“Wandering fourth heart sound”

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Case Description

An 86-year-old woman with uncontrolled hypertension was referred to our institution owing to significant bradycardia caused by complete atrioventricular block. Chest radiography revealed bilateral pulmonary congestion concomitant with significant cardiomegaly, and brain natriuretic peptide level was elevated at 430 pg/mL, indicating acute decompensated heart failure. Cardiac auscultation revealed grade 2/6 systolic ejection murmur along with intermittent augmentation of the first heart sound (i.e., “Cannon sound”). Unexpectedly, a low-pitched strange heart sound was intermittently auscultated at the apex. Of note, this peculiar heart sound was completely coincided with prominent a wave in the jugular venous pulsation, which suggested that this excessive heart sound was generated by atrial contraction. Phonocardiogram revealed the strange heart sound to be an isolated fourth heart sound (iS4), corresponding to non-conducted P wave on electrocardiogram, resulting in strange heart rhythm accompanied by “wandering iS4” (A and B). Transthoracic echocardiography clearly confirmed the iS4 was generated by atrial kick independent of ventricular contraction (C, D, and E). After dual chamber pacemaker implantation (active mode: atrial sensing and ventricular pacing mode), signs and
symptoms of heart failure were significantly alleviated with the complete disappearance of
the “wandering iS4.”

S4 is generated by a compensatory increase in the atrial booster pump function
against an increased ventricular end-diastolic pressure and a non-compliant ventricle. In
the present case, “wandering iS4” was clearly auscultated presumably due to incidental
combination of significant bradycardia resulting from complete atrioventricular block, non-
compliant ventricle caused by uncontrolled hypertension, presence of the ventricular apex
with sufficient vibration capability, and integrity of compensatory augmentation of the
atrial booster pump function.

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this case report including images and associated text has been obtained from the
patient in line with COPE guidance.

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References

Figure legend

Before pacemaker implantation (left panel), phonocardiogram (A) clearly showed an isolated fourth heart sound (iS4), corresponding to non-conducted P wave on electrocardiogram (B). M-mode echocardiogram (C), Pulsed-wave echocardiogram (D), and colour M-mode echocardiogram (E) confirmed the iS4 was generated by atrial kick independent of ventricular contraction. After dual chamber pacemaker implantation, the “wandering iS4” was completely disappeared (right panel).
(A) Phonocardiogram

(B) Electrocardiogram

(C) M-mode echocardiogram of the mitral valve

(D) Pulsed-wave Doppler waveform of the transmitral flow

(E) Color M-mode echocardiogram of the mitral inflow

Figure 1

150x84 mm (x DPI)