Challenges and Solutions for a Unified TIRADS: K-TIRADS Perspective

Dong Gyu Na, Radiology, GangNeung Asan Hospital, Republic of Korea

Multiple ultrasound (US)-based risk stratification systems (RSSs) including Thyroid Imaging Reporting and Data System (TIRADS) 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 four 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, 4) standardized communication and reporting. 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.

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 [1, 2]. A recent international survey highlighted the need for a unified international RSS [1]. The first step toward a unified TIRADS is establishing a standardized terminology and definitions for the US lexicon (same language), which will provide a foundation for developing a unified TIRADS structure. Against this backdrop, the International Thyroid Nodule Ultrasound Working Group recently published an international expert consensus on a unified US lexicon for thyroid nodules, aiming to develop a unified RSS (tentatively called International-TIRADS)[2].

Similarities and differences among TIRADSs

Developing a unified TIRADS requires a thorough analysis of existing RSSs. The appropriateness of malignancy risk for each classification category should be assessed in the context of thyroid nodule management, and the real-world clinical performance of TIRADS should be assessed using biopsy criteria in clinically significant thyroid nodules (>1 cm). The diagnostic performance of current TIRADSs for malignancy should be evaluated based on sensitivity (ability to detect malignancy) and specificity (ability to reduce unnecessary biopsies of benign nodules), stratified by nodule size, given that tumor size is a key prognostic factor. However, the development of a unified system remains challenging, as numerous previous studies are hindered by non-standardized US lexicons, cohort heterogeneity with selection bias, and disparate methodologies for evaluating diagnostic performance.

A recent comparative study of RSSs using a standardized I-TIRADS US lexicon [3] revealed that current TIRADS and RSS demonstrated notable differences in nodule classification, malignancy risk across categories, and diagnostic performance according to nodule size. This study demonstrated that biopsy size thresholds and US classification criteria was the primary factors underlying the disparate diagnostic performances of RSSs for small nodules (≤ 2 cm). In contrast, for larger nodules (> 2 cm), the predominant factor was the variations in US criteria for no-biopsy-indicated nodules.

Challenges and potential solutions in the development of a unified TIRADS

The development of a unified TIRADS requires the establishment of a standardized US lexicon (a 'common language'), a structure for malignancy risk stratification of nodules, and biopsy criteria. The system's structure should encompass risk stratification method (point-based vs. pattern- or feature-based), number of classified categories, and algorithm for nodule classification (feature combinations vs. assigned points). The biopsy criteria should be determined based on the risk of malignancy within each category, maximal nodule size, US or clinical high-risk features (such as gross extrathyroidal extension or lymph node metastasis). These challenging issues could be addressed through extensive international collaboration and consensus, supported by robust data-driven evidence. Furthermore, several key factors need to be considered in this developmental process.

First, nodule size should be integrated into the evaluation of TIRADS diagnostic performance, as this significant prognostic factor necessitates distinct management strategies. For small nodules, accepting a relatively lower sensitivity for detecting low-risk tumors—combined with US surveillance rather than immediate biopsy—may help reduce the rate of unnecessary biopsies. Conversely, for large nodules, maintaining higher sensitivity is necessary to avoid missing clinically significant malignancies, even at the expense of a higher unnecessary biopsy rate.

Second, more effective risk classification for large, low-suspicion nodules is essential. For large nodules, RSSs with a lower proportion of "no-biopsy-indicated" nodules (such as ATA, EU-TIRADS, and K-TIRADS) exhibit very high sensitivity but higher unnecessary biopsy rates. In contrast, RSSs with a higher proportion of "no-biopsy-indicated" nodules (such as ACR-TIRADS and C-TIRADS) demonstrate lower unnecessary biopsy rates, albeit at the cost of relatively lower sensitivity [3]. Therefore, for large nodules (> 2 cm), highly specific benign US criteria for the "no-biopsy-indicated" category and refined risk stratification for low-suspicion nodules are needed to balance sensitivity and unnecessary biopsy rates. Improvements are required to reduce the unnecessary biopsy rates in EU-TIRADS and K-TIRADS, while enhancing the sensitivity of ACR-TIRADS and C-TIRADS for large nodules. Furthermore, follicular-patterned malignant tumors have a propensity for low-suspicion US patterns compared to papillary carcinomas, yet predictive US features for these tumors remain unestablished. Current TIRADS frameworks, which are primarily based on US predictors for papillary carcinoma, lack effectiveness in risk-stratifying large, low-suspicion nodules. Therefore, developing an optimized risk stratification system—incorporating specific US predictors for follicular-patterned malignancy—is warranted.

In conclusion, developing a unified TIRADS system will improve the accuracy and consistency of thyroid nodule assessment, ultimately enhancing the quality of patient care. It is now imperative for professional societies and experts to prioritize global collaboration to establish a unified TIRADS.

Reference

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