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The significance of the BRAF V600E mutation and the cytomorphological features for the optimization of papillary thyroid cancer diagnostics

Augustas Beisa^{1,2}, Mindaugas Kvietkauskas^{1,2}, Virgilijus Beisa^{1,2}, Mindaugas Stoskus^{1,2}, Elvyra Ostaneviciute^{1,2}, Eugenijus Jasiunas³, Laimonas Griskevicius^{1,2}, and Kestutis Strupas^{1,2}

¹Vilnius University, Lithuania

²Vilnius University Hospital Santaros Klinikos, Lithuania

³Mykolas Romeris University, Lithuania

Background: Ultrasound guided fine needle aspiration biopsy with cytologic analysis is an initial step in diagnostic of thyroid nodules. Unfortunately, up to 30% of biopsies are indeterminate and diagnostic surgery is required. The aim of this study was to estimate the diagnostic value of BRAF V600E mutation status, cytomorphological features, and combination of both these features for diagnosis of papillary thyroid cancer (PTC) in cytologically indeterminate thyroid nodules.

Methods: A prospective study analyzed patients who had ultrasound suspicious thyroid nodules, underwent fine needle aspiration and cytological examination, and were assigned to indeterminate categories of the Bethesda system. These patients were examined for BRAF V600E mutation and 22 cytomorphological features, and underwent thyroid surgery. The utility of three diagnostic methods was evaluated.

Results: A total of 219 patients met study criteria. After histological examination, 77 (35.2%) patients were diagnosed with PTC and 142 (64.8%) with benign nodular thyroid disease. The sensitivity of BRAF V600E mutation status for diagnosis of PTC in cytologically indeterminate thyroid nodules was 67.5%, specificity-100%, positive predictive value-100%, and negative predictive value-85%. Regression model based on cytomorphological features achieved a sensitivity of 68.8%, specificity of 91.6%, positive predictive value of 81.5%, and negative predictive value of 84.4%. Combined use of BRAF V600E mutation status and cytomorphological features showed the best diagnostic efficiency, with sensitivity of 80.5%, specificity of 99.3%, positive predictive value of 98.4%, and negative predictive value of 90.4%.

Conclusions: Evaluation of BRAF V600E mutation status combined with cytomorphological features for diagnosis of PTC in cytologically indeterminate thyroid nodules can significantly improve diagnostic accuracy and reduce the number of diagnostic operations (calculator available at www.ptc-calc.we2host.lt).

augustas.beisa@santa.lt

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