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EXTENDED

EARLY PRENATAL ULTRASOUND DETECTION OF VENTRICULAR SEPTAL DEFECT (VSD): A STANDARDIZED PROTOCOL, CONFIRMATION CRITERIA, AND STRATEGIES TO REDUCE OVERDIAGNOSIS

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Background: Ventricular septal defect (VSD) is the most common congenital heart defect and one of the leading reasons for referral to expert fetal echocardiography. Despite continuous improvements in ultrasound equipment and screening protocols, VSD remains a frequent source of diagnostic uncertainty: small defects may be missed, while pseudo-defects are often misinterpreted as true shunts. In early gestation (late first to early second trimester), the diagnostic challenge is amplified by the “dropout” phenomenon (apparent discontinuity of the septum caused by unfavorable beam–septum geometry), limited spatial/temporal resolution, motion artifacts from atrioventricular valves, and angle dependence of Doppler signals. These factors contribute to overdiagnosis, patient anxiety, unnecessary referrals, and increased burden on expert centers. Therefore, reproducible confirmation criteria and a standardized, quality-controlled screening workflow are needed.

Objective

To summarize evidence-based approaches for early prenatal detection of VSD and to propose an extended practical algorithm that includes: (1) standardization of mandatory cardiac planes (four-chamber view and three-vessel-and-trachea view—3VT), (2) pragmatic criteria for distinguishing true VSD from pseudo-defects, (3) rational use of transvaginal fetal echocardiography in early gestation, and (4) a structured follow-up pathway through postnatal confirmation.

Materials and Methods (practical protocol)

Based on a master’s level project framework, we propose the review and analysis of >100 prenatal ultrasound protocols performed at 12–20 weeks’ gestation, with expert reassessment and, when available, correlation with neonatal echocardiography. Maternal history and fetal risk factors (family history of congenital heart disease, maternal diabetes, teratogenic exposures, sonographic markers of aneuploidy, and extracardiac anomalies) are recorded. Examinations are performed transabdominally, and, in early gestation and/or suboptimal visualization, transvaginally when clinically indicated and acceptable to the patient.

The minimum fetal cardiac screening dataset includes: (1) confirmation of situs, (2) four-chamber view (4C) with focused assessment of the interventricular septum, (3) 3VT view to assess great-vessel relationships. If VSD is suspected, the protocol is expanded to include outflow tracts (LVOT/RVOT), short-axis ventricular views, and color Doppler interrogation across the septum.

Confirmation criteria and prevention of overdiagnosis

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To improve diagnostic reliability, a combined morphologic–hemodynamic approach is recommended, avoiding definitive diagnosis based solely on a grayscale “gap”. Key practical principles include:

- Assess the septum in at least two non-parallel planes (e.g., 4C plus short-axis or outflow-tract views). A finding that disappears with angle change is more consistent with dropout.
- Use color Doppler as a confirmation tool: true defects are more likely to demonstrate a reproducible shunt jet with appropriate settings (PRF/scale, gain, color box size and placement).
- Minimize technical sources of false flow: keep the color box small, avoid excessive gain, control aliasing, reduce PRF for low-velocity jets, and consider power Doppler/high-sensitivity flow modes when needed.
- Consider valve-related artifacts: atrioventricular valve leaflet/chordal motion may mimic septal discontinuity; cine-loop review and slow-motion playback help differentiate artifact from true defect.
- For suspected small muscular VSD without a convincing shunt, avoid premature final labeling; recommend repeat expert scanning in 1–3 weeks and mandatory postnatal verification.
- Store standardized still images and cine loops with documented settings to support reproducibility and inter-observer agreement.

Role of transvaginal fetal echocardiography in early gestation

Transvaginal scanning at 11–14 weeks (and selectively up to ~16 weeks) may improve signal-to-noise ratio and visualization due to shorter insonation distance and higher operating frequencies. It is particularly useful in early gestation, in challenging maternal habitus, retroverted uterus, or when screening findings are equivocal. Transvaginal echocardiography should be considered complementary to standard transabdominal assessment, performed under the ALARA principle (as low as reasonably achievable) with appropriate patient counseling.

Triage and follow-up algorithm

Proposed stepwise workflow:

- 11–13+6 weeks: if risk factors are present or 4C/3VT is suspicious—early (preferably transvaginal when appropriate) fetal echocardiography; if indeterminate, repeat at 14–16 weeks.
- 16–18 weeks: targeted expert fetal echocardiography with mandatory Doppler confirmation of a suspected septal shunt and assessment of LVOT/RVOT.
- 18–22 weeks: detailed anatomic classification (muscular, perimembranous, inlet, outlet), defect sizing, and evaluation for associated anomalies; genetic counseling when indicated.
- Isolated small VSD: counseling regarding generally favorable prognosis and potential spontaneous closure; plan neonatal echocardiography within the first weeks of life.
- Large and/or complex defects: plan delivery in a center with neonatal cardiology/cardiac surgery access; multidisciplinary case conference and individualized follow-up.

Expected outcomes and clinical relevance

Implementation of a standardized protocol with Doppler-based confirmation, documentation of planes and settings, and clear “equivocal case” criteria is expected to: (1) reduce overdiagnosis

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of VSD in late first/early second trimester screening, (2) improve inter-observer agreement, (3) optimize referral pathways to expert centers, and (4) increase the proportion of prenatally suspected cases that are appropriately verified postnatally.

Conclusions

Early prenatal VSD detection is feasible when mandatory screening planes (4C and 3VT) are obtained under a quality-controlled workflow and a multiplanar septal assessment is combined with Doppler confirmation. Transvaginal fetal echocardiography can improve early visualization in selected cases, but should be used rationally and safely. The core elements to reduce overdiagnosis are artifact control (dropout), optimized Doppler settings, repeat expert scanning for equivocal findings, and mandatory postnatal verification.

Keywords: Ventricular septal defect; prenatal diagnosis; fetal echocardiography; ultrasound screening; transvaginal ultrasound; four-chamber view; 3VT view; color Doppler; STIC; dropout; overdiagnosis.

Referens:

1. Усмонов Т. Ю., Тошпулатов Б. ИММУНОЛОГИЧЕСКИЕ ИЗМЕНЕНИЯ У ДЕТЕЙ С ХРОНИЧЕСКИМИ ЗАПОРАМИ, ВЛИЯНИЕ ХИРУРГИЧЕСКОГО ЛЕЧЕНИЯ //International innovation and researches. – 2025. – Т. 2. – №. 2. – С. 109-111.
2. Тошпулатов Б. Б., Кенжаева Г. ПРИЧИНА ВЫСОКОЙ СМЕРТНОСТИ ПРИ ВРОЖДЕННОЙ ДИАФРАГМАЛЬНОЙ ГРЫЖЕ И ПУТИ ЕЁ СНИЖЕНИЯ //International innovation and researches. – 2025. – Т. 2. – №. 2. – С. 106-108.
3. Тошпулатов Б. Б., Туланова О. НЕПРОИЗВОЛЬНОЕ ВЫДЕЛЕНИЕ ФЕКАЛИЙ ПОСЛЕ ОПЕРАЦИИ ПРИ БОЛЕЗНИ ГИРШПРУНГА, ПАТОГЕНЕЗ, ПРОФИЛАКТИКА И ЛЕЧЕНИЕ //International innovation and researches. – 2025. – Т. 2. – №. 2. – С. 114-118.
4. Тошпулатов Б. Б., Урмонова Р. Ф. БОЛЕЗНЬ ДОЛИХОСИГМА У ДЕТЕЙ //International innovation and researches. – 2025. – Т. 2. – №. 2. – С. 112-113.
5. Тошпулатов Б. Б., Туланова О. С. СОВРЕМЕННЫЕ ПОДХОДЫ К ДИАГНОСТИКЕ И ЛЕЧЕНИЮ БОЛЕЗНИ ГИРШПРУНГА У ДЕТЕЙ //International innovation and researches. – 2025. – Т. 2. – №. 2. – С. 104-105.
6. Goziyeva M. A., SH G. M., Toshpulatov B. B. TRANSVAGINAL ULTRASOUND WITH COLOR DOPPLER MAPPING IN THE DIAGNOSTIC WORK-UP OF UTERINE MASS LESIONS: A PRACTICAL ALGORITHM AND HEMODYNAMIC CRITERIA (SINGLE-CENTER CLINICAL SERIES) //Shokh Articles Library. – 2026. – Т. 1. – №. 1.
7. SH G. M., Goziyeva M. A., Toshpulatov B. B. PREVALENCE AND ULTRASONOGRAPHIC FEATURES OF BILIARY TRACT ABNORMALITIES IN WOMEN OF REPRODUCTIVE AGE AND PREGNANT WOMEN WITH CHRONIC HEPATITIS B //Shokh Articles Library. – 2026. – Т. 1. – №. 1.
8. SH G. M., Goziyeva M. A., Toshpulatov B. B. PREVALENCE AND ULTRASONOGRAPHIC PHENOTYPES OF BILIARY TRACT INJURY IN WOMEN OF REPRODUCTIVE AGE AND PREGNANT WOMEN WITH CHRONIC HEPATITIS B //Shokh Articles Library. – 2026. – Т. 1. – №. 1.

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9. Toshpulatov B. B. et al. LEFT HEMICOLECTOMY FOR DOLICHOSIGMA IN CHILDREN: A COMPARATIVE ANALYSIS OF PERIOPERATIVE PARAMETERS AND COMPLICATION RATES //Shokh Articles Library. – 2026. – Т. 1. – №. 1.
10. Toshpulatov B. B. et al. DIAGNOSTIC METHODS FOR DOLICHOSIGMA IN CHILDREN: A CONTEMPORARY REVIEW AND PRACTICAL ALGORITHM //Shokh Articles Library. – 2026. – Т. 1. – №. 1.
11. Эркинжонов А., Тошпулатов Б. ХИРУРГИЧЕСКАЯ ТАКТИКА ПРИ ЛЕЧЕНИИ ВЕНТРАЛЬНЫХ ГРЫЖ У ДЕТЕЙ С СОПУТСТВУЮЩЕЙ АБДОМИНАЛЬНОЙ ПАТОЛОГИЕЙ //International innovation and researches. – 2025. – Т. 2. – №. 2. – С. 85-87.
12. Мамажанов У. Ш., Тошпулатов Б. Б. ДОЛИХОСИГМА У ДЕТЕЙ: СОВРЕМЕННЫЕ ДИАГНОСТИЧЕСКИЕ КРИТЕРИИ, ДИФФЕРЕНЦИАЛЬНАЯ ДИАГНОСТИКА И ПОЭТАПНАЯ ТАКТИКА ЛЕЧЕНИЯ //Eurasian Journal of Medical and Natural Sciences. – 2025. – Т. 5. – №. 12. – С. 159-171.