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Original Research Article

Role of Fine Needle Aspiration Cytology in Diagnosing Soft Tissue Tumors : A Study of 653 Cases

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Abstract

Introduction: Fine needle aspiration cytology (FNAC) is a useful diagnostic modality in soft tissue lesions. However an exact cytological diagnosis is often difficult due to constraints of recognizable tissue architectural pattern. *Aims/Objectives*: 1) To study distribution pattern of various soft tissue lesions at our institute. 2) To assess the utility of FNAC in those cases where biopsy was available. *Material and Methods*: This is 8 years study of FNAC's performed in the Department of Pathology, SDM Institute of Medical Sciences and Hospital, Dharwad. Correlating clinical, cytomorphological and imaging modalities, final diagnosis was arrived at. In cases of biopsy, histopathological correlation was carried out. *Results*: 653 cases FNAC were of soft tissue lesions in which 613 cases (93.88%) were benign and 40 cases (6.12%) were malignant. In benign category, maximum cases were lipoma (85.31%) followed by benign spindle cell lesion (5.38%). In malignant category, maximum cases were small round cell tumor (17.5%) followed by spindle cell sarcoma (15%). Histopathological correlation available in 112 cases with diagnostic accuracy of 99.10%. Our study results were comparable with other studies on FNAC of soft tissue lesions. *Conclusion*: Fine needle aspiration cytology is an effective and reliable diagnostic tool in categorizing soft tissue lesions pre-operatively for further clinical management. Diagnostic accuracy is increased with correlation of clinical and imaging findings.

Keywords: Soft tissue lesions; FNAC; Histopathology.

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Introduction

Soft tissue tumors are a heterogenous group of neoplasms that lack recognizable tissue architectural pattern in cytological preparation making the diagnosis by fine needle aspiration cytology (FNAC) more difficult. Also the soft tissue lesions possess overlapping histopathologic and cytomorphologic attributes, adding on to the

diagnostic challenges [1,2]. However, FNAC has emerged to be one of the important diagnostic tools for soft tissue lesions with the following advantages [3].

It is a simple, inexpensive, rapid outpatient procedure and distinguishes benign from malignant soft tissue tumors. In elderly patients, the risk of surgery in benign neoplasms can be avoided. In high grade malignant and recurrent neoplasms, decision of palliative treatment can be taken.

Soft tissue sarcomas are rare and account for less than 1% of total malignancies [5]. Their annual incidence is about 300 per 1,00,000 population [2]. In United States soft tissue sarcomas account for 2% of cancer deaths [4]. In establishing the diagnosis of sarcoma by FNAC, the reported diagnostic sensitivity and specificity is approximately 95% [1].

The aims and objectives of this study are, to assess utility of FNAC in diagnosing soft tissue lesions and to study distribution pattern of various soft tissue lesions at our institute.

Materials and Methods

The present study was conducted for a period of 8 years from January 2007 to December 2014 at SDM Institute of Medical Sciences and Hospital, Dharwad. In this period, totally 653 cases were studied.

All patients with soft tissue swelling referred to our department for fine needle aspiration cytology were included in the study. All cases of soft tissue swelling where the aspirate was acellular/ hemorrhagic were excluded from the study. 21-23 G needle along with 10 ml syringe was used to perform FNAC procedure under aseptic precautions. 95% alcohol fixed smears were stained with Hematoxylin & eosin (H&E) stain and by Papanicolaou stain. Air dried smears were stained with Leishman stain. Correlating clinical, cytomorphological and imaging modalities, final diagnosis was arrived at. In cases where biopsy was done, histopathological correlation was carried out. Specimens were fixed in 10% buffered formalin and subjected to gross examination. Biopsy specimens were routinely processed with Leica automated tissue processor. 3–6 µm paraffin sections were taken with rotary microtome, which were stained with haematoxylin and eosin stains.

Data was analysed in software SPSS version 20. Descriptive statistics were used to analyse the data.

Results

Total soft tissue FNACs were 653. Out of the 653 cases, 613 were benign lesions constituting 93.88% and 40 were malignant lesions constituting 6.12% of the total cases.

The most common age group affected was 31–40 years of age with 169 cases followed by 41–50 years of age with 155 cases. 348 patients (53.29%) were males and 305 patients (46.71%) were females with a male: female ratio of 1.14:1. Of the 613 benign cases, majority (162 cases) of them were seen in the age group of 31–40 years of age and had a slight female preponderance. Of the 40 malignant lesions, 7 cases (17.5%) were seen in the age group of 31 – 40 years of age followed by 6 cases (15%) in the age group of 11–20 years and 51–60 years.

Majority of the cases were observed in upper extremity constituting 217 cases (33.23%) followed by chest, trunk and back regions with 142 cases (21.74%) and head and neck region with 114 cases (17.45%). Majority of the benign cases affected the upper extremity constituting 210 cases (34.25%) followed by chest, trunk and back regions constituting 136 cases (22.18%). Of the total malignant cases, 12 cases (30%) affected the lower extremity, followed by upper extremity constituting 7 cases (17.5%).

Of the 613 benign lesions diagnosed on FNAC, 523 cases (85.31%) were lipoma, which constituted majority of the cases. It was followed by benign spindle cell lesion with no further categorization which constituted 33 cases (5.38%). Tumors of neural origin : Neurofibroma (15 cases) and schwannoma (3 cases) constituted 2.93% of the benign cases. Lesions of vascular origin were 17 cases (2.77%). Fibroblastic and fibrohistiocytic tumors comprising of fibromatoses (5 cases), benign fibrous histiocytoma (3 cases), nodular fasciitis (2 cases) and proliferative fasciitis (2 cases) altogether constituted 12 cases(1.95%) of the benign cases (Table 1).

Of the 40 malignant cases, small round cell tumor constituted 7 cases (17.5%) of the total malignant cases. This was followed by spindle cell sarcoma with 6 cases (15%) and myxoid sarcoma constituting 6 cases (15%). Synovial sarcoma and pleomorphic sarcoma were found in 4 cases (10%). 1 case of dermatofibrosarcoma protuberans was also diagnosed (Table 2).

Of the 653 cases diagnosed on cytology, 112 cases underwent subsequent biopsy. Of the 105

Table 1: Types of Benign Tumors Diagnosed Cytologically

Benign Lesions	Categorization
1. Adipose tissue origin (523, 85.31%)	• Lipoma (523, 100%)
2. Benign spindle cell lesion (with no further categorization) (33, 5.38%)	
3. Neural origin (18, 2.93%)	• Neurofibroma (15, 83.3%) • Schwannoma (3, 16.7%)
4. Vascular origin (17, 2.77%)	• Hemangioma (8, 47%) • Ganglion (9, 53%)
5. Fibroblastic and fibrohistiocytic tumors (12, 1.95%)	• Fibromatoses (5, 41.66%) • Benign fibrous histiocytoma (3, 25%) • Nodular fasciitis (2, 16.7%) • Proliferative fasciitis (2, 16.7%)
6. Giant cell tumor of tendon sheath (6, 0.98%)	• Giant cell tumor of tendon sheath (6,100%)
7. Lymphatic vessel origin (2, 0.32%)	• Lymphangioma (2,100%)
8. Granular cell tumor (2, 0.32%)	• Granular cell tumor (2,100%)
Total	613 Cases

Table 2: Types of Malignant Tumors Diagnosed Cytologically

Malignant Lesions	Categorization
1. Small round cell tumor (7,17.5%)	• Small round cell tumor (7, 100%)
2. Spindle cell sarcoma (with no further categorization) (6, 15%)	• Spindle cell sarcoma (with no further categorization) (6, 100%)
3. Myxoid sarcoma (6, 15%)	• Malignant fibrous histiocytoma (03, 50%) • Myxoid chondrosarcoma (02, 33.3%) • Myxoid sarcoma (01, 16.7%)
4. Synovial sarcoma (4, 10%)	• Synovial sarcoma (4, 100%)
5. Pleomorphic sarcoma (4, 10%)	• Pleomorphic sarcoma (4, 100%)
6. Malignant soft tissue tumor (with no further categorization) (3, 7.5%)	• Malignant soft tissue tumor (with no further categorization) (3, 100%)
7. Fibrosarcoma (3, 7.5%)	• Fibrosarcoma (3, 100%)
8. Rhabdomyosarcoma (3, 7.5%)	• Embryonal rhabdomysarcoma (2, 66.7%) • Alveolar rhabdomyosarcoma (1, 33.3%)
9. Leiomyosarcoma (1, 2.5%)	• Leiomyosarcoma (1, 100%)
10. Dermato fibrosarcoma protuberans (1, 2.5%)	• Dermato fibrosarcoma protuberans (1, 100%)
11. Clear cell sarcoma (1, 2.5%)	• Clear cell sarcoma (1, 100%)
12. Adipocytic tumors (1, 2.5%)	• Liposarcoma (01, 100%)
Total	40 Cases

Table 3: Comparative Analysis of FNAC and Histological Diagnosis: Benign Lesions

FNAC diagnosis	No. of histopathological cases	Histopathological diagnosis	Concordant cases	Discordant cases
Lipoma	95	Lipoma - 95	95	00
Hemangioma	02	Hemangioma – 02	02	00
Lymphangioma	01	Lymphangioma – 01	01	00
Neurofibroma	02	Neurofibroma – 02	02	00
BFH	01	BFH – 01	01	00
BSCL	03	Neurilemmoma- 01 BFH – 01 FDCS – 01	02	01
Nodular fasciitis	01	Nodular fasciitis – 01	01	00
Total	105		104	01

benign lesions on cytology, 104 cases correlated well with the histopathological findings. 1 case reported as benign spindle cell lesion on FNAC turned out to be follicular dendritic cell sarcoma on histopathology. All 7 cases of malignant lesions on cytology correlated with histopathological findings (Table 3).

Statistical analysis was performed. Sensitivity was 87.5% and specificity was 100%. Diagnostic accuracy was found to be 99.10%.

Table 4: Comparative Analysis of FNAC and Histopathological Diagnosis : Malignant Lesions

FNAC diagnosis	No. of cases	Histopathological diagnosis	Concordant cases	Discordant cases
Rhabdomyosarcoma	01	Rhabdomyosarcoma – 01	01	--
Myxoid MFH	01	Myxoid MFH – 01	01	--
DFSP	01	DFSP – 01	01	--
MSCT	01	DFSP – 01	01	--
Fibrosarcoma	01	Fibrosarcoma – 01	01	--
Pleomorphic sarcoma	01	Pleomorphic Rhabdomyosarcoma -01	01	--
Myxoid sarcoma	01	Myxoid sarcoma	01	--
Total	07		07	--

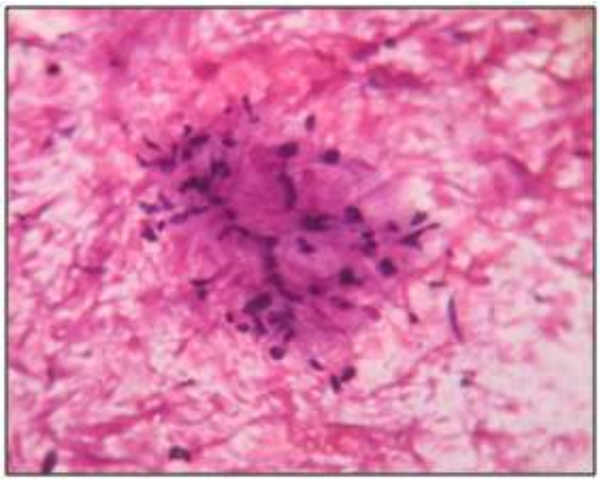

Fig. 1: Myxoid Malignant Fibrous Histiocytoma – FNAC (H & E 40X)

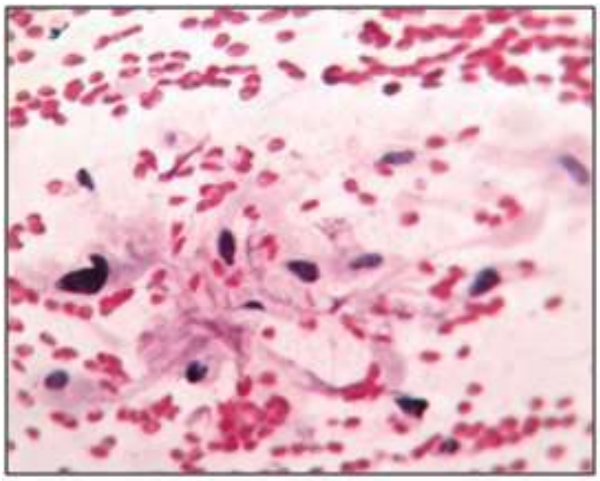

Fig. 2: Myxoid Malignant Fibrous Histiocytoma - FNAC (H & E 40X)

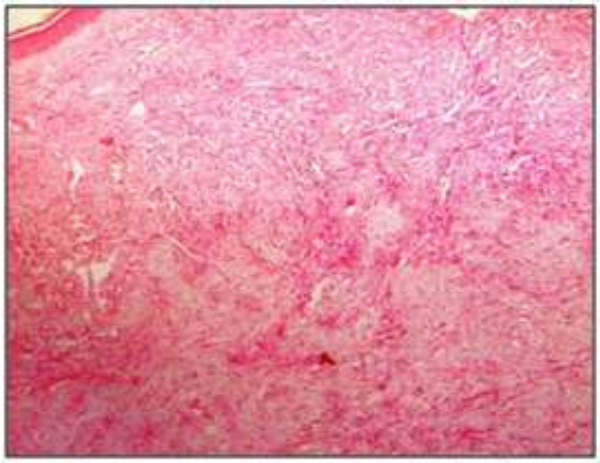

Fig. 3: Myxoid Malignant Fibrous Histiocytoma Histopathology (H & E 4X)

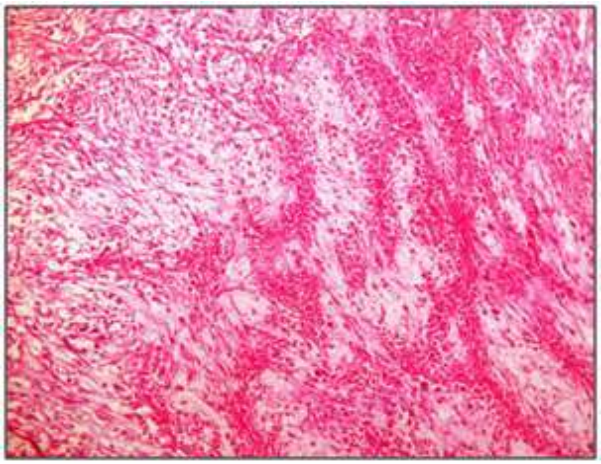

Fig. 4: Myxoid Malignant Fibrous Histiocytoma Histopathology (H & E 10X)

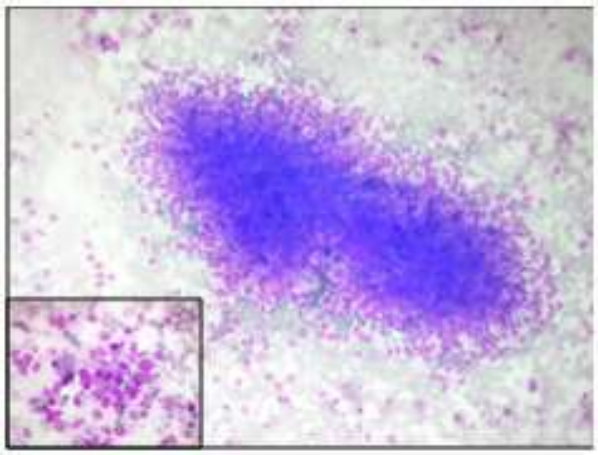

Fig. 5: Pleomorphic Sarcoma – FNAC (Leishman 4X); Inset 40X

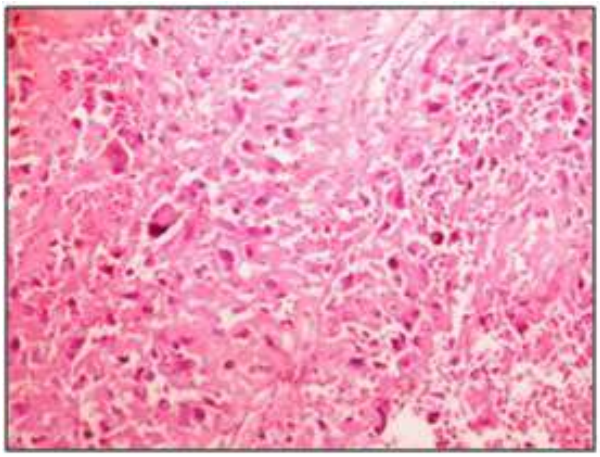

Fig. 6: Pleomorphic Sarcoma – Histopathology (H & E 10X)

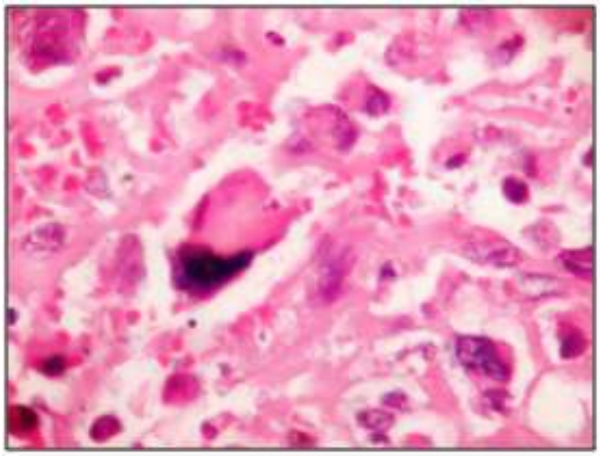

Fig. 7: Pleomorphic Sarcoma – Histopathology (H & E 40X)

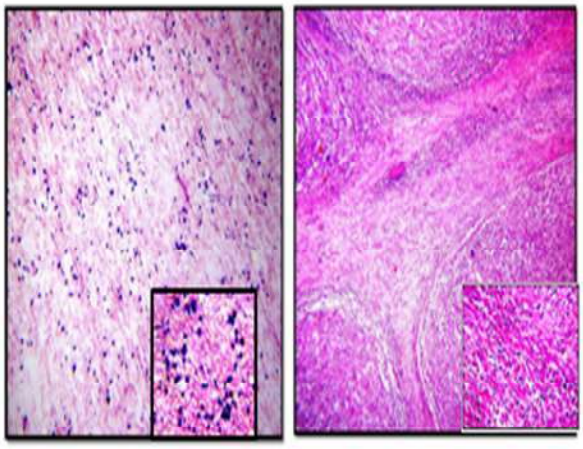

Fig. 8: Discordant Case – Cytology and Histopathology of Follicular Dendritic Cell Sarcoma

Discussion

FNAC has an established role in the primary evaluation of soft tissue tumors and their categorization into neoplastic and non- neoplastic lesions. Though it is very difficult to exactly diagnose a soft tissue lesion by FNAC due to its complex heterogeneity, familiarity with diverse histological entities, experience with interpretation of different cell types on cytological smears along with awareness of fallacies of this procedure mostly help in achieving high diagnostic accuracy.

Out of 653 cases evaluated, 613 (93.88%) were found to be benign lesions and 40 (6.12%) were malignant lesions. These results were comparable with the findings of other authors. Tailor HJ *et al.* [6] found 93.58% of cases with benign lesions and 6.42% malignant lesions in their study. Soni PB *et al.* [7] found 95.3% benign lesions and 3.34% malignant lesions. Vijayabharathi I *et al.* [8] in their study of 216 cases observed 83.3% benign lesions and 16.7% malignant lesions.

The most common age group for benign and malignant tumors in this study was 31-40 years of age group. Similar findings were seen in a study by Tailor HJ *et al.* [6], Bhalodia JN *et al.* [9], Vijayabharathi I *et al.* [8].

In the present study, of the 653 patients, 348 were males and 305 were females with a ratio of 1.14:1. In a study by Tailor HJ *et al.* [6], male:female ratio was 1.29:1. Vijayabharathi I *et al.* [8], ratio was found to be 1.18:1. Bhalodia JN *et al.* [9] in their study found that ratio was 1:1.3.

Maximum cases of benign lesions (34.25%) were observed in upper extremities in the present study. Similar findings were observed by Tailor HJ *et al.* [6] with 32.06% cases Soni PB *et al.* [7] with 43.5% of the cases affecting the upper extremity. Majority

of the malignant cases (30%) were seen in lower extremities in the present study. Similar findings were seen in Soni PB *et al.* [7] and Vijayabharathi I *et al.* [8] with 44.4% of malignant cases seen in lower extremities.

Maximum number of benign lesions reported were lipoma constituting 85.31% of the cases, followed by benign spindle cell lesion with no further categorization with 5.38% and neural tumors with most common lesion being neurofibroma and Schwannoma constituting 2.93% cases. These findings were similar to study done by Tailor HJ *et al.* [6] where lipomatous tumors formed a major bulk (80.15%) of benign tumors followed by neural tumors (3.82%). In a study by Bhalodia JN *et al.* [9] observed that 82.66% of the cases were lipomatous tumors. Chandrakar R *et al.* [10] observed 80% of the cases were lipoma followed by neural tumors (5.9%).

Of the malignant lesions, small round cell tumors (17.5%) were seen most commonly in our study. Spindle cell sarcoma (15%), myxoid sarcoma (15%) and pleomorphic sarcoma (10%) were seen forming a major chunk of malignant lesions. Similar findings were seen in studies by Chandrakar R *et al.* [10] with 32.2% cases of round cell tumor and Hirachand S *et al.* [11] with 50% of the cases of round cell tumor and spindle cell sarcoma. Vijayabharathi I *et al.* [8] observed spindle cell sarcoma to be the most common malignant lesion in their study of 216 cases.

In the present study, histopathological study was done in 112 cases. Of them, benign lesions were 105 cases. In 104 cases, the cytological diagnosis were concordant with the histopathological diagnosis. One case reported as benign spindle cell lesion on FNAC was Follicular dendritic cell sarcoma on histopathology. This was probably due to sparsely cellular smears with lack of mitotic figures and nuclear pleomorphism. Cytological features of FDCS are diverse. Chandrakar *et al.* [10] also misdiagnosed a case of sarcoma as benign spindle cell lesion as the aspirate showed only the benign part of the tumor. Repeated aspirations are required for the accurate diagnosis in such cases.

In the present study, the sensitivity was 87.5%, specificity was 100% and diagnostic accuracy was 99.10%. Tailor HJ *et al.* [6] observed 100% diagnostic accuracy in their study. Our findings were also similar to study done by Soni PB *et al.* [7] where sensitivity was 70%, specificity 100% and accuracy was 98%. Vijayabharathi I *et al.* [8] found sensitivity 84.2%, specificity 97.75% and diagnostic accuracy was 95.37%. Our results nearly correlated with above mentioned studies.

Conclusion

Fine needle aspiration cytology is a safe, effective and reliable diagnostic tool in categorizing soft tissue lesions into benign and malignant. Diagnostic accuracy is increased with correlation of clinical and imaging findings along with histopathology. Type specific diagnosis can be achieved with the aid of immunohistochemistry. Hence, a multidisciplinary approach comprising of clinical details, radiological findings, FNAC, histopathological study, ancillary diagnostics will aid in the accurate diagnosis of benign and malignant soft tissue lesions.

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