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Hyperechoic Rim in a Follicular Variant of Papillary Thyroid Carcinoma – A Rare Ultrasonographic Feature

Yavor Assyov[1]*, Antoaneta Gateva[1], Radina Ivanova[2] and Zdravko Kamenov[1]

[1]Department of Endocrinology, Alexandrovska University Hospital, Medical University-Sofia, Bulgaria
[2]Laboratory of Clinical Pathology, University Hospital of Endocrinology, Medical University-Sofia, Bulgaria

Abstract

We present a case of a follicular variant of papillary thyroid carcinoma (PTC) with an uncommon sonographic feature– hyperechoic rim. A 24-year old female was referred to our department for an incidentally discovered nodule in the left lobe of the thyroid gland with an accompanying neck lymphadenomegaly. Ultrasound revealed a 1-cm hypoechoic nodule with a hyperechoic periphery with peripheral vascularity. The cytological finding was suspicious for PTC. Histology confirmed the suspected diagnosis. Hyperechoic rim is an uncommon ultrasound feature of thyroid nodules. A potential association with follicular variant of PTC needs to be explored.

Keywords: Papillary thyroid carcinoma; Hyperechoic rim; Thyroid ultrasound

Introduction

Thyroid nodules are very common in the general population and the majority of them are benign [1]. It is estimated that approximately 3% to 7% of the population have a palpable nodule and this prevalence might increase to 70% if patients are screened by an ultrasound [2]. Circa 5% of ultrasound-detected thyroid nodules are malignant, rising up to 33% if the nodule was discovered by a PET scan [3,4]. Papillary thyroid carcinoma (PTC) is the most common thyroid malignancy, representing approximately 70% to 80% of all cases [5]. Histologically, it is composed of multifocal papillary and follicul ar elements [6]. Its prognosis is generally favorable as it tends to grow and metastasize slowly [6].

The follicular variant of papillary thyroid carcinoma (FVPTC) is the most common variant of PTC, representing 30% of all PTCs [7]. It is more common in women with a 3.6:1 female to male ratio with mean age at presentation being the 5th decade [8]. Despite the variations based on presence or absence of invasion, the overall clinical outcome tends to be excellent for these tumors [9]. Two main types of FVPTC exist: encapsulated and invasive follicular variants, while the diffuse and macrofollicular variants are exceedingly rare [10,11]. By definition, follicular architecture must be the main finding, on the background of nuclear features of a PTC. Papillary structures are required to be <1% of the volume, while necroses, increased mitoses and psammoma bodies are usually absent [12].

Ultrasound (US) is widely considered the first-line diagnostic tool for the evaluation of thyroid nodules because of its sensitivity and convenience [13]. Albeit no single US criterion of the thyroid nodule can distinguish between benign and malignant with 100% reliability, some have been identified as predictors of thyroid malignancy. These include marked hypo-echoic characteristics, solid, taller-than-wide shape, presence of microcalcifications and irregular margins [14-16]. The "halo" sign as an ultrasound feature is described as a complete or partial hypo-echoic margin that surrounds the periphery of a mass and can be found in mostly benign nodules. It has been proposed to be helpful in distinguishing benign from malignant thyroid nodules [13,17]. Furthermore, the absence of the halo was proposed as one of the patterns, predictive of malignancy with a specificity of 77% and sensitivity of 67% [18].

However, the presence of a hyperechoic margin of a hypoechoic thyroid nodule as an ultrasound feature has been largely ignored in the literature [19]. We present a case with a follicular variant of papillary thyroid carcinoma with lymph node metastases with such ultrasonographic feature.

Case Report

Our patient was a 24-year-old female who was referred to our Department for an incidentally discovered thyroid nodule. She denied having compression symptoms or those of thyroid hormone excess. Serum anti-thyroglobulin antibodies, thyroid-peroxidase antibodies and calcitonin were within the reference ranges.

Ultrasound revealed an oval hypoechoic lesion in the left lobe of the thyroid with the dimensions of 10 mm × 12 mm × 9 mm with microcalcifications present and type I blood-flow. It was surrounded by a massive hyperechoic periphery, suggestive of fibrosis, with irregular margins (Figure 1). Ipsilateral lymph nodes with similar US characteristic were also present- level IV- with dimensions going up to 2 cm longitudinally (Figure 2). Fine-needle aspiration biopsy (FNA) of the thyroid nodule revealed atypical follicular cell proliferations, suspicious for PTC (Bethesda V, Figure 3). The cytological smears showed moderate cellularity, including some follicular- and papillary-like clusters of overlapping cells but typical intranuclear inclusions and nuclear grooves were present only in single nuclei. FNA of the aforementioned lymph node found one group of atypical cells, suggestive for thyroid follicular origin but the thyroglobulin (Tg) concentration in the wash-out fluid was higher compared to the serum Tg level- 71.04 ng/ml and 30.28 ng/ml, respectively.

The patient was referred for surgical treatment where total thyroidectomy with a radical left neck lymph node dissection was performed. Histological evaluation revealed an infiltrative FVPTC, with predominant micro-follicular growth pattern and nuclear features of the cells characteristic for PTC, but also some fibrous septa and psammoma bodies in the vicinity of the tumor (Figure 4). Tumor metastases in

***Corresponding author:** Yavor Assyov, Department of Endocrinology, Alexandrovska University Hospital, Medical University-Sofia, Bulgaria, Tel: 00359887451961; E-mail: y.assyov@medical-arts.bg

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two of the eight extirpated lymph nodes were also found. The final histopathological staging was pT1N1aMO. Postoperatively, the patient was referred for a thyroid remnant ablation of I-131 with Tg of 0.861 ng/ml and TSH of 35.76 mU/l. No areas of intense radiofixation in the thyroid bed, as well as in the neck lymph nodes were reported on SPECT-CT. On the sixth postoperative month Tg concentration was less than 0.01 ng/ml.

Discussion

The presence of a halo sign is a frequent finding on a thyroid nodule.

Figure 1: Ultrasound appearance of the thyroid nodule in our case.

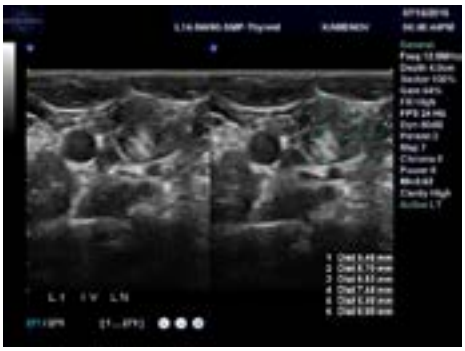

Figure 2: Ultrasound appearance of the suspected metastatic lymph nodes on which FNA and thyroglobulin wash-out was performed.

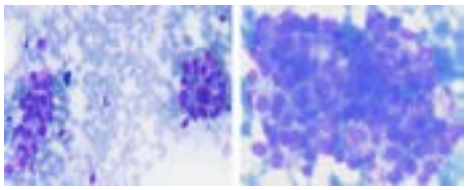

Figure 3: Cytological findings on fine-needle aspiration biopsy of thyroid nodule (x80, MGG).

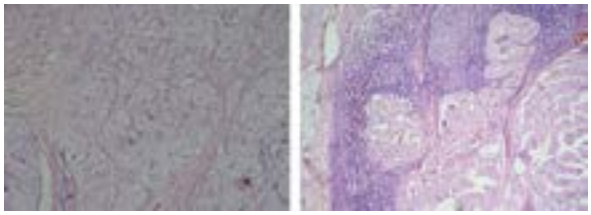

Figure 4: Histological findings of the thyroid nodule and metastatic lymph node (x40, HE).

It is generally defined as a peripheral hypoechoic rim around a nodule, which has been suggested to represent either a capsule or compressed thyroid tissue or vessels [20]. It is widely accepted as a benign sonographic feature [13,17]. The significance of the hyperechoic rim in thyroid nodules, however, has been widely ignored. A single Chinese study reported a series of 228 histologically proven thyroid nodules (137 malignant and 91 benign) in which the presence of this feature is evaluated. The authors have found that the hyperechoic rim was present in approximately one-third of the papillary thyroid carcinomas and had a high specificity of 94.5% but low sensitivity (31.39%) in predicting malignancy ($p<0.05$). The malignant lesions with this ultrasonographic feature had a boundary zone of mixed structure comprising apparent fibrous stroma bands or dense collagenous border with a mixed population of cancerous cells on microscopic evaluation. The authors concluded that the presence of this particular US feature could be a new criterion for the differential diagnosis of thyroid nodules [19]. The variants of the papillary carcinomas, discussed in the aforementioned article, however, have not been discussed. No study in the literature has reported an association between hyperechoic rims and follicular variant of PTC as our case. We hypothesize of a potential such association based on the similar percentage of subjects exhibiting this US feature in the Chinese study (30%) as is the reported incidence of FVPTC of PTC cases.

It is worth noting that this particular US feature is very similar in breast lesions, where it is suggested to be key in the identification of breast cancer [21]. Histopathological studies have shown that hyperechoic halos represent a speculated edge and invading margin of the malignant breast lesion under microscopy [19]. It has been suggested that this US feature may be caused by heterogeneous components, which are smaller than the sound wave which results in a backscattering and a band with a higher acoustic impedance difference, as seen on US. This phenomenon, however, was not as apparent in the thyroid as in breast lesions because the former has no fatty tissue and a less mixed histologic structure. It could be that the hyperechoic rim may be one specific type of irregular margin seen in papillary carcinomas [19].

Conclusion

Hyperechoic rim as an ultrasonographic feature of thyroid nodules could be a new criterion for the differentiation of PTC. The authors hypothesize that this feature could be associated with follicular variant of PTC.

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