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**Case Report**

# A rare case of recurrent paroxysmal supraventricular tachycardia in pregnancy managed with adenosine, a wonder drug

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## ABSTRACT

Paroxysmal supraventricular tachycardia (PSVT) is the most common sustained arrhythmia during pregnancy and a challenging situation due to lack of evidence based guidelines. About 50% of PSVT, who fail to respond to vagal maneuvres, responds to therapies as pharmacologic agents as adenosine and electrocardioversion. We reported a case of 29 years old primigravida women with no organic heart disease who presented at 21 weeks of period of gestation with complaints of palpitations and shortness of breath. Her ECG revealed PSVT for which she received adenosine as anti-arrhythmic for conversion to sinus rhythm. She was started prophylactically on tablet metoprolol 25 mg twice daily, as advised by cardiologist. In third trimester, she had recurrent episodes of PSVT for which she received adenosine in emergency department. She delivered a healthy female baby by an elective caesarean section done under spinal anesthesia. Fortunately, her intraoperative and postpartum was uneventful with no recurrence of PSVT during hospital stay. She was discharged on day 4 of caesarean section on tablet metoprolol 12.5 mg twice daily and followed in postpartum period for complications. To summarize, PSVT occurring during pregnancy, labour or at caesarean section is not uncommon. Treatment remains a challenge though, as clinical decision must be tackled with appropriate consideration of both maternal and fetal factors. So, multi-disciplinary approach is needed for treatment including obstetrician, cardiologists, physician and neonatologists. Our case highlighted the necessity of keeping anti-arrhythmic drugs such as adenosine readily available on the labour ward.

**Keywords:** Recurrent paroxysmal supraventricular tachycardia, Pregnancy, Adenosine, Metoprolol

## INTRODUCTION

Pregnancy is an arrhythmogenic state in which heart rhythm disorders may appear for first time or there can be exacerbation of pre-existing condition.[1] Potential risk factors in pregnancy that can promote arrhythmogenesis include the hyperdynamic state, the altered hormonal milieu, autonomic changes, underlying heart disease and emotional changes related to pregnancy, which may include increase in plasma catecholamine concentrations and adrenergic receptor sensitivity; atrial stretch and increased end-diastolic volumes due to intravascular volume expansion.[2,3]

Cardiac arrhythmias are among the most common cardiac complications encountered during pregnancy and incidence is expected to be 1.2 per 1000 in the pregnant population.[4] Ectopic beats and non-sustained arrhythmias are encountered in more than 50% of pregnant women investigated for palpitations which are generally benign and well tolerated requiring no treatment.[5] Sustained tachycardias are less common and the prevalence in women of child-bearing age has been estimated at around 2-3/1000.[5,6] Nonetheless, immediate treatment is needed with hemodynamic compromise which may jeopardise the mother and her fetus due to associated decrease in uterine blood flow.

PSVT is the most common sustained cardiac arrhythmia in pregnant women.[7] SVT in pregnancy is defined as any tachyarrhythmia with a heart rate greater than 120 beats min requiring atrial or atrio-ventricular junctional tissue for its initiation and maintenance. The term paroxysmal describes an arrhythmia that begins and ends abruptly.[8] There are no reliable data on the incidence of paroxysmal SVT in pregnant women. The incidence in the general population is 35 per 1,00,000 person years.[9-11] Although PSVT is usually considered transient and harmless, its association with maternal and fetal outcomes during pregnancy are unknown.[12]

Tachycardias are initiated and perpetuated by one or more of three mechanisms: focal, re-entrant or ion channelopathy, all of which may be initiated or modified by the physiological changes of pregnancy.[6] However, the main mechanism for the development of SVT is via re-entry, most commonly atrioventricular nodal re-entrant tachycardia (in 60% of cases) and atrioventricular re-entrant tachycardia (in 30%). Other subtypes include atrial tachycardia, sino-atrial nodal re-entrant tachycardia, junctional ectopic tachycardia and Wolf-Parkinson-White syndrome account for the majority of SVT in this population, with an incidence of 1.2 per 1000 people.[8,11]

PSVT is usually uncommon in healthy women without underlying organic heart disease. Although there are reports of new onset of PSVT in pregnancy, in absence of structural heart disease.[13] Episodes of SVT occur with increased frequency during pregnancy particularly in third trimester. The pregnant patient with arrhythmias most often seeks medical attention because of palpitations, light-headedness, shortness of breath, presyncope and/or anxiety.[14] However, these symptoms are frequent in pregnancy leading to either over or delayed diagnosis of the condition with its consequences.

Herein, we described a previously asymptomatic woman who developed the new onset of symptomatic PSVT in second trimester of pregnancy with no organic heart disease. Patient received intravenous adenosine in acute emergency situations as anti-arrhythmics for conversion into sinus rhythm and received metoprolol as prophylaxis with good fetal and maternal outcome.

There were very few reported cases in the literature of new onset PSVT in pregnancy with different approach of management. Adenosine ultimately as used in our case report may prove to be the preferred agent for termination of PSVT in pregnant females. This case report highlighted about the complexities in the diagnosis and management with adenosine of PSVT.

## CASE REPORT

A 29 year old female, married since 2 years, brought by relatives, to emergency department of our hospital at 21 weeks of period of gestation (spontaneous conception) with sudden onset of palpitations and breathlessness. She had one previous spontaneous abortion of 2 months without any complications. She had no previous history of any major medical illness particularly any cardiac or pulmonary disease presenting with such complaints or any surgical interventions in past.

With urgent cardiology consultation, she was admitted in intensive care unit immediately with simultaneous application of physical therapy like carotid sinus massage and Valsalva maneuver, left lateral position, administering 100% oxygen. She was conscious, alert and the clinical examination showed an irregular pulse rate of 240 beats/min. The cardiac examination revealed loud first heart sound, normal second sound without click, rub, murmur or gallop. A 12 lead electrocardiogram (ECG) showed presence of supraventricular tachycardia (SVT) with narrow complexes (240 beats/min) minus delta waves but with hemodynamic stability (BP=110/70 mm of Hg, RR=20/min, SPO2=98%). There was no pedal edema and auscultation of lung was normal. She had no history of giddiness, syncopal attack, cough, fever, bleeding or leaking per vaginally. Anemia, electrolyte imbalance and hyperthyroidism were excluded.

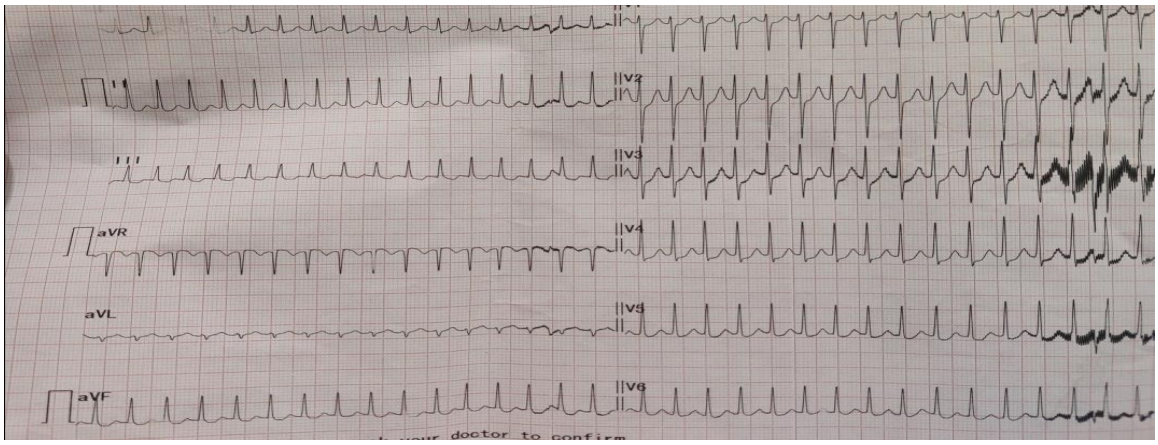


**Figure 1: ECG showing supraventricular tachycardia (SVT).**

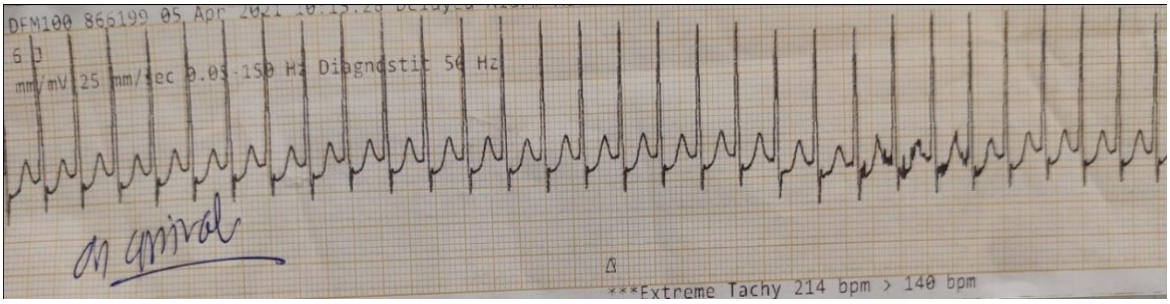


**Figure 2: ECG showing PSVT (done before giving intravenous adenosine).**

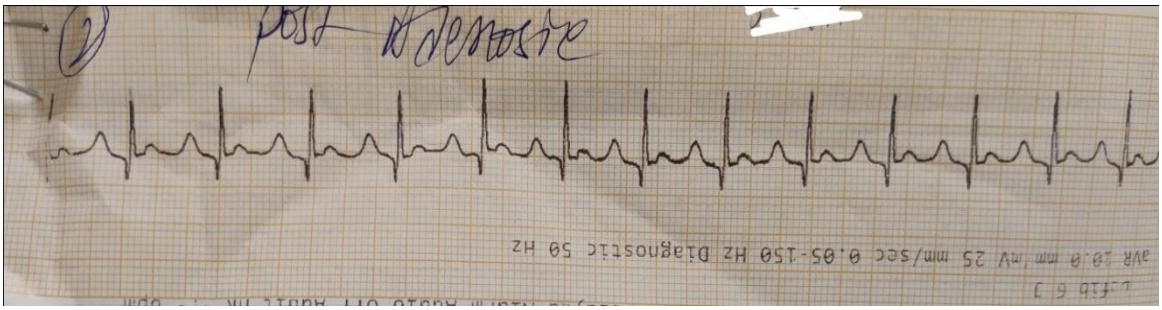

**Figure 3: ECG showing normal sinus rhythm after intravenous adenosine.**

Immediately, two peripheral lines were secured with large bore I. V. cannulas and all the necessary investigations sent. Still patient had persistent heart rate around 240 beats/min and BP=100/60 mm of Hg. Intravenous adenosine (total dose of 12 mg divided in two doses) at that time was given to revert SVT to normal sinus rhythm. 2D echocardiography revealed no structural heart abnormality. It was important to detect and stop factors worsening previously diagnosed arrhythmias and causing new arrhythmias such as tobacco, caffeine and illicit drug use. Close observation of symptoms and signs done, over next 48 hours response. Simultaneously, fetal heart was monitored regularly. After the stabilization of heart rate, she was discharged on tablet metoprolol (25 mg twice daily), a β-blocker to control ventricular rate.

Patient was taking all medication as advised and had not missed any dose. Still, patient had PSVT attacks every month till 36 weeks of period of gestation. Thereafter, she had weekly episodes of PSVT. In total duration of pregnancy, she had 9 episodes of PSVT out of which 5 episodes were managed with intravenous adenosine and rest episodes were managed with non-invasive maneuvers as Valsalva maneuvers. Patient was advised to undergo fluoroless radiofrequency catheter ablation around 26 weeks of period gestation due to recurrence of PSVT. As recent ACC/AHA/ESC guidelines for management of SVT list catheter ablation as a reasonable approach in pregnant patients with highly symptomatic, recurrent, drug-refractory SVT with efforts toward minimizing radiation exposure. This was considered a IIb indication with a level of evidence C (primarily based on expert consensus).[15] But, patient refused to undergo surgery in pregnancy and considered to do it after delivery.

For the purpose of fetal monitoring, anomaly scan, fetal 2D echocardiography and serial ultrasound for fetal wellbeing were done and were normal, with no adverse effects. Antenatal steroid coverage was done for lung maturity of fetus at 30 weeks of gestation. Fetal non-stress test and biophysical profile remain reactive throughout pharmacological treatment.

Patient and her family were anxious because of her cardiac condition and due to uncertainty about maternal health and concern for the fetus. Because of concerns that labor pains may exacerbate her cardiac symptom, it was decided to deliver her by elective caesarean section under combined spinal epidural anaesthesia at 37 weeks of gestation as was considered to be the best course of action.

She delivered a healthy female baby of birth weight 3.1 kg with Apgar score of 7/10 and 10/10 at 1 and 5 min postpartum. Adenosine was kept ready during the surgery to terminate unexpected episode of SVT. Fortunately, her intraoperative and postoperative period was uneventful with no recurrence of SVT. Metoprolol was continued in postpartum period. Postoperatively, a cardiac echo was performed for her and was normal. On day 4 of caesarean section, she was discharged in sinus rhythm on oral metoprolol 25 mg twice a day. The neonate was evaluated and no structural or functional abnormality detected in neonate.

Patient was followed in postpartum period with cardiologist as she was still having PSVT episodes a month.

## DISCUSSION

Palpitations are a very common symptom in pregnancy. In pregnancy, heart rate (HR) increases by 25%; thus sinus tachycardia, particularly in the third trimester, was not uncommon.[5] The cardiovascular system undergoes significant change in adaptation to pregnancy including an increased heart rate and cardiac output, reduced systemic resistance, increased plasma catecholamine concentrations and adrenergic receptor sensitivity, atrial stretch and increased end-diastolic volumes due to intravascular volume expansion as well as hormonal and emotional changes.

PSVT is the commonest tachyarrhythmia found in pregnancy presenting with palpitations, shortness of breath and presyncope. Its relationship with pregnancy and mechanism of exacerbation were unclear, but a hyperdynamic state of pregnancy may be a key factor. Supraventricular tachycardia, in which the atrioventricular node was part of the re-entry circuit, included atrioventricular nodal re-entrant tachycardia and atrioventricular reciprocating tachycardia involving an accessory pathway, as in WPW syndrome.[16]

Clinical assessment of vital signs and 12-lead ECG investigation were mandatory for an accurate diagnosis of arrhythmia.[4] Echocardiography is essential to exclude structural and functional heart diseases as the presence of organic heart diseases was an important risk factor for arrhythmias during pregnancy.[4] It was important to involve cardiologist early to diagnose SVT and to detect any underlying etiology which can be life-threatening. Close collaboration between the cardiologist and the obstetrician was important throughout the pregnancy as well as puerperium to develop care strategies for potential recurrences of SVT.

Management of PSVT during pregnancy was similar to that for the general population.[17] Treatment of tachyarrhythmias as PSVT during pregnancy and lactation was complicated by concerns regarding safety and tolerability for the fetus or infant.[3] Thus, appropriate consideration of both maternal and fetal factors was important for decision of management of PSVT even in acute situation. First off, it was important to correctly diagnose the type and mechanism of any underlying arrhythmia and to implement the appropriate therapeutic modality, examining the existence of organic heart disease and discarding causes likely to favor or trigger it. The ECG in tachycardia and sinus rhythm aids in the diagnosis of the specific etiology of the SVT.[18] Echocardiography was an essential and safe tool to identify patients with structural heart disease in pregnancy. Laboratory studies should include evaluation for anemia, electrolyte disorders and thyroid function testing.[18]

Initial treatment consisted of stimulation of the vagus nerve by manoeuvers such as carotid sinus massage and valsalva maneuver to control SVT can transiently block atrioventricular nodal conduction and were well tolerated during pregnancy. If these measures failed, pharmacological treatment was needed, especially if haemodynamic instability and severe symptoms or there was a threat for the foetus or pregnant woman. In cases of failure of above measure or when there was hemodynamic compromise, electrical cardioversion or invasive method like radiofrequency ablation was justified, which may jeopardize the mother and her fetus.[9]

Adenosine, a naturally occurring purine nucleotide, was the agent most commonly used during pregnancy, with conversion to normal sinus rhythm in over 80% of cases of acute SVT especially effective in terminating re-entrant tachycardias that involve AV node as a part of their re-entrant circuit.[7,14] Because of its known rapid onset, elimination half-life of less than 10 second, highly effect, low incidence and brevity of side effects in the mother and comparative safety in the fetus due to probable lack of placental transfer, intravenous adenosine seems to be the drug of choice for treating PSVT during pregnancy.

Beta-blockers have been extensively used during pregnancy in the treatment of conditions such as hypertension, thyrotoxicosis, fetal tachycardia and were generally well tolerated.[19] However, beta-blockers cross the placental barrier and were associated with several adverse effects such as delayed intrauterine growth, respiratory depression, neonatal bradycardia and hypoglycemia, particularly when treatment was started early on in the pregnancy (at 12-24 weeks).

Verapamil had been used in treatment of SVT fetal and management of preeclampsia without adverse effects. Clinical studies reported no maternal teratogenicity but few data reported maternal hypotension, fetal heart block and depression of contractility during treatment of fetal arrhythmias.[20] There was also a risk potential for reduction in uterine blood flow. Therefore, verapamil should best be avoided in acute treatment, particularly if adenosine can be used. The effect of diltiazem was less known, but similar limitations were assumed.[14]

Initially, DC countershock of 50-100 J should be delivered immediately for acute management of PSVT if hemodynamically unstable (wide- QRS tachycardias). If it was unsuccessful, higher energy was mandatory (100-360 J) and without any risk for mother and children.[14]

Non-pharmacological treatment included electrical cardioversion and radiofrequency ablation. Electrical cardioversion (up to 400 joules) 80 has been performed without complications in all stages of pregnancy to treat PSVT but with fetal monitoring.[21] Being careful, cardioversion should be performed only when absolutely indicated.

RSVT during pregnancy may present a difficult management problem, mainly due to concerns about pharmacotherapy and radiation to the fetus. It was possible to perform a radiofrequency ablation procedure in cases of recurrent or difficult to control with antiarrhythmic drugs. At present we had the technological means to accomplish this with minimal intervention and even in the absence of X-rays.[22]

## CONCLUSION

Arrhythmias during pregnancy are common and PSVT is the most common sustained cardiac arrhythmia in pregnant women. Arrhythmias associated with structural cardiac abnormality or an abnormal ECG in sinus rhythm is the cause for concern. Treatment remains a challenge though, as clinical decision must be tackled with appropriate consideration of both maternal and fetal factors. So, multi-discipliniary approach is needed for treatment including obstetrician, cardiologists, physician and neonatologists. Our case highlighted that PSVT can almost always be managed successfully with a conservative approach and judicious use of anti-arrhythmic drugs. Also, about the necessity of keeping antiarrhythmic drugs such as adenosine readily available on the labour ward. First-line pharmacological treatment for PSVT is adenosine, followed by low dose of b-blockers. Second choice is verapamil but only after the first trimester of pregnancy and only in acute circumstances. When drugs fail or in case of life threatening symptoms such as shock and pulmonary edema, ECV is indicated. To conclude, the key for successful management of SVT in pregnancy are multidisciplinary approach, regular follow up, prompt and correct diagnosis, proper use of physiological treatment and drugs such as adenosine and metoprolol if needed with proper maternal and regular fetal monitoring.

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