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Fine needle aspiration cytology (FNAC) of cystic soft tissue lesions and end tissue metamorphosis-a three year study

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Abstract

Objective: Superficial soft-tissue masses may be seen in clinical practice, but a systematic approach may help to achieve a definitive diagnosis or differential diagnosis for soft tissue lesions. The cystic lesions constitute a heterogeneous group with highly varied etiology, cytology and diversified histopathology. The aim of this study is to investigate the accuracy of FNAC diagnosis of varied cystic lesions of soft tissue lesions by comparing with the radiological and histopathology diagnosis.

Materials and Methods: Fine needle aspirations were done using a 22-24 gauge disposable needle and a 5cc to 10 cc disposable syringe for suction. Wet-fixed smears with isopropyl alcohol were stained with hematoxylin and eosin (HxE). Dry-fixed smears were stained with Leishman Giemsa along with Papanicolaou stains (PAP) were studied for cytological details and diagnosis. The excised surgical specimen and biopsy samples of the cases were processed routinely and stained with HxE and immunohistochemistry (IHC) panel was applied.

Results: Examined cystic soft-tissue masses were found as superficial (82%) and deep (18%). Superficial lesions were categorized into mesenchymal tumors, skin appendage lesions, tumor like lesions, pseudoudo tumoural soft tissue lesions or parasitic /inflammatory lesions. Deeper lesions with cystic presentation were mostly (74%) malignant. The differential diagnosis was done according to the age of the patient, anatomic location of the lesion, salient imaging features and clinical manifestations.

Conclusion: Although the fine needle aspiration cytology of the cystic lesions, imaging characteristics of the lesions discussed are not always corresponding to the histopathologic findings what we assume, combining them with lesion location and clinical features may allow the diagnosticians to suggest a specific diagnosis in most cases.

Keywords: FNAC, Cystic soft tissue lesions

Introduction

Cystic Soft tissue tumors are defined as nonepithelial extraskeletal tissue of the body exclusive of the reticuloendothelial system, glia, and supporting tissue of various parenchymal organs (1, 2). The absence of recognizable tissue architectural patterns in cytological preparation and in cases of inflammation, rupture and trauma makes diagnosis by FNAC more difficult. Soft tissue lesions or soft tissue tumor like cases may deceive pathologist and radiologist. This soft tissue structures known as oops lesions which are focused in this study may defined according to following the final histopathological diagnosis.

The histological subtyping of soft tissue tumors in fine-needle aspiration (FNA) smears is more reliable when dealing with well differentiated tumors showing specific cytomorphological diagnostic and immunocytochemical criteria. Conversely, poorly differentiated soft tissue sarcomas can represent a difficult diagnostic group because of lack of distinctive morphological and immunocytochemical criteria. Ancillary techniques are used in and out nowadays as diagnostic help in morphological diagnosis of soft tissue lesions. Essentially the same ancillary techniques are used for cytological as for histopathological diagnosis like after preparing cell blocks.

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The most commonly used technique is Immunocytochemistry. In addition cytogenetic and molecular biological techniques as well as electron microscopy play an important role. Techniques such as polymerase chain reaction (PCR) and fluorescence in situ hybridization have been proved to be suitable for fine needle aspiration samples (1,3,4). The technique for FNA for soft tissue tumours is the same as for other types of lesions. A good guided aspiration is essential for accurate diagnosis. Frequent problems occurring can be due to missing of the lesion altogether by aspirator and reactive changes mimicking malignant cystic sarcomas (3,4). In addition, representative diagnostic areas may be difficult to aspirate from cystic, necrotic or haemorrhagic masses

Materials and Methods

The aim of the study was to know the accuracy of Fine needle aspiration cytology for diagnosis of varied cystic lesions of soft tissue in correlation with ultrasonography and histopathology diagnosis. Aspirations were done using a 22-24-gauge disposable needle and a 5cc to 10cc disposable syringe for suction. Wet-fixed smears with isopropyl alcohol were stained with hematoxylin and eosin (HxE). Dry-fixed smears were stained with Leishman Giemsa along with PAP Stain were studied for cytological details and diagnosis. The excised surgical specimen and biopsies of the cases were processed routinely and stained with Hematoxylin and Eosin and IHC panel was applied wherever requirement was there.

Statistical Analyzes

Percent of Mean and SD values of the stains were compared and presented in the tables.

Results

Out of total 60 patients accounted for 53 lesions were benign and 7 were malignant. The 41 out of 53 benign lesions were truly cystic lesions and 12 were partly cystic and solid. All the 7 malignant lesions were partly cystic and solid. The 82% of the total lesions were superficial and 8% were deep seated. Table 1 shows the distribution and types of benign cystic lesions, table 2 points to partly cystic lesions and table 3 deals with malignant cystic lesions. Statistical analysis showed that the sensitivity of FNAC for malignant lesions was 75% and for benign lesions 97.5% (Table 4,5). Sensitivity, specificity followed by positive predictive value and negative predictive value were analyzed for both benign and malignant cystic soft tissue lesions (Table 5).

Benign cystic lesions were anechoic semi cystic to cystic lesions (Fig1-4).Partially cystic lesions had mixed echogenicity comprising of anechoic to hyperechoic regions (Fig 5). Malignant cystic lesions were mostly homogenous with cystic degeneration and increased vascularity (Fig6-7). Occurrence of oops lesion was also seen (Fig 8-9).

Table1: Classification of studied benign cystic lesion.

Type of lesion	Age	Male	Female	Location	Usg finding	Total
Ganglion cyst	20-30	5	2	Finger<foot<ankle<wrist	Thick walled anechoic lesion	07
Synovial cyst	40-50	1	1	Joints<tendon	Anechoic lesion,thick wall	02
Bursal cyst	All ages	1	2	Knee<elbow<pop fossa	Thick wall,anechoic lesion	03
Epidermal inclusion cyst	All ages	8	7	Forearm<face<neck<trunk	Thick wall,fine intermission	15
Cystcercosis	40-50	2	1	Thigh<pubic area	Anechoic lesion,cystic spaces	03
Lymphocoele	20-30	2	-	Neck	Multiple thin septa,<3 mm	02
Seroma	60-70	1	1	Thigh<forearm	Anechoic,cystic mural nodule	02
Post traumatic hematomas	30-40	4	1	Lower extremity<upper extremity<abd wall	Thick irregular valves,internal breakdown	05
Cutaneous microfilaria	20-30	-	01	Subcutaneous nodule	Distended lymphatics,anechoic lesion	01
Foreign body granuloma	20-30	01	0	Sacral region	Isoechoic lesion	01
Total		25	16			41

Table 2: Classification of studied partly cystic and partly solid lesions

Type of lesion	Age	Male	Female	Location	Total
Hidradenitis suppurata	30-40	0	1	Axilla	1
Glomus tumours	20-30	1	2	Thumb, ankle	3
Lymphangioma	20-30	1	0	Suboccipital	1
Hemangioma	<20	1	0	Face	1
Myxoma	40-50	0	1	Thigh	1
Schwannoma	40-50,	1	1	Gluteal Region, Leg	2
Neurofibroma	50-60	2		Thigh ,Shoulder	2
Giant cell tendon	20-30	1		Sheath tumour	1
Total		7	5		12

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Table 3: Clasification of studied cystic malignant lesions:

Lesion	Age	Male	Female	Location	Usg finding	Total
Synovial sarcoma	40-50	1	-	Gluteal region	homogeneously hypoechoic subcutaneous cystic mass	1
Myxoid liposarcoma	40-60	1	1	Thigh	heterogeneous echoic mass without internal hypervascularity	2
Cystic malignant nerve sheath tumour	50-60	-	1	Thigh	Heterogenous hyperechoic mass	1
Myxofibrosarcoma	40-50		1	Abdominal wall	Homogenous hypoechoic mass	1
Inflammatory MFH	30-40	01		Elbow	Complex hypoechoic mass with increased vascularity	1
Undifferentiated pleomorphic sarcoma with intense inflammation and cystic degeneration	70-80		1	Gluteal region	homogeneous echo pattern and hypoechoic margins with cystic changes and internal vascularity	1
Total		3	4			7

Table 4: Number of benign and malignant lesions cases.

	Benign Cyst	Malignant	Total
Benign	39(true negative)	2(false negative)	41
Malignant	1(false positive)	6(true positive)	7

Table 5: Statistical comparison of USG sensitivity of benign and malignant lesion cases

USG sensitivity for cystic malignant lesions	True Positive(TP)/TP+FalseNegative(FN)	75%
Specificity of Benign cystic lesions	True negative(TN)/TN+FN	97.5%
Positive predictive value of malignant lesions	TP/TP+FN	75%
Negative predictive value of benign lesions	True negative/TN+FN	90%

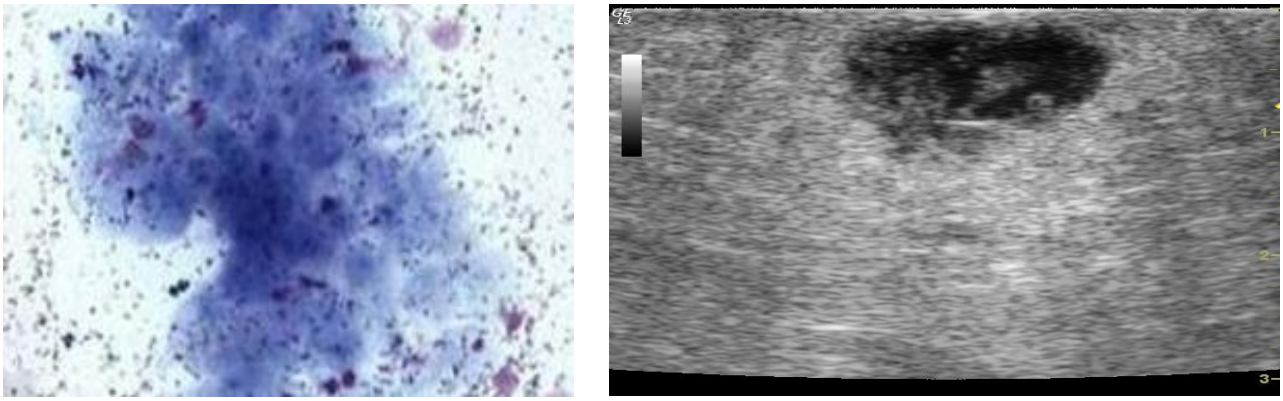

Figure 1: Cysticercosis cellulose with cyst wall in FNAC and rupture of the cystic wall on sonography.

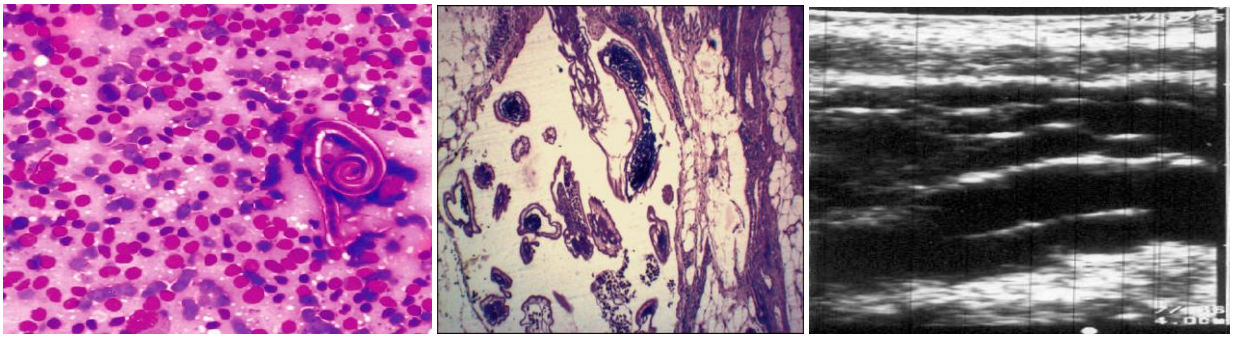

Figure 2: FNAC, HPE, USG: microfilarial worm, filarial worms were noted , lymphatics distended lymphatics in sonography in axilla-microfilaria on FNAC cystic presentation.

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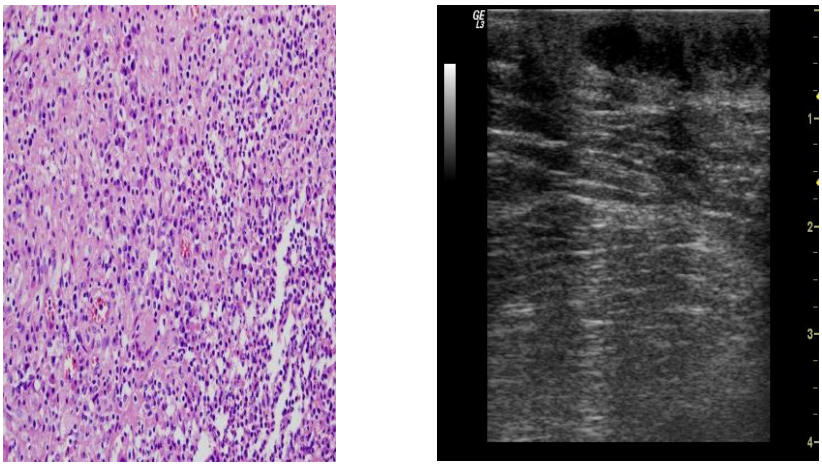

Figure 3: Lymphocoele with cystic presentation in an inflammory background with anechoicto isoechoic presentation with thin septa

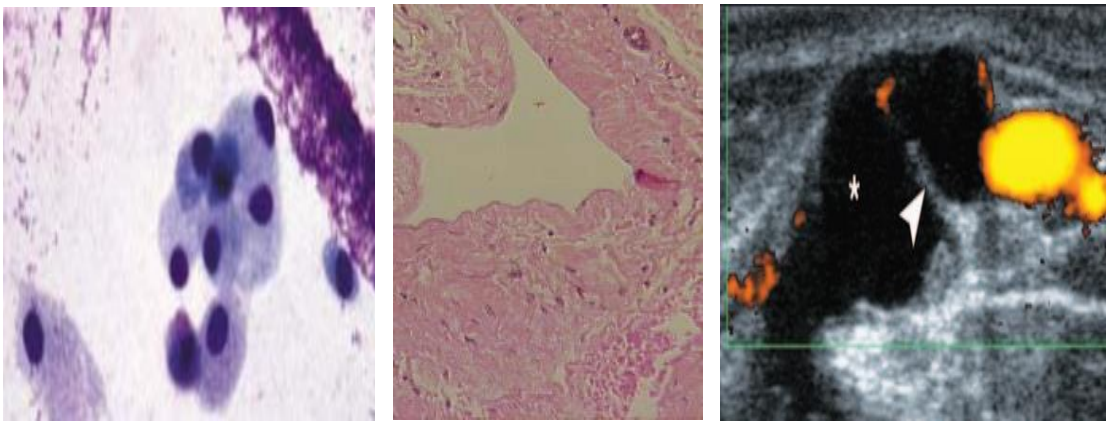

Figure 4: FNAC from ganglion cyst shows a few histiocytic like cells with pale abundant cytoplasm, myxoid background and USG shows anechoic center, thin septa (arrowhead) without increased vascularity on Doppler sonography.

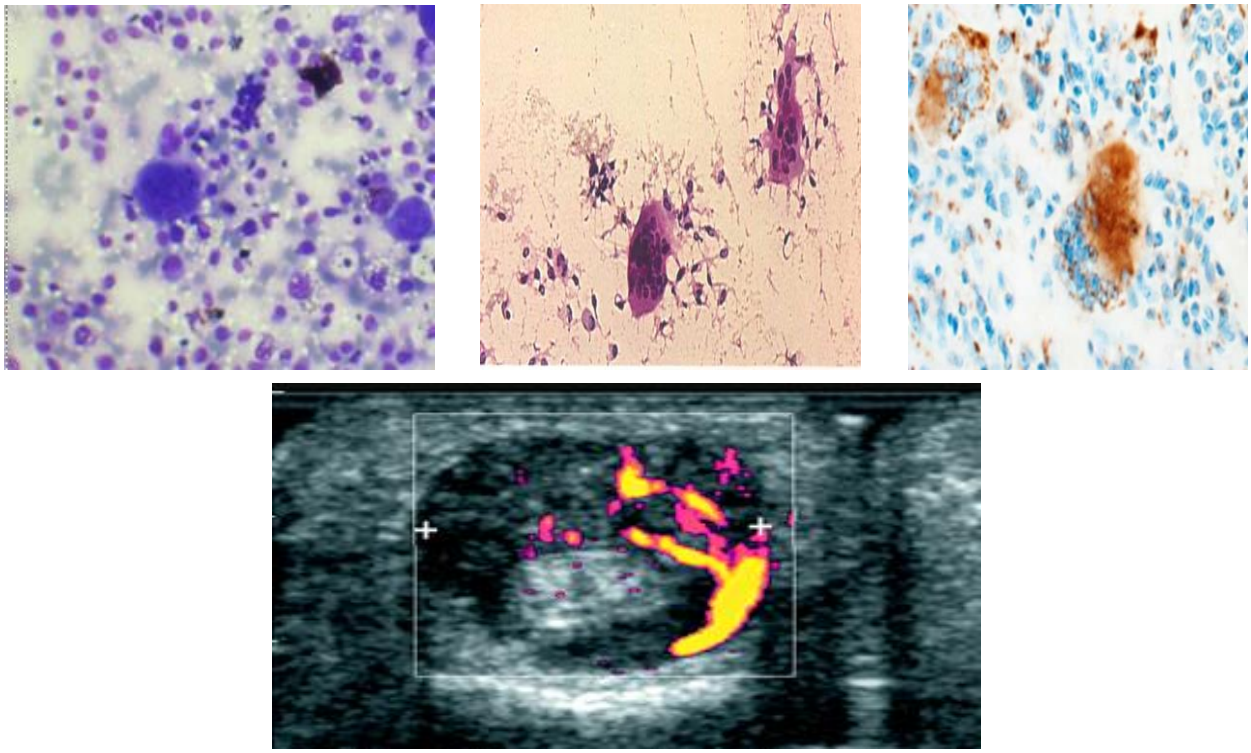

Figure 5: Giant cell tumour of tendon sheath female, index finger. FNAC shows loose clusters of spindle cells and a variable number of multinucleated giant cells with pigment (CD 68 positivity for giant cells). Transverse color power Doppler sonogram shows that tumor (*cursors*) has readily detectable blood flow located peripherally and centrally.

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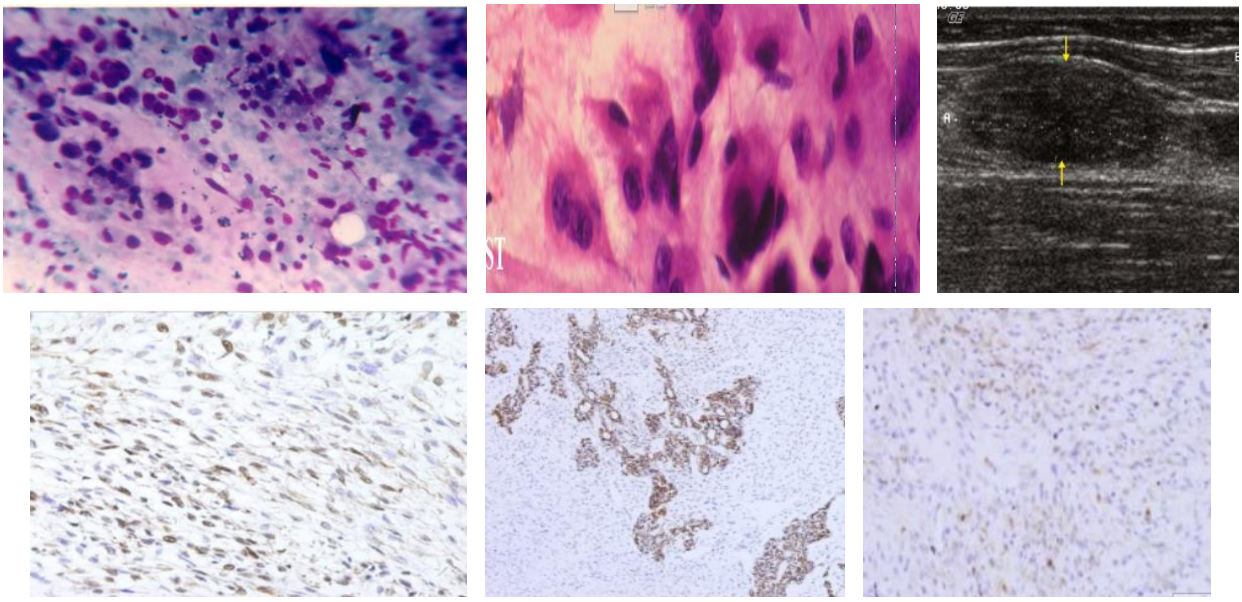

Figure 6: Malignant peripheral nerve sheath tumor (Mpnst). Cystic soft tissue swelling over forearm in 30 yr old male. Cohesive clusters and single spindle cell or pleomorphic pattern. USG shows heterogeneous hypoechoic nodule (arrows) in the left forearm with marginal infiltration. Respective spindle cell positivity for S100, Cyatokeratin and Vimentin.

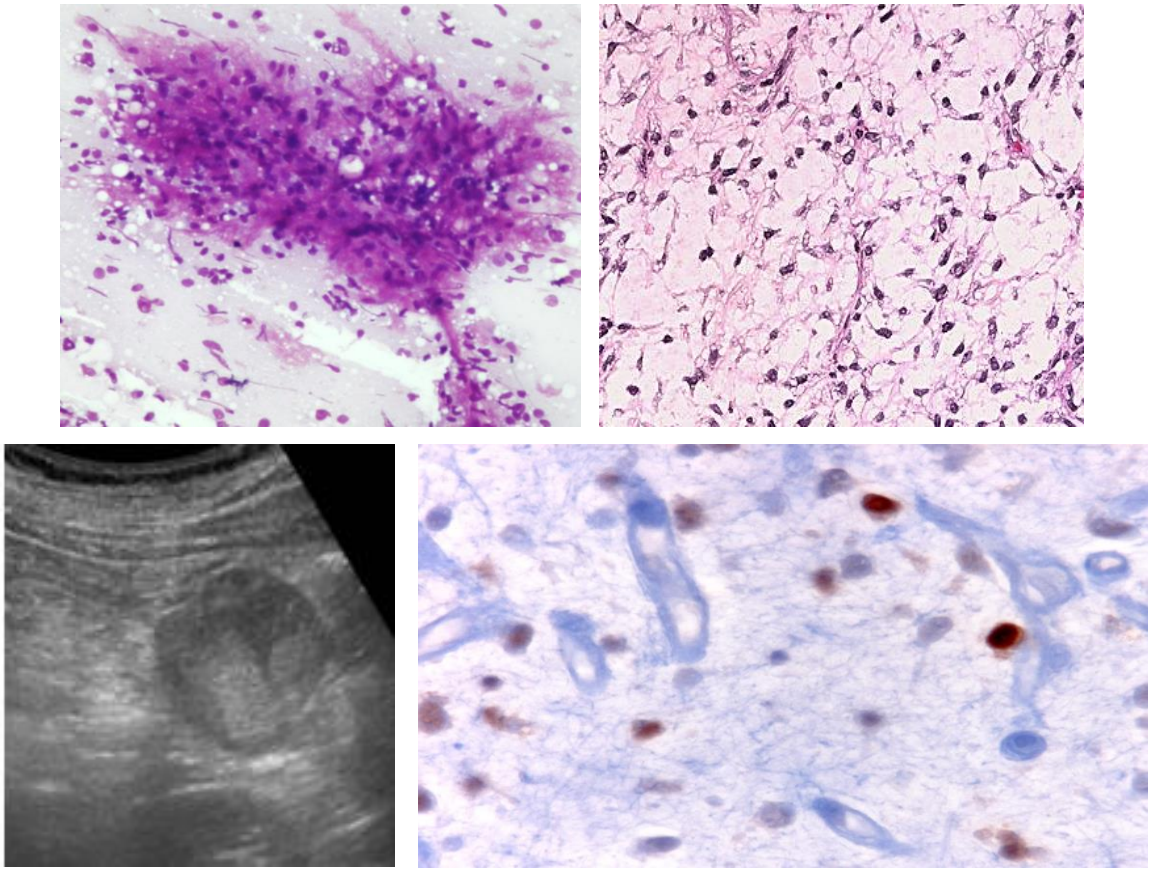

Figure 7: Myxoid stroma with plexiform capillary network,Numerous vacuolated cells. Cells have round to ovoid nuclei ,usg shows heterogeneous echoic mass without internal hypervascularity as evidenced in the color Doppler ultrasonography with S100 positivity on Immunohistochemistry

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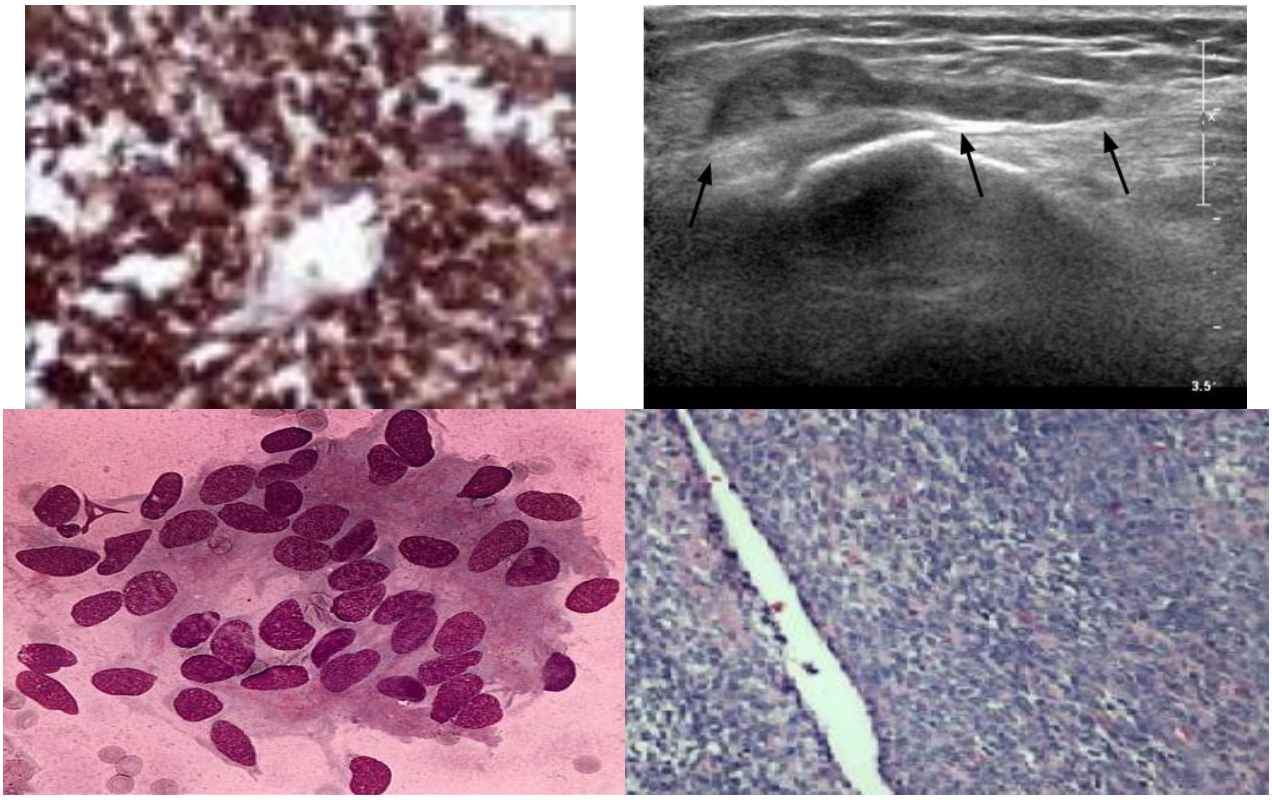

Figure 8: OOPS LESIONS, Benign Looking Malignant Lesions: Elderly female, Ultrasonography shows a homogeneously hypoechoic subcutaneous cystic mass in the lateral aspect of the left knee joint. Benign lesion was suggested.Cluster of oval to spindle cell noticed, given as malignant spindle cell lesion. Histology and IHC with cytokeratin positivity, confirmed the tumours to be cystic biphasic synovial sarcoma

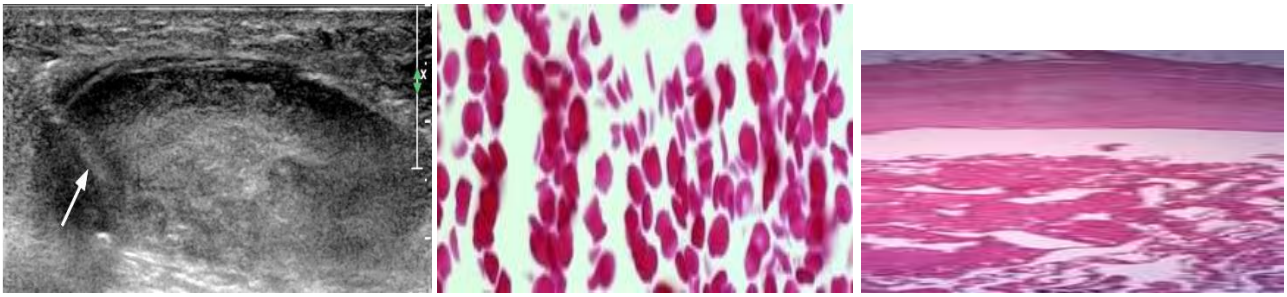

Figure 9: Malignant looking benign lesions: Ultrasonography elderly, female, shows a well-defined heterogeneously hyperechoic mass on the abdominal wall. At the corner of the mass biopsy a needle is seen. Nonneoplastic tissue with hemorrhage, fibrin exudation, and hyalinization was observed. Cystic cavity with necrotic debris, fibrin and blood clots on HPE.

Discussion

Fine needle aspiration cytology is proved to be useful and convenient method in diagnosis of cystic soft tissue tumors. It gives fairly accurate diagnosis when combined with clinical and USG findings (3,4). The concept of combining Diagnostic cytology and therapeutic surgery for soft tissue sarcoma was based on assumptions that since open biopsy is omitted contamination by tumor cells in the wound hematoma is avoided and surgical margins can be left less extensive with minor predictable loss of function (5,6). However, observed cystic changes in the tumours can hinder maliciously the real findings of the same.

There are not many published series which extensively discuss FNAC of cystic soft tissue tumors with sonographic studies (7,8,9). USG though is not gold standard but remains the most commonly used diagnostic modality due to portability, cost effectiveness and lesser time taken (12-14) .The present study showed that USG has 95% accuracy in cases of malignant tumors. Hence FNAC is a safe, useful screening test with good diagnostic accuracy when supported by other diagnostic data (9-11).

The present study, whose aim was to prove the efficacy of FNAC as a useful tool and a reliable technique in diagnosing soft tissue tumors, showed a sensitivity of 81.2%, specificity of 95.75%, positive predictive value of 81%, and negative predictive value of 92% that well correlated with other studies. Therefore, when a differential diagnosis for a cystic soft tissue mass is made, all available information should be considered, such as demographic data, laboratory findings, and findings from other imaging modalities (15-19). In addition, practitioners should be familiar with the variability in US imaging findings (20-23).

Conclusion

Fine needle aspiration cytology of cystic soft tissue tumours has important limitations. Samples may be limited in cellularity as a result insufficient for a diagnosis. There are certain neoplasms in which a benign versus malignant differentiation cannot be made with certainty from FNAC and it may be impossible to predict the grade on the basis of the cytology smears especially with spindle cell neoplasms that can be difficult in a background of cystic changes.US findings are helpful in the diagnosis of soft tissue tumors (24,25,26). However, the diagnosis of soft tissue tumours on the basis of US findings alone has some limitations. Thus, it is not unexpected that “oops lesions” are encountered during clinical practice but still from the above observations, we can conclude that FNAC of STT has several advantages that outweigh disadvantages. It is a useful, safe, cost-effective and easily performed as outpatient procedure for the evaluation of soft tissue tumors with accuracy rate at par with that of biopsy. It provides a rapid, non-traumatic procedure for sampling both superficial and deep seated mass lesion. Multiple samples can also be obtained during a single clinical visit thereby increases the likelihood of specimen adequacy for other ancillary tests. Our study proves the efficacy of FNAC in the diagnosis of soft tissue tumors as a useful cost–effective procedure as the results showed that the diagnostic accuracy of FNAC of soft tissue tumors is 95.37. In the light of all these results, the necessity of the use of differential methods beside FNAC for soft tissue lesions detection and classification should not be ignored.

Conflict of Interest: The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Author’s Contributions: RT, RSB, PG: Research concept and design, Patient examination and Sample/data collecting, **RT:** Preparation of article and Revisions. All authors approved the final version of the manuscript

Ethical issues: All Authors declare, originality and ethical approval of research. Responsibilities of research, responsibilities against local ethics commission are under the Authors responsibilities.

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