

DIGITAL PATHOLOGY & ARTIFICIAL INTELLIGENCE: FEASIBILITY FOR CLINICAL PRACTICE

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Abstract

There is increasing interest in applying artificial intelligence (AI) tools to Anatomical Pathology. AI algorithms can detect rare events, automatically quantify features, and diagnose diseases by analyzing digital images. However, very few laboratories today routinely use such AI tools. Therefore, the aim of this study was to determine the feasibility of developing and validating AI technology for routine use in Anatomical Pathology. Four experiments were conducted that utilized whole-slide image datasets to train and test deep learning models. The first experiment involved a deep learning algorithm to screen digitized acid fast-stained slides for mycobacteria. With AI assistance pathologists were more accurate, quicker and found it easier to identify acid-fast bacilli than using manual modalities. The second experiment critiqued an AI tool that quantified mitotic figures in images of invasive breast carcinoma. For end-users of varying experience their accuracy and time spent counting mitoses improved with AI support. The third experiment concerned a blinded validation study and clinical deployment of an AI-based algorithm to aid reviewing prostate core needle biopsies. This algorithm was highly accurate at detecting prostate adenocarcinoma, distinguishing low- from high-grade Gleason scores, and identifying Gleason pattern 5 or perineural

invasion. The fourth experiment demonstrated the success of using an AI-based image search tool to rapidly resolve the tissue floater conundrum encountered in pathology practice. All four AI-based tools successfully aided pathologists with routine tasks typically encountered in pathology practice and overall proved to be more accurate, efficient, standardized and easier to use than outdated and onerous manual methods.