

Potts shunt improves right ventricular function in pediatric patients with suprasystemic pulmonary hypertension.

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Backgrounds and Objective

Pulmonary arterial hypertension (PAH) carries a poor prognosis. Right ventricular (RV) function and reserve are pivotal to survival in PAH. Recent application of pulmonary to systemic shunt, Potts shunt, to off-load the RV has demonstrated promising initial clinical results. Studies to evaluate the impact of Potts shunt on RV mechanics that may impact survival are lacking. The objective of this study was to mechanistically evaluate RV mechanics before and after surgical Potts shunt in pediatric PAH patients.

Method:

In a retrospective study with prospective analysis, we assessed clinical improvement and echocardiographic indices before and after (6.0 ± 2.2 days) Potts shunt performed in 12 consecutive pediatric patients (median age 11.2 (0.3-17.6) years, weight 32.8 (5.0-72.0) with suprasystemic PAH. We measured tricuspid annular plane systolic excursion (TAPSE) to assess RV systolic function; tricuspid regurgitation (TR) jet velocity to estimate pulmonary artery systolic pressure (PASP); pulmonary artery acceleration time (PAAT) as well as its ratio to RV ejection time (RVET) as indices of pulmonary artery hemodynamics; and TAPSExPASP and TAPSExPAAT to develop length-force relationships. We analyzed pre- and post-shunt data using Wilcoxon signed-ranked test. A $p < 0.05$ was considered significant.

Result

8 patients have survived to most recent follow-up with 7 seeing improved WHO functional classification, 1 patient required a lung transplant, and 3 died. Compared to pre-, post-Potts shunt RV systolic function (TAPSE increase 13.4%) and pulmonary hemodynamics (PAAT increase 36.7%) significantly improved (both $p < 0.05$) but PASP did not ($p = 0.27$). RV work significantly improved (% increase of TAPSExPAAT 56.2% and TAPSExPASP 22.0; $p < 0.05$).

Conclusions

RV improves rapidly after the Potts shunt. This initial evidence of improved RV function and reserve may indicate a protective effect of the Potts shunt on the RV that may aid survival in pediatric patients with PAH.