Original Article

Assessing the Diagnostic Accuracy of Ultrasound-Guided Fine Needle Aspiration Cytology (FNAC) for Thyroid Nodules — A Comparative Analysis of Sensitivity, Specificity, and Predictive Values

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ABSTRACT

Introduction: *The utilization of fine needle aspiration cytology (FNAC) in the examination of the thyroid gland has proven to be a dependable and economically efficient approach in the diagnosis of thyroid diseases. Due to the potential influence of operator proficiency on FNAC outcomes, there exists a pressing necessity to investigate the correctness of FNAC.*

Objective: *The present study was aimed at assessing the USG Guided FNAC in thyroid nodule diagnosis.* ***Methods and Materials****: This Observational Prospective Study was performed in the department of Otolaryngology & Head Neck Surgery, Dhaka Medical College Hospital. Dhaka over 6 months duration from January 2019-June 2019. A total of 73 patients with thyroid swelling were selected after taking informed written consent and fulfilling the inclusion criteria. Smears were taken by standard procedure and then was stained with papanicolaou stain and haematoxylin and eosine stain. The smears were classified into categories like benign, indeterminate,*

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malignant, and unsatisfactory. The sensitivity, specificity, positive and negative predictive value, and accuracy of USG Guided FNAC was calculated and compared to already available data. Appropriate statistical analysis was done to make comparison between final histopathological findings with initial USG Guided FNAC findings. ***Results:*** *According to the findings of USG Guided FNAC nearly half (43.83%) of the patients had Multinodular goiter, Followed by colloid goiter (16.43%). Only 18(24.66%) Patients had carcinoma. From histopathological diagnosis, 55 patients had benign lesion and 18 patients had carcinoma. So the efficacy of USG Guided FNAC of diagnostic tool of solitary thyroid nodule where the sensitivity, specificity, PPV, NPV, PLR, NLR of USG Guided FNAC were 94.73%, 100%, 100%, 98.18%, 0 and 0.052 respectively.*

Conclusion: *The findings of this study indicate that the USG Guided (FNAC) treatment had a specificity level of 100%, therefore suggesting its effectiveness as a minimally invasive approach. The present investigation revealed a sensitivity rate of 94.73% for ultrasound-guided fine-needle aspiration cytology (FNAC) in the United States. Therefore, it may be inferred that the diagnosis is accurate in most cases.*

Keywords: *Swelling, USG Guided FNAC, Benign, Malignant.*

INTRODUCTION

There is a high incidence of thyroid nodules, with an adult prevalence rate of palpable nodule prevalence ranging from 4% to 7%. Because of the widespread application of ultrasound (US) as a screening modality, a significant percentage of people are mistakenly diagnosed as having non-palpable nodules [1,2]. This happens because US is a non-invasive screening method. Over ninety-five percent of thyroid nodules have been found to be benign in nature [3]. It is recommended to execute surgical interventions on persons who have a considerable likelihood of malignancy in order to reduce the number of needless invasive thyroid surgeries. This will help to lessen the number of people who have to undergo these surgeries. On the other hand, the clinical presentation is not sufficient to discriminate between benign and malignant lesions [4]. The first published account of the procedure known as fine-needle aspiration cytology, or FNAC, for evaluating the thyroid was written in 1948 [5]. The FNAC method has been acknowledged as a reliable, cost-efficient, and time-efficient way for detecting and managing significant thyroid nodules. This has led to a decrease in the number of needless thyroid surgeries, particularly when paired with ultrasound-guided fine-needle aspiration (FNA) [6]. In addition, the FNAC method has been shown to reduce the risk of developing thyroid cancer. Utilizing the Thy classification, the Thy categories that were established by the UK Royal College of Pathologists (RCPath) are widely used to promote conversation over the following therapy of thyroid nodules. There have been a plethora of scientific publications that have been produced that detail the findings of fine-needle aspiration cytology (FNAC) in relation to thyroid nodules, as well as the variable levels of accuracy that have been noticed throughout different places around the world. In general, FNAC is commonly recognized as an accurate diagnostic method for diagnosing thyroid lesions [7,8]. This is the case for a number of reasons. A total of 166

participants were included in the study that was carried out in France, and the researchers found that the diagnosis accuracy rate was roughly 89%. It was discovered that the diagnostic test has a sensitivity of 68 percent while also having a specificity of 99.2 percent [9]. In a different study that was carried out in Egypt, the sensitivity rate was found to be 92.8%, while the specificity rate was found to be 94.2%, which resulted in an overall accuracy rate of 93.6% [10]. The present study was aimed to assess the USG Guided FNAC in thyroid nodule diagnosis.

METHODS & MATERIALS

This Observational Prospective Study was performed in the department of Otolaryngology & Head Neck Surgery, Dhaka Medical College Hospital. Dhaka over 6 months duration from January 2019-June 2019. Total 73 patients with thyroid swelling was selected after taking informed written consent and fulfilling the inclusion criteria. Smears were taken by standard procedure and then was stained with papanicolaou stain and haematoxylin and eosine stain. The smears were classified into categories like benign, indeterminate, malignant, and unsatisfactory.

Sensitivity, specificity, positive and negative predictive value and accuracy of USG Guided FNAC was calculated and compared to already available data. Appropriate statistical analysis was done to make comparison between final histopathological findings with initial USG Guided FNAC findings.

RESULTS

Table I presents an overview of the cytology observed within the sample population. Approximately 43.83% of the patients exhibited Multinodular goiter, with colloid goiter being the second most prevalent condition at 16.43%. A total of 18 patients, accounting for 24.66% of the sample, received a diagnosis of cancer.

Table I: Distribution of patients according to FNAC diagnosis (n=73)

FNAC diagnosis (n=73)	Frequency	(%)
Multinodular goiter	32	43.83%
Colloid goiter	12	16.43%
Colloid cyst	2	2.74%
Hashimoto's thyroiditis		
With MNG	2	2.74%
Without MNG2	2	2.74%
Follicular adenoma	5	6.85%
Follicular variant of papillary carcinoma	7	9.59%
Papillary Carcinoma	11	15.07%

Table II illustrates the distribution of 55 benign findings obtained using ultrasound-guided fine-needle aspiration cytology (FNAC). The outcomes of USG-guided FNAC demonstrated a high level of accuracy.

Table II Relationship of USG Guided FNAC and Histopathological Diagnosis (n=73)

Diagnosis	USG Guided FNAC finding (n=73)
Benign	55
Malignant	18

Total	73

Tables III present the results of a study evaluating the effectiveness of ultrasound-guided fine-needle aspiration cytology (FNAC) as a diagnostic tool for solitary thyroid nodules. The tables display various performance measures, including sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), positive likelihood ratio (PLR), and negative likelihood ratio (NLR). The sensitivity of FNAC was found to be 94.73%, indicating its ability to correctly identify true positive cases. The specificity was 100%, indicating its ability to correctly identify true negative cases. The PPV and NPV were both 100%, indicating the accuracy of FNAC in predicting positive and negative cases, respectively. The PLR was 98.18%, indicating the likelihood of a positive FNAC result in a patient with a thyroid nodule. The NLR was 0, indicating the absence of a negative FNAC result in a patient without a thyroid nodule. Finally, the NLR was 0.052, indicating the likelihood of a negative FNAC result in a patient with a thyroid nodule. Non-malignant instances encompass a range of conditions, such as benign and suspicious situations.

Table III: Accuracy measures of USG Guided FNAC (n=73)

USG Guided FNAC	Percentage
Sensitivity	94.73%
Specificity	100%
Positive Predictive Value	100%
Negative Predictive Value of	98.18%
Positive likelihood ratio	0
Negative likelihood ratio	0.052%

DISCUSSION

The utilization of USG Guided Fine Needle Aspiration Cytology is widely recognized as the preferred and most reliable method for the initial evaluation of thyroid swellings [11]. The procedure is characterized by its safety, simplicity, and efficiency, exhibiting a minimal risk of complications. Moreover, it aids in the preoperative assessment of individuals who are candidates for surgical intervention. Thyroid carcinoma is the prevailing malignant tumor within the endocrine system, accounting for around 0.6% and 1.6% of all instances of malignant neoplasms in males and females, respectively.

A study conducted in Bihar examined 178 individuals with thyroid enlargement, utilizing USG Guided FNAC. The findings revealed that colloid goitre was present in 75.84% of the cases, whereas thyroiditis was observed in 8.43% of the cases [12]. In our analysis, we observed a prevalence of 60.265% for multinodular goiter and 5.5% for colloid goiter, which closely aligns with the findings reported by the authors.

In a separate study examining the findings of USG Guided FNAC in a substantial study cohort over a span of five years, it was seen that the presence of thyroid enlargement resulted in the identification of malignancy in a mere 128 instances out of a total of 1488 cases, corresponding to a prevalence rate of 7.8%. In our research, we observed a malignancy rate of 24.66%, a significantly greater proportion compared to the data reported by others.

In our study, the sensitivity of USG Guided Fine Needle Aspiration Cytology (FNAC) was shown to be 94.73%, indicating its ability to accurately detect positive cases. Additionally, the specificity of this procedure was found to be 100%, suggesting its capacity to correctly identify negative cases. According to Alta ria et al. , the sensitivity and specificity of USG Guided FNAC were found to be 71.43% and 100% respectively [13]. Similarly, Al-rikabi et al. reported sensitivity and specificity values of 78% and 100% respectively [14]. Additionally, Goellner et al. observed sensitivity and specificity rates of 98% and 99% respectively for USG Guided FNAC [15].

There are multiple factors that contribute to the broad spectrum of sensitivity and specificity. The accuracy of thyroid lesion diagnosis is contingent upon several factors, including the sufficiency of samples, the methodology employed for sample collection, the expertise of the pathologist responsible for interpreting the smears, and the potential for cytological features to overlap between benign and malignant thyroid lesions. The utilization of USG Guided Fine Needle Aspiration Cytology (FNAC) demonstrates a commendable accuracy rate ranging from 90% to 100% in the identification of malignant thyroid conditions.The numerical value provided is.

In our study, the accuracy of ultrasound-guided fine-needle aspiration cytology (FNAC) performed in the United States was found to be 99%. However, in other studies, the accuracy of this procedure ranged from 79% to 98%. This variability can be attributed to factors such as the level of experience of the individual doing the ultrasound guided FNAC and the expertise of the cytologist responsible for interpreting the cytology data.

CONCLUSION

The study findings indicated that the minimal invasive approach demonstrated a specificity level of 100%. The present study determined that the sensitivity of ultrasound-guided fine-needle aspiration cytology (FNAC) in the United States was 94.73%. Therefore, it may be inferred that the diagnosis is accurate in most cases. Based on the above discourse, it can be inferred that USG Guided FNAC is the preeminent diagnostic modality for preoperative assessment of thyroid edema.

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