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Histopathological Spectrum Of Soft Tissue Tumours According To The World Health Organization Classification: A Retrospective Descriptive Study At A Tertiary Care Centre

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Abstract
Background: *Soft tissue tumours (STTs) are mesenchymal neoplasms with diverse histological lines of differentiation and overlapping clinical, radiological and morphological features. Regional epidemiological data from southern Karnataka, particularly using the recent World Health Organization (WHO) classification, remain limited.*
Aim: *To study the histopathological spectrum of soft tissue tumours according to the recent WHO classification and to evaluate their age, sex and anatomical site distribution at a tertiary care centre.*
Materials and Methods: *A retrospective descriptive study of 188 histopathologically diagnosed soft tissue tumour cases received in the Department of Pathology, SIMS & RC, between November 2023 and October 2025 was carried out. Formalin-fixed specimens were processed routinely; 3–5 µm sections were stained with haematoxylin and eosin. Immunohistochemistry was performed in five diagnostically ambiguous cases. Tumours were classified according to the WHO classification and stratified into benign, intermediate and malignant categories.*
Results: *Of 188 cases, 155 (82.4%) were benign, 2 (1.1%) intermediate and 31 (16.5%) malignant. Mean age was 43.4 ± 15.1 years (range 3–80), with a female-to-male ratio of 2.24:1 and peak incidence in the 41–50 year age group (36.7%). The uterus was the predominant anatomical site (41.5%), followed by head and neck (16.0%) and lower extremity (8.5%). Leiomyoma (n = 79) and lipoma (n = 43) were the commonest benign tumours; chondrosarcoma, malignant peripheral nerve sheath tumour (MPNST) and undifferentiated sarcomas (4 cases each) led the malignant group. Immunohistochemistry confirmed the diagnosis in all five ambiguous cases.*
Conclusion: *Histopathological examination with haematoxylin and eosin remains the diagnostic cornerstone for soft tissue tumours, with immunohistochemistry serving as a vital adjunct for morphologically ambiguous lesions.*
Keywords: *Soft tissue tumours; Histopathology; WHO classification; Immunohistochemistry; FNCLCC grading.*
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I. Introduction

Soft tissue tumours (STTs) constitute a clinically and pathologically heterogeneous group of mesenchymal neoplasms arising from extraskeletal, non-epithelial tissues, excluding the viscera, lymphoreticular system and meninges.[1] According to the fifth edition of the World Health Organization (WHO) Classification of Soft Tissue and Bone Tumours, these neoplasms recapitulate the morphology and immunophenotype of adult mesenchymal tissues (adipose tissue, fibrous connective tissue, smooth and skeletal muscle, blood and lymphatic vessels, and peripheral nerves) and are classified primarily according to their line of differentiation rather than the tissue of origin.[1,2] The classification further stratifies tumours into benign, intermediate (locally aggressive or rarely metastasising) and malignant categories, an approach that informs both prognosis and clinical management at the bedside.[1]

Soft tissue sarcomas (STSs) account for less than 1% of all human malignancies and approximately 2% of cancer-related mortality globally.[3,4] Population-based incidence estimates range from 4 to 5 cases per 100,000 person-years, with a slight upward trend in recent decades that is attributable, at least in part, to improved diagnostic recognition rather than a true rise in tumour biology.[4,5] Benign STTs, in contrast, are

substantially more frequent, outnumbering their malignant counterparts by a ratio of approximately 100:1 in the community setting, although this disparity narrows considerably in hospital-based series where smaller, asymptomatic benign lesions are less likely to be biopsied.[6]

The Rhône-Alpes Sarcoma Network prospective study by Ducimetière and colleagues reported an annual STS incidence of 6.2 per 100,000 person-years among adults, with men comprising 56% of cases and a median age at diagnosis of 65 years.[6]

The histopathological diagnosis of STTs presents a recurring challenge to surgical pathologists owing to extensive morphological overlap between entities with vastly different clinical implications. Benign lesions such as nodular fasciitis may simulate sarcoma; intermediate lesions such as desmoid fibromatosis straddle the boundary between proliferative and frankly neoplastic; and high-grade undifferentiated sarcomas often require ancillary techniques for definitive sub-classification.[2,7] Careful histomorphological assessment of haematoxylin and eosin (H&E) stained sections remains the cornerstone of diagnosis, supplemented by clinical context — the age of the patient, site, size, depth and growth pattern of the lesion.[7,8]

The introduction of immunohistochemistry (IHC) has transformed the diagnostic workup of STTs. Markers such as desmin and myogenin for myogenic differentiation, S-100 protein and SOX-10 for neural and melanocytic tumours, CD31, CD34 and ERG for vascular tumours, and smooth muscle actin and calponin for smooth muscle differentiation now enable reproducible recognition of lineage in lesions where light microscopy alone is insufficient.[7] Coindre noted that IHC is now considered indispensable for the accurate diagnosis of certain sarcoma subtypes, including rhabdomyosarcoma, epithelioid sarcoma, clear cell sarcoma, gastrointestinal stromal tumour and desmoplastic small round cell tumour, both for diagnostic clarity and to guide targeted therapy where applicable.[7] More recently, molecular techniques

— fluorescence in situ hybridisation, reverse-transcription polymerase chain reaction and next-generation sequencing — have further refined this diagnostic algorithm, particularly for translocation-defined sarcomas, although their availability remains uneven in resource-constrained settings.[1,2]

For sarcomas, histological grading provides essential prognostic information that directly guides therapeutic decision-making, including the use of neoadjuvant and adjuvant chemotherapy. The grading system devised by the Fédération Nationale des Centres de Lutte Contre le Cancer (FNCLCC), originally described by Trojani and colleagues in 1984, has emerged as the most widely accepted system worldwide.[8]

The FNCLCC system stratifies sarcomas into three grades based on three independent parameters — tumour differentiation, mitotic count per ten high-power fields, and percentage of tumour necrosis — and has demonstrated robust correlation with metastatic risk and disease-specific survival in large multicentric cohorts.[8,9] In a landmark validation study of 1240 adult sarcoma patients, Coindre and colleagues demonstrated that FNCLCC grade independently predicted the development of distant metastasis ($P < 0.001$), confirming its prognostic utility across major sarcoma histotypes including liposarcoma, leiomyosarcoma and malignant peripheral nerve sheath tumour.[9]

Soft tissue tumours can arise virtually anywhere in the body, but distinct topographical patterns are recognised across the benign and malignant spectrum. Kransdorf, in a large referral series of 18,677 benign STTs, found the lower extremity (28.6%) and trunk/abdomen (25.4%) to be the most common sites overall, with adipocytic tumours accounting for 16% of cases and an overall male-to-female ratio of 1:1.[10] A parallel analysis of 12,370 malignant STTs by the same author identified the lower extremity (46%) as the dominant site of sarcoma involvement, with malignant fibrous histiocytoma (now reclassified as undifferentiated pleomorphic sarcoma) and liposarcoma as the leading histotypes.[11] Most contemporary series report a modest male predominance with an overall male-to-female ratio between 1.1:1 and 1.4:1, although certain entities such as dermatofibrosarcoma protuberans, aggressive angiomyxoma and uterine leiomyoma demonstrate clear female predilection.[5,10]

Indian hospital-based series have explored the regional spectrum of STTs across diverse geographic settings, contributing useful epidemiological data despite considerable methodological heterogeneity. A study conducted by Singh and colleagues (2017) analysed 270 STTs from a North Indian tertiary centre and reported 67.0% benign, 7.0% intermediate and 25.9% malignant lesions, with adipocytic tumours leading at 34.1%; immunohistochemistry contributed to definitive diagnosis in 67.3% of malignant cases ($P = 0.007$).[12] Pagaro and colleagues subsequently studied 100 cases from Pune in western Maharashtra and documented a benign predominance of 90% with adipocytic tumours constituting 55%, while sarcomas peaked in the seventh decade.[13] Pratti and Oruganti reported 215 STTs from coastal Andhra Pradesh with 83.2% benign, 8.3% intermediate and 8.3% malignant lesions, again with adipocytic tumours (50.2%) as the dominant histological category and the lower extremity as the leading site (37.6%).[14]

A two-year analysis from southern Assam by Tapadar and colleagues included 89 STTs and demonstrated similar findings: 85.4% benign, 4.5% intermediate, 10.1% malignant, with adipocytic predominance (43.8%) and a fifth-to-sixth decade peak for malignant lesions.[15] While such series have collectively enriched the Indian sarcoma literature, contemporary data from the southern Karnataka region —

particularly using the updated WHO classification scheme — remain conspicuously scarce.

Histopathology, augmented by IHC and FNCLCC grading, therefore remains the gold standard for the diagnosis and prognostication of soft tissue tumours.[9,12] Robust regional epidemiological data are essential to inform clinical practice, training and resource allocation in tertiary care pathology services, particularly in centres serving mixed urban and rural catchment populations where the lesion spectrum may differ from that reported in metropolitan series. The present study was therefore undertaken to characterise the histopathological spectrum of soft tissue tumours diagnosed at a tertiary care centre in Shivamogga, Karnataka, over a 24-month period; to classify these lesions according to the recent WHO scheme; to evaluate their age, sex and anatomical site distribution; and to assess the role of immunohistochemistry in the diagnosis of morphologically ambiguous cases.

II. Aims And Objectives

Primary objective: To study the histopathological spectrum of soft tissue tumours diagnosed on biopsy and resection specimens at a tertiary care hospital, according to the recent WHO classification.

III. Materials And Methods

Study design and setting

This was a retrospective descriptive study carried out in the Department of Pathology, Sapthagiri Institute of Medical Sciences and Research Centre (SIMS&RC), Benagluru, Karnataka, India, between November 2023 and October 2025. The institution is a tertiary care teaching hospital serving a predominantly mixed urban–rural population from the Southern and central Karnataka regions. Institutional Ethics Committee approval was obtained before the commencement of the study, and all patient identifiers were anonymised before analysis.

Study population and sample size

All histopathologically diagnosed soft tissue tumour cases received in the Department of Pathology during the 24-month study period were screened. Total enumerative sampling was used, and a total of 188 cases met the eligibility criteria and were enrolled.

Inclusion criteria

Formalin-fixed soft tissue specimens received in the Department of Pathology with a histopathological diagnosis of soft tissue tumour, in patients of all age groups and either sex, and with complete clinical and pathology records, were included.

Exclusion criteria

Cases were excluded if the specimens were autolysed, inadequately preserved or of poor quality; if relevant clinical or pathology records were incomplete; or if histological re-evaluation could not confirm a soft tissue tumour diagnosis.

Specimen processing

All specimens were received in 10% neutral buffered formalin and fixed for a minimum of 12 hours. Following gross examination, representative sections were taken with documentation of the tumour size, colour, consistency, encapsulation, depth of involvement and presence of haemorrhage or necrosis. Tissue was processed routinely using an automated tissue processor and embedded in paraffin wax. Sections of 3–5 μm thickness were cut on a rotary microtome and stained with haematoxylin and eosin. Special stains, including periodic acid–Schiff (PAS), reticulin and Masson trichrome, were performed wherever indicated.

Histopathological evaluation and classification

All H&E-stained sections were examined by two pathologists independently, and any discordance was resolved by joint review. Tumours were classified according to the WHO Classification of Soft Tissue and Bone Tumours, fifth edition, into adipocytic, fibroblastic/myofibroblastic, so-called fibrohistiocytic, smooth muscle, skeletal muscle, vascular, peripheral nerve sheath, pericytic, tumours of uncertain differentiation and undifferentiated/unclassified sarcomas.[1] Each lesion was further stratified as benign, intermediate (locally aggressive or rarely metastasising) or malignant on the basis of WHO criteria.

Immunohistochemistry

Immunohistochemistry was performed selectively in cases where the H&E morphology was insufficient for definitive diagnosis. Indirect peroxidase–antiperoxidase technique was used on 3–4 μm sections mounted on positively charged slides. The panel of antibodies was tailored to the morphological differential

diagnosis and included pan-cytokeratin (AE1/AE3), epithelial membrane antigen, vimentin, S-100 protein, smooth muscle actin, desmin, myogenin, CD34, CD68, CD56, CD99 and calponin, as appropriate.

Data analysis

Demographic, clinical and pathological data were entered into Microsoft Excel and analysed using descriptive statistics. Continuous variables were expressed as mean ± standard deviation and as median with range. Categorical variables were expressed as frequencies and percentages. The findings were compared with published Indian and international series.

IV. Results

Demographic profile

A total of 188 cases of soft tissue tumours were analysed over the 24-month study period. The mean age of the study cohort was 43.4 ± 15.1 years, with a median age of 45 years and an overall range of 3 to 80 years. The peak incidence occurred in the 41–50 year age group, accounting for 69 cases (36.7%), followed by the 51–60 year age group (22 cases; 11.7%) and the 31–40 year age group (40 cases; 21.3%). The overall female-to-male ratio was 2.24:1, with 130 female (69.1%) and 58 male (30.9%) patients. The demographic characteristics of the study population are summarised in Table 1.

Table 1. Demographic characteristics of the study population (n = 188).

Parameter	Value
Total number of cases	188
Mean age, years (± SD)	43.4 ± 15.1
Median age, years	45
Age range, years	3 – 80
Female:Male ratio	2.24 : 1
Female, n (%)	130 (69.1)
Male, n (%)	58 (30.9)
Peak age group, years	41 – 50 (36.7%)

Distribution by tumour behaviour

Of the 188 soft tissue tumours studied, 155 cases (82.4%) were benign, 2 cases (1.1%) were classified as intermediate and 31 cases (16.5%) were malignant. The benign-to-malignant ratio was therefore approximately 5:1. The distribution of tumours by behaviour is presented in Table 2.

Table 2. Distribution of soft tissue tumours by behaviour (n = 188).

Behaviour	n	%
Benign	155	82.4
Intermediate	2	1.1
Malignant	31	16.5
Total	**188**	**100.0**

Distribution by WHO histological category

When stratified by WHO histological category, smooth muscle tumours formed the largest single group (81 cases; 43.1%), driven almost entirely by uterine leiomyomas. Adipocytic tumours constituted the second largest category (44 cases; 23.4%), followed by peripheral nerve sheath tumours (14 cases; 7.4%). Vascular tumours and bone and cartilage tumours each contributed 9 cases (4.8%). Meningothelial and central nervous system tumours, predominantly transitional meningioma, formed a smaller subset (8 cases; 4.3%). The complete WHO category distribution is presented in Table 3.

Table 3. Distribution of soft tissue tumours by WHO histological category (n = 188).

WHO histological category	n	%
Smooth muscle	81	43.1
Adipocytic	44	23.4
Peripheral nerve sheath	14	7.4
Vascular	9	4.8
Bone and cartilage	9	4.8
Meningothelial / CNS	8	4.3
Fibroblastic / Myofibroblastic	6	3.2

Undifferentiated / Unclassified sarcomas	5	2.7
Tumours of uncertain differentiation	4	2.1
So-called fibrohistiocytic	3	1.6
Skeletal muscle	2	1.1
Other	3	1.6
Total	**188**	**100.0**

Anatomical site distribution

The uterus and female genital tract emerged as the predominant anatomical site, accounting for 78 cases (41.5%), reflecting the high contribution of uterine leiomyomas to the cohort. The head and neck region, including intracranial lesions, was the second most common site (30 cases; 16.0%). The lower extremity, traditionally the dominant site of soft tissue sarcomas, accounted for 16 cases (8.5%), followed by the upper extremity (10 cases; 5.3%) and the abdomen and retroperitoneum (9 cases; 4.8%). The complete site distribution is shown in Table 4.

Table 4. Anatomical site distribution of soft tissue tumours (n = 188).

Anatomical site	n	%
Uterus / Female genital tract	78	41.5
Head and neck / CNS	30	16.0
Lower extremity	16	8.5
Upper extremity	10	5.3
Abdomen / Retroperitoneum	9	4.8
Trunk / Back	7	3.7
Male genital	3	1.6
Breast	2	1.1
Thorax / Lung	2	1.1
Skin	2	1.1
Other / Unspecified	29	15.4
Total	**188**	**100.0**

Spectrum of benign tumours

Among the 155 benign soft tissue tumours, leiomyoma was overwhelmingly the most frequent diagnosis, accounting for 79 cases (51.0% of benign lesions). Of these, 76 were uterine in origin, with isolated cases involving the cervix and scrotum. Lipoma was the second most common benign tumour with 43 cases (27.7%), predominantly involving the head and neck, back and upper extremity. Benign peripheral nerve sheath tumours — schwannoma, neurofibroma, plexiform neurofibroma, ancient schwannoma and ganglioneuroma — collectively contributed 12 cases (7.7%). Benign vascular tumours (cavernous and capillary haemangioma, lymphangioma and arteriovenous malformation) accounted for 8 cases (5.2%). The top benign diagnoses are detailed in Table 5.

Table 5. Spectrum of benign soft tissue tumours (n = 155).

Benign diagnosis	n	% of benign
Leiomyoma	79	51.0
Lipoma	43	27.7
Peripheral nerve sheath tumours (benign)	12	7.7
Vascular tumours (benign)	8	5.2
Meningothelial tumours	6	3.9
Fibroblastic / Myofibroblastic (benign)	5	3.2
Fibrohistiocytic tumours	3	1.9
Other benign lesions	10	6.5
Total benign	**155**	**100.0**

Spectrum of malignant tumours

Among the 31 malignant tumours, chondrosarcoma, malignant peripheral nerve sheath tumour (including its epithelioid variant), and undifferentiated sarcomas each contributed 4 cases (12.9% of malignant lesions). Chordoma and Ewing's sarcoma accounted for 3 cases each (9.7%). Leiomyosarcoma, pleomorphic rhabdomyosarcoma and synovial sarcoma (monophasic and biphasic) each had 2 cases (6.5%), and

oligodendroglioma was diagnosed in 2 cases (6.5%). Single instances of liposarcoma, fibrosarcoma, osteosarcoma, epithelioid angiosarcoma and malignant paraganglioma (carotid body tumour) were also identified. The complete malignant spectrum is detailed in Table 6.

Table 6. Spectrum of malignant soft tissue tumours (n = 31).

Malignant diagnosis	n	%
Chondrosarcoma	4	12.9
Malignant peripheral nerve sheath tumour	4	12.9
Undifferentiated sarcomas	4	12.9
Chordoma	3	9.7
Ewing's sarcoma	3	9.7
Leiomyosarcoma	2	6.5
Pleomorphic rhabdomyosarcoma	2	6.5
Synovial sarcoma (monophasic + biphasic)	2	6.5
Oligodendroglioma	2	6.5
Liposarcoma	1	3.2
Fibrosarcoma	1	3.2
Osteosarcoma	1	3.2
Epithelioid angiosarcoma	1	3.2
Malignant paraganglioma (carotid body)	1	3.2
Total malignant	**31**	**100.0**

Role of immunohistochemistry

Immunohistochemistry was performed in five diagnostically ambiguous cases and contributed to a definitive diagnosis in each. The IHC profile of these cases is summarised in Table 7. Synovial sarcoma was diagnosed in two cases on the basis of pan-cytokeratin (AE1/AE3) and epithelial membrane antigen positivity in the epithelial component, together with vimentin, calponin, smooth muscle actin and CD56 expression in the mesenchymal component. Malignant peripheral nerve sheath tumour of the right forearm in a 71-year-old female showed focal S-100, smooth muscle actin, vimentin and CD68 positivity. An undifferentiated spindle cell sarcoma of the retroperitoneum demonstrated CD99 and CD34 positivity. A spindle cell vascular lesion of the right forearm initially favoured spindle cell haemangioma but was reclassified as lobular capillary haemangioma on the basis of CD34, smooth muscle actin and vimentin staining patterns. Immunohistochemistry therefore contributed to definitive sub-classification in 100% of cases in which it was performed.

Table 7. Immunohistochemistry profile of diagnostically ambiguous cases (n = 5).

Case	Final diagnosis	Site / Age / Sex	Positive IHC markers
1	Monophasic synovial sarcoma	Left retroperitoneum, F/70	CK (AE1/AE3), EMA
2	Biphasic synovial sarcoma	Right extrapleural soft tissue, F/55	CD56, vimentin, SMA, calponin
3	Malignant peripheral nerve sheath tumour	Right forearm, F/71	Vimentin, SMA, S-100, CD68
4	Undifferentiated spindle cell sarcoma	Retroperitoneum, F/50	CD99, CD34
5	Lobular capillary haemangioma	Right forearm, M/64	Vimentin, SMA, CD34

V. Discussion

The present study analysed 188 soft tissue tumours diagnosed over a 24-month period at a tertiary care centre in southern Karnataka. The clear predominance of benign lesions (82.4%) over malignant (16.5%) and intermediate (1.1%) tumours in our cohort is consistent with the established global epidemiology of STTs, in which benign lesions outnumber malignant counterparts even in hospital-based settings.[6,10]

A study conducted by Singh and colleagues (2017) at a North Indian tertiary centre reported 67.0% benign, 7.0% intermediate and 25.9% malignant STTs among 270 cases.[12] Compared with this cohort, our benign proportion was higher (82.4% versus 67.0%) while the malignant proportion was lower (16.5% versus 25.9%). The higher malignant fraction in Singh and colleagues' series likely reflects their explicit inclusion of locally aggressive and borderline mesenchymal tumours within the intermediate category, together with a broader surgical-oncology referral base.

A study conducted by Pagaro and colleagues (2019) from Pune analysed 100 STTs and documented 90% benign, 2% intermediate and 8% malignant lesions, with adipocytic tumours predominating at 55%.[13] A

study conducted by Pratti and Oruganti (2019) from coastal Andhra Pradesh evaluated 215 STTs and reported 83.2% benign, 8.3% intermediate and 8.3% malignant lesions.[14] A study conducted by Tapadar and colleagues (2021) from southern Assam evaluated 89 STTs and found 85.4% benign, 4.5% intermediate and 10.1% malignant lesions.[15]

The benign predominance in our cohort (82.4%) therefore aligns closely with these contemporary Indian series, supporting the validity of our regional case-mix and lending external validity to the descriptive findings.

With respect to histological category distribution, smooth muscle tumours predominated in our cohort (43.1%), driven almost entirely by uterine leiomyomas (n = 79), with adipocytic tumours forming the second largest group (23.4%). When viscera-confined leiomyomas are conceptually excluded, adipocytic tumours emerge as the leading "true" soft tissue category

— a pattern that mirrors all major Indian series. A study conducted by Singh and colleagues reported adipocytic tumours as the leading category at 34.1%.[12] A study conducted by Pratti and Oruganti also reported adipocytic tumours as the leading category at 50.2%.[14] Tapadar and colleagues likewise found adipocytic tumours at 43.8% as the leading category.[15] Our finding is therefore consistent with the broader literature once gynaecological smooth muscle lesions are contextualised within the institutional specimen mix.

The age distribution of our cohort revealed a mean of 43.4 ± 15.1 years with a peak in the 41–50 year age group (36.7%). The mean age was higher in malignant lesions compared with benign tumours, a pattern reported consistently across all major series.[12,15] Singh and colleagues demonstrated a statistically significant correlation between increasing age and tumour malignancy (P = 0.001), confirming that the frequency of malignant tumours rises with advancing age.[12] Ducimetière and colleagues, in their prospective European population-based study, similarly reported a median age of 65 years for sarcomas with a steeply rising incidence beyond the fifth decade.[6]

Our overall female-to-male ratio of 2.24:1 is notably higher than that reported in most STT series, which typically demonstrate a slight male predominance (M:F approximately 1.1–1.4:1).[5,10,12] This deviation is almost entirely accounted for by the high proportion of uterine leiomyomas in our cohort, contributing 79 cases (all female). When uterine leiomyomas are conceptually excluded, our cohort demonstrates a balanced sex distribution that compares well with published Indian and international series. This observation underscores the importance of considering institutional specimen-mix when interpreting sex-related epidemiological signals.

Lower-extremity involvement was observed in 8.5% of cases overall, but it was the leading site for malignant lesions, consistent with the well-established sarcoma predilection for the lower limb.

Kransdorf, in a large referral population, reported the lower extremity as the dominant site of sarcoma involvement, accounting for 46% of malignant STTs.[11] This finding has been reproduced across multiple Indian series, including those by Pratti and Oruganti (37.6% lower extremity for sarcomas)[14] and Tapadar and colleagues (lower-limb predominance).[15] The lower-extremity preference in our malignant subset therefore reaffirms a well-established anatomic pattern.

Among malignant tumours, chondrosarcoma, malignant peripheral nerve sheath tumour and undifferentiated sarcomas each formed the leading subtypes (4 cases each, 12.9%). The relatively diverse malignant spectrum reflects the broad referral base of our institution. Ewing's sarcoma occurred predominantly in young males, consistent with the well-recognised peak incidence of this tumour in the second decade of life.[11]

Immunohistochemistry was performed in five diagnostically ambiguous cases and contributed to definitive sub-classification in each, yielding a diagnostic concordance of 100%. This finding is consistent with the established literature on the role of IHC in soft tissue tumour diagnosis. Coindre, in his seminal review, emphasised that IHC is indispensable for sarcomas such as rhabdomyosarcoma, synovial sarcoma, epithelioid sarcoma, gastrointestinal stromal tumour and desmoplastic small round cell tumour, both for diagnostic accuracy and for therapeutic guidance.[7] A study conducted by Singh and colleagues reported that IHC contributed to a definitive diagnosis in 67.3% of malignant STTs in their cohort, a finding that reached statistical significance (P = 0.007).[12] Our findings therefore reinforce the indispensable role of IHC as an adjunct to histopathology in the modern diagnostic workup of soft tissue tumours.

Strengths and limitations

The strengths of this study include a moderately sized cohort (n = 188), classification according to the recent WHO scheme, and selective use of immunohistochemistry for ambiguous cases. The study provides region-specific data from southern Karnataka, a setting underrepresented in the current Indian sarcoma literature.

Several limitations should, however, be acknowledged. First, the retrospective single-centre design carries an inherent risk of referral and selection bias. Second, immunohistochemistry was performed only in selected ambiguous cases owing to financial and panel-availability constraints. Third, molecular and cytogenetic confirmation was not undertaken for translocation-defined sarcomas, which may have refined diagnoses in select cases.

Fourth, FNCLCC grading could not be applied uniformly across all malignant lesions because of small biopsy size in several cases. Fifth, the descriptive scope of the present study precluded analysis of follow-up data and patient outcomes.

VI. Conclusion

Histopathological examination of haematoxylin and eosin-stained sections remains the diagnostic cornerstone of soft tissue tumour evaluation, with immunohistochemistry serving as a vital adjunct in morphologically ambiguous lesions. In our cohort of 188 cases, benign lesions predominated (82.4%) with a benign-to-malignant ratio of approximately 5:1, while smooth muscle and adipocytic tumours formed the leading WHO histological categories. The clinical and pathological patterns observed largely reproduce those reported in contemporary Indian series, while also highlighting the contribution of a high gynaecological specimen load to the institutional case-mix. Regular updates of regional STT epidemiology, ideally accompanied by broader immunohistochemistry panels and selective molecular adjuncts, are warranted to ensure accurate and contemporary diagnosis in clinical practice and to inform training and resource allocation in tertiary care pathology services.

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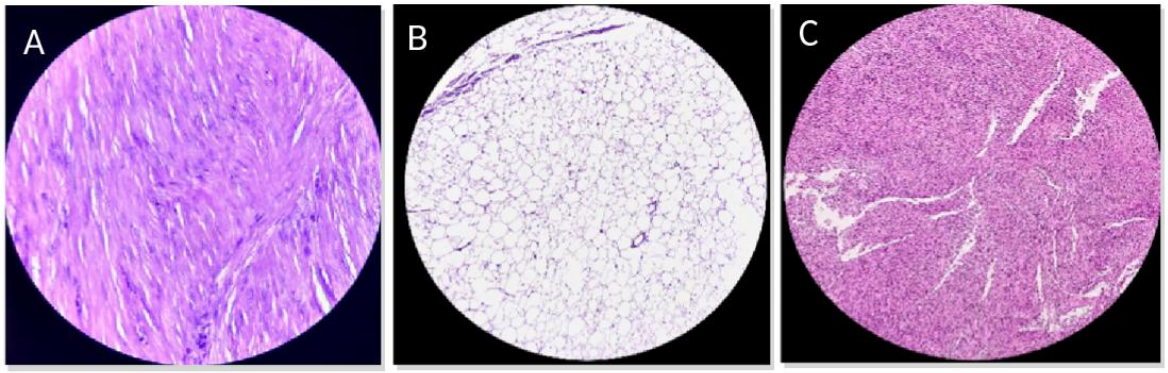
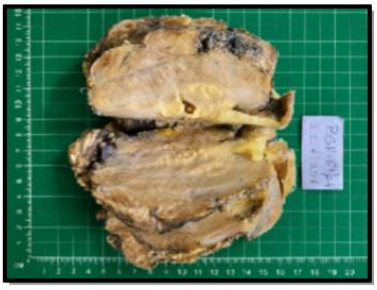
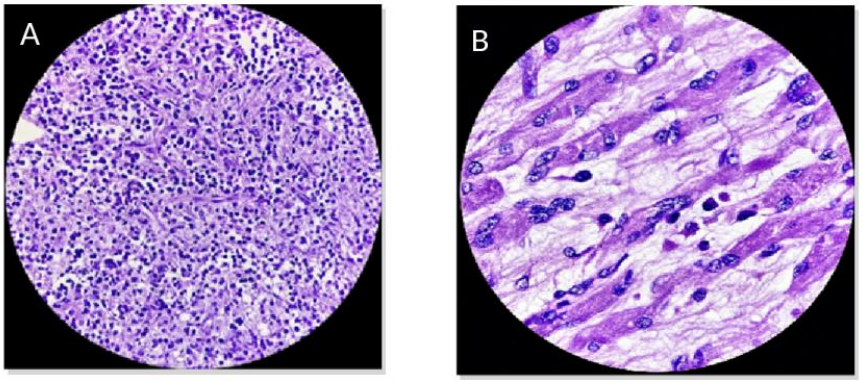
Benign Gross Pictures: A) Leiomyoma: Myometrium showing multiple leiomyomas, largest measuring 3.6x3.2x2.8 cm. Cut surface: Grey- white; whorled appearance.
B) Plexiform Neurofibroma: Deep lesions are well circumscribed and solid to cystic, with dilated vessels and with thrombus formation.
C) Cavernous Hemangioma: Unencapsulated, infiltrative lesion with multiple tortuous, rope-like enlarged nerve bundles ("bag of worms").



Benign microscopic pictures: A) Leiomyoma composed of interlacing fascicles of uniform spindle cells (H&E, x400)
B) Lipoma composed of lobules of mature adipocytes separated by delicate fibrous septa (H&E, x100)
C) Schwannoma showing Antoni A and Antoni B areas. (H&E, x100)

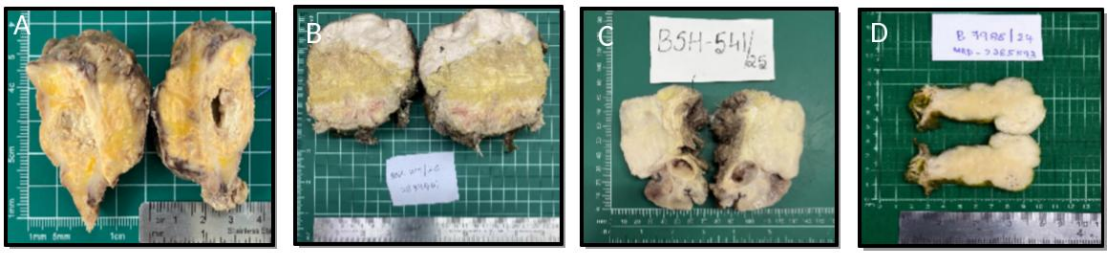


Intermediate lesions (Inflammatory Myofibroblastic tumour)- Soft tissue mass measuring 15.0x12.0x6.0 cm. Cut surface of tumour: Grey- white with grey- yellow, rubbery with areas necrosis.



Intermediate lesions (Inflammatory Myofibroblastic tumour)- A) Interlacing fascicles of spindle cells in loose myxoid stroma with interspersing inflammatory cell infiltrates composed of lymphocytes, plasma cells and eosinophils (H&E, x100)

B) Spindle cells have bland, elongated nucleus with eosinophilic cytoplasm. Areas of compact proliferation of spindle cells in fascicles seen (H&E, x400)



Gross Pictures (Malignant lesions): A) Liposarcoma- Large firm mass with coarse lobulation that is surrounded by the more grossly fatty appearing component
B) Sarcoma- Large, firm, infiltrative soft tissue mass. Grey-white to yellow-white, fleshy or fibrous cut surface.
C) MPNST- Poorly circumscribed, infiltrative soft tissue mass. Grey-white to grey-tan, fleshy cut surface. Firm with fascicular/whorled appearance.
D) GIST- Well-circumscribed, unencapsulated submucosal tumour arising from the gastric wall. The tumour is grey-white to tan-white, solid, homogeneous and fleshy with a characteristic whorled/fascicular appearance.