

Sustained Ventricular Tachycardia in Cesarean Section

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INTRODUCTION

Cardiovascular disease affects 1 to 4% of all pregnancies in the United States, with the most common adverse events being arrhythmias. There has been an increase in observed arrhythmias due to advances in heart surgery for congenital and structural heart disease leading to increased survival. Pregnant women are at a higher risk for arrhythmias due to pregnancy-related physiologic hemodynamic changes and increased sympathetic response.

Ventricular tachycardia (VT) lasting greater than 30 seconds with concurrent hemodynamic instability requires urgent treatment to maintain uteroplacental perfusion and reduce the risk of cardiac ischemic damage or development of subsequent lethal or non-perfusing arrhythmias to the parturient. Cases of sustained VT have been reported during Cesarean sections, with the underlying cause being the patient’s cardiac or structural heart disease.

CASE PRESENTATION

A 37 year-old gravida 2 para 2 with a history of hypothyroidism and congenital pulmonary valve stenosis, treated with a valvuloplasty at the age of 2, presented at 36 weeks gestation with PPROM and was scheduled for an urgent repeat C-section. The patient had a cardiac assessment at 20 weeks with normal sinus rhythm on EKG and trace pulmonic regurgitation on echocardiogram.

CLINICAL COURSE

The patient proceeded to the OR where an uncomplicated CSE was performed with subsequent hypotension requiring vasopressor support, including a phenylephrine infusion. Prior to incision, the patient developed a 1:1 atrial bigeminy on ECG, quickly followed by a sustained wide complex monomorphic ventricular tachycardia successfully treated with IV lidocaine. An uncomplicated CS was performed, and the patient was transferred to the ICU post-operatively. A repeat echocardiogram postoperatively showed right atrial dilation, mitral valve prolapse, severe mitral regurgitation, and severe pulmonic regurgitation. The patient underwent an unremarkable EP study with no reproducible arrhythmia and was subsequently discharged on POD#3 where she was lost to follow-up.

DISCUSSION

Cardiac arrhythmias may appear for the first time in pregnancy with or without any history of structural heart disease. The most likely cause is pregnancy related cardiovascular changes which include increased cardiac output, increased heart rate and increased blood volume, which often increase atrial and ventricular stretching leading to membrane channel activity, increased depolarization and shortened refractory periods, creating a proarrhythmogenic environment.

In this patient with congenital structural heart disease that was surgically repaired in her childhood, and an unremarkable cardiologic assessment 3 months prior to delivery, the decision was made to proceed with neuraxial anesthesia and Cesarean section without any additional workup or higher levels of care. Her subsequent hemodynamic collapse and arrhythmia along with newly diagnosed severe valvular pathology highlights the 27% increased probability of developing a ventricular tachyarrhythmia in this patient population. It is suspected that this patient had developed worsening mitral and pulmonic regurgitation in her third trimester which was exacerbated during labor and the administration of phenylephrine after neuraxial anesthesia.

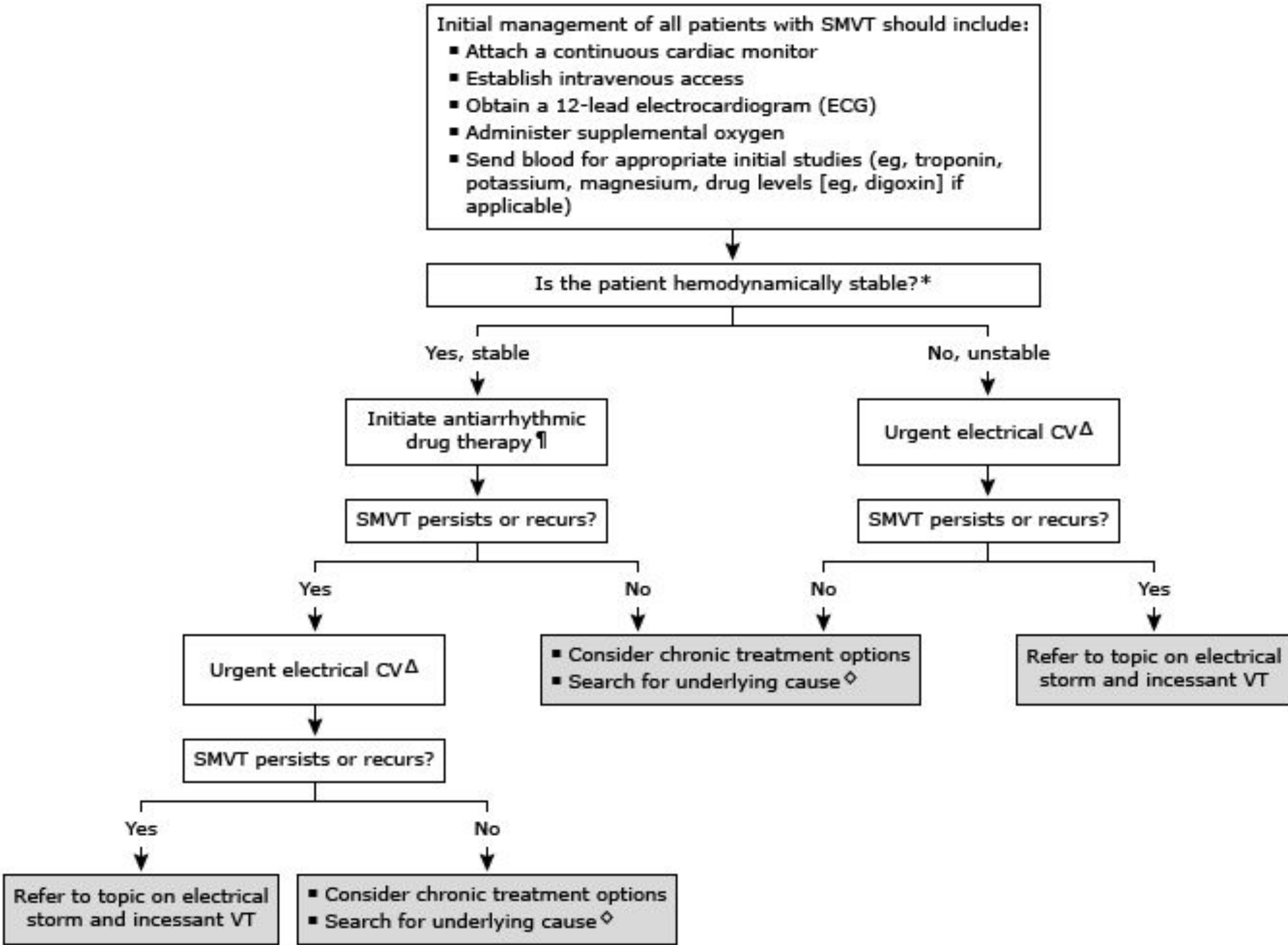


Table 1. Modified World Health Organization Classification of Cardiovascular Disease in Pregnancy ^{1,2}	
Risk Classification	Cardiac Lesions
Class I No detectable increased risk of maternal mortality and no or minimal increase in maternal morbidity	• Uncomplicated mild pulmonary stenosis • Ventricular septal defect • Patent ductus arteriosus • Mitral valve prolapse with no more than trivial mitral regurgitation • Successfully repaired simple lesions (atrial or ventricular septal defect, patent ductus arteriosus, anomalous pulmonary venous drainage) • Isolated ventricular extra-systoles and atrial ectopic beats
Class II Small increased risk of maternal mortality or moderate increase in morbidity	• Unrepaired atrial or ventricular septal defect • Repaired tetralogy of Fallot • Most arrhythmias • Hypertrophic cardiomyopathy • Native or tissue valvular heart disease not considered Modified World Health organization I or IV • Repaired coarctation • Marfan syndrome without aortic dilatation
Class II-III Moderate increased risk of maternal mortality or morbidity	• Bicuspid valve with aorta <45 mm • Mild ventricular impairment • Heart transplantation • Mechanical valve • Systemic right ventricle • Portal circulation • Unrepaired cyanotic heart disease • Other complex congenital heart disease • Marfan syndrome with aorta 40-45 mm • Bicuspid aortic valve with aorta 45-50 mm • Pulmonary hypertension • Eisenmenger syndrome • Systemic ventricular ejection fraction <30% • Systemic ventricular dysfunction with New York Heart Association class II-IV
Class III Significantly increased risk of maternal mortality or severe morbidity, and expect cardiac and obstetric pregnancy, antenatal, and postnatal care are required	• Severe mitral stenosis or symptomatic aortic stenosis • Marfan syndrome with aorta >45 mm • Bicuspid aortic valve with aorta >50 mm • Native severe coarctation • Previous peripartum cardiomyopathy with any residual impairment of ventricular function
Class IV Pregnancy is highly discouraged	

Table 2. Maternal Levels of Care ³					
Level	Title	Maternal Health	Hospital Capabilities	Anesthesia Staffing	Modified World Health Organization Patients*
Birth center	Birth center	Low risk	Not applicable	None	None
Level I	Basic care	Low to moderate risk	Limited obstetric ultrasound Blood bank	Anesthesia provider readily available at all times	Modified World Health Organization class I
Level II	Specialty care	Moderate to high risk	Computed tomography scanning/magnetic resonance imaging Maternal echocardiogram Nonobstetric ultrasound Interventional radiology	Anesthesiologist readily available at all times	Modified World Health Organization class I or II
Level III	Subspecialty care	More complex maternal, obstetric and fetal conditions	In-house capability of all blood	Board-certified anesthesiologist physically present at all times	Modified World Health Organization class I or II, some III
Level IV	Regional perinatal health center	Most complex maternal conditions	ICU care with Maternal Fetal Medicine comanagement Cardiovascular surgery, ECMO, and transplant capabilities	Board-certified anesthesiologist with obstetric anesthesia fellowship or experience in obstetric anesthesia physically present at all times	Modified World Health Organization class I, II, III, or IV
*The addition of the Modified World Health Organization classifications into the Maternal Levels of Care is an extrapolation based upon Drs. Meng and Arendt's experience, and is not a direct recommendation from the American College of Obstetricians and Gynecologists, Society of Maternal–Fetal Medicine, or Modified World Health Organization. ECMO, extracorporeal membrane oxygenator; ICU, intensive care unit.					

CONCLUSIONS

Pregnancy related physiologic cardiovascular changes can predispose parturients with structural or other cardiac disease to arrhythmias and hemodynamic compromise after neuraxial anesthesia. Thorough assessment including TTE in the third trimester can aid providers in caring for this at risk population.

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Tables adapted from UpToDate and WHO/ACOG online bulletins.