

Minimally Invasive Diagnosis of Tubercular Lymphadenitis – The Role of Fine Needle Aspiration Cytology

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Abstract

Background: Tuberculosis is a leading cause of enlarged lymph nodes in developing countries. Fine needle aspiration cytology (FNAC) is an easy to perform, rapid, affordable and effective outpatient diagnostic procedure for evaluating lymphadenopathies.

Aim: Study various cytomorphological patterns in tubercular lymphadenitis and correlate with the AFB positivity.

Material and Methods: FNAC smears of 820 cases diagnosed as tuberculous lymphadenitis in the Department of Pathology, RBIPMT, Delhi over a period of 1 year was reviewed. All the smears stained by May Grunwald Giemsa and Ziehl-Neelsen stain for acid fast bacilli were evaluated.

Results: The disease was most frequently observed in third decade with female preponderance. Cervical lymph nodes were the most common nodes to be involved. Among the four cytomorphological patterns on FNAC, maximum cases demonstrated caseous necrotic material with degenerated inflammatory cells. Ziehl-Neelsen staining showed overall AFB positivity of 59.6%. Maximum AFB positivity was noted in cases having caseous necrotic material and degenerated inflammatory cells.

Conclusion: FNAC enables early detection of extrapulmonary tuberculosis based on cytomorphological evaluation and ZN stain for AFB, facilitating timely treatment and ultimately decreasing the morbidity and mortality.

Keywords: Cervical lymph nodes, FNAC, Necrosis Tuberculosis, ZN stain

Introduction

Lymphadenopathy is a common presentation seen frequently in clinical practice with varied etiological factors. The prompt identification and diagnosis of enlarged lymph nodes holds significant clinical value. Fine needle aspiration cytology (FNAC) is an easy to perform, rapid, affordable and effective outpatient diagnostic procedure for evaluating lymphadenopathies.

Tuberculosis is a leading cause of enlarged lymph nodes in developing countries. According to Global tuberculosis Report 2024, India accounts for 26% of global tuberculosis burden and 26% of global TB – related deaths. Among extrapulmonary manifestations of tuberculosis, lymphadenitis is most prevalent and frequently affects the cervical lymph nodes.¹ FNAC is a crucial diagnostic tool for identifying tuberculous lymphadenitis, thus helps in avoiding unnecessary surgical interventions. Cytopathological diagnosis of tuberculosis includes demonstration of epithelioid cells with or without Langhans giant cells and necrosis along with bacteriological confirmation using Ziehl Neelsen (ZN) stain/ culture for definitive diagnosis. The present study was done to evaluate the effectiveness of FNAC in diagnosing tuberculous lymphadenitis and assess the correlation between cytomorphological features and AFB positivity.

Material and Methods

The present study consisted of retrospective analysis over a period of one year, in which records of patients presenting with peripheral lymphadenopathy aspirated in the Cytology section of Pathology department at Rajan Babu Institute of Pulmonary Medicine and Tuberculosis, New Delhi were examined with respect to age, sex,

clinical diagnosis, site of lesion and cytological diagnosis. All the smears stained by May Grunwald Giemsa (MGG) and ZN stain were reviewed. The diagnosis of tuberculosis was suggested based on characteristic cytomorphological patterns consisting of epithelioid cell granulomas with or without inflammation along with necrosis and inflammation, confirmed by ZN stain in some cases. Culture for AFB, PCR and CBNAAT were advised in some cases. Further correlation with clinical findings and other investigations were advised.

Results

A total of 820 cases showing tuberculous morphology and caseation necrosis were included in the present study. Tubercular lymphadenitis was observed maximum in individuals of 3rd decade (36.3%) followed closely by those in 2nd decade (25.4%) (Table 1). There was female predominance, with male to female ratio being 1:2. Most common involvement was in cervical lymph nodes (71.4%) and least common in inguinal group (0.24%).

Table 1: Age distribution (n=820)

Age group	No. of patients
0-10	59
11-20	209
21-30	298
31-40	160
41-50	50
51-60	27
61-70	09
71-80	08

The cellular components visualized in the smears were epithelioid cells, langhans giant cells, lymphocytes and neutrophils with or without accompanying necrosis. According to the cytomorphological patterns smears were categorized into four patterns. (Table 2).

1. Smears showing epithelioid cell granuloma without necrosis (Fig.1)

2. Smears showing epithelioid cell granuloma with caseous necrosis (Fig.2)
3. Smears showing with only caseous necrosis (Fig.3)
4. Smears showing caseous necrotic material with degenerated inflammatory cells (Fig.4)

Langhans giant cells were noted in 15 cases (1.82%) (Fig.5) Ziehl-Neelsen (ZN) stain for AFB was done in all cases (Fig.6) (Table 3). Maximum positivity was noted in smears with caseous necrotic material and inflammatory cells and least positivity was noted in smears where there was only granuloma and no necrosis.

Table 2: Cytomorphological pattern

Cytomorphological pattern	No of cases n=820	Percentage %
Epithelioid cell granuloma without necrosis	143	17.4
Epithelioid cell granuloma with caseous necrosis	268	32.8
Only caseous necrosis	18	2.20
Caseous necrotic material with degenerated inflammatory cells	391	47.7

Table 3: AFB Positivity

Cytomorphological pattern	No. of cases n=820	AFB Positivity n=489	Percentage %
Epithelioid cell granuloma without caseous necrosis	143	48	33.5
Epithelioid cell granuloma with caseous necrotic necrosis	268	151	56.3
Only caseous necrosis	18	09	50.3
Caseous necrotic material with degenerated inflammatory cells	391	281	71.8

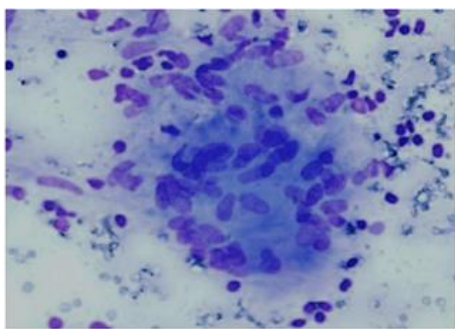


Figure 1: Cytology smear on MGG stain showing epithelioid cell granuloma without caseous necrosis, (40x10X)

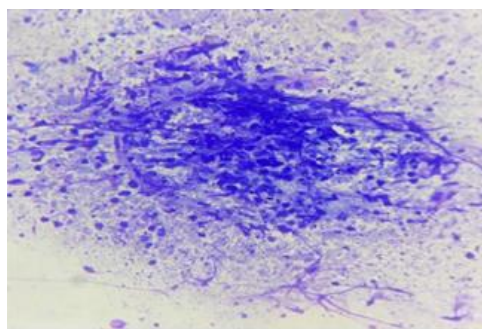


Figure 2: Cytology smear on MGG stain showing epithelioid cell granulomas with caseous necrosis, (40x10X)

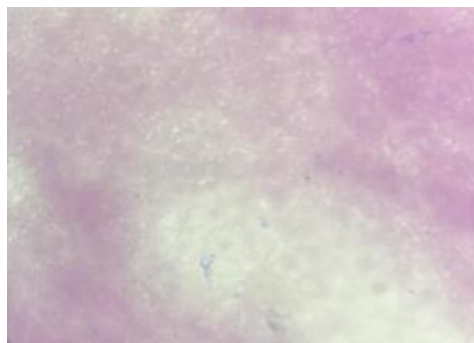


Figure 3: Cytology smear on MGG stain showing caseous necrotic material only, (40x10X)

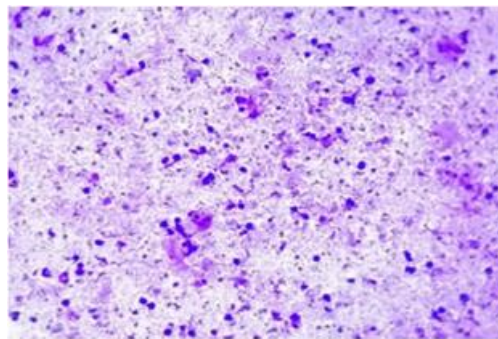


Figure 4: Cytology smear on MGG stain showing caseous necrotic material with degenerated inflammatory cells, (40x10X)

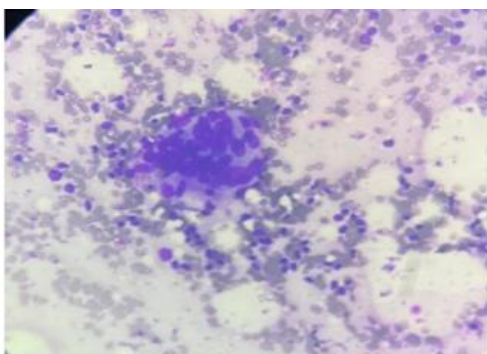


Figure 5: Cytology smear on MGG stain showing Langhans giant cells

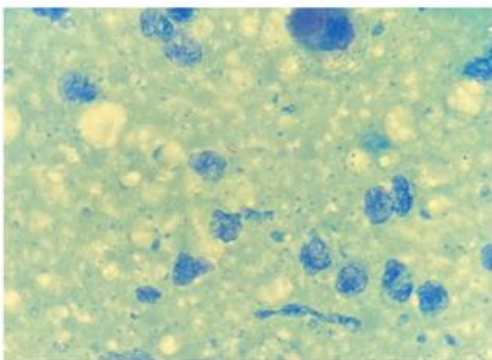


Figure 6: Cytology smears on Z-N staining showing AFB positivity

Discussion

Tuberculous lymphadenopathy is the most prevalent form of lymphadenopathy in India.²⁻⁵ Tuberculosis affects individuals across all communities and socioeconomic backgrounds, although it disproportionately impacts those from lower socioeconomic groups. Although tuberculosis is a curable disease, delayed diagnosis and treatment can lead to serious consequences, including the spread of infection to others, significant morbidity and potentially even mortality. FNAC has gained widespread acceptance in India due to its simplicity, safety, affordability and reliability, making it a preferred initial diagnostic tool for evaluating lymphadenopathy.

The present study showed the maximum incidence of tubercular lymphadenitis in individuals of 2nd decade

closely followed by those in their teens. Similar pattern of age distribution was also reported in some studies.^{6,7}

The present study has found that the condition was twice as common in females as in males. The increased susceptibility of Indian women, particularly those from low socio-economic backgrounds and of childbearing age to illness may be attributed to their low immune status. Paliwal et al.,⁸ Khajuria et al.⁹ and Narang et al.¹⁰ also observed the higher incidence of the condition in females.

The cervical lymph node were the most frequently affected site (71.4%). Cervical lymph nodes were the most common sites of involvement consistent with studies.^{8,9}

For cyto-diagnosis of tubercular lymphadenopathy, we need to demonstrate epithelioid cell granuloma, langhans giant cells with or without caseous necrotic material along with demonstration of AFB positivity by ZN staining. Studies by Gomes et al.¹¹ and Das et al.¹² also followed same cytomorphological patterns for the diagnosis of tubercular lymphadenitis.

In our study based on cytomorphological features we categorized the lesions into four categories (Table 2). Nayak et al.,¹³ Sheela et al.¹ and Chand et al.⁷ also described four cytomorphological pattern of tubercular lymphadenitis. Das et al.,¹² Khajuria et al.⁹ and Llatjos et al.¹⁴ has described only three cytological patterns. In this study of 820 cases, among the four cytological patterns, maximum cases were having caseous necrotic material with degenerated inflammatory cells without epithelioid cell granulomas (47.7%) followed by epithelioid cell granulomas with caseous necrosis (32.8%), epithelioid cell granulomas without necrosis (17.4%) and caseous necrotic material (2.2%).

Chand P et al.⁷ in their series of 550 cases of tubercular lymphadenopathy also had the same pattern of caseous necrotic material with degenerated inflammatory cells without epithelioid cell granulomas in maximum number of cases (34.4%). This was followed by epithelioid cell granulomas without necrosis (28.4%), caseous necrotic material with epithelioid cell granulomas (21.8%) and caseous necrotic material (15.4%).

In our study overall AFB positivity was 59.6%, similar to the study by Bezabih et al.¹⁵ which showed AFB positivity in 59.5 % of cases. Paliwal et al.⁸ had AFB positivity in 71% of cases. Comparatively low AFB positivity was reported by Chand et al.⁷ (44.45%) and Das Gupta et al.¹⁶ (45.65%). A very low positivity (19.6%) rate was reported by Aggarwal et al.¹⁷

The highest AFB positivity in our study was in smears with caseous necrotic material and degenerated inflammatory cells (71.8%) followed by epithelioid cell granuloma with caseous necrosis (56.3%) and caseous necrotic material (50%). Least AFB positivity (33.5%) was observed in cases with only epithelioid cell granulomas. Bezabih et al.¹⁵ also showed maximum AFB positivity (69.7%) in cases of non - granulomatous abscess necrosis similar to our study. Studies indicate that the presence of cold abscesses, characterized by necrosis and degenerated inflammatory cells, increases the likelihood of detecting acid – fast bacilli.¹⁸

Difficulty arises in pattern 1 which showed minimum AFB positivity, as epithelioid cell clusters can be seen in sarcoidosis, brucellosis and occasionally in malignancies like Hodgkins disease and metastatic neoplasms. In the Indian context, this finding would strongly suggest tuberculosis as the likely diagnosis until proved otherwise, since the disease is more prevalent and widespread here.¹⁹ There is also difficulty in diagnosing

tubercular lymphadenitis in smears and aspirates which contain only necrotic material. All patients of only granulomas and necrosis with inflammation with AFB negative on ZN stain were correlated with other clinical, biochemical, hematologic parameters and were advised to do CBNAAT, PCR and AFB culture. The sensitivity and specificity of FNAC for the diagnosis of TB lymphadenitis is 83.3% and 94.8% respectively.²⁰

PCR and CBNAAT can aid in early diagnosis of extrapulmonary tuberculosis, but its availability is limited in developing countries where the disease is widespread, and even when accessible, it is often too expensive for the patients.

FNAC offers a cost-effective minimally invasive solution to diagnose extrapulmonary tuberculosis in resource – constrained developing countries, providing a high degree of diagnostic accuracy. A significant proportion of lymphadenopathy can be accurately diagnosed by combining cytomorphological findings of granulomatous inflammation with clinical correlation, and further confirmed by ZN staining for acid -fast bacilli.

Conclusion

In resource – constrained environments, FNAC enables early detection of extrapulmonary tuberculosis based on cytomorphological evaluation and ZN stain for AFB, facilitating timely treatment and ultimately decreasing the morbidity and mortality.

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