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Closed loop stimulation-guided atrial pacing in young patients with complex congenital heart defects: is it physiological? A case series

Pazzano V. (1), Silvetti M.S. (1), Battipaglia I. (1), Di Mambro C. (1), Saputo F.A. (1), Tamburri I. (1), Carotti A. (2), Torcinaro S. (3), Drago F. (1)
Paediatric Cardiology and Arrhythmia/Syncope Unit, IRCCS Bambino Gesù Children's Hospital, Rome, Italy (1); Heart Surgery Unit, IRCCS Bambino Gesù Children's Hospital, Rome, Italy (2); Biotronik Italy (3)

Objectives:
Young patients with operated complex congenital heart defects (CHD) often develop sinus node dysfunction requiring permanent pacing, with rate-responsive function to respond to physiological stresses. Activity-driven sensors cannot account for non-movement stress and cannot modulate heart rate physiologically. Closed Loop Stimulation (CLS, Biotronik, Berlin, Germany) is a physiological rate-responsive pacemaker based on the indirect measure of ventricular contractility. No data are available on the effects of such pacing strategy in young patients with CHD and single-chamber atrial pacing.

Methods:
We report a series of 5 patients with CHD and sinus node dysfunction who underwent CLS atrial pacing with endocardial or epicardial systems. CLS pacing was compared with rate-responsive accelerometer-driven pacing. During the first 15-30 days, the pacemaker was programmed in atrial pacing mode and then was switched to CLS atrial pacing mode. An in-hospital control was scheduled 1-2 months later to evaluate the CLS response to neurovegetative stresses (i.e. non-movement stress - Stroop color test, handgrip - and exercise stress test).

Results:
At telemetric interrogation, CLS pacing showed a more physiological pattern of 24-hour heart rate trends than accelerometer sensors. The data obtained during non-movement stress and exercise stress test demonstrated a physiological increase in the pacing rate with CLS. The accelerometer sensor histogram showed a "non-response" behavior, where only lower rate events were documented during neurovegetative stresses.

Conclusions:
In young CHD patients, endocardial/epicardial CLS atrial pacing demonstrated a physiological response of heart rate to neurovegetative and physical stresses. This is the first report on the efficacy of CLS-guided single-chamber atrial pacing in ensuring physiological pacing in young patients with complex congenital heart defects and sinus node dysfunction after surgery.