Utility of fine needle aspiration cytology in diagnosing soft tissue tumors- experience in our institution

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Abstract

Introduction: Soft tissue tumours are a heterogeneous group of lesions arising from non-epithelial extraskeletal tissue of the body. Benign out number malignant tumors by being 10 times more commoner in a hospital population. The use of fine needle aspiration cytology (FNAC) in the evaluation of soft tissues tumour is debatable because of their extremely varied morphology.

Aims: 1. To evaluate role of FNAC as a routine procedure in diagnosing soft tissue tumors. 2.To evaluate the diagnostic accuracy and correlation of cytomorphological features with histomorphology.

Materials and Method: This is a retrospective study of cytological analysis of FNAC performed on soft tissue tumors reporting to SDMCMS&H, Dharwad over a period of five years. Histomorphological features of the biopsies performed were evaluated and correlated with FNA findings. Relevant clinical details were obtained from the patients records.

Results: Of 450 cases of soft tissue tumors studied 412(91.5%) were benign, 36(8.1%) malignant and 2(0.4%) inconclusive. Among benign tumors Lipoma and its variants constituted the major group (83%), and Pleomorphic sarcoma (19.5%) in malignant cases. Cytohistomorphological correlation was 100% concordant in malignant cases and 2 cases which were reported as benign turned out to be malignant on biopsy.

Conclusion: FNAC a safe, cost effective diagnostic procedure provides fairly accurate correlation with the histomorphology in soft tissue tumors.

Keywords: FNAC, Soft tissue tumor, Benign, Malignant

Introduction

Soft tissue is defined as "the complex of non-epithelial extraskeletal structures of the body exclusive of the supportive tissue of the various organs and the hematopoietic/lymphoid tissue" which includes fibrous (connective) tissue, adipose tissue, skeletal muscle, blood and lymph vessels, and peripheral nervous system. Embryologically it's derived from mesoderm, with a neuroectodermal contribution corresponding to the peripheral nerves.[(1)]Soft tissue tumors(STT) are a heterogeneous group of lesions arising from non-epithelial extraskeletal tissue of the body.Benign out number malignant tumors by being 100 times more commoner.[(2)] Routine light microscopic analysis is often not enough to diagnose these tumors because of its varied morphology and lack of proper tissue architecture and lack of familiarity since they are very rare. Often additional diagnostic methods like histochemistry, immunohistochemistry and molecular analysis is done to come for definitive diagnosis. The use of fine needle aspiration cytology (FNAC) in the evaluation of soft tissues tumor is debatable because of their extremely varied morphology.However since 1980's FNAC is been increasingly used in diagnostic workup of STT's with fairly good results. The other advantages of FNAC being quick, simple and less painful outpatient procedure which doesn't require long patient stay compared to core needle biopsy and open biopsy and also the availability of the material for ancillary techniques has made it one of the preferable initial investigations even in evaluating STT's.[(3)]

The present study is undertaken to study the nature of various soft tissue tumors by FNAC and to evaluate the diagnostic accuracy and correlation of cytomorphological features with histomorphology.

Materials and Method

It was a retrospective study which involvedstudy of all FNAC's performed on soft tissue tumors reporting to our institute in five years. Ethical clearance was obtained from institutional ethical committee prior to the start of the study.FNAC's were performed using 23 guage needle with 10ml syringe, suction was used wherever necessary. Air dried smears were stained with leishman stain and alcohol fixed smears with Papanicolau (Pap) and Haematoxylin and Eosin (H&E) stains.Slides were retrieved and detailed cytomorphological examination done.Histomorphological features of the corresponding biopsies performed were evaluated and correlated with FNA findings.Relevant clinical details were obtained from the patient's clinical records. Data was compiled in MS excel and analyzed.

Results

During the study period FNA was performed on 450 cases of soft tissue tumors, among them412(91.5%)cases were benign, 36(8.1%) cases were malignant and 2(0.4%) cases turned out to beinconclusive.Clinical data of these were obtained from medical records. It was observed that the distribution of these lesions showed wide range of

incidence from first toseventh decade (age group 2years-78 years).

Benign lesions were commonly seen in the age group 31-40 years comprising 126 cases (30.58%) followed by 21-30years 92 cases(22.33%) together comprising 52.91% of cases. Malignant lesions showed 2 peaks 11-20 years and 60-70 years comprising 8 case each (22.21%). Two cases given as inconclusive were of 36 and 42 years respectively. (Table 1)

Male patients outnumbered female in both benign and malignant lesions, with male to female ratio of 1.34:1 in benign and 1.25:1 in malignant cases. Both cases given as inconclusive were males.

Benign lesions were more commonly seen in upper extremities 165 cases (40.04%) followed by trunk 117 (28.4%) cases, lower extremities 91(22.1%) casesand head and neck region 39(9.5%) cases. Trunk was the common site of malignant lesions14 cases (38.9%) of the total followed by upper extremities 9 (25%) cases, lower extremities 8(22.2%) cases and 5(13.9%) cases in head and neck. Both the cases given as inconclusive were seen in upper extremities.(Table 2)

Lipomas comprised majorbulk in benign lesions with 342 (83%) casesfollowed by benign spindle cell lesions with 33(8%) cases,hemagioma and neuro fibroma 8(1.9%) cases each. There were 5(1.2%) cases of giant cell tumor of tendon sheath, 4 (0.97%) cases of lymphangiomas and 3 (0.7%) cases of desmoids and nodular fasciitis each and 1 case reported as inflammatory pseudo tumor. Among malignant tumors 8 (22.22%) cases were reported as Small round cell tumors followed by malignant spindle cell lesionand fibrosarcoma 5(13.88%)cases each,4(11.11%) cases were diagnosed as pleomorphic sarcoma and 2 (5.5%) cases each as rhabdomyosarcoma, granular cell tumor , synovial sarcoma and osteogenic sarcoma. There was 1 (2.8%) case of liposarcoma and 1 (2.8%) case of malignant peripheral nerve sheath tumor.(Table 3)

Histopathological correlation was available in 145 cases, 9 malignant and 136 benign.All 9 malignant cases were concordant with histopathology. Two cases diagnosed as small round cell tumors in FNA were diagnosed as Rhabdomyosarcoma and Ewings sarcoma on histopathology.One case each of granular cell tumor, malignant fibrous histiocytoma and rhabdomyosarcoma (Fig. 1) were signed out the same in histopathology. 2 cases given as malignant spindle cell lesion turned out to be malignant peripheral nerve sheath tumor. One case diagnosed as pleomorphic sarcoma turned out to be rhabdomyosarcoma and one case given as fibrosarcoma was typed as myxofibrosarcoma in biopsy.

Among 136 benign cases of which histopathological correlation was available 114 cases of lipoma, 3 cases of schwannoma(Fig. 2), 2 cases of giant cell tumor,2 cases of neurofibroma, 2 cases of nodular fasciitis, 1 case of lymphangioma, 1 case of inflammatory pseudotumor and one case of desmoid were reported the same in histopathology. In the10 cases given as benign spindle cell lesion on FNA, 4 cases were diagnosed to be fibromatoses, 2 schwannomas and 1 spindle cell lipoma on histopathology. Three cases were discordant, 2 turned out to be low grade myxofibrosarcoma and one Dermatofibrosarcoma protuberance (Fig. 3). Two cases which were inconclusive on FNA were diagnosed as dermatofibrosarcoma protruberance on histopathology. (Table 4)

The diagnostic accuracy for malignant tumors is 100% and benign tumors are 97.79% with overall diagnostic accuracy being 97.93%. The overall sensitivity is 100% and specificity is 97.93%. Positive predictive value is 100% and negative predictive value is 97.79%.

Table 1: Age wise distribution of tumors

Age in years	Benign	Malignant	Inconclusive	Total
1-10	4	5	-	09
11-20	46	8	-	54
21-30	92	2	-	94
31-40	126	3	1	130
41-50	74	3	1	78
51-60	38	4	-	42
61-70	27	8	-	35
71-80	05	3	-	08
Total	412	36	2	450

Table 2: Anatomical Distribution of Soft Tissue Tumors on FNAC

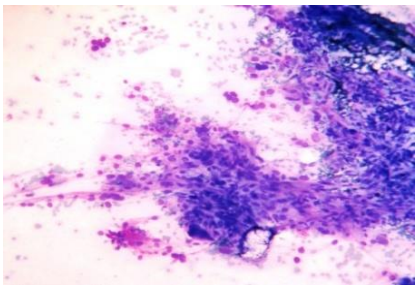
	Malignant	Benign	Inconclusive	Total
Head& Neck	5	39	-	44
Trunk	14	117	-	131
Upper Extremities	9	165	2	176
Lower Extremities	8	91	-	99
Total	36	412	2	450

Table 3: Types of Lesion Diagnosed By FNA

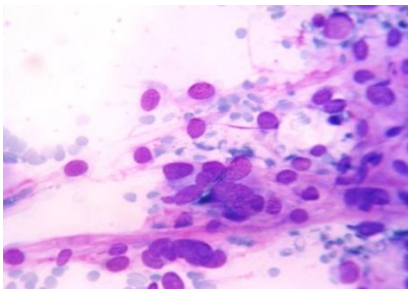
Benign		**Malignant**	
➢ Lipoma	342	➢ Small Round Cell Tumor	8
➢ Benign Mesenchymal Lesions	33	➢ Malignant spindle cell lesion	5
➢ Neurofibroma	8	➢ Fibrosarcoma	5
➢ Hemangioma	8	➢ Malignant fibrous histiyocytoma	3
➢ Schwannoma	5	➢ Pleomorphic sarcoma	4
➢ Giant Cell Tumor Of Tendon Sheath	5	➢ Rhabdonyosarcoma	2
➢ Lymphangioma	4	➢ Granular celltumor	2
➢ Nodular Fascitis	3	➢ Synovial sarcoma	2
➢ Desmoid	3	➢ Osteogenic sarcoma	2
➢ Inflammatory Pseudotumor	1	➢ Liposarcoma	1
		➢ Malignant peripheral nerve sheath tumor	1
Inconclusive – 2			

Table 4: Cytohistopathological Correlation

FNA diagnosis	**No.**	**Histopathology**	**No.**
Malignant			
Small round cell tumor	2	- Ewings sarcoma - Rhabdomyosarcoma	1 1
Malignant spindle cell lesion	2	Malignant peripheral nerve sheath tumor	2
Malignant fibrous histiocytoma	1	Malignant fibrous histiyocytoma	1
Pleomorphic sarcoma	1	Rhabdomyosarcoma	1
Fibrosarcoma	1	Myxofibrosarcoma	1
Rhabdomyosarcoma	1	Rhabdomyosarcoma	1
Granular cell tumor	1	Granular cell tumor	1
Total cases	**9**	**Total cases**	**9**
Benign			
Lipoma	114	Lipoma and its variants	114
Benign spindle cell lesion	10	- Fibromatosis - Schwannoma - Spindle cell lipoma - Low grade fibrosarcoma(discordant) - 1 Dermatofibrosarcoma protuberance(discordant)	4 2 1 2 1
Schwannoma	3	Schwannoma	3
Giant cell tumor of tendon sheath	2	Giant cell tumor of tendon sheath	2
Neurofibroma	2	Neurofibroma	2
Nodular Fasciitis	2	Nodular Fasciitis	2
Inflammatory pseudotumor	1	Inflammatory pseudotumor	1
Lymphangioma	1	Lymphangioma	1
Desmoid	1	Desmoid	1
Total cases	136	Total cases	136



1A



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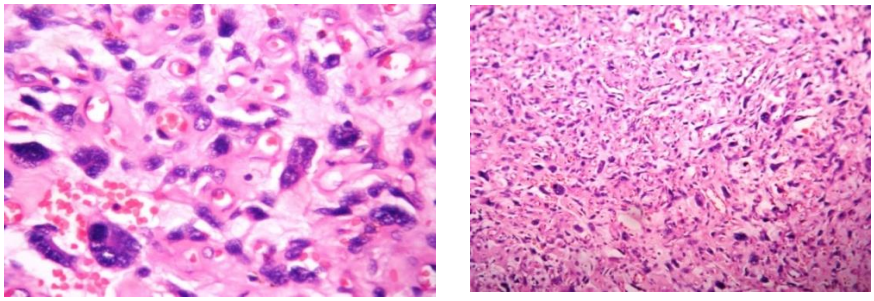
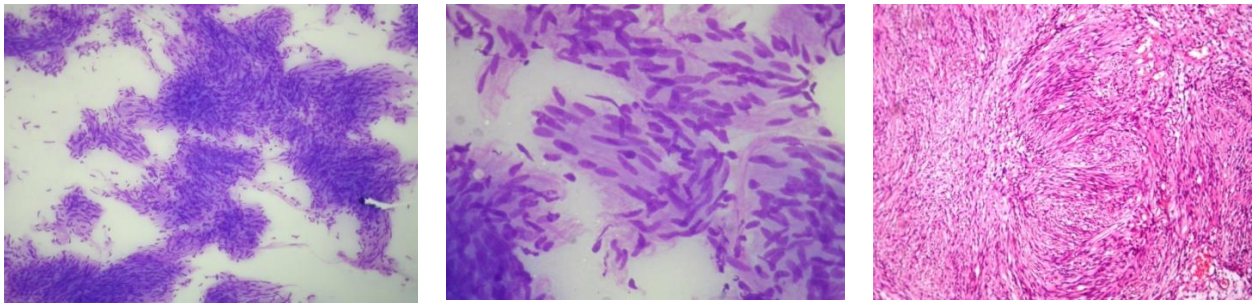


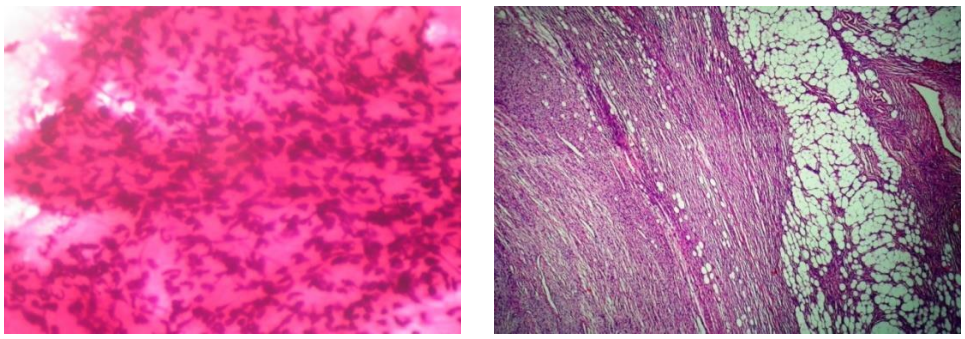
C **D**

Fig. 1: Rhabdomyosarcoma: Pic 1a,1b: Variably cohesive highly pleomorphic rhabdomyoblast like cells in FNAC. Pic1c and 1d: Numerous large pleomorphic cells with giant cells in histopathology



2A **2B** **2C**

Fig. 2: Schwannoma-Pic 2a,2b: Cohesive tissue fragments, spindly pallisading nuclei with pointed ends in FNAC. Pic 2c: Spindle cells with elongated nuclei in palisades and whorls in histopathology



3A **3B**

Fig. 3: Dermatofibrosarcoma protuberans: Pic 3a: Spindle cells clustered in myxoid background given as benign spindle cell lesion in FNAC. Pic 3b: High cellularity with spindle cells in storiform pattern and infiltration to subcutaneous fat in histopathology

Discussion

Soft tissue tumors are a highly heterogeneous group of tumors that are classified on a histologic basis according to adult tissue they resemble which are usually divided into benign and malignant variants along with a borderline variant of which it's difficult to understand the malignant potential.Diagnosis of STT's is difficult because of the heterogeneity of the tumors and also due to the rarity of occurrence. Definitive diagnosis of STT is usually based on the histopathological evaluation which requires open/ incisional biopsy or core needle biopsy. However surgical biopsies cannot be done as outpatient procedure and can lead to local complications post operatively like infections, hematoma etc. and it takes more time before the results are out. Core needle biopsy is an outpatient procedure which requires local anaesthesia to be given and chances of bleeding after the procedure and formation of hematoma are high, also diagnosis will be relatively late since the biopsy needs to be processed like any other biopsies and chances of missing the lesion is possible. FNA on the other hand could be done as outpatient procedure which is easy, relatively painless and the result obtained is quick and also multiple passing's can be done in different directions to obtain representative material. However

the lesion can be completely missed, or only suboptimal material can be aspirated which can give rise tofalse and inconclusive diagnosis. FNAC along with radiological guidance improves the better yield of material also the material obtained by FNA can be used for cytochemical analysis. Thus FNA is very useful in giving a preliminary picture which will be very useful for the clinician to plan the treatment effectively.[1,3,4]

In the present study out of 450 FNAC performed 91.5%(412 cases) were benign, 8.1% (36cases) were malignant and 0.4% (2 cases) turned out to be inconclusive due to lack of sufficient material. Benign cases outnumbered the malignant cases which can be compared to thestudies done by Soni PB et al,[5]Tailor HJ et al,[6]Vijayabarathi et al[7] and Beg et al[8] in which benign:malignant tumor ratio were 95.3%: 3.34%, 93.58%: 6.42%, 83.3%: 16.7% and 83.3%: 16.7% respectively. However in a study done by Bharath Reki et al[9] it was observed that 7.9% cases were benign and 79.5% were malignant. The study being done in a tertiary referral centre where predominantly malignant cases were referred could be the reason for that.

In our study age distribution of soft tissue tumors as diagnosed by FNAC showed benign tumors more common in the age group 21-40 years comprising 52.91% of all benign cases which is comparable to the studies done by Chandrakar et al,[10]Soni PB et al,[5] Hasan J et al,[11] Tailor HJ et al,[6] Arul P et al[12] and Mandakini P et al[13] where benign tumors were more commonly seen in the age group 21-40 years. However in studies done by Paul et al[14] and Chatura et al[15] they observed benign tumors being more common in 5th decade.Malignant cases showed two peaks 11-20 years and 61-70years with 22.21% cases each which can be compared to the study done by Tailor HJ et al[6] which also showed two peaks 0-10years and 61-70 years. In studies done by Chandrakar et al,[10]Hasan J et al[11] andBeg et al[8] malignant tumors were most commonly seen in the age group 11-20 years.

Male patients outnumbered the female patients in both benign (1.34:1) and malignant (1.25:1) cases which is similar to the studies by Chandrakar et al,[10] Vijayabarathi et al,[7] Tailor HJ et al,[6] Arul P et al,[12] Chatura et al,[15]Roy et al[16] and Kulkarni R D et al[17] In all these studies males outnumbered females in both benign and malignant cases.

Common site of benign tumors was upper extremities (40.04%) followed by trunk and lower extremities and head and neck region being the least(9.5%) which is comparable to the studies done by Chandrakar et al,[10]Soni PB et al[5] – 43.5%, Hasan J et al,[11] Tailor HJ et al[6] -32.86%, Arul P et al[12] and Mandakini P et al[13] where benign tumors were most commonly observed in upper extremities. Trunk was the most common site of malignant tumors with 38.9% of all malignant cases which can be compared to the studies done bySoni PB et al,[5]Vijayabarathi et al[7] andRoy et al[16]. However in studies done by Hasan J et al,[11] Beg et al[8] and Tailor HJ et al[6] malignant tumors were most commonly seen in lower extremities.

Most common benign tumors observed in our study were lipomas with 83% cases followed by benign spindle cell lesions which can be compared to the studies by by Chandrakar et al,[10]Soni PB et al[5] and, Tailor HJ et al[6] with percentages of lipoma being 79.9%, 88.2% and 80.15% respectively. Lipoma was also seen to be predominant tumor in studies done by Hasan J et a[11], Vijayabarathi et al,[7]Beg et al,[8] Parajuli et al,[18] Arul P et al[12] and Roy et al[16] with more than 60% cases of lipomas. Small round cell tumors was the most common malignant tumor observed in our study. Similar observation is made in studies by Chandrakar et al,[10] Beg et al[8] and Hirachand et al.[19] However Rhabdomyosarcoma was the most common malignant tumor observed by Hasan J et al[11] and Bharat Reki et al.[9]

Diagnostic accuracy for malignant tumors in the study is 100% and benign tumors is 97% with overall accuracy rate being 97.93% which can be compared to studies by Chandrakar et al,[10]Soni PB et al,[5]Hasan J et al[11]Vijayabarathi et al.[7] Arul P et al,[12] Roy et al[16]Bharath Reki et al[9] and Wakeley et al[4]with the diagnosing accuracy of 90%, 98%, 86.9%, 95.37%, 97%, 90.8%, 98%and 95% respectively.

Sensitivity and specificity in our study is 100% and97.3% respectively which can be compared to the results obtained by the studies done by Soni PB et al,[5] Hasan J et al,[11] Vijayabarathi et al,[7]Beg et al,[8]Arul P et al[12] and)Bharath Reki et al[9] which are 70%and 100%, 77.8 and 92.3%, 84.2 and 97.75%, 98.1% and 96.7%, 91.7% and 97.7% and 100% and 83.3% respectively.

Positive predictive value is 100% in our study and negative predictive value is 97.79% which is similar to the study done by Soni PB et al[5]in which the values are 97.9% and 100% respectively. In a study by Beg et al[8] positive predictive value was 97.2% and in a study by Arul P et al[12] negative predictive value is 98.9% whichare comparable to our study.

Conclusion

FNAC is a safe, cost effective diagnostic procedure provides fairly accurate correlation with the histomorphology in soft tissue tumors. Thus it can be concluded that FNACcan be used as a reliable diagnostic tool for preoperative workup with fair sensitivity, specificity, andaccuracy, even though a specific diagnosis may not be possible in all cases.

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