

# Evaluation of Thyroid Fine Needle Aspiration Biopsy Results: A Single Center Experience

## Tiroid İnce İğne Aspirasyon Biyopsi Sonuçlarının Değerlendirilmesi: Tek Merkez Deneyimi

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### ABSTRACT

**Aim:** It was aimed to examine the results of thyroid fine needle aspiration (FNA) biopsy performed in our clinic and to investigate its effectiveness.

**Methods:** In this study, the results of 101 patients who underwent thyroid FNAB in Tarsus State Hospital endocrinology clinic between December 2021 and July 2022 were retrospectively analyzed.

**Results:** Ultrasonographic features of thyroid nodules were classified according to EU-TIRADS, 51(50.5%) were in EU-TIRADS-3, 31 (30.7%) were in EU-TIRADS-4, 19(18.8%) were in EU-TIRADS-5. When we categorize cytology results according to Bethesda classification, 23 (22.8%) Bethesda I, 48 (47.5%) Bethesda II, 16 (15.8%) Bethesda III, 4(4%) Bethesda IV, 10(9.9%) detected as Bethesda VI. Bethesda II was found in the EU-TIRADS-3 category with the highest frequency, while Bethesda VI was found in the EU-TIRADS-5 category with the highest frequency. The mean nodule diameter was found to be 20.48± 9.73mm.

**Conclusion:** Ultrasonographic findings of the nodules correlated with cytology results. The EU-TIRADS categorization has a good concordance with the Bethesda system. The coordinated use of the two classifications helps the clinician to avoid the risk of unnecessary invasive procedures.

**Key Words:** Biopsy, Thyroid Nodule, Ultrasonography

### ÖZET

**Amaç:** Kliniğimizde yapılan tiroid ince iğne aspirasyon biyopsi (İİAB) sonuçlarımızı inceleyip etkinliğini araştırmak amaçlandı.

**Yöntem:** Bu çalışmada Aralık 2021 -Temmuz 2022 tarihleri arasında Tarsus Devlet Hastanesi Endokrinoloji Kliniğinde tiroid İİAB yapılan 101 hastanın sonuçları retrospektif olarak incelendi.

**Bulgular:** Tiroid nodüllerinin ultrasonografik özellikleri EU-TIRADS'a göre sınıflandırıldığında 51(50.5%)'i EU-TIRADS-3, 31 (30.7%)'i EU-TIRADS-4, 19(18.8%)'u EU-TIRADS-5 kategorisindeydi. Sitoloji sonuçlarını Bethesda sınıflamasına göre kategorize ettiğimizde ise 23 (22.8%)'ü Bethesda I, 48 (47.5%)'i Bethesda II, 16(15.8%)'sı Bethesda III, 4(4%)'ü Bethesda IV, 10(9.9%)'si Bethesda VI olarak tespit edildi. Bethesda II en yüksek frekans ile EU-TIRADS-3 kategoride saptanırken Bethesda VI ise en yüksek frekans ile EU-TIRADS-5 kategoride yer aldı. Ortalama nodul çapı 20.48± 9.73 mm olarak bulundu.

**Sonuç:** Nodüllerin ultrasonografik bulguları sitoloji sonuçları ile korelasyon göstermiştir. EU-TIRADS sınıflandırması, Bethesda sistemi ile iyi bir uyum içindedir. İki sınıflamanın koordineli kullanılması, klinisyene gereksiz invaziv prosedür riskinden kaçınmak için yardımcı olmaktadır.

**Anahtar Kelimeler:** Biyopsi, Tiroid nodülü, Ultrasonografi

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## Introduction

Thyroid nodules are a common clinical problem, and epidemiological studies have shown that the prevalence rate of palpable nodules in iodine-deficient areas is 5% in women and 1% in men [1,2]. These are intrathyroidal lesions that can be radiologically separated from the thyroid parenchyma and have been detected incidentally on ultrasonography (USG) at a rate of up to 68% in healthy people [3,4]. Most nodules are cytologically benign and do not require treatment, but some nodules may cause compression symptoms and cosmetic complaints. These nodules may cause overt or subclinical hyperthyroidism by gaining autonomy [4-6]. USG-guided fine-needle aspiration biopsy (FNAB) is a widely used and accepted method in the investigation of thyroid nodules [7]. The clinical significance of thyroid nodules is due to the fact that 7–15% of nodules are associated with thyroid cancer, and this is related to age, sex, radiation exposure, and family history [5,8]. In this single-center study, we present the FNAB results of thyroid nodules examined in our hospital.

## Materials and Methods

The study protocol was approved by the institutional Ethics Committee of Cukurova University (Date: 22/07/2022, No: 124/57).

In this study, the results of 101 patients who underwent thyroid FNAB in the endocrinology clinic of Tarsus State Hospital between December 2021 and July 2022 were retrospectively analyzed.

FNAB procedure was performed in endocrinology clinic with high frequency (7-13 mHz) linear probe USG (Aplio 300, Toshiba, Tokyo, Japan). All procedure performed by the single endocrinologist and all specimens evaluated by the same pathologist. FNAB procedure was performed using 22 gauge needle tip and 10-20 cc injectors. During aspiration, negative pressure was applied by sonographically monitoring that the tip of the needle was inside the nodule.

Information including demographic data of the patients, USG findings and cytology results were recorded. Nodule morphologies were categorized according to the findings in the USG results. All Cytology results of thyroid biopsies were classified according to the "Bethesda thyroid cytopathology reporting system" 2017 guidelines [9]. These cytological results were compared with the USG findings.

All of the 101 nodules were scored according to the European Thyroid Association Guidelines for Ultrasound Malignancy Risk Stratification of Thyroid Nodules in Adults (EU-TIRADS) [10].

## Statistical Analysis

A frequency analysis was performed for the categorical variables (sex, FNAB results, and USG characteristics), and descriptive statistics were performed for the numerical variables (age, diameter, thyroid-stimulating hormone [TSH] level, and thyroxine [T4] level). The suitability of the numerical variables to the normal distribution was evaluated using the Kolmogorov-Smirnov test. Among all variables, only age showed a normal distribution. The relationship between EU-TIRADS categories and FNAB results was evaluated with Chi-Square analysis, and the relationship between nodule diameter and FNAB results was evaluated with Kruskal-Wallis H test. The relationship between TSH and T4 levels and US character was evaluated with Kruskal-Wallis H test, and the relationship between TSH and T4 levels and nodule diameter was evaluated with Pearson Correlation analysis. Significance level was accepted as  $p < 0.05$ . All evaluations were made in SPSS 28.0 program.

## Results

In this study we included 84 (83.2%) female and 17 male (16.8%) patients. The patients' mean age was  $49.3 \pm 11.5$  years. When the patients' thyroid functions were examined, the mean TSH level was found to be  $2.13 \pm 1.85$  mIU / L (0.35–5.5), and the free T4 level was  $1.09 \pm 0.18$  ng/dl (0.89–1.76). The mean nodule diameter was  $20.48 \pm 9.73$  mm.

Using the EU-TIRADS, all of the nodules were categorized on the basis of the USG features described in ETA guidelines (Table 1). When we categorized the cytology results according to the Bethesda classification, 23 (22.8%) were Bethesda I; 48 (47.5%), Bethesda II; 16 (15.8%), Bethesda III; 4 (4%), Bethesda IV; and 10 (9.9%), Bethesda VI (Table 1).

Statistically significant difference was found between the nodule characteristics detected on USG and the FNAB cytology results ( $p = 0.017$ ). Cytologically Bethesda VI nodules were more frequently detected among the nodules with category EU-TIRADS 4-5.

The FNAB cytology results showed no statistically significant correlation with age, sex, and thyroid function (Table 2). While nodule diameter and TSH level showed a significant negative correlation ( $r = -0.263$ ), neither of the two showed a significant correlation with the FNAB results.

## Discussion

Thyroid nodules alone do not cause a serious problem unless they cause an obstructive pressure or cosmet-

**Table 1.** EU-TIRADS categories and cytology results

<b>Nodule character</b>	<b>Bethesda I</b>	<b>Bethesda II</b>	<b>Bethesda III</b>	<b>Bethesda IV</b>	<b>Bethesda VI</b>	<b>Total</b>
<b>EU-TIRADS-3</b>	12	31	6	1	1	51(50.5%)
<b>EU-TIRADS-4</b>	8	13	5	1	4	31(30.7%)
<b>EU-TIRADS-5</b>	3	4	5	2	5	19 (18.8%)
<b>Total</b>	23(22.8%)	48(47.5%)	16(15.8%)	4(4%)	10(9.9%)	101(100%)

**Table 2.** Comparison of FNAB cytology results with other parameters

	<b>Age (years)</b>	<b>Sex</b>	<b>TSH (mIU/L)</b>	<b>Free T4 (ng/dL)</b>	<b>Nodule diameter (mm)</b>
<b>FNAB Cytology (p-value)</b>	0.269	0.833	0.059	0.52	0.467

ic discomfort. The main concern with thyroid nodules is whether they are suspected of malignancy or cause thyroid dysfunction. Most thyroid nodules are benign, and thyroid cancer develops in 5% to 15% of thyroid nodules. The incidence of thyroid cancer depends on age, sex, radiation exposure, and family history [11]. Many studies have shown that thyroid nodules are more prevalent in women than in men [12,13]. In our study, the prevalence of thyroid nodules was higher in the female population, consistent with the reports in the literature.

In our study malignancy rate was found to be 9.9% in nodules, which was in line with the studies conducted around the world and in our country. [14-17] and malignancy rate was found to be statistically significantly higher among EU-TIRADS-5 category. Highest concordance was found among both the low risk (EU-TIRADS 3 and Bethesda II) and the higher risk categories (EU-TIRADS 5 and Bethesda IV-VI) in this study, which is consistent with the previously described in literature [28]. The American Thyroid Association (ATA) has associated thyroid nodules with a high risk of malignancy if they are hypoechoic, have irregular and unclear infiltrative borders, present with microcalcifications, show no halo, and have a height greater than the transverse size. The ATA recommends a FNAB for nodules which have these features and more than 1 cm in size [4]. Studies have shown that hypo echogenicity has high sensitivity and specificity in predicting malignancy [18,19]. However, it should be kept in mind that some benign nodules may have a hypoechoic appearance [20]. The malignancy rate was found to be higher in hypoechoic, irregularly circumscribed nodules in our study. A direct relationship was reported between nodule size and cancer risk [21]. In our study, all of the patients except one with malignant results had the nodule larger than 1 cm.

In our study, the rate of nondiagnostic cytology was slightly higher than that reported in the literature [22,23]. Considering that FNAB was performed for the first time in our center, factors such as cytologist experience and equipment adequacy undoubtedly had a significant impact on the adequacy of the procedure.

We found that the FNAB results in our study were not statistically significantly correlated with age and sex. Although we cannot associate cytology with age and sex, we know that both are risk factors of thyroid cancer [24-26]. Thyroid cancer is more common in women than in men, although the cause cannot be fully understood. This is mainly attributed to estrogen, and studies have shown that estrogen levels may be associated with the risk of thyroid cancer [24,27]. Similarly, age is a risk factor of thyroid cancer and is a main component of important thyroid cancer staging systems [26].

### Conclusion

FNAB is an easy-to-apply method with high specificity in the diagnosis of thyroid nodules. In determining the necessity of surgery in the thyroid nodules management, the result of a FNAB performed under USG guidance is of great diagnostic value to clinicians. The coordinated use of EU-TIRADS category and Bethesda helps the physician to avoid the risk of unnecessary invasive operations. Our results are similar to those reported in the literature and clearly demonstrate that the rate of proficiency in performing the procedure will improve with increasing experience. Performing the procedure with USG affects both the diagnostic accuracy and adequacy. Considering that the hospital where the procedure was initially performed is a second care hospital and that more than a hundred

biopsy procedures were performed in a short time by the single endocrinologist, this study reveals that the biopsy procedure to be performed to diagnose thyroid cancer is easily accessible even in limited working conditions. Thus, this study may encourage clinicians working under similar conditions to perform the procedure.

## Limitations

The first among the limitations of the study is that only the first biopsy results were incorporated in the study. Participants were scheduled to undergo repeat biopsies for Bethesda I and Bethesda III results, but the results could not be included because these procedures did not occur within the planned study period. The second limitation is that the histopathology results of the patients who were referred surgery for Bethesda IV and Bethesda VI could not be included in the study because there was no experience of thyroid surgery in our center. Study was conducted in a one district of Turkey, and it may not reflect the country's thyroid nodule epidemiology.

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**Ethics Committee Approval:** Prior to the study, approval was obtained from the Çukurova University Faculty of Medicine Non-Invasive Clinical Research Ethics Committee. (Date: 22/07/2022, No: 124/57).

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