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Cytomorphology of Soft Tissue Tumors in a Tertiary Hospital in India– A Retrospectivestudy

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Abstract:
Background*: Soft tissue which is embryologically derived principally from mesoderm functions as a supporting tissue of various organs. Soft tissue tumors (STT) are a group of highly heterogeneous tumors whose diagnosis has posed quite the challenge to pathologists, especially cytopathologist. Despite the challenges, Fine Needle Aspiration Cytology (FNAC) has proven time and again to be the basic initial mode of diagnosis of Soft Tissue tumors. Our study aims to evaluate various Soft Tissue Tumors and their diagnostic pitfalls we have faced in our institute.*
Materials and Methods*: This is a retrospective study conducted for one year from March 2018 to March 2019. A total of 956 cases were referred to department of cytology of which 117 patients with suspected soft tissue tumors were included in the study and their various cytological features evaluated. Wherever possible, histopathological, clinical and radiological correlation was made.*
Results*: Soft TissueTumors were found to have a female predilection with 69 (59%) cases and 48 (41%) cases in males. Anatomically, upper extremity wasthe most common site for Soft Tissue Tumors accounting for 35 cases (29.9%). Out of 117 cases, 113 (96.58%) are benign whereas 4 (3.41%) are malignant Out of 113 benign lesions, most common was lipoma with 98 (86.72%) cases followed by benign spindle cell lesion with 8 (7.07%) cases. Among the four malignant lesions, both soft tissue sarcoma and malignant spindle cell lesions accounted for 50% each.*
Conclusion: *FNAC, being a simple, safe, cost-effective and least invasive procedure has the potential to diagnose and differentiate benign and malignant Soft Tissue Tumors.*
Key Word*: FNAC, Soft tissue tumors, Cytological evaluation, Histocytological correlation*

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I. Introduction

Soft tissue can be defined as non epithelial 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, peripheral nerves and fibrous tissue, along with the vessels serving these tissues. Embryologically soft tissue is derived principally from mesoderm, with some contribution from neuroectoderm[1].

FNAC is a simple, cost-effective, rapid and least invasive procedure that can be performed on an out-patient basis for diagnosing soft tissue tumors which are a highly heterogeneous group of tumors. It is used as a first-line investigation in the primary evaluation of tumors native to breast,thyroid,lymphnode and other superficial soft tissue tumors, but its use in the diagnosis of soft tissue tumors is still contentious[2].The relative absence of a discernible architectural pattern of tissue in cytological preparation renders the diagnosis by FNAC more difficult to make. However, the upside of FNAC is that it provides a predictive diagnosis of a benign or malignant neoplasm and in case of the former, surgery could be avoided in elderly or in patients with poor surgical risk[3].Present study is conducted to evaluate the role of fine-needle aspiration cytology in categorizing the various lesions of soft tissue with histopathological correlation whenever possible.

II. Materials And Methods

Our study was conducted for one year, from March 2018 to March 2019, during which a total of 956 cases were referred to the Cytopathology section of Department of Pathology, Government General Hospital (GGH), Nizamabad, Telangana, India. Of the 956 cases referred for FNAC, 117 were suspected soft tissue tumors, which are included in the present study. The GGH provides services for a rural area with more than 3 lakh

outpatients and about 75,000 in patients in a year. Written consent, detailed clinical history, clinical examination of these patients were taken and FNAC was carried out using 22-24 gauge needles and aspirated with 10cc disposable syringes whenever needed. Aspirated material was smeared on a minimum of three labelled glass slides. All the slides were fixed with 95% isopropyl alcohol and stained with routine haematoxylin and eosin stain as per protocol. The stained smears were submitted for microscopic examination and interpretation was made.

III. Results

Age of the patients ranged from 10 years to 80 years, the youngest patient being a 10-year-old girl child and the oldest being a 75-year-old woman.

Table no 1: Age and gender-wise distribution of cases

AGE	MALES	FEMALES	TOTAL NO OF CASES
0-10 YEARS	0 (0%)	01 (1.44%)	01 (0.85%)
11-20 YEARS	01 (2.08%)	04 (5.8%)	05 (4.27%)
21-30 YEARS	09 (18.75%)	14 (20.2%)	23 (19.65%)
31-40 YEARS	14 (29.1%)	23 (33.33%)	37 (31.6%)
41-50 YEARS	14 (29.1%)	09 (13.03%)	23 (19.65%)
51-60 YEARS	02 (4.16%)	10 (14.49%)	12 (10.25%)
61-70 YEARS	07 (14.58%)	06 (8.69%)	13 (11.11%)
71-80 YEARS	01 (2.08%)	02 (2.9%)	03 (2.56%)
TOTAL	48	69	117

Table 1 shows that soft tissue tumors are more common in females compared to males. Out of 117 cases, 69 (59%) were females and 48 (41%) were males. Most common age group over all was 30-40 years with 37 (32.45%) followed by 23 (19.65%) cases each in the age group of 21-30 and 41-50 years.

Table no 2: Anatomical distribution of benign and malignant soft tissue tumors

SITE	BENIGN	MALIGNANT	TOTAL NO OF CASES
UPPER EXTREMITY	34 (30.08%)	01 (25%)	35 (29.9%)
LOWER EXTREMITY	10 (8.84%)	01 (25%)	11 (9.4%)
ABDOMEN	05 (4.42%)	01 (25%)	06 (5.12%)
CHEST, BACK AND TRUNK	22 (19.46%)	01 (25%)	23 (19.65%)
HEAD AND NECK	21 (18.58%)	0	21 (17.95%)
GLUTEAL REGION AND LOIN	06 (5.3%)	0	06 (5.12%)
MULTIPLE AND ALL OVER	02 (1.77%)	0	02 (1.70%)
AXILLA	09 (7.96%)	0	09 (7.69%)
BREAST	04 (3.53%)	0	04 (3.41%)
TOTAL	113	04	117

Table 2 indicates that soft tissue tumors are distributed over various parts of the body like upper and lower extremities, chest, back, trunk, abdomen, head and neck, gluteal and loin region, axilla and breast. The upper extremity is the most common site for benign Soft Tissue Tumors accounting for 34 (30.08%) cases, followed by trunk and head and neck region each accounting to 22 (19.46%) and 21 (18.58%) respectively. The four malignant Soft Tissue Tumors were found to be equally distributed over the upper, lower extremities, abdomen and trunk.

Table no 3: Spectrum of benign and malignant soft tissue tumors

TYPE OF BENIGN LESION	NUMBER	TYPE OF MALIGNANT LESION	NUMBER
LIPOMA	98 (86.72%)	SOFT TISSUE SARCOMA	2 (50%)
BENIGN SPINDLE CELL LESION	08 (7.07%)	MALIGNANT SPINDLE CELL LESION	2 (50%)
NEUROFIBROMA	05 (4.42%)		
FIBROHISTIOCYTOMA	01 (0.88%)		
MYXOMA	01 (0.88%)		
TOTAL	113 (96.58%)		4 (3.41%)

Table 3 shows that out of a total 117 cases, 113 (96.58%) are benign whereas 4 (3.41%) are malignant. Lipoma is the most common benign soft tissue tumor accounting for 98 (86.72%) cases in the present study followed by benign spindle cell tumors with 8 (7.07%) cases. Among the four malignant lesions, two cases are of soft tissue sarcoma and two are malignant spindle cell tumors.

Results were compared and correlated with histopathology wherever available and it showed accurate diagnosis in case of a majority of benign soft tissue tumors like lipoma and neurofibromas. Out of four malignant cases, one malignant spindle cell lesion was followed up on histopathology, where the diagnosis of synovial sarcoma was made. Another case with a diagnosis of malignant spindle cell lesion was a previous case of liposarcoma confirmed on histopathology.

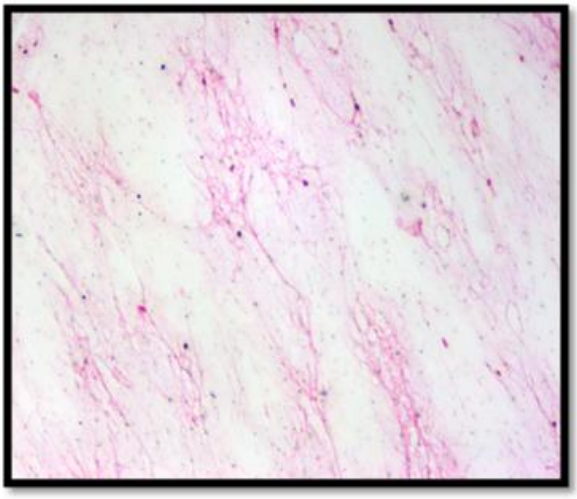

Fig1: Fibrolipoma showing mature adipocyte clusters- cytology smear

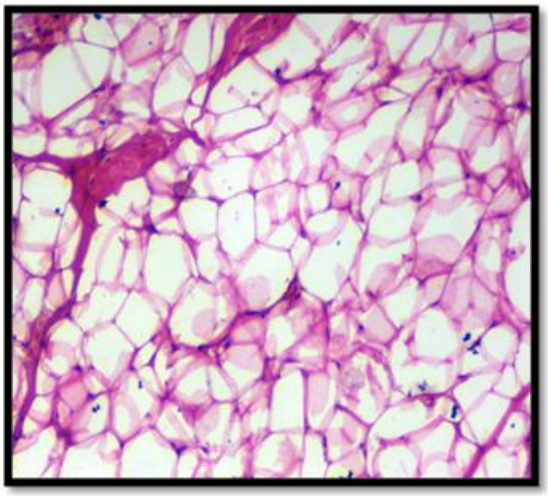

Fig2: Lipoma showing mature adipocytes separated by thin fibrous septae- on histopathology

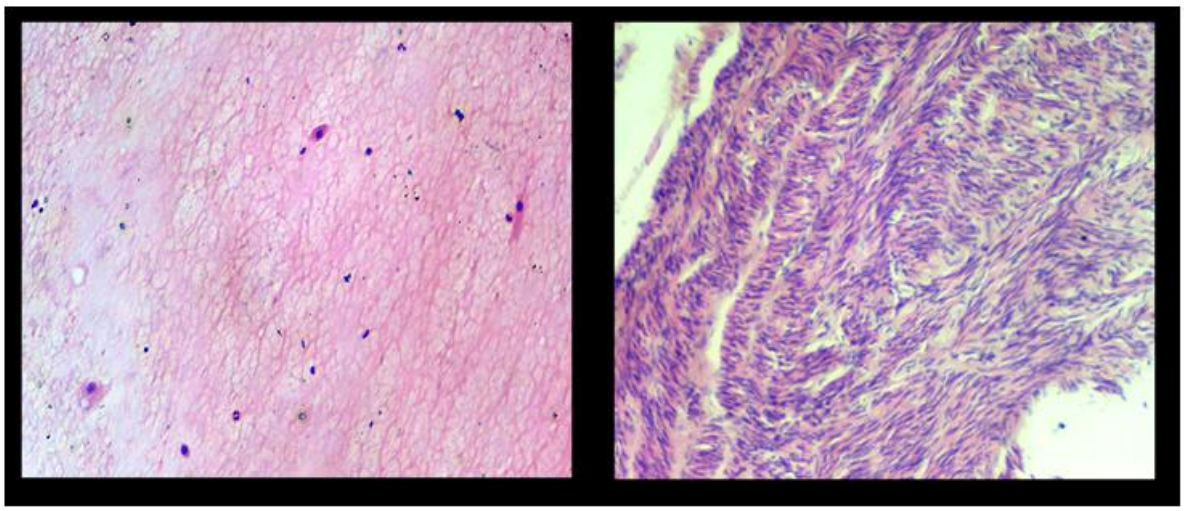

Fig 2: Neurofibroma on cytology showing bland spindle cells with scant cytoplasm and oval elongated nucleus

Fig 3: Neurofibroma on histology showing interlacing bundles of cells with wavy serpentine nuclei, interspersed with collagen

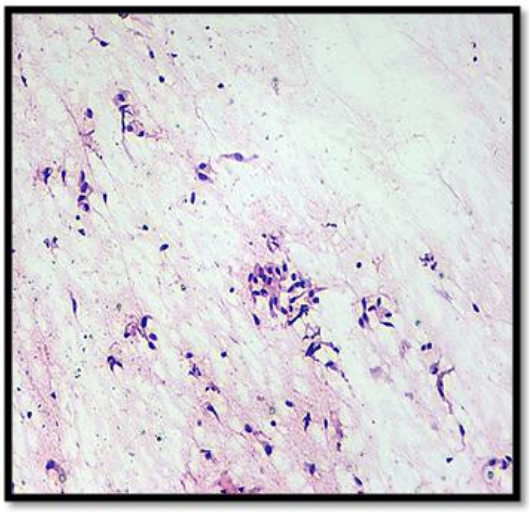

Fig 3: Benign spindle cell lesion showing benign spindle cells arranged in clusters of cells with abundant cytolplasm

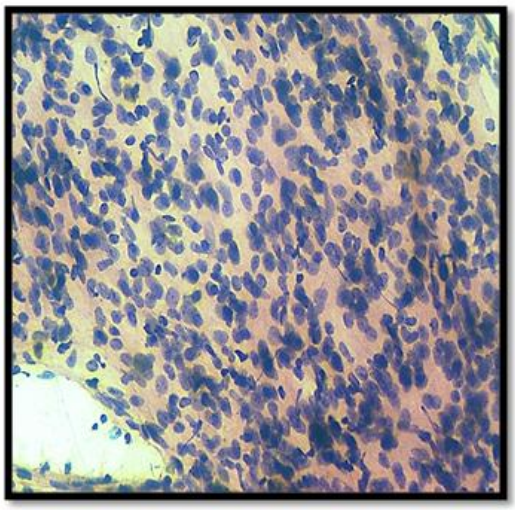

Fig 4: Malignant spindle cells lesion showing atypical spindle cells with pleomorphic nuclei and nucleoli

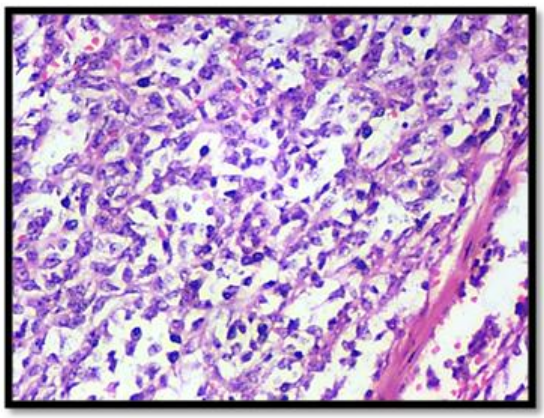

Fig 5: Synovial sarcoma on histopathology showing fascicular architectureand cells with scant cytoplasm and hyperchromatic nucleus

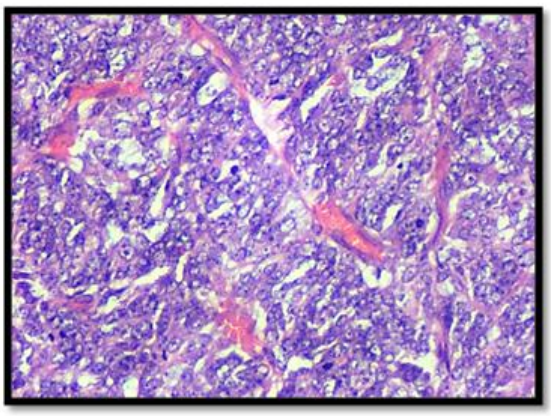

Fig 6: Synovial sarcoma- round cells with vesicularoverlapping nucleus, prominent nucleoli, frequent mitosis and stag-horn vessels

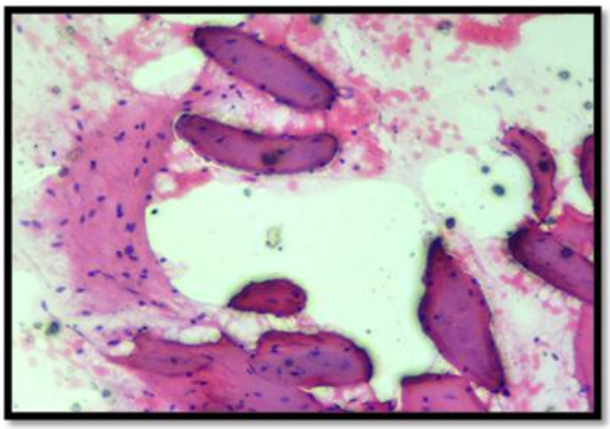

Fig 7: Malignant spindle cell lesion showing atypical spindle cells and muscle cells- previous case of liposarcoma

IV. Discussion

Diagnosis of soft tissue tumors, in surgical pathology particularly the cytopathology, is quite a daunting task. The diagnosis can be obtained in various ways including FNAC, core needle biopsy or excisional biopsy, each of which has its advantages and disadvantages. Evaluation of a clinically suspicious soft tissue mass has conventionally been from specimens obtained by open biopsy. It acquires a larger amount of tissue and this technique has the least sampling error but carries local complications like infection or hematoma[4]. Also an improperly done open biopsy in a sarcoma can increase the risk of tumor spread into the surrounding uninvolved areas of muscle or adipose tissue. Whereas, numerous passes to different areas of the lesion can be applied in FNAC, to sample large tumors contrasting to core needle biopsy or open biopsy[5]. In the current era with rising trend of people preferring least-invasive procedures, FNAC offers a solution as it is a safe, rapid, cost-effective procedure whose brilliance lies in its simplicity. It is considered as a first-line investigation in the primary evaluation of tumors from breast, thyroid, lymph nodes but in cases of Soft Tissue Tumors role of FNAC in primary diagnosis is still controversial with their challenging light microscopic features and their heterogeneous composition, which could be a source of diagnostic uncertainty[2].

Kilpatrick et al.[6] elaborated the extent to which cytology can be effectively utilized in the diagnosis of STT thus impacting the initial therapy in adults and pediatric sarcoma. Rekhi et al.[7] opined that FNAC is fairly sensitive and specific in Soft Tissue Tumor diagnoses for primary, recurrent, and metastatic lesions and cytological types.

Parajuli et al.[8] also concluded that FNAC is highly sensitive to detect benign soft tissue tumors and highly specific for malignant soft tissue tumors. Kulkarni et al.[11] concluded that FNAC of STT provided acceptable diagnostic accuracy when supported by appropriate clinical and other diagnostic data.

Table no 4: Table showing gender predilection in comparison with other studies

Authors	Jain V et al.[15]		Chaitanya et al.[14]		Present study	
	Benign	Malignant	Benign	Malignant	Benign	Malignant
Female (in percentage)	51.8%	22.7%	25.4%	20%	58.4%	50%
Male (in percentage)	48.2%	77.3%	74.6%	80%	40.7%	50%
Ratio (Female: Male)	1.07:1	1:3.4	1:1.34	1:1.25	1.43:1	1:1

In our study, female patients out-numbered males with, 69 (59%) and 48 (41%) of males, with a ratio of 1.43:1, in both benign in malignant tumors. Benign cases were 66 (58.4%) and 46 (40.7%) in females and males respectively, while malignant STTs were 2 (50%) cases each in both females and males.

Similar to our study, Jain V et al.[15] observed a slight female predilection in a ratio of 1.07:1 in benign but a male preponderance of malignant tumors with a female to male ratio of 1:3.4. In contrast to our study, Chaitanya et al.[14] showed a male preponderance of both benign, with female to male ratio of 1:1.34 and malignant cases with a ratio of 1:1.25, which was similar to studies by Tailor HJ et al.[2], Roy et.al[3] and Kulkarni et al[11].

Table no 5: Table showingthe distribution of benign and malignant STTs in comparison with other studies

Authors	Soni et al.[9]	Beg et al.[10]	Present study
Benign (in percentage)	95.3%	82.5%	96.58%
Malignant (in percentage)	3.34%	17.5%	3.41%

In our study, benign STT formed 96.58% and malignant STT, 3.41% which were comparable to Soni et al., study (95.3% and 3.34% respectively).[9] Whereas Beg et al[10]. observed benign (82.5%) and malignant cases (17.5%)[10]. The proportion of the benign and malignant cases in FNAC may vary from one institution to the other based on the evaluation protocol they follow some of them may prefer FNAC in all cases while others may prefer only excision/core needle biopsy in suspicious cases.

Table no 6: Table showing age distribution in comparison with other studies

Authors	Soni et al.[9]	Roy et al.[3]	Present study
The age range for benign tumors (in decades)	2^{nd}- 5^{th}	Above 3^{rd}	3^{rd}-4^{th}
The age range for malignant tumors (in decades)	4^{th}-5^{th}	All ages	5^{th}-6^{th}

We observed in our present study that benign and malignant tumors were more common between second to fifth decades and fourth to sixth decades respectively similar to Soni et al.,[9] study. While Roy et al.,[3] noted that benign STTs were common in the third decade and above, and malignant STTs in all ages.

Table no 7: Table showing the anatomical distribution of benign and malignant STTs

Authors	Soni et al.[9]	Roy et al.[3]	Present study
Benign STT	Upper extremity	Equally distributed across all parts of body	Upper extremity and trunk
Malignant STT	Trunk	Trunk	Distributed equally across both extremities, trunk and abdomen

Similar to Soni et al.,[9] we found the highest number of benign STTs in upper extremities and trunk but malignant STT were equally common in upper and lower extremities, abdomen and trunk. Whereas the least common sites included breast and gluteal region, in contrast to the head and neck region as observed by Chaitanya et al.[15]. In contrast to our study, Roy et al.[3] observed that benign tumors are roughly equally distributed across all parts of the body with a slight predilection for the upper extremities and the commonest site of involvement of the malignant tumors was the trunk.

Table no 8: Table showing the most common benign and malignant STTs

Authors	Nagira et al.[12]	Beg et al.[10]	Present study
Benign STT	Benign spindle cell lesion	Lipoma	Lipoma
Malignant STT	Pleomorphic cell carcinoma	Spindle cell sarcoma	Spindle cell sarcoma

The findings of the current study were similar to that of Beg et al.[10] showing that lipoma was the most common benign STT, and spindle cell sarcoma was the most common malignant STT. In contrast to the present study, Nagira et al.,[12]reported that most common benign STT was spindle cell lesion (31.5%) followed by lipomatous tumor (14.6%) while the most common malignant STT was pleomorphic cell sarcoma (35%) followed by round cell sarcoma (19.3%). Some institutions may not prefer to do FNAC in a clinically obvious lipoma, thus their protocol regarding FNAC may be the reason for their difference in the distribution of several histological subtypes.[13]

Out of the four malignant cases in our study, two were diagnosed to be a sarcoma, one of which was recurrent and FNAC was helpful in diagnosis thus not calling for a further excision biopsy. One other case diagnosed as malignant spindle cell lesion was later diagnosed as round cell tumor, synovial sarcoma.

Among the other cases made to correlate with histopathology, two out of the eight lesions diagnosed as benign spindle cell lesion were confirmed as neurofibroma. Most of the cases of lipoma were confirmed as the same on histopathology. Histocytopathological correlation of followed up cases indicated fair accuracy of FNAC in STT diagnosis, especially in lipomatous and neural tumors. Most of the other cases could not be correlated with histopathology and that is one of the limitations of this study.

However, three of the benign cases which were confirmed as lipoma on FNAC were sent as fat necrosis, abscess, and suspicious of malignancy on clinical diagnosis. One case which was diagnosed as neurofibroma on ultrasonography was diagnosed as sarcoma on FNAC which correlated with histopathology further. Another case diagnosed as suspicious of malignancy and given as BIRADS- IV on mammography was diagnosed as lipoma on FNAC and histopathology further on.

V. Conclusion

FNA cytology was found to be a reliable diagnostic procedure for early diagnosis of STT with no complication and fair sensitivity, speci瑓city and accuracy. It is a useful technique for initial diagnosis of STT as well as for identi瑓cation of recurrent and metastatic cases FNA cytology was found to be a reliable diagnostic procedure for early diagnosis of STT with no complication and fair sensitivity, speci瑓city and accuracy. It is a useful technique for initial diagnosis of STT as well as for identi瑓cation of recurrent and metastatic cases FNA cytology was found to be a reliable diagnostic procedure for early diagnosis of STT with no complication and fair sensitivity, speci瑓city and accuracy. It is a useful technique for initial diagnosis of STT as well as for identi瑓cation of recurrent and metastatic cases

In the present study, benign soft tissue tumors are more common among the younger age group and malignant tumors in the older age group. The most common tumor was lipoma in the benign lesions whereas malignant tumors included malignant spindle cell lesion and soft tissue sarcoma.

FNAC has shown to be an accurate, safe, simple, cost-effective and least-invasive method for initial diagnosis of primary benign and malignant soft tissue tumors. The cytopathological diagnosis offered after correlating with clinical, radiological and other data has been found to reach fair sensitivity, specificity and accuracy. However, FNAC alone can even be helpful to rule out some of the clinical and radiological misdiagnoses, until further correlation with histopathology.

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