Aims and objectives

Thyroid carcinoma is considered by the SEOM (Sociedad Española de Oncología Médica) the most frequent of endocrine tumors, with estimations that range from 2 to 20 new cases per 100,000 people per year.

But thyroid nodules are very common, occurring in up to 37% to 50% of the adult population, however thyroid cancer is rare, with less than 5% to (less likely) 15% of all nodules being malignant. [1-3].

So as the majority of thyroid nodules are benign, it is not cost effective to biopsy all nodules. Therefore, there are several recommendations that warrant biopsy from different subspecialty societies regarding US findings, such as the recommendations from the Society of Radiologists in Ultrasound (SRU). [4-5]

Thyroid cancer has been subject to numerous studies, such as that of the article published in the magazine Radiology from June 2014 [6] that concluded that 2% among 2,090 patients' thyroid cancers would have been missed.

Consequently, the main objective of this study is to describe our experience on the diagnostic accuracy of ultrasonographic (US) criteria for thyroid malignancy by using tissue diagnosis as the reference standard in the referral population.

Moreover, our secondary objective is to describe the ultrasonographic findings for each thyroid malignant tumor, such as: papillary, papillary carcinomas with a follicular pattern, medullary, follicular, lymphoma, anaplastic carcinoma with sarcomatoid morphology, enteroid carcinoma and finally the hürthle cell carcinoma.
Methods and materials

It is an observational retrospective case-control study from a population-based cohort study.

From 2,765 thyroid nodules referred for ultrasound guided fine needle aspiration cytology (US-FNAC), in our hospital (May 2009-2014), we examined 150 cytologically malignant nodules. 10 were excluded for insufficient information; so 140 malignant nodules, all with histological verification, were evaluated with US and compared with 202 benign nodules.

We reviewed: gender, age, size, number (single/multiple), thyroiditis background and selected US manifestations: echogenicity (hypo/iso/hyper), appearance (solid/mixed), margin (well/poorly defined), vascularization, microcalcification and a taller-than-wide shape.

A chi-squared test and a univariate and multivariate logistic regression analysis were performed, considering each risk factor independently.
Results

From 140 malignant tumors: 122 were papillary, 4 papillary carcinomas with a follicular pattern, 6 medullary, 2 follicular, 1 lymphoma, 1 anaplastic carcinoma with sarcomatoid morphology, 1 enteroid carcinoma and 3 Hürthle cell carcinoma.

Findings of malignancy with statistically significant odds-ratio (P < 0.05) were: microcalcifications (9.08) hypoechoogenicity (4.43), solid (2.39), poorly defined margin (1.99) and unique (2.41).

Age, gender, size, thyroiditis background, hypervascularity and a taller-than-wide shape were not statistically significant.

However, if we consider each malignant tumor individually these where the main findings:

Papillary carcinoma: predominantly hypoechoic (81%), solid (85.7%), multiple (57%), no thyroiditis background (81.7%), defined margins (53%), hypervascular (50.5%), microcalcifications (51.2%). [Fig. 1 on page 6, Fig. 2 on page 6, Fig. 3 on page 7 and Fig. 4 on page 8]

Papillary carcinomas with a follicular pattern: no thyroiditis background, hypoechoic, poorly defined, solid, hypervascular, no microcalcifications, and no taller-than-wide shape. After the US-FNAC, the citology results were a follicular pattern. [Fig. 5 on page 9]

Medullary: no thyroiditis background, hypoechoic (83.3%) and isoechoic (16.7%), poorly defined, solid, hypervascular (50%), with microcalcifications and no taller-than-wide shape. [Fig. 6 on page 10, Fig. 7 on page 11 and Fig. 8 on page 12]

Follicular carcinoma: no thyroiditis background, hypoechoic (50%) and isoechoic with the rest of the thyroid gland (50%), poorly defined margins (50%), solid, avascular, microcalcifications (50%) and no taller-than-wide shape. As you could see there is not an exact ultrasonographic pattern for this kind of tumor. [Fig. 9 on page 13 and Fig. 10 on page 14]

Lymphoma: no thyroiditis background, hypoechoic, poorly defined margins, solid, avascular, with no microcalcifications and no taller-than-wide shape.[Fig. 11 on page 15 and Fig. 12 on page 16]
Anaplastic carcinoma with sarcomatoid morphology: no thyroiditis background, hypoechoic, poorly defined, solid, hypervascular, with no microcalcifications and no taller-than-wide shape. [Fig. 13 on page 17 and Fig. 14 on page 18]

Enteroid carcinoma: no thyroiditis background, hypoechoic, well defined margins, solid, with microcalcifications and no taller-than-wide shape. [Fig. 15 on page 19 and Fig. 16 on page 20]

Hurthle cell carcinoma: no thyroiditis background, hypoechoic, well defined margins, solid (66.6%) hypervascular, no microcalcifications (66.6%) and no taller-than-wide shape. [Fig. 17 on page 21]

We also wanted to evaluate these variables were correlated: young patients (less than 30 years old), solid and hypoechoic nodules, not finding any significant correlation between them.
**Fig. 1:** Papillary carcinoma: nodule in left thyroid lobe measures 1.9 cm, is hypoechoic, solid, with well-defined margins and microcalcifications.

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**Fig. 2:** Papillary carcinoma: nodule in right thyroid lobe measures 8.3mm, is hypoechoic, solid, with well-defined margins and microcalcifications.

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Fig. 3: Papillary carcinoma: nodule in left thyroid lobe measures 1.9 cm, is hypoechoic, solid, hypervascular in Doppler US, with well-defined margins and microcalcifications.

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Fig. 4: Papillary carcinoma: nodule in left thyroid lobe is hypoechoic, solid, hypervascular in US Doppler Color, with well-defined margins and microcalcifications.

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Fig. 5: Papillary carcinoma with a follicular pattern: nodule in right thyroid lobe measures 1.4 cm, is hypoechoic, solid and with well-defined margins.

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Fig. 6: Medullary carcinoma: a nodule in the right thyroid lobe, measures 12.6 x 10.4 mm (T x AP), is isoechoic, solid with poorly defined margins and microcalcifications.

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Fig. 7: Medullary carcinoma: a nodule in the right thyroid lobe is isoechoic, poorly defined, solid, hypervascular in Doppler US and with microcalcifications.

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Fig. 8: Medullary carcinoma: a nodule in the left thyroid lobe is hypoechoic, poorly defined, solid and hypervascular in the Doppler US.

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Fig. 9: Follicular carcinoma: a nodule in the right thyroid lobe measures 8.3mm, is hypoechoic, solid, well defined and with a coarse microcalcification.

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**Fig. 10:** Follicular carcinoma: a nodule in the right thyroid lobe measures 8.1 x 5 mm, is hypoechoic, solid, well defined and with microcalcifications.

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**Fig. 11:** Lymphoma: nodule in the right thyroid lobe measures 20.7mm, is hypoechoic, poorly defined margins, solid and with no microcalcifications.

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Fig. 12: Lymphoma: Adenopathy in IIIB/IV of 9mm.

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**Fig. 13:** Anaplastic carcinoma with sarcomatoid morphology: no thyroiditis background, is hypoechoic, poorly defined, solid and with no microcalcifications.

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**Fig. 14:** Anaplastic carcinoma with sarcomatoid morphology: no thyroiditis background, is hypoechoic, well defined margins, solid, hypervascular in the margins in the Doppler US and with no microcalcifications.

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Fig. 15: Enteroid carcinoma: a nodule in the left thyroid lobe measures 12.6 x 11.6 mm (T x AP), is hypoechoic, well defined margins, solid with microcalcifications.

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**Fig. 16:** Enteroid carcinoma: a nodule in the left thyroid lobe measures 13.6mm (CC), is hypoechoic, well defined margins, solid and with microcalcifications.

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Fig. 17: Hürthle cell carcinoma: is a nodule in the left thyroid lobe measures 19.6 x 19.1 mm (AP x T), is hypoechoic, solid, well defined and with no microcalcifications.

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Conclusion

Sometimes we are overwhelmed with all the ultrasonographic thyroid nodules and all the US-FNAC requests, so we need to keep a cool head and focus on the malignant characteristics, which are: microcalcifications, hipoechogenicity, solid, irregular margin and single nodule.

These are helpful criteria for the discrimination of malignant and benign nodules, and should never be left without characterization.
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References


