

Digital Pathology

Transforming Pathology from a Qualitative to a Quantitative Science

ARUP Laboratories' Medical Director Mohamed Salama, MD, is a professor of pathology and the director of the hematopathology fellowship program at the University of Utah School of Medicine. His expertise spans all aspects of hematopathology, including morphology and specialized studies of bone marrow and lymph nodes.

A leader in the realm of digital pathology, Dr. Salama often speaks worldwide about the evolution and power of whole slide imaging (WSI) in research, educational, and clinical environments. "WSI is a tool destined to change the evolution of pathology, much like functional magnetic resonance imaging (fMRI) changed neurology," claims Dr. Salama, who serves on the College of American Pathologists' (CAP) committee for digital imaging.

In the following Q & A, Dr. Salama shares his insights regarding how digital pathology can benefit us, where it is leading us, and the challenges it presents.



Expert Edge

Mohamed E. Salama, MD
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Q: Are most labs using whole slide imaging yet; why or why not?

A: According to the 2014 CAP survey, only 32% of laboratories are using WSI for some applications. The most frequently reported barrier to WSI technology is the cost related to the scanners, storage, and support without clear ROI. Other barriers include the absence of FDA clearance in using WSI for primary diagnoses, IT-related issues, and the fear of disruption to the workflow. I anticipate these barriers will diminish as the pathology community gains a better understanding of this technology.

Q: How can WSI help us better diagnose disease?

A: Digital images can immediately be transported to the primary or consulting pathologists. They are virtual microscopes that produce high-resolution, diagnostic-quality images that can be used anywhere across the web; transporting specimens becomes a one-way electronic process instead of a two-way physical trip, greatly reducing turnaround time and allowing for a quicker diagnosis. With increasing medical sub-specialization, scanned slides can be easily shared with specialized pathologists for interpretation.

Q: From a practical perspective, how is digital imaging an advantageous tool?

A: Unlike glass slides, which can be lost or damaged during transport or possibly fade with time, digital images can be archived and retrieved easily. In contrast to traditional microscopy, WSI permits annotations and clinical metadata presented with the image, potentially with all the clinical and prognostic information needed to correlate morphology with genomic, proteomic, or immunohistochemical data.

Another powerful aspect is the ability to

perform morphometry with computer-aided image analysis, which improves accuracy and standardization by eliminating observer variability between pathologists' interpretations. This is essential in fostering translational research involving new biomarker discoveries.

Q: How does digital pathology aid medical education?

A: It enhances the learning experience by allowing medical students to practice histology and pathology in various settings. The technology facilitates group learning, as it enables students to discuss interesting slides by viewing them on large computer monitors or projection screens. This technology also provides the ability to construct course-specific modules, with the practical versatility of the slides being simultaneously available to everyone in multiple courses, which is a significant cost savings. This also benefits graduate medical education trainees in pathology and other clinical disciplines, as well as students in medical laboratory sciences.

Q: What excites you about this area of pathology?

A: I see it increasingly transforming pathology from a qualitative science into a quantitative one. At its core, such imaging helps with the diagnosis of patients and could help lead us to major discoveries. It really is content-rich material, and we have to take advantage of it.

Q: What are the challenges as digital pathology evolves?

A: Its full adoption into the clinical laboratory requires careful consideration of FDA regulatory issues, workflow modification, development of standards for practice and validation guidelines, as well as defining situations where WSI technology will improve practice in a cost-effective way.