

Scope for improvement

A VIRTUAL MICROSCOPE IS OPENING UP A NEW DIMENSION IN THE QUEST FOR QUALITY ASSURANCE, WRITES TONY JAMES.

PHOTOGRAPHER: EAMON GALLAGHER

Pathologists' microscopes have been evolving for centuries, but one feature has remained constant – the glass slide used to mount a thin sliver of stained tissue. Each slide is unique, requiring skilled preparation and maintenance.

Although the slides are ideal for a single pathologist making a diagnosis on an individual patient, replicating the image for training or continuing education has always been a challenge. A merging of information technology and traditional

microscopy techniques provides a solution, and new opportunities for quality assurance.

The ScanScope system, consisting of a purpose-built high-resolution scanner and accompanying software, scans an entire slide. Unlike a simple photograph taken down a microscope, the image includes the whole tissue section, which might be tens of millimetres wide, rather than a tiny, and perhaps unrepresentative, section.

The scanning technology also takes account of the fact that the tissue on the slide – although only a fraction of a millimetre thick – is three-dimensional.

When using a microscope, pathologists adjust the focus up and down to capture “the full picture”, inspecting the slide at different depths. ScanScope software mimics this process, with automatic focusing to reconstruct a detailed image accurately reflecting the complete structure.

Once the multi-megabyte file is on disc, the image can be viewed on a display monitor and panned and zoomed as with a conventional microscope. Like any digital file, it can be stored on a computer hard drive, CD or DVD, transmitted by email or viewed on the internet. Many users can view and discuss the same image at the same time.

Associate Professor Richard Williams, director of anatomical pathology at St Vincent's Hospital in Melbourne, has been closely involved in bringing the virtual microscope to Australia.

After seeing virtual images demonstrated by his colleagues from Queen's University in Belfast, he and Professor John Skinner, from Adelaide, saw the potential for the technology to enhance existing quality assurance programs for anatomical pathologists in Australia. Follow-up investigations by the Royal College of Pathologists of Australasia led to Commonwealth Government support for buying the ScanScope.

“Traditionally, QA programs have consisted of slides being circulated to participating pathologists, and their interpretations checked against the ‘right’ diagnosis,” Professor Williams says.

Virtual microscope and quality assurance

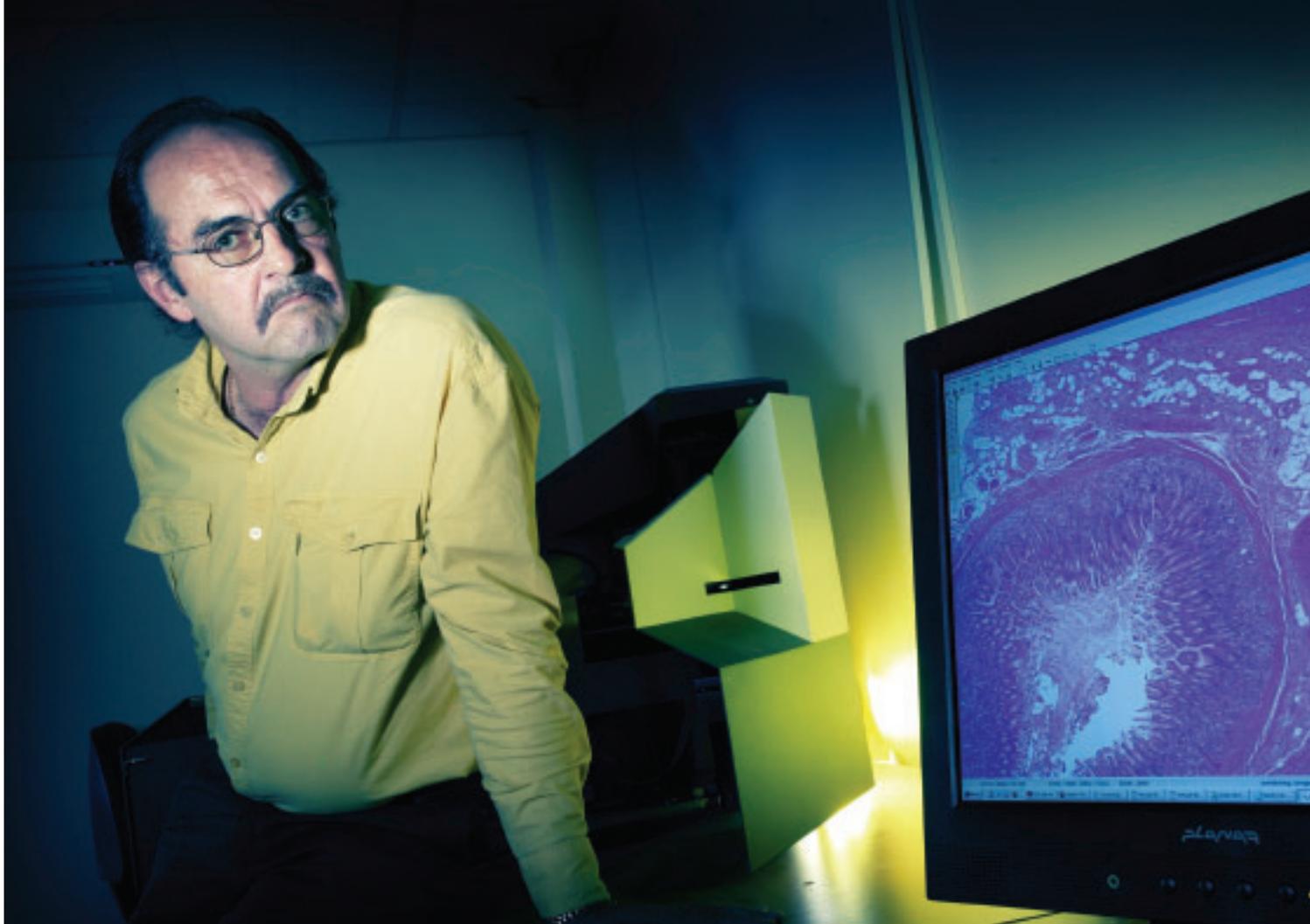
The ScanScope ‘virtual microscope’ has considerable potential to both standardise and enhance quality assurance programs for pathology laboratories, according to Professor David Davies. Professor Davies is Chairman of Anatomical Pathology QA provided by RCPA Quality Assurance Programs Pty Limited. The company was established in 1988 separate from the College of Pathologists to provide external proficiency testing, quality assessment and appropriate education programs to public and private pathology laboratories in Australia, New Zealand and elsewhere.

“About 270 laboratories participate in the Anatomical Pathology program,” Professor Davies says. “Five times each year, as part of a module assessing diagnostic skills, we distribute slides from six cases to all participants. It will have enormous advantages if we can do this simply by sending a DVD containing identical images to every laboratory.” Each laboratory would be reporting on exactly the same material, and the

practical difficulties associated with preparing and distributing several hundred sections from the same piece of tissue would be avoided. It would also allow the program to increase the range of cases, to include small tissue biopsies.

During 2005 samples of the ‘virtual microscope’ images will be distributed free to laboratories to introduce the concept, together with specifications for computers required to manipulate the images. It is planned to use the system for routine QA assessments from 2006.

Professor Davies says it takes a little time to get used to manipulating and interpreting an image on a computer screen rather than through a microscope, but the advantages in QA, education and training quickly become apparent. The concept of virtual microscopy has attracted wide interest, and the College's initiative is being closely observed by pathologists and their professional organisations overseas.



Associate Professor Richard Williams, Director of Anatomical Pathology at St Vincent's Hospital in Melbourne, has been closely involved in bringing the virtual microscope to Australia.

“The tissue is cut and stained to show the same features, but every slide is unique. This new technology of high-resolution scanning allows us to provide identical material to each laboratory and to individual pathologists.”

The College has been at the forefront of external QA programs. The anatomical pathology QA program maintains diagnostic and technical expertise among histopathology laboratories and individual pathologists, and participation is mandatory for the laboratories to be accredited and for services to receive Medicare benefits.

Professor Williams has a particular interest in quantitative pathology, and analysing the way in which pathologists make a diagnosis from the tissue they are inspecting. Rather than simply recognising distinctive patterns associated with specific diseases, they work through a series of steps – whether consciously or subconsciously – to define the abnormalities in the specimen and their implications.

“For example, in breast tissue from an elderly woman you would normally see very few cells, and a higher degree of cellularity is suggestive of cancer,” he says. “The extent of cellularity can be given a score, as can other features, and when all these individual characteristics are assessed and given the appropriate weightings it should be possible to make an accurate diagnosis, and one which can be repeated by the same pathologist some time later or by another pathologist applying the same rules.”

“InView” is a pathology training system that combines images from the virtual microscope with a program based on a series of questions about the tissue’s features. It can be used to analyse the way a pathologist makes diagnostic decisions, measure individual diagnostic performance, identify and correct errors in the diagnostic process and train young pathologists.

“This allows individuals to test the repeatability of their own approach to diagnosis over time, providing ‘internal’ benchmarking, as well as compare their

diagnostic opinion with that of their peers using the same standardised analytical approach, as a form of external benchmarking,” Professor Williams says.

Are pathologists in danger of doing themselves out of a job through advances in information technology and automated analysis of tissue specimens? “We will always be able to provide more sophisticated analysis than computers, to interpret the subtleties, and to place our findings in a clinical context,” he says.

Another application of virtual microscopy might be the use of high-resolution digital images to replace the tonnes of glass that laboratories accumulate. Slides have to be stored for up to 25 years because of medico-legal requirements, and the sheer weight and bulk of glass poses considerable practical problems – for example, whether the floors in a multi-storey building are strong enough to carry the load.

For more information about the RCPA Quality Assurance Program visit <http://www.rcpaqap.com.au>
