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**Original Research Article**

# Diagnostic efficacy of fine needle aspiration cytology in soft tissue tumors and cytohistological correlation

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## ABSTRACT

**Background:** Soft tissues are the supportive tissue of various organ as well as the nonepithelial, extraskeletal structure. Fine needle aspiration cytology (FNAC) is a rapid diagnostic technique with limited patient morbidity for diagnosing soft tissue tumours. However, FNAC of soft tissue lesion has not been widely used because of concern about its diagnostic accuracy. The difficulties arise in exact typing and diagnosis of low-grade sarcomas. This study was undertaken to study the acceptability and diagnostic efficacy of cytodiagnosis as compared conventional histological diagnosis and determine distribution of soft tissue tumours according to age and sex.
**Methods:** The study was conducted in the department of pathology, RNT Medical College, Udaipur for period of 1 year. FNAC was done in 77 cases of suspected soft tissue tumors. In 51 cases biopsy resorted and HPE carried out. On the correlation of FNAC diagnosis with histopathological diagnosis the sensitivity, specificity, accuracy and positive predictive were calculated.
**Results:** Maximum number of cases noted were in 40 to 60 years of age with wide range of 11 months to 81 years. Male to female ratio was 1.8:1. Out of total 51 cases 38 found benign and rest were found malignant. Lipomas were the commonest soft tissue tumors. Overall sensitivity obtained in the study using cytology as compared to histopathology was 100%, specificity was 67%, positive predictive value was 54%, negative predictive value was 100%.
**Conclusions:** Cytology though with pitfall, can serve as a diagnostic tool especially when a rapid diagnosis is required.

**Keywords:** Cytology, FNAC, HPE, Soft tissue tumors

## INTRODUCTION

Soft tissues are the supportive tissue of various organs as well as the nonepithelial, extra skeletal structure. They include adipose tissue, fibrous connective tissue, skeletal muscle, blood vessels and peripheral nervous system. They are almost entirely derived from mesoderm except for the peripheral nerves. Somatic soft tissue made up 50% of adult body weight and 25% of weight in children.[1]

Soft tissue tumours (STT) are a highly heterogeneous group of tumours and are classified on a histogenetic basis according to their resemblance to adult tissue. Though this large bulk theoretically runs the same risk of developing cancers, it is a curious biological paradox that this large body mass is blessed with very low incidence of cancer. Though the actual number of soft tissue tumour is less, their ability to occur at practically any anatomic site make this field difficult to master. The most common location of their occurrence are the extremities, trunk and abdominal cavity besides their rare site.[2]

Fine needle aspiration cytology (FNAC) is a rapid diagnostic technique with limited patient morbidity. It may be preferred for the rapid and of superficial soft tissue lesions. This combined with its relatively low cost makes it important alternative compare to traditional biopsy technique in the rapid work up of palpable soft tissue tumour.[3]

However, FNAC of soft tissue lesion has not been widely used because of concern about its diagnostic accuracy. The difficulties arise in exact typing and diagnosis of low-grade sarcomas.

With this background we used cytology and histopathology for diagnosis of soft tissue tumours. The aim and objectives of our study were to study the cytomorphological features of different soft tissue tumours. To determine the distribution of soft tissue tumours according to site, age and sex. To study the acceptability and diagnostic efficacy of cytodiagnosis in soft tissue lesions and to evaluate the reliability of cytodiagnosis as compare to conventional histopathological diagnosis.

## METHODS

The present study was a cross sectional study conducted in the department of pathology, RNT Medical College and associated group of hospitals, Udaipur, Rajasthan between period from 21 July 2021 to 20 July 2022. A detailed clinical history of all 51 patients were taken including examination findings, radiological investigations.

A total of 51 patients were included in the study.

### *Inclusion criteria*

All the cases of soft tissue lesions present at cytology section and their excised tissue received at histopathology section was included. All suspected soft tissue lesion on radiological findings were included. Only cases with adequate and relevant clinical, biochemical and imaging data were included.

### *Exclusion criteria*

Inadequate smears with 'no' or scanty cells were excluded. Hemorrhagic aspirate and smears with other obscuring factors were excluded from the study. All those patients who do not undergo biopsy were excluded.

### *Procedure and technique*

FNAC was done under aseptic precautions with 22/23G needle attached to 10 ml disposable plastic syringe and smears fix with 95% methanol were stained with MGG stain and Papanicolaou stain if required. A detail clinical history, blood investigations and radiological investigations as mention in proforma was taken. For deep seated lesions USG guided or CT guided FNAC was done. The smears were studied for cytological detail for diagnosis and were categorized as benign, suspicious of malignancy and malignant along with specific subtyping of lesion. The smears were also assessed for the principal pattern shown by tumor cells. In histopathology section the excised tissue specimen received after surgical excision of all the above cases were fixed by neutral buffered 10% formalin. Gross examination was done of received tissue specimen. All the tissue sections were processed by fixation, dehydration and clearing followed by impregnation in wax. The wax blocks will be cut in 3-4 micron sections and was stained with hematoxylin and eosin stain and examined under microscope.

All diagnostic FNAC results from patients who underwent a subsequent surgical excision was compared for diagnostic concordance using histology result as the gold standard.

### *Statistical analysis*

All collected data were entered and analysed in Microsoft excel 2016, qualitative data were analysed for ability to recognize malignancy using statistical parameters of sensitivity, specificity, positive predictive value and negative predictive value.

## RESULTS

A total number of 77 cases of soft tissue tumors were studied during a period of one year, i.e. 21 July 2021 to 20 July 2022 from which 51 cases were available for histopathological examination. Hence study in reference to age, sex, site of distribution and cytohistological correlative study were on 51 cases.

### *Age and sex distribution*

Out of 51 cases, number of male patients was 33 and that of female patients were 18. Male to female ration in this study was 1.8 maximum number of cases was seen in the 4$^{th}$ and 5$^{th}$ decade- 21.57% and 19.61% respectively. Minimum number of cases was seen in 1st decade 5.88%. In this study, youngest patient was 11-month-old female child and oldest was 81 years old male (Table 1).

**Table 1: Age and sex distribution.**

| Age | Male | Female | Total | Percentage |
|---|---|---|---|---|
| **Up to 10** | 0 | 3 | 3 | 5.88 |
| **11-20** | 5 | 1 | 6 | 11.76 |
| **21-30** | 4 | 1 | 5 | 9.80 |
| **31-40** | 6 | 2 | 8 | 15.69 |
| **41-50** | 5 | 6 | 11 | 21.57 |
| **51-60** | 7 | 3 | 10 | 19.61 |
| **61 and above** | 6 | 2 | 8 | 15.69 |
| **Total** | 33 | 18 | 51 | 100 |

Maximum number of cases were seen in extremities (32) and minimum in head and neck region (2) rest are seen in trunk.

Out of 51 cases studied 38 were benign and 13 were malignant.

***Overall statistical result of cytology***

Overall statistical result were sensitivity 100%; specificity 67%; positive predictive value 54%; negative predictive value 100%.

**Table 2: Lesions taken for study.**

| Lesions | No. of cases |
|---|---|
| **Adipocytic tumors** | 17 |
| **Lipoma** | 12 |
| **Fibrolipoma** | 2 |
| **Liposarcoma (myxoid variant)** | 2 |
| **Atypical lipomatous tumor** | 1 |
| **Peripheral nerve sheath tumors** | 6 |
| **Neurofibroma** | 4 |
| **Schwannoma** | 2 |
| **Fibroblastic and myofibroblastic tumors** | 6 |
| **Fibroma** | 1 |
| **Solitary fibrous tumor** | 1 |
| **Nodular fasciitis** | 1 |
| **Dermatofibroma protuberance** | 1 |
| **Fibrosarcoma** | 1 |
| **Myxoid fibrosacroma** | 1 |
| **Fibrohistiocytic tumors** | 1 |
| **Tenosynovial giant cell tumor** | 1 |
| **Vascular tumors** | 6 |
| **Hemangioma** | 6 |
| **Tumour of skeletal muscle** | 4 |
| **Spindle cell rhabdomysarcoma** | 1 |
| **Intramuscular myxoma** | 1 |
| **Alveolar rhabdomyosaroma** | 1 |
| **Pleomorphic rhabdomyosaroma** | 1 |
| **Undifferentiated sarcoma** | 6 |
| **Pleomorphic sarcoma** | 4 |
| **Undifferentiated pleomorphic sarcoma** | 1 |
| **Spindle cell sarcoma** | 1 |
| **Others** | 5 |
| **Giant cell tumour of tendon sheath** | 5 |

**Table 3: Sensitivity and specificity of cytological diagnosis and HPE.**

| Cytology diagnosis | Number of cases | Histopathologically confirmed cases | | Sens | Spec | PPV | NPV | Accuracy |
|---|---|---|---|---|---|---|---|---|
| | | Consistent | Inconsistent | | | | | |
| **Lipoma** | 17 | 13 | 4 | 100% | 89.47% | 76.47% | 100% | 92.16 |
| **Sarcomatous lesion** | 5 | 0 | 5 | - | 90.20% | 0.00% | 100% | 90.19 |
| **Malignant lesion** | 5 | 0 | 5 | - | 90.20% | 0.00% | 100% | 90.19 |
| **Neurofibroma** | 2 | 1 | 1 | 100% | 98% | 50% | 100% | 98.03 |
| **Fibrohistiocytic lesion** | 2 | 0 | 2 | - | 96% | 0% | 100% | 96.07 |
| **Fibrohistiocytoma** | 1 | 0 | 1 | - | 98% | 0% | 100% | 98.04 |
| **Fibroma** | 1 | 0 | 1 | - | 98% | 0% | 100% | 98.04 |
| **Schwannoma** | 1 | 1 | 0 | 100% | 100% | 100% | 100% | 100 |
| **Fibroxanthoma** | 1 | 0 | 1 | - | 98% | 0% | 100% | 98.04 |
| **Chronic** | 1 | 0 | 1 | - | 98% | 0% | 100% | 98.04 |

Continued.

| Cytology diagnosis | Number of cases | Histopathologically confirmed cases | | Sens | Spec | PPV | NPV | Accuracy |
|---|---|---|---|---|---|---|---|---|
| **inflammatory lesion** | | | | | | | | |
| **Myxoid fibrosarcoma** | 1 | 1 | 0 | 100% | 100% | 100% | 100% | 100 |
| **metastatic sarcoma** | 1 | 0 | 1 | - | 98% | 0% | 100% | 98.04 |
| **giant cell tumour** | 1 | 1 | 0 | 100% | 100% | 100% | 100% | 100 |
| **Haemangioma** | 5 | 5 | 0 | 100% | 100% | 100% | 100% | 100 |
| **giant cell tumour of tendon sheath** | 4 | 3 | 1 | 100% | 98% | 75% | 100% | 98.03 |
| **Rhabdomyosarcoma** | 1 | 0 | 1 | - | 98% | 0% | 100% | 98.04 |
| **spindle cell sarcoma** | 1 | 1 | 0 | 100% | 100% | 100% | 100% | 100 |
| **Ganglion** | 1 | 0 | 1 | - | 98% | 0% | 100% | 98.04 |

## DISCUSSION

There is some unwillingness among clinician and cytopathologist to use FNAC for the diagnosis of soft tissue tumours. FNAC has many advantages over conventional open incisional biopsy, including little or no risk of tumour cell contamination of the biopsy track, significantly less risk of morbidity and mortality and ease of learning and performance by most physicians.[4] An added advantage is the ability, especially in paediatric sarcoma to determine an immediate interpretation, allowing for obtainment of ancillary studies and planning of surgical intervention and/or neoadjuvant therapy at the initial presenting clinic visit.[5]

The present study, over a period of one year (July 2021 to June 2022). The study has been undertaken to evaluate the sensitivity, specificity, positive predictive value and negative predictive value of cytodiagnosis in comparison with histopathology. In this study 51 cases of soft tissue tumours included. In this sensitivity, specificity, positive predictive value, negative predictive value was 100%, 67%, 54% and 100% respectively. Akerman et al, conducted a study on 517 patients over a period of 20 years and showed accuracy of 94% in diagnosing benign and malignant soft tissue tumors.[6] These results were comparable with the findings of Chalita et al.[7] She studied 213 cases and claimed that cytological diagnosis showed sensitivity of 89%, specificity of 100%, positive and negative predictive value of 100%and 96% respectively and efficacy of 97%.[7] In this study, the majority of soft tissue tumours were found to be benign (74.51) and of these lipomatous tumours were the commonest variety (33.33). A study done by Bezabih et al in 2001 found benign tumours constitute (82.8%) and lipoma were constitute 70% of total.[8] In this study majority cases were found in 4$^{th}$ to 5$^{th}$ decade. A wide range of age noticed from 11 months to 81 years. Beg et al found that most common age group for benign were observed in 4$^{th}$ and 5$^{th}$ decade and for malignant tumours 1$^{st}$ and 2$^{nd}$ decade.[9] In our study majority cases are found in extremities followed by trunk. Arul et al, found that highest number of benign soft tissue tumours in trunk and upper extremities and malignant soft tissue tumours in lower extremities.[10]

The present study therefore concludes that cytology though with pitfall, can serve as a diagnostic tool especially when a rapid diagnosis is required. The technique of cytology, categorization of soft tissue tumours into benign and malignant is quite accurate but exact subtyping is rather difficult. However this rapid differentiation is extremely helpful in further management of soft tissue tumors.

## CONCLUSION

Cytohistological correlation with FNAC has been found to be appreciably good in the cases of soft tissue tumors. Cytology is a simple, rapid and reliable method and can be an alternative to frozen sections, especially in a country like India where facilities for the frozen section are available only at few centres. Increased familiarity with the technique, proficient sampling and smear preparation will further enhance the role of cytology as a reliable and efficient method of pathologic interpretation.

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