

## **Extra cellular volume imaging of left ventricular walls in children with congenital heart diseases and impaired ventricular function**

### **ABSTRACT**

**Background/Hypothesis:** In children with congenital heart diseases, myocardial fibrosis is a possible long term complication with impairment of left ventricular function. Extra-Cellular Volume (ECV) imaging of left ventricular (LV) walls using Cardiac Magnetic Resonance Imaging (CMR) offers early detection of fibrosis before late gadolinium enhancement (LGE) changes are seen. Aim of the study was to determine ECV of a cohort of children with congenital heart diseases and any association with their left ventricular function. **Materials and Methods:** 19 children with congenital cardiac conditions who had undergone CMR from March to December 2016 at Birmingham Children's Hospital UK were included in the study. All subjects underwent CMR (Siemens Avanto 1.5 T scanner) to assess LV function, measurement of ECV on T1- mapping (MOLLI sequence) and standard late gadolinium enhancement (LGE) imaging. ECV values were determined from 5 different LV wall segments on short axis images (inter-ventricular septum, anterior, antero-lateral, inferio-lateral, inferior segments). **Results:** 4 children (age  $10.9 \pm 3.9$  years old) had impaired LV ejection fraction ( $44.5 \pm 6.0\%$ ) and increased LV end diastolic volume indexed ( $82.2 \pm 14.5$  ml.m<sup>2</sup>). One of the children had LGE changes seen on the inter-ventricular septum. ECV parameters of the inter-ventricular septum were higher in children with impaired LV function ( $38.6 \pm 7.0\%$  vs  $30.0 \pm 3.5\%$ ,  $p = 0.002$ ). No significant difference were found in the ECV of LV free walls ( $32.2 \pm 5.2\%$  vs  $28.7 \pm 5.7\%$ ,  $p = 0.279$ ). **Conclusions:** ECV technique has promising possibility in detection of myocardial fibrosis in children with impaired LV function, similar as adult studies. In those with poor LV function, there is a strong possibility that area of fibrosis is in the inter-ventricular septum. However, normal ECV parameters will need to be determined first in children before comparing with those with cardiac illnesses.

**Keyword:** Congenital heart diseases; Extra-cellular volume (ECV); Left ventricular; Cardiac magnetic resonance imaging (CMR)