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# Hummingbird-like cannon a-waves

**Hiroto Hayashi[1], Tatsuya Kawasaki [2]*, Chieko Sakai[2], and Satoaki Matoba[3]**

[1]Kyoto Prefectural University of Medicine, Kyoto, Japan; [2]Department of Cardiology, Matsushita Memorial Hospital, Sotojima 5-55, Moriguchi, Osaka 570-8540, Japan; and [3]Department of Cardiovascular Medicine, Graduate School of Medical Science, Kyoto Prefectural University of Medicine, Kyoto, Japan

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**ESC curriculum** 5.1 Palpitations • 5.5 Supraventricular tachycardia

An 80-year-old woman presented with a 1-month history of dyspnoea. The patient had hypertension, which was well controlled with valsartan 80 mg and bisoprolol 2.5 mg daily. On examination, her blood pressure was 126/92 mmHg, her pulse rate was 123 b.p.m., and her oxygen saturation level was 96% while she was breathing ambient air. The right external jugular vein was distended in the supine position (*Figure 1A*); of note, the internal jugular venous pulsation (JVP) in the sitting position was found to fluctuate at more than 200 cycles per min (*Figure 1B* and *C*; see Supplementary material online, *Video S1*). Pulsation of the brachial artery was noted at ∼120 pulses per min (see Supplementary material online, *Video S2*), almost half of the JVP rate. Chest auscultation revealed no gallop but coarse crackles in both lower lung fields, and there was moderate oedema in the lower legs.

Electrocardiography (ECG) showed a regular narrow complex tachycardia at a rate of 125 b.p.m. with distinct P-waves (*Figure 1D*), findings seemingly consistent with 1:1 atrial–ventricular conduction with a prolonged PR interval. A chest radiograph showed mild pulmonary congestion and pleural effusion. Blood tests including thyroid function tests were normal. The brain natriuretic peptide level was 448.9 pg/mL (reference value, ≤18.4). Echocardiography revealed a left ventricular ejection fraction of 45% without significant valvular disease; the mean pulmonary artery pressure was estimated to be 25 mmHg. A diagnosis of heart failure was made, and furosemide 20 mg daily was initiated, as was digoxin 0.25 mg daily for rate control without a negative effect on the impaired contractility.

One week later, her symptoms abated. Electrocardiography revealed an atrial rate of 250 b.p.m. and a ventricular rate of 70–100 b.p.m. without ST-T changes (*Figure 1E*), leading to the diagnosis of atrial tachycardia. Normal sinus rhythm was achieved with electrical cardioversion (*Figure 1F*). At a follow-up visit 2 weeks after electrical cardioversion, ECG was normal and she reported no symptoms. A final diagnosis of tachycardia-induced cardiomyopathy was made. Electrophysiology study was deferred based on her preferences. The patient has been doing well for months without recurrence on furosemide 20 mg, valsartan 80 mg, and edoxaban 30 mg daily.

Jugular venous pulsation is useful not only for estimating central venous pressure but also for distinguishing arrhythmias by waveform analysis.[1] Waveform analysis of JVP can be difficult unless the heart rate is <100 b.p.m.,[2] but the frog sign, a classic physical finding of atrioventricular nodal reentry tachycardia (AVNRT), is useful in clinical practice. This unique bedside sign is explained by right atrial contraction against a closed tricuspid valve, causing reflux of blood into the jugular veins (i.e. cannon a-waves).[3] In the present patient, the cycle of the JVP was faster than that of the frog sign during AVNRT because of the double number of a-waves with 2:1 atrial–ventricular conduction. The cycle may be too fast to recognize at first glance, like the flapping of a hummingbird's wings, resulting in misdiagnosis, such as sinus tachycardia, based on ECG alone. This case highlights the importance of acknowledging that diagnosing cardiovascular disease without a bedside physical examination performed in a clinical context may lead to incorrect or delayed diagnoses.

* Corresponding author. Tel: +81 66992 1231, Fax: +81 66992 4845, Email: js-k@wf6.so-net.ne.jp
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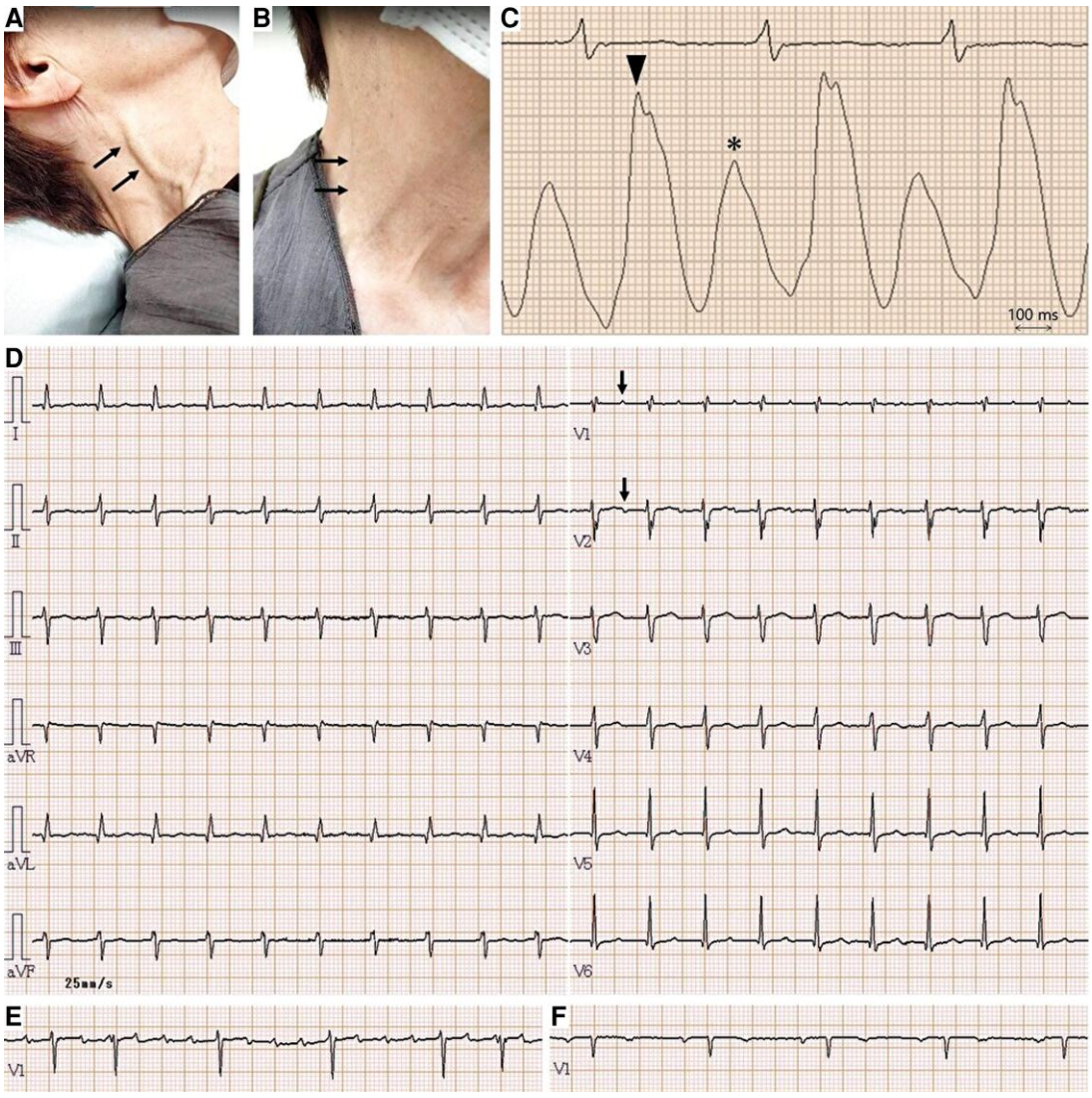


**Figure 1** (*A*) The right external jugular vein is distended in the supine position with a pillow (arrows). (*B*) In the sitting position, skin fluctuation due to the internal jugular venous flapping is noted (arrows; see Supplementary material online, *Video S1*). (*C*) The jugular pulse tracing shows a prominent positive wave (arrowhead) and another wave (asterisk), findings consistent with an atrial contraction around QRS (i.e. in the phase of a closed tricuspid valve) and during late systole to early diastole, respectively, although P-waves are indistinct on lead II. (*D*) Electrocardiography shows a regular narrow complex tachycardia at a rate of 125 b.p.m. without ST-T changes; a P-wave is present ~200 ms before the following QRS (arrows). (*E*) After administration of digoxin, follow-up ECG shows an atrial rate of 250 b.p.m. with 2:1 to 4:1 atrial–ventricular conduction, a finding consistent with the diagnosis of atrial tachycardia. (*F*) Normal sinus rhythm is achieved with electrical cardioversion.

## Supplementary material

Supplementary material is available at *European Heart Journal – Case Reports* online.

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## Data availability

The data underlying this article are available in the article and in its online supplementary material.

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