



Original Research Article

A study of the histopathological spectrum of soft tissue tumours in a tertiary care centre

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ARTICLE INFO

Article history:

Received 14-06-2019

Accepted 26-07-2019

Available online 22-11-2019

Keywords:

Soft tissue

Histopathology

Benign

Malignant

Lipoma

Sarcoma

ABSTRACT

Introduction: Soft tissue encompasses the supportive connective tissue of various organs and the other nonepithelial, extra skeletal structures excluding the viscera, lymphoreticular system and meninges. The aim & objectives were to study the histopathological spectrum of various soft tissue tumours (STTs), to know the proportion of benign, intermediate and malignant soft tissue tumours and to know the age, gender and site distribution of these tumours.

Materials and Methods: It was a prospective study of 100 cases carried out at the Department of Pathology, Dr. D. Y. Patil Medical College, Hospital and Research Centre, Pune, Maharashtra. All specimens were received in 10% buffered formalin and processed through standard paraffin embedding technique. Sections of 3-5 micrometre thickness were cut and stained with Haematoxylin and Eosin stain. All STTs were classified as per the 2013 WHO classification.

Results: Out of the 100 cases of STTs, 90% were benign, 2% were intermediate and 8% were malignant. Sarcomas showed a predominance above the sixth decade. STTs showed a male preponderance with a male to female ratio of 1.3, while a female predominance was seen in the malignant STTs. Majority of the STTs were located on the extremities (35%), followed by the head and neck region (32%). Adipocytic tumours (55%) were the most common STTs, followed by nerve sheath tumours (18%) and vascular tumours (14%).

Conclusion: In spite of various ancillary techniques like special stains, immunohistochemistry, in situ hybridization (ISH) and molecular genetics, histopathological examination remains the gold standard for proper diagnosis of soft tissue tumours.

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1. Introduction

Soft tissue encompasses the supportive connective tissue of various organs and the other nonepithelial, extra skeletal structures excluding the viscera, lymphoreticular system and coverings of the brain (meninges). It is represented by adipose tissue, fibrous connective tissue, peripheral nervous system, skeletal muscle and blood/lymph vessels.¹

Most of the soft tissues originate embryologically from the mesodermal layer.

Benign mesenchymal tumours are commoner than the malignant ones and outnumber them by a ratio of almost 100:1.² But the fact that most of the benign lesions

like lipomas and haemangiomas, are not investigated and biopsied, makes it difficult to apply data from many hospital studies for the general population.³

Soft tissue sarcomas comprise less than 1% of all the malignant tumours. Due to the rarity of these tumours, there is a paucity of the literature regarding the soft tissue sarcomas especially among the developing countries.⁴

The pathogenesis of most of the soft tissue tumours is still unknown.⁵ Some of the known causes are irradiations, immune deficiency, genetic factors, viral infections and environmental factors.

Even though soft tissue tumours may appear at any age, there is a relation between the patient's age, gender, location and type of tumour.^{6,7}

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Both benign and malignant soft tissue tumours most commonly present as slowly growing painless mass. A sudden and rapid enlargement of a soft tissue mass must arise a suspicion of a malignant lesion.¹

Soft tissue tumours have been seen to arise almost anywhere in the body, but the most frequent locations include extremities, head and neck region, trunk and abdominal cavity.⁸

The major indications of biopsy in case of soft tissue lesions are a mass arising with or without a history of trauma and a mass present beyond 6 weeks after local trauma. An open biopsy is considered as the gold standard in diagnosing soft tissue neoplasms.⁹

A microscopic examination of the haematoxylin & eosin stained sections remains the gold standard in diagnosing soft tissue tumours.

The diagnostic accuracy can be increased by application of special techniques like electron microscopy, conventional special stains, cytogenetics, immunohistochemistry and molecular methods.¹⁰ Availability now of an updated histogenetic classification (WHO classification) and a standard nomenclature offers a good clinicopathological correlation. The aim and objectives of this study are:

1. To study the histopathological spectrum of various soft tissue tumours in our hospital setup.
2. To study the proportion of benign, intermediate and malignant soft tissue tumours.
3. To study the age, gender and site distribution of soft tissue tumours.

2. Materials and Methods

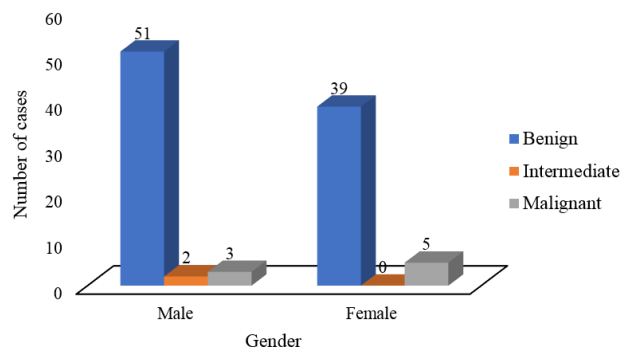
This was a prospective study of 100 cases conducted at the Department of Pathology at Dr. D. Y. Patil Medical College, Hospital and Research Centre, Pune, Maharashtra. Institute Ethics Committee Clearance (IECC) was obtained before the start of the study. Detailed clinical history, important clinical examination findings, radiological findings were obtained and noted on a structured proforma.

All specimens were received in 10% buffered formalin and were processed through the standard paraffin embedding technique. Sections of 3-5 micrometre thickness were cut and stained with Haematoxylin and Eosin stain. Special stains like PAS, Reticulin and IHC were done wherever necessary. The sections were examined under the microscope and classified as per the 2013 WHO classification.

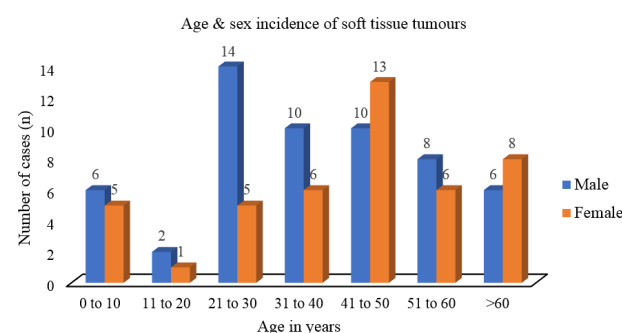
3. Results

Total 100 cases of soft tissue tumours were included in our study.

1. Benign soft tissue tumours formed 90% of all soft tissue tumours, while 2% were intermediate and



Graph 1: Gender wise incidence of all categories of soft tissue tumours



Graph 2: Diagram showing age and sex incidence of soft tissue tumours

malignant soft tissue tumours comprised an 8% among all the soft tissue tumours. The benign to malignant ratio was 11.3 (Graph 1).

2. The soft tissue neoplasms overall had a marginal male predominance with a male to female ratio of 1.3:1. In the benign lesions, it was 1.3:1 while among the malignant tumours it was 1:1.7, that is, sarcomas showed a female predominance. (Graph 1)
3. Soft tissue tumours were seen most commonly in the fifth decade (23%) followed by the third decade (19%) (Graph 2).
4. The benign soft tissue tumours had a peak incidence in the fifth decade. While the malignant soft tissue tumours were seen to occur in the age group above 60 years of age.
5. On histopathological examination of the soft tissue tumours, most common histological type was adipocytic tumours, which constituted 55% of all the tumours, followed by nerve sheath tumours (18%) and vascular tumours (14%) (Table 1).
6. Lipoma (5 4.4 %) was the most common benign tumour of soft tissue (Table 1).
7. Amongst the intermediate grade of soft tissue tumours, one was a case of atypical lipomatous tumour, while the other case was a fibrosarcomatous variant of DFSP.

Table 1: Incidence of benign, intermediate and malignant soft tissue tumours

Type	Category of Soft tissue tumours			Total
	Benign	Intermediate	Malignant	
Adipocytic tumours	52	1	2	55
Fibroblastic/Myofibroblastic tumours	3	1	1	5
So-called Fibrohistiocytic tumours	2	0	0	2
Smooth muscle tumours	0	0	1	1
Skeletal muscle tumours	0	0	1	1
Vascular tumours	14	0	0	14
GIST	1	0	0	1
Nerve sheath tumours	17	0	1	18
Tumours of uncertain potential	1	0	0	1
Undifferentiated/Unclassified sarcomas	-	-	2	2
Total	90	2	8	100

Table 2: Site wise distribution of benign, intermediate and malignant soft tissue tumours

Site	Benign	Intermediate	Malignant	Total
Extremities	29	0	6	35
Head and neck	32	0	0	32
Back and shoulder	18	0	0	18
Trunk and abdomen	9	2	2	13
Others	2	0	0	2
Total	90	2	8	100

8. The most commonly encountered malignant soft tissue tumours were liposarcomas and undifferentiated pleomorphic sarcomas (25% each).
9. Benign soft tissue tumours had a predilection for the head and neck region, followed by extremities (Table 2).
10. Malignant soft tissue neoplasms had a predilection for the lower extremities (Table 2).

4. Discussion

Soft tissue tumours, both benign and malignant, are those fascinating group of lesions which arise from the supportive soft tissue of the body and have a very broad spectrum not only of the histological entities, but also of their behaviour and histomorphologic features with close histopathologic similarities between certain tumours and having only subtle differences which are detectable on a detailed microscopic examination, thus posing a diagnostic challenge to the histopathologist.

Soft tissues comprise the nonepithelial extra skeletal tissues of our body, which does not include the reticuloendothelial system, glia and supporting tissues of various parenchymal organs. They are represented by adipose tissue, fibrous tissue and voluntary muscles along with the vessels supplying these tissues.

In the present study, we analysed 100 cases of soft tissue tumours out of which 90% were benign, 2% were intermediate and 8% were malignant, showing that benign tumours were most common followed by malignant

tumours. Intermediate category of tumours were the least commonly encountered tumours in the study. These proportions were similar to those reported by Jain P et al,⁵ Umarani MK et al¹² and Swagata D et al,¹³ Narayanan NO et al¹ studied 291 cases of soft tissue tumours and reported 93.8% benign, 3.4% intermediate and 2.8% malignant tumours. A retrospective study by Peterson et al¹¹ showed 49% malignant, 35% benign, 11.4% intermediate and 4.6% of tumours with uncertain potential.

In all these studies, benign tumours have been seen to predominate the malignant ones, although the relative frequency of benign to malignant soft tissue tumours till date has been difficult to estimate. This could be because the benign soft tissue tumours do not cause many complaints to the patients and hence, they do not usually report to the clinician or surgeon and these benign tumours are thus not surgically excised.

Soft tissue tumours have a varied age distribution and all ages are at risk for developing these lesions. The majority of cases in the present study were seen in the fifth decade (23%) followed by the third decade (19%). We reported haemangiomas to be the most common tumour of childhood. We found that the sarcomas were more common in the elderly and had a peak incidence in the 6th decade and beyond (50%). Similar findings were reported by Narayanan NO et al,¹ Baste BD et al¹⁴ and Janaki M et al.¹⁵

In our study, we had 56 males and 44 females with a male to female ratio of 1.3:1 which is same as the ratio of Swagata D et al¹³ and Jain P et al.⁵ Our findings are also similar

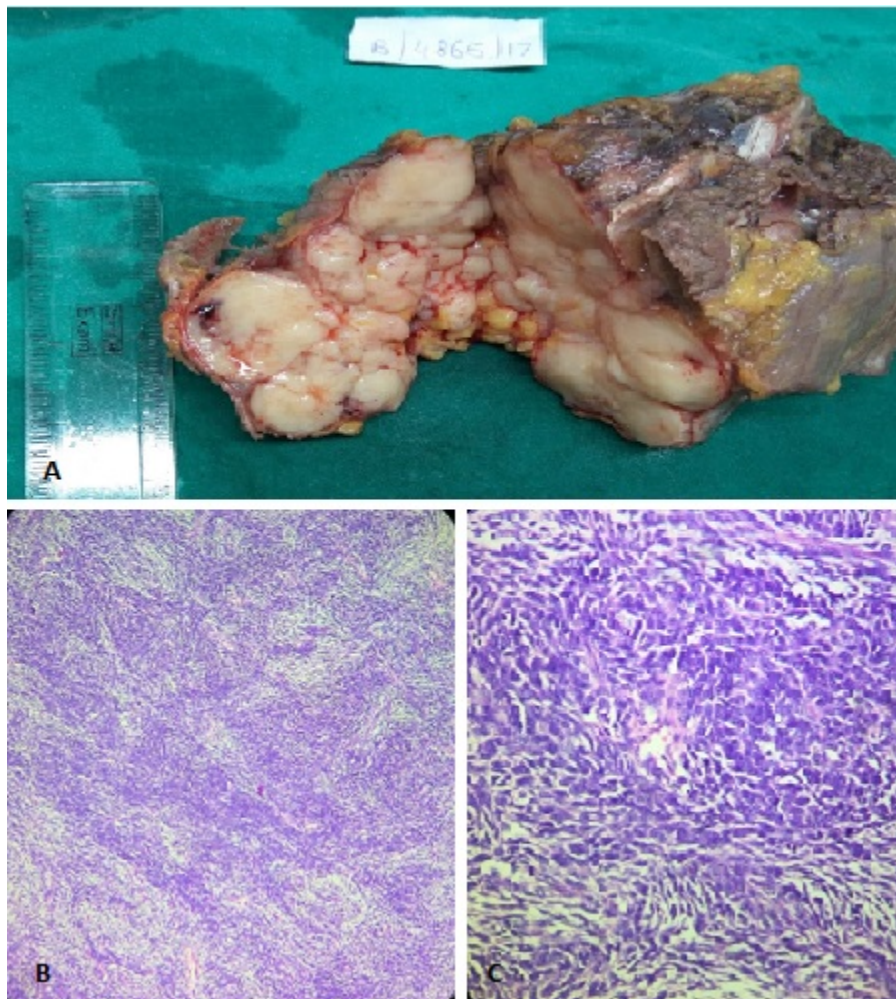


Fig. 1: DFSP, fibrosarcomatous variant: (Gross, H&E, x100 & x400) **A):** (Gross)- showing well-circumscribed, large, whitish, lobular soft to firm mass; **B):** Photomicrograph showing tumour tissue arranged in a predominantly storiform or herringbone pattern. (H&E, x100); **C):** Photomicrograph showing spindled tumour cells containing plump or elongated wavy nuclei with pleomorphism and many hyperchromatic nuclei. Few atypical mitotic figures noted. (H&E, x400).

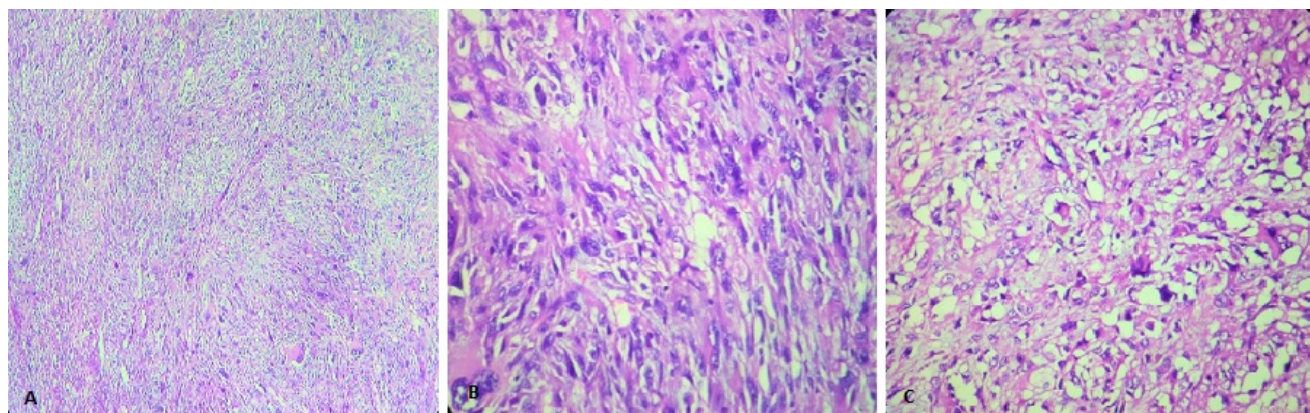


Fig. 2: Pleomorphic liposarcoma: (H&E, x100 & x400); **A):** Photomicrograph showing spindled cells and multinucleate tumour giant cells arranged in short fascicles. (H&E, x100); **B):** Showing pleomorphic hyperchromatic nuclei with vesicular chromatin and prominent nucleoli with few atypical mitotic figures. (H&E, x400); **C):** Showing extremely large lipoblasts with clear or vacuolated cytoplasm and central nucleus. (H&E, x400).

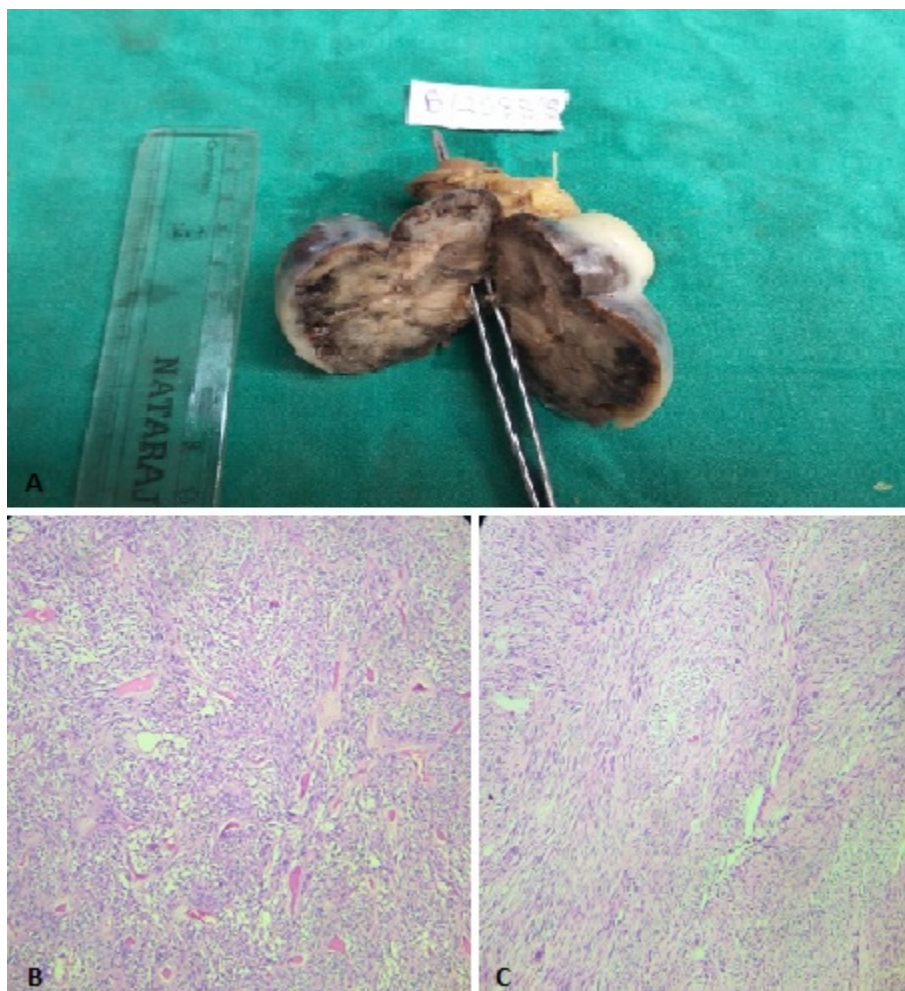


Fig. 3: GIST: (Gross, H&E, x100 & x400); **A):** (Gross)- showing tumour mass which is greyish white with few dark areas, solid and firm in consistency; **B):** Photomicrograph showing spindle shaped cells with epithelioid cells at places and occasional skeinoid fibres and hyalinized blood vessels. (H&E, x100); **C):** Photomicrograph showing tumour tissue having classical spindle cell morphology and arranged in fascicles and organoid pattern. (H&E, x100).

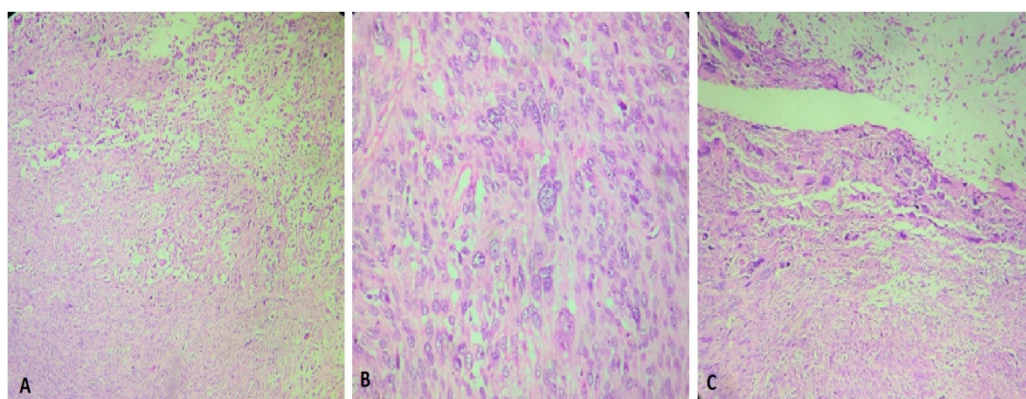


Fig. 4: Undifferentiated pleomorphic sarcoma: (H&E, x100 & x400); **A):** Photomicrograph showing tumour tissue arranged in fascicles with prominent rhabdoid differentiation. (H&E, x100); **B):** Showing tumour cells having plump, spindle-shaped and round cells with large hyperchromatic pleomorphic nuclei with nucleoli & few atypical mitotic figures. (H&E, x400); **C):** Showing multinucleate tumour giant cells with bizarre hyperchromatic nuclei. (H&E, x100).

Table 3: Distribution of soft tissue tumours in various studies

Studies	Benign	Intermediate	Malignant	Total number of tumours
Jain P et al 2014 ⁵	335 (90.6%)	-	35 (9.4%)	370
Peterson et al 2011 ¹¹	(35%)	(11.4%)	(49%)	5469
Umarani MK et al 2015 ¹²	204 (92.7%)	5 (2.3%)	11 (5%)	220
Swagata D et al 2016 ¹³	44 (88%)	1 (2%)	5 (10%)	50
Narayanan NO et al 2016 ¹	273 (93.8%)	10 (3.4%)	8 (2.8%)	291
Present study	90 (90%)	2 (2%)	8 (8%)	100

to the study done by Umarani MK et al¹² who found the male to female ratio to be 1.1:1. A male predominance was noted in almost all the soft tissue tumours among the various studies available. The male to female ratio in benign soft tissue tumours in the present study was 1.3:1; while among the malignant tumours it was 1:1.7, that is the malignant tumours showed a female preponderance. The reason for this could be that females generally tend to ignore their health issues and hence present to the clinician at a late stage when there has been a rapid and massive increase of the lesion which poses many difficulties in their day to day activities.

Among the benign soft tissue tumours, adipose tissue tumours (57.8%) formed the largest group followed by nerve sheath tumours (18.9%) and vascular tumours (15.6%). Similar findings were reported by Umarani MK et al¹² and Baste BD et al.¹⁴ There has been noted a highly significant association between the type and category of soft tissue tumours. Gastrointestinal stromal tumours (GIST) and tumours of uncertain potential (1.1% each) constituted the least commonly encountered tumours in our study. Most of the benign tumours in our study were located in the head and neck region (35.6%), followed by the extremities (32.2%). Various studies available in literature like Narayanan NO et al,¹ Jain P et al,⁵ Baste BD et al, etc. found extremities to be more commonly involved than the head and neck region. The reason for higher proportion of benign tumours in head and neck region could be that since our study was conducted in an urban area, patients reported more frequently to us with head and neck tumours due to cosmetic reasons.

Liposarcomas and undifferentiated pleomorphic sarcomas (25% each) were the most common malignant soft tissue tumours in our study. Our findings were in accordance with Baste BD et al¹⁴ and Samarth V et al.¹⁶ Majority of the soft tissue sarcomas were located in the extremities (75%), especially the lower extremities (62.5%), followed by the trunk and abdomen (25%). Similar findings were reported by Samarth V et al,¹⁶ Jain P et al⁵ and Narayanan NO et al.¹ However, the study conducted by Mandong et al¹⁷ reported extremities (45.7%) to be the most common site of malignant soft tissue tumours, followed by head and neck region (25.6%).

As per the 2013 WHO classification of soft tissue tumours, an intermediate group of soft tissue tumours

exists which has been reported to cause repeated local recurrences and also known to have a low to moderate risk for metastasis. There were 2 cases of intermediate soft tissue lesions in our study. One was an atypical lipomatous tumour/ well-differentiated liposarcoma arising from the retroperitoneum in a 57-year-old male, which on microscopy showed relatively mature adipocytic proliferation with significant pleomorphism, focal adipocytic nuclear atypia with hyperchromasia and scattered hyperchromatic and multinucleated stromal cells. The other intermediate grade case was a fibrosarcomatous variant of dermatofibrosarcoma protuberans (DFSP) arising from the anterior abdominal wall of a 40-year male. Grossly it showed a well-circumscribed, large, whitish, lobular soft to firm mass. Microscopy showed predominantly storiform or herringbone pattern. The individual spindle shaped tumour cells showed plump or elongated, hyperchromatic, wavy nuclei with pleomorphism. Few atypical mitotic figures were also seen.

The recent WHO classification has been found to contribute significantly to understanding the prognosis of sarcomas. Histopathological examination highlighting the architectural pattern and individual cell morphology is usually enough to establish a diagnosis and ancillary techniques may be used wherever necessary. For proper therapy of these sarcomas, their grading is the single most important criteria, which also helps in predicting their biological behaviour. Grading of the malignant soft tissue tumours (usually done based on the FNCLCC grading system) is mainly based on three independent prognostic factors namely: amount of necrosis, mitotic count per high power field and degree of differentiation.

5. Conclusion

A team perspective is required for the diagnosis and management of soft tissue tumours. Even though malignant sarcomas are rare and usually present as a painless lump, a high degree of clinical suspicion is necessary for early diagnosis and better management. A detailed gross examination and adequate sampling of the tumour specimen is essential. We conclude that in spite of many recently developed ancillary techniques like special stains, immunohistochemistry, in situ hybridization and molecular genetics, histopathological examination has triumphantly

withstood the test of time and remains the gold standard for proper diagnosis of soft tissue tumours.

6. Acknowledgment

None

7. Source of funding

None

8. Conflict of interest

None.

References

1. Narayanan NO, Sapna M, Sumangala B. Spectrum of soft tissue tumors in a tertiary care centre - A 5 year study. *Natl J Med Dent Res.* 2016;4(2):83–88.
2. Weiss SW, Goldblum JR. General Considerations. In: Enzinger FM, Weiss SW, editors. *Enzinger & Weiss's Soft Tissue Tumours.* Mosby ; 2001., p. 2011–2019.
3. GRamnani B, Kumar A, Chandak S, Ranjan A, Patel MK. Clinicopathological Profile of Benign Soft Tissue Tumours: A Study in a Tertiary Care Hospital in Western India. *J Clin Diagn Res.* 2014;8(10):1–4.
4. Shukla NK, Deo SVS. Soft Tissue Sarcoma-Review of Experience at a Tertiary Care Cancer Centre. *Indian J Surg Oncol.* 2011;2(4):309–312.
5. Jain P, Shrivastava A, Malik R. Clinicomorphological Assessment of Soft Tissue Tumors. *Sch J App Med Sci.* 2014;2(2D):886–890.
6. Kransdorf MJ. Benign soft-tissue tumours in a large referral population: distribution of specific diagnoses by age, sex, and location. *Am J Roentgenol.* 1995;164(2):395–402.
7. Kransdorf MJ. Malignant soft tissue tumours in a large referral population: Distribution of specific diagnosis by age, sex and location. *Am J Roentgenol.* 1995;164(1):129–134.
8. Hassawi BA, Suliman AY, Hasan IS. Soft tissue tumours-Histopathological study of 93 cases. *Ann Coll Med Mosul.* 2010;36(1&2):92–98.
9. Kasraeian S, Allison DC, Ahlmann ER, Fedenko AN, Menendez LR. A Comparison of Fine-needle Aspiration, Core Biopsy, and Surgical Biopsy in the Diagnosis of Extremity Soft Tissue Masses. *Clin Orthop Relat Res.* 2010;468:2992–3002.
10. Abudu EK, Akinde OR, Oyeadejo TO, Efunshile AM, Musa OA, Banjo AA. Histopathological study Sagamu, South-west Nigeria. *Nig Q J Hosp Med.* 2010;20(1):42–45.
11. Petersen I, Gunther B, Mildner K, Subhi F, Knosel T, Altendorf-Hofmann A. Update from the soft tissue tumour registry in Jena. *Pathol.* 2011;32(1):40–46.
12. Umarani MK, Lakra PS, Bharathi M. Histopathological Spectrum of Soft Tissue Tumors in a Teaching Hospital. *IOSR J Dent Med Sci.* 2015;14(4):74–80.
13. Swagata D, Gobil T, Projnan S. Spectrum of soft tissue tumours at a tertiary care centre in North East India. *Indian J Basic Appl Medl Res.* 2016;5(4):303–306.
14. Swami BD, Swami SY, Narhire VV, Dhamecha MP, Costa GD. A clinicopathologic study of soft tissue neoplasms: An experience from a rural tertiary care hospital. *Ann Trop Med Public Health.* 2017;10:348–352.
15. Janaki M, Arora KVS, Rani S, Kumar MP, Krupal S. Morphological study of soft tissue tumours. *Int J Res Health Sci.* 2015;3(2):364–368.
16. Samartha V, Hegde S, Ahmed Z, Umaru N. Histopathological Study of Malignant Soft Tissue Tumours. *J Evol Med Dent Sci.* 2015;4:3320–3328.
17. Mandong BM, Kidmas AT, Manasseh AN, Echejoh GO, Tanko, Madaki AJ. Epidemiology of soft tissue sarcomas in Jos, North Central Nigeria. *Niger J Med.* 2007;16(3):246–249.

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Cite this article: Pagaro PM, Gambhir AS, Agrawal NS, Naragude PU, Pathak P. A study of the histopathological spectrum of soft tissue tumours in a tertiary care centre. *Indian J Pathol Oncol* 2019;6(4):603-609.