

Challenging Issues Toward Unified TIRADS

Request for a unified risk stratification system, TIRADS

The widespread use of ultrasound (US) and other imaging studies has resulted in the increased detection of incidentally discovered thyroid nodules, which are found in more than 50% of adults. This has also led to the increased detection of small thyroid cancers, raising concerns regarding overdiagnosis and overtreatment. Consequently, there has been a need for US-based risk stratification systems (RSS) or Thyroid Imaging Reporting and Data System (TIRADS) to facilitate appropriate diagnosis and management of thyroid nodules.

Multiple RSSs have been proposed by international professional organizations since 2014, which include widely used eight systems of the American Association of Clinical Endocrinologist/American College of Endocrinology/Associazione Medici Endocrinologi AACE/ACE/AME), American College of Radiology (ACR TI-RADS), American Thyroid Association (ATA), British Thyroid Association (BTA), Chinese Society of Ultrasound in Medicine (C-TIRADS), European Thyroid Association (EU-TIRADS), Japan Association of Breast and Thyroid Sonology/Japan Society of Ultrasonics in Medicine (JABTS/JSUM), Korean Thyroid Association / Korean Society of Thyroid Radiology (K-TIRADS). The US-RSS or TIRADS has three major clinical roles in the management of thyroid nodules; 1) selection of patients to perform US-guided biopsy, 2) management decision of thyroid nodules not indicated for the following diagnostic test, biopsy, 3) management decision of a thyroid nodule after biopsy. The US-RSS serves as a triage test to select patients for US-guided biopsy, aiming to reduce unnecessary biopsies and rule out malignancy. Therefore, the biopsy criteria of TIRADS needs to achieve high specificity for reducing unnecessary biopsies and an appropriate sensitivity for clinically significant thyroid malignant nodules according to nodule size. In addition to estimating malignancy risk and guiding management, these systems are intended to standardize communication and reporting [1, 2].

However, the plethora of RSSs or TIRADS for thyroid nodules confuses physicians and patients and raise problems in the real-world practice managing patients with thyroid nodules. The differences in the definition of US lexicon among the RSSs induce considerable interobserver variability in US features, unreliable identification of US features, and possible different risk classification of the same nodule. The malignancy likelihood associated with each risk category also differ considerably between RSSs. Disparities between RSSs are further characterized by differing size cutoffs for biopsy and recommendations for follow-up, potentially leading to differences in the management outcomes for the same nodule [1, 2].

Challenging issues in development of a unified TIRADS

A recent international survey on utilization of five thyroid nodule RSSs reported that 91% of respondents agreed or strongly agreed that there was value in RSS use, and more than half of the respondents expressed a desire for a universal lexicon to reduce interobserver variability [1]. The clinical adoption of a unified TIRADS or RSS developed with the same language (unified US lexicons and descriptors) holds the potential to reduce diversity in thyroid nodule classification and management strategies, which would benefit both practitioners and patients. However, several challenging issues need to be addressed to achieve this goal and find the Holy Grail of thyroid nodule

management.

The unified TRIADS requires development of unified US lexicons (same language), structure of the system including the risk stratification method (point-based vs. pattern or feature-based), the number and algorithm (combination of features vs. points awarded for features) of classified categories, and biopsy criteria based on the risk of classified nodule category, maximal nodule size, high risk features of malignancy (gross ETE or lymph node metastasis), and clinical factors. It also requires consensus on the management of thyroid nodules that do not meet the biopsy criteria and US based management strategy of nodules after biopsy.

The development of a unified TIRADS should start with a thorough analysis of current RSSs or TIRADSs, and the performance of the developed unified TIRADS requires rigorous verifications. The appropriateness of the estimated malignancy risk of each classified category need to be evaluated in terms of management of thyroid nodules. The real-world clinical performance of RSS should be verified by the diagnostic performance of biopsy criteria in clinically significant thyroid nodules (≥ 1 cm). The performance of current RSSs or TIRADSs should be assessed and compared by the appropriateness of sensitivity (performance to detect malignancy) and specificity (performance to reduce the number of benign nodules undergoing biopsy). Addressing these challenges will be essential for developing a unified TIRADS system that improves the accuracy and consistency of thyroid nodule assessment and ultimately enhances patient care.

Future perspective

The ongoing International Thyroid Nodule Ultrasound Working Group (ITNUWG) started since 2018, which includes the five professional organizations of ACR, ATA, ETA, AME, and KSThR/KTA. The ITNUWG agreed to develop the unified US lexicons (phase I) and a unified TIRADS (tentatively called International-TIRADS) (phase II). The international expert consensus on US Lexicon for thyroid nodules, which is the result of phase I, was recently published (2). The multidisciplinary study is needed to measure and validate the consistency of the developed US lexicons. The integrating AI technology and advanced imaging techniques such as elastography, contrast-enhanced US, and microvascular flow imaging into a unified TIRADS poses a challenge and needs further validation.

Reference

1. Hoang JK, Asadollahi S, Durante C, Hegedüs L, Papini E, Tessler FN. An International Survey on Utilization of Five Thyroid Nodule Risk Stratification Systems: A Needs Assessment with Future Implications. *Thyroid*. 2022;32(6):675-681.
2. Durante C, Hegedüs L, Na DG, Papini E, Sipos JA, Baek JH, Frasoldati A, Grani G, Grant E, Horvath E, Hoang JK, Mandel SJ, Middleton WD, Ngu R, Orloff LA, Shin JH, Trimboli P, Yoon JH, Tessler FN. International Expert Consensus on US Lexicon for Thyroid Nodules. *Radiology*. 2023 ;309(1):e231481.