

Automatic real-time cardiac mapping system for the evaluation of cardiac resynchronization therapy

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Introduction: Cardiac resynchronization therapy (CRT) is currently guided by ECG criteria, hindering the determination of whether the ventricles are adequately resynchronized. This study aims to demonstrate the viability of a new automated imageless Electrocardiographic Imaging (ECGI) system in guiding the implant for evaluating ventricular dyssynchrony in real-time.

Methods: A new imageless ECGI system that allows real-time mapping during CRT was developed. The system performs automatic beat selection and projects cardiac signals onto an artificial intelligence-derived statistical shape model. The system's viability was assessed in four left bundle branch block (LBBB) patients during LBB pacing implantation. Local activation time (LAT) maps were calculated during basal rhythm (LBBB) and pacing from the LBB according to ECG criteria guidelines (see figure).

Results: ECGI was able to evaluate the synchronicity of the ventricles in each step of the pacemaker implantation in real-time. ECGI-derived metrics during the procedure showed a significant reduction in intra- and interventricular dyssynchrony post-lead positioning (Table 1).

Conclusion: This study demonstrates the viability of an automated imageless ECGI system in guiding CRT and assessing ventricular synchronization during pacemaker implantation interventions.

Table 1. ECGI derived metrics

	Basal	Final (LBBP)
QRS Duration (ms)	164[147-204]	108[92-125]
Total Activation Time (AT) (ms)	117[104-139]	67[56-80]
Left Vent. AT (ms)	99[84-112]	55[40-73]
Vent. Electrical Uncoupling	50[38-63]	7[1-20]

