WHITEPAPER

Ki-67 [MIB-1]: Quantitative Analysis, AI, and You

BIOCARE MEDICAL

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In today's digital age, it is becoming increasingly clear that digital analysis and artificial intelligence (AI) are the way of the future, and medicine is no exception. The World Health Organization (WHO) itself has acknowledged the opportunity for AI and digital technology in health management.[2] The field of digital pathology is growing, and Ki-67 has emerged as a primary marker of interest for this new frontier.

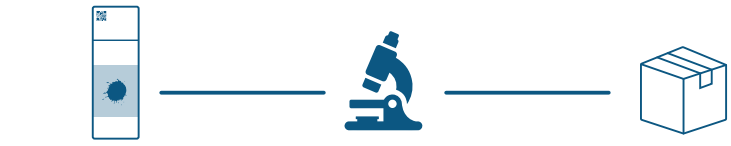
Digital pathology involves digitizing glass slides through whole-slide imaging (WSI) technology.[1] Whole slide images are generally gigapixel images at up to 40X resolution.[1] These images are then analyzed via machine learning and/or deep learning models to assist pathologists.[2] This method is intended to provide fast, reliable, objective results that are less susceptible to variability between slides and between pathologists.[2]

Ki-67 has been a prime candidate for digital pathology development due to its wide use and quantitative application. Ki-67 is an indicator of cell proliferation rate and is considered one of the most important markers in the evaluation of breast cancer.[4,5] It is involved in the subclassification of diagnoses of brain tumors, adrenal cortical carcinomas, thyroid cancers, and neuroendocrine neoplasms.[4,5] Classification and risk stratification of these disease states involve mitotic counts according to the Ki-67 labeling index.[5]

However, traditional scoring of Ki-67 by manual count is both time-consuming and variable, making Ki-67 subject to a lack of uniformity and consistency in its quantification.[1,5] Since the reproducibility of manual cell counts is generally poor, the current guidelines recommend that printed images with at least 500 neoplastic cells be used for analysis.[2,5] Fortunately, this also makes Ki-67 a prime candidate for digital and AI pathology. When staining with Ki-67, WSI can be used in combination with AI to perform automated quantitative analysis, which can produce greater consistency in grading, particularly in cases of grade transitions between G1 and G2 or G2 and G3.[1,2] This is of particular benefit when dealing with fine needle aspiration (FNA) cytology samples.[2]

Currently, some limitations still exist, but more sophisticated AI algorithms are being developed, and Digital Pathology is well on its way to being a staple in the future.

TRADITIONAL HISTOPATHOLOGY



Physical slide section prepared and stained

Slides analyzed under microscope

Storage of physical slides in onsite facilities and sometimes offsite for 10 years or more

DIGITAL HISTOPATHOLOGY

Physical slide section prepared and stained

Slides scanned using digital slide scanner

Slides analyzed using a computer

Digital slide files are stored on a server

The physical slide may still need to be analyzed under a light microscope for certain diagnostic criteria

To learn more about Biocare's Ki-67 marker, please visit our website at biocare.net or call 1-800-799-9499, option #3.

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4. Volynskaya, Z., Mete, O., Pakbaz, S., Al-Ghamdi, D., & Asa, S. L. (2019). Ki67 Quantitative Interpretation: Insights using Image Analysis. Journal of pathology informatics, 10, 8. https://doi.org/10.4103/jpi.jpi_76_18