ECRONICON OPEN ACCESS

EC CARDIOLOGY
Case Report

Iterative Atrial Tachycardia Originating from the Small Cardiac Vein

Chen Chun-Hui*, Fu Yan, Ning Li-Ye and Tu Lu-Yu

Cardiovascular Medicine Department, Dongguan Kanghua Hospital, Dongguan, China

***Corresponding Author:** Chen Chun-hui, Cardiovascular Medicine Department, Dongguan Kanghua Hospital, Dongguan, China.

Received: March 12, 2022; **Published:** March 14, 2022

DOI: 10.31080/eccy.2022.09.00869

Abstract

A case report of iterative atrial tachycardia for 2 years. During electrophysiologic study, the tachycardia showed a constant cycle length of 430 ms and the earliest atrial activation site from the posterior to the lateral CS (coronary sinus), The three-dimensional electroanatomical map (Rhythmia) indicates that the sites of earliest activation was the entrance of the small cardiac vein to the right atrial appendage. Low-energy radiofrequency applications eliminated the tachycardia in this sites. During 1-year follow-up, the patient remained asymptomatic without tachycardia recurrences. On the basis of this, we speculate that the muscular sleeves surrounding the small cardiac vein might be involved in the genesis of this tachycardia.

Keywords: *Irregular Atrial Tachycardia; Small Cardiac Vein; Radiofrequency Catheter Ablation*

Introduction

Atrial tachycardia (AT) is generally poorly responsive to medication, and radiofrequency ablation is often needed. The electrophysiological mechanism of atrial tachycardia is mainly focal or macro-re-entrant. Radiofrequency ablation this form of tachycardia can be treated with high long-term success [1,2]. The foci responsible for AT tend to occur along the crista terminalis (CT) [2] tricuspid annulus (TA) [3] ostium of the coronary sinus (CS), the parahissian region, the ostia of the pulmonary veins (PVs) [4] and, less commonly, at the mitral annulus [5], left atrium appendage, right atrium appendage and left-sided septum [6], aortomitral junction [7]. However, it is rarely reported that the atrial tachycardia originates from the small cardiac vein.

Case Report

A 56-year-old woman was admitted to the hospital, and her chief complaint was palpitation for 2 years. Her Holter test showed persistent tachycardia, and her was no background disease. The ablation operation would be arranged after signing then consent form. The 12-lead ECG showed that the P wave of Ⅱ, Ⅲ and AVF leads was positive, AVR lead was negative and AVL lead was positive. According to the characteristics of the 12-lead ECG, it is speculated that the tachycardia originated from the right atrial appendage or crista terminalis. When the ten-pole mapping electrode was placed into the coronary sinus, it was observed that the activation sequence of A wave was gradually delayed from CS9-10 to CS1-2, and the tachycardia cycle length is 430 ms (Figure 1). The three-dimensional electroanatomical

map (Rhythmia) indicates that the earliest activation area is located at the base of the right atrial appendage. The cycle length that can be mapped in the right atrium on the three-dimensional electroanatomical model is 173 ms, accounts for 40% of the cardiac cycle. The mapping results suggest that the tachycardia is focal atrial tachycardia. The earliest excitation point on the model advances the P wave 25 ms. The ablation catheter is placed in this zone and ablation is performed at 35W in temperature control mode. When the ablation energy is released, the tachycardia can stop briefly, but it will relapse again after stopping the energy release. It is speculated that the reason may be that the focus is located in the deep myocardium and the ablation energy cannot permeate well. In the process of constantly adjusting the angle and direction of ablation catheter, it was found that there was a diverticulum near the earliest activation zone. A more perfect target can be mapped after the ablation catheter was inserted into the diverticulum. At this target, the distal potential of the ablation catheter advances the P wave 28 ms (Figure 2). The tachycardia terminates after ablation of 35W power in temperature control mode for 15 seconds. And repeated atrial pacing stimulation can not induced tachycardia again. Angiography was performed by injection of contrast medium through the ablation catheter, it is confirmed that the location is the entrance of the small cardiac vein to the right atrial appendage (Figure 3).

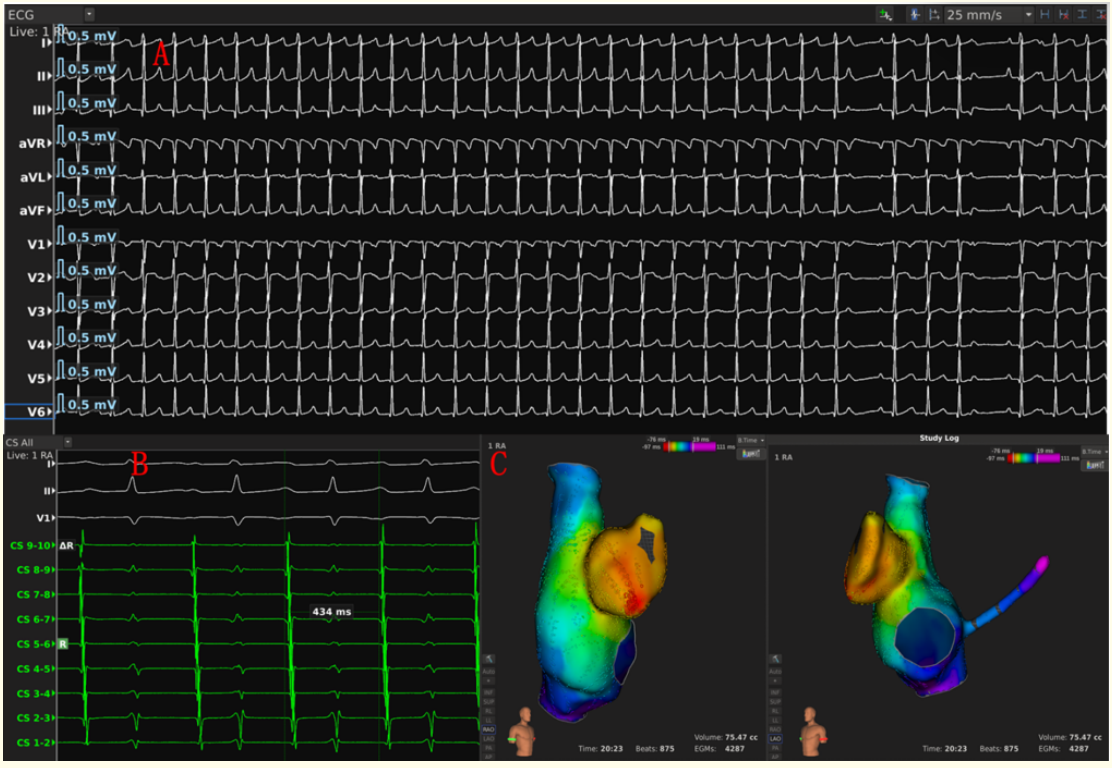

Figure 1: *(A) 12-lead ECG of atrial tachycardia. (B) Activation sequence of electrodes within the coronary sinus and tachycardia cycle length. (C) The three-dimensional electroanatomical map (Rhythmia).*

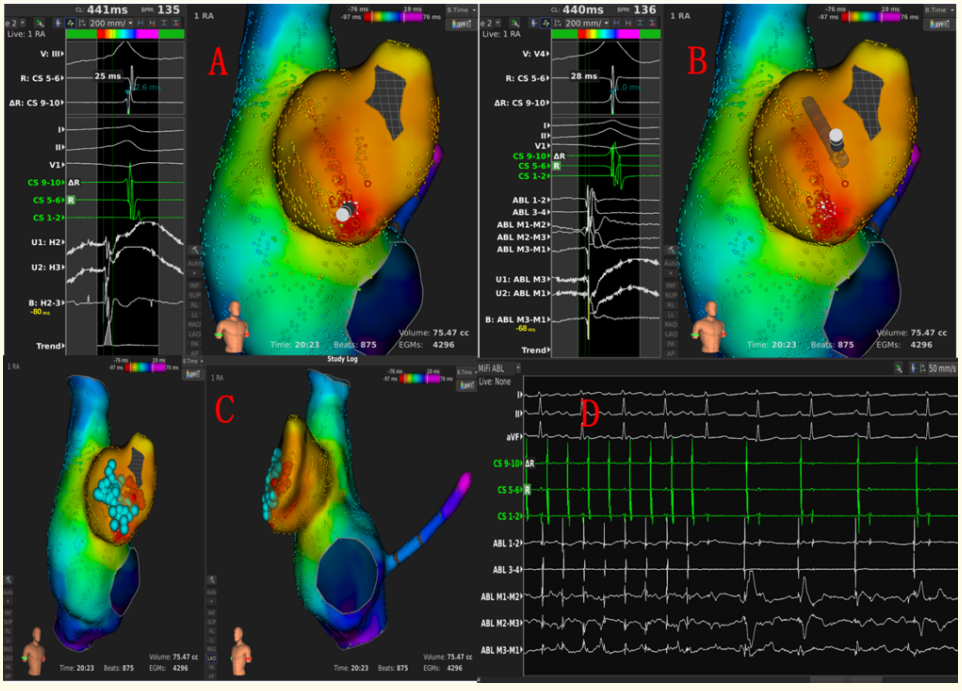

Figure 2: *(A) The earliest excitation point on the three-dimensional electroanatomical map model advances the P wave 25 ms. (B) Successful ablation target advances the P wave 28 ms. (C) The blue dot is the ablation zone of the earliest activation point of the model, and the red dot is the ablation zone of the successful target. (D) The tachycardia terminates after ablation of 35W power in temperature control mode for 15 seconds.*

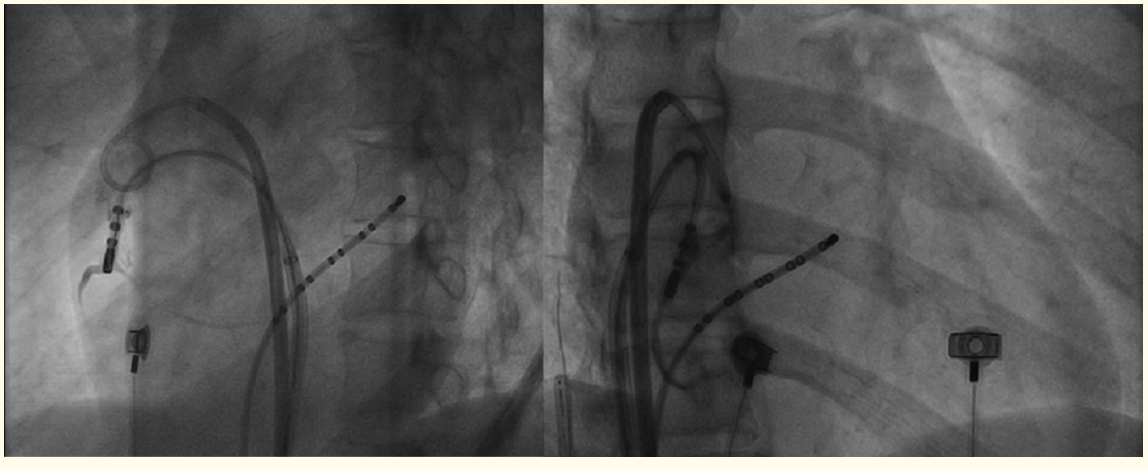

Figure 3: *Digital Subtraction Angiography (DSA) imaging of ablation targets (left: LOT 45°, right: ROT 30). The ablation catheter is located in the entrance of the small cardiac vein to the right atrial appendage.*

Discussion

Abnormal myocardium is often found in the atrial tachycardia focuses, the abnormal myocardium has been seen with areas of myocardial fibrosis, myocyte hypertrophy, inflammatory infiltration and fatty substitution [8]. Low amplitude and fractionated electrograms have been described at sites of successful ablation in patients with focal atrial tachycardia [9]. The difference is that the high frequency and high amplitude electrograms have been mapped at sites of successful ablation in this case. This electrograms is commonly recorded in the muscular sleeves surrounding the cardiac veins [10]. The radiography after successful ablation was confirmed that the sites of successful ablation was the entrance of the small cardiac vein to the right atrial appendage. To our knowledge, this is the first reported case of atrial tachycardia successfully cured by radiofrequency ablation delivered within the small cardiac vein.

Right atrial appendage that has pectinate muscle and smooth-walled vestibule and low blood flow, thus increases the difficulty of successful ablation. Moreover, the thin walled structure of atrial appendage increases the chances of cardiac perforation during ablation procedure [11]. These factors lead to the low rate of success cured by radiofrequency ablation right atrial appendage atrial tachycardia ablation. Now we believe that atrial tachycardia originated from the small cardiac vein, which is also one of the reasons for the failure of cured by radiofrequency ablation. For such cases, if the catheter is ablated only on the endocardial surface, it is difficult for the energy to penetrate well into the focus, resulting in the recurrence of tachycardia after stopping the release of ablation energy. In this case, the catheter needs to be extended into the orifice of the cardiac venule and ablated on the epicardial side, the ablation energy is set to 20-35W, and the temporary release of energy tachycardia can be eliminated.

Conclusion

The muscular sleeves surrounding the cardiac veins is one of the causes of focal atrial tachycardia. When the ablation of atrial tachycardia on the endocardial side of the right atrial appendage is not effective, It is recommended that electroanatomical map be carried out at the entrance of the vein, and it is possible that the focal atrial tachycardia originated from this site.

Funding Support

The source of funding for this article is: Dongguan Social Development Science and Technology Project (20211800902732).

Bibliography

1. Chen SA., et al. "Sustained atrial tachycardia in adult patients. Electrophysiological characteristics, pharmacological response, possible mechanisms and effects of radiofrequency ablation". Circulation 90.3 (1994): 1262-1278.
2. Kalman JM., et al. ""Cristal tachycardias": origin of right atrial tachycardias from the crista terminalis identified by intracardiac echocardiography". Journal of the American College of Cardiology 31.2 (1998): 451-459.
3. Morton JB., et al. "Focal atrial tachycardia arising from the tricuspid annulus: electrophysiologic and electrocardiographic characteristics". Journal of Cardiovascular Electrophysiology 12.6 (2001): 653-659.
4. Kistler PM., et al. "Electrophysiological and electrocardiographic characteristics of focal atrial tachycardia originating from the pulmonary veins: acute and long-term outcomes of radiofrequency ablation". Circulation 108.16 (2003): 1968-1975.

5. Kistler PM., et al. "Focal atrial tachycardia arising from the mitral annulus: electrocardiographic and electrophysiologic characterization". Journal of the American College of Cardiology 41.12 (2003): 2212-2219.

6. Marrouche NF., et al. "Clinical and electrophysiologic characteristics of left septal atrial tachycardia". Journal of the American College of Cardiology 40.6 (2002): 1133-1139.

7. Lee S H., et al. "Atrial Tachycardia Originating from the Aortomitral Junction". Yonsei Medical Journal 55.2 (2014): 530-534.

8. Mcguire M A., et al. "Surgical therapy for atrial tachycardia in adults". Journal of the American College of Cardiology 14.7 (1990): 1777-1782.

9. Kalman J M., et al. "Cristal Tachycardias?: Origin of Right Atrial Tachycardias From the Crista Terminalis Identified by Intracardiac Echocardiography". Journal of the American College of Cardiology 31.2 (1998): 451-459.

10. Tritto M., et al. "Iterative Atrial Tachycardia Originating from the Coronary Sinus Musculature". Journal of Cardiovascular Electrophysiology 12.10 (2010): 1187-1189.

11. Morady F. "Catheter ablation of supraventricular arrhythmias: state of the art". Pacing and Clinical Electrophysiology 27.1 (2004): 125-142.

Volume 9 Issue 2 February 2022