the diagnosis was made either by cytodiagnosis, surgical findings or histology.
(3) The proportion of patients with lipomas who present to hospital clinics, compared to those who present to general practitioners and health care centres, is the same as for all patients. (According to local health authorities, 3/5 of patients present to hospital clinics and 2/5 to general practitioners and health care centres).

On these assumptions, the clinical incidence of lipoma was 60% higher than the number of lipomas sent for histologic examination. If all

clinical diagnosis of lipoma were correct, this figure would instead be 70%.

DISCUSSION

The findings in several large series published on *subcutaneous lipoma* (Adair et al. 1932, Geschickter 1934, Bick 1936, Myhre-Jensen 1981) are similar to ours in the following respects: (1) Lipomas are uncommon in children. (2) Most are smaller than 5 cm. (3) The most common locations are the trunk, shoulder, upper arm and the neck. They are unusual in the lower leg, foot and hand. Our results are at variance with earlier reports in the following respects: (1) Lipomas have been reported as being more common in females (Adair et al. 1932, Geschickter 1934). (2) In our series only 3% of the lipomas were located in the thigh. In the only report (Geschickter 1934) where the thigh was separately recorded, the figure was 13%, probably because multiple lipomas, which are common in the trunk, arm and thigh (Adair et al. 1932, Geschickter 1934, Bick 1936), were included. In our study solitary lipomas of the lower arms were more frequent in young patients and males had more lipomas located on the chest. Some of these patients probably had or were developing multiple lipomas. Likewise, the 11 young males among our 16 patients with two lipomas each, may have been developing multiple lipomas. The sex difference for lipomas located on the shoulder, thigh and head and neck region may be due to differences in the distribution of subcutaneous fat.

In this series the frequency of *multiple lipomas* was greater and the proportion of males to females was higher than in earlier reports. The age distribution we found, however, was the same (Geschickter 1934, Howard & Helwig 1960, Kirchner & Wünsch 1981). Multiple lipomas are thus virtually non-existent in children but often appear in early adulthood. A high proportion of angiolipomas in patients with multiple lipomas has been reported previously (Howard & Helwig 1960, Dixon et al. 1981). Berendes (1974) found an autosomal dominant mode of inheritance with low penetrance and suggested that this condition is a specific entity unrelated to solitary lipomas. The strong male predominance, lower age and high proportion of angiolipomas in our patients with multiple lipomas may support this suggestion.

Kindblom et al. (1974) recently stated that *subfascial lipomas* are more frequent than previously thought and constitute the most common subfascial tumour. A subfascial lipoma which does not infiltrate muscular tissue has no histologic features to differentiate it from a subcutaneous lipoma. This may well be an explanation for the low frequency of subfascial versus subcutaneous lipoma (0/102, 3/640) in earlier reports (Bick 1936, Myhre-Jensen 1981). For the same reason we assume that the incidence found in this study is a minimum figure.

A clinical diagnosis of lipoma in patients seeking medical attention for several other health problems might not be recorded on a diagnosis code list. The annual incidence of patients consulting a doctor for a lipoma in our population (clinical incidence) may, thus, be about twice the number of lipomas sent for histological examination, or 1/1000. We have found no figures on incidence in the literature.

Comparison between soft-tissue sarcoma and solitary lipoma

The data on soft-tissue sarcomas used for this comparison are taken from the files of the Orthopaedic Oncology Group at the University Hospital in Lund covering all 278 soft-tissue sarcomas in the locomotor system diagnosed in Southern Sweden (1.3 million inhabitants), during a 15-year period (unpublished observations). In this series, 89/278 tumours were smaller than 5 cm, 55/278 tumours were larger than 10 cm and 156/267 (missing data in 11 tumours) were deep-seated. Thirty-six % (100/278) of the tumours were located in the thigh. The annual incidence of soft-tissue sarcoma was 1.4/100,000. The data for lipomas are those reported above, and the estimated clinical incidence was used for the comparison. Patient age, sex and duration of symptoms were of minor value for clinical differentiation of lipoma and sarcoma. In one-half of the patients with lipoma the duration of symptoms was less than 1 year, while 10% of the

sarcoma patients had had symptoms for more than 1 year. The median size (longest axis) was 4 (1–16) cm and 8 (1–30) cm for subcutaneous and subfascial sarcomas, respectively. These figures are similar to those found for lipomas. Obviously, a certain tumour volume forces the patient to see a doctor. The type of tumour, sarcoma or lipoma seems to be less important.

Tumour size related to tumour depth was thus of no help in differentiation. Considering only tumour size, irrespective of tumour location and depth, we found the ratio of solitary lipoma to sarcoma to be 150/1 for tumours smaller than 5 cm and 20/1 for tumours 5 cm or larger. For tumours larger than 10 cm, this ratio was 6/1. In the thigh, irrespective of size and depth, the ratio of lipoma to sarcoma was 6/1. Among subfascial tumours, irrespective of size and location, the ratio of lipoma to sarcoma was 4/1.

Myhre-Jensen (1981) found that only 1% of all benign soft-tissue tumours were deep-seated and that only 5% measured 5 cm or more. These figures are even smaller than those we found for lipomas and imply an even greater ratio between malignant and benign lesions, other than lipomas, when they are deep-seated or larger than 5 cm.

It may be concluded that a tumour 5 cm or larger, a tumour in the thigh or a subfascial tumour is relatively more likely to be a sarcoma. These conclusions may be useful in the selection of patients with soft-tissue lesions who should be referred to a tumour centre before any surgery. They may also be useful in the selection of patients who should be further evaluated before surgery by fine-needle aspiration biopsy (Åkerman et al. 1981, Rydholm et al. 1983b) and such radiographic examinations as computed tomography (Halldorsdottir et al. 1982) and angiography.

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REFERENCES

Adair, F. E., Pack, G. T. & Farrior, J. H. (1932) Lipomas. *Am. J. Cancer* **16**, 1104–1120.

Åkerman, M., Idvall, I. & Rydholm, A. (1981) Cytodiagnosis of soft tissue tumours and tumour-like conditions by means of fine needle aspiration biopsy. *Arch. Orthop. Traumat. Surg.* **96**, 61–67.

Berendes, O. (1974) Multiple tumours of the skin: clinical, histopathological and genetic features. *Hum. Genet.* **22**, 181–210.

Bick, E. (1936) Lipoma of the extremities. *Ann. Surg.* **104**, 139–143.

Dixon, A. Y., McGregor, D. H. & Lee, S. H. (1981) Angiolipomas: An ultrastructural and clinicopathological study. *Hum. Pathol.* **12**, 739–747.

Geschickter, C. F. (1934) Lipoid tumors. *Am. J. Cancer* **21**, 617–641.

Halldorsdottir, A., Ekelund, L. & Rydholm, A. (1982) CT-Diagnosis of lipomatous tumors of the soft tissues. *Arch. Orthop. Traumat. Surg.* **100**, 211–216.

Howard, W. R. & Helwig, E. B. (1960) Angiolipoma. *Arch. Dermatol.* **82**, 924–931.

Jönsson, G. (1938) Malignant tumours of the skeletal muscles, fasciae, joint capsules, tendon sheaths and serous bursae. *Acta Radiol.* Suppl. 16, 177.

Kindblom, L. G., Angervall, L., Stener, B. & Wickbom, I. (1974) Intermuscular and intramuscular lipomas and hibernomas: A clinical, roentgenologic, histologic and prognostic study of 46 cases. *Cancer* **33**, 754–762.

Kirchner, Th. & Wünsch, P. H. (1981) *Weichgewebstumoren. Bioptische Diagnostik und Statistische Analyse.* Urban & Schwarzenberg, München.

Myhre-Jensen, O. (1981) A consecutive 7-year series of 1331 benign soft tissue tumours. *Acta Orthop. Scand.* **52**, 287–293.

Rydholm, A., Berg, N. O., Persson, B. M. & Åkerman, M. (1983a) Treatment of soft-tissue sarcoma should be centralized. *Acta Orthop. Scand.* **54**, 333–339.

Rydholm, A., Åkerman, M., Idvall, I. & Persson, B. M. (1983b) Aspiration cytology of soft-tissue tumours. A prospective study of its influence on choice of surgical procedure. *Int. Orthop.* **6**, 209–214.

Simon, M. A. (1982) Current concepts review. Biopsy of musculoskeletal tumors. *J. Bone Joint Surg.* **64**-A, 1253–1257.

Stener, B. (1979) Surgical treatment of soft tissue tumors. In: (Ed. Kumar, S.) *Advances in medical oncology research and education.* Pergamon Press, Oxford and New York.

Stout, A. P. (1953) Tumors of the soft tissues. *Atlas of tumor pathology,* fasc. 5 (1st series). Armed Forces Institute of Pathology, Washington, D.C.

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