

Original Research Article

Role of FNAC in soft tissue tumors and its histopathological correlation

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ABSTRACT

Background: Soft tissue tumours are very rare. They are diagnosed initially by Fine needle aspiration cytology (FNAC). The present study was conducted with the aim to study the acceptability and diagnostic accuracy of cytodiagnosis in soft tissue lesions, to evaluate the reliability of cytodianosis as compared conventional histological paraffin section and to assess nuclear grade in various soft tissue lesions.

Methods: The present study was conducted on 140 patients of soft tissue tumours during the period from August 2002 to July 2003 in the Department of pathology and microbiology, LLRM medical college, Meerut. FNAC was done in 132 cases and histopathology was conducted in 86 cases and correlation of those results was done.

Results: Diagnosis of STT by FNAC was done in 132 cases. In benign tumours maximum number of cases (28) was in the age group of 20-29 years and in malignant tumours maximum number of cases (7) was in the age group of 40-49 years. 110 (83.3%) cases were benign and 22 (16.7%) cases were found to be malignant. Maximum number of STT was observed in trunk followed by limb extremities. Male preponderance was observed in the study. The overall accuracy of the present study was 97.7%. Accuracy for diagnosing benign soft tissue tumours was 100% and for malignant STT was 94.5%. The sensitivity, specificity and predictive value of the present study was 100%, 98.6% and 93.3%.

Conclusions: FNAC plays a very important role in initial diagnosis of soft tissue tumours. It provided acceptable diagnostic accuracy when supported by histopathology.

Keywords: Cyto-histo correlation, FNAC, Histopathology, Soft tissue tumours

INTRODUCTION

Soft tissue tumors (STTs) are an extremely varied group of tumors and are classified on a histogenetic basis according to their similarity to adult tissue.¹ They can be initially diagnosed by fine needle aspiration cytology (FNAC) for the identification of recurrent and metastatic cases.² FNAC has replaced conventional large needle core biopsy in diagnosis of lesions. The 22-23-gauge fine needle has advantage of causing significantly less discomfort and very low risk of complication. Hospitalization of the patient is not necessary FNAC can be done from multiple sites thus providing more representative material.³

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 an important alternative more traditional biopsy technique in the rapid work up of palpable tumour invading the musculoskeletal system.⁴

However, FNAC of soft tissue lesions has not been widely used because of concern about its diagnostic accuracy. The difficulties arise in exact typing and diagnosis of low grade sarcomas. But it gives fairly accurate result regarding the nature of lesion, especially when supported by appropriate clinical findings and other diagnostic data.⁵

This study was undertaken with the objectives to study the acceptability and diagnostic accuracy of cytodiagnosis in soft tissue lesions, to evaluate the reliability of cytodiagnosis as compared conventional histological paraffin section and to assess nuclear grade in various soft tissue lesions.

METHODS

The present study was conducted on 140 patients of soft tissue tumours during the period from August 2002 to July 2003 in the department of pathology and microbiology, LLRM Medical College, Meerut. FNAC was done in 140 cases and eight aspirations from patients with suspected hemangiomas and lymphangiomas were unsatisfactory for evaluation and these were excluded from the study. All the smears were stained with Leishman's stain. In 86 cases, biopsy was resorted and the histological examination of tissue was carried out. The paraffin sections of surgically resected specimens were with stained haematoxylin and eosin, reticulin, Van Gieson, Masson trichome stain, Phosphotungstic acid hematoxylin, periodic acid Schiff (PAS). The routine investigations and other necessary investigations were also carried out to conform the diagnosis. A comparison was made between the cytological and histological findings wherever material for histopathological examination was available. On the correlation of FNAC diagnoses with histopathological diagnoses the sensitivity, specificity, accuracy and positive predictive values were calculated. Various diagnostic methods were calculated by Z test and Chi square test.

RESULTS

Of 140 cases, 8 cases were excluded from the study. Diagnosis by FNAC was done in 132 cases. In benign tumours maximum number of cases (28) was in the age group of 20-29 years, followed by 26 cases in 10-19 years. In malignant tumours maximum number of cases (7) was in the age group of 40-49 years as shown in Table 1.

Table 1: Age specific distribution of STT (n=132).

Age groups (years)	Benign	Malignant	Total	%
0-9	8	1	9	6.8
10-19	26	1	27	20.4
20-29	28	2	30	22.7
30-39	18	4	22	16.6
40-49	14	7	21	15.9
50-59	10	5	15	11.3
60-69	5	2	7	5.3
>70	1	-	1	0.7

On FNAC smears, 110 (83.3%) cases were benign and 22 (16.7%) cases were malignant. As shown in Table 2, soft tissue tumours were classified into six types. Among

them largest number of samples 41 (31.1%) samples were categorized to be lipomas followed by spindle cell carcinomas in 39 (29.5%) cases, myxoid in 28 (21.2%) cases, pleomorphic in 5 (3.8%), round cell in 5 (3.8%) and polygonal in 1 (0.7) case.

Table 2: Distribution of STT on FNAC (n=132).

Type of STT	Benign (%)	Malignant (%)	Total (%)
Myxoid	27 (24.5)	1 (4.5)	28 (21.2)
Spindle cell	31 (28.2)	8 (36.4)	39 (29.5)
Pleomorphic	2 (1.8)	3 (13.6)	5 (3.8)
Polygonal	-	1 (4.5)	1 (0.7)
Round cell	-	5 (22.7)	5 (3.8)
Miscellaneous	40 (36.4)	1 (4.5)	41 (31.1)
Tumour like lesions	10 (9.1)	3 (13.6)	13 (9.9)

As in Table 3, maximum number of benign cases of tumour were seen in trunk and peritoneum 40 (36.4%) followed by upper 38 (34.5%) and lower 22 (20%) extremities and head and neck 10 (9.5%). Most common malignant tumours were noticed in lower extremities 10 (45.1%) followed by trunk 9 (40.9%).

Table 3: Distribution of cases of STT according to site (n=132).

Site	Benign (%)	Malignant (%)	Total (%)
Head and neck	10 (9.5)	1 (4.5)	11 (8.3)
Trunk/retroperitoneum	40 (36.4)	9 (40.9)	49 (37.1)
Upper extremity	38 (34.5)	2 (9.0)	40 (30.3)
Lower extremity	22 (20.0)	10 (45.1)	32 (24.2)

Out of 132 cases 53 (48.2%) cases of benign tissue tumours and 18 (77.3%) of malignant were seen in males. In females 57 (51.8%) were benign and 5 (22.7%) were malignant cases. Benign cases were more in females and malignant cases were more in males. Overall male preponderance 71 (53.7%) was observed in the study (Table 4).

Table 4: Distribution of cases of STT according to sex (n=132).

Sex	Benign (%)	Malignant (%)	Total (%)
Male	53 (48.2)	18 (77.3)	71 (53.7)
Female	57 (51.8)	5 (22.7)	62 (46.9)

In this study, grading was done on cellularity, nuclear features such as nuclear atypia, nuclear overlap, mitotic figures and necrosis. Nuclear atypia was used to separate grade 3 from grade 2 in the presence of necrosis and frequent mitoses. Out of 22 (16.6%) cases, grading was done in 18 (81.8%) cases. 11 (61.1%) cases come under grade 1, 5 (27.8%) cases under II and only 2 (11.1%) cases some under grade III. Grading was not done in

lymphoma, plasmacytoma and Ewing's sarcoma cases (Table 5).

Table 5: Grading of FNAB specimens of STT (n=18).

Type of STT	Grade-I (%)	Grade-II (%)	Grade-III (%)
Myxoid	-	1 (5.5)	-
Spindle cell	5 (27.7)	2 (11.1)	1 (5.5)
Pleomorphic	1 (5.5)	1 (5.5)	1 (5.5)
Polygonal	1 (5.5)	-	-
Round cell	3 (16.6)	1 (5.5)	-
Miscellaneous	1 (5.5)	-	-
Total	11 (61.1)	5 (27.8)	2 (11.0)

Table 6 showing that grading has no correlation with age. Although grade 3 tumours were found only in males, it is difficult to comment upon this finding as the number of cases was too less. Majority of the patients (13) were males in all three grades.

Most common site for grade 1 tumour was lower extremity (6 cases), followed by trunk and retroperitoneum (3 cases) and for grade 2 tumours, was lower extremity, trunk and retroperitoneum. Grade 3 tumours were 1 each in trunk/ retroperitoneum and lower extremity (Table 7).

Table 6: Correlation of grading with age and sex (n=18).

Age groups (years)	Grade 1		Grade 2		Grade 3	
	Male	Female	Male	Female	Male	Female
0-9	1	-	1	-	-	-
10-19	-	-	1	-	1	-
20-29	-	1	-	-	-	-
30-39	2	1	-	-	-	-
40-49	2	-	1	-	1	-
50-59	1	2	-	1	-	-
60-69	1	-	1	-	-	-
>70	-	-	-	-	-	-
Total	7	4	4	1	2	-

Table 7: Correlation of grading with site (n=18).

Site	Grade 1	Grade 2	Grade 3
Head and neck	1	-	-
Trunk and retroperitoneum	3	2	1
Upper extremity	1	1	-
Lower extremity	6	2	1
Total	11	5	2

Table 8: Correlation of cytodiagnosis and histologic diagnosis.

Type of STT	Cytodiagnosis (n=132)	Histologic diagnosis (n=86)	
		Consistent	In consistent (n=2)
Myxoid	28	10	1
Spindle cell	39	24	-
Pleomorphic	5	2	-
Polygonal	1	1	-
Round cell	5	3	1
Miscellaneous	41	37	-
Tumour like lesions	13	7	-

Out of 132 samples of FNAC, histopathological specimens were available in 86 cases (65.2%). Out of 86 cases available, 84 (97.7%) cases were diagnosed correctly, while in 2 (2.3%) cases the diagnosis was inconsistent. In histology also, out of 41 cases the most common soft tissue tumour noticed was lipoma in 36

(41.8%) cases. The next largest category was spindle cell carcinoma. Out of 39 cases, 24 cases were found to be consistent with histologic diagnosis. In the 3 cases of spindle cell sarcomas the histopathology specimen was available in one case and diagnosis come out was fibro sarcoma. Out of 28 cases of myxoid tumour, 10 cases

were shown consistent with histology. 5 samples out of 13 cases of tumour like lesions were observed to be consistent with histological findings (Table 8).

The overall accuracy of the present study was 97.7%. Accuracy for diagnosing benign soft tissue tumours was 100% and for malignant STT was 94.5%. The sensitivity, specificity and predictive value of the present study was 100%, 98.6% and 93.3%.

Table 9: Diagnostic accuracy in the present study.

Accuracy	Percentage (%)
Overall	97.7
For benign soft tissue tumours	100
For malignant soft tissue tumours	94.5

DISCUSSION

There is some reluctance among clinicians and cytologists to use FNAC for the diagnosis of soft tissue tumours. Maitra et al studies however demonstrated that FNAC leads to an accurate diagnosis of many types of tumour in various parts of the body.⁶ FNAC has several advantages over traditional open incisional biopsy, including little or no risk of tumor cell contamination of the biopsy track, significantly less risk of morbidity and mortality and ease of learning and performance by most physicians.⁷ An added advantage is the ability, especially in pediatric 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.⁸

The present study has been undertaken to evaluate the acceptability, reliability and accuracy of cytodiangosisin comparison to open biopsy. In this study, one hundred and forty aspirations from patients with soft tissue masses were performed of which 8 were excluded from the study, because they were unsatisfactory for evaluation.

The maximum number of benign soft tissue tumors occurred in the age group 20-29 years, while maximum number of malignant soft tissue tumour occurred in the age group 40-49 years. Bezabih found that the most common age group for benign tumors observed as 4th and 5th decades and for malignant tumors, 1st and 2nd decades.⁹ In the present study, males outnumbered the females in the incidence of STT. This was similar with the observations of Beg et al.¹⁰

Out of 132 tissue samples, 110 were identified as benign and majority of them was lipomas in 40 cases and 22 were as malignant and most of them (8 cases) were spindle cell carcinoma in. As like present study, Bezabih also stated lipoma (70.5%) as the most common benign STT and spindle cell tumor as the most common malignant STT (63.6%).⁹ We reported majority of STT (37.1%) in trunk/peritoneum region followed by upper (30.3%) and lower (24.2%) extremities. Arul et al, found

that highest number of benign STT in trunk and upper extremities and malignant STT in lower extremities.¹¹ In a study by Beg et al, maximum number of STT was observed in extremities 53 cases (42.1%).¹⁰

In most instances, therapy for sarcoma is driven by tumor location and stage, the latter of which incorporates tumor grade.^{12,13} Among the most important histologic parameters in grading soft tissue sarcomas are the number of mitotic figures and amount of necrosis in the lesion.¹⁴ Palmar et al, found these parameters applicable to the evaluation of subgrouping and grading soft tissue sarcomas by FNAB of 84 specimens.¹⁵ FNAB was able to predict the grade in 90% of histologically confirmed sarcomas, when segregated into high or low grade lesions. Pleomorphic, small round cells and epithelioid/polygonal subgroups corresponded to high grade sarcomas in all cases with only minor non-correlations. Major grading non-correlations occurred in 50% of myxoid and 9% of spindle cell sarcomas. Attention should be given to specimen adequacy, and caution should be exercised when attempting to grade myxoid and spindle cell sarcomas by FNAC.

In the present series, out of 22 (16.6%) cases, grading was done in 18 (81.8%) cases. 11 (61.1%) cases some under grade 1, 5 (27.8%) cases under grade II and only 2 (11.1%) cases come under grade III. Grading was not done in lymphoma, plasmacytoma and Ewing's sarcoma cases. Out of all the FNAC diagnosis, 24 out of 39 spindle cell tumours, 10 out of 28 myxoid tumours, 37 out of 41 well differentiated liposarcomas (miscellaneous), 2 out of 5 pleomorphic cases, and 3 out of 5 round cell tumours, showed consistent results upon histological diagnosis. 71 benign lesions and 15 malignant lesions were correlated by histopathological examination. The discrepancy between the cytological and histopathological diagnosis was noted in 2 cases. In a study by Chatura et al, such difference in findings of cytology and histology was noticed in 9 cases out of 27.⁴

In this study, the overall accuracy in diagnosing soft tissue tumours by FNAC was 97.7%. Accuracy for diagnosing benign soft tissue tumours was 100% and for malignant tumours accuracy was 94.5%. 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.¹⁶ Sapi et al, claimed that the diagnosis of mesenchymal neoplasm by fine needle aspiration biopsy has an accuracy approaching 95%.¹⁷

In the present study, the sensitivity, specificity and predictive values of FNAC for predicting STT was 100%, 98.6% and 93.3%. These results were comparable with the findings of Chalita et al.¹⁸ She studied 213 cases and claimed that cytological diagnosis showed sensitivity of 89%, specificity of 100%, positive and negative predictive value of 100% 96% respectively and efficacy of 97%.

CONCLUSION

The present study concluded that aspiration cytology was found to be an outstanding procedure for early diagnosis of soft tissue lesions with no complications. When utilized in context with the clinical history and radiographic findings, it was found to be powerful tool in the multidisciplinary approach to the diagnosis and management of soft tissue lesions. It was more accurate in diagnosing benign lesions as compared to malignant lesions. High accuracy as in the present study (97.7%), was achieved with the close cooperation of the clinician, radiologist and pathologist. The results indicate that the grading scheme can accurately grade most of soft tissue sarcomas on FNAC specimens.

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REFERENCES

- Roy S, Manna AK, Pathak S, Guha D. Evaluation of fine needle aspiration cytology and its correlation with histopathological findings in soft tissue tumours. J Cytol. 2007;24:37-40.
- Rekhi B, Gorad BD, Kakade AC, Chinoy R. Scope of FNAC in the diagnosis of soft tissue tumors-a study from a tertiary cancer referral center in India. Cyto J. 2007;4:20.
- Tailor HJ, Bhagat VM, Kaptan KBR, Italiya SL, Balar HR, Agarwal MP. Diagnostic accuracy of fine needle aspiration cytology in soft tissue tumors: our institutional experience. Int J Res Med Sci. 2013;1:443-7.
- Chatura KR, Katyal A, Hiremath SS. Fine-needle aspiration cytology in soft tissue tumors: How far did we go? J Adv Clin Res Insights. 2015;2:1-5.
- Moschetta M, Telegrafo M, Carluccio DA, Jablonska JP, Rella L, Serio G, et al. Comparison between fine needle aspiration cytology (FNAC) and core needle biopsy (CNB) in the diagnosis of breast lesions. G Chir. 2014;35(7-8):171-6.
- Maitra A, Ashfaq R, Saboorian MH, Lindberg G, Gokaslan ST. The role of fine-needle aspiration biopsy in the primary diagnosis of mesenchymal lesions: a community hospital-based experience. Cancer. 2000;90:178-85.
- Bennert KW, Abdul Karim FW. Fine needle aspiration cytology versus core needle biopsy of soft tissue lesions: a comparison. Acta Cytol. 1994;38:381-4.
- Kilpatrick SE, Geisinger KR. Soft tissue sarcomas; The utility and limitations of fine needle aspirations biopsy. Am J Clin Pathol. 1998;110(1):50-68.
- Bezabih M. Cytological diagnosis of soft tissue tumors. Pathologie. 2007;368(76):28.
- Beg S, Vasenwala SM, Haider N, Ahmad SS, Maheshwari V, Khan M. A comparison of cytological and histopathological findings and role of immunostains in the diagnosis of soft tissue tumors. J Cytol. 2012;29:125-30.
- Arul P, Masilamani S. Fine needle aspiration cytology of soft tissue tumors with its histopathological correlation in a rural hospital of South India: A retrospective study. Clin Cancer Invest J. 2016;5(2):146-50.
- Pollock RE, Karnell LH, Menek HR, Winchester DP. The National cancer Data Base report on soft tissue asarcoma. Cancer. 1996;78:2247-57.
- Kilpatrick SE. Prognostication in soft tissue sarcomas grading versus subtyping or both a comprehensive review of the literature with proposed practical guidelines. Ann Diagn Pathol. 1999;3(1):48-61.
- Enzinger FM, Weiss SW. Soft tissue tumors. 3rd ed. St. Louis: CV. Mosby Co.; 1995: 491-508.
- Palmer HE, Mukunyadzi P, Culbreth W, Thomas JR. Subgrouping and grading of soft tissue sarcomas by fine needle aspiration cytology. A histopathologic correlation study. Diagn Cytopathol. 2001;24:307-16.
- Akerman M, Rydholm A, Persson BM. Aspiration cytology of soft-tissue tumors. The 10-year experience at an orthopedic oncology center. Cytopathol. 2007;18:234-40.
- Sapi Z, Antal I, Papai Z, Szendroi M, Mayer A, Jakab K, et al. Diagnosis of soft tissue tumours by fine needle aspiration with combined cytopathology and ancillary techniques. Diagn Cytopathol. 2002;26(4):232-42.
- Chalita MC, Matira JM, Alves MT, LangattoFilho A. Non-aspiration fine needle cytology and its correlation in canine skin and soft tissue tumours. Annal Quart Cytol Histol. 2001;23(6):399.

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