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Short Report

Termination of atrial fibrillation by ablation of high-dominant frequency sites adjacent to epicardial adipose tissue



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ABSTRACT

We report an interesting case in which atrial fibrillation (AF) was terminated during ablation of high-dominant frequency (DF) sites covered with epicardial adipose tissue (EAT). High-DF sites are known to be related to the center of focal-firing rotors or local reentry circuits. Therefore, this phenomenon suggests that EAT may be related to the development of dominant rotors maintaining AF.

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1. Case

A 77-year-old man with symptomatic paroxysmal atrial fibrillation (AF) was referred for catheter ablation. In the electrophysiological study, three-dimensional (3D) geometries of the left atrium (LA) and pulmonary veins (PVs) were constructed with an EnSite NavX mapping system (St. Jude Medical Inc., St. Paul, MN, USA). After 5 min of AF stabilization induced by rapid atrial pacing, dominant frequency (DF) maps were created with a DF software installed in NavX (sampling rate, 1200 Hz; resolution, 0.14 Hz; with a Hamming window function), using data obtained with a 20-pole circular mapping catheter (1.5 mm interelectrode spacing, Livewire Spiral HP catheter, St. Jude Medical). The bipolar signals during 5 s recordings were analyzed, and the highest peak frequency of the resulting spectrum was identified as the DF. On the DF map, high-DF sites were defined as sites with frequencies of > 8 Hz and in bright purple. High-DF sites were observed at the left inferior PV (LIPV); antrum of the left superior PV (LSPV); LIPV and right superior PV (RSPV); septal portion, roof, and floor of the LA; and mitral isthmus (Fig. 1). NavX and single Lasso catheter (Biosense Webster Inc., Diamond Bar, CA, USA)-guided extensive encircling ipsilateral PV isolation (EEPVI) was performed during AF with a 4-mm irrigated-tip radiofrequency (RF) ablation

catheter (Safire BLU, St. Jude Medical; 25–30 W, 41 °C). During the EEPVI of the left PVs, the AF was terminated by RF deliveries at the posterior and anterior aspects of the LSPV antrum, but recurred immediately after these RF deliveries. After the creation of an entrance block into the left PVs, the AF became sustained; therefore, we then performed EEPVI of the right PVs. Such a termination and subsequent recurrence of AF occurred during the RF deliveries at the posterior aspect of the RSPV antrum. The AF eventually terminated during the ablation of the anterior aspect of the RSPV antrum, although the EEPVI of the right PVs was not completed (see the red ablation points in Fig. 1). 3D DF maps of the LA and PVs were merged offline with 3D CT images of the LA, PVs, and epicardial adipose tissue (EAT), which was reconstructed by assigning the Hounsfield units (–50 to –200) generally used for detecting adipose tissue. Interestingly, 3 of 4 AF termination sites were located at high-DF sites, which were all covered with EAT (Fig. 1). High-DF sites are known to be related to the center of focal-firing rotors or local reentry circuits [1]. In this case, termination of the AF by ablation and a subsequent immediate recurrence was repeatedly observed at 3 high-DF sites, which provided an insight for understanding the mechanism of high-DF sites. However, an RF delivery applied to the posterior aspect of the RSPV antrum without a high-DF site also terminated the AF. This could have been caused by a substrate modification and/or triggered firing from the left PVs because the AF termination at that site occurred after the EEPVI of the left PVs was completed. Moreover, we reported that high-DF sites corresponded to EAT sites [2]. Since EAT contains ganglionated plexi and secretes

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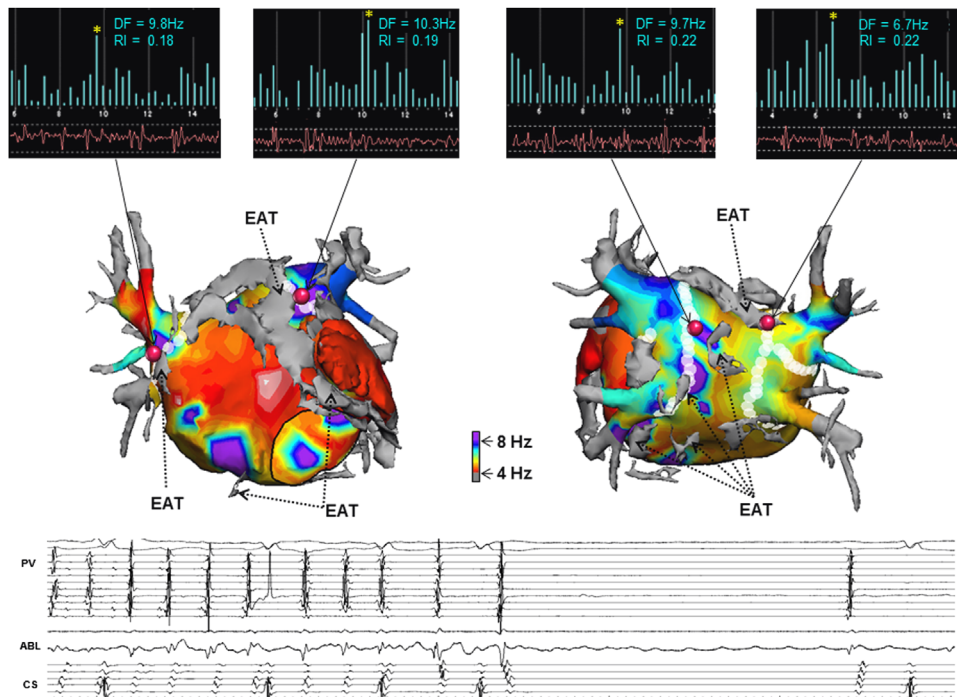


Fig. 1. Anteroposterior (AP) and posteroanterior (PA) views of the left atrial dominant frequency (DF) maps with an ablation set and epicardial adipose tissue (EAT). On the DF map, high-DF sites were defined as sites with frequencies of > 8 Hz and in purple. High-DF sites were seen at the left inferior PV (LIPV); antrum of the left superior PV (LSPV); LIPV and right superior PV (RSPV); septal portion, roof, and floor of the LA; and mitral isthmus. EAT was reconstructed by assigning the Hounsfield units (-50 to -200) generally used for adipose tissue detection. During PV isolation, termination and subsequent recurrence of AF occurred during the RF deliveries at the anterior and posterior aspects of the LSPV antrum, and the posterior aspect of the RSPV antrum. The AF eventually terminated during the ablation of the anterior aspect of the RSPV antrum, although the EEPVI of the right PVs had not been completed (see the red ablation points). Three of 4 AF termination sites were located at high-DF sites, which all were covered with EAT.

several inflammatory cytokines, it could be the substrate for the development of high-DF sites. Therefore, this phenomenon also presents the insightful observation that EAT may be related to the development of dominant rotors maintaining AF; however, further prospective studies are needed to clarify this relation.

Conflict of interest

No conflicts of interest to disclose for any of the authors.

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