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Case Report

Silent Complexity: A Term IUGR Neonate & Common Atrium, Bradycardia & Hidden Admixture Physiology: A Comprehensive Case Report

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ABSTRACT

We report a term small-for-gestational-age male infant who presented with antenatal suspicion of congenital heart disease and fetal growth restriction. Postnatal echocardiography confirmed complex congenital heart disease (CHD) with admixture physiology, common atrium, small PDA, and pulmonary hypertension. The neonate exhibited persistent bradycardia (70–90 bpm) throughout the NICU stay, an unusual but clinically relevant finding in the context of complex CHD. Despite stable perfusion and acceptable systemic oxygenation, bradycardia persisted, prompting referral to a tertiary pediatric cardiac intervention center. This case highlights the challenges in correlating antenatal and postnatal diagnostic findings and emphasizes the importance of early specialized referral in complex CHD with conduction abnormalities.

KEYWORDS

• Intrauterine Growth Restriction (IUGR) • Neonatal Bradycardia • Cyanotic Congenital Heart Disease • Common Atrium • Admixture Physiology • Mixing Lesion • Atrial Septal Defect Spectrum

INTRODUCTION

Congenital heart disease is the most common congenital malformation, with spectrum and severity varying widely. *Common atrium*, a rare defect characterized by complete absence of atrial septation, often exists as part of complex

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admixture lesions. Conduction abnormalities such as *persistent neonatal bradycardia* are uncommon but may indicate sinus node dysfunction, AV nodal involvement, or depressed autonomic regulation, and warrant urgent cardiology evaluation.

This case underscores the limitations of antenatal diagnosis, the complexity of postnatal physiology in admixture lesions, and the clinical significance of persistent bradycardia in neonates with CHD.

CASE PRESENTATION:

Maternal & Antenatal History:

- Mother: 30 years old, B Positive, Primigravida with 11 years of infertility & third-generation consanguinity
- ANC uneventful with all viral markers and VDRL negative
- Antenatal ultrasound (24.10.2025):
  1. IUGR (EFW at 4th percentile)
  2. Raised uterine artery PI → uteroplacental insufficiency
  3. Fetal bradycardia
  4. Suspicion of AVSD
  5. Persistent right umbilical vein (PRUV)
  6. Prominent left SVC (PLSVC)
  7. Ductus venosus not visualized
  8. Umbilical artery & MCA Doppler: normal

Delivery Details:

- Gestation: Full Term (39 weeks + 3 days)
- Mode: Emergency LSCS for persistent fetal bradycardia
- DOB: 15 November 2025
- Time of Birth: 08:54 AM
- Gender: Male
- Apgar: 8, 9, 9
- Birth Weight: 2200 g
- Length: 47 cm
- Head Circumference: 33 cm

Baby cried at birth with no need for active resuscitation.

Postnatal Course:

Initial Examination:

1. SGA, hemodynamically stable
2. No dysmorphism or respiratory distress
3. Peripheral perfusion adequate
4. Persistent Bradycardia:

Throughout NICU stay, the infant demonstrated *persistent bradycardia*:

- Heart rate: 70–90 bpm (baseline)
- Rare acceleration with crying
- No episodes of apnea or desaturation
- Capillary refill & perfusion remained stable

Possible causes considered:

- Sinus node dysfunction
- Atrioventricular conduction delay
- High vagal tone
- Structural correlation with common atrium
- Admixture physiology–related autonomic imbalance

ECG was planned but definitive evaluation was deferred in view of the need for advanced cardiac intervention.

INVESTIGATIONS:

Chest X-ray:

- Mild cardiomegaly
- Lungs clear

Ultrasound Abdomen:

- Normal abdominal organs
- No heterotaxy
- No PRUV-related complications

Echocardiography (Day 1):

Key Findings:

- Complex congenital heart disease with admixture physiology
- Common atrium* → complete absence of atrial septum
- Small PDA* with bidirectional shunting
- Pulmonary hypertension
- Good biventricular systolic function

- Cardiac position normal (levocardia)
- Ventriculoarterial concordance maintained

INTERPRETATION

A cyanotic CHD with complete mixing at the atrial level, transitional pulmonary hypertension, and high risk for progression of cyanosis and right-sided pressures.

NICU COURSE AND DECISION FOR REFERRAL:

Despite,

- Adequate perfusion
- Acceptable saturation
- Good feeding tolerance

The baby continued to have *persistent bradycardia (70–90 bpm)* without improvement. Given the combination of:

1. *Common atrium*
2. *Admixture physiology*
3. *Pulmonary hypertension*
4. *Persistent neonatal bradycardia*
5. Need for advanced electrophysiological assessment
6. Need for surgical/palliative cardiac intervention

The baby was referred to a higher pediatric cardiac intervention center for:

- Detailed ECG & Holter evaluation
- Advanced echocardiography
- Possible MRI cardiac assessment
- Surgical/palliative planning (septation or staged repair)

Parents were counselled extensively regarding the diagnosis, prognosis, and need for urgent specialized care.

DISCUSSION

1. Diagnostic Discrepancy between Antenatal & Postnatal Studies

Antenatal suspicion of AVSD and PRUV was partially consistent but underestimated the ultimate complexity of the lesion.

This is well-recognized due to:

- Suboptimal fetal imaging
- Overlapping cardiac structures
- Inability to fully assess atrial septation
- Late gestational age limiting acoustic windows

2. Common Atrium & Admixture Physiology

Common atrium results in:

- Complete systemic–pulmonary venous mixing
- Dependence on pulmonary vascular resistance (PVR)
- Baseline mild cyanosis
- Risk of pulmonary hypertension

3. Persistent Neonatal Bradycardia

This is a *key differentiating factor* in this case. Possible mechanisms:

- Sinus node hypoplasia or dysfunction
- Structural displacement due to common atrium
- Inadequate chronotropic response in admixture lesions
- Elevated vagal tone in IUGR infants
- Potential conduction tissue malalignment.

Persistent HR < 100 bpm in absence of hypoxia is *concerning* and a strong indication for tertiary cardiac care.

4. Importance of Early Referral:

Babies with admixture physiology and bradycardia may deteriorate rapidly as PVR falls in the first weeks of life.

Early transfer allows:

- Multidisciplinary evaluation
- Surgical planning
- Prevention of pulmonary vascular remodeling
- Management of conduction abnormalities

CONCLUSION

This case demonstrates the complexity of neonatal cardiac diagnosis and management when antenatal suspicion evolves into definitive postnatal identification of *common atrium with admixture physiology and pulmonary hypertension*. The presence of *persistent neonatal bradycardia* significantly alters the clinical course and necessitates *early

referral to a tertiary pediatric cardiac center* for advanced evaluation and intervention.

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