A novel, automated approach providing standardized sample preparation for multiple Liquid Biopsy analyses

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Background & objectives

The pre-analytical phase of liquid biopsy for cancer detection is not standardized among different laboratories, being the cause of around 50% of analytical errors in diagnosis. The current clinical practice relies mostly on chemically stabilized blood samples shipped to clinical laboratories, posing the samples at risk of biological degradation or operators' manual errors in blood processing. Tethis presents See.d the pre-analytical platform for standardized and automated preparation of fresh blood samples at the point of blood collection for comprehensive analysis of biomarkers in cancer management.

Methods

Fresh whole blood samples collected in 10 mL K2EDTA tubes from 20 healthy donors (HD) were automatically processed by See.d; plasma was firstly collected in a vial, then the cellular fraction was gently lysed; white blood cells (WBC) fraction was finally resuspended in phosphate-buffered saline (PBS), allowed to spontaneously adhere on proprietary, nanocoated SBS slides, and fixed with paraformaldehyde. Plasma has been further analyzed for genomic contamination and cfDNA quality; WBC fraction on SBS slides was analyzed for different quality parameters and subjected to immunofluorescent staining with hematopoietic markers and DAPI as well as with Giemsa.

Results

From each 10 ml blood sample, 2.5 mL of plasma and 10 SBS slides containing a monolayer of WBC were obtained. See.d processed plasma allowed to extract a comparable quantity of cfDNA with the one extracted through a manual clinical protocol. Fragment-size analysis has shown negligible contamination of genomic DNA in all plasma samples. Their excellent quality was maintained even after submitting the samples to storage and shipment mimicking conditions. SBS slides contained around 2,5x10^6 cells each with homogenous distribution across the adhesion area. Giemsa and hematopoietic staining of WBC have shown intact cellular morphology of all blood cell types; moreover, slides conservation under the same conditions as tested for plasma samples, showed optimal cell morphology and staining quality

Conclusion

See.d automates and standardizes the preanalytical step of liquid biopsy for blood samples: cells on SBS slides and plasma are stable and can be shipped to analytical laboratories for multianalyte tests in liquid biopsy (CTC, cfDNA, WBC, etc…). We are currently performing studies for the certification of the platform according to IVDR regulations.