RNA-based, multi-gene molecular assays are available and widely used for patients with ER-positive/HER2-negative breast cancers. However, RNA-based genomic tests can be costly and are not available in many countries. Methods for inferring molecular subtype from histologic images may identify patients most likely to benefit from further genomic testing. To identify patients who could benefit from molecular testing based on H&E-stained histologic images, we developed an image analysis approach using deep learning. Our investigators created image-based classifiers for tumor grade, ER status, PAM50 intrinsic subtype, histologic subtype, and risk of recurrence score (ROR-PT). The resulting classifiers were applied to an independent test set, and accuracy, sensitivity, and specificity of each assessed on the test set. Histologic image analysis with deep learning distinguished low-intermediate vs. high tumor grade ER status, Basal-like vs. non-Basal-like, Ductal vs. Lobular, and high vs. low-medium ROR-PT scores with good accuracy. Image-based methods could be promising for identifying patients with a greater need for further genomic testing, or in place of
classically scored variables typically accomplished using human-based scoring.

**Related Publications:**

- Image analysis with deep learning to predict breast cancer grade, ER status, histologic subtype, and intrinsic subtype.  
  NPJ Breast Cancer. 2018 Sep 3;4:30

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