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International Journal of Surgery & Surgical Techniques
ISSN: 2578-482X

Correlation between TIRADS and Bethesda Systems with Histopathological Report of Thyroid Nodules in Post Thyroidectomy Patients at Ricardo Baquero Gonzalez Hospital Period January 2017- March 2022: Correlational Retrospective Study

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Research Article

Volume 6 Issue 2

Received Date: November 10, 2022

Published Date: November 22, 2022

DOI: 10.23880/ijsst-16000172

Abstract

Objective: The main purpose of the research was to establish the correlation between TIRADS and Bethesda systems with the histopathological report of thyroid nodules in post-thyroidectomy patients.

Methods: Retrospective, correlational and observational design. The population and sample consisted of 30 patients. The clinical records of all thyroid patients with the presence of a thyroid nodule who underwent thyroidectomy were analyzed. To evaluate the homogeneity of the study sample the following variables were taken into account: clinical data, age, sex, nodule size, anatomopathological study, TIRADS and Bethesda systems.

Results: The study showed that the average age was 42.15 years, with a predominance of female 93.3% and male 6.7%. In the location of the nodules there was a predominance of multinodular goiter 60%, right lobe 26.67% and left lobe 13.33%. The results showed that 3 patients were classified as Tirads 4, of these, two were TIRADS 4a, who's FNA was Bethesda II and Bethesda III. While the third was Tirads 4b, being categorized as Bethesda IV. All TIRADS <4 were 100% true negative and TIRADS ≥ 4 were true positive at the histopathological examination.

Conclusion: It is concluded that both the TIRADS system and the Bethesda system are effective predictor of malignancy in thyroid nodules. The TIRADS system is slightly more sensitive than Bethesda in cases of thyroid nodules ≥ 3 cm.

Keywords: Thyroid Nodule; Thyroidectomy; Ultrasonography

Introduction

Thyroid nodules are a very common disease with a great clinical importance, although most of cases are benign and only 4.5 to 6.5% are malignant; It is necessary to distinguish those cases to reduce the frequency of unnecessary thyroidectomies. For the year 2022, the calculations of the American Society Against Cancer,

indicate that around 43,800 new cases of thyroid cancer will be diagnosed (11,860 in men and 31,940 in women). About 2,230 people will die from thyroid cancer (1,070 men and 1,160 women) [1]. The detection of thyroid nodules by palpation is 3-7%, while by ultrasound it increases from 20-76% [2]. Thyroid Imaging Reporting and Data System (TI-RADS) is an ultrasound classification that helps increase the diagnostic effectiveness of thyroid nodules and reduces the use of preoperative fine needle aspiration (FNA). Currently, TIRADS is used to make a differential diagnosis between benign and malignant thyroid nodules, based on 5 categories, the latter being highly suspicious of malignancy [2]. In recent years, due to its accuracy, simplicity, and low cost, ultrasound-guided fine-needle aspiration has practically replaced thyroid scintigraphy in the study of euthyroid patients with a thyroid nodule, as the study of first choice. Since the 1970s, thyroid FNA has proven to be a reliable method for aetiological diagnosis, with a rate of between 1 and 8% of false positives and between 1 and 11% of false negatives; with a sensitivity of 83 to 99% and a specificity of 70 to 91% [3]. In the past, patients with thyroid nodules would have been requested as a first line study an ultrasound and later thyroid scintigraphy. After that, if the nodule was solid and hypocaptant, the patient would have undergone surgery. With this system, only 20% of the resected nodules were carcinomas [4]. With FNA as a first-line diagnostic procedure, 50% of the nodules removed are malignant and the number of patients undergoing surgery is significantly reduced [3,4].

In euthyroid patients with the presence of nodules, thyroid FNA has proven to be highly sensitive in establishing a diagnosis, distinguishing benign from malignant lesions, and allowing appropriate conduct to be established, thus avoiding unnecessary surgeries [5]. The Bethesda system is a method of cytological categorization of the thyroid nodule, effective in identifying the risk of malignancy. This has the inherent limitation of intra- and interobserver variability in the cytopathological study. In addition, it must be considered that multinodular goiter is the most common of all the disorders of the thyroid gland, a single patient may present various subsidiary nodules to be biopsied by FNA due to their ultrasound characteristics, which increases the complexity of the diagnostic-therapeutic process [6]. The main concern of this study was to detect the variation in diagnostic effectiveness between TIRADS and Bethesda system. Which is why the following question is formulated: What is the correlation between the TIRADS and Bethesda systems with the histopathological report of thyroid nodules in post-thyroidectomy patients?.

Methods

A retrospective, correlational and observational study design. The population consisted in all the medical records of patients with the presence of a thyroid nodule who have undergone thyroidectomy at the Dr. Ricardo Baquero González Hospital during the period 2017 - 2022. The sample was 30 medical records of patients who met the inclusion criteria: patient with thyroid nodule, who has a FNA result classified with the Bethesda system, who presents an ultrasound result classified with the TIRADS system, a frozen section biopsy and biopsy result. The Exclusion criteria were patients with thyroid nodule who was only followed up, patients classified as TIRADS VI, that the fine needle aspiration was not guided by ultrasound and incomplete medical records. The study variables were considered: Clinical data of the population under study. Age, sex, nodule size, pathology study, TIRADS and Bethesda systems. Cases were categorized as positive tests when the TIRADS classification ≥4, if the histopathological exam results as malignant will be true positives, in case of being benign they will be false positives. Patients with a negative ultrasound study (TIRADS < 4) were classified as true negative cases when the histopathological exam results were benign and as false negatives when the findings were malignant. Regarding the Bethesda system, types I, II and III were classified as benign and types IV, V and VI as malignant. After surgery, the correlation between the results of the FNA and the histopathological exam was performed. Data processing was classified considering the variables defined for the investigation. The data was processed using the Microsoft Excel program, for which different tables were created taking the study variables as criteria [7]. Data analyses were used Excel formulas function, the absolute frequency (ni), its percentage and its graphic representation were determined for the different variables of the study. Descriptive statistics were used for data analysis, considering those variables that presented a higher absolute frequency [8]. Additionally, the means were taken as a measure of central tendency.

Results

The present study showed that the average age was 42.15 years, with predominance of the female sex 93.3% and male 6.7%. On the other hand, it was found that, in the location of the nodules, there was a predominance of multinodular goiter of 60%, right lobe 26.67% and left lobe 13.33%. In relation to thyroid hormones, a TSH is shown (Mean Ẋ of 1.93 with a Standard deviation of 1, 16) (Mean Free T3 Ẋ of 2.58 with a Standard deviation of 0.69) and one (Free T4 with a Mean Ẋ of 1.42 and a Standard deviation of 0.33) within the normal range (Table 1).

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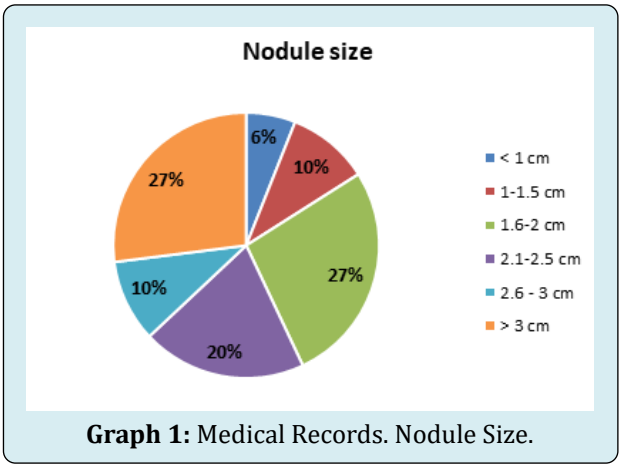
Sex			
Age	**Female**	**Male**	**(%)**
18-30	6	0	-20
31-40	7	0	(23,33)
41-50	9	1	(33,33)
51-60	3	1	-13.33
>60	3	0	-10
Total	28	2	-100
Mean (Ẋ) 42.15			
Nodule Location			
	n	**(%)**	
Right lobe	8	-26.67	
Left lobe	4	-13.33	
Multinodular goiter	18	-60	
Total	30	-100	
Free T3, Free T4 and TSH			
	Mean (Ẋ)	**Standard Deviation (σ)**	
TSH	1.93	±1.16	
Free T3	2.58	±0.69	
Free T4	1.42	±0.33	

Table 1: Medical Records, Clinical Data.

The symptoms presented by the patients in this study were lump in the neck, sense of mass while swallowing, neck pain, compressive symptoms such as dysphagia and hoarseness. Regarding the nodule's sizes, it was found that 6% were <1cm, 10% were between 1-1.5cm, 27% between 1.6 - 2cm, 20% between 2.1 - 2.5cm, 10 % between 2.6cm – 3cm and 27% >3cm (Graph 1).



Graph 1: Medical Records. Nodule Size.

The 3 patients with histopathological results as thyroid cancer, two patients were females with 18 and 54 years, both with multinodular goiter, whose largest nodule was over 3 cm. The third case was a 48-year-old male with the presence of a 2.5cm right nodule. The correlation between the TIRADS - Bethesda systems, it was shown that all patients categorized as TIRADS 2 and 3 were classified as Bethesda II in the cytological study. While the remaining 3 patients were categorized as TIRADS 4. Of these cases, two as TIRADS 4a, where the result was one benign (Bethesda

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II) and one probably benign (Bethesda III). While the third patient studied obtained parameters for TIRADS 4b, where the cytological analysis reported to be Bethesda IV (Table 2).

	BI	IBI	III	BIV	B.V.	BVI
TIRADS 1	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
TIRADS 2	0 (0%)	17(100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
TIRADS 3	0 (0%)	10(100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
TIRADS 4	0 (0%)	1(33.3%)	1(33.3%)	1(33.3%)	0 (0%)	0 (0%)
TIRADS 5	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)

Table 2: Medical Records. TIRADS/Bethesda System Correlation.

When establishing the FNA - biopsy relationship, it was observed that of the 30 cases studied by FNA, 29 (96.6%) were benign and one (3.33%) malignant. However, when the histopathological result was performed on these, it was found that 27 (90%) were indeed benign and 2 were recategorized as malignant, for a total of three (10%) cases. These 3 cases were two papillary cancers in the female patients with multinodular goiter and one papillary micro carcinoma of right thyroid lobe in the male patient (Table 3).

FNA/Biopsy correlation	Benign	Malignant	Total
FNA	29(96.67%)	1(3.33%)	30
Biopsy	27(90.00%)	3(10.00%)	30

Table 3: Medical Records. FNA/Biopsy Correlation.

When analyzing the correlation between TIRADS - histopathological exam, all TIRADS <4 were 100% true negatives and all TIRADS ≥4 were 100% true positives (Table 4).

TIRADS/Biopsy	Benign	Malignant	Total
TIRADS < 4	27 BV	0 FN	27
TIRADS ≥4	0 FP	3 PV	3
Total	27	3	30

Table 4: VN: True Negatives; FN- False Negatives; FP: False Positives; VP: True Positives.

Regarding the surgical procedure, 34% of patients underwent total thyroidectomy, 13% lobectomy + isthmusectomy, 27% right lobectomy, 13% left lobectomy, 10% total thyroidectomy + central lymphadenectomy and 3% subtotal thyroidectomy (Graph 2).

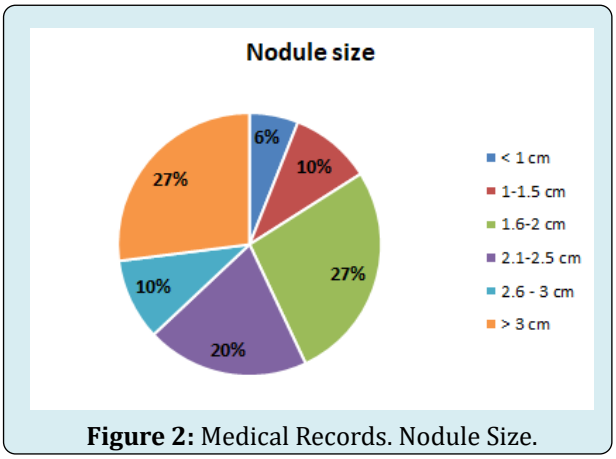

Figure 2: Medical Records. Nodule Size.

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Discussion

Thyroid nodules are one of the most common endocrinopathies of the thyroid gland, especially considering the incidental thyroid nodule findings on ultrasound that have made it possible to demonstrate a higher prevalence of these. It´s more frequent in women [3,4]. The presence of thyroid nodules increases with age [9]. Ghanaati H, et al. observed that in 147 patients evaluated with the presence of thyroid nodules, 85.7% were female and the mean age was 49.8 ± 13.7 years [10]. Results that are similar to our study (See Table 1), which allows us to conclude that thyroid nodules are more frequent in females and their incidence increases from the fourth decade of life. The risk of cancer in thyroid nodules is double in males [9]. This is corroborated by our study because 50% of males with thyroid nodules had thyroid cancer. See table 1. Belfiore et al, concluded that the highest incidence of cancer was found in patients under 30 years of age and over 60 years of age, the minority being in the fourth decade [9, 11]. In our study age was not a determining factor because only one case was within the ages of highest incidence for cancer Table 1. Ghanaati, et al. concluded that on case of unilateral thyroid nodule, 52.4% were on the right lobe [10]. Results that is similar to our study, which allows us to conclude that the right thyroid lobe has a higher risk (Table 1).

Tollin S, et al. concluded that 5% of the dominant nodules in patients with multinodular goiter studied by FNA were thyroid cancer and has the same risk as solitary nodules [12]. It should be noted that in patients with multinodular goiter, FNA is regularly taken from the dominant nodule, a study by Young & et al, showed that 50% of thyroid cancers were found in non-dominant nodules [13]. In our study, two cases of patients with multinodular goiter were recategorized as malignant at the histopathological exam Table 3. Kamran S, et al. concluded that thyroid cancer appears to be more common in nodules ≥ 2 cm compared to those < 2 cm. Furthermore, the accuracy of FNA is lower in those with nodules >3 cm [14]. In our study, the same theory was confirmed, since the presence of cancer was found in nodules with a size greater than 2.5 cm (graph 1).

Regarding the correlation between the TIRADS and Bethesda systems, considering all the nodules studied, there is a strong association between both systems, especially those categorized as benign Table 2. Our results are similar to the study by Rahal J, et al. where concluded that nodule´s classified as TIRADS 2 and 3, were Bethesda II in 95.5% and 92.5% respectively [15]. Nebu A, et al. concluded that the Bethesda system had greater sensitivity, specificity and diagnostic accuracy than the TIRADS [16]. In our study TIRADS was a better predictor of malignancy compared to the cytological study when both systems were compared with the final histopathological report Tables 2-4. Debanu D, et al. found that 3 patients (14.28%) with benign cytological diagnosis and suspicious ultrasound (TIRADS 4-5), in the final histopathological report turned out to be malignant [17]. Results that are similar to our study where TIRADS was a better predictor of malignancy. Kraus F, et al. indicates that when the cytopathological diagnosis is Bethesda VI, the positive predictive value of malignancy in terms of the final biopsy is close to 99%, for type V 79.1% and IV 35.7 %. Whereas, if the result is benign, the false negative rate is less than 3% [18]. Data that is related to our results Tables 2 and 3. Therefore, we conclude that as the Bethesda system is less conclusive for malignancy, its positive predictive value for malignancy decreases.

Conclusion

It is concluded that both the TIRADS system and the Bethesda system are effective predictor of malignancy in thyroid nodules. The TIRADS system is slightly more sensitive than Bethesda in cases when the thyroid nodules ≥ 3 cm. In cases of small nodules with TIRADS (2-3), they should be considered benign in order to reduce the overuse of FNA in the future. This study has some limitations such as sonographic and cytology assessment performed by different operators. This study does not rule out the predictive value of both classifications.

Conflict of Interest

The authors declare that they have no conflict of interest regarding this study.

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