

CARDIOLOGY

INAPPROPRIATE SINUS TACHYCARDIA PRESENTED DURING PREGNANCY (CLINICAL CASE)

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RESUME

Inappropriate sinus tachycardia (IST) is a sinus tachycardia unexplained by visible physiological and secondary causes with a resting heart rate of more than 100 beats per minute. The true prevalence of IST is unknown. At the same time, IST seems to be common in normal pregnancies, which causes significant difficulties in differential diagnosis and patient management. There is no practice of diagnosing IST in Russia. An analysis of the literature revealed no descriptions of clinical cases of IST in pregnant women in Russian publications and found only one report of IST in the review article.

The paper presents a clinical case of IST in a 33-year-old woman in the third trimester of pregnancy. The patient had sinus tachycardia with a heart rate of 180 beats per minute, accompanied by complaints of shortness of breath, weakness, and palpitations. During Holter monitoring, sinus tachycardia was recorded during both daytime and nighttime hours. A differential diagnosis with paroxysmal reciprocal sinus tachycardia and postural orthostatic tachycardia syndrome was performed. Other potential causes of sinus tachycardia were ruled out. The diagnosis of ICT has been established. Therapeutic options were limited due to pregnancy. Administration of metoprolol succinate at a dose of 25 mg produced only a modest reduction in heart rate to 120 beats per minute. At 38 weeks of gestation, delivery was performed via cesarean section. During dynamic follow-up 4 months after delivery, a decrease in tachycardia to 100 beats per minute was noted, which requires continued monitoring.

The features of the presented clinical case are the extremely high heart rate for the sinus rhythm described for the first time (180 beats per minute) and persistent moderate sinus tachycardia 4 months after delivery.

Key words: sinus tachycardia, pregnancy, inappropriate sinus tachycardia

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НЕФИЗИОЛОГИЧЕСКАЯ СИНУСОВАЯ ТАХИКАРДИЯ, ВЫЯВЛЕННАЯ ВО ВРЕМЯ БЕРЕМЕННОСТИ (ОПИСАНИЕ КЛИНИЧЕСКОГО СЛУЧАЯ)

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РЕЗЮМЕ

Нефизиологическая синусовая тахикардия (НСТ) — это необъяснимая видимыми физиологическими и вторичными причинами синусовая тахикардия с частотой сердечных сокращений в покое более 100 в 1 мин. Истинная распространенность НСТ неизвестна. При этом НСТ, по-видимому, нередко встречается при нормально протекающей беременности, что вызывает существенные затруднения в дифференциальной диагностике и тактике ведения пациентов. Практика постановки диагноза НСТ в России отсутствует. При анализе литературы не выявлено описаний клинических случаев НСТ у беременных в отечественных изданиях и обнаружено лишь одно сообщение о НСТ в обзорной статье.

В работе представлен клинический случай НСТ у 33-летней женщины в третьем триместре беременности. У пациентки выявлена синусовая тахикардия с частотой 180 в мин., сопровождавшаяся жалобами на одышку, слабость, сердцебиение. При холтеровском мониторировании сердечного ритма синусовая тахикардия регистрировалась как в дневные, так и в ночные часы. Проведен дифференциальный диагноз с пароксизмальной реципрокной синусовой тахикардией и синдромом постуральной ортостатической тахикардии. Исключены другие возможные причины синусовой тахикардии. Установлен диагноз НСТ. Наличие беременности ограничивало возможности медикаментозной терапии. На фоне приема метопролола суccionата 25 мг отмечался незначительный эффект по снижению частоты сердечных сокращений до 120 в мин. На сроке 38 недель проведено родоразрешение путем кесарева сечения. В ходе динамического наблюдения через 4 месяца после родов отмечено уменьшение тахикардии до 100 в мин, что требует продолжения наблюдения. Особенности представленного клинического случая является описанная впервые чрезвычайно высокая для синусового ритма ЧСС (180 в 1 мин.) и сохраняющаяся умеренная синусовая тахикардия через 4 месяца после родов.

Ключевые слова: синусовая тахикардия, беременность, неадекватная синусовая тахикардия

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INTRODUCTION

In 1939, Codville and Boucher [1] first described inappropriate sinus tachycardia (IST), which is a benign condition characterized by symptoms that occur in patients with sinus tachycardia. The 2015 Consensus defines IST as sinus tachycardia with a heart rate (HR) at rest exceeding 100 beats per minute (bpm), an average 24-hour HR exceeding 90 bpm during Holter monitoring, and symptoms associated with persistent tachycardia [2].

The symptoms of IST are nonspecific and can include weakness, fatigue, dizziness, palpitations, and other symptoms at rest, during minimal exertion, or during recovery that cannot be explained by physiological demands. IST is a diagnosis of exclusion that can only be made after ruling out various potential causes of sinus tachycardia, such as dehydration, hyperthyroidism, bleeding, iron deficiency anemia, hypoxia, pulmonary embolism, heart failure, trauma, inflammation, infection, and postural orthostatic tachycardia syndrome (POTS) [3–5].

The exact prevalence of IST remains unknown. According to an OPERA study (Oulu Project), which examined the risk of atherosclerosis, the estimated prevalence of IST was 1.16 %. However, this figure likely does not represent the true prevalence in the general population, as the study only included individuals aged 40–59 years [6], whereas IST is more common in younger individuals [3, 5, 7].

The pathogenesis of IST involves multiple factors. Potential mechanisms include dysregulation of the sinus node's automaticity, decreased parasympathetic activity caused by autoantibodies targeting M_2 receptors or hypoactivity, and increased sympathetic activity resulting from autoantibodies against beta-adrenoceptors or beta-adrenoceptor hyperactivity [2, 4, 5, 8].

Pregnancy is a common trigger for IST [7, 9]. Due to the fact that sinus tachycardia is frequently observed during pregnancy, IST often goes unnoticed [9, 10]. The mechanisms behind IST in pregnancy relate to sympathetic activation and changes in baroreceptor sensitivity [3, 7, 10]. The diagnosis of IST in pregnant women is based on the 2015 Consensus Criteria. However, in certain cases, diagnosis can be challenging, as heart rate (HR) physiologically increases during pregnancy and up to 10 % of healthy pregnant women have resting HRs exceeding 100 bpm [3].

The prognosis for IST is generally favorable. A follow-up study of 305 patients for over 3.5 years did not reveal any cases of tachycardia-induced cardiomyopathy [7]. Typically, patients with IST do not have structural heart disease [5, 7], although isolated cases of tachycardia-induced cardiomyopathy have been reported [2], including in pregnant women [10]. Treatment of IST in pregnant women presents challenges due to the potential risks to the fetus and the lack of conclusive evidence regarding the safety of certain medications during pregnancy.

AIM

To present a case report of IST in a pregnant patient and discuss the approaches to its diagnosis, differential diagnosis, and management.

CASE REPORT

Informed consent for the publication of medical data and examination results was obtained from the patient.

Patient, K.P.A., a 33-year-old woman, was admitted to the cardiology department on April 14, 2025, at 30 weeks gestation. The patient presented with palpitations, both at rest and during activity, which reached 160–180 bpm, accompanied by shortness of breath. The patient denied any sudden onset of the palpitations or dependence of HR on body position. The blood pressure (BP) was 100/70 mmHg. For the past three months (since the 27th week of pregnancy), the patient had been taking metoprolol succinate at a dose of 25 mg. However, despite this treatment, the tachycardia persisted at this dose. In April 2025 (at 30 weeks), evidence of impaired placental blood flow was noted, and the metoprolol dosage was reduced to 12.5 mg.

On April 14 (while still taking metoprolol succinate 12.5 mg), the patient underwent evaluation by a cardiologist, who documented a heart rate of 186 bpm and blood pressure of 89/78 mmHg, leading to hospitalization.

The patient reported a history of tachycardia dating back to childhood. Previous electrocardiogram (ECG) records were unavailable. The patient had never experienced sudden palpitations, and she had been able to tolerate physical activity and was active in sports. This was her first pregnancy. In December 2024, at 12 weeks gestation, Holter monitoring showed a mean 24-hour HR of 119 bpm, a mean nocturnal HR of 96 bpm, and a maximum HR of 178 bpm. Based on these findings, metoprolol succinate was prescribed at a dose of 25 mg per day. In February 2025, the patient was diagnosed with mild iron deficiency anemia (hemoglobin 103 g/L, ferritin 2.7 µg/L). Oral iron supplementation in the form of ferric hydroxide polymaltose complex was prescribed, and serum iron levels increased to 24.48 µmol/L after treatment.

On admission, the patient's height was 165 cm and weight was 70 kg. Oxygen saturation was 98 % and body temperature was 36.5°C. The general condition was satisfactory. The skin was of normal color and texture, and respiratory rate was 12 breaths per minute. Lungs exhibited vesicular breathing with no crackles, and heart sounds were rhythmic with no murmurs. HR was 180 bpm. There was no jugular venous distension and BP was 124/87 mmHg. The abdomen was enlarged due to the presence of a pregnancy, but there was no edema. Fluid intake was adequate.

The Table shows dynamic changes in HR and BP during hospitalization.

The ECG performed on April 14, 2025, revealed sinus tachycardia with a heart rate of 180 bpm. The PQ interval was 0.12 s, the QRS duration was 0.06 s, and the QT interval was 0.26 s. The QTc was 0.4 s. There was no deviation in the electrical axis (Fig. 1).

Fetal ultrasound (April 17, 2025). Gestational age: 30 weeks and 4 days. Fetal HR: 133 bpm. Reduced fetal growth and low birth weight have been observed. There is no evidence of impaired uteroplacental or fetoplacental blood flow.

Thyroid ultrasound (April 22, 2025). Diffuse changes in the thyroid gland were noted.

Echocardiography (April 24, 2025): normal valves, no chamber enlargement, no ventricular hypertrophy. Left ventricular ejection fraction (Simpson): 56 %. Right ventricular systolic pressure (by tricuspid regurgitation): 30 mmHg. No pericardial effusion. Transmitral diastolic flow with E and A peak merged due to tachycardia. Inferior vena cava was not dilated, collapsing > 50 % during inspiration.

TABLE
DYNAMICS OF HEART RATE AND BLOOD PRESSURE OF THE PATIENT K.P.A.

Parameter	April 14, 2025, 4:00 p.m.	April 14, 2025, 8:00 p.m.	April 15, 2025	April 18, 2025	April 25, 2025
HR, bpm	180	167	166	148	142
BP, mmHg	120/80		122/84		117/78

Note. BP – blood pressure; HR – heart rate.



FIG. 1.
ECG of patient K.P.A. from April 14, 2025

Holter monitoring (April 16, 2025, while taking metoprolol 12.5 mg) was performed. The duration of monitoring was 24 hours, during which sinus rhythm was recorded. The mean heart rate was 141 bpm, with a minimum of 110 bpm at 3:40 a.m. and a maximum of 176 bpm at 9:51 a.m. The mean daytime heart rate was 150 bpm and the mean nighttime heart rate was 123 bpm. There was no ectopic activity or pauses recorded.

The laboratory examination revealed mild normochromic anemia (red blood cells $3.06 \times 10^{12}/L$; hemoglobin 96 g/L; hematocrit 28.2 %; mean corpuscular hemoglobin 31.5 pg; mean corpuscular hemoglobin concentration 342 g/L). Serum iron levels were 31.8 $\mu\text{mol}/L$. Glucose, creatinine, and potassium levels were within normal ranges. Free thyroxine level (T4: 5.19 pmol/L), free triiodothyronine level (T3: 3.64 pmol/L), thyroid stimulating hormone level (2.66 $\mu\text{IU}/\text{mL}$), and anti thyroid peroxidase antibody level (0.32 IU/mL) were all within the reference ranges.

During her stay in the cardiology unit, the patient continued taking metoprolol succinate 25 mg. On April 28, 2025, she was discharged from the unit with the following diagnoses: **pregnancy at 32 weeks. Inappropriate sinus tachycardia. Mild iron deficiency anemia.**

The patient was seen at the perinatal center for consultation. During the examination, the HR was 120 bpm and BP was 114/72 mmHg. Fetal movement count was more than 6 in two hours. The uterus was of normal tone and the fetal heart rate was 126 bpm. Hospitalization for the pathology of pregnancy department of the regional perinatal center on June 4, 2025 was recommended. On June 7, 2025 at 38 weeks gestation, a scheduled cesarean section was performed.

After delivery, four months later, the patient was invited for follow-up evaluation. The ECG showed sinus rhythm of 100 bpm. The patient reported feeling well and was continuing breastfeeding. In the postpartum period, the patient discontinued metoprolol. Continued monitoring of symptom dynamics and heart rate was recommended.

DISCUSSION

The relevance of this clinical case lies primarily in the rarity of the diagnosis of IST. In the Russian medical literature, we have found only one mention of IST in a review article [11], with no descriptions of cases of IST in pregnant women. In the international literature, there are isolated case reports of IST in pregnant women [10, 12], as well as a retrospective cohort study of 19 women [9]. However, the actual prevalence of IST is likely to be higher than reported, especially among pregnant women, where IST may be misdiagnosed as a normal consequence of pregnancy. Interest in IST has increased since it was recognized as occurring frequently as part of post-COVID syndrome. The 2025 guidelines

of the Russian Society of Cardiology on supraventricular tachycardias emphasize the need to differentiate physiological from non-physiological tachycardia, but they do not provide criteria for the diagnosis of IST [13]. The recently published ESC Guidelines on cardiovascular disease in pregnancy do not include information on IST [12]. This lack of information creates difficulties for healthcare professionals in the differential diagnosis and treatment of this condition.

Pregnancy has been shown to be associated with an increased incidence of arrhythmias, such as sinus tachycardia [15], which can be caused by hypovolemia, hypoxemia, anemia, or infection. In some cases, these arrhythmias may occur without an identifiable underlying medical condition [16]. Identifying and treating arrhythmias is essential for optimizing the health of both the mother and fetus [17].

During pregnancy, HR increases by 3–5 % in the first trimester, 10–15 % in the second, and 15–20 % in the third [18]. After 18 weeks of gestation, an HR exceeding 100 bpm and after 28 weeks exceeding 105 bpm is observed in more than 10 % of healthy pregnant women [19]. Therefore, some authors argue that the current diagnostic criteria for IST [2], which define a resting sinus rhythm of 100 bpm as the upper limit of normal HR, may be too low for pregnant women [12]. Others maintain that, despite a 10–20 bpm increase in HR, resting tachycardia > 95 bpm is rare in pregnant women [20]. Consequently, resting sinus tachycardia exceeding 100 bpm in pregnant women in the absence of other causes should be considered as IST [9, 10].

Our patient had sinus tachycardia that far exceeded the level expected as a normal response to pregnancy. Other potential causes of sinus tachycardia, such as hyperthyroidism, infection, cardiac or pulmonary pathology, were ruled out. Pulmonary embolism was also excluded. Mild anemia was unlikely to account for the significant tachycardia. Mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), and serum iron levels were within normal ranges. The modest decreases in hemoglobin and red blood cell counts could be attributed to physiological changes associated with pregnancy. Therefore, the patient was diagnosed with IST. Notably, the severity of the tachycardia in this case was unusual: resting HR reached up to 180 bpm, and Holter monitoring revealed a mean 24-hour HR of 141 bpm, a daytime mean of 150 bpm, and a nocturnal mean of 123 bpm. Sharp et al. described IST in 19 pregnant women, with a maximum resting HR ranging from 101 to 148 (121 ± 16) bpm and a mean 24-hour HR on Holter monitoring of $92-118$ (99 ± 6) bpm [9].

Differentiation between IST and POTS is necessary. POTS is characterized by symptoms that occur when a person assumes an upright position, along with an increase in HR of ≥ 30 bpm (or ≥ 40 bpm in individuals aged 12–19 years), in the absence of orthostatic hypotension (a decrease in systolic BP > 20 mmHg) [2]. Assessment of HR and BP during orthostatic stress is essential

for differentiating between IST and POTS, and tilt-table testing may sometimes be required [2, 5, 8]. In our patient, tachycardia was consistently present in both supine and standing positions. Holter monitoring showed marked sinus tachycardia at night (in the supine position), with an average nocturnal HR of 126 bpm. The lowest nocturnal HR was 110 bpm. Upon standing up (based on correlation between heart rate and diary entries), there was no significant increase in HR. These signs rule out POTS.

Differential diagnosis of IST and sinus reciprocating tachycardia. The ECG features of IST and sinus reciprocating tachycardia can be similar. In contrast to paroxysmal tachycardia, IST is characterized by gradual acceleration and deceleration of heart rate (HR). Paroxysmal sinus reciprocating tachycardia is characterized by sudden onset and termination [3, 5, 8], and can be triggered by premature atrial beats. These episodes can be terminated with the use of adenosine or vagal maneuvers [8]. In our patient, the absence of sudden episodes of onset and termination during Holter monitoring led us to rule out paroxysmal atrial tachycardia. Shortening of the PQ interval is a characteristic feature of IST, while prolongation of the PR interval is seen in atrial tachyarrhythmias [20]. During sinus tachycardia, our patient exhibited a PQ interval of 0.12 s at an HR of 180 bpm.

Treatment of IST typically involves β -blockers and non-dihydropyridine calcium channel blockers [5, 8, 22]. Although β -blockers are commonly used, in a retrospective study by Shabtaie et al., only 20 % of the 245 patients experienced symptom improvement, and only 4 % achieved complete resolution of symptoms. The effectiveness of non-dihydropyridine calcium blockers was also low, with only 10 % of patients experiencing symptom improvement and none achieving resolution [22].

Ivabradine, which blocks the If channels in the sinus node, inhibits its automaticity [23]. A pooled analysis of nine prospective studies including 145 patients found that ivabradine significantly decreased resting and maximum HR and improved symptoms, while being well-tolerated [8]. Comparative studies of ivabradine versus beta-blockers (metoprolol succinate and bisoprolol) showed advantages of ivabradine in terms of efficacy and tolerability [8, 24]. Unlike beta-adrenergic receptor blockers, at lower doses, ivabradine has a more potent effect on sinus node automaticity at higher HR and is more effective for treating IST [25, 26]. Ivabradine lowers baseline, average, and maximum HR and reduces symptoms with a good safety profile [25]. According to Khan et al., these findings support using ivabradine as first-line therapy for IST [25]. In a small trial of 20 patients, a combination of ivabradine and metoprolol was superior to metoprolol alone [22].

In cases of drug-resistant IST, catheter ablation may be considered as a treatment option. A retrospective analysis by Shabtaie et al., involving 305 patients treated at Mayo Clinic between 1998 and 2018, found that 55 (18 %) patients underwent ablation, with 90.9 % being endocardial and 9.1 % being epicardial, due

to medication non-response. A high complication rate (34.5 %) was noted, including 3.6 % cases with perforation [22]. Another option for patients who do not respond to therapy is AV node ablation with pacemaker implantation [26].

Treatment of IST during pregnancy presents a particular challenge, as ivabradine is contraindicated [10]. Metoprolol succinate has been shown to be effective in some cases [27], and compared to other beta-blockers, it has the least impact on fetal birth weight reduction [15]. Atenolol is also contraindicated during pregnancy [10, 15].

Our patient was treated with metoprolol succinate, starting at a dose of 25 mg. Due to the detection of low fetal weight and growth restriction by ultrasound, the dosage was subsequently reduced to 12.5 mg. Despite the administration of metoprolol, there was a modest improvement in the effectiveness, with the HR remaining at approximately 120 bpm. In the postpartum period, after the discontinuation of β -blocker treatment, a moderate decrease in HR to approximately 100 bpm was noted.

According to available literature, calcium channel blockers do not appear to be associated with an increased risk of congenital abnormalities. Verapamil has been considered safe for use during pregnancy and lactation [15], although its efficacy may be limited [22]. If medication proves ineffective, ablation may be considered as an alternative treatment option, but it carries the risk of substantial fetal radiation exposure. Nevertheless, despite this relative contraindication, there have been reports of successful ablation in a pregnant woman with IST and tachycardia-induced cardiomyopathy [10].

This case is notable for its exceptionally high resting HR (180 bpm) in a patient with a sinus rhythm. To our knowledge, this is the first time such a high resting rate has been reported in the literature for this condition. In previous studies of IST, the highest resting heart rate observed was 148 bpm [9]. Additionally, tachycardia in this patient persisted for 4 months after delivery, while most patients with IST reportedly return to normal heart rates after delivery [9]. This requires continued follow-up and consider the possibility of reinitiating rate-controlling therapy, as well as closely monitoring for the development of tachycardia-induced cardiomyopathy.

CONCLUSION

This case report describes the diagnostic process, differential diagnosis, clinical course, and treatment of inappropriate sinus tachycardia in a pregnant patient. The diagnosis of IST is very rarely established in Russian clinical practice. The case stands out for the extremely high heart rate for a sinus rhythm (up to 180 bpm), which has not been previously described, and for the detailed description of the long-term course of the condition.

Conflicts of interest

The authors declare no conflicts of interest.

REFERENCES

1. Codvelle MM, Boucher H. Tachycardie sinusale permanente a haute frequence sans troubles fonctionnels. *Bull Mem Soc Med Hop Paris*. 1939; 54: 18491852.
2. Sheldon RS, Grubb BP, Olshansky B, Shen W-K, Calkins H, et al. Heart Rhythm Society expert consensus statement on the diagnosis and treatment of postural orthostatic tachycardia syndrome, inappropriate sinus tachycardia, and vasovagal syncope. *Heart Rhythm*. 2015; 12: e41e63. doi: 10.1016/j.hrthm.2015.03.029
3. Mayuga KA, Fedorowski A, Ricci F, Gopinathannair R, Dukes JW, et al. Sinus Tachycardia: A Multidisciplinary Expert Focused Review. *Circ Arrhythm Electrophysiol*. 2022; 15(9): e007960. doi: 10.1161/CIRCEP.121.007960
4. Yasin OZ, Vaidya VR, Chacko SR, Asirvatham SJ. Inappropriate sinus tachycardia: current challenges and future directions. *J Innov Cardiac Rhythm Manage*. 2018; 9(7): 3239–3243. doi: 10.19102/icrm.2018.090706
5. Ahmed A, Pothineni NVK, Charate R, Garg J, Elbey M, de Asmundis C, et al. Inappropriate sinus tachycardia: etiology, pathophysiology, and management. *J Am Coll Cardiol*. 2022; 79: 24502462. doi: 10.1016/j.jacc.2022.04.019
6. Still AM, Raatikainen P, Ylitalo A, Kauma H, Ikaheimo M, Kesaniemi YA, et al. Prevalence, characteristics and natural course of inappropriate sinus tachycardia. *Europace*. 2005; 7: 104112. doi: 10.1016/j.eupc.2004.12.007
7. Shabtaie SA, Witt CM, Asirvatham SJ. Natural history and clinical outcomes of inappropriate sinus tachycardia. *J Cardiovasc Electrophysiol*. 2020; 31: 137–143. doi: 10.1111/jce.14288
8. Ali M, Haji AQ, Kichloo A, Grubb BP, Kanjwal K. Inappropriate sinus tachycardia: a review. *Rev. Cardiovasc. Med*. 2021; 22(4): 1331–1339. doi: 10.31083/j.rcm2204139
9. Sharp A, Patient C, Pickett J, Belham M. Pregnancy-related inappropriate sinus tachycardia: a cohort analysis of maternal and fetal outcomes. *Obstetric Medicine*. 2021; 14(4): 230234. doi: 10.1177/1753495X21990196
10. Belham M, Patient C, Pickett J. Inappropriate sinus tachycardia in pregnancy: a benign phenomena? *BMJ Case Rep*. 2017; 2017: bcr2016217026. doi: 10.1136/bcr2016217026
11. Bunin YA, Miklishanskaya SA, Zolozova EA, Chigineva VV. Atrial tachyarrhythmias and atrial flutter: the basics of diagnostics and modern opportunities of therapy. *Rational Pharmacotherapy in Cardiology*. 2019; 15(1): 115124. (In Russ.). [Бунин Ю.А., Миклишанская С.В., Золозова Е.А., Чигинева В.В. Предсердные тахикардии и трепетание предсердий: основы диагностики и современные возможности терапии. *Рациональная Фармакотерапия в Кардиологии*. 2019; 15(1): 115124.]. doi: 10.20996/1819-6446-2019-15-1-115-124
12. Coad F, Frise C. Tachycardia in pregnancy: when to worry? *Clin Med*. 2021; 21: e434e437. doi: 10.7861/clinmed.2021-0495
13. Popov SV, Davtyan KV, Shubik YuV, Artyukhina EA, Bazaev VA, Batalov RE, et al. 2025 Clinical practice guidelines for Supraventricular tachycardias. *Russian Journal of Cardiology*. 2025; 30(7): 6448. (In Russ.). [Попов С.В., Давтян К.В., Шубик Ю.В., Артюхина Е.А., Базеев В.А., Баталов Р.Е. и др. Наджелудочковые тахикардии. Клинические рекомендации 2025. *Российский кардиологический журнал*. 2025; 30(7): 6448.]. doi: 10.15829/1560-4071-2025-6448
14. De Backer J, Haugaa KH, Hasselberg NE, de Hosson M, Brida M, Castelletti S, et al. 2025 ESC Guidelines for the management of cardiovascular disease and pregnancy. *Eur Heart J*. 2025; 46(43): 4462–4568. doi: 10.1093/eurheartj/ehaf193
15. Tamirisa KP, Elkayam U, Briller JE, Mason PK, Pillarisetti J, Merchant FM, et al. Arrhythmias in pregnancy. *JACC Clinical Electrophysiology*. 2022; 8(1): 12035. doi: 10.1016/j.jacep.2021.10.004
16. Varrias D, Sharma N, Hentz R, Ma R, Gurciullo D, Kleiman J, et al. Clinical significance of unexplained persistent sinus tachycardia in women with structurally normal heart during the peripartum period. *BMC Pregnancy and Childbirth*. 2022; 22(1): 677. doi: 10.1186/s12884-022-05012-3
17. Williams DS, Mikhova K, Sodhi S. Arrhythmias and Pregnancy. Management of preexisting and new-onset maternal arrhythmias. *Cardiol Clin*. 2021; 39: 67–75. doi: 10.1016/j.ccl.2020.09.013
18. American College of Obstetricians and Gynecologists' Presidential Task Force on Pregnancy and Heart Disease and Committee on Practice Bulletins – Obstetrics. ACOG Practice Bulletin No. 212: Pregnancy and Heart Disease. *Obstet Gynecol*. 2019; 133(5): e320–56. doi: 10.1097/AOG.0000000000003243
19. Green LJ, Mackillop LH, Salvi D, Pullon R, Loerup L, Tarassenko L, et al. Gestation-specific vital sign reference ranges in pregnancy. *Obstet Gynecol*. 2020; 135: 653664. doi: 10.1097/AOG.0000000000003721
20. Loerup L, Pullon RM, Birks J, Fleming S, Mackillop LH, Gerry S, et al. Trends of blood pressure and heart rate in normal pregnancies: a systematic review and meta-analysis. *BMC Med*. 2019; 17(1): 167. doi: 10.1186/s12916-019-1399-1
21. Field ME, Donato P, Bottoni N, Iori M, Brignole M, Kipp RT, et al. P-wave amplitude and PR changes in patients with inappropriate sinus tachycardia: findings supportive of a central mechanism. *J Am Heart Assoc*. 2018; 7(9): e008528. doi: 10.1161/JAHA.118.008528
22. Shabtaie SA, Witt CM, Asirvatham SJ. Efficacy of medical and ablation therapy for inappropriate sinus tachycardia: A single-center experience. *J Cardiovasc Electrophysiol*. 2021; 32: 10531061. doi: 10.1111/jce.14942

23. Kaczmarek K, Klingenhoben T, Poddebska I, Urbanek I, Wranicz JK, Cygankiewicz I, et al. Baseline intrinsic heart rate and response to ivabradine treatment in patients with inappropriate sinus tachycardia. *Ann Noninvasive Electrocardiol.* 2020; 25: e12709. doi: 10.1111/anec.12709
24. Martino A, Rebecchi M, Sette A, Cicogna F, Politano A, Sgueglia M, et al. Ivabradine versus bisoprolol in the treatment of inappropriate sinus tachycardia. *Journal of Cardiovascular Medicine.* 2021; 22(12): 892–900. doi: 10.2459/JCM.0000000000001203
25. Khan A, Ling J, Parikh VK, Bekheit S. Should ivabradine be first-line therapy for inappropriate sinus tachycardia? *Pacing Clin Electrophysiol.* 2025; 48(7): 725–732. doi: 10.1111/pace.15214
26. Cappato R. Treatment of inappropriate sinus tachycardia: still a long way to go. *J Cardiovasc Electrophysiol.* 2021; 32: 10621064. doi: 10.1111/jce.14940
27. Shah AN, Ferreira SW, Padanilam BJ, Prystowsky EN. Management of inappropriate sinus tachycardia during pregnancy. *Heart Rhythm O2.* 2022; 4(1): 6566. doi: 10.1016/j.hroo.2022.11.001

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