NEW 3D SPECKLE TRACKING ECHOCARDIOGRAPHY IDENTIFIES GLOBAL IMPAIRMENT OF LEFT VENTRICULAR MECHANICS WITH A HIGH SENSITIVITY IN CHILDHOOD CANCER SURVIVORS

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Authors: Hong-Kui Yu, Wei Yu, Ka-leung Cheuk, Godfrey CF Chan, Sophia J Wong, Yiu-fai Cheung, Department of Paediatrics and Adolescent Medicine, Queen Mary Hospital, The university of Hong Kong, Hong Kong, People’s Republic of China

Background: Cardiovascular disorders are important causes of late morbidity in childhood cancer survivors. This study assessed the usefulness of three-dimensional speckle tracking echocardiography (3D-STE) in the evaluation of global left ventricular (LV) myocardial performance in adolescent and adult survivors of childhood cancers.

Methods: 53 anthracycline-treated survivors of childhood cancers aged 18.6±5.1 years and 38 controls were studied. 3D-STE was performed to assess LV global and segmental 3D strain, time-to-peak segmental 3D strain, LV torsion, end-systolic and diastolic volumes, and ejection fraction (EF). LV systolic dyssynchrony index (SDI) was calculated as % of SD of times-to-peak strain of the 16 segments/RR interval. A global performance index (GPI) was calculated as (global 3D strain•torsion)/SDI. The area under the receiver operating characteristic curve (AUC) was calculated to determine capability of various echocardiographic indices to discriminate between patients and controls.

Results: Compared with controls, patients had significantly reduced LV global 3D strain (35.4±7.5% vs 44.6±7.8%, p<0.001), torsion (1.3±0.5º/cm vs 1.9±0.7º/cm, p<0.001), GPI (6.7±3.9 º/cm vs 20.2±10.6 º/cm, p<0.001) and greater SDI (7.8%±3.1% vs 4.9%±1.9%, p<0.001). All except the septal basal anterior segment in patients had reduced regional 3D strain compared with controls (all p<0.05). The mean LVEF was lower (55.6%±4.2% vs 60.1%±4.2%, p < 0.001), but within normal range, in patients than controls. Global 3D strain (r =-0.32, p =0.018), SDI(r =0.41, p =0.003) and GPI (r=-0.32, p=0.020) correlated with cumulative anthracycline dose. The AUCs of GPI, global 3D strain, SDI, torsion, and EF were 0.92, 0.79, 0.79, 0.79 and 0.78, respectively. The GPI cutoff of 10.6 º/cm had a sensitivity of 84.9% and a specificity of 81.6% of differentiating patients from controls.

Conclusions: 3D-STE enables the derivation of an index of LV global performance that incorporates LV 3D strain, dyssynchrony, and torsion for sensitive detection of altered LV mechanics in childhood cancer survivors.