Results: The relationship between electrical dyssynchrony (79±27ms) and mechanical dyssynchrony (150±40ms) is highly statistically significant (p<0,000001) while the QRS duration (164±15ms) does not show any statistical significance to mechanical dyssynchrony. Example of comparison between electrical depolarization and mechanical activation of LV myocardium in LBBB patient is shown in Figure 1.
Conclusion: The dyssynchrony of electrical depolarization distribution over V leads is comparably similar to mechanical activation of myocardium. The electrical myocardial dyssynchrony can be numerically assessed with units of ms precision. Better temporal and spatial resolution of used higher density ECG allows for easy and accurate assessment of electrical depolarization of ventricles. This simple and cheap method could be used for more precise diagnostics of LBBB and thus more proper selection of CRT recipients and also possibly CRT setting optimization.
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P5743
Effect of lower interatrial septal pacing on atrial hemodynamic function and mechanical synchrony in patient with cardiac resynchronization therapy and abnormal interatrial delay

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Background: Hemodynamic effect of interatrial septal (IAS) pacing is limited in unselected patients with cardiac resynchronization therapy (CRT). The impact of IAS pacing on atrial mechanical performance in subjects with slowed interatrial delay (IAD) in biventricular pacing remains unclear.
Aims: To compare the atrial hemodynamic function and mechanical synchrony between IAS versus right atrial appendage (RAA) pacing in patients with CRT and abnormal IAD.
Methods: Candidates for CRT with P wave duration (PWD) ≥140ms underwent electrophysiological (EP) study to measure intrinsic IAD, and the subjects with the IAD≥100ms was were randomly assigned to atrial lead implantation either at lower IAS or RAA. During atrial pacing, detailed echocardiographic examinations were performed to calculate left atrial ejection fraction and active emptying fraction. Wall motion synchronicity of right lateral atrium (RLA), IAS and left lateral atrium (LLA) were estimated using strain doppler imaging.
Results: After EP study, 54 patients (age 60±11 years) with the intrinsic IAD = 130±22.3ms were selected for randomization. The baseline clinical and EP characteristics were comparable between groups. Left atrial ejection fraction (45.6±12.3 vs. 32.7±15.5%, P=0.04) and active emptying fraction (29.4±6.5 vs. 19.6±7.1%, P=0.001) were higher in IAS group (n=26) than in RAA group (n=28) during atrial pacing. Time differences in the intervals from pacing spike to the peak strain of the LLA and RLA segment were significant (13.4±9.5 vs. 68.0±14.6ms, P=0.021) between IAS pacing and RAA pacing.
Conclusions: IAS pacing in patients with CRT and slowed IAD showed better atrial mechanical function and synchrony compared to RAA pacing, which may promise improvement of over-all cardiac output and suppression of AF development.

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Long-term response prediction to cardiac resynchronization therapy by acute pacing-induced changes in 3D trajectory of pacing cathode pole in coronary sinus: preliminary results of TRAJECTORIES study

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Background: In our previous work, the coronary sinus (CS) lead pacing tip movements were investigated as a source of information about acute resynchronization of left ventricular (LV) mechanics in cardiac resynchronization therapy (CRT) recipients. An automated method for 3D reconstruction of CS lead's pacing cathode trajectory (3DTJ) throughout a cardiac cycle showed that trajectory's geometry at biventricular pacing (BIV) start suddenly changed in responders (R), becoming less eccentric and more multi-directional, as described by the ratio between its two major axes (S1/S2). Acute 3DTJ changes could be related to CRT effects on LV reverse remodeling.
Purpose: The TRAJECTORIES study (Trajectory Changes Of Coronary Sinus Lead Tip And Cardiac Resynchronization Therapy Outcome, NCT02340546) is a multicenter observational study aiming at evaluating the clinical value of 3DTJ in a sample of 100 patients in seven Italian centers. Study description and preliminary results are reported.
Methods: In patients submitted to CRT implant 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 and after the start of BIV. 3DTJ before and after CS pacing was reconstructed from these views, using a procedure to detect and track the CS lead cathode pole throughout the cardiac cycle. Several 3D trajectories were reconstructed applying stereo-photogrammetric rules and the mean trajectory over a cardiac cycle was computed. Geometric feature and shape of mean 3DTJ were then analyzed. Changes of S1/S2 (ΔS1/S2) between pre-CRT and CRT start were compared with the volumetric response at six-month f.u: the percent negative variation of S1/S2 (ΔS1/S2<0) induced by BIV, 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 107 patients enrolled in 36 months, 32 pts ended f.u. (23 m; age 69±11) and 6 dropped–out. Fluoroscopies were acquired easily and 3DTJ were fully reconstructed. Patients baseline features were: ischemic heart disease 19/32 pts; sinus rhythm 29/32 pts; upgrade from PM/ICD 8/32 pts; QRS morphology was LBBB in 21/32 pts, intraventricular aspecific delay in 4/32 pts and RV pace in 6 pts; LV ejection fraction 32±11%; QRS duration 165±28 ms. At f.u., volumetric R were 22 (68%). Concordance between ΔS1/S2 (as either ΔS1/S2<0 or ΔS1/S2>0) and volumetric response was 84% overall (27/32), 90% in R (20/22), 70% in non-R (7/10).This 3DTJ metric showed sensitivity = 70%, specificity = 90% and positive predictive value = 78%.
Conclusions: Metrics of 3DTJ seem promising to acutely predict long-term volumetric response to CRT. 3DTJ might depict aspects of CRT delivery effects on LV mechanics.

CATHETER ABLATION

P5745
Protection of the esophagus from thermal injury with a novel esophageal cooling device: a mathematical model of experimental findings

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Introduction: Radiofrequency (RF) ablation of the left atrium for the treatment of atrial fibrillation risks injury to the esophagus, ranging from the most extreme injury, atrioesophageal fistula (AEF), to more common but benign visible thermal lesions which are presumed to be the precursor to AEF. A new device which cools the esophagus to perform whole-body hypothermia has increasingly been used clinically to prevent thermal injury during ablative procedures, and pre-clinical data has been published quantifying the protective effects in animal models.
Purpose: We sought to derive a reliable mathematical model describing the effects seen experimentally, in order to establish a framework from which to guide further analysis and development of this new esophageal protective strategy.
Methods: We utilized mathematical modeling software to build a 2D model of esophageal injury, then compared this model to experimentally-derived data from an animal model utilizing direct application of RF energy to exposed esophagus via a 7Fr 4mm ablation catheter. Water was circulated within the esophageal cooling device at varying temperatures using a commercially available heat exchanger supplying water at a flow rate of 60 L/hour. The presence of mucosal lesions was evaluated visually after tissue staining, and depth of thermal injury was measured via histology. The modeling governing equations utilized mass, momentum and energy balances, with the boundary conditions defined by the experimental values for temperatures of the ablation catheter tip, cooling water and subject animal.
Results: Our model results compared favorably to experimental conditions, in which application of 10 W for 30 seconds at 15g of contact force resulted in visible transmural lesions (seen on outer and mucosal surfaces of esophagus). The initiation of water circulation through the esophageal cooling device at 30°C elim-

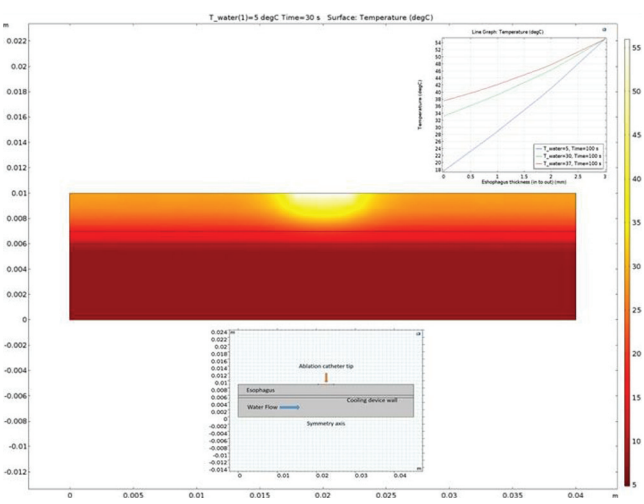

Figure 1