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Right ventricular volumes and function assessed by three-dimensional echocardiography in children with surgically corrected Tetralogy of Fallot and their healthy controls: Comparison to cardiac MRI

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Objectives: Deterioration of right ventricular (RV) function is common in patients with tetralogy of Fallot (TOF) because of chronic volume loading due to pulmonary regurgitation. Severe dysfunction and dilatation might be irreversible and therefore regular assessment of RV function is indicated. Cardiac magnetic resonance imaging (CMR) is still the golden standard for these measurements. A more available, less expensive and faster method is real time 3-dimensional echocardiography (RT3DE), which is already proven to be adequate in adult patients with TOF. The aim of this study was to determine if the 3DE could be used for assessment of RV function already in children and adolescents.

Methods: 50 pediatric patients (mean age 13.1 ± 3.1 years,) who had undergone TOF repair and their 45 healthy age and gender matched controls underwent RT3DE-study to assess the RV ejection fraction (EF), end diastolic volume and end systolic volume (EDV and ESV). CMR-study was performed as a reference.

Results: RT3DE data quality was sufficient in 79% of all subjects examined. When RT3DE was compared with CMR EDV was 97 ± 27 ml/m² vs. 100 ± 28 ml/m² ($p = 0.42$), ESV was 46 ± 16 ml/m² vs. 48 ± 20 ml/m² $p = 0.50$ and EF $55 \pm 8.4\%$ vs. $51 \pm 6.6\%$, respectively ($p = 0.0023$). Good correlation between these two methods was shown in all measurements, EDV ($r = 0.51$, $p < 0.0001$), ESV ($r = 0.44$, $p = 0.006$) and EF ($r = 0.38$, $p = 0.04$).

Conclusions: CMR is the standard method for measuring the RV function but is time consuming and expensive. Our study shows that RT3DE is a valuable, faster tool in assessing RV volumes and EF already in pediatric patients. RV volumes measured with RT3DE -study correlate fairly well with CMR. We believe that RT3DE is a promising tool in assessment of RV volume and function in ambulatory patients also in children.