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Original Research Article

The Use of Fine Needle Aspiration Cytology (FNAC) for the Identification of Soft Tissue Cancers and Lesions that Resemble Malignancies

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Abstract

Background: Soft tissue tumors are a diverse category of lesions that develop from the body's extraskeletal non-epithelial tissue. In a hospital population, benign tumors outnumber malignant ones by a factor of ten. Due to their incredibly diverse shape, it is questionable whether or not soft tissue tumors should be evaluated with fine needle aspiration cytology (FNAC). The primary objective was to assess the value of FNAC as a standard method for identifying soft tissue cancer, and, 2. To assess the diagnostic precision and relationship between cytomorphological and histomorphological traits.

Methods: The cytological examination of FNAC conducted on soft tissue cancers reported to Jannayak Karpoori Thakur Medical College and Hospital, Madhepura in over a 1-year period is the subject of this retrospective study. Evaluation and correlation of the histomorphological characteristics of the biopsies taken with FNAC results. The patient records contained pertinent clinical information that was collected.

Results: 172 (91.5%) of the 200 cases of soft tissue tumors examined were benign, 25 (8.1%) were malignant, and 3 (0.4%) were inconclusive. Lipoma and its variations made up the majority of benign tumors (82%), while Pleomorphic sarcoma made up 19.4% of malignant cases. In malignant patients, cytohistomorphological correlation was 99% concordant, and one case that had been initially diagnosed as benign turned out to be malignant after the biopsy.

Conclusion: A safe and affordable diagnostic method called FNAC can pretty accurately correlate the histomorphology of soft tissue cancers.

Keywords: FNAC, Benign Soft Tissue Tumor, Malignant.

Introduction

According to definitions, soft tissue is "the complex of non-epithelial extra-skeletal structures of the body exclusive of the supporting tissue of the various organs and the hematopoietic/lymphoid tissue," which comprises fibrous (connective) tissue, adipose tissue, skeletal muscle, blood and lymph arteries, and peripheral nervous system. It is generated from mesoderm embryologically, with a contribution from

neuroectoderm that corresponds to the peripheral nerves [1].

Soft tissue tumors (STT) are a diverse category of lesions that develop from the body's nonepithelial extraskeletal tissue. Malignant tumors are 100 times less common than benign tumors (2; Figure 1). Due to their variable appearance, poor tissue architecture, and rarity, a routine light microscopic investigation is frequently insufficient to diagnose these tumors.

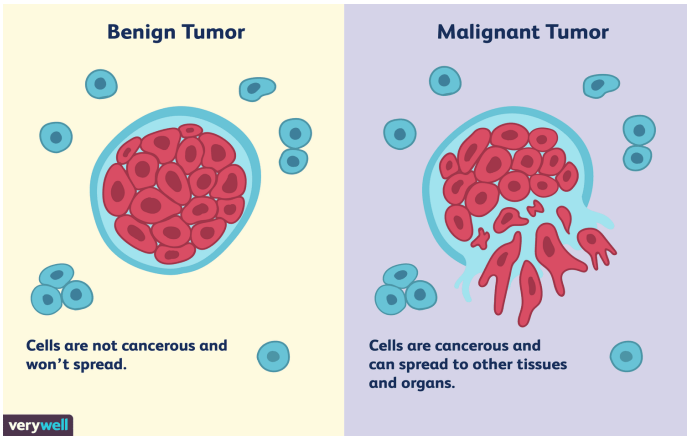

Figure 1: Benign tumor and Malignant tumor

Other diagnostic techniques, including histochemistry, immunohistochemistry, and molecular analysis, are frequently used to arrive at a final diagnosis. Due to their incredibly diverse shape, it is questionable whether or not soft tissue tumors should be evaluated by fine needle aspiration cytology (FNAC). Nonetheless, with reasonably acceptable outcomes, FNAC has been employed more frequently since the 1980s in the diagnostic workup of STTs. One of the preferred initial investigations even when evaluating STT is FNAC due to its additional benefits, including being a quick, easy, and less painful outpatient procedure that doesn't require a lengthy patient stay compared to core needle biopsy and open biopsy, as well as the availability of the material for ancillary techniques [3].

The purpose of the current study is to investigate the nature of various soft tissue tumors by FNAC, as well as to assess the diagnostic precision and relationship between cytomorphological and histomorphological aspects.

Methods

A retrospective study in which all FNACs conducted on soft tissue tumors reported to our institute over a five-year period were examined. Before the study began, the institutional ethical committee granted its approval. A 20-gauge needle and a 15-ml syringe were used to do FNACs, and suction was employed as needed.

The Leishman stain was applied to air-dried smears, and Pap Haematoxylin and Eosin (H&E) stains were applied to alcohol fixed smears. Slides were collected, and a thorough cytomorphological analysis was performed. The executed relevant biopsies' histomorphological characteristics were assessed and the results of the FNAC were correlated. The patient's clinical records were consulted for pertinent clinical information. MS Excel was used to compile and evaluate the data.

Results

200 soft tissue tumour cases were investigated during the study period, and 200 cases of FNAC were performed on. Among the 200 cases, 172 (91.5%) were benign, 25 (8.1%) were malignant, and 3 (0.4%) were inconclusive. Medical records were used to acquire the clinical information for these. It was noted that the occurrence of these lesions varied greatly from the first to the seventh decade (in the age range of 1 year to 77 years).

Age groups between 21 and 30 years old accounted for 90 instances (22.33%) and 120 cases (30.57%) of the 52.90% of cases that were benign lesions. Malignant lesions had 1 peak each between the ages of 11 and 20, and between 60 and 70 (22.20%). Two cases, aged 35 and 41, were reported as being inconclusive.

Table 1: Distribution of Tumor on the basis of different Age Groups

Age in years	Benign	Malignant	Inconclusive
1-10	3	4	-
11-20	35	1	-
21-30	90	1	-
31-40	25	2	2
41-50	10	2	2
51-60	35	2	-
61-70	14	7	-
71-80	2	2	1

Male patients outnumbered female patients in both benign and malignant lesions, with a ratio of 1.32:1 for benign cases and 1.24:1 for malignant ones. Both of the cases listed as being inconclusive involved men.

The upper extremities (160 cases, 40.03%), the trunk (76 instances, 28.3 %), lower extremities (90 cases, 22.0%), and the head and neck region (38 cases, 9.4%) all had a higher prevalence of benign lesions. Malignant lesions most frequently appeared on the trunk in 13 instances (38.7% of the total), followed by the upper and lower extremities in 8 (24%) and 7 (22.1%) cases, respectively, and the head and neck in 4 (13.8%) cases. The upper extremities were involved in both cases that were deemed inconclusive [Table 2].

Table 2: Soft Tissue Tumor Anatomical Distribution on FNAC

Site	Benign	Malignant	Inconclusive
Head & Neck	33	4	0
Trunk	38	13	0
Upper Extremities	82	8	1
Lower Extremities	37	7	0

Lipomas made up the majority of benign lesions, accounting for 142 (82%) cases. Benign spindle cell lesions came in second with 38 (7%) occurrences, followed by hemangiomas and neurofibromas with 7 (1.8%) cases each. Giant cell tumors of the tendon sheath occurred in 4 (1.1%) instances, lymphangiomas in 3 (0.96%), desmoids in 2, nodular fasciitis in 2, and inflammatory pseudotumors in 2. Small round cell tumors

made up 7 (22.21%) of all malignant tumor cases, followed by malignant spindle cell lesions and fibrosarcoma. Pleomorphic sarcoma was identified in 4 (13.87%) of the cases, whereas rhabdomyosarcoma, granular cell tumor, synovial sarcoma, and osteogenic sarcoma were identified in 1 (5.4%) of the cases each. Two (2.7%) cases each of liposarcoma and malignant peripheral nerve sheath tumor were reported.

There were 140 instances with accessible histopathological correlation, 132 benign and 8 malignant. The eight malignant cases all agreed with the histology. Two cases in which FNAC revealed tiny round cell tumours were ultimately found to be rhabdomyosarcoma and Ewing's sarcoma. In histology, there were two cases of each of granular cell tumour, malignant fibrous histiocytoma, and rhabdomyosarcoma. One example that was initially diagnosed as a malignant spindle cell lesion was actually a malignant peripheral nerve sheath tumour. 2 case of pleomorphic sarcoma was actually rhabdomyosarcoma, and another instance of fibrosarcoma was actually myxofibrosarcoma upon biopsy.

110 cases of lipoma, 2 cases of schwannoma, 1 case of giant cell tumour, 1 case of neurofibroma, 1 case of nodular fasciitis, 2 cases of lymphangioma, 2 cases of inflammatory pseudotumor, and 1 case of desmoid were reported as the same in histopathology among the 132 benign cases for which there was available histopathological correlation. On FNAC, 11 instances were identified as benign spindle cell lesions; however, histology revealed that 3 cases were fibromatoses, 1 was a schwannoma, and 2 were spindle cell lipomas. Two instances had discrepancies; one had low-grade myxofibrosarcoma and the other two had protruding dermato-fibrosarcomas. On histology, one instance that was unresolved on FNAC was identified as dermatofibrosarcoma protuberance.

The total diagnostic accuracy is 97.92%, with malignant tumours having a 99% accuracy rate and benign tumours having a 97.78% accuracy rate. Both sensitivity and specificity are 100% overall. 99% of predictions are positive, whereas 97.78% of predictions are negative.

Discussion

Soft tissue tumours are a highly heterogeneous group of tumours that are categorised histologically based on the adult tissue they resemble. These tumours are typically divided into benign and malignant variants as well as a borderline variant, the malignant potential of which is difficult to understand. Due to the variety of the tumours as well as their rarity, STTs are challenging to diagnose. The histopathological analysis, which needs an open/incisional biopsy or a core needle biopsy, is typically used to make the final diagnosis of STT. Unfortunately, surgical biopsies cannot be performed as an outpatient operation since they can result in local issues after surgery, such as infections or hematomas, and it takes longer for the results to be available. Core needle biopsy is an outpatient treatment that requires local anaesthesia. There is a high risk of bleeding after the procedure and the development of hematomas. Also, since the biopsy must be processed like any other biopsy, there is a danger of missing the lesion. On the other hand, FNAC can be performed as an outpatient operation that is quick, simple, and relatively painless. Moreover, many passings can be performed in various directions to gather representative material.

Yet, it is possible to entirely miss the lesion or to aspirate only inadequate material, leading to a misleading or equivocal diagnosis. The yield of material is improved by FNAC and radiological guidance, and the material produced by FNAC can be used for cytochemical examination. Hence, FNA is highly helpful in providing a preliminary

picture that will be very helpful for the doctor to successfully design the treatment [1,3,4]. The number of benign cases outweighed the number of malignant cases, which is comparable to studies by Soni PB *et al* [5], Tailor HJ *et al* [6], Vijayabarathi *et al* [7], and Beg *et al* [8], in which the ratio of benign to malignant tumours was 95.3%: 3.34%, 93.58%: 6.42%, 83.3%: 16.7%, and 83.3%: 16.7%, respectively. However, it was discovered in a study by Bharath Reki *et al* [9]. that 7.9% of cases were benign and 79.5% were malignant. That may be due to the study being conducted in a facility with a high volume of referrals for cases with cancer.

In this study age distribution of soft tissue tumours as diagnosed by FNAC showed benign tumours more common in the age group 21-40 years comprising 52.90% 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 tumours were more commonly seen in the age group 21-40 years. However, in research by Paul *et al* [14]. and Chatura *et al* [15], it was found that benign tumours were more prevalent in the fifth decade.

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According to studies by Chandrakar *et al*., [10] Soni PB *et al*., [11] Tailor HJ *et al*., [12] and Mandakini P *et al* [13], benign tumours were most frequently found in the upper extremities (40.03%), followed by the trunk and lower extremities, and the head and neck region was the least common site (9.4%). With 38.8% of all malignant cases occurring in the trunk, this study's findings are comparable to those of Soni PB *et al*., [5] Vijayabarathi *et al*., [7] and Roy *et al* [16].

As compared to other studies [5–12], lipomas and benign spindle cell lesions were the most prevalent benign tumours found in our investigation. In our investigation, small round cell tumours were the most typical malignant tumour found. Studies by Chandrakar *et al* [10] Beg *et al* [8] and Hirachand *et al* [10] made comparable observations [17-19] However, Hasan J *et al* [11] and Bharat Reki *et al*. reported that rhabdomyosarcoma was the most typical malignant tumour they had seen [9]. The study's overall accuracy rate is 97.92%, compared to studies [10–16] with diagnoses accuracy rates of 90%, 98%, 86.9%, 95.37%, 97%, 90.8%, 98%, and 95%, respectively. Diagnosis accuracy for malignant tumours in the study is 99%, while benign tumours are 97%. Our study's 99% sensitivity and 97.3% specificity can be contrasted to the findings of studies [5–19] that had sensitivity and specificity of 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% correspondingly.

Our study has a 99% positive predictive value and a 97.78% negative predictive value, which is similar to the study by Soni PB *et al*. [5], in which the values are 100% and 97.9%, respectively. Positive predictive value in a study by Beg *et al* [8] was 97.2%, and negative predictive value in a study by Arul

P *et al* [12] is 98.9%, both of which are comparable to our work.

Conclusion

The safe and inexpensive diagnostic method known as FNAC may rather effectively correlate the histomorphology of soft tissue tumors. While roughly half of the people with DPN exhibited symptoms, even though a specific diagnosis may not always be possible, FNAC can be used as a reliable diagnostic method for preoperative workup with fair sensitivity, specificity, and accuracy.

Urinary albumin and greater HbA1c levels were linked to an increased risk of DPN. Early diagnosis can be aided by the use of urine albumin and HbA1c point-of-care assays. Those who were less educated had diseases for longer periods of time or had PVD were also more likely to develop DPN. Primary care physicians should check for DPN if there are symptoms and risk factors present. Simple foot exams, such as inspection of the feet, testing of sensation, pulse palpation, and reflex testing, should be performed routinely on all diabetic patients who visit primary health centers. This will aid in the early diagnosis and prompt treatment of the patients, reducing ulceration and amputation.

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