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ORIGINAL ARTICLE

Concordance in diagnosis of Neck masses using Clinical Pre-diagnosis and Pathological analysis

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Abstract

Background: Neck swelling is one of the commonest presentations in otorhinolaryngological practice. Study aimed to analyze the demographics and symptomatology of cervical masses, the degree of accuracy of clinical examination as well as the correlation between the clinical diagnosis and pathological results in patients presenting with neck masses. **Material & Method**: The present prospective observational study is conducted among the patients attending the out-patient and in-patients setting of ENT department with complaints of neck mass/ masses either primarily or in conjunction with other complaints, for more than 3 weeks duration. The patients with complaints of neck mass of acute inflammatory origin of less than 3 weeks and patients with inflammatory causes of lymphadenopathy including those secondary to upper aero-digestive tract infection and those of tubercular origin on initial assessment were excluded. Following a thorough clinical examination appropriate radiological investigations were advised, followed by cytological evaluation. FNAC was performed, either guided or unguided as per the discretion of the pathologist. Further Histopathogical evaluation was conducted in tissue specimens, wherever required, after either surgical excision of the entire mass or a biopsy. Histopathology involves the examination of sampled whole tissues under the microscope. **Results**: Age distribution placed majority of females in the young adult (16-40 yrs) category and males in the late adult (> 40 yrs) group. The majority of neck masses were thyroid swellings (42%) followed by lymph nodal masses (29%) and salivary gland lesions (14%). Of all the neck masses in females 87% were benign whereas amongst males 62% were malignant. The accuracy of clinical pre-diagnosis was seen to be 93.4%. The sensitivity for thyroid lesions for suspicion of malignancy however, was seen to be only 33% as papillary carcinoma thyroid essayed no symptoms or signs of malignancy. FNAC as an investigation for pre-diagnosis, the accuracy on the whole was seen to be 84.7% with a sensitivity of 82.5% which is comparable to other Indian studies. For thyroid lesions however the sensitivity was very low, 33.3%. This may be due to the inconsistent use of guidance systems and inexperience of our junior aspirators which act as confounding factors. **Conclusion**: Accuracy of FNAC in comparison to the definitive diagnosis was 84.7%. Inconsistent use of guidance systems, inexperience of junior aspirators and aspiration from representative node/ part of the lesion may act as confounding factors resulting in the discordance between clinical pre-diagnosis and FNAC accuracy with respect to the definitive diagnosis

Keywords: FNAC, Accuracy, Thyroid, histopathology

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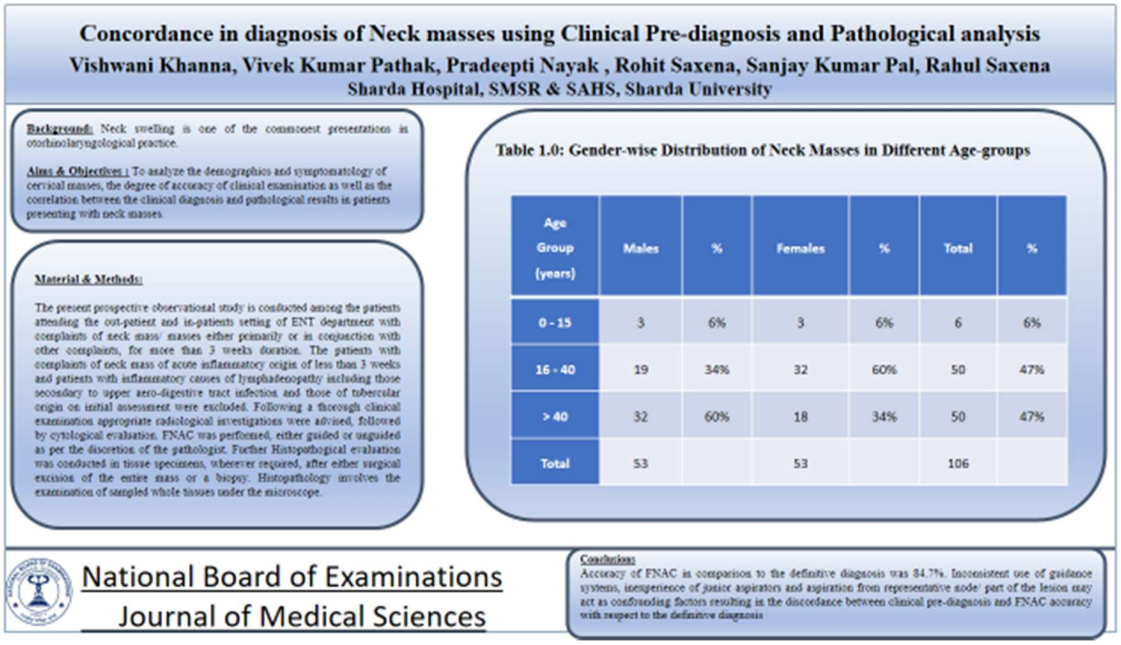
Graphical Abstract



Introduction

Neck swelling is one of the commonest presentations in otorhinolaryngological practice. It is also a major cause of morbidity and mortality amongst patients in India [1,2]. Due to the anatomical complexity of the neck region, diagnosis of lesions in this region becomes a diagnostic dilemma. A plethora of pathological conditions present with identical symptoms. Conversely, the same disease may present with diverse symptoms. Majority of the neck swellings can be accurately diagnosed by a comprehensive history and a thorough clinical examination [3].

Neoplasms of the neck region are a major form of cancer in India, accounting for 23% of all cancer in males and 6% in females [4]. It is therefore imperative to diagnose a malignant neck mass at the earliest and institute the correct management. The vital parameters that determine whether the mass is malignant or not include the age of the patient, location, size and duration of the mass. A neck mass in children is most likely to be an inflammatory or developmental condition. Neoplasms (benign or malignant) are more likely to present in older individuals. Often a cervical lymph nodal mass is the only presentation of a primary malignancy elsewhere in the head or neck region like mouth, pharynx or larynx.

Radiological investigations such as ultrasonography, computed tomography, magnetic resonance imaging, angiography and scintigraphy may further assist in coming to a diagnosis. FNAC or fine needle aspiration cytology is the primary investigation of choice in evaluation of head and neck masses, reasons being its high degree of diagnostic accuracy, cost-effectiveness and the minimally disruptive nature of the procedure. Histopathological evaluation of excisional and incisional biopsy specimen is required for the definitive diagnosis of the lesion [5,6].

This study is therefore being conducted to analyze the demographics and

symptomatology of cervical masses, the degree of accuracy of clinical examination as well as the correlation between the clinical diagnosis and pathological results in patients presenting with neck masses.

Material and Methods

The present prospective observational study is conducted over a period of 1 year (Jan 2022 to March 2023) among 106 patients attending the out-patient and in-patients setting of ENT department with complaints of neck mass/ masses either primarily or in conjunction with other complaints, for more than 3 weeks duration. The patients with complaints of neck mass of acute inflammatory origin of less than 3 weeks and patients with inflammatory causes of lymphadenopathy including those secondary to upper aero-digestive tract infection and those of tubercular origin on initial assessment were excluded.

A thorough history was elicited from the patients. Important factors include onset progression, duration, location, number, symptoms localizing the primary diagnosis (if any), risk factors and constitutional symptoms. Evaluation of risk factors has been included in this study to assist in clinical pre-diagnosis of associated neck masses, especially thyroid and lymph nodal masses. Constitutional symptoms suggest disorders such as tuberculosis, lymphoma, collagen vascular diseases, unrecognized infection or malignancy. Examination for thyroid gland was performed on all patient. The patient was asked to extend their neck and tip their head back to inspect for the thyroid gland. It is not visible in all patients, but is usually found inferior to the cricoid cartilage. Following a thorough clinical examination appropriate radiological investigations were advised, followed by cytological evaluation. FNAC was performed, either guided or unguided as per the discretion of the pathologist. Further Histopathogical evaluation was conducted in tissue specimens, wherever required, after either surgical excision of the entire mass or a biopsy. Histopathology involves the examination of sampled whole tissues under the microscope.

Statistical analysis: All the data collected was collated and subjected to statistical analysis by Statistical Package for Social Sciences (SPSS) version 24. Chi square test was applied to analyze the significance of various parameters of clinical evaluation on the presumptive diagnosis. $P < 0.05$ was considered significant and $P < 0.01$ was considered highly significant. Statistical parameters were applied to study the correlation between Clinical pre-diagnosis and the definitive diagnosis (Histopathological Report/HPR) and well as the FNAC results with the HPR. Sensitivity and accuracy were determined for both the Clinical pre-diagnosis and FNAC with respect to the HPR. Other parameters like Predictive values and specificity were calculated for individual groups of neck masses wherever possible

Results

Evaluation of gender-wise distribution of the neck masses shows that the distribution was equal amongst males and females with no gender predilection. Also an age-wise break-up of the above distribution showed that majority of males were in the late adult group (60%) whereas an equivalent proportion of females were in the young adult age-group (60%). This may be attributed the fact that malignancies were seen to be more common amongst

males and thyroid lesions amongst females. Children (0-15 years) showed no gender predilection the presentation of neck masses (Tables 1 and 2).

Table 1. Gender-wise Distribution of Neck Masses in Different Age-groups

Age Group (years)	**Males**	**%**	**Females**	**%**	**Total**	**%**
0 - 15	3	6%	3	6%	6	6%
16 - 40	19	34 %	32	60 %	50	47 %
> 40	32	60 %	18	34 %	50	47 %
Total	53		53		106	

Table 1. Distribution of Neck masses

Type of mass	**Diagnosis**	**Number of Patients**	**Total**	**Percentage**
Thyroid			45	42%
	Colloid Goitre	30		
	Follicular Adenoma	6		
	Thyroglossal Cyst	3		
	Papillary Carcinoma	4		
	Medullary Carcinoma	1		
	Thyroid Lymphoma	1		
Lymphadenopathy			31	29%
	Metastatic Lymphadenopathy	29		

	Non-Hodgkins Lymphoma	1		
	Rosai Dorfman Syndrome	1		
Salivary Gland			15	14%
	Chronic Submandibular Sialoadenitis	5		
	Chronic Parotid Sialoadenitis	3		
	Pleomorphic Adenoma	4		
	Mucoepidermoid Carcinoma	2		
	Carcinoma Parotid (Squamous cell carcinoma)	1		
Parapharyngeal Masses			3	3%
	Schwannoma	2		
	Carcinoma Tonsil	1		
Cystic Swellings			9	9%
	Branchial Cyst	1		
	Sebaceous Cyst	3		
	Dermoid Cyst	4		
	Retention cyst (Plunging Ranula)	1		
Miscellaneous			3	3%
	Odontogenic Cyst	1		
	Lipoma	2		

Overall distribution of different neck masses (with respect to the definitive diagnosis) was tabulated. The majority of neck masses were thyroid swellings (42%) followed by lymph nodal masses (29%), salivary gland lesions (14%), cystic lesions of the neck (9%), Parapharyngeal masses (3%) and other miscellaneous conditions (3%) (Tables 3, 4 and 5).

Table 2. Skin and Soft tissue lesions amongst the Neck Masses

Diagnosis	Number	%
Dermoid cyst	4	3.7
Sebaceous cyst	3	2.8
Lipoma	2	1.8
Schwannoma	2	1.8
Total	11	

Table 3. Distribution of Primary sites in Malignant Lymphadenopathy and Neck Masses as per Clinical Diagnosis

Primary Diagnosis	**Number**	**%**
Carcinoma Supraglottis	16	53
Carcinoma Buccal Mucosa	8	27
Carcinoma Tongue	3	10
Carcinoma Hypopharynx	1	3.3
Carcinoma Subglottis	1	3.3
Non-Hodgkins Lymphoma	1	3.3
Diagnosis	Number of Patients	Percentage
Benign Thyroid Swelling	41	38.70%

Metastatic Lymphadenopathy	29	27.35%
Parotid swelling	9	8.50%
Submandibular swelling	5	4.70%
Dermoid cyst	4	3.80%
Thyroglossal cyst	3	2.80%
Parapharyngeal mass	3	2.80%
Sebaceous cyst	3	2.80%
Cyst	2	1.90%
Lymphoma	1	1%
Lipoma	1	1%
Madibular bony lesion	1	1%
Branchial cyst	1	1%
Thyroid cyst	1	1%
Submental swelling	1	1%
Benign Lymphadenopathy	1	1%

Table 4. Gender-wise distribution of Thyroid masses

Thyroid Masses	**Male**	**%**	**Female**	**%**	**Total**	**%**
Colloid Goitre	5	16.6	25	83.3	30	66.6
Follicular Adenoma	0	0	6	100	6	13.3
Thyroglossal Cyst	1	33.3	2	66.6	3	6.6
Papillary Carcinoma	2	50	2	50	4	8.8

Medullary Carcinoma	1	100	0	0	1	2.2
Thyroid Lymphoma	0	0	1	100	1	2.2
Total	9	20	36	80		

Age-wise distribution of the Neck masses was analyzed and the distribution of neck masses was seen to be equal amongst the young adult (47%) and late adult (47%) age groups. Malignant lesions like Metastatic lymphadenopathy (83%), Medullary carcinoma thyroid (100%), Carcinoma parotid (100%), Carcinoma tonsil (100%), Thyroid lymphoma (100%) was concentrated largely in the late adult age group, except Mucoepidermoid carcinoma (50% - young adult, 50% - late adult) and Papillary carcinoma thyroid (25% - late adult, 75% - young adult) and NHL (100% - young adult). Benign thyroid lesions like colloid goitre (63%), follicular adenoma (83%) was more common in the young adult age group (Tables 6 and 7).

Table 5. Distribution of diagnosis of patients

Diagnosis	**Total**	**Present**	**%**
Carcinoma (Head and Neck)	29	29	100
Mucoepidermoid Carcinoma	2	2	100
Carcinoma Tonsil	1	1	100
Papillary Carcinoma Thyroid	4	1	25
Colloid Goitre	30	1	3.3
NHL	1	0	0
Thyroglossal Cyst	3	0	0
Carcinoma Parotid	1	0	0
Medullary Carcinoma Thyroid	1	0	0
Follicular Adenoma	6	0	0
Thyroid Lymphoma	1	0	0

Table 6. Calculation of statistical parameters for Clinical pre-diagnosis and HPR

Histopathology			
Clinical pre-diagnosis	Malignant	Benign	Total
Malignant	36	0	36
Benign	4	66	70
Total	40	66	106

The correlation between the Clinical Pre-Diagnosis and the Definitive diagnosis (Histopathological report) was studied. Maximum discordance was seen in the thyroid lesions. Malignant thyroid lesions were identified in only 33% of the cases which were mistaken as benign. A case of Pleomorphic adenoma due to unusual position and clinical characteristics was diagnosed as a lipoma, a lipoma was mistaken for a sebaceous cyst and 1 case of schwannoma was mistaken for a case of benign lymphadenopathy. Further analysis of the data was done and statistical parameters were analyzed. Overall accuracy of Clinical pre-diagnosis based on all factors was found to be 93.4% In case of prediction of benign and malignant lesions the sensitivity was found to be 90%, specificity 100%, positive predictive value 100% and Negative predictive value of 94.29% (Table 8).

Table 7. Calculation of statistical parameters for FNAC and HPR

Histopathology			
FNAC	Malignant	Benign	Total
Malignant	33	0	33
Benign	7	65	72
Total	40	65	105

The correlation between the FNAC and histopathological results was also analyzed. It was observed that the accuracy of FNACwas 84.7% on the whole. Overall the sensitivity of FNAC in this study was 82.5% (to differentiate between benign and malignant lesions), with specificity of 100%, positive predictive value of 100% and negative predictive value of 90.28%.

For thyroid lesions the overall accuracy was found to be 80%, with a sensitivity of 33.3%, specificity of 100% with positive predictive value of 100%, negative predictive value of 90.70% (to differentiate between malignant and benign lesions). For lymphadenopathy the overall accuracy was 90.3% with sensitivity 90%, specificity of 100%, positive predictive value of 100% and negative predictive value of 25%.

Regarding Tables 15 and 16, it should be noted that in case of the clinical pre-diagnosis, many parameters of the history and clinical examination are considered comprehensively of which most of the parameters have very equivocal criteria for suspicion of malignancy. In case of FNAC, the varying expertise of the pathologists, infrequent use of guidance systems and sampling of only a representative part of the lesion should be taken into consideration.

Discussion

This study included all the patients who presented with complaints of neck masses and attended either the out-patient section of the Department of E.N.T or were admitted for treatment of the same. Patients presenting with neck masses of less than 3 weeks' duration were considered 'acute' and hence not included in the study. This excluded all the neck masses of inflammatory and infectious origin as they invariably initially presented within 3 weeks of their apparent onset and were either resolved on treatment or lost to follow-up.

It was observed that there was no gender predilection of neck masses in our study with them being equally distributed amongst males and females. Females with neck masses however presented predominantly in the young adult age group (16-40 years) (60%) and males in the old adult age group (> 40 years) (60%).

In general Thyroid lesions were more common in females (80%) whereas Lymph nodal masses (90.3%) and salivary gland lesions (66.6%) were seen to be more common in males. The age and gender distribution of neck lesions was similar to various studies done by Popat et al, Basista et al., Ozkiris et al., Irani S et al. and Suryavanshi et al. [7-11].

The most common neck lesions in this study were thyroid lesions (39.62%) and the second most common lesion in the neck was lymph nodal lesion at 29.24% comparable to earlier studies [7-11]. (Table 2) As cases of inflammatory lymphadenitis including tubercular lymphadenitis were excluded, our study cannot be compared to other studies where the most common lesion was reactive lymphadenitis followed by tuberculous lymphadenitis like Vachhani et al, and Suryavanshi et al. [11,12]. All the 11 soft tissue tumours encountered in our study were benign. The most common tumour was dermoid cyst (36.3%) followed by sebaceous cyst. In a study done by Vahini [12]. Lipomas constituted 34.7% of all benign soft tissue tumours and were most common in the head and neck region, in contrast to our study where they constituted only 18.1% of all soft tissue tumours. Schwannomas comprised of 18.1% of all soft tissue

tumours. Majority of the cases in this study were in the young adult age group (16 – 40 years).

As per clinical consensus, of the 106 lesions, 35 were diagnosed as malignant (33%) and 71 (67%) as benign, comparable to the study by Ozdas et al with the masses being benign in 58.2 % and malignant in 22.8 %, with the character of the mass not differentiated in 18.9 %. The definitive diagnosis of all patients was made by histopathological examination. Histopathological examination revealed that 40 (37.7%) of the patients had malignant lesions whereas 66 (62.3%) specimens were benign. Ozdas et al, in their study found that 78.7 % of the 127 specimens were benign and 21.2 % were malignant which is fairly similar to our study [13].

In our study the mean age of the patients with a malignant mass was 51.79 years and those with benign mass was 33.86 years comparable to the study by Ozdas et al. where the average age of presentation for malignant and benign masses was 57.3 and 44.6 years respectively. This is comparable to the studies by Ozdas et al and Bhattacharya et al. where the relationship between age and malignancy was found to be highly significant ($P < 0.01$) [13,14].

Since masses of acute onset and short duration (<3 weeks) were excluded all our patients presented with masses ranging in duration from months (sub-acute) to years (chronic). No statistically significant relationship was found between the duration of the mass and definitive diagnosis and between the location of the mass and the definitive diagnosis comparable to the study by Ozdas et al. [13] In contrast, in Bhattacharya's [14] study location and duration of the mass were reported as important and statistically significant parameters for prediction of neoplasia.

Presence of relevant history was evaluated for the various neck masses. Relevant history included family history of malignancy, history of symptoms relating to affliction of different regions of head and neck, history in change of the size or character of the mass with episodes of URTI, features of hyper/hypothyroidism etc. They were not individually compared to the definitive diagnosis but collated on the whole wherever relevant. These features play an important role in the preliminary diagnosis of the lesion under evaluation. In our study the presence of relevant history showed a highly significant relation in prediction of benign and malignant neck masses with a P value of < 0.00001. They were also found to be a significant indicator of malignancy for thyroid lesions (P value 0.00225). However, for Lymph nodal masses specifically (P value – 0.0078) it was found to be statistically insignificant. This could be due to the fact that the inflammatory and reactive lymphadenopathy were excluded from our study and that may have caused a selection bias when it came to statistical analysis. They were also not found to be significant in singular diagnosis of the neck lesions. No other study has analysed the implication of relevant history in the diagnosis of neck masses.

Presence of risk factors including history of tobacco exposure, alcohol abuse, exposure to radiation and dietary deficiencies was studied with respect to their significance in coming to a diagnosis. The risk factors were not seen to be significant in terms of the definitive individual diagnosis. However, they were found to be highly significant statistically in prediction of benign and malignant neck

masses (P value < 0.00001). They were also found to be significant in prediction of malignancy in chronic non-inflammatory lymph nodal masses (P value < 0.00001). They were however not found to be significant in the prediction of malignancy in thyroid lesions (P value – 0.1186) as a very small proportion of patients presented with risk factors relevant to their pathology. This is in contrast with the study by Bhattacharya et al,[14] where no statistically significant relation was found in between the presence of risk factors and malignancy in neck lesions. This may be due to the regional variation in habit and addiction patterns.

Mobility of the neck masses is considered another very important clinical parameter in the evaluation of a neck mass. Distribution of mobility of the neck masses was analysed with its relevance to the diagnosis and it was seen that malignant lesions made for 88% (23 of the 26) of the immobile/ fixed neck lesions in our study. An analysis of the mobility of the mass with the respect to indication of malignancy in a neck mass was found to be highly significant statistically. Features suggestive of malignancy on clinical examination like skin fixation, fungation etc were also evaluated with respect to their assistance in diagnosis and they were collectively found to be highly significant.

The final clinical diagnosis was arrived at for all the patients after a comprehensive, qualitative analysis of all the aforementioned parameters. The correlation between the clinical diagnosis and the definitive diagnosis (Histopathological report) was then analyzed. The accuracy of clinical pre-diagnosis was found to be 93.4% comparable to the study by Ozdas et al, where a statistically significant correlation was seen between the clinical pre-diagnosis considered by ENT specialists and definitive histopathological diagnosis [13]. A strong and positive relationship was found between clinical pre-diagnosis and definitive histopathological diagnosis ($p < 0.01$).

Discordance was however observed in the thyroid lesions. Malignant thyroid lesions were identified in only 33% of the cases which were erroneously thought to be benign. This is in accordance with other studies [15,16] which indicate that it is difficult to differentiate between malignant and benign thyroid lesions based on clinical characteristic alone. In case of thyroid lesions, therefore, sensitivity of clinical diagnosis was only 33.3%.

The correlation between the FNAC and histopathological results was also analysed. It was observed that overall the sensitivity of FNAC in this study was 82.5% comparable to studies by Showkat et al (87.4%), Shrivastava et al with 88.64% and Suryawanshi et al with 81.81% [11,16,17]. In the study by Basista et al, 2015 sensitivity of FNAC was found to be 78.03% [8].

For thyroid lesions the sensitivity was only found 33.3%, with a positive predictive value of 100% comparable to the study by Basista et al. [8] where the sensitivity for thyroid swellings was 85.51% and specificity 100%. For lymphadenopathy the sensitivity was found to be 90% with a specificity of 100% in our study comparable again to that of Basista et al with a sensitivity of 83.33 and specificity of 100% [8]. This is in contrast with studies like Mobley et al, and Edward M et al, in developed countries which showed a much higher accuracy for FNAC, of 94.4% and 94.5% respectively [15,18]. This may be due to better facilities, expertise and

consistent use of guidance systems as compared to our setup, which being a teaching hospital in a developing country may show a wide variation in proficiency of the pathologists and varying use of guidance systems [19].

It should be noted that clinical pre-diagnosis is an amalgamation of the clinician's experience and a general qualitative analysis of all the aforesaid clinical parameters. These parameters are subject to the observer's judgement and liable to be inconsistent, prone to observer bias. Also the clinical parameters evaluated tend to lean towards suspicion of malignancy for any atypical features, which in turn leads to an increase in sensitivity for clinical diagnosis. Furthermore, this being a teaching hospital, there may be a wide variation in the expertise of the pathologist performing and/or reporting the aspiration cytology. Moreover, FNAC is usually performed from a representative area of the lesion/ representative node whereas histopathology evaluates the entire specimen sent (especially in cases of thyroidectomies and neck dissection specimens). This may lead to decrease in sensitivity and also an increase in false negative reports for FNAC.

Conclusion

Thyroid masses were mainly seen in females and metastatic lymphadenopathy in males. In females 87% of the neck masses were benign whereas amongst males 62% were malignant. Accuracy of FNAC in comparison to the definitive diagnosis was 84.7%. Inconsistent use of guidance systems, inexperience of junior aspirators and aspiration from representative node/ part of the lesion may act as confounding factors resulting in the discordance between clinical pre-diagnosis and FNAC accuracy with respect to the definitive diagnosis.

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Conflict of interest

There is no conflict of interests. All authors are equally contributed.

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Publication Ethics

The present study is ethically approved.

Authors Contributions

"Conceptualization, V.K.P. and R.S..; methodology, V.K. and P.N.; validation, V.K.P. and R.S.; formal analysis, V.K..; investigation, V.K., V.K.P. and P.N..; resources, R.S.; data curation, V.K.; writing—original draft preparation, V.K..; writing—review and editing, R.S.; visualization, R.S.; supervision, V.K.P.; project administration, R.S.

References:

1. Swain SK, Behera IC, Sahu MC. Primary sinonasal tuberculosis: Our experiences in a tertiary care hospital of eastern India. Egypt J Ear, Nose, Throat Allied Sci. 2017;18(3):237–40.
2. Swain SK, Behera IC, Sahu MC. Primary laryngeal tuberculosis: Our experiences at a tertiary care teaching hospital in Eastern India. J Voice. 2019;33(5):812-e9.

3. Adegbiji WA, Aremu SK, Nwawolo C, Olajuyin OA, Olatoke F. Diagnosis and management of hoarseness in developing country. Open Sci J. 2018;1–10.
4. Mehrotra R, Singh M, Gupta R, Singh M, Kapoor A. Trends of prevalence and pathological spectrum of head and neck cancers in North India. Indian J Cancer. 2005;42(2):89–93.
5. Arabi H, Yousef N, Bandyopadhyay S, Feng J, Yoo GH, Al-Abbadi MA. Fine needle aspiration of head and neck masses in the operating room: accuracy and potential benefits. Diagn Cytopathol. 2008;36(6):369–74.
6. Moor JW, Murray P, Inwood J, Gouldesbrough D, Bem C. Diagnostic biopsy of lymph nodes of the neck, axilla and groin: rhyme, reason or chance? Ann R Coll Surg Engl. 2008;90(3):221–5.
7. Popat V, Vora D, Shah H. Clinico-pathological correlation of neck lesions: a Study Of 103 Cases. Internet J Head Neck Surg. 2010;4(2):1–12.
8. Batsakis JG, Regezi JA, Solomon AR, Rice DH. The pathology of head and neck tumors: mucosal melanomas, part 13. Head Neck Surg. 1982;4(5):404–18.
9. ÖzKIRIŞ M, KAlA M. histopathological Examination of Patients operated on for a neck Mass: 4-Year Follow-Up Results. Türk Patoloji Dergisi/Turkish J Pathol. 2011;134.
10. Irani S, BIDARI ZF, Sabeti S. Prevalence of pathological entities in neck masses: A study of 1208 consecutive cases. 2016;
11. Suryawanshi KH, Damle RP, Nikumbh DB, Dravid N V, Newadkar D V. Cyto-histopathological correlations of head and neck swellings in a rural hospital in North Maharashtra: our experience. Ann Pathol Lab Med. 2015;2:121–6.
12. Vachhani A. International Journal of Biomedical And Advance Research.
13. Ozdas T, Ozcan KM, Ozdogan F, Cetin MA, Dere H. The correlation between clinical prediagnosis and pathology results in the diagnosis of neck masses. Indian J Otolaryngol Head Neck Surg. 2014;66(3):237–40.
14. Bhattacharyya N. Predictive factors for neoplasia and malignancy in a neck mass. Arch Otolaryngol Neck Surg. 1999;125(3):303–7.
15. Mobley DL, Frable MAS, Wakely Jr PE. Fine-needle aspiration biopsy: application to pediatric head and neck masses. Laryngoscope. 1991;101(5):469–72.
16. Srivastava M, Tyagi S, Shukla A. Fine needle aspiration cytology (FNAC) in evaluation of neck masses. J Evol Med Dent Sci. 2015;4(90):15552–4.
17. Showkat SA, Lateef M, Wani AA, Lone SA, Singh K, Yousuf I. Clinicopathological profile of cervicofacial masses in pediatric patients. Indian J Otolaryngol Head Neck Surg. 2009;61(2):141–6.
18. Young JEM, Archibald SD, Shier KJ. Needle aspiration cytologic biopsy in head and neck masses. Am J Surg. 1981;142(4):484–9.
19. Lioe TF, Elliott H, Allen DC, Spence RAJ. The role of fine needle aspiration cytology (FNAC) in the investigation of superficial lymphadenopathy; uses and limitations of the technique. Cytopathology. 1999;10(5):291–7.