

## My approach to the diagnosis and treatment of fetal tachycardias

*Como eu faço o diagnóstico e o tratamento das taquicardias fetais*

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Fetal heart rhythm is considered normal when the relationship between atrial and ventricular contractions is 1:1 and the heart rate (HR) ranges from 120 to 180 bpm. Fetal heart rhythm irregularities affect approximately 0.5% to 2% pregnancies and account for 10% to 20% of the referrals for fetal echocardiogram.<sup>1</sup> The incidence of sustained fetal tachycardias is 1/1,000 pregnancies and is related to an increase in fetal morbidity and mortality.<sup>2</sup>

Fetal HR is evaluated by echocardiography in two-dimensional, M, and Pulsed-Wave Doppler modes, with simultaneous analysis of the atrial and ventricular contractions. The M mode makes evaluating atrial and ventricular wall motion possible, by positioning the cursor to encompass the contraction of both cavities simultaneously (Figure 1). Pulsed-Wave Doppler can also be used to evaluate the atrioventricular (AV) sequence, concomitantly demonstrating the relationship between the atrial and ventricular waves. Usually, the sample is positioned between the left ventricular entry and exit routes. The mitral (A wave of the mitral valve, which is equivalent to atrial systole) and aortic (ventricular systole) flows are then recorded.

Though fetal tachycardias (HR  $\geq$  180 bpm) are rare, they may lead to increased morbidity and mortality. In the presence of fetal tachycardia, the final diastolic ventricular pressure increases, which can increase the central venous pressure and result in hydrops and decreased cardiac output. The most frequent fetal tachycardias are the AV nodal reentry tachycardia (approximately two-thirds of the cases) and atrial flutter, among others (including ventricular tachycardia).<sup>3</sup>

### Keywords

Diagnosis; Tachycardia; Fetus; Echocardiography.

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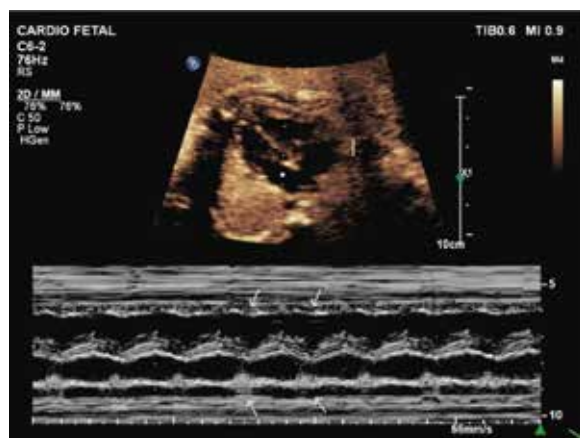
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AV nodal reentry tachycardia is characterized by a 1:1 AV conduction and a HR  $\geq$  180 bpm (usually above 220 bpm). (Video 1 and Figure 2). Atrial flutter shows an atrial frequency ranging from 300 to 400 bpm, with AV conduction variability (2:1, 3:1, and 4:1) and ventricular frequency variability (from 200 to 250 bpm) (Video 2 and Figure 3). Treatments aim to reverse tachycardia or maintain sinus rhythm for as long as possible, in order to improve the hydrops and/or ventricular dysfunction and enable a full-term pregnancy. Treatment is indicated for sustained (fetus shows tachycardia for more than 50% of the examination period) or intermittent (fetus shows tachycardia for less than 50% of the examination period) fetal tachycardia with concomitant hydrops and/or signs of ventricular dysfunction. In fetuses close to term, childbirth can be brought forward. Treatment depends on conditions such as gestational age, tachycardia etiology (for example, associated structural heart disease), hemodynamic repercussion, and maternal hemodynamic condition. Considering these, including sustained or intermittent supraventricular tachycardia with signs of heart failure and/or ventricular dysfunction, pharmacological therapy is indicated. The current maternal clinical conditions and cardiac history should be assessed and maternal electrocardiogram (ECG) should be performed. In the absence of maternal contraindications, treatment should be initiated with 160 mg sotalol, every 12 hours/day. The maternal corrected QT interval should be monitored by serial ECG every three to five days and should be prevented from increasing above 480 msec. If the arrhythmia is not resolved, the dose can be increased by 40–80 mg, up to a maximum of 480 mg.<sup>1,4-6</sup> The Brazilian Fetal Cardiology Guidelines (*Diretrizes Brasileiras de Cardiologia Fetal*)<sup>1</sup> recommend digoxin as the first-line treatment for fetal supraventricular tachycardias. The recommended dose is high, because only 50 to 70% of the drug is able to cross the placental barrier. Hence, 3 g is recommended in the first 48 hours, i.e., 0.50 mg (two tablets) every eight hours. The maintenance dose is then kept at 0.25 to 0.75 mg/day. Due to the need for hospitalizing pregnant women and monitoring serum digoxin levels (which should be maintained within 1–2 ng/mL) and the lower efficacy of digoxin in hydrops fetalis, I prefer sotalol as the first-line treatment. This is supported by both the American Heart Association expert consensus<sup>6</sup> and recent meta-analyses.<sup>2,4</sup> Furthermore, maternal side-effects are more frequent during digoxin use.<sup>4</sup> In the United States, flecainide (which is not sold in Brazil) is reportedly more effective than digoxin and sotalol in treating supraventricular tachycardias.<sup>2,4,6</sup>

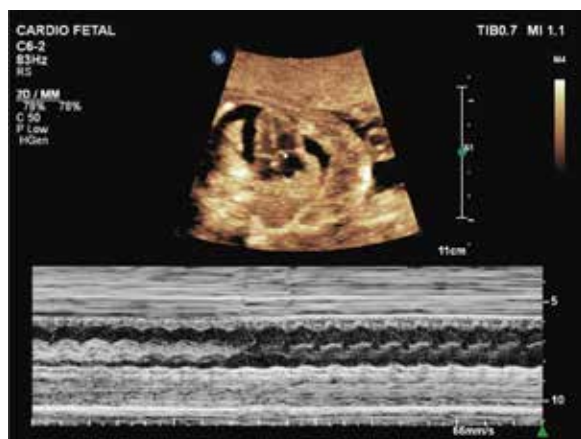
In the presence of atrial flutter, there is consensus on the use of sotalol as the drug of choice in the same scheme described for supraventricular tachycardia. Drug combinations



**Figure 1** – An M-mode echocardiograph showing simultaneous atrial and ventricular contractions in a normal 28-week-old fetus.



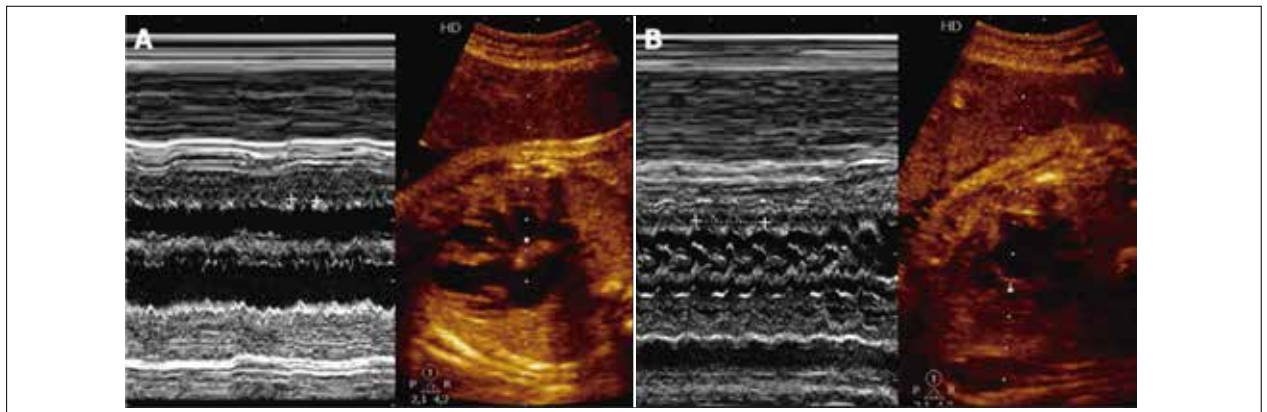
**Video 1** – Two-dimensional four-chamber view of a 28-week-old fetus with hydrops and supraventricular tachycardia.



**Figure 2** – An M-mode echocardiograph of a fetus with hydrops and supraventricular tachycardia showing 1:1 atrial and ventricular contraction with a heart rate of 270 bpm.



**Video 2** – Two-dimensional four-chamber view of a 26-week-old fetus showing atrial contraction that is more rapid than the ventricular contraction (atrial flutter).



**Figure 3** – An M-mode echocardiograph of a fetus with atrial flutter: (A) atrium with a frequency of 360 bpm; (B) ventricle with a frequency of 180 bpm.

are available; however, whenever possible, treatment should be pursued with a single drug. Even after controlling for tachycardia, the pregnant woman should receive a maintenance dose until delivery. After delivery, treatment should be based on the same drug used in the intrauterine period and ECG and Holter monitoring should be performed. The treatment should be maintained for six months to one

year. Generally, fetal tachycardia does not recur in half the cases in the postnatal period.<sup>1</sup>

### Conflict of interest

The authors have declared that they have no conflicts of interest.

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