Aim was to evaluate the longitudinal systolic left ventricular (LV) - right ventricular (RV) interaction in 146 operated patients with tetralogy of Fallot (TOF). Biventricular measures of indexed ventricular end-diastolic volume (EDVi), ejection fraction (EF), LV longitudinal function parameters determined by magnetic resonance imaging (MRI), and M-mode data of mitral annular plane systolic excursion (MAPSE) and tricuspid annular plane systolic excursion (TAPSE) were investigated and compared to established normal z-score values (**). Methods:

146 TOF patients (66 male; 80 female) were investigated during routine clinical follow-up. RV outflow tract was repaired by means of a transannular patch made of autologous untreated pericardium in all patients at a mean age of 8.7 month (range: 3.0 – 23.1 months). The patients were evaluated from the newborn age to the age of 32 years, at a time interval from 0–30.2 years after cardiac surgery. Cardiac Magnetic Resonance Imaging (cMRI) studies were performed on a 1.5 T machine. To evaluate the movement of the atrioventricular plane, maximal tricuspid and mitral annular plane systolic excursions (TAPSE and MAPSE, respectively) were measured (Figure 1).

MAPSE values decline below the 1 SD and below the 2 SD after 13 and 22 postoperative years, respectively, when compared to age-normalized values (Figure 2). TOF patients with a measured RVEDVi >150 ml/m² had a decreased LVEF (r = - .455, p <.001), and a reduced RVEF (r = - .532, p <.001). The LVEF significantly correlated with the MAPSE in MRI and M-Mode data measurements (Figure 3). Correlation between MRI-MAPSE and M-Mode-MAPSE was significant (r = .879, p <.001), as was the correlation between MRI-TAPSE and M-Mode-TAPSE (r = .780, p <.001) (Figure 4). Patients with a RVEDVi<150 ml/m² have a MAPSE of 1.43 ± 0.20 cm and operated TOF patients with a RVEDVi >150 ml/m² a decreased MAPSE of 1.30 ± 0.26 cm (Figure 5).

Discussion:

LV systolic dysfunction is a known risk factor for sudden cardiac death in adults late after repair of TOF (**). Interaction between RV and LV has been suggested to be attributed to suboptimal RV-LV systolic interaction between the ventricles in TOF patients. In 23% of our operated TOF patients the MRI and echo measured LVEF was <55 %. Those patients showed a reduced MAPSE compared to normal values (1.2 ± 0.1 cm vs. 1.5 ± 0.1 cm; p <.001). This is in agreement with adult data (***) showing reduction of MAPSE in adult patients with cardiak pathologies who had a reduced LVEF. Correlation between MRI derived MAPSE and M-mode guided MAPSE was significant, showing the accuracy of this simple M-Mode measurement for detecting longitudinal systolic function/dysfunction.

Conclusion:

Our study is the first directly to compare mitral and tricuspid annular motion in the pediatric and young adult TOF patients with the use of M-mode echocardiography and cardiac MRI. Our data suggest unfavourable ventricular-ventricular interaction in our patients. We show that assessment of the M-mode guided MAPSE is as sensitive then determination of LVEF for revealing ventricular-ventricular interaction mid-to-long-term after corrective surgery for TOF in early childhood. The results of this study confirm the importance of serious evaluation of RV and LV parameters during follow-up of patients with operated TOF.

References: