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Original Article

Fetal Echocardiography Findings and Postnatal Outcomes: Are There Significant Changes?

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Abstract

Objectives: This study aimed to determine the accuracy and concordance rates of prenatal and postnatal diagnoses in cases evaluated with fetal echocardiography (FE) during pregnancy and transthoracic echocardiography (TTE) in the postnatal period.

Methods: Data from 163 cases referred for FE to the Pediatric Cardiology Clinic between December 2017 and December 2024, and subsequently evaluated with postnatal TTE, were retrospectively analyzed. Demographic characteristics, indications for FE, prenatal and postnatal diagnoses, and diagnostic concordance rates were examined. Diagnostic agreement was assessed using the Kappa statistic.

Results: The overall concordance rate between prenatal and postnatal echocardiographic diagnoses was 91.41%. The sensitivity of prenatal diagnoses was 86.36%, specificity 94.85%, positive predictive value 91.94%, and negative predictive value 91.09%. A diagnostic concordance rate of 100% was achieved for major congenital heart diseases (CHD) such as tetralogy of Fallot, transposition of the great arteries, hypoplastic left heart syndrome, double outlet right ventricle, and complete atrioventricular septal defect. In contrast, lower prenatal detection rates were observed for lesions such as atrial septal defect and partial anomalous pulmonary venous drainage. In addition, some complex anomalies, including aortic arch hypoplasia, demonstrated reduced diagnostic concordance.

Conclusion: Prenatal echocardiography provides high accuracy and agreement in the early diagnosis of major CHD. However, diagnostic limitations persist in small defects and complex lesions. Systematic comparison of prenatal and postnatal echocardiographic findings is essential to enhance diagnostic reliability and improve family counseling.

Keywords: Congenital heart disease; fetal echocardiography; newborn; postnatal echocardiography.

Fetal Ekokardiyografi Bulguları ve Postnatal Sonuçlar: Önemli Değişiklikler Var mı?

Özet

Amaç: Bu çalışmada, fetal ekokardiyografi (FE) yapılan ve postnatal dönemde transtorasik ekokardiyografi (TTE) ile değerlendirilen olgularda prenatal ve postnatal tanıların doğruluk ve uyum oranlarının belirlenmesi amaçlanmıştır.

Gereç ve Yöntem: Aralık 2017–Aralık 2024 tarihleri arasında Ordu Üniversitesi Eğitim ve Araştırma Hastanesi Çocuk Kardiyoloji Polikliniği'ne FE amacıyla yönlendirilen ve doğum sonrası TTE ile kardiyak değerlendirmesi tamamlanan 163 olgunun verileri retrospektif olarak analiz edildi. Demografik veriler, FE'ye yönlendirme nedenleri, prenatal ve postnatal tanılar ile tanısal uyum oranları incelendi. Tanısal uyum, Kappa istatistiği ile değerlendirildi.

Bulgular: Çalışmada, prenatal ve postnatal ekokardiyografi tanılarının genel uyum oranı yüzde 91,41 olarak bulundu. Prenatal tanıların duyarlılığı yüzde 86,36, özgüllüğü yüzde 94,85, pozitif prediktif değeri (PPV) yüzde 91,94 ve negatif prediktif değeri (NPV) yüzde 91,09 idi. Fallot tetralojisi (TOF), büyük arterlerin transpozisyonu (TGA), hipoplastik sol kalp sendromu (HLHS), çift çıkışlı sağ ventrikül (DORV) ve komplet atriyoventriküler septal defekt (CAVSD) gibi majör konjenital kalp hastalıklarında yüzde 100 tanısal uyum elde edildi. Buna karşılık, özellikle atriyal septal defekt (ASD) ve parsiyel anormal pulmoner venöz dönüş (PAPVD) gibi lezyonlarda prenatal tanı oranlarının daha düşük olduğu gözlemlendi. Ayrıca, aort arkus hipoplazisi gibi bazı kompleks anomalilerde tanılar arasında uyumun düşük olduğu saptandı.

Sonuç: Prenatal ekokardiyografi, majör konjenital kalp hastalıklarının erken tanısında yüksek doğruluk ve uyum sağlamaktadır. Ancak küçük defektler ve kompleks lezyonlarda tanısal sınırlılıklar devam etmektedir. Prenatal ve postnatal ekokardiyografi bulgularının sistematik olarak karşılaştırılması, tanısal doğruluğun ve aile danışmanlığının artırılması açısından önemlidir.

Anahtar sözcükler: Doğumsal kalp hastalığı; fetal ekokardiyografi; yenidoğan; postnatal ekokardiyografi.

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Introduction

Congenital heart disease (CHD) is one of the most common congenital anomalies, affecting approximately 0.6% to 1.2% of live births.[1] CHD accounts for nearly 42% of infant deaths related to congenital anomalies and represents a leading cause of infant mortality worldwide.[2] Early detection of these anomalies during pregnancy allows for prenatal management planning as well as preparation for postnatal treatment.

Fetal echocardiography (FE) is a non-invasive and reliable imaging method that enables detailed evaluation of fetal cardiac anatomy from the late first trimester onwards. In particular, prenatal diagnosis of certain structural heart lesions allows delivery planning at tertiary care centers, facilitates rapid initiation of postnatal stabilization, and enables timely surgical interventions when necessary.[3] It has been demonstrated that prenatal detection of severe lesions such as hypoplastic left heart syndrome (HLHS) and transposition of the great arteries (TGA) favorably influences morbidity and neurodevelopmental outcomes.[4,5]

The reported sensitivity of FE ranges between 60% and 90%. However, this rate may vary depending on the type of CHD diagnosed, the imaging protocol used, gestational age, and image quality.[6,7] Factors influencing diagnostic performance include maternal obesity, probe frequency, fetal position, amniotic fluid volume, and the presence of abdominal scars.[8,9]

Initially limited to four-chamber view screening, fetal cardiac assessment has become more sensitive with the addition of outflow tract and three-vessel–trachea views. At present, extended protocols including both right and left ventricular outflow tracts, the main pulmonary artery and its branches, enable intrauterine detection of even smaller defects.[6] In line with this, organizations such as the American Heart Association, the American Society of Echocardiography, and the international society of ultrasound in obstetrics and gynecology have published guidelines and established standards for the application of FE.[10–13]

Despite efforts to improve prenatal detection rates, studies evaluating the diagnostic accuracy of FE remain limited. The lack of standardized classifications for assessing diagnostic discrepancies makes cross-study comparisons difficult.[14] Therefore, systematic comparison of FE findings with postnatal transthoracic echocardiography (TTE) results is crucial to enhance diagnostic reliability and optimize counseling practices.

In this study, we retrospectively compared prenatal FE results with postnatal TTE findings in cases referred for fetal cardiac assessment in our pediatric cardiology clinic, with the aim of investigating diagnostic accuracy and potential causes of discordance.

Materials and Methods

Study Design

This was a single-center, observational, retrospective study conducted at the Pediatric Cardiology Clinic, including cases referred for FE between December 2017 and December 2024, who subsequently underwent postnatal TTE. Postnatal TTE was performed in the neonatal period (within the first 7 days after birth) in all cases. The study was a single-center study, and since pediatric cardiology services were provided by a single pediatric cardiologist in the region, postnatal evaluations were not blinded to prenatal findings. The study was approved by the Clinical Research Ethics Committee (approval number: 91120269-800-E.0721090). Due to its retrospective design, informed consent was not obtained. The study was conducted in accordance with the principles of the Helsinki Declaration.

Inclusion Criteria

- FE performed at our clinic for fetal cardiac assessment,
- Availability of postnatal follow-up data,
- Postnatal TTE performed for cardiac evaluation,
- Complete and accessible FE and postnatal TTE records within the hospital database.

Exclusion Criteria

- Cases in which pregnancy did not result in live birth after FE,
- Newborns who did not undergo postnatal TTE,
- Cases with incomplete or inaccessible medical records.

Data Collection

Patient data were obtained from the hospital automation system and the pediatric cardiology FE records. The following parameters were systematically evaluated:

- Gestational age at the time of FE,
- Gestational age at birth,
- Birth weight (g),
- Presence of extracardiac anomalies,
- Prenatal (fetal) echocardiography diagnosis,
- Postnatal TTE diagnosis,
- Indication for FE referral,
- Concordance between prenatal and postnatal diagnoses.

All fetal and postnatal echocardiographic examinations were performed by an experienced pediatric cardiologist in accordance with international guidelines for the diagnosis of CHD. Postnatal TTE results were compared with prenatal diagnoses. For patients who underwent multiple prenatal FE examinations, only the last FE was considered.

Statistical Analysis

Data were analyzed using IBM Statistical Package for the Social Sciences Statistics software (version 25.0; IBM Corp., Armonk, NY, USA). Descriptive statistics were presented as mean ± standard deviation or median (minimum-maximum) for continuous variables, and as frequency (n) and percentage (%) for categorical variables. For statistical comparisons, Student's t-test was used for normally distributed continuous variables, the Mann-Whitney U-test for non-normally distributed continuous variables, and the Chi-square test or Fisher's exact test for categorical variables. Diagnostic concordance between FE and postnatal TTE was assessed using the Kappa (κ) statistic.

Table 1. Demographic characteristics of the study group and reasons for referral for fetal echocardiography

Parameters	Value	Reasons for referral	n	%
FE week, mean±SD (min-max)	26.67±4.40 (18–36)	Fetal cardiac anomaly	42	25.8
Gestational age, mean±SD (min-max)	37.73±2.57 (29–40)	Family history	34	20.9
Birth weight (grams), mean±SD (min-max)	3132±651 (1.540–4.500)	GDM	22	13.5
Singleton pregnancy, n (%)	158 (96.9)	Abnormal fetal lie	20	12.3
Twin pregnancy, n (%)	5 (3.1)	Hyperechogenic focus	16	9.8
Additional anomaly-yes, n (%)	8 (4.9)	Maternal CHD	7	4.3
Additional anomaly-no, n (%)	155 (95.1)	Fetal tachycardia	6	3.7
Premature birth, n (%)	29 (17.8)	In sibling CHD	5	3.1
		Down syndrome	3	1.8
		Sjogren, in mother	2	1.2
		Absence of ductus	2	1.2
		ARSA	1	0.6
		Pericardial effusion	1	0.6
		Gastroschisis	1	0.6
		Maternal myocarditis	1	0.6
		Total	163	100

FE: Fetal echocardiography; SD: Standard deviation; GDM: Gestational diabetes mellitus; CHD: Congenital heart disease; ARSA: Aberrant right subclavian artery

Results

A total of 177 cases underwent FE during the study period; however, 14 cases were excluded from the study due to the inability to perform diagnostic confirmation, as they either lacked a postnatal TTE or their records were inaccessible. That's why a total of 163 cases were included in the study. The mean gestational age at FE was 26.67±4.40 weeks (range: 18–36). The mean gestational age at birth was 37.73±2.57 weeks (range: 29–40), and the mean birth weight was 3132±651 grams (range: 1,540–4,500). Of the pregnancies, 96.9% (n=158) were singleton and 3.1% (n=5) were twin pregnancies. Extracardiac anomalies were detected in 4.9% (n=8), while the rate of preterm birth (<37 weeks) was 17.8% (n=29).

Indications for FE

The most frequent indication for FE referral was suspected fetal cardiac anomaly (25.8%, n=42), followed by family history of CHD (20.9%, n=34) and gestational diabetes mellitus (13.5%, n=22). Other common indications included unfavorable fetal position (12.3%, n=20) and echogenic intracardiac focus (9.8%, n=16). Less frequent indications were maternal CHD (4.3%, n=7), fetal tachycardia (3.7%, n=6), sibling history of CHD (3.1%, n=5), Down syndrome (1.8%, n=3), maternal Sjögren's syndrome (1.2%, n=2), ductal agenesis (1.2%, n=2), aberrant right subclavian artery (ARSA) (0.6%, n=1), pericardial effusion (0.6%, n=1), gastroschisis (0.6%, n=1), and maternal myocarditis (0.6%, n=1). Demographic data and referral indications are summarized in Table 1.

Prenatal and Postnatal Diagnoses

The most common prenatal diagnosis was normal cardiac anatomy, observed in 61.96% of cases (n=101). Postnatal evaluation confirmed normal cardiac anatomy in 59.51% (n=97). Four discordant cases were identified who were evaluated as normal prenatally but were diagnosed with cardiac anomalies postnatally. One of these cases was diagnosed with venosum-type atrial septal defect (ASD) with partial anomalous pulmonary venous return (PAPVR), one with aortic arch hypoplasia, and the other two with wide secundum-type ASD. These diagnoses were confirmed by TTE performed in the postnatal period. Ventricular septal defect (VSD) was the second most frequent prenatal diagnosis, identified in 14.11% (n=23), while postnatal TTE confirmed VSD in 12.27% (n=20).

Among complex CHDs, tetralogy of Fallot (TOF) and complete atrioventricular septal defect (CAVSD) were prenatally detected in 2.45% of cases each (n=4) and were fully concordant with postnatal diagnoses. Similarly, TGA (1.84%, n=3) and HLHS (1.84%, n=3) showed complete agreement between prenatal and postnatal findings.

Less frequent diagnoses included ascending aortic dilatation, aortic arch hypoplasia, coarctation of the aorta, truncus arteriosus, right atrial isomerism (RAI)-CAVSD, Ebstein anomaly, tricuspid atresia with ventriculoarterial discordance (TA-VAD), total anomalous pulmonary venous drainage (TAPVD), double outlet right ventricle (DORV), VSD with pulmonary atresia (VSD-PA), interrupted aortic arch, borderline left ventricle, aortic stenosis, ARSA, pulmonary atresia with intact ventricular septum, right ventricular hypoplasia with pulmonary stenosis (RV hypoplasia-PS), and tricuspid atresia with ventriculoarterial concordance. All of these cases demonstrated 100% concordance between prenatal and postnatal diagnoses.

A noteworthy finding was that ASD was prenatally diagnosed in only 1 case (0.61%), while postnatal evaluation identified ASD in 8 cases (4.91%). The ASD detected in prenatal ultrasonography was primum type, and the distribution of 8 ASD cases diagnosed in the postnatal period was determined as follows; 1 primum ASD, 1 high (sinus venosus type) ASD accompanying partial anomalous pulmonary venous drainage (PAPVD), and 6 secundum ASD. In addition, a case of PAPVD associated with ASD, undetected prenatally, was diagnosed postnatally.

Table 2. Comparison of prenatal and postnatal echocardiographic diagnoses in congenital heart diseases: distribution of cases and diagnostic concordance

Diagnosis name	Fetal diagnosis count	Fetal diagnosis percentage	Postnatal diagnosis count	Postnatal diagnosis percentage
Normal	101	61.96	97	59.51
VSD	23	14.11	20	12.27
TOF	4	2.45	4	2.45
CAVSD	4	2.45	4	2.45
TGA	3	1.84	3	1.84
HLHS	3	1.84	3	1.84
Ascending aortic dilatation	2	1.23	2	1.23
Aortic arch hypoplasia	2	1.23	1	0.61
Aortic coarctation	2	1.23	2	1.23
Truncus arteriosus	2	1.23	2	1.23
RAI-CAVSD	2	1.23	2	1.23
Ebstein's anomaly	2	1.23	2	1.23
TA-VAD	1	0.61	1	0.61
TAPVD	1	0.61	1	0.61
DORV	1	0.61	1	0.61
VSD-PA	1	0.61	1	0.61
Interrupted aortic arch	1	0.61	1	0.61
Borderline LV	1	0.61	1	0.61
Aortic stenosis	1	0.61	1	0.61
ARSA	1	0.61	1	0.61
IVS-PA	1	0.61	1	0.61
RV hypoplasia - PS	1	0.61	1	0.61
TA-VAC	1	0.61	1	0.61
ASD	1	0.61	8	4.91
DILV-VAD	1	0.61	1	0.61
PAPVD-ASD	0	0.0	1	0.61
Total	163	100	163	100

VSD: Ventricular septal defect; ASD: Atrial septal defect; TOF: Tetralogy of fallot; TGA: Transposition of the great arteries; PAC: Premature atrial complex; TA-VAC: Tricuspid atresia + Ventriculoarterial concordance; RV: Right ventricle; PS: Pulmonary stenosis; HLHS: Hypoplastic left heart syndrome; PA: Pulmonary atresia; TAPVD: Total anomalous pulmonary venous drainage; ARSA: Aberrant right subclavian artery; IVS-PA: Intact ventricular septum-Pulmonary Atresia; CAVSD: Complete atrioventricular septal defect; DORV: Double outlet right ventricle; PAPVD: Partial anomalous pulmonary venous drainage; VSD-PA: Ventricular septal defect + Pulmonary atresia; TA-VAD: Tricuspid atresia + Ventriculoarterial discordance; DILV-VAD: Double inlet left ventricle + Ventriculoarterial discordance. When Kappa (Cohen's kappa) was used to evaluate the overall diagnostic agreement between fetal and postnatal echo diagnoses, the kappa value was found to be 0.949.

As shown in Table 2, FE achieved high diagnostic accuracy in major and complex CHDs such as TOF, TGA, HLHS, CAVSD, and DORV. However, detection rates were lower for lesions such as ASD and PAPVD, which are more readily diagnosed in the postnatal period.

The overall concordance rate between prenatal and postnatal echocardiographic diagnoses was 91.4%. The sensitivity of prenatal diagnoses was 86.36%, specificity 94.85%, positive predictive value (PPV) 91.94%, and negative predictive value (NPV) 91.09%. These findings indicate that FE demonstrates a high level of agreement with postnatal echocardiographic diagnoses. Diagnostic concordance rates and metrics are detailed in Table 3.

Table 3. Concordance rate and diagnostic metrics between prenatal echocardiography with postnatal diagnoses

Tanı Adı	Concordance rate (%)	SEN (%)	SPE (%)	PPV (%)	NPV (%)
General diagnostic accuracy metrics	91.41	86.36	94.85	91.94	91.09
Normal	91.4	94.8	86.3	91.1	91.9
VSD	96.9	95	97.2	82.6	99.3
ASD	95.7	12.5	100	100	95.7
TOF	100	-	-	-	-
Ascending aortic dilatation	100	-	-	-	-
TGA	100	-	-	-	-
TA-VAC	100	-	-	-	-
RV hypoplasia - PS	100	-	-	-	-
Ebstein's anomaly	100	-	-	-	-
Aortic arch hypoplasia	99.3	-	-	-	-
IVS-PA	100	-	-	-	-
Aortic coarctation	100	-	-	-	-
ARSA	100	-	-	-	-
Borderline LV	100	-	-	-	-
Aortic stenosis	100	-	-	-	-
RAI-CAVSD	100	-	-	-	-
CAVSD	100	-	-	-	-
DORV	100	-	-	-	-
Interrupted aortic arch	100	-	-	-	-
HLHS	100	-	-	-	-
VSD-PA	100	-	-	-	-
TAPVD	100	-	-	-	-
TA-VAD	100	-	-	-	-
Truncus arteriosus	100	-	-	-	-
DILV-VAD	100	-	-	-	-

Prenatal and postnatal concordance rates by diagnostic subgroup are included in the table. However, sensitivity (SEN), specificity (SPE), positive predictive value (PPV), and negative predictive value (NPV) are calculated and presented only for diagnostic groups with sufficient numbers of cases. For diagnoses with fewer cases, these metrics may not be statistically significant, so a '-' sign is used. SEN: Sensitivity; SPE: Specificity; PPV: Positive predictive value; NPV: Negative predictive value; VSD: Ventricular septal defect; ASD: Atrial septal defect; TOF: Tetralogy of fallot; TGA: Transposition of the great arteries; PAC: Premature atrial complex; TA-VAC: Tricuspid atresia + Ventriculoarterial concordance; RV: Right ventricle; PS: Pulmonary stenosis; HLHS: Hypoplastic left heart syndrome; PA: Pulmonary atresia; TAPVD: Total anomalous pulmonary venous drainage; ARSA: Aberrant right subclavian artery; IVS-PA: Intact ventricular septum-Pulmonary atresia; CAVSD: Complete atrioventricular septal defect; DORV: Double outlet right ventricle; PAPVD: Partial anomalous pulmonary venous drainage; VSD-PA: Ventricular septal defect + Pulmonary atresia; TA-VAD: Tricuspid atresia + Ventriculoarterial discordance; DILV-VAD: Double inlet left ventricle + Ventriculoarterial discordance.

On a diagnosis-based analysis, the majority of cases consisted of normal cardiac anatomy (62.0%; 101/163) and VSD (14.1%; 23/163). Concordance rates were 91.09% for normal cardiac anatomy and 82.61% for VSD. Importantly, many complex CHDs (e.g., TOF, TGA, DORV, and HLHS) were accurately diagnosed prenatally, with 100% concordance with postnatal findings. Particularly for critical lesions requiring surgical planning, such as TOF, TGA, and DORV, complete concordance underscored the clinical value of FE.

For some anomalies, such as aortic arch hypoplasia, concordance rates were lower (50.0%), highlighting the need for careful follow-up in anatomically challenging or progressive lesions.

Discussion

In this study, prenatal FE findings were compared with postnatal TTE results to evaluate diagnostic accuracy and concordance. Our findings demonstrate that FE provides high diagnostic accuracy in detecting both common and rare CHD, although certain lesions continue to present diagnostic challenges.

The overall diagnostic concordance rate in our study was 91.41%, with a sensitivity of 86.36%, specificity of 94.85%, PPV of 91.94%, and NPV of 91.09%. These values are consistent with previously reported results in the literature, which indicate diagnostic accuracy rates between 85% and 99%.[15–17] Furthermore, the achievement of 100% concordance in cases with complex CHDs such as TOF, TGA, HLHS, DORV, and CAVSD highlights the reliability of FE in identifying critical lesions that require surgical planning.[18–20]

Another noteworthy finding was the relatively low prenatal detection rates of lesions such as ASD and PAPVD, which have minimal hemodynamic impact during the prenatal period. In our cohort, ASD was detected prenatally in only one case, whereas eight cases were diagnosed postnatally. This may be attributed to the physiological characteristics of fetal circulation, limitations in assessing the atrial septum, and the presence of a physiologic right-to-left shunt through the patent foramen ovale, all of which may mask ASD in utero.[21,22] Similarly, the literature reports that lesions such as ASD, small VSDs, and mild pulmonary stenosis are frequently missed during prenatal evaluation.[23]

The concordance rate for aortic arch hypoplasia was 50%, consistent with the known challenges in diagnosing this lesion prenatally. Diagnostic difficulty is largely related to postnatal anatomical changes following ductal closure and the reduced image quality at later gestational ages.[24,25] High rates of both false-positive and false-negative diagnoses for coarctation of the aorta and other anatomically narrow segments have also been reported in the literature.[15,26]

We observed that diagnostic discordance increased in cases with highly complex cardiac anatomy. This finding supports previous observations by Benavidez et al.[27] and Stern et al.,[28] which emphasized the increased risk of diagnostic error in complex cases. In such scenarios, second opinions, case discussions in multidisciplinary conferences, and lesion-specific imaging protocols are recommended.

Overall, our results suggest that FE remains a powerful tool in the early detection of CHDs, particularly in high-risk pregnancies. Nevertheless, small defects and lesions located in anatomically challenging regions may require additional postnatal evaluation. To improve diagnostic accuracy, early evaluation in high-risk pregnancies (14–18 weeks), repeat examinations when necessary, and optimization of imaging techniques are recommended.[29,30]

The present study has several limitations. Being single-centered and retrospective in design limits the generalizability of our findings. In addition, the relatively small number of cases with rare CHD subtypes may reduce the reliability of calculated diagnostic accuracy rates for these lesions. Moreover, only patients with available postnatal follow-up were included, which may have introduced selection bias.

In conclusion, our study demonstrates that FE provides high diagnostic concordance for major CHDs, while diagnostic limitations persist in smaller and more complex lesions. These findings underscore the importance of systematically comparing prenatal and postnatal echocardiographic results, both to enhance diagnostic accuracy and to strengthen the reliability of family counseling.

Conclusion

Prenatal FE demonstrates high diagnostic accuracy and strong concordance with postnatal TTE in the evaluation of CHD. The method is particularly reliable in detecting major and critical lesions such as TOF, TGA, HLHS, DORV, and CAVSD, which require early surgical planning and family counseling.

However, diagnostic limitations persist in small defects (e.g., ASD and VSD) and anatomically challenging or complex lesions (e.g., aortic arch hypoplasia and PAPVD). These results highlight the necessity of systematic comparison between prenatal and postnatal echocardiographic findings to improve diagnostic accuracy, reduce false-positive and false-negative rates, and ensure more accurate parental counseling.

Ultimately, FE should be considered an indispensable tool in perinatal cardiology, particularly in high-risk pregnancies, while maintaining awareness of its limitations. Multidisciplinary collaboration and the use of lesion-specific imaging strategies may further enhance diagnostic reliability in complex cases.

Disclosures

Ethics Committee Approval: The study was approved by the Ordu University Clinical Research Ethics Committee (no: 91120269-800-E.0721090, date: 22.04.2022).

Informed Consent: Due to its retrospective design, informed consent was not obtained.

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