

# Vascular

## Endeavors in Using 3D Images in Crossover Intervention —Arrhythmia Treatment

### Utilizing Trinias in Catheter Ablation for Atrial Fibrillation



Kazuo Kato, M.D.

Department of Cardiology, Nagoya Tokushukai General Hospital

Kazuo Kato

#### 1. Introduction

The national health insurance has been covering the charge of catheter ablation in Japan since 1994. The indications for the catheter ablation have been spreading to almost all the arrhythmias since then, and the number of catheter ablations performed is rising dramatically as with the other catheter interventions of the cardiovascular system. In the last few years, our hospital has also seen a large increase in cases across all cardiovascular diseases indicated for catheter ablation, which has prompted the hospital to improve its angiography systems and to procure Shimadzu's Trinias B12 unity edition angiography system (hereinafter, Trinias unity edition). This article provides an overview as to how we apply Trinias unity edition for the catheter ablation and the characteristic features of the system.

#### 2. Catheter Ablation for Tachyarrhythmia in Japan

In the early days, the only imaging modalities that displayed the position of the catheters were diagnostic X-ray systems intended for angiographic imaging, which was not competent for accurate lesion mapping of arrhythmic foci. Then all kinds of arrhythmias have not been candidates for catheter ablation, and limited arrhythmias which do not require contiguous or deeper lesion were able to be indicated for this procedure. At that time, atrial fibrillation has been known to be the most common arrhythmia that increases in prevalence with age and is somewhat known for affecting celebrities, which had been unfortunately adopted for the catheter ablation as a matter of course.

In 1991, it was reported that the atrial fibrillation could be cured by making incisions in the atria by open heart surgery<sup>1)</sup>, which required accurate and contiguous incisions and the idea of a catheter-based management of the atrial fibrillation was still a distant dream.

#### 3. Catheter Ablation for Atrial Fibrillation

In 1998, it was reported that atrial fibrillation can be initiated by the spontaneous firing originating from the pulmonary veins<sup>2)</sup>, which could be treated with an electrical blockade between the pulmonary veins and the left atrium by catheter ablation. Since then, this led to a dramatic increase in numbers of cases indicated for treatment by catheter ablation. Since the year 2000, magnetic fields have also been applied to render the position of catheters in a three-dimensional image, the outcomes regarding catheter ablations have been improved dramatically, and many facilities are now able to perform catheter ablations to various kinds of arrhythmias including atrial fibrillation. Nevertheless, there is still no established method to treat longstanding persistent atrial fibrillation with catheter ablation, and lots of research has been underway into methods beyond isolating the pulmonary veins.

Recently, wider pulmonary vein isolation has been reported to obtain a better recurrence rate and the pulmonary veins isolation including the posterior wall of the left atrium, i.e., a box PVI has also been proposed as a good option for the various types of atrial fibrillation ablation. In our hospital, we perform box PVI in all atrial fibrillation cases and have achieved a better outcome than before. However, box PVI is known to be more difficult to attain, because the accurate information of the position of the catheter must be indispensable for the procedure. Current 3D mapping systems have been providing the position of the catheter with very high accuracy but hardly complementing the catheter movement arising from not only respiratory and cardiac motion but also patient movement, which can elicit errors of the positions. Safer and more accurate ablations should require more precise assessment of the catheter position within the heart, and only angiography systems can be an option for complementing the abovementioned errors. However, it is also important to minimize the radiation exposure.

As mentioned above, operators performing catheter ablation need to know the position of the catheter in 3D within the left atrium. Our newly procured Trinias unity edition can visualize the catheter with extremely

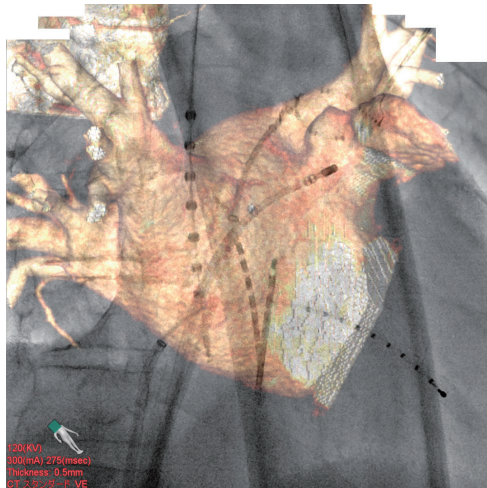


Fig.1

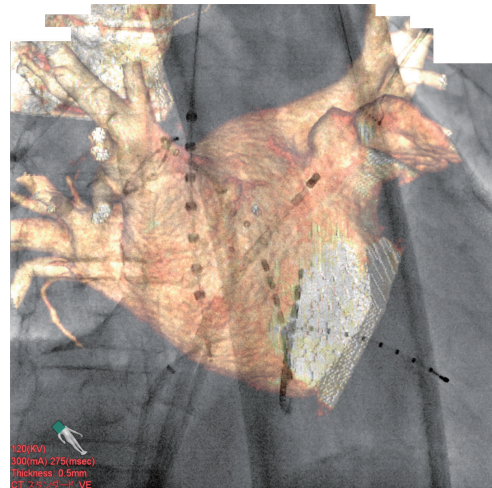


Fig.2

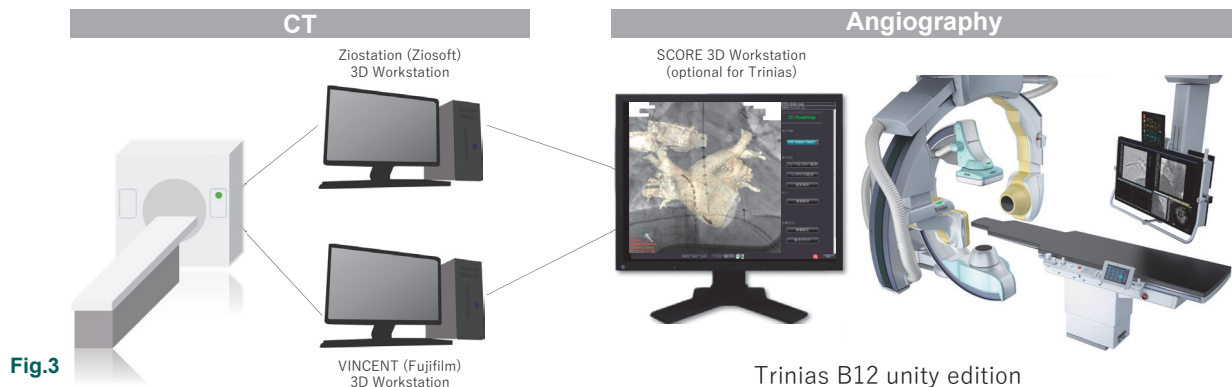


Fig.3

low dose fluoroscopy, and its SCORE Navi+Plus can also overlay these fluoroscopic images with a reconstructed 3D image of the patient obtained during preoperative CT. This shows us the position of the catheter within the reconstructed 3D image precisely and gives us the same feeling of control as a dedicated 3D mapping system designed for ablation. Previously in our hospital, ablation procedures were performed with an angiogram of the left atrium (reference image) on one screen and fluoroscopic images of the catheter on another screen. This forced the operator to look between the two screens to verify the position of the catheter inside the heart (left atrium). Now, SCORE Navi+Plus overlays fluoroscopic images of the catheter onto the reconstructed 3D image obtained by preoperative CT and presents this as a single image. Free of the need to look between two screens, operators are now better able to concentrate on the operating field and accurately assess the position of the catheter. Also, because responsibility for spatially aligning the real time fluoroscopic images on the reconstructed 3D image (image registration) can be handed off to a radiological technologist, operators can give their full attention to the procedure at hand. As shown by **Fig. 1** and **Fig. 2**, catheters can be manipulated safely and without difficulty following the shape of the heart. Our hospital can create the reconstructed 3D images obtained by preoperative CT on either of two workstations: a VINCENT (Fujifilm) and a Ziostation (Ziosoft)

workstation. Thankfully, SCORE Navi+Plus can connect and communicate with either workstation so both can be used in ablation procedure to create reconstructed 3D images for SCORE Navi+Plus (**Fig. 3**). This compatibility of SCORE Navi+Plus with different workstation manufacturers demonstrates the expandability and user-friendliness of SCORE Navi+Plus.

## Conclusion

This article outlines how we use Trinias in catheter ablation for atrial fibrillation.

Trinias unity edition is an angiography system that enables us to accurately track the position of the catheter in three dimensions with extremely low exposure doses both safely and while causing less stress to the patient—features not available from popular dedicated 3D mapping systems for catheter ablation. We are convinced that Trinias unity edition will help improve outcomes in arrhythmia treatment.

## References:

- 1) Cox JL, Schuessler RB, D'Agostino HJ Jr, Stone CM, Chang BC, Cain ME, Corr PB, Boineau JP. The surgical treatment of atrial fibrillation. III. Development of a definitive surgical procedure. *J Thorac Cardiovasc Surg.* 1991 Apr;101 (4) :569-83.
- 2) Haïssaguerre M, Jaïs P, Shah DC, Takahashi A, Hocini M, Quiniou G, et al. Spontaneous initiation of atrial fibrillation by ectopic beats originating in the pulmonary veins. *N Engl J Med.* 1998; 339 (10) : 659-66.