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Foetal Arrhythmias: Prenatal Evaluation and Intrauterine Treatment

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Introduction

Fetal arrhythmias are found in 1–3% of pregnancies, and they account for 10–20% of foetal cardiology referrals. Premature atrial contractions (PACs) (28/45, 62.2%), atrial bigeminal ectopic beats (3/45, 6.7%), premature ventricular contractions (PVCs) (2, 4.4%), supraventricular tachycardia (SVT) (5/45, 11.1%), ventricular tachycardia (1, 2.2%), second-degree atrioventricular (AV) block (1, 2.2%), second-degree. A 10-year study of pregnant women discovered 29 occurrences of foetal arrhythmias, with 12 (41.4%) being foetal tachycardias (10 cases with SVT, 2 cases with 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). Total AV block and SVT are malignant foetal arrhythmias that occur infrequently [1].

Those with benign arrhythmias, such as PACs <11 beats per minute (bpm) and sinusal tachycardias, did not need treatment before or after birth; however, those with postnatal arrhythmias associated with hemodynamic fluctuations did, as these can contribute to preterm delivery. Long-term foetal arrhythmias further raise the risk of hydrops fetalis, cardiac dysfunction, and possibly foetal death. As a result, in order to improve foetal survival rates, prenatal therapy is required. The goal of this study is to delve into the complicated and difficult topic of prenatal screening and intrauterine therapy for foetal arrhythmias [2].

Description

Diagnosis

Diagnosis characteristics may be compromised by early detection in the first trimester, unfavourable foetal position, hydrops fetalis, foetuses with cardiac contractile malfunction, and obese pregnant mothers. The AV and ventriculoatrial (VA) gaps, foetal heart rate, AV conduction, and even ejection percent can all be detected with M-mode ultrasonography. Crowley et al. employed a two-dimensional scan head with M-mode data to diagnose foetal arrhythmias. To measure foetal heart rate and rhythm, researchers used semilunar and AV valve opening and closing points, as well as a waves and ventricular wall movements. Arrhythmias were identified in two foetuses in their patient context using only two-dimensional echo. Anatomic M-mode views display simultaneous two-dimensional real-time images, enabling for more accurate tracing of the atria and ventricles than standard M-mode views [3].

Doppler ultrasound allows for simultaneous recordings of atrial and ventricular waves. In SVT, mechanical VA intervals can be classified as either short or lengthy. Doppler echocardiography can assist distinguish between AV nodal re-entrant tachycardia and permanent junctional bidirectional tachycardia, both of which have short and long VA intervals. In the ascending aorta and superior vena cava, Doppler ultrasound catches flow velocity waveforms better than M-mode. In foetuses with transient VA tachycardia, it may show a typical Doppler flow velocity pattern with 1:1 AV conduction and a tall A wave overlaid on the aortic ejection wave. A fast-conducting AV accessory pathway re-entrant tachycardia was diagnosed.

In protracted VA tachycardia, an A wave with a normal amplitude and AV time interval may be detected before the aortic ejection wave. The simultaneous acquisition of atria and ventricles systoles is aided by Doppler waves collected in the inferior vena cava and descending aorta. The results may be compromised if the foetus is in an improper position for simultaneous recordings. The heartbeat By detecting the flow imaging frequency band of the pulmonary arteries and pulmonary veins, Doppler echocardiography can detect rhythm discrepancies between the spectra and arrhythmic patterns. This approach can readily differentiate between atrial and ventricular systoles and measure the PR interval [1].

Foetal Electrocardiography (ECG) does not provide beat-to-beat analysis since it detects the signal averaging of electrocardiographic complexes. As a result, it can't be used to detect foetal rhythm or conduction anomalies in patients with irregular cardiac rhythms.

Because magnetic signals have better transmission characteristics than electrocardiography, foetal Magnetocardiography (MCG) can identify and classify arrhythmias in real time with higher signal quality than electrocardiography. Prenatal diagnosis is possible for foetal arrhythmias such as complete AV block, premature contractions, paroxysmal SVT, Wolff-Parkinson-White syndrome, and long QT syndrome. On the other hand, using the magnetic equivalent of ECG necessitates the use of a magnetically protected environment. Both the MCG and the ECG can provide information on cardiac time intervals such the QRS and QT intervals [4].

Prognosis

Foetal arrhythmia comes in a variety of forms, each with its own prognosis. The sort of person should determine individualised treatment and clinical treatment. The most common type of foetal arrhythmia is premature contractions, which have a favourable short- and long-term prognosis and have no influence on foetal growth and development. SVT is the most prevalent type of rapid foetal arrhythmia, accounting for 0.4-0.6 percent of all foetuses. A nonorganic, mostly transient lesion causes the majority of rapid foetal arrhythmias. Early therapy of foetal bradycardia with steroids and/or plasmapheresis has shown modest therapeutic value, and it is still disputed. The patient's clinical outcome and prognosis are usually determined by the type and severity of the heart defect. When a foetal arrhythmia is identified, especially foetal bradycardia, it's important to pay close attention to see whether there are any heart structural abnormalities. Appropriate clinical measures should be taken into account in terms of outcomes and prediction [5].

Conclusion

Benign foetal arrhythmias, such as premature contractions and sinus tachycardia, do not require perinatal treatment. Sustained foetal arrhythmias must be treated as quickly as possible since they can cause hydrops fetalis, cardiac dysfunction, or even foetal mortality. Intrauterine therapy for foetal

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tachyarrhythmias is beneficial depending on the kind of arrhythmia, the cause, and the foetal conditions (hydrops fetalis, cardiac function, and maternal autoantibody positivity, etc.). The transplacental administration of first-line antiarrhythmic medications resulted in a significant conversion rate. Foetal cardiac pacings are an effective approach to re-establish sinus rhythm in drug-resistant or hemodynamically challenged patients. A postnatal pacemaker should be implanted right away in refractory situations.

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