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

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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.