

TWO SPECTRUMS IN INAPPROPRIATE SINUS TACHYCARDIA TWO SPECTRUMS; TWO CASE REPORTS

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Received date: 14 April 2022

Revised date: 04 May 2022

Accepted date: 24 May 2022

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ABSTRACT

Inappropriate sinus tachycardia (IST) is often an undermined ailment in clinical practice. It sparks interest when sinus tachycardia persists chronically without paroxysms. The basis of IST is still not fully understood. However, a variety of underlying pathologies can be a trigger, including increased sinus node automaticity, and decreased parasympathetic activity. We present two cases of IST, a 23-year-old and 50-year-old woman, both presented with complaints of persistent palpitations, yet with two contrasting treatment outcomes, emphasizing the importance of behavioral modifications and commitment to treatment.

KEYWORDS: *IST, sinus tachycardia, inappropriate sinus tachycardia.*

INTRODUCTION

Inappropriate sinus tachycardia (IST) is a syndrome in which the heart beats faster than 100 beats per minute (bpm) at rest, not caused by any primary cause, and is accompanied by palpitations, fatigue, and low exercise tolerance.^[1] IST patients have heart rates over 90 BPM during Holter monitoring, with significant increases following minimal exertion, emotional stress, or isoproterenol infusion.^[2] It remains unclear as to what causes IST, but it is thought to result either from extrinsic factors including excessive sympathetic activity, decreased parasympathetic activity, impaired neurohumoral modulation, or from intrinsic factors such as elevated sinus node automaticity or β -adrenergic hypersensitivity.^[3] Inappropriate sinus tachycardia is generally regarded as an exclusionary diagnosis since it occurs without cardiovascular disease or other conditions such as hyperthyroidism, anemia, or fever. The diagnosis should be confirmed by 12-lead ECG, echocardiogram, 24- or 48-hour Holter monitor, and an exercise stress test.^[1]

CASE REPORT

First case, a 23-year-old female, known for Type I Diabetes Mellitus, presented complaining of palpitations for 2 days. Palpitations were intermittent, associated occasionally with mild shortness of breath and dizziness, but no loss of consciousness. Found to have sinus tachycardia in the presenting ECG (figure 1). She was maintaining her blood pressure with a heart rate of 126 beats per minute (bpm), and had an unremarkable physical examination, with no orthostatic hypotension or postural orthostatic tachycardia syndrome (POTS). She had a history of palpitations in the past. 24h Holter monitoring was done twice in the past, which showed sinus tachycardia averaging 97 bpm, with a sleeping average of 72 bpm. An echocardiogram is normal along with repeated lab work including thyroid profile, hemoglobin, and electrolytes. Vitamin d3, calcium, and magnesium were borderline normal. She was started on Metoprolol succinate due to the diagnosis of Inappropriate Sinus Tachycardia; she frequently presents with bursts of sinus tachycardia mainly induced by excess caffeine, soda drinks with habitual ingestion of fast unhealthy food. Notorious for non-compliance to both beta-blocker and Diabetes medicine.

Second case, a 50-year-old female was referred from the Plastic surgical team to Cardiology for evaluation of palpitation after Abdominoplasty. Initial workup revealed sinus tachycardia related mostly to Anxiety VS

Burn out syndrome and was started on Metoprolol 25 mg daily after excluding Psychiatric illness, later increased to the maximum tolerated dose of Metoprolol 50 mg daily.

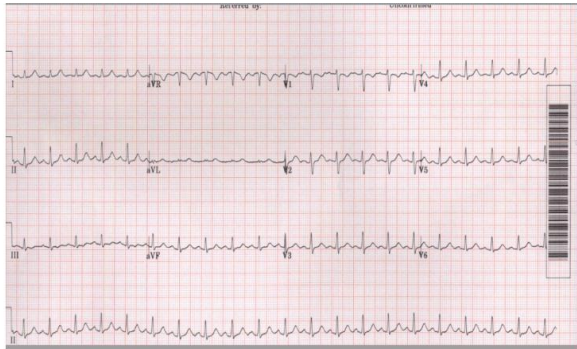


Figure 1: ECG showing sinus tachycardia.

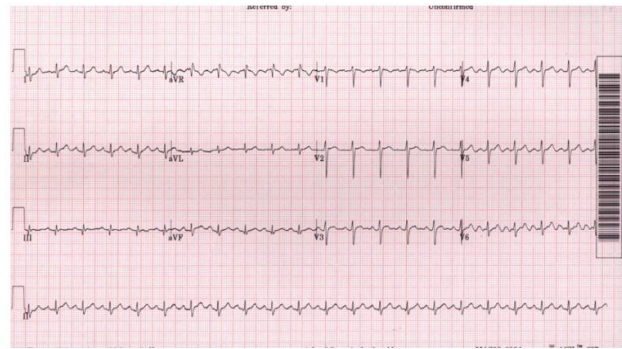


Figure 2: ECG showing sinus tachycardia.

On her regular follow-up with Cardiology, she was still complaining of palpitation associated with shortness of breath and fatigue, vitals on routine clinic visit, BP was normal, Pulse was averaging between 90-100 beat per minute (bpm), orthostatic hypotension and POTS was excluded. ECG shown (figure 2), further cardiac workup including echocardiography was normal, Holter done twice three years apart was consistent with sinus tachycardia average 98-104 bpm, with Minimum rate of 74-83 while sleeping and max 134-137 bpm while active no arrhythmia detected. Stress ECG was negative for exercise-induced ischemic heart disease and arrhythmia. Furthermore, 24 Ambulatory blood pressure monitoring (ABM) was done twice to exclude underlying hypertension not apparent on clinic visits, the first ABM off Betablocker showed an average BP of 137/74 mmHg, heart rate 104 bpm, and the second ABM on beta-blockers was 106/62 mmHg heart rate 98 bpm.

Off note, she had Diabetes Mellitus and dyslipidemia on treatment. Later in a follow-up clinic visit, a thorough workup of possible missed triggering factors was conducted. Thyroid profile was normal, hemoglobin was 10.2 gm/dl, with mildly reduced Iron level, low Vitamin b12, calcium, magnesium, and vitamin D3 levels. All were optimized to a high normal. After which she reported subjective improvement in shortness of breath and fatigue, however, Resting heart rate remained 90-100 bpm.

DISCUSSION

Inappropriate sinus tachycardia (IST) is a syndrome in which the sinus heart rate is perplexingly faster than expected. At rest, even in a supine position, the heart rate can surpass 100 beats per minute; minimal activity spurs the rate rapidly considerably. Thus, recreational activity can be restricted for IST patients. The resting daytime sinus rates reaches more than 100 BPM, and the average 24- heart rates frequently surpass 90 BPM. Acceleration in rate with minimal exercise is excessive, and in essence heart rate recovery is extended. Diagnosing inappropriate

sinus tachycardia is mainly considered an exclusive diagnosis because it happens without cardiovascular disease, hyperthyroidism, anemia, or fever.^[1] Caffeine, alcohol, and anxiety disorders concede the possibility to generate IST and can manifest as palpitations, shortness of breath, fatigue, dizziness, or near-syncope.^[2,4] Associated emotional and psychiatric problems often are identified, but some connection to IST is doubtful.^[4]

The pathophysiologic means of this syndrome is poorly implicit and is thought to consist of intrinsic hyperactivity of the sinus node (increased sympathetic-reduced parasympathetic) accompanied by a form of dysautonomia^[5] Most patients are young females; however, the latent epidemiologic determinants are unknown. The episodes of tachycardia are seen at hand precipitously and can linger over months or even years. IST patient's rhythm slows during sleep and varies diurnally thus concluding a favorable prognosis.^[6] IST is exceptionally associated with tachycardia-induced cardiomyopathy, although isolated reports do exist.^[7,8,9]

Our first patient represents a young female who has an underlying serious diagnosis of type 1 diabetes mellitus, who chose to ignore physicians' advice for medication compliance, furthermore, she led a lifestyle governed by her own choices and habits. She probably represents a large sector of females at her age presenting with the same complaints, nonetheless, continues addiction to caffeine, energy drinks, soda, and non-healthy food with poor water intake. While our second patient was more mature, compliant, and composed - who was initially demanding radiofrequency (RF) ablation-, improved subjectively with compliance to supplemental vitamins, modest iron therapy, and regular physical exercise, yet she still had inappropriate sinus tachycardia objectively, she abandoned the idea of RF ablation. Later, she was offered Ivabradine instead of beta-blockers, however, a rebound rise in blood pressure was a limiting factor, and a combination of both was not attempted due to its deleterious effects. The common factor between both

was dysautonomia secondary to underlying diabetes mellitus, while the contrast was behavioral, age, lifestyle, and dedication.

Differentiating IST from appropriate sinus tachycardia, and postural orthostatic tachycardia syndrome is essential. In addition, determining a triggering factor may help in determining the longevity of the problem. Postural tachycardia syndrome (POTS) is defined as a clinical syndrome that is usually characterized by (1) frequent symptoms that occur withstanding such as lightheadedness, palpitations, tremulousness, generalized weakness, blurred vision, exercise intolerance, and fatigue; (2) an increase in heart rate of ≥ 30 bpm when moving from a recumbent to a standing position held for more than 30 seconds (or ≥ 40 bpm in individuals 12 to 19 years of age); and (3) the absence of orthostatic hypotension (>20 mm Hg drop in systolic blood pressure).^[1] Sinus tachycardia, even if extravagantly fast, mainly is a temporary and reversible condition with an explicable cause and a rate appropriate for the condition (caffeine, anxiety, deconditioning).^[10]

Managing cases with IST remains a challenge and no single therapy can reduce heart rate and relieve symptoms efficiently. Beta-blockers, calcium channel blockers, and exercise training to improve quality of life could be the solution in most cases.^[11]

Small studies and various case reports proved the potential value of Ivabradine to treat IST.^[12] Ivabradine can have a dramatic effect on restricting heart rate. It may be effective and an alternative to beta-blockers. Ivabradine may precipitate excess bradycardia if used in combination with blockers or calcium-channel blockers. The opposite effect of Ivabradine, which is unique is atrial fibrillation (AF).^[13] Radiofrequency catheter ablation can be tried rarely after exhausting other options. The aim is to modify the sinus node without total ablation, to avoid the need for permanent pacemaker implantation.^[14]

CONCLUSION

Inappropriate sinus tachycardia is a baffling medical condition. It remains of uncertain cause and a more uncertain management approach. We aim in these two case reports to support behavioral and lifestyle changes in IST patients, but utmost we support optimizing deficits in calcium, magnesium, vitamin D3, and vitamin b12 in addition to standard treatment with beta-blockers, calcium channel blockers, and Ivabradine.

Ethical Considerations

Ethical approval: The study was approved by King Abdullah International Medical Research Center (KAIMRC) (#).

Consent: Written informed consent was obtained from the patient for publication.

Competing interest: The authors declare no conflicts of interest.

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