

# First-in-man percutaneous pulmonary vein isolation enhanced by augmented reality system

Pierwsza u człowieka izolacja żył płucnych wspomagana rozszerzoną rzeczywistością

Piotr R. Łodziński<sup>1</sup>, Paweł Balsam<sup>1</sup>, Michał Peller<sup>1</sup>, Jakub Kamiński<sup>2</sup>, Grzegorz Opolski<sup>1</sup>

<sup>1</sup>1<sup>st</sup> Department of Cardiology, Warsaw Medical University, Warsaw, Poland

<sup>2</sup>Faculty of Physics and Applied Computer Science, AGH University of Science and Technology, Krakow, Poland

Percutaneous pulmonary vein isolation (PVI) is a well-established treatment for patients with symptomatic atrial fibrillation. Nowadays, electro-anatomic mapping systems are widely used during this procedure. However, we are still looking for novel tools that might improve the visualisation of the patient's anatomy and therefore reduce the time of procedure and increase its efficacy. A 54-year-old man with paroxysmal symptomatic atrial fibrillation (EHRA III) was admitted to the hospital for percutaneous PVI. In the past, electrical cardioversion was required to restore sinus rhythm. A few days before the procedure computed tomography (CT) of the heart was performed. Raw data from the CT was imported to a Carina Life<sup>®</sup> analytical telemedical system (MedApp SA), which allowed us to create holographic images of three-dimensional (3D) data. During the procedure the operator wore a head-mounted display, which is part of the augmented reality system (Fig. 1). The visualisation that is used there is based on advanced volume rendering and gives more information than the common surface rendering scenario (Fig. 2). An operator may use voice commands to zoom, translate, or rotate the object in space and also to cut the object using arbitrary planes to see the inside. Moreover, this technique allows the operator to directly compare a real-time image with an image based on the previously performed CT. In addition to 3D imaging, the device is capable of augmenting the operator's view with other information such as the patient's vital parameters or the technical parameters used during the procedure. What is more, 3D imaging may significantly reduce the time and dose of fluoroscopy, which increase the safety of the procedure for the patient and for the operator. The duration of the procedure was 135 min with 143 s of fluoroscopy time, and no complications were observed. During three months of follow-up, there was a single self-terminating atrial fibrillation episode (duration: 2 h; 72 h after PVI). To conclude, additional 3D imaging options may be successfully used during electrophysiological procedures to improve the visualisation of anatomical structures. It may also be used as a tool for teaching students and young physicians.



Figure 1. Photo from pulmonary vein isolation procedure

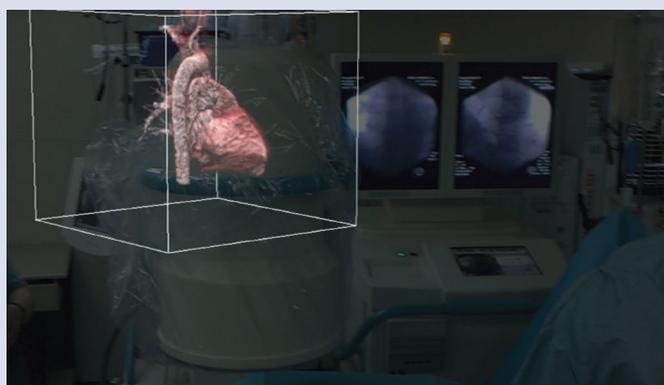


Figure 2. View from Microsoft HoloLens™ device

#### Address for correspondence:

Paweł Balsam, BA, MD, PhD, 1<sup>st</sup> Department of Cardiology, Warsaw Medical University, ul. Banacha 1a, 02-097 Warszawa, Poland, tel: +48 22 599 19 58, fax: +48 22 599-19-57, e-mail: pawel@balsam.com.pl

**Conflict of interest:** J. Kamiński is employed by MedApp SA.

Kardiologia Polska Copyright © Polskie Towarzystwo Kardiologiczne 2018