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Optimization Of Diagnostics Of Nodular Thyroid Diseases Based On TI-RADS And TBSRTC Systems

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ABSTRACT

To evaluate the effectiveness of the integrated use of TI-RADS and TBSRTC systems and their significance in the formation of therapeutic tactics in patients with nodular thyroid pathology.

KEYWORDS

Nodular goiter, thyroid cancer, ultrasound, cytology, TI-RADS, TBSRTC.

INTRODUCTION

The medical and social significance of the problem of thyroid nodules is indisputable [6]. Today, ultrasound and fine needle puncture aspiration biopsy (TAPB) are the main methods for detecting and verifying thyroid nodules [19] The rapid growth in the number of patients with nodular focal lesions of the thyroid gland requires, taking into account the current situation, the development of approaches aimed at solving the problem. One of the ways is the formation of new algorithms based on the latest achievements of science and technology [13]. To date, ultrasound both in the world and in Russia is considered the " gold standard" for the detection of thyroid nodules [3, 11].The advantages of this method are recognized all over the world [7,8,5], despite the existing element of subjectivism [18].The American Thyroid Association believes that thyroid sonography should be performed in all patients with identified nodules or suspected nodules [17]. With ultrasound, it is possible to visualize not only a typically located thyroid gland, but also to conduct a differential diagnosis with a tumor formation of a different ethology and to identify metastases to the lymph nodes [1,4]. In 2009, E. Horvat and colleagues [14], based on the BIRADC (Mammary Gland) system, proposed to extend the principles of ranking to the evaluation of thyroid images, which was called the Thyroid Image Reporting and Data System (TI-RADS). According to it, ultrasound provides indicative information about the nature of the process and specifies the subsequent actions of the clinician. The task of implementing the TI-RADS system can be formulated as follows: clarification of indications for cytological examination [2,9,12]. Despite the undoubted advantages of the system, the introduction of TI-RADS into the daily practice of Russian medical institutions is slowed down [15]. The task of another TBSRTC system (The Bethesda System for reporting thyroid cytopathology) is more significant – the formation of therapeutic tactics based on the morphological structure of the node.To date, information covering the experience of the integrated use of the ultrasound assessment system (TI-RADS) and the cytological assessment system (TBSRTC) in the work of medical institutions in Russia is very scarce and does not give a reliable idea of the results of their use.

MATERIALS AND METHODS

A retrospective study of 200 medical records of patients undergoing surgical treatment in the clinic was conducted "Vitamed " in 2019-2020.

The data of preoperative examination and protocols of operations and data of postoperative pathomorphological examination in 200 patients with nodular pathology of the thyroid gland were analyzed. Of these, there were 172 women (86%) and 28 men(14%). The age cohorts of operated patients were different: 2 people (1%) under the age of 20, 18 people (9%) from 21 to 30 years, 35 people (17.5%) from 31 to 40 years, 45 people (22.5%) from 41 to 50 years, 64 people (32%) from 51 to 60 years, 36 people (18%) older than 61 years and more.

At the prehospital stage, all operated patients underwent ultrasound examination and fine needle aspiration biopsy under the control of ultrasound, followed by cytological examination. According to medical histories, ultrasound was performed according to the standard protocol [10]. Ultrasound examination was performed on Acuson S-2000 (Siemens, Germany), DC-8 (Mindray, China) using 7.5-18 MHz linear sensors in standard modes using a range of basic and latest technologies and techniques. The state of the parenchyma, the presence of diffuse changes and nodes in the B-mode (location, size, shape, echogenicity, homogeneity of the structure, the presence of calcifications and liquid inclusions, borders, contours) and in the CDC and ED modes (vascularization), the state of surrounding tissues and organs, zones of regional lymph outflow were evaluated. The main task of ultrasound specialists was to identify ultrasound predictors of thyroid nodular pathology. The recommendations of 2009 were taken as a basis [10]. Taking into account the goal of the study, a retrospective standardization of ultrasound protocols and images was carried out using the TIRADS system [16]. In particular, all images were ranked by groups: TIRADS 2 (benign change), TIRADS 3 (possible benign change), TIRADS 4 (suspected malignant change), TIRADS 5 (probable malignant change). TIRADS 1 gradations were excluded from the study (due to the absence of focal pathology) and TIRADS 6 (it is difficult to comment on TIRADS 6, since cytological verification precedes ultrasound, and the morphological structure of the thyroid node is known to the ultrasound specialist even before the study). Cytological examination was carried out according to the standard method [20]. A prerequisite was the implementation of TAPB under the control of ultrasound, a large number of smears, and the removal of compromising impurities. The smears were painted according to Romanovsky. The material was evaluated by experienced cytologists who have passed specialized training and have many years of experience in studying thyroid punctates. Taking into account the goal of the study, a retrospective standardization of cytological results was carried out according to the TBSRTC system according to the standard of pathological criteria [20]. Cytological conclusions and ultrasound data were compared with the operating protocols and data of postoperative pathomorphological examination. The results were processed using standard statistical methods.

RESULTS

Based on ultrasound using the main 10 signs (TIRADS criteria), the following data were obtained. It was found that the ultrasonic characteristics of TIRADS 2 have a fairly broad interpretation. The least controversial is the picture of a colloidal node of type 1: an anechoic node with hyperechoic inclusion, avascular. Also included in the TIRADS 2 group were non-encapsulated nodes of mixed structure with hyperechoic inclusions, with good peripheral blood flow. This variant of the echocart is referred to as a type 2 colloidal node or a "spongy" node. The TIRADS 2 group also included thyroid nodules that are iso - or hypoechoic, of mixed or solid structure, with good vascularization, and single hyperechoic calcinates (colloidal node type 3). These ultrasound characteristics were observed in 96 patients (48%).Hashimoto's pseudonodes (hyper, iso - or hypoechoic nodes partially encapsulated with peripheral vascularization with changes in the surrounding tissue such as Hashimoto's thyroiditis) were included in the TIRADS 3 group. The interpretation of such a picture is very complex. Although on the background of AIT, the probability of developing breast cancer decreases by 4-5 times, it still exists, which is the basis for performing TAPB. This group was the smallest (14 patients-7.0%), which reflects current trends in the limited use of TAPB in patients with inflammatory processes in the thyroid gland. In the above cases, the probability of detecting a tumor was unlikely, with TIRADS 4 it was significantly increased. This group of patients was the most "motley" and included a variety of pathologies. In the TIRADS group 4A (undefined result) there were hyper -, iso-and hypoechoic nodes of solid and mixed structure with a thin clear capsule, hypoechoic heterogeneous lesion without calcification (characteristic of de Quervain's thyroiditis) and hyper -, iso-and hypoechoic, hypervascularized nodes with a clear, thick capsule containing calcifications (microcalcinates and complete calcification). The greatest probability of detection of PCV was in TIRADS 4: hypoechoic, heterogeneous, non-encapsulated nodes, irregular shape, with uneven edges, hypervascular, with vessels having a chaotic structure, with or without calcification. Such an ultrasound picture was interpreted as "suspicion of malignancy" (malignant lesion A). Ultrasound specialists were not given the task of a specific fine assessment within group 4, since they worked with protocols 3-8 years ago. This group included 64 patients (32%). The TIRADS 5 group included thyroid nodes with a potentially "malignant" ultra sound structure: non-encapsulated iso - and hypo-and hyperechoic nodes with multiple microcalcifications and increased chaotic blood flow of mixed type and non-encapsulated isoechoic nodes of mixed structure, hypervascular, with and without calcifications. This cohort included 26 patients (13.0%).

In TAPB with subsequent cytological examination, 10 patients (5%) received little-informative material in the form of a liquid or thick colloid (TBSRTC 1), benign changes (TBSRTC 2) were detected in 103 patients (51.5%), uncertain results were obtained in 5 patients (2.5%), the presence of a follicular tumor without specifying the degree of dysplasia was recorded in 41 cases (20.5%). Given the significant spread of indicators, it was interesting to analyze the correspondence of data from preoperative diagnosis and pathomorphological examination of surgical material. According to the histological study, thyroid cancer of various morphological structures was detected in 42 patients (21%), thyroid adenoma - in 58 patients (29%), nodular and multi - nodular goiter-in 100 patients (50%).

Statistical analysis revealed that the detection of a malignant tumor in TIRADS 2 was relatively rare. In this group, a cytological study concluded TBSRTC 5-6 in 4 patients (4.14%), and a pathomorphological study revealed thyroid cancer in 5 patients (5.2%). At the same time, in this group, "empty glasses" were more often received (79.7% of all cases of TBSRTC1), for which it is impossible to give a qualified morphological conclusion (8 patients) – 8.33% of all patients in the TI-RADS 2 group. This ultrasound pattern most often (76.01%) revealed changes ranked as TBSRTC 2 (benign).

Cases of TIRADS 3 were also predominantly benign (TBSRTC 2) – 78.6%, the probability of detection of a malignant tumor was higher and was 7.1%. The group of patients ranked as TIRADS 4 was the most problematic. With a low frequency of uninformative results of TAPB (TBSRTC 1-3.1%) and atypia of unclear significance (TBSRTC 3-3.1%), benign lesions were detected in 35.9% of patients, and the probability of tumor damage was significant (64%), including the probability of detecting thyroid cancer (TBSRTC 5-6) was 17.2%.

In patients who had ultrasound signs characteristic of TIRADS 5, during cytological examination, uninformative, questionable results and benign changes (TBSRTC 1,2,3) were detected in only 1 case (3.85%), and the probability of detecting thyroid cancer (TBSRTC 5-6) was 96.15%. (Figure 1).

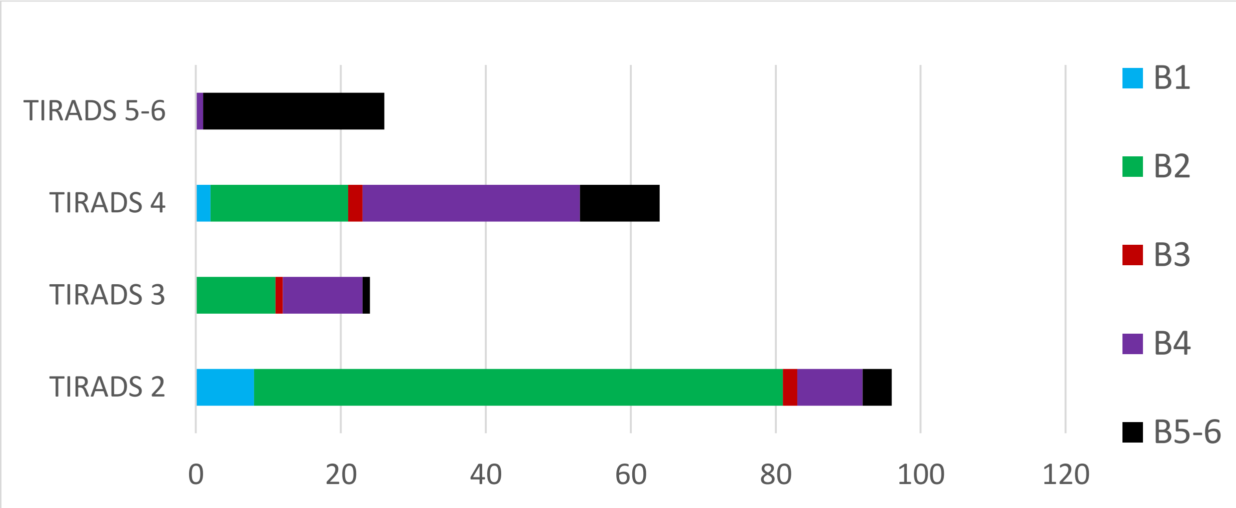

Fig. 1 Ranking of patients with nodular thyroid pathology according to the TIRADS and TBSRTC systems.

Thus, when selecting patients for TAPB, first of all, it is necessary to pay attention to patients with ultrasound signs of TIRADS 4 and 5, in which the probability of detecting breast cancer is high (18.75% and 92.3%, respectively). In patients with TIRADS 4 and 5, when receiving a cytological conclusion of TBSRTC 1,2 and 3, it is necessary to repeat the TAPB. When re-receiving the conclusion of TBSRTC 2 in patients with TIRADS 4 and 5, careful monitoring of the patient is necessary, and when re-receiving the conclusion of TBSRTC 1 or 3, radical (surgical) treatment should be recommended. On the other hand, if there are signs of TIRADS 2, obtaining the conclusion of TBSRTC 1 or 3 is the basis for performing repeated TAPB (TBSRTC 3) or you can limit yourself to observation without repeated TAPB (TBSRTC 1). When analyzing the effectiveness of using cytology at the prehospital stage, it was found that in the group of patients with TBSRTC 1, nodular and multi – nodular colloidal goiter and AIT were diagnosed in 78.5% of cases during pathomorphological examination, and in 23.33% – thyroid tumors. In the group of patients with TBSRTC 2, 72.3% had nodular and multi-nodular colloidal goiter, 4.4% - AIT, 23.3% – thyroid tumors, including 3.5% (30 cases) of thyroid cancer. In the group of patients with TBSRTC 3, benign changes were detected in 51.6%, thyroid adenoma-in 22.6%, and PCR - in 25.8%. In patients with TBSRTC 4, benign changes were found in 15.9%, thyroid adenomas in 72.5%, and thyroid cancer in 11.6%. In the group with suspected malignant tumor (TBSRTC 5), thyroid cancer and thyroid adenomas were detected in 66.1% and 20.3%, respectively, and benign changes were detected in only 13.6%. In the TBSRTC 6 group, the diagnosis of thyroid cancer was confirmed in 97.4%, thyroid adenoma was verified in 2.0%, and colloidal goiter was confirmed in only 0.6%.

CONCLUSIONS

1. The TI-RADS classification allows you to standardize the protocol of ultrasound examination of the thyroid gland.
2. The introduction of TI-RADS node classification into the algorithm of early

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radiation diagnosis of thyroid cancer allows to improve the diagnosis of thyroid cancer. 3. The combined use of TIRADS and TBSRTC systems opens up new opportunities in the formation of therapeutic tactics for nodular pathology of the thyroid gland.

3. Ultrasound imaging (TIRADS) and cytological conclusion (TBSRTC) are important additional methods that justify the choice of tactics in nodular pathology of the thyroid gland.

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