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# Lumbosacral Myelomeningocele Associated With Sonographic Signs of Chiari II Malformation: A Case Report

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***Abstract:*** *Myelomeningocele is the most severe open form of spina bifida and results from failure of neural tube closure. Prenatal diagnosis is primarily based on ultrasonography, which permits direct visualization of the spinal defect and identification of indirect intracranial signs suggestive of Chiari II malformation. We report the case of a 40-year-old multiparous woman with no significant medical history who was admitted at term in early labor following an unmonitored pregnancy. Obstetric ultrasound revealed a live singleton fetus in cephalic presentation with an estimated fetal weight of 3000 g. Cerebral examination showed lateral ventricular ventriculomegaly measuring 15 mm, dilatation of the third ventricle, non-visualization of the cisterna magna, a banana-shaped cerebellum, and a lemon-shaped appearance of the frontal bones. Spinal examination demonstrated a 2.30 × 0.75 cm lumbosacral posterior spinal defect containing echogenic structures compatible with neural tissue and communicating with the spinal canal. The lesion was covered by a thin membrane without complete skin coverage, consistent with open myelomeningocele. Vaginal delivery resulted in the birth of a male neonate weighing 3100 g, with an Apgar score of 8/10. Neonatal examination revealed spina bifida associated with clubfeet. The newborn was referred for specialized pediatric surgical management. This case emphasizes the importance of systematic fetal morphological ultrasound examination, particularly assessment of the spine and posterior fossa, in the prenatal diagnosis of neural tube defects.*

**Keywords:** myelomeningocele; spina bifida; Chiari II malformation; prenatal diagnosis; obstetric ultrasound; ventriculomegaly; neural tube defects

## Introduction

Neural tube defects are congenital malformations resulting from failure of neural tube closure during embryogenesis. They include anencephaly and the various forms of spina bifida.

Spina bifida is characterized by a defect in the closure of the posterior vertebral structures. It may be closed, when the defect is covered by skin, or open, when the meninges and/or neural structures communicate with the external environment. Myelomeningocele represents the major form of open spina bifida and consists of a vertebral defect with herniation of the meninges and neural tissue.

Prenatal diagnosis of neural tube defects is primarily based on obstetric ultrasonography. The second-trimester morphological examination generally permits systematic assessment of the skull, brain, posterior fossa, and entire spine. In cases of open spina bifida, several indirect intracranial signs may be observed, including ventriculomegaly, the lemon sign of the frontal bones, the banana sign of the cerebellum, and effacement or non-visualization of the cisterna magna. These findings are characteristic of the Chiari II malformation spectrum [1-3].

Recognition of these intracranial signs is particularly important when the spinal defect is difficult to visualize. Abnormalities of the posterior fossa may therefore prompt a systematic search for a spinal lesion [2,3].

We report a case of lumbosacral myelomeningocele diagnosed at term in a patient whose pregnancy had not received prenatal follow-up and in whom several sonographic findings were suggestive of Chiari II malformation.

## Case Report

A 40-year-old woman,G4P3, with no significant medical history was admitted to our department for management of term labor following an unmonitored pregnancy.

On admission, the patient was conscious, afebrile, and hemodynamically and respiratorily stable. Urinalysis was negative. Gynecological and obstetric examination revealed a uterine height appropriate for gestational age. Fetal heart sounds were present and regular. The patient was in spontaneous early labor with intact membranes.

## Ultrasound Findings

Obstetric ultrasound revealed a live singleton fetus with positive cardiac activity, cephalic presentation, and a homogeneous fundal placenta. The estimated fetal weight was 3000 g.

The morphological examination revealed several abnormalities involving the fetal central nervous system.

At the cerebral level, ventriculomegaly involving the lateral ventricles, measuring 15 mm, was observed, together with dilatation of the third ventricle. The cisterna magna was not visualized. The cerebellum showed a characteristic banana-shaped appearance, while the frontal bones demonstrated inward concavity, resulting in a lemon-shaped appearance.

Spinal examination revealed a posterior spinal defect at the lumbosacral level measuring approximately 2.30 × 0.75 cm. The lesion was heterogeneous and contained echogenic structures compatible with neural tissue. It communicated with the spinal canal and was covered by a thin membrane without complete skin coverage.

The combination of these findings was consistent with an open spinal dysraphism of the lumbosacral myelomeningocele type, associated with intracranial sonographic findings suggestive of Chiari II malformation.



Figure 1:Transverse ultrasound view of the fetal head showing ventriculomegaly



Figure 2:Sagittal ultrasound view of the fetal spine showing the lumbosacral spinal defect consistent with spina bifida.



Figure 3:Postpartum photograph of the newborn showing a lumbosacral spinal malformation consistent with spina bifida.

**Delivery and Neonatal Outcome**

Labor progressed spontaneously without reported complications, and vaginal delivery was performed.

A male neonate was delivered with a birth weight of 3100 g and an Apgar score of 8/10.

Neonatal examination revealed spina bifida associated with clubfeet. The newborn was referred to the pediatric surgery department for specialized management.

The maternal postpartum course was uneventful.

**Discussion**

Myelomeningocele is a major congenital anomaly resulting from failure of neural tube closure. It is an open form of spina bifida and may result in significant neurological, orthopedic, and urological sequelae. Clinical presentation and functional prognosis depend, among other factors, on the level and extent of the spinal lesion [1,4].

In the present case, the diagnosis was established at term in the setting of an unmonitored pregnancy. Ultrasonography identified both the lumbosacral spinal defect and several intracranial abnormalities suggestive of the Chiari II spectrum.

**Sonographic Diagnosis of Myelomeningocele**

Ultrasonography is the first-line imaging modality for prenatal screening and diagnosis of neural tube defects. Current recommendations support a second-trimester morphological ultrasound examination with systematic assessment of the fetal brain and spine [1].

In open forms of spina bifida, the spinal defect may be directly visualized as an interruption of the posterior vertebral arches associated with protrusion of the meninges and neural structures.

In our case, the posterior lumbosacral defect was associated with a 2.30 × 0.75 cm lesion communicating with the spinal canal and containing echogenic structures compatible with neural tissue. The absence of complete skin coverage further supported the diagnosis of an open spinal dysraphism.

The presence of neural tissue within the herniated sac helps distinguish myelomeningocele from meningocele, in which the sac primarily contains meninges and cerebrospinal fluid.

Ultrasonography may also provide an approximate assessment of the level of the spinal defect. However, precise identification of the upper level of the lesion may be challenging, and fetal magnetic resonance imaging may provide additional anatomical information in selected cases [5].

**Intracranial Signs Suggestive of Chiari II Malformation**

Chiari II malformation is strongly associated with open spina bifida. It is characterized by abnormalities of the posterior fossa and downward displacement of posterior fossa structures.

Classic prenatal sonographic findings include ventriculomegaly, concavity of the frontal bones producing the lemon sign, and deformation of the cerebellum producing the banana sign, often associated with reduction or non-visualization of the cisterna magna [2,3].

A systematic review reported that these abnormalities are frequently observed in fetuses with myelomeningocele. The banana sign was reported in 50% to 100% of cases depending on the series, the lemon sign in 53% to 100%, and ventriculomegaly in 45% to 89% [2].

In our case, the combination of ventriculomegaly, non-visualization of the cisterna magna, a banana-shaped cerebellum, and lemon-shaped frontal bones was highly suggestive of the Chiari II spectrum.

However, Chiari II malformation was not confirmed by documented postnatal neuroimaging in our case. Therefore, the more rigorous terminology is “sonographic findings suggestive of Chiari II malformation.”

**The Lemon Sign and the Banana Sign**

The lemon sign corresponds to concavity of the frontal bones on an axial view of the fetal skull. It was initially described as an indirect sonographic sign of open spina bifida [6].

The banana sign refers to deformation and curvature of the cerebellum around the brainstem and represents another classic indirect sign of open spina bifida [7].

These intracranial signs may be particularly useful when the spinal defect is small or difficult to visualize. Assessment of the posterior fossa can therefore contribute significantly to the prenatal diagnosis of open spina bifida [8].

Nevertheless, the lemon sign is not completely specific for myelomeningocele and should be interpreted in the context of the complete fetal morphological examination [9]. In our case, its association with the banana sign, non-visualization of the cisterna magna, ventriculomegaly, and direct visualization of the spinal lesion considerably strengthened the diagnostic suspicion.

**Ventriculomegaly**

Ventriculomegaly is a frequent intracranial abnormality associated with myelomeningocele. In our case, the lateral ventricles measured 15 mm, corresponding to significant ventriculomegaly.

The frequency of ventriculomegaly in fetuses with myelomeningocele varies among series and according to gestational age. It may evolve during pregnancy and may reflect disturbances in cerebrospinal fluid dynamics associated with the Chiari II spectrum [2].

The presence of ventriculomegaly warrants careful cerebral assessment and appropriate sonographic follow-up when prenatal follow-up is possible.

**Orthopedic Manifestations**

Our case also demonstrated clubfeet at neonatal examination.

Orthopedic abnormalities, particularly foot deformities, are frequently associated with severe forms of spina bifida and may reflect underlying neurological involvement. They should therefore be assessed systematically during fetal ultrasound examination and after birth.

Postnatal management generally requires a multidisciplinary approach involving pediatric surgery or neurosurgery, neurology, orthopedics, urology, and rehabilitation according to the neurological and functional sequelae.

**Importance of Prenatal Diagnosis**

Prenatal diagnosis of neural tube defects allows parental counseling, assessment of associated anomalies, evaluation of prognostic factors, and planning of delivery and postnatal care in an appropriate specialized center [1].

In selected cases, prenatal repair of myelomeningocele may be considered in specialized centers. The Management of Myelomeningocele Study demonstrated that fetal surgery, in appropriately selected patients, reduced the need for postnatal cerebrospinal fluid shunting and improved certain neurological outcomes, although it was associated with increased maternal and obstetric risks [10].

In our case, the diagnosis was made at term, precluding fetal intervention. The newborn was therefore referred for specialized postnatal management.

**Prevention of Neural Tube Defects**

Primary prevention of neural tube defects relies particularly on adequate folic acid supplementation before conception and during early pregnancy. International recommendations emphasize the importance of preconceptional and early pregnancy supplementation [11].

Because the pregnancy in our case had not received prenatal follow-up, information regarding folic acid supplementation was unavailable. Therefore, no conclusion can be drawn regarding the presence or absence of a preventive factor in this case.

**Conclusion**

Lumbosacral myelomeningocele is a major neural tube defect for which prenatal diagnosis relies primarily on ultrasonography. In the present case, direct visualization of an open lumbosacral spinal defect containing structures compatible with neural tissue, together with ventriculomegaly, a banana-shaped cerebellum, lemon-shaped frontal bones, and non-visualization of the cisterna magna, strongly supported the diagnosis of lumbosacral myelomeningocele with sonographic findings suggestive of Chiari II malformation.

This case emphasizes the importance of systematic fetal morphological examination, including detailed assessment of the brain, posterior fossa, and entire spine. Recognition of indirect signs of Chiari II malformation can facilitate the diagnosis of open spina bifida, particularly when the spinal defect is difficult to visualize. Early prenatal diagnosis also permits appropriate parental counseling and facilitates multidisciplinary management in a specialized center.

**Declarations**

**Conflict of Interest:** The authors declare that they have no conflict of interest.

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**Informed Consent: [Please confirm before submission: Written informed consent was obtained from the parents for publication of the clinical information and accompanying images of the newborn.]**

**Ethics Approval: [Please replace this statement with the actual status of institutional ethics committee/IRB approval or exemption. Do not submit the current wording "To be adapted..."].**

**Authors' Contributions:** All authors participated in the clinical management, analysis and interpretation of the data, drafting of the manuscript, and critical revision of the manuscript.

**Data Availability:** All relevant data supporting the findings of this case are presented in the manuscript. Additional information may be made available by the corresponding author in accordance with ethical and institutional requirements.

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