Use of Circulating Tumor DNA to Monitor Minimal Residual Disease Among Patients With Colorectal Cancer

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The emergence of molecular analysis approaches that use circulating tumor DNA (ctDNA) to measure minimal residual disease is shifting the management of colorectal cancer and many solid tumor cancers. Analysis of ctDNA has several advantages: It is less invasive than an open biopsy; serial testing can occur; it may be more representative of the whole tumor, including metastatic sites; and it can provide a quantitative analysis of tumor burden. Nurses can help educate the patient and family about ctDNA testing in cancer management, assist in collecting blood, monitor test results, participate in interprofessional collaboration of care, and advocate for coverage of testing.

AT A GLANCE

- Liquid biopsies using cell-free ctDNA have emerged as a valuable, less invasive diagnostic tool to manage cancer.
- Oncology nurses can help educate the patient and family about the value and purpose of including ctDNA and minimal residual disease measurement in the plan of care.
- Nurses can advocate for expanded insurance coverage and access to ctDNA as a prognostic biomarker.

KEYWORDS
colorectal cancer; ctDNA; circulating tumor DNA; minimal residual disease

DIGITAL OBJECT IDENTIFIER
10.1188/23.CJON.369-374

Standard-of-care therapies for solid tumors have largely been influenced by whole-exome sequencing molecular analysis to identify pathogenic variants from individual tumor specimens, which has facilitated precision medicine approaches to treatment. Liquid biopsies that use cell-free DNA obtained from plasma have emerged as a valuable and less invasive diagnostic tool used after the initial cancer diagnosis when tumor tissue is unavailable for molecular analysis (De Mattos-Arruda & Siravegna, 2021). Liquid biopsies are also used to differentiate the cancer diagnosis in settings where ambiguity exists (Corcoran & Chabner, 2018). Cell-free DNA is released into the bloodstream through apoptosis or necrosis and is referred to as circulating tumor DNA (ctDNA) in patients with cancer (Corcoran & Chabner, 2018).

In 2019, minimal residual disease (MRD), also known as molecular residual disease, assays using ctDNA technology became commercially available in the United States. The original liquid biopsy assays were tumor informed, meaning that they used an existing tissue sample to compare and identify associated ctDNA (Tie et al., 2019). More recently, innovative tumor-agnostic assays, which do not require matching tumor sequencing to detect ctDNA, have been developed. ctDNA can be detected in peripheral blood specimens and used as a biomarker in almost all solid tumors (Tie et al., 2019), and it has been extensively studied in colorectal cancer (CRC). This article provides an overview of the current clinical use of ctDNA MRD assays to inform treatment decisions for patients with CRC.

CRC

CRCs comprise about 8% of all new cancer cases, and they accounted for about 9% of all cancer deaths in 2022 (National Cancer Institute Surveillance, Epidemiology, and End Results Program, n.d.). Between 2012 and 2016, the incidence rates of CRC increased by 2.2% per year in individuals aged younger than 50 years and by 1% per year in those aged 50–64 years. However, during the same period, CRC incidence decreased 3.3% per year in adults aged 65 years or older (American Cancer Society, 2020). The escalating CRC death rate (1.3% per year), coupled with the fact that early-stage CRCs comprise more than half of newly diagnosed cases, indicates a need for more curative-focused treatment options. Identifying