From Studies to Clinical Practice: Screening for Anthracycline-Induced Cardiomyopathies with 2-dimensional Speckle-Tracking Derived Global Strain and Strain Rate – A Feasibility Study in Consecutive Outpatients

Spriestersbach H. (1), Schmitt B. (1), Berger F. (1,2), Schmitz L. (2)
Department of Congenital Heart Disease, Deutsches Herzzentrum Berlin, Germany (1); Department of Pediatric Cardiology, Charité - Universitaetsmedizin Berlin, Germany (2)

Introduction: Studies showed that 2-dimensional speckle-tracking derived strain and strain rate can detect left ventricular systolic dysfunction earlier than ejection fraction or fractional shortening (FS). This study aimed to evaluate the potential value of different strain and strain rate parameters for the follow-up of anthracycline-treated patients in daily clinical practice.
Methods: We included all anthracycline-treated patients who attended our outpatient unit in a one-year period for routine echocardiographic follow-up examination. An age and sex-matched healthy control group was established. Global longitudinal strain and strain rate (GSL, GSrL) were derived from the apical four-chamber (4CH) view, and global circumferential and average radial strain and strain rate (GSC, GSrC, AvSR, AvSrR) from a parasternal short axis (SAX) view. Global values were given directly by the software; radial averages were calculated by the observer. Intra- and inter-observer variations were measured in 40 randomly selected subjects by the Bland-Altman method, the coefficient of variation (CoV) and intraclass correlation coefficient (ICC).
Results: 131 patients and 66 control subjects were included. The feasibility of tracking the whole ventricular wall was better in the 4CH than in the SAX (76% vs. 62.4%). In only 48% it was possible to study both axes. Most often inadequate tracking occurred in the 4CH's apical-lateral (17%) and the SAX's lateral segment (29%). GSL, GSrL, GSC, GSrC and FS were significantly lower in patients than controls (-20.3 ±1.8% vs. -19.2 ±1.9%; -1.11 ±0.12/s vs. -1.02 ±0.16/s; -19.8 ±3.1% vs. -17.6 ±3.0%; -1.27 ±0.22/s vs. -1.13 ±0.20/s; 35.5 ±3.5% vs. 32.7 ±4.1% ($p<0.005$)). AvSR and AvSrR were not significantly lower in patients (51.2 ±13.1% vs. 46.2 ±14.1%; 1.94 ±0.33/s vs. 1.85 ±0.38/s ($p>0.05$)). Only GSC and GSrC showed significant results throughout in subgroup-analyses (gender, diagnosis and cumulative anthracycline dose). GSL showed the best intra- and interobserver reproducibility without bias, CoV <5% and ICC >0.90.
Conclusions: For clinical practice GSL and GSrL provide the best combination of feasibility, sensibility and reproducibility. However GSC and GSrC seem to be the most sensitive measurements in patients with suitable echocardiographic windows. AvSR and AvSrR showed several disadvantages and failed to detect a difference between patients and controls.