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Safety and Efficacy of Atrial Anti-tachycardia Pacing in Congenital Heart Disease

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Background: Cardiac arrhythmias are a relatively common sequela following congenital heart disease (CHD) surgery resulting from cardiac anomalies, fibrosis and surgical scars. Atrial arrhythmias, including sinus node dysfunction, complete heart block and intra-atrial reentrant tachycardia (IART) are among the most prevalent. The presence of IART significantly increases morbidity and mortality. Atrial anti-tachycardia pacemakers (ATPM) have been utilized to prevent and treat IART in CHD but little is known about the safety and efficacy of newer generation ATPMs.

Methods: A single center, retrospective study was performed to determine if ATPMs are effective in the management of IART in children and adults with CHD. Demographic, CHD diagnosis, surgical, anti-arrhythmic, and atrial arrhythmia data were collected as well as therapy success and adverse events. Chi-square analyses and two sample t-tests were used for statistical evaluation of categorical and continuous data sets respectively.

Results: 91 CHD patients (median 27.3 yrs, range 6.9 – 59.8 yrs of age at time of first ATPM implant) underwent ATPM placement for the management of atrial arrhythmias at the University of Iowa Hospitals and Clinics and satellite centers between 2001 and 2016. Median number of annual follow up visits included in analysis was 4 (range 1 -15). Diagnoses included: D-TGA (atrial switch, n=26), Fontan (n=18), L-TGA (n=14), repaired TOF (n=13), and Ebstein's Anomaly (n=5) among others. Prior to ATPM therapy, 63 (69%) of patients were on anti-arrhythmic medication (digoxin, beta-blockers, calcium channel blockers, sotalol, amiodarone) and 22 (24%) were on multi-drug therapy. Due to physiologic limitations, 10 patients had only an atrial lead. 81% of CHD patients with a history of external DC cardioversion in the 5 years prior to ATPM placement (n=36) did not require subsequent DC cardioversion (median number of post op years =4). A total of 28 patients received ATP therapy. ATP therapy success, measured by average percent success by patient, was more successful in the D-TGA (status post atrial switch) population (83.5%, n=9) when compared to the remaining CHD cohort (70.7%, n=19, p = <0.01). One patient passed away as a result of respiratory failure and cardiac arrest secondary to IART which became intractable. No other patients died as a direct result of atrial arrhythmias, atrial antitachycardia pacing complications, or device failure.

Conclusion: ATPM therapy decreased the need for DC cardioversion in this CHD population. ATPM therapy was most successful in patients with D-TGA status post atrial switch surgery compared to other varieties CHD. No serious adverse events occurred as a result of ATPM therapy. These results support the safety and efficacy of ATPM use in CHD for the management of atrial arrhythmias.