

Augmented reality in left atrial appendage occlusion

Wykorzystanie rzeczywistości rozszerzonej w zamykaniu uszka lewego przedsionka

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Augmented reality (AR) is gaining practicality with the increasing number of applications it offers combined with modern hardware and software. It is becoming a credible tool for peri-procedural assessment in interventional cardiology. We present two cases of left atrial appendage occlusion (LAAO) in patients with atrial fibrillation (AF) and contraindications to oral anticoagulants (OAC) performed with assistance of holograms and AR. The first patient is an 84-year-old woman with a history of heart failure with preserved ejection fraction (HFpEF), stable coronary artery disease (sCAD), paroxysmal AF, and hypertension. Based on high risk of stroke (CHA₂DS₂-VASc score 6), the patient was administered OAC; however, due to gastrointestinal bleeding without an overt source and anaemia, anticoagulants were stopped and the patient was referred for LAAO. Because of chest angina aggravation, a coronary angiography was performed revealing a significant lesion in proximal left anterior descending artery, which was subsequently treated with coronary angioplasty. A transoesophageal echocardiography (TEE) and cardiac computed tomography (cCT) were performed in order to exclude thrombus in the left atrium and to assess the morphology and anatomy of the appendage. Based on the perimeter-derived diameter of the landing-zone from cCT (20 mm) and three-dimensional (3D) reconstructions, a 20 mm Amplatzer Amulet[®] device was selected and successfully implanted. A transthoracic echocardiography (TTE) performed on the following day showed no signs of pericardial effusion, and a control TEE was scheduled for three months later. The second patient is an 87-year-old man with a history of paroxysmal AF, HFpEF, sCAD, hypertension, and angiodyplasia of the duodenum and large intestine causing chronic gastrointestinal bleeding. Due to high risk of stroke (CHA₂DS₂-VASc score 5) and contraindications to OAC the patient was referred for LAAO. Again, TEE and cCT were performed. According to the perimeter-derived diameter of the LAA landing zone (24 mm), a 25-mm Amplatzer Amulet[®] device was selected and, with the assistance of holograms, successfully implanted. A TTE on the following day revealed correct implant position and no cardiac effusion. The patient was discharged three days later and a TEE was scheduled for three months after the procedure. In both cases, in order to facilitate the pre-procedural assessment, cCTs were processed and holographic reconstructions obtained. Next, 3D images were analysed before and during interventions through a set of AR goggles (Microsoft HoloLens[®]) with a variety of gestures and voice commands to allow rotation, magnification, slicing, and partitioning (Fig. 1). Models were created and managed using Carnalife Holo[®] (MedApp S.A., Cracow, Poland) software. A thorough assessment of the LAA and the adjoining structures such as the pulmonary artery and the circumflex artery is essential before LAAO. A 3D reconstruction of the heart accessible via a set of goggles with gestures and voice commands for analysis proved to be a useful enhancement.

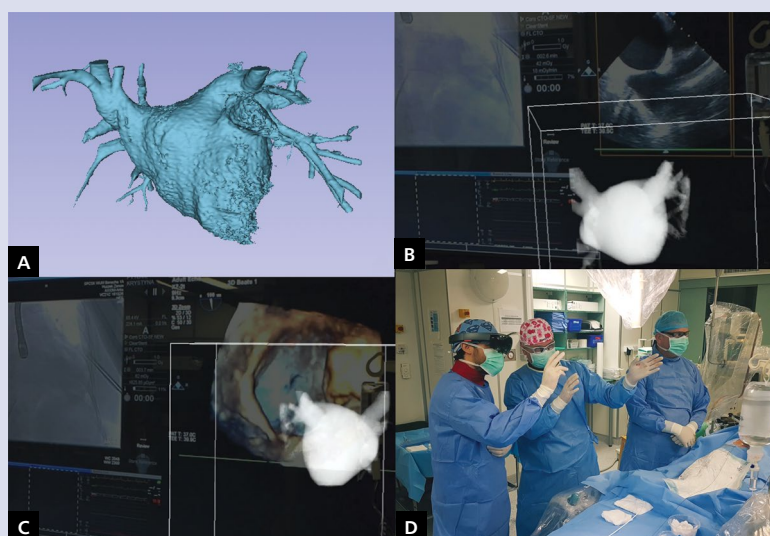


Figure 1. A. Three-dimensional reconstruction of the left atrium created with Carnalife[®] software; B, C. Holographic images seen during the procedure with simultaneous overview of the operating room; D. View of the operating room

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