PATHOLOGY FROM THE COCKPIT

Bidding adieu to handling glass slides

The James
Pathology From the Cockpit

Digital pathology promises to help pathologists focus more on diagnoses and consultations and less on chasing down glass slides

BY KENDALL POWELL

Until recently, when a pathologist wanted to review the prior slides from a complex case with an expert pathologist or colleague, he or she had to request the glass slides from the archives and wait hours to days for the slides to arrive so that they could be shared. But that is changing at Ohio State.

In May 2017, The Ohio State University Comprehensive Cancer Center – James Cancer Hospital and Solove Research Institute (OSUCCC – James) initiated a comprehensive Digital Pathology Program that will fully digitize anatomical pathology services over the next 10 years.

The new system will enable OSUCCC – James pathologists to sit at a large viewer and, with a few clicks, call up a patient’s digitized and annotated biopsy specimens, along with his or her medical record, complete with molecular biomarker tests and genomic data.

The program uses whole-slide imaging (WSI) technology, which scans entire glass pathology slides and converts them into digital images. “With that technology, a computer becomes a microscope,” says Anil Parwani, MD, PhD, MBA, who heads the program as director of Digital Pathology at the OSUCCC – James.

The system provides fully automated end-to-end pathology workflow and a bank of ultra-fast scanners that are used to digitize both current and past glassslides.
pathology slides.

OSUCCC – James pathologists will soon sit at desktop “digital-pathology cockpits” to view digitized histology slides and other diagnostic images, share pathology images for second opinions and report findings to treating physicians.

WSI technology was introduced in the early 1990s, but the images were low-quality, enormous in size and slow to upload. Pathologists were skeptical; they could work more quickly and accurately by viewing their slides directly.

By the 2000s, the technology had improved and desktop computers could accommodate large image files. Universities began using digital slides for teaching and research.

The digital images were easily stored and transferred—no more hunting down archived glass slides only to find that a slide was lost, broken or faded. What’s more, multiple people could simultaneously analyze digital slides from anywhere, vastly speeding up consultations. Their use became more widespread.

But could digital slides be used for the primary diagnosis of cancer and other diseases? In 2009, the U.S. Food and Drug Administration categorized WSI scanners as Class III in vitro diagnostic devices, indicating a high risk that a misdiagnosis could be associated with high morbidity or mortality. A leading question was whether information was lost when a glass slide was converted to a digital image.

That concern is being addressed by improvements in the technology and by studies that show high concordance between glass and digital slide diagnoses, Parwani says. In addition, OSUCCC – James researchers will run large validation studies to show how digital slide diagnoses compare with those made from glass slides.

Other hurdles remain, also. “Digital pathology in the clinical arena is still in its infancy,” Parwani says.

For example, different WSI scanners use different image formats, making transfers between systems difficult. Parwani says the field should choose a standard format like the DICOM standard used for digital radiology images. And, he says, his generation of pathologists remains reluctant to adopt a technology that was not
mature when they first tested it nearly 20 years ago. They are wary of the time and cost required to convert to digital pathology and scan thousands of old slides.

“In reality, the technology is very good now, the images move seamlessly and viewing them is much like viewing an image on your iPhone,” he says. Parwani recalls a senior pathologist at another center who thought that digital pathology would slow her down, but he persuaded her to give the technology another try. “She fell in love with it. She was consulting on difficult cases from China, and she got really excited. It extended her spectrum of things that she might not have otherwise seen.”

Since his recruitment from the University of Pittsburgh in 2016, Parwani has created that same excitement at the OSUCCC – James. “We brought in Anil as someone already experienced who could lead the OSUCCC – James into this vital space,” says Wendy Frankel, MD, professor and chair of Pathology at The Ohio State University Wexner Medical Center.

Parwani highlights three major advantages in adopting digital pathology. First is efficient information management. He estimates that pathologists spend 10-15 percent of their time manually managing cases, matching paperwork to patient slides or finding prior samples from a patient and ordering those slides from storage.

“Once a slide is digitized, the image has a barcode that stores all of the patient’s information, and it will be integrated into our information systems,” he says. “This puts all the material associated with a particular patient at my fingertips.”

This idea has been referred to as the “digital pathology cockpit,” with a patient’s electronic medical record, including molecular data on biomarkers and gene sequencing, attached to the digitized slides. Ease of image sharing is another advantage to digital pathology. Pathologists have long sent photomicrographs to colleagues, but they provide only a limited view of a sample. Entire digital slides, on the other hand, can be easily emailed to colleagues anywhere.

Freeing the image from a physical slide also means that multiple
“At Ohio State, we’re creating a Digital Pathology Center that at its core will create an end-to-end digital pathology solution for primary diagnosis, research, education, consultations and all aspects of pathology.”

—Anil Parwani, MD, PhD, MBA