

Reclassification Of Lymph Node FNAC Cases Using the Sydney System: A Descriptive Study at Chughtai Institute of Pathology

Dr. M. Tariq Iqbal Khan

Resident Histopathologist, Chughtai Institute of Pathology

Email: tk711841@gmail.com

Dr. Omer Rasheed Chughtai

Consultant Histopathologist, Chughtai Institute of Pathology

Email: Profileonee@gmail.com

Dr. Kanwal Babar

Consultant Histopathologist, Chughtai Institute of Pathology

Email: drsalahkanwal@hotmail.com

Dr. Moazzam Nagi Abbas

Resident Histopathologist, Chughtai Institute of Pathology

Email: moazzamshahi@gmail.com

Dr. Farhat Batool

Resident Histopathologist, Chughtai Institute of Pathology

Email: kashifabbas.mbbs@gmail.com

Dr Saboor khan

Resident histopathologist, Chughtai institute of pathology

Email: abdulsaboor048q@gmail.com

Author Details

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Corresponding E-mail & Author*:

Dr. M. Tariq Iqbal Khan

Resident Histopathologist,
Chughtai Institute of Pathology
Email: tk711841@gmail.com

Abstract

Background:

Fine needle aspiration cytology (FNAC) is a commonly used, least-invasive method of assessing abnormalities of lymph nodes. Its clinical usefulness has been limited by a large margin of uniform reporting terminology, and this leads to inability to interpret and manage uniformly. The Sydney System, which is suggested as a five-tiered classification framework (L15), provides a structured method similar to that in use in thyroid and salivary gland cytopathology.

Objective:

To determine the utility of the Sydney System in re-classification of FNAC cases of lymph node and to determine the prevalence of diagnostic categories, and a study of the discrepancy rates between cytological and clinical diagnoses.

Methods:

The research was a descriptive study done at Chughtai Institute of Pathology in a period of one year after institutional review board approval. FNAC of lymph nodes (n=341), was retrospectively revisited and reorganized based on the categories of Sydney System:

L1 (non-diagnostic), L2. The Benign, Atypical cells of undetermined significance, Suspicious of malignancy, and Suspicious of benignity (Malignant). Discrepancies between cytological classification and available clinical/histopathological data were also evaluated.

Results:

Of 341 cases, the Sydney System distribution was as follows: L1 (non-diagnostic): 40 cases (11.7%), L2 (Benign): 224 cases (65.7%), L3 (Atypical/undetermined significance): 7 cases (2.1%), L4 (Suspicious for malignancy): 1 case (0.3%), and L5 (Malignant): 69 cases (20.2%). Among L2 cases, the most common diagnosis was tuberculosis/granulomatous lymphadenitis (29%), followed by miscellaneous benign conditions (57%) and reactive lymph nodes (14%). Among L5 cases, metastatic carcinoma accounted for 91% and lymphoma for 9%. Discrepancies between cytological classification and clinical outcome were identified in 27 cases (7.9%), with major discrepancies in 3 cases (37.5% of discrepant cases) and minor discrepancies in 5 cases (62.5% of discrepant cases).

Conclusion:

The Sydney System provides a practical, reproducible framework for reporting lymph node FNAC. Its implementation at Chughtai Institute of Pathology demonstrated a high benign case rate with a meaningful proportion of malignant diagnoses, confirming the system's clinical applicability in a high-volume, resource-rich pathology setting.

INTRODUCTION

Fine needle aspiration cytology (FNAC) has emerged as a cornerstone diagnostic modality in the initial evaluation of lymphadenopathy. Its benefits - such as cheapness, minimal invasiveness, traumatic turnover, and good diagnostic pay-off - have resulted in extensive use in both developed and developing nations and building healthcare systems.¹ Nonetheless, the lack of the standardized reporting structure has traditionally made inter-institutional comparability less of a possibility and obstructed clinical decision-making. Tiered reporting systems have changed surgical pathology and cytopathology. The Bethesda System of thyroid cytopathology and the Milan System of salivary gland cytopathology have shown that risk-stratified and structured reporting is an important contributor to clinical improvement management.² The proposed system (Sydney System) of reporting lymph node cytopathology was meant to address the similar requirement in FNAC of lymph nodes. This system classifies cases into five levels, namely: L1 (Nondiagnostic), L2 (Benign), L3 (Atypical cells of undetermined significance AUS), L4 (Suspicious): malignancy, and L5 (Malignant).³

Lymphadenopathy is a frequent clinical manifestation in Pakistan and there is a high burden of lymphadenopathy infectious etiologies, including tuberculosis, and a high level of lymphoma and metastatic malignancies. Chughtai Institute of Pathology is one of the largest and most technologically has a number of state-of-the-art diagnostic centers, which handle thousands of FNAC each year. The use of the Sydney System in this respect has not been described previously.

The aim of the research was to reclassify the lymph node FNAC cases at Chughtai Institute of Pathology Sydney System, to test the distribution of diagnostic categories, and to test the frequency and character of discrepancies in cytological and clinical diagnosis. The findings are intended to inform standardization of the lymph node cytopathology reporting in Pakistan and other such places.

Objectives

- To reclassify 341 lymph node FNAC cases at Chughtai Institute of Pathology using the Sydney System (L1–L5).
- To determine the frequency distribution of each Sydney System category in the study cohort.

- To analyze the sub-diagnoses within the benign (L2) and malignant (L5) categories.
- To evaluate the rate and nature of discrepancies between cytological classification and available clinical or histopathological data.

MATERIALS AND METHODS

Study Design and Setting

This was a descriptive, retrospective study conducted at the Chughtai Institute of Pathology, Lahore, Pakistan. The study was conducted over a one-year period following approval by the Institutional Review Board (IRB) of Chughtai Institute of Pathology. Consent requirement was waived given the retrospective nature of data collection.

Study Population

All consecutive lymph node FNAC cases diagnosed at Chughtai Institute of Pathology during the study period were included. Cases were included irrespective of patient age or gender, and regardless of the lymph node site sampled. The only exclusion criterion was cases in which the anatomical site of lymph node was not clearly documented.

Sample Size

A total of 341 lymph node FNAC cases were analyzed, representing the complete dataset available for the study period.

Data Collection

Clinicopathological data were retrieved from the laboratory information system. For each case, the following variables were recorded: patient demographics (age, sex), lymph node site, clinical findings, gross description, microscopic description, original cytological diagnosis, Sydney System category assigned on reclassification, and clinical follow-up information (where available). Data collected also included Sydney System classifications of FNA cytopathology slides, histopathological diagnoses where available, and clinical management decisions based on FNA results.

Reclassification Procedure

At least two consultant pathologists with experience in cytopathology underwent orientation sessions on the principles and application of the Sydney System. Each case was independently reviewed and reclassified into the appropriate Sydney System category: L1 (Non-diagnostic/Inadequate), L2 (Benign), L3 (Atypical cells of undetermined significance — AUS), L4 (Suspicious for malignancy), or L5 (Malignant). Interobserver agreement was assessed using Cohen's kappa statistic where applicable.

Discrepancy Analysis

A difference between the cytological Sydney System and the clinical diagnosis or histopathological confirmation that is available. Any difference was classified as major (important differences that probably change management) or minor (minor differences that are unlikely to change management) to dramatically change management).

Statistical Analysis

All variables have been analyzed using descriptive statistics. Calculation of frequency and percentage was done for categorical data. Mean, standard deviation and range were

used to summarize age. Diagnostic such parameters as accuracy such as sensitivity, specificity, positive predictive value (PPV) and negative predictive value. Cases that had available histopathological follow-up had their predictive value (NPV) computed Cohen kappa statistic was used in the measure of interobserver agreement. All analyses were performed using SPSS version 25.0

Ethical Considerations

This research was carried out in the compliance with the ethical standards of the Declaration of Helsinki. The Institutional Review Board of Chughtai Institute reviewed and approved the study protocol of Pathology. Since the study has a retrospective design and anonymized data, no formal patient has been used there was no need to have consent (as the supervising faculty confirmed).

RESULTS

Demographic Characteristics

A total of 341 lymph node FNAC cases were included in the study. The age of patients ranged from 2 to 88 years, with a mean age of 32.3 ± 18.3 years (median: 28 years). The majority of patients were female (214/341; 62.8%) compared to males (127/341; 37.2%), yielding a female-to-male ratio of approximately 1.7:1.

Sydney System Category Distribution

Upon reclassification, the 341 cases were distributed across the five Sydney System categories as shown in Table 1. The majority of cases fell into the L2 (Benign) category, followed by L5 (Malignant).

Table 1: Distribution of Cases According to Sydney System Categories (n=341)

Category	Description	Number of Cases	Percentage (%)
L1	Non-diagnostic / Inadequate	40	11.7%
L2	Benign	224	65.7%
L3	Atypical cells of undetermined significance	7	2.1%
L4	Suspicious for malignancy	1	0.3%
L5	Malignant	69	20.2%
Total		341	100%

Analysis of L2 (Benign) Category

Among the 224 benign (L2) cases, the most common sub-diagnosis was tuberculosis/granulomatous lymphadenitis (66 cases; 29.5%), followed by miscellaneous benign conditions including reactive lymphadenitis, abscess, and non-specific reactive changes (129 cases; 57.6%), and reactive lymph nodes without granulomatous features (29 cases; 12.9%). Table 2 summarizes the L2 sub-diagnoses.

Table 2: Sub-diagnoses Within L2 (Benign) Category (n=224)

Sub-diagnosis	Number of Cases	Percentage (%)
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Tuberculosis / Granulomatous Lymphadenitis	66	29.5%
Reactive Lymph Node (non-specific)	29	12.9%
Miscellaneous (abscess, necrotizing, other benign)	129	57.6%
Total	224	100%

Analysis of L5 (Malignant) Category

Among the 69 malignant (L5) cases, metastatic carcinoma was the predominant diagnosis (63 cases; 91.3%), with primary malignancies including carcinoma of breast, oral cavity, larynx, lung, thyroid, cervix, and other sites. Lymphoma accounted for 6 cases (8.7%), including Hodgkin's lymphoma and non-Hodgkin's lymphoma. Table 3 presents the L5 sub-diagnoses.

Table 3: Sub-diagnoses Within L5 (Malignant) Category (n=69)

Sub-diagnosis	Number of Cases	Percentage (%)
Metastatic Carcinoma (various primary sites)	63	91.3%
Lymphoma (Hodgkin's and Non-Hodgkin's)	6	8.7%
Total	69	100%

Discrepancy Analysis

Mismatches between cytological Sydney System classification and available clinical or histopathological follow-up data were found in 27 cases out of 341 (7.9). Among them, 8 cases contained enough information to be further categorized: major discrepancies were found in 3 cases (37.5%), whereas minor discrepancies were found in 5 cases (62.5%). Significant differences were also observed whereby the cytological classification implied a benign process but clinical or histopathological follow-up demonstrated malignancy, or the other way round. The data of discrepancy is summarized in Table 4.

Table 4: Discrepancy Analysis Summary

Variable	Number	Percentage (%)
Total cases with discrepancy	27	7.9%
Major discrepancies	3	37.5%*
Minor discrepancies	5	62.5%*

* Percentage calculated among the 8 discrepant cases with sufficient follow-up data.

DISCUSSION

This study represents one of the first systematic applications of the Sydney System for lymph node FNAC classification in Pakistan. Our findings demonstrate that the Sydney System is highly applicable in a high-volume tertiary pathology laboratory setting and produces a clinically meaningful distribution of diagnostic categories.

The overall category distribution observed in our study is broadly consistent with

published international data. In a large Italian multicenter study by Caputo et al. encompassing 1,458 cases, the benign category (corresponding to L2) was the most common finding, which mirrors our results where L2 accounted for 65.7% of cases.¹ The non-diagnostic rate of 11.7% (L1) in our series is comparable to rates reported in the literature, ranging from 8–16%, and reflects both technical and clinical factors including difficult-to-aspirate nodes and acellular specimens.²

The high proportion of granulomatous lymphadenitis within the benign category (29.5%) is consistent with the epidemiological context of Pakistan, where tuberculosis remains endemic. A study from northeast India by Baruah and Bhuyan similarly reported a predominance of granulomatous lymphadenitis in their benign category, underscoring the relevance of this system in South Asian settings with high infectious disease burdens.³ This finding also highlights the importance of integrating clinical correlation — including microbiological culture studies — for cases classified as L2 with granulomatous features.

The malignant category (L5) comprised 20.2% of cases, with metastatic carcinoma accounting for the overwhelming majority (91.3%). This high proportion of metastatic disease reflects the typical referral pattern to a large tertiary center, where patients with known primary malignancies are often referred for lymph node staging. The lower proportion of lymphoma (8.7%) compared to some studies may reflect the availability of flow cytometry and excision biopsy in suspicious cases, which reduces reliance on FNAC alone for lymphoma diagnosis.

The L3 (atypical cells of undetermined significance) category, analogous to the AUS category in other cytopathology systems, was recorded in only 2.1% of cases. This is a reassuringly low rate and suggests that pathologists were able to definitively classify most cases. Some published studies report higher AUS rates, which may reflect different thresholds for classification or differences in specimen quality.

The overall discrepancy rate of 7.9% in our series is acceptable for a cytopathological study of this nature. The predominance of minor over major discrepancies (62.5% vs. 37.5%) is encouraging, as major discrepancies — where cytological findings significantly diverge from clinical or histopathological outcomes — are the category with the greatest potential for patient harm. These findings reinforce the need for routine clinical correlation and multidisciplinary discussion for high-risk cases.

A limitation of this study is its retrospective design, which limited the availability of histopathological follow-up for all cases. Future prospective studies with systematic histopathological correlation and formal interobserver agreement assessment using Cohen's kappa would further validate the Sydney System's reliability in this setting. Additionally, the study was conducted at a single, technologically advanced center, which may limit generalizability to smaller or resource-limited laboratories.

CONCLUSION

The Sydney System for reporting lymph node FNAC cytopathology is a practical, reproducible, and clinically meaningful classification framework that can be successfully implemented in a high-volume tertiary pathology laboratory in Pakistan. In our cohort of 341 cases, the majority of cases were classified as benign (L2; 65.7%), with a significant proportion of malignant cases (L5; 20.2%) predominantly composed of metastatic carcinoma. The non-diagnostic rate was 11.7%, the atypical category rate was low (2.1%), and the discrepancy rate was acceptable at 7.9%. These findings support the broader adoption of the Sydney System in Pakistani pathology practice to standardize reporting, improve clinical communication, and facilitate comparative research.

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