Myocardial work index: a novel tool for detection of early cardiotoxicity in breast cancer patient

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Introduction: Breast cancer patients receiving anthracyclines are particularly prone to develop cancer therapeutics-related cardiac dysfunction (CTRCD). Early detection of cardiotoxicity onset is required for optimal timing of cardio protection treatment. The latest guidelines consider a relative reduction of 15% in global longitudinal strain (GLS) from baseline as risk for cardiotoxicity. Nevertheless, the more recent Myocardial Work Index (MWI) offers a load-independent tool for detection of subclinical heart failure (HF). Data in cancer patients are still scarce.

Purpose: This study analyses the predictive value of MWI for cardiotoxicity diagnosis after 6 months chemotherapy.

Methods: The study population consists of breast cancer patients referred for chemotherapy with anthracyclines and taxanes. Patients with a history of HF previous to chemotherapy or depressed LV function at baseline were excluded. Echocardiography was performed before onset of the chemotherapy (baseline) and after 6 months follow-up. LVEF, GLS and MWI were assessed offline using EchoPAC software. The values at baseline and 6 months follow-up were pairwise compared to detect subclinical cardiac dysfunction. Mean LVEF, GLS and MWI at baseline were taken as cut-off value to compare the predictive value of each parameter. Moreover, patients were categorized in one group with GLS reduction >15% (Group 1) and one group with GLS reduction <15% (Group 2).

Results: From April 2016 to January 2020, 24 women with breast cancer were included (age 54 ± 11 years, LVEF 58 ± 4%, GLS -21 ± 2%, MWI 2181 ± 325 mmHg). All patients underwent the same standard chemotherapy protocol (4xEC, 12xTaxol). No difference in baseline characteristics between group 1 (n = 9) and group 2 (n = 15) was observed. At 6 months follow up a significant decrease in LVEF (53 ± 8%, p = 0.003), GLS (-19 ± 3%, p = 0.002) and MWI (1933 ± 410 mmHg, p = 0.005) was shown without any change in blood systolic pressure. However, while mean LVEF and GLS at baseline did not predict any significant change, patients with MWI under the mean value at baseline (n = 13) presented significant lower LVEF (49 ± 8%, p = 0.006), GLS (-18 ± 4%, p = 0.045), MWI (1753 ± 341 mmHg, p = 0.018) after 6 months. Additionally, both groups had similar MWI at baseline (2199 ± 390 mmHg vs 2170 ± 294 mmHg, p = 0.85), whereas those patients with GLS reduction >15% showed significant lower MWI after 6 months (1626 ± 344 mmHg vs 2116 ± 334 mmHg, p = 0.003, Figure 1).

Conclusions: At 6 months follow up, a decline of the LV systolic function as side effect of chemotherapy can be seen. In comparison to LVEF and GLS, MWI shows the best predictive value for development of early cardiotoxicity. Further studies are warranted to better understand the role of MWI in predicting CTRCD and its clinical relevance.

Abstract Figure. Change in MWI