Journal of Arrhythmia 31 (2015) 252–254

Contents lists available at ScienceDirect

Journal of Arrhythmia

journal homepage: www.elsevier.com/locate/joa

Case Report

Coexistence of persistent left superior vena cava with common inferior pulmonary vein in a patient with atrial fibrillation

Kunihiko Kiuchi, MD*, Katsunori Okajima, MD, Yu Takahashi, MD, Kiminobu Yokoi, MD, Akira Shimane, MD

Department of Cardiology, Himeji Cardiovascular Centre, 520 kou saishou, Himeji, Hyogo, Japan

ARTICLE INFO

Article history:
Received 13 November 2014
Received in revised form
8 December 2014
Accepted 15 December 2014
Available online 11 February 2015

Keywords:
Atrial fibrillation
Persistent left superior pulmonary vein
Common inferior pulmonary vein

ABSTRACT

Coexistence of a persistent left superior vena cava (PLSVC) with a common inferior pulmonary vein (CIPV) is very rare. The electrical assessment of those thoracic veins was performed during the atrial fibrillation ablation.

1. Case

A 68-year-old man with palpitations was referred to our center for catheter ablation because of drug-refractory atrial fibrillation (AF). The preoperative multidetector computed tomography showed a congenital vascular anomaly: persistent left superior vena cava (PLSVC) and common inferior pulmonary vein (CIPV). Unfortunately, the ring catheter could not be placed in the CIPV because of the short common trunk (Fig. 1B). No pulmonary vein potential was recorded by the ablation catheter in the CIPV. The high frequency and fractionated potential were recorded in the left superior pulmonary vein (LSPV) and the PLSVC. The trigger of AF was likely from the LSVC or LSPV (Fig. 2A). Pulmonary vein isolation (PVI) was performed during AF, resulting in conversion of AF into atrial tachycardia, which ended spontaneously (Fig. 2B). With pacing from the PLSVC, the residual, single, sharp potential recorded on the ring catheter in the LSPV was considered a near far-field potential of the PLSVC (Fig. 2C). The double potential, with a fractionated potential in between was recorded at the distal portion of the PLSVC (Fig. 2D). The NavX system showed the electrical activation from the distal to the proximal portion of the PLSVC during sinus rhythm (Fig. 1C). Detailed mapping could identify the fusion electrogram of the LA and PLSVC potentials. Hence, radiofrequency applications at the distal portion of the PLSVC could eliminate the single sharp potential in the LSPV (Fig. 2D, right panel). The NavX system showed the conduction delay at the distal portion of the PLSVC (Fig. 1D and E). Complete PLSVC isolation from the left atrium (LA) was attempted, but could not be achieved. Isolation of the right superior pulmonary vein without electrical activity was not attempted. There was no recurrence of AF at the 6-month follow-up.

Isolated PLSVC has an estimated prevalence of 0.3% [1]. Previous studies reported that the PLSVC can be the arrhythmogenic source of AF. In the current case, the modification for the distal PLSVC was considered a reasonable option as AF ablation strategy to reduce the AF source [2]. Regarding CIPV, a previous study reported that no clear evidence of arrhythmogenecity was observed [3]. We speculated that the amount of myocardial sleeve into the CIPV was significantly less than that into other PVs. Embryologically, a PLSVC and a CIPV develop at a different time. These developmental abnormalities may not be related.

This case highlights a very rare anomaly of the thoracic veins and the electrical property initiating and maintaining AF.

Financial support

None.

Conflict of interest

None.

* Correspondence to: Tel.: +81 79 293 3131; Fax: +81 79 295 8199.
E-mail address: kunihikokiuchi@yahoo.co.jp (K. Kiuchi).

http://dx.doi.org/10.1016/j.joa.2014.12.007
1880-4276/

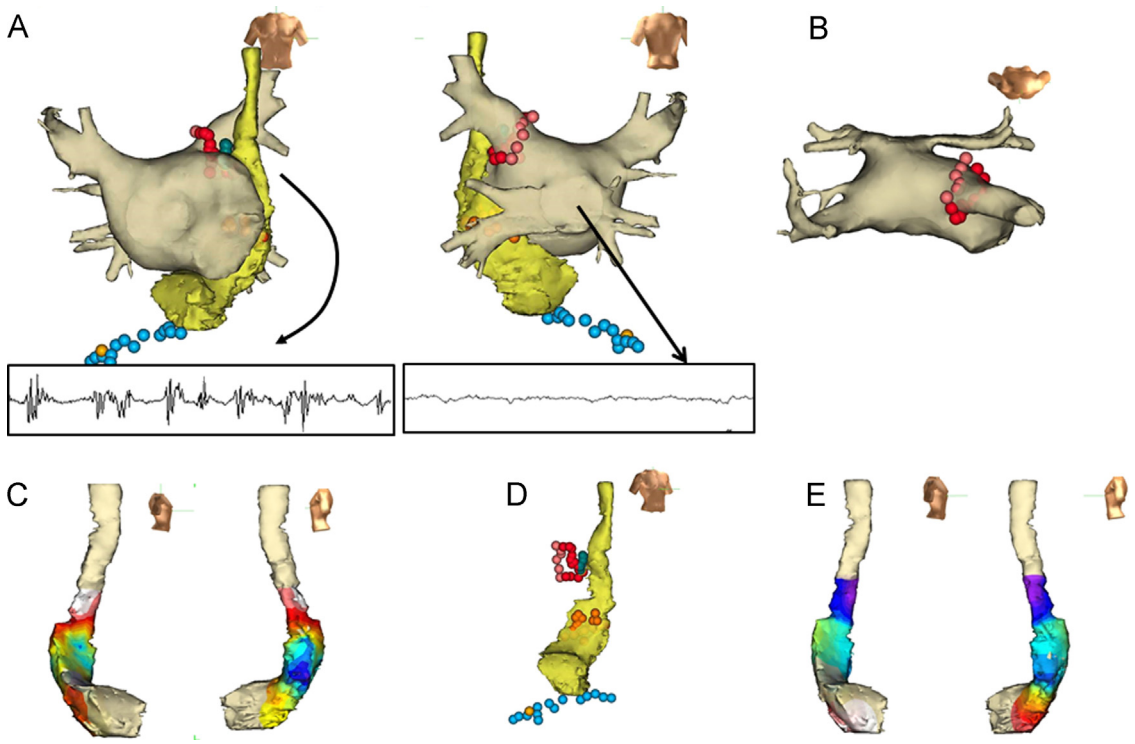

Fig. 1. (A) Three-dimensional reconstruction using the NavX system. Anterior–posterior view in the left panel. Posterior–anterior view in the right panel. The yellow model indicates the huge coronary sinus and the PLSVC. The red tags indicate the ablation site. The pink tags indicate the ablation site with reduced power because of esophageal temperature rise. The blue tags indicate the ablation site for the CTI. The orange tags indicate the ablation sites for the PLSVC. (B) Three-dimensional reconstruction using the NavX in the cranial view. (C) Activation map of the PLSVC during sinus rhythm using NavX. The electrical conduction between the LA and the distal portion of the PLSVC is observed, which activated the proximal CS. (D) Ablation points on the NavX. The blue tags in the PLSVC indicate the RF application points for eliminating the conduction between the LA and the PLSVC at the distal portion of the PLSVC. The orange tags indicate the RF application points attempting complete PLSVC isolation. The pink and light pink tags indicate the RF application points for achieving PVI. (E) Activation map of the PLSVC after RF application at the distal portion of the PLSVC. The electrical activation after ablation changed dramatically compared to that before ablation.

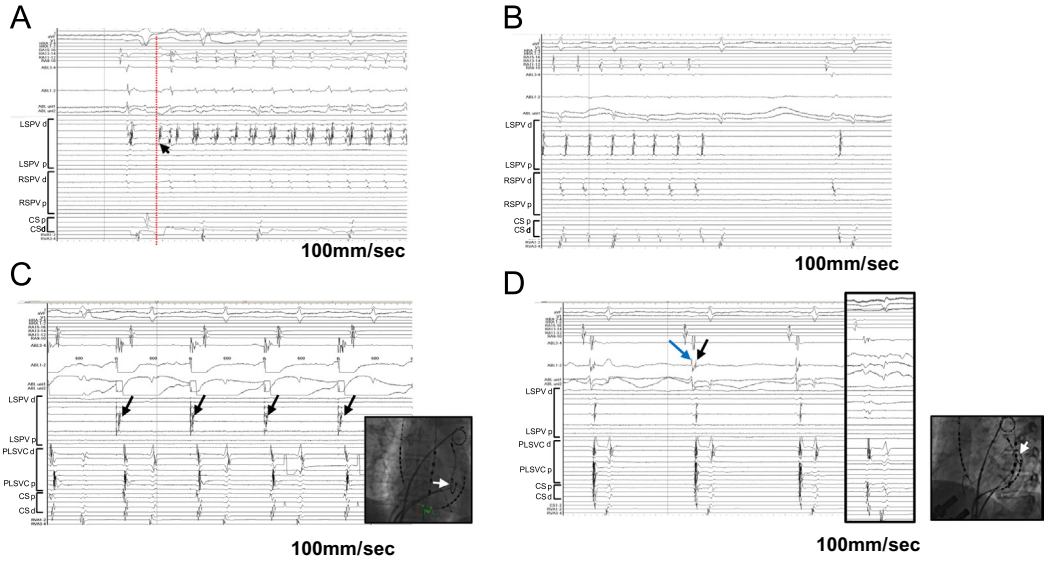

Fig. 2. (A) AF initiation from the sharp signal in the LSPV. The red dotted line indicates the earliest activation site of AF initiation. (B) Termination of the converted AT. (C) A pacing with a lower output of 0.4 V from the ablation catheter placed in the PLSVC. The interval between the pacing spike to the single sharp potential is only 8 ms. The single sharp potential is considered to originate from the PLSVC. The fluoroscopic image is shown in LAO view (right panel). The electrograms in the PLSVC were recorded by the ring catheter in the PLSVC (white arrow). (D) Electrograms in the distal portion of the PLSVC. The blue and black arrows indicate the LA far-field potential and the PLSVC potential, respectively. Of note, the fractionated potentials between the LA far-field potential and the PLSVC potential are visible. The black square indicates the elimination of the PLSVC potential recorded by the ring catheter in the LSPV. The fluoroscopic image is shown in LAO view (right panel). The electrograms in the PLSVC were recorded by the ring catheter in the distal PLSVC (white arrow). The sharp potential superimposed onto the far-field ventricular electrogram was documented by the ring catheter in the PLSVC. The potential depended on the location of the ring catheter, but not the RF application in the PLSVC.

Acknowledgment

We would like to thank Dr. Osamu Igawa for reviewing the manuscript.

References

[1] Miyazaki S, Derval N, Shah A, et al. Mitral isthmus block in a case of persistent left superior vena cava. J Cardiovasc Electrophysiol 2011;22:343–5.

[2] Ejima K, Arai K, Suzuki T, et al. Long-term outcome and preprocedural predictors of atrial tachyarrhythmia recurrence following pulmonary vein antrum isolation-based catheter ablation in patients with non-paroxysmal atrial fibrillation. J Cardiol 2014;64:57–63.

[3] Yamane T, Date T, Tokuda M, et al. Prevalence, morphological and electrophysiological characteristics of confluent inferior pulmonary veins in patients with atrial fibrillation. Circ J 2008;72:1285–90.