Control Number: 73

Abstract Category: Translational Science in Cardio-Oncology

Title: T1- and T2-Mapping for Early Detection of Myocardial Changes in Breast Cancer Patients: Longitudinal Assessment during Radiation Therapy

ABSTRACT BODY

Background

A large proportion of breast cancer patients who undergo external radiation therapy (RT) are at risk for unwanted cardiac irradiation. The purpose of this pilot study is to investigate whether magnetic resonance imaging relaxation times (T1 and T2) can be used for early detection of myocardial tissue changes related to cardiac irradiation in breast cancer patients treated with RT.

Methods

Ten patients (7 left-sided and 3 right-sided) underwent magnetic resonance imaging and echocardiography within one week before RT start, two to three weeks after RT start, one month and six months after RT was completed. Myocardial T1 and T2 relaxation times, left ventricular mass (LVM) and left ventricular ejection fraction (LVEF) were measured with MRI and global longitudinal strain (GLS) together with E/é ratio were measured with echocardiography.

Results

Significant changes in T1 and T2 relaxation times were found over time (Fig 1). The T1 relaxation time significantly increased between measurement 1 (before treatment start) and measurement 4 (six months after RT was completed). For T2, a significant decrease ($p < 0.05$) in relaxation time was found early, already after 3 weeks into radiation therapy. Measurements of left ventricular mass, global longitudinal strain and E/é ratio demonstrated a significant difference from before RT start to 6 months after RT was completed (Mean difference: LVM: 2.1 g; GLS: -3.0 %; E/é: 0.8) $p < 0.05$). No significant difference in left ventricular ejection fraction was found between these time points.

Conclusion

MRI relaxation times can be used to study early myocardial effects in breast cancer patients undergoing RT. In this relatively small patient cohort, significant changes were found from before radiation therapy start to six months after RT was completed. Findings indicate an increased T1, left ventricular mass and E/é ratio together with a decrease in GLS six months after radiation therapy, which may suggest an increased fibrotic component.

Clinical Implications

Monitoring effects of unintended irradiation of cardiac tissue may help detect markers of radiation-induced cardiac responses that enable the early identification of patients at risk that might benefit from preventive measures to reduce cardiovascular complications.

Image 1