Comparison of circulating tumor cell capture efficiency of the CellCollector™ technology vs CellSearch® in prostate cancer patients at multiple time points

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Castration-resistant prostate cancer is the second most common cause of cancer-related death in men. Since most prostate cancer patients have a biopsy performed only at the time of diagnosis, representative tumor tissue samples giving real-time information about the disease status are generally missing. Therefore, the detection of circulating tumor cells (CTCs) in the blood of patients with castration-resistant prostate cancer might, in addition to their prognostic value, serve as a liquid biopsy, complementing or replacing prostate-specific antigen determination in predicting and monitoring the response to different therapies. However, capturing these rare cells from whole blood is still a major challenge that needs significant improvement. Here we present the results of a comparison study, in which we compared CellCollector™, a unique in vivo approach for the isolation of CTCs, with CellSearch®, the current standard.

The comparison study included 25 prostate cancer patients (15 with localized [PCa-l] and 10 with metastasized prostate cancer [PCa-m]) and 29 individuals in the control group (24 men with benign prostate hypertrophy and 5 women). At multiple time points of treatment, CTCs were enumerated (42 applications for PCa-l and 29 for PCa-m). CellCollector™, a medical wire coated with epithelial cell adhesion molecule antibodies, was inserted in the cubital vein and incubated for 30 min. The captured CTCs were identified by immunofluorescence staining using cytokeratin- and DAPI-positive as well as CD45-negative as criteria. For the CellSearch® measurements, a blood draw of 7.5 mL blood was performed. We found that in 77.5% (55/71) of applications, the cancer patient was positive for CTCs using CellCollector™ (PCa-l: 55.2% [16/29]; PCa-m: 88.1% [37/42]). In contrast, CellSearch® resulted in only 42.2% (30/71) in the detection of CTCs (PCa-l: 17.2% [5/29]; PCa-m: 61.9% [26/42]). The counting after application to benign prostate hypertrophy patients resulted in 20.8% (5/24) in low numbers of CTCs and 12.5% (3/24) regarding CellSearch®. Two women showed a very low number of cytokeratin-positive cells (1 and 3, respectively). In addition, we found a correlation of the CTC levels detected by CellCollector™ and CellSearch® with the prostate-specific antigen level during treatment. In summary, our comparison study shows an improved sensitivity of CellCollector™ compared with the current standard regarding the isolation of CTCs from prostate cancer patients, and gives new insights in the value of CTCs for monitoring prostate cancer treatment.
**INTRODUCTION**

- Representative tumor tissue samples giving real-time information about the disease status are often missing in castration-resistant prostate cancer.
- Circulating tumor cells (CTCs) in patients' blood might serve as a liquid biopsy, predicting and monitoring the response to different treatments.

**METHODS**

- The study included 25 prostate cancer patients (25 with localized and 10 with metastatic prostate cancer (PCa-l and PCa-m)) and 29 individuals in the control group (24 men with benign prostate hypertrophy [BPH] and 5 women) (Figure 2).
- At multiple time points of treatment, CTCs were enumerated and prostate-specific antigen (PSA) levels were determined.
- CellCollector™, a medical wire coated with EpCAM antibodies, was inserted in the cubital vein and incubated for 30 min.
- For the CellSearch® measurements, a blood draw of 7.5 mL blood was performed.
- The captured CTCs were identified by immunofluorescence staining using cytokeratin- and Hoechst-positive as well as CD45-negative as criteria.

**RESULTS**

- The detected CTC levels correlated with the PSA level.
- The study compared CellCollector™ with CellSearch® (Figure 4).
- The captured CTCs were identified by positive nuclear staining (Hoechst) (A), positive cytokeratin (B), negative CD45 staining (C), and overlay of all images, size, and morphological characteristics (D).

**CONCLUSIONS**

- This comparison study shows an improved sensitivity of CellCollector™ compared with the current standard regarding the isolation of CTCs from prostate cancer patients.
- The detected CTC levels correlated with the respective PSA levels.
- CTCs hold great promise as liquid biopsy for monitoring prostate cancer treatment.

**REFERENCE**


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