Liquid Biopsy for cancer diagnosis

Liquid biopsy for cancer diagnosis is a non-invasive medical test that analyzes biological fluids, typically blood, to detect the presence of cancer or provide information about a person's cancer status. This approach has gained significant attention and utility in oncology due to its potential to detect cancer at earlier stages, monitor treatment responses, and assess genetic mutations associated with cancer. Here are the key aspects of using liquid biopsy for cancer diagnosis:

Detection of Circulating Tumor Markers: Liquid biopsies primarily focus on detecting various circulating tumor markers or components in the bloodstream. These markers include:

Circulating Tumor Cells (CTCs): These are cancer cells that have broken away from the primary tumor and entered the bloodstream. Detecting and analyzing CTCs can provide insights into the presence of cancer, its metastatic potential, and its molecular characteristics. Cell-Free DNA (cfDNA): cfDNA consists of small fragments of DNA released by dying cells, including tumor cells. It may contain genetic mutations or alterations associated with cancer. Analyzing cfDNA allows for the identification of specific genetic changes in cancer cells. MicroRNA: Abnormal levels of specific microRNAs in the bloodstream can be indicative of cancer. MicroRNAs are small RNA molecules involved in gene regulation, and their dysregulation is associated with various cancers. Early Cancer Detection: Liquid biopsies have the potential to detect cancer at earlier stages when tumors are smaller and more treatable. This can lead to earlier intervention and improved treatment outcomes.

Monitoring Disease Progression: Liquid biopsies are valuable for monitoring cancer progression during and after treatment. They can assess how well a patient is responding to therapy, detect relapses or metastases, and provide information for treatment adjustments.

Identification of Genetic Mutations: Liquid biopsies can identify specific genetic mutations or alterations within cancer cells. This information is crucial for selecting targeted therapies and personalized treatment plans.

Non-Invasive Nature: Liquid biopsies are minimally invasive compared to traditional tissue biopsies, which require surgical procedures to obtain tissue samples. This makes them more acceptable to patients and reduces the risk of complications.

Challenges and Limitations: Liquid biopsies are not suitable for all cancer types, and their sensitivity and specificity can vary depending on the specific markers and technologies used. Factors such as tumor size and location can also impact their effectiveness.

Clinical Use: Liquid biopsies are increasingly integrated into cancer care and are used alongside other diagnostic methods, such as imaging and tissue biopsies, to provide a more comprehensive assessment of a patient's cancer status.

Research and Development: Ongoing research is focused on improving the accuracy and clinical utility of liquid biopsies. New technologies and markers are continuously being explored to enhance their diagnostic capabilities.

Liquid biopsy for cancer diagnosis represents a promising avenue for improving cancer care. It allows for earlier detection, more personalized treatment approaches, and minimizes the invasiveness associated with traditional biopsy procedures. As technology and research in this field continue to advance, liquid biopsies are expected to play an increasingly significant role in cancer diagnosis and management.

Despite being the second leading cause of death worldwide, many cancers do not have screening programs and many people with a high risk of developing cancer fail to follow the advised medical screening regime due to the nature of the available screening tests and other challenges with compliance. Moreover, many liquid biopsy strategies being developed for the early detection of cancer lack the sensitivity required to detect early-stage cancers. Early detection is key for improved quality of life, and survival, and to reduce the financial burden of cancer treatments which are greater at later stage detection. Connal et al. review the clinical utility of liquid biopsy technologies for the earlier detection of solid cancers, with a focus on how a combination of various spectroscopic and -omic methodologies may pave the way for more efficient cancer diagnostics [1)]

A high-risk tissue biopsy can be replaced by a liquid biopsy; however, the blood-brain barrier (BBB) prevents tumor-associated components from entering the peripheral blood, making the development of blood-based biomarkers challenging [2)].

Differentiating treatment necrosis from tumor recurrence poses a diagnostic conundrum for many clinicians in neuro-oncology. To investigate the potential role of circulating tumor cells (CTCs) detection in differentiating tumor recurrence and treatment necrosis in brain gliomas, Gao et al. retrospectively analyzed the data of 22 consecutive patients with tumor totally removed and new enhancing mass lesion(s) showed on MRI after initial radiotherapy. The 22 patients were finally classified into tumor recurrence group (n = 10) and treatment necrosis group (n = 12), according to evidence from the clinical course (n = 11) and histological confirmation (n = 11). All 22 patients received CTCs detection, and DSC-MRP and 11C-MET-PET were performed on 20 patients (90.9%) and 17 patients (77.3%) respectively. The data of the diagnosis efficacy to differentiate the two lesions by CTC detection, MPR and PET were analyzed by ROC analysis. The mean CTCs counts were significantly higher in the tumor recurrence group (6.10 ± 3.28) compared to the treatment necrosis group (1.08 ± 2.54, $p < 0.001$). The ROC curve showed that an optimized cell count threshold of 2 had 100% sensitivity and 91.2% specificity with AUC = 0.933 to declare tumor recurrence. The diagnostic efficacy of CTC detection was superior to rCBV of DSC-MRP and rSUVmax in MET-PET. Furthermore, they observed that CTCs detection could have a potential role in predicting tumor recurrence in one patient. The research results preliminarily showed the potential value of CTC detection in differentiating treatment necrosis from tumor recurrence in brain gliomas, and is worthy of further confirmation with large samples involved [3)].

Liquid biopsy-derived RNA sequencing

Liquid biopsy-derived RNA sequencing

Dxcover® Cancer Liquid Biopsy

Dxcover Cancer Liquid Biopsy

Liquid biopsy for glioblastoma diagnosis

Liquid biopsy for glioblastoma diagnosis

Liquid biopsy for Primary central nervous system lymphoma diagnosis

Liquid biopsy for Primary central nervous system lymphoma diagnosis.

Liquid biopsy for intracranial metastases diagnosis

see Liquid biopsy for intracranial metastases diagnosis.

Cerebrospinal Fluid Liquid Biopsy

Cerebrospinal Fluid Liquid Biopsy.

1)
Connal S, Cameron JM, Sala A, Brennan PM, Palmer DS, Palmer JD, Perlow H, Baker MJ. Liquid biopsies: the future of cancer early detection. J Transl Med. 2023 Feb 11;21(1):118. doi: 10.1186/s12967-023-03960-8. PMID: 36774504.
2)
Dobra G, Gyukity-Sebestyén E, Bukva M, Harmati M, Nagy V, Szabó Z, Pankotai T, Klekner Á, Buzás K. MMP-9 as Prognostic Marker for Brain Tumours: A Comparative Study on Serum-Derived Small Extracellular Vesicles. Cancers (Basel). 2023 Jan 24;15(3):712. doi: 10.3390/cancers15030712. PMID: 36765669.
3)
Gao F, Zhao W, Li M, Ren X, Jiang H, Cui Y, Lin S. Role of circulating tumor cell detection in differentiating tumor recurrence from treatment necrosis of brain gliomas. Biosci Trends. 2021 Apr 29. doi: 10.5582/bst.2021.01017. Epub ahead of print. PMID: 33952802.

From:
https://neurosurgerywiki.com/wiki/ - **Neurosurgery Wiki**

Permanent link:
https://neurosurgerywiki.com/wiki/doku.php?id=liquid_biopsy_for_cancer_diagnosis

Last update: **2024/06/07 02:59**