

# Prenatal Assessment and Intrauterine Treatments for Foetal Arrhythmias

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## Introduction

Fetal arrhythmias are a common occurrence with a variety of causes. Prenatal diagnosis and management of foetal arrhythmias are still up for debate. The most recent two decades' worth of literature on prenatal diagnosis and therapy of foetal arrhythmias was downloaded, gathered, and assessed. Both a foetal magnetocardiogram and an electrocardiogram can provide information on heart time intervals, such as the QRS and QT intervals. The AV and VA intervals, foetal heart rate, and AV conduction are all detected with M-mode ultrasonography. The atrial and ventricular waves can be recorded simultaneously using Doppler ultrasound. Premature contractions and sinus tachycardia are benign foetal arrhythmias that do not require therapy before or after birth. Active therapy is required for persistent foetal arrhythmias that can lead to hydrops fetalis, cardiac dysfunction, or foetal death. The transplacental method has been used for intrauterine therapy of foetal tachyarrhythmias. If maternal transplacental treatment fails, antiarrhythmic medicines can be injected intraumbilically, intraperitoneally, or directly into the foetal muscle. The types or genesis of foetal arrhythmias, as well as foetal circumstances, influence the outcomes of intrauterine therapy for foetal tachyarrhythmias. The majority can be treated transplacentally with first-line antiarrhythmic drugs. In drug-resistant or hemodynamically compromised instances, foetal cardiac pacings are effective ways to reestablish sinus rhythm. In refractory cases, a postnatal pacemaker should be implanted right away [1].

## Description

### Definition

Fetal arrhythmias are identified in 1–3 percent of pregnancies, and 10–20 percent of foetal cardiology referrals are due to them. Premature atrial contractions (PACs) (28/45, 62.2 percent), atrial bigeminal ectopic beats (3/45, 6.7 percent), premature ventricular contractions (PVCs) (2, 4.4 percent), supra-ventricular tachycardia (SVT) (5/45, 11.1 percent), ventricular tachycardia (1, 2.2 percent), second-degree atrioventricular (AV) block (1, 2.2 percent) and second-degree. A 10-year study of pregnant women found 29 cases of foetal arrhythmias, with 12 (41.4%) being foetal tachycardias (10 cases with SVT, 2 cases with atrial flutter (AF), 5 (17.2%) being foetal bradyarrhythmias (all 5 cases with AV block), and 12 (41.4%) being foetal irregular cardiac rhythms (premature atrial beats). Malignant foetal arrhythmias, such as total AV block and SVT, are quite uncommon, occurring in 1 in 5000 pregnancies [1].

Fetuses with benign arrhythmias, such as PACs under 11 beats per minute (bpm) and sinus tachycardias, did not require therapy before or after birth; however those with postnatal arrhythmias associated with hemodynamic

fluctuations did, as they can lead to preterm delivery. Furthermore, prolonged foetal arrhythmias increase the risk of hydrops fetalis, cardiac dysfunction, and even foetal death. As a result, prenatal therapy is necessary to improve foetal survival rates. The purpose of this study is to explore the complex and difficult subject of foetal arrhythmias prenatal assessment and intrauterine treatments [2].

## Diagnosis

Early detection in the first trimester, unfavourable foetal position, hydrops fetalis, fetuses with cardiac contractile dysfunction, and obese pregnant women may compromise detection qualities. M-mode ultrasound can detect the AV and ventriculoatrial (VA) intervals, foetal heart rate, AV conduction, and even ejection fraction. For the diagnosis of foetal arrhythmias, Crowley et al. used a two-dimensional scan head with M-mode recordings. Semilunar and AV valve opening and closing points, as well as a waves and ventricular wall motion, were used to determine foetal heart rate and rhythm. Two-dimensional echo alone was used to identify arrhythmias in two fetuses in their patient context. Anatomic M-mode views provide simultaneous two-dimensional real-time images, allowing for better atria and ventricle tracings than regular M-mode views [3].

Simultaneous recordings of atrial and ventricular waves can be acquired using Doppler ultrasound. Mechanical VA intervals can be characterised as short or long VA intervals in SVT. Doppler echocardiography can help distinguish between kinds of foetal tachycardias with short and long VA intervals, such as AV nodal reentrant tachycardia and permanent junctional reciprocating tachycardia. The Doppler ultrasound captures flow velocity waveforms in the ascending aorta and superior vena cava better than the M-mode. It may show a characteristic Doppler flow velocity pattern with a 1:1 AV conduction and a tall A wave superimposed on the aortic ejection wave in fetuses with brief VA tachycardia. It was diagnosed as a fast-conducting AV accessory route reentrant tachycardia. An A wave of normal amplitude and AV time interval might be identified in advance of the aortic ejection wave in protracted VA tachycardia. Doppler waveforms obtained in the inferior vena cava and descending aorta aid in the simultaneous acquisition of atrial and ventricular systoles. However, when the foetus is in an unsuitable position for simultaneous recordings, the results may be harmed. The pulse Doppler echocardiography may detect the rhythm variations between the spectra and the arrhythmic patterns by detecting the flow imaging frequency spectrum of the pulmonary arteries and pulmonary veins. This method can easily distinguish between atrial and ventricular systoles as well as measure the PR interval [1].

By detecting the signal averaging of electrocardiographic complexes, foetal electrocardiography (ECG) does not give beat-to-beat analysis. As a result, it's useless for identifying foetal rhythm and conduction abnormalities in patients with irregular heart rhythms. Due to the more advantageous transmission qualities of magnetic signals, foetal magnetocardiography (MCG) enables for real-time detection and classification of arrhythmias with greater signal quality than electrocardiography. Complete AV block, premature contractions, paroxysmal SVT, Wolff-Parkinson-White syndrome, and long QT syndrome are among the foetal arrhythmias that can be diagnosed prenatally. The use of the magnetic counterpart of ECG, on the other hand, necessitates the usage of a magnetically protected environment. MCG and ECG can both provide information about cardiac time intervals such the QRS and QT intervals [4].

## Prognosis

There are several forms of foetal arrhythmia, each with a different prog-

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nosis. Individualized treatment and clinical treatment should be determined based on the type of person. Premature contractions are the most prevalent kind of foetal arrhythmia, with a good short- and long-term prognosis and no effect on foetal growth and development. Rapid foetal arrhythmia, particularly SVT, is relatively common, accounting for 0.4-0.6 percent of all fetuses. The majority of fast foetal arrhythmia is caused by a nonorganic, mainly transitory lesion. Early treatment with steroids and/or plasmapheresis for foetal bradycardia has demonstrated minimal therapeutic benefit, and it is still debatable. The kind and amount of heart abnormality usually determines the patient's clinical outcome and prognosis. When foetal arrhythmia is discovered, especially foetal bradycardia, careful attention should be devoted to whether cardiac structural abnormalities are present. In terms of outcomes and prognosis, appropriate clinical measures should be taken into account [5].

## Conclusion

Premature contractions and sinus tachycardia are examples of benign foetal arrhythmias that do not require perinatal therapy. Sustained foetal arrhythmias, which can lead to hydrops fetalis, cardiac malfunction, or even foetal death, must be treated as soon as possible. The effectiveness of intra-uterine therapy for foetal tachyarrhythmias is dependent on the kind of foetal arrhythmia, its cause, and the foetal circumstances (hydrops fetalis, cardiac function, and maternal autoantibody positivity, etc.). The use of first-line anti-

arrhythmic medicines via the transplacental route resulted in a high conversion rate. In drug-resistant or hemodynamically compromised instances, foetal cardiac pacings are effective ways to reestablish sinus rhythm. In refractory cases, a postnatal pacemaker should be implanted right away.

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