## CASE STUDY

### 108. The Hidden Rhythm: A Rare Case of Isoarrhythmic Sick Sinus Syndrome Defying Chronotropic Expectations

Tooba Fatima Iram,[1] Yusra Fatima Anam,[1] Haroon Abdullah Shaheed,[1] Rahul Kumar Agarwal,[1] Naazira Begum.[1]

[1] Care Hospitals, India

**Background:** Isoarrhythmic sick sinus syndrome (SSS) is a rare and often under-recognized variant of sinus node dysfunction, where the sinus and junctional rates are nearly identical, masquerading as a normal rhythm. Typically, SSS is associated with chronotropic incompetence (the inability of the heart to appropriately increase its rate during exertion), leading to symptoms such as fatigue, syncope, or exercise intolerance. It remains a common indication for permanent pacemaker implantation. However, cases demonstrating preserved chronotropic response are extremely uncommon, and recognizing these can directly influence management strategies.

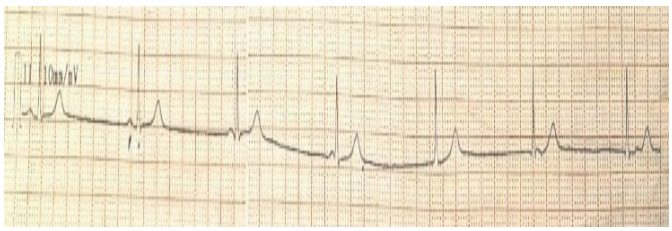
**The Case:** We present a 72-year-old male with longstanding hypertension and chronic tobacco use, who presented with progressive dyspnea over one month, bilateral leg swelling, palpitations, and productive cough. On examination, he was in sinus bradycardia (57 bpm), hypertensive (200/100 mmHg), and had signs of fluid overload. Initial ECG suggested second-degree AV block; however, careful analysis revealed junctional rhythm with intermittent sinus capture, consistent with isoarrhythmic AV dissociation, confirming SSS.

A 24-hour Holter monitor demonstrated a maximum sinus pause of 1.8 seconds, confirming sinus node dysfunction. To evaluate SA node function under physiological stress, a treadmill exercise test using the Bruce protocol was performed. Surprisingly, the patient exhibited a robust chronotropic response, with heart rate rising from 52 bpm to 133 bpm, without ischaemic changes or arrhythmias.

Management focused on controlling hypertensive emergency with intravenous antihypertensives and alleviating heart failure symptoms with diuretics. Given the preserved chronotropic competence, absence of syncope, and no severe bradycardia, permanent pacemaker implantation was deemed unnecessary. The patient was discharged in stable condition with close cardiology follow-up.

**Conclusion:** This case highlights isoarrhythmic SSS as a subtle but clinically significant variant of sinus node dysfunction, which can easily be misdiagnosed as AV block or overlooked due to near-identical sinus and junctional rates. It underscores the essential role of detailed ECG analysis, Holter monitoring, and exercise testing in evaluating sinus node function. Importantly, preserved chronotropic response challenges the conventional indication for pacemaker implantation, supporting a conservative, individualized approach in selected patients. Clinicians should maintain a high index of suspicion for isoarrhythmic SSS in elderly patients presenting with bradyarrhythmias, heart failure, or hypertensive crises. This case emphasizes that accurate diagnosis and functional assessment of the sinus node can prevent unnecessary interventions, optimize patient outcomes, and provide insight into the nuanced spectrum of sinus node disorders.

***Figure 1.*** CXR Massive Cardiomegaly and Right Lung Infiltrate.





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