# Fine needle aspiration cytology of soft tissue tumours, its accuracy and pitfalls--our institutional experience

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**ABSTRACT**

**Background:** Soft tissue tumours are extremely rare neoplasms. Fine needle aspiration cytology (FNAC) is being increasingly used for diagnosing soft tissue tumours inspite of its poor sensitivity, specificity and inadequacy. **Aims:** The aim of this study is to study the usefulness of fnac in diagnosing and sub grouping of soft tissue lesions. **Methods and Material:** FNAC smears of 92 cases of soft tissue lesions with adequate cellularity (at least 5 clusters of 10 unobscured cells) were reported under the following cytomorphological headings- spindle cell, round cell, pleomorphic, myxoid and lipomatous type, along with benignicity or malignant nature of the lesion. Immunocytochemistry (ICC) was performed wherever feasible. **Results:** Out of the 92 cases, 61(66.3%) were benign, 21 (22.8%) malignant and 10 (10.9%) inconclusive on fnac. Benign lesions occurred in 2$^{nd}$ to 4$^{th}$ decade of life with a predilection for extremities (54%), whereas malignant tumours occurred in all age groups and at all sites. Males had a higher incidence than females. 87 %( 53 cases) of benign soft tissue lesions and 62 %( 13 cases) of malignant soft tissue lesions could be diagnosed by fnac alone, while ICC helped in 6 cases(out of 15). Lipomatous tumours (46%) were most easy to diagnose, whereas round cells, spindle cells and myxoid lesions were most difficult. False positive diagnosis was made in only 1% of adequate smears. **Conclusion**- In spite of its limitations, FNAC can be an useful cost-effective tool for preoperative diagnosis of soft tissue lesions, with low morbidity, high compliance and acceptable accuracy. Ancillary techniques like ICC can help in improving the accuracy of fnac diagnosis.

**Keywords:** Cytology, Fine Needle Aspiration Cytology, soft tissue

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## INTRODUCTION

Soft tissue tumours (STTs) are extremely rare neoplasms. Sarcomas are relatively rare, constituting about 1% of all malignant tumours.[1] Benign lesions are usually estimated to be approximately 100 times more frequent than sarcomas.[1] FNA of soft tissue and bone is not widely accepted for obtaining a definitive diagnosis.[2] Several factors have been implicated such as the low cellularity, the overlapping cytomorphological features in a variety of entities, and the wide variability in reported sensitivities, specificities, and inadequacy rates over the past 2 to 3 decades.[2]-[14] This has lead to scepticism regarding the accuracy and utility of this technique. Currently, the diagnostic workup of a soft tissue tumour before surgery include site, type(benign/malignant) and location in relation to the surrounding tissues, especially major nerves and vessels. So, the main important point for planning a surgery is the preoperative diagnosis of a benign/malignant nature of the lesion rather than a definitive diagnosis.[3] Also, FNAC offers several other advantages [15] –

1. If the diagnosis is of a benign neoplasm, surgery can be avoided in the elderly or other patients who are of poor surgical risk.
2. In case of a high grade malignancy or of recurrent cancers and metastasis, a cytological diagnosis allows the administration of a palliative treatment.
3. FNAC is an outpatient department procedure, necessitating neither patient preparation nor general anesthesia. It is safe, almost painless and cost effective

The aim of the present study was to evaluate FNAC smears from soft tissue tumours, sub classify them into various cytomorphological categories and to identify cyto-histological concordance in terms of malignancy.

## MATERIAL AND METHODS

The study was undertaken at the cytology section in the department of pathology in New Civil Hospital, Surat. 92 aspirates (unaided and guided) from STTs were evaluated over a period of 6months. Complete clinical history, examination findings and radiological data of all patients was noted. Only cases diagnosed as soft tissue lesions on cytology or performed from clinically looking soft tissue lesion were included in

study. Cases of pseudosarcomas were excluded from study. After informed patient consent and proper antiseptic cleaning with rectified spirit, aspiration was done by a fine 22 to 24 G needle fitted with a 10 cc plastic syringe. Conventional Papanicolaou (Pap), Haematoxylin and Eosin (in wet fixed smears) and May Grunewald Giemsa (MGG) (in air dried smears) were performed in all cases. In large tumours, multiple aspirations were performed from different sites. Repeat aspirations were performed in case the first aspiration failed to give a diagnosis or where adequate cellularity was not obtained. Adequacy was defined as at least 5 clusters of 10 unobscured cells in all slides.

On examination, all cases were labelled under the following 6 cytomorphological categories--- spindle cell, round cell, pleomorphic, myxoid and lipomatous type . In cases of mixed components, the specific subtype was assigned based on the predominant morphological pattern. Immunocytochemistry (ICC) was performed on smears and cell blocks wherever possible for an exact sub typing. A definitive diagnosis based on clinical history, cytological and ICC findings was given wherever feasible; otherwise a broad diagnosis of benign/malignant nature of the lesion was given with possible cytomorphological subtype and differential diagnosis. Cases which yielded only blood/necrosis/poor yield in repeat aspirations were labelled as "inconclusive diagnosis". All cases were advised for histopathological examination.

**Immunocytochemistry-**

Unfixed smears were used and so antigen retrieval was not attempted. Blocking serum was applied, followed by incubation with primary antibody~1 hour and TBS washing. Further, secondary antibody was applied for 30 min, followed by washing with TBS and application of avidin-biotin complex (ABC). Afterwards, TBS washing was carried out with subsequent staining with Diamino Benzidine (DAB) reagent. Harris' haematoxylin was used as a counter stain. Finally, the smears were mounted with DPX. The cases were accompanied with appropriate controls. A limited panel of markers was carried out on the smears, including vimentin, desmin, S-100, cytokeratin (CK), myogenin, neuron specific enolase (NSE),

synaptophysin, chromogranin and myeloperoxidase (MPO).

**OBSERVATION AND RESULTS**

92 cases were diagnosed and classified by cytological examination, of which 61 cases (66.3%) were benign and 21 cases (22.8%) were malignant. 10 cases (10.9%) were inconclusive on fnac.

Out of 82 diagnosed cases, the average age of involvement was 36 years (range 4-70years).The age distribution of soft tissue tumours as diagnosed by fnac showed that benign tumours were relatively common in the 2nd to 4th decade of life (except the 4 cases of giant cell tumours of bone/tendon sheath occurring in the 2nd decade), whereas malignant tumours (sarcomas and lymphomas) occurred in all age groups (table 1). Male were more commonly involved than female in both benign (1.5:1) and malignant lesions (2.5:1). The extremities (hands and legs) were the most commonly involved by benign soft tissue tumours (54%), although specific cytomorphological findings were specific for specific locations (eg. giant cell tumour of tendon sheath in the distal phalanges). Malignant soft tissue tumours had no site specifications, although lymphomas occurred at multiple sites.

Table 1: Age wise distribution of benign and malignant lesions.

| Cytomorphology | No. | | 0-10yrs | | 10-20yrs | | 20-40yrs | | >40yrs | |
|---|---|---|---|---|---|---|---|---|---|---|
| Type of lesion | b | m | b | m | b | m | b | m | b | m |
| Lipomatous | 43 | 0 | 1 | 0 | 2 | 0 | 23 | 0 | 17 | 0 |
| Spindle | 9 | 2 | 0 | 0 | 0 | 0 | 8 | 1 | 1 | 1 |
| Round | 2 | 17 | 0 | 1 | 0 | 0 | 2 | 6 | 0 | 10 |
| Pleomorphic | 4 | 1 | 0 | 0 | 3 | 1 | 1 | 0 | 0 | 0 |
| Myxoid | 3 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| Total | 61 | 21 | | | | | | | | |

*b=benign, m=malignant

ICC was performed on 15 cases, out of which in 6 cases of malignant round cell tumour, ICC helped in diagnosis. 2 cases of Ewing's sarcoma, 1 case each of malignant round cell tumour with neuroendocrine differentiation, plasma cell neoplasm, carcinoma, metastasis from round cell tumour was diagnosed with the help of ICC. The rest of the 9 cases gave inconclusive results due to technical reasons/inadequate cellularity.

Out of the 82 case diagnosed by fnac, only 9 cases could be correlated with histological examination.

**DISCUSSION**

FNAC was performed in 92 cases, out of which 82 cases were diagnosed and classified by cytological examination, of which 61 cases (66.3%) were benign and 21 cases (22.8%) were malignant. 10 cases (10.9%) were inconclusive on fnac. Out of 10 inconclusive FNAC cases, 2 were radiologically suspected to be haemangioma, and 2 were too small for fnac to be adequately performed, but were done on the insistence of the clinician. The probable reason behind inconclusive result may be excessive fibrosis or necrotic/cystic change in the tumour or maybe due to vascular nature of the tumour and thus yielded blood only. Also fnac on too tiny soft tissue swelling (small neurofibroma, lipoma) usually yielded scanty cellularity and thus should better be diagnosed clinically. Also, simple radiological tests like usg can diagnose haemangioma more correctly than by fnac and will help in localizing the lesion for performing fnac from the correct site. Also, radiological investigations can be helpful in finding viable tissue in extensively necrotic or cystic tumours. Like other studies (Ackerman et al [16]-series of 517 cases, 6% inconclusive;. Roy S. et al[15]-105 case series,6.7% inconclusive),in the present study inconclusive cases were around 6%.The increase in inconclusive cases in our study may be due to performance of fnac in too small swellings which were not done in other studies. Another point we have realized while reporting soft tissue tumours on fnac that there are no clear cut guidelines for cellularity. While a single malignant looking cell may be sufficient to stamp a lesion as suspicious for malignancy, it is more difficult in case of reactive/post chemotherapy lesions, as few atypical cells may be inadequate for reporting depending on the confidence of the cytopathologist. We propose a minimum adequacy criterion of 5 cell clusters of 10 unobscured cells for reporting a soft tissue lesion.

Out of 61 benign soft tissue tumours diagnosed on FNAC, 53 cases (87%) could be given a proper diagnosis from cytology alone.8 cases(13%) could not given a proper diagnosis, However in 2 cases(out of these 8),the cell of origin of the tumour could be predicted(one of muscular origin, and other fibrohistiocytic). Lipomatous

tumours (46%) are most easy to diagnose on cytology, followed by giant cell tumour of bone and tendon sheaths(4%) and schwannoma/neurilemmoma(4%),given their typical cytological appearance and clinical presentation. In case of round cells, other spindle cells and myxoid lesions, it is very difficult to come to a definitive diagnosis without the help of proper clinical history, radiological findings and ancillary studies like ICC. Only 2 benign cases were followed up and confirmed by HPE (1 schwannoma, other myxoid neurofibroma). The low rate of histological follow up in benign lesions is due to the fact that the cases being benign were not excised and instead followed up. This is indeed one of the advantages of fnac, preventing unnecessary surgery in benign soft tissue lesions.

. 21 cases were diagnosed as malignant soft tissue tumour on FNAC, of which 13 (62%) cases could be precisely diagnosed on FNAC. Rest of the 8 cases (38%) could not be given a specific diagnosis, however the cytomorphology, the malignant nature of the lesion, and sarcoma/carcinoma was reported to help the clinician correlate clinically and plan therapy accordingly.ICC helped in diagnosing 6 cases. So, we propose that ICC and special stains(eg.PAS) should be carried out whenever practicable as a correct diagnosis on FNAC can help in therapy( eg.chemoradiotherapy in case of Ewing's sarcoma instead of surgery).1 case(1% of adequate smears) of false positive diagnosis was reported on fnac(fibromatosis wrongly diagnosed as low grade myxoid fibrosarcoma/extraskeletal chondrosarcoma on FNAC).This may be due to large size of the tumour and inadequate sampling leading to erroneous interpretation.3 cases of minor discordance was found (dermatofibrosarcoma protruberans, lymphoplasmacytic lymphoma, myxoid neurofibroma—all being given a broader cytological diagnosis like malignant soft tissue tumour, poorly differentiated tumour on cytology).This may be due to inadequate cellularity on fnac, heterogenesity of soft tissue lesions, absence of particular pattern in cytological smears, inadequate history, inability to perform ICC in all cases. Ewing's sarcoma, malignant melanoma and Schwannoma were most correctly diagnosed. In the study performed by Akerman et al[3], an erroneous cytological

diagnosis was found in 5% of adequate smears. In our study, it was only 1% of adequate smears, which may be due to better sampling, following an adequacy criteria for cellularity, use of ICC, and low histolopathological follow up.

## CONCLUSION

The present study points to the fact that fnac can be a useful tool for preoperative diagnosis of benignicity or malignancy in soft tissue lesions, although specific diagnosis may not be possible in all cases. But several pitfalls and limitations of fnac must be kept in mind---the experience of the aspirator, the paucity of adequate clinical history and radiological data, experience of the cytopathologist and the marked atypia that may occur in reactive processes. Also, multiple passes should be done from different sites in large tumours as soft tissues often have a variegated composition, and in case of cystic/necrotic masses radiological help should be sought. Also, proper clinical history (esp. in cases of lymphomas and multiple myelomas) and radiological investigations ( in bone tumours, haemangioma, skeletal myxomas etc) is a prerequisite for interpreting the fnac. Cases those are inconclusive on fnac and clinically suspicious for malignancy should be followed up by biopsy. We also propose an adequacy criterion (at least 5 cell clusters with 10 unobscured cells in all slides) for cellularity in soft tissue lesions, as that may help the cytopathologist to decide when to perform a repeat fnac, and not to be overzealous while reporting a smear with inadequate cellularity.

Fnac is a useful and convenient technique for diagnosis of primary, metastasis and post chemotherapy lesions. Current management practices of soft tissue tumours requires an accurate diagnosis and grade of the lesion in many cases.( eg, follow up in benign lesions, chemo and radiotherapy in case of lymphomas and Ewing's sarcoma, and surgery in other sarcomas).ICC may help in this matter to give a correct diagnosis. Also, histological grading of sarcomas (poor/well differentiated) can be done on fnac provided adequate cellularity is present and fnac is done from multiple sites.

Keeping the above points in mind, fnac of soft tissue tumours is a useful, cost effective, preoperative procedure with low morbidity, high compliance and acceptable accuracy.

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