

## Research Article

# Diagnostic accuracy of FNAC in diagnosis for causes of lymphadenopathy: a hospital based analysis

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## ABSTRACT

**Introduction:** The lymphadenopathy consist wide range of etiology from inflammatory process to a malignant condition and it is most common clinical presentation in outpatient department. Fine needle aspiration cytology is a simple, safe, reliable, rapid and inexpensive method of diagnosis in lymph nodes.

**Aims and objectives:** To find out diagnostic accuracy of FNAC in lymphadenopathy and common pattern of lymphadenopathy in our institute.

**Methods:** This prospective study was carried out in the department of Pathology of Index Medical College Hospital and research Centre, Indore, India from June 2011 to May 2013. The patients with palpable lymph nodes were included in this study. The slides were stained with Papanicolaou and May Grunewald Geimsa stain. Special stain like Ziel Neelson, Alcian blue was done whenever is required. A detailed analytic study was performed for correlation of Cyto-histopathological diagnosis.

**Results:** The result shows male to female ratio of 1.0:0.8. The age of the patients ranges from 2 to 79 year with mean age of 32 years. The study shows reactive hyperplasia 149 (33.38%), tubercular lymphadenitis 177 (39.77%), granulomatous lymphadenitis 32(7.1%), lymphoma 25 (5.5%), metastatic carcinoma 40 (8.9%) and others 22 (4.9%). We found cyto-histopathological concordant in 161 (95.8%) cases and discordant in 7 (4.2%) cases.

**Conclusion:** The sensitivity of FNAC in lymphoma and metastatic tumors is 81.48% and 97.5% with test accuracy of 96.5% and 99.4% respectively. Hence FNAC should be used as preliminary screening investigation in all forms of lymphadenopathy and interpretation should be done in conjunction with clinical picture of the patients.

**Keywords:** Fine needle aspiration cytology, Lymphadenopathy, Histopathology

## INTRODUCTION

The lymphadenopathy consist very wide etiology ranging from inflammatory process to a malignant condition and it account most common clinical presentation in outpatient department patients.<sup>1</sup> Fine needle aspiration cytology is a simple safe, reliable and rapid and

inexpensive method of establishing the diagnosis of various organs.<sup>2</sup>

The FNAC in lymph node was first used by Greig and Gray in 1904 to diagnosed trypanosomiasis and Guthrie in 1921 systemically performed FNA on lymph nodes for diagnostic purpose.<sup>3</sup> Later on the roll of FNAC in

lymphadenopathy is well established by various researchers.<sup>4-6</sup> Therefore it is considered as a first line investigation to rule out causes of lymphadenopathy.

In the past assessment of lymphadenopathy was made directly from the clinicopathological parameters or biopsy, but now a day's biopsy avoided in most of the cases as FNAC is fairly accurate in the diagnosis of lymphadenopathy.<sup>7</sup> FNAC is choice of investigation in children also because it allay tension and anxiety of surgical procedure.<sup>8</sup>

The FNAC can be used for superficial as well as deep seated lymph nodes in abdominal cavity and thorax with imaging aid such as CT scan and ultrasonography.<sup>9,10</sup>

The diagnostic accuracy depends on the cytological expertise and on a good clinicopathological correlation with simple clinical investigation such as X-rays, peripheral blood smear, ESR and Montoux test and knowledge of the common pitfalls. Diagnostic accuracy not only depends on the aspirate being representative, but also very much on the quality of cytological preparation.

The common influencing factors for the cytological interpretation are fibrosis, necrosis, previous irradiations and number of puncture made.<sup>11</sup> The aspirated sample can be used for ancillary testing i.e. immunocytochemistry,<sup>12</sup> flowcytometry<sup>13</sup> and PCR.<sup>14</sup>

#### **Aims and Objectives**

The objectives of present study were to find out diagnostic accuracy of FNAC in lymphadenopathy and common pattern of lymphadenopathy in our institute.

#### **METHODS**

The present study was prospective and analytical types carried out in the department of Pathology of Index Medical College Hospital and research Centre, Indore, India from June 2011 to May 2013 after taking permission from ethical committee of institution. The patients with palpable lymph nodes referred from various clinical departments of the institution for FNAC were involved in the study. The case history of the patient was recorded. The examination of lymph nodes was done with recording of size and site, number, consistency, matted or discrete, pain or tenderness of lymph nodes involvement. Consent was taken after due explanation of the procedure and its benefit to the patients.

The skin over the lymph nodes was wiped with antiseptic solution and spirit, nodes was held with one hand in a position favorable to fine needle aspiration. Procedure was done by using 20 gauge needle fitted on 10 ml disposable syringe in Franzen Syringe Holder. When needle had entered the lymph node area, the piston of the syringe was retracted thus creating a vacuum with the needle in a position to move back and fro, three or more

times in a different direction of the lymph nodes. Throughout the procedure negative pressure was maintained in a syringe then just before removing needle from the lump negative pressure was resolved. The needle was withdrawn and air was filled in the syringe, reconnected to the needle and material was smeared on glass slide with the help of cover glass gently. The four smears were prepared from each patient. The one wet smear fixed with Ether Alcohol mixture stained with Papanicolaou Stain. The one air dried smear fixed in Methyl Alcohol stained with May Grunewald Geimsa. Special stain like Ziehl Neelson (ZN) stain for acid fast bacilli (AFB), Alcian blue for mucin were done whenever is required. All the slides were evaluated by cytopathologist to arrive on probable diagnosis. The cytological results were compared with the histological findings. A detailed analytic study was performed for correlation of Cyto-histopathological diagnosis and clinical parameters were compared.

#### **RESULTS**

Total 457 patients with palpable lymph nodes were aspirated in two year of study, in which 12 (2.6%) were reported as inconclusive due to unsatisfactory smears. These cases were not included in this study.

Most of the cases of reactive hyperplasia and tuberculosis lymphadenitis on FNAC were not received for histopathology. The reactive hyperplasia and tubercular lymphadenitis was most commonly involving 149 (33.38%) and 177 (39.77%) of cases which account about 73.15% of total cases followed by granulomatous, 32(7.1%), lymphoma 25 (5.5%), metastatic carcinoma 40 (8.9%) and others 22 (4.9%) (Table 1).

**Table 1: Cytological diagnosis of lymphadenopathy.**

S.N.	Cytological diagnosis	No. of cases	Percentage %
1.	Reactive hyperplasia	149	33.38
2.	Tubercular lymphadenitis	177	39.77
3.	Granulomatous lymphadenitis	32	7.1
4.	Non Hodgkin's Lymphoma	18	4.0
5.	Hodgkin's Lymphoma	7	1.5
6.	Metastatic carcinoma	40	8.9
7.	Others	22	4.9
	Total	445	100

Most of the patients were male 236 (53%), with male to female ratio of 1.0:0.8. The age of the patients in our study ranges from 2 year to 79 year with mean age of 32

years. Benign conditions such as Reactive hyperplasia, tubercular and granulomatous lymphadenitis mainly observed before third decade of life however malignant conditions such as lymphoma and metastatic carcinoma seen after fourth decades of life (Table 2).

Cervical group of lymph nodes were involve in most of the pathology in 81.12% cases followed by the axillary 8.98%, inguinal 3.1%, and more than one group of lymph nodes (generalized lymphadenopathy) in 6.7% of cases (Table 3). The diagnosis of reactive hyperplasia was based on high cellularity, polymorphic pattern of cells and significant number of tangible body macrophages.

The smears with epitheloid granuloma with or without giant cells and absence of caseous necrosis were diagnosed as granulomatous lymphadenitis.

The smears with presence of epitheloid cell granuloma, langerhans giant cell with caseous necrosis were diagnosed as tubercular lymphadenitis. All cases were stained with Ziehl Neelson staining, among these only 42.8% cases were positive for acid fast bacilli.

The lymph nodes diagnosed as suppurative lymphadenitis shows predominantly neutrophils, lymphoid cells and necrotic debris materials. The lymph nodes diagnosed as suppurative lymphadenitis, sinus histiocytosis, were includes in other groups. Out of the 25 cases of lymphoma 18 (72%) were non Hodgkin's while 7 (28%) were Hodgkin's lymphoma.

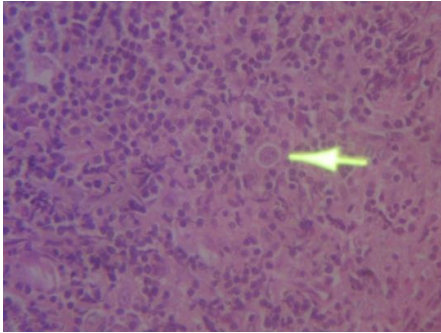
All Hodgkin's lymphoma involved in cervical lymph nodes while non Hodgkin's lymphoma involved cervical nodes as well as showed generalized lymphadenopathy (Figure 1).

**Table 2: Age and sex distribution of FNAC cases.**

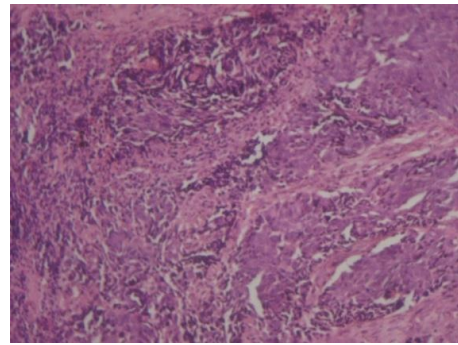
Age group (Years)	Reactive hyperplasia		Tubercular lymphadenitis		Granulomatous lymphadenitis		Lymphoma		Metastatic carcinoma		Others	
	M	F	M	F	M	F	M	F	M	F	M	F
00-10	32	23	13	16	3	1	2	1	1	0	2	1
11-20	21	17	18	34	7	0	0	0	0	0	1	1
21-30	12	13	32	9	4	1	2	0	1	0	2	0
31-40	8	5	14	6	4	2	1	2	1	1	3	3
41-50	4	3	11	8	2	1	5	3	5	6	2	1
51-60	2	3	3	5	1	3	3	1	7	4	0	1
>60	2	4	6	4	1	2	3	2	10	4	4	1
Sub-Total	81	68	97	80	22	10	16	9	25	15	14	8
Total	149		177		32		25		40		22	
Percentage (%)	33.38		39.77		7.1		5.5		8.9		4.9	

**Table 3: Lymph nodes group involvement on FNAC.**

	Reactive hyperplasia	Tubercular lymphadenitis	Granulomatous lymphadenitis	Lymphoma	Metastatic carcinoma	Others
Cervical Group	121 81.2%	151 85.3%	22 68.75%	16 64%	33 82.5	18 81.8%
Axillary Group	14 9.39%	15 8.4%	4 12.5%	--	3 7.5%	4 18.2%
Inguinal Group	6 4%	3 1.7%	1 3.12%	--	4 10%	--
Generalized	8 5.3%	8 4.5%	5 15.62%	9 36%	--	--
Total	n= 149	n= 177	n=32	n= 25	n= 40	n= 22

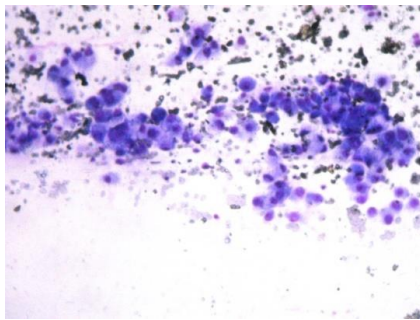


**Figure 1: Hodgkin lymphoma in histopathology (H&E Stain at 400x).**

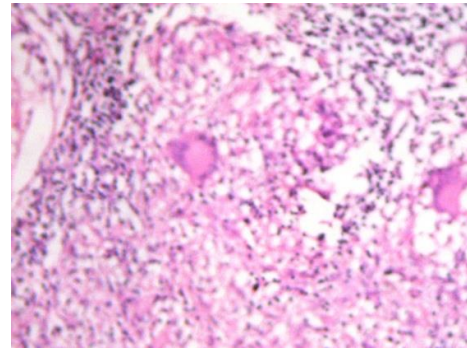


**Figure 3: Metastatic carcinoma in histopathology (H&E Stain at 400x).**

Out of 40 cases of metastatic carcinoma 30 (75%) were squamous cell carcinoma, mainly from oral cavity and lung followed by the adenocarcinoma, mainly from stomach and ductal carcinoma of breast. (Figure 2 & 3)



**Figure 2: Metastatic carcinoma in histopathology (MGG Stain at 400x).**



**Figure 4: Tubercular lymphadenitis in histopathology (H&E Stain at 400x).**

**Table 4: Cyto-histopathological correlation of diagnosis.**

Cytological diagnosis	No. of cases	Histopathological diagnosis					
		Reactive hyperplasia	Tubercular lymphadenitis	Granulomatous lymphadenitis	Lymphoma	Metastatic carcinoma	Brachial cyst
Reactive hyperplasia	60	57	--	--	03	--	--
Tubercular lymphadenitis	26	--	26	--	--	--	--
Granulomatous lymphadenitis	20	--	--	18	02	--	--
Lymphoma	23	1	--	--	22	--	--
Metastatic carcinoma	38	--	--	--	--	39	--
Brachial cyst	1	--	--	--	--	--	--
Total	168	58	44	--	27	39	--

The correlation was done in 168 (38%) of cases which were diagnosed on both FNAC as well as histopathology. Out of 168 cases 60 case were reactive lymphadenitis, in which 57 were true positive and 3 were false positive, on histopathologically they were turned out to be lymphoma. The sensitivity and specificity was 100% and 97.3% respectively (Table 4).

The 26 cases of tubercular lymphadenitis were correlated and all were proved to be tubercular lymphadenitis on histopathology however out of 20 cases of granulomatous lymphadenitis two were proved to as lymphoma on histopathology. Hence sensitivity and specificity was 100% each for tubercular lymphadenitis.

A total 59 malignant cases were correlated in which 23 were Lymphoma and 38 were metastatic carcinoma. Out of 23 cases of lymphoma 22 were proved as lymphoma while one case on histopathology was diagnosed as reactive hyperplasia of lymph nodes. The sensitivity and specificity in lymphoma was 81.48% and 99.3% respectively.

In cases of metastatic carcinoma to lymph nodes 38 cases were correlated and all cases were proved as metastatic carcinoma on histopathology, additionally one cases reported as brachial cyst was turned out in to metastatic carcinoma on histopathologic examination. Therefore sensitivity and specificity of FNAC in metastatic carcinoma proved to be 97.5% and 100% respectively.

## DISCUSSION

The fine needle aspiration cytology is a simple, safe and cost effective procedure. We can reach at diagnosis in short time. The FNAC can be done in outpatient department without anesthesia and there will be no disfigurement or scar on the skin.<sup>15</sup>

The present study showed that lymphadenopathy may be present in any of the age ranging from 2 to 87 years, the similar observation was observed by other studies also.<sup>4, 16</sup> In this study most of the patients were male with male to female ratio 1.0:0.8. The similar observations were recorded by other investigators also.<sup>4,17,18</sup>

Cervical lymph nodes were most commonly involved in our finding, which was comparable with the finding of other workers.<sup>1,4,17</sup>

In our study most of the cases were benign 380 (85.4%), and 65 (14.6%) were malignant. Our finding were similar to finding of Hirachand et al<sup>4</sup> and Sarda et al.<sup>15</sup> Out of benign lesions reactive were most common 149 (33.38%), followed by tubercular lymphadenitis 177 (39.77%) which is the same as reported by Tilak V et al<sup>19</sup> in their study (Figure 4).

In malignant group we reported 25 (5.5%) case of lymphoma and 40 (8.9%) cases of metastatic tumors. The studied conducted by the Tilak V et al<sup>19</sup> and Hirachand S et al<sup>4</sup> also find lymphoma in 5.8% and 6.1% respectively, which were very close to our findings. The studies conducted by the Hirachand S et al<sup>4</sup> and Maharjan M et al<sup>20</sup> shows 12.3% and 11% metastatic carcinoma respectively, which is also comparable to our findings.

The common metastatic carcinoma, in our study was squamous cell carcinoma in 30 (75%) case of metastatic carcinoma. The Hajdu SI et al<sup>21</sup> and Engzell Vet al<sup>22</sup> also reported squamous cell carcinoma as most common metastatic carcinoma in lymph nodes followed by adenocarcinoma.

We found cyto-histopathological concordant in 161 (95.8%) cases and discordant in 7 (4.2%) cases. Out of seven discordant cases one case was diagnosed as brachial cyst on FNAC was histopathologically proved as cystic changes with metastatic squamous cell carcinoma.

Squamous cell carcinoma is particularly prone to undergo liquefactive necrosis. Aspirates from such a node consist of thin, mucoid, yellow fluid, and well preserved neoplastic squamous cell may be few in number and are very well differentiated. Therefore a risk of brachial cyst diagnosis is increased in cystic metastasis of well differentiated squamous cell carcinoma.<sup>3</sup>

One case of granulomatous lymphadenitis and one case of reactive lymphadenitis diagnosed on FNAC were histopathologically confirmed as lymphoma.

The clusters of the epithelioid cell are sometimes found in malignant lymphoma, particularly in Hodgkin's lymphoma, peripheral T cell lymphoma, metastatic seminoma and metastatic carcinoma. One must therefore look carefully for abnormal lymphoid cells, for non lymphoid cells in smear containing epithelioid histiocytes and clinical presentation of the patients.<sup>11</sup> The case of Hodgkin's lymphoma nodular sclerosis type on cytological smear due to poor biopsy yield, smear with only few lymphocytes, fibroblast and fragments of collagen may be suggest a chronic inflammatory process.<sup>11</sup>

The sensitivity and specificity in our study was 81.48% and 99.3% for lymphoma and 97.5% and 100% for metastatic carcinoma. Our study findings were comparable with Hirachand S et al<sup>4</sup> sensitivity and specificity was respectively 80% and 100% for lymphoma and 100% and 100% for metastatic carcinoma.

The diagnostic accuracy of lymphoma varies from 84% to 98% and for metastatic carcinoma 90% to 96% (Table 5). The diagnostic accuracy in lymphoma can be

increased by cytomorphological study of smear along with simultaneously use of immunocytochemical marker and other ancillary technique on the aspirated cells.

The careful observation of smear, clinical correlation and knowledge of common pitfall may increase the

sensitivity. FNAC should always be considered as a screening tool for understanding the etiology of disease process. Unnecessary surgeries can be avoided because most of the cases always were reactive or inflammatory.

**Table 5: Diagnostic accuracy of FNAC in lymphoma and metastatic carcinoma.**

Lymphoma			Metastatic carcinoma		
Authors	No. of cases	Diagnostic accuracy	Authors	No. of cases	Diagnostic accuracy
Carter et al <sup>23</sup>	133	88.0	Engzell et al <sup>22</sup>	257	90.0
Gupta et al <sup>24</sup>	50	84.0	Kline et al <sup>28</sup>	376	96.0
Russel et al <sup>25</sup>	59	90.0	Piscioli et al <sup>20</sup>	71	93.0
Das et al <sup>26</sup>	HL 101	98.0	Zadelza et al <sup>30</sup>	722	96.0
Das et al <sup>27</sup>	NHL 163	98.0			
Present study	25	96.5	Present study	40	99.4

## CONCLUSION

The sensitivity of FNAC in lymphoma and metastatic tumors is 81.48% and 97.5% with test accuracy of 96.5% and 99.4% respectively. Our experience suggests that FNAC should be used as preliminary screening investigation in all forms of lymphadenopathy and interpretation should be done in conjunction with clinical picture of the patients to avoid unnecessary surgical procedure.

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