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Research Article

LYMPH NODE CYTOLOGY REPORTING BY "SYDNEY SYSTEM: A COMPREHENSIVE APPROACH TO LYMPH NODE FINE-NEEDLE ASPIRATION CYTOLOGY"

ABHISHEK SINGH[1]*, SHIVENDRA DUTT SHUKLA[2]

[1]Department of Pathology, Maharshi Vishwamitra Autonomous State Medical College, Ghazipur, Uttar Pradesh, India. [2]Department of Microbiology, Maharshi Vishwamitra Autonomous State Medical College, Ghazipur, Uttar Pradesh, India.
***Corresponding author: Abhishek Singh; Email: abhiguru.singh@gmail.com**

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ABSTRACT

Objectives: The major goal of the current investigation was to categorize the lesions found in lymph nodes using the Sydney approach for reporting cytopathology of lymph nodes.

Methods: This investigation was carried out retrospectively at Maharshi Vishwamitra autonomous state medical college in Ghazipur, between January 2022 and December 2023. Total 250 patients were examined; cytopathologically assessed, and categorized using the Sydney method. Whenever feasible, a link between histopathology and clinical findings was made.

Results: Out of 250 cases, 04% (n=10) were inadequate/non-diagnostic (L1 category), 87% (n=218) were benign (L2 category), 02% (n=05) were atypical (L3 category), 2.8% (n=2.8%) were suspicious of malignancy (L4 category), and 04% (n=10) were malignant (L5 category). The sensitivity and specificity was 94.4% and 98.1%. The positive predictive value, negative predictive value, and diagnostic accuracy were 94.4%, 98.1%, and 97.1%, respectively. For L2 category, the probability of malignancy was 1.9 %, for L3 category 66.6% and for L4 and L5 was 100%.

Conclusion: The suggested reporting system intends to provide consistent recommendations on management regimens, improve communication between cytopathologists and doctors, and standardize reporting.

Keywords: Lymphadenopathies, Sydney method, Fine-needle aspirations, Lymph node cytopathology.

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INTRODUCTION

Lymph nodes are one of the main components of the human immune system. Lymphadenopathy is the term used for abnormal increase in size and consistency of lymph nodes. Most of the lymphadenopathies are benign (90%) in nature such as reactive lymphoid hyperplasia or infectious in nature. As far as pathogenesis, natural history, prognosis, and best management are concerned, the current World Health Organization categorization system has more than 50 different lymphomas. The two main forms of lymphoma are Hodgkin's and non-Hodgkin's lymphoma [1]. Malignant causes of lymphadenopathy (10%) include lymphoma, both Hodgkin's and non-Hodgkin's lymphoma and metastatic disease [2,3]. Fine-needle aspiration cytology (FNAC) is minimally invasive, making it a preferred choice for patients, as it involves a thin needle rather than a surgical procedure. Moreover, it offers cost-effectiveness, providing an affordable diagnostic option for individuals and healthcare systems alike. Its rapid diagnostic capabilities enable timely treatment decisions, expediting patient care. Furthermore, FNAC's low complication rate ensures a safe and reliable diagnostic experience for patients with minimum risk [4]. This system provides the categorization of lymph node fine-needle aspiration (FNA) diagnosis as well as provides insight on management algorithms [5]. Five categories are used by the Sydney method to classify lymph nodes: Category I/L1: Inadequate/non-diagnostic, category II/L2: Benign, category III/L3: Atypical cells of undetermined significance/atypical lymphoid cells of uncertain significance, category IV/L4: Suspicious for malignancy, and category V/L5: Malignant [5].

Ancillary testing is integral part of FNAC for reaching a correct and final diagnosis such as Ziehl-Neelsen stain (ZN) for acid-fast bacilli (AFB) and cartridge based nucleic acid amplification test (CBNAAT) for diagnosis of mycobacterium tuberculosis, immunophenotyping, and flow cytometry for diagnosis for lymphoid neoplasms.

METHODS

The Pathology Department at Maharshi Vishwamitra autonomous state medical college (MVASMC), Ghazipur performed a retrospective analysis on FNAC performed on lymph nodes between January 2022 and December 2023. The study was approved by the Institutional Ethics Committee before it began (Reference No. MVASMC/SN/52/2022). All ages and genders of cases were taken into account. All clinical information about the patients was recorded using requisition forms. 22 gauge needles and a 10-mL syringe were used for the FNAC; informed consent was obtained and all pertinent clinical data were recorded. Ethanol-fixed smears were produced as usual and Giemsa and Papanicolaou stains were employed for staining. In case pus was aspirated, an unstained unfixed slide was kept for ZN Staining. Furthermore, pus was provided for the CBNAAT whenever possible. Five different diagnostic categories were created for the smears using the Sydney reporting method (Table 1).

As part of the statistical study, the lymph nodes FNAC's sensitivity, specificity, negative predictive value (NPV), positive predictive value (PPV), and diagnostic accuracy were calculated. A genuine positive was defined as any malignant case classified as L3–L5, regardless of whether it was verified histologically or clinically, while any case in category L2 that was shown to be benign was considered a true negative. Any case that is histologically proved to be benign and falls into categories L3–L5 is considered a false positive; any case that is histologically verified to be malignant and falls into category L2 is considered a false negative. The proportion of proven malignant lesions to all patients with clinical or histological follow-up was used to calculate the risk of malignancy (ROM).

Statistical analysis

A Microsoft Excel spread sheet and the Statistical Package for the Social Sciences version 23 programs were used for the statistical analysis. p-value must be <0.05 to be considered statistically significant. Assessments were made of lymph node FNAC's sensitivity, specificity, PPV, NPV, and overall diagnostic accuracy.

RESULTS

During the course of the investigation, 250 lymph node FNA smears, ranging in age from 2 months to 75 years, were evaluated (26.9 years is the mean age, and 24 is the median age) and both sex, n=110 males (44%) and n=140 females (56%). Cervical lymph nodes were the most often used FNA site (n=181, 72.4%), The most frequent location for FNA was the cervical lymph nodes, which were followed by the lymph nodes in the inguinal region, submental region, supraclavicular region, submandibular region, axillary region, and post-auricular region (Table 2).

A total of 4% cases (n=10) were non-diagnostic/inadequate for evaluation where hemorrhagic smear was seen or only fat was aspirated. Majority of cases 87.2% (n=218) fell in category L2 and were diagnosed as benign. Most of the benign cases were necrotizing lymphadenitis (n=90) followed by (n=68) granulomatous lymphadenitis, as shown in Table 3. Fig. 1 showing the granulomatous lymphadenitis, that is, clusters of epitheloid cells with interspersed lymphocytes in Giemsa staining at 40×).

About 02% cases (n=05) were atypical, 2.8% cases (n=07) were suspicious for malignancy, and 04% cases (n=10) were malignant mentioned in Table 3. The cellular smear in Fig. 2 is thought to be malignant due to its high N/C ratio and somewhat pleomorphic cells (Type L5).

ZN staining was performed whenever pus was aspirated. In addition, if there was sufficient material, the pus sample was also tested using the CBNAAT to confirm tuberculosis in cases where it was suspected. Among 68 cases of granulomatous lymphadenitis, blood was aspirated in 65 cases and pus in three cases, out of which two came AFB positive. Among 90 cases of necrotizing lymphadenitis pus was aspirated material in 80 cases, 56 came out positive for AFB. CBNAAT could be performed in only 45 cases due to adequacy of aspirated material. Out of 45 samples sent for CBNAAT, 40 came positive for mycobacterium tuberculosis. All the cases that were AFB positive and were sent for CBNAAT testing came out to be positive. Two cases were negative on AFB smear examination but were positive on CBNAAT testing as presented in Table 4.

Whenever histopathology or clinical correlation was available, ROM was calculated, highest risk was found in L4 and L5 category (100%) and lowest risk in L2 category 1.9%, and histopathological correlation was not available in L1 category, as shown in Table 5.

Table 1: IAC-Reporting of lymph node cytology using the new Sydney system

Cytological categories	Explanation
L-1	Inadequate/non-diagnostic
L-2	Benign type
L-3	(AUS/ALUS)
L-4	Suspicious of malignancy
L-5	Malignant type

AUS: Atypical cells of undetermined significance, ALUS: Atypical lymphoid cells of uncertain significance, IAC: Immune assessment core

Table 2: Clinico-pathological summary of patients

Site	Number	Percentage
Cervical	181	72.4
Submandibular	25	10
Supraclavicular	12	4.8
Axillary	15	06
Inguinal/submental/post auricular	17	6.8

All variables are qualitative so we calculated frequency along with percentage

Table 3: Summary of diagnostic categories

S. No	Diagnostic category	Cytology diagnosis	Total number and percentage
1	Inadequate/ non-diagnostic (L1)	Blood=07 Fat=03	10 (04)
2	Benign (L2)	Granulomatous=68 Reactive=33 Acute suppurative=07 Necrotizing lymphadenitis=90 Nonspecific inflammatory=20	218 (87.2)
3	Atypical (L3)	Atypical lymphoid cells=04 Atypical non-lymphoid cells=01	05 (02)
4	Suspicious (L4)	Lymphoma=02 Metastasis=05	07 (2.8)
5	Malignant	Lymphoma=02 Metastasis=08	10 (04)

All variables are qualitative so we calculated frequency along with percentage

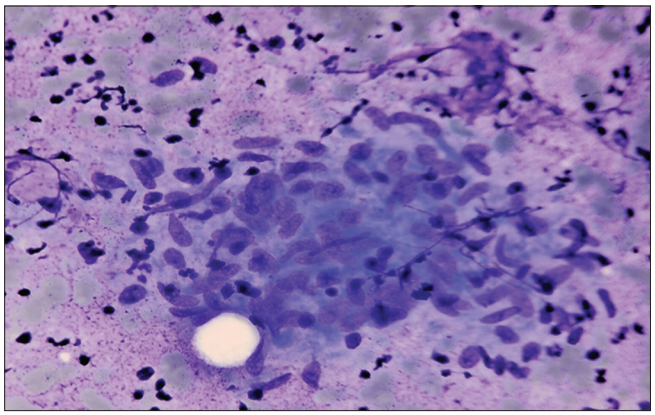

Fig. 1: Granulomatous lymphadenitis: Cluster of epitheloid cells with interspersed lymphocytes. (40×, Geimsa staining)

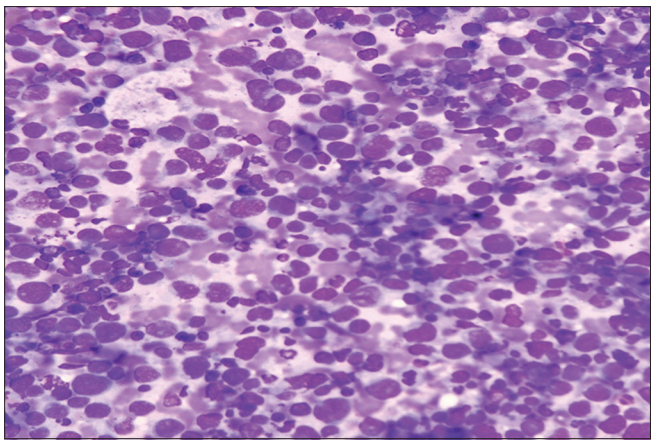

Fig. 2: A cellular smear that is suspected of being malignant due to its high nuclear-cytoplasmic (N/C) ratio and somewhat pleomorphic cells (type L5)

The present investigation yielded the following results for the Sydney reporting system: sensitivity (94.4%), specificity (98.1%), PPV (94.4%), NPV (98.15%), and (97.1%) accuracy as per Table 6.

Table 4: Summary of granulomatous and necrotizing lymphadenitis

Lesion	Pus aspirated	AFB (+ve)	CBNAAT (n=45)
Granulomatous (n=68)	03	02/03	-
Necrotizing (n=90)	80	56/80	40/45

All variables are qualitative so we calculated frequency along with percentage. AFB: Acid-fast bacilli, CBNAAT: Cartridge-based nucleic acid amplification test

Table 5: Risk of malignancy for Sydney system diagnostic category

Diagnostic group	Histopathological/ Clinical monitoring	Verified malignancy	ROM
L1 (n=10)	-	-	-
L2 (n=218)	52	01	1.9
L3(n=05)	03	02	66.6
L4(n=07)	05	05	100
L5(n=10)	10	10	100

All variables are qualitative so we calculated frequency along with percentage. ROM: Risk of malignancy

Table 6: Statistical analysis of lymph node FNAC

Statistics	Value (%)	95% CI (%)
Sensitivity	94.4	72.7–99.8
Specificity	98.1	89.7–99.9
Positive predictive value	94.4	70.8–99.1
Negative predictive value	98.1	88.3–99.7
Accuracy	97.1	90.0–99.6

FNAC: Fine-needle aspiration cytology, CI: Conflict of interval

DISCUSSION

The goals of the 2020 Sydney lymph node cytology reporting strategy were to improve communication with doctors, standardize reporting, and provide guidelines for management procedures. The present study has demonstrated the Sydney system's diagnostic accuracy for reporting lymph node cytology. The most frequent site of aspiration, according to this study and those by Gupta *et al*., Vigliar *et al*., and Pandya *et al*., was the cervical lymph nodes. While Pandya *et al*. [6]. reported a roughly equal frequency of benign and malignant lesions, this study found a higher prevalence of category L2 (87.2%) and a lower prevalence of category L3 (2%), similar to the 0.5% reported by Gupta *et al*. The category L5 prevalence in the present study was 4%, which was not comparable to the findings of investigations by Vigliar *et al*. and Gupta *et al.,* these disparate findings could be due to differences in sample size and research location, as shown in Table 7.

The current investigation only included blood or fat aspirations in the L1 category. For this histopathological correlation or clinical follow-up was not done, hence, ROM was not calculated, while study of Gupta *et al*. [7] showed ROM 27.5% and Vigliar *et al.* [8] showed a ROM of 50%. Histopathological/clinical follow of L2 category showed malignancy in one out of 52 follow-up cases. ROM calculated was 1.9% which was similar to a study done by Vigliar *et al.* (1.92%), but far less than that in the Gupta *et al.* study [7] who noted the malignancy risk in 35 out of 304 cases (11.5%). Out of cases followed in L3 category, two cases were confirmed malignant; hence, ROM was 66.6 % which resembled the research done by Gupta *et al*. [7] who calculated ROM to be 66.7% while ROM in study of Vigliar *et al.* [8] was 58.3% for category L3. The present investigation yielded a 100% ROM for categories L4 and L5, which is in close accordance with the findings of Gupta *et al.* and Vigliar *et al.* [7,8] who reported corresponding risks of 99.6% and 88%, as presented in Table 8.

The present investigation has a sensitivity of 94.4% and a specificity of 98.1%, according to the Sydney reporting system. According to the Sydney system, the diagnostic accuracy, PPV, and NPV for this inquiry were 94.4%, 98.1%, and 97.1%, respectively. These numbers

Table 7: Comparison between different studies according to diagnostic category

Categories	Current study (%)	Study of Gupta *et al.* (%)	Study of Vigliar *et al.* (%)	Study of Pandya *et al.* (%)
L1-non diagnostic	04	4.1	6.7	4.12
L2-Benign type	87.2	48.6	34.7	61.34
L3-Atypical type	02	0.5	8.3	8.3
L4-Suspicious type	2.8	1.4	4.3	13.4
L5-Malignant type	04	45.5	46	18.04

Table 8: ROM Comparison between different studies according to diagnostic category

Categories	Current study (ROM)	Study of Gupta *et al.* (ROM)	Study of Vigliar *et al.* (ROM)
L1-Non diagnostic	--	27.5	50
L2-Benign type	1.9	11.5	1.92
L3-Atypical type	66.6	66.7	58.3
L4-Suspicious type	100	99.6	88
L5-Malignant type	100	99.6	88

ROM: Risk of malignancy

Table 9: Comparison of statistical values with other studies

Categories	Current study (%)	Study of Gupta *et al.* [7] (%)	Study of Vigliar *et al.* [8] (%)	Study of Pandya *et al.* [6] (%)
Sensitivity	94.4	79.9	98.4	95.2
Specificity	98.1	98.7	95.3	94.1
Positive predictive value	94.4	98.4	96.3	98.4
Negative predictive value	98.1	83.1	98.1	84.2
Diagnostic accuracy	97.1	89.3	97.1	-

are similar to those found in other studies that are mentioned in (Table 9).

CONCLUSION

The main method of screening for lymphadenopathy is FNAC. Most of the lymphadenopathies are benign in nature while few turn out be malignant which be primary or secondary. In cases where pus is aspirated, in addition of providing diagnosis, it provides material for ancillary studies as CBNAAT. Uniform reporting system of lymph node cytology not only provides a better communication between cytopathologist and clinician but also to an extent provides an insight to general management for each category. Hence, Sydney system of reporting should be widely recognized and used by every cytopathologist to enhance uniformity in reporting.

AUTHORS' CONTRIBUTIONS

Dr. Abhishek was the one who produced the conceptual framework and the draft. The last round of editing was performed by Drs. Abhishek and Shivendra, who also helped to the data collecting and microbiology analysis.

CONFLICTS OF INTEREST

None.

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None.

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