Simultaneous quantification of activated immune cells and PD-L1 expressing circulating tumor cells (CTCs) in peripheral blood of cancer patients receiving checkpoint inhibitor therapy

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Background

• Expression of PD-L1 on tumor and tumor infiltrating lymphocytes has been associated with improved response to PD-1 and PD-L1 immune checkpoint inhibitors (ICI), however clinical utility is limited and tumor biopsies are not always available.
• Analysis of the peripheral immune cell subpopulations could aid in the prediction of response to immunotherapy, however current technology robust enough for a clinical setting utilizing flow cytometry suffers from low sensitivity and a lack of standardization.
• Epic’s Functional Cell Profiling (FCP) platform uses high-throughput microscopy to analyze all nucleated cells within a tube of blood in a robust and reproducible manner.
• Here we sought to characterize activated T-Cell subpopulations using FCP in patients receiving ICI therapy as a proof of concept with the overarching aim of developing better diagnostic tools for immunotherapies' response prediction and pharmacodynamics studies.

Methods

The Epic Sciences Functional Cell Profiling platform

1) SLIDE PREPARATION
2) CELL STAINING
3) SCANNING
4) SINGLE CELL DIGITAL PATHOLOGY

• Imaging and automatic phenotyping of every cell within a tube of blood
• Accurate identification of rare cell populations in a background of 10^9 other cells

CTC and Immune Cell Imaging

A. CTC staining

B. Immune cell staining

Cloud-based Epic Discovery Platform

• Epic Discovery Platform provides a new way to quantify leukocyte subpopulations by analyzing all cells and supports image storage, analysis, and provenance management.
• Cell Explorer links image-based features, cell location, and any relevant metadata for every cell on the slide.

Conclusions

• Epic’s Functional Cell Profiling (FCP) platform can simultaneously measure immune related biomarkers in CTCs and leukocytes at single cell resolution from a single blood sample.
• Archived samples can be banked for months to years after procurement enabling retrospective testing with multiple assays.
• The platform has extreme sensitivity and reproducibility over conventional methodologies - Cell sub-populations that exist in a background of 10^9 other cells are readily identified.
• Changes in immune cell sub-populations in patients receiving ICIs were observed across multiple cancer types including bladder, kidney, and prostate.
• Efforts to identify morphological subpopulations within each canonical leukocyte category and comparison of leukocyte and CTC biomarker panels to patient outcomes are ongoing in multiple trials.