Abstract: P1567

Early detection of left ventricular dysfunction after breast cancer radiotherapy using speckle tracking echocardiography: association between cardiac exposure and myocardial strain changes (BACCARAT)

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Background: Breast radiotherapy (RT) can be associated with long-term, silent and lately detected (i.e 10–15 years after RT) cardiotoxicity. Early detection of left ventricular dysfunction, by assessing a decreased LVEF after RT, may be too late for treatment. Use of longitudinal strain (LS) as a more sensitive parameter of LV dysfunction has been suggested, but little is known on the impact of RT-induced cardiac exposure on LS.

Purpose: To analyze the relationship between cardiac exposure and myocardial LS changes after RT in breast cancer patients from the BACCARAT study.

Methods: BACCARAT is a monocentric prospective cohort study that included left or right unilateral breast cancer patients treated with RT without chemotherapy between 2015 and 2017. Each patient was included just before RT and is followed for 2 years with repeated cardiac imaging examinations, including 2-D speckle LS imaging for the detection of subclinical LV abnormalities with measurement of global LS. Individual dosimetric evaluation provided information on cardiac doses in particular for whole heart, left ventricle (LV), left anterior descending artery (LAD). For clinically meaningful purpose, the event “decreased global LS” was defined as ≥10% reduction, i.e. % change, in global LS compared to baseline.

Results: This analysis was based on 94 patients (15 right-sided BC, 79 left-sided BC) aged 58±8 years with a follow-up of 6 months post RT. Mean doses to the heart, LV and LAD were respectively: 3.0, 6.7 and 16.6 Gy for the left-sided patients; 0.6, 0.2 and 0.3 Gy for the right-sided patients. Considering BC laterality as a raw index of exposure, an altered global LS was observed for left-sided BC patients (−15.5±3.7% before RT vs. −14.1±4.0% at RT+6 months, p=0.02), but not for right-sided BC patients (−15.0±4.2% vs. −15.0±4.2%, p=0.99). Almost half of the population (48%) had “decreased global LS” (38% among right-sided patients, 50% among left sided patients). Considering cardiac doses for the whole population, both mean dose to the heart and LV were significantly associated with “decreased global LS”: OR/1Gy=1.4 95% CI [1.1–1.9] (p=0.02) and OR/1Gy=1.2 [1.1–1.3] (p=0.01) respectively, even after adjustment on age, arterial hypertension, body mass index and hypercholesterolemia. LV doses was the best predictor of “decreased global LS”, in particular the volume of LV in %, receiving at least 10 Gy (OR/1%=1.07 [1.02–1.12], p=0.007), with an optimal cut-off for prediction of 15% (OR/≥15% vs <15%=3.9 [1.6–9.9], p=0.0027).

Conclusion: This study is the first to establish a dose-response relationship between RT-induced cardiac doses and decreased global LS, 6 months after RT, illustrating the potential importance to reduce cardiac exposure in order to limit the risk of LV dysfunction. Longer follow-up until 2 years post RT will allow refining these results on the detection of subclinical LV dysfunction in patients treated for breast cancer.
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