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Letter to Editor

Regional Variation in Left Ventricular Longitudinal Peak Systolic Strain is a Predictor of the Early Stages of Subclinical Cardiotoxicity in Patients with Breast Cancer Undergoing Anthracycline Therapy

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ABSTRACT

Reduction in regional longitudinal systolic strain after chemotherapy has been reported in previous studies. Nonetheless, in pre-radiotherapy patients with breast cancer in our cardio-oncology department, we have noticed that left ventricular longitudinal strain is decreased earlier in the infero-posterior and infero-septal segments than in the other segments.

Keywords: Regional longitudinal strain; Global longitudinal strain; Ejection fraction; Cardiovascular imaging; Ventricular dysfunction

LETTER TO EDITOR

Cardiotoxicity is a major side effect of several antineoplastic agents, particularly anthracyclines and humanized monoclonal antibodies such as trastuzumab, which are used for breast cancer treatment, with an approximate incidence rate of 3% to 12% for anthracycline therapy alone and up to 28% when combined with trastuzumab [1]. Global Longitudinal Strain (GLS) is used in clinical practice for the early detection of changes in the myocardial contractile function. According to the American Society of Echocardiography and the European Association of Cardiovascular Imaging, myocardial deformity changes precede Left Ventricular (LV) dysfunction. A reduction of more than 15% in GLS, immediately after or during anthracycline treatment, is the most useful parameter to predict cardiotoxicity, while a reduction of less than 8% may exclude its diagnosis [2]. A key advantage of strain or strain rate measurement is its ability to differentiate between active and passive movements within a myocardial segment, allowing for the analysis of regional myocardial deformation independently of the translational motion of the heart [3].

Whereas some studies have reported significant reductions in regional longitudinal strain and radial systolic strain after chemotherapy more commonly in the LV septal and lateral walls [1-3], others have reported such reductions in the inferior regions [3-5].

A systematic review of 21 studies on 1504 patients reported that changes in GLS occurred early after the commencement of anthracycline therapy and preceded alterations in the Ejection Fraction (EF); nevertheless, not all the studies reported these results or the same indices as predictors. Changes in strain values appeared to be regional, although the segmental variation was inconsistent among the studies [3].

In a study by Stoodley et al., [5] a regional two-dimensional analysis of LV longitudinal strain showed significant reductions in all but mostly in the api colateral segment after chemotherapy. A regional analysis of radial strain revealed significantly reduced measurements in 3 of the 6 regions (i.e., the anteroseptal, septal, and inferior segments) following chemotherapy. However, a regional analysis of circumferential strain showed a significant reduction in the septal segment only. Stoodley and colleagues also observed variations in peak LV systolic strain between regions and also within regions; these variations were greatest in the radial plane and smallest in

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the circumferential plane, as was attested to by greater radial strain standard deviations [5,6].

Poterucha et al., [7] assessed adolescents on anthracycline therapy and found that changes in two-dimensional LV global longitudinal peak systolic strain preceded reductions in the EF segmental changes in the mid- and apical LV longitudinal peak systolic strain denoted an increased likelihood of a depressed LVEF later in follow-ups.

Still, none of the aforementioned studies reported a consistent pattern of regional wall motion abnormalities. The small size and heterogeneity of study populations in many investigations, different types of chemotherapy agents used, the impact of artifacts, and seemingly random variations in regional strain values as well as the known inter observer variations in regional wall motion assessments may have contributed to the inconsistencies in the findings.

The occurrence of visibly detectable regional wall motion abnormalities with strain study during cancer chemotherapy signifies significant myocardial injury and may be associated with a reduction in the LVEF. Management decisions based on such findings may improve patients' outcomes.

We recommend comprehensive large multimodality studies focused on a regional approach to demonstrate a possible relationship between a particular regional pattern of wall motion abnormalities and chemotherapy-induced cardiomyopathy [7,8].

CONCLUSION

We posit that regional reductions in longitudinal strain, particularly in the infero-posterior and infero-septal segments, tend to occur in the early stage of cardiotoxicity in patients with breast cancer before receiving radiotherapy and Herceptin. Indubitably, our hypothesis needs to be confirmed in further comprehensive studies; nonetheless, the recognition of the visibly detectable regional wall motion abnormalities during cancer chemotherapy may prove to be a useful way for monitoring chemotherapy-related cardiotoxicity.

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ETHICS APPROVAL

The manuscript does not contain clinical studies or patient data.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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