Validation of Histology Tissue Processing and Stain Quality of Logos Rapid-Cycle Microwave Processor in Lean Continuous Flow Operations

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Background
Pathology report timeliness can be enhanced by technology that reduces time waste in histology. The largest delay is overnight fixation and prolonged processor times. These throughput bottlenecks can be targeted by integrating tissue processors capable of rapid-cycle times especially when aligned with continuous flow Lean work design.

Design
Evaluation of a rapid-cycle microwave processor (Logos, Milestone Medical, Kalamazoo, MI) was performed at Henry Ford Hospital Histology Core Laboratory with aims to 1) integration of processor into continuous flow work process; 2) compare specimen quality in split samples processed by conventional overnight processors and the rapid-cycle instrument. We assessed technical quality of block processing, slide cutting and H+E staining by histotechnologists and quality of H+E, special and immunohistochemical stains by pathologists with a standard input form. 238 specimens were dissected fresh and split by 2 PAs. 3 part scheme with free text comments was used for histology assessment (High, Average, Low Quality) and pathologists’ microscopic evaluation (Acceptable, Inferior, Unacceptable for Diagnosis). Analysis was stratified by tissue type and processed thickness.

Validation & Quality Assessment Input Form

Grosser’s Evaluation:
Date: ___________________ Case Number: ____________ Tissue Type: ____________ Case Block No: ____________
Tissue Thickness: 1mm ____________________ 2mm ____________________ 3mm ____________________

Histology Evaluation: Scale: High Quality = 1 Average Quality = 2 Low Quality = 3
Conventional Processor - Block processing & cutting Quality: _______________________
LOGOS Processor - Block processing & cutting Quality: _______________________

Pathologist’s Microscopic Evaluation for Diagnosis:
ACCEPTABLE Quality = 1 INFERIOR Quality = 2 UNACCEPTABLE for DIAGNOSIS = 3
Conventional H&E Stain Quality: _______________________
LOGOS H&E Stain Quality: _______________________
Conventional Special Stain Quality: _______________________
LOGOS Special Stain Quality: _______________________
Conventional IHC Quality: _______________________
LOGOS IHC Quality: _______________________
Comments: ____________________________________________________________________________

Results

| Technical Comparison |
| Fresh tissue specimens | Tissue Thickness | Processor | Histology cutting quality | Stain quality | Microscopic quality |
| 19 Needle Bx | 1mm | conventional overnight | High Quality, no difference | H&E, SS | Excellent Quality, No difference |
| | 1mm | LOGOS Rapid Cycle | Average Quality with Logs & Conventional | H&E, SS | Excellent Quality, No difference |
| 28 Small Bx | 2mm | conventional overnight | Higher Quality with Logs (9 cases), Less dry or brittle (prostate, LN, fibroid, placenta) | H&E, SS | Excellent Quality, No difference |
| | 2mm | LOGOS Rapid Cycle | | IHC | |
| 161 Large specimens | 3mm | conventional overnight | | H&E, SS | Excellent Quality, No difference |
| | 3mm | LOGOS Rapid Cycle | | IHC | |

Results

| Processing Time Savings in Validation Study |
| Same day vs Overnight |
| 72% reduction |

Validated Special Stains & Immunostains
Iron, trichrome, reticulin, Grocott, calretinin, PAS, AFB, CK 5/6, 7, 19, CD10, 20, 34, 163, AE1/AE3, p63, H. pylori, TTF-1, CMV, HSV, Melan-A, S-100, Napsin-A, BCL 6

Conclusions
This study validates the technical, H+E and immunohistochemical stain quality obtained with a new rapid-cycle microwave processor over a range of tissue types and processed thicknesses. The abbreviated cycle time including fixation (1.25-3 hours) facilitates the Lean approach to continuous flow processing with continuous slide production. Used in this fashion, the instrument facilitates potentially shorter report turnaround times compared to conventional overnight processing.