Assessment of inter-atrial, inter-ventricular and atrio-ventricular interactions in Tetralogy of Fallot patients after surgical correction. Insights from 2-Dimensional Speckle tracking and 3-Dimensional Echocardiography

Abd El Rahman M (1,2), Raedle- Hurst T. (1), Rentzsch A.(1), Abdul-Khaliq H.(1)
Saarland University Hospital, Homburg, Germany (1)
Cairo University, Egypt (2)

Introduction:
The atria play a crucial role in patients evolving heart failure. We aimed to assess bi-atrial size and function, presence of inter-actions on atrial and ventricular levels as well as atrio-ventricular coupling, in patients after TOF repair.

Methods
Thirty-four patients with a mean age of 20.9 ± 9 years and 25 healthy controls were included and underwent two-dimensional speckle tracking echocardiography (2D STE) and real time three-dimensional echocardiography (RT3DE) to evaluate ventricular and atrial function. Using 2D STE the mean peak atrial longitudinal strain (PALS) reflecting the passive atrial deformation and the mean peak atrial contraction strain (PACS) representing the active atrial deformation were assessed. Using RT3DE atrial and ventricular end-diastolic (ED), end-systolic (ES) volumes were measured and the ventricular as well as atrial ejection fraction (EF) was calculated. All volumes were normalized to the body surface area (BSA)

Results
When compared to controls TOF patients had significantly reduced right atrial (RA) PALS (p = 0.0001), RA PACS (p = 0.0001), RA EF p = 0.0001), left atrial (LA) PALS (p = 0.003), LA PACS (p = 0.021), LA EF (p = 0.005).

In the TOF group, left ventricular (LV) EF significantly related to the right ventricular (RV) EDV/BSA (r= -0.66, p = 0.0001), RV EF (r = 0.63, p = 0.0001). The RA EDV/BSA correlated significantly with LA PALS (r = 0.66, p= 0.0001) and LA PACS (r = 0.67, p = 0.0001) among the TOF patients. At the atrio-ventricular level, the RA EF among the TOF patients correlated negatively with RV ESV/BSA (r = 0.64, p =0.0001) and positively with RV EF (r = 0.633, p = 0.0001). Such correlations were not present on the left side.

Conclusions:
In TOF patients with moderately enlarged RV and mildly impaired biventricular systolic function bi-atrial dysfunction exists and can be quantified via 2D-speckle tacking as well as RT3DSTE. Robust right atrio-ventricular interaction, altered inter-aterial and inter-ventricular interactions are evident among such cohort.