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A Novel Coronary Sinus: Related Right Atrial Pseudo-Mass Mimicking the Coumadin Ridge on Neonatal Transthoracic Echocardiography: A Case Report

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ABSTRACT

Normal echocardiographic variants in neonates present a diagnostic challenge because benign intracardiac structures may mimic pathological masses. Accurate differentiation is essential to prevent unnecessary diagnostic investigations and potentially harmful treatments. Diagnostic evaluation should integrate fetal echocardiography, obstetric and delivery history, neonatal physical examination, and laboratory findings. When transthoracic echocardiography is inconclusive, additional imaging modalities, including transesophageal echocardiography, three-dimensional echocardiography, CT angiography, or cardiac MRI, may be required. Nevertheless, transthoracic echocardiography remains the most accessible, practical, and low-risk imaging technique for distinguishing normal variants from pathological findings in paediatric patients. We report a healthy, one-day-old, preterm female neonate with normal clinical and laboratory findings who exhibited several recognised normal echocardiographic variants, along with a previously undescribed normal right atrial structure resembling the Coumadin ridge typically observed in the left atrium. This case highlights the importance of recognising rare normal neonatal echocardiographic variants to improve diagnostic interpretation and guide decisions regarding further imaging evaluation.

Introduction

Transthoracic echocardiography is essential for evaluating neonatal cardiac anatomy, enabling early detection of congenital abnormalities while identifying benign structures that may mimic pathological masses [1-4]. Accurate differentiation is critical to prevent misdiagnosis and unnecessary intervention. Common benign right atrial variants include the crista terminalis, Chiari network, Coumadin ridge, and the Thebesian and Eustachian valves [5-8]. Although left atrial pseudo-masses such as the Coumadin ridge are well recognized, no comparable coronary sinus-related pseudo-mass has been reported in the right atrium. We describe a previously unreported coronary sinus-associated right atrial pseudo-mass in a neonate and highlight

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its echocardiographic features to facilitate accurate distinction from pathological findings.

Case Presentation

A preterm 37-week female neonate was delivered by cesarean section due to premature rupture of the maternal chorionic membrane. At birth, she had a low Apgar score (8/10) at the fifth minute of birth due to cyanosis, but she resolved rapidly with administration of supplemental oxygen and without the need for advanced resuscitation. No abnormalities were detected on physical examination or in laboratory investigations in the first hour after birth. There were no signs of infection in view of prematurity and cyanosis. Because of prematurity and perinatal cyanosis, transthoracic echocardiography with a neonatal probe was performed. Transthoracic echocardiography in the four-chamber view (best diagnostic view) showed a fixed, hyperechoic, mass-like structure (3.9 mm × 4.4 mm) at the coronary sinus end of the right atrium, with a classic Q-tip appearance, similar to the left atrial Coumadin ridge (Figures 1, 2, 3). The lesion was nonmobile and nonobstructive. Other normal variants, including a left atrial Coumadin ridge, Chiari network, crista terminalis, and false tendon, were also present. The infant remained well on follow-up, and repeat echocardiography showed unchanged benign findings.

Discussion

Neonatal right atrial echogenic structures may represent benign anatomical variants rather than

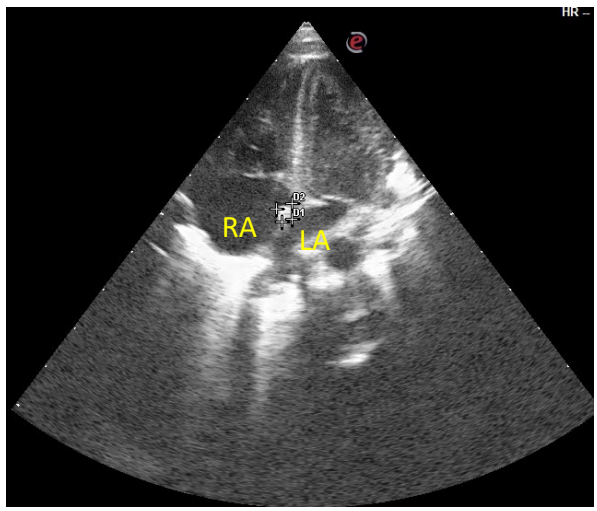


Fig. 1. Transthoracic echocardiography in the 4-chamber view shows the Pseudo-Mass mimicking the Coumadin Ridge in right atrium (3.9mm*4.4mm). RA, right atrial; LA, left atrial.

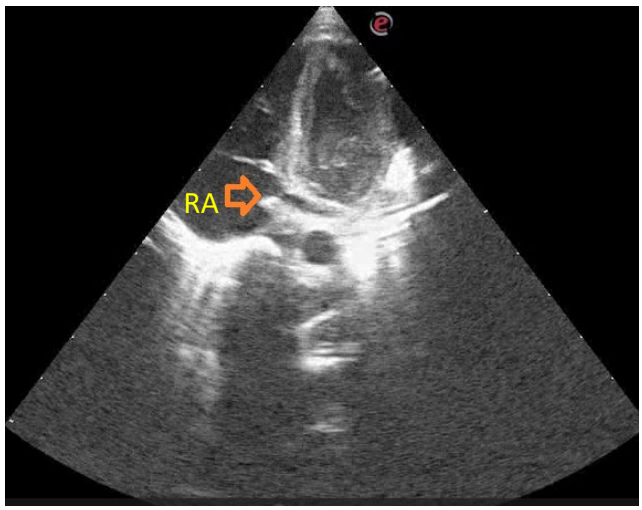


Fig. 2. Orange Arrow: Transthoracic echocardiography in the 4-chamber view shows the coronary sinus–related right Atrial pseudo mass mimicking the Coumadin Ridge. RA, right atrial

true masses, and careful morphologic assessment can prevent unnecessary anticoagulation, advanced imaging, or surgery (Figs. 4-7; Table 1).

The Coumadin ridge has been well described as a left atrial pseudo-mass that may resemble thrombus or tumor on echocardiography, underscoring the broader diagnostic problem of normal variants mimicking pathology [1-3]. In neonates, reported right atrial masses have most often been interpreted as thrombi or tumors, and their management has ranged from observation to invasive intervention, depending on the perceived risk of obstruction or embolization [4, 5] (Table 2).

In the case report, the mass observed in the neonate's right atrium can be attributed to a prominent coronary sinus orifice or a thickened, echogenic Thebesian valve. In this context, the present case is novel because the lesion was stable, nonobstructive, and anatomically related to the coronary sinus, supporting a benign congenital variant rather than a pathologic mass. Differential diagnoses such as myxoma and lipomatous hypertrophy should be discussed, but they are less consistent with the neonatal age, fixed appearance, and absence of hemodynamic compromise [6, 7]. The case therefore expands the spectrum of recognized echocardiographic pseudo-masses and highlights the importance of integrating imaging features with clinical context, including normal neonatal examination, absence of thrombosis risk factors, and short-interval follow-up. This report adds practical

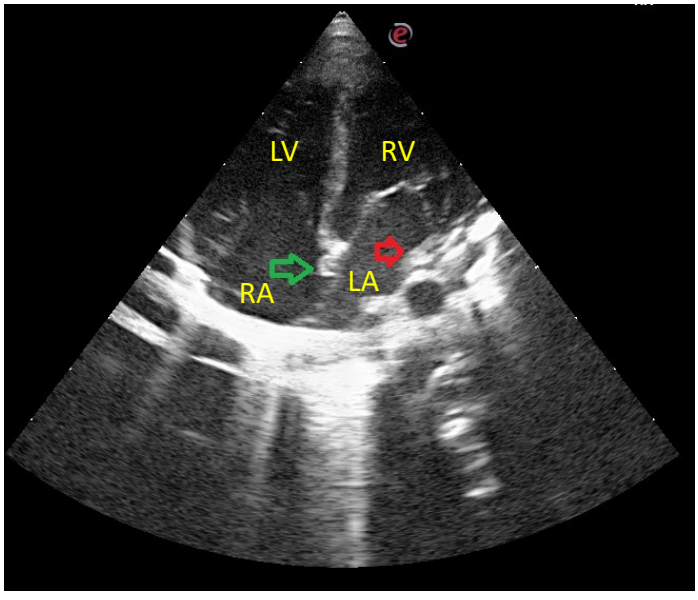


Fig. 3. Red Arrow: Transthoracic echocardiography in the 4-chamber view shows the coumadin ridge in LA. Green Arrow: Coronary sinus–related right atrial pseudo mass mimicking the coumadin ridge RA, right atrial; LA, left atrial; RV, right ventricle; LV, left ventricle.

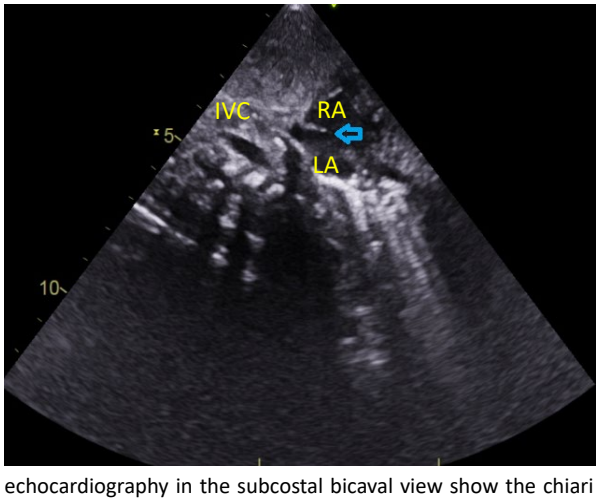


Fig. 4. Blue Arrow: Transthoracic echocardiography in the subcostal bicaval view show the chiari network. RA, right atrial; LA, left atrial; IVC, inferior vena cava

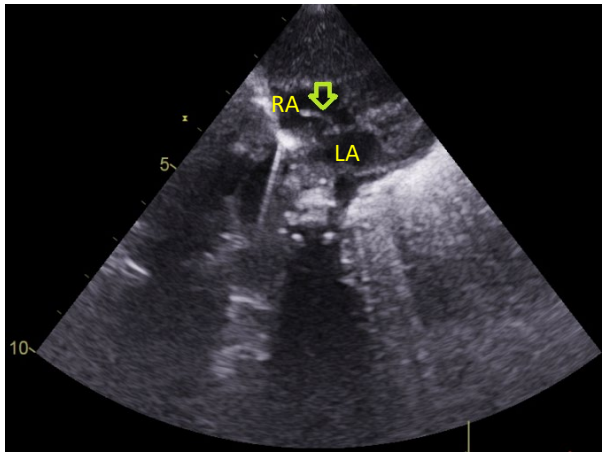


Fig. 5. Green Arrow: Chiari network in subcostal 4-chamber view of transthoracic echocardiography. RA, right atrial; LA, left atrial

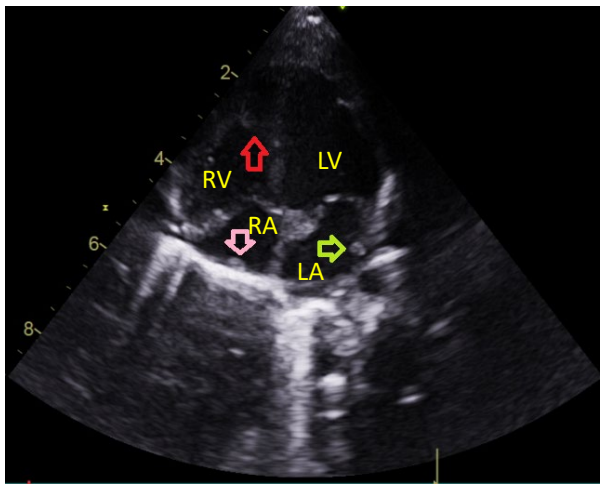


Fig. 6. Red Arrow: Transthoracic echocardiography in the 4-chamber view shows the moderator band in RV. Green Arrow: Coumadin ridge in LA. Pink Arrow: Crista terminalis in RA. RA, right atrial; LA, left atrial; RV, right ventricle; LV, left ventricle.

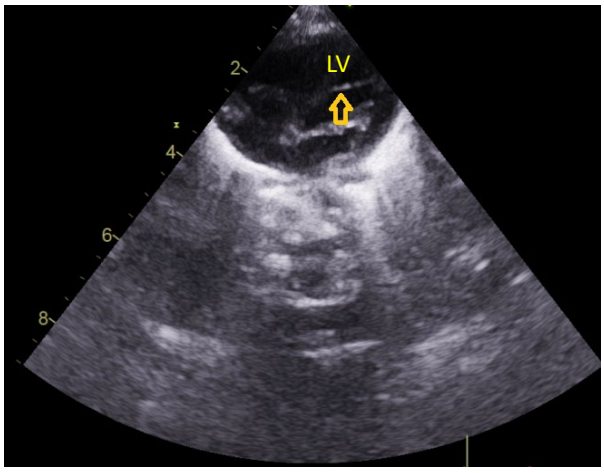


Fig. 7. Yellow Arrow: Transthoracic echocardiography in the 4-chamber view shows the false tendon in LV. LV, Left ventricle.

Table 1. Benign and abnormal findings in neonatal thoracic echocardiography:

Diagnosis	Position in the atrium or ventricle	Echogenicity	Motion	Doppler flow obstruction	Association
Chiari network	RA, between the IAS and IVC	Echogenic (thin, web-like, fenestrated membrane)	highly mobile	No	ASD, ASA, SVT, TR, and PS
Coumadin Ridge	Muscular linear ridge between LUPV and LAA	echogenic (broad, nodular tip or linear or Q-shaped)	fixed	No	-
Crista terminalis	Fibromuscular nodule on the posterolateral wall of the RA between the SVC and IVC	Echogenic (Phasic size changes in atrial systole (thicker or larger)	fixed	No	Septal aneurysm, arrhythmia
Eustachian valve	crescent-like fold/ leaf-like linear: attached to the opposite wall of the IVC	echogenic	mobile	No	-
False tendon	Fibromuscular strand or thin bands between the LV Free wall to IVS	echogenic	mobile	No	-
Thebesian valve	Coronary sinus membranous valve in the RA	echogenic	Fixed	No	-

ASD (atrial septal defect), RA (Right atrium), IAS (interatrial septum), ASA (Atrial septal aneurysm), SVT (supraventricular dysrhythmia), TR (tricuspid valve regurgitation), PS (pulmonary valve stenosis), LUPV (left upper pulmonary vein), LAA (left atrial appendage), SVC (superior vena cava), IVC (inferior vena cava), LV (left ventricle), IVS (inter ventricular septum)

Table 2. Abnormal findings on neonatal thoracic echocardiography:

Diagnosis	Position in the atrium or ventricle	Echogenicity	Motion	Doppler flow obstruction	Distinguishing feature
Lipomatosis (LHIS)	hyper trophy IAS	Hyperechoic (Thickened dumbbell-shaped IAS sparing fossa ovalis)	Fixed	Yes	rare benign, older and obese woman, arrhythmias, death
Atrial myxoma	IAS to the LA	Inhomogeneous echogenicity, sometimes calcified	Mobile (pedunculated)	Yes	in the 3rd to 6th decade of life
Thrombosis	various locations	Inhomogeneous echogenicity	mobile	Yes	history of clot or infection

LHIS (lipomatosis hypertrophied inter atrial septum), IAS (interatrial septum), LA (left atrium)

value by helping clinicians avoid overdiagnosis and by refining the echocardiographic differential diagnosis of right atrial findings in newborns [8].

Conclusion

This article describes, for the first time, a normal structure adjacent to the coronary sinus in the right atrium that may appear as an intracardiac mass on neonatal echocardiography but is, in fact, a prominent coronary sinus orifice or a thickened, echogenic Thebesian valve. This abnormality is like the left-sided variant of the Coumadin ridge in that there is no hemodynamic implication at all in this structure, just like the well-known Coumadin ridge structure. Being able to diagnose this normal variant, which is considered stable, non-obstructive, and related to the coronary sinus, is very crucial to avoid misdiagnosis and unnecessary intervention. The combination of prenatal imaging and perinatal history, lab tests, and neonatal physical exam might help diagnose these variations. Awareness of this variant will reassure clinicians and families and refine echocardiographic evaluation of neonatal atrial anatomy, especially in premature infants. Also, recording these normal findings in the echocardiography report is very important and sometimes vital for cases where there is a need to review the history and previous echo reports in the future.

Ethical Considerations

Compliance with ethical guidelines

There were no ethical considerations to be considered in this article.

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Conflict of Interests

The authors declare that they have no competing interests.

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