

EP CASE STUDY:

Innova 3D Spin
rotational angiography

Rotational angiography can help enable clinical confidence in ablations for atrial fibrillation

A new X-ray imaging technique delivers volume images that can help provide a reliable match with overlaid electrophysiology maps

Since March 2011, physicians at the Cardiovascular Center Aalst in Belgium have used a new imaging/mapping integration technique to help position catheters accurately for radiofrequency ablation treatment of complex heart arrhythmias.

The technique uses the CARTO® 3 mapping system to overlay electrophysiology (EP) maps on 3D rotational angiography images acquired on the Innova* interventional X-ray system from GE Healthcare. The rotational images replace the CT images used previously for mapping. Cardiologist Tom De Potter observes that the technique may help minimize radiation exposure and improve clinical confidence by revealing the precise location of the catheter during the procedure.

In 2010, the Cardiovascular Center Aalst completed a renovation of its electrophysiology lab, replacing older equipment and creating five new rooms (two equipped with Innova X-ray imaging systems capable of 3D rotational angiography). In performing left atrial ablations, De Potter uses the CARTO® mapping system to create color-coded electrical maps of the heart with data from GE's CardioLab* electrophysiology recording system. These maps are then overlaid on 3D angiography images from the Innova system and displayed on-screen.

Rotational images acquired at the time of the procedure can help provide a more reliable match to the patient's anatomy than those acquired previously on CT. "On the day after the CT, the patient's anatomy is generally still in the same state, but not always," De Potter observes. "Sometimes there are volume status changes. Sometimes the patient is in arrhythmia during the CT and not during the procedure, or vice versa. That can lead to changes in geometry or changes in volume, potentially causing a mismatch. With rotational angio, we make the reconstruction online during the procedure."



He observes that the CARTO®/X-ray interface can help physicians confidently reach certain difficult areas, including the ridge on the anterior side of the left pulmonary veins. “It is a narrow rim of tissue that the ablation catheter needs to be on precisely,” De Potter says. “This is definitely easier if we have some kind of 3D volume. If there is a mismatch between the volume we acquired and the actual anatomy, it is much harder to position the catheter on that location.”

De Potter and colleagues found only a short learning curve for rotational angiography once the lab was set up to accommodate it. De Potter asserts that the time invested to learn the procedure has been well worthwhile.

Rotational angiography in repeat atrial fibrillation ablation

Case submitted by: Tom De Potter, Department of Cardiology, Cardiovascular Center Aalst, OLV Hospital, Aalst, Belgium

Pulmonary vein (PV) isolation is an established treatment for patients with atrial fibrillation but remains a challenging task because of anatomical complexity and variation of the left atrium (LA) and the PVs.

A 56-year-old patient with drug-refractory paroxysmal atrial fibrillation (AF) underwent PV isolation with radiofrequency catheter ablation (RFCA) in another hospital. Four months later, the patient presented with recurrent symptomatic episodes of AF and was therefore scheduled for a redo PV isolation with RFCA.

To improve mapping accuracy and help minimize procedural radiation exposure, the original contrast-enhanced cardiac computed tomography (CCT) obtained prior was considered to be reused for integration with the 3D images of the LA. The patient underwent pre-procedural transesophageal echocardiography to exclude the presence of atrial thrombi.

A CARTO® electro-anatomical map was created and then integrated with 3D images from the CCT to form a CARTOMERGE map to guide the ablation strategy. However, the merging process was qualitatively poor, very likely due to LA volume status changes between the procedures. Therefore, it was decided to perform a direct contrast-enhanced rotational angiography (RTA) using the Innova 3D application.

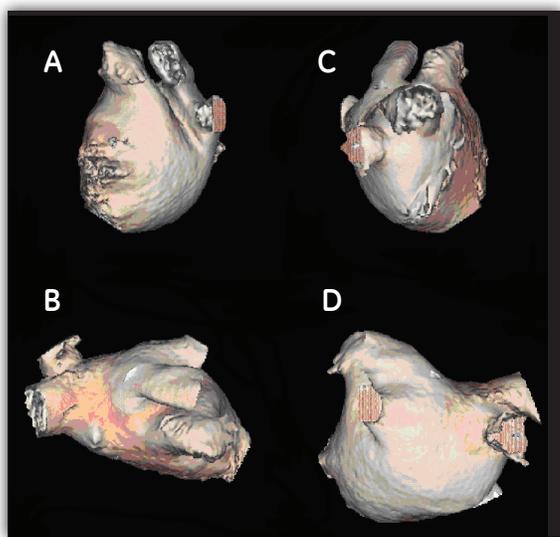


Figure 1. A 3D volume rendering after rotational angiography (RTA) accurately represents the anatomy at the time of the procedure. **A:** Left lateral view. **B:** Right lateral view. **C:** Superior view. **D:** Poster view.

After the acquisition, ventricular pacing was started until spontaneous atrioventricular conduction resumed. Upon completion of RTA, pacing was withheld with subsequent restoration of blood pressure. A 3D reconstruction of the RTA imaging data was performed.

The resulting 3D model (Figure 1 on previous page) was imported into and then successfully merged with the CARTO® electro-anatomical map (Figure 2) using anatomical landmarks on the PVs. Mean distance between the CARTO® volume and RTA volume was 2.68 ± 2.36 mm. The end point of the procedure was the electrical isolation of all PVs defined as both:

- Elimination of PV potentials recorded on the duodecapolar LASSO® NAV Catheter, which was positioned as close as possible to the PV ostium.
- Confirmation of exit block by pacing from the circular catheter showing local PV capture without conduction to the LA.

The 3D reconstruction of the RTA imaging was successfully used to guide ablation of PV potentials located on the ridge (Figure 3). This case shows that intraprocedural 3D reconstruction of the LA by RTA is an effective alternative to CCT for performing online 3D reconstructions.

About the physician

Cardiologist Tom De Potter is associate director of the Cardiovascular Center Aalst in Belgium. He is responsible for management of complex arrhythmia procedures in the center's electrophysiology sub-unit.

About the facility

The 115-bed Cardiovascular Center Aalst has full-time affiliates that include 18 cardiologists and five cardiac surgeons. Total annual visits exceed 21,000 and more than 8,300 patients per year are admitted. Annual procedures include some 6,000 diagnostic catheterizations, 1,700 interventional catheterizations, 41,000 electrocardiograms, 18,000 echocardiograms, and 1,200 electrophysiology studies and ablations.

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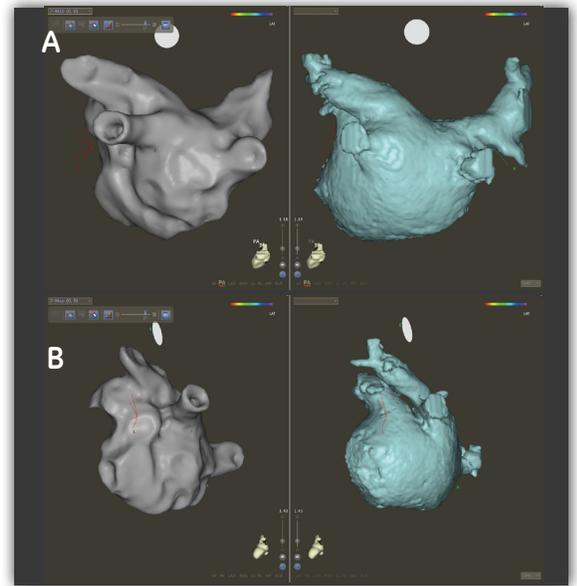


Figure 2. A 3D electro-anatomical fast map obtained by CARTO® system and rotational angiogram accurately presents the anatomy and can help enhance confidence in catheter placement. **A:** Posterior projection. **B:** Left lateral view.

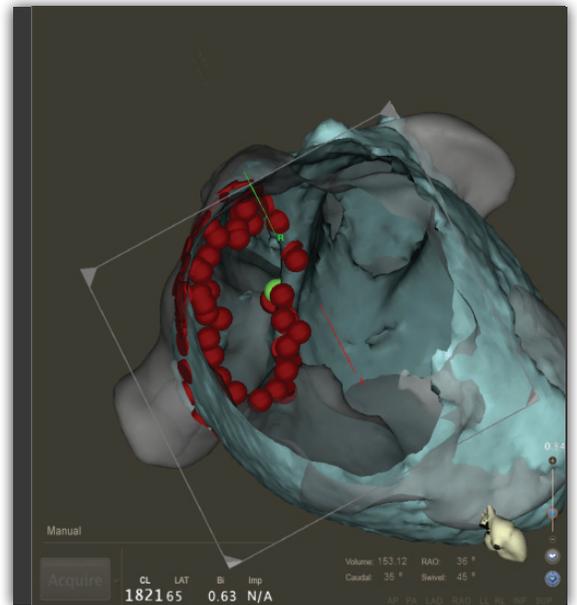


Figure 3. The 3D reconstruction of the RTA imaging was successfully used to guide ablation of PV potentials located on the ridge. Clipping plane view after successful merge with CARTO® anatomical map.

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ThermoCool® Navigation Catheters are approved for drug refractory recurrent symptomatic paroxysmal atrial fibrillation, when used with CARTO® Systems (excluding NaviStar® RMT ThermoCool® Catheter).

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GE Healthcare provides transformational medical technologies and services that are shaping a new age of patient care. Our broad expertise in medical imaging and information technologies, medical diagnostics, patient monitoring systems, drug discovery, biopharmaceutical manufacturing technologies, performance improvement and performance solutions services helps our customers to deliver better care to more people around the world at a lower cost. In addition, we partner with healthcare leaders, striving to leverage the global policy change necessary to implement a successful shift to sustainable healthcare systems.

Our “healthymagination” vision for the future invites the world to join us on our journey as we continuously develop innovations focused on reducing costs, increasing access and improving quality around the world. Headquartered in the United Kingdom, GE Healthcare is a unit of General Electric Company (NYSE: GE). Worldwide, GE Healthcare employees are committed to serving healthcare professionals and their patients in more than 100 countries. For more information about GE Healthcare, visit our website at www.gehealthcare.com.

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CAR-0333-10.11-EN-US