Supporting Frozen Section Consultation through Tele-Pathology – Importance of Workflow Optimisation and IT integration

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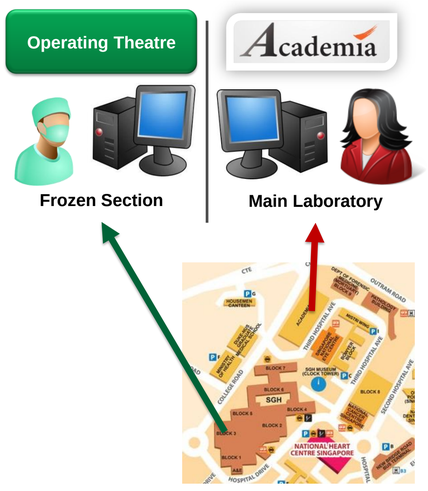
Introduction

Intraoperative frozen section (FS) diagnosis on tissue sample is performed to provide rapid histological opinions which may affect treatment decisions during surgery. During FS, the sole pathologist in the FS laboratory, located a distance away from the main laboratory, may like to seek real-time second opinions from subspecialty colleagues located in the department. Digital pathology allows the production of whole slide images (WSI) which support remote consultation and collaboration through tele-pathology.



❖ Frozen section (FS) laboratory is located remotely within the campus from the main laboratory i.e 15 to 20 minutes away

❖ Sole pathologist in the FS laboratory may like to seek real-time second opinions from subspecialty colleagues located in the main laboratory in the Academia building

Aim

❖ Integrate digital pathology solution (DPS) with the laboratory information system (LIS)

❖ Optimize workflow in the FS operating theatre (FS-OT)

Methodology

Old Workflow at SGH FS-OT

Specimen arrived in SGH FS-OT
↓
Check that patient's particulars and specimen tally
↓
Manually assign FS number (different from final accession number) to forms and specimens
↓
Gross description and trimming
↓
Freeze and label specimen, then proceed to cryosectioning where slides are manually labelled
↓
Stain and mount FS slides
↓
Reporting by FS pathologist
↓
Return to Histology Lab
-Assign a final "PB" accession number (different from the FS number indicated on the slides).
-Receive additional /follow up surgical resection specimens to match with FS case and specimens

Figure 1: Case assignment with pre-printed labels in main laboratory

❖Pre-assignment of biopsy numbers in frozen section (using pre-printed labels) as practiced in main laboratory was not possible as both used the same prefixes (i.e. "PB")

❖Hence, upfront case accessioning of frozen section specimen into LIS was not possible

❖ Potential mismatch of FS slide and "PB" number

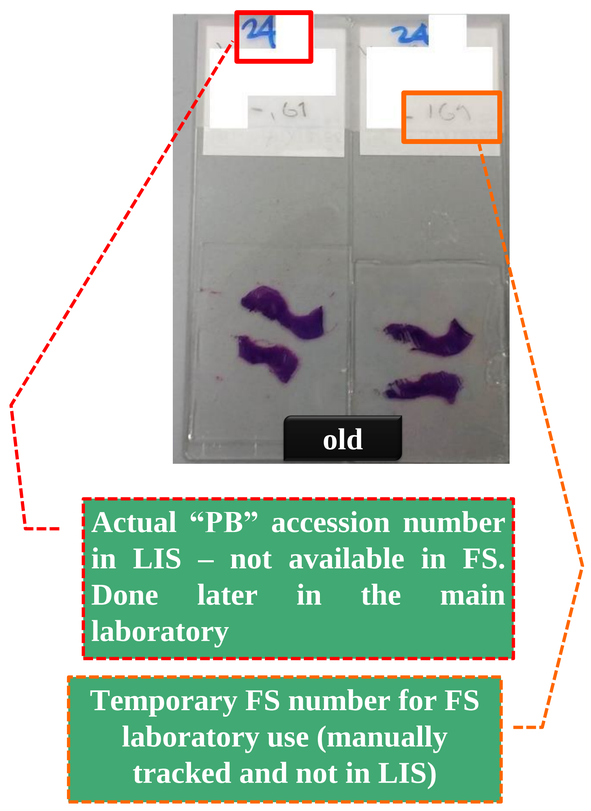


Figure 2: Assignment of final "PB" accession number (different from the FS number indicated on the slides).

Optimised Workflow at SGH FS-OT

Specimen arrived in SGH FS-OT
↓
Check that patient's particulars and specimen tally
↓
Assign final "PF" accession number (specific for FS cases) directly and affix labels on specimens and forms
↓
Gross description and trimming
↓
Freeze and label specimen, then proceed to cryosectioning where slides are manually labelled
↓
Stain and mount FS slides
↓
Reporting by FS pathologist
↓
Quick accessioning of case in LIS with final "PF" accession number, and label slide directly with 2D bar code generated from LIS
↓
Slide scanning for remote consultation if required
↓
Return to Histology Lab
-Receive additional /follow up surgical resection specimens accompanied by frozen report with "PF" number assigned

❖ For remote consultation between FS laboratory and main laboratory (e.g. subspecialty opinion), upfront accessioning of FS case is required

❖ After detailed study, it is strongly felt that case must exist in the LIS so that patient and case information is available to be used and clearly displayed with the slide within the WSI system (i.e. "case accountability").

❖ Solution: Introduction of a new prefix "PF" unique for frozen section cases that can be assigned directly in the FS laboratory

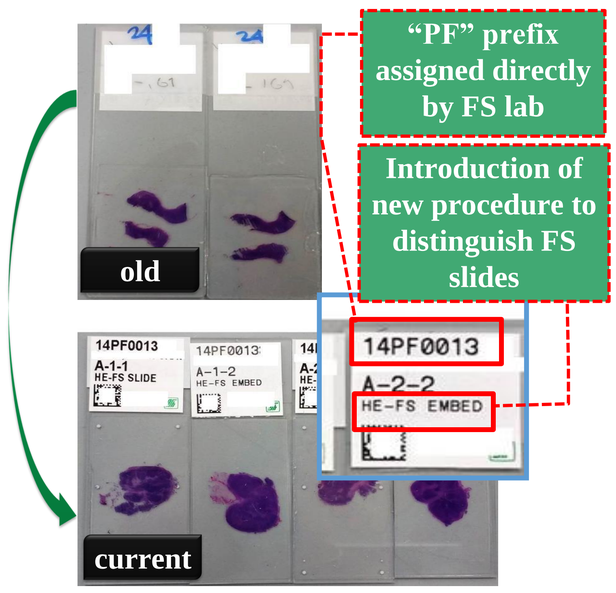


Figure 3: FS slides labelled directly with final "PF" accession number and 2D bar code generated from LIS

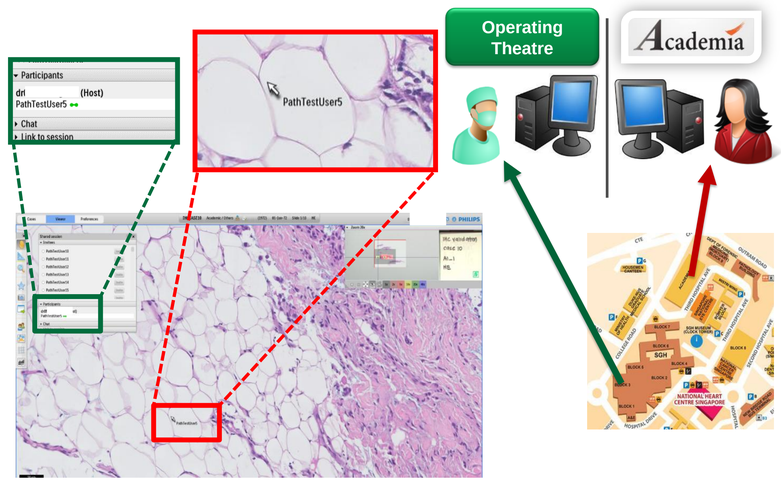


Figure 4 (on the left):
- After slide is accessioned, case information is passed from LIS to DPS.

- When the slide is scanned, the WSI is available for use and displayed with the patient and case information for safe identification.

- Real time collaboration with WSI is possible (as displayed in the diagram) and named arrow allows clear identification of user together with clear context of the histology slide shown as WSI.

Result

1) Rapid upfront case accessioning in LIS allows:
❖ Clear identification and accountability of FS slides
❖ Avoids subsequent confusion and potential mismatch of additional /follow up FS surgical resection specimens and slides
❖ Clear identification of FS cases maintaining the chain of specimen tracking during the diagnostic process
❖ Ease of tracking of FS workload
❖ Ease of retrieving FS cases for audit

2) Use of digital WSI for remote FS tele-consultation lowers the barrier for second opinion consultation

Conclusion

While digital WSI are used in many aspects of pathology research and education, application in daily clinical practice, including diagnostic tele-pathology, remains challenging. Pre-emptive workflow optimisations allowed smooth integration and implementation of DPS into FS practice that enables remote consultation to be made readily available for delivery of higher level patient care through tele-pathology.