Analysis of RV components after reoperation of the right ventricular outflow tract in patients with Tetralogy of Fallot


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Introduction: In patients with repaired Tetralogy of Fallot (TOF), reoperation of the right ventricular outflow tract (RVOT) is often necessary. This study aims to analyse the functional recovery of the right ventricle (RV) and the RVOT after a reoperation using volumetrical data from cine MRI.

Methods: 22 patients (25.0 ± 9.2 yrs) underwent an MRI examination before and after (9.6 ±5.6 months) pulmonary valve replacement or reconstruction (PVR). For segmental analysis of the RV, a custom made analysis software was developed. The method provides an automatic contour detection algorithm for the determination of the RV blood volume and enables the user to segregate the blood volume of the RVOT based on anatomic landmarks and to generate volume-time-curves over a cardiac cycle. The analysis of volume-time-curves of the RV allowed calculation of Peak-Filling-Rate (PFR) and Time-to-Peak-Filling-Rate (TPFR), which are surrogate parameters for diastolic dysfunction.

Results: A significant reduction in blood volumes of the RV as well as the RVOT was present after a PVR (RV-ESV -19.0 ±27.2 ml/m2, p=0.004, RVOT-ESV -5.5 ±6.1 ml/m2, p<0.001, RV-EDV -36.5 ±27.9 ml/m2, p<0.001, RVOT-EDV -7.3 ±7.9 ml/m2, p<0.001). Pulmonary insufficiency was also significantly reduced (-24.3 ±15.8%, p<0.001). The PFR decreased (-149.2 ±261.8 ml/s, p=0.001) and the TPFR increased (0.06 ±0.12s, p=0.041), indicating improvement of RV diastolic function. Additionally, late gadolinium imaging showed that non-viable tissue was present in 5.7 ±3.8% of the RV mass and in 11.9 ±7.2% of the RVOT mass before operation and did not change on follow-up.

Conclusion: After reoperation of the RVOT in TOF patients the systolic and diastolic function of the right ventricular components improved within less than a year. The end-diastolic and end-systolic blood volumes decreased significantly in the RVOT and the total RV. The dedicated analysis software enables the user to assess the components of the RV in a time-efficient and precise manner.