

## Fetal Atrial Ectopic Rhythm Detected Using Handheld Doppler

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### Abstract

Atrial ectopic rhythm is one of the most common fetal arrhythmias that can present during the prenatal period. Detection of fetal arrhythmia can be made by auscultating fetal heart rate and rhythm using a fetal handheld Doppler, and this can be done even in a resource-limited setting. The finding of an abnormal fetal heart rate and rhythm should prompt early referral to a pediatric cardiologist, as this may improve clinical outcomes. We present a case of atrial ectopic rhythm detected in utero using a handheld Doppler.

### Introduction

Atrial ectopic rhythm is a fetal arrhythmia that can be detected in primary care. Fetal arrhythmia occurs in 1–3% of all pregnancies, and the most common arrhythmia is atrial ectopic rhythm, or premature atrial contractions (PAC).<sup>1</sup> Fetal atrial ectopic rhythm is a benign arrhythmia that can present transiently for a few hours or may persist throughout pregnancy and into the neonatal period.<sup>1</sup> It can be detected via the auscultation of fetal heart rate, and diagnosis is confirmed with M-mode and pulsed Doppler fetal echocardiography.<sup>1</sup> Although it is usually idiopathic, it can also be associated with congenital heart disease, fetal cardiomyopathy, fetal tumors, fetal atrial fibrillation, or fetal heart block.<sup>1,2</sup> Depending on the degree of prematurity of an ectopic event, a PAC may be conducted to the ventricles or be blocked within the AV node and then manifest as an extra beat or missed beat on auscultation.<sup>3</sup> Atrial ectopic rhythm has been reported to resolve spontaneously without any treatment, but, in rare cases, it can progress to life-threatening supraventricular tachycardia.

The handheld Doppler is a handheld ultrasound transducer used to detect the fetal heartbeat during prenatal care.<sup>4</sup> It provides a steady-state number of beats per minute (bpm) as well as audible auscultation of the fetal heart. Auscultation of fetal heart rate (FHR) during prenatal checkups is routinely done using a handheld Doppler or Pinard fetal stethoscope, as these can increase the detection of FHR abnormalities. Any suspected fetal arrhythmia during auscultation should be referred promptly to a specialist for assessment.

### Case Report

A 24-year-old, gravida 6 para 5 with underlying maternal obesity (Body Mass Index of 36 kg/m<sup>2</sup>) came for a routine prenatal checkup at 38 weeks of pregnancy at a primary health care clinic on 8th October 2018. The prenatal history was uneventful up to this presentation. Clinically, she was well with a blood pressure of 120/70 mmHg and a pulse rate of 72 bpm. Other systemic examination was unremarkable, and the uterus size corresponded to the gestational period. During abdominal and uterine examinations, an abnormal heart sound was detected by auscultation using a handheld Doppler (Audio File 1). Fetal heart rate was noted to be in the range of 110–200 bpm, with an average heart rate of 146 bpm. The rhythm was regularly irregular. The nurse had never heard such a peculiar fetal heart sound, which was described as “dududup... dududup...dududup”. The fetal heart rhythm persisted despite positioning the mother in left lateral position. Transabdominal ultrasound showed fetal parameters that corresponded to gestational age with a grossly normal heart structure. Otherwise, the mother did not have signs or symptoms of autoimmune diseases, hyperthyroidism, or infection.

The patient was then referred to a consultant obstetrician on the same day and was admitted to a tertiary hospital. In the ward, the cardiotocography (CTG) showed fetal arrhythmia with fetal heart rate ranging from 70 to 200 bpm. A decision for emergency lower segment cesarean section (LSCS) and bilateral tubal ligation was made due to persistent fetal arrhythmia and completed family. A baby boy weighing 3.42 kg was born with a good Apgar

score. On examination at birth, the baby was pink with no cyanosis, and the heart rate was 149 bpm. Systemic examination was normal and no signs of heart failure were observed.

However, at 10 minutes of life, the baby's oxygen saturation dropped to 72–78% under room air with presence of subcostal recession. A Neopuff® Infant T-piece Resuscitator was used for 15 minutes, and oxygen saturation rose to 92%. Subsequently, the baby was admitted to the Neonatal Intensive Care Unit (NICU) for observation and close monitoring. The baby's blood investigations were normal, as shown in Table 1 below.

**Table 1:** Blood investigation results

Blood Investigations	Result
Hemoglobin	17.7 g/dL
White blood count	14.67 u/L
Platelet	321 u/L
Calcium	2.55 mmol/L
Phosphate	1.91 mmol/L
Magnesium	0.8 mmol/L
Blood gas pH	7.29
Blood gas pO <sub>2</sub>	42.0 mmHg
Blood gas cHCO <sub>3</sub>	25.0 mmol/L
Base excess (BE)	-2.3 mmol

At 30 minutes of life, the baby's oxygen saturation had improved to 100% and oxygen supplementation was changed to nasal prong oxygen at 2 L/minute. There was no pre- and post-ductal oxygen saturation discrepancy. Continuous cardiac monitoring showed the baby's heart rate ranging from 120–130 bpm with intermittent bradycardia (heart rate 50–60 bpm) that resolved spontaneously. A 12-lead ECG showed sinus rhythm with ectopic beats (**Picture 1**). The baby's blood pressure was stable at 68/30 mmHg, and there were no signs of respiratory distress or apnea. Echocardiogram showed a structurally normal

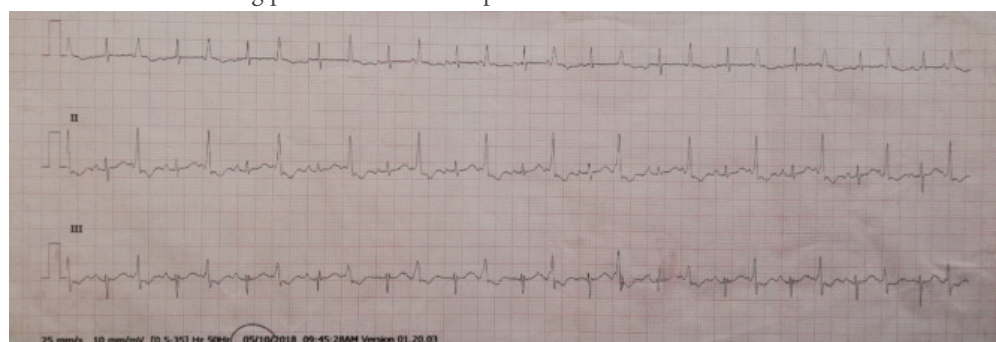
heart. The case was discussed with a pediatric cardiologist, and the diagnosis of atrial ectopic rhythm was made with a plan to observe for any persistent arrhythmia.

On the next day, the baby's oxygen supplementation was reduced to 1 L/minute, and he was subsequently weaned off at 28 hours of life. He was able to maintain oxygen saturation at 99–100% under room air. The respiratory deterioration was attributed to transient tachypnea of the newborn. As his condition stabilized, breastfeeding on demand was initiated. Heart rate was noted to be at 120–140 bpm with no more bradycardia or ectopic episodes. The baby was observed for 72 hours and discharged well at day 4 of life. He was seen at a pediatric clinic by a visiting pediatric cardiologist at the age of one month old, and a repeated ECG was noted to be normal. The child had no symptoms of heart failure, cyanosis, or rapid breathing. He breastfed well, and his weight had increased to 6 kg. The mother was screened for thyroid disease and autoimmune diseases, which all came back as normal.

## Discussion

Fetal arrhythmia is a benign condition, and it has been reported to occur in 0.6–3% of all pregnancies.<sup>1,2</sup> Fetal arrhythmias can be categorized into sustained bradycardia (heart rate <100 bpm), sustained tachycardia (heart rate >180 bpm), or a combination of irregular rhythm and abnormal heart rate.<sup>5</sup> It has been reported that approximately 10% of all referrals for fetal rhythm abnormalities were clinically significant and could lead to mortality issues.<sup>6</sup> Therefore, because there is a possibility of intervention being necessary, it requires an early recognition and diagnosis as well as access to expert services. An accurate early diagnosis is crucial for the selection of prenatal and postnatal treatment.

**Picture 1:** ECG showing premature atrial ectopic



Atrial ectopic rhythm, or premature atrial contraction, is due to an activity of the atrium that starts before the normal atrium beats, which resets the normal sinus beat.<sup>7</sup> Depending on the degree of prematurity of the ectopic event, a PAC may be conducted to the ventricles or be blocked within the AV node, resulting in an extra beat or a missed beat on auscultation.<sup>3</sup> This condition is usually well tolerated and resolves spontaneously without treatment.<sup>1</sup> Nevertheless, in rare cases, progression to supraventricular tachycardia (SVT) or fetal bradycardia, such as complete heart block, can occur.<sup>3</sup> Perinatal factors that may predict conversion of PACs to SVT includes fetus with cardiomegaly, evidence of ventricular systolic dysfunction, AV valve regurgitation, hydrops, and lack of conversion to normal sinus rhythm during the prenatal period.<sup>6,8</sup> It is not common to have fetal atrial ectopic rhythm with any signs or symptoms, but it can be suspected in fetuses with persistent FHRs below 110 bpm coupled with a family history of fetal or neonatal demise or sudden unexplained death in a young adult.<sup>2</sup> Auscultation of fetal heart rate once per week is recommended in fetal arrhythmia cases to exclude the development of major and life-threatening tachy- or bradyarrhythmia.<sup>1</sup> Mothers of fetuses with arrhythmia are usually asymptomatic, but the mother should be warned of the red flag symptoms of fetal tachycardia, which are an increase in abdominal and uterine girth secondary to polyhydramnios and a decrease in fetal movement.<sup>5</sup>

Fetal arrhythmias can be detected as early as 18 weeks using a handheld Doppler during routine fetal monitoring in prenatal clinics. During a prenatal care checkup, the nurse will screen the development of the fetus using a checklist. This checklist is printed in the standardized prenatal record book, and it includes clinical examinations for uterine size, fetal presentation, fetal heart rate, and presence of fetal movement. According to the standard operating procedure in the national perinatal guidelines, the nurses are expected to do fetal heart auscultation from 24 weeks of gestation using a Pinard stethoscope or from 14 weeks if using a handheld Doppler monitor for at least 30 seconds to determine the fetal heart rate, rhythm, and/or variability.<sup>9</sup> This routine fetal examination is useful and should be done properly because it can screen for fetal abnormalities such as poor fetal growth, abnormal amniotic fluid level, and abnormal heart rate or rhythm.

Although there are new technologies, such as fetal ECG and magnetocardiography,<sup>10</sup> a simple tool like the handheld Doppler allows for detection of fetal abnormalities. This is especially important in a limited-resource settings where early detection with a handheld Doppler can prompt the attending nurse to refer the patient to a doctor and, subsequently, to a tertiary center for early intervention. In this case, the attending nurse was able to detect the abnormal heart rhythm from auscultation during a routine prenatal checkup. This allowed for the patient's immediate admission to a tertiary center where there was a team of professional health care providers, including obstetric and pediatric specialists equipped for any possible outcomes during delivery.

Ultrasound is the primary modality for the diagnosis of fetal arrhythmias, and fetal echocardiography using M-mode or pulsed Doppler is the mainstay in the assessment of fetal heart rate.<sup>2</sup> This evaluation is done by a fetal cardiologist or perinatologist to rule out any associated cardiac lesion. Once confirmed to have fetal atrial ectopic rhythm, subsequent monitoring of fetal heart rate is recommended to be done weekly because of a small risk of sustained fetal tachycardia.<sup>7</sup> Most atrial ectopic beats are benign, do not need any specific intervention, and are not indicated for LSCS.<sup>1,11</sup> In fetuses with sustained fetal tachycardia, emergency delivery is indicated if they are term or near-term in gestation.<sup>12</sup> Analysis of the mode of delivery in 84 cases of fetal atrial ectopic rhythms showed that only 32% underwent cesarean section for a cardiac indication.<sup>13</sup> The decision for an emergency cesarean section in this case was made based on the CTG finding of persistent fetal arrhythmia and the pregnancy being at term. Due to a lack of expertise to confirm the diagnosis of benign fetal atrial ectopic rhythm in utero, the decision for immediate delivery via LSCS was made to reduce morbidity and mortality risks to the baby. Postnatal outcomes for fetal atrial ectopic rhythm are favorable, as most of them will resolve as the child grows older.<sup>1</sup> Although the child in this case developed a few episodes of bradycardia in the first few hours of life, probably due to blockage of the premature beat at the AV node, it was not persistent, and the echocardiography findings also showed a structurally normal heart. The majority of patients usually present with postnatal arrhythmia within the first 48 hours of life. Therefore, patients should be monitored in the

hospital for rhythm disturbances within the first 48 hours and then discharged home if well with the instructions of monitoring the heart rate for the first one to two months of life.<sup>8</sup>

### Conclusion

This case report on an atrial ectopic rhythm fetal arrhythmia underlines the importance of proper auscultation performed prenatally to identify potentially life-threatening conditions in the fetus. This procedure, which has an easy implementation and a low cost, enables an early diagnosis that is vital in preventing complications. The management of fetal arrhythmias requires a quality hospital environment, allowing the safe conduct of invasive fetal procedures and delivery. Equivalently, survival and quality of life for both mother and baby are protected by the presence of an appropriately specialized multidisciplinary team.

### Recommendations

This case report highlights the importance of routine prenatal monitoring for detecting fetal abnormalities using a simple handheld Doppler. It is important that these routine care practices are not neglected in day-to-day practice. We also want to highlight the importance of not only listening to heart rate but also noting the fetal heart rhythm during prenatal screening.

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