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**Research Article**

# A COMPARATIVE STUDY OF DIAGNOSTIC ACCURACY OF FNAC AND ULTRASONOGRAPHY IN EVALUATION OF NECK SWELLINGS

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**A R T I C L E I N F O**

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FNAC, USG, Neck swellings, sensitivity, specificity, PPV, NPV, Diagnostic accuracy.

**A B S T R A C T**

**Objective:** To compare the diagnostic accuracy of Fine needle aspiration cytology and Ultrasonography of neck swellings.

**Material And Method:** The present study was conducted at Department of Pathology, Adesh Institute of Medical Sciences (AIMSR), Bathinda, from 1st January 2017 to 31st December 2017.The study design was prospective diagnostic accuracy study.The present study was conducted at Department of Pathology, Adesh Institute of Medical Sciences (AIMSR), Bathinda, from 1st January 2017 to 31st December 2017.The study design was prospective diagnostic accuracy study.

RESULT: In this study most of the patients were aged between 41 to 50 years (24.29%). However, 5.71% of the patients were aged < 18 years and 4.28% of the patients were aged > 60 years. The mean age was 40.23±15.13 years. In the present study the common site swelling was thyroid swelling (62.8%) followed by swellings on nape of neck (14.2%), lymph nodes (10%) and miscellaneous swellings (12.8%).The sensitivity of USG considering HPE as gold standard was 50% with specificity of 93.75%, PPV of 42.86, NPV of 95.24% and diagnostic accuracy was 90%. The sensitivity of FNAC considering HPE as gold standard was 83.33% with specificity of 100%, PPV of 100%, NPV of 98.46% and diagnostic accuracy was 98.57%.

**Conclusion:** FNAC is more sensitive and has higher diagnostic accuracy than USG.



## INTRODUCTION

Neck swellings are commonest incidental findings that are present in all age groups.Fine Needle Aspiration Cytology (FNAC) is a simple, inexpensive and quick method used for sampling these superficial masses found in the neck and is usually performed in the outpatient clinic. It helps in making early diagnosis and aids in the treatment of neck lesions. FNAC has good amount of accuracy up to 97% in the preoperative diagnosis of various neck lesions.[1]For the work-up of cervical masses and nodules it is particularly important because biopsy of cervical swelling should be avoided unless all other diagnostic modalities have failed to establish a diagnosis. FNAC does not give the same architectural detail as histology but it can provide cells from the entire lesion as many passes through the lesion can be made while aspirating.[2] Various diagnostic modalities used to evaluate and diagnose neck swellings include Clinical Examinations, Biochemical study, Scintiscan, Ultrasonography (USG), Fine Needle Aspiration Cytology (FNAC), and Histopathological examination.[3]All patients cannot afford CT or MRI study. Consequently, ultrasonography of these swellings is helpful to define these criteria and is cost-effective and radiation hazard free.The optimal treatment is dogged by the early recognition of a mass and its further appearance in relation to size and echo-genecity. Sonography cannot substitute histology.For ultrasonography to be helpful in diagnosis, a full understanding of the patient's history and clinical signs and symptoms in the neck region is critical.

Several suspicious ultrasonography features that predict cancer, such as hypoechogenicity, marked hypoechogenicity, a microlobulated or spiculated margin, micro- or macro-calcifications, and a taller-than-wide shape.[4-6] Although conventional USG can provide meaningful information in diagnosis, there has been considerable variation in diagnostic performances.[7]Furthermore, studies have suggested that USG alone is not sufficiently reliable to differentiate benign from malignant nodules. Final diagnosis requires morphological examination of lesions and for this FNAC or histological examination becomes mandatory.[8-10]

To make an effective surgical intervention in these lesions, it is very vital to make a pre-operative assessment of the morphological nature of lesion.[11]Due to its simplicity, low cost and absence of major complications, this procedure is being

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performed on an increasing number of patients, which has led to the detection of thyroid cancers at earlier stages, resulting in better outcome of patients.[12] Now, FNAC is an integral part of patient management but comprises only part of overall evaluation.[13] If nodules are not palpable, then this procedure can be performed under ultrasound guidance.[14] Overall diagnostic efficacy of FNAC is 94.2%. Though, FNAC contributes significantly to the pre-operative investigation in patients with neck swelling but there are some limitations. The first such drawback of FNAC is the high inadequate sample rate. The second major limitation is its inability to distinguish follicular adenoma from follicular carcinoma in thyroid cytology. This diagnosis requires detailed histological examination for vascular or capsular invasion and cannot be reliably made on routine FNAC specimens.[15-18]The aim of the present study was to compare diagnostic accuracy of fine needle aspiration cytology and radioimaging in evaluation of neck lesions.

## MATERIALS AND METHODS

The present study was conducted at Department of Pathology, Adesh Institute of Medical Sciences (AIMSR), Bathinda, from 1st January 2017 to 31st December 2017.The study design was prospective diagnostic accuracy study. Patients of all age groups and sex with neck swellings were included in the study. However, patients withunavailability of histopathology specimen and not willing for imaging were excluded from the study.

All neck swellings were screened and USG was done in Radiology department, before performing FNAC. Patients with neck swelling were followed up and those operated were subjected to Histopathological examination. USG findings of the swellings of neck were recorded as per composition, echogenecity, shape, and margin of swelling. Imaging impression of the swelling was also recorded.The aspirations were performed without USG guidance in this study. The success of FNA depends on getting the sample which is adequately representative of the underlying pathology. The standard technique was followed while performing the procedure. The present study was conducted at Department of Pathology, Adesh Institute of Medical Sciences (AIMSR), Bathinda, from 1st January 2017 to 31st December 2017.The study design was prospective diagnostic accuracy study.

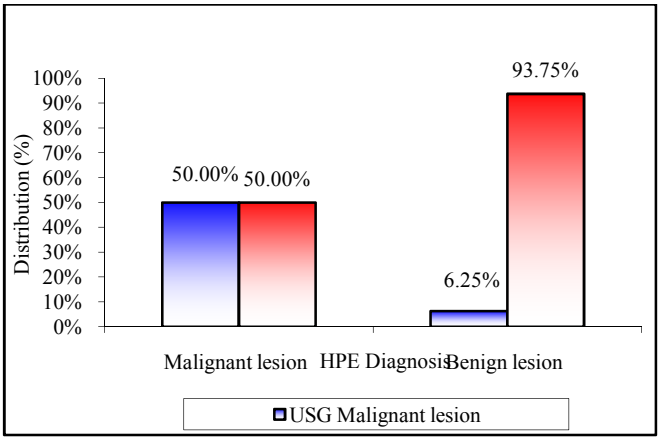
## RESULTS

In this study most of the patients were aged between 41 to 50 years (24.29%). However, 5.71% of the patients were aged < 18 years and 4.28% of the patients were aged > 60 years. The mean age was 40.23±15.13 years. In the present study the common site swelling was thyroid swelling (62.8%) followed by swellings on nape of neck (14.2%), lymph nodes (10%) and miscellaneous swellings (12.8%).

**Table 1** Accuracy of USG in predicting malignant lesions considering HPE as standard of reference

| Type of lesion based on USG | Type of lesion based on HPE | | | | Total (n=70) | |
|---|---|---|---|---|---|---|
| | Malignant | | Benign | | | |
| | No. | % | No.. | % | No | % |
| Malignant | 3 | 50.00 | 4 | 6.25 | 7 | 7.78 |
| Benign | 3 | 50.00 | 60 | 93.75 | 63 | 70.00 |
| Total | 6 | 8.57 | 64 | 91.43 | 70 | 100.00 |

p=0.011; sensitivity=50%; specificity=93.75%; PPV=42.86; NPV=95.24%; Diagnostic accuracy=90%



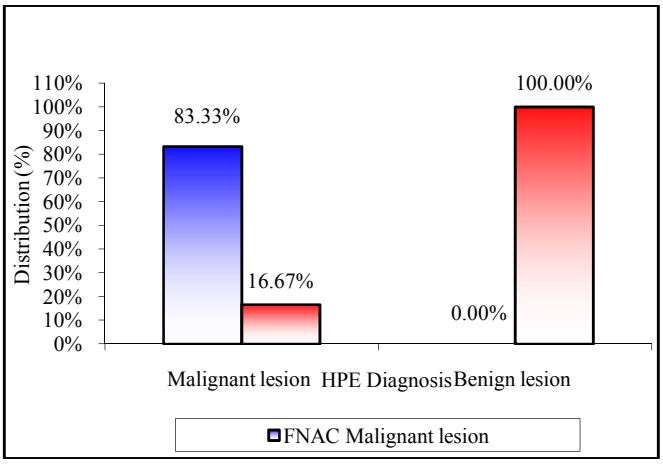

**Graph 1** Accuracy of USG in predicting malignant lesions considering HPE as standard of reference

Table1 and graph 1 shows: Histopathological examination revealed malignant lesions in six patients. Of which 3 (50%) lesions each were malignant and benign on USG (p<0.001). The sensitivity of USG considering HPE as gold standard was 50% with specificity of 93.75%, PPV of 42.86, NPV of 95.24% and diagnostic accuracy was 90%

**Table 2** Accuracy of FNAC in predicting malignant lesions considering HPE as standard of reference

| Type of lesion based on FNAC | Type of lesion based on HPE | | | | Total (n=70) | |
|---|---|---|---|---|---|---|
| | Malignant | | Benign | | | |
| | No. | % | No. | % | No. | % |
| Malignant | 5 | 83.33 | 0 | 0.00 | 5 | 7.14 |
| Benign | 1 | 16.67 | 64 | 100.00 | 65 | 92.86 |
| Total | 6 | 8.57 | 64 | 91.43 | 70 | 100.00 |

p=0.001; Sensitivity=83.33%; specificity=100.00%; PPV=100; NPV=98.46%; Diagnostic accuracy=98.57%




**Graph 2** Accuracy of FNAC in predicting malignant lesions considering HPE as standard of reference

Table 2 and Graph 2 shows: Histopathological examination revealed malignant lesions in six patients. Of which 5 (83.33%) lesions were malignant and 1 lesion (16.67%) was benign on FNAC (p<0.001). The sensitivity of FNAC considering HPE as gold standard was 83.33% with specificity of 100%, PPV of 100%, NPV of 98.46% and diagnostic accuracy was 98.57%.

**Table 3** Comparison of Sensitivity, Specificity, PPV, NPV and Diagnostic Accuracy of FNAC and USG considering Histopathology as standard of reference.

| Diagnostic Parameter | FNAC | USG |
|---|---|---|
| Sensitivity | 83.33% | 50% |
| Specificity | 100% | 93.75% |
| Positive Predictive value | 100% | 42.86% |
| Negative Predictive value | 98.46% | 95.24% |
| Diagnostic Accuracy | 98.57% | 90% |

Table 3- Shows FNAC has greater sensitivity, specificity, PPV, NPV and diagnostic accuracy in comparison to USG.

## DISCUSSION

Benign and malignant lesions both show isoechogenecity, hypoechogenecity and Anechogenecity. Many benign lesions were showing irregular margins. There was overlapping in the USG findings in benign and malignant lesions. So, USG alone is not sufficiently reliable to differentiate benign from malignant lesion. Final diagnosis requires morphological examination of lesions and for this FNAC or histological examination becomes mandatory. FNAC is widely accepted and has become a cornerstone in evaluation of neck swellings because it is a simple and accurate screening test with high sensitivity and specificity in the preoperative evaluation.[8-10] Important factor for the satisfactory test includes adequate sample from the swelling and an experienced cytopathologist to interpret the findings.

Histopathological examination showed concordance with FNAC in all the cases except one case (1.53%). On FNAC colloid goiter was the diagnosis which on histopathological examination came out to be papillary carcinoma thyroid. So, FNAC showed 1 false negative case.

USG shows discordance with FNAC in 2 cases of benign lesions. 2 lymph node swellings were diagnosed as malignant lesions on USG which on FNAC and histopathological examination show granulomatous lymphadenitis. So, USG showed 2 false positive cases.

In the present study we sought to derive the accuracy of both the modalities that is USG with HPE, FNAC with HPE and combined USG and FNAC with HPE. The comparison of accuracies evaluated based on different modalities is as shown in table below.

| Modality | Sensitivity (%) | Specificity (%) | PPV (%) | NPV (%) | Diagnostic accuracy | p value |
|---|---|---|---|---|---|---|
| USG with HPE | 50.00 | 93.75 | 42.86 | 95.24 | 90.00 | 0.011 |
| FNAC with HPE | 83.33 | 100.00 | 100.00 | 98.46 | 98.57 | 0.001 |

From the above table it is evident that all the modalities were significant in predicting malignant lesions with varying sensitivity, specificity and diagnostic accuracy. However, FNAC was highly sensitive and specific in the diagnosis of benign and malignant lesions with higher diagnostic accuracy. The sensitivity of USG observed in the present study in the diagnosis of malignant lesions was low compared to the other studies in the literature e.g. Rastogi A. *et al.*[19] (2018) and Hwang HS *et al.*[20] (2009).The lower sensitivity of USG observed in the present study can be explained by the methodological differences especially sample size and the interobserver variability as the USG examination was carried out by different radiologists.

In the present study, the sensitivity of USG in comparison with FNAC was low (60%) but it was highly specific (92.31%) with PPV of 37.5%, NPV of 96.77% and higher diagnostic accuracy (90%).Study by Nilakanthan *et al.*[21] (2007) reported lower sensitivity as low as 20% but higher specificity (97.67%).Similarly higher sensitivity and specificity were reported by Popli *et al.*[22] (2012) (81.81% and 87.24% respectively) and Kim *et al.*[5](2002) (93.8% and 66% respectively. However, Lee *et al.*[23] (2011) reported sensitivity of 72% with 100% specificity which was comparable to the present study.

Overall, the present study showed that, FNAC of neck swelling is one of the most useful, safe, accurate, relatively simple, inexpensive, less time-consuming OPD procedures, virtually painless, highly patient-compliant with highly accurate dependable tool in the diagnosis of neck pathology. However, it is not a substitute for conventional surgical histopathology but can be regarded as an extremely valuable complement in diagnosis and is indispensable. Based on the ultrasound findings, one can go in for further investigations with FNAC which is the ideal initial investigation for neck swellings for guiding management and further investigations. Hence USG and FNAC should be treated as a first-line diagnostic test for neck swellings to guide the management though it can't replace histopathological examination as a need to improve primary healthcare in developing countries like India.

The strength of the study was that, to augment compliance all pertinent investigations in our study population were conducted in the OPD to reduce their length of stay in the hospital and that helped in better patient compliance. However, the findings of the present study need careful interpretation due to some limitations of the study. viz. firstly this was a single centre study involving relatively smaller sample size. Secondly the USG examination was done by experienced but different radiologists which may have resulted in interobserver variability. Further, multicentric studies involving large sample are required to confirm the precise role of FNAC and USG. Also, research on the optimization and standardization of diagnostic criteria for the progress of patient management practice based on diagnostic scheme would explore the precise role of FNAC in neck swellings.

## CONCLUSION

FNAC is more sensitive and has higher diagnostic accuracy than USG. But the combination of USG along with FNAC will increase the accuracy of diagnosis.

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