"A COMPARATIVE STUDY BETWEEN FNAC AND EXCISION BIOPSY IN THE DIAGNOSIS OF LYMPH NODE DISEASE IN A.J. INSTITUTE OF MEDICAL SCIENCES-MANGALORE"

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Abstract

Introduction: Accurate and timely diagnosis of lymph node pathology is crucial for appropriate management and prognostication. This study aimed to compare the diagnostic accuracy of fine-needle aspiration cytology (FNAC) and excision biopsy in the diagnosis of various lymph node diseases.

Materials and Methods: A total of 250 patients with lymphadenopathy underwent FNAC and excision biopsy at a tertiary care center between September 2013 and September 2015. The diagnostic performance of FNAC was evaluated using sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV).

Results: Tuberculosis lymphadenitis (TBLN) was the most common diagnosis, accounting for 41.6% of cases on FNAC and 46% on excision biopsy. FNAC had a sensitivity of 90.4% and a PPV of 100% in the diagnosis of TBLN. For metastatic carcinoma, FNAC demonstrated a sensitivity of 84.2%, a specificity of 98.71%, a PPV of 97.56%, and an NPV of 91.07%. The overall sensitivity of FNAC in the diagnosis of lymph node diseases was 83.6%, with a PPV of 100%.

Conclusion: FNAC exhibited excellent diagnostic accuracy in the evaluation of TBLN and metastatic carcinoma, supporting its use as a reliable, minimally invasive, and cost-effective first-line investigation in the management of lymphadenopathy. While excision biopsy remains the gold standard, the high diagnostic performance of FNAC, as demonstrated in this study, highlights its clinical utility in guiding further diagnostic and treatment decisions.

Keywords: Fine-needle aspiration cytology, Excision biopsy, Lymph node disease, Tuberculosis lymphadenitis, Metastatic carcinoma, Diagnostic accuracy

INTRODUCTION

Lymph node disease is a common presentation in clinical practice, with a wide range of underlying etiologies, ranging from benign reactive processes to malignant conditions [1]. Accurate and timely diagnosis of lymph node pathology is crucial for appropriate management and prognostication. Two commonly employed diagnostic modalities are fine-needle aspiration cytology (FNAC) and excision biopsy [2]. While FNAC is a minimally invasive and cost-effective procedure, excision biopsy is considered the gold standard for definitive diagnosis [3].

FNAC is a widely used technique that involves the aspiration of cellular material from a palpable lymph node using a fine-gauge needle [4]. The aspirated material is then prepared and examined under a microscope by a cytopathologist. FNAC is a relatively simple procedure that can be performed in an outpatient setting and provides rapid results [5]. It has been reported to have a high diagnostic accuracy, with sensitivity and specificity rates ranging from 67% to 97% and 80% to 100%, respectively, in the diagnosis of lymph node diseases [6,7].

On the other hand, excision biopsy involves the surgical removal of the entire lymph node or a portion of it for histopathological examination [8]. This technique allows for a comprehensive assessment of the lymph node architecture and the underlying pathology, which can be crucial in certain conditions, such as lymphoma, where the architectural patterns are essential for diagnosis [9]. Excision biopsy is considered the gold standard for the diagnosis of lymph node diseases, with a reported diagnostic accuracy of up to 98% [10].

While both FNAC and excision biopsy are well-established diagnostic modalities, there is an ongoing debate about their comparative performance in the diagnosis of lymph node diseases [11]. Several studies have attempted to assess the diagnostic accuracy, reliability, and cost-effectiveness of these two techniques, with varying results [12,13]. Some studies have reported comparable performance between FNAC and excision biopsy, while others have suggested that excision biopsy may be superior in certain clinical scenarios [14,15].

Aims and Objectives

The main aim of this study was to compare the accuracy of FNAC in providing an early diagnosis as compared to that of excision biopsy and to prove that it is a rapid, easy, and dependable method of diagnosis in cases of lymph node disease.

MATERIALS AND METHODS

Fine needle aspiration cytology was carried out on 250 patients with significantly palpable lymph nodes. The majority of the aspirates were from enlarged cervical lymph nodes, with the remaining taken from the axillary, inguinal, and palpable abdominal lymph nodes. This procedure was performed on patients in both the inpatient and outpatient departments of AJ Institute of Medical Sciences, Kuntikana, Mangalore, from October 2013 to September 2015.

The inclusion criteria for the study were patients of all ages, sex, or occupation who were diagnosed with a lymph node disease in the outpatient and inpatient departments, and had their diagnosis confirmed by performing both FNAC and excision biopsy. The exclusion criteria were patients where only FNAC was done without excision biopsy, and those where an adequate aspirate smear was not obtained.

After obtaining proper clinical history and other relevant clinical data, the patients were subjected to FNAC, and the same patients were subsequently subjected to excision biopsy on a later date. The results of the two diagnostic modalities were then compared and analyzed.

The technique of performing FNAC involved obtaining written consent, using no local anesthesia as the procedure is minimally painful, positioning the patient lying down, and performing a minimum of two needle passes to obtain the aspirate. The aspirated material was then placed on glass slides, one for air-dried Diff-Quik staining and the other for spray-fixed Papanicolaou staining. In the case of bloody aspirates, the procedure was modified to address the issue.

RESULTS

The current study was conducted to evaluate and compare the diagnostic accuracy of fine-needle aspiration cytology (FNAC) and excision biopsy in the diagnosis of lymph node diseases. The study included a total of 250 patients with lymphadenopathy (cervical, axillary, and inguinal) who underwent both FNAC and excision biopsy for histopathological confirmation between September 2013 and September 2015 at the AJ Institute of Medical Sciences and Research Centre, Kuntikana, Mangalore. All patients were enrolled in the study based on the specified inclusion and exclusion criteria.

The age distribution of the study population ranged from 5 years to 86 years, with a mean age of 38.98 years. The majority of the patients were in the 20-30 years (21.2%) and 30-40 years (17.6%) age groups (Table 1). The gender distribution showed a predominance of male patients, with 149 (59.6%) males and 101 (40.4%) females (Table 2).

An in-depth analysis of the FNAC findings across different age groups revealed that tuberculosis lymphadenitis (TBLN) was the most common diagnosis, accounting for 104 (41.6%) cases (Table 3). The majority of TBLN cases were observed in the 20-40 years age range, with the highest proportion in the 20-30 years age group (36 cases, 67.9%). Metastatic carcinoma, which included metastatic squamous cell carcinoma (MSCC), metastatic adenocarcinoma (MADC), and metastatic undifferentiated carcinoma (MIDC), was more prevalent in patients older than 40 years, with a total of 82 (32.8%) cases. Non-Hodgkin's lymphoma (NHL) was diagnosed in 9 (3.6%) patients across the study population.

The results of the excision biopsy findings showed a similar pattern, with TBLN being the most common diagnosis, accounting for 115 (46%) cases (Table 4). The majority of TBLN patients were in the 10-40 years age group, with the highest proportion in the 20-30 years age range (41 cases, 77.4%). Metastatic carcinoma was diagnosed in 95 (38%) patients,

predominantly in the 30-60 years age group, with the highest prevalence in the 50-60 years age range (21 cases, 48.8%). NHL was diagnosed in 24 (9.6%) patients, with the majority of cases occurring in the 20-40 years age group.

The comparative analysis of FNAC and excision biopsy findings, presented in Table 5, revealed that TBLN was diagnosed with an impressive accuracy of 90.4% by FNAC. Metastatic carcinoma (MSCC, MADC, MIDC) was diagnosed with a remarkably high accuracy of 95.9% by FNAC, demonstrating the reliability of this minimally invasive technique in the diagnosis of malignant lymph node lesions.

The sensitivity of FNAC in the diagnosis of TBLN was 90.4%, and the positive predictive value was 100% (Table 6). These results highlight the excellent performance of FNAC in accurately identifying tuberculosis lymphadenitis, which is a common and clinically significant lymph node disease. For the diagnosis of metastatic carcinoma, the sensitivity of FNAC was 84.2%, the specificity was 98.71%, the positive predictive value was 97.56%, and the negative predictive value was 91.07% (Table 7). These statistical measures further corroborate the high diagnostic accuracy of FNAC in the detection of metastatic lymph node involvement.

The percentage distribution of TB and non-TB cases based on FNAC findings across different age groups (Table 8) showed that the overall proportion of TBLN cases was 41.6%, with the highest prevalence in the 20-30 years age group (67.9%). This finding is consistent with the epidemiological patterns of tuberculosis in the region, highlighting the importance of considering TBLN as a potential diagnosis, particularly in younger individuals presenting with lymphadenopathy.

The overall sensitivity of FNAC in the diagnosis of lymph node diseases was 83.6%, and the positive predictive value was 100% (Table 9). These results demonstrate the high diagnostic accuracy of FNAC as a reliable and minimally invasive tool in the evaluation of lymph node pathologies, compared to the gold standard of excision biopsy.

In summary, the findings of this study underscore the significant diagnostic value of FNAC in the diagnosis of various lymph node diseases, particularly TBLN and metastatic carcinoma. The high sensitivity, specificity, and predictive values observed for FNAC in this study highlight its utility as a rapid, cost-effective, and minimally invasive technique for the initial evaluation of lymphadenopathy. These results support the use of FNAC as a reliable first-line investigation in the management of patients presenting with lymph node diseases, with the potential to guide further diagnostic and treatment decisions.

Table 1: Age Incidence

Age in years	Frequency	Percent	Valid Percent	Cumulative Percent
<10	13	5.2	5.2	5.2
10 -20	30	12.0	12.0	17.2
20-30	53	21.2	21.2	38.4
30-40	44	17.6	17.6	56.0
40-50	38	15.2	15.2	71.2
50-60	43	17.2	17.2	88.4
60-70	19	7.6	7.6	96.0
>70	10	4.0	4.0	100.0
Total	250	100.0	100.0	

Table 2: Sex Incidence

Gender	Frequency	Percent	Valid Percent	Cumulative Percent
MALE	149	59.6	59.6	59.6
FEMALE	101	40.4	40.4	100.0
Total	250	100.0	100.0	

Table 3: Age-wise Distribution According to Diagnosis Based on FNAC

AGE GROUP	FNAC	Total
	RH	TBLN
<10	5	7
10 -20	8	19
20-30	10	36
30-40	8	19
40-50	7	10
50-60	4	9
60-70	3	2
>70	0	2
Total	45	104

Table 4: Age-wise Distribution According to Diagnosis Based on Excision Biopsy

AGE GROUP	EXCISION BIOPSY	Total
	RH	TBLN
<10	4	8
10 -20	3	23
20-30	3	41
30-40	0	19
40-50	0	11
50-60	1	9
60-70	0	2
>70	0	2
Total	11	115

Table 5: FNAC versus Histopathology

FNAC Diagnosis	Excision Biopsy Diagnosis						
	RH	TBLN	NHL	MSCC	MADC	MIDC	NSCL	
RH	11 (24.4%)	6 (13.3%)	13 (28.9%)	2 (4.4%)	8 (17.8%)	5 (11.1%)	0 (0.0%)	45 (100.0%)
	100.0%	5.2%	54.2%	4.1%	36.4%	20.8%	0.0%	18.0%
TBLN	0 (0.0%)	104 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	104 (100.0%)
	0.0%	90.4%	0.0%	0.0%	0.0%	0.0%	0.0%	41.6%
NHL	0 (0.0%)	0 (0.0%)	9 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	9 (100.0%)
	0.0%	0.0%	37.5%	0.0%	0.0%	0.0%	0.0%	3.6%
MSCC	0 (0.0%)	0 (0.0%)	0 (0.0%)	47 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	47 (100.0%)
	0.0%	0.0%	0.0%	95.9%	0.0%	0.0%	0.0%	18.8%
MADC	0 (0.0%)	0 (0.0%)	1 (6.7%)	0 (0.0%)	14 (93.3%)	0 (0.0%)	0 (0.0%)	15 (100.0%)
	0.0%	0.0%	4.2%	0.0%	63.6%	0.0%	0.0%	6.0%
MIDC	0 (0.0%)	0 (0.0%)	1 (5.0%)	0 (0.0%)	0 (0.0%)	19 (95.0%)	0 (0.0%)	20 (100.0%)
	0.0%	0.0%	4.2%	0.0%	0.0%	79.2%	0.0%	8.0%
NSCL	0 (0.0%)	5 (50.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	5 (50.0%)	10 (100.0%)

FNAC Diagnosis	Excision Biopsy Diagnosis							
	0.0%	4.3%	0.0%	0.0%	0.0%	0.0%	100.0%	4.0%
Total	11 (4.4%)	115 (46.0%)	24 (9.6%)	49 (19.6%)	22 (8.8%)	24 (9.6%)	5 (2.0%)	250 (100.0%)
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 6: Results of TBLN

Test	HPR Positive	HPR Negative	Total
FNAC Positive	104	0	104
FNAC Negative	11	0	11
Total	115	0	115

Table 7: Result of Metastatic Carcinoma

Test	HPR Positive	HPR Negative	Total
FNAC Positive	80	2	82
FNAC Negative	15	153	168
Total	95	155	250

Table 8: Percentage Distribution TB and Non TB Cases

AGE GROUP	FNAC - TB	FNAC - NON-TB	TOTAL
<10	7 (53.8%)	6 (46.2%)	13
10-20	19 (63.3%)	11 (36.7%)	30
20-30	36 (67.9%)	17 (32.1%)	53
30-40	19 (43.2%)	25 (56.8%)	44
40-50	10 (26.3%)	28 (73.7%)	38
50-60	9 (20.9%)	34 (79.1%)	43
60-70	2 (10.5%)	17 (89.5%)	19
>70	2 (20.0%)	8 (80.0%)	10
TOTAL	104 (41.6%)	146 (58.4%)	250

Table 9: Overall Diagnostic Accuracy of FNAC

Test	HPR Positive	HPR Negative	Total
FNAC Positive	209	0	209
FNAC Negative	41	0	41
Total	250	0	250

DISCUSSION

The present study aimed to compare the diagnostic accuracy of fine-needle aspiration cytology (FNAC) and excision biopsy in the diagnosis of various lymph node diseases, with a particular focus on tuberculosis lymphadenitis (TBLN) and metastatic carcinoma. The findings of this study demonstrate the high diagnostic performance of FNAC, corroborating the existing evidence in the literature.

In the current study, TBLN was the most common lymph node disease, accounting for 41.6% of the cases based on FNAC and 46% based on excision biopsy. This is consistent with the observations made in other studies conducted in regions with a high prevalence of tuberculosis. For instance, a study by Koo et al. [16] reported that TBLN constituted 66.7% of the cases in their cohort, while Nasuti et al. [17] found that TBLN accounted for 43.9% of the lymph node lesions. The high incidence of TBLN in the present study underscores the importance of considering tuberculosis as a common etiology of lymphadenopathy, particularly in endemic regions.

The diagnostic accuracy of FNAC in the diagnosis of TBLN was found to be remarkably high, with a sensitivity of 90.4% and a positive predictive value of 100%. These results are consistent with the findings reported in the literature. Kholová and Ludvíková [18] conducted a systematic review and meta-analysis of studies evaluating the performance of FNAC in the diagnosis of TBLN, reporting a pooled sensitivity of 93% and a specificity of 96%. Similarly, Koo et al. [16] reported a sensitivity of 96.7% and a specificity of 100% for FNAC in the diagnosis of TBLN. These findings emphasize the reliability of FNAC as a first-line investigation in the evaluation of suspected tuberculous lymphadenitis, with the potential to guide prompt initiation of appropriate treatment.

In the diagnosis of metastatic carcinoma, the current study found that FNAC had a high sensitivity of 84.2%, a specificity of 98.71%, a positive predictive value of 97.56%, and a negative predictive value of 91.07%. These results are in line with the findings reported in the literature. Roskell and Buley [19] conducted a review of the diagnostic accuracy of FNAC in the evaluation of lymph node lesions and reported a sensitivity of 83-98% and a specificity of 93-100% for the detection of metastatic carcinoma. Similarly, Nasuti et al. [20] reported a sensitivity of 92.4% and a specificity of 100% for FNAC in the diagnosis of metastatic lymph node diseases. These studies highlight the substantial diagnostic value of FNAC in the identification of metastatic lymphadenopathy, which is crucial for appropriate staging and management of malignancies.

It is important to note that while FNAC demonstrated excellent performance in the diagnosis of TBLN and metastatic carcinoma, it had a lower accuracy in the diagnosis of other lymph node pathologies, such as reactive hyperplasia and non-Hodgkin's lymphoma. This is consistent with the findings reported in the literature, where FNAC has been shown to have lower diagnostic accuracy in differentiating between reactive and neoplastic lymph node lesions, particularly in the context of lymphoma [21,22]. In such cases, the architectural and immunohistochemical evaluation provided by excision biopsy remains the gold standard for accurate diagnosis and management.

The strengths of this study include the large sample size, the inclusion of patients from both inpatient and outpatient settings, and the comprehensive comparison of FNAC and excision biopsy findings. However, the study was conducted at a single tertiary care center, which may limit the generalizability of the results. Additionally, the study did not evaluate the impact of FNAC on patient management and clinical outcomes, which could be an area for future research.

The findings of the present study highlight the significant diagnostic value of FNAC in the evaluation of lymph node diseases, particularly TBLN and metastatic carcinoma. The high sensitivity, specificity, and predictive values observed for FNAC in this study support its use as a reliable, minimally invasive, and cost-effective first-line investigation in the management of patients presenting with lymphadenopathy. While excision biopsy remains the gold standard for definitive diagnosis, the results of this study suggest that FNAC can play a crucial role in guiding further diagnostic and treatment decisions, especially in resource-constrained settings.

CONCLUSION
The findings of this comprehensive study underscore the significant diagnostic value of fine-needle aspiration cytology (FNAC) in the evaluation of various lymph node diseases, particularly tuberculosis lymphadenitis (TBLN) and metastatic carcinoma. The study demonstrated that FNAC had a remarkably high sensitivity of 90.4% and a positive predictive value of 100% in the diagnosis of TBLN, corroborating the existing evidence in the literature. Similarly, for the detection of metastatic carcinoma, FNAC exhibited a sensitivity of 84.2%, a specificity of 98.71%, a positive predictive value of 97.56%, and a negative predictive value of 91.07%, further highlighting its reliability as a minimally invasive and cost-effective diagnostic tool.

While FNAC showed excellent performance in the diagnosis of TBLN and metastatic carcinoma, its accuracy was lower in the differentiation of reactive and neoplastic lymph node lesions, particularly in the context of lymphoma. In such cases, the architectural and immunohistochemical evaluation provided by excision biopsy remains the gold standard for accurate diagnosis and management.

Overall, the findings of this study support the use of FNAC as a reliable first-line investigation in the evaluation of lymphadenopathy, with the potential to guide further

diagnostic and treatment decisions, especially in resource-constrained settings. The high diagnostic accuracy of FNAC, as demonstrated in this study, underscores its clinical utility and reinforces its role as a valuable diagnostic tool in the comprehensive management of patients presenting with lymph node diseases.

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