

Cardiac Ablation Catheters Generic Arrhythmia Indications for Use; Guidance for Industry

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**U.S. Department of Health and Human Services
Food and Drug Administration
Center for Devices and Radiological Health**

**Cardiac Electrophysiology and Monitoring Branch
Division of Cardiovascular and Respiratory Devices
Office of Device Evaluation**

Preface

Public Comment

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For questions regarding the use or interpretation of this guidance contact Randall Brockman at (240) 276-4080 or by email randall.brockman@fda.hhs.gov.

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Introduction

During the past 10 years, catheter-based radiofrequency (RF) ablation has rapidly become the standard of care for patients with certain cardiac arrhythmias, and devices used to perform this procedure have been extensively studied. Most marketed devices are of a similar design and are intended to create endocardial lesions. The safety and effectiveness of these Class III devices for treating many common arrhythmias has been reported and is now well characterized in the medical literature.¹⁻¹²

Because of our understanding of the safety and effectiveness of these devices for a wide variety of arrhythmias, the Center for Devices and Radiological Health (CDRH) of the Food and Drug Administration (FDA) is encouraging manufacturers of approved conventional RF ablation catheters to submit a PMA supplement to revise their indications statement from an arrhythmia-specific indication to a generic arrhythmia treating indication. The purpose of this document is to provide support for FDA's recommendation to label approved conventional RF ablation catheters for the generic indication of treating cardiac arrhythmias. The recommendations discussed in this document are limited to the use of RF catheters for treating cardiac arrhythmias with ablation, and not for any other treatment modality.

Scope

Based on the review of the medical literature, FDA defines conventional RF cardiac ablation catheters as those that have the following features:

- Create endocardial lesions
- Single 4-5 mm ablation electrode
- Temperature sensing capability
- Not irrigated or cooled

- “Steerable” (i.e., catheter has a manually-deflectable tip)
- Placed percutaneously
- Designed to deliver a maximum of 50W RF power to the endocardium

Current FDA Recommendations for Clinical Evaluation of Investigational RF Ablation Systems

Conventional RF ablation catheters have been previously approved by the FDA for treating supraventricular tachycardias (SVTs) including the following:

- Atrioventricular (AV) Reentrant Tachycardias
- AV Nodal Reentrant Tachycardia
- Atrial Tachycardias with Rapid Ventricular Response

To obtain premarket approval of a conventional RF ablation system, it is currently necessary for a manufacturer to perform a prospective clinical study to collect data that demonstrate a reasonable assurance of the safety and effectiveness of the ablation system for treating a specified arrhythmia. Typically, the evaluated endpoints have included Acute Success, Chronic Success (3-6 Month Success), and Safety (occurrence rate of major complications). Table 1 below provides estimates of target values and confidence boundaries for these study endpoints (based on current medical literature). For the above specific indications, it has been acceptable for the sponsor to statistically compare the clinical performance of its investigational ablation system to clinical data reported in the medical literature.

Table 1. Acceptable Endpoint Criteria Based on Medical Literature

STUDY ENDPOINT	TARGET VALUE	95 % CONFIDENCE BOUND
Acute Success	> 95 %	≥ 85 %
Chronic Success	> 90 %	≥ 80 %
Major Complications	< 2.5 %	≤ 7 %

- Acute success - non-inducibility of the target arrhythmia
- Chronic success - 3-month freedom from recurrence of target arrhythmia
- Major complication - procedure or device-related adverse event requiring any intervention to prevent permanent medical intervention

Clinical Data Reported in the Medical Literature

RF ablation catheters for the treatment of cardiac arrhythmias are a mature technology. The biophysics of RF lesion creation when using conventional RF technology is also well characterized and predictable as reported in the medical literature.¹³⁻¹⁵

Safety and Effectiveness

There is extensive medical literature reporting the safe and effective use of conventional RF ablation catheters for treating a variety of arrhythmias in addition to those listed above. Table 2 shows data pooled from the medical literature on three arrhythmias to specifically illustrate different ablation techniques. Literature data for these arrhythmias were chosen to demonstrate the safety and effectiveness of using conventional RF catheters to create either focal or linear lesions in any of the four chambers of the heart. Existing data for the treatment of these three arrhythmias are discussed in more detail below.

Table 2: Safety and Effectiveness of RF Ablation Using Conventional RF Ablation Catheters

ARRHYTHMIA	N	ACUTE SUCCESS	CHRONIC SUCCESS	COMPLICATIONS	COMMENTS
Atrial Flutter ^{1,6-8,10,11,16}	1437	72 - 100%	85-100%	0 - 6%	Linear lesions across isthmus
Ventricular Tachycardia ^{10,11,16}	1463	66 - 85%	86%	2 - 8%	Right and left ventricles
Atrial Tachycardia ^{4,16}	494	91%	85%	3%	Right and left atria

Atrial Flutter

Atrial flutter is usually a well defined macro-reentrant circuit with the critical zone defined as the isthmus between the tricuspid valve and the inferior vena cava. Radiofrequency ablation of atrial flutter in this location with the creation of a linear lesion across the tricuspid isthmus has proven to be successful in the majority of patients treated. This technique using RF ablation is becoming a first line therapy for atrial flutter with highly predictable results. In the 1998 North American Society for Pacing and Electrophysiology (NASPE) Prospective Catheter Ablation Registry,¹⁶ 477 patients were treated with RF ablation for atrial flutter. The major complication rate was less than 3% and included bleeding/hematoma (3 patients), cardiac tamponade (1 patient), hemopneumothorax (1 patient), new tricuspid regurgitation (1 patient), hypoxia (1 patient), and hypotension (1 patient).

Ventricular Tachycardia

Patients being treated with RF ablation for ventricular tachycardia (VT) usually have either ischemic VT or “normal heart” VT. Patients with ischemic VT often have multiple co-

morbidities and have undergone various other treatment modalities, including multiple antiarrhythmic medications. Radiofrequency ablation of VT requires placement of the catheter in either the right or the left ventricle depending on the underlying substrate. Acute and chronic success rates are variable because patients often have multiple VT morphologies, especially in ischemic heart disease patients where the underlying disease substrate is progressive. Radiofrequency ablation procedures for “normal heart” VT are often curative, whereas procedures for ischemic VT are often palliative (i.e., reduces the number of implantable cardioverter defibrillator discharges for ventricular tachycardia episodes). In the 1998 NASPE Prospective Catheter Ablation Registry,¹⁶ 299 patients were treated with RF ablation for VT. The major complication rate was 3.8% and included cardiac tamponade (2 patients), respiratory failure (1 patient), sepsis (1 patient), worsening congestive heart failure (2 patients), and pericarditis (1 patient).

Atrial Tachycardia

A third atrial arrhythmia commonly treated with RF ablation is atrial tachycardia (AT). Radiofrequency ablation of AT usually involves creating a focal lesion in either the right or left atrium. Electrophysiologic mechanisms of AT include automaticity, triggered automaticity, and reentry. Success rates vary because of the heterogeneity of this arrhythmia. In the 1998 NASPE Prospective Catheter Ablation Registry,¹⁶ there were 216 patients that had atrial tachycardia ablations and the major complication rate was 3%. The reported complications were cardiac tamponade (2 patients), transient AV block (1 patient), aspiration pneumonia (1 patient), and right atrial to aortic fistulae (1 patient).

American College of Cardiology/American Heart Association Guidelines

Under the American College of Cardiology/American Heart Association (ACC/AHA) Guidelines for Clinical Electrophysiological and Catheter Ablation Procedures,¹² RF ablation is given a Class I indication for the treatment of many tachyarrhythmias. Class I indications are defined as the preferred treatment modality by general agreement in the medical community. The ACC/AHA guidelines are widely accepted and have been adopted into current medical practice and are included in training programs for cardiac electrophysiology.

Generic Arrhythmia Indications

The combination of published safety and effectiveness data and the published ACC/AHA guidelines for medical use provide persuasive evidence to support a generic arrhythmia indication. FDA encourages manufacturers of approved conventional RF ablation catheters to submit a PMA supplement to revise their indications statement from arrhythmia-specific indications to a generic arrhythmia treatment indication, such as:

Creating endocardial lesions during cardiac ablation procedures to treat arrhythmia.

The PMA supplement should describe any labeling changes to be made as a result of the generic indications.

If the manufacturer intends to indicate the device for treatment of a cardiac arrhythmia other than those described above, supportive clinical information may be required.

Conclusion

In conclusion, FDA is now suggesting that manufacturers of approved conventional RF ablation catheters consider submitting a PMA supplement to revise their indications statement from an arrhythmia-specific indication to a generic arrhythmia treating indication. FDA believes that product-specific clinical data for specific arrhythmias along with available literature data support a more generic arrhythmia treating indication for conventional RF cardiac ablation catheters.

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