Management of tachyarrhythmias in pregnancy

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Abstract

Advances in human reproductive science are allowing women to get pregnant even at advanced ages. Thus, the incidence of arrhythmic events in pregnancy is rising and represents a significant cause of hospitalization and morbidity for mother and fetus. The most common arrhythmias in this context are atrial fibrillation and supraventricular tachycardia, which acutely can be managed, as usual, with adenosine or cardioversion, and beta blockers in the long-term. For recurrent cases, sodium blockers, such as propafenone, or even fluoroless cardiac ablation can be used. In the context of maternal congenital heart disease, ventricular tachycardia can occur, demanding a specific approach including cardiac defibrillator implant. Unfortunately, the medical evidence in this context is scarce, and most available reviews don't have the objectivity needed to guide daily's practice. This review aims to be a straightforward guide to the approach to tachyarrhythmias in pregnancy.

Introduction

Due to advanced maternal age, cardiovascular risk factors, and the successful management of congenital heart diseases, the prevalence of cardiovascular conditions complicating pregnancy is rising. Arrhythmias in pregnancy are rare but, when present, they increase mother and fetus morbidity and mortality by 1.5-3 times.

The most frequent arrhythmias, apart from premature beats, are atrial fibrillation (AF) and paroxysmal supraventricular tachycardia (PSVT). While the first is observed in 27 cases every 100.000 pregnant women, the second is observed in 22-24/100.000. Pregnancy can be either the trigger for a first episode or a catalyzer for recurrences, especially in older women and in those with congenital heart disease. However, symptomatic exacerbations of PSVT are usually benign, and in most of the times, they can be controlled with medication. Fortunately, life-threatening ventricular tachycardia (VT) and ventricular fibrillation are even rarer during pregnancy, also occurring especially in patients with congenital heart disease.

The purpose of this review is to facilitate the approach to tachycardias in pregnant women and to present a new algorithm considering the efficacy and drug safety based on the current evidence.

Particularities of arrhythmias in pregnancy

During pregnancy, there is a wide array of anatomical, hormonal and hemodynamic adaptive changes to optimize fetal growth and development. While healthy women can adapt without significant consequences, in those with underlying cardiac conditions, these changes may unmask a previously unknown condition or exacerbate pre-existing illnesses.

The physiological changes include increased plasma volume and fat accumulation, decreased plasma binding proteins, and increased hepatic and renal clearance. One of the consequences is pharmacokinetics modification, altering drug effects in both mother and fetus. Thus, the use of medications during pregnancy requires a careful evaluation, balancing fetal and maternal risk-benefit. Available data regarding drugs'

teratogenicity are limited and primarily based on animal models, retrospective analyses, advisory boards, or case reports. Only a few drugs have documented side effects leading to human fetal malformation or death, yet the medicolegal implications are so severe that drug manufacturers hardly commit to declaring the safety of a given drug safety during pregnancy.

Management of tachyarrhythmias in pregnancy

Management of tachyarrhythmias in pregnancy is quite similar to non-pregnant patients, however, the threshold to initiate medications is generally higher. The therapeutic decisions have to take into account the necessity, urgency, timing during gestation, and fetal adverse effects. The first trimester of pregnancy is the most sensitive period for adverse drug effects in fetal development, when a given drug is strictly necessary it should be used at the lowest possible dose. The mother should be counseled on risks and benefits based on current data, acknowledging limitations.

Acute management of supraventricular tachycardia and atrial fibrillation

For acute conversion of PSVT, vagal maneuvers are recommended and, if they fail, adenosine is the first drug of choice. Immediate electrical cardioversion is recommended only for those tachycardias with hemodynamic instability or for pre-excited AF. This procedure seems to be safe in all phases of pregnancy, there's no evidence of fetal blood flow compromise, and the risk of inducing fetal arrhythmias or initiating preterm labor seems to be very small. After cardioversion, fetal heart rate control is advised. Another option in the acute phase is the use of intravenous (IV) beta-1-selective blockers such as metoprolol which can not only interrupt a PSVT but also control heart rate in an AF context. IV ibutilide or flecainide may be considered for atrial flutter and AF termination in stable patients with structurally normal hearts. Cardioversion obviously demands sedation and should be preceded by anticoagulation when appropriate (see below). A suggested workflow is available in figure 1.

It is important to avoid the use of amiodarone due to its consequences, such as disorders in thyroid function (thyroid insufficiency, hyperthyroidism, and goiter), bradycardia, impairment in fetal neurological development, and premature birth.

Acute management of ventricular tachyarrhythmias

Immediate electrical cardioversion should be performed in the context of unstable VT. On the other hand, for acute conversion of sustained, hemodynamically stable, monomorphic VT (e.g. idiopathic VT), IV beta blocker, sotalol, flecainide, procainamide, or overdrive ventricular pacing should be considered.

In the event of a cardiopulmonary arrest, standard ACLS (Advanced Cardiovascular Life Support) protocols should be followed including the use of medications and defibrillation.

Long-term management of SVT and AF

Drug therapy to prevent recurrence can be used based on the severity of symptoms and hemodynamic compromise during the index event. For the prevention of PSVT, beta-blockers (except atenolol), especially metoprolol, or verapamil are first-line agents in patients without pre-excitation on resting ECG. For the prevention of PSVT in patients with Wolff-Parkinson-White (WPW) syndrome, flecainide or propafenone are recommended instead.

In patients with AF, rhythm control should be considered the preferred treatment strategy during pregnancy. For either rhythm or rate control strategy, the use of oral beta-blockers is recommended. Digoxin and verapamil should be considered for rate control of atrial tachycardia (AT) or AF only if beta-blockers fail. Flecainide, propafenone, or sotalol, in those without structural heart disease, should be considered to prevent PSVT, AT, and AF if AV nodal blocking agents fail.

Episodes of atrial flutter are usually not well tolerated in patients with congenital heart disease, and, in these cases, electrical cardioversion should, therefore, be performed to restore sinus rhythm.

In cases of drug-refractory and poorly tolerated PSVT, catheter ablation with nonfluoroscopic electroanatomical mapping and catheter navigation systems, in experienced centers, should be considered. If possible, it should be postponed to the second trimester. A suggested workflow can be seen in figure 2.

Long-term management of ventricular tachyarrhythmias

Beta-blocking agents or verapamil are recommended for the prevention of idiopathic sustained VT if associated with severe symptoms or hemodynamic compromise . If they fail, sotalol or flecainide may be used instead. In those with long QT syndrome or catecholaminergic polymorphic VT beta-blocking agents are essential during pregnancy and post-partum.

Implantable cardioverter-defibrillator (ICD), preferably single chamber, is recommended prior to pregnancy when clinically indicated. If an indication emerges during pregnancy, subcutaneous ICD implantation is advised since its implant does not demand fluoroscopy. When, for any given reason, an endocardial implant is chosen, echocardiographic and/or electroanatomical mapping guidance is recommended, especially if the fetus is in the first trimester of gestation. Catheter ablation with electroanatomical mapping systems may be considered in experienced centers for sustained drug-refractory and poorly tolerated VT if there are no other alternatives.

Anticoagulation

Direct oral anticoagulants, so far, are prohibited in pregnancy as there is little information on maternal and fetal safety. The choice between therapeutic anticoagulation with low molecular weight heparin (LMWH) or vitamin K antagonist (VKA) is made according to the stage of pregnancy. Warfarin, a VKA, crosses the placenta and can cause fetal bleeding, including intracranial hemorrhage, and increase fetal anomalies, with the latter occurring mainly during the first trimester. Neither unfractionated heparin nor LMWH crosses the placenta, so these agents do not cause fetal bleeding or teratogenicity, although bleeding at the uteroplacental junction and fetal wastage are possible. Therefore, heparins are recommended for anticoagulation in the first trimester, being replaced by VKA after that. Women receiving VKA should be changed to either LMWH or unfractionated heparin after 36 weeks of gestation to reduce the risk of fetal hemorrhage at the time of vaginal delivery as well as delivery-associated maternal bleeding.

Sedation prior to electrical cardioversion

Most drugs used for analgesia and sedation are capable of getting into the umbilical venous blood and fetal circulation. Thus, the potential adverse effects of an agent on the fetus must be considered when selecting a medication. For analgesia, any opioid is acceptable since they are not considered to be human teratogens. Sedation is required to tolerate electrical cardioversion. Midazolam is theoretically superior to lorazepam based on the observation of teratogenic effects in animal studies. However, the clinical importance of these findings is unclear. Propofol crosses the placenta and may be associated with neonatal respiratory depression. Data on the clinical use of propofol in pregnant critically ill patients is limited to case reports, so its use should be limited until more prospective data is available. The limited available human data suggest that ketamine may be used in low doses throughout pregnancy, but other agents may be preferable.

Conclusion

Arrhythmias treatment during pregnancy is challenging due to the lack of definitive evidence. Despite being mostly benign, they often impair patients' quality of life, demanding prompt action in the acute setting and wise drug choices in the long-term. In this review, we presented a suggested straightforward workflow to facilitate the management in clinical practice.

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Figures

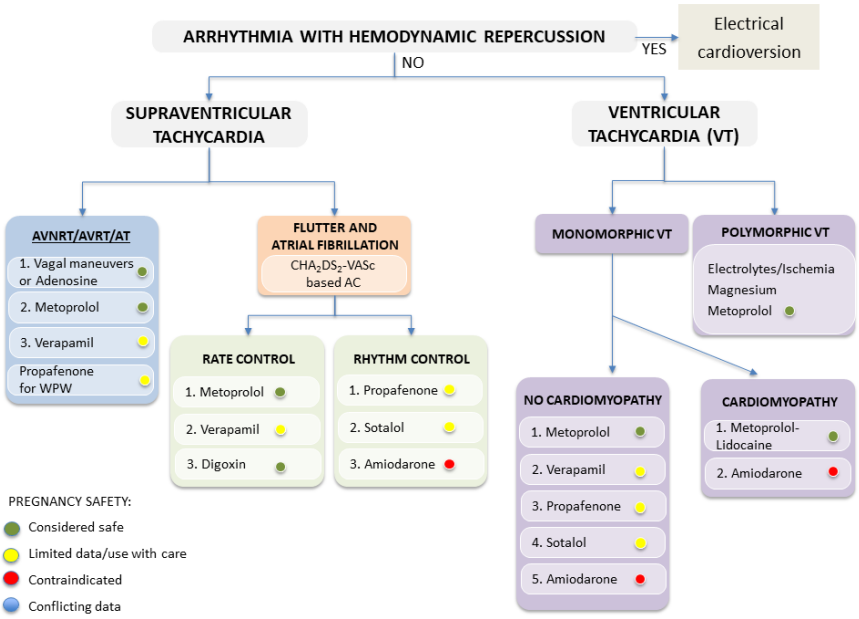

Figure 1 . Acute setting tachyarrhythmias management in pregnancy workflow

AVNRT: atrioventricular nodal reentrant tachycardia; AVRT: atrioventricular reciprocating tachycardia; AT: atrial tachycardia; WPW: Wolff-Parkinson-White syndrome; AC: anticoagulation; VT: ventricular tachycardia

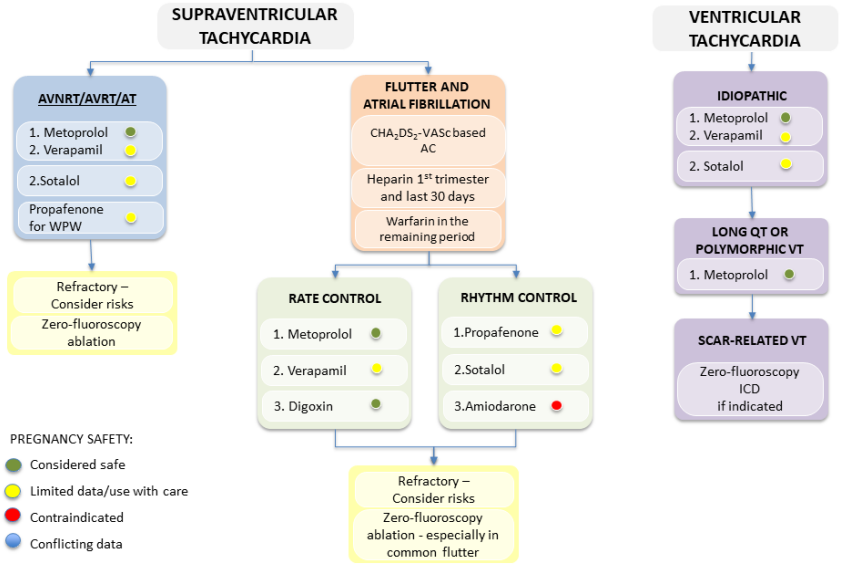

Figure 2. Long-term management of tachyarrhythmias in the pregnancy workflow

AVNRT: atrioventricular nodal reentrant tachycardia; AVRT: atrioventricular reciprocating tachycardia; AT: atrial tachycardia; WPW: Wolff-Parkinson-White syndrome; OAC: oral antic VT: ventricular tachycardia; ICD: implantable cardioverter-defibrillator