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Original Research Article

Spectrum of soft tissue lesions in upper and lower extremities on fine needle aspiration cytology: A three years' experience from Western Indian population

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ABSTRACT

Context: Soft tissue lesions have a wide spectrum which includes non- neoplastic, benign & malignant lesions. FNAC act as preliminary diagnostic tool providing a predictive diagnosis of a benign or malignant soft tissue neoplasm and thus helps for further intervention.

Aims: This study discusses the spectrum of FNAC of soft tissue lesions in upper and lower limbs.

Methods and Materials: All cytology smears of soft tissue lesions from both upper and lower limbs were included over a period of three years at tertiary care hospital.

Results: The most common age group was 31 to 40 years with male to female ratio being 1.3:1. The spectrum included broadly neoplastic (65.7%) & non-neoplastic (34.3%) cases. The neoplasms were further divided as benign (42.8 %), malignant (18.6%) and suspicious for neoplasm (4.3%) whereas (34.3 %) were non-neoplastic lesions. The most common lesion was giant cell tumor (GCT) of tendon sheath. The most common site was hand (24%) followed by feet (22.5%).

Conclusions: FNAC of soft tissue lesions is useful for differentiating various lesions and neoplasms in extremities so as to help patients in further management.

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1. Introduction

Soft tissues are the nonepithelial, extraskeletal structures and thus form the supportive tissue of various organs. Soft tissue lesions have a large heterogeneous spectrum which includes non- neoplastic, benign and malignant lesions. The benign soft tissue tumors are about ten times more common than that of malignant ones.¹ Among benign tumors, lipoma is the commonest soft tissue tumor.² Fine needle aspiration cytology (FNAC) is a painless, easily performed, rapid, safe, and cost effective diagnostic tool in the initial categorization of tumors. It is fairly specific and sensitive in the diagnoses of primary, recurrent, and metastatic tumors.³ FNAC offers several advantages as it can provide a predictive diagnosis of

a benign or malignant soft tissue neoplasm and thus helps in further intervention management.

FNAC is used as a first line investigation for tumors of breast, thyroid and lymph nodes, but for diagnosis of soft tissues tumors (STT), its role is still debated.^{4,5} In STT, FNAC plays main role for detecting suspicious recurrences or metastases. For a variety of reasons, FNA cytopathology of soft tissue remains controversial across the world. This study will discuss the spectrum of fine needle aspiration cytology (FNAC) of soft tissue lesions specifically in upper and lower limbs, including reactive non-neoplastic and neoplastic lesions over a period of three years at tertiary health care center. We also tried to correlate with the histopathology results depending upon the availability. Thus, we attempted to assess the utility of FNAC for practical purpose in soft tissue lesions of

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extremities.

2. Materials and Methods

This retrospective study was undertaken in the cytology section of Department of Pathology at tertiary care hospital. Local ethical committee sanction was obtained. The study included the cytology smears of soft tissue lesions of both upper and lower limbs received in cytology section over a period of three years from January 2017 to December 2019. Informed consent were already taken before performing each FNAC. Cases of lipoma and epidermal cysts which formed the majority of the bulk were excluded. The soft tissue lesions included neoplastic as well as non-neoplastic lesions from upper and lower limbs. Neoplastic tumors were further categorized as benign, malignant and suspicious for neoplasm. Non-neoplastic lesions included infectious and inflammatory lesions. FNA was done with 23/24G needle attached to 10mL disposable plastic syringe and material was divided into two equal parts. The air dried smears were stained with Giemsa stain and 95% ethanol fixed smears were stained with Papanicolaou stain. The cytology smears were studied and categorized as non-neoplastic, benign, malignant and unable to categorize, along with specific subtyping of the lesion. The diagnostic FNAC results from patients who underwent a subsequent surgical excision were compared for diagnostic concordance using histological parameter. For statistical purpose, SPSS software was used for analysis.

3. Results

Total 408 patients visited cytology section for FNAC of soft tissue swellings of extremities over a period of three years from January 2017 to December 2019. Of these, 244 cases of lipoma (184 in upper limbs and 70 in lower limbs) and 94 cases of keratinous cysts (42 in upper limbs and 52 in lower limbs) were excluded. Thus total 70 cases were included in this retrospective analysis with male to female ratio being 1.3:1. The age of patients vary from minimum of 8 years to the maximum of 80 years. The most common age range belonged to 31-40 years with the mean age being 43 years.

The cases were classified broadly as neoplastic (65.7%) and non-neoplastic lesions (34.3%) [Table 1]. The neoplastic lesions were further categorized as benign (65.2%), malignant (28.3%), suspicious for neoplasm (6.5%). Overall the benign tumors (42.8%) exceeded in number followed by the non-neoplastic lesions (34.3%). The benign tumours were the most common in 11 to 20 years of age group (6 out of 6 tumours) while malignant tumours were the most common in 61 to 70 years of age group (5 out of 8 tumours). Also, the non-neoplastic lesions were the most common in 51 to 60 years of age group (4 out of 9 lesions).

It was obviously noted that male patients presented with predominance of the lower limb lesions (62.5%) while the upper limb lesions were more common in females (73.3%)[Table 2]. The neoplastic lesions were slightly higher in males (54.4%) than females (42.6%). Benign neoplasms were more common in upper limb (60%) while malignant tumors were predominant in lower limbs (61.5%). Non neoplastic lesions were more common in males (62.5%) compared to females (37.5%). Infectious lesions were more common in upper limbs (5/8) while inflammatory lesions were more common in lower limbs (7/12).

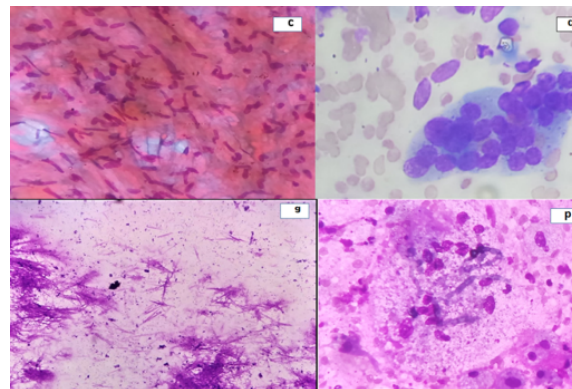


Fig. 1: a & b: Soft tissue tumor involving finger with cytological features of myxofibrosarcoma [Papanicolaou stain 400x]; **c & d:** Soft tissue tumor involving fingers with cytological features of low grade sarcoma. [Papanicolaou stain 400x]



Fig. 2: a: Cytology smear showing abundant needle shaped crystal in a case of Gout. [Papanicolaou stain 400x]; **b:** Cytology smear showing fungal hyphae, necrosis and inflammatory cells.[Papanicolaou stain 400x]; **c:** Cytology smear showing benign spindle cell lesion.[Papanicolaou stain 400x]; **d:** Cytology smear showing giant cell and background spindle cells in a case of Giant cell tumor of tendon sheath. [Giemsa stain 400x]

The upper limb lesions (N=37; 52.9%) outnumbered the lower limb lesions (N=33; 47.1%).[Table 3] The most

Table 1: Age and sex-wise distribution of cases:

Age range	Sex		Benign	Neoplasm (N=46; 65.7%)		Non-neoplastic lesions (N=24; 34.3%)	Total
	Male	Female		Malignant	Suspicious for malignancy		
1-10	0	1	0	0	0	1	1
11-20	5	3	6	0	0	2	8
21-30	7	3	6	1	0	3	10
31-40	9	8	8	1	2	6	17
41-50	6	3	5	1	0	3	9
51-60	4	5	1	3	1	4	9
61-70	7	6	3	5	0	5	13
71-80	2	1	1	2	0	0	3
Total	40 (57.1%)	30 (42.8%)	30 (42.8%)	13 (18.6%)	3 (4.3%)	24 (34.3%)	70

Table 2: Distribution of cases in male and females compared with upper & lower extremities:

Cytology diagnoses (70)		Male (N=40)		Female (N=30)	
		Upper Limb (UL) 15(37.5%)	Lower Limb(LL) 25(62.5%)	Upper Limb(UL) 22(73.3%)	Lower Limb(LL) 8(26.7%)
Neoplastic lesions (46) [25M+21F] [25UL+21LL]	Benign (30) (16M+14F) (18UL+12LL)	6	10	12	2
	Suspicious for malignancy (3) (1M+2F) (2UL+1LL)	1	0	1	1
	Malignant (13) (8M+5F) (5UL+8LL)	3	5	2	3
Non neoplastic lesions (24) [15M+9F] [12UL+12LL]	Infections (8) (5M+3F) (5UL+3LL)	2	3	3	0
	Inflammatory (12) (8M+4F) (5UL+7LL)	2	6	3	1
	Regenerative/ Reactive (4) (2M+2F) (2UL+1LL)	1	1	1	1

Table 3: Cytology diagnoses of cases in upper and lower extremities:

Total (70)	(UL+LL)	UL (N=37; 52.8%)	LL (N=33; 47.1%)
Neoplastic lesions 65.7% (25+21=46)	Benign (18+12=30)	Giant cell tumor of tendon sheath (2M, 7F) Benign spindle cell tumor (4M,4F) Benign pigmented skin lesion (1F)	Giant cell tumor of tendon sheath (3M,1F) Benign spindle cell tumor (5M,1F) Benign adnexal tumor (1M) Benign fibrohistiocytic lesion (1M)
	Suspicious for Malignancy (2+1=3)	Suspicious for low grade sarcoma (1M) Possibility of appendiceal tumor (1F)	Malignant adnexal tumor cannot be ruled out (1F)
	Malignant (5+8=13)	Low grade sarcoma (1M,1F) Pleomorphic sarcoma (1M) Atypical lipomatous tumor (1M) Malignant melanoma (1F)	Low grade sarcoma (1M) Myxoid pleomorphic sarcoma (1M) Liposarcoma (1M) Malignant melanoma (1M,1F) Giant cell rich soft tissue neoplasm (1F) Hematolymphoid malignancy (1F) High grade malignancy (sarcoma vs melanoma) (1M)
Non neoplastic 34.3% (12+12=24)	Infections (5+3=8)	Fungal abscess (1M,3F) Cysticercosis (1M)	Fungal abscess (3M)
	Inflamm-atory (5+7=12)	Inflammatory lesion (2M) Tenosynovitis (1F) Ganglion cyst (1F) Myositis (1F)	Bursal cyst (3M) Ganglion cyst (1M) Acute bursitis (1M) Gouty tophus (1M) Calcinosis cutis (1F)
	Regen-erative/ Reactive (2+2=4)	Osteoid forming lesion (1F) Reactive mesenchymal proliferation (1M)	Traumatic fat necrosis (1F) Degenerative/reactive soft tissue lesion (1M)

*M= male, F= female

Table 4: Cytology diagnosis of lesions in hand and feet:

FNAC diagnosis	Hand	Feet	Total
GCT of tendon sheath	9	5	14
Benign spindle cell tumor	3	1	4
Neoplastic lesions			
Benign adnexal tumor	0	1	1
Low to intermediate grade sarcoma	1	0	1
Low grade sarcoma, myxofibrosarcoma favored	1	1	2
Ganglion cyst	1	1	2
Fungal abscess	1	2	3
Non –neoplastic lesions			
Osteoid forming lesion	1	0	1
Bursal cyst	0	3	3
Gouty tophus	0	1	1
Degenerative /reactive soft tissue lesion	0	1	1
Total	17	16	33

#One case labelled as suspicious for low grade sarcoma on cytology was reported as synovial cyst on follow up.

§One case of fungal infection on cytology was reported as necrobiotic granuloma on histopathology. Special stains for fungus were negative.

Table 5: Histopathological follow up of soft tissue swellings of extremities:

	Total cases	HP available	Concordant	Discordant	Inadequate
Benign tumors	30	20 (66.7%)	18	2*	0
Suspicious for malignancy	03	1	-	1#	-
Malignant tumor	13	4 (38.5%)	4	0	0
Infections	8	3 (37.5%)	1	1§	1
Inflammatory lesions	12	2 (16.7%)	2	0	0
Reactive lesions	4	1 (25%)	0	0	1
Total	70	31 (44.3%)	25 (80.6%)	4 (12.9%)	2 (6.5%)

*Two cases showed minor discordance, one reported as benign fibrohistiocytic lesion on cytology turned out to be lipoma while other case reported as neurogenic tumor was pilar leiomyoma on histopathology.

common site was forearm (20%) followed by finger (15.7%) and thigh (14.2%). In the upper extremities, the benign tumors (51.35%) were the most common entity followed by non-neoplastic lesions (29.7%) while in lower limbs, benign tumors and non-neoplastic lesions were equal in numbers (36.4% each). Out of the neoplastic lesions, the benign tumours were more common in upper limbs and in females with the most common tumour being giant cell tumour of tendon sheath. [Figure 1] The malignant tumours were frequent in lower limbs and in males compared to upper limbs with sarcomas being the most common tumour. Infections were more common in upper limbs and included fungal infection as the most common infectious lesion. Strikingly all fungal lesions in lower limbs were observed in male patients. Inflammatory lesions were more common in lower limbs as well as male patients and included bursal cyst as the most common entity. The most common lesion in both male and female was Giant cell tumor of tendon sheath.

We also studied lesions in the hand and feet separately compared to rest of the extremities. In the upper limbs, 45.9 % lesions were present in hands compared to rest of upper limb lesions while in lower limbs, 48.5% lesions were present in feet compared to lower limb lesions. Neoplastic lesions were more common in hands (N=14) compared to

feet (N=8). The commonest diagnosis in hand and feet was GCT of tendon sheath (9 and 5 respectively). There were 2 cases of low grade sarcoma in hands while only one case of low grade sarcoma was observed in foot. [Figure 2]

Histopathological follow up was available in 44.3% of cases with 80.6% concordance rate [Table 5]. In addition, 3 cases had clinical follow up where in patients had not operated but the swelling remained of same size.

4. Discussion

FNAC has several advantages over open biopsy due to its cost-effectiveness and yields. Also its turnaround time helps in rapid diagnosis. It can also be used as an alternative for excision biopsy of soft tissue tumors as a diagnostic workup.⁶

Also, multiple passes performed during FNAC in various directions of the swelling helps to cover almost all representative areas of tumors helps in diagnosis.⁷ But in soft tissue tumors, role of FNAC in primary diagnosis is bit controversial. The reason being cellular composition heterogeneity, soft tissue tumors can be a source of diagnostic confusion and consternation. So it needs good experience and further studies. Cytopathology diagnosis of

soft tissue is bit challenging aspect but FNAC is very useful to differentiate benign from malignant soft tissue tumors. Though exact categorization may not be possible. Although FNAC at least helps to differentiate primary malignant soft tissue tumors from benign lesions and also other malignancies like carcinoma, metastasis and lymphomas and dermal appendageal tumors.

Roy et al.⁸ observed that benign STT were relatively common above third decade of life, while the present study they were common in 2-4th decade.

Rekhi et al. observed that the commonest age group is 21–30 years for STT which correlated with the present study.³ Soni et al had¹ the commonest age group was 21–30 years and 40–50 years for benign and malignant STT, respectively. In present study, the commonest age group was 21–40 years and 60–80 years for benign and malignant soft tissue sarcoma respectively.

The benign tumors are more common than malignant tumors,⁹ and this correlated with the present study. In present study, the commonest site was foot (25%) followed by hand (21%). For benign, most common site was hand (14%) and for malignant thigh (7%). which was in concordance with the study done by Soni et al.¹ A study by Roy et al. stated that there was nearly equal distribution for benign tumors with a slight predilection for the upper parts and for the malignant tumors the commonest site was lower extremity.⁸ In the present study, most common benign tumor was Giant cell tumor of tendon sheath. It is one of the commonest benign tumor after lipoma diagnosed on cytology, being the second most common lesion of the hand and wrist specifically.¹⁰ In the present as we have excluded lipoma, this finding was in concordance with the other studies.¹¹

In the present study we have found 18% benign spindle cell tumor. Tailor et al found 8.57% were diagnosed as benign soft tissue lesions.¹² Benign Nerve Sheath Tumor includes schwannomas and neurofibromas which are commonly aspirated for diagnosis. Aspiration from neurofibromas is usually painful. Smears show spindle cells having moderate cellularity in fibrillary background is common in both schwannomas and neurofibromas.¹³ It is noted that Nuclei of both tumors have tapering ends and have a buckled appearance. The nuclear palisading (or Verrocay bodies) favors a schwannoma over a neurofibroma but FNAC cannot help make this distinction between the two and cannot be reliably made in its absence.¹⁴

Many times FNAC helps to differentiate benign from malignant rather than a precise histological diagnosis. It is mainly based on cellularity, nuclear pleomorphism, mitosis, and necrosis. Careful evaluation is necessary to distinguish a low-grade sarcoma from a benign spindle cell neoplasm.⁴

Aspirates from malignant soft tissue tumor show spindle cell fragments with high cellularity and/or nuclear pleomorphism, hyperchromatic nuclei or anisonucleosis,

mitotic figures. Necrosis may be present. Any one of the above features should prompt an inconclusive report making histological examination mandatory for definitive diagnosis.¹⁴ In our study we found 15.7 % (11/70) malignant tumors diagnosed on FNAC which included 3 cases of Melanoma, 7 sarcoma, and 1 was hematomalymphoid malignancy.

Kilpatrick et al. observed the utility of cytology for effective diagnosis of Soft tissue tumors and its effectiveness on initial therapy in adults and pediatric soft tissue tumors.¹⁵ Rekhi et al. concluded the fair specificity and sensitivity of FNAC in STT diagnoses for primary, recurrent, and metastatic lesions and the subtypes.³ Parajuli and Lakhey also concluded with the similar findings regarding the high sensitivity of FNAC to detect benign soft tissue tumors and highly specific for malignant soft tissue tumors.¹⁶ Kulkarni et al. concluded that with relevant clinico- radiological findings FNAC of STT provided accurate diagnoses.¹⁷

In conclusion, FNAC of soft tissue lesions of extremities has a fair sensitivity and specificity when done by experienced cytopathologists and it has definite role for the management of the patient regarding further treatment or intervention.

5. Conflict of Interest

The authors declare that there are no conflicts of interest in this paper.

6. Source of Funding

None.

References

1. Soni PB, Verma AK, Chandoke RK, Nigam JS. A prospective study of soft tissue tumorshistocytology correlation. *Pathol Res Int*. 2014;p. 678628. doi:10.1155/2014/678628.
2. Tailor HJ, Bhagat VM, Kaptan K, Italiya SL, Balar HR, Agarwal MP, et al. Diagnostic accuracy of fine needle aspiration cytology in soft tissue tumors : our institutional experience. *Int J Res Med Sci*. 2013;1(4):443–7.
3. 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. doi:10.1186/1742-6413-4-20.
4. Costa MJ, Campman SC, Davis RL, Howell LP. Fine-needle aspiration cytology of sarcoma: Retrospective review of diagnostic utility and specificity. *Diagn Cytopathol*. 1996;15(1):23–32. doi:10.1002/(SICI)1097-0339(199607)15:1<23::AID-DC6>3.0.CO;2-R.
5. Silverman JF, West RL, Larkin EW, Park HK, Finley JL, Swanson MS, et al. The role of fine-needle aspiration biopsy in the rapid diagnosis and management of thyroid neoplasm. *Cancer*. 1986;57(6):1164–70.
6. Bennert KW, Abdul KFW. Fine needle aspiration cytology versus needle core biopsy of soft tissue tumors - a comparison. *Acta Cytol*. 1994;38(3):381–4.
7. Khalbuss WE, Teot LA, Monaco SE. Diagnostic accuracy and limitations of fine-needle aspiration cytology of bone and soft tissue lesions: A review of 1114 cases with cytological-histological correlation. *Cancer Cytopathology*. 2010;118(1):24–32.

8. 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(1):37–40.
9. Rosenberg AE. “Bones, joints, and soft-tissue tumours editors,” in Robbins’s and Cotran Pathologic Basis of Disease. In: Kumar V, Abbas A, Fausto N, Aster J, editors. 8th Edn. Saunders, Philadelphia, Pa, USA; 2010. p. 235–49.
10. Plate AM, Lee SJ, Steiner G, Posner MA. Tumorlike lesions and benign tumors of the hand and wrist. *JAAOS-J Am Acad Orthop Surg.* 2003;11(2):129–41.
11. Wakely PE, Frable WJ. Fine-needle Aspiration Biopsy Cytology of Giant-cell tumor of Tendon Sheath. *Am J Clin Pathol.* 1994;102(1):87–90.
12. Tailor HJ, Bhagat VM, Kaptan KB, Italiya SL, Balar HR, Agarwal MP, et al. Diagnostic accuracy of fine needle aspiration cytology in soft tissue tumors: our institutional experience. *Int J Res Med Sci.* 2013;1(4):443–7.
13. Dahl I, Hagmar B, Idvall I. Benign solitary neurilemmoma (Schwannoma): A correlative cytological and histological study of 28 cases. *Acta Pathol Microbiol Immunol Scand A.* 1984;92(2):91–101.
14. Iyer VK. Cytology of soft tissue tumors: Benign soft tissue tumors including reactive, nonneoplastic lesions. *J Cytol.* 2008;25(3):81–6. doi:10.4103/0970-9371.44034.
15. Kilpatrick SE, Cappellari JO, Bos GD, Gold SH, Ward WG. Is fine-needle aspiration biopsy a practical alternative to open biopsy for the primary diagnosis of sarcoma? Experience with 140 patients. *Am J Clin Pathol.* 2001;115(1):59–68.
16. Parajuli S, Lakhey M. Efficacy of fine needle aspiration cytology in diagnosing soft tissue tumors. *J Pathol Nepal.* 2012;2(4):305–8.
17. Kulkarni DR, Kokandakar HR, Kumbhakarna NR, Bhople KS. Fine needle aspiration cytology of soft tissue tumours in correlation with histopathology. *Indian J Pathol Microbiol.* 2002;45(1):45–8.

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