Case Report

The case of successful catheter ablation using only the approach from the upper part of the subject’s body, with meandering aorta and implanted IVC filter

Daisuke Sato (MD, PhD) a,∗, Hajime Otani (MD, PhD) a, Satoko Higashiyama (MD) a, Fujita Masanori (MD) a, Junji Iwasaka (MD) a, Haengnam Park (MD) a, Yoshihiro Yamamoto (MD) a, Naoki Minato (MD, PhD) b, Toshiji Iwasaka (MD, PhD, FJCC) a

a Second Department of Internal Medicine, Kansai Medical University, Moriguchi City, Japan

b Department of Thoracic and Cardiovascular Surgery, Kansai Medical University, Moriguchi City, Japan

Received 27 November 2010; received in revised form 30 May 2011; accepted 14 July 2011

KEYWORDS
Atrioventricular reciprocating tachycardia; Brachial artery; Femoral vessels; Inferior vena cava filter; Radiofrequency catheter ablation

Summary  A 79-year-old female had paroxysmal supraventricular tachycardia. However, she was implanted with an inferior vena cava filter and her descending aorta had significant meandering. It was thought that the insertion of the catheters would be difficult from the femoral vessels. Therefore we inserted electrode catheters from the right subclavian vein and internal jugular vein. As a result of an electrophysiology study, we diagnosed atrioventricular reciprocating tachycardia with a left lateral concealed accessory pathway (AP). An ablation catheter was introduced retrogradely through the left brachial artery and it was pushed forward under the mitral valve. Furthermore, it was put into the part where the earliest retrograde atrial deflection was recorded under the right ventricular apex pacing, and we succeeded in ablation of the AP. All catheters were inserted only from the upper part of the person’s body. As for catheter operability, electric potential, operation time, and fluoroscopy time, there was no change in the case of either approach from the femoral vessels. Because we did not puncture the inguinal region, the patient was able to return to her ward on foot after the operation. In addition, we were able to perform a radical cure without complications.

© 2011 Japanese College of Cardiology. Published by Elsevier Ltd. All rights reserved.

Introduction

Catheter ablation for atrioventricular reciprocating tachycardia (AVRT) with concealed accessory pathway (AP) is now established as a front-line treatment [1]. Electrophysiology (EP) study usually involves inserting many electrode
catheters and an ablation catheter from the femoral vein and artery.

We report on the case of a subject that had AVRT with left concealed AP. The case had meandering in the descending aorta and had been implanted with an inferior vena cava (IVC) filter. It was thought that it would be difficult to insert electrode catheters from the femoral vein and artery. Electrode catheters and the ablation catheter were inserted from the upper part of the person’s body and ablation was performed. A report that some catheters were inserted in the upper part of the person’s body at catheter ablation has appeared, but we inserted all the catheters from the upper part of the person’s body, and there has not yet been a report that ablation in these circumstances has succeeded.

We report on this, including catheter operability, electric potential, operation time, fluoroscopy time, and complications.

Case report

A 79-year-old female had received thymus enucleation for myasthenia gravis at the age of 58 years, and she was implanted with an IVC filter for pulmonary embolism at the age of 68 years. There were no especially significant hereditary factors. She had noticed palpitation from about the age of 20 years, and this was diagnosed as paroxysmal supraventricular tachycardia (PSVT). Medication by verapamil, bisoprolol, and hydrochloric acid pilsicainide continued, but two or three times a month she noticed palpitations. She hoped for a radical cure by catheter ablation and had a hospital consultation to that end.

A 12-lead electrocardiogram (ECG) at the time of the tachycardia showed a regular tachycardia of narrow QRS complex in 174 bpm. It showed a positive P wave in V1 and a negative P wave in II, III, and aVF after QRS complex (Fig. 1A). The tachycardia was stopped by injection of adenosine triphosphate (10 mg). The ECG after the tachycardia stopped did not have a delta wave for sinus rhythm (Fig. 1B) [2]. The above suggested an AVRT by the concealed AP [3]. The left wall was considered to be the location of the concealed AP [4].

The meandering of the aorta was shown by chest X-ray and a contrasting computed tomography (CT) of the aorta was carried out (Fig. 2). The result showed that the descending aorta had significant meandering. It was thought that passage through the descending aorta would be difficult even if we inserted an ablation catheter from the femoral artery, and it was supposed that the catheter ablation operation would be more difficult. In addition, an IVC filter was implanted, and it was thought that a trans-septal approach by the Brockenbrough technique was high-risk, not to mention the insertion of the electrode catheters from the femoral vein. Therefore, we decided to insert all electrode catheters and the ablation catheter only from the upper part of the patient’s body.

Sheaths were introduced through the right internal jugular vein (5-French) and the subclavian vein (7-French). These punctures were guided by ultrasound [5]. A duo-decapolar electrode catheter (5-French, distance between electrodes is 2 mm, St. Jude Medical, St Paul, MN, USA) was introduced through the right internal jugular vein and advanced into the coronary sinus. Three quadripolar electrode catheters (2-French, Ensemble, distance between electrodes is 5 mm, Japan Lifeline Co., Ltd., Tokyo, Japan) were introduced from the subclavian vein and positioned in the high right atrium (HRA), right ventricular apex (RVA), and atrioventricular junction. Although operability declined a little when the catheter was compared with normal electrode catheters, we were able to record a good electric potential. Intracardiac signals were filtered at 30–150 Hz.

There was an AA interval of 759 ms, AH interval of 81 ms, and HV interval of 34 ms for sinus rhythm at the time of the start of the EP study (Fig. 3A). We recorded the earliest atrial deflection distal of the CS catheter by RVA pacing. It did not show a conduction delay in response to an increase in the rate in the St-A interval by extra stimulation from RVA. The tachycardia was easily caused by extra stimulation from RVA. The cycle length of the tachycardia was 323 ms and the earliest atrial deflection distal of the CS catheter (Fig. 3B). A ventricular stimulus delivered during the His bundle refractoriness succeeded in advancing the tachycardia [6]. It extended the post-pacing interval and the difference of the cycle length with only 94 ms entrainment by RVA pacing [7].

From the above, we made a diagnosis of AVRT with concealed AP of the left lateral wall. As stated above, the descending aorta had significant meandering, and an IVC filter was implanted. Therefore, a sheath (7-French, 30 cm, TERUMO Corp., Tokyo, Japan) and a 7-French ablation catheter (Ablaze Fantasista 4-mm-tipped, Japan Lifeline Co., Ltd.) were introduced through the left brachial artery.

An ablation catheter was introduced using a retrograde transaortic approach and pushed forward under the mitral valve. Furthermore, it was put in the part where the earliest retrograde atrial deflection was recorded under RVA pacing. This was a catheter operation from the brachial artery, but there was no spasm of the artery, and the operability did not change from the femoral artery. It was supposed that the place was AP and radio frequency (RF) energy was delivered at the site with the earliest atrial activation during RVA pacing. RF energy was delivered using a 30-W, 50° setting and a single RF delivery at the site successfully resulted (Fig. 4). PSVT was not caused afterwards.

The operation time was 1.6 h and fluoroscopy time was 23 min, which was not very different to the usual time (average operation time and fluoroscopy time for the concealed AP in the past year in this hospital is 1.3 h and 18.6 min).

After having removed the catheters and sheaths, we applied pressure using tape after having compressed the right subclavian vein, right internal jugular vein, and left brachial artery by hand for 15 min. Because we did not puncture the inguinal region, the patient was able to return to her ward on foot after the operation. All pressure was removed after three hours. The procedure was performed without subsequent complications such as hematoma or median nerve disorder. One year has passed, but there are no symptoms that could suggest AVRT.
Figure 1  The electrocardiogram (ECG) of the tachycardia and sinus rhythm. (A) The ECG showed a regular tachycardia of narrow QRS complex in 174 bpm. (B) Sinus rhythm.
Discussion

We were faced with a case of AVRT with a concealed AP in which it was thought that the insertion of the catheters would be difficult from the femoral vessels. The electrode catheters and the ablation catheter were inserted from the upper part of the person’s body and ablation was performed. When the 2-French catheter was compared with normal electrode catheters, operability was not very good. Therefore we looked for a place where the His bundle deflection could be recorded in the first catheter, and put the catheter in RV or HRA if that was impossible. The second catheter had a curved shape, unlike the first, and aimed at His bundle deflection. The third was similar, too. It seems that it is better to look for a place where the His bundle deflection can be recorded in one of the electrode catheters of three curved shapes because it was comparatively easy to put in HRA and RV. The other catheters and the ablation catheter were operated without a problem.

Puncture is necessary for subclavian vein and internal jugular vein in the case of EPS from the upper part of a person’s body. If there is a guide by ultrasound, it is reported that the success rate and safety do not have a difference in the case of femoral venopuncture [5,8]. In addition, the catheter operation was different in the case of the approach from femoral vein, but there was no inferiority about the electric potential [8]. However, an electric potential record was slightly insufficient for this case. Technical problems, in the approach part, the type of electrode catheter, and patient factors are considered among the reasons why an electric potential record was insufficient. Fortunately, the diagnosis was easy because there was AP in the left lateral wall in this case. However, a diagnosis may be difficult for septal AP or multiple AP cases. It seems that there is room for further examination about this point.

Regarding the artery, the brachiocephalic trunk may show meandering in an elderly patient or a patient with hypertension, and it is thought that the approach from the left brachial artery is better [9]. Fortunately, this case did not
Ablation using only access from the upper part of the subject’s body

Figure 4  Surface electrocardiogram and intra-cardiac electrocardiogram during the right ventricular pacing and ablation. AP was ablated after 2.7 s of RF energy delivery. (B) The position of the ablation catheter at the earliest activation site in the endocardial. (Left: right anterior oblique. Right: left anterior oblique). ABL d = Ablation Catheter distal; ABL p = Ablation Catheter proximal.

become problematic, but the ablation catheter insertion from the brachial artery may cause a spasm of the artery. Therefore, it seems that it is wise to use a long sheath. In this case we used a sheath of 30 cm.

The operation time and fluoroscopy time did not change in comparison with the approach from the femoral vessels. The patient was able to return to her ward on foot after the operation because we did not puncture the inguinal region. Of course, no complications occurred. As for the patient resting quietly in bed after the operation, this is not necessary if all catheters are inserted via the upper part of the patient’s body, as in this case. This can help to avoid pulmonary embolism and bedsores and can promote postoperative quality of life improvement of the patient. In addition, a sense of embarrassment can accompany hair shaving and the puncture of the inguinal region. However, if the procedure is initiated from the upper part of a person’s body, there is comparatively little embarrassment, and it is good news that there are increased choices for patients hesitating to accept ablation. Catheter ablation should become a low trauma standard procedure.

In conclusion, we succeeded in catheter ablation only using an approach from the upper part of the patient’s body to treat left concealed AP with AVRT that showed meandering in the descending aorta and with an implanted IVC filter.

References


