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## **The US-FNA system for malignancy risk in thyroid nodules: 5-Tier classification**

Hyobin Seo<sup>1</sup>, Dong Gyu Na<sup>2</sup>, Ji Hoon Kim<sup>3</sup>

<sup>1</sup>Seoul National University Hospital Healthcare System Gangnam Center, <sup>2</sup>Human Medical Imaging and Intervention Center, <sup>3</sup>Seoul National University Hospital, Korea.  
nndgna@gmail.com

**PURPOSE:** To evaluate diagnostic performance of the US-FNA (UF) system for thyroid malignancy by comparing with the Bethesda (BE) system of thyroid cytopathology.

**MATERIALS AND METHODS:** US-guided FNA was performed at 2049 thyroid nodules of 1210 consecutive patients. Among these nodules, a total of 704 nodules with final diagnoses (214 malignant and 490 benign nodules) were included for this study. The malignancy risk of thyroid nodules were classified into 4-tiers by US features. The UF system was stratified into 5-tiers of malignancy risk by combination of US-based 4-tier classification and 6-tier FNA results of BE system. The 5-tier malignancy risk of UF system was categorized as probably benign (BE category 1 with US-probable benign, low or intermediate risk nodule; all nodules with BE category 2), low risk (BE category 3 with US-probably benign or low risk nodules and category 4 with US-probably benign), intermediate risk (BE category 1 with US-high risk, BE category 3 with US-intermediate risk nodules, and BE category 4 with low risk nodules), high risk (BE category 3 with US-high risk nodules and BE category 4 with US-intermediate or high risk nodules), and probably malignancy (all nodules with BE category 5 or 6). The diagnostic performance of each system for predicting malignancy was calculated with receiver operating characteristics (ROC) analysis.

**RESULTS:** The thyroid nodules were classified into 4 tiers by US-based stratification of malignancy risk; probably benign (risk < 3%, n = 101), low risk ( $\geq 3\%$  and < 15%, n = 149), intermediate risk ( $\geq 15$  and < 50%, n = 211), and high risk ( $\geq 50\%$ , n = 243). The FNA results were BE category 1 (n = 35), category 2 (n = 404), category 3 (n = 89), category 4 (n = 9), category 5 (n = 92), and category 6 (n = 75). In nodules with BE category 1, malignancy were found only in US-high risk nodules, and malignancy risk gradually increased according to US-based malignancy risk in nodules with BE category 3. The malignancy risk of nodules was classified by the UF system as probably benign (n = 418, 1.4%), low risk (n = 32, 12.5%), intermediate risk (n = 52, 40.4%), high risk (n = 35, 48.6%), and probably malignancy (n = 167, 99.4%). In overall nodules, the area under the ROC curve of UF system (Az = 0.972) was greater than that of the Bethesda system (Az = 0.948) (p = 0.08).

**CONCLUSION:** The UF system may be more accurate and effective for predicting malignancy compared with the FNA BE system alone.