



# Comparison of Thyroid Imaging Reporting and Data Systems in Malignancy Risk Stratification of Indeterminate Thyroid Nodules

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The Thyroid Imaging Reporting and Data System (TIRADS) is a quantitative scoring system for risk stratification of thyroid nodules that has played a crucial role in thyroid nodule evaluation and management [1]. Since it was first introduced in 2009 [1], national and international professional organizations have developed their own TIRADS for risk-stratification of thyroid nodules [2-7]. Several comparative studies of various TIRADS' diagnostic performance for malignancy, including meta-analyses, have recently been published [8-18]. Although various TIRADS have similarities in most aspects of their ultrasonography (US) lexicons, significant differences were observed in the classified categories and diagnostic performance of the fine-needle aspiration biopsy (FNAB) criteria for malignancy [17]. Comparative studies have shown that the Korean-TIRADS (K-TIRADS) had the highest sensitivity and highest rate of unnecessary biopsies [13-15,17]. The modified K-TIRADS was also validated to evaluate its diagnostic performance and rate of unnecessary biopsies compared with the 2016 K-TIRADS and other US-based risk stratification systems [18]. Na et al. [17] reported that the modified K-TIRADS reduced the high rate of unnecessary biopsies, while maintaining relatively high sensitivity and diagnostic accuracy for small malignant tumors compared to other risk stratification systems, including the 2016 K-

TIRADS.

In light of these results, Kang et al. [19] retrospectively compared the diagnostic performance of the K-TIRADS with that of the American College of Radiology (ACR)-TIRADS for predicting the malignancy risk of indeterminate thyroid nodules at a single referral hospital. They reported that the K-TIRADS and ACR-TIRADS had similar overall sensitivity and specificity for indeterminate thyroid nodules classified as Bethesda categories III, IV, and V. However, unlike ACR-TIRADS, adding K-TIRADS 5 significantly increased the risk of malignancy in nodules classified as Bethesda category III. Therefore, Kang et al. [19] suggested that the K-TIRADS may have further beneficial effects in predicting malignancy risk for Bethesda category III nodules. Similarly, Slowinska-Klencka et al. [20] also recently reported that the K-TIRADS had higher diagnostic efficacy in terms of the area under the curve (AUC) than the ACR-TIRADS in nodules classified as Bethesda category III. However, a meta-analysis of six studies that concluded direct comparisons between the K-TIRADS and ACR-TIRADS showed that the K-TIRADS had higher sensitivity than the ACR-TIRADS (0.91 [95% CI, 0.85 to 0.95] vs. 0.85 [95% CI, 0.79 to 0.90]), but the difference was not statistically significant ( $P=0.13$ ). Furthermore, the pooled specificity was 0.24 (95% CI, 0.19 to 0.29)

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versus 0.57 (95% CI, 0.47 to 0.66) ( $P < 0.001$ ) [9]. The K-TIRADS and ACR-TIRADS have somewhat different strengths. The K-TIRADS is easier and more intuitive in terms of clinical use in real-world practice because of its pattern-based system according to the echogenicity and solidity of nodules and further analysis of malignant sonographic features [4]. The ACR-TIRADS is a point based risk stratification system based on scoring suspicious sonographic features [6]. The ACR-TIRADS has a relatively high size limit of thyroid nodules for which diagnostic FNAB is considered appropriate. Thus, a strength of the ACR-TIRADS is that it reduces unnecessary FNAB [6]. In contrast, the K-TIRADS could have a higher rate of unnecessary FNAB because of its lower size cutoff for biopsies compared with other TIRADS [18]. However, this issue has been overcome in the modified K-TIRADS [17,18]. The modified K-TIRADS reduced the unnecessary biopsy rate while maintaining high sensitivity for small malignant thyroid nodules and high sensitivity for large malignant thyroid nodules by increasing the size cutoff for biopsy of K-TIRADS category 3 nodules [17]. However, there are some differences among previous comparative studies regarding the size cutoff of various TIRADS, the method for the final pathologic diagnosis (e.g., surgery or core needle biopsy), and the selection of nodules for analysis in relation to the FNAB category [10-18].

Therefore, further prospective multicenter studies are needed to validate the diagnostic performance of the modified K-TIRADS compared with other TIRADS in various populations with different prevalence rates of papillary thyroid cancer. In addition, further efforts should be made to establish a consensus on a unified risk stratification system.

The management strategy for thyroid nodules has recently become more conservative to minimize the over-diagnosis and over-treatment of small thyroid cancer, which has an indolent disease course. Considering this issue, the modified K-TIRADS will play an essential role in making clinical decisions and optimizing the management of indeterminate thyroid nodules.

## CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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