One-puncture, double-transseptal catheterization manoeuvre in the catheter ablation of atrial fibrillation


Division of Cardiovascular Diseases, Cardiac Rhythm Management Laboratory, University of Alabama at Birmingham, VH B147, 1670 University Boulevard, 1530 3rd AVE S, Birmingham, AL 35294-0019, USA

Received 27 December 2006; accepted after revision 19 March 2007; online publish-ahead-of-print 9 May 2007

Pulmonary vein isolation (PVI) guided by circumferential mapping has been established as a curative treatment of atrial fibrillation. In the PVI technique, two transseptal catheters are necessary for mapping and catheter ablation. The one-puncture, double-transseptal catheterization manoeuvre is generally used in the PVI technique. However, to the best of our knowledge, there have been no reports describing transseptal manoeuvre in detail. In this article, the manoeuvre to achieve double-transseptal catheterization easily and safely is described.

KEYWORDS
Atrial fibrillation; Transseptal procedure; Radiofrequency catheter ablation

Pulmonary vein isolation (PVI) guided by circumferential mapping has been established as a curative treatment of atrial fibrillation.1–3 In the PVI technique, two transseptal catheters are necessary for mapping and catheter ablation.1–3 The one-puncture, double transseptal catheterization manoeuvre is generally used in the PVI technique.1–3 However, to the best of our knowledge, there have been no reports describing transseptal manoeuvre in detail. In this article, the manoeuvre to achieve a double transseptal catheterization easily and safely is described.

First, transseptal access is obtained using an 8-French transseptal sheath (Fast-Cath™ Swartz™ SL1 or 2, St Jude Medical, AF Division, Minnetonka, MN, USA) with a Brockenbrough needle with the guidance of biplane fluoroscopy imaging and/or intracardiac echocardiography using the standard technique.3 Once transseptal access is obtained, intravenous heparin is administered to maintain an activated clotting time of >400 s throughout the procedure. After the transseptal sheath with the dilator is introduced into the left atrium, the Brockenbrough needle is replaced by the guidewire, which comes in the package with the sheath, and the guidewire is positioned into the left superior or inferior pulmonary vein (Figure 1). An ablation catheter is then introduced through another femoral vein sheath and positioned in the right atrium. Following that, the transseptal sheath is pulled back into the right atrium leaving the guidewire in the left pulmonary vein, and the ablation catheter is then advanced into the left atrium across the transseptal puncture beside the guidewire (Figure 1). Finally, the transseptal sheath is re-advanced into the left atrium over the guidewire. With this manoeuvre, the double-transseptal catheterization can be achieved (Figure 1).3 This manoeuvre was successful without any complications in 211 (93%) of 226 consecutive patients who underwent PVI from January to December 2006. Throughout the transseptal catheterization, continuous monitoring of the electrocardiogram was performed to detect the occurrence of any coronary artery spasms provoked by the mechanical effects of the transseptal puncture on the inter-atrial vagal network4 or coronary artery embolism,5 and intermittent monitoring of the cardiac silhouette excursion on the fluoroscopic images6 and continuous monitoring of the systemic blood pressure were performed to detect any impending pericardial tamponades.

However, in 15 (7%) patients, the transseptal manoeuvre was unsuccessful because of a small transseptal puncture hole or atrial septal aneurysm.7 In those cases, we attempted three different techniques to achieve the one-puncture, double-transseptal catheterization. In the first technique, two guidewires were introduced into the left inferior PV through the transseptal sheath. After the transseptal sheath was removed, two transseptal sheaths were introduced into the left atrium via the femoral vein over the two guidewires, respectively. In the second technique, the guidewire was introduced into the left inferior PV through the transseptal sheath. The transseptal sheath was then replaced by a dilator from a 12-French transseptal sheath, and the transseptal puncture hole was enlarged. Thereafter, the standard technique described above was...
attempted again. Although those two manoeuvres were successful in all cases, as a major limitation, bleeding from the sides of the sheaths at the femoral vein puncture site was observed in three of three (100%) patients with the first technique and three of five (60%) with the second one. In the third technique, the ablation catheter was introduced into the left atrium across the transseptal puncture beside the guidewire and then the tip of the ablation catheter was deflected below the guidewire towards the bottom of the left atrium (Figure 2). Following that, the ablation catheter was pulled down so that the transseptal puncture hole was extended and the atrial septum was not pushed away. Finally, with the ablation catheter held in that position, the transseptal sheath was re-advanced into the left atrium over the guidewire (Figure 2). This manoeuvre was successful without any complications in seven of seven
(100%) patients. Our experience has demonstrated that the third technique was the best because it could achieve the one-puncture, double-transseptal catheterization easily and safely.

The double-transseptal puncture technique is used to achieve the double-transseptal catheterization. Actually, a second transseptal puncture is easy to perform in most of the cases, because once the first sheath has been placed transseptally, it can be used as a guide to show the correct location for the second transseptal puncture. However, in some cases, the transseptal puncture may be successful only in a limited area. In those cases, the second transseptal puncture may be difficult and the creation of a double-puncture with the two sheaths too close to each other may at times cause the sheaths to limit one another’s movement. Another disadvantage of the double-transseptal puncture technique is that this technique requires the use of a second transseptal sheath. The double-transseptal puncture technique achieves manipulation of the catheters easily than the one-puncture, double-transseptal catheterization technique, which may sometimes cause the catheters to 'stick' to one another. However, when such difficulty occurs with the one-puncture, double-transseptal catheterization technique, by pulling the sheath back into the right atrium after the introduction of the catheter into the left atrium via the sheath, it can create enough space in the transseptal hole to allow the two catheters to be easily manipulated without 'sticking' to one another.

References