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Prova 1

1. Spiegare brevemente perché il liquido cerebrospinale (CSF) può essere preferibile al plasma nello studio dei tumori cerebrali

2. Per SPAM si intende:
   a) l'invio non richiesto di messaggi di posta elettronica con fini commerciali o offensivi
   b) un programma che permette di scrivere messaggi di posta elettronica
   c) una truffa bancaria on line

3. Leggere e tradurre il seguente testo

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REVIEW

Clinical utility of liquid biopsy in distinguishing true progression from radiation necrosis and pseudoprogression in malignant brain tumor

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Abstract

Background Distinguishing true tumor progression from pseudoprogression (PsP) and radiation necrosis (RN) following radiotherapy or radiosurgery for intracranial tumors remains a significant clinical challenge. Conventional imaging modalities, including MRI and PET, often lack sufficient diagnostic accuracy, while histopathological confirmation, although definitive, is invasive and not always feasible. Liquid biopsy (LB) has emerged as a promising noninvasive diagnostic approach.

Methods A systematic review was conducted across PubMed, Embase, Scopus, and Cochrane databases. A total of 964 records were identified, including PubMed ($n=322$), Embase ($n=280$), Scopus ($n=297$), and Cochrane ($n=65$), along with three clinical trials identified from trial registers. After removal of 157 duplicates using Covidence, 807 studies were screened by title and abstract. Of these, 749 were excluded, and 58 articles underwent full-text review. Ultimately, 11 studies met the inclusion criteria and were included in the analysis.

Results A diverse range of LB-based biomarkers has been investigated, including immune cell-based markers (e.g., HLA-DR$^{neg/low}$ and VNN2^{+} CD14^{+} monocytic myeloid-derived suppressor cells), immune-related proteins (e.g., CXCL11 and MUC-16), circulating tumor cells, cell-free DNA, mitochondrial DNA, B1-SINE elements, microvesicles, and RNA analytes. Plasma was the most used biofluid, with limited evaluation of urine and cerebrospinal fluid. Analytical techniques varied widely, including flow cytometry, PCR-based assays, immunostaining-FISH, and multiplex protein platforms. Several biomarkers showed statistically significant differences among RN, PsP, and tumor recurrence; however, these findings were largely derived from small, heterogeneous cohorts with inconsistent reporting of diagnostic performance metrics. Composite indices, such as the DR–VNN2 index (DVI) and the Necrosis Prediction Index (NPI), showed potential for improving diagnostic differentiation.

Conclusions LB-based biomarkers show promise for differentiating RN and PsP from tumor recurrence; however, current evidence is limited by small sample sizes, methodological heterogeneity, and lack of standardized diagnostic criteria. Larger prospective studies and validation of composite biomarker models are required to establish their clinical utility.

Clinical trial number Not Applicable.

Keywords Liquid biopsy · Radiation necrosis · Pseudoprogression · True progression · Radiotherapy · Radiosurgery · Biomarkers · Glioma · Brain metastases

Norma Rosati 25/06/2026

Prova non eseguita

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Prova 2

1. Descrivere brevemente il concetto di biopsia liquida e indicare almeno due biomarcatori tumorali analizzabili

2. Per URL si intende una sequenza di caratteri che identifica:
   a) un componente del sistema operativo
   b) un linguaggio di programmazione
   c) univocamente l'indirizzo di una risorsa web

3. Leggere e tradurre il seguente testo

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RESEARCH

CSF ctDNA analysis guides molecular reclassification of diffuse glioma patients

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Abstract

Background There is a critical need for better strategies to diagnose and monitor patients with gliomas. Liquid biopsies are less invasive than tissue biopsies and are amenable to serial collection at multiple timepoints. However, the analysis of circulating tumor DNA (ctDNA) in cerebrospinal fluid (CSF) from patients with gliomas remains underutilized in clinical practice due to technical challenges.

Methods We collected CSF samples from 43 patients with various types of gliomas and evaluated ctDNA derived from CSF with a next generation sequencing (NGS) panel interrogating 600 cancer-related genes.

Results Total cell-free DNA (cfDNA) concentration obtained from CSF (0.4-5 mL) ranged from 0.09 to 60 ng/μL. Mutations were detected in 26/43 (60%) samples including 19/43 (44%) with single nucleotide variants (SNV), 11/43 (25%) with copy number variants (CNV), 8/43 (18.6%) with frameshifts and 1/43 with fusion (2.3%). Mutations were not identified in 17 CSF samples, and most of these samples (15/17; 88%) had suboptimal DNA input (<30 ng). We identified diagnostic alterations in CSF including mutations in *IDH1* (3/6 IDH-mutant gliomas), TERTp (7/29 glioblastomas), *EGFR* amplification (5/29 glioblastomas), and *H3-3A* (4/4 pediatric high-grade gliomas). Some of these mutations, in combination with other clinical parameters, allowed us to identify specific CNS tumor types based on the 2021 World Health Organization (WHO) classification of CNS tumors, resulting in the reclassification of 3 patients. Furthermore, we observed a significant association between the CSF-ctDNA detection and imaging features.

Conclusion This study highlights the potential clinical utility of CSF-ctDNA analysis for evaluating and reclassification of patients with gliomas.

Keywords Liquid biopsy · Next generation sequencing · Diffuse gliomas · Cerebrospinal fluid · Glioblastoma

SP

Nayme Rossi 25/06/2026

Prova estratta

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Prova 3

1. Indicare il ruolo del ctDNA nel monitoraggio della malattia oncologica

2. In Excel cosa è una "funzione"?
   a) un comando che ci permette di stampare
   b) un algoritmo di calcolo precostituito che ci permette di elaborare un calcolo complesso sui dati contenuti nelle celle
   c) un comando che ci permette di creare un grafico

3. Leggere e tradurre il seguente testo

nature > npj precision oncology > articles > article

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Molecular features unique to circulating tumor DNA enable the tumor-naïve liquid biopsy of glioblastoma

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Abstract

Glioblastoma is the most common and deadly brain cancer in adults. Although the disease disrupts the blood-brain barrier and exposes the tumor to the systemic circulation, using circulating cell-free DNA as a non-invasive biomarker for diagnosing glioblastoma remains elusive. The main obstacles are the confounding effects from artifactual variants in cell-free DNA caused by errors during next-generation sequencing and real variants in cell-free DNA originating from white blood cells that acquired somatic mutations during normal aging. Here, we developed and validated TrueR sequencing to overcome next-generation sequencing-related false positives in cell-free DNA. Subsequently, TrueR identified molecular features unique to tumor-derived cell-free DNA (i.e., circulating tumor DNA) that are detectable in blood during a tumor-naïve search. Specifically, variants associated with glioblastoma circulating tumor DNA were exclusively present in cell-free DNA (i.e., absent in white blood cell DNA) and showed gene-specific subclones. These features were uncommon in low-grade glioma, stroke, and age-related somatic mosaicism of white blood cells. We also detail a variant-agnostic method, demonstrating that copy number gains and losses in short cell-free DNA fragments (<90 bp) support the detection of glioblastoma. Finally, we present evidence that our findings extend beyond glioblastoma, supporting the broader advancement of the liquid biopsy.

Nome Rossi 25/06/2026

Prova non esatta

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