Left ventricular end-diastolic volume mediated declines in ejection fraction after potentially cardiotoxic cancer treatment

Giselle C Meléndez, MD,* Jennifer H Jordan, PhD, MS,* Ralph B D'Agostino, Jr, PhD,† and W. Gregory Hundley, MD*
From the Departments of Internal Medicine, Section on Cardiovascular Medicine* and Biostatistical Sciences† within the Wake Forest School of Medicine, Winston-Salem, North Carolina

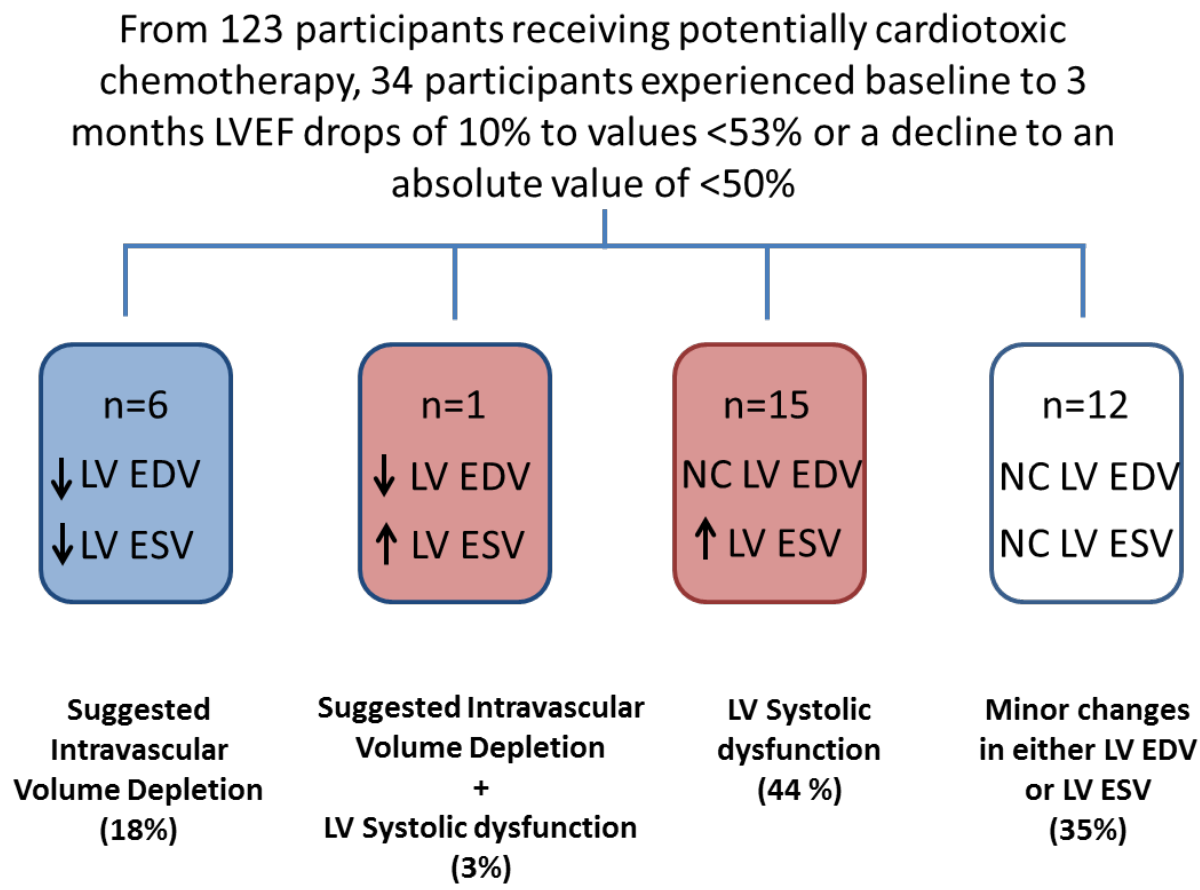
Background: Decreases in left ventricular (LV) ejection fraction (EF) are commonly used to monitor the presence of chemotherapy-related cardiotoxicity. It is often assumed that such declines are related to a decrease in overall LV contractility reflected as an increased end-systolic volume (ESV). We sought to determine the frequency by which decreases in LV end-diastolic volume (EDV) with and without increases in ESV impacted early cancer treatment-associated declines in LVEF.

Methods: One hundred twenty-three consecutively recruited individuals underwent blinded cardiovascular magnetic resonance imaging (CMR) measures of LV volumes and LVEF before and 3 months after initiating potentially cardiotoxic chemotherapy. LVEF drop was defined, according to previously published criteria, as a decline of more than 10% to LVEF values of <53% or a decline to an absolute value of <50%; cut points for significant LV volume changes were defined by the median volume change.

Results: Thirty-four participants (28%, aged 47 ± 15 years) dropped their LVEF, of whom 79% received anthracyclines and had cancer diagnoses of breast cancer (n=15), leukemia (n=6), lymphoma (n=11), renal cell carcinoma (n=1) or sarcoma (n=1). As shown in the Figure, 18% experienced LVEF drops due to declines in EDV and ESV that are more consistent with declines in intravascular volume; 44% experienced an increase in ESV that was associated with their LVEF decline and 3% experienced both a substantive decline in EDV and increase in ESV. The remainder of subjects with a decline in LVEF (n=12) experimented small changes in EDV or ESV.

Conclusions: A notable proportion of individuals experiencing deteriorations in LVEF 3 months after receipt of potentially cardiotoxic chemotherapy, do so due to a decline in EDV rather than an increase in ESV. Since reductions in intravascular volume (which could be treated by volume repletion) may account for EDV related declines in LVEF, these data indicate that LV volumes should be reviewed along with LVEF measures during noninvasive imaging when monitoring for cardiotoxicity.

Figure.



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