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CMR for Chemotherapy Induced Cardiomyopathy

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Cardiac MRI (CMR) plays a pivotal role in the diagnosis, treatment monitoring, and prognostic assessment of chemotherapy-induced cardiotoxicity (CTRCD). As the reference standard for noninvasive myocardial characterization, CMR provides precise quantification of ventricular volumes, ejection fraction, and myocardial mass—parameters essential for detecting early left ventricular (LV) dysfunction before symptomatic heart failure develops. Beyond function, CMR uniquely visualizes and quantifies tissue changes caused by anthracyclines, targeted agents, and other cardiotoxic therapies.

Quantitative mapping techniques such as native T1, T2, and extracellular volume (ECV) mapping enable detection of diffuse interstitial fibrosis, inflammation, and edema that precede changes in LVEF. Late gadolinium enhancement (LGE) identifies focal necrosis or replacement fibrosis, serving as an imaging biomarker of irreversible myocardial injury.

In treatment monitoring, serial CMR allows precise tracking of functional and tissue changes during or after chemotherapy, enabling timely treatment. A decline in myocardial strain or an increase in T1/T2/ECV values may indicate early, potentially reversible injury, whereas LGE positivity often predicts poor recovery of LV function. Combining strain imaging with mapping techniques enhances sensitivity for detecting subclinical toxicity compared to echocardiography alone.

For prognosis, elevated T2 or ECV values correlate with adverse remodeling, arrhythmias, and future heart failure events, making CMR a powerful predictor of long-term outcomes. Thus, CMR serves as a comprehensive tool—detecting early injury, guiding therapeutic decisions, monitoring recovery, and predicting prognosis—in the multidisciplinary management of chemotherapy-related cardiotoxicity.

In this lecture, I will review the latest guidelines in cardio-oncology, examine the role of CMR in chemotherapy-induced cardiotoxicity, and introduce ongoing research and its results