NOTA CLÍNICA

Gac Med Bilbao. 2025;122(4):177-183

More than just a fast heartbeat: a case of inappropriate sinus tachycardia in a young patient

Emiliani-Cortés Juan-Diego[a], Ortiz-Pérez David-Fernando[a,b,c], Montoya-Jaramillo Mario-Enrique[a,b,c], Daza-Iguarán Jesús-José[d], Meza-Pérez Juan-Camilo[d]

(a) Department of Internal Medicine, Cartagena del Mar Medical Center, Cartagena, Colombia.
(b) Internal Medicine Program, Universidad del Sinú, Cartagena, Colombia.
(c) Medistar Internal Medicine Research Group.
(d) Critical Care and Intensive Care Medicine Program, Universidad del Sinú, Cartagena, Colombia.

Recibido el 7 de abril de 2025; aceptado el 1 de diciembre de 2025.

DOI: https://doi.org/10.64246/0588gmb

Abstract:
Inappropriate sinus tachycardia (IST) is a rare and diagnostically challenging clinical entity characterized by an elevated resting heart rate disproportionate to physiological demand, often accompanied by debilitating symptoms such as palpitations, fatigue, and syncope. Its prevalence is low, and diagnosis is frequently delayed due to symptom overlap with psychiatric or anxiety-related disorders and a general lack of clinical awareness. We report the case of a 19-year-old woman with a 10-year history of palpitations and unexplored syncope, who presented with persistent tachycardia and a profound impact on her quality of life. Following a thorough evaluation including Holter monitoring and exclusion of structural heart disease, IST was diagnosed. The patient responded positively to beta-blocker therapy, with marked clinical improvement and no recurrence of syncope at one-month follow-up. This case highlights the diagnostic challenges of IST and the importance of a high index of suspicion in young patients, especially women, presenting with unexplained sinus tachycardia. Prompt diagnosis and personalized treatment can significantly improve outcomes and restore quality of life.

KEY WORDS

Adrenergic Beta-Antagonists.
Arrhythmias.
Cardiac.
Autonomic Nervous System Diseases.
Heart Rate.
Palpitations.
Syncope.
Tachycardia Sinus.

Autor para correspondencia: jemilianicortes@gmail.com (Emiliani-Cortés Juan-Diego).

PALABRAS CLAVE

Antagonistas beta-adrenérgicos.
Arritmias cardíacas.
Enfermedades del sistema nervioso autónomo.
Frecuencia cardíaca.
Palpitaciones.
Síncope.
Taquicardia sinusal.

Mucho más que un corazón acelerado: un caso de taquicardia sinusal inapropiada en una paciente joven

Resumen:
La taquicardia sinusal inapropiada (TSI) es una entidad clínica poco frecuente y de difícil diagnóstico, caracterizada por una frecuencia cardiaca elevada en reposo desproporcionada a la demanda fisiológica, a menudo acompañada de síntomas incapacitantes como palpitaciones, fatiga y síncope. Su prevalencia es baja y el diagnóstico suele retrasarse debido al solapamiento sintomático con trastornos psiquiátricos o relacionados con la ansiedad, así como a una limitada concienciación clínica. Presentamos el caso de una mujer de 19 años con una historia de 10 años de palpitaciones y síncopes no estudiados, que acudió con taquicardia persistente y un impacto significativo en su calidad de vida. Tras una evaluación exhaustiva, que incluyó monitorización Holter y la exclusión de cardiopatía estructural, se estableció el diagnóstico de TSI. La paciente respondió favorablemente al tratamiento con betabloqueantes, con una mejoría clínica notable y sin recurrencia de síncope en el seguimiento al mes. Este caso pone de relieve los retos diagnósticos de la TSI y la importancia de mantener un alto índice de sospecha en pacientes jóvenes, especialmente mujeres, que presentan taquicardia sinusal inexplicada. Un diagnóstico precoz y un tratamiento individualizado pueden mejorar significativamente los resultados clínicos y restaurar la calidad de vida.

GILTZA-HITZAK

Beta-adrenergikoen antagonista.
Bihotz-aritmiak.
Nerbio-sistema autonomoaren gaixotasunak.
Bihotz-maiztasuna.
Palpitazioak.
Sinkopea.
Taquikardia sinusala.

Bihotz-taupada azkarrago bat baino gehiago: taquikardia sinusalen desegokiaren kasu bat paziente gazte batean

Laburpena:
Taquikardia sinusalen desegokia (TSD) entitate kliniko arraroa eta diagnostikatzeko zaila da, atsedenaldian bihotz-maiztasun altua izateagatik ezaugarritua, eskari fisiologikoarekiko neurrigabea dena, eta askotan sintoma ezintzaileekin batera agertzen dena, hala nola palpitazioak, nekea eta sinkopea. Bere prebalentzia txikia da, eta diagnostikoa maiz atzeratzen da sintomen gainjartzea dela eta antsietatearekin edo nahasmendu psikiatrikoekin, baita kontzientzia kliniko eskasa ere. Hemen aurkezten da 19 urteko emakume baten kasua, 10 urteko palpitazio- eta aztertu gabeko sinkope-historiarekin, taquikardia iraunkorra eta bizi-kalitatean eragin nabarmena zituena. Ebaluazio sakon baten ondoren —Holter monitorizazioa eta bihotz-egitura-gaixotasunaren bazterketa barne— TSDren diagnostikoa ezarri zen. Pazienteak erantzun positiboa izan zuen betablokeatzaileen tratamenduarekin, hobekuntza kliniko nabarmenarekin eta hilabeteko jarraipenean sinkope-errepikarik gabe. Kasu honek TSDren diagnostiko-erronkak azpimarratzen ditu, eta azaldu gabeko taquikardia sinusala duten paziente gazteengan, bereziki emakumeengan, susmo-maila altua mantentzearen garrantzia. Diagnostiko goiztiarrak eta tratamendu pertsonalizatuak emaitza klinikoak nabarmen hobe ditzakete eta bizi-kalitatea berreskuratzen lagundu.

Introduction

Inappropriate sinus tachycardia (IST) is a relatively rare and often misunderstood condition that poses diagnostic challenges due to its nonspecific presentation and overlap with anxiety disorders and other causes of tachycardia. It has been defined as a persistent or paroxysmal elevation of the resting sinus heart rate exceeding 100 beats per minute, not explained by physiological demand, and associated with distressing symptoms such as palpitations, dizziness, and fatigue[1]. According to epidemiological studies, IST affects approximately 1.2% to 5% of individuals evaluated for sinus tachycardia, with a marked predominance in young females between 15 and 45 years old, who comprise up to 80% of diagnosed cases[2]. Its etiology remains incompletely understood, but hypotheses in-

clude intrinsic sinus, node abnormality, beta-adrenergic receptor stimulating autoantibody, beta-adrenergic receptor supersensitivity, muscarinic receptor autoantibody, or hyposensitivity, impaired baroreflex control, depressed efferent parasympathetic/vagal function, nociceptive stimulation, central autonomic overactivity and aberrant neurohumoral modulation[1]. Patients frequently undergo prolonged diagnostic journeys, often receiving multiple referrals and ineffective treatments before a definitive diagnosis is established. Despite being considered benign in terms of cardiovascular outcomes, IST can have a significant psychological and functional impact on daily life[3]. Recognizing the burden on affected individuals and validating their symptoms with an empathetic, structured diagnostic approach is essential. Management includes beta-blockers, ivabradine, and lifestyle modifications, although treatment response varies and may require a multidisciplinary strategy[4,5].

Case presentation

A 19-year-old female patient was admitted to the emergency department of the Cartagena del Mar Clinic with a 10-year history of sudden-onset palpitations and unstudied syncope, including two episodes of unprovoked syncope in the last hour. Over the past three months, her condition worsened, with new-onset shortness of breath, chest pain, and marked fatigue. Episodes were predominantly triggered by minimal physical exertion, rather than postural changes, and occurred unpredictably throughout the day. The patient has a medical history of anxiety diagnosed seven years ago, currently managed with a serotonin reuptake inhibitor.

Family history

Her mother has atrial fibrillation, managed with beta blockers, and has been stable in recent years. Her father has a history of hypertension and depression. She has a healthy 10-year-old younger sister.

Admission findings

Vital signs showed BP 136/78 mmHg, HR 122/min, RR 20/min, and oxygen saturation 97% (FiO2 21%), with no orthostatic changes in heart rate or blood pressure. Physical examination revealed generalized pallor and dry mucous membranes, with no facial asymmetry, palpable neck masses, or jugular vein distension. Cardiovascular examination revealed tachycardic but rhythmic heart sounds, with no added murmurs. The chest and abdomen were normal. Neurologically, no deficits were found.

Investigations

A complete blood count, coagulation profile, and biochemistry (blood sugar, renal, liver, bone, and lipid profiles), thyroid function tests, and a chest X-ray were all within normal limits [Table 1]. ECG revealed sinus tachycardia with a normal PR interval, absent delta waves, and normal QRS morphology [Figure 1]. A brain CT scan showed no evidence of ischemic or hemorrhagic lesions or space-occupying abnormalities. A transthoracic echocardiogram revealed no structural or functional alterations, valvulopathy, or abnormalities in the interventricular or interatrial septum.

Holter monitoring

A 24-hour Holter electrocardiography was performed [Table 2], showing sinus tachycardia with an average heart rate of >90 bpm and no supraventricular paroxysms.

The patient was evaluated by the cardiology department, and based on the findings, along with Holter electrocardiography monitoring, a diagnosis of inappropriate sinus tachycardia (IST) was established.

Further electrophysiological studies were deemed unnecessary at the moment. Treatment with bisoprolol was initiated, and the patient was discharged with follow-up care arranged. At the one-month follow-up post-hospitalization, the patient reported resolution of symptoms, with no recurrence of syncope or other clinical manifestations.

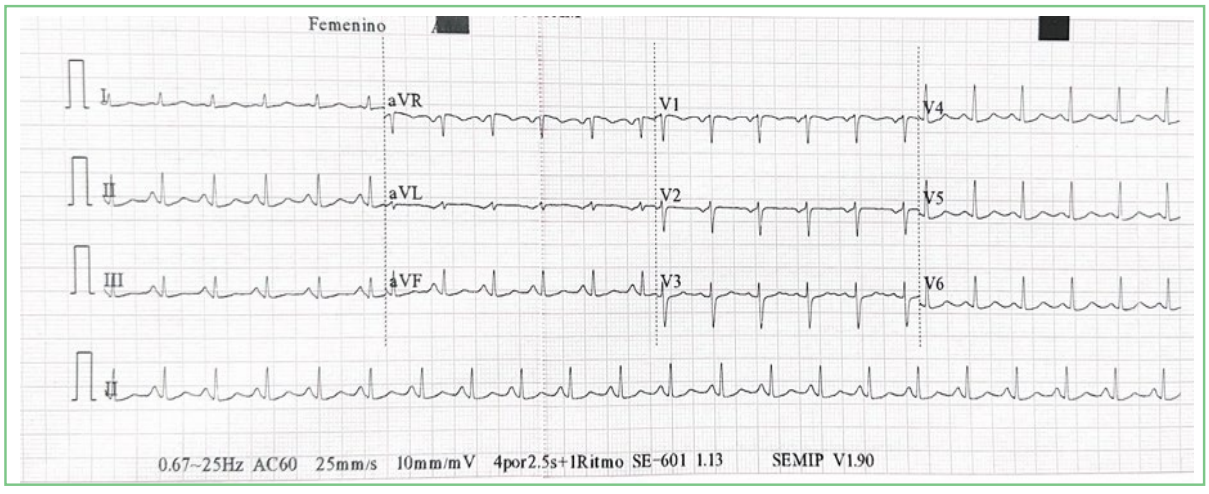

Figure 1. Twelve-lead ECG showing a narrow QRS complex tachycardia with a heart rate of 125 bpm, no axis deviation, positive P waves in lead II, III, aVF, suggesting a supraventricular origin compatible with sinus tachycardia.

Table 1. Laboratory results

	Value	Reference
Sodium	139.5 mEq/L	135-145 mEq/L
Potassium	3.85 mEq/L	3.5-5.2 mEq/L
Cloro	102.5 mEq/L	96-106 mEq/L
Calcium	9.8 mg/dL	8.5-10.2 mg/dL
Magnesium	1.9 mg/dl	1.7-2.2 mg/dL
Blood glucose	98 mg/dL	70-110 mg/dL
Aspartate aminotransferase	25 U/L	4-40 U/L
Alanine aminotransferase	29 U/L	4-36 U/L
TP	13 seconds	Control 12.5 seconds
TTP	24.5 seconds	Control 25.8 seconds
TSH	1.83 uUL/ml	0.25-5.0 uUL/ml
T4	1.28 ng/dL	0.70-1.48 ng/dl
Total cholesterol	110 mg/ dL	< 200 mg/dL
LDL	45 mg/ dL	< 100 mg/dL
HDL	65 mg/ dL	> 60 mg/dL
Triglycerides	98 mg/ dL	< 150 mg/dL
Creatinine	0.80 mg/dL	0.6-1.1 mg/dL
BUN	17 mg/ dL	7-21 mg/dL
C reactive protein	3 mg/dL	< 5 mg/dL
Troponin I	0.01ng/ml	<0.3 ng/ml
Blood Count		
Hemoglobin	12.9 g/dL	12.5-16 g/dL
Hematocrit	35.2%	33-39%
Medium corpuscular value	85.5 fL	80-97 Fl
Leucocytes	8.850/mm3	4.500-10.000/mm3
Neutrophiles	5.360/mm3	1.500-5.000/mm3
Lymphocytes	4.009/mm3	3.6-8/mm3
Platelets	329,000/u/L	150,000-450,000/uL

Discussion

Tachycardia is commonly defined as a sinus heart rate exceeding 100 beats per minute. It can be a normal, physiologically beneficial, response to physical and psychological stresses driven by an increase in sympathetic activation, circulating catechol amines, and/or a decrease in parasympathetic tone[6]. Inappropriate Sinus Tachycardia (IST) is a clinical syndrome characterized by a sinus heart rate inexplicably higher than one hundred beats per minute (bpm) at rest that is associated with symptoms like palpitations, dyspnea or dizziness in the absence of primary causes of tachycardia[7]. Noncardiac symptoms, such as anxiety, depression, abdominal discomfort, myalgia, and headaches are frequent as well[3].

Inappropriate sinus tachycardia (IST) has a prevalence of approximately 4.98% among symptomatic patients with sinus rhythm, predominantly affecting younger individuals with a mean age of 39.6 years and showing a higher prevalence in females, who account for about 60% of cases as reported in a large cross-sectional study[8]. The IST prognosis is benign in terms of clinical outcomes and echocardiographic evidence of ventricular dysfunction[9].

The main discussion regarding IST lies in the understanding of pathophysiological triggering mechanics, although some studies suggest that the cause is due to intrinsic increase of sinus node activity[6]. Additionally, intrinsic sinus node abnormalities, including heightened automaticity and sensitivity to adrenergic stimulation, may contribute[2]. Many authors mention triggering factors such as neurohormonal regulation dysfunction or the presence of anti-β-receptor autoantibodies, which may lead to increased sympathetic activity through prolonged activation of β-adrenergic receptors[7]. Dysautonomia can impair vascular tone regulation and cerebral perfusion, especially in upright positions or under stress, leading to transient loss of consciousness despite structurally normal cardiovascular and neurological evaluations[14]. This is why the difficulty in diagnosing the condition, combined with the still unclear understanding of its causes, emphasizes the need for more research to fully uncover the mechanisms behind it.

The diagnosis of IST is made by considering a sinus tachycardia at rest [heart rate (HR) >100 bpm] in a sitting position or/and as an average HR >90 bpm during 24-hour Holter monitoring in symptomatic pa-

tients[3]. Orthostatic vital signs help distinguish orthostatic hypotension and postural orthostatic tachycardia syndrome (POTS) from IST[2]. The precise relationship of IST and POTS is not known, overlapping multisystem, symptoms, and autonomic abnormalities observed in selected patients with IST suggest these two syndrome complexes may share some common pathophysiologic mechanisms[10].

Table 2. 24-hour Holter electrocardiography monitor showing sinus tachycardia

HEART RATE DATA	
Total Beats	108061 Beats
Analyzed %	99.9
Min HR	74 BPM at 08:19:10
Avg HR	97 BPM
Max HR	143 BPM at 15:07:29
QTc Max	>450 ms
Total VE Beats	0 (0.0%)
Triplets	0
Couplets: 0	0
R on T 0	0
Bi/Trigeminy 0	0
Total SVE Beats	(0.0%)
Atrial Runs	0
Fastest	0
Atrial Runs	0
Beats: 0	0
Longest: 0	0
Fastest	0 BPM
Atrial Pairs	2 Events
Single PAC's	2
Bi/Trigeminy	0/0 Beats

IST is mainly diagnosed by ruling out other potential causes, such as anemia, hyperthyroidism, or infections, through a detailed medical evaluation. A comprehensive diagnostic approach includes ambulatory ECG monitoring, such as 24-hour Holter or implantable loop recorders, documenting the heart rate patterns and assessing temporal relationships with symptoms and activities[2,6]. A 24-hour Holter monitor is essential for detecting persistent or abnormally elevated sinus tachycardia that is not associated with typical physical activity or physiological demands[11]. A tilt-table test is rarely required to differentiate IST from POTS or another overlapping syndrome, such as vasovagal syncope[12].

Advanced autonomic testing, including baroreflex sensitivity and heart rate variability analysis, can provide insights into underlying autonomic dysfunction[6]. Additionally, tools like echocardiography and cardiopulmonary exercise testing help evaluate structural and functional cardiac abnormalities that could contribute to tachycardia[5]. Emerging wearable technologies and multiparametric monitoring further enhance diagnostic accuracy by integrating physiological data beyond heart rate[10]. Even with these improvements, the wide range of symptoms and the overlap with other conditions like postural orthostatic tachycardia (POTS) make it difficult to clearly diagnose inappropriate sinus tachycardia (IST).

Management of IST typically combines pharmacological and non-pharmacological approaches, depending on symptom severity and impact on quality of life. Beta-blockers may help manage tachycardia in IST, particularly during exercise, but they are often ineffective even at high doses for many patients[12]. Ivabradine has emerged as a first-line pharmacological treatment due to its selective sinus node inhibition and favorable tolerability[5,7]. Ivabradine selectively inhibits the If channels of the sinoatrial node, effectively lowering the heart rate without impacting blood pressure, making it a valuable option for IST patients who do not tolerate or respond well to beta-blockers[12,13]. Ivabradine, while effective, can cause bradycardia (especially with beta-blockers or calcium channel antagonists), headaches, and is contraindicated with strong CYP 3A4 inhibitors, liver or severe renal dysfunction, hypotension, pregnancy, or breastfeeding, raising concerns for its use in IST patients[12]. Studies show that ivabradine lowers resting and maximum heart rates, improves exercise capacity, and significantly enhances quality of life.

Other suggested treatments (fludrocortisone, volume expansion, pressure stockings, phenobarbital, clonidine, psychiatric evaluation, erythropoietin) may be harmful, are unproven and may be targeting patients with POTS[2]. It is important to mention the impact that the modification of lifestyle factors such as caffeine reduction and increased activity have on these patients, which constitute a fundamental pillar in the management of these patients[8].

IST can be challenging to manage, and in cases where pharmacological treatments prove ineffective, interventions such as radiofrequency ablation may be considered as an alternative. Radiofrequency catheter ablation for IST achieves an acute success rate of 88.9% by modifying the sinus node but carries risks like phrenic nerve damage, pacemaker dependency, and a 19.6% recurrence rate, limiting its use to cases where medications have failed[12]. Surgical ablation of the sinus node may be ineffective because in patients with IST, rapid escape rhythms, including those from the AV junction, may subsequently occur[2].

New advanced approaches are rising like Robotic-enhanced hybrid ablation (RE-HA) which offers a promising, minimally invasive alternative for IST, providing greater access, visualization, precision and safety compared to video-assisted thoracoscopic surgery (VATS) approaches[15]. This approach could lead to better results and fewer complications, making a significant contribution to improving IST treatment.

The diagnostic process began with a thorough clinical evaluation and history-taking, which emphasized the chronicity and consistency of her symptoms. Importantly, the absence of identifiable triggers, such as fever, anemia, or hyperthyroidism, prompted clinicians to con-

sider primary electrical disorders of the heart. A 12-lead electrocardiogram confirmed a resting sinus tachycardia, and 24-hour Holter monitoring revealed an average heart rate exceeding 100 bpm with persistent diurnal elevation. This was critical in differentiating IST from physiological or situational causes of tachycardia. Additionally, transthoracic echocardiography showed preserved cardiac structure and function, and laboratory results excluded metabolic, endocrine, or infectious etiologies.

Collectively, these findings supported a diagnosis of IST—defined as a persistent elevation in resting sinus rhythm not attributable to secondary causes and associated with troubling symptoms. The diagnosis was further reinforced by the exclusion of other autonomic syndromes such as postural orthostatic tachycardia syndrome (POTS), which was ruled out based on positional heart rate variability. The integration of clinical acumen, appropriate use of non-invasive diagnostic tools, and thoughtful exclusion of differential diagnoses enabled a confident, patient-centered diagnosis.

Although inappropriate sinus tachycardia (IST) is typically considered a benign condition, the presence of recurrent syncope in this patient posed a significant diagnostic challenge. IST is classically defined by a persistently elevated heart rate at rest or with minimal exertion, but it is not commonly associated with true syncope. In our case, the syncopal episodes were preceded by classic prodromal symptoms such as blurred vision, sweating, and generalized weakness, suggesting more than an arrhythmic mechanism. This clinical profile indicates that IST may not solely reflect a primary sinus node disorder but rather a broader manifestation of autonomic dysfunction.

The patient's favorable response to beta-blocker therapy likely reflects not only heart rate control but also modulation of underlying sympathetic overactivity, a hallmark of autonomic imbalance in IST. This highlights the need for a more integrated therapeutic approach—one that targets both the electrical rhythm and the autonomic system. The rapid and sustained improvement observed in our patient after years of misattribution to anxiety reinforces the importance of a patient-centered diagnostic process that goes beyond surface-level symptoms. Clinicians should maintain a high index of suspicion for IST and its autonomic overlap, particularly in young women with long-standing, unexplained symptoms. Recognizing IST as part of a spectrum of dysautonomia rather than an isolated arrhythmia opens the door to more effective and compassionate management strategies.

Conflicts of interest

There are no conflicts of interest.

Bibliography

1. Ali M, Haji AQ, Kichloo A, Grubb BP, Kanjwal K. Inappropriate sinus tachycardia: a review. Rev Cardiovasc Med. 2021;22(4):1419–1426. Doi: 10.31083/j.rcm2204139.
2. Ahmed A, Pothineni NVK, Charate R, Garg J, Elbey M, de Asmundis C, et al. Inappropriate sinus tachycardia: etiology, pathophysiology, and management: JACC review topic of the week. J Am Coll Cardiol. 2022;79(25):2450–62. doi: 10.1016/j.jacc.2022.04.019.
3. Rasmus P, Pękala K, Kasprzak JD, Ptaszyński P, Kozłowska E, Sobów T. Inappropriate sinus tachycardia – cardiac syndrome or anxiety-related disorder? Psychiatr Pol. 2016;16(3):126–30.
4. Ali M, Haji AQ, Kichloo A, Grubb BP, Kanjwal K. Inappropriate sinus tachycardia: a review. Rev Cardiovasc Med. 2021;22(4):1331–9. doi:10.31083/j.rcm2204139.
5. Reissmann B, Fink T, Schlüter M, Metzner A, Ouyang F, Kuck KH. Catheter ablation for inappropriate sinus tachycardia: clinical outcomes of sinus node ablation. HeartRhythm Case Rep. 2020;6(2):81–5. doi: 10.1016/j.hrcr.2019.10.016.
6. Mayuga KA, Fedorowski A, Ricci F, Gopinathannair R, Dukes JW, Gibbons C, et al. Sinus tachycardia: a multidisciplinary expert focused review. Circ Arrhythm Electrophysiol. 2022;15(6): e007960. Doi: 10.1161/CIRCEP.121.007960.
7. Ruzieh M, Moustafa A, Sabbagh E, Karim MM, Karim S. Challenges in treatment of inappropriate sinus tachycardia. Curr Cardiol Rev. 2018;14(1):42–4.
8. Şimşek E, Özbay B, Mutlu I, Gürses E, Kemal HS, Yağmur B, et al. Prevalence of inappropriate sinus tachycardia and comparison of heart rate variability with propensity-matched controls. Turk Kardiyol Dern Ars. 2020;48(2):96–102. doi:10.5543/tkda.2020.32726.
9. Yasin O, Vaidya V, Chacko S, Asirvatham S. Inappropriate sinus tachycardia: current challenges and future directions. J Innov Cardiac Rhythm Manag. 2018;9(7):3239–43.
10. De Asmundis C, Chierchia GB, Lakkireddy D, Romeya A, Okum E, Gandhi G, et al. Sinus node sparing novel hybrid approach for treatment of inappropriate sinus tachycardia/postural sinus tachycardia: multicenter experience. J Interv Card Electrophysiol. 2022;63(3):531–44. doi:10.1007/s10840-021-01044-5.
11. Showkat HI, Sharma V, Anwar S, Gupta L, Kumar V, Arora AP, et al. Inappropriate sinus tachycardia: brief review. J Cardiovasc Med Surg [Internet]. 2016;2(1):11–3 [cited 2024 Mar 30]. Available from: http://rfppl.co.in/view_abstract.php?jid=43&art_id=3391.
12. Olshansky B, Sullivan RM. Inappropriate sinus tachycardia. Europace. 2019;21(2):194–207. doi:10.1093/europace/euy128.
13. Mathew ST, Po SS, Thadani U. Inappropriate sinus tachycardia – symptom and heart rate reduction with ivabradine: a pooled analysis of prospective studies. Heart Rhythm. 2018;15(2):240–7. doi: 10.1016/j.hrthm.2017.10.004.

14. Miglis MG, Muppidi S. Dysautonomia: a common comorbidity of systemic disease. Curr OpinEndocrinol Diabetes Obes. 2025;32(2):110–117. doi: https://doi.org/10.1007/s12026-025-09661-2.

15. Khalpey Z, Kumar U, Abraham A, Krauthammer Y. Robotic-enhanced hybrid ablation for inappropriate sinus tachycardia: a world-first approach. Interdiscip Cardiovasc Thorac Surg. 2024;39(5). doi:10.1093/icvts/ivad005.