

Diagnostic Accuracy of Fine Needle Aspiration Cytology in The Diagnosis of Thyroid swelling A Study of 114 Patients

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Abstract: **Background:** Fine needle aspiration cytology (FNAC) is the investigation of choice in thyroid swellings. It has excellent patient compliance, is simple, can be performed in the outpatient department, and is readily repeated. **Aim:** This study aims to evaluate the accuracy of fine needle aspiration cytology (FNAC) in the management of thyroid swelling and comparing it with post-operative histopathological diagnosis. **Patients and Method:** This study is implemented in the clinical prospective case series where it is setting to general surgical wards, AL-Jumhoori Teaching Hospital Iraq. This Study period is determined to last one year (October 2019 - September 2020), which included 114 patients in Mosul. This study included Patients with thyroid swellings subjected for thyroidectomy and had FNAC, while exclusion criteria included patients having unsatisfactory FNAC results because of inadequate cellular material was obtained (7 patients). **Intervention:** Clinical data, preoperative FNAC, thyroidectomy, and FNAC, and postoperative histopathology. **Outcome measures:** FNAC and histopathology. **Statistical analysis:** p-value. **Results:** 107 patients enrolled, 98 were females, and 8 were males. The F: M ratio was 12.3: 1. FNAC was accurate in 97.1%, overall sensitivity was 60%, and specificity 99 %, as compared with postoperative histopathology. **Conclusions:** FNAC is used for the evaluation of thyroid gland swelling before surgery. FNAC is more specific than sensitive in detecting thyroid malignancy; histopathological examination remains essential for the final diagnosis.

Keywords: Fine Needle Aspiration Cytology; Thyroid Swelling; FNAC; and histopathological.

INTRODUCTION

Thyroid gland is a highly vascular, brownish-red gland located anteriorly in the lower neck, extending from the level of the fifth cervical vertebra down to the first thoracic. The gland varies from an H to a U shape and is formed by two elongated lateral lobes with superior and inferior poles connected by a median isthmus, overlying the second to fourth tracheal rings. Thyroid weight varies; it averages 25 to 30 g in adults (it is slightly heavier in women). The gland enlarging menstruation and pregnancy. Discrete thyroid swellings are common and present in 3-4% of the population in UK and USA [Singh, A. *et al.*, 2017; Amrikachi, M. *et al.*, 2001; Bouvet, M. *et al.*, 1992]. They are three to times more frequent in females than males, but discrete swelling, a male, is much more likely to be malignant than in a female. A discrete thyroid swelling in an otherwise impalpable gland is termed isolated or solitary, whereas the preferred term is dominant for similar swelling in a gland with clinical evidence of generalized abnormality in the form of generalized nodularity. True incidence of multinodular thyroid is less apparent in the clinical estimate. When such a gland is exposed at operation or examined by ultrasonography, clinically invisible nodules are often detected. [Iqbal, J. *et al.*, 2016; Srirangaprasad, K. *et al.*, 2015]

The usual presentation of thyroid nodularity is with swelling, pressure symptoms, or toxicity symptoms. The significance of the discrete thyroid nodule lies in the risk of neoplasia; 15% of isolated thyroid swellings are malignant. At present, the available tools which are used to know the nature of the thyroid nodule are thyroid function tests, thyroid autoantibodies, imaging studies like ultrasonography or computerized tomography (CT) scan, isotope scanning, fine needle aspiration cytology (FNAC), and histopathological analysis of the thyroid tissue. [Sunder, K.S. *et al.*, 2017; Cai, X.J. *et al.*, 2006; Team, R.C, 2013]

Fine needle aspiration cytology (FNAC) of the thyroid gland is an accurate diagnostic test and is routinely used in the initial evaluation of the thyroid swelling. A Survey of clinical members of the American Thyroid Association revealed that most endocrinologists (96%) performed FNAC for diagnosing thyroid swelling. The diagnosis of the thyroid nodules by needle biopsy was first described by Martin and Ellis in 1930 when they used an 18-gauge needle aspiration technique. Subsequently, cutting needle biopsy with Silverman or Trucut needles was used for tissue examination [Mittal, A. *et al.*, 2015; Ahmadinejad, M. *et al.*, 2015]. None of these techniques gained

wide acceptance because of fear of malignant implants in the needle track, false-negative results, and serious complications. However, Scandinavian investigators introduced small-needle aspiration biopsy of the thyroid in the 1960s, and this technique came into widespread use in North America in the 1980s. For FNAC, most of the pathologists use fine or thin (22 to 27-gauge) needles, and the most commonly used nowadays is a 25-gauge needle. Although the FNA technique seems to be simple, considerable time and experience are required to acquire and maintain a skillful FNA technique [Tabaqchali, M.A. *et al.*, 2000; Kamal, M.M. *et al.*, 2002]. FNAC is widely accepted as the most accurate, sensitive, specific, and diagnostic procedure in the assessment of the thyroid nodules. It is the primary diagnostic procedure in diagnosing the thyroid malignancy. Numerous studies have shown that FNAC had a high sensitivity and specificity in diagnosing thyroid malignancy, especially papillary thyroid carcinoma. [Jo, V.Y. *et al.*, 2010]

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maintain a skillful FNA technique [Kuru, B. *et al.*, 2010].

Most patients suffering from some discomfort in the area of aspiration for a few hours. No serious complications, such as tumor seeding or nerve injury, have been reported. Other complications like bleeding, infection and cyst formation rarely occurred. FNAC cannot differentiate between follicular adenoma and follicular carcinoma; they can only be identified by histopathological analysis [Sadler, T.W, 2004]. The results of FNAC are reported as inadequate or non-diagnostic, benign, suspicious, and malignant. This study aims to 1) determining the accuracy of FNAC in the diagnosis and the treatment of the thyroid swelling and 2) assessing the correlation between the preoperative cyto-diagnosis and the postoperative histopathological diagnosis.

PATIENTS AND METHODS

Study Design

This study is implemented as a clinical prospective case series study. The setting in which it was carried out was at the Department of Surgery at the Al-Jumhoori Teaching Hospital, Mosul, Iraq. This study was conducted during the last year, starting from 1st October 2019 to 30th September 2020. In this study, 114 patients were recruited about patients presenting with thyroid swelling who, under FNAC, thyroid surgery, and postoperative histopathological diagnosis, were included in the study.

This study was conducted that patients having unsatisfactory FNAC results because of inadequate cellular material was obtained (7 patients), where it included preoperative FNAC, thyroidectomy, and postoperative histopathology. The data were analyzed using statistical analysis called the p-value. This study is approved by the Local Scientific Council of the Arab Board of Health specializations of General Surgery in Iraq, and the Mosul Ethical Research Committee, Directorate of Health in Ninawa.

RESULTS**Table 1: Age Distribution of Thyroid Nodule patients**

Age, Group	No. Patients	%
≥ 20	5	4.7
21-40	62	57.9
41-60	36	33.6
61-80	4	3.7
Total	107	100

Table 2: Presenting Symptoms of Thyroid Swelling

Presenting Symptom	No. of Patients	%
Neck swelling	49	45.8
Neck pain	21	19.7
Dysphagia	18	16.8
Dyspnea	10	9.3
Hoarsness of voice	3	2.8
Hyper-thyroidisim symptoms	6	5.6
Hypo-thyroidisim symptoms	0	0
Total	107	100

Table 3: Finding on examination of the Thyroid Swelling

Sign	No. of Patients	%
Solitary nodule	42	39.3
Multiple nodules	65	60.7
Total	107	100

Table 4: FNAC Results of Thyroid Nodule

Type of swelling	FNAC Results	No. of Patients	%
Non-neoplastic swelling	Nodular Colloid Goiter	71	66.4
	Hyperplastic Nodule	11	10.3
	Follicular Cell Hyperplasia	10	9.3
	Hashimoto's Thyroiditis	7	6.5
Neoplastic swelling	Papillary Ca.	4	3.7
	Follicular Adenoma	4	3.7
Total		107	100

Table 5: Histopathological Results of Thyroid Swelling

Type of swelling	Histopathology Results	No. of Patients	%
Non-neoplastic swelling	Nodular Colloid Goiter	65	60.7
	Hashimoto's Thyroiditis	20	18.7
	Hyperplastic Nodule	4	3.7
Neoplastic swelling	Follicular Adenoma	11	10.3
	Papillary Carcinoma.	5	4.7
	Hurthle cell adenoma.	2	1.9
Total		107	100

Table 6: A comparison between FNAC and Histopathological Results

Type of thyroid swelling	Diagnosis	FNAC	Histopathology
Non-neoplastic	Nodular Colloid Goiter	71(66.4%)	65(60.7%)
	Hashimoto's Thyroiditis	7(6.5%)	20(18.7%)
	Hyperplastic Nodule	11(10.3%)	4(3.7%)
Neoplastic	Follicular Adenoma	4(3.7%)	11(10.3%)
	Papillary carcinoma	4(3.7%)	5(4.7%)
	Hurthle cell adenoma.	-----	2(1.9%)

Table 7: Accuracy of FNAC Results of the Thyroid Swelling

FNAC Test	Malignant in Histopathological	Benign in Histopathological
Positive Test	True Positive (TP) * 3	True Negative (TN) *** 101
Negative Test	False Negative (FN) ** 2	False Negative (FN)**** 1

Table 8: False Results of FNAC in comparison with Histopathology

False +ve in FNAC	Histopathology	False -ve in FNAC	Histopathology
Papillary Thyroid Carcinoma (1 case) thyroid	Nodular Colloid Goiter	Hyperplastic nodule	Papillary Thyroid Carcinoma. (1cases)
		Nodular colloid goiter	Papillary Thyroid Carcinoma (1cases)

DISCUSSION

Thyroid diseases are not uncommon, and the patients are referred for FYC as well as tissue specimen diagnosis for various thyroid swellings, Fine needle aspiration cytology (FNAC) is a well-established technique for preoperative investigation of the thyroid swelling. The technique is one of the least invasive, cost-effective, and efficient of differentiating benign and malignant thyroid swelling [Landis, J.R. *et al.*, 1997]. In the present study, out of 107 cases, the females were higher in frequency (n=99; 92.5%) than the males (n=8; 7.5%). Our study was compared with the study of Abdulqadir M. Zangana, which showed 123 patients, and (I I .4%). In the present study, FNAC showed non-neoplastic thyroid swelling in 99 patients (92.52%) and neoplastic swelling in 8 patients (7.47%). Among non-neoplastic thyroid nodules, colloid goiter was common; in 71 patients (66.35%), followed by hyperplastic in II patients (10.28%). While among neoplastic nodule follicular thyroid adenoma in four patients (3, 73%) and papillary thyroid carcinoma in four (3.73%). Our study was compared with the study of Nepali R., which showed thirty-seven (74%) non-neoplastic, and thirteen (26%) neoplastic thyroid swelling (papillary Ca. in 7 patients (14%) and follicular Ca. in four patients (8%). The results were compared also with Md. Shafiqul Islam's results which showed seventy-one (78%) non-neoplastic and nineteen (22%) neoplastic swelling (papillary Ca. in fourteen patients (15.56%) and follicular Ca. in three patients (3.33%).

Cytological study of FNAC of the thyroid swelling of 107 patients showed a sensitivity of 60% and specificity of 99.01%. Our study was compared

with other studies by Haruna A. Nggada, Alhaji B. Musastudy (sensitivity was 90% and specificity was 100%), and Nepali R. stu (sensitivity was 91.66% and specificity was 97.29%) and kumar et al. (sensitivity was 77% and specificity was 100%). [Gharib, H. *et al.*, 2010]

The accuracy, the percentage of false negatives, and the predictive value of negative results of FNAC. The current study revealed diagnostic accuracy of (97.19%) which goes in line with the diagnostic accuracy of Frable's and Nepali's studies which were (95%) and (94%), respectively [Kuru, B. *et al.*, 2010; Sadler, T.W, 2004]. The predictive value of the negative results of the present study was (98.05%) as in Nepali's study, which was (97.29%).

CONCLUSION

FNAC is a minimally invasive diagnostic modality used in the investigation of thyroid swelling. FNAC is more specific than sensitive in detecting thyroid malignancy; It had high specificity and accuracy. Benign FNAC dicynosis should be viewed with caution as false negative results do occur; any clinical suspicion of malignancy, even in the presence of benign FNAC, requires assessment of the patient, clinical examination, cytology and with further investigations like imaging. FNAC result of thyroid swelling is, therefore, only one factor that determines the management options.

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