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Tirads and Bethesda Scores Application in Thyroid Cancer Diagnosis

Salimova M.U.[1], Ismailov S. I.[1], Shamansurova Z. M.[1,2]

[1]Tashkent Pediatric Medical Institute, Tashkent, Uzbekistan; [2]Institute of Biophysics and Biochemistry at the National University of Uzbekistan, Uzbekistan.

ABSTRACT

Introduction: Malignant tumors of the thyroid gland are common in the field of endocrinology as an oncological disease, accounting for 0.5% of all oncological diseases. It also accounts for 5% of malignant oncological tumors in the head and neck area. The incidence rate of thyroid cancer ranges from 3.5% to 8% annually in different countries.

Aims: Aim of this study was to evaluate accuracy of thyroid cancer diagnosis by traditional methods and by application of TI-RADS and Bethesda systems scores.

Methodology: To evaluate the effectiveness of the integrated use of TIRADS and Bethesda systems and their significance in the formation of therapeutic tactics in 90 patients with thyroid cancer were observed with gathering data about clinical signs, complaints, anamnestic data specific to thyroid pathology, history of the disease, blood check for thyroid stimulating hormone (TSH), free T4 (T4), thyroglobulin (TG) level, titre of antibodies against TG (AT-TG); preoperative US-imaging of the thyroid gland performed according to old traditional description and by using TIRADS system, cytological analysis of the FNAB test - according to simple traditional histology description and by using Bethesda classification, operative protocol and express histological analysis of the macropreparation assessed according to the Bethesda classification, as well as final histological analysis.

Results: Results showed the complex application of Bethesda systems in cytological examination by FNAB in and US-imaging TIRADS is 4 times more effective with using TIRADS and BETHESDA than in group used conventional classification and method. Moreover, the informativeness of histological examinations described by the Bethesda system were in 1.4 times higher. This indicator of high importance significantly reduces diagnostic errors through the complex use of TIRADS and Bethesda systems in the diagnosis of thyroid cancer.

Conclusion: 1. The use of the TIRADS system is the most accurate and effective method of early diagnosis in the assessment of nodal derivatives, especially in the process of diagnosing TC. In particular, the systematic tactics of TIRADS 3, TIRADS 4, TIRADS 5 stages further simplify the diagnostic process. 2. Obtaining conclusions using the Bethesda system in cytological and express histological examinations facilitates intraoperative decision-making for the physician and ensures effective completion of surgical tactics.

Key Words: Bethesda, Cytology, Histology, Thyroid cancer, TIRADS, Ultrasound

INTRODUCTION

Malignant tumors of the thyroid gland are common in the field of endocrinology as an oncological disease, accounting for 0.5% of all oncological diseases. It also accounted for 5% of malignant oncological tumors in the head and neck area.[11] The incidence of thyroid cancer (TC) ranges from 3.5% to 8% annually in different countries.[13] Problems with TC and its diagnosis are one of the current issues in modern endocrinology. The frequency of TC encounters has doubled over the last decade.[4,9] The emergence of this phenomenon may be associated with the development of tumor diagnosis, mainly with the use of ultrasound (US), fine-needle aspiration biopsy (FNAB), cytological and molecular-genetic methods.[7] A number of scientists believe that the main reason for the true growth of TC is an increase in thyroid papillary cancer (TPC). In 5–24% of deaths due to TPC, microscopic examination of the thyroid gland by autopsy showed no signs of early objective injury.[4] These indicators necessitate the optimization of TC tumor screening methods and the definition of a diagnostic algorithm.[9] While US is used as the primary method at a time when the number of TC nodal derivatives is increasing, the FNAB test method is second only to the "gold standard". However, in approximately 10–30% of cases, the

Corresponding Author:
Shamansurova Z. M., Institute of Biophysics and Biochemistry at the National University of Uzbekistan, Uzbekistan.
Email: shamansurova@yahoo.com

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method of cytological examination remains unclear.[8] This, of course, creates significant diagnostic problems for professionals. Therefore, additional preoperative examination methods that accurately describe the nature of the nodule are needed.

Today, there are more than 20 classifications of images of thyroid pathologies on ultrasound examination. TIRADS (Thyroid Imaging Reporting and Data Systems) is the most common of these and is used to assess thyroid nodule products. The TIRADS classification was first proposed in 2009 by E. Horvath.[6] The main goal was to create a classification that best suited the FNAB guideline in thyroid nodal pathologies. Then in 2011 J.Y. Kwak created a relatively simpler K-TIRADS (Korean Thyroid Imaging Reporting and Data Systems). In 2017, scientists from France, Denmark, Turkey, Italy and the United Kingdom created the European TI-RADS System (EU TIRADS) based on K-TIRADS . In May 2017, ACR TIRADS was announced by the Journal of the American College of Radiology. This option is simpler, each character (structure, exogenousness, shape, calcination, and contour) is evaluated by scores, and then categorized by the sum of the scores.[12]

The Bethesda classification for reporting thyroid cytopathology was developed by WHO in 2009 to summarize and clarify cytological findings.[1,5] According to the classification, it consists of 6 diagnostic categories (diagnosis), through which the tactics of treatment are determined. It is also possible to learn about the risk of malignancy and patient control in this classification. In 2017, the classification was revised and a new version was announced. In the new option, we can see a change in the risk level of poor quality products, as well as new recommendations in patient management measures. In addition, molecular genetic testing of Category III and IV samples with uncertain diagnostic data is recommended.[2]

METHODOLOGY

90 patients who were admitted to surgery in Republican Specialized Scientific Practical Medical Centre Endocrinology (RSSPME) named after academician Y.Kh. Turakulov (n = 60) and city hospital "Vitamed Clinical" (n = 30) with TC diagnosis during 2018-2021 years were analyzed. The main research group as a qualifying criterion of the study were clinical signs, complaints and anamnestic data specific to thyroid pathology in the history of the disease, thyroid hormone (TSH), free T4 (T4), thyroglobulin (TG), antibody against TG (AT-TG); US analysis of the thyroid gland according to old traditional description and by using TIRADS system, cytological analysis of the FNAB test according to the simple traditional histology description and by using the Bethesda classification, operative protocol and express histological analysis of the macropreparation according to the Bethesda classification, as well as final histological analysis. All steps of investigation were performed under signed consent form, according to agreement and protocols approved by Local Ethical Committee.

In the study, all patients (n = 90) were divided into 2 groups: Group 1 - a study group on modern classifications of US and Cytology, in which the number of patients was 70, all patients were diagnosed with TIRADS in US, Bethesda classification in Cytology. Group 2 - Old-fashioned examination group, the number of patients is 20. No modern classifications have been used in the diagnosis of the disease in these patients. All first and second group patients underwent total thyroidectomy surgery.

RESEARCH RESULTS AND DISCUSSION

According to modern US results based on the TIRADS system, the following ratios were obtained in group 1 patients (n = 70): TIRADS 2 (not suspicious) 3% (n = 2), TIRADS 3 (mildly suspicious) 27% (n = 18), TIRADS 4 (moderate suspicious)55% (n = 39), TIRADS 5 (highly suspicious) 15% (n = 11) (Fig.1). Given the essence of the main content of the creation of the TIRADS system, changes specific to TIRADS 1 (benign) did not occur in patients with thyroid cancer.

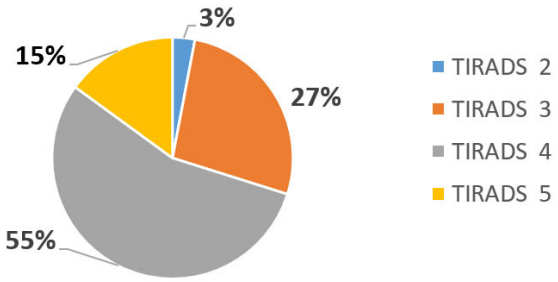


Figure 1: Ratio of TIRADS system levels on ultrasound examination of patients with thyroid cancer (%).

During the study, the FNAB method was performed for cytological examination in all examined patients (n = 90). This method of examination was performed in patients with a nodule in the TC area at US and who were instructed to use the FNAB method according to the TIRADS classification. The analysis of the materials received for the examination was carried out by qualified cytologists in the cytological laboratory of the RSSPMCE and the clinic "VITAMED". The results were analyzed according to 6 categories of cytological classification in the International Bethesda(Fig.2). In the FNAB examination, which is the next stage of diagnosis of patients with thyroid cancer, the following cytological changes were detected in group 1 patients (n = 70) according to the Bethesda classification: B2 (Benign)- n = 12 (17%),

Bethesda 3 (Atypia of undetermined significance/follicular lesion of undetermined significance) - n = 2 (3%), Bethesda 4 (Follicular neoplasm/suspicious for a follicular neoplasm)- n = 36 (51%), Bethesda 5 (Suspicious for malignancy)- n = 18 (26%), Bethesda 6 (Malignant)- n = 2 (3%).

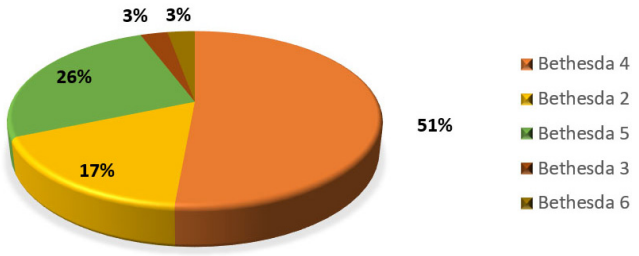


Figure 2: Occurrence rate of Bethesda classification categories in patients with TCFNAB examination (%).

As a criterion for the accordance of ultrasound and cytological methods in the diagnosis of thyroid cancer, TIRADS were analyzed in groups 3,4,5, taking into account the occurrence of categories Bethesda 4,5,6 (n = 57). According to this, the accordance was observed in 57 patients (81.4%). In this case, 13 patients (TIRADS 2 and Bethesda 2 groups) were not eligible (Fig.3).

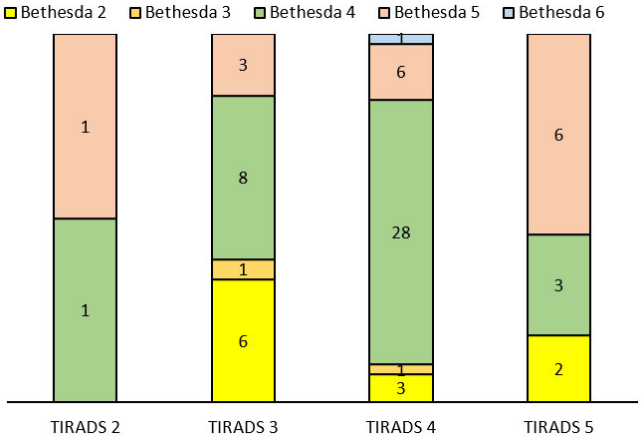


Figure 3: Bethesda frequency in TIRADS groups (n = 70).

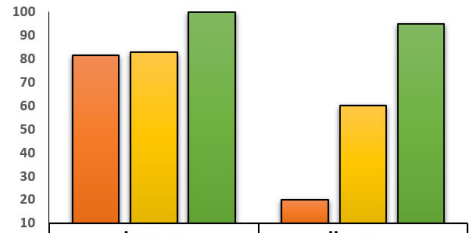
In group 1 patients (n = 70), 89% (n = 62) of the histologically examined materials according to the results of express histology gave results in Bethesda 5, 11% (n = 8) in Bethesda category 4.

Express histological examination is important during thyroid cancer surgery. Getting a quick fix during surgery depends on the surgeon's knowledge, and experience. This examination requires the surgeon to select the scope of surgery and carefully examine the glandular tissue.

In the Bethesda system, the correlation between cytological and express histological analyzes is 82.8%. At Bethesda, there was an 80% correlation between categories 4, 5, 6, and in 1 case (2.8%) a diagnosis of cytology was made in Bethesda 3 (Atypia of undetermined significance/follicular lesion of undetermined significance) and then in express histology Bethesda 4 (follicular cancer). In general, this has been an important diagnostic step in the diagnosis of thyroid cancer, as were shown by other authors.[13,14,15] All of the patients in the study were patients with thyroid cancer i.e. the final histological findings confirmed the diagnosis of cancer. In this context, the presence of only 5 categories in Bethesda and 4 in Bethesda in express histology in group 1 indicates that these two histological examinations are 100% appropriate.

In order to compare the results of group 1 patients, group 2 patients (n = 20) were obtained who did not use TIRADS and Bethesda systems during the examinations. A number of inconveniences, deficiencies, and imbalances were observed in the examinations of these patients as a result of the non-use of the TIRADS and Bethesda systems.

Thus, when comparing patients of group 1 (n = 70) and group 2 (n = 20), in 1 group the results of the examination on modern classifications of cytology by US and FNAB confirmed in 81.4% (n = 57) cases, ie TC . However, in group 2, this result showed 20% (n = 4) . The FNAB result in group 1 matched the express histology result in 82.8% (n = 58) . In group 2, this result was 60% (n = 12). In group 1, the express histological conclusion of the modern classification corresponds to the final histological conclusion in 100% (n = 70). In group 2, this figure is 95% (n = 19). Thus, the complex application of TIRADS and Bethesda systems solves medical, economic, social problems in the diagnosis of thyroid cancer(Fig. 4).



	I-group	II-group
US and FNAB,%	81.4	20
FNAB and express histology,%	82.8	60
Express histology and final histology,%	100	95

Figure 4: Indicators of accordance of the results of sonographic, cytological and histological examination in groups.

The complex application of Bethesda systems in cytological examination by TIRADS and FNAB in ultrasound examination is 4 times more effective in group 1 than in group 2. When FNAB cytology and express histological examinations are described by the Bethesda system, we can see

that the informativeness is 1.4 times higher. This indicator of high importance significantly reduces diagnostic errors through the complex use of TIRADS and Bethesda systems in the diagnosis of thyroid cancer.

CONCLUSIONS

1. The use of the TIRADS system is the most accurate and effective method of early diagnosis in the assessment of nodal derivatives, especially in the process of diagnosing TC. In particular, the systematic tactics of TIRADS 3, TIRADS 4, TIRADS 5 stages further simplify the diagnostic process. In the study, the correlation between TIRADS and Bethesda classification in cytology was 81.4%. This indicator of high importance significantly reduces diagnostic errors through the complex use of TIRADS and Bethesda systems in the diagnosis of thyroid cancer.
2. Obtaining conclusions using the Bethesda system in cytological and express histological examinations facilitates intraoperative decision-making for the physician and ensures effective completion of surgical tactics. In the study, the coherence of these studies according to the modern Bethesda classification was 82.8%, indicating that its importance was high. During the study, the results of the express and final histological examination were 100% mutually compatible, confirming that specific tactics had been selected in diagnosis and treatment.

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Conflict of interest: Authors do not have any conflict interest.

Authors contribution: MS – data collecting, paper body; IS – patients observation, surgery, paper correction, leader of this study; SZ – data analysis, paper correction, corresponding author.

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