Tissue characterization and myocardium strain by cardiac magnetic resonance imaging in the early detection of anthracycline cardiotoxicity

I.B.S.S. Costa[1], B.M. Leal[1], C.B.B.V. Cruz[1], A.V.B. Pavani[1], J. Pereira[1], V. Buccheri[1], C.S. Bittar[1], S.I. Rizk[1], D.R. Garcia[1], J.T. Fukushima[1], C.E. Negrao[2], R. Kalil Filho[2], C. Nomura[2], C.E. Rochitte[2], L.A. Hajjar[2]

[1]*Cancer Institute of University of Sao Paulo, Sao Paulo, Brazil;* [2]*Heart Institute of the University of Sao Paulo (InCor), Sao Paulo, Brazil*

Funding Acknowledgement: Type of funding source: Public Institution(s). Main funding source(s): Fundação de Apoio a pesquisa do estado de São Paulo - FAPESP

Background: Cardiotoxicity (CT) remains an important cause of morbidity and mortality in patients with lymphomas treated with anthracyclines. Current strategies for early detection of CT during chemotherapy are not yet fully established.

Purpose: To evaluate the performance of cardiac magnetic resonance with T1 mapping and myocardium strain by feature tracking during chemotherapy in detecting anthracycline CT in patients with lymphoma.

Methods: From June 2017 to March 2019, patients with lymphoma planned to start chemotherapy with anthracyclines were evaluated by a cardiologist to check the eligibility criteria. At baseline (Time 1), at the end of 3° cycle (Time 2) and 30 days after the final cycle (Time 3), patients were evaluated through cardiac biomarkers, electrocardiogram and cardiac magnetic resonance (CMR). Strain, MapT1 and extracellular volume (ECV) were evaluated in all patients. CT was defined as drop of the left ventricular fraction (LVEF) >10% or LVEF decrease below 50%. A p value <0.05 was considered statistically significant.

Result: We included 48 patients, mean age was 45.32 (± 17.84) years-old and 25 (52.1%) were female. The prevalence of hypertension, diabetes and dyslipidemia was 18.8%, 10.4% and 10.4%, respectively. CT was diagnosed in 13 patients (27%). At baseline, there was no difference between cardiotoxicity group (CTG) and no cardiotoxicity group (nCTG) in CMR diastolic volume, systolic volume, nativeT1 map and global longitudinal strain (GLS), respectively (116 [103.6–138.1]ml vs 136.3 [115.7–173.8], p=0.069), (46 [38.0–58.5] ml vs 63.0 [44.5–74.2, p=0.069), (1540.6 [1478.3–1591.1]ms vs 1514.8 [1487.5–1786.3]ms, p=0.568) and (–15.94±2.91% vs –14.84±2.65%, p=0.243). Regarding the others CMR parameters, we showed that comparing CTG patients with nCTG patients at Time 3, systolic volumes were higher (54.8 [45.0–67.0] ml vs 78.51 [53.9–96.3] ml, p=0.007), right ejection fraction was lower (53.41±9.73% vs 46.29±3.93%, p=0.002), LVEF was lower (58.7±5.69% vs 46.67±8.12%, p<0.001) and GLS and radial strain were also reduced (–13.92±1.76% vs –12.44±2.7%, p=0.043) and (22.9 [21.18–27.43]% vs 19.84 [17.12–21.73], p=0.017), respectively. We did not observe any difference between groups in the native T1 map between groups at Time 2 and 3 1537.75 (1493.76–1589.72)ms vs 1601.99 (1501.12–1673.44)ms (p 0.383) and 1538.43 (1479.03–1633.6)ms and 1612.85 (1522.74–1638.34) ms (p=0.289). Similarly, the ECV value was no difference between groups at Time 2 and 3 (25.17 [23.62–32.83]% vs 24.42 [22.75–27.47], p=0.281 and 27.5 [23.59 - 31,9]% vs 27.2 [23.84–28.47]%, p=0.529, respectively).

Conclusions: Cardiotoxicity is a frequent complication in anthracycline treated patients. CMR evaluation, through analysis of volumes, ejection fraction and strain might early identify these patients, allowing prevention strategies to be initiated to improve cardiovascular outcomes.