

## CLINICAL IMAGE

# Repeated catheter ablation induced intra-atrial conduction delay mimicking atrial stiffness syndrome

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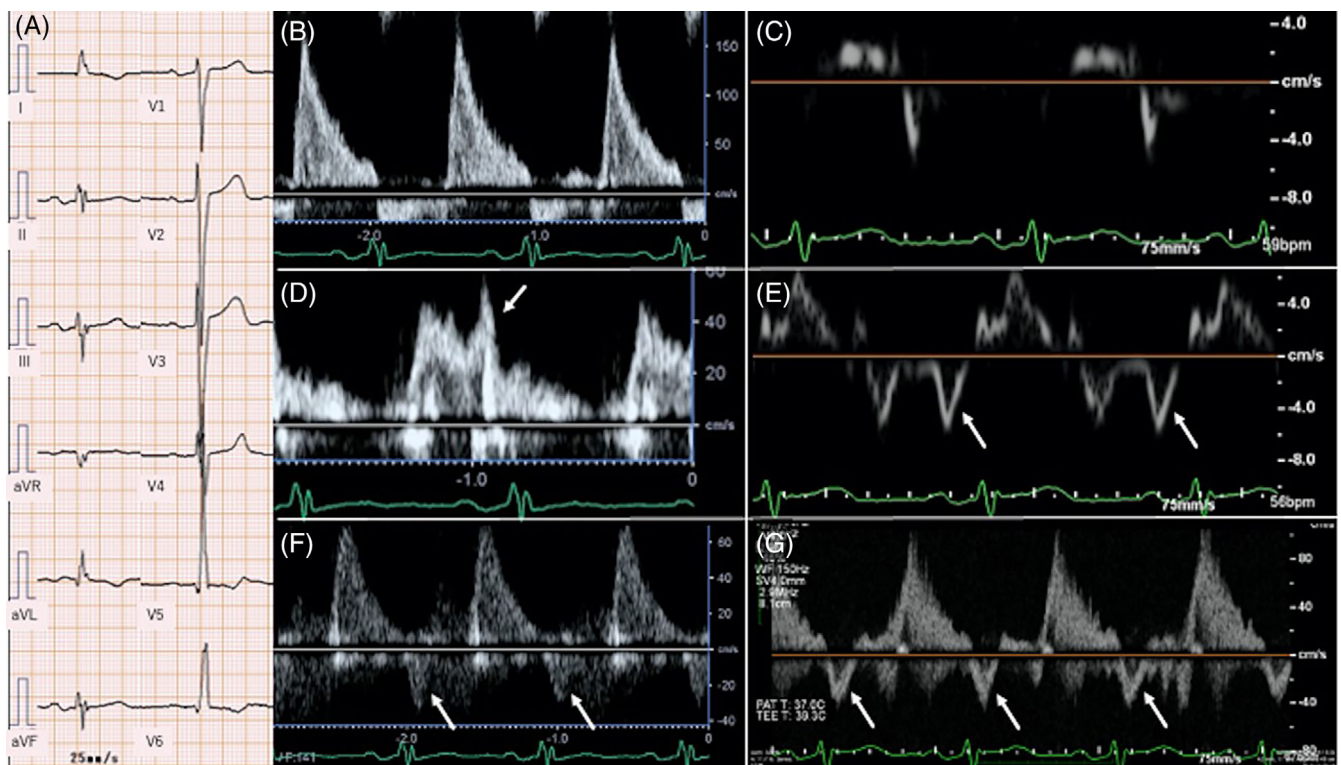
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## 1 | CASE

A 70-year-old man presented with dyspnea on exertion. His medical history included three instances of catheter ablation (CA) for atrial

fibrillation. The first CA was for pulmonary venous isolation (PVI) and cavo-tricuspid isthmus line (CTI) 3 years ago. The second CA was for left atrial appendage isolation, mitral isthmus line, left atrial roof line, repeated PVI, and CTI 2 years ago. The third CA was for superior vena



**FIGURE 1** A, We noted sinus rhythm with P-wave prolongation on 12-lead electrocardiography. B, Atrial wave was absent in the transmittal flow by echocardiography. C, Lateral mitral annular tissue velocity associated with atrial contraction was absent by echocardiography. D, Atrial wave (arrow) was apparent in the trans-tricuspid flow. E, Lateral tricuspid annular tissue velocity associated with atrial contraction (arrow) was apparent. F, Atrial wave (arrow) was detected by pulmonary venous flow on transthoracic echocardiography. G, Atrial wave (arrow) was detected by pulmonary venous flow on transesophageal echocardiography

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cava line and repeated PVI 1 year ago. Physical examination showed signs of heart failure such as jugular venous distension and peripheral edema. The electrocardiogram showed sinus rhythm with P-wave prolongation (Figure 1A). Echocardiography showed preserved left ventricular systolic function with moderate mitral regurgitation. Despite sinus rhythm, atrial wave was absent in both the transmitral flow (Figure 1B) and lateral mitral annular tissue velocity ( $a'$ ; Figure 1C). However, atrial wave was apparent in both the trans-tricuspid flow (Figure 1D) and lateral tricuspid  $a'$  (Figure 1E). Intra-atrial conduction delay was suspected based on the pulmonary venous (PV) flow (Figure 1F) that was approved on performing transesophageal echocardiography (Figure 1G).

Frequent catheter ablation for atrial fibrillation rarely causes atrial stiffness syndrome.<sup>1,2</sup> The syndrome is based on atrial dysfunction caused by the increase of atrial stiffness due to frequent catheter ablation-induced myocardial scar. Frequent catheter ablation also causes intra-atrial conduction delay. The PV flow determined using echocardiography can distinguish the two conditions. In some cases of atrial stiffness syndrome, there might be left atrial contraction delay due to intra-atrial conduction delay.

#### CONFLICT OF INTEREST

The authors declare there is no conflict of interest.

#### AUTHOR CONTRIBUTIONS

Conceptualization: Akihiro Hayashida, Misako Toki

Writing—review and editing: Atsushi Hirohata, Kiyoshi Yoshida

Writing—original draft: Akihiro Hayashida

All authors have read and approved the final version of the manuscript.

Akihiro Hayashida had full access to all of the data in this study and takes complete responsibility for the integrity of the data and the accuracy of the data analysis.

#### TRANSPARENCY STATEMENT

Akihiro Hayashida affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

#### DATA AVAILABILITY STATEMENT

The authors confirm that the data supporting the findings of this study are available within the article.

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