Utility of High-Resolution Electroanatomic Mapping of the Left Ventricle Using a Multispline Basket Catheter in a Swine Model of Chronic Myocardial Infarction

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Published September 2015 in Heart Rhythm

Introduction

With standard electroanatomic mapping systems, electrophysiologists (EPs) use a single catheter to perform left ventricular (LV) substrate mapping. With a new system, the Rhythmia™ Mapping System from Boston Scientific, EPs instead create maps with a 64-electrode mini-basket catheter. The aim of this study was to compare the accuracy of electroanatomic mapping using the Rhythmia system with that of mapping using a standard linear catheter in a swine model of chronic myocardial infarction (MI).

Methods

The Rhythmia Mapping System uses an 8F deflectable catheter with a mini-basket (1.8 cm diameter) of 8 splines of 8 electrodes (total 64 electrodes, 2.5 mm spacing). The system automatically generates chamber geometry and a high-resolution activation map using electrograms (EGMs) recorded within 5 mm of the chamber surface. It automatically acquires EGM and location information based on EGM stability and respiration phase.

Ten swine underwent left anterior descending coronary artery occlusion to create an anteroseptal MI. To assess the MI size, the researchers obtained delayed-enhancement magnetic resonance imaging (MRI) scans. They then created detailed LV voltage maps with both the basket and linear catheters. They compared map characteristics and scar area between the MRI, linear catheter, and Orion basket catheter. Lastly, they mapped induced ventricular tachycardia (VT) with the basket catheter.

Results

More points were acquired with the basket catheter than with the standard linear catheter (Table 1). And the correlation between MRI and catheter scar area measurement was best for the basket catheter (Figure 1). In three animals, sustained poorly tolerated VT was initiated and the circuit mapped successfully with the Orion basket catheter in < 5 minutes.

Table 1. Mapping Results in 10 swine

<table>
<thead>
<tr>
<th>Map Type</th>
<th>EGM Points Acquired</th>
<th>Total Scar Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orion mini-basket catheter</td>
<td>8,762 (±3164)</td>
<td>17.8 cm² (±8.7)</td>
</tr>
<tr>
<td>Standard linear catheter</td>
<td>1,712 (±551)</td>
<td>20.9 cm² (±10.5)</td>
</tr>
<tr>
<td>MRI</td>
<td>N/A</td>
<td>17.5 cm² (±7.4)</td>
</tr>
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* Using a 1.5 mV bipolar voltage cutoff

Conclusion

Rapid substrate and activation mapping using the Rhythmia Mapping System allows detailed voltage and activation mapping in postinfarction cardiomyopathy. This system may be useful for substrate and VT mapping in human postinfarction cardiomyopathy.

TO READ THE FULL ARTICLE, CLICK HERE http://www.sciencedirect.com/science/article/pii/S1547527114009254
The limitations of this study include the following that the basket catheter was not used with other commercially available mapping systems, that the healthy LV was not mapped due to cost limitations. Low voltage points required review to determine if adequate control was achieved. Some of the mapping time was not included since the mapping was done by fellows who were at various stages of their training. Finally, the author was unable to perform entainment mapping due to the fact that the swine became hemodynamically unstable.

RHYTHMIA® MAPPING SYSTEM INTENDED USE/INDICATIONS FOR USE

The Rhythmia® Mapping System and accessories are indicated for catheter-based atrial and ventricular mapping. The mapping system allows real-time visualization of intracardiac catheters as well as display of cardiac maps in a number of different formats. The acquired patient signals, including body surface ECG and intracardiac electrograms, may also be recorded and displayed on the system’s display screen.

CONTRAINDICATIONS

There are no known contraindications.

WARNINGS AND PRECAUTIONS

The use of the Rhythmia Mapping System in conjunction with radio frequency ablation and other medical devices, as a part of the diagnosis and treatment of cardiac arrhythmias, may pose a risk of adverse events, such as cardiac perforation and arrhythmias (new and/or exacerbation of existing arrhythmias) that may require additional intervention. Do not operate the Rhythmia Mapping System near flammable anesthetics. System operation near flammable anesthetics may cause an explosion that could cause injury or death to the patient or user. Only stimulators that are certified for IEC 60601-1-1 requirements and any other relevant safety standards. When connected to other devices, the combined systems’ configuration must meet the IEC 60601-1-1 safety standards. The use of the Rhythmia Mapping System with accessories and devices that do not comply with relevant standards may reduce the safety of the system, cause equipment damage or system malfunction, or harm to the patient or user. Only stimulators that are certified for IEC 60601-1-1 requirements and any other relevant safety standards. When connected to other devices, the combined systems’ configuration must meet the IEC 60601-1-1 safety standards.

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