Comparison of conventional resynchronization therapy to multipoint pacing using two separate left ventricular leads by non-invasive imaging of cardiac electrophysiology

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A 64-year-old woman with non-ischaemic cardiomyopathy (left ventricular ejection fraction 30%), mild heart failure symptoms, and left bundle branch block underwent implantation of a cardiac resynchronization therapy (CRT)-defibrillator device. Previous endomyocardial biopsy had revealed no signs of infiltrative disease or ongoing myocarditis. As venous anatomy included both a postero- and anterolateral vein, two separate left ventricular leads were implanted (Panel A).

Clinical follow-up showed normalization of systolic left ventricular function and significant reduction of QRS complex duration. To separate the effects of conventional CRT to multipoint pacing (MPP), non-invasive imaging of cardiac electrophysiology (NICE) was performed 3 days after implantation: NICE is a novel imaging tool which works by fusing data from high-resolution electrocardiogram mapping with a model of the patient’s individual cardiothoracic anatomy created from magnetic resonance imaging. Beat-to-beat endo- and epicardial ventricular activation sequences were computed using NICE during intrinsic conduction as well as during different pacing modes (right ventricular, conventional resynchronization, MPP; Panels B and C). Multipoint pacing resulted in a marked shortening of total activation duration of both ventricles when compared with conventional CRT, intrinsic conduction, and right ventricular pacing.

Multipoint pacing by two separate left ventricular leads seems to further improve the clinical and structural response to CRT, and may be considered in selected patients depending on the individual anatomy of the cardiac vein system.