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Original Article

Diagnostic Accuracy of Fine Needle Aspiration Cytology in Soft Tissue Sarcomas

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Abstract

Background: To study diagnostic validity of fine needle aspiration cytology in soft tissue sarcoma.

Methods: In this descriptive study patients of all ages and both gender with obvious soft tissue swellings and patient in whom both FNAC followed by histopathology, were included. Cases with obvious inflammatory lesions were excluded from the study. Immunohistochemistry was employed where required.The diagnosis made on FNAC was then compared with the diagnosis made on histopathology.

Results: Mean age of the patients was 28 years± 16yrs. Lower extremity tumours were seen in 65%. Most common soft tissue sarcoma on FNAC was spindle cell sarcoma (11 cases) followed by round cell sarcoma(10 cases). Subsequent histopathology of cases showed 55% of benign soft tissue tumours and 45% of soft tissue sarcomas. Hence there were 4 false negative cases and one false positive case on cytology. On comparing with histopathological correlation diagnostic accuracy of FNAC in diagnosing soft tissue sarcoma came out to be 92.3%.The sensitivity and specificity of FNAC in soft tissue sarcoma was 86.2 % and 97.2% respectively.

Conclusion: FNAC is a useful procedure in pre-operative diagnosis of benign and malignant soft tissue tumours , with a high sensitivity, specificity and diagnostic accuracy in soft tissue sarcomas.

Key Words: Soft tissue tumours, Fine needle aspiration cytology, Soft tissue sarcoma.

Introduction

Soft tissue Tumours (STT) are classified as benign and malignant based on biological behaviour. With the majority of STT being benign in nature. Malignant soft tissue tumours or soft tissue sarcomas (STSs) are rare and account for less then 1 % of overall malignancies. Due to biological heterogeneity and morphological overlap diagnosis of STT is a challenging job.Biopsy is generally considered gold standard for diagnosing STT. However in current era role of FNAC is gaining importance in diagnosing STT.It can provide a predictive diagnosis of a benign or malignant neoplasm and in many cases also of specific tumour type. Fine needle aspiration cytology (FNAC) is a useful tool and important diagnostic modality for primary diagnosis of STT.

Soft tissue is the non-epithelial extra skeletal supporting tissue of body.[1,2] It comprises of tendons, muscles ligaments, cartilage, nerves, blood vessels fat and other tissue. Tumours arising from these tissues are called soft tissue tumours (STT)[3]. On the basis of biological behaviour STT are classified as benign and malignant.[4] The large majority of soft tissue tumours are benign, with a very high cure rate after surgical excision. Malignant STT or soft tissue sarcomas (STSs) are locally aggressive and are capable of invasive or destructive growth, recurrence and distant metastasis .They account for less then 1 % of overall malignancies, but they are life threatening and may pose a significant diagnostic and therapeutic challenges.

Biological heterogeneity and morphological overlap is a limiting factor in diagnosing soft tissue tumours especially sarcomas.[5]Biopsy is generally considered gold standard for diagnosing soft tissue tumours. However in current era where needle is preceding scalpel, role of FNAC in diagnosing soft tissue tumors is gaining importance.[6,7] It can provide a predictive diagnosis of a benign or malignant neoplasm and in many cases also of specific tumour type. If the diagnosis is of a benign neoplasm, surgery can be avoided in the elderly or other patients who are of poor surgical risk. In case of a high grade malignancy or of recurrent cancers, a cytological diagnosis allows the administration of a palliative treatment.

FNAC is an out patient department procedure. It is easy, safe less traumatic and cost effective technique for giving early diagnosis with minimum risk of infection bleeding or tumour seedlings.[7,8,9] It can help in relieving patients anxiety by giving early diagnosis followed by discussion on therapeutic options.

FNAC has been used successfully, preferentially over incisional and core needle biopsy in Europe and United States.[10] Recent workers clearly established the role of cytology in diagnosing soft tissue sarcomas with highly sensitive and specific tumour detection rate in their study group.[11,12] Various regional studies have also documented sensitivity and specificity of FNAC in soft tissue tumours to be 90 to 95%. [13-16]

The risk of serious complications with FNAC is very few even when the wrong target is hit.[17,18] Pain is usually minor and well tolerated. There are almost no contraindications of the procedure. The risk of tumour seeding which is the most common complication associated with needle core biopsy is negligible with FNAC. As a general rule, the incidence of complications increases proportionately as the diameter of needle increases. Aspirates from superficial swellings are associated with lesser incidence of complications. Also incidence of complications reduces as the skill of person increases.Since FNAC of STSs is not routinely being practiced in most tertiary care hospitals hence the rationale of this study is to firmly establish diagnostic validity of FNAC in soft tissue sarcoma which can be used as primary diagnostic modality in an environment like ours with minimal resources thus saving both time and money.

Patients and Methods

This descriptive study was performed in department of Pathology, Pakistan Institute of Medical Sciences , from January 2013 to September 2014. Inclusion criteria for the study group was patient of all ages and both gender with obvious soft tissue swellings and patient in whom both FNAC followed by histopathology was advised. Cases with obvious inflammatory lesions were excluded from the study. FNAC was performed using a 21 gauge needle. The surgical specimens received were formalin fixed and processed routinely to form paraffin blocks followed by H&E staining In some cases immunohistochemistry was also used for confirmation of diagnosis, using appropriate antibody panels. The slides of FNAC and surgical specimens were examined by consultant histopathologist on separate days so as to remove any bias. The diagnosis made on FNAC was then compared with the diagnosis made on histopathology. Validation of FNAC was established by calculating its sensitivity and specificity .At the end diagnostic accuracy was also determined. For this purpose 2x2 tables were used.

Results

Total 65 cases of soft tissue tumours were included in our study. The age range of patients was between 1-83 years with the mean age of 28 ±16 years. Out of the 65 cases maximum no of patients i,e 27 (42%) were between 20-40 years (Table 1).Lower extremities were the commonest site (35 %)(Table 2).FNAC of these 65 cases showed 26(40%) cases of soft tissue sarcomas, 38(58%) cases of benign soft tissue tumours and 1 case of hemorrhagic aspirate. FNAc and histopathological examination revealed spindle cell sarcoma as commonest (Table 3&4;Figures 1-4).Subsequent histopathology showed that there were 4 false negative cases and one false positive case on FNAC .Among 4 false negative cases 3 of the cases were diagnosed as benign spindle cell tumours on FNAC which were proved to be spindle cell sarcomas on subsequent histopathology. One false negative case was hemorrhagic aspirate on FNAC which on subsequent biopsy came out to be angiosarcoma. Only one false positive case on FNAC was that in which diagnosis of spindle cell soft tissue sarcoma was given on aspirate which turned out to be fibromatosis on biopsy.The diagnostic accuracy of FNAC in diagnosing soft tissue sarcoma came out to be 92.3%.The sensitivity and specificity of FNAC in soft tissue sarcoma was 86.2 % and 97.2% respectively (Table 5-7).

Table 1:Age Distribution

Age Range	Number
1-20 years	23
20-40 years	27
40-60 years	13
60 and above	2

Table 2 : Distribution of Soft Tissue Tumours

Site	Number
Lower Extremities	22
Upper Extremities	17
Head and Neck	16
Others	10

Table 3: Frequency of FNAC Diagnosis (n=65)

Cytomorphological Category	Number of Cases
Spindle Cell Sarcoma	11
Round Cell Sarcoma	10
Pleomorphic Sarcoma	3
Polygonal Cell Sarcoma	2
Miscellaneous category	39

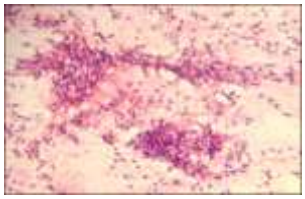

Figure 1. FNAC of spindle cell sarcoma showing loose clusters of spindle shape cells admixed with numerous discohesive cells in a fibrillary background.

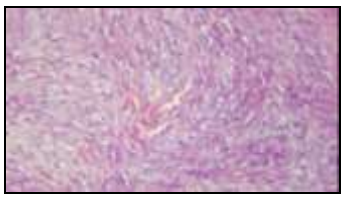

Figure 2Histology of the same case(figure 1) diagnosed as spindle cell sarcoma malignant peripheral nerve sheath type.

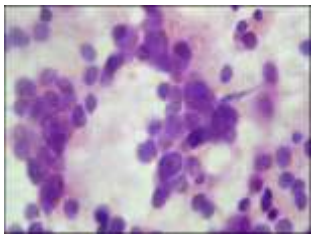

Figure 3.FNAC of Round Cell Sarcoma

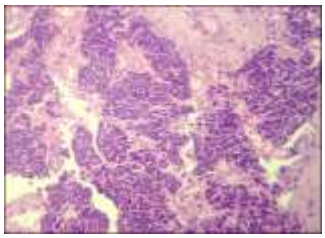

Figure 4:Histology of same case(figure 3) on histology showing sheets of round blue Cells diagnosed as Round cell sarcoma

Table 4: Frequency of Histopathology Diagnosis

Histopathological Diagnosis	Number Of Cases
Spindle Cell Sarcoma	14
Round Cell Sarcoma	10
Pleomorphic Sarcoma	3
Polygonal Cell Sarcoma	2
Benign Soft Tissue Tumours	36

Table 5.Diagnostic Accuracy of FNAC In Soft Tissue Sarcoma

	Histopathology of STS	
FNAC of STS	25	1
	4	35

Diagnostic accuracy =25+35/(25+1+4+35)*100=92.3%

Table 6.Sensitivity of FNAC in diagnosing soft tissue sarcomas

	Histopathology of STS	
FNAC of STS	25	1
	4	35

Sensitivity= 25/(25+4)*100 = 86.2%

Table 7.Specificity of FNAC in soft tissue sarcoma

	Histopathology of STS	
FNAC of STS	25	1
	4	35

Specificity =35/(1+35)*100=97.2%

Discussion

Soft tissue sarcomas are a heterogeneous group of uncommon neoplasms that represent fewer than 1% of all malignancies. Soft tissue sarcomas have been diagnosed with the time-honored histopathology that is recognized as the 'gold standard' for their evaluation. However, in the current era role of FNAC in diagnosing STSs is gaining importance.Recent workers clearly established the role of cytology in this field with highly sensitive and specific tumour detection rate in their study group.[11,12]With this background, we used cytology for diagnosis of STSs in the present study. Total 65 cases of soft tissue tumours were included in this study .

Age range of the patients in our study was 1-80 years. Mean age was 28 ± 16 years. Majority of patients being in the age range of 20-40 years. In the study of Sharanabasav C et all patients ranged in age from 8 days to 80 years, with mean age of 35.01 years. Majority of patients were in the age group of 21-60 years(71%). [19]Lower extremities was the most common affected location in (35%) cases followed by upper extremities (26%)cases and head and neck (23%) cases.As most of the sarcomas cannot be accurately cytodiagnosed. Standard approach is to categorize tumours in to predominant cell type which permit initiation of theraphy in many cases i,e spindle cell, round cells, pleomorphic, myxoid and polygonal cell sarcoma.[5,6,20]

In present study cytological aspirate was divided into five cytological categories spindle cell sarcoma, round cell sarcoma, pleomorphic cell sarcoma, polygonal cell sarcoma and miscellaneous category which included benign as well as hemorrhagic aspirates. Spindle cell sarcoma accounted for most commonly diagnosed sarcoma on FNAC i,e in 11 (16%) cases in our series The results of subsequent histopathology of cytology smears showed four false negative cases in our study. Among these four false negative cases one case was missed on FNAC as the aspiration smear contained hemorrhage only. This case on subsequent histopathology was diagnosed as angiosarcoma. As we know angiosarcomas are highly hemorrhagic tumours because of their vascular origin. This may be the

reason of yielding hemorrhagic aspirate on cytology in this particular case.

There were three false negative cases of spindle cell sarcomas which were rendered diagnosis of benign spindle cell tumour on cytology. Misinterpretation of these FNAC can be due to failure to obtain adequate specimen as the needle might had missed the diagnostic cellular area of the tumour. Spindle cell sarcoma poses greatest diagnostic difficulties on cytology and has the greatest potential for false negative diagnosis due to difficulty in distinguishing benign proliferations from border line and low grade sarcomas.[20]There was one false positive case in our study in which cytodiagnosis of spindle cell sarcoma was made which on subsequent histopathology came out to be a case of fibromatosis. This is a commonly reported mistake and occurs due to high cellular yield, pleomorphism and increased mitotic rate of the aspirates from fibromatosis.[22,13]Among various cytological categories our study showed similar results between cytological and histopathological diagnosis in case of all the round cell pleomorphic and polygonal cell sarcoma

Soft tissue sarcomas are rare malignancies with the majority of soft tissue tumors being benign in nature. Even in our study subsequent histopathology of cases showed predominance of benign cases i,e in (55% as compared to malignant one (44%) .These are consistent with the findings of other workers. [23]

Limitation of our study was that we could not exactly subtype soft tissue sarcoma on FNAC. Complex heterogeneity of STSs is known to be a limiting factor in their exact categorization. With the advent of ancillary techniques like IHC, flow cytometry, cytogenetics and molecular techniques the exact categorization of STSs is only possible if they are used on cytology smears. But this is only possible in centres where these techniques are available.There have been studies highlighting application of ancillary techniques in exact sub typing of soft tissue tumors.[24]

Since we lacked such techniques in our hospital exact categorization of sarcoma on cytology was not possible. However various studies have shown that if one is able to at the least, place the sarcoma into the proper cytomorphologic group using the approach illustrated above therapy at most institutions can proceed appropriately.[25]

Conclusion

1. FNAC is a useful procedure in pre-operative diagnosis of benign and malignant soft tissue tumors, with high sensitivity,specificity and diagnostic accuracy in soft tissue sarcomas.
2. Even though the exact typing of tumors into specific type is difficult.Cytological categorization of these malignancies according to predominant cell type will definitely help in early formulation of effective management protocols.

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