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Original Research Article

ADEQUACY OF FINE NEEDLE ASPIRATION CYTOLOGY FOR CONFIRMATION OF TYPE OF THYROID LESIONS

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Abstract: *Thyroid nodules commonly arise within an otherwise normal thyroid gland. Nodular thyroid lesions are so common that they are present as solitary or multiple nodules. Fine-needle aspiration and capillary sampling are the 2 most commonly used diagnostic techniques for assessing cytopathology of thyroid nodules. Objectives: To determine the frequency of adequacy of fine needle aspiration cytology for detecting thyroid lesions in patients with thyroid lesions. Materials and Methods: 75 patients with thyroid lesions were enrolled after meeting the inclusion criteria. Informed consent and demographic information were taken. The patient's TSH level was noted. Then, FNAC was done after collecting the specimen through FNAC, and the specimen was sent to the hospital laboratory for cytology. The diagnosis was made. All the collected information was noted and entered in SPSS version 20 for analysis. Results: In our study, the mean age of the patients was 43.20±9.35 years, male to female ratio of the patients was 0.7:1. Out of 75 patients on FNAC, 50(66.7%) samples were adequate. In this study, a malignant thyroid nodule on FNAC was noted in 21(28%) patients, and a benign thyroid nodule on FNAC was noted in 54(72%) patients. Conclusion: The adequacy of fine needle aspiration cytology for detecting thyroid lesions in patients with thyroid lesions was 66.7%.*

Keywords: Thyroid Lesion, Cytology, Adequacy, Fine Needle Aspiration

Introduction

Nodular lesions in the thyroid are highly prevalent and can appear as single or multiple nodules. Upon initial diagnosis, these nodules can be benign or cancerous (Balaji et al., 2016). A discrete swelling in an otherwise non-palpable gland is referred to as solitary, while in a clinically multinodular gland, it is termed dominant (Saddique et al., 2008). Multinodular goiter remains a significant global concern. The occurrence of thyroid nodules is highly prevalent, with an estimated 4-7% of adults experiencing noticeable thyroid enlargement, while a significantly larger proportion may have undetectable nodules (Esmaili and Taghipour, 2012). Approximately 275,000 thyroid nodules are identified each year, of which only around 1400 cases are diagnosed as thyroid cancers (Mistry et al., 2015; Qureishi et al., 2015).

Fine Needle Aspiration Cytology (FNAC) is a secure, cost-effective, minimally invasive, and superior alternative to thyroid scintigraphy and ultrasound. Moreover, it boasts exceptional patient compliance and can be effortlessly performed in outpatient settings (Agrawal et al., 2017). In older individuals, lymph nodes suspected of lymphomas or malignant metastasis are frequently examined using fine-needle aspiration cytology (FNAC). FNAC enables the pathologist to evaluate the cells obtained from the affected area. Due to its simplicity, minimal invasiveness, low risk of complications, and quick turnaround time for results, FNAC remains an important diagnostic tool and is recommended as the initial investigation for suspected cases of malignancy (Nggada and Khalil, 2003).

This study aims to investigate the effectiveness of fine needle aspiration cytology (FNAC) in accurately detecting thyroid lesions in patients. Existing literature suggests that FNAC has a high adequacy rate of approximately 98% in evaluating nodules and distinguishing between malignant and benign types. However, conflicting data has been reported in the literature, leading to a debate regarding the reliance on FNAC alone or the need for excisional biopsy to determine the nature of thyroid nodules. We plan to conduct this study to address this controversy and establish solid evidence. Our objective is to assess the reliability of FNAC and explore alternative methods for evaluating the adequacy of thyroid nodule samples, particularly for benign tumors. The findings from this study will contribute to improving clinical practices and guidelines regarding using FNAC in our local setting.

Methodology

Patients of age 18 – 60 years, either gender, presenting with a lump in the neck (nodule/goiter) moving with swallowing and tongue protrusion, planned to undergo excisional biopsy.

After approval from the hospital ethical committee, patients fulfilling the selection criteria were included in the study from wards of the Department of General Surgery, Aziz

Bhatti Shaheed Teaching Hospital, Gujrat. After obtaining informed consent, demographic details like name, age, sex, duration of thyroid nodules, and TSH level were noted. Then all patients were FNAC by the researcher himself under the supervision of a consultant surgeon. After collecting specimens through FNAC, they were sent to the hospital laboratory for cytology. If the sample was adequate to diagnose thyroid nodule, then the case was labeled as adequate (per operational definition).

All the information mentioned above was entered and analyzed with SPSS 20. Mean and Standard deviation were calculated for age, duration of thyroid lesions, and TSH level. Frequency and percentage were calculated for gender and adequacy of FNAC. Data was analyzed for age, BMI, gender, duration of thyroid lesion, and TSH level to deal with the effect modifier. Post-stratification, the chi-square test was applied to compare the frequency of adequacy of FNAC in stratified groups. Pvalue≤0.05 was considered significant.

Results

In this study total of 75 patients were enrolled. The mean age of the patients was 43.20±9.35 years, with minimum and maximum ages of 20 & 59 years, respectively. Out of 75 patients 32(42.67%) patients were male while 43(57.33%) patients were females. Male to female ratio of the patients was 0.7:1. According to this study, the mean BMI of the patients was 24.91±5.28 kg/m2 with minimum and maximum BMI values of 16.50 & 35.00 kg/m2, respectively. According to this study, the mean duration of lesions of the patients was 5.75±2.61 years with minimum and maximum duration values of 1 & 10 years, respectively. In this study, the mean TSH level of the patients was 19.23±12.37 IU/l with minimum and maximum values of 4 & 50 IU/l, respectively. In this study, out of 75 patients on FNAC, 50(66.7%) samples were adequate. In our study, a malignant thyroid nodule on FNAC was noted in 21(28%) patients, and a benign thyroid nodule on FNAC was noted in 54(72%) patients. Fig. The study results showed that among patients with age ≤ 40 years, the sample adequacy on FNAC was found in 18(58.1%) samples, whereas, among patients with age >40 years, the sample adequacy was noted in 32(72.7%) samples. This difference was statistically insignificant, i.e., p-value=0.185.

The study results showed that among male patients, the sample adequacy on FNAC was found in 22 (68.8%) samples, whereas, among female patients, the sample adequacy was noted in 28(65.1%) samples. This difference was statistically insignificant, i.e., p-value=0.741. According to this study, among underweight BMI patients, the sample adequacy on FNAC was found in 8(80.0%) samples; among patients with normal BMI, the sample adequacy on FNAC was found in 23(79.3%) samples, whereas among overweight & obese BMI patients the sample adequacy was noted in 19(52.8%) samples. This difference was statistically significant, i.e., p-value=0.028. (Table-6)

According to this study, among patients with a duration of nodule ≤ 5 years, the sample adequacy on FNAC was found in 22(62.9%) samples, whereas, among patients with a duration of disease>5 years, the sample adequacy was noted in 28(70%) samples. This difference was statistically insignificant, i.e., p-value=0.513. The study results showed that among patients with TSH level ≤ 25 IU/l, the sample adequacy on FNAC was found in 37(69.8%) samples, whereas among patients with TSH level >25 IU/l, the sample adequacy was noted in 13(59.1%) samples. This difference was statistically insignificant, i.e., p-value=0.370

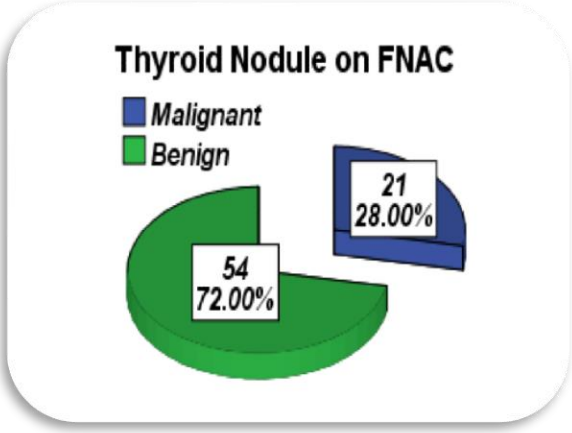

Fig 01: Frequency distribution of diagnosis of thyroid nodule on FNAC .

Table 01: Frequency distribution of sample adequacy on FNAC stratified by TSH

		Sample on FNAC		Total	p-value
		Adequate	Inadequate		
TSH (IU/l)		37	16	53	0.370
		69.8%	30.2%	100%	
	>25	13	9	22	
		59.1%	40.9%	100%	
Total		50	25	75	
		66.7%	33.3%	100%	

Discussion

In a recent cross-sectional study conducted at the Department of General Surgery, Aziz Bhatti Shaheed Teaching Hospital in Gujrat, the frequency of fine needle aspiration cytology (FNAC) adequacy was investigated for detecting thyroid lesions in patients. FNAC is a widely practiced technique for examining thyroid, breast, and

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lymph node swellings. The American Association of Clinical Endocrinologists guidelines state that FNA is the most effective method for differentiating between benign and malignant thyroid nodules (Polyzos et al., 2007; Vander et al., 1968). Thyroid nodules are frequently encountered in clinical practice, with a reported prevalence ranging from 4% to 7% among adults. However, only a small percentage, less than 5%, of these nodules are found to be malignant (Basharat et al., 2011; Sclabas et al., 2003). In our study of 75 patients, we observed that 50 samples (66.7%) obtained through fine-needle aspiration cytology (FNAC) were deemed sufficient for analysis. Among these patients, 21 (28%) were diagnosed with a malignant thyroid nodule based on FNAC results, while 54 (72%) were found to have a benign thyroid nodule.

Based on the findings of their study, Rabia Basharat et al. (Basharat et al., 2011) concluded that fine needle aspiration (FNA) was a more accurate predictor of malignancy than a thyroid scan. Moreover, FNA resulted in fewer excisions performed for benign nodules. Another study by Vincent A. Leung et al. (Leung et al., 2017) documented that the rates of nondiagnostic or unsatisfactory FNA significantly decreased from 15.1% to 8.5% ($p < 0.001$) after introducing a biopsy center. The implementation of the biopsy center increased the likelihood of obtaining an adequate sample (odds ratio: 2.07; 95% CI: 1.43–3.01), even after adjusting for patient age, nodule size, the performing radiologist, and the study period.

One study reported that FNAC had an inadequate sample rate of 1.9% for cytological assessment of thyroid nodules, while 98.1% of samples were deemed adequate for assessment 11. However, another study found that FNAC yielded adequate samples for cytological assessment in only 74.5% of cases (Sclabas et al., 2003). Additionally, a different study showed that FNAC samples were determined to be adequate for diagnosing thyroid nodules in 56% of cases (Basharat et al., 2011).

In a study by Richa Bhartiya et al., (Bhartiya et al., 2016) out of 224 cases, all obtained smears were considered adequate for cytological interpretation. The study concluded that FNAC is a rapid, simple, safe, and cost-effective diagnostic method for investigating thyroid diseases, with high sensitivity, specificity, and accuracy. The inadequacy rate in this study was reported as 5.88%. Another researcher, Ali (Ali, 2011), suggested that the rate of inadequate samples should ideally be below 10%. All thyroid FNAs must have technically adequate samples with well-prepared and representative smears for interpretation. Nggada HA et al. 16 explained that inadequate samples may be due to sclerotic or calcified lesions and extensive cystic degeneration or necrosis. In their study, FNA from three patients (1.9%) resulted in inadequate samples, consistent with findings from other studies.

A study by Saeed A. Mahar et al. (Mahar et al., 2006) also emphasized the value of FNAC as a minimally invasive procedure for pre-operative assessment of thyroid nodules. They found that FNAC had high sensitivity for detecting malignancy in the thyroid and demonstrated high diagnostic accuracy. Among the "Inadequate sampling group" in their study, two patients were ultimately determined to have benign conditions, while one had a malignant condition. An international study by Guido M. Sclabas et al. (Sclabas et al., 2003) evaluated fine needle aspiration of the thyroid and its correlation with histopathology in 240 patients. They reported inadequate sampling rates ranging from 1% to 5%.

Conclusion

According to this study, the adequacy of fine needle aspiration cytology for the detection of thyroid lesions in patients with thyroid lesions was 66.7%.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate
Not applicable

Consent for publication
Not applicable

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Not applicable

Conflict of interest

The authors declared an absence of conflict of interest.

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