Visualization of Critical Isthmus by Delayed Potential Mapping

Yong-Seog Oh, MD, PhD
Cardiovascular Center, Seoul St. Mary’s Hospital, Catholic University of Korea

ABSTRACT

A 57-year-old man was admitted to our institution with frequent implantable cardioverter-defibrillator (ICD) shock. The ICD was implanted for aborted sudden cardiac death due to non-ischemic cardiomyopathy. Recurrent ventricular tachycardia (VT) was suspected, so an electrophysiological study was performed. Four types of VT were induced and delayed potential mapping visualized a critical isthmus. Successful ablation was performed and VT was no longer induced.

Key words: • 3D mapping • ablation • delayed potential • ventricular tachycardia

Introduction

Many patients with structural heart disease have hemodynamically unstable ventricular tachycardia (VT). If hemodynamically stable, mapping can be performed. Conventional stable VT mapping consists of voltage mapping for defining scar,1 electrogam mapping for characterizing the slow conduction zone, and entrainment/pace mapping for isthmus mapping. Mapping systems recreate the geometry of the ventricles using point-by-point sampling.

Here, we present activation mapping guided by delayed potentials, which facilitate simultaneous visualization of a slow conduction zone and isthmus/exit mapping.

Case Report

A 57-year-old man presented to our institution with frequent implantable cardioverter-defibrillator (ICD) shock. He had undergone an ICD implantation 12 months previously for the treatment of syncope with non-ischemic cardiomyopathy (ejection fraction, 19%). We performed an electrophysiological study. Four types of VT were induced (Figure 1) using a magnetic navigation system (Noiba®). During the ongoing VT, the patient was hemodynamically stable and activation mapping was performed. De-
layed potentials observed on the scar guided the activation mapping (Figure 2). A comparison of conventional mapping and our method is shown in Figures 3 and 4. Radiofrequency energies were applied to the critical isthmus and the scar border. No subsequent VT was induced.

Figure 1. Four types of ventricular tachycardia were induced. In analysis of ICD EGM, (A) was culprit VT inducing ICD shock.

Figure 2. Sequence of delayed potential represents direction of ongoing ventricular tachycardia.
Figure 3. Tracking point and window of interest set.

Figure 4. Activation mapping result (continued on the next page).
Figure 4. (continued) Activation mapping result.

Pre-Editing

White arrow shows the direction of propagation: from apex to base

Post Editing

White arrow shows the direction of propagation: figure 8 reentry through isthmus
Discussion

Conventional mapping, which usually consists of voltage mapping, defining delayed potentials, and entrainment mapping, requires VT stability and considerable mapping time.

The presence of a delayed potential is referred to as an "isthmus." As such, sequential mapping can reveal the critical isthmus, the exit of which is located in the end. Our method simultaneously applied activation mapping and delayed potential mapping, and allowed visualization of the critical isthmus and exit site (Figure 5).

References
