Atrioventricular-block necessitating ventricular pacing after tricuspid valve surgery in patients with a systemic right ventricle: long term follow-up

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Background: Patients with transposition of the great arteries (TGA) after atrial switch or congenitally corrected TGA (ccTGA) are prone to systemic right ventricular (sRV) failure. Atrioventricular (AV)-conduction disturbances and tricuspid regurgitation aggravate the course of sRV dysfunction. Timely tricuspid valve (TV) surgery stabilizes sRV function. However, TV surgery is an independent risk for AV-block and ventricular pacing in non-congenital cardiothoracic surgery patients. Chronic subpulmonary ventricular pacing-induced dyssynchrony further contributes to sRV failure, potentially reducing the beneficial effects of the tricuspid valve surgery.
Purpose: The aim of this study is to explore the incidence, timing and functional consequences of AV-conduction block requiring ventricular pacing after TV surgery in sRV patients.
Methods: Consecutive adolescent and adult patients with a sRV who underwent TV surgery in the period 1989–2020 and follow-up at our tertiary care center were included in this observational cohort study. Patients who were $<$10 years of age at the time of operation and/or died in perioperative, in-hospital, setting were excluded from analysis (n=5). Demographic and clinical data was collected from the patient records.
Results: Data of 28 patients (54% female, 57% ccTGA) was analysed (Figure). The mean age at surgery was 38±13 years, 5 patients (18%) received chronic ventricular pacing preoperatively. Mean follow-up was 9.7±6.8 years, during which 7 patients (25%) died and 3 (11%) underwent ventricular assist device implantation (VAD). Two patients died awaiting VAD/HTx, one patient died awaiting CRT upgrade. Seven (25%) patients underwent a re-operation, of which 3 (11%) TV replacement, 3 (11%) VAD and 1 (4%) pulmonary valve replacement. Of the 23 patients at risk of developing AV-block, 11 (48%) developed an indication for chronic ventricular pacing, of which 6 within 24 months postoperatively (4 before hospital discharge). Of the 21 patients with a device, 7 (25%) had successful resynchronization therapy (2 before TV surgery). Patients with chronic ventricular pacing had a wider QRS-duration (mean 121 ms vs 194 ms in those without pacing, $p<0.001$) and 43% had a severely reduced sRV function (vs 36% in those without pacing) at latest follow-up.
Conclusions: Patients with a failing sRV who undergo TV surgery are prone to AV-conduction abnormalities with 48% of this group developing an indication for chronic ventricular pacing during follow-up. Pacing-induced dyssynchrony can further contribute to sRV dysfunction. Implantation of an epicardial sRV lead at the time of TV surgery for future CRT may be considered to attenuate the detrimental effects of subpulmonary ventricular pacing in this heart failure prone patient group with complex anatomy, limiting transvenous possibilities.

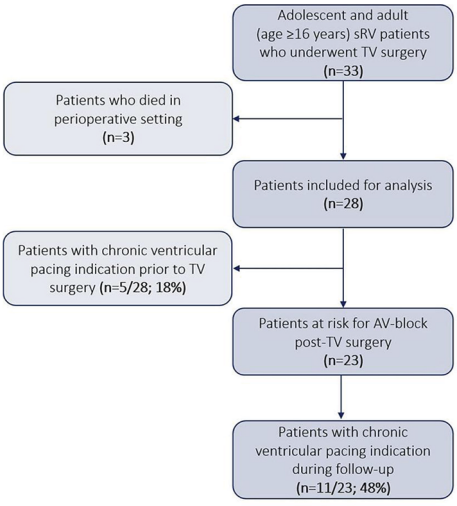

Figure 1. Study flow chart illustrating AV-block necessitating ventricular pacing after tricuspid valve surgery in patients with a systemic right ventricle.

sRV, systemic Right Ventricle; TV, tricuspid valve; AV, atrioventricular.