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Original Article

Diagnostic Correlation of Antenatal Ultrasonography and Fetal MRI in the Evaluation of Fetal Central Nervous System Anomalies: A Hospital-Based Cross-Sectional Observational Study

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ABSTRACT

Background: Fetal central nervous system (CNS) anomalies are among the most common congenital malformations detected antenatally, second only to cardiac defects. Although prenatal ultrasonography (USG) remains the principal screening modality, its diagnostic accuracy is limited by operator dependence, fetal position, calvarial ossification and poor soft-tissue contrast. Fetal magnetic resonance imaging (MRI) has been proposed as a complementary modality that may refine and extend sonographic findings.

Objectives: To define the spectrum of fetal CNS anomalies on USG and MRI, to assess MRI confirmation of antenatal sonographic findings, and to compare the diagnostic efficacy of USG and fetal MRI in detecting fetal CNS anomalies.

Materials and Methods: A hospital-based cross-sectional observational study was conducted in the Department of Radiodiagnosis, Government Medical College and Rajindra Hospital, Patiala, on 35 pregnant women in whom fetal CNS anomalies were suspected or detected on routine or level II antenatal ultrasonography. All cases underwent fetal MRI on a 1.5-Tesla system (Siemens MAGNETOM AERA) using single-shot fast spin-echo T2-weighted, steady-state T1-weighted, fast multiplanar spoiled gradient-recalled and echo-planar diffusion-weighted sequences. MRI was interpreted by an experienced radiologist blinded to the sonographic interpretation. Diagnostic agreement, refinement and additional findings were analysed using SPSS, with chi-square, Fisher's exact, Mann–Whitney U, t-test and binary logistic regression as appropriate; $p < 0.05$ was considered significant.

Results: The mean maternal age was 26.03 ± 4.30 years and the mean gestational age at imaging was 23.66 ± 3.46 weeks. Neural tube defects (NTDs) were the most common anomaly category (42.9%), followed by ventriculomegaly (25.7%) and posterior fossa anomalies (20.0%). Complete agreement between USG and fetal MRI was observed in 15 cases (42.9%), partial agreement (refinement by MRI) in 16 (45.7%) and discordant findings in 4 (11.4%). Fetal MRI provided additional CNS findings in 16 of 35 cases (45.7%), with the highest yield in posterior fossa anomalies (57.1%) and ventriculomegaly (55.6%). Diagnostic agreement was lowest for posterior fossa anomalies, with no case of complete agreement ($p = 0.012$). On binary logistic regression, maternal age was an independent predictor of additional MRI yield (OR = 0.800, 95% CI 0.650–0.984, $p = 0.035$).

Conclusion: Antenatal USG remains the indispensable first-line modality for the detection of fetal CNS anomalies, but fetal MRI provides important additional or refined diagnostic information in nearly half of the cases, especially in posterior fossa malformations and complex ventriculomegaly. The combined use of USG

and fetal MRI yields a more accurate prenatal characterisation of fetal CNS anomalies, supporting better counselling and perinatal management.

Keywords: Fetal MRI; antenatal ultrasonography; fetal CNS anomalies; ventriculomegaly; neural tube defects; posterior fossa anomalies; prenatal diagnosis.

INTRODUCTION

Fetal central nervous system (CNS) anomalies represent a heterogeneous group of structural and developmental disorders that arise from disturbances of normal embryogenesis. They affect virtually every component of the developing nervous system, from the cerebral hemispheres and ventricular system to the posterior fossa and spinal cord, and constitute one of the most important diagnostic categories in antenatal imaging because of their relative frequency and major impact on perinatal survival, neurodevelopmental outcome and quality of life [1,2]. Among congenital malformations detected during pregnancy, CNS anomalies consistently rank second only to congenital cardiac defects [3].

Their clinical importance extends well beyond the antenatal period. Severe malformations such as anencephaly are incompatible with life and may result in stillbirth or early neonatal death, whereas survivors of less severe lesions often face cognitive impairment, seizures, motor disability and sensory deficits [5]. Even apparently mild abnormalities, such as isolated mild ventriculomegaly or partial agenesis of the corpus callosum, may have important neurocognitive implications. Accurate prenatal identification is therefore essential, both to inform parental decision-making within the relevant legal and ethical framework and to allow multidisciplinary planning involving obstetricians, radiologists, neonatologists and pediatric neurosurgeons [4].

Antenatal ultrasonography is the universally accepted first-line modality for screening of fetal CNS anomalies. It is portable, real-time, inexpensive, repeatable and free of ionising radiation, and remains the cornerstone of mid-trimester anomaly scanning [4,14]. Using the standard transthalamic, transventricular and transcerebellar axial planes, ultrasound permits reliable assessment of ventricular atrial width, the cavum septum pellucidum, the cerebellum and the cisterna magna, and is highly sensitive for major lesions such as anencephaly, encephalocele, open spina bifida, severe ventriculomegaly and posterior fossa cysts [16,17]. However, its accuracy is constrained by operator experience, maternal habitus, oligohydramnios, fetal position, multiple gestation and progressive calvarial ossification, and its limited soft-tissue contrast resolution reduces sensitivity for subtle cortical malformations, neuronal migration disorders and small haemorrhagic or ischaemic lesions [2,14].

Fetal MRI has emerged over the past two decades as a powerful adjunct to prenatal ultrasonography. Performed on 1.5-Tesla systems using ultrafast sequences after 18–20 weeks of gestation, it provides multiplanar imaging with excellent soft-tissue contrast and is unaffected by maternal body habitus, calvarial ossification or oligohydramnios [7,8]. Multiple studies, including the multicentre MERIDIAN trial, have shown that fetal MRI can refine or alter the sonographic diagnosis in a significant proportion of cases, particularly for complex or equivocal CNS lesions, and that this additional information may directly influence prenatal counselling and management [21,28,30,31,32].

Despite a growing body of literature, the relative diagnostic contribution of fetal MRI compared with antenatal USG continues to vary across populations, anomaly types, gestational ages and institutional protocols. There are relatively few prospective data from tertiary care centres in northern India, and the impact of demographic variables such as maternal age on diagnostic yield has been incompletely explored. The present study was therefore undertaken to describe the spectrum of fetal CNS anomalies in our population and to evaluate the correlation, additional diagnostic yield and agreement between antenatal ultrasonography and fetal MRI in a single tertiary care centre.

Aims and Objectives

- To define the spectrum of fetal CNS anomalies detected on antenatal USG and fetal MRI.
- To assess the confirmation of antenatal sonographic findings by subsequent fetal MR imaging.
- To compare the diagnostic efficacy of USG with fetal MRI in the diagnosis of fetal CNS anomalies.

MATERIALS AND METHODS

Study Design and Setting

This was a hospital-based, cross-sectional, observational study conducted in the Department of Radiodiagnosis, Government Medical College and Rajindra Hospital, Patiala, Punjab, India. Pregnant women referred from the Department of Obstetrics and Gynaecology for routine or level II antenatal ultrasonography with suspected fetal CNS abnormalities were prospectively enrolled. The study protocol was approved by the Institutional Ethics and Research Committee, and informed written consent was obtained from every participant prior to enrolment.

Study Population and Sample Size
A minimum of 35 cases was calculated as adequate to obtain statistically meaningful results, using the standard formula for estimation of proportions based on the prevalence of fetal CNS anomalies reported in previously published series. All consecutive eligible women presenting during the study period were included.

Inclusion and Exclusion Criteria
Pregnant women referred for routine or level II antenatal ultrasonography in whom fetal CNS anomalies were detected or suspected, as well as women with a history of fetal CNS anomalies in previous pregnancies, were included in the study. Women unwilling to undergo MRI and those with absolute contraindications to MRI, such as cardiac pacemakers or other incompatible implants, were excluded.

Imaging Equipment and Protocol
Ultrasonography was performed on a whole-body colour Doppler system using a 3.5–5.0 MHz transabdominal curvilinear probe. Examinations were carried out in standardisedtransthalamic, transventricular and transcerebellar axial planes, supplemented by coronal and sagittal sweeps and dedicated assessment of the ventricular atrial width, cavum septum pellucidum, cerebellum, cisterna magna and the fetal spine.
Fetal MRI was performed on a 1.5-Tesla MRI system (Siemens MAGNETOM AERA, Erlangen, Germany) without maternal or fetal sedation. The standard protocol included:

- Single-shot fast spin-echo T2-weighted imaging in three orthogonal planes.
- Steady-state T1-weighted imaging in the axial plane.
- Fast multiplanar spoiled gradient-recalled acquisition sequences.
- Echo-planar diffusion-weighted imaging in the axial plane with b-values of 0 and 800 s/mm².

No intravenous contrast was administered. MRI images were interpreted by an experienced consultant radiologist who was blinded to the detailed sonographic findings, and observations were recorded on a structured proforma.

Data Collection and Statistical Analysis
Maternal demographic data, gestational age at imaging, USG diagnosis, MRI diagnosis and the nature of any additional or discordant findings were recorded for each case. For each fetus, the MRI diagnosis was categorised as completely concordant with USG, refined (additional details by MRI without changing the diagnostic category) or discordant (MRI altered the primary diagnostic category). Data were entered into Microsoft Excel and analysed using SPSS. Continuous variables were expressed as mean ± standard deviation (SD) with 95% confidence intervals, and categorical variables as frequencies and percentages. Associations between categorical variables were tested using the chi-square test or Fisher's exact test as appropriate; continuous variables were compared using the independent t-test and Mann–Whitney U test. Binary logistic regression was used to identify independent predictors of additional MRI diagnostic yield. A p-value < 0.05 was considered statistically significant.

RESULTS
Thirty-five pregnant women with suspected fetal CNS anomalies detected on antenatal ultrasonography and subsequently evaluated with fetal MRI were included in the analysis.

Demographic and Gestational Characteristics
The mean maternal age was 26.03 ± 4.30 years (range 18–34 years; 95% CI 24.60–27.45) and the mean gestational age at imaging was 23.66 ± 3.46 weeks (range 18–31 weeks; 95% CI 22.51–24.80). The majority of women belonged to the 26–30 year age group (40.0%), followed by 21–25 years (34.3%). Most imaging examinations were performed between 21 and 24 weeks of gestation (40.0%), with a further 31.4% performed between 25 and 28 weeks (Table 1).

Table 1. Distribution of maternal age and gestational age at imaging (N = 35)

Parameter	Category	n (%)
Maternal age (years)	≤ 20	4 (11.4)
	21–25	12 (34.3)
	26–30	14 (40.0)
	> 30	5 (14.3)
	Mean ± SD	26.03 ± 4.30
Gestational age (weeks)	18–20	7 (20.0)
	21–24	14 (40.0)

	25–28	11 (31.4)
	> 28	3 (8.6)
	Mean ± SD	23.66 ± 3.46

Spectrum of Fetal CNS Anomalies

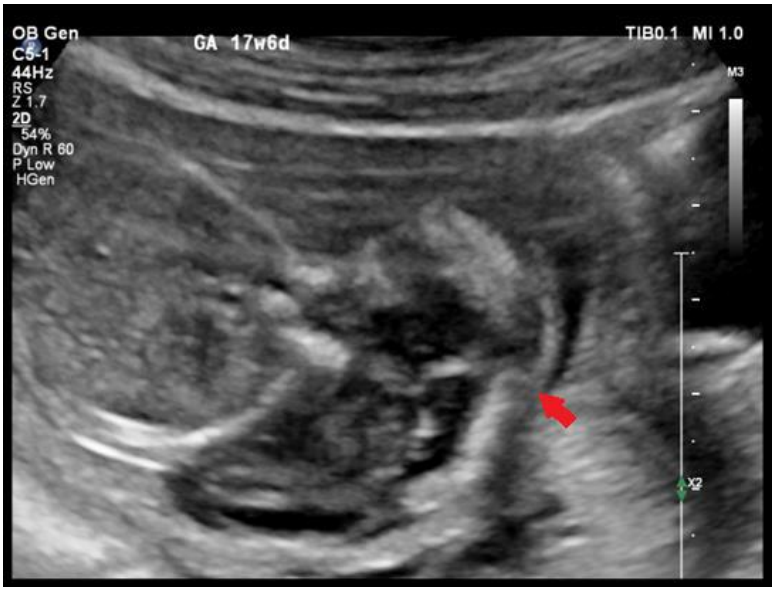
On final fetal MRI diagnosis, neural tube defects (NTDs) were the most frequent abnormality, occurring in 15 of 35 fetuses (42.9% as a combined category, including one case of NTD with Chiari II malformation and one case of encephalocele with inencephaly). Ventriculomegaly was the next most common finding (9 cases, 25.7%), followed by posterior fossa anomalies (7 cases, 20.0%) and midline/corpus callosal anomalies (2 cases, 5.7%). No case of cortical malformation such as schizencephaly was identified. On primary antenatal ultrasonography, NTDs (40.0%), ventriculomegaly (28.6%) and posterior fossa anomalies (20.0%) were also the most commonly detected categories; in addition, ultrasonography raised the suspicion of cortical malformation in two fetuses (5.7%) that were subsequently not confirmed on MRI (Table 2).

Table 2. Distribution of fetal CNS anomalies on primary antenatal USG and final fetal MRI diagnosis (N = 35)

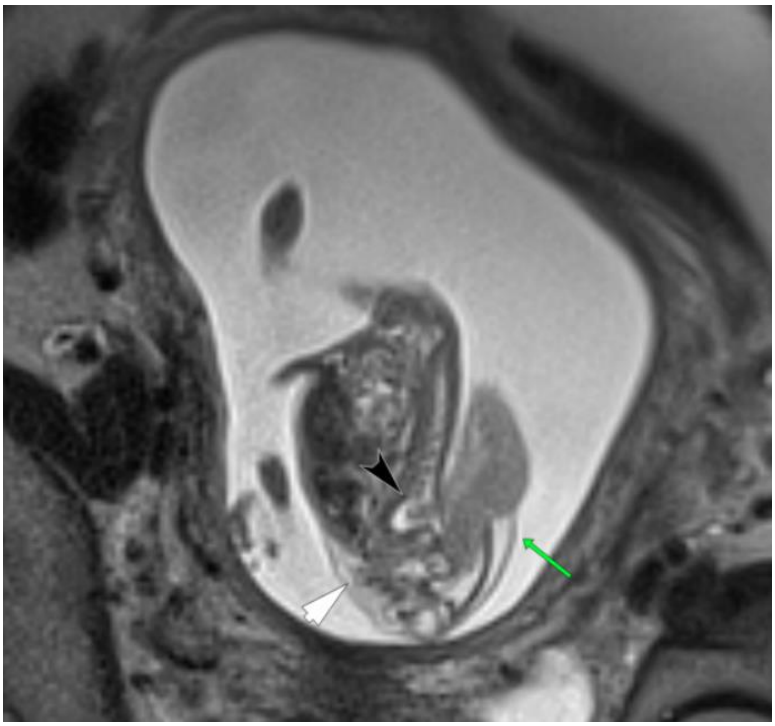
CNS Anomaly Category	USG, n (%)	Fetal MRI, n (%)
Neural tube defects	14 (40.0)	15 (42.9)
Ventriculomegaly	10 (28.6)	9 (25.7)
Posterior fossa anomalies	7 (20.0)	7 (20.0)
Midline / corpus callosal anomalies	2 (5.7)	2 (5.7)
Cortical malformations	2 (5.7)	0 (0.0)
Total	35 (100.0)	35 (100.0)

Representative antenatal USG and fetal MRI correlation images for the principal anomaly categories encountered in the study are shown as eight illustrative index cases in Figures 1–8.

Figure 1. Occipital encephalocele with inencephaly (Case 1).

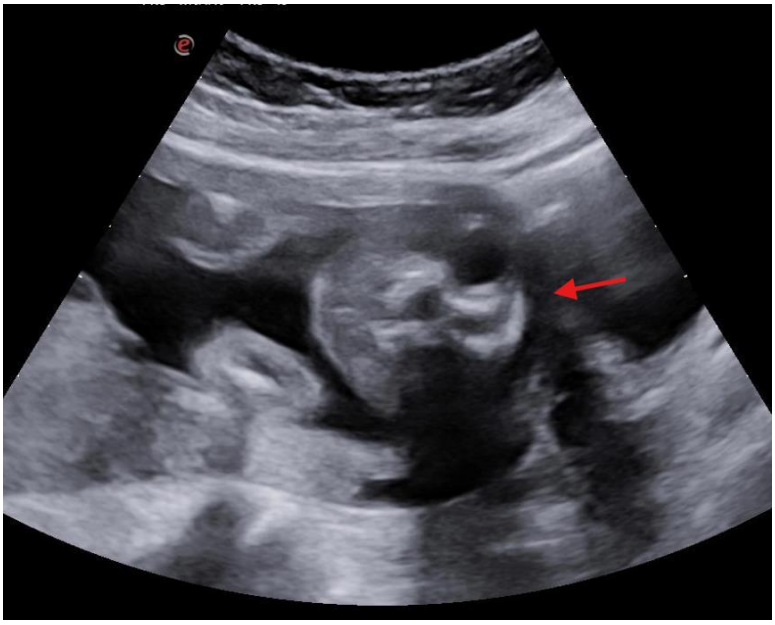


USG image showing a sagittal section of herniated brain tissue through the occipital region (red arrow) – occipital encephalocele.

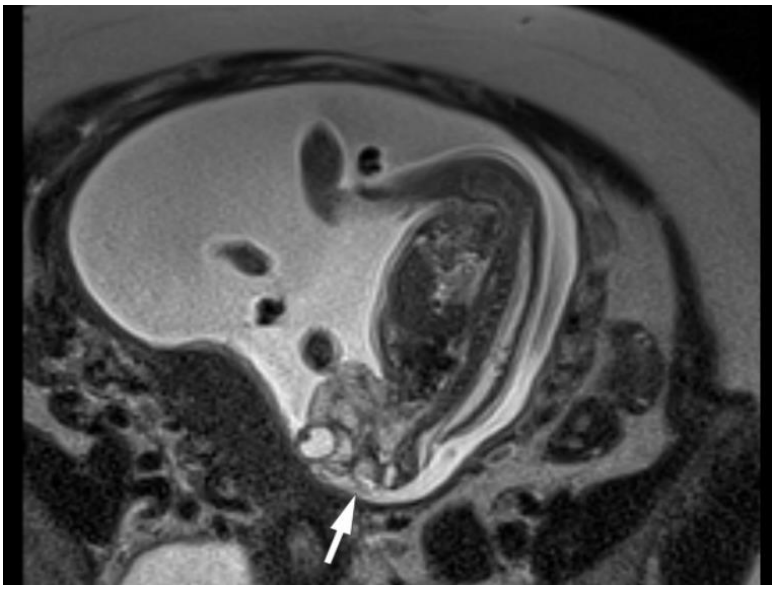


Sagittal T2-weighted MR image showing the "star-gazer" appearance of inencephaly: occipital defect with herniating brain contents – occipital encephalocele (green arrow), fused mandible with chest (white arrow) and absent / fused cervical vertebrae (black arrow).

Figure 2. Anencephaly (Case 2).

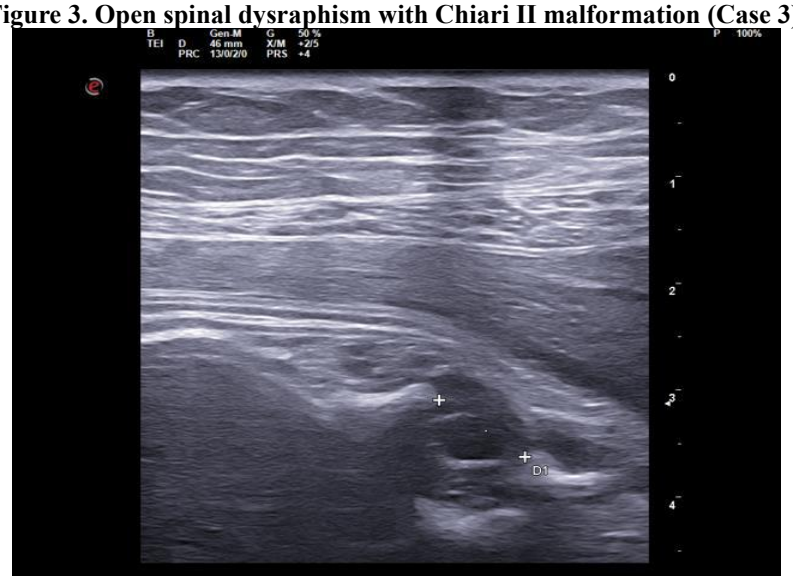


USG image showing a coronal section giving the typical "frog-eye" appearance of anencephaly.

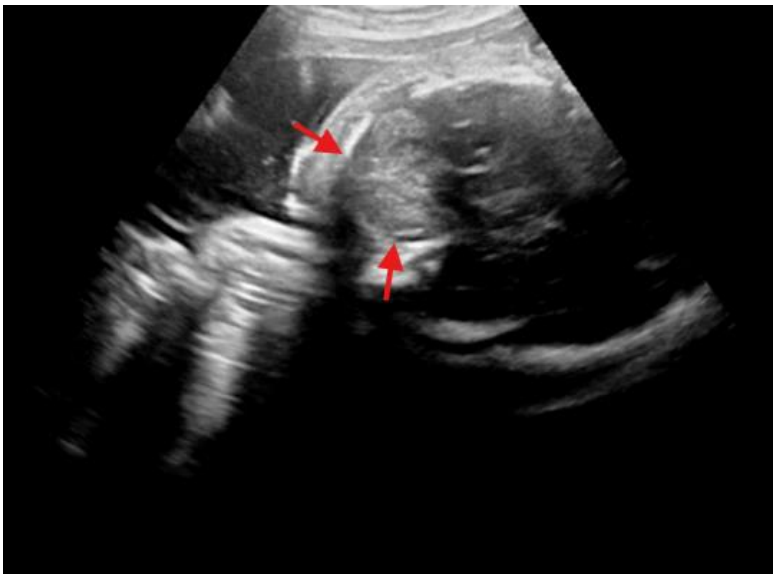


Sagittal MR image showing absent cranial vault and cortical tissue (white arrow).

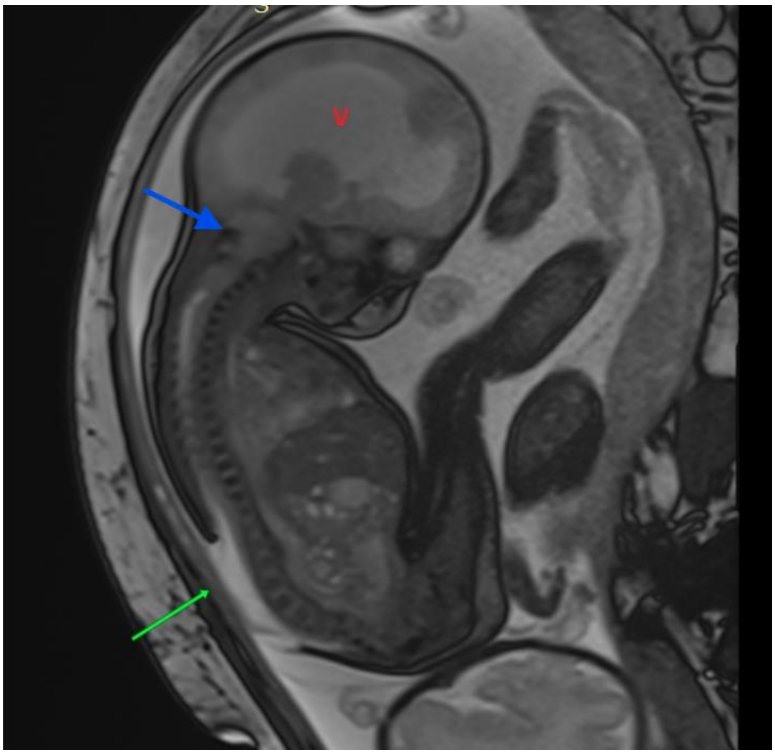
Figure 3. Open spinal dysraphism with Chiari II malformation (Case 3).



USG axial image acquired using a linear probe (3–12 MHz) showing splaying of the vertebral elements.

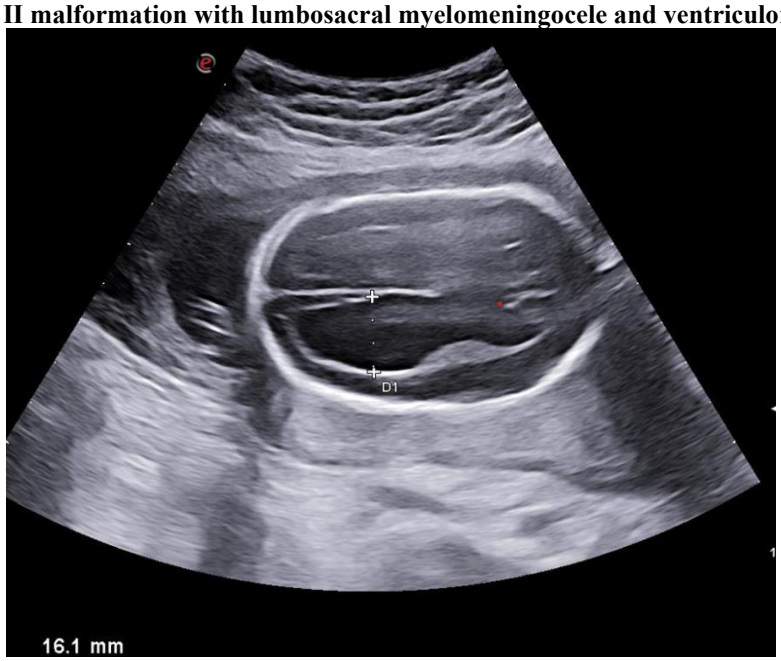


USG axial image showing a crowded posterior fossa giving a banana-shaped appearance of the cerebellum (red arrows).

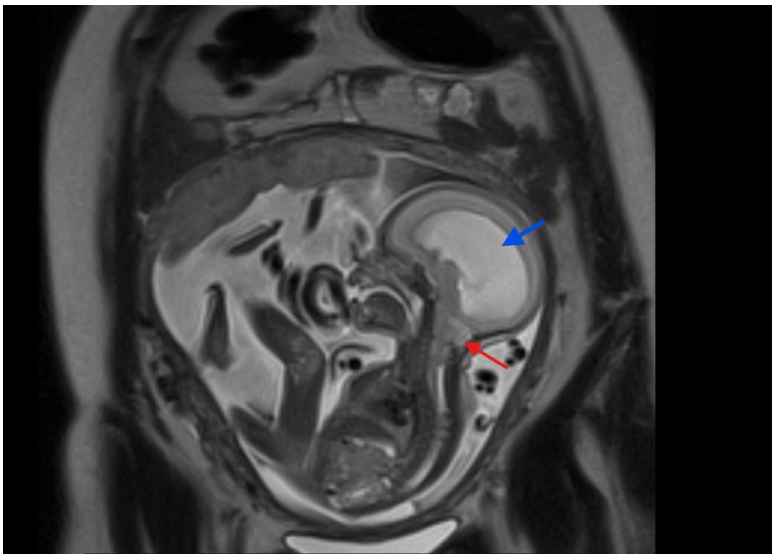


T2 TRUFI sagittal MR image showing ventriculomegaly (V), inferiorly displaced cerebellum and vermis with a crowded foramen magnum (blue arrow), and lumbosacral myelomeningocele (green arrow).

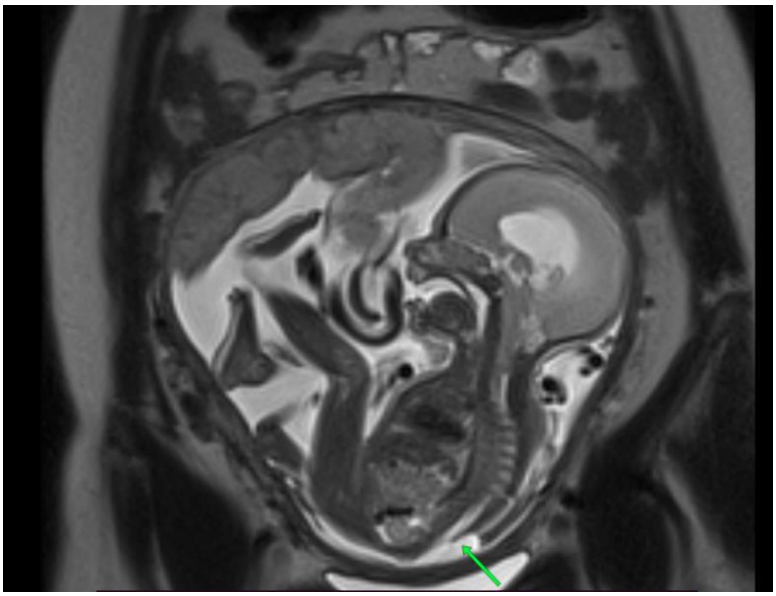
Figure 4. Chiari II malformation with lumbosacral myelomeningocele and ventriculomegaly (Case 4).



USG axial image showing dilated lateral ventricles.

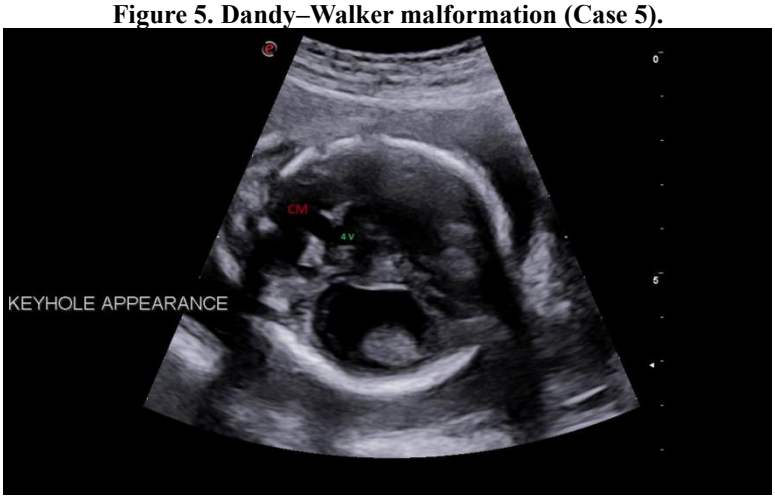


T2 HASTE sagittal MR image showing ventriculomegaly and inferiorly displaced cerebellum and vermis with a crowded foramen magnum (blue arrow).

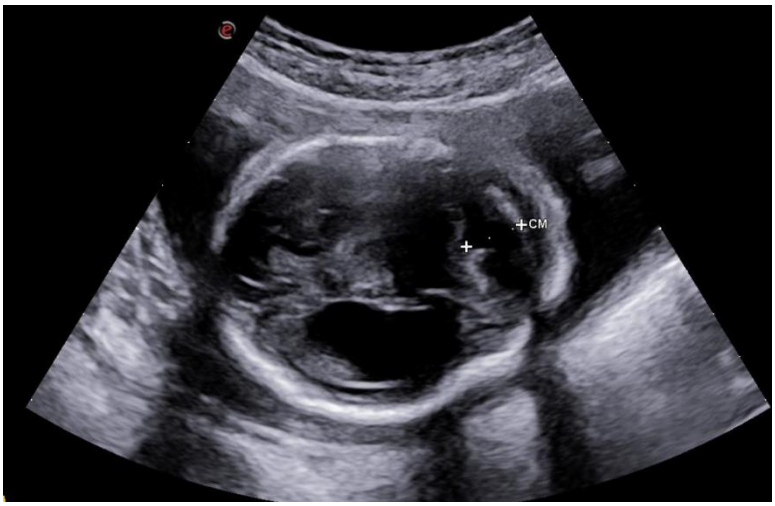


T2 HASTE sagittal MR image showing lumbosacral myelomeningocele (green arrow).

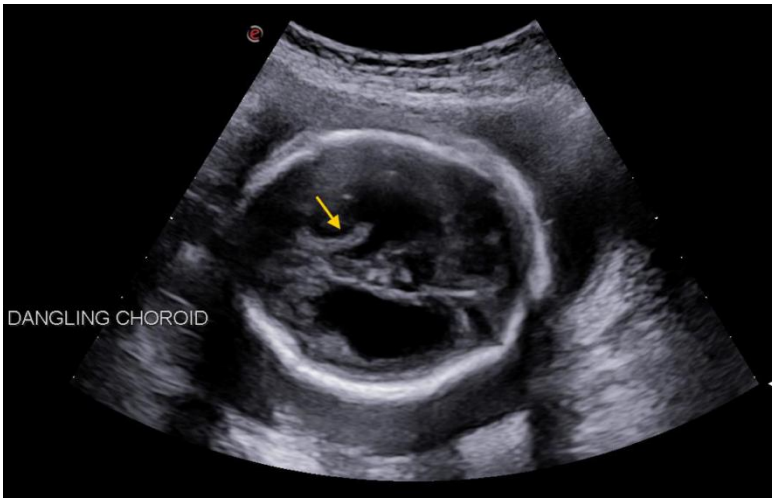
Figure 5. Dandy–Walker malformation (Case 5).



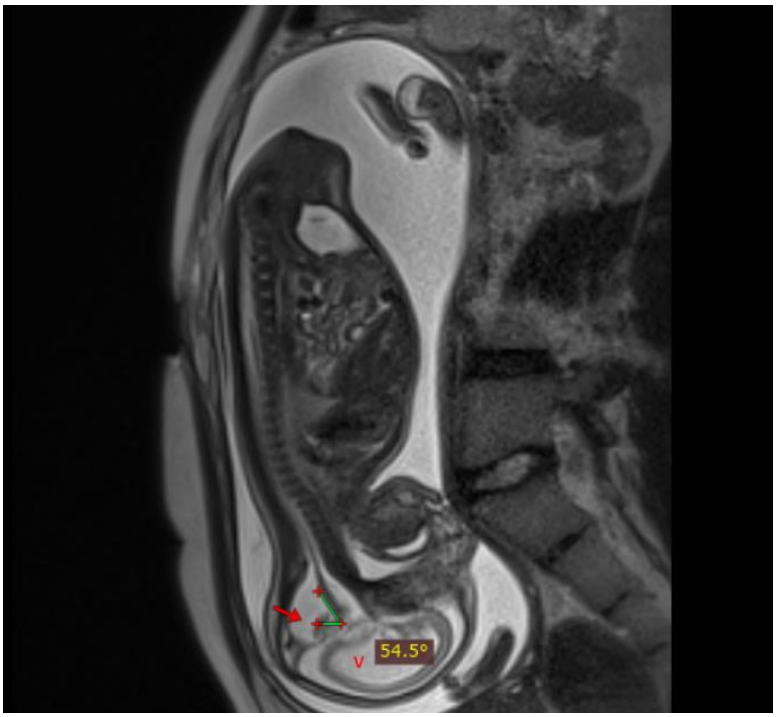
USG image showing communication of the fourth ventricle (4v) with the cisterna magna (CM).



USG axial image showing an enlarged cisterna magna (>10 mm).

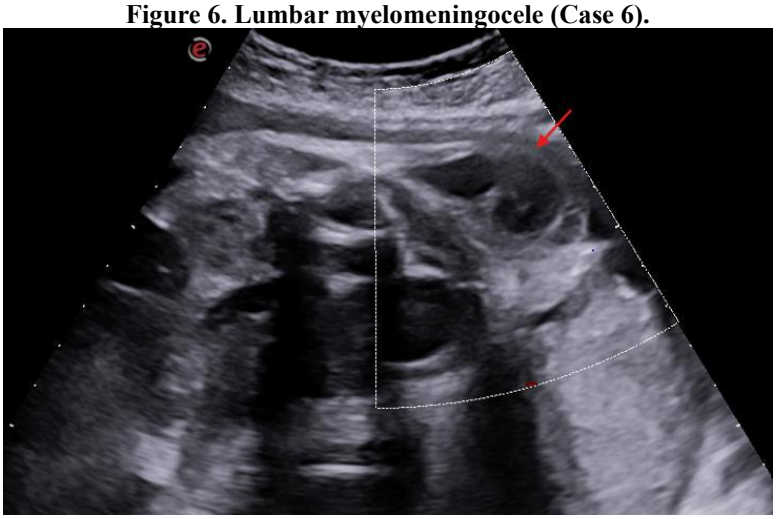


USG image showing enlarged lateral ventricles with the dangling choroid sign.



T2 midline sagittal MR image showing Dandy–Walker malformation: cystic enlargement of the posterior fossa, tegmento-vermian angle >45°, absent / hypoplastic inferior vermis (red arrow) and enlarged lateral ventricles (V).

Figure 6. Lumbar myelomeningocele (Case 6).



USG axial image showing a herniated fluid-filled sac through a lumbar vertebral defect (red arrow).

Confirmation and Diagnostic Agreement

Complete agreement between USG and fetal MRI (full confirmation of the primary sonographic diagnosis without addition or modification) was observed in 15 cases (42.9%). In the remaining 20 cases (57.1%), MRI either refined or altered the sonographic diagnosis. Categorising the agreement further, partial agreement, in which MRI added diagnostic detail without changing the primary diagnostic category, was seen in 16 cases (45.7%), whereas a complete change in diagnostic category (discordance) occurred in 4 cases (11.4%) (Table 3).

Table 3. Overall diagnostic agreement between antenatal USG and fetal MRI (N = 35)

Agreement Category	n	Percentage
Complete agreement (USG = MRI)	15	42.9
Partial agreement (MRI refined USG)	16	45.7
Discordant (MRI changed USG diagnosis)	4	11.4
Total	35	100.0

Additional Diagnostic Yield of Fetal MRI

Fetal MRI provided additional CNS findings beyond antenatal ultrasonography in 16 of 35 cases (45.7%). Anomaly-wise, the highest additional yield was observed for posterior fossa anomalies, where MRI revealed additional information in 4 of 7 cases (57.1%), followed by ventriculomegaly (5 of 9, 55.6%), midline/corpus callosal anomalies (1 of 2, 50.0%) and NTDs (6 of 15, 40.0%). The differences across anomaly categories were not statistically significant ($p > 0.05$) (Table 4).

Table 4. Anomaly-wise additional diagnostic yield of fetal MRI (N = 35)

CNS Anomaly Category	Total (n)	MRI Added (n)	Additional Yield (%)	p-value*
Neural tube defects	15	6	40.0	0.734
Ventriculomegaly	9	5	55.6	0.700
Posterior fossa anomalies	7	4	57.1	0.677
Midline / corpus callosal	2	1	50.0	1.000
Cortical malformations	0	0	—	1.000
Total	35	16	45.7	—

**Fisher's exact test.*

Diagnostic Agreement by Anomaly Type

Complete agreement between USG and fetal MRI was highest for NTDs, observed in 8 of 15 cases (53.3%), followed by midline/corpus callosal anomalies (1 of 2, 50.0%) and ventriculomegaly (4 of 9, 44.4%). In striking contrast, no posterior fossa anomaly demonstrated complete agreement; 4 of 7 cases showed partial agreement and 3 of 7 showed discordance. This anomaly-specific difference in diagnostic agreement was statistically significant ($p = 0.012$) (Table 5).

Table 5. Anomaly-wise distribution of diagnostic agreement between USG and fetal MRI (N = 35)

CNS Anomaly Category	Total	Complete Agreement	Partial Agreement	Discordant	Agreement (%)	p-value*
Neural tube defects	15	8	6	1	53.3	0.321
Ventriculomegaly	9	4	5	0	44.4	1.000
Posterior fossa anomalies	7	0	4	3	0.0	0.012
Midline / corpus callosal	2	1	1	0	50.0	1.000
Total	35	15	16	4	42.9	—

**Fisher's exact test.*

Influence of Gestational and Maternal Age

The additional diagnostic yield of fetal MRI was highest in fetuses imaged between 21 and 24 weeks of gestation (64.3%) and lowest beyond 28 weeks (0%); however, this association did not reach statistical significance ($\chi^2 = 5.301$, $p = 0.151$). The mean gestational age was similar in cases with and without additional MRI findings (23.25 ± 2.77 vs 24.00 ± 3.99 weeks; $t = -0.634$, $p = 0.530$).

Maternal age, on the other hand, was significantly lower in cases in which MRI added information (24.44 ± 4.08 years) than in those without additional findings (27.37 ± 4.11 years; $t = -2.108$, $p = 0.043$). The proportion of cases with additional MRI findings progressively declined with increasing maternal age category, from 75.0% in women ≤ 20 years to 20.0% in those > 30 years. On binary logistic regression, maternal age emerged as a statistically significant independent predictor of additional MRI diagnostic yield ($\beta = -0.223$, OR = 0.800, 95% CI 0.650–0.984, $p = 0.035$), whereas gestational age did not ($\beta = -0.148$, OR = 0.862, 95% CI 0.686–1.083, $p = 0.202$) (Table 6).

Table 6. Binary logistic regression: predictors of additional diagnostic yield from fetal MRI (N = 35)

Predictor	β	SE	Odds Ratio	95% CI for OR	p-value
Gestational age (weeks)	−0.148	0.116	0.862	0.686 – 1.083	0.202
Maternal age (years)	−0.223	0.106	0.800	0.650 – 0.984	0.035

DISCUSSION

In this prospective hospital-based observational study, fetal MRI provided additional or refined diagnostic information in nearly 60% of fetuses with suspected CNS anomalies on antenatal ultrasonography, with complete USG–MRI agreement in only 42.9% of cases. These findings reaffirm the role of fetal MRI as a clinically valuable adjunct to antenatal ultrasonography, particularly in complex or equivocal lesions, and they are broadly concordant with the existing international literature.

Spectrum of Fetal CNS Anomalies

Neural tube defects were the most frequent abnormality in our cohort, followed by ventriculomegaly and posterior fossa anomalies. This pattern is in close agreement with Singh et al. (2025), who reported ventriculomegaly (25.9%), NTDs (21.2%) and posterior fossa anomalies (18.8%) as the leading CNS abnormalities in a similar Indian cohort [42], and with Gosavi et al. (2025), in whose autopsy series CNS malformations constituted the most frequent congenital anomalies overall [44]. The relatively high proportion of NTDs in our cohort likely reflects ongoing variability in periconceptional folic acid supplementation and population-specific genetic factors [9,13].

No case of cortical malformation was confirmed on MRI in our series, although two such cases had been suspected on USG. This is consistent with the well-recognised difficulty of imaging cortical development in mid-gestation: Glenn et al. (2012) reported that diagnostic sensitivity for cortical malformations is highly dependent on gestational age and is markedly lower before 24 weeks [29]. The sonographic over-call in two cases also illustrates the known limitation of USG in resolving subtle cortical and migrational abnormalities [21,22].

Diagnostic Confirmation, Refinement and Discordance

Complete USG–MRI agreement was observed in 42.9% of fetuses, partial agreement (MRI refining USG) in 45.7% and discordance in 11.4%. These figures match closely the seminal study by Levine et al. (1999), who reported additional diagnostic information in 40% and improved CNS diagnostic clarity in 50% of cases [21], and Shin et al. (2018), who described MRI-related modification or addition in 52.5% of cases [32]. The MERIDIAN trial by Griffiths et al. (2017), the largest prospective multicentre study of fetal MRI in suspected brain abnormalities, demonstrated that MRI provided additional clinically relevant information in nearly half of all cases and changed prenatal counselling in roughly one-third [31]. Meta-analyses by Rossi and Prefumo (2014) and D'Antonio et al. (2016) have reported additional diagnostic yields of 22–24% [14,30]; the somewhat higher yield in our series may reflect the smaller, more selected, tertiary-referral nature of our cohort.

Anomaly-Specific Diagnostic Yield

The greatest incremental contribution of fetal MRI was observed in posterior fossa anomalies, where MRI added information in 57.1% of cases and complete USG–MRI agreement was not achieved in any case ($p = 0.012$). This is in strong agreement with Volpe et al. (2011), who emphasised the superior role of MRI in differentiating Dandy–Walker spectrum disorders, vermian hypoplasia and Blake's pouch cyst [3], and with the comprehensive review by Miller et al. (2021), which underscored MRI's ability to detect associated supratentorial abnormalities in fetuses with posterior fossa malformations [35]. The combination of subtle vermian anatomy and the technically demanding mid-sagittal sonographic view explains why posterior fossa pathology is particularly susceptible to sonographic mischaracterisation.

In ventriculomegaly, our additional diagnostic yield of 55.6% mirrors the findings of Ouahba et al. (2006), Yin et al. (2010) and Krishnan et al. (2021), all of whom demonstrated that fetal MRI frequently identifies occult intracranial abnormalities—particularly corpus callosal dysgenesis, cortical malformations or haemorrhagic lesions—that are not appreciated on ultrasound [25,27,36]. For NTDs, the relatively higher proportion of complete agreement (53.3%) is consistent with Aaronson et al. (2003), who reported that ultrasound and MRI are largely comparable in establishing the level of spinal lesions, with MRI mainly contributing additional anatomical detail rather than redefining the diagnosis [20].

Influence of Gestational and Maternal Age

Additional diagnostic yield was highest between 21 and 24 weeks (64.3%) and absent beyond 28 weeks; however, the association with gestational age did not reach statistical significance, as also reported in the meta-analyses of Rossi and Prefumo (2014) and D'Antonio et al. (2016), which concluded that the incremental value of fetal MRI is largely independent of gestational timing [14,30]. Mourad et al. (2019) and Levine et al. (2008) have argued that MRI becomes particularly valuable in later gestation, when calvarial ossification limits ultrasonography [24,33]; the absence of additional MRI findings beyond 28 weeks in our series likely reflects the small number of fetuses imaged at that gestation rather than a true diagnostic limitation.

An interesting observation in our study is the statistically significant inverse relationship between maternal age and additional MRI diagnostic yield (OR = 0.800 per year, $p = 0.035$). Previous landmark studies, including Levine et al. (1999), Griffiths et al. (2017), Shin et al. (2018) and Chauhan and Nandolia (2023), did not identify maternal age as a major determinant of MRI yield [21,31,32,40]. The finding in our cohort may represent either a chance association arising from a modest sample size or a population-specific phenomenon linked to differences in referral patterns, anomaly spectrum or sonographic vigilance across age groups. This observation merits further evaluation in larger, multicentre studies.

Clinical Implications

Taken together, our findings support a complementary rather than competitive view of antenatal USG and fetal MRI. Ultrasonography correctly identified the principal CNS lesion category in nearly 89% of cases, in keeping with its role as the universal screening modality. Fetal MRI, however, contributed substantively to diagnosis in nearly half of all cases, especially when posterior fossa pathology or complex ventriculomegaly was suspected, and avoided over-call in fetuses with sonographically suspected cortical malformations. In a clinical context where prenatal counselling, decisions regarding continuation of pregnancy and planning for perinatal neurosurgical or neonatal care depend critically on the accuracy of imaging, the addition of fetal MRI to USG in selected high-risk cases is likely to translate into more informed parental choices and improved perinatal management.

Limitations

1. The sample size of 35 cases, although adequate for the planned proportions analysis, limits the statistical power of subgroup comparisons and the generalisability of the findings.
2. The study was conducted in a single tertiary care centre, introducing the possibility of selection and referral bias.
3. Postnatal imaging, surgical findings and autopsy correlation were not uniformly available for all cases, which would have constituted the strongest reference standard for diagnostic accuracy.
4. Both USG and MRI interpretations, although standardised, remain dependent on operator expertise and equipment, which may influence sensitivity for subtle CNS anomalies.

CONCLUSION

Antenatal ultrasonography remains the principal and indispensable screening modality for the detection of fetal CNS anomalies. In our cohort, fetal MRI complemented USG by providing additional or refined diagnostic information in nearly 60% of suspected cases and by avoiding sonographic over-call in fetuses initially thought to harbour cortical malformations. The incremental contribution of MRI was greatest in posterior fossa anomalies, where no case showed complete USG–MRI agreement, and in complex ventriculomegaly. Maternal age was identified as an independent predictor of additional MRI yield, a finding that warrants validation in larger studies. The combined use of antenatal USG and fetal MRI provides a more accurate and comprehensive prenatal characterisation of fetal CNS anomalies, supporting better counselling, multidisciplinary planning and perinatal management.

DECLARATIONS

Ethical approval: The study protocol was approved by the Institutional Ethics and Research Committee, Government Medical College, Patiala. Written informed consent was obtained from all participants.

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Author contributions: NSB: study design, data acquisition, image interpretation, data analysis and manuscript drafting. MM: study concept, supervision, image interpretation and critical review of the manuscript. PK: clinical correlation, obstetric data acquisition and critical review. All authors approved the final version of the manuscript.

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