



The Stomach-Bladder Proximity Sign: What Does it Say?

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J Fetal Med

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Abstract

Keywords

- ▶ anterior coronal sonogram
- ▶ congenital diaphragmatic hernia
- ▶ gastrointestinal
- ▶ gastroschisis
- ▶ stomach bladder proximity

Fetal gastrointestinal tract (GIT) anomalies account for 7 to 8% of congenital malformations. There are no well defined protocols for examining fetal GIT, which is a dynamic system that plays a vital role in amniotic fluid homeostasis. We present four cases that highlight the importance of the relative positions of the stomach, small bowel, and bladder in the coronal plane of the fetal abdomen in the diagnosis/exclusion of certain anomalies.

Introduction

Fetal gastrointestinal tract (GIT) anomalies account for 7.35% of congenital malformations.¹ There are no well defined protocols to examine fetal GIT, unlike fetal echocardiogram or neurosonogram. Amniotic fluid homeostasis is maintained by the balance between the inflow from the fetal urinary tract and lung secretion and the outflow by swallowing and absorption by the fetal GIT.² Hence, the fetal GIT is a dynamic system that plays a vital role in amniotic fluid homeostasis. We present four cases that highlight the importance of the relative positions of the stomach, small bowel, and bladder in the coronal plane of the fetal abdomen in the diagnosis/exclusion of certain anomalies.

Case 1

A 21 year old primigravida was referred at 26 weeks with suspected congenital pulmonary airway malformation. She had not undergone a first trimester screening and target

scan. Her antenatal course was otherwise uneventful. There was no significant medical or surgical history. On ultrasound examination at our center, the fetal growth, liquor, and Doppler appeared appropriate for gestational age.

The axial section of the thorax at the level of the 4 chamber view revealed a mild mediastinal shift to the left (▶**Fig. 1A**). The coronal view of the fetal abdomen showed an unusual proximity of the fetal stomach and the bladder (stomach bladder proximity sign) (▶**Fig. 1B**). Coronal and parasagittal views of the diaphragm revealed a discontinuity with herniation of the small bowel and upper pole of the left kidney into the left hemithorax. The right lung appeared mildly compressed.

Color Doppler imaging confirmed the bowel herniation by the demonstration of an upturned superior mesenteric artery (▶**Fig. 1C**).

The final diagnosis was left sided congenital diaphragmatic hernia (CDH) with small bowel as content. The observed to expected lung area to head circumference ratio (O/E LHR) was 80%. The couple was counseled in detail and reassured

DOI <https://doi.org/10.1055/s-0044-1789584>.
ISSN 2348-1153.

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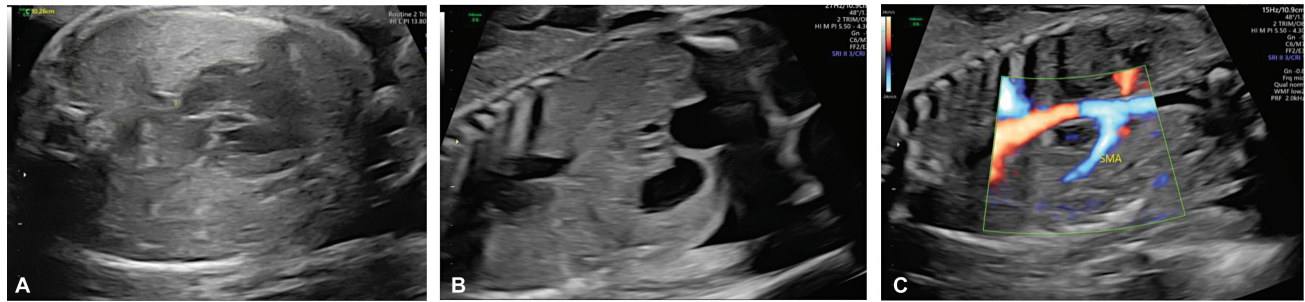


Fig. 1 (A) Axial section of thorax showing mediastinal shift. (B) Anterior coronal sonogram showing the stomach in contact with the bladder. (C) The upturned superior mesenteric artery sign.

regarding a favorable outcome. However, they chose to terminate the pregnancy.

Case 2

A 29 year old second gravida at 20 weeks of gestation was referred for a routine target scan. Her first trimester combined screening for common aneuploidies had returned screen negative. There was no significant past medical history. On imaging, fetal anatomy, fetal growth, and liquor were appropriate for the gestational age. The axial section of the thorax appeared normal (► **Fig. 2A**). The anterior coronal plane of the fetal abdomen showed a normal relative position of the fetal stomach, small bowel, and bladder (► **Fig. 2B**).

She was referred back to us at 33 + 6 days with suspected congenital pulmonary airway malformation. On examination, a mild mediastinal shift toward the right was noted in the axial section of the thorax at the level of the 4 chamber view (► **Fig. 2C**). Additionally, we noted the stomach bladder proximity sign (► **Fig. 2D**). Coronal and parasagittal views revealed discontinuity in the left dome of the diaphragm and

displacement of the small bowel to the left hemithorax through the defect on the left side. The right lung appeared mildly compressed. Color Doppler imaging confirmed the bowel herniation by the demonstration of an upturned superior mesenteric artery (► **Fig. 2E**).

The final diagnosis was a late onset left sided CDH with a small bowel as content (stomach down left CDH). The O/E LHR was 85%.

The couple was counseled at length and reassured about a favorable outcome. At 38 weeks, a male baby weighing 2,100g was delivered by elective cesarean section. The baby underwent surgery for a CDH on day 2 of life and was discharged on day 15. The baby is doing well currently.

Case 3

An 18 year old primigravida was referred in view of suspected gastroschisis at 29 weeks. She had not undergone the combined first trimester screening. There was no significant medical or surgical history and her antenatal course was unremarkable.

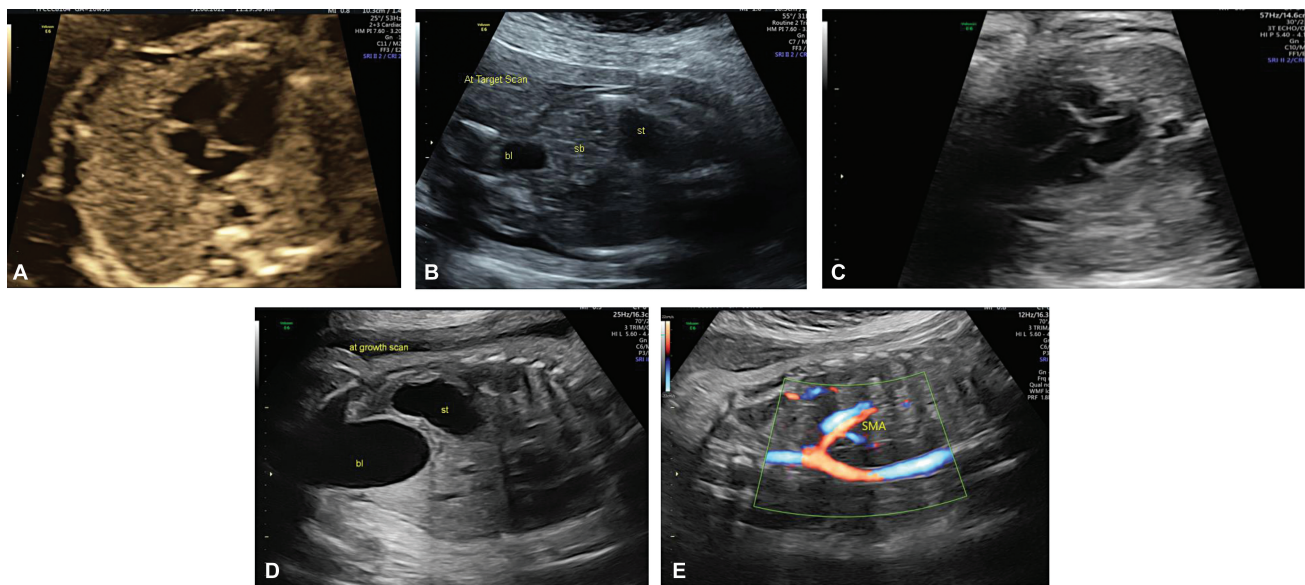


Fig. 2 (A) Target scan: axial section of thorax showing normal mediastinum. (B) Anterior coronal plane showing the normal position of the stomach and bladder. (C) Growth scan, axial section of thorax showing mediastinal shift to the right. (D) Growth scan, anterior coronal plane showing the proximity of stomach and bladder. (E) Uprturned superior mesenteric artery sign.



Fig. 3 (A) Anterior coronal sonogram showing the stomach in contact with the bladder. (B) Free floating bowel loops in amniotic cavity. (C) Image showing superior mesenteric artery.

Upon imaging at our center, we found that the fetus was small for gestational age. Fetal Doppler examination, liquor, and activity appeared appropriate for gestational age.

A coronal view of the fetal abdomen demonstrated the stomach bladder proximity sign (►Fig. 3A). The axial view revealed a ventral wall defect of size 8.9 mm to the right of a normal appearing cord insertion. Free floating loops of small bowel were seen in the amniotic cavity (►Fig. 3B). There was no evidence of vascular pedicle torsion (►Fig. 3C).

The final diagnosis was gastroschisis and small for gestational age. The parents were counseled at length in the multidisciplinary meeting, postnatal surgical management, and favorable prognosis. The patient delivered a male baby weighing 2 kg at 38 weeks in a tertiary institution. The baby underwent surgery on day 1 of life for gastroschisis. Postoperatively, the baby developed an intolerance to feeds, abdominal distension, and sepsis. Another surgery was done 4 weeks later. The baby is tolerating feeds and is being monitored in the neonatal intensive care unit.

Case 4

A 21 year old, G4P1L1A2, was referred to us at 22 weeks with suspected gastroschisis. She had not undergone the combined first trimester screening. There was no significant past medical or surgical history.

Examination at our center revealed a small for gestational age fetus with normal Doppler parameters, liquor, and activity for the gestational age. The fetal kidneys appeared echogenic with enhanced corticomedullary differentiation.

A coronal view of the fetal abdomen showed normal relative positions of the stomach, small bowel, and bladder (►Fig. 4A). However, an axial view of the fetal abdomen revealed a ventral wall defect measuring 6.3 mm to the right of a normal appearing umbilical cord insertion (►Fig. 4B). Free floating loops of small bowel were seen in the amniotic cavity (►Fig. 4C). There was no evidence of vascular pedicle torsion (►Fig. 4D). The final diagnosis was small for gestational age, gastroschisis, and bilateral echogenic kidneys. Amniocentesis returned negative for copy number variations. The couple opted for the termination of pregnancy.

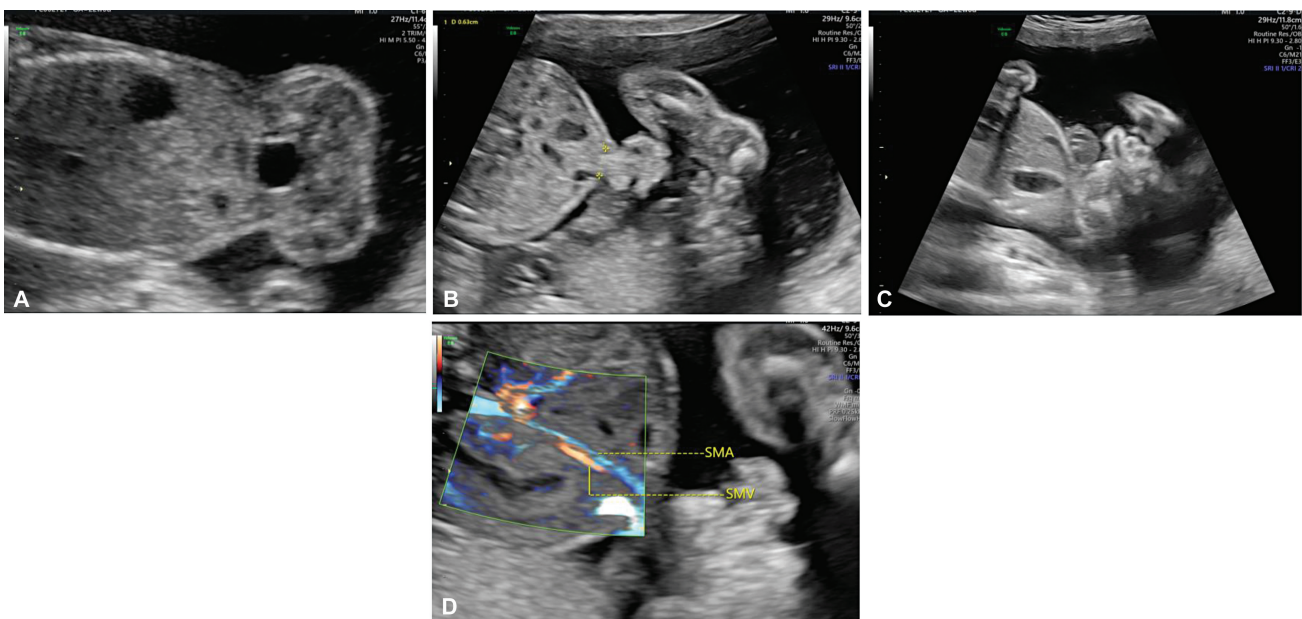


Fig. 4 (A) Anterior coronal plane showing the normal position of the stomach and bladder. (B) Anterior abdominal wall defect on the right side. (C) Free floating bowel loops in the amniotic cavity. (D) Image showing superior mesenteric artery.

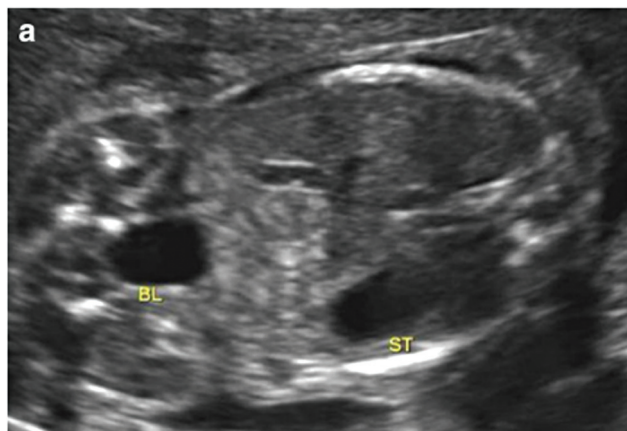


Fig. 5 Well depicted anterior coronal plane of the fetus; shows the stomach, fetal liver, gallbladder, small bowel, and bladder. Note that the stomach is spaced from the bladder with small bowel in between.

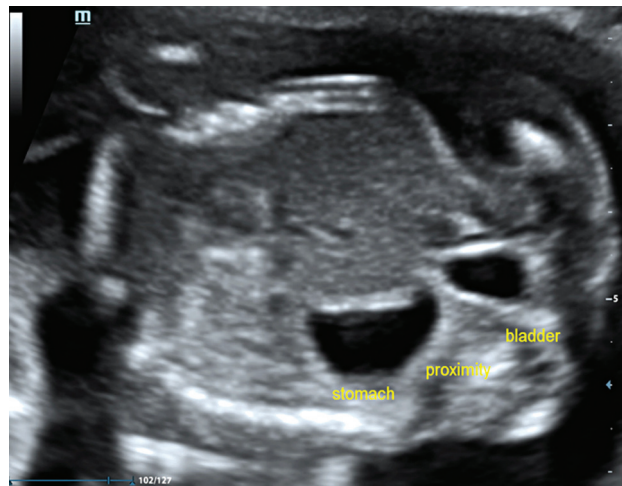


Fig. 6 Stomach bladder proximity in 20 weeks + 5 days.

Discussion

The International Society for Ultrasound in Obstetrics and Gynecology has described the 20 plus 2 planes approach to the routine mid trimester scan. Its practice guidelines recommend three axial views of the fetal abdomen: the transverse section of the upper abdomen with stomach and umbilical vein, the transverse section of the mid abdomen at cord insertion, and the axial view of the fetal kidneys.³

Suresh and Suresh recommend an additional anterior coronal plane of the fetal abdomen in their “7 + 3 = 10” approach for the mid trimester anomaly screening.⁴ This section documents the relative positions of the fetal stomach, small bowel, and bladder in the fetal abdomen (→ Fig. 5).

Aiello et al. described the abnormal position of the stomach in contact with the fetal bladder in the anterior coronal plane of the fetal abdomen as a specific sign in the setting of stomach down left CDH in 6 of 9 cases (67%).⁵ They suggested that the visualization of the stomach in contact with the bladder may be a specific sonographic marker of left CDH.⁵ This was later reiterated by Morgan et al in their study of a larger series showing a similar incidence in 15 of 22 cases (68%).⁶

However, as shown here, the stomach bladder proximity is a nonspecific sign observed when there is total/near total transmigration of the small bowel out of the abdominal cavity, such as in a case of diaphragmatic hernia or severe gastroschisis. This was alluded to later in a letter by Aiello et al.⁷ Additionally, this sign may be falsely positive in advanced gestation when the fetus assumes a flexed attitude. Therefore, when the stomach bladder proximity sign is seen, one should initiate a systematic search for the location of the small bowel.

We acknowledge that the principal utility of this sign will be in the diagnosis of the stomach down left CDH, as the diagnosis is often overlooked in the mid trimester since the echogenicity of the herniated small bowel and that of the lungs may appear similar. The utility of this sign is not so much in diagnosing gastroschisis but would alert the inexperienced operator not to confuse the free floating bowel

loops as coils of umbilical cord. In both cases, use of color Doppler adds additional information regarding the position and direction of the superior mesenteric artery, thus clarifying the situation.

It is also worthwhile noting that the normal relative position of the stomach and bladder does not always exclude abdominal defects as depicted in our fourth case. We contemplated that the possible absence of stomach bladder proximity was related to early gestational age of the fetus. However, our database search revealed stomach bladder proximity as early as 20 weeks and 5 days in a case of stomach down left CDH (→ Fig. 6).

The demonstration of the fetal stomach, small bowel, and bladder in their relative positions in the anterior coronal abdominal plane is an important practical view that can reassure the examiner to a large extent. On the other hand, when abnormal, it also provides a clue to the abovementioned abnormalities.

Detail of Each Author with His/Her Contribution to this Paper is as Under

Name of the author and e-mail ID	Types of contribution
Dr. Viveka Subramaniam Mohan	Data collection, analysis, and preparation of manuscript
Dr. Nivedhitha T	Data collection, analysis, and preparation of manuscript
Dr. Vaishnavi Neelavannan	Preparation of manuscript
Dr. Ponmozhi Ganesan	preparation of manuscript
Dr. Manikandan Krishnan	Selection of topic, expert opinion and preparation of manuscript

Conflict of Interest
None declared.

Acknowledgement

We acknowledge the valuable inputs from Dr. Aarthi M. Rangaraj, Prana Fetal Care Center, in the preparation of this manuscript.

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