A 2-step full digital pathology implementation in a multi-site academic pathology department: first lessons from the second step

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Abstract

Background
University Hospital of South-Paris is organized around 3 sites (Bièvres, Antoine-Béclère and Paul-Brousse) located on the south shore of Paris within a 15km perimeter. For better resources allocation, increased technical efficiency and savings, it was decided in 2013 to reunite the 3 Pathology Departments on a single site based in Bièvres Hospital. The department includes 12 pathologists, 3 residents and 21 technicians for 30,000 cases annually.

We will discuss how digital pathology has allowed the reorganization of pathology activities within the 3 sites. This presentation covers the key issues that must be addressed to make it possible, such as technical requirements, workflow restructuring, storage strategy, management adaptation, training and staff participation. The perspectives towards full DP adoption and IA in the service will also be explored.

Methods
The 1st step: Digital Pathology (DP) was prioritized from the beginning as a tool allowing remote frozen sections and enabling multi-site staff and Tumor Boards. Since July 2013, remote frozen sections using digital slide technology have been implemented with Aperio Scanner (Leica) and CaloPix IMS (TRIBVN Healthcare). This initial step proves to be a success both in terms of efficiency for the lab as well as in terms of physicians’ acceptance.

The 2nd step: In March 2018, all staff was regrouped in one brand new facility at Bièvres Hospital. High throughput scanners (3D Histech P250 & P1000) and pathologist’s digital workstations (CaloPix) were bought thanks to the financial support from ARS Idf. IT was completely replaced and LIS integration (Diamic CS, Dedalus) has been updated. It aims to create a full and modern digital pathology service.

Results
The use of digital pathology brought benefits for pre and post-analytic workflows in the service. They concern mainly the service organization, medical-time savings, easy access to cases and associated information and the sharing of cases. Different issues have been encountered during the project, in particular technical ones. They concern the digital slides quality linked to slides’ preparation and scanning, but also post-scanning such as LIS/IMS interface, slides storage retention shortage and the global adaptation to the digital workflow.

Corrective actions have already been taken, mainly during the pre-analytic workflow. There are still opportunities for improvement in order to address the issues. The main opportunities include: scanner software, LIS/IMS interface and digitization of the whole workflow.

Conclusions
The use of digital pathology has proven to be effective for concerned staff. The service’s main improvements concern the pre-analytic workflow standardization and robustness. Its major perspective involves the development of artificial intelligence projects.

Background

12 pathologists
3 residents
21 technicians
30,000 cases annually

> Fluorescence slides digitized since June 2018
> 100% slides digitized since June 2019

Methods and material

> P1000 and P250 scanners from 3D Histech
> Aperio CS and 3D Histech Desk2 frozen sections scanners
> Lenovo ThinkStation P210 with 2 monitors for doctors’ workstation
> CaloPix IMS from TRIBVN Healthcare with LIS integration

CaloPix IMS

Results

Digital pathology benefits
> Better work organization (13% medical time gained)
> Precision in the measures
> Easy sharing of slides for meetings, staffs and medical networks
> No mistake in the slide/patient association
> Direct access to patient history with comparative view
> No fading of stains on fluorescence slides
> Easy structural reorganization of the service
> Second opinion teleconsultation
> Biomarkers quantification
> Image analysis algorithms for diagnostic support
> Residents strong enthusiasm
> Ideal for immunofluorescence and biopsies

Main issues encountered to be solved
> Blurred slides (4% of digitized slides)
> Slide QR Code detection error (11% of digitized slides)
> Tissue detection error
> Scanner software not adapted to mass digitization
> Insufficient LIS/IMS interface (data mapping, high-throughput support)
> Double workflow (digital and physical slides)
> Insufficient non-medical staff to handle digitization step
> Partial MD adoption
> Project management insufficient

Perspectives for the service
> Resolve interface problems
> Workflow improvement (slides scanning storage, communication within the technical workflow, report)
> Engineering and technical staff adaptation to the new digital workflow
> Artificial intelligence projects development
> Add a scanner to smooth the workflow
> Bigger servers for storage
> Pre-analytic equipment improvement (X-Press, Prisma stainer)

Artificial intelligence algorithms bring new perspectives in terms of down timing time-consuming tasks for pathologists as well as for diagnostic support. They will impact the sorting of samples and help to identify and grade pathologies. The service is involved in the following projects: small fibre neuropathy (Quantmetry), prostate cancer (Context vision), breast cancer (Keelab), Dysplasia on digestive biopsies (TRIBVN Healthcare), Smart Imaging (pathomics/radiomics).

We believe this experience is useful for all pathology services toward their digital pathology adoption.