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Diagnosis of Thyroid Nodule with New Ultrasound Imaging Modalities

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Abstract

Introduction: B-mode ultrasound (US) technology is an integral part of diagnosing and assessing risk stratification of thyroid nodules (TNs). The addition of shear wave elastography and three-dimensional (3D) US imaging may improve risk stratification for thyroid cancer (TC).

Materials and Methods: The patient was evaluated in our clinic with US imaging including B-mode, shear wave elastography, 3D-US, and fine needle aspiration biopsy (FNAB). Laboratory measurements were performed at LabCorp. The patient gave informed consent.

Case: A 20-year-old female referred for hypothyroidism who was on levothyroxine 25μg daily. Her thyroid-stimulating hormone (TSH) was 3.870 (0.45–4.5 μIU/mL). Thyroid peroxidase antibody and thyroglobulin antibody were elevated, suggestive of Hashimoto's thyroiditis. Her thyroid ultrasongraph showed a heterogeneous thyroid gland with a hypoechoic TN in the right lobe measuring $9.2 \times 8.9 \times 9$ mm. Shear wave elastography examination was suggestive of a hard TN. The shear wave velocity (SWV) measurements for the target TN was 3.9 m/s. 3D-US examination demonstrated a hypoechoic TN with irregular margins and a volume of 0.322 cm^3. FNAB of right TN was performed. The cytopathology was read as malignant (Bethesa Category VI), diagnostic for papillary thyroid cancer (PTC). She underwent total thyroidectomy. Surgical pathology report showed an 8 mm PTC in the right lobe and 2 mm PTC in the left lobe with a background of Hashimoto's thyroiditis. There were 3/10 positive lymph nodes (LNs) for metastases. The largest metastatic LN measured 5 mm at level 6.

Discussion: This case illustrates recent advances in US technology. For decades, clinicians relied on B-mode US to assess the risk for TC. This case illustrates important challenges and advances in US

technology. Current ACR-TIRADS guideline for TN management is based on B-mode US features and TN size.[1] In our experience, including additional factors such as elastography, 3D-US, and laboratory evaluation helps to improve our diagnostic accuracy. In this case, her laboratory was suggestive of autoimmune thyroid disease. This information was helpful to put this patient in a higher risk category. Recent large studies reported an association between differentiated TC and autoimmune thyroid disease and/or TSH when all Bethesda classifications were included.[2–4] Shear wave elastography examination showed that this TN had a high SWV, suggestive of a hard TN, which is suspicious for malignancy. Several recent publications have reported that elastography can assess the malignant potential of TN.[5–10] In our prospective study, we reported that in a single cutoff analysis for predicting malignancy in TNs, a maximum SWV of 3.54 m/s had the best sensitivity. With greater SWV values, specificity increased but sensitivity decreased.[6] 3D-US technology enhances our ability to visualize the target lesion because of adding a new dimension, coronal view, to the existing B-mode that consists of transverse and longitudinal views. In this case, irregular margins of the TN are seen much better with 3D-US. This is a preliminary report, and more studies need to be done.

Conclusion: Adding SWE and 3D-US technology to B-mode US may enhance our ability for risk stratification for TN before FNAB. 3D-US may improve our ability to visualize the margins of TN.

No competing financial interests exist.

Runtime of video: 2 mins 5 secs

Keywords: thyroid nodule, thyroid cancer, ultrasound, elastography, 3D ultrasound

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References

1. Tessler FN, Middleton WD, Grant EG, et al. ACR thyroid imaging, reporting and data system (TI-RADS): White paper of the ACR TI-RADS committee. J Am Coll Radiol 2017;14:587–595.
2. Kim ES, Lim DJ, Baek KH, et al. Thyroglobulin antibody is associated with increased cancer risk in thyroid nodules. Thyroid 2010;20:885–891.
3. Azizi G, Keller JM, Lewis M, et al. Association of Hashimoto's thyroiditis with thyroid cancer. Endocr Relat Cancer 2014;21:845–852.
4. Haymart MR, Repplinger DJ, Leverson GE, et al. Higher serum thyroid stimulating hormone level in thyroid nodule patients is associated with greater risks of differentiated thyroid cancer and advanced tumor stage. J Clin Endocrinol Metab 2008;93:809–814.
5. Liao LJ, Chen HW, Hsu WL, Chen YS. Comparison of strain elastography, shear wave elastography, and conventional ultrasound in diagnosing thyroid nodules. J Med Ultrasound 2019;27:26–32.
6. Azizi G, Keller JM, Mayo ML, Piper K, Puett D, Earp KM, Malchoff CD. Thyroid nodules and shear wave elastography: A new tool in thyroid cancer detection. Ultrasound Med Biol 2015;41:2855–2865.
7. Xu JM, Xu XH, Xu HX, et al. Conventional US, US elasticity imaging, and acoustic radiation force impulse imaging for prediction of malignancy in thyroid nodules. Radiology 2014;272:577–586.
8. Friedrich-Rust M, Vorlaender C, Dietrich CF, et al. Evaluation of strain elastography for differentiation of thyroid nodules: Results of a prospective DEGUM multicenter study. Ultraschall Med 2016;37:262–270.

9. Azizi G, Keller J, Lewis M, Puett D, Rivenbark K, Malchoff C. Performance of elastography for the evaluation of thyroid nodules: A prospective study. Thyroid 2013;23:734–740.
10. Bhatia KS, Lam AC, Pang SW, Wang D, Ahuja AT. Feasibility study of texture analysis using ultrasound shear wave elastography to predict malignancy in thyroid nodules. Ultrasound Med Biol 2016;42:1671–1680.

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