Section: Pathology

Original Research Article

STUDY OF CYTOMORPHOLOGY OF LYMPH NODE LESION BY FINE NEEDLE ASPIRATION CYTOLOGY

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ABSTRACT

Background: Fine Needle Aspiration Cytology (FNAC) serves as an essential method for diagnosing diseases affecting lymph nodes. The Sydney System (2020) introduced a unified framework for classifying and reporting lymph node FNAC findings, emphasizing consistency through standardized terminology and morphological criteria. The purpose of this study was to analyse the cytomorphological features of lymph node lesions obtained from different anatomical sites and categorize them based on the Sydney System classification.
Materials and Methods: A retrospective study was conducted at C U Shah Medical College from July 2020 to July 2024, analyzing 550 lymph node FNAC specimens collected from various anatomical sites including cervical, axillary and supraclavicular regions involving patients of all age groups. The specimens were subsequently classified according to the Sydney System into L1 (non-diagnostic), L2 (benign), L3 (atypical), L4 (suspicious), and L5 (malignant).
Results: Out of 550 lymph node FNAC cases, 4(0.73%) cases were classified as L1, 458(83.27%) cases as L2, 8(1.5%) cases as L3, 20(3.5%) cases as L4, and 60(10.91%) cases as L5. Among 458(83.27%) benign cases, most common lesion was reactive lymphoid hyperplasia accounting 189(34.80%) cases and among 60(10.91%) malignant cases, metastatic carcinoma accounts 52(9.5%) and lymphoma accounts 8(1.5%) cases. Cervical lymph nodes were most frequently aspirated which accounts for 419(76.6%) cases.
Conclusion: The Sydney System offers standardized FNAC reporting, precise terminology, significantly improving FNAC's diagnostic accuracy and patient communication, integrating ancillary techniques can further enhance FNAC's diagnostic precision and clinical utility.
Keywords: FNAC, Cytomorphology, Lymphadenopathy, sydney system

INTRODUCTION

Lymphadenopathy is a common clinical finding associated with various pathological conditions, ranging from benign reactive changes to serious malignancies. Fine Needle Aspiration Cytology (FNAC), a minimally invasive procedure, offers a rapid and reliable diagnostic approach. However, variation in FNAC interpretation, emphasizing the need for a standardized reporting system to ensure effective clinical communication and risk assessment.

The Sydney System, introduced in 2020, offers uniform classification for lymph node FNAC, enhancing diagnostic consistency. The aetiology of lymphadenopathy varies across age groups and geographical regions with infection being common in children, while metastatic malignancies are more frequent in adults. Tuberculosis remains most common infectious cause in developing countries.[1]

FNAC plays an essential role in diagnosing lymphadenopathy and can also be used for ancillary studies such as flow cytometry and immunocytochemistry. Its reliability in detecting metastatic malignancies is well-established.[2] Standardized reporting formats, like those used for thyroid, salivary gland, and breast FNAC, have improved clinical communication, and the Sydney System follows this model.

In May 2019, during the 20th International Conference of Cytology in Sydney, a structured system was introduced for the assessment,

categorization, and reporting of lymph node cytopathology. According to this system, cytologic samples from lymph nodes are classified into five distinct categories, each based on specific cytological characteristics. The cytology report must assign one of these five primary diagnostic categories and provide a detailed description of the observed cytomorphology.

The key features of the five categories are outlined as follows:

1. I/L1 - Inadequate/Insufficient: This category is used when the sample is non-diagnostic due to limited cellular content, necrosis, or technical issues. A follow-up FNAC or biopsy is recommended, depending on the clinical context.
2. II/L2 - Benign: This includes cases with a heterogeneous lymphoid population, dominated by small lymphocytes, such as suppurative, granulomatous, or specific infections.
3. III/L3 - Atypical Lymphoid (Cells) of Undetermined Significance / Atypical (Cells) of Uncertain Significance (ALUS/AUS): This category includes samples that indicate a reactive process within a heterogeneous lymphoid population but cannot rule out follicular lymphoma. It also includes cases with an excess of large cells, immature small lymphoid cells, or atypical non-lymphoid cells. For the latter cases, the term AUS is applied.
4. IV/L4 - Suspicious: Refers to cases with small or medium-sized, monomorphic atypical lymphoid cells that suggest lymphoma but lack sufficient cytological features for a definitive diagnosis. It also encompasses samples containing Reed-Sternberg-like cells or atypical cells suspicious for metastasis, though insufficiently abundant for a conclusive determination.
5. V/L5 - Malignant: This category includes small to medium-sized cells consistent with non-Hodgkin lymphoma (NHL), corroborated by flow cytometry or molecular testing, as well as Hodgkin lymphoma confirmed by the presence of diagnostic Reed-Sternberg cells. Additionally, it includes cases of metastatic neoplasms.

Objectives:

- To analyse the distribution of lymph node lesions based on demographic variables.
- To evaluate the cytomorphological features of lymph node lesions aspirated from various sites.
- To classify lymph node lesions using the Sydney System's five diagnostic categories.

MATERIALS AND METHODS

The present study was a retrospective observational analysis of lymph node aspirates obtained during four-year period from July 2020 till July 2024, done in the department of pathology at c. u. shah medical college, in august 2024.

Procedure: FNAC procedures were carried out with prior informed consent from the patients. Ultrasound or CT guidance was utilized for smaller or deeply located lymph nodes. The smears were preserved using 85% isopropyl alcohol for Papanicolaou staining, while air-dried smears were utilized for May Grunwald Giemsa staining. For cases suspected of tuberculosis, Ziehl-Neelsen staining was employed to detect acid-fast bacilli. In instances involving bloody samples, cell block preparations were utilized. The cytological findings were subsequently classified into five categories in accordance with the Sydney system guidelines.

RESULTS

A total of 550 lymph node FNAC cases were analysed.

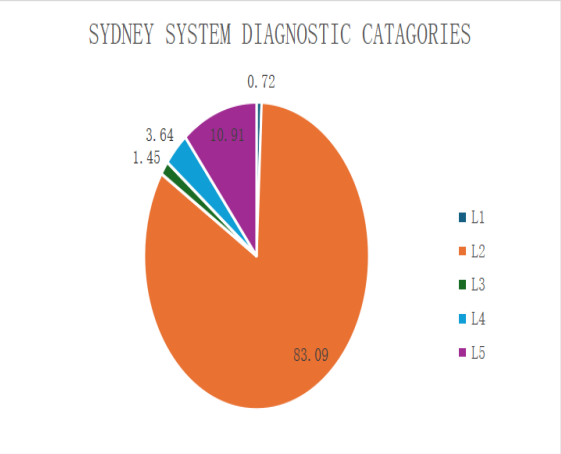

Figure 1: Sydney syatem diagnostic catagories

Table 1: Percentage of lymph node FNAC according to age group and gender (n=550)

Sr no.	Age group	Male	Female	Total frequency
1	<13	82 (14.19%)	47(8.55%)	129(23.45%)
2	14-20	43 (7.8%)	69(12.55%)	112(20.36%)
3	21-30	43 (7.8%)	63(11.45%)	106(19.27%)
4	31-40	30 (5.4%)	42(7.64%)	72(13.09%)
5	41-50	31 (5.6%)	25(4.55%)	56(10.18%)
6	51-60	19 (3.4%)	14(2.55%)	33(6%)
7	61-70	14 (2.5%)	10(1.82%)	24(4.36%)
8	>70	15 (2.7%)	03(0.55%)	18(3.27%)
Total	550	277(50.36%)	273(49.64%)	550(100%)

Highest cases in <13 years (23.45%), followed by 14-20 years (20.36%).
Gender Distribution: Male: 277 (50.36%), Female: 273 (49.64%), Ratio: 1.02:1.
Age Trends: Majority cases under 30 years (63.08%), lowest in >70 years (3.27%).

Table 2: Category wise distribution of cytological lesions across different lymph node groups. (n-550).

Group of lymph node	Non-diagnostic category I	Benign category II	AUS category III	Suspecious category IV	Malignant category V	Total frequency
Cervical (76)	2(0.36)	365(66.36)	3(0.55)	13(2.36)	36(6.55)	419(76.36)
Supraclavicular (3)	0(0)	13(2.36)	0(0)	0(0)	4(0.73)	17(3.09)
Axillary (3.9)	0(0)	9(1.64)	1(0.18)	3(0.55)	8(1.45)	21(3.82)
Inguinal (4.4)	0(0)	15(2.73)	2(0.36)	2(0.36)	5(0.91)	24(4.36)
Submandibular (7.6)	1(0.18)	35(6.36)	1(0.18)	1(0.18)	4(0.73)	42(7.64)
Postauricular (2.5)	0(0)	10 (1.82)	1(0.18)	0(0)	3(0.55)	14(2.55)
Sub-mental (2)	0(0)	9(1.64)	0(0)	1(0.18)	0(0)	10(1.82)
Occipital (0.6)	1(0.18)	2(0.36)	0(0)	0(0)	0(0)	3(0.55)
Total	04(0.72)	458(83.09)	08(1.45)	20(3.64)	60(10.91)	550 (100)

Table 3: Category wise cytological diagnosis as per the proposed Sydney System in the present study (n-550).

	Sydneysystem Diagnostic Catagories	Total Frequency (%) 550	Cytology Diagnosis (N-550)	Frequency (%)
1	Category I/(L1) inadequate/non-diagnostic	04(0.73)	Blood only	2(0.36%)
			Scanty material	2(0.36%)
2	Category II/(L2) benign	458(83.27)	Reactive lymphoid Hyperplasia	189(34.40%)
			Acute/suppurative Lymphadenitis	35(6.35%)
			Granulomatous Lymphadenitis	116(21.25%)
			Necrotizing lymphadenitis	38(6.90%)
			Miscellaneous-reactive lymphadenitis with Histiocytes	80(14.54%)
3	Category III/(L3) ALUS/AUS	08(1.5)	Atypical lymphoid cells	08(1.5)
4	Category IV/(L4): suspicious	20(3.5)	Suspicious of lymphoma	5(0.9)
			Suspicious for metastasis	15(2.73)
5	Category V/(L5): malignant	60(11)	Lymphoma	8(1.5)
			Metastasis	52(9.5)

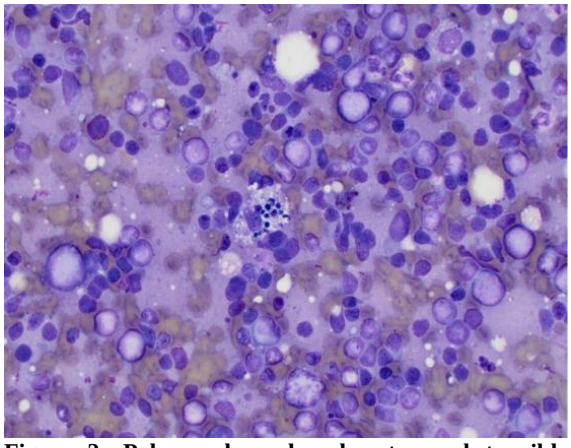

Figure 2: Polymorphous lymphocytes and tangible body macrophages of a reactive axillary lymph node (H&E-40X)

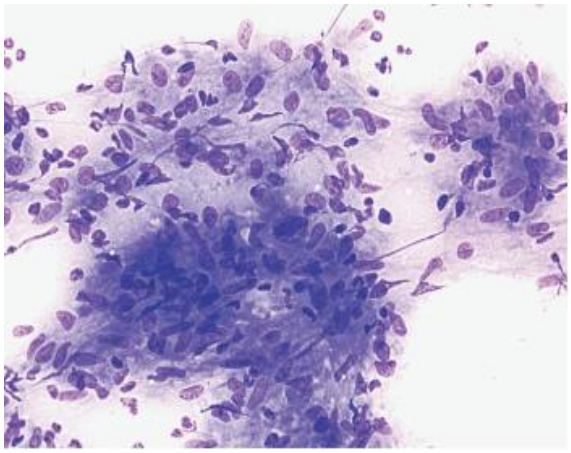

Figure 3: Granulomatous lymphadenitis: epithelioid histiocytes with elongated slipper-shaped nuclei(PAP-40X)

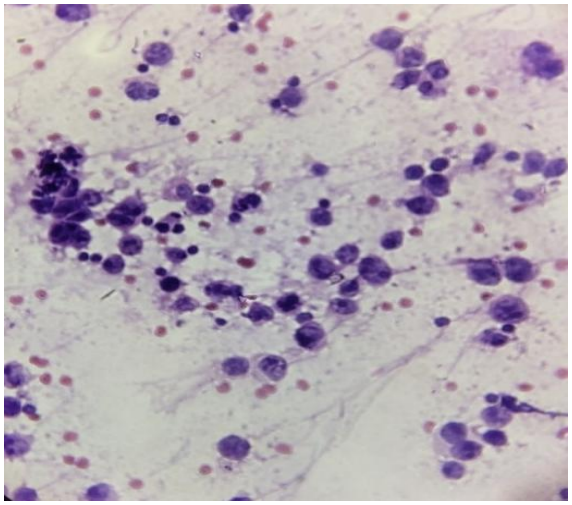

Figure 4: Smear shows large cells with irregular nuclei, prominent nucleoli, scanty cytoplasm (H&E-10X)

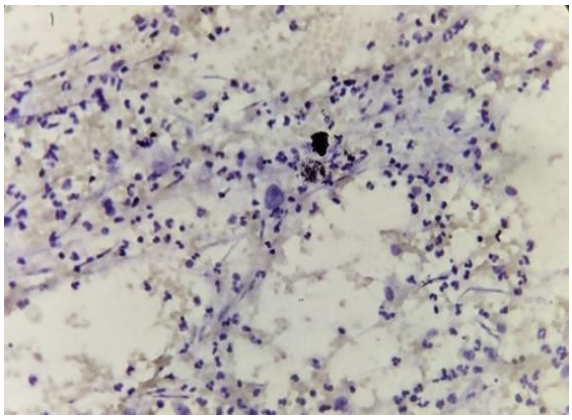

Figure 5: Large atypical lymphoid cells of NHL having vesicular chromatin and prominent nucleoli (H&E-40X)

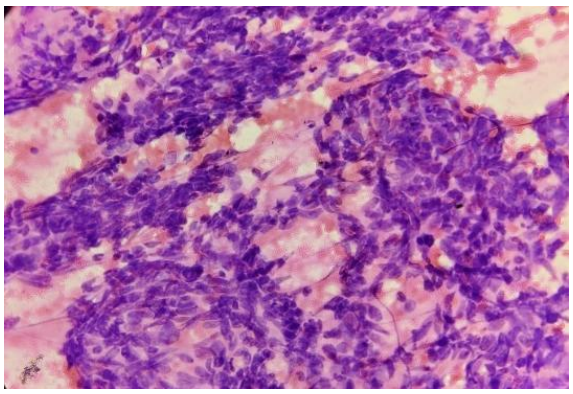

Figure 6: Metastatic SCC -show Irregular cohesive sheets of tumour cells with high N/C ratio and nuclear hyperchromasia. (H&E-10X).

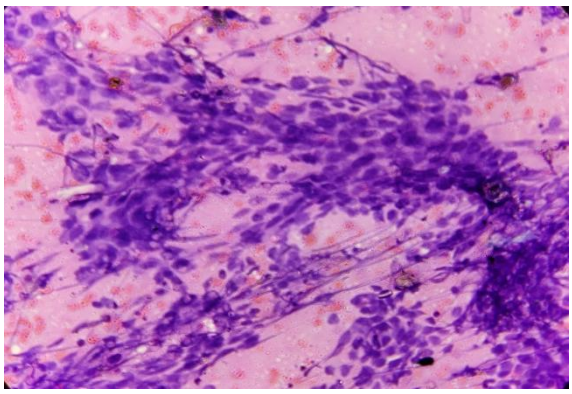

Figure 7: Metastatic adenocarcinoma- Cohesive clusters of cells with papillary arrangement along with single scattered cells. (H&E-10X)

DISCUSSION

Table 4: Comparative Demographic Analysis of Lymph Node Lesions in FNAC: Present Study vs. Other Studies

Sr no	Your study	Doaa Alqaidy et all [4]	Goyal el all [5]	Vigliar et all [6]
Age group	5-75	6-80	2-85	10-75
Mean age	27.82	45.2	38.5	38.5
Most affected age group	13-30	32-40	41-50	31-40
Male: female ratio	1.02:1	1.2:1	1.5:1	1:1

Our study's demographic data indicate a younger population (mean age: 27.82 years) compared to similar studies, such as Goyal et al. (38.5 years). The male-to-female ratio in our study is nearly equal, contrasting with other studies that report a higher male predominance.

Table 5: Comparison of Lymph Node Involvement in Fine Needle Aspiration Cytology (FNAC) Across different Studies

Studies	Cervical	Axillary	Inguinal	Sub mandibular	Supra clavicular	Sub mental	Posterior Auricular	Occipital
Present study	419(76.3)	21(3.8)	24(4.3)	42(7.6)	17(3.09)	10(1.82)	14(2.55)	3(0.5)
Doaa Alqaidy et all,[4]	72(38.3%)	20(10.6%)	2(1.1%)	8 (4.3%)	3 (1.6%)	-	-	-
Goyal el all,[5]	365(66.36%)	66(22%)	15(2.73%)	35(6.36%)	10(1.82%)	9(1.64%)	10 (1.82%)	2(0.36)
Vigliar et all,[6]	136(45.3%)	66 (22%)	40(13.3%)	55(18.3%)	-	-	-	-

Comparison to the study by Doaa Alqaidy et al., our study shows a higher prevalence of cervical lymph node involvement (76.3% vs. 38.3%). However, Doaa Alqaidy et al.'s study reports more frequent axillary (10.6%) and inguinal (4.3%) lymphadenopathy than our study (3.8% and 4.3%, respectively). The submandibular and supraclavicular lymph nodes show a similar distribution in both studies. Notably, our study reports a significantly lower frequency of posterior auricular (0.5%) and occipital (0%) nodes compared to their findings. These differences highlight regional variations and potential methodological influences in both studies.[4-6]

Table 6: Comparative Analysis of Lymph Node Pathology Findings Across Different Studies

Aspect	Present Study	Khan et al,[7]	Gupta et al,[8]	Patel et al,[9]	Sharma et al,[10]
Classification System	Sydney System	Sydney System	Sydney System	Sydney System	Sydney System
Benign Cases (%)	83.27%	63.20% (Reactive hyperplasia: 22.85%)	64% (Reactive hyperplasia: 36%)	71.67% (Reactive hyperplasia: 26.67%)	87.55% (Reactive hyperplasia: 35.47%)
Malignant Cases (%)	10.91%, with 9.5% metastatic carcinoma	20% (Metastatic carcinoma)	14.6% (Metastatic carcinoma)	18.33% (Metastatic carcinoma)	12.45% (Metastatic carcinoma: 11.32%)
Lymphoma Prevalence (%)	1.5%	12.85%	10.6%	10%	1.13%
Tuberculous Lymphadenitis	21%	35.71%	21%	35%	42.26%

This study reported 83.27% benign and 10.91% malignant cases, which aligns with findings from Gupta et al. and Patel et al. High prevalence of tuberculous lymphadenitis in this study (21%), alien with other research from high-TB-endemic regions reported tuberculosis as the leading cause of benign lymphadenopathy.[8,9]

A significant finding across multiple studies, including this, is the predominance of metastatic carcinoma among malignant cases, accounting for 9.5% in this study, comparable to the 8–10% range in similar research. Lymphomas, however, were relatively less frequent (1.5%), while other studies (such as Sharma et al.) reported a higher prevalence of up to 5%.[10]

CONCLUSION

This study reinforces the role of FNAC as a minimally invasive, cost-effective, and rapid diagnostic tool for lymph node evaluation. The Sydney System has demonstrated its utility in enhancing diagnostic clarity, thereby improving communication between pathologists and clinicians.

Adopting a standardized reporting system like the Sydney System can facilitate better clinical decision-making, guide appropriate patient management, and reduce the need for unnecessary biopsies. Future research should focus on optimizing these diagnostic workflows and expanding their applicability in routine clinical practice.

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