

# EUROPEAN JOURNAL OF CARDIO-THORACIC SURGERY

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*Eur J Cardiothorac Surg* 2009;36:407-409  
DOI: 10.1016/j.ejcts.2009.04.023

**This information is current as of August 18, 2010**

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How-to-do-it

# A simple and safe technique for positioning a bipolar radio-frequency device for pulmonary vein isolation

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Received 13 February 2009; received in revised form 10 April 2009; accepted 14 April 2009; Available online 22 May 2009

## Abstract

We describe a simple and safe technique to position a bipolar radio-frequency ablation device around the pulmonary veins when performing pulmonary vein isolation. The technique consists of insertion of a rubber catheter with stylet, originally an introducer from a left vent catheter, behind the pulmonary veins, and subsequent placement of the lower jaw of the ablation clamp using a rubber catheter to guide the device into position. This novel method avoids excessive compression or displacement of the heart and enables easy and safe positioning of the ablation device around the pulmonary veins.

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**Keywords:** Radio-frequency ablation; Arrhythmia surgery; Atrial fibrillation

## 1. Introduction

Pulmonary vein (PV) isolation has become an effective means of managing atrial fibrillation [1,2]. With the development of bipolar radio-frequency ablation devices, it can be easily accomplished on the beating heart from an epicardial approach [3,4]. One key point during the procedure is the positioning of the bipolar radio-frequency ablation clamp around the PVs. A rubber catheter is placed behind the PVs for the subsequent safe positioning of the ablation clamp around them. However, rigid instruments such as a large bronchus clamp are necessary to place the catheter behind the PVs, and a large working space is required for such instruments inside the pericardium. Forcible manoeuvres with such instruments can produce serious tissue injury. Displacement or compression of the heart, which is usually inevitable during left PV isolation, may cause haemodynamic instability [5]. We introduce our technique of using a rubber Robinson catheter to guide the ablation clamp for easy access to the PVs.

## 2. Technique

### 2.1. Left PV isolation

Blunt dissection is performed between the left pulmonary artery (PA) and the left superior PV. The ligament of Marshall

between the two vessels is divided using cautery, and dissection is advanced to the oblique sinus. The malleable stylet, originally an introducer from a left ventricular vent catheter, is inserted into a rubber Robinson catheter, and the catheter is bent into a J shape. We prefer to use an introducer from a Flexmate<sup>TM</sup> vent catheter (Toyobo, Osaka, Japan) and an 11-Fr. Dys-Nelaton<sup>TM</sup> rubber catheter (Sawatani Rubber Works, Tottori, Japan) (Fig. 1). The J-shaped catheter is inserted between the left PA and the left superior PV (Fig. 2a). The catheter is advanced gently towards the diaphragm through the oblique sinus (Fig. 2b). The stylet is removed from the catheter (Fig. 2c), and the lower jaw of the ablation clamp is inserted into the open end of the catheter (Fig. 2d). By pulling the catheter caudally, the lower jaw is directed behind the PVs (Fig. 2e), and the catheter is released from the clamp. The clamp is positioned on the left atrial cuff, and ablation lesions are created (Fig. 2f).

### 2.2. Right PV isolation

Blunt dissection is performed between the right superior PV and the right PA lateral to the superior vena cava. Additional blunt dissection is performed to open the oblique sinus between the right inferior PV and the inferior vena cava (IVC). The rubber catheter and stylet are inserted between the right PA and the right superior PV (Fig. 2g). The catheter is advanced to the diaphragm on the left side of the IVC. The stylet is removed from the catheter (Fig. 2h), and the catheter tip is drawn to the right side of the IVC through the aperture between the right inferior PV and the IVC (Fig. 2i).

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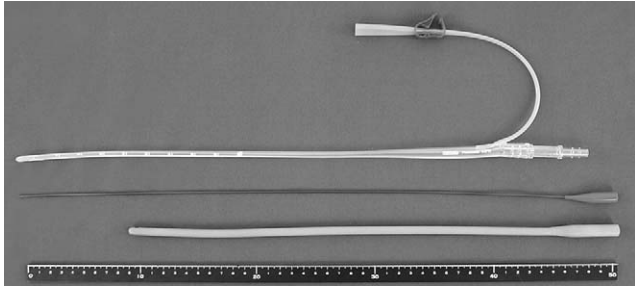


Fig. 1. (Top) Left vent catheter. (Middle) Inner introducer from a left vent catheter. (Bottom) Rubber Robinson catheter.

The lower jaw of the ablation clamp is inserted into the open end of the catheter (Fig. 2j). The catheter is pulled caudally behind the PVs, and the clamp is brought around the right PVs (Fig. 2k). The clamp is removed from the catheter and positioned on the atrial cuff, and isolation lines are created (Fig. 2l).

If it is difficult to feed the ablation clamp caudally, the rubber catheter can be cut transversely at the tip to open the lumen (Fig. 2m). The lower jaw of the clamp is inserted into this open end (Fig. 2n) and is advanced cephalad behind the PVs (Fig. 2o), following which the clamp is removed from the catheter and is properly positioned to create ablation lines (Fig. 2p).

### 3. Results

We initially applied this technique in four patients with chronic atrial fibrillation (one male patient, mean age: 66.5

years). All patients underwent bilateral PV isolation as a part of a full Maze lesion set and a concomitant variety of valve procedures. The technique was used successfully in all patients, and no PV injury or haemodynamic deterioration occurred during the procedure. Sinus rhythm was restored in three of the four patients before discharge. There was no operative death, re-exploration for bleeding, PV stenosis or stroke during follow-up.

### 4. Discussion

Devices designed exclusively to provide easy access around the PVs have been developed and marketed (Lumitip Dissector™, AtriCure, Inc., West Chester, OH, USA; Navigator™ Tissue Dissector, Medtronic, Inc., Minneapolis, MN, USA). Both these devices have a light at the tip to provide illumination for navigating the soft tissue around anatomical structures. The devices are especially useful to develop the pericardial reflection between the oblique and transverse sinuses, whereas disadvantages of the devices are high cost and the requirement of single use.

The rubber catheter introduced here is small, pliable and splayed on its proximal end, which allows for easy insertion of the lower jaw of the ablation clamp. The stylet allows the catheter to be shaped for easy insertion behind the PVs without large, rigid surgical clamps. Both the catheter and stylet are inexpensive, and no other special devices are required. They yield easily to cardiac structures, thus preventing tissue injury. Moreover, the technique does not require a large working area inside the pericardium, which helps to avoid excessive compression or displacement of the heart.

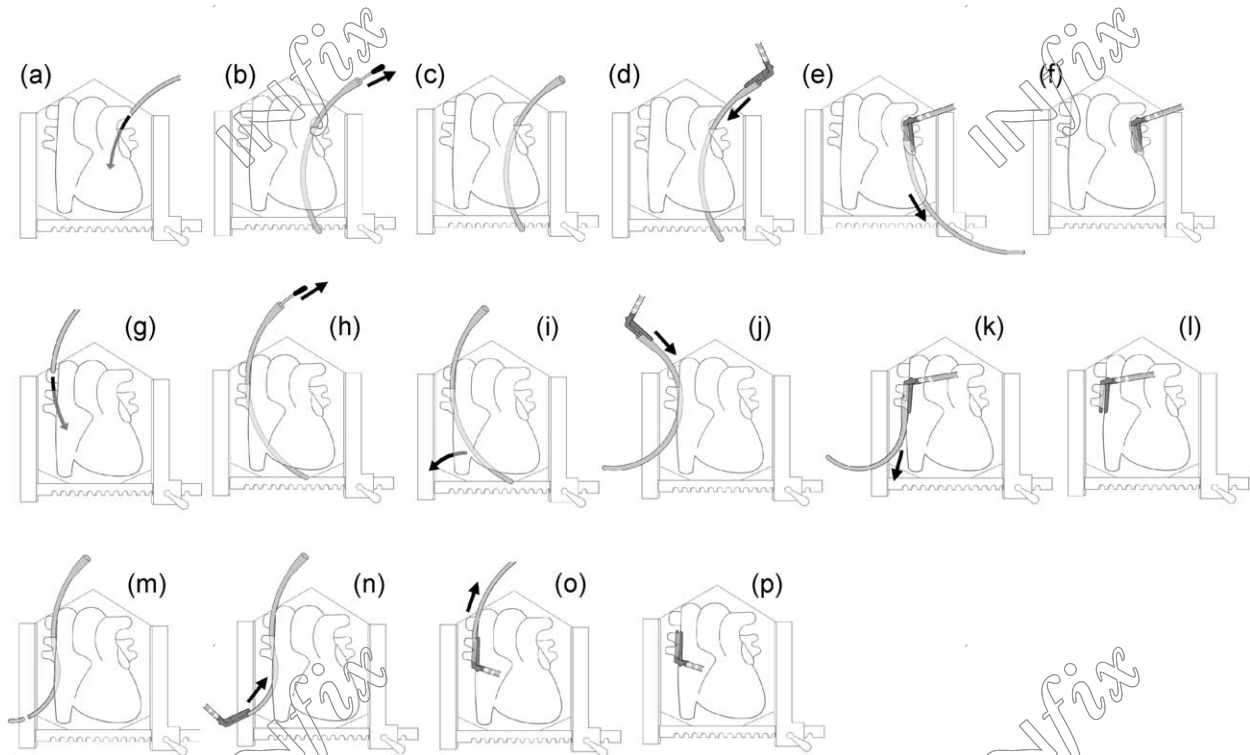


Fig. 2. Technique for using a rubber Robinson catheter to guide the ablation clamp for easy access to the pulmonary veins. See text for details.

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