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Original Research Article

# Morphological spectrum of soft tissue tumors in a tertiary care hospital affiliated with a teaching institute: A 4 years retrospective study

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**Article Info**

**Received:** 2nd January, 2019

**Accepted:** 23rd February, 2019

**Published Online:** 9th August, 2019

**Keywords:** Peripheral Neuroblastic tumors, Neuroblastoma, Ganglioneuroblastoma, Ganglioneuroma, Immunohistochemistry.

## Abstract

**Aims and Objectives:** 1) To study the morphological spectrum of soft tissue tumors in detail on the basis of both histopathological features and recent WHO classification and 2) To study the relative frequencies of Benign, Intermediate and Malignant tumors along with their locations, age groups of presentation and gender ratio.

**Materials and Methods:** The present 4 years retrospective study was conducted at the department of Pathology, GMERS Medical College-Junagadh from January 2015 to December 2018. It includes 105 cases of soft tissue tumors that presented and diagnosed at our institute on both clinical and pathological basis.

**Results:** Out of 105 cases, 101 (96.19%) were benign, only one (0.95%) was intermediate & 3 (2.86%) were malignant in nature. The commonest age group was 41-50 years & M: F ratio was 1.56:1. Among benign tumors, adipocytic tumors constituted majority of the cases (78.22%) followed by vascular tumors (7.92%). Both upper & lower extremities were found to be the commonest location for such tumors.

**Conclusion:** Soft tissue tumors are diagnosed on the basis of gross & light microscopic features in majority of the cases. However, in certain cases of malignancies or sarcomas, ancillary techniques like special histochemical staining & IHC become quite helpful in diagnosis.

## Introduction

Soft tissue can be defined as nonepithelial extraskeletal tissue of the body exclusive of the reticuloendothelial system, glia, and supporting tissue of various parenchymal organs. It is represented by the voluntary muscles, fat, and fibrous tissue, along with the vessels serving these tissues. By convention it also includes the peripheral nervous system because tumors arising from nerves present as soft tissue masses and pose similar problems in differential diagnosis and therapy. Embryologically, soft tissue is derived principally from mesoderm, with some contribution from neuroectoderm. Soft tissue tumors are a highly heterogeneous group of tumors that are classified by the line of differentiation, according to the adult tissue they resemble.[1]

Soft tissue tumors form a complex group of lesions and show a broad range of differentiation. So, for the purpose of diagnostic uniformity & accuracy of outcomes, an up-to-date edition (4th) of WHO classification was established in 2013 that replaces the previous (3rd) edition in 2002. The major changes from the previous edition are the addition of three new chapters namely gastrointestinal stromal tumors (GIST), nerve sheath tumors, and undifferentiated/unclassified sarcomas.[2,3]

This recent edition of WHO classification includes the following twelve groups: (1) adipocytic tumors, (2) fibroblastic/myofibroblastic tumors, (3) so-called fibrohistiocytic tumors, (4) smooth muscle tumors, (5) pericytic (perivascular) tumors, (6) skeletal muscle tumors, (7) vascular tumors, (8) gastrointestinal stromal tumors, (9) nerve sheath tumors, (10) chondro-osseous tumors, (11) tumors of uncertain differentiation, and (12) undifferentiated/unclassified sarcomas. According to their biological behavior, each group is further divided into four categories: benign, intermediate (locally aggressive), intermediate (rarely metastasizing), and malignant.[4]

Soft tissue tumors can occur in all age groups and both genders and they usually present as painless mass. The commonest location of these tumors is the extremities followed by the trunk, abdominal cavity and head and neck region.[5,6] The diagnosis of a soft tissue lesion requires clinical information and adequate, well processed tissue. At a minimum, the pathologist should have an idea about the patient's age as well as the location and the growth characteristics of the tumor itself. Imaging studies like CT scan, MRI, etc help in understanding the extent of the tumor and its relationship to the surrounding normal structures. Soft tissue tumors have many diagnostic problems & challenges because of constantly evolving histopathological criteria, particularly concerning ancillary investigations such as immunohistochemistry and molecular genetics.[6]

Aims and Objectives of this study are as mentioned below:

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http://doi.org/10.18231/j.ijpo.2019.090

1. To study the morphological spectrum of soft tissue tumors in detail on the basis of both histopathological features and recent WHO classification.
2. To study the relative frequencies of Benign, Intermediate and Malignant tumors along with their locations, age groups of presentation and gender ratio.

## Materials and Methods

The present 4 years retrospective study was conducted at the department of Pathology, GMERS Medical College-Junagadh from January 2015 to December 2018. All soft tissue specimens sent for histopathological examination were included in the study. A total number of 105 cases were studied. Relevant clinical data including patient's history, clinical examination findings, Ultrasonography and other radiological findings were obtained. Gross examination findings of specimens were noted. The sections were stained by H&E and examined microscopically and categorized according to WHO classification. Inclusion and Exclusion criteria are mentioned below:

**Inclusion Criteria**

All the cases of soft tissue neoplasms or tumors of benign/intermediate/malignant category admitted at our institute & diagnosed on both clinical as well as pathological basis

**Exclusion Criteria**

Cases of Tumor like lesions of soft tissues (e.g. Hamartomas) & Tumors arising from supporting tissue of various parenchymal organs such as uterine and gastrointestinal parenchyma (e.g. Leiomyoma of uterine myometrium)

## Result

A total number of 105 cases were enrolled in this present study that constitutes around 5% of whole specimen load in our department of pathology during the last 4 years. Out of them, 101 cases (96.19%) were Benign, 1 case (0.95%) was Intermediate and 3 cases (2.86%) were Malignant in nature. Both the genders were affected with male prepondence and gender ratio (M: F ratio) was 1.56:1. Three broad categories of tumors are mentioned below in table 1 and morphological spectrum of benign soft tissue tumors is mentioned below in table 2.

**Table 1:** Broad categories of soft tissue tumors (according to WHO classification)

| Histopathological Group | Benign | Intermediate | Malignant |
|---|---|---|---|
| Adipocytic tumors | 79 | --- | --- |
| Vascular tumors | 08 | --- | --- |
| Pericytic (perivascular) tumors | 02 | --- | --- |
| Fibroblastic/Myofibroblastic tumors | 02 | 01 | --- |
| Fibrohistiocytic tumors | 04 | --- | --- |
| Peripheral nerve sheath tumors | 03 | --- | --- |
| Chondro-osseous tumors | 03 | --- | --- |
| Skeletal muscle tumors | --- | --- | 01 |
| Tumors of uncertain differentiation | --- | --- | 02 |
| **Total** | **101 (96.19%)** | **01 (0.95%)** | **03 (2.86%)** |

As mentioned above in table 1, intermediate and malignant categories of soft tissue tumors are quite uncommon or rare as compared to their benign counterparts. Among benign ones, Adipocytic tumors (Lipoma and Variants) are quite commonly seen.

**Table 2:** Morphological spectrum of benign soft tissue tumors (according to WHO classification)

| Histopathological Group | No. of cases |
|---|---|
| **Adipocytic or Lipomatous tumors (79 cases)** | |
| Lipoma | 72 |
| Fibrolipoma | 04 |
| Angiolipoma | 02 |
| Myxolipoma | 01 |
| **Vascular tumors or Tumors of blood/lymph vessels (08 cases)** | |
| Hemangioma | 07 |
| Lymphangioma | 01 |
| **Pericytic or perivascular tumors (02 cases)** | |
| Glomus Tumor | 02 |
| **Fibroblastic/Myofibroblastic tumors (02 cases)** | |
| Nodular Fascitis | 01 |
| Angiofibroma | 01 |
| **Fibrohistiocytic tumors (04 cases)** | |

| | |
|---|---|
| Benign Fibrous Histiocytoma (BFH) | 02 |
| Giant Cell Tumor of Tendon Sheath (GCT) | 02 |
| **Peripheral nerve sheath tumors (03 cases)** | |
| Neurofibroma | 02 |
| Schwannoma | 01 |
| **Chondro-osseous tumors (03 cases)** | |
| Soft Tissue Chondroma | 03 |
| **Total** | **101 (96.19%)** |

Age-wise and Location wise distributions of soft tissue tumors are mentioned below in Table 3 & 4 respectively.

**Table 3:** Age-wise distribution of soft tissue tumors

| | **Different Age Groups in years** | | | | | | |
|---|---|---|---|---|---|---|---|
| **Histopathological Group** | **20 or less** | **21-30** | **31-40** | **41-50** | **51-60** | **More than 60** | **Total** |
| Adipocytic tumors | 02 | 16 | 18 | 26 | 10 | 07 | 79 |
| Vascular tumors | 02 | 03 | 01 | 02 | -- | -- | 08 |
| Pericytic or perivascular tumors | -- | -- | -- | 01 | 01 | -- | 02 |
| Fibroblastic/Myofibroblastic tumors | 01 | 01 | 01 | -- | -- | -- | 03 |
| Fibrohistiocytic tumors | 01 | 02 | 01 | -- | -- | -- | 04 |
| Peripheral nerve sheath tumors | 02 | 01 | -- | -- | -- | -- | 03 |
| Chondro-osseous tumors | 03 | -- | -- | -- | -- | -- | 03 |
| Skeletal muscle tumors | -- | -- | -- | -- | -- | 01 | 01 |
| Tumors of uncertain differentiation | 01 | -- | -- | -- | 01 | -- | 02 |
| **Total** | **12** | **23** | **21** | **29** | **12** | **08** | **105** |

As mentioned above, Adipocytic tumors can be found in all age groups, while other soft tissue tumors are more or less age-specific in their occurrence. Benign ones are often found among children and young adults (below 40 years of age).

**Table 4:** Location-wise distribution of soft tissue tumors

| | **Different Locations or Sites of occurrence** | | | | | | |
|---|---|---|---|---|---|---|---|
| **Histopathological Group** | **Head, Neck & Face** | **Thorax** | **Abdo-minal wall & Flanks** | **Back** | **Upper Limbs & Axillae** | **Lower Limbs & Groins** | **Total** |
| Adipocytic tumors | 11 | -- | 04 | 35 | 14 | 15 | 79 |
| Vascular tumors | 05 | 01 | -- | 02 | -- | -- | 08 |
| Pericytic or perivascular tumors | -- | -- | -- | -- | 02 | -- | 02 |
| Fibroblastic/Myofibroblastic tumors | 01 | -- | -- | -- | 01 | 01 | 03 |
| Fibrohistiocytic tumors | -- | -- | -- | -- | 03 | 01 | 04 |
| Peripheral nerve sheath tumors | 01 | -- | -- | -- | 02 | -- | 03 |
| Chondro-osseous tumors | -- | -- | -- | -- | -- | 03 | 03 |
| Skeletal muscle tumors | -- | -- | 01 | -- | -- | -- | 01 |
| Tumors of uncertain differentiation | -- | 01 | 01 | -- | -- | -- | 02 |
| **Total** | **18** | **02** | **06** | **37** | **22** | **20** | **105** |

As mentioned above, extremities (both upper & lower) as well as back are commonly involved locations while others are rare. Adipocytic tumors are frequently seen over back and limbs while vascular tumors are frequently seen over head & neck region. Nerve sheath tumors, Fibrohistiocytic tumors and Pericytic tumors are frequently seen over upper extremities or limbs.

In our present study, only one case of intermediate soft tissue tumor was included namely Dermatofibrosarcoma Protuberans (DFSP). The tumor itself is having low malignant potential and it is rarely metastasizing tumor. The patient was a 32 years old male presented with multiple nodules in neck region. Microscopic features of DFSP include high cellularity, tight storiform and occasionally fascicular growth patterns, monomorphic spindle shaped

tumor cells with scant cytoplasm and hyperchromatic nuclei, etc. (Fig. 1a)

Our present study also included three cases of soft tissue sarcomas. Out of them, one case was a 65 years old female presented with a progressive soft tissue mass over left sided flank region. Histopathologically, it was diagnosed as Pleomorphic Rhabdomyosarcoma showing microscopic features like large, atypical & multinucleated polygonal eosinophilic cells, malignant looking spindle cells, frequent mitosis & seldom cross-striations. (Fig. 1b) Rests of the two cases were diagnosed histopathologically as Synovial Sarcoma. Out of them, one was a 15 years old boy presented with a rapidly progressive soft tissue mass attached with rib over left sided flank region and another was a 60 years old male presented with a painless progressive mass attached with chest wall and arising from pleura. Microscopic features of both cases are better shown in Fig. 1c and 1d respectively.

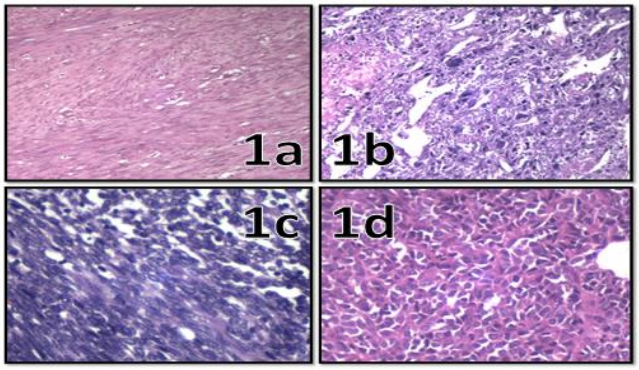


**Fig. 1**: Microscopic features of various intermediate & malignant soft tissue tumors (H & E); **1a:** Dermatofibrosarcoma Protuberans (DFSP), **1b:** Pleomorphic Rhabdomyosarcoma, **1c:** Spindle cell Synovial Sarcoma, **1d:** Epitheloid Synovial Sarcoma

## Discussion

This present study includes a total number of 105 cases of various soft tissue tumors and they are broadly classified into three categories namely benign, intermediate and malignant. Benign tumors are more in number than intermediate & malignant ones and comparison of this relative frequencies of various studies is demonstrated below in table 5.

**Table 5:** Relative frequencies of benign, intermediate & malignant tumors

| Name of the study | Benign (%) | Intermediate (%) | Malignant (%) |
|---|---|---|---|
| Naik V et al [7] | 95.5 | --- | 4.5 |
| Navya Narayanan O et al [8] | 93.8 | 3.4 | 2.8 |
| Umarani M.K. et al [5] | 92.7 | 2.3 | 5.0 |
| Zope RD et al [6] | 97.48 | 0.64 | 1.88 |
| Jain P et al[9] | 90.6 | --- | 9.4 |
| Batra P et al [10] | 89.2 | --- | 10.8 |
| **Present Study** | **96.19** | **0.95** | **2.86** |

As mentioned in table 5, relative frequency remains more or less similar in all studies and results are quite comparable. Among benign tumors, Lipoma & its variants constitute majority of the cases (total 79 out of 101, 78.22%) followed by cases of Vascular tumors (total 8 out of 101, 7.92%). In a similar study done by Navya Narayanan O et al,[8] out of 273 benign tumors, Adipocytic tumors (Lipoma & its variants) constitutes a total number of 178 cases (65.20%) followed by Vascular tumors (47 cases, 17.22%). Other similar studies like those done by Naik V et al[7] and Zope RD et al[6] also show similar outcomes. Relative frequencies of Adipocytic & Vascular tumors in both of them are 58.33% & 19.44% as well as 59.35% & 20.00% respectively. In a study done by Umarani M.K. et al,[5] Nerve sheath tumors constitute second most common group (42 out of 204 cases, 20.59%) following Adipocytic tumors, that is not comparable with our present study.

After Adipocytic & Vascular soft tissue tumors, third common group may be of Fibrohistiocytic tumors or Nerve sheath tumors in different studies. In our present study, third group is made up of Fibrohistiocytic tumor (4 cases, 3.96%). Therefore, it is now obvious that spectrum of benign soft tissue neoplasms or tumors remains more or less similar everywhere with Adipocytic tumors being the commonest ones.

Soft tissue tumors are seen in both genders with a slight male prepondence. In this study, the gender ratio (M: F ratio) is 1.56:1. In other similar studies like those done by Naik V et al,[7] by Navya Narayanan O et al,[8] by Umarani M.K. et al,[5] by Zope RD et al,[6] by Jain P et al[9] and by Batra P et al,[10] the gender ratios are 1.13:1, 1.7:1, 1.1:1, 1.01:1, 1.2:1 & 2.1:1 respectively. So we can say that ratios are different but results are comparable in all studies. We can say that soft tissue tumors are more commonly seen among males than among females.

Both upper & lower extremities are the most common location for soft tissue tumors, particularly for benign ones. In our study, total 42 cases (38.89%) belong to soft tissue tumors over extremities. Next common location is back region (37 cases, 35.24%). Head, neck, chest wall and abdominal wall are less common locations. In other studies like those done by Navya Narayanan O et al[8] & Zope RD et al,[6] the next common location for soft tissue tumors is head and neck region after extremities.

In this study, the most common age group for soft tissue tumors is 41-50 years. In a study done by Zope RD et al[6] also, the result is similar. In other studies like those done by Naik V et al[7] & by Navya Narayanan O et al,[8] the commonest age group for soft tissue tumors is 31-40 years. Malignant soft tissue tumors or Sarcomas are commonly seen in elderly people (60 years of age or beyond). In our study also, we have included three cases of sarcomas & out of them two cases are elderly people, one is a 65 years old female and the other is a 60 years old male.

Apart from benign & malignant tumors, intermediate soft tissue tumors also exist with either repeated local recurrences or infrequent metastasis. We have reported one such case of a 32 years old male presented with multiple

nodules in neck region and histopathological diagnosis given is DFSP or Dermatofibrosarcoma Protuberans. A similar case has also been reported by Zope RD et al.[6] Other studies like those done by Navya Narayanan O et al[8] & by Umarani M.K. et al[5] show 3.4% and 2.3% of intermediate soft tissue tumors respectively and these results are somewhat higher as compared to our present study.

In our study we have not included any ancillary technique like special histochemical staining or immuno-histo-chemistry (IHC) or electron microscopy, because these techniques are not available in our institute at present. We have included only morphological features of tumors that are based upon light microscopic examination of formalin fixed, paraffin embedded and H & E stained tissue sections.

## Conclusion

Soft tissue tumors constitute around 5% of whole specimen load in our department of pathology during the last 4 years. Benign tumors outnumber malignant ones and intermediate ones. Majority of cases are males and common age groups are 31-40 and 41-50 years. Extremities (particularly upper ones) are the commonest location. Spectrum of benign tumors remains similar with minor exceptions. Lipoma & its variants constitute majority of the cases of benign soft tissue tumors. Malignant & intermediate tumors are quite uncommon but require specific attention during diagnosis & management. Gross & light microscopic features are sufficient for diagnosis in most of the cases of soft tissue tumors but in some cases of sarcomas, ancillary techniques like histochemical staining & IHC become necessarily helpful.

**Conflict of Interest:** None.

**Source of Funding:** None.

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**How to cite this article:** Menapara CB, Kokani MJ. Morphological spectrum of soft tissue tumors in a Tertiary care hospital affiliated with a Teaching institute: a 4 years retrospective study. *Indian J Pathol Oncol* 2019;6(3):471-5.