Speckle Tracking Echocardiography for Early Identification of Chemotherapy-Induced Cardiotoxicity

Michael Anderson
Department of Cardio-Oncology, Mayo Clinic, USA

Advances in cancer therapy have significantly improved patient survival; however, many chemotherapeutic agents, particularly anthracyclines and HER2-targeted therapies, are associated with cardiotoxic effects that may compromise long-term cardiovascular health. Early identification of subclinical myocardial dysfunction is essential to prevent irreversible cardiac damage and optimize patient outcomes. Speckle tracking echocardiography (STE) has emerged as a highly sensitive and reproducible imaging technique for detecting subtle myocardial abnormalities before reductions in left ventricular ejection fraction (LVEF) become clinically evident.

This prospective study enrolled 210 adult oncology patients receiving anthracycline-based chemotherapy at a tertiary cancer center. Comprehensive echocardiographic assessments, including conventional two-dimensional echocardiography and global longitudinal strain (GLS) analysis using STE, were performed at baseline, during chemotherapy, immediately after treatment completion, and at six-month follow-up. Clinical characteristics, cumulative chemotherapy dosage, cardiovascular risk factors, and cardiac biomarkers, including troponin and B-type natriuretic peptide (BNP), were also evaluated to determine their association with early myocardial injury.

Patients demonstrating early reductions in global longitudinal strain were significantly more likely to develop clinically relevant cardiac dysfunction during follow-up despite maintaining normal left ventricular ejection fraction in the initial stages of treatment. The combination of STE findings with elevated cardiac biomarkers improved the early detection of cardiotoxicity and enabled clinicians to identify high-risk patients before the onset of symptomatic heart failure. Early initiation of cardioprotective therapies, including angiotensin-converting enzyme inhibitors and beta-blockers, resulted in improved preservation of ventricular function and reduced progression to overt chemotherapy-induced cardiomyopathy.

The study findings highlight the clinical value of incorporating STE into routine cardio-oncology surveillance programs. Regular assessment of myocardial strain provides a reliable, non-invasive method for monitoring cardiac function throughout cancer treatment, facilitating personalized risk stratification and timely therapeutic intervention. Routine implementation of STE has the potential to improve cardiovascular outcomes, reduce treatment-related complications, and enhance the overall quality of life for patients undergoing potentially cardiotoxic cancer therapies.

Biography

Dr. Michael Anderson is a Cardio-Oncology Specialist at Mayo Clinic, USA. His research focuses on advanced cardiac imaging, chemotherapy-related cardiotoxicity, and preventive cardiovascular care for oncology patients. He has published extensively in international cardiovascular journals.