

Macro digital pathology imaging: advanced practice in Manchester

Caroline Glennie and colleagues at Manchester Royal Infirmary have been using the MacroPATH pro-x system from Menarini since January. Here, they report on a revolution in histopathology dissection.

Manchester Royal Infirmary has changed dramatically since it was established in 1752. It is now part of Central Manchester University Hospitals NHS Foundation Trust and is a large teaching hospital and a specialist regional centre for kidney and pancreas transplants, haematology, sickle cell disease and cardiac services. Manchester Royal Infirmary is also a host to research across many disciplines.

The trust has one of the largest laboratories in the United Kingdom, receiving more than three million samples per year and performing around 10 million tests. The adult histopathology department deals with approximately 30,000 surgical cases and in excess of 1000 autopsies on behalf of HM Coroner annually. The department comprises over 75 medical, scientific and ancillary staff and has an excellent reputation for clinical and scientific training. In order to continue to provide these important

'Digital pathology imaging permits a complete audit trail in dissection to be recorded and saved, and the facility to annotate images easily'

services, it is essential that the laboratory keeps up to date with the latest innovations to provide a fast, efficient and reliable service.

Digital dissection

One area of the laboratory that has recently seen significant improvement is the busy specimen dissection area. In January 2016, four MacroPATH pro-x Digital Dissection Management Systems from Menarini Diagnostics were installed. These systems for macro digital imaging have been placed at each of the department's four cut-up benches and are interfaced to the laboratory information management system.

Lead biomedical scientist Caroline Glennie explained that the main reason for using digital pathology to this extent is primarily to enable a complete audit trail in dissection and to be able to save and annotate images easily. Second, it is used as a tool for photographing cassette baskets before these go on the tissue processor to provide a full chain of custody throughout the laboratory. Finally, the MacroPATH pro-x is to be used as a teaching aid to assist with the training of advanced biomedical scientist staff in specimen dissection as they have been given more responsibility in this area.

Image capture

The MacroPATH pro-x from Menarini is the company's latest innovation in macro digital pathology and has helped the department at the Manchester laboratory to succeed in achieving its goals. The new MacroPATH pro-x is a user-friendly, high-resolution image capture system that can be either mounted to fit any existing grossing workstation or used as a standalone resource.



Three of the four MacroPATH pro-x units in cut-up at Manchester Royal Infirmary



Consultant histopathologist Dr James Bolton at the dissection bench.



Dissecting a leiomyoma of uterus.

The high-resolution 16 megapixel camera can capture images and videos. It is possible then to annotate the images and record audio to support macroscopic descriptions. This avoids the need for lengthy or subjective descriptions and reduces specimen turnaround time in cut-up dramatically.

The laboratory at Manchester Royal Infirmary has found that the MacroPath Pro-X facilitates a permanent record of the specimen to be captured that can be recalled long after the specimen has been dissected and discarded. This full documentation of a surgical specimen is becoming increasingly important both for quality assurance, in fulfilling the requirements of ISO 15189 accreditation, and any potential present or future medical or legal matters.

Sharing the information with clinicians is easy as selected images can be used to supplement synoptic or preformatted reports, providing essential data or clinical relevance. The stored images form a powerful and invaluable diagnostic database for quality assessment (QA), routine grossing, teaching and research. In addition, connection to remote transmission facilities permits teleconferencing and telepathology consultations.

Permanent record

Caroline added: "Previously we had just one camera, linked to a single PC, which was shared between four cut-up benches. Transporting specimens around the dissection room was difficult as formalin-fixed specimens had to be moved away from the downdraught bench in order to take a photograph. It has also saved huge amounts of time, as it is now no longer necessary to wait to use the camera. It is also not necessary to print out images separately in order to annotate them, as the annotation facility on the MacroPath Pro-X

makes this so simple and much easier to keep a permanent record."

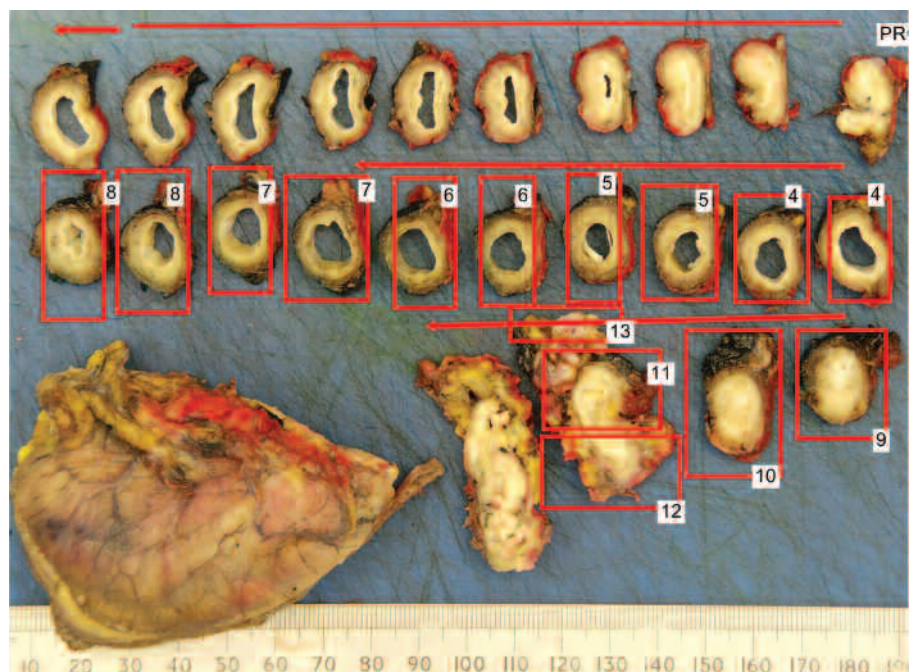
Biomedical scientist Pete Pilatis added that he finds the measurement tools within the MacroPATH pro-x software really useful, and that the system is really easy to use. He has been able to train others easily and confidently as the software is so accessible. He believes that the implementation is going to reduce the need for paper in the laboratory dramatically as it is no longer necessary to print out and annotate images. He also expects that, by capturing so many images, it will be great for quality control and errors will be eliminated.

Tracking and training

The MacroPATH pro-x is also used as a QA tool for tracking tissue cassette baskets. Caroline said: "We have always photographed cassette baskets prior to tissue processing as it is a simple way

to keep a full chain of custody of specimens and track which tissue processor specimens have been loaded. The MacroPATH pro-x allows us to do this more quickly and safely, as we are able to capture the images at the downdraught bench and save images straight to the network.

"In recent years, we have seen the development and implementation of a training programme for biomedical scientists in specimen dissection. Guidelines from the IBMS and The Royal College of Pathologists on *Principles of Good Practice for Biomedical Scientist Involvement in Histopathological Dissection*, strongly recommends the use of digital imaging systems. This is because they advise recording images of the intact specimen and following dissection to record the sites from which blocks have been taken. These images will also provide information on the



A case of Barrett's oesophagus showing the system's ability to annotate images.

orientation and relationships of abnormalities in the specimen, which will inform the histopathologist reporting the microscopic features.”

Advanced practice

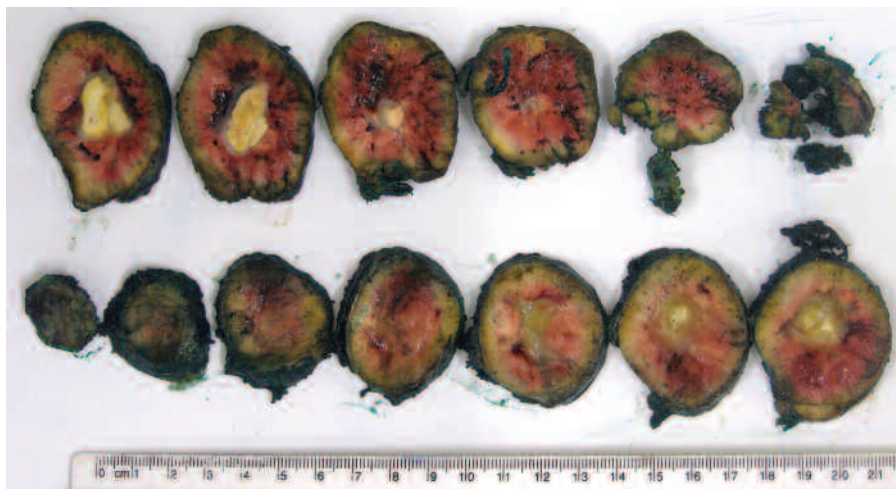
Several of the advanced biomedical scientist staff in the laboratory are finding the MacroPATH pro-x fantastic for providing evidence in their portfolios. Della Thomas, Danielle McCluskey and Anna McEwen find they are taking photographs that previously they would not have taken, owing to time constraints involved in the old process. They find the images extremely easy to annotate and it is possible to save multiple images, which is perfect for case reviews and also allows the biomedical scientists and trainee doctors to build upon their portfolios of interesting cases. Furthermore, they each reported that the images are of excellent quality for publication purposes, projects as well as for meetings and presentations.

Although the laboratory is not specifically working towards any guideline in photographing specimens at cut-up, it has always had an internal policy of photographing all loop biopsies and cone biopsies. The MacroPATH pro-x has made this process far easier.

Revolution and resolution

Consultant pathologist Dr Nic Mapstone said: “The MacroPATH pro-x has truly revolutionised the way I perform cut-up. I take so many more photographs than previously as it is just so easy and it doesn’t add delays in the cut-up process; in fact, it saves so much time. Also, the image quality is excellent.”

The MacroPATH pro-x differs from the previous generations of MacroPATH by having a fixed stand and cut-up board.



Record of the dissection of an adrenal gland containing a paraganglioma.

This has removed the need to calibrate the system before each use as the distance between the camera and cut-up board is fixed. Therefore, a digital image can be captured immediately regardless of whether or not it was initially thought that a photograph would be necessary. The sharing of images over the network permits images to be viewed remotely and also for images to be viewed easily during multidisciplinary team (MDT) meetings.

The images are saved in JPEG format and uploaded automatically to the trust server; therefore no separate storage is required. If necessary, however, it is possible to store the images simultaneously in up to three locations. The saved image of the gross sample is proving invaluable to the histopathologist reporting on a case, especially if the initial cut-up has been performed by an advanced biomedical scientist. Moreover, this allows the pathologists a greater level of confidence in allowing advanced

biomedical scientist staff to perform a larger number of cases at cut-up. Consultant histopathologist Dr James Bolton commented: “The system gives me immediate access to all images on the shared drive and I find the software extremely user friendly. I am particularly impressed by how good the resolution is compared to any other systems available.”

Positive impact

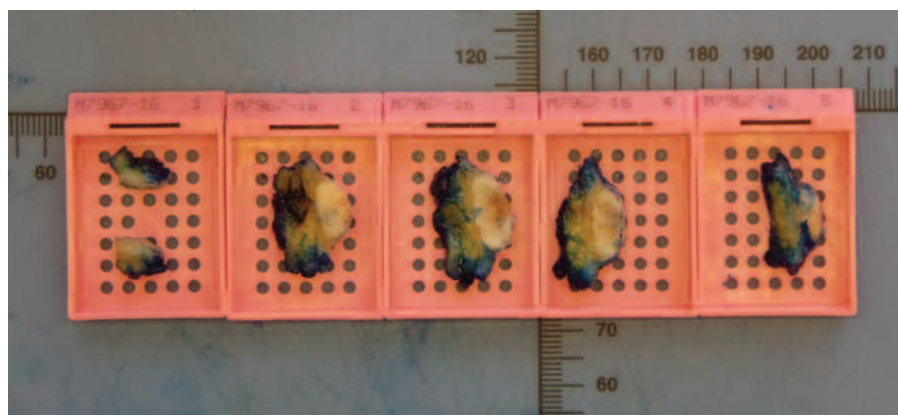
Manchester Royal Infirmary is a teaching hospital with many trainees passing through its doors. Consultant histopathologist Professor Ray McMahon can see a huge benefit for the MacroPATH pro-x in this area as he commented: “This is an excellent tool for teaching junior staff to take appropriate photographs of specimens and has certainly had a very positive impact in our laboratory. I have found I am much more likely to photograph specimens now as it is just so easy to use and is always at the cut-up bench.” He went on to highlight other benefits of the system: “It is fantastic to be able to take images back to surgeons to show if resection margins are correct. I can also foresee a huge benefit for any future medico-legal requirements.”

One aspect of the system that the laboratory is not currently utilising but is considering for the future is the video capability. It is believed that this will allow for the creation of visual standard operating procedures (SOPs) for more difficult or unusual cases. In addition, it plans to use the video function as a method of storing evidence required for training portfolios, as each user can have a unique file that is date- and time-stamped with a record of their work.

Caroline concluded: “Overall, we are extremely happy with our choice of MacroPATH pro-x. We have found the service team at Menarini to be extremely helpful and friendly and are very happy with the support received.”

PIP

‘Images provide information on the orientation and relationships of abnormalities in the specimen, which inform the histopathologist reporting microscopic features’



Cassettes containing blocks from a squamous skin carcinoma prior to automated tissue processing.