Abstract: P1173

Prediction of reverse remodeling in cardiac resynchronization therapy by acute changes in three-dimensional trajectory of pacing cathode pole in coronary sinus: preliminary results

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Background: In cardiac resynchronization therapy (CRT) patients, the coronary sinus (CS) lead pacing cathode movements have been proposed as a source of information about left ventricular (LV) mechanic response to CRT. An automated method for 3D reconstruction of CS lead’s pacing cathode trajectory (3DTJ) was described by our group, and in a small exploratory study we found that trajectory’s geometry at biventricular pacing (BIV) start suddenly changed in CRT responders (R), becoming less eccentric and more multi-directional, as described by the ratio between its two major axes (S1/S2).

Purpose: The TRAJECTORIES study (Trajectory Changes Of Coronary Sinus Lead Tip And Cardiac Resynchronization Therapy Outcome, NCT02340546) is an observational study by seven Italian centers about the prediction of CRT-induced LV reverse remodeling by means of the acute 3DTJ changes at CRT implant. Preliminary description and results are reported.

Methods: In CRT implants with standard indications, stable CHF and regular ventricular rhythm, a fluoroscopic sequence in two standard X-rays views of a few seconds was acquired immediately before (T-1) and after the start of BIV (T0). 3DTJ at T-1 and T0 were reconstructed using a procedure to track the CS lead cathode pole throughout the cardiac cycle and applying stereo-photogrammetric rules, and the mean 3DTJ over a cardiac cycle was computed. Geometric features and shape of mean 3DTJ were then analyzed. Changes of S1/S2 (?S1/S2) between T-1 and T0 were compared with the volumetric response at six-month f.u: the percent negative variation of S1/S2 (?S1/S2<0), marking a more multi-directional shape of 3DTJ, was assumed to predict the response to CRT. Volumetric response was adjudicated by a core-lab using a cut-off reduction = 15% in echocardiographic LV end-systolic volume at f.u.

Results: Out of 119 patients enrolled in 42 months, 39 pts ended f.u. (28 m; age 69±10) and 10 dropped-out. Fluoroscopies were acquired easily and 3DTJ were fully reconstructed. Patients baseline features were: ischemic heart disease (IHD) 24/39 pts; sinus rhythm 35/39 pts; upgrade from PM/ICD 9/39 pts; QRS morphology with LBBB 30/39, intraventricular aspecific delay 3 and RV pace 6 pts; LV ejection fraction (EF) 32±10%; QRS duration 162±26 ms. At f.u., volumetric R were 26/39 (66%). Concordance between ?S1/S2 (as either ?S1/S2<0 or ?S1/S2>0) and volumetric response was 79% overall (31/39), 92% in R (24/26), 61% in non-R (8/13). Non-concordant patients were older (73±8), predominantly with IHD (6/8) and mostly non-R (5/8), but no differences in QRS and EF were found. The proposed 3DTJ metric showed sensitivity = 82%, specificity =72%; positive predictive value = 88%, negative predictive value = 61%.

Conclusions: Metrics of 3DTJ seem promising to acutely predict CS pacing site-specific response to CRT in long-term, above all in R. 3DTJ might depict aspects of CRT delivery effects on LV mechanics.