

Three-Dimensional Vectorcardiographic Characteristics of Breast Cancer Patients Treated with Chemotherapy

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Abstract

Background: Patients receiving chemotherapy for breast cancer (BC) may develop cardiac electrophysiological abnormalities. The aim of this study is to evaluate the deterioration of cardiac electrophysiological parameters detected by three-dimensional vectorcardiograms (3D-VCGs) in patients with BC received chemotherapy.

Methods: This is a prospective single-center cohort study conducted in Fourth Hospital of Hebei Medical University, China. Patients with BC referred for chemotherapy from May 1, 2019, to October 1, 2019 are invited to participate in the study. A 3D-VCG and echocardiography were recorded at rest four times (baseline, after the first cycle, after third cycles and at the end of the regimen, respectively).

Results: A total of 63 patients were studied. Compared with baseline, reduces in 3-dimensional maximum T vector magnitude (TVM) (0.29 ± 0.10 vs. 0.25 ± 0.10 mV; $p<0.05$) and 3-dimensional T/QRS ratio (0.26 ± 0.11 vs. 0.21 ± 0.11 ; $p<0.05$) were observed by the end of chemotherapy regimen, while echocardiographic parameters showed no significant variation during the whole procedure (all $P>0.05$). After completion of chemotherapy, maximum TVM were correlated with left ventricular ejection fraction (LVEF) (3-dimensional: $r=0.33$, $p<0.01$; front plane: $r=0.32$, $p=0.01$; horizontal plane: $r=0.27$, $p=0.03$; right side plane: $r=0.38$, $p<0.01$).

Furthermore, the cut-off value with 0.23 of 3-dimensional T/QRS ratio (sensitivity: 100%; specificity: 46%; the area under the curve [AUC] 0.725) for differentiating LVEF reduction $\geq 10\%$ after therapy from baseline. The AUC of the front plane T/QRS ratio and horizontal plane T/QRS ratio for the detection of an LVEF reduction $\geq 10\%$ was 0.725 (cut-off value: 0.30; sensitivity: 67%; specificity: 75%) and 0.763 (cut-off value: 0.31; sensitivity: 83%; specificity: 75%), respectively.

Conclusions: This study demonstrated that 3D-VCGs can be used to detect electrophysiological abnormalities in BC patients receiving chemotherapy. 3D-VCGs changes may reflect subclinical cardiac dysfunction before the echocardiographic abnormalities.