A reproducibility study to evaluate the performance of a novel urine-based biomarker (CellDetect®) for the identification of urothelial cancer cells in voided urine

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Background: CellDetect® is a unique histochemical-stain enabling colour and morphological discrimination between benign and malignant cells. In a blinded study, we have shown the superior capability of CellDetect® to accurately identify low-grade urothelial cell carcinoma (UCC) in voided urine. The objective of the current study was to evaluate the reproducibility and performance of CellDetect® in the settings of a cytology laboratory.

Methods: Patients with history of UCC undergoing routine cystoscopic surveillance or TURT/cystectomy were enrolled in this study. Preserved voided urine samples were centrifuged twice and processed into two smears using a cytocentrifuge. Slides were stained automatically by CellDetect® or Papanicolaou stain, and observed by a cytopathologist who was blinded to the final diagnosis. The results were then compared to the gold standard (biopsy for positive cases and biopsy or cystoscopy for negative cases).

Results: A total of 73 urine smears, including 51 negative cases and 22 positive cases, were prepared. The sensitivity of CellDetect® was significantly higher than that of standard Papanicolaou staining (82% versus 59%, $p<0.05$) while the specificity was not significantly different (86% versus 94%). Notably, higher sensitivity was observed for both low grade tumours (73% versus 45%, n=11) and high grade tumours (91% versus 73%, n=11). When the patients were grouped according to disease stage, the advantage of the biomarker was also shown since higher sensitivity was observed for both early stage (71% versus 50%, n=14) and advanced stage tumours (100% versus 71%, n=7). Finally, CellDetect® was found to be useful in separating the undetermined category between benign and malignant lesions.

Conclusion: This study validates the usability of CellDetect® in clinical settings. Particularly, it confirms its ability to accurately identify UCC recurrence throughout all cancer grades and its usefulness in the ruling out of malignancy in undetermined atypia.

References

Yossepovich et al. European Urology Suppl 2016; 15(3):751
Davis et al. Journal of Urology 2014; 192:1628-1632