Temporal sequence of right ventricular function in children after tetralogy of Fallot repair: comparison of pulse wave Doppler echocardiography versus tissue Doppler imaging.

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Objectives: The aim of the study was a temporal analysis of right ventricular (RV) function and its consequences for hemodynamic disturbances in children after tetralogy of Fallot repair (RTOF).

Methods: 52 RTOF children (mean age 13.7±3.4) and 32 healthy controls (mean age 13.7±2.9) were studied. The pulmonary valve opening time (PVO), ejection time (ET), and pulmonary valve closure time (PVC) were measured from pulmonary systolic outflow pulse wave Doppler patterns (PW). The tricuspid opening time (TVO), relaxation time (RT) and tricuspid closure time (TVC) were evaluated from PW of tricuspid inflow patterns. The contraction time (CT), relaxation time (RT), isovolumic relaxation (IVRT) and isovolumic contraction time (IVCT) by tissue Doppler imaging (TDI) at the RV free wall of the tricuspid annulus site were assessed. Heart rate (HR) was determined in all children on the basis of 3 consecutive echo cycles.

Results: There were not significant differences in HR between RTOF and healthy children. RTOF patients demonstrated increased PVO: 96.4±23.4ms vs 72.8±17.4ms(p<0.01), ET: 334.7±41.3ms vs 236.4±59.6ms(p<0.01), PVC 408.0±44.6ms vs 371±44.2ms(p<0.01), TVO 453.0±74.2ms vs 419±50.4ms(p<0.01) and TVC 783.7±132.8ms vs 745.0±129.1ms(NS) compared to the controls. RT was reduced in the RTOF comparing the healthy children, respectively 325.5±128.1ms vs 333.0±102.1ms(NS). In TDI both CT: 211.5±52.1ms vs 253.9±38.6ms(p<0.01) and RT 414.2±111.9ms vs 420±113.8ms(NS) were reduced in the RTOF comparing to the controls. IVRT in the RTOF and healthy children was respectively 84.4±41.2ms vs 39.3±11.3ms(p<0.01) and IVCT 113.2±58.0ms vs 60.9±26.4ms(p<0.01). ET was statistically significantly longer than CT (p<0.01) in the RTOF patients while in healthy controls significant difference between ET and CT was not found.

Conclusions:
1. The temporal sequence of right ventricular function is deeply disturbed in patients after tetralogy of Fallot repair.
2. The discrepancy between ejection time in PW and contraction time in TDI indicates the predominance of passive flow through the right ventricular outflow tract due to impaired right ventricular systolic function.