VE VideoEndocrinology

Diagnosis of Parathyroid Adenomas with New Ultrasound Imaging Modalities

Ghobad Azizi, MD
Wilmington Endocrinology, PA, Wilmington, North Carolina.
E-mail: azizi@wilmingtonendo.com

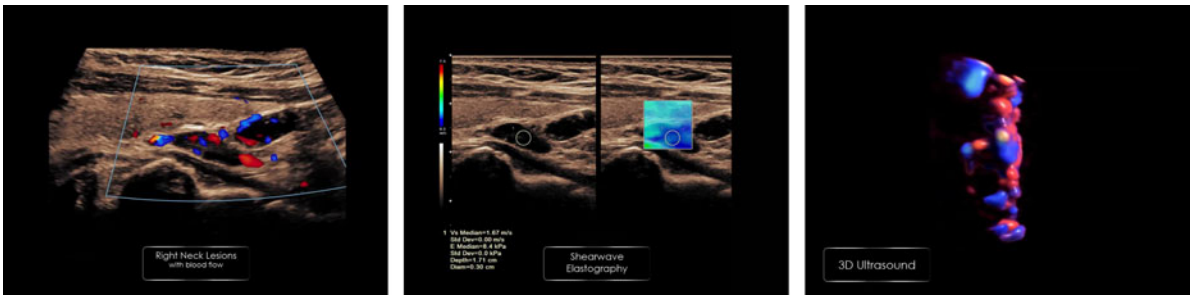
Michelle L. Mayo, PA-C
Wilmington Endocrinology, PA, Wilmington, North Carolina.

James Keller, MD
Wilmington Pathology Associates, Wilmington, North Carolina.

Jessica Farrell
Wilmington Endocrinology, PA, Wilmington, North Carolina.

Carl Malchoff, MD
University of Connecticut, Farmington, Connecticut.

Mary Ann Liebert, Inc. and American Thyroid Association DOI: 10.1089/ve.2019.0163



Abstract

Ultrasound technology is becoming an integral part of diagnosing parathyroid adenomas. Careful ultrasound evaluation with b-mode, shear wave elastography, and three-dimensional (3D) of parathyroid adenomas may improve localization and outcome.

Introduction: A 60-year-old woman was referred for the evaluation of hyperparathyroidism. This patient gave her informed consent. She had a history of hypothyroidism and thyroid nodules. She was being treated with levothyroxine 50 mcg daily. Routine testing revealed hypercalcemia. The serum calcium was 11.2 (nL range 8.7–10.2 mg/dL), creatinine was 0.69 (nL range 0.57–1.00 mg/dL), intact parathyroid hormone (PTH) was 70 (nL range 15–65 pg/mL), phosphorus was 2.7 (nL range 2.5–4.5 mg/dL), vitamin D was 38.7 (30–100 ng/mL), and 24 hours urine calcium was 362.9 (100–300 mg/24 hour). The neck ultrasound showed two lesions one superior/posterior and the other in the inferior/posterior aspect of the right thyroid lobe measuring $11.6 \times 4.4 \times 9.7$ mm and $14.6 \times 5.0 \times 10.0$ mm, respectively. Both lesions resembled parathyroid adenomas. Shear wave velocity (SWV) measurements for the superior and inferior lesions were 1.67 and 1.77 m/second, respectively. For the adjacent thyroid tissue SWV was 2.3 m/second, significantly higher. 3D ultrasound examination demonstrated a polar artery in both lesions.

A sestamibi scan showed a probable right parathyroid adenoma and she was referred for surgery. She was found to have two right parathyroid adenomas in the superior and inferior poles corresponding with the ultrasound finding. Intraoperative PTH level decreased from 139.9 to 17 pg/mL postresection. Six weeks after surgery, her calcium and PTH were normal.

Materials and Methods: This patient was evaluated in our clinic with ultrasound imaging, including b-mode, shear wave elastography (SWE), and 3D ultrasound.

Discussion: Most patients with primary hyperparathyroidism have a single parathyroid adenoma. Other causes include glandular hyperplasia, multiple adenomas, and parathyroid carcinoma.[1,2] This case shows two parathyroid adenomas in the neck posterior to the right thyroid lobe. The role of ultrasound in diagnosing parathyroid adenomas is becoming more prominent because of improved technology, low cost, and noninvasive nature.

With this case we illustrate that SWE can be an added value to b-mode ultrasound in diagnosing parathyroid adenomas. Our previous publication in the *Journal of European Radiology* reported that SWV measurement of parathyroid adenomas may enhance other sonographic parameters to predict the diagnosis. In our view, parathyroid adenomas appear to have a more homogenous texture and lower tissue stiffness when compared with the thyroid gland.[3] This case confirms our prior findings.

It can be challenging to differentiate parathyroid adenomas from lymph nodes (LNs) and ectopic thyroid tissue at level 6, with b-mode ultrasound. A combination of 3D ultrasound images with 3D color Doppler (CD) might improve our ability to identify the polar artery and enhance differentiation from LN. 3D technology might improve the view by adding coronal view to current b-mode that comprises of transverse and longitudinal views. This is a preliminary report, and more studies need to be done.

Conclusion: Combining multiple image modalities, including b-mode, shear wave elastography, and 3D technology, may improve our ability to identify parathyroid adenomas. Parathyroid adenomas have a lower SWV compared with thyroid tissue. 3D ultrasound technology may enhance view of polar artery when adding 3D CD. This challenging case illustrates the utility of these additional modalities.

No competing financial interests exist.

Runtime of video: 1 min, 52 secs

Keywords: parathyroid adenoma, elastography, 3D ultrasound, ultrasound, hyperparathyroidism

Cite this video

Ghobad Azizi, Michelle L. Mayo, James Keller, Jessica Farrell, Carl Malchoff, Diagnosis of Parathyroid Adenomas with New Ultrasound Imaging Modalities, VideoEndocrinology. 2019, DOI: 10.1089/ve.2019.0163.

References

1. Patel CN, Salahudeen HM, Lansdown M, Scarsbrook AF. Clinical utility of ultrasound and 99mTc sestamibi SPECT/CT for preoperative localization of parathyroid adenoma in patients with primary hyperparathyroidism. Clin Radiol 2010;65:278–287.
2. Ruda JM, Hollenbeak CS, Stack Jr. BC. A systematic review of the diagnosis and treatment of primary hyperparathyroidism from 1995 to 2003. Otolaryngol Head Neck Surg 2005;132:359–372.
3. Azizi G, Piper K, Keller JM, Mayo ML, Puett D, Earp KM, Malchoff CD. Shear wave elastography and parathyroid adenoma: A new tool for diagnosing parathyroid adenomas. Eur J Radiol 2016;85:1586–1593.

Original Publication Date: 2019