

# Sotalol Treatment in a Case with Fetal Atrial Flutter

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## Abstract

**Objective:** Fetal tachycardia leads to nonimmune hydrops fetalis and increases fetal morbidity and mortality. Supraventricular tachycardia and atrial flutter are the most diagnosed by ultrasonography. We present a case with fetal atrial flutter in the second trimester, firstly digoxin then, digoxin plus sotalol therapy were given successfully.

**Case:** A thirty years old patient was sent to our clinic for having maternal diabetes mellitus at 24 weeks of gestation. Her gravidity was 3, parity was 2. A fetus in 24th weeks was seen on obstetric ultrasonography and fetal tachycardia was detected. Fetal atrial rate was 529 beats per minute (bpm) and ventricular rate was 312 bpm in fetal echocardiography and fetal atrial flutter was diagnosed. The first fifteen days digoxin, then digoxin plus sotalol treatment was given. After digoxin plus sotalol treatment fetal heart rate was decreased and returned to sinus rhythm. Pregnancy was continued until term without any complication and a girl baby was delivered by cesareansection

**Conclusion:** Fetal echocardiography is a safe tool for diagnosis and followingup for fetal tachycardia. Digoxin is a first choice drug for fetal tachycardia but we need second line drugs if tachycardia does not respond in therapeutic range. Sotalol does not have negative inotropic effect therefore, it is accepted a safe second line drug. If fetal tachycardia is resistant to these treatments, congenital heart disease or any organ abnormality should be considered

**Keywords:** Fetal atrial flutter, echocardiography, digoxin, sotalol

## *Fetal atrial flutterli bir olguda sotalol tedavisi*

**Amaç:** Fetal taşiaritmi nonimmün hidrops fetalise neden olarak fetal morbidite ve mortaliteyi artırabilmektedir. Supraventriküler taşikardi ve atrial flutter ultrasonografi ile en sık tanı konulanlardır. İkinci trimesterde atrial flutter tespit edilen, önce digoksin, sonra digoksin ve sotalol ile başarılı bir şekilde tedavi ettiğimiz bir hastayı sunduk.

**Olgu:** Otuz yaşında gravidası 3, paritesi 2 olan hasta, 24. gebelik haftasında maternal diabet tanısı ile kliniğimize gönderilmişti. Obstetrik ultrasonografide 24 haftalık gebelikle uyumlu tek fetus tespit edildi ve taşikardisi olduğu görüldü. Fetal ekokardiyografide atrial hız 529 atımdak ve ventriküler hız 312 atımdak tespit edildi ve fetal atrial flutter tanısını konuldu. İlk on beş gün tek başına digoksin, sonra yanıt alınamayınca digoksin ve sotalol ile tedavi edildi. Digoksin ve sotalol tedavisinden sonra fetal kalp atım hızının azaldığı ve sinus ritmine döndüğü görüldü. Gebelik terme kadar sağlıklı bir şekilde devam ettirildi ve sezeryanla 1.dakika Apgar skoru 9, 5. dakika Apgar skoru 10 olan bir adet 3500gram kız bebek doğurtuldu.

**Sonuç:** Fetal ekokardiyografi fetal taşiaritmilerin tanısında ve takibinde güvenilir bir yöntemdir. Digoksin fetal aritmilerin tedavisinde ilk seçenek ajandır ancak terapötik düzeylerde iken yanıt alınamadığında ikinci seçenek ajanlara ihtiyaç duyulmaktadır. Sotalol negatif inotropik etkisi olmadığı için güvenle kullanılabilecek iyi bir ikinci seçenek antiaritmik ajandır.

**Anahtar Sözcükler:** Fetal atrial flutter, ekokardiyografi, digoksin, sotalol.

## Introduction

Atrial flutter (AF) is a tachyarrhythmia involves generally a conduction system between atrias and originates from an extra source. It occurs in later pregnancy compared to supraventricular tachycardia.<sup>1</sup> Atrial rate ranges between 350 and 500 beats per minute (bpm). It usually associated with 2:1 atrioventricular block.<sup>2</sup> Fetal death was reported when ventricular rate is over 480 bpm. It has been shown that consequences of the cases with ventricular rate between 220 and 240 bpm are better when atrioventricular block is associated however; the risk of hemodynamic disturbance continues.<sup>3</sup> M mode and the analysis of Doppler wave forms are the most common diagnostic methods. Fetal echocardiography allows the diagnosis of an underlying congenital cardiac disease as well.<sup>3,4</sup> Transabdominal fetal echocardiogram (EKG) and magneto cardiogram (MKG) are two popular methods and they provide data for the electrophysiological side of the fetal heart.<sup>5,6</sup> In the treatment of fetal AF, it may be necessary to chose between emergency birth and pharmacological treatment. The method of treatment should be choose by considering the balance between the factors such as: gestational age and lung maturity, changes in the fetal circulation, existence of a new born unit appropriate for postnatal management and the preferences of the family. When a resistant tachycardia and an abnormality in the circulation exist, emergency procedures must be used to avoid congestive heart failure and fetal death.<sup>7</sup> Prenatal antiarrhythmic treatment can first be applied transplacental or to fetus directly. Maternal drug treatment should be reach to effective concentration in fetus to be efficient. Direct fetal application should be preferred in cases especially those associated with severe

hydrops and placental edema and those resistant and fetus can not tolerate.<sup>8</sup> There is no prospective study showing the superiority of any antiarrhythmic treatment. Digoxin has been used safely as a first line treatment for the long time. Flecainide, sotalol and amiodarone are the widely used second line treatments.<sup>9</sup>

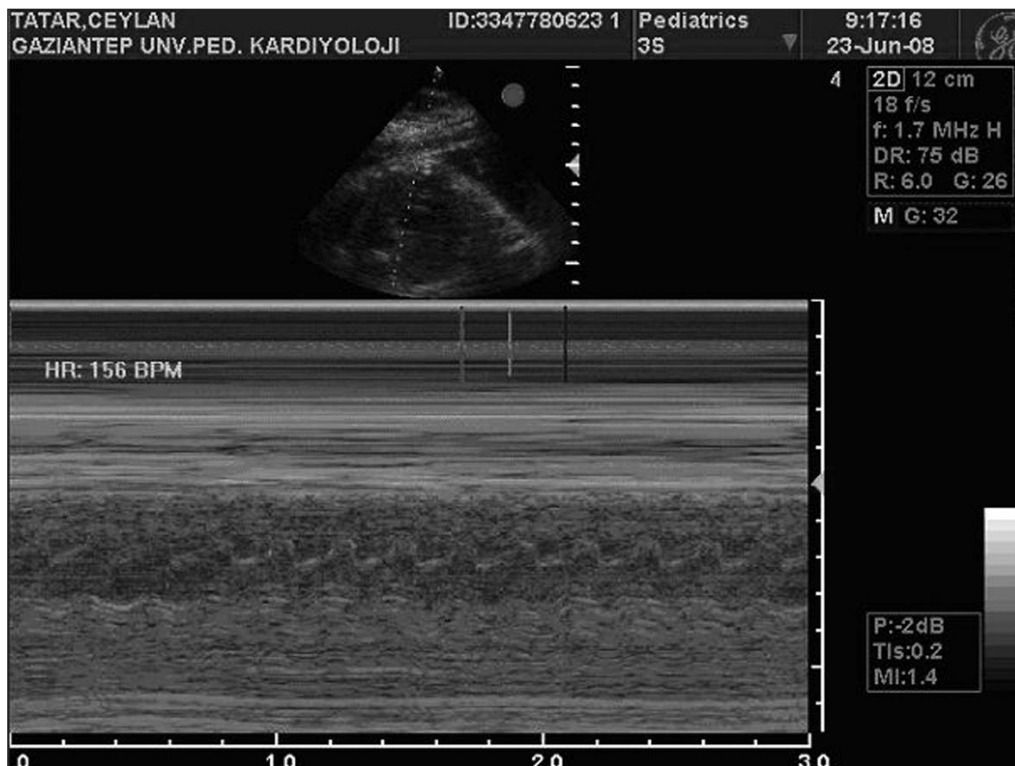
## Case

Thirty-two years old woman with 24 weeks of pregnancy, gravidity 3, parity 2 was applied for routine following up to our hospital. She had gestational diabetes for 2 months and taking insulin treatment. Blood sugar regulation was good (HbA1C 6.3%). She had two cesarean section operations for cephalo-pelvic disproportion in the history. On the ultrasonography, a single fetus was seen with tachycardia. Fetal echocardiography (M-mode) was shown that atrial rate was 528 beats per minute, ventricular rate was 257 beats per minute and approximately 2:1 atrioventricular block was detected (Picture 1 and 2). Mitral and aortic valve in the left ventricle, inferior vena cava-descendant aorta, superior vena cava-ascendant aorta and, aorta-pulmonary artery, pulmonary artery-pulmonary vein were evaluated by Echocardiography for Doppler wave form. Doppler Echocardiography which is recorded the wave forms of mitral and tricuspid valves were showed a 2:1 block which belongs to atrial flutter. M-mode section was performed which includes both of atrium and ventricle. Atrial and ventricular rate were measured separately by time cursor in M Mode echocardiography. No structural abnormality was detected in the heart. Digoxin treatment, 0,25 mg oral three times a day was started and maternal plasma level was kept in recommended therapeutic dose (1.8 ng/mL). Fetal tachyarrhythmia continued for two weeks during digoxin treatment

and heart rate did not decreased. Sotalol treatment was added to digoxin treatment as secondary choice (twice a day, 80 mg). Because fetal heart rate did not decreased, sotalol dose was increased to 160 mg, twice a day. Three weeks after two drugs regimen was started, fetal heart rate turned back to normal. Heart rate was 132 beats/minutes with 1:1 sinus rhythm. Congestive heart failure was not detected in serial echocardiographies during treatment period. Thirteen weeks after the treatment was started, sub segment c-section was performed to the patient at 13th week and forth day of her pregnancy due to uterine contractions and repeated c-sections previously. A 3800 gram of baby girl was delivered. Electrocardiogram showed normal sinus rhythm after the delivery. Echocardiography showed normal anatomy.

## Discussion

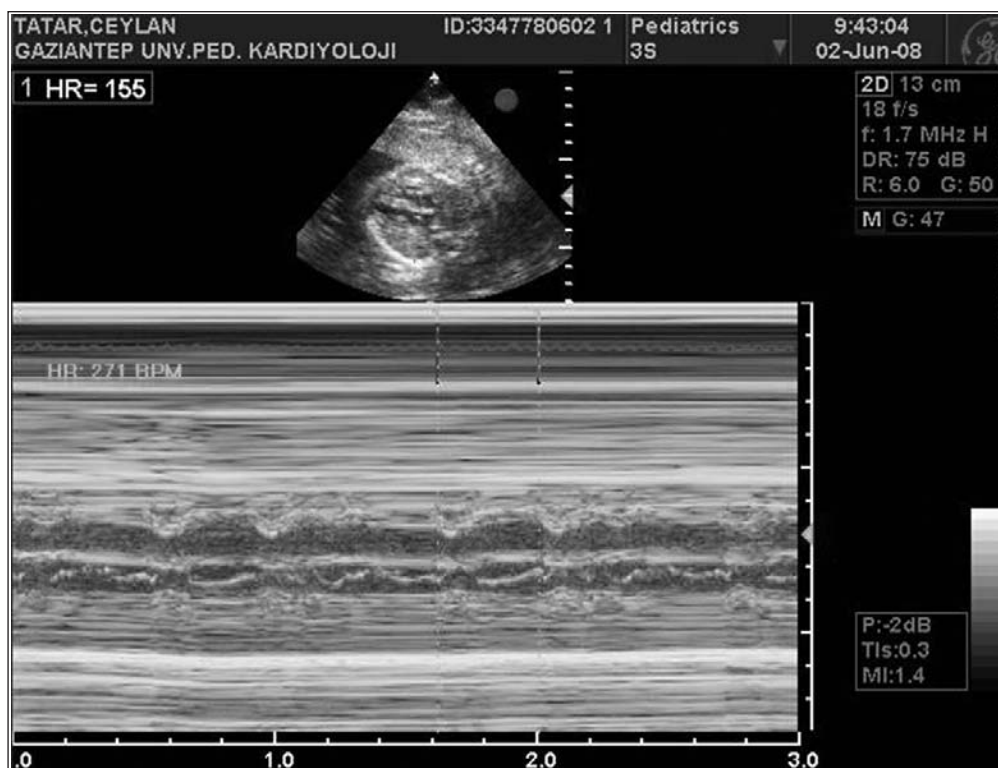
Fetal AF is the most common form of fetal tachycardias following supraventricular tachycardia. It is described as a slow ventricular rhythm with regular atrial rate (300-600 beats/minutes) and frequent blocks. This condition might be associated with congestive heart failure, fetal hydrops, neurological morbidity and intrauterine death.<sup>10</sup> Therefore, it requires prenatal care. The aims of the prenatal care are to provide a sufficient ventricular speed, to prevent congestive heart failure and to avoid preterm delivery.<sup>2</sup> Two-dimensional ultrasonography is used in the diagnosis of specific arthymias, in the evaluation of cardiac anatomy, and in the detection of hydrops fetalis. Heart anatomy should be examined carefully, because arthymias could be associated with congenital heart diseases. A fluid collection accordant with hydrops is a finding shows that normal heart physiology is deterior-



**Picture 1.** Atrial Flutter in M-mode.

rated due to impact in ventricular filling and output. Fetal echocardiography with M-Mode imaging and Doppler wave form are the most common ultrasonographic methods in the evaluation of fetal arrhythmias.<sup>3,5</sup> M-Mode is performed most frequently at the level where the four chamber's imaging can be taken, and it helps to detect atrial/ventricular wall movement and/or semilunar and atrioventricular valve movement. This helps the detection of relative timing of cardiac findings and the features of arrhythmias. Examination of the Doppler wave forms of left ventricle inner and outer ways, the region of vena cava inferior- aorta, the region of superior vena cava- ascendant aorta, and the region of pulmonary artery - pulmonary vein helps to diagnosis. Examination of the Doppler wave form is dependant to fetal position however, the large size of the area to be investigated helps to avoid this problem.<sup>3</sup> Transabdominal fetal EKG

and MKG are the methods enlightening the electrophysiology of the heart are becoming to be used more frequently. The success rate in the serial EKGs is reported to be 75-91%. The perception rate of efficient signals decreases between 27 and 36 weeks when fetal tachycardia and extrasystoles are associated.<sup>5</sup> Fetal MKG is to record the magnetic area created by fetal heart activity. Typically, P-QRS complex in EKG shows the wave form. The signal quality of MKG is better than that of EKG because the transition ability of magnetic signals is superior and this allows better results in the examination of cardiac time intervals. Atrioventricular time interval in the ultrasonography should be considered as PR interval in EKG. It is a useful method when fetal heart block was considered. The measurement of atrioventricular time interval during sinus rhythm in fetuses is the single method could be used in the diagnosis of first degree AV



**Picture 2.** During AF discordans between atrial and ventricular rate and AV block.

block. AV and ventriculoatrial intervals during tachycardia and their relation allow us to reach the data to understand the mechanism of tachycardia.<sup>6</sup>

Digoxin is one of the drugs used most commonly in the treatment of fetal tachyarrhythmia. The treatment is started with a dose of 0.25 mg twice a day then is increased to maximum 0.5 mg twice a day. Dose should be adjusted to keep maternal serum concentration in the therapeutic range of 0.8-2 ng/mL. In non-hydropic fetuses with tachyarrhythmia good prognosis can be provided with transplacental treatment.<sup>11</sup> In our case, initially digoxin was given with a dose of 0.25 mg twice a day then dose was increased maximum up to 0.5 mg twice a day by keeping the maternal serum concentration in the therapeutic range (1.8 ng/mL). Because fetal tachyarrhythmia did not respond to this treatment, sotalol treatment was started. Sotalol is a strong beta blocker agent with additional third class antiarrhythmic effect. It has intermediate or no negative inotropic effect. Sotalol should not be used in subjects who have the followings: QT interval longer than 450 milliseconds, bronchial asthma or chronic obstructive lung disease, or creatinine clearance less than 40 mL/minutes.<sup>12</sup> Quidijk et al. reported three intrauterine deaths following digoxin and sotalol treatment in 4 hydropic fetus with supraventricular tachycardia.<sup>12</sup> They suggested that proarrhythmic events in these fetuses might be started by sotalol. They stated that this should be considered when sotalol is used in hydropic fetuses.

In our case, a non-hydropic fetus who diagnosed as fetal AF by fetal echocardiography was successfully treated with digoxin and sotalol. Digoxin is the first choice in the treatment of fetal AF however; sotalol can be used safely as a

second choice in non-hydropic cases who do not respond to digoxin.

## Conclusion

In our case,atrial flutter was diagnosed by fetal echocardiography and performed for fetal tachycardia.First digoxin,then digoxin plus sotalol treatment were given successfully.

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