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Comparison of Sonographic-Based TI-RADS Classification and Cytological-Based Bethesda Scoring: 6-Month Experience in Somalia

Sonografik Tabanlı TI-RADS Sınıflandırması ile Sitolojik Tabanlı Bethesda Skorlamasının Karşılaştırılması: 6 Aylık Somali Deneyimi

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Abstract

The aim of this study is to investigate the agreement between the thyroid image reporting and data systems (TI-RADS) classification and the Bethesda scoring in adults with thyroid nodules and to evaluate the effectiveness of our clinic in the management of thyroid nodules. In this prospective study, in which the analyzes of the patients who applied to the Interventional Radiology Department of our hospital for fine needle aspiration biopsy due to thyroid nodule were analyzed, 59 patients were included between January 1, 2020 and June 1, 2020. Sonographic features (composition, echogenicity, shape, margin, and echogenic foci) of all nodules were recorded for TI-RADS scoring before biopsy and TI-RADS scoring was performed by the radiologist. It was then the results compared with the Bethesda scoring, which is the cytological classification. A total of 59 patients (n=43; 72.9% female and, n=16; 27.1% male) were analyzed. Of the biopsied nodules, 31 (52.5%) were localized in the right lobe and 28 (47.5%) in the left lobe. The mean longest diameter of the nodules was 35.9±13.9 mm (range, 13-70 mm). The TI-RADS category was also significantly higher in those with larger nodule diameters (p=0.026). There was moderate agreement between both scorings (kappa value=0.406 and p<0.001). There were 7 (11.9%) patients with TI-RADS ≥ 4 and 10 (16.9%) patients classified as Bethesda ≥ 4. Thyroid nodules reported as highly suspected of malignancy (TIRADS ≥ 4) had good agreement with Bethesda scoring (Kappa value= 0.658 and p<0.001). According to the findings of our study, there is a moderate agreement between TI-RADS scoring and Bethesda. However, the rate of compliance was increasing in nodules classified as malignant nodules (TI-RADS ≥4).

Keywords: TI-RADS, Bethesda, Thyroid nodule, Thyroid ultrasound, Fine-needle aspiration cytology.

Özet

Bu çalışmanın amacı tiroid görüntü raporlama ve veri sistemleri (TI-RADS) sınıflandırması ile Bethesda skorlaması arasındaki uyumu araştırmak ve tiroid nodüllerinin yönetiminde kliniğimizin etkinliğini

değerlendirmektir. Bu prospektif çalışmada 1 Ocak 2020 ve 1 Haziran 2020 tarihleri arasında hastanemiz Girişimsel Radyoloji bölümüne tiroid nodülü nedeniyle ince iğne aspirasyon biyopsisi için başvuran hastalar analiz edildi. 18 yaş altındakiler çalışmaya dahil edilmedi. Biyopsi öncesi TI-RADS sınıflandırması için tüm nodüllerin sonografik özellikleri işlemi yapan radyolog tarafından kaydedildi (kompozisyon, ekojenite, şekil, kontur ve ekojenik odaklar). Sonrasında sonuçlar sitolojik sınıflandırma olan Bethesda skorlaması ile karşılaştırıldı. Çalışmaya toplam 59 hasta (n=43; %72.9 kadın ve n=16; %27.1 erkek) dahil edildi. Biyopsi yapılan nodüllerin %52.5'i (n=31) sağ lobda, %47.5'i (n=28) sol lobda lokalizeydi. Nodüllerin en uzun çapı ortalama 35.9±13.9 mm (minimum-maksimum; 13-70 mm) idi. Nodül boyutu büyük olanlarda TI-RADS kategorisi anlamlı olarak daha yüksekti (p=0.026). TI-RADS ve Bethesda skorlamaları arasında orta düzeyde bir uyum vardı (kappa değeri=0.406 ve p<0.001). Bethesda ≥ 4 olarak sınıflandırılan 10 (%16.9) ve TI-RADS ≥ 4 olan 7 (%11.9) hasta vardı. TI-RADS ≥ 4 olarak sınıflandırılan nodüllerde Bethesda ile uyum daha iyiydi (kappa değeri=0.658 ve p<0.001). Sonuçlarımıza göre TI-RADS skorlaması ile Bethesda sınıflaması arasında orta düzeyde bir uyum olup, malign özellikteki nodüllerde (TI-RADS ≥4) Bethesda sınıflaması ile olan uyum artmaktadır. Bu sınıflamanın rutin kullanıma girmesi malign nodüllerin daha kolay tespit edilmesini sağlayabilir.

Anahtar Kelimeler: TI-RADS, Bethesda, Tiroid nodülü, Tiroid ultrasonu, İnce iğne aspirasyon biyopsisi.

Introduction

Thyroid nodules are very common in the population, with a prevalence ranging from 20% to 76% [1]. Although most thyroid nodules are benign, only 1.6% to 12% are at risk of malignancy [2]. When diagnosed early and well differentiated pathologically, malignant nodule can be easily treated and its prognosis is close to perfect. The 5-year relative survival rate of most stage 1 thyroid cancers approaches 100% [3].

As a result of the widespread use of Ultrasound (US) and expanded availability of cytology analysis using fine-needle aspiration cytology (FNAC), guided by US, thyroid nodules are becoming more common every day. It is controversial whether or not such a benefit exists because most of the nodules are generally benign [4,5].

Thyroid image reporting and data systems (TI-RADS) is a classification system based on US characteristics developed by Horvath et al. [6]. In this way, better selection of thyroid nodules with FNAC will be allowed and unnecessary operations will be eliminated. The TI-RADS classification, which was developed to provide standardization and to create a common report language in the evaluation of thyroid nodules, has been used frequently in recent years [7].

The aim of this study was to investigate the agreement between the TI-RADS classification and the Bethesda category in adults with thyroid nodules and to evaluate the effectiveness of our clinic in the management of thyroid nodules.

Material and Method

Ethical approval was obtained from the Ethics Committee of Somali Turkey Recep Tayyip Erdogan Hospital before the commencement of this study (05.12.2019; 177, MSTH/2718). Confidentiality of the participants was maintained as the names and other identifications were not required during the data collection process. Between January 1, 2020, and June 1, 2020, patients referred to the Interventional Radiology Department of our hospital for FNAC due to a thyroid nodule were analyzed. Adult patients older than 18 years were included in this prospectively planned study. Normal thyroid scans (TI-RADS 1) and proven cases of thyroid malignancy (TI-RADS 6) were not included in this study. After inclusion and exclusion criteria, 59 patients were included in the study. Sonographic features of all nodules were recorded for TI-RADS scoring before biopsy and TI-RADS scoring was performed by an experienced radiologist of 4 years. It was then compared with the Bethesda scoring, which is the cytological classification.

US-FNAC and pathological examination

A detailed US examination was performed for each patient before US-FNAC. The location, size, and sonographic features of the nodules (composition, echogenicity, shape, margin, and echogenic foci) were evaluated using a 7.5 MHz high-resolution linear transducer (Canon Aplio 500, Otawara, Japan) (Figure 1). Sonographically, the nodules with the most suspicious morphological features were accepted as the

target. All biopsies were performed by an interventional radiologist under US guidance. The skin was disinfected with a povidone-iodine solution. A sterile plastic sheath was placed on the US probe. A 22-gauge (G) needle was inserted for FNAC. When the needle was in the targeted area, aspiration was performed a minimum of three times with a 10-cc syringe, and samples were taken from each patient at least twice to ensure sample adequacy. The aspirated material was spread on the glass slide. Some of the slides were placed in alcohol, while the remaining part was air dried. Air-dried preparations were stained using the May-Grünwald-Giemsa Quick (MGG-Q) method and those fixed to alcohol using the Papanicolaou staining method.

Statistical analyses

All analyses were performed using SPSS software v. 22.0 (IBM SPSS Statistics Version 22.0. Armonk, NY: IBM Corp.). The variables were divided into two groups as categorical or continuous. Categorical variables were expressed as numbers and percentages and compared with the chi-square ($\chi 2$) test. Continuous variables were expressed as mean ± standard deviation (mean±SD).

The Kolmogorov Smirnov test was used to test normality and a $p>0.05$ was considered to indicate normally distributed data. Continuous variables that showed normal distribution were compared using Student's t test, whereas the Mann-Whitney U test was used for non-normally distributed samples. The statistical significance level was accepted as $p<0.05$. In addition, Cohen's kappa test was performed to determine the consistency between TI-RADS and Bethesda scores (Table 1).

Table 1. Kappa agreement table.

Kappa value	*Agreement level*
0.93-1	Excellent
0.81-0.92	Almost perfect
0.61–0.80	Substantial
0.41–0.60	Moderate
0.21– 0.40	Fair
0.01–0.20	None to slight
<0	No agreement

Results

Of the 59 patients included in the study, 16 (27.1%) were male and 43 (72.9%) were female. The mean age of the patients was 34.1±12.6 years (range, 19-60 years).

Of the biopsied nodules, 31 (52.5%) were localized in the right lobe and 28 (47.5%) in the left lobe. The mean longest diameter of the nodules was 35.9±13.9 mm (range, 13-70 mm). The TI-RADS category was also significantly higher in those with larger nodule diameters ($p=0.026$) (Table 2 and Figure 2).

Table 2. Distribution of patients by Thyroid Imaging Reporting and Data System (TI-RADS).

TI-RADS scoring	All patients, n (%)	Long diameter (mm)
TI-RADS 2	38 (64.4)	32.1±13.7
TI-RADS 3	14 (23.7)	39.8±11.5
TI-RADS 4	3 (5.1)	49.1±5.2
TI-RADS 5	4 (6.8)	48.7±14.3

The distribution of patients according to TI-RADS and Bethesda scores is shown in Table 2 and Table 3. There was moderate agreement between both scorings (kappa value 0.406 and $p<0.001$). There were 7 (11.9%) patients with TI-RADS ≥ 4 and 10 (16.9%) patients classified as Bethesda ≥ 4. We found that 6 of the 7 nodules reported as TIRADS ≥ 4 were Bethesda ≥ 4. Accordingly, TI-RADS ≥ 4 detected a malignant nodule with a high sensitivity of 85.7%. Thyroid nodules reported as highly suspected of malignancy (TIRADS ≥ 4) had good agreement with Bethesda scoring (Kappa value= 0.658 and $p<0.001$). A comparison of TI-RADS and Bethesda scorings is shown in Table 4.

Table 3. The distribution of patients according to Bethesda scoring.

Bethesda scoring	*All patients, n (%)*
Bethesda 1	5 (8.5)
Bethesda 2	31 (52.5)
Bethesda 3	13 (22.0)
Bethesda 4	5 (8.5)
Bethesda 5	5 (8.5)

Table 4. Comparative evaluation of TI-RADS and Bethesda scores.

	TI-RADS 2	TI-RADS 3	TI-RADS 4	TI-RADS 5
Bethesda 1	5	-	-	-
Bethesda 2	27	4	-	-
Bethesda 3	5	7	1	-
Bethesda 4	1	2	1	1
Bethesda 5	-	1	1	3

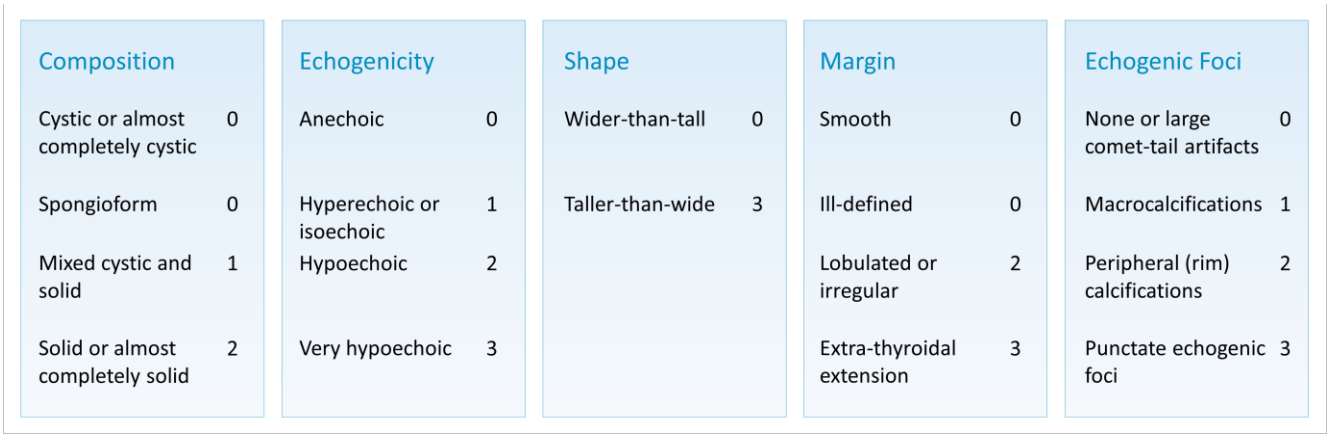

Figure 1: The five sonographic features of TI-RADS and an assessment of the malignancy risk.

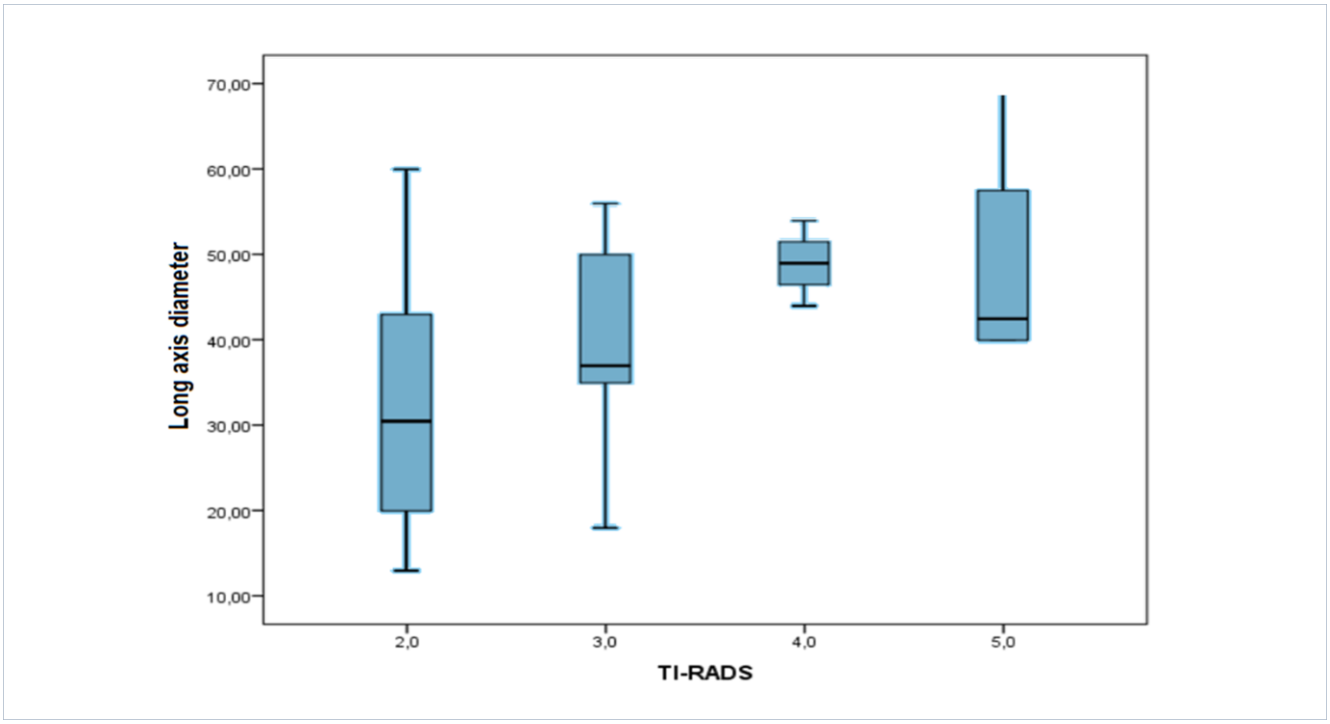

Figure 2: The TI-RADS category was significantly higher (p=0.026) in those with larger nodule diameters.

Discussion

This current study reveals that there is overall a moderate agreement between TI-RADS classifications and Bethesda categories. Furthermore, we found that as the TI-RADS (scoring ≥ 4) category increased, compliance with Bethesda improved further in the same context. There was good agreement between high TI-RADS category nodules and Bethesda scoring (Kappa value= 0.658 and p<0.001). A study in

young adults (18-25 years) showed fair agreement between TIRADS and Bethesda (Cohen's κ = 0.238) [8]. In our study, we used TI-RADS scoring, which is increasingly used in radiology practice, is used in different centers, and has a good interobserver agreement. Studies conducted in various interventional radiology units have reported a high level of agreement with cytology reports [9,10]. This scoring will prevent unnecessary FNAC from thyroid nodules. Thus, we think that TI-RADS scoring will soon replace the American Thyroid Association (ATA) guideline. On the other hand, in a study evaluating the relationship of nodule size with malignancy [11], the odds of malignancy for thyroid nodules less than 3.0 cm was similar to those for nodules of 3.0 cm or greater (0.26 compared with 0.29; p=0.77). Contrary to this, in our study, nodules with high TIRADS category were significantly larger in size (p=0.026). In the region where our study was conducted, it is thought that it is difficult for patients to access health centers as a factor.

Thyroid US should be used in the initial evaluation of the gland and nodule. Despite the high incidence of thyroid nodules, offering FNAC to patients is still controversial. The incidence of thyroid cancer is constantly increasing due to the development and widespread use of diagnostic methods. Early diagnosis and correct treatment are the most important factors in reducing the mortality rate. Although FNAC is useful and inexpensive method for diagnosing thyroid cancer, it is a minimally invasive process. Performing such test in all thyroid nodules is neither cost effective nor advisable, it is necessary to prioritize cases based on their malignancy risk. Therefore, a common reporting language should be established [9].

Standardization of terminology and reporting improves the quality of thyroid ultrasound and imaging-guided biopsy [12,13]. A related study compared ultrasound reports before and after TIRADS administration. The related study revealed that standardized reports better predict malignancy and the importance of neglected nodule features [13]. Moreover, the use of TIRADS has reduced unnecessary biopsies and healthcare costs.

Our study evaluated the concordance between the TI-RADS classification and the Bethesda reporting system. Our study reveals that malignancy increases as you go from TIRADS 3 to 5. We found that 6 of the 7 nodules reported as TIRADS ≥ 4 were Bethesda ≥ 4. Accordingly, TI-RADS ≥ 4 detected a malignant nodule with a high sensitivity of 85.7%. This was a relatively low agreement compared to previous studies. Shayganfar et al. [1] found the sensitivity of TI-RADS to be very high as 91.67%. The reason for this may be that the TI-RADS classification has only recently been used in our clinic and there is a lack of experience. In addition, the low number of cases can be considered as another factor. These factors could be attributed to our study limitations.

Conclusion

According to the findings of our study, there is a moderate agreement between TI-RADS scoring and Bethesda. However, the rate of compliance was increasing in nodules classified as malignant nodules (TI-RADS ≥4). Radiologists should be encouraged to use TIRADS scoring more effectively. As a result, there will be a common reporting language. In addition, earlier detection of nodules at risk of malignancy and prevention of unnecessary biopsies will be ensured.

Conflict of interest: The authors declare that there is no conflict of interest. The authors alone are responsible for the content and writing of the paper. **Financial disclosure:** There is no financial support to this study.

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