ORIGINAL ARTICLE

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THYROID NODULES CLASSIFIED AS ACR TI-RADS 4 AND 5 - A PICTORIAL ESSAY

MELISSA PEREIRA LOPES VIEIRA PINTO , THATIANY PASLAR LEAL, LEONARDO DE SOUZA PIBER

ABSTRACT

OBJECTIVE: The Thyroid Imaging Reporting and Data System, published by the American College of Radiology (ACR TI-RADS) is a risk stratification and categorization system for ultrasound (US) findings of thyroid nodules. By this system, the nodules are classified into five categories, according to morphological characteristics, the last one having the greatest potential for risk of malignancy, that is, it has an increasing pattern of severity. The objective is to present sonographic images of thyroid nodules classified as moderately and highly suspected of malignancy, ACR TI-RADS 4 and ACR TI-RADS 5, respectively.

METHOD: This is a pictorial essay with a collection of original images from the database of a diagnostic imaging center in the city of São Paulo. Eligibility criteria were: nodules classified as ACR TI-RADS 4 and 5, therefore, with moderate and high degree of suspicion for malignancy and recommendation of aspiration puncture for cytological evaluation.

RESULT: The evaluation of the nodules and their characteristics evidences the morphological variability of thyroid nodules whose ACR TI-RADS classification can be moderately and increasingly suspicious of malignancy.

In this way, it helps the attending physician to take the most appropriate course of action, which can be: expectant in relation to the nodule; perform ultrasound control or indicate a fine needle aspiration for cytological analysis of the nodule.

CONCLUSION: This system seeks to simplify the interpretation of images obtained by radiologists, which is a valuable, safe and widely available imaging tool, in addition to being easily reproduced to stratify the risk of thyroid injury and help to avoid unnecessary invasive procedures.

KEYWORDS: ACR TI-RADS, TI-RADS 4, TI-RADS 5, THYROID NODULES, THYROID ULTRASOUND

INTRODUCTION

The thyroid is an endocrine gland, with the characteristic of capturing iodine. The microscopic architecture of the thyroid gives it the ability to secrete and store hormones, called thyroid hormones. This has a conformation of spheres or acini, each one composed of a single layer of cells around the lumen filled with colloid, which has, inside, mainly thyroglobulin. Thyroglobulin (Tg) is a glycoprotein produced by the thyroid follicle, from the stimulus of TSH (thyroid-stimulating hormone), which acts as a "support" for the production of thyroid hormones, that is, acting as a form of storage of these and their precursors. (MANFRO, 1999; OLIVEIRA, 2009).

Among the diseases that affect the thyroid, thyroid nodules are frequent, with a prevalence of 4 to 7% in the adult population. Its detection has increased [2-4] times in the last three decades, mainly due to the increased use and advancement of ultrasound. According to recent reported guidelines and recommendations, ultrasound remains the most important tool in the initial evaluation of thyroid nodules, having the ability to detect and diagnose potentially malignant nodules. However, less than 5.0 – 6.5% of discovered thyroid nodules are malignant. Thus, it is important to establish criteria for selecting thyroid nodules for fine needle aspiration (FNA) according to their risk of malignancy (HEEP, 2018).

In 2017, the American College of Radiology (ACR) established a system for stratifying and categorizing the risk of ultrasound findings of thyroid nodules, called: Thyroid Imaging Reporting and Data System (TI-RADS), which aims to group the nodules into different categories. Nodules are classified into five categories, according to morphological characteristics, composition, echogenicity, shape, margin and calcifications, if any, must be evaluated. Sonographic features predict greater or lesser probability of benign or malignant nodules. The last category, TI-RADS 5, is the one with the greatest potential for risk of malignancy, that is, the system has an increasing pattern of severity, and until the TI-RADS 3 classification, the nodule is considered non-suspicious. When classified in TIRADS 4, there is a wide variety of morphological possibilities for the nodules, and these are considered moderately suspicious (HEEP, 2018; PIRES, 2021; RAHAL JUNIOR et al., 2016; ZHANG et al., 2020).

The characteristics that give the highest score seen on ultrasound are: solid or almost totally solid nodular composition, being markedly hypoechoic, having irregular margins or

1. Departamento de Imaginologia, Universidade Santo Amaro, São Paulo

MAILING ADDRESS
LEONARDO DE SOUZA PIBER
Rua Marechal Deodoro, 135 apartamento 62B
Bairro Granja Julieta - São Paulo, SP - CEP 04738-000
E-mail: prof.leonardopiber@gmail.com

extrathyroidal extension, taller than wide shape, presence of microcalcifications or intermingled echogenic foci (RAHAL JUNIOR et al., 2016; ZHANG et al., 2020; PIRES, 2021).

The TI-RADS aims to classify the risk of the nodule being malignant, in order to help the attending physician to take the most appropriate course of action, which can be: expectant in relation to the nodule; perform ultrasound control or indicate a fine needle aspiration (FNA) for cytological analysis of the nodule (RAHAL JUNIOR et al., 2016; ZHANG et al., 2020).

This system seeks to simplify the interpretation of images obtained by radiologists, which is a valuable, safe and widely available imaging tool, as well as being easily reproduced to stratify the risk of thyroid injury and help to avoid unnecessary invasive procedures such as fine needle aspiration aspiration (FNA) in a significant number of patients.

OBJECTIVE

Show sonographic images of thyroid nodules classified by ACR TI-RADS 4 and 5, moderately and highly suspicious, respectively.

METHODS

This is a pictorial essay, that is, a collection of original images from the database of a diagnostic imaging center in the city of São Paulo. Eligibility criteria were: nodules classified as ACR TI-RADS 4 and 5, therefore, with moderate and high degree of suspicion for malignancy and recommendation of aspiration puncture for cytological evaluation depending on their dimensions, according to ACR TI-RADS 2017.

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RESULTS AND DISCUSSION

The characteristics that contributed to the score that determined the TI-RADS classification for each nodule will be highlighted.

In the variability of nodules classified as TI-RADS [4], hypoechogenicity and solid or predominantly solid composition stand out, as shown in figures 1 and 2.

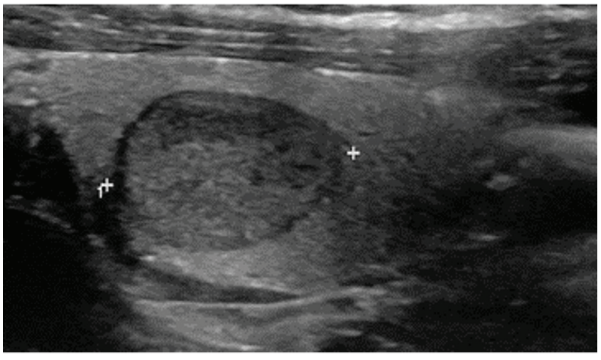

Figure 1 – Hypoechogenic nodule, almost completely solid, regular, measuring 1.4 cm. ACR TI-RADS [4]

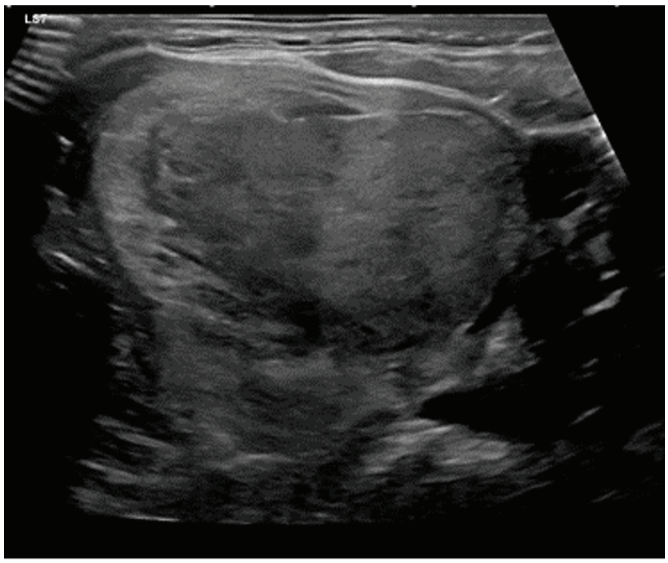

Figure 2 – Hypoechogenic nodule, almost completely solid, regular, wider than high, measuring 2.2 cm. ACR TI-RADS [4].

However, there are characteristics that may or may not be associated, despite the maintenance of the same ACR TI-RADS 4 classification. These may be irregular margins and calcifications, predominantly.

In figures 3 and 4 it is possible to observe irregular margins in the nodules classified as TI-RADS 4.

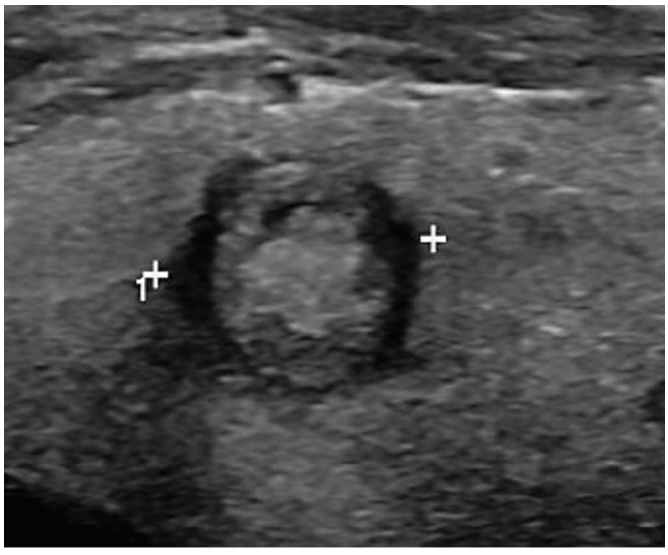

Figure 3 – Isoechogenic, solid, irregular nodule, measuring 0.9 cm. ACR TI-RADS 4 and Bethesda II.

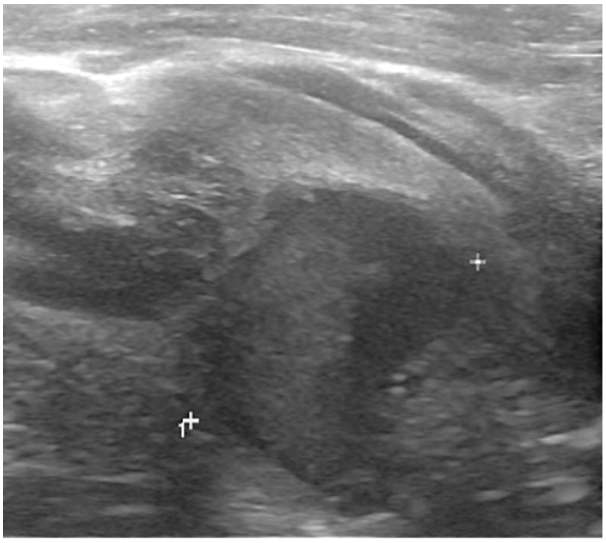

Figure 4 – Hypoechogenic, solid, irregular nodule, measuring 2.2 cm. ACR TI-RADS [4].

In figures 5, 6 and 7, it is possible to observe calcifications, also one of TI-RADS 4 characteristics.

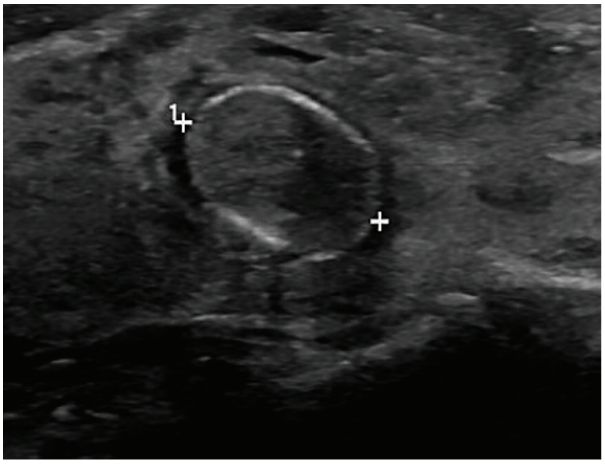

Figure 5 – Hypoechogenic, solid, regular nodule, with peripheral calcification, measuring 1.0 cm. ACR TI-RADS [4].

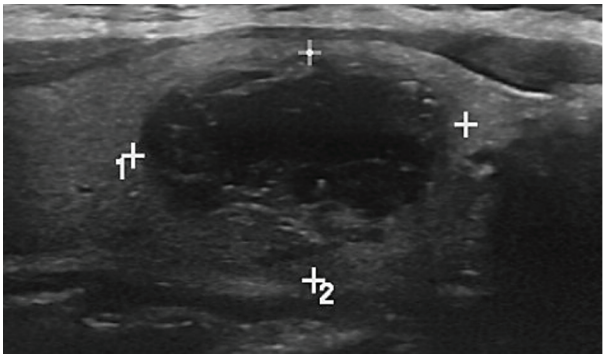

Figure 6 – Hypoechogenic, mixed, regular nodule, with punctate echogenic foci, measuring 2.2 cm. ACR TI-RADS [4].

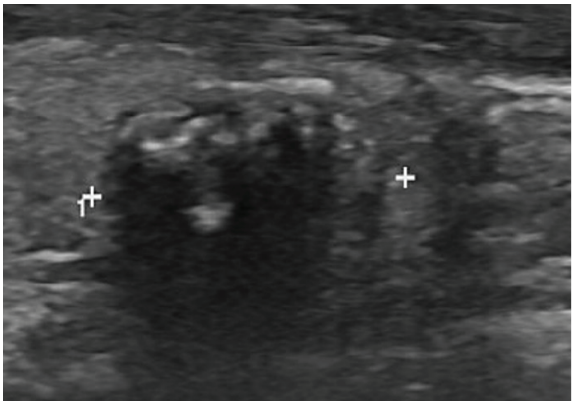

Figure 7 – Solid hypoechoic nodule with macrocalcifications and posterior acoustic shadow, measuring 1.2 cm. TI-RADS 4 and Bethesda II

Regarding the ACR TI-RADS [5] nodules, the evaluation of the selected images shows that they can also be hypoechogenic nodules, with solid composition, irregular margins. However, the taller-than-wide shape and the presence of punctate echogenic foci stand out. See figures 8 to 19.

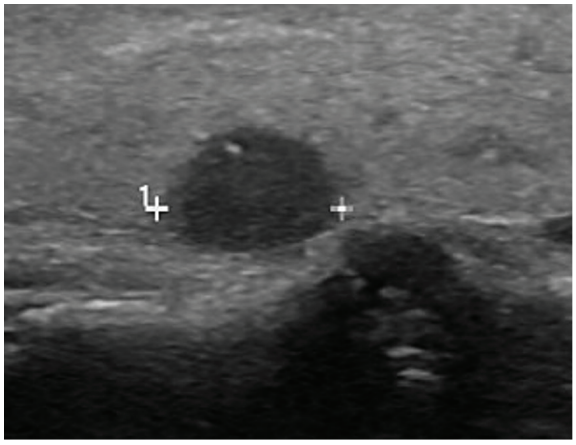

Figure 8 – Markedly hypoechogenic, solid, irregular nodule, measuring 0.7 cm. ACR TI-RADS [5].

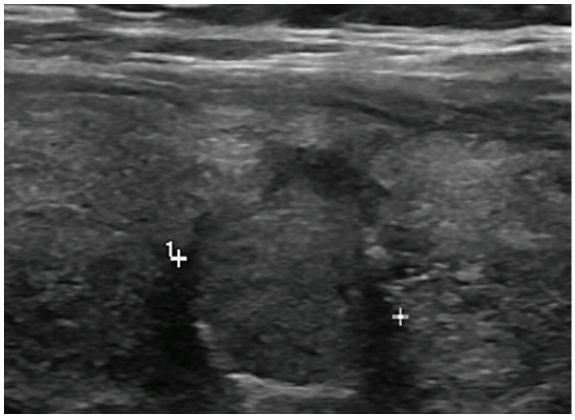

Figure 9 – Hypoechogenic, solid, irregular nodule, with thin peripheral calcification, measuring 1.0 cm. ACR TI-RADS [5].

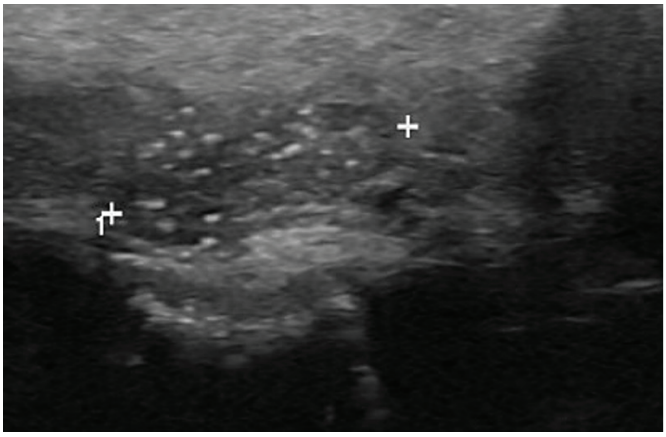

Figure 10 – Solid hypoechoic nodule with punctate echogenic foci, measuring 1.3 cm. ACR TI-RADS [5], Bethesda II (benign).

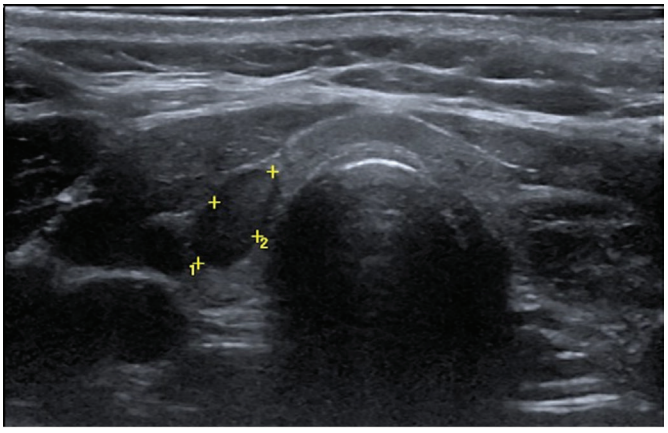

Figure 11 - Solid, markedly hypoechogenic nodule, height greater than width, on the right isthmus. ACR TI-RADS [5], Bethesda V (suspected malignancy, papillary carcinoma).

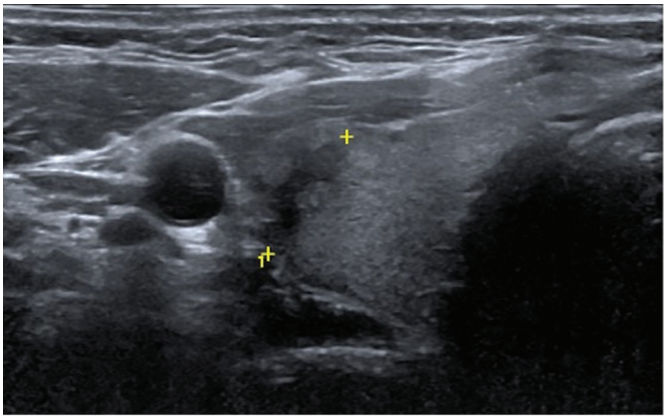

Figure 12 - Solid, markedly hypoechogenic, irregular nodule, height greater than width, in the middle third of the right lobe. ACR TI-RADS [5], Bethesda V (suspected malignancy, papillary carcinoma).

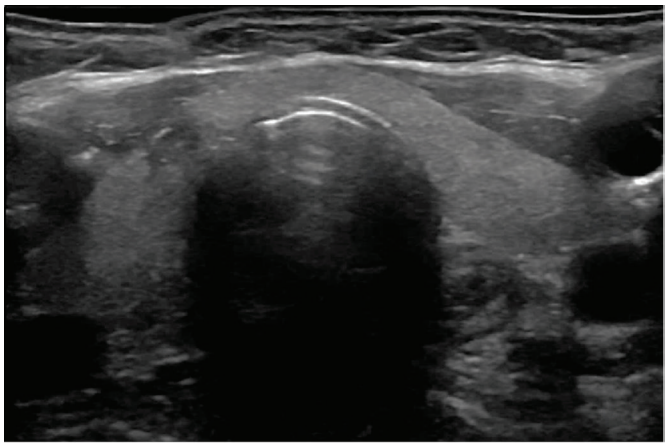

Figure 13 - Solid, hypoechogenic, irregular nodule, height greater than width, in the right isthmus. ACR TI-RADS [5], Bethesda V (suspected malignancy, papillary carcinoma).

Figure 14 - Solid, heterogeneous, hypoechogenic, irregular nodule, with macrocalcification, in the middle third of the right lobe. ACR TI--RADS [5], Bethesda V (suspected malignancy, papillary carcinoma).

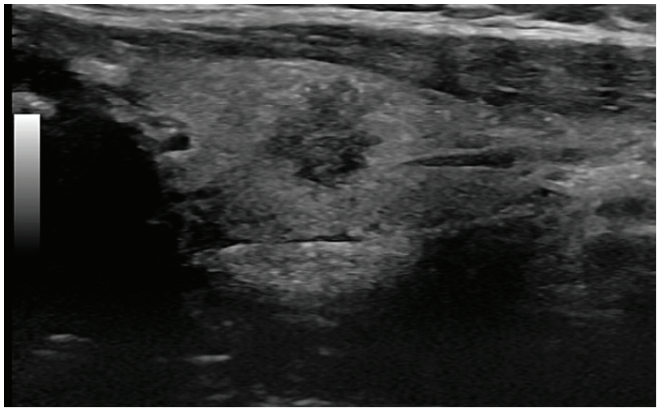

Figure 15 – Hypoechogenic, solid, irregular nodule, with punctate echogenic foci, measuring 1 cm. ACR TI-RADS [5].

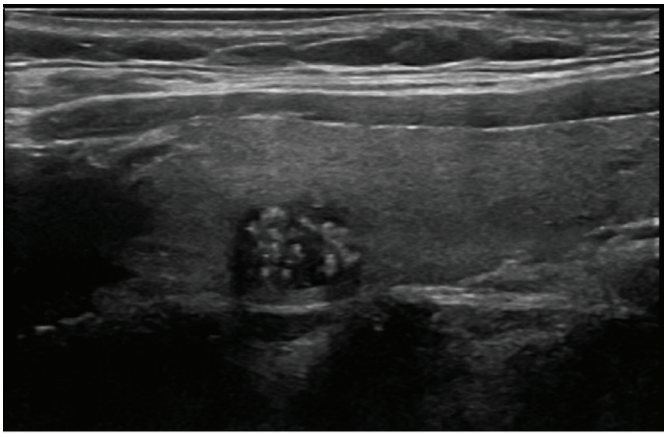

Figure 16 - Solid, markedly hypoechogenic, irregular nodule, with punctate echogenic foci, in the middle third of the right lobe. ACR TI-RADS [5], Bethesda V (suspected malignancy, papillary carcinoma).

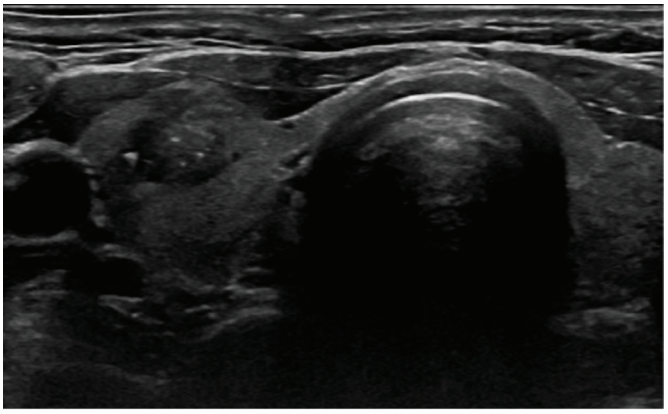

Figure 17 - Solid, hypoechoic, irregular nodule, with punctate echogenic foci, in the middle third of the right lobe. ACR TI-RADS [5], Bethesda V (suspected malignancy, papillary carcinoma).

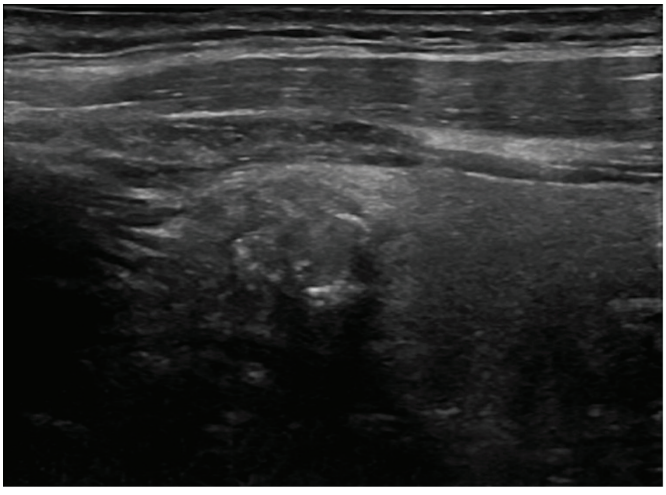

Figure 18 - Solid, hypoechoic, irregular nodule, with punctate echogenic foci and macrocalcifications, in the upper third of the right lobe. ACR TI-RADS [5], Bethesda V (suspected malignancy, papillary carcinoma).

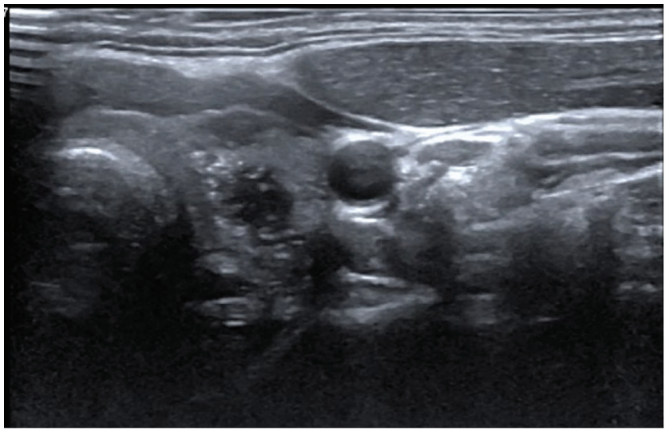

Figure 19 - Solid, markedly hypoechogenic nodule with punctate echogenic foci, height greater than width, in the middle third of the left lobe. ACR TI-RADS [5], Bethesda V (suspected malignancy, papillary carcinoma).

CONCLUSION

It is up to the imaging specialist to know how to recognize the morphological variety of the nodules, regardless of their ACR TI-RADS classification. With regard specifically to level [4], moderately suspect, there is a range of morphological variations, whose hypoechogenicity and solid composition are common features.

On the other hand, ACR TI-RADS [5] nodules are highly suspicious of malignancy, with striking features, such as the presence of punctate echogenic foci or a taller than wide shape.

Thus, the ability to recognize the sonographic characteristics of these nodules has an influence on early diagnosis, keeping a direct relationship with the evolution and prognosis of this prevalent focal thyroid disease.

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