

70. Zhao X, Burger M, Liu Y, Das MK, Combs W, Wenk JF *et al.* Simulation of LV pacemaker lead in marginal vein: potential risk factors for acute dislodgement. *J Biomech Eng* 2011;**133**:031006. doi: 10.1115/1.4003323.
71. Biffi M, Moschini C, Bertini M, Saporito D, Ziacchi M, Diemberger I *et al.* Phrenic stimulation: a challenge for cardiac resynchronization therapy. *Circ Arrhythm Electrophysiol* 2009;**2**:402–10.
72. Biffi M, Foerster L, Eastman W, Eggen M, Grenz NA, Sommer J *et al.* Effect of bipolar electrode spacing on phrenic nerve stimulation and left ventricular pacing thresholds: an acute canine study. *Circ Arrhythm Electrophysiol* 2012;**5**:815–20.
73. Biffi M, Zanon F, Bertaglia E, Padeletti L, Varbaro A, DeSanto T *et al.* Short-spaced dipole for managing phrenic nerve stimulation in patients with CRT: the “phrenic nerve mapping and stimulation EP” catheter study. *Heart Rhythm* 2013;**10**:39–45.
74. Medina-Ravell VA, Lankipalli RS, Yan GX, Antzelevitch C, Medina-Malpica NA, Medina-Malpica OA *et al.* Effect of epicardial or biventricular pacing to prolong QT interval and increase transmural dispersion of repolarization: does resynchronization therapy pose a risk for patients predisposed to long QT or torsade de pointes? *Circulation* 2003;**107**:740–6.
75. Chen Z, Hanson B, Sohal M, Sammut E, Child N, Shetty A *et al.* Left ventricular epicardial electrograms show divergent changes in action potential duration in responders and nonresponders to cardiac resynchronization therapy. *Circ Arrhythm Electrophysiol* 2013;**6**:265–71.
76. Quadripolar Pacing Post Approval Study (Quad PAS). ClinicalTrials.gov Identifier: NCT01555619.
77. More Options Available with a Quadripolar LV Lead pRovidE In-clinic Solutions to CRT Challenges (MORE-CRT). ClinicalTrials.gov Identifier: NCT01510652.
78. Attain Performa(TM) Quadripolar Lead Study. (ClinicalTrials.gov Identifier: NCT 01751022).
79. The Maximizing CRT Delivery by Using Multipolar Coronary Sinus Lead Family ACUITY[®] X4 (RALLY X4) study. (Clinical trials.gov Identifier: NCT02066467).
80. MultiPoint Pacing IDE Study (MPP IDE). ClinicalTrials.gov Identifier: NCT01786993.
81. MOre REsponse on Cardiac Resynchronization Therapy with MultiPoint Pacing (MORE-CRT MPP). ClinicalTrials.gov Identifier: NCT02006069.
82. Rao RK, Kumar UN, Schafer J, Viloria E, De Lurgio D, Foster E. Reduced ventricular volumes and improved systolic function with cardiac resynchronization therapy: a randomized trial comparing simultaneous biventricular pacing, sequential biventricular pacing, and left ventricular pacing. *Circulation* 2007;**115**:2136–44.
83. Burri H, Sunthorn H, Somsen A, Zaza S, Fleury E, Shah D *et al.* Optimizing sequential biventricular pacing using radionuclide ventriculography. *Heart Rhythm* 2005;**2**:960–5.
84. Boriani G, Muller CP, Seidl KH, Grove R, Vogt J, Danschel W *et al.* Randomized comparison of simultaneous biventricular stimulation versus optimized interventricular delay in cardiac resynchronization therapy: the Resynchronization for the Hemodynamic Treatment for Heart Failure Management II Implantable Cardioverter Defibrillator (RHYTHM II ICD) study. *Am Heart J* 2006;**151**:1050–8.
85. Bogaard MD, Houthuizen P, Bracke FA, Doevendans PA, Prinzen FW, van Meine M *et al.* Baseline left ventricular dP/dtmax rather than the acute improvement in dP/dtmax predicts clinical outcome in patients with cardiac resynchronization therapy. *Eur J Heart Fail* 2011;**13**:1126–32.

EP CASE EXPRESS

doi:10.1093/europace/euu270

Online publish-ahead-of-print 27 October 2014

The role of surface electrocardiogram after complex left atrial arrhythmias' ablation: behind electrical mechanisms

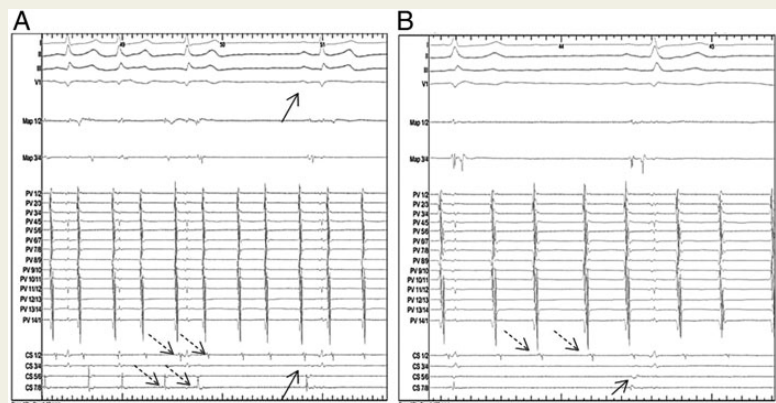
Alessandra Buiatti*, Katharina Mayer, and Tilko Reents

Deutsches Herzzentrum München, Klinik für Herz- und Kreislauferkrankungen, Faculty of Medicine, Technische Universität München, Lazarettstr. 36, 80636 Munich, Germany

* Corresponding author. Tel: +49 89 1218 2020; fax: +49 89 1218 4593. E-mail address: elam4@libero.it

We report of an interatrial dissociation after two relatively limited left atrial ablations for paroxysmal atrial fibrillation (PAF), with sinus rhythm in the right atrium (RA) and ongoing atrial tachycardia in the left atrium (LA). Patients suffering from PAF are supposed to have less electrical and anatomical remodelling, however the role of low-voltage and scar areas with functional conduction block in these patients is still ongoing discussion.

We report of an interatrial dissociation after two relatively limited LA endocardial ablation procedures, performed in a 64-year-old woman for PAF since 1 year. The patient underwent a successful pulmonary vein isolation (PVI), and 3 months later she developed symptomatic persistent AF requiring a second ablation. The patient underwent a re-PVI and limited ablation of complex fractionated atrial electrograms in LA, including the coronary sinus (CS) region, but none septally. During ablation, AF converted into an organized AT, resulting in two consecutive left localized re-entries, both related to a slow conduction zone within spontaneous low voltage area. After ablation at the anterior wall, surface ECG showed a conversion into sinus rhythm, whereas intracardiac electrograms revealed complete electric inter-atrial (left to right atrium) dissociation (Figure, panel A). Sinus rhythm in the RA was recorded at the proximal CS catheter (CS ostium), while ongoing AT was recorded from the circular mapping catheter (left atrial appendage) and from the distal CS catheter (inferior perimitral LA) (Figure, panel B). We performed an electrical cardioversion with restoration of sinus rhythm in both atria. During a 5-month follow-up the patient had no arrhythmia recurrences on Holter ECG monitoring. However, one might question the role of surface ECG regularly performed during her long term follow-up, since a recurrence of (only) left atrial arrhythmia would have been unrecognizable.



The full-length version of this report can be viewed at: http://www.escardio.org/communities/EHRA/publications/ep-case-reports/Documents/the_role_of_surface.pdf.