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# Case Series of Prenatal Imaging of Fetal Anomalies in Ultrasound: A Radiologic Prospective

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Abstract: Prenatal imaging plays a crucial role in the early detection and evaluation of fetal anomalies, allowing for timely diagnosis, counselling, and management. Ultrasound remains the primary modality for fetal anomaly screening due to its accessibility, safety, and high-resolution imaging capabilities. This review explores the radiologic perspective on ultrasound-based prenatal imaging, detailing the role of different ultrasound techniques, including two-dimensional (2D), three-dimensional (3D), and Doppler imaging, in assessing structural and functional fetal abnormalities. Common congenital anomalies affecting the central nervous system, cardiovascular system, gastrointestinal tract, and musculoskeletal structures are discussed, along with their characteristic ultrasound findings. Additionally, the integration of adjunct imaging modalities such as fetal MRI is highlighted, particularly for complex or inconclusive cases. Advancements in artificial intelligence and emerging ultrasound technologies further enhance diagnostic accuracy and prognostic assessment. Understanding the strengths and limitations of ultrasound in fetal anomaly detection is essential for radiologists and maternal-fetal medicine specialists to optimize prenatal care and improve perinatal outcomes.

Keywords: Prenatal, Ultrasound, Chairi malformation, club foot, Aqueductal stenosis

## **1.Introduction**

Prenatal imaging plays a vital role in the early detection, diagnosis, and management of fetal anomalies, significantly influencing perinatal outcomes. Ultrasound (US) remains the cornerstone of prenatal anomaly screening due to its realtime imaging capabilities, safety, cost-effectiveness, and widespread availability. It serves as the first-line modality for assessing fetal development, detecting structural abnormalities, and guiding further diagnostic evaluations.

Routine ultrasound screening, typically performed in the first and second trimesters, allows for the early identification of congenital anomalies affecting various organ systems, including the central nervous, cardiovascular, gastrointestinal, and musculoskeletal systems. Advances in ultrasound technology, such as high-resolution twodimensional (2D) imaging, three-dimensional (3D) reconstruction, and Doppler assessment, have significantly improved the detection and characterization of fetal anomalies. Furthermore, emerging technologies, including artificial intelligence and machine learning applications, are enhancing the accuracy and efficiency of anomaly detection.

Despite its many advantages, ultrasound has limitations, particularly in cases of maternal obesity, oligohydramnios, or complex anomalies requiring further evaluation. In such scenarios, adjunct imaging modalities such as fetal magnetic resonance imaging (MRI) may provide additional diagnostic clarity. A comprehensive understanding of ultrasound techniques, fetal anomaly patterns, and the integration of advanced imaging approaches is essential for radiologists, obstetricians, and maternal-fetal medicine specialists to optimize prenatal care and facilitate early interventions when necessary.

This article provides a radiologic perspective on the role of ultrasound in prenatal imaging of fetal anomalies, highlighting its diagnostic capabilities, limitations, and recent advancements in the field.

#### Case 1

A 27-year-old multiparous female came for routine TIFFA scan at 21 weeks 1 day of gestational age with a history of one spontaneous miscarriage following imaging shows SEVERE HYDROCEPHALUS DUE TO AQUEDUCTAL STENOSIS



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Fetal ultrasound shows Figure A: Dilated bilateral lateral ventricles and third ventricle Figure B: Absent cavum septum pellucidum Figure C: Dangling choroid plexus seen. Figure D: Fourth ventricle appears normal. Case 2:

A 25-year-old primigravida female came for routine anomaly scan at 22 weeks 5 days gestational age shows BILATERAL CLUB FOOT.





Figure A & B shows anatomical deviation of bilateral foot, findings were consistent with congenital talipes equinovarus

## Case 3:

28-year-old multiparous women came for routine antenatal scan at 16 weeks. NT scan was not done.



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Ultrasound image of **Figure A & B** shows absent cranial vault. On coronal view of face, due to absence of cranium and bulging orbits it gives an appearance of frog eye.

#### **Diagnosis:** Anencephaly.

#### Case 4:

A 19-year-old primigravida female came for routine TIFFA scan at 21 weeks.





Figure A shows: Inward indentation of frontal bone and appears as lemon shaped skull.Figure B shows: Herniation of brain tissue through a defect in the posterior fossa region represents the occipital encephalocele

Diagnosis: Arnold Chairi Malformation

## **2.Discussion**

Ultrasound remains the primary imaging modality for the prenatal detection of fetal anomalies, offering a non-invasive, real-time, and cost-effective approach to evaluating fetal development. Its widespread availability and absence of ionizing radiation make it the preferred choice for routine screening and detailed anomaly scans. The ability to detect structural abnormalities early in gestation allows for timely interventions, parental counselling, and pregnancy management decisions.

#### **Common Fetal Anomalies Detected on Ultrasound**

Ultrasound effectively identifies a wide range of congenital anomalies across various organ systems:

- Central Nervous System (CNS) Anomalies Neural tube defects (e. g., anencephaly, spina bifida), ventriculomegaly, and holoprosencephaly are among the most commonly detected CNS abnormalities. Ultrasound helps assess brain structures and ventricular dilation, often prompting further evaluation with fetal MRI.
- Cardiac Anomalies Congenital heart defects (CHDs), including hypoplastic left heart syndrome, tetralogy of Fallot, and transposition of the great arteries, can be identified using fetal echocardiography. Early detection of CHDs is critical for perinatal planning and postnatal surgical interventions.
- Gastrointestinal and Abdominal Anomalies Conditions such as gastroschisis, omphalocele, and congenital diaphragmatic hernia can be diagnosed with ultrasound, allowing for early surgical planning and neonatal care coordination.
- Genitourinary and Skeletal Anomalies Renal agenesis, polycystic kidney disease, and limb abnormalities such as clubfoot or skeletal dysplasias can be identified through targeted ultrasound assessments.

# **3.**Conclusion

The ability to detect fetal anomalies through ultrasound has profound clinical implications, allowing for informed parental decision-making, multidisciplinary care coordination, and, in some cases, in utero therapeutic interventions. While ultrasound remains the gold standard for fetal anomaly detection, integrating advanced imaging techniques and emerging technologies will further refine diagnostic accuracy and improve perinatal outcomes. Continued research and technological developments will enhance the role of ultrasound in fetal medicine, ensuring early and accurate detection of congenital anomalies.

#### Conflict of Interest: Nil

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