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Right and left atrium volumes in Repaired Tetralogy of Fallot: impact on ventricular dysfunction and adverse cardiac event

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Introduction: Left atrium (LA) enlargement is directly proportional to the severity of the diastolic left ventricle (LV) filling abnormality, reflecting the severity of underlying cardiovascular burden. The meaning of right atrium (RA) and LA enlargement in Repaired Tetralogy of Fallot (repaired-TOF) has not been fully studied. The aim of the study is to evaluate the RA and LA atriums volumes in a large cohort of repaired TOF, to determine if they reflect conventional indexes of ventricular dysfunction and to assess their association to adverse cardiac event.

Methods: Consecutive repaired-TOF with age ≥ 12 years referred to our center have been evaluated by a protocol comprehensive of clinical evaluation, electrocardiogram, trans-thoracic Echo (TTE), CMR comprehensive of atri volumes, cardio-pulmonary-exercise test (CPT), NT-Pro BNP.

Results: the population study was constituted of 170 repaired-TOF (28 ± 13 years). RA indexed volume (RAVi) correlates with LA indexed volume (LAVi) ($r:0.59$, $P < 0.01$), with indexed right ventricular end-diastolic volumes (RVEDVi) ($r:0.49$, <0.001 ; $r: 0.7$, $p < 0.001$) and inversely with RVEF ($r:-0.21$, $p=0.005$) and LVEF ($r:-0.22$, $p=0.003$). RAVi and LAVi increase with age: respectively $r:0.52$, $P < 0.001$, $r:0.59$ $p < 0.001$; and correlate with age at primary repair ($r:0.45$, $p < 0.001$; $r: 0.7$, $p < 0.001$), indexed LV end-diastolic volumes (LVEDVi) ($r:0.32$, $p < 0.001$; $r:0.38$, $p < 0.001$). RAVi was higher in patients with significant tricuspid regurgitation: 51 ± 16 ml/m² vs 63 ± 19 ml/m², $p < 0.001$. LAVi and RAVi resulted less dilated in patients classified NYHA I in comparison with patients in NYHA II/III: 29.6 ± 7.8 ml/m² vs 39.6 ± 22 ml/m² $p < 0.001$ and 52.5 ± 16.3 ml/m² vs 62.3 ± 23 ml/m² $p < 0.001$, with Ln Nt-ProBNP $r:0.45$, $p < 0.001$ and $r:0.45$, $p < 0.001$ and RA correlate inversely with Vo_2 /kg/min at CPT: $r:-0.22$, $P=0.006$. LAVi and RAVi were associated to adverse cardiac event before and during Follow-up ($p < 0.01$), mainly for atrial arrhythmias for RAVi, while LAVi was associated to both atrial and ventricular arrhythmias.

Conclusion: In our population of repaired-TOF, RAVi correlates with LAVi. Both of them correlate with conventional indexes of ventricular dysfunction and were associated to adverse cardiac event before study and during follow-up. Further longitudinal studies are required to shed light on the prognostic value of the atri.