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HEAD AND NECK IMAGING

LETTER TO THE EDITOR

Reply: letter to editor: dual-energy computed tomography-based volumetric thyroid iodine quantification: correlation with thyroid hormonal status, pathologic diagnosis, and phantom validation

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Dear Editor,

I would like to express my sincere appreciation for your thoughtful consideration of my recent publication, "Dual-Energy Computed Tomography-Based Volumetric Thyroid Iodine Quantification: Correlation with Thyroid Hormonal Status, Pathologic Diagnosis, and Phantom Validation," in Diagnostic and Interventional Radiology.[1] I am particularly grateful for your suggestion regarding the potential utility of our dual-energy computed tomography (DECT)-based iodine quantification method for monitoring iodine organification before and after radioactive iodine (RAI) therapy. This insightful perspective highlights an important clinical application that we had not previously explored in depth.

Since the 1940s, RAI therapy using the oral administration of ^{131}I has been widely employed for the ablation of residual or recurrent differentiated thyroid carcinoma and normal thyroid tissue after total thyroidectomy, as well as for the normalization of hormonal function and volume reduction in benign thyroid diseases such as Graves' disease, toxic nodules, and non-toxic nodular goiter.[2] To optimize radioiodine uptake, patients are required to undergo a prolonged washout period of up to 6–8 weeks for iodine-containing agents. In some instances, treatment is initiated only after confirmation of 24-hour urinary iodine concentration (IC). Despite its widespread use, RAI therapy is associated with certain limitations, including radiation-induced thyroiditis, which may transiently exacerbate hyperthyroidism and, in rare instances, precipitate thyroid storm. Furthermore, larger thyroid glands or more severe hyperthyroidism may exhibit greater radioresistance, necessitating higher doses of ^{131}I. However, current RAI treatment protocols are typically based on 24-hour radioiodine uptake measurements or the clinician's experience, rather than the actual thyroid radiation dose, and there are reports of thyroid stunning caused by diagnostic use of ^{123}I or ^{131}I.[3]

In light of the foregoing considerations, we believe that DECT iodine quantification may offer unique advantages in the management of benign thyroid disorders–such as Graves' disease–in which the thyroid gland remains intact, as opposed to the post-thyroidectomy state. Notably, this technique eliminates the need for administration of ^{123}I or ^{131}I, thereby avoiding the risk of thyroid stunning and enabling simultaneous assessment of thyroid parenchymal IC and glandular volume without requiring additional patient visits. Furthermore, this approach could serve as a valuable adjunct for monitoring dynamic changes in thyroid hormonal status during and after therapeutic interventions.

In our study, non-contrast dual-energy neck computed tomography was utilized for the preoperative evaluation of lymph node metastasis in patients undergoing thyroid surgery. Nonetheless, the accuracy of iodine quantification was validated using phantom studies, and the associated radiation dose (volume computed tomography dose index: 3.4 ± 0.6 mGy; dose-length product: 61.1 ± 14.5 mGy·cm; effective dose: 0.36 ± 0.09 mSv) was found to be lower than that of conventional 24-hour radioiodine uptake measurements using ^{123}I (0.74 mSv) or ^{131}I (1.5 mSv).[4,5] However, as you have pointed out, further optimization of the ra-

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diation dose and timing for thyroid parenchymal IC measurement using non-contrast DECT images remains necessary. We fully agree that additional validation studies, ideally in conjunction with nuclear medicine tracer uptake assessments, are required before this technique can be reliably incorporated into clinical decision-making.

Once again, I thank you for your constructive comments, which have substantially enhanced the clinical relevance and potential impact of our findings.

Footnotes

Conflict of interest disclosure

The author declared no conflicts of interest.

References

1. Lee Y. Dual-energy computed tomography-based volumetric thyroid iodine quantification: correlation with thyroid hormonal status, pathologic diagnosis, and phantom validation. *Diagn Interv Radiol.* 2025;31(3):226-233. [CrossRef]
2. Silberstein EB, Alavi A, Balon HR, et al. The SNMMI practice guideline for therapy of thyroid disease with ^{131}I 3.0. *J Nucl Med.* 2012;53(10):1633-1651. [CrossRef]
3. Park H-M, Gerard SK. Stunning: Untoward Effect of 131I Thyroid Imaging Prior to Radioablation Therapy. In: Wartofsky L, Van Nostrand D, eds. *Thyroid Cancer: A Comprehensive Guide to Clinical Management.* Totowa, NJ: Humana Press. 2006:337-345. [CrossRef]
4. Christner JA, Kofler JM, McCollough CH. Estimating effective dose for CT using dose-length product compared with using organ doses: consequences of adopting International Commission on Radiological Protection publication 103 or dual-energy scanning. *AJR Am J Roentgenol.* 2010;194(4):881-889. Erratum in: *AJR Am J Roentgenol.* 2010;194(5):1404. [CrossRef]
5. Giovanella L, Avram AM, Iakovou I, et al. EANM practice guideline/SNMMI procedure standard for RAIU and thyroid scintigraphy. *Eur J Nucl Med Mol Imaging.* 2019;46(12):2514-2525. [CrossRef]