Circulating tumor cells isolated from non-small cell lung cancer patients using an effective in vivo technology, the GILUPI CellCollector®


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ABSTRACT

Background: Access to tumor tissue is often limiting and archival samples may not be reflective of the current disease. Alternative approaches using liquid biopsies are being explored to support personalized treatment of cancer patients. Circulating tumor cells (CTCs) detached from primary tumors or metastases into the blood may reflect the current molecular tumor profile, providing the opportunity to monitor molecular changes in the tumor. As CTCs are rare cells in the bloodstream and most metastases into the blood may reflect the current molecular tumor profile, providing the opportunity to monitor molecular changes in the tumor.

RESULTS

Figure 1. GILUPI CellCollector®: an in vivo circulating tumor cell isolation technology

Figure 2. Immunocytochemistry analysis. CTCs were captured in vivo from liquid biopsy samples of NSCLC patients using the GILUPI CellCollector®. The CTCs were identified and enumerated via positive EpCAM and/or cytokeratin expression and DAPI staining, negative CD45 staining (left); direct and immunocytochemical analysis. The CTCs analyses shown represent different NSCLC patient. The white bars are correspondingly set at 20 µm.

Figure 3. Immunocytochemical analysis. CTCs were isolated from non-small cell lung (NSCLC) patients using the GILUPI CellCollector®. This method allows the molecular analysis of captured CTCs for possible therapeutic targets and early response to treatment, which might be used in the setting of personalized cancer therapies and clinical development.

SUMMARY

- CTCs were efficiently captured in vivo from patients with NSCLC using the GILUPI CellCollector®, with an isolation rate of 74%.
- The successful isolation of CTCs was significantly more frequent with the GILUPI CellCollector® compared with CELLSEARCH®, which has a detection rate of 26%.
- Due to this high CTC detection rate, the GILUPI CellCollector® device may overcome current limitations in the enrichment of CTCs, especially during the early stages of the disease.
- The implementation of the GILUPI CellCollector® in clinical practice may improve early detection, prognosis and therapy monitoring of patients with lung cancer.
- In addition to CTC enumeration, this method allows the molecular analysis of the CTCs, enabling personalized treatment management.

Acknowledgments

Under the authors’ conceptual direction, editorial assistance was provided by The Prime Medical Group (Kievotek, UK), and was supported by Bayer HealthCare Pharmaceuticals.

*Presented at the American Association for Cancer Research Annual Meeting, 18–22 April 2015, Philadelphia, PA

102 stage I–IIIB non-small cell lung cancer (NSCLC) patients and 7 healthy individuals were screened for CTCs using the GILUPI CellCollector® (GILUPI GmbH, Germany). CTCs were detected in 76 out of 102 NSCLC patients (75%; median: 3 CTCs; range from 0–300). For comparison, using the U.S. Food and Drug Administration-cleared CELLSEARCH® system, only 26% of the samples in this cohort were positive for CTCs (median: 0 CTCs; range from 0–300). In most samples, the GILUPI CellCollector® detected the same or higher numbers of CTCs. Healthy individuals were devoid of any cells classified as CTC. Investigating the KRAS and EGFR status on CTCs captured by the GILUPI CellCollector®, we were able to detect the KRAS G12D and the EGFR H773R mutations that were earlier identified in the tissue of the primary lung tumor. This molecular analysis of a patient with known mutations confirmed the predictive value of CTCs as ‘liquid biopsy’.

Conclusions: The GILUPI CellCollector® is a promising novel device for the in vivo isolation of CTCs and the device effectively isolated CTCs from NSCLC patients of all stages, including the non-metastatic setting. The implementation of the GILUPI CellCollector® into clinical practice has the potential for early disease detection. Furthermore, this approach allows the molecular characterization of CTCs for possible therapeutic targets and early response to treatment, which might be used in the setting of personalized cancer therapies and clinical development.

Mann–Whitney test p<0.0001. The isolation rate for the 102 GILUPI CellCollector® applications was 74%. CTC, circulating tumor cell

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