Supraventricular tachycardia in pregnancy: a rare case series and dilemmatic antiarrhythmic drug choices in the rural area

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ABSTRACT

Background: The prevalence of cardiovascular disease in pregnancy is reported to be increasing and becoming a major cause of maternal morbidity and mortality. The incidence of arrhythmia during pregnancy has been linked to increased fetal mortality and complications. Arrhythmias can develop de novo during pregnancy or be exacerbated by pregnancy.

Case Description: A 35-year-old (third trimester) and a 25-year-old (second trimester) woman complained of shortness of breath and palpitations. The first patient was in her sixth pregnancy, with three live births and two miscarriages. Meanwhile, the second patient was in her first pregnancy and had never miscarried. The first and second patients’ pulse rates were 180 and 160 beats per minute, respectively. In both cases, 12-lead electrocardiography revealed an atrioventricular nodal re-entrant tachycardia rhythm. Initially, both patients were given carotid artery massages. The first patient’s heart rate returned to normal sinus, but carotid artery massage failed in the second patient. Then, the second patient received a slow bolus of 0.5 mg digoxin IV. The heart rate returned to normal sinus rhythm following the observation. Both patients were admitted to the intensive care unit.

Conclusion: Atrioventricular nodal re-entrant tachycardia is a type of paroxysmal supraventricular tachycardia. Effective management highly depends on both clinical presentation and the trimester of pregnancy. This arrhythmia can be treated with vagal maneuvers in mild cases. When vagal maneuvers fail, medical management is preferred. The main concern with using antiarrhythmic drugs during pregnancy is the risk of fetal harm and the decision should be tailored based.

Keywords: Pregnancy, Arrhythmia, Supraventricular tachycardia, Atrioventricular nodal re-entrant tachycardia.


INTRODUCTION

The prevalence of cardiovascular disease in pregnancy, both diagnosed and previously unrecognized, is reported to be increasing and becoming a major cause of maternal morbidity and mortality. Acquired cardiovascular conditions are the largest proportion of maternal morbidity and mortality with increasing prevalence. The incidence of arrhythmia and hospitalization due to arrhythmia during pregnancy is reported to be increasing. It has been reported that the frequency of any arrhythmia is 68 per 100,000 pregnancy-related hospitalizations, with supraventricular tachycardia (SVT) being the most common at 22 per 100,000.1 It has been linked to increased fetal mortality and complications. Arrhythmias can develop de novo during pregnancy or being pregnant can also exacerbate existing arrhythmias, which is related to hormonal effects.2,3 For women of childbearing age with cardiovascular disease, pregnancy planning is crucial to maximize maternal and fetal health. Ideally, pregnancy management begins with pre-conception counseling and recommendations on long-term contraceptive options, which should be discussed before a woman is actually pregnant.4

Effective management of SVT in pregnancy depends on the clinical presentation and trimester of pregnancy. In patients with unstable hemodynamics, an aggressive treatment approach is required. In general, antiarrhythmic drug treatment for SVT should be reserved for SVT that causes hemodynamic compromise or significant symptoms. The main concern about using antiarrhythmic drugs during pregnancy is the potential harm to the fetus. The risks and benefits of continuing versus discontinuing medication must be carefully considered in terms of the risk of recurring SVT and the potential for hemodynamic compromise. Individualized decisions should be made based on the clinical situation and the possibility of additional structural heart disease. Patients who present with hemodynamic instability due to SVT should be treated with emergency synchronized cardioversion. When patients are more stable, vagal maneuvers are recommended as a first-line treatment.
strategy. When vagal maneuvers fail, medical management becomes the preferred treatment. However, evidence suggests that there aren't many large-scale controlled studies on the use of antiarrhythmic drugs during pregnancy.5–7

In this report, we present a case series of In this case series, we present the cases of two pregnant women in their second and third trimesters, who complained of shortness of breath and palpitations, as well as supraventricular tachycardia on electrocardiogram.

CASE REPORT

A 35-year-old woman (third trimester) and a 25-year-old woman (second trimester) went to the ER with sudden complaints of shortness of breath and palpitations. There were also complaints of cold sweat all over the body. The first patient was in her sixth pregnancy, with three live births and two abortions. Meanwhile, the second patient was in her first pregnancy and had no history of abortion. Both patients received regular antenatal care (ANC) from their obstetrician and gynecologist.

On physical examination, the first patient's vital signs revealed a BP of 100/60 mmHg, an HR of 180 BPM, and RR of 34x/min and the second patient's vital signs revealed a BP of 100/60 mmHg, HR of 160 BPM, and RR of 22x/min. Physical examination in both patients revealed chest wall retraction with vesicular breath sounds without the presence of fine/coarse rales or wheezing. Single S1 and S2 sounds were normal with no murmurs. The extremities were cold without edema.

The 12-lead electrocardiogram of the first patient showed AV nodal reentry tachycardia with 170 BPM, normoaxis, and ST depression in leads II, III, aVF, and V3-V6 (Figure 1). A 12-lead electrocardiogram in the second patient also revealed an AV Nodal Reentry Tachycardia rhythm with 151 BPM, normoaxis, and T inversion in leads II and aVF (Figure 2). Both patients received initial emergency management based on the Advance Cardiac Life Support principles, followed by carotid artery massage for 3 minutes.

After carotid artery massage, the first patient's rhythm returned to normal sinus rhythm with an HR of 85 BPM, BP of 106/59 mmHg, and RR of 24 x/min.

The patient had another ECG-12 lead evaluation and obtained a normal sinus rhythm, 85 BPM, normoaxis, T inversion in lead V1, and occasional PVCs in leads...
I, II, III, aVR, aVF, aVL (Figure 3). Same as the others, the second patient was given a carotid artery massage for 3 minutes. However, carotid artery massage was unsuccessful. Due to the unavailability of intravenous (IV) adenosine, the patient was given an IV 0.5 mg digoxin. After 30 minutes of monitoring, the patient returned to normal sinus rhythm with an HR 94 BPM, BP of 110/60 mmHg, RR of 22 x/min. Evaluation with ECG-12 leads was repeated and showed normal sinus rhythm, 94 bpm, normoaxis, and early repolarization (Figure 4). Following a stable condition, both of the patient were admitted to the ICU.

After stable condition, both patients were carried out echocardiography by the cardiologist. Echocardiographic examination in both patients showed global normokinetic. The first patient had an ejection fraction of 69%, with mild mitral regurgitation (Figure 5). Meanwhile, the second patient showed an ejection fraction of 70% without any abnormalities (Figure 6).

DISCUSSION

Supraventricular tachycardia (SVT) is a tachyarrhythmia involving the atrial tissue or atrioventricular junction tissue. A heart rate above 120 beats per minute characterizes this tachyarrhythmia. There are four types of SVT, but atrioventricular reentrant tachycardia (AVRT) and atrioventricular nodal reentrant tachycardia (AVNRT) are the two most common forms of SVT. Clinical manifestations of SVT symptoms may consist of palpitations, shortness of breath, hemodynamic instability, or may be asymptomatic. An SVT has been linked with an increased risk of mortality during pregnancy. It has been reported that the frequency is 68 per 100,000 pregnancy-related hospitalizations for any arrhythmia, especially 22 per 100,000 for SVT.

The etiology of SVT in pregnancy is complicated and multifactorial. Women's physiology changes significantly during pregnancy, which begins during the first trimester with up to 50% increase in blood volume in the circulating system. An increase in blood volume can enhance atrial stretching, which results in an electrical change. This becomes a predisposing factor for arrhythmias in pregnant women. Increased amounts of estrogen and catecholamine levels in the circulation have a significant effect on the excitability of cardiac tissue at the molecular level via additional adrenergic receptors, which can lead to arrhythmias.

Pregnancy should not prevent tachyarrhythmia management. The first priority is to identify and treat underlying conditions. The effective management of tachyarrhythmias, especially SVT, in pregnancy highly depends on both clinical presentation and the trimester of pregnancy. Although most SVT exacerbations during pregnancy are benign and can be effectively treated with standard medical therapy, other factors to consider include the foetus’s well-being and the effects on labor, delivery, and lactation. Consequently, the safest
treatment should be considered to ensure maternal safety and prevent adverse fetal outcomes. Treatments used for SVT during the second or third trimester may be contraindicated when SVT occurs in the first trimester.

The main concern about using antiarrhythmic drugs during pregnancy is possible harm to the fetus. While the first trimester has the highest teratogenic risk, drug exposure later in pregnancy can have negative effects on fetal growth and development, uterine contractility, and an increased risk of pre-arrrhythmia. There are fewer medication-related limitations during the second trimester as organogenesis is complete at this time. The risk of spontaneous abortion and fetal loss is lower than during the first trimester. Some medications contraindicated in the first trimester can be used either chronically or acutely during this trimester. Fetal loss also less possible during the third trimester. Preterm infants have a higher chance to survive outside the mother’s uterus during this trimester.

Vagal maneuvers remain the first-line non-invasive management of SVT in all trimesters of pregnancy and have been shown to be well tolerated (Class 1; LoE C). The vagal maneuver is a technique used to increase the vagal parasympathetic tone. This could be beneficial in the treatment of various SVTs. The modified valsalva maneuver and carotid sinus massage are well-known techniques. When these maneuvers fail, pharmacological agents such as intravenous adenosine are reported as the drug of choice for acute conversion. However, there is little evidence regarding pharmacologic management of SVT in pregnant women in terms of fetal harm, particularly the effect of antiarrhythmic drug administration when SVT occurs in the first trimester, when organogenesis occurs. But, during the second and third trimesters of pregnancy, adenosine has been shown to be a first-line treatment option (Class 1; LoE C). There is a scarcity of data on the management of SVT during the first trimester.

After carotid artery massage, our first patient’s rhythm returned to normal sinus rhythm. This suggests that vagal maneuvers are effective in treating SVT.

However, carotid artery massage failed to treat SVT in our second patient. Following that, the patient was given IV digoxin, which is contrary to the guideline recommendation that adenosine be the next treatment option if vagal maneuvers fail. The European Society of Cardiology (ESC) 2019 recommends administration of intravenous digoxin when beta-blockers fail to control the rate of atrial tachycardia (Class IIa; LoE C). Digoxin has been used safely during the first trimester of pregnancy. Then, during the second trimester, digoxin can be used, but it may not be effective as a single agent. Digoxin is contraindicated for managing atrioventricular re-entrant tachycardia in the setting of pre-excitation on the resting electrocardiogram. In our second patient, beta blockers were not given due to the unavailability of these drugs in our facility. All beta-blockers can cause fetal bradycardia and hypoglycemia. For this reason, intravenous beta-1 selective blockers [bisoprolol, esmolol, metoprolol, and nebivolol (except atenolol)] should be considered for acute conversion or rate control of SVT (Class IIa; LoE C). This is due to their lower effect on uterine relaxation. Beta-blockers should be given as slow infusions to avoid hypotension. Except for those with known pre-excitation or a history of Wolf Parkinson-White syndrome, the first-line treatment for recurrent SVT in pregnancy is beta-blocker therapy, with digoxin and calcium channel blockers as second-line agents.

After three days of treatment and the patient’s vital signs have stabilized, both patients are discharged and receive outpatient care. The first patient received a bisoprolol 1x5mg, while the second patient received a bisoprolol 2.5 mg and diltiazem 200 mg. This is in line with the theory that beta-1 selective beta-blockers [bisoprolol, esmolol, metoprolol, and nebivolol (except atenolol)] or verapamil, in that order of preference, should be considered for SVT prevention in patients without pre-excitation or a history of Wolf Parkinson-White syndrome (Class IIa; LoE C). However, all beta-blockers can cause fetal bradycardia and hypoglycemia. As a result, these drugs should be used with caution and under the supervision of a doctor. Administration of non-hydropyridine calcium channel blockers (CCBs) in the second trimester such as verapamil and diltiazem, could be considered if SVT is refractory to adenosine or beta blockers. The risk of maternal hypotension and fetal bradycardia is higher with verapamil and diltiazem compared to adenosine. Verapamil is considered safer than diltiazem and can be used as prophylactic treatment in patients with persistent symptoms.

CONCLUSION

Women with acquired cardiovascular disease require thorough evaluation and risk stratification before conception planning. During pregnancy, careful attention should be required to maintain maternal health. This is crucial for optimizing fetal health. Considering the complexity of the condition, multidisciplinary management is essential. When considering diagnostic imaging procedures or therapeutic treatment as part of care, the preference should be good for both mother and fetus. During the first trimester, second trimester, third trimester, management of SVT is mainly based on the patient’s symptoms, stage of pregnancy, and body’s response to treatment. Further studies are needed to determine the best management methods for SVT during stage. This is due to the limited information on this topic.

CONFLICT OF INTEREST

The author declares that there is no personal or financial conflict of interest in writing the case report.

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All authors contributed equally in writing and revising the case report.

ETHICAL CONSIDERATION

The patient had received signed written informed consent regarding publication of medical data as a case report in medical journal.
REFERENCES


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