THE ABILITY OF A FILTER-BASED ANTIBODY-INDEPENDENT APPROACH TO CAPTURE CIRCULATING TUMOUR CELLS FOR THE DIAGNOSIS OF LUNG CANCER

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Background

The ability to capture and characterise peripheral blood circulating tumour cells (CTCs) has the potential for the development of a blood test for cancer. A number of technological platforms are available to obtain CTCs including filtration-based devices utilising advances of antibody independent capture of cells. This technique shows promising results in experimental conditions; however, its performance has not yet been well evaluated in a clinical setting. We have evaluated diagnostic performance of filtration-based technology using cytomorphologic criteria in patients undergoing surgery for lung cancer.

Methods

From 06/03/2012 to 24/01/2013 we obtained and processed blood from 74 patients undergoing surgery for known or suspected lung cancer using ScreenCellTM Cyto devices. Captured cells were stained using H&E and independently assessed by two pathologists (AGN, AR) for the presence of atypical cells suspicious for cancer. Results were reported as confirmed cancer, suspicious or no evidence for cancer. Diagnostic performance was evaluated against the reference of cancer identified within surgically obtained specimens reported by a principal pathologist. Sensitivity and specificity analyses were undertaken. Inter-observer agreement was established by kappa-statistics.

Figure. The study pipeline
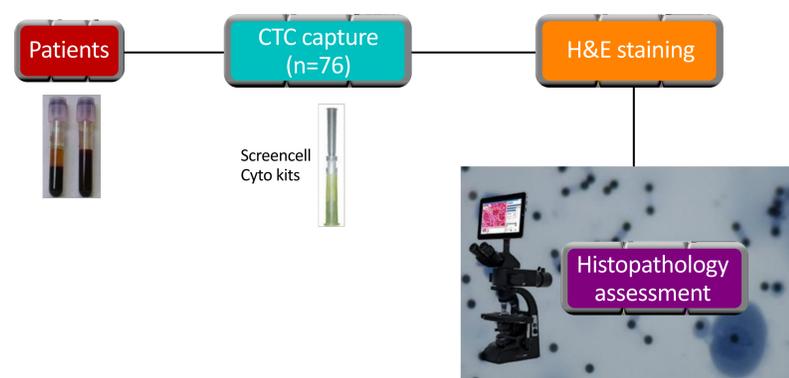
Results

According to histopathology assessment, 42 patients (56.7%) had primary lung cancer, 18 patients (24.3%) had metastatic cancer (predominantly of colorectal origin), and 14 patients (18.9%) had benign lung diseases.

The proportion of patients in which cells suspicious for cancer were identified was 39 (52.7%) and 42 (56.7%) as reported by two pathologists. Among those cases, 6 (15.4%) and 14 (33.3%) were reported as confirmatory. The agreement between the pathologists was 77% corresponding to a kappa-statistics of 53.7% indicating moderate agreement.

In metastatic cancer patients, suspicious cells were discovered in 10 (55.6%) and 9 (50%) cases by two pathologists. In non-cancer patients, suspicious cell were found in 6 (42.8%) and 5 (35.7%) cases by two pathologists, respectively.

The test performance for the diagnosis of cancer using cytomorphological criteria yielded poor-to-moderate sensitivity and specificity values, high positive predictive values and low negative predictive values (Table).

Table – The performance of the diagnosis of cancer using filter-based antibody-independent technique of CTCs trapping

Statistics	Pathologist 1	Pathologist 2
Sensitivity (95% CI), %	55.0 (41.6-67.9)	61.7 (48.2-73.9)
Specificity (95% CI), %	57.1 (28.9-82.3)	64.3 (35.1-87.2)
Positive Predictive Value (95% CI), %	84.6 (69.5-94.1)	88.1 (74.4-96.0)
Negative Predictive Value (95% CI), %	22.9 (10.4-40.1)	28.1 (13.7-46.7)

Conclusions

The results of our study highlight the potential of filter-based antibody-independent technology to develop an accurate blood test for the diagnosis of cancer in the peripheral blood. However, conventional cytomorphological criteria used for the diagnosis provide inadequate sensitivity and specificity. Improved performance with immunocytochemistry is still required prior to further clinical validation.