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Prenatal Diagnosis and Management of Foetal Arrhythmias

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Abstract

Arrhythmias in the fetus are a common occurrence with rather intricate causes. The diagnosis and treatment of fetal arrhythmias during pregnancy are still the subject of debate. The retrieved, compiled, and analyzed literature from the past two decades on prenatal diagnosis and treatment of fetal arrhythmias. The types or etiologies of fetal arrhythmias as well as fetal conditions determine the outcomes of intrauterine therapy for fetal tachyarrhythmia's. The majority can be treated with the first-line antiarrhythmic through a trans placental procedure. In cases of drug resistance or thermodynamic impairment, fetal cardiac pacing's can successfully restore sinus rhythm. In refractory cases, implantation of an immediate postnatal pacemaker is required.

Keywords: Heart failure • Neprilysin • Inhibitor valsartan • Cardiac resynchronization

Introduction

Arrhythmias in the fetus are common and can be caused by a variety of factors. Foetal arrhythmia diagnosis and treatment during pregnancy are still up for debate. The literature on prenatal diagnosis and treatment of foetal arrhythmias from the last two decades was downloaded, compiled, and evaluated. Heart time intervals, such as the QRS and QT intervals, can be obtained from both an electrocardiogram and a foetal magnetocardiogram. M-mode ultrasonography can detect the foetal heart rate, AV conduction, and the AV and VA intervals. Using Doppler ultrasound, both the atrial and ventricular waves can be recorded simultaneously. Sinus tachycardia and premature contractions are benign fetal arrhythmias that do not require treatment before or after birth. Foetal arrhythmias that persist and have the potential to cause hydrocephalus, cardiac dysfunction, or even death are treated with active therapy. Foetal tachyarrhythmia intrauterine therapy has utilized the trans placental method. Antiarrhythmic medications can be injected intraumbilically, intraperitoneally, or directly into the foetal muscle if maternal trans placental treatment is unsuccessful. The outcomes of intrauterine therapy for foetal tachyarrhythmias are influenced by the types or genesis of fetal arrhythmias as well as fetal circumstances. The majority can be treated with first-line antiarrhythmic medications transplacentally. Foetal cardiac pacings are an efficient means of reestablishing sinus rhythm in situations where drugs are resistant or thermodynamically compromised. A postnatal pacemaker should be inserted immediately in refractory cases [1].

Description

Treatment was not required prior to or after birth for fetuses with benign arrhythmias, such as sinusal tachycardias and PACs below 11 bpm; However, those with postnatal arrhythmias resulting from hemodynamic fluctuations performed better, as these conditions can result in preterm birth. Furthermore, hydrops fetalis, cardiac dysfunction, and even fetal death are all increased by prolonged foetal arrhythmias. Prenatal therapy is therefore required to increase fetus survival rates. The motivation behind this study is to investigate the mind boggling and troublesome subject of fetal arrhythmias pre-birth appraisal and intrauterine medicines. Unfavorable foetal position, hydrops fetalis, fetuses with cardiac contractile dysfunction, obese pregnant women, and early detection in the first trimester all have the potential to compromise detection capabilities. The AV and ventriculoatrial (VA) intervals, fetal heart rate, AV conduction, and even the ejection fraction can all be observed with M-mode ultrasound. Crowley et al.'s diagnostic criteria for fetal arrhythmias used recordings in M-mode with a two-dimensional scan head. Foetal heart rate and rhythm were determined using semilunar and AV valve opening and closing points, waves, and ventricular wall motion. Two foetuses were identified with arrhythmias in their patient context using only two-dimensional echo. Compared to standard M-mode views, anatomic M-mode views offer simultaneous two-dimensional real-time images, making it possible to perform better tracings of the atria and ventricles [2].

Doppler ultrasound can be used to record both the atrial and ventricular waves simultaneously. In SVT, mechanical VA intervals can be described as short or long. Foetal tachycardias with short and long VA intervals, such as AV nodal reentrant tachycardia and permanent junctional reciprocating tachycardia, can be distinguished using doppler echocardiography. The ascending aorta and superior vena cava flow velocity waveforms are better captured by the Doppler ultrasound than by the M-mode. In foetuses with brief VA tachycardia, it may display a typical Doppler flow velocity pattern with a 1:1 AV conduction and tall A waves superimposed on the aortic ejection wave. It was determined to be a reentrant tachycardia with a fast-conducting AV accessory route. In prolonged VA tachycardia, an A wave of normal amplitude and AV time interval may be detected prior to the aortic ejection wave. The simultaneous acquisition of atrial and ventricular systoles is made possible by the doppler waveforms obtained in the inferior vena cava and descending aorta. However, the outcomes may be affected if the foetus is in an unsuitable position for simultaneous recordings. By analyzing the flow imaging frequency spectrum of the pulmonary arteries and veins, pulse Doppler echocardiography can detect rhythm variations between the spectra and arrhythmic patterns. In addition to measuring the PR interval, this method is simple to distinguish between atrial and ventricular systoles [3].

Foetal electrocardiography (ECG) does not provide beat-by-beat analysis because it only detects the signal averaging of electrocardiographic complexes. Folate rhythm and conduction abnormalities cannot be detected using it in patients with irregular heart rhythms. Foetal magnetocardiography (MCG) allows for real-time detection and classification of arrhythmias with better signal quality than electrocardiography because magnetic signals have better transmission qualities. Foetal arrhythmias that can be diagnosed prenatally include complete AV block, premature contractions, paroxysmal SVT, Wolff-Parkinson-White syndrome, and long QT syndrome. On the other hand, using the ECG's magnetic counterpart requires a magnetically protected environment. The cardiac time intervals known as the QRS and QT

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intervals can both be obtained from an electrocardiogram (ECG) [4].

Foetal arrhythmia comes in a variety of forms, each with a unique outlook. Clinical treatment and individualized treatment should be chosen according to the person. The most common type of fetal arrhythmia is premature contractions, which have no effect on the growth and development of the fetus and have a favorable short- and long-term prognosis. SVT, a rapid foetal arrhythmia, is fairly common, affecting between 0.4% and 0.6% of all fetuses. A nonorganic, mostly transitory lesion is the most common cause of fast foetal arrhythmia. Foetal bradycardia treated early with steroids and/or plasmapheresis has shown little therapeutic benefit, but this is still up for debate. The patient's clinical outcome and prognosis are typically determined by the type and extent of their heart abnormalities. When fetal arrhythmias, particularly bradycardia, are discovered, careful consideration ought to be paid to the possibility of cardiac structural abnormalities. The most appropriate clinical measures ought to be taken into consideration in terms of outcomes and prognosis [5].

Conclusion

Premature contractions and sinus tachycardia are examples of benign fetal arrhythmias for which there are no perinatal treatments required. Early treatment is required for sustained fetal arrhythmias that can lead to hydrops fetalis, cardiac dysfunction, or even fetal death. The types or etiologies of fetal tachyarrhythmias as well as fetal conditions (hydrops fetalis, cardiac function, maternal autoantibody positivity, etc.) determine the effect of intrauterine therapy. the transplacental administration of first-line antiarrhythmic medications resulted in a high conversion rate. In cases of drug resistance or hemodynamic compromise, fetal cardiac pacings can successfully restore sinus rhythm. In refractory cases, implantation of an immediate postnatal pacemaker is required.

Acknowledgement

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Conflict of Interest

None.

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