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Cardiac Arrhythmias During Pregnancy

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Cardiovascular disease affects 1% to 4% of all pregnancies in the United States (US) each year.[1] Among the most common complications are cardiac arrhythmias, which raise concerns about the health of mother and fetus.[2] The incidence of arrhythmia during pregnancy has increased over time in the US, partly because the number of women of childbearing age who were born with congenital heart disease and survived as a result of advances in congenital heart surgery has increased, as has the number of women with structural heart disease.[3] Managing arrhythmias during pregnancy requires a multidisciplinary approach, including oversight by experts in obstetric maternal-fetal medicine and monitoring by cardiologists and electrophysiologists. We briefly review the possible causes of arrhythmia during pregnancy and the available approaches to managing and treating it.

Who Is At Risk?

All pregnant women are at risk of cardiac complications because pregnancy alters hemodynamic function and increases sympathetic response. Women with established arrhythmias, structural heart disease, and congenital heart disease are at greater risk,[4] as are those with peripartum cardiomyopathy and those of advanced maternal age.[5] Conditions associated with living in lower income households can also increase the risk of arrhythmias.[5]

Mechanisms of Arrhythmia

Cardiac arrhythmias may appear for the first time in pregnant women who have no history of heart disease or in those with underlying structural heart disease. In the latter case, preexisting arrhythmias can worsen (Table I).[2] Precisely how the arrhythmia burden increases during pregnancy is unclear, but the main driving force appears to be adaptive cardiovascular, hemodynamic, and autonomic changes. Cardiovascular changes include increases in cardiac output and blood volume, and reductions in systemic vascular resistance and blood pressure.[6] These changes begin early in pregnancy and peak during the second trimester through early in the third trimester. Cardiac output increases by nearly 50%, and heart rate increases by 10 to 20 beats/min. Atrial and ventricular stretching also increases, secondary to the increased blood volume, and this leads to stretch-activated ion channel activity that causes membrane depolarization, shortened refractory periods, and slowed conduction. The higher levels of estrogen during pregnancy are also thought to increase the levels of α-adrenergic receptors, thus increasing sympathetic tone.[5]

Types of Arrhythmia During Pregnancy

Supraventricular Arrhythmias

Supraventricular arrhythmias can occur in several forms during pregnancy[7-9]:

- Atrial premature beats are frequent, cause few or no symptoms, and are generally considered benign.

★ ***CME Credit***

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TABLE I. Mechanisms of Arrhythmia

Structurally Diseased Heart	Structurally Normal Heart
Congenital (reentrant circuits)	Congenital ("electrical only")
• Acyanotic heart disease (eg, ASD/VSD)	• Dual AV nodal pathways causing AVNRT
• Cyanotic heart disease (eg, tetralogy of Fallot)	• WPW/accessory pathway
• Valvular heart disease (eg, bicuspid aortic valve)	• Channelopathy
Acquired	Acquired
• Valvular heart disease secondary to rheumatic fever	• Degenerative conduction system disease
• Valvular heart disease secondary to endocarditis	• Long QT syndrome (eg, drug-induced, metabolic)
• Cardiomyopathy	

ASD = atrial septal defect; AV = atrioventricular; AVNRT = atrioventricular nodal reentrant tachycardia; VSD = ventricular septal defect; WPW = Wolff-Parkinson-White

Adapted with permission from Adamson DL, Nelson-Piercy C. Managing palpitations and arrhythmias during pregnancy. Heart 2007;93(12):1630-6.[2]

- Paroxysmal supraventricular tachycardia is the most common tachyarrhythmia in women without structural heart disease. Atrioventricular nodal reentrant tachycardia (AVNRT) and atrioventricular reciprocating tachycardia (AVRT) are the most frequent manifestations.
- Focal atrial tachycardia is rare and occurs mainly in pregnant women with structural heart disease. It is often persistent and refractory to treatment, but is generally well tolerated and usually ends after delivery.

Atrial Fibrillation and Flutter

Atrial fibrillation and atrial flutter are less common than supraventricular tachycardia (SVT) during pregnancy.[10] Women with structural heart disease and metabolic disturbances such as hyperthyroidism and electrolyte imbalance are affected more often, and their risk of thromboembolism is substantially increased because of their procoagulable state during pregnancy.

Ventricular Arrhythmias

Ventricular arrhythmias can also occur in several forms during pregnancy[7,10-12]:

- Ventricular premature contractions occur frequently during pregnancy, but they usually produce few or no symptoms and are benign.
- Ventricular tachycardia (VT) and ventricular fibrillation (VF) rarely occur during pregnancy. When they do, they most often occur in women with structural heart disease or with a history of VT or VF. Patients with inherited cardiomyopathies such as hypertrophic cardiomyopathy and arrhythmogenic right ventricular cardiomyopathy are more susceptible to VT during pregnancy.

Diagnosis and Treatment

The approach to treating cardiac arrhythmias in pregnant women is similar to that in nonpregnant women. Treatment during pregnancy depends on preexisting cardiac conditions, symptom severity, and gestational age. The main considerations are to avoid some medications (Fig. 1)[13] and to closely monitor the patient during pregnancy and the postpartum period. The choice of pharmacologic agents depends on whether acute or chronic treatment is needed. In general, benign arrhythmias should not be treated, and invasive procedures involving fluoroscopy should be avoided.[5] Finally, patients with arrhythmias who are suitable candidates for ablation should undergo treatment before they conceive.[5]

Supraventricular Tachycardia

Treatment of premature atrial contractions is typically conservative and includes reassurance as the mainstay, unless the contractions are intolerable. Symptomatic premature atrial contractions can be safely treated with β-blockers. Recommended acute treatment of SVT-AVNRT and AVRT includes vagal maneuvers[7,11]; if that fails, adenosine should be administered intravenously.[14] Adenosine terminates SVT in approximately 90% of such cases.[14]

Atrial Fibrillation and Flutter

As in nonpregnant women, treating AF and atrial flutter in pregnant women involves preventing embolic and coagulative complications. Using the CHA_2DS_2-VASc score helps determine thromboembolic risk; and because no specific drug regimen has been recommended for pregnant women, physicians must determine the teratogenicity of all medications. In patients with chronic AF, anticoagulation with low-molecular-weight heparin or unfractionated heparin can be considered. Warfarin should not be used during pregnancy, unless the patient has a mechanical valve, which places her at high risk of thrombotic events.[15] If rhythm control is unsuccessful, then a rate control strategy including β-blockers or calcium channel blockers can be instituted. If a patient with AF needs cardioversion, pharmacologic conversion can be performed with use of ibutilide or flecainide.[8]

Ventricular Tachycardia

Ventricular tachycardia in all patients should be treated acutely with electrical or pharmacologic cardioversion.[14] In those with structural heart disease, the

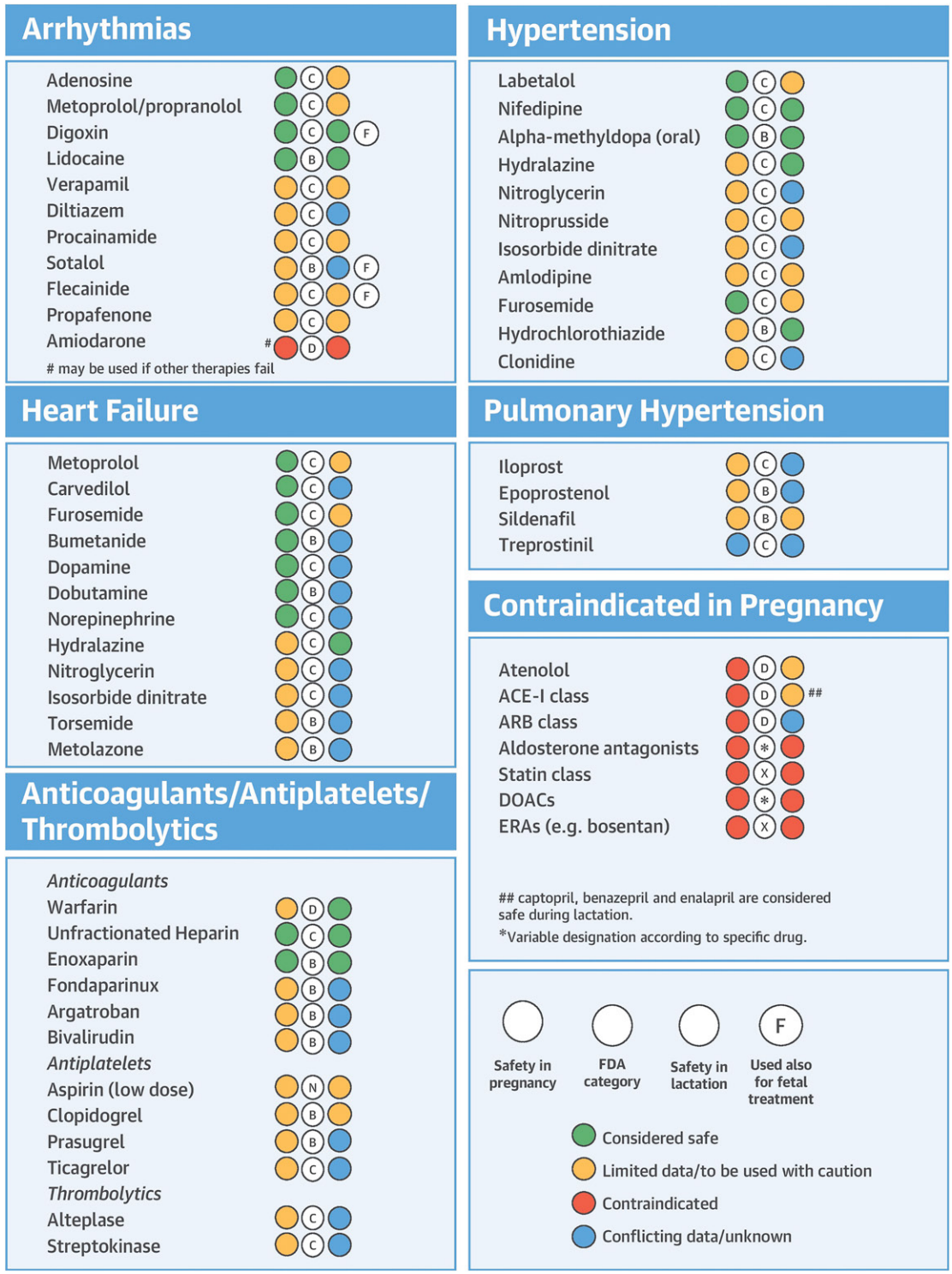

Fig. 1 *Cardiovascular medications in pregnancy, classified according to former U.S. Food and Drug Administration ABCDX categories: A, no demonstrated risk to the fetus based on well-controlled human studies; B, no demonstrated risk to the fetus based on animal studies; C, animal studies have demonstrated fetal adverse effects, no human studies, potential benefits may warrant use of the drug; D, demonstrated human fetal risk, potential benefits may warrant use of the drug; X, demonstrated high risk for human fetal abnormalities outweighing potential benefit; and N, nonclassified.*

ACE-I = angiotensin-converting enzyme inhibitor; ARB = angiotensin receptor blocker; DOAC = direct oral anticoagulant; ERA = endothelin-receptor antagonist

Adapted with permission from Halpern DG, Weinberg CR, Pinnelas R, Mehta-Lee S, Economy KE, Valente AM. Use of medication for cardiovascular disease during pregnancy: JACC state-of-the-art review. J Am Coll Cardiol 2019;73(4):457-76.[13]

treatment of VT should be tailored to the underlying cardiac condition.

In hemodynamically unstable patients with any sustained arrhythmia, electrical cardioversion is effective and reasonable at all stages of pregnancy. Because of the small amount of energy that could potentially reach the fetus, the risk of inducing fetal arrhythmias is minimal; however, during cardioversion, the fetal rhythm should be monitored.[8]

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