Cardiac magnetic resonance using T1 mapping for assessment of late cancer therapeutics-related cardiotoxicity in childhood cancer survivors

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Funding Acknowledgement: Type of funding source: Public grant(s) – EU funding. Main funding source(s): Supported by the European Regional Development Fund - Project ENOCH (no. CZ.02.1.01/0.0/0.0/16_019/0000868)

Introduction: Due to cardiotoxic treatment, childhood cancer survivors (CCS) are at 15-fold increased risk of developing chronic heart failure and are at 7-fold higher risk of premature death due to cardiac causes compared with the general population. Cardiac magnetic resonance (CMR) has the potential to detect early cardiac involvement with consecutive possibilities of preventive steps against the development of advanced stages of heart failure. So far, only a few studies using T1mapping in CCS monitoring have been published.

Purpose: This study aimed to assess early cardiac involvement in a population of CCS using T1 mapping.

Methods: One hundred five CCS of age 24,9±5,4 years were included, mean time since the end of cancer-therapeutics treatment was 12,2±5,8 years. One hundred of them underwent complete CMR examination at 1,5T scanner. Cine images for assessment of left ventricular (LV) volumetric and functional parameters, pre- and post-contrast Modified Look-Locker Inversion recovery (MOLLI) images were acquired for assessment of native T1 relaxation time and extracellular volume (ECV), and delayed postcontrast images for evaluation of late gadolinium enhancement (LGE). The measured parameters were compared between CCS patients and 50 healthy controls.

Results: CCS patients had not enlarged LV (end-diastolic volume 128±30ml vs 124±30ml, p=NS) and normal, although lower systolic LV function than the controls – LV ejection fraction 59±6% vs 67±5% ($p<0,05$). In CCS group, only 3 (3%) patients had LV ejection fraction $<50\%$, four (4%) patients had regional LV hypokinesia, and small non-ischemic LGE was found in 4 (4%) patients. Mean native T1 relaxation time was not prolonged - 987±31 msec vs 986±24msec (p=NS), and mean ECV value was not increased – 24,6±5,3% vs 23,8±2,3% (p=NS).

Conclusion: In this study, the late cancer therapeutics-related cardiotoxicity was quite low. Native and postcontrast T1mapping did not show any significant subclinical myocardial involvement.