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Risk Stratification of Thyroid Nodules Using the Thyroid Imaging Reporting and Data System (ACR-TIRADS) in Women of Reproductive Age in Kashkadarya Region

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Abstract A total of 491 women of reproductive age (prospectively) with thyroid nodules (TN) were examined in the period from 2014 to 2024 in the Kashkadarya branch of the Republican Scientific and Practical Medical Center of Endocrinology and Epidemiology of the Ministry of Health of the Republic of Uzbekistan. The average age of the patients was 36.2 ± 5.2 years. The control group consisted of 20 healthy women of the corresponding age. The use of thyroid ultrasound, aimed at detecting developing tumors, in routine surveillance of patients with TN may aid in the early detection of thyroid malignancies The combination of thyroid scintigraphy in the TIRADS model is important for preventing unnecessary fine-needle biopsy and thyroid surgery.

Keywords Nodular goiter, TIRADS, Women

1. Introduction

Thyroid nodules are a common finding, especially in iodine-deficient regions. Ultrasound scoring systems such as the Thyroid Imaging Reporting and Data System (TIRADS) are useful in differentiating benign from malignant thyroid nodules, offering a risk stratification model. Depending on the constellation or number of suspicious ultrasound features, fine-needle biopsy is recommended. Thyroid nodules are more common in women [1], although the reasons for this phenomenon are not fully understood. There is an opinion that the appearance of nodules is associated with various factors, including increased estrogen levels, autoimmune diseases, stress, environmental endocrine disorders, excess iodine, and other circumstances.

The prevalence of thyroid nodules is high, especially in iodine-deficient countries [1]. Overall, the prevalence of thyroid nodules in adults without previously diagnosed thyroid disease is estimated to be 59%, with a higher prevalence in the elderly population. [2,3]. In addition, multinodular structure is a common finding in patients with thyroid nodules. [3,4]. However, only a small number of these nodules are of clinical significance. Accordingly, the official journal of the German Medical Association has published a statement against sonographic screening of thyroid nodules in elderly asymptomatic patients. [5]. A similar recommendation against screening asymptomatic adults was published in 2017 by the U.S. Preventive Services Task Force. [6]. On the other hand, thyroid nodules are a common incidental finding on imaging studies of the neck, including arterial duplex sonography, MRI or CT, and ultrasonography in the context of otolaryngological examinations. Thus, it is necessary to decide which nodules represent a potential risk and require further investigation to identify either those that are presumed to be malignant (fine needle biopsy, thyroid surgery) or those that are functionally significant autonomous nodules.

Official guidelines emphasize the importance of high-resolution ultrasound for accurate assessment of the sonomorphological features of nodules. B-mode ultrasound can be combined with color duplex to assess vascularity and, more recently, with sonoelastography to assess the elasticity or stiffness of thyroid nodules. [7,8].

In the past, several ultrasound characteristics have been identified that indicate malignant or benign nodules. [9,10]. ACR TI-RADS classifies ultrasound features as benign, low suspicious, moderately concerning, or highly suspicious for malignancy. Each ultrasound feature of a nodule is assigned a score, with additional points being given to more worrisome features. When analyzing a nodule, the physician selects one

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feature from the first four categories, plus all relevant features from the last category, and calculates a total score. The resulting score determines the ACR TI-RADS grade of the nodule, which ranges from TR1 (benign) to TR5 (high probability of malignancy).

The above served as the reason for the present study.

Main part – to investigate the value of the ACR-TIRADS classification in assessing the risk stratification of thyroid nodules.

2. Material and Inspection Methods

491 women of reproductive age (prospectively) with NTG were examined in the period from 2014 to 2024 in the Kashkadarya branch of the Republican Scientific and Practical Medical Center of Epidemiology and Gynecology of the Ministry of Health of the Republic of Uzbekistan. The average age of the patients was 36.2 ± 5.2 years. The control group consisted of 20 healthy women of the corresponding age.

Inclusion criteria: autoimmune thyroiditis, nodular, women of childbearing age.

Exclusion criteria: pregnant and lactating women, children and adolescents, men, type 1 diabetes mellitus, chronic adrenal insufficiency, acute kidney and heart disease, connective tissue diseases, vasculitis, amyloidosis, systemic cancer, vitiligo, rheumatism.

Research methods – general clinical, biochemical (bilirubin, direct, indirect, lipid spectrum, ALT, AST, PTI, coagulogram, hormonal (TSH, free thyroxine, antibodies to TPO, to thyroglobulin and thyrocyte receptors, prolactin in the blood) and instrumental: ECG, ultrasound of the thyroid gland, internal organs, chest X-ray, etc.

Thyroid ultrasound examination was performed using a Hitachi EUB 5000 G or Hitachi Avius Hi Vision equipped with a 5–10 MHz linear transducer.

The analysis included American recommendations for thyroid nodules according to the ACR-TIRADS (American College of Radiology-Thyroid Image Reporting and Data System) classification.

Statistical calculations were performed in the Microsoft Windows software environment using the Microsoft Excel-2007 and Statistica version 6.0, 2003 software packages. We summarized the baseline and demographic characteristics using descriptive statistics. A two-sided $p<0.05$ was considered statistically significant.

3. Research Results

First of all, we analyzed the number of women registered with thyroid diseases in 2024 (Table 1).

As can be seen from Table 1, the largest number of patients with thyroid diseases was identified in the city of Karshi – 1648 (12%) out of 12764 women with thyroid diseases. Table 2 shows the number of women registered with a thyroid nodule in 2024.

Table 1. Number of women registered with thyroid diseases in 2024

No.	Name of the settlement	Total	Of these, women
1	city of Karshi	1776	1648
2	Shahrisabz city	1147	808
3	Guzor district	699	542
4	Dehkonobod	282	231
5	Kamashi	732	514
6	Karshi	568	471
7	Kasbi	565	445
8	Koson	962	746
9	Kitob	2118	1471
10	Muborak	326	313
11	Mirishkor.	304	253
12	Nishon	407	322
13	Chiroqchi	595	522
14	Shahrisabz	2740	2416
15	Yakkabog	2197	1923
16	Kukdala	220	139
	Total for the region	**15638**	**12764**

Table 2. Number of women registered with thyroid nodules (TN) in 2024

No.	Name of the settlement	Total	Of these, women
1	city of Karshi	28	22
2	Shahrisabz city	49	48
3	Guzor district	70	49
4	Dehkonobod	46	45
5	Kamashi	26	24
6	Karshi	0	0
7	Kasbi	2	2
8	Koson	94	79
9	Kitob	53	47
10	Muborak	16	16
11	Mirishkor.	38	37
12	Nishon	26	22
13	Chiroqchi	37	37
14	Shahrisabz	33	33
15	Yakkabog	36	24
16	Kukdala	8	6
	Total for the region	**562**	**491**

From table 2 it follows that the largest number of patients with TN were identified in the city of Koson – 79 women (16%) out of 491 patients with TN throughout the region.

Patient characteristics and ultrasound imaging of thyroid nodules at all sites of study are given in Table 3.

The database included 491 patients with 491 thyroid nodules.

The ACR-TIRADS classification (2015) identified 98 (19.9%), 180 (36.6%), 180 (36.6%), 30 (6.1%), and 3 (0.61%) nodes in categories ≤3, 4A, 4B, 4C, and 5, respectively.

It should be noted that the recommendations of the German Society of Nuclear Medicine [11] and the German

Association of Endocrine Surgeons recommend additional scintigraphy for nodules larger than 1 cm regardless of the TSH level [12], if it is necessary after ultrasound investigation.

In 2017, the ACR TIRADS Committee released a white paper introducing a new risk scoring format for thyroid nodules called ACR TIRADS. This system classifies nodules into the following categories: benign (TR1, 0 points), not suspicious (TR2, 2 points), slightly suspicious (TR3, 3 points), moderately suspicious (TR4, 4-6 points), and highly suspicious for malignancy (TR5, 7 points). [13-15].

Table 3. Patient characteristics and ultrasound imaging of thyroid nodules at all study sites

Characteristic	General	Test	*r*
Patients	491 (100)	$\chi 2$	0.0002
Average age (years)	36.2 ± 5.2	Analysis of variance	0.0002
Female	37.7 ± 13.2		0,0231
Nodes	615 (100)	—	—
Average largest diameter (mm)	23.2 ± 10.0	Analysis of variance	0.0002
Patients with hyperthyroidism	117 (20.1)	$\chi 2$	1.0000
Resected nodules	42 (6.8)	$\chi 2$	<0.0001
Ultrasound characteristics			
Solid composition	348 (56.6)	$\chi 2$	1.0000
Hypoechogenicity	311 (50.6)	$\chi 2$	1.0000
Marked hypoechogenicity	34 (5.5)	$\chi 2$	1.0000
Calcification	263 (42.8)	$\chi 2$	0,0168
Microcalcification	209 (34.0)	$\chi 2$	0.0021
Uneven fields	117 (19.0)	$\chi 2$	1.0000
Lobular edges	62 (10.1)	$\chi 2$	1.0000
Fuzzy boundaries	55 (8.9)	$\chi 2$	1.0000
The shape is taller than wider	66 (10.7)	$\chi 2$	1.0000

• Qualitative data are expressed as numbers followed by percentages in parentheses; continuous data are expressed as mean or median ± SD.

4. Conclusions

The implementation of the ACR TIRADS system is a necessary measure for the early diagnosis of thyroid nodules. This system provides step-by-step instructions on the management and monitoring of thyroid nodules, creating conditions for timely puncture biopsy.

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