



Correspondence

Non-invasive mapping of persistent atrial fibrillation and dextroposition of the heart



For the first time worldwide, a patient with cardiac dextroposition and persistent atrial fibrillation was mapped with the CardiInsight™ non-invasive 3D mapping system. In this report we describe the distribution of the focal and rotor activities of this very rare case. Non-invasive phase mapping of atrial fibrillation (AF) is a relatively new tool that allows high-resolution recording of biatrial AF activation sequences under circumstances close to normal physiological conditions [1]. This technology has been used in patients with lone-AF undergoing catheter ablation [2] and has also been successfully used in patients prior to surgical ablation of AF [3].

The present report describes a 79-year-old male patient with a rare condition of dextroposition of the heart and with persistent atrial fibrillation that had recently undergone a MitraClip™ NTR procedure because of mitral valve insufficiency (for computed tomography (CT) scan see Fig. 1 and Supplementary Video 1). During the procedure, partial tearing of the anterior mitral valve leaflet

occurred and resulted in high-grade mitral valve insufficiency. Two weeks after, the patient was admitted to our department for surgical correction and presented with severe mitral valve insufficiency (showing in echocardiography a jet directed posteriorly) and moderate to severe tricuspid valve insufficiency. Normal left ventricular and mild-moderately reduced right ventricular function were present; systolic pulmonary artery pressure was 61 mmHg; CT-scan measurements showed LA size: 80 × 65 mm and RA size: 64 × 67 mm.

The patient was mapped 3 days prior to surgery with a non-invasive three-dimensional, beat-by-beat mapping system (ECVUE, CardiInsight™, Medtronic Inc., Minneapolis, Minnesota, USA). Normally patients planned for surgical ablation are not routinely mapped prior to surgery, therefore the electrophysiological mechanism and the anatomical distribution of their AF drivers is unknown. Details regarding the ECVUE mapping technique have been previously described [3]. In short, the CardiInsight™ is a non-invasive mapping system that collects chest ECG signals and combines these signals with CT scan data to produce and display simultaneous, bi-atrial, 3D epicardial maps (Supplementary Fig. 1). The patient had to receive intravenous infusion of metopro-



Fig. 1. CT-scan image acquired prior to the MitraClip™ procedure. CTA, computed tomography angiography; LA, left atrium; LV, left ventricle; RA, right atrium; RV, right ventricle.

Acknowledgements

None.

Appendix A. Supplementary material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijcha.2020.100640>.

References

- [1] N. Ad, A. Schneider, I. Khaliulin, J.B. Borman, H. Schwalb, Impaired mitochondrial response to simulated ischemic injury as a predictor of the development of atrial fibrillation after cardiac surgery: in vitro study in human myocardium, *J. Thorac. Cardiovasc. Surg.* 129 (2005) 41–45.
- [2] P.S. Cuculich, Y. Wang, B.D. Lindsay, et al, Noninvasive characterization of epicardial activation in humans with diverse atrial fibrillation patterns, *Circulation* 122 (2010) 1364–1372.
- [3] M.P. Ehrlich, G. Laufer, I. Coti, et al, Noninvasive mapping before surgical ablation for persistent, long-standing atrial fibrillation, *J. Thorac. Cardiovasc. Surg.* 157 (2019) 248–256.
- [4] M. Haissaguerre, M. Hocini, A. Denis, et al, Driver domains in persistent atrial fibrillation, *Circulation* 130 (2014) 530–538.
- [5] M. Molteni, H. Polo Friz, L. Primitz, G. Marano, P. Boracchi, C. Cimminiello, The definition of valvular and non-valvular atrial fibrillation: results of a physicians' survey, *Europace* 16 (2014) 1720–1725.
- [6] H.R. Haththotuwa, S.W. Dubrey, A heart on the right can be more complex than it first appears, *BMJ Case Rep.* (2013), 2013:bcr2013201046.
- [7] E. Chong, S.-L. Chang, S.-A. Chen, Pulmonary vein isolation in a patient with dextrocardia, *EP Europace* 14 (2012) 1725.
- [8] M.P. Ehrlich, E. Osorio-Jaramillo, T. Aref, et al., Atrial Fibrillation Following Cardiac Surgery: Electrophysiological Mechanism and Outcome, *The Annals of Thoracic Surgery*. 2020 Feb 12 [E-pub ahead of print]; <https://doi.org/10.1016/j.athoracsur.2019.12.069>.

Emilio Osorio-Jaramillo*

Sarah Klenk

Philipp Angleitner

Guenther Laufer

Marek P. Ehrlich

Division of Cardiac Surgery, Medical University of Vienna, Austria

* Corresponding author at: Division of Cardiac Surgery, Medical University of Vienna, Waehringer Guertel 18-20, A-1090 Vienna, Austria.

E-mail address: emilio.osorio@meduniwien.ac.at (E. Osorio-Jaramillo)

Piotr N. Rudziński

Department of Coronary and Structural Heart Diseases, The Cardinal Stefan Wyszyński National Institute of Cardiology, Warsaw, Poland

Niv Ad

Cardiothoracic Surgery, Adventist HealthCare White Oak Medical Center, Silver Spring, Md and Division of Cardiac Surgery, University of Maryland School of Medicine, Baltimore, MD, USA

Received 22 August 2020

Received in revised form 2 September 2020

Accepted 3 September 2020