IMAGES IN ELECTROPHYSIOLOGY

Left atrial vagal stimulation resulting in atrial fibrillation driven from the right atrium

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Case report

A 45-year-old man was referred for the ablation of atrial fibrillation (AF) of 5 years’ history, persistent for up to 8 days. Episodes predominantly occurred at night. At the upper part of the left superior pulmonary vein ostium, an ablation-induced vagal reflex occurred, which consisted of slowing of sinus rhythm followed by a sinus pause of 6 s (Figure 1A). Atrial fibrillation was spontaneously initiated immediately following this event (Figure 1B). Forty electrogram samples of 8 s each were collected at both atria using the Electroview™ mapping system (Bard Electrophysiology, MA, USA). Briefly, the location of the catheter tip was manually placed on an electronic 3D anatomic model, using the fluoroscopic image and catheter manipulation. Intracardiac electrograms, recorded on a computer-based digital amplifier/recorder system (Bard Electrophysiology, MA, USA), were automatically related to each tagged site. Electrograms were then automatically transformed to the frequency domain using the Fast Fourier analysis (Figure 1C). There was a significant dominant frequency gradient between the right (mainly between 7 and 9 Hz) and the left atrium (between 5 and 7 Hz). Following this analysis, ablation was directed to the site with the highest dominant frequency that was located in the right atrial appendage (RAA) (9.01 Hz, regularity index: 0.29, and organization index: 0.31) (Figure 1C, white arrow). A circular mapping catheter (Lasso, Biosense Webster, Diamond Bar, CA, USA) was positioned in the RAA for tracking rapid and complex atrial activity. Ablation was performed without the aim of complete RAA electrical disconnection and led to a slowing of the AF cycle length (155 ms) and to the restoration of sinus rhythm. Atrial fibrillation could not be induced anymore. Pulmonary vein isolation was completed in sinus rhythm. The patient has been arrhythmia-free for 3 months following the ablation procedure. This case illustrates that vagally induced AF from the left superior pulmonary vein ostium can be perpetuated by driving activity from the RAA. In this case, the frequency domain analysis illustrated the inter-atrial connections of the autonomic nervous system. It may help to identify patients who need additional right atrial ablation (including the RAA), which can occur in up to 20% of the cases during persistent AF.1,2

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References


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Figure 1  (A) During left superior pulmonary vein isolation, occurrence of an ablation-induced vagal reflex with a sinus pause of 6 s. (B) Spontaneous initiation of AF (star), immediately after the sinus pause. (C) Forty electrogram samples of 8 s manually placed on an electronic 3D anatomic model (Electroview™ mapping system, Bard Electrophysiology, MA, USA). After Fast Fourier Transform analysis, visualization of a significant dominant frequency gradient between the right and the left atrium. The site with the highest dominant frequency is located in the right atrial appendage (white arrow, dominant frequency: 9.01 Hz).