From Validation to Practice: Transforming Pathology with Aperio Solutions

Using Digital Pathology for Frozen Section Intraoperative Consultation in an NHS Multi-Hospital Trust

INTRODUCTION

Pathology Departments today are faced with many challenges in regards to effectively handling their workflow. More pathologists and technologists are retiring, while demand for specialist pathologists is increasing. Hospital laboratories are being forced to consolidate services and are seeking tools that can help them effectively provide more services without impacting on patient treatment.

CASE STUDY

The Royal Brompton & Harefield NHS Foundation Trust is the largest specialist heart and lung centre in the UK, pioneering techniques for the treatment of cardiothoracic disease. The two Trust sites, Royal Brompton Hospital in Chelsea and Harefield Hospital near Uxbridge are located in London, approximately 20 miles apart.

THE CHALLENGE

Following the retirement of a consultant histopathologist, the service needed to be reconfigured to a single, central site and a partner site, with the partner site staffed no more than 1-2 days a week. However, thoracic surgery occurs on a daily basis on partner site, with a constant need for intraoperative reporting by frozen section. The decision was made to introduce an Aperio ePathology scanner and software solution to address this situation. The system was installed at Harefield Hospital, and was validated for use of remote review and reporting on intraoperative frozen section samples. Following the successful validation period, the system was put into live practice, and agreement with traditional glass slide review was subsequently assessed over a period of 10 months.
DIGITAL PATHOLOGY INCREASES EFFICIENCY

“We have been using the Aperio ePathology Leica Biosystems system for over four years, both in relation to education and for the past year in relation to providing a frozen section reporting service.

I have found the system user friendly and it more importantly has allowed us to increase the efficiency in our department.”

Professor Andrew G. Nicholson

100% CONCORDANCE WITH GLASS

In the initial validation study, 98% concordance was found between manual diagnosis and remote digital review of the frozen section. The single minor discrepancy was not related to use of digital techniques.

In subsequent, daily practice over 10 months, assessment of glass versus remote viewing, digital read showed 100% agreement between the methods.

VALIDATION METHODOLOGY:

Biomedical scientists were first trained to undertake cut-up and sampling of specimens for frozen sections, the live system supplemented by remote supervision from a histopathologist via live streaming video. Frozen section slides were scanned at 20x magnification and relevant data entered to the software. All hardware was tested at the beginning of every day to ensure functionality and the on-call consultant histopathologist was informed by telephone when a frozen section was submitted to the laboratory. After scanning, the consultant reviewed the case remotely through the Aperio ePathology software, and then phoned through the result to the surgeon on the remote site. The consultant could also request an additional 40x scan, although this was rarely undertaken.

During the validation period, a pathologist was present at Harefield Hospital for all intraoperative frozen sections to confirm the diagnosis via glass slides, in keeping with guidance produced by the Royal College of Pathologists. The study found 98% concordance between manual and digital read of the frozen section cases, with the single non-concordance being due to a discrepancy in knowledge of patient history between the two pathologists, and unrelated to use of digital pathology. The validation data was presented to the Hospital Clinical Practice Committee, and approval was granted to use Aperio ePathology solutions for intraoperative frozen section reporting.

ASSESSMENT IN ROUTINE PRACTICE:

After completing the validation process, the Trust implemented digital pathology in routine practice. Over the first 10 months of practice, 101 intraoperative samples from 70 patients were reported using digital pathology and, when compared with review of the glass slides, 100% concordance was found.

The digitally reviewed samples were also compared against 207 frozen section specimens reviewed traditionally at the Royal Brompton Hospital. Accuracy of diagnosis between frozen sections and subsequent paraffin sections was assessed, and time from sample submission to final report was measured. Both the digital and manual read frozen sections showed similar accuracy compared with paraffin, and similar rates of deferral of diagnosis to paraffin.

During the assessment period, remote reporting took an average of 9 minutes longer, which was believed to be in part, due to logistical issues such as cut-up of specimens by biomedical scientists with remote supervision by a pathologist. While remote review introduced a degree of delay to the process, this was found to be within acceptable operative limits for single frozen sections, and work is ongoing to reduce this time difference. For example, it is expected that selection of samples by surgeons before sending to the laboratory would reduce this discrepancy.
**FUTURE AND CONCLUSION:**

The ability to report frozen sections remotely has allowed successful centralization of the pathology service in this specialist setting, with the particular benefit of no longer having a single isolated pathologist responsible for sporadic, on-site reporting, reduced travel time between sites, and increasing overall efficiency of the Trust histopathology service.

Following their success using Aperio ePathology for intraoperative consultation, the Trust Histopathology Department is working to expand use of the solution for consultation on difficult cases, both between the two hospitals and with other institutions. This removes the cost, risk and delay of shipping glass slides. The system has also been used for specialist pathology training workshops, allowing multiple people to access teaching slides simultaneously.

**REMOTE REPORTING IN 90 SECONDS**

During validation, average time for a 20x scan was 4 minutes, and average time from scan completion to final report was approximately 90 seconds.

Logistical issues associated with remote review added a delay to the process, but this was found to be within acceptable operative limits.

**NO INTERRUPTION TO PATHOLOGY SERVICES**

With Aperio ePathology, the Trust pathology service was reconfigured to a more centralized service, whilst retaining the ability to perform intraoperative frozen section consultations when the satellite site was not staffed by a histopathologist.

Aperio ePathology provides the Royal Brompton & Harefield NHS Foundation Trust with a solution to maintain their pathology services remotely. Implementation of digital pathology has allowed them to solve staffing issues and increase efficiency, without impacting standards of patient care.
Dr. Alexandra Rice

Dr. Alexandra Rice is a thoracic pathologist with over 15 years’ experience in surgical pathology. Her areas of expertise include lung cancer, neo-plastic lung disease, and heart and lung transplantation pathology.

Dr. Rice regularly lectures on all aspects of lung pathology at undergraduate and postgraduate level. She has co-authored a variety of papers, review articles and chapters on lung pathology. She is a member of the pathology council of the International Society for Heart & Lung Transplantation.

Pratibha Shah

Pratibha Shah BSc, MSc, CSci, MIBMS is a senior biomedical scientist at the Trust, with responsibility for running the digital system cross-site.

Prof. Andrew G. Nicholson

Prof. Andrew Nicholson is a consultant histopathologist specialising in thoracic pathology, and honorary professor of respiratory pathology, National Heart and Lung Institute, Imperial College, London.

He has particular expertise in thoracic pathology (lung and mediastinum) and conducts research into lung cancer and interstitial lung disease in particular. He sees around 300 referrals from clinicians and other pathologists, nationally and internationally, each year.

Prof. Nicholson has co-authored over 300 peer-reviewed publications, and lectures regularly at regional, national and international levels.