

A digital expression signature of circulating tumor cells to monitor prostate cancer

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Background: Circulating tumor cells (CTCs) in the bloodstream provide a noninvasive source of material to monitor the presence and composition of prostate cancer. The development of microfluidic CTC isolation technologies allows for the efficient, tumor epitope-independent isolation of CTCs with intact RNA.

Methods: By combining the microfluidic CTC-iChip with a digital assay for expression of multiple prostate-lineage-specific and cancer-specific RNA transcripts, we established a high throughput, quantitative, and highly specific assay for the detection of prostate cancer cells in the blood.

Results: Compared to immunofluorescence-based microscopic imaging, the digital-CTC assay showed increased sensitivity and specificity for the detection of CTCs. CTCs were detected in the majority of patients with metastatic prostate cancer, and a subset of cases with localized cancer. Individual cancer-specific and lineage-specific markers showed potential for predictive value in a cohort of patients with metastatic castration-resistant prostate cancer who were followed prospectively on first line therapy with abiraterone.

Conclusions: Combined with microfluidic CTC isolation, this high throughput, highly sensitive and specific quantitation of transcripts derived from CTCs that have invaded into the bloodstream enables noninvasive interrogation of critical cancer markers predictive of treatment success.

Conflict of Interest Statement: MGH has applied for patent protection for the CTC-iChip

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