Deep convolutional neural network models for the diagnosis of thyroid cancer

We read the paper by Xiangchun Li and colleagues,[1] in which the authors describe a newly developed deep convolutional neural network model that can achieve high accuracy, sensitivity, and specificity in automated thyroid cancer diagnosis in a real-world setting.

In this study, the developed deep convolutional neural network model had similar sensitivity to that of a group of skilled radiologists (84·3–93·4% *vs* 89·0–96·9%) and an even higher specificity (86·1–87·8% *vs* 57·1–68·6%) in three validation sets in identifying patients with thyroid cancer. Yet this results raise some queries. First, the reported specificity of the skilled radiologists in this study was quite low (57·1–68·6%) compared with previous studies of skilled radiologists (94·9%–96·4%).[2,3] The authors defined an American College of Radiology Thyroid Imaging, Reporting and Data System score of 5 (ACR TI-RADS 5) as malignant. Two large cohort datasets obtained from the SOMARTUS and KSThR database, including a total of 902 (>5 mm) and 2000 (≥1 cm) consecutive nodules with a frequency of malignancy of 29·5% and 22·7%, respectively, showed that the ACR TI-RADS 5 had a sensitivity of 52·2–75·9% and a specificity of 86·8–95·5% for detection of thyroid cancer by skilled radiologists.[4,5] Regarding this issue, we consider that the tumour size, incidence of malignancy, cancer subtypes and the definition of "gold standard for diagnosis" should be explained in more detail in the validation sets used by Li and colleagues. Second, in this study a classification model was developed without the provision of any information about ultrasonography features. Since several ultrasonography features are strongly associated with thyroid cancer, such as microcalcifications, spiculated or microlobulated margins, and a taller-than-wide shape, the current guidelines (from the American Thyroid Association and the Korean Society of Thyroid Radiology) provide risk stratification systems based on ultrasonography features. To gain understanding of how the deep convolutional neural network model arrives at a prediction, the currently available systems[2,3] report information about ultrasonography features in addition to the possible diagnosis. We wonder how the ultrasonography features affected the final diagnosis in the deep convolutional neural network model used by Liu and colleagues. Finally, we believe that the technical performance of this study should be thoroughly validated in a different geographic setting.

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