

## Isolated Fourth Heart Sound

**A** 77-year-old man with a history of coronary artery bypass grafting presented with general fatigue and dyspnea on effort. He was classified as having New York Heart Association functional classification III heart failure symptoms. His brain natriuretic peptide level was elevated at 569 pg/mL. Initial physical examination on admission to the general ward revealed bradycardia with a pulse rate of 32 beats per minute and an apparent atrial gallop created by the fourth heart sound immediately before the first heart sound. Furthermore, an additional low-pitch small single heart sound was regularly auscultated between the second heart sound and the next atrial gallop. From these findings, 2:1 atrioventricular block was speculated, which was confirmed by subsequent electrocardiography (Figure). The extra heart sound was the isolated fourth heart sound created at the atrial kick phase without ventricular conduction, which was also confirmed by subsequent phonocardiography and echocardiography (Figure).

The multicomponent fourth heart sound is mainly created when the left atrial contraction rapidly distends the left ventricle.<sup>1</sup> It reflects left ventricular stiffness and is correlated with elevated left ventricular end-diastolic pressure and brain natriuretic peptide level.<sup>2</sup> Exact auscultation of the fourth heart sound requires dedication, training, and experience.<sup>1,3</sup> The fourth heart sound is easier to detect in a case of a prolonged PR interval, as shown in this case. Furthermore, in the situation of a 2:1 atrioventricular block with heart failure, it becomes much easier to recognize the characteristic fourth heart sound with its isolated form, as demonstrated in this case. Even our junior resident (Dr Kanazawa) could recognize this isolated fourth heart sound with ease, enhancing high educational value at every auscultation in a case of 2:1 atrioventricular block presenting with heart failure symptoms. Moreover, this finding highlights the importance of basic auscultation skills, even in modern clinical cardiology.

### DISCLOSURES

None.

### AFFILIATIONS

From the Division of Cardiovascular Medicine, Department of Internal Medicine (S.Y., S.M., F.K., H.T., Y.S., H.I., K.F., K.-i.H.), and Section of Arrhythmia, Division of Cardiovascular Medicine, Department of Internal Medicine (K.F., K.-i.H.), Kobe University Graduate School of Medicine, Japan; and Department of Clinical Laboratory, Kobe University Hospital, Japan (Y.T.).

### FOOTNOTES

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**Shun Yokota, MD**  
**Shumpei Mori, MD, PhD**  
**Fumiaki Kanazawa, MD**  
**Hiroyuki Toh, MD**  
**Yuto Shinkura, MD**  
**Yasuna Takuma**  
**Hiroshi Imada, MD**  
**Koji Fukuzawa, MD, PhD**  
**Ken-ichi Hirata, MD, PhD**

**Correspondence to:** Shumpei Mori, MD, PhD, Division of Cardiovascular Medicine, Department of Internal Medicine, Kobe University Graduate School of Medicine, 7-5-1, Kusunoki-cho, Chuo-ku, Kobe, Hyogo, 650-0017, Japan. E-mail shumpei\_8@hotmail.com

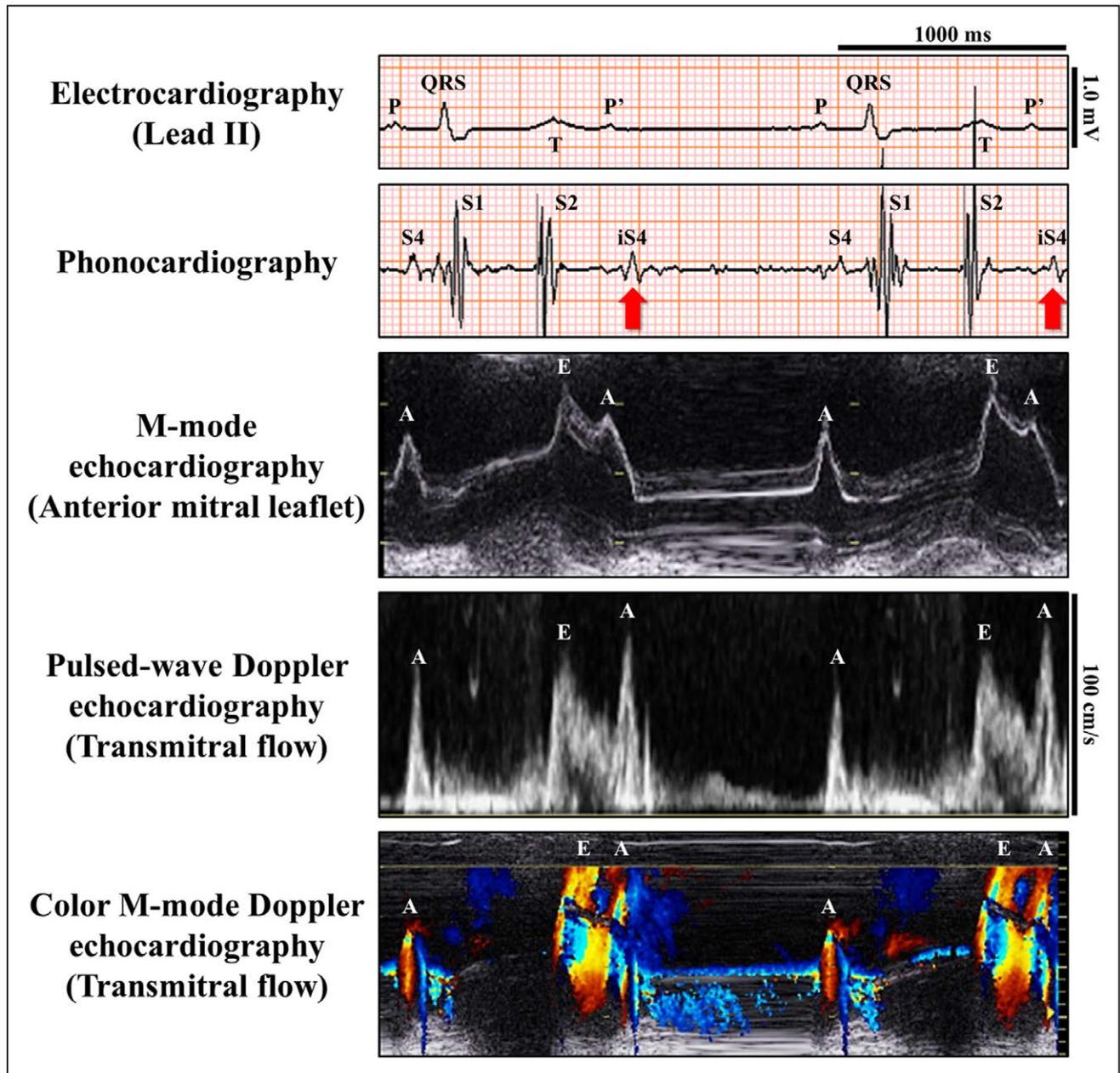
**Key Words:** atrioventricular block ■ echocardiography ■ electrocardiography ■ fourth heart sound ■ phonocardiography

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**Figure.** Electrocardiography, phonocardiography, and echocardiography on admission, demonstrating 2:1 atrioventricular block with the isolated fourth heart sound (iS4, red arrows).

Note that P peak to S4 duration (87 ms) is shorter than P' peak to iS4 duration (102 ms), and the echocardiographic atrial kick is smaller and shorter at the P-S4 phase than at the P'-iS4 phase. This may reflect a greater distended left ventricle with higher left ventricular diastolic pressure because of prolonged diastole at the P-S4 phase, compared with the P'-iS4 phase. A indicates atrial wave; E, early diastolic wave; P', P wave (P) without ventricular conduction; S1, first heart sound; S2, second heart sound; and S4, fourth heart sound.

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