

Diagnostic Accuracy of FNAC in Tuberculosis Cervical Lymphadenitis- Experience from a Tertiary Care Centre

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Abstract

Objective: To analyze the role of Fine Needle Aspiration Cytology (FNAC) in the detection of tuberculous cervical lymphadenitis.

Methods: A retrospective cross-sectional study was carried out at the Dr. Ruth K. M. Pfau Civil Hospital Karachi's ENT-Head and neck surgery department, from April 2021 till March 2022. Patients with ages between 30-70 years having cervical lymphadenopathy lasting for more than or equal to 3 months and having 1 or more palpable lymph nodes of more than or equal to 1 cm were included in the study. A questionnaire was designed for data collection from the patients. The names, ages, gender of the patients, the duration of disease noted down. The dominating nodes' FNAC and ultrasound neck were done. Inconclusive FNAC were followed by excisional biopsy. The sample size was taken as 50, with analysis done through SPSS version 23.

Results: There were 34 (64%) females and 16 (32%) males present. The patients' average age was 52.94 ± 9.43 years; 33 patients were below the age of 55, out of which 25 (75.7%) had positive and 8 (24.2%) had negative FNAC. Of the patients over the age of 55, 11 (64.7%) had positive and 6 (54.5%) had negative FNAC. The illness lasted 5.84 ± 2.63 months on average, 2 months being the minimum duration of disease, while maximum duration was 15 months. The duration of less than or equal to six months was observed in 40 (80%) and the duration of more than 6 months was observed in 10 (20%) of patients. With a mean size of 2.5 ± 1.14 cm, 29 patients (58%) had unilateral nodes and 21 (42%) had bilateral nodes. FNAC has a sensitivity of 97% and specificity of 72.2%, meaning that it was positive in 36 individuals and negative in 14.

Conclusion: FNAC plays a significant role in the diagnosis of tuberculous cervical lymphadenitis.

Keywords: Cervical lymphadenitis, Tuberculosis, FNAC.

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Introduction

One of the earliest known diseases to affect humans is believed to be tuberculosis (TB). Its is one of the global health problem¹. It is an infection that enters the body through the lungs, caused by *Mycobacterium tuberculosis*², and causes severe coughing, fever, and chest pain³. But it also has

an impact on other body organs and causes a range of symptoms. Cervical lymphadenopathy is a prevalent clinical condition. It is one of the main causes of swollen lymph nodes in emerging nations⁴. Additionally, it is the most prevalent type of extra pulmonary tuberculosis.

The clinical course of TB has shown a remarkable change when it is associated with HIV infection. It was reported that the frequency of extra pulmonary TB is more in patients with HIV. But the exact phenomenon by which this happens is still not known. It is also not clear as to what exactly causes the increase in extra-pulmonary forms; i.e., whether that is due to problems related to sputum examination or true change in epidemiological trends.

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It is still difficult to diagnose tuberculous cervical lymphadenitis, even with advances in diagnostic tools. The explanation for this is that tuberculosis produces contradictory physical and laboratory results and resembles other disease conditions. Before a biopsy and culture can confirm the diagnosis, a thorough history and physical examination, a tuberculin test, staining for acid-fast bacilli, radiographic examination, fine-needle aspiration, and PCR can all be useful in reaching an early diagnosis and starting treatment. However, the development of fine needle aspiration and cytology has simplified the study of cervical lymphadenopathy because these techniques provide a fast, accurate, and affordable means of diagnosis. A study by Paliwal Nidhi et al. confirmed that FNAC is a very sensitive test for tuberculous lymphadenitis⁵. The purpose of this study was to examine how fine needle aspiration cytology may be used to identify patients with palpable neck nodes in our community who had tuberculous cervical lymphadenitis.

Methodology

This study, which lasted a year from April 2021 to March 2022, was a retrospective cross-sectional investigation carried out at the ENT Head and Neck Surgery Department, Dr. Ruth K. M. Pfau Civil Hospital Karachi.

The patients selected were from both genders with age between 30 – 70 years, having cervical lymphadenopathy lasting for more than or equal to 3 months and having 1 or more palpable lymph nodes of more than or equal to 1 cm. Patients having a history of tuberculosis in the past, those who have used anti-tubercular drugs, have suspicion of metastatic or malignant lesions and those not giving consents for study were excluded.

The patients presented to the ENT OPD meeting the inclusion criteria were enrolled by the Principal investigator (PI). Data has been collected via a questionnaire. The names, ages, gender of the patients, the duration of disease noted down. Ultrasound neck of the patients conducted by consultant radiologist and neck nodes confirmed. FNAC of the dominant nodes was performed using a 23- gauge

needle by the interventional radiologist, who was a specialist in doing it. Epithelioid cell granuloma and caseous necrosis were defined as Tuberculous cervical lymphadenitis. FNAC was followed by excisional biopsy by a senior ENT consultant under supervision of the PI. The histopathological reports collected and important findings added in the questionnaire. Patients with FNAC diagnostic of TB are not further subjected to excisional biopsy in our setting. The excisional biopsy is done only if patients have inconclusive FNAC.

The sampling technique used was a non-probability consecutive technique. The calculations were done using a sample size calculator. Taking the patient proportion of tuberculous cervical lymphadenitis as 15, confidence level 95% and margin of error 10%, the sample size calculated to be **50**.

With SPSS version 23, data analysis was carried out. The mean \pm standard deviation was computed based on the patients' age and illness duration. For gender, unilateral, bilateral nodes, FNAC, and histology results, frequency and percentages were computed. Using histopathology as the gold standard, the following metrics were derived for FNAC: sensitivity, specificity, positive predictive value, and negative predictive value. To regulate effect modifiers, age, length of illness, and lymph node size were stratified.

Results

In total, fifty patients were included in the research. The patients' mean age was 52.94 \pm 9.43 years (95% Confidence Interval: 50.26-55.62). Out of 50 patients there were 33 (66.0%) patients of age less than or equal to 55 years and 17 (33.0%) of patients were over 55 years.

Table 1. Diagnostic accuracy of FNAC in two different age groups

Age Group	FNAC	Histopathology		Total
		Positive	Negative	
<55 years	Positive	20	5	25
	Negative	0	8	8
	Total	20	13	33
Age Group	FNAC	Histopathology		Total
>55years	Positive	11	0	11
	Negative	1	5	6
	Total	12	5	17

Age stratification revealed that, of 33 patients under the age of 55, 25 (75.7%) had positive and 8 (24.2%) had negative FNAC; True positive (TP), False positive (FP), False negative (FN), and True negative (TN) were 20, 5, 0 and 8 cases, respectively; sensitivity, specificity, positive predictive value, and negative predictive value were found to be 100%, 61.5%, 80%, and 100%, respectively. Of the patients over the age of 55, 11 (64.7%) had positive and 6 (54.5%) had negative FNAC; TP, FP, FN, and TN were identified as 11, 0, 1, and 6 cases, respectively; sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were found to be 91.61%, 100%, 100%, and 83.3%, respectively.

Mean duration of disease was 5.84±2.63 months with 95% CI (5.09-6.59), 2 months being the minimum duration of disease, while maximum duration was 15 months. The duration of less than or equal to six months was observed in 40 (80%) and the duration of more than 6 months was observed in 10 (20%) of patients.

Table 2. Diagnostic accuracy of FNAC as per duration of disease

Duration of disease	FNAC	Histopathology		Total
		Positive	Negative	
<6 months	Positive	21	5	26
	Negative	1	13	14
	Total	22	18	40
>6 months	Positive	10	0	10
	Negative	0	0	0
	Total	10	0	10

26 (65%) of the 40 patients were positive on FNAC, and 14 (35%) were negative on FNAC, based on the stratification of patients with a disease duration of less than or equivalent to six months. There were 21, 5, 1, and 13 cases for TP, FP, FN, and TN, in that order. Positive predictive value (NPV), specificity, sensitivity, and specificity were determined to be 95.45%, 72.2%, 80.7%, and 92.8%, respectively. In ten patients whose illness had lasted longer than six months, there were no negative FNAC cases. There were 10 (100%) true positives and no FP, FN, or TN instances. Table 2's several cells were empty, making it impossible to

calculate the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV).

There were 16 (32%) males and 34 (64%) females, and the male to female ratio was 1:2.1. On stratification of gender out of 16 male patients' total number of positive cases on FNAC was 14 (87.5%) and negative were 2 (12.5%) cases. There were 13, 1, 0, and 2 cases for TP, FP, FN, and TN, respectively. Positive predictive value (PPV), sensitivity, specificity, and NPV were determined to be 100%, 66.6%, 92.8%, and 100%, respectively. Of the 34 female patients, 22 (84.7%) had good results on the FNAC, while 12 (35.3%) had negative results. There were 18, 4, 1, and 11 cases for TP, FP, FN, and TN, in that order. The results showed that the sensitivity, specificity, negative predictive value (NPV), positive predictive value (PPV), and 81.8%, 91.6%, and 73.3%, respectively, were obtained.

Table 3. Diagnostic accuracy of FNAC as per gender distribution

Gender	FNAC	Histopathology		Total
		Positive	Negative	
Male	Positive	13	1	14
	Negative	0	2	2
	Total	13	3	16
Female	Positive	18	4	22
	Negative	1	11	12
	Total	19	15	34

Overall, the FNAC was positive in 36 (72%) and negative in 14 (28%) patients. True positives were 31 and false positives were 5. False negative was 1 and true negative were 13 patients. The FNAC had a sensitivity of 97%, specificity of 72.2%, positive predictive value (PPV), and negative predictive value (NPV) of 86.1%, respectively.

The lymph node measured 2.50 + 1.14 cm on a confidence interval of 2.17 - 2.83. The maximum size was 5 cm and the minimum size was 1 cm. The size of lymph nodes less than or equal to 2 cm and more than 2 cm were equally distributed, containing 25 (50%) patients each. Unilateral distribution of nodes was noted in 29 (58%) and bilateral distribution of nodes in 21 (42%) of cases.

Using classification based on lymph node size, out of 25 instances, 17 (68%) had positive FNAC results, while 8 (32%), negative results. There were 16, 1, 0, and 8 cases for TP, FP, FN, and TN, in that order. Positive predictive value (PPV), sensitivity, specificity, and NPV were determined to be 100%, 88.8%, 94.1%, and 100%, respectively. 6 (24%) and 19 (76%) of the 25 instances of size > 2 cm were negative FNAC cases. The cases for TP, FP, FN, and TN were 1, 4, 1, and 5, in that order. Positive predictive value (NPV), specificity, sensitivity, and specificity were determined to be 93.75%, 55.5%, 78.9%, and 83.3%, respectively.

Table 4. Diagnostic accuracy of FNAC as per size of lymph node

Size of lymph node	FNAC	Histopathology		Total
		Positive	Negative	
<2 cm	Positive	16	1	17
	Negative	0	8	8
	Total	16	9	25
Age Group	FNAC	Histopathology		Total
		Positive	Negative	
>2 cm	Positive	15	4	19
	Negative	1	5	6
	Total	16	9	25

Regarding the FNAC's diagnostic accuracy in relation to lymph node distribution, it was shown that, of 29 patients with unilateral lymph node distribution, 23 (79.3%) had positive results and 6 (20.6%) had negative results. There were 21, 2, 0 and 6 cases for TP, FP, FN, and TN. Positive predictive value (PPV), sensitivity, specificity, and NPV were determined to be 100%, 75%, 91.3%, and 100%, respectively. Of the 21 individuals whose lymph nodes were distributed bilaterally, 13 (61.9%) had positive FNAC results, while 8 (38.09%) had negative results. There were 10, 3, 1, and 7 cases for TP, FP, FN, and TN, respectively. 90.90%, 70%, and 76.9% were determined to represent the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV).

Table 5. Diagnostic accuracy of FNAC as per lymph node distribution

Lymph node distribution	FNAC	Histopathology		Total
		Positive	Negative	
Unilateral	Positive	21	2	23
	Negative	0	6	6
	Total	21	8	29
Bilateral	FNAC	Histopathology		Total
		Positive	Negative	
Bilateral	Positive	10	3	13
	Negative	1	7	8
	Total	11	10	21

Discussion

All six global areas are experiencing a decline in the incidence of tuberculosis due to the global coordination of control efforts. But the HIV pandemic-related TB disease burden continues to be at historically high levels^{6, 7}. Strong laboratory networks can be beneficial in developing nations, but most aspects of the current system are still subpar. In ENT practice, cervical lymphadenitis continues to be the most typical extrapulmonary mycobacterium TB presentation⁸⁻¹¹.

Children and young adults are more frequently affected by Tuberculous lymphadenitis¹³. Most studies report a female predilection¹³⁻¹. Fever, weight loss, exhaustion, and sporadic night sweats are among the systemic symptoms of tuberculous lymphadenitis. Cough, though, is a less noticeable characteristic. These manifestations depend on the stage, nature and location of the disease with a range of physical findings.

FNAC is a non-invasive test indicated in patients with nodal masses for sample collection. It helps in the early diagnosis of mycobacterial disease and also assists to rule out alternative diagnosis that may require urgent treatment. Diagnostic sensitivity for mycobacterial diseases depends on the pathologist's experience¹⁶⁻¹⁸. Finding the causing organism is crucial, particularly in immune-compromised patients, since morphological patterns may be similar in other opportunistic infections, such as those caused by fungi. ZN staining is a straightforward identification technique that is less sensitive than auto fluoroscopy, which doesn't need any additional staining⁷. Although culture is frequently thought of as the "gold standard," its sensi

tivity is low and greatly depends on the inoculation method and culture media employed. Further PCR-based testing for speciation is necessary in the event of a positive result, which is one to six weeks away^{19, 20}. FNAC has become a standard diagnostic tool in the assessment of a variety of pathological conditions. It has gained great importance in identification of tuberculous lymphadenitis. Its prime cytological features on FNAC include caseous necrosis, multinucleated giant cells and epithelioid granuloma formation^{17, 19, 20}.

Study conducted by Hafez et al. showed the sensitivity and specificity of FNAC in tuberculous lymphadenitis to be 90.9% and 67.2% respectively¹⁷ although other studies reported that the sensitivity could range from 80%²¹ to 96.7%²⁰ and specificity could range from 42.3%¹⁸ to 100%.²⁰ However, according to our study, the sensitivity of FNAC was 97% and specificity was 72.2%. Our results are supported to some extent by above mentioned studies. The diagnostic accuracy of 83.7%²² and 92.1%²¹ has been reported which makes FNAC a reliable tool in screening and diagnosing lymph node disease.

In our study the younger age group was found to be more affected (33% versus 17%). These results were similar to other studies which describe the young age group as the commonest age group affected by disease^{7,23,20}. Cervical tuberculosis is more common in females¹³⁻¹⁵. In our study too there was female preponderance compared to the study^{20,13} in which cervical tuberculosis is common in females with low socioeconomic status and low body mass index.

In our study, 80% of patients had disease for less than 6 months while 20% with disease lasting for more than 6 months. In one study, the symptoms started between 1-2 months (~3 weeks-8 months)¹⁵ and the duration of symptoms was longer in males than females¹⁴. The progression of disease was directly related to the more delayed presentation in patients. The lesions transform from firm and mobile nodes to matted fluctuant nodes to draining sinuses²⁴.

Conclusion

The results of the study concluded that the FNAC is proved to be a reliable tool in detecting tuberculous cervical lymphadenitis.

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