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Machine Learning by Ultrasonography for Risk Stratification of Axillary Breast Lymph Nodes

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Introduction: Breast cancer is the most common cancer among women worldwide, and ultrasonography has been an essential tool in the management of breast cancer. In order to improve upon ultrasonography efficacy, establishing a machine learning image analysis model would provide additional prognostic and diagnostic factors in the evaluation, monitoring, and treatment of breast cancer.

Methods: This retrospective study utilizes axillary lymph node ultrasound images of patients at Thomas Jefferson University Hospital who have had axillary lymph node biopsies. Automated machine learning of the images was performed on AutoML Vision; Google LLC which generated custom models for classification. About 80% of images were utilized to train the model, about 10% for validation, and about 10% to test accuracy. Outcomes involve model classification as high or low risk lymph nodes, while model accuracy was compared to biopsy and histopathology results.

Results: Results are incomplete as the model is continuing to be trained, but results are anticipated to demonstrate high specificity when classifying lymph nodes are high or low risk for metastasis. Accuracy is anticipated to be fair.

Discussion: Establishing a machine learning model with high specificity and accuracy as anticipated demonstrates the ability to provide additional factors in determining management of invasive breast cancer using ultrasonography. Establishing a reliable model can assist in determining the need for invasive or noninvasive procedures such as core needle lymph node biopsies, sentinel lymph node biopsies, lymph node resection, or radiation therapy. Future work can improve upon limitations, particularly variation among ultrasound operators and the study’s retrospective nature.