Bipolar transseptal pacing reduces left ventricular dyssynchrony compared with unipolar para-left bundle branch pacing

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Introduction: Right ventricular (RV) apical pacing is associated with reduced left ventricular dysfunction. In this regard, electrophysiologists have gained enormous interest in physiological pacing by targeting the conduction system. However, His bundle pacing is often associated with high pacing threshold that requires placement of an extra lead in dependent patients. Recently, researchers have found it feasible to capture the left bundle branch (LBB) transeptally. Positioning of pacing lead at the LBB is largely anatomical as the LBB potential cannot be mapped. In published case series, a LBB potential was only seen in two-thirds of the patients. On the other hand, the absence of LBB potential did not appear to affect the pacing electrocardiographic morphologies or the QRS width, suggesting that the LBB could be involved by direct capture or retrograde penetration during unipolar pacing when the distal electrode is positioned near the LBB. The direction of current flow in bipolar pacing differs from that in unipolar pacing. When a pacing lead is screwed into the para-LBB region transeptally, a bipolar current flow across the septum may improve capturing of the LBB, and may also capture the right bundle branch (RBB). We hypothesize that bipolar transseptal pacing was associated with increased engagement of the conduction system and thus reduced dyssynchrony than unipolar para-LBB pacing. Here, we study the effect of unipolar and bipolar transseptal pacing at different outputs on left ventricular (LV) dyssynchrony by echocardiographic strain analysis.

Methods: A total of 16 consecutive patients who had a normal LV systolic function and attended our institution in April to June 2019 for symptomatic bradycardia requiring a high rate of RV pacing were recruited. A specialized pacing lead with the distal electrode located at the screw tip was advanced to the proximal or mid septum and screwed in by turning the lead body clockwise until an R' was seen at V1 during unipolar pacing. One patient who failed to achieve a transseptal pacing after 5 attempts was excluded. The primary endpoint, time-to-peak-strain-standard deviation (TPS-SD), and secondary endpoint, global longitudinal strain (GLS), were assessed one month after implantation during unipolar and bipolar pacing at threshold, twice threshold, nominal, 5V and maximum outputs.

Result: Of the 15 patients [male:9 (60%), age:72±16 years] who were included in this study, 7 (47%) had hypertension, 3 (20%) had diabetes and 6 (40%) had coronary artery disease. Complete or advanced secondary degree atrioventricular block were found in 11 (73%) patients. Overall, bipolar pacing was associated with a shorter QRS width than unipolar pacing (126±24 vs. 143±20ms, p<0.01). After adjusted for demographics, comorbidities and indications, bipolar pacing was independently associated with a lower TPS-SD (beta=-0.17, t=-2.5, p=0.01). TPS-SD (beta=0.76, t=9.37, p<0.01), but bipolar pacing itself, (beta=-0.01, t=-0.03, p=0.98), was associated with an improved GLS.

Conclusion: Bipolar transseptal pacing was associated with reduced LV dyssynchrony, as evidenced by a reduced TPS-SD, compared with unipolar para-LBB pacing.