



CASE REPORT

Recovery of Segmental Ventricular Contractility in a Fetus with Mixed Arrhythmia: Monitoring with Fetal Speckle-Tracking Echocardiography

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Abstract

Background: Fetal arrhythmias can disrupt coordinated myocardial contraction and, in severe cases, impair cardiac function. While conventional echocardiography assesses global systolic and diastolic performance, subtle segmental disturbances may go undetected. Fetal speckle-tracking echocardiography (STE) provides quantitative evaluation of ventricular mechanics and may offer added value in monitoring therapy response. **Case Presentation:** A 30-year-old pregnant woman at 27+3 weeks' gestation was referred for suspected fetal arrhythmia. She had occupational exposure to various chemicals but no autoimmune antibodies. Fetal echocardiography revealed ventricular bradycardia (93 bpm) with atrial rate of 160 bpm, prolonged atrioventricular conduction with intermittent Wenckebach-type block, frequent atrial and ventricular ectopy, and cardiomegaly (CTAR 0.40). STE (FetalHQ) demonstrated global segmental left ventricular (LV) dysfunction and right ventricular (RV) impairment except in basal segments, despite no signs of hydrops. Maternal therapy with intravenous dexamethasone and oral salbutamol was initiated. Serial follow-up showed gradual normalization of ventricular rate, regression of cardiomegaly, and progressive recovery of segmental function, culminating in complete restoration of RV contractility and near-normal LV performance by 34+3 weeks. **Conclusions:** This case highlights the utility of fetal STE in detecting regional ventricular dysfunction and objectively documenting myocardial recovery in fetuses with mixed arrhythmias. Integration of advanced imaging into routine surveillance may improve assessment of treatment efficacy, guide management, and provide reassurance to both clinicians and parents when rhythm stabilization leads to functional recovery.

Introduction:

Case Description:

A 30-year-old pregnant woman, employed as a hairdresser until the second trimester, presented for fetal cardiology consultation at 27 + 3 weeks' gestation due to suspected arrhythmia. Occupational exposure included aromatic amines, ammonia, hydrogen peroxide, persulfates, formaldehyde, and alcohols (methanol/ethanol). She was otherwise healthy, with negative anti-SSA/SSB antibodies.

Fetal echocardiography (27w3d) revealed:

- Ventricular bradycardia (93 bpm) with atrial rate 160 bpm
- Prolonged atrioventricular conduction with intermittent AV block (possible Wenckebach-type)
- Frequent supraventricular and ventricular ectopy
- Cardiomegaly (cardiothoracic area ratio CTAR = 0.40)
- Speckle-tracking echocardiography (STE, FetalHQ) showed global segmental contractility disorders: SF-shortening fraction LV: all 24 segments abnormal; RV: abnormal except segments 1–3.
- No hydrops, effusions, or signs of heart failure were present.

Management:

Due to suspected immune-mediated atrioventricular- AV conduction disturbance, maternal intravenous dexamethasone was initiated, despite negative antibody status, alongside oral salbutamol to improve AV conduction and ventricular rate.

Serial follow-up (STE + standard echo):

- 29w1d: ventricular heart rate-VHR 94 bpm; atrial heart rate-AHR 182 bpm; CTAR 0.40. SF LV: normal segments 1–

6; SF RV: normal segments 17–20.

- 31w2d: VHR 100 bpm; AHR 164 bpm; CTAR 0.40. SF LV: normal 1–2, 5–6; SF RV: normal 1–6, 18–24.
- 34w3d: VHR 135 bpm; AHR 135 bpm; CTAR 0.30 (normalized). SF RV: all 24 segments normal; SF LV: normal apical segments 21–24, residual base-mid dysfunction.
- At final evaluation, rhythm was regular with isolated supraventricular extrasystoles, cardiomegaly regressed, and hemodynamic status remained stable.

Discussion:

This case illustrates the role of fetal speckle-tracking echocardiography in detecting and monitoring regional ventricular dysfunction in a fetus with mixed arrhythmia [1-2]. While standard echocardiography confirmed preserved global systolic and diastolic function and absence of heart failure [3-5], STE provided quantitative evidence of segmental recovery during treatment; culminating in complete restoration of RV contractility and near-normal LV function.

Fetal arrhythmias, particularly those involving AV conduction delay, can cause transient myocardial impairment through dyssynchronous activation and altered loading [3-5]. FetalHQ allows reproducible 24-segment analysis of both ventricles, offering a sensitive tool to document subclinical dysfunction and therapeutic response [1-2].

Combined dexamethasone (anti-inflammatory) and β -agonist therapy remains a recognized approach for selected fetuses with evolving AV conduction abnormalities, even in the absence of maternal antibodies, especially when accompanied by bradycardia and ventricular dysfunction [3-5].

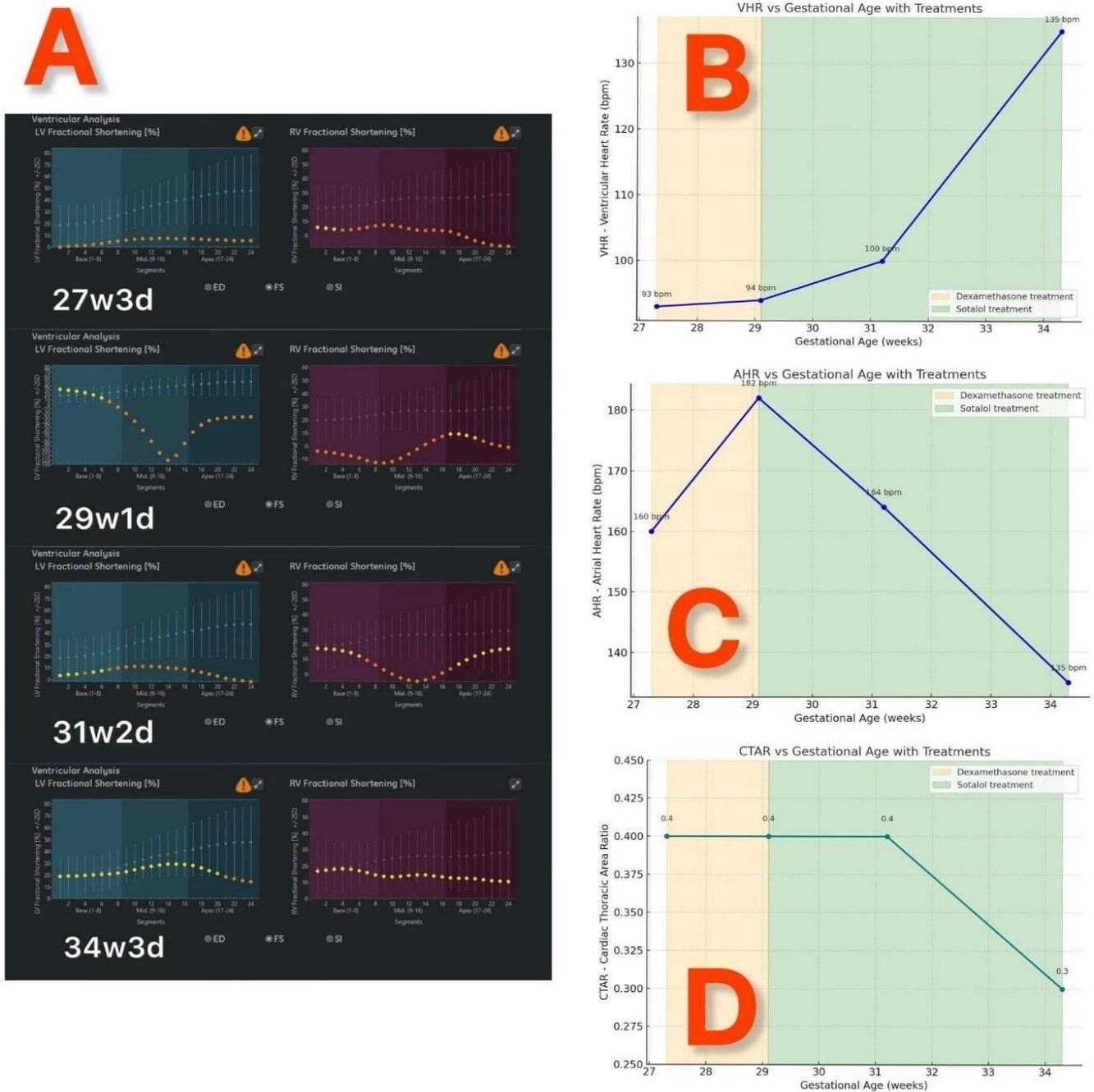


Figure 1:

- A: SF for left and right ventricles: across gestational age with timing of dexamethasone (yellow) and salbutamol (green) therapy. Panels derived from serial fetal speckle-tracking analysis.
- B: VHR- ventricular heart rate: across gestational age with timing of dexamethasone (yellow) and salbutamol (green) therapy. Panels derived from serial fetal echocardiography.
- C: AHR- atrial heart rate: across gestational age with timing of dexamethasone (yellow) and salbutamol (green) therapy. Panels derived from serial fetal echocardiography.
- D: CTAR- Cardio-thoracic area ratio: across gestational age with timing of dexamethasone (yellow) and salbutamol (green) therapy. Panels derived from serial fetal echocardiography.

Conclusion:

Incorporating fetal STE into arrhythmia surveillance allows detailed assessment of regional mechanics and objective demonstration of myocardial recovery. This case highlights the value of advanced imaging to guide management and reassure both clinicians and parents when rhythm control translates into mechanical normalization.

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