



Use of image analysis and digital slides in clinical immunohistochemistry (IHC) pathology applications and the impact of region selection on quantitative results

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Abstract

Introduction: Image Analysis and digital slide scanning are changing the way IHC slides are evaluated today. The manual evaluation of IHC slides generally combines the visual selection of tissue regions using morphology combined with an assessment of either staining intensity or percentage of positive cells. Image analysis can support this evaluation by accurately measuring staining intensity and/or quantifying the percent positive cell population in pathologist selected regions of interest. In addition to whole slide scanning for archival purposes, the Automated Cellular Imaging System (ACIS™ III) from Dako provides accurate and consistent measurements of regions of interest on IHC stained pathology slides. The system includes clinical applications for HercepTest (HER2), ER, and PR; all of which are FDA cleared. Image analysis algorithms have been demonstrated to aid in the consistent scoring of IHC slides; moreover, the selection of appropriate tissue regions by a pathologist is essential in obtaining consistent reads in manual or Image Analysis assisted settings.

Methods: A study was conducted to evaluate the impact of region selection on the scoring of ER stained IHC slides. 62 slides were stained with Dako's ER PR pharmDx kit and the percentage of ER positive staining cells was determined multiple times using manual and Image Analysis assisted protocols. For manual reads, the pathologist used the entire tumor area. Using Image Analysis, in addition to a whole tumor area score, a pathologist was instructed to score a slide 5 times selecting 1, 5, 10 and 15 specific tumor regions respectively. The percent positive scores obtained from Image Analysis were compared to the manual assessment.

Results: Good correlation was found between the manual assessment and the image analysis assisted 5, 10 and 15 selected region protocols. The correlation between manual assessment and Image Analysis for single and whole tumor selected region protocols was observed to be lower in high percentage ER positive cell cases. A probable explanation for this could be that the selected regions contained negative areas, which in turn lowered the overall measurement.

Conclusion: Region selection on a digital slide for image analysis is very important in assuring high quality results. Selecting a significant number of regions on a slide using an Image Analysis assisted protocol correlates well with traditional manual scoring and ensures that the heterogeneity of tumor regions is taken into account.