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Original Research Paper

Adjunctive Study Between Fine Needle Aspiration Cytology and Histopathological Results of Thyroid Nodules

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ABSTRACT:

Introduction: Fine needle aspiration cytology (FNAC) is an effective method for the differential diagnosis of thyroid nodules. The Bethesda system helped define the clinical approach by standardizing cytopathology reports. However, the percentage of cytological-histological incompatibility varies between 10% and 30%. Results in the literature vary by clinic. These results warrant reassessment of the efficacy and safety of fine-needle aspiration biopsy. **Aim of the work**: Evaluate the diagnostic accuracy of FNAC for thyroid nodules by correlating the cytopathological results of FNAC with postoperative histopathological results. **Materials and Methods**: In this retrospective study, thyroid FNAC results and postoperative histopathological examination results were compared in patients who underwent thyroidectomy at our hospital from January 2016 to December 2021.Accuracy, sensitivity (Sn), specificity (Sp), positive predictive value (PPV), negative predictive value (NPV), false positive rate (FPR) and false negative rate (FNR) were calculated. Cases with non-diagnostic FNAC results were excluded from the calculations. FNAC results with follicular neoplasm/suspected follicular neoplasm (FN/SFN) and suspected malignancy were included in the malignancy group. **Results**: A total of 91 patients were included in the study. The male/female ratio was 1:21.75. As a result of the study, malignancy was detected histopathologically in 9 (9.9%) patients. The commonest malignancy detected was papillary carcinoma. According to the Bethesda system, the results were evaluated in six categories but no cases in I and VI. The incidence of malignancy in the Bethesda categories were 2.9%, 7.7%, 40% and 100%, respectively. Accordingly, the specificity and sensitivity of FNAC for detecting malignancy were 96.3% and 66.6%, respectively. The accuracy was 93.4%. The false positive rate, false negative rate, positive predictive value, and negative predictive value were 3.7%, 33.3%, 66.6%, and 96.3%, respectively.
Conclusion: In conclusion, FNAC is a valid method for the differential diagnosis of thyroid nodules and provides a satisfactory level of reliability.

Keywords: Fine Needle Aspiration Cytology; Histopathology; Thyroid Nodule.

INTRODUCTION:

Thyroid nodules are one of the most common endocrine disorders in society. Incidence is up to 65% in serial dissections [1]. In iodine-deficient countries, the prevalence is even higher. They are detected on clinical and ultrasound examinations with a probability of 19–35% [2, 3]. In general, the malignancy rate of these nodules is approximately 7-15% [4]. Thyroid cancer is the most common endocrine cancer [5]. Recently, there has been a significant increase in the incidence of thyroid cancer worldwide compared to other types of cancer [5, 6]. A major goal in the clinical management of thyroid lesions is the differential diagnosis of malignant lesions [6]. Fine needle aspiration cytology (FNAC) is the most common and effective method for this purpose. Thyroid FNAC is a minimally invasive procedure and is well tolerated in patients with a low complication rate [7]. FNAC plays a very important role in surgical and conservative treatment decisions. Identification of malignant nodules allows early

diagnosis and surgery, and also prevents unnecessary surgical intervention [8]. In clinical management, surgical decisions ranging from lobectomy to total thyroidectomy to central neck dissection are based on FNAC results. However, this method has certain limitations due to false positive (FP) and false negative (FN) results. Cytological and histologic mismatch rates vary between 10% and 30%. Results vary by clinic [9]. This situation warrants reassessment of the efficacy and safety of FNAC. In this study, we aimed to speak about the efficacy and accuracy of FNAC with the aid of using correlating FNA cytopathology outcomes with postoperative histopathology outcomes.

Patients And Methods:

This study was a retrospective study on the efficacy and accuracy of FNAC using correlations between FNA cytopathology and postoperative histopathology results in the city of Tobruk. The study included specimens of both sexes, from the medical records of all patients who underwent thyroidectomy in the surgical department and from previous FNAC and histopathological results in the Department of Pathology, Tobruk Medical Center, an age range of 13 to 70 years was collected. From 1 January 2016 to 31 December 2021, the total number of cases was 91. Excluded were patients whose thyroid FNAC results were indeterminate, who underwent surgery without requiring FNAC, or whose histopathologic results could not be determined. The histopathological results of the patients included in the study correlated with the results of preoperative FNA cytopathology. FNACs were performed on all patients by interventional radiology or pathology departments with ultrasound scans. The decision to undergo surgery was based on the combination of FNAC and laboratory test results.

FNAC results are classified according to the 2017 Bethesda system [10] and the corresponding patient management recommendations are summarized in Table (1).

Diagnostic Category	Decription	Management
I	Nondiagnostic or unsatisfactory	Repeat FNAC with ultrasound guidance
II	Benign	Clinical and sonographic follow-up
III	Atypia or follicular lesion of undetermined significance	Repeat FNAC, molecular testing, or lobectomy
IV	Follicular neoplasm or suspicious	Molecular testing, lobectomy
V	Suspicious for malignancy	Near-total thyroidectomy or lobectomy
VI	Malignant	Near-total thyroidectomy or lobectomy

Table (1): Bethesda System for Reporting Thyroid Cytopathology and recommended clinical management

All necessary basic information and data were obtained from medical documents. Excel was used for data collection and descriptive analysis.

RESULTS:

A total of 91 patients participated in this study. Eighty-seven (95.6%) of the patients were female. The mean age of patients was 37.9 years (range: 13-70 years). The male to female ratio was 1:21.75. As a result of the study, malignant tumors were detected histopathologically in 9 (9.9%) patients. The malignant lesion was papillary carcinoma. Classical (n=4, 44.5%), follicular (n=2, 22.2%), cystic (n=1, 11.1%) and microvariants (n=2, 22.2%). Of the FNAC results analyzed according to the Bethesda classification, no patients were reported as nondiagnostic/ insufficient or malignant, 69 (75.8%) were reported as benign cytology, and 13 (14.3%) were reported as atypical/follicular lesion of undetermined significance (AUS/FLUS). Five (5.5%) were follicular or suspected follicular tumors (FN/SFN) and four (4.4%) were suspected malignant. The Bethesda System II (benign cytology) (n=69, 75.8%) found Hashimoto's thyroiditis to be histopathologically detected in 8 patients. These included 55 patients with nodular colloid goiter, 4 patients with follicular adenoma, and 2 malignant cases. The malignancy rate was 2.9%. Histopathology of AUS/FLUS (Bethesda System III) patients secondary to FNAC reported 12 as follicular adenoma and 1 as papillary carcinoma. The malignancy rate was 7.7%. Histopathological results of 5 patients with FNAC results of FN/SFN (Bethesda System IV) found papillary carcinoma in 2 patients and follicular adenoma in 3 patients. We found a malignancy rate of 40% in this category.

The malignancy rates found at the end of the study and the malignancy rates reported in the Bethesda system are shown in Table (2).

Bethesda	Risks of malignancy (%)	Result (%)
I	5-10	No cases
II	0-3	2.9
III	~10-30	7.7
IV	25-40	40
V	50-75	100
VI	97-99	No cases

Table (2): Implied risk of malignancy per each category of the Bethesda system compared with malignancy rates of our study

All four patients with FNAC results (Bethesda System V) suggestive of malignancy had thyroid cancer. The findings are summarized in Table (3).

Bethesda	Number (%)	Benign (number (%))	Malignant (number (%))
I	0	0	0
II	69 (75.8%)	67 (97.1.8%)	2 (2.9%)
III	13 (14.3%)	12 (92.3%)	1 (7.7%)
IV	5 (5.5%)	3 (60%)	2 (40%)
V	4 (4.4%)	0 (0%)	4 (100%)
VI	0	0	0

Table (3): Comparison of fine needle aspiration cytopathology with histopathology

For statistical analysis, patients with AUS/FLUS FNAC results were considered benign lesions. FN/SFN and FNAC results with suspected malignancy were included in the malignancy group. The calculations were performed as follows: Sn = TP/(TP + FN) = 6/(6 + 3) = 66.6%, Sp = TN/(TN + FP) = 79/(79 + 3) = 96.3%, PPV = TP/(TP + FP) = 6/(6 + 3) = 66.6%, NPV = TN/(TN + FN) = 79/(79 + 3) = 96.3%, FPR = FP/(FP + TN) = 3/(3 + 79) = 3.7%, FNR = FN/(FN + TP) = 3/(3 + 6) = 33.3%, accuracy = TP + TN/total number of cases = 6 + 79/91 = 93.4%. The Sp and Sn of FNAB for detecting malignancy were 96.3% and 66.6%, respectively. FPR, FNR, PPV, and NPV were 3.7%, 33.3%, 66.6%, and 96.3%, respectively. The accuracy of FNAB was 93.4%.

DISCUSSION:

Thyroid FNAC is an inexpensive, non-invasive, low-complication method for the differential diagnosis of thyroid nodules. The Bethesda System for Reporting Thyroid Cytopathology achieves standardization of the FNAC classification and facilitates patient management by reducing diagnostic discrepancies. According to this classification, outcomes were rated into six categories and given predicted malignancy rates [11]. Thyroid cancer is a common type of cancer in pathological specimens because it does not cause symptoms in its early stages. In our study, the malignancy rate was 9.9%. In general, the malignancy detection rate of FNAC varies between 5% and 10%, but for surgical materials it has been reported to be 2.6% to 10.7% [12]. The malignancy rates we found appear to be similar to those reported in the literature. This is due to the fact that most of the patients classified as benign based on FNAC were closely monitored without surgery. This is evidence that FNAC reduces the number of wasted operations. There are also literature studies reporting similar results to ours [13,14]. The reason for the gradual increase in thyroid cancer is the increasing incidence of papillary thyroid cancer. In our study, all malignant cases were papillary carcinomas. The results were consistent with literature [15]. The study identified malignancy in 40% of cases reported as FN/SFN. This rate is similar to the 25-40% malignancy rate predicted by the Bethesda system. However, another study reported a Bethesda Category IV malignancy rate of 50-79% [16]. These results demonstrate that FN/SFN patients can also be operated with a malignant-like approach.

Malignancy was found in 7.7% of patients whose FNAC results were reported as AUS/FLUS. This percentage is close to the risk of malignancy as defined by Bethesda 2017. There are studies in the literature reporting malignancy rates of 35-53% [9, 17, 18]. These findings require repeat biopsy or lobectomy, as recommended by the Bethesda system. Although thyroid FNAC leads to a reduction in the number of unnecessary surgeries, it also increases the rate of malignancies reported on histopathology [19]. A remarkable achievement in our study was the detection of malignancy from histopathological results in all patients with malignant or suspected malignant FNAC results. The Bethesda

system reports this rate at 99-97%. A study by Zarif et al [20] found that 100% of cases with malignant cytology were diagnosed as malignant. As a result of our study, the sensitivity and specificity we found were consistent with the literature [21]. According to the literature, the sensitivity rate of FNAC varies between 65% and 98% and the specificity is between 72% and 100% [22]. The reasons for these differences depend on the experience of the operator performing the procedure, the use of ultrasound-guided biopsy techniques, and the classification of suspicious lesions [23,24]. Our results showed that the accuracy, false-positive rate, false-negative rate, positive predictive value, and negative predictive value of thyroid FNAC for detecting malignancies were consistent with the literature [25]. The results obtained in statistical analysis indicate that FNAC has a moderately satisfactory ability to detect thyroid malignancies.

Limitations of the Study:

Due to the retrospective nature of this study, there are some limitations. Patients included in this study consisted of those who had FNAC results and underwent surgery. Therefore, the histopathological outcome in patients without surgery is unknown. Furthermore, the nature of this retrospective study limits it to regional results.

CONCLUSION:

FNAC is a valid method for the differential diagnosis of thyroid nodules and provides a satisfactory level of reliability. This article highlights the high rate of malignancy in Bethesda Category III and IV thyroid nodules.

If graded using the Bethesda system, a Category III result should be noted and the biopsy should be repeated. The incidence of malignancies found in Bethesda Category IV is substantial. Therefore, clinical approaches to this category need to be studied similarly to malignant groups.

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