Evaluation of Myocardial T1 Mapping and Extracellular Volume (ECV) After Pediatric Heart Transplantation

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Objective: Cardiac magnetic resonance imaging (CMR) with T1 mapping has emerged for clinical use in adult populations. Altered longitudinal relaxation due to myocardial fibrosis can be quantified with increased native (non contrast) T1 and post contrast T1, allowing calculation of extra cellular volume (ECV). Few studies, though, have focused on pediatric populations and fewer on pediatric heart transplantation patients. This pilot study sought to characterize a pediatric heart transplant population by CMR.

Methods: Eleven pediatric heart transplant patients underwent CMR scans on a Siemens 3 Tesla Skyra scanner from September 2016 to July 2017 at Children's Hospital of Wisconsin. Short axis (SA) cine images were acquired and T1 basal, mid, and apical SA images were obtained before and 15 minutes post 0.2 mmol/kg gadodiamide, Gd). Cardiac volumetric data, T1 mapping (native and post contrast), and ECV were determined using Circle CVI 42 Cardiovascular Imaging software. Relationships were sought between these CMR data and treated rejection, transplant ischemic time, and duration of transplant.

Results: 3 females and 8 males (median age 14.5 years, range 8.9 – 19.3) were scanned with median of 9 years from transplant (range 6.2 – 17.8). 8 of 11 subjects had analyzable native T1 data and post contrast T1 data, allowing ECV calculation. Median ECV at basal, mid, and apical LV slices were 28, 28, and 29 % (normal). A significant negative correlation was seen, though, for time from 1st rejection and native T1 for the entire LV ($r= -0.88$, $p=0.047$), indicating that more recent rejection corresponded with increased T1. No other correlations were significant, although a few trends were noted.

Conclusion: As the first pilot 3T CMR pediatric heart transplant myocardial characterization study, these data are intriguing and warrant further investigation to understand the utility of T1 mapping as biomarker for rejection and a measure of myocardial fibrosis.