Sonographic diagnosis of isolated fetal ascites due to meconium peritonitis – case report and literature review

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Abstract

Fetal intestinal volvulus is a rare life-threatening condition with variable degrees of gravity and survival. In this article we are presenting a review of pathogenesis and current diagnosis of fetal volvulus, starting from the case of a preterm newborn with ascites who was incidentally diagnosed by ultrasound at the Emergency Department of Bucharest University Emergency Hospital, when a 35-week-pregnant patient arrived for uterine contractions and vaginal bleeding. The infant was born subsequently via urgent caesarean and underwent emergency exploratory laparotomy with small bowel resection. Late pregnancy manifestations of fetal pathologies contribute to a high rate of morbidity and mortality, and because of that we recommend that the third-trimester ultrasound performed between 32 and 34 weeks of amenorrhea should be routinely done, including a thorough assessment of all the organs, including the fetal bowel.

Keywords: *fetal volvulus, meconium peritonitis, ultrasound*

Rezumat

Volvulusul intestinal fetal este o afecțiune rară, cu grade variabile de gravitate și supraviețuire. În acest articol prezentăm o revizuire a patogenezei și a diagnosticului actual al volvulusului fetal, pornind de la cazul unui nou-născut prematur cu ascită care a fost diagnosticat accidental prin ecografiere la Departamentul de Urgență al Spitalului Universitar de Urgență din București, când o pacientă gravidă de 35 de săptămâni a sosit pentru contracții uterine și sângerări vaginale. Copilul s-a născut ulterior prin cezariană de urgență și a suferit o laparotomie exploratorie, cu o mică rezecție intestinală. Manifestările târzii ale unor patologii fetale contribuie la o rată ridicată de morbiditate și mortalitate, iar din acest motiv recomandăm ca ecografiile din trimestrul al treilea, între 32 și 34 de săptămâni de amenoree, să fie efectuate de rutină și să includă o evaluare aprofundată a tuturor organelor, inclusiv intestine.

Cuvinte-cheie: *volvulus fetal, peritonită meconială, ecografie fetală*

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Diagnosticul ecografic al ascitei fetale izolate datorate peritonitei meconiale – prezentare de caz şi review de literatură

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Introduction

Meconium peritonitis is a rare life-threatening condition for newborn infants and requires urgent diagnosis and management. Volvulus occurs when bowel loops become twisted and the twisting of the mesenteric artery leads to congestion with impaired venous return and bowel necrosis[1,2]. The incidence of fetal volvulus is not described in the literature, but symptomatic neonatal intestinal rotation has been estimated at 1 in 6000[3].

Classification of meconium peritonitis

1. With intestinal obstruction either from:
- endoluminal origin (i.e., meconium ileus)
- parietal origin (i.e., atresia, stenosis)
- external origin (i.e., volvulus).

2. Without intestinal obstruction:
- defect in muscularis
- vascular accident (ischemia)
- hypertrophy of Lieberkuhn gland.

3. Other types of peritonitis in neonatal period:
- acute bacterial peritonitis (acute apendicitis, perforated peptic ulcer, perforation of intestine)
- bile peritonitis.

The diagnosis of this condition is challenging, because the clinical signs of fetal midgut volvulus are not pathognomonic[1]. Complications such as perforation and haemorrhagic ascites, which may lead to anaemia, hypovolemia, heart failure and fetal demise, were reported in the literature[1].

Three studies – from Tan et al., Noreldeen et al., and Kornacki et al. – reported cases of fetal vovulus where ascites was identified on prenatal ultrasound with anaemia suggested by elevated MCA PSV[1,2,4,5].

Isolated fetal ascites is defined as abnormal fluid accumulation in the abdominal cavity without fluid accumulation in any other cavities or subcutaneous tissue[6]. The isolated fetal ascites requires a systematic approach which includes investigations of the fetus and also of the mother, such as: ultrasound, fetal echocardiography for the diagnosis of congenital heart disease/arrythmias, complete blood count, assessment of blood type of both parteners, serology for TORCH titers, VDRL testing, amniocentesis, cordocentesis, placental biopsy[6-8].

Causes of fetal ascites[6-8]:

1. Maternal causes:

- blood groups and RH incompatibilites
- viral infections: TORCH, parvovirus.

2. Fetal causes:

- cardiovascular (congenital heart disease and arrythmias)
- fetal anaemia
- chromosomal abnormalities
- congenital infections: TORCH, parvovirus, syphilis, adenovirus
- hepatic insufficiency
- gastrointestinal causes (e.g., volvulus)
- twin-to-twin transfusion
- idiopathic.

Case report

A 28-year-old G2P1 woman, with 35 weeks of gestation, A+ blood type, presented at the Emergency Room (ER) of the Bucharest University Emergency Hospital with uterine contractions and vaginal bleeding.

We immediately performed a detailed ultrasound in the ER, which revealed important fetal ascites (AC=46 cm; above the 95th percentile) with no evidence of subcutaneous edema or any other fluid collections in pleural or pericardial cavities (Figure 1 and Figure 2), normal placenta, and polihydramnios (AFI=28), that was probably the origin of uterine contractions and cervical modifications.

The umbilical artery velocimetry was normal, and the Doppler interrogation of cerebral middle artery didn't find any evidence of fetal anemia (Figure 3 and Figure 4).

The ecocardiography of the fetus was also normal. The male neonate was born via urgent caesarean delivery, weighting 2930 g, with an Apgar score of 6/10 at 1 minute, and heart rate of 165/minute. At the clinical examination we immediately noted an important abdominal distension, with cianotic and oedematous teguments (Figure 5).

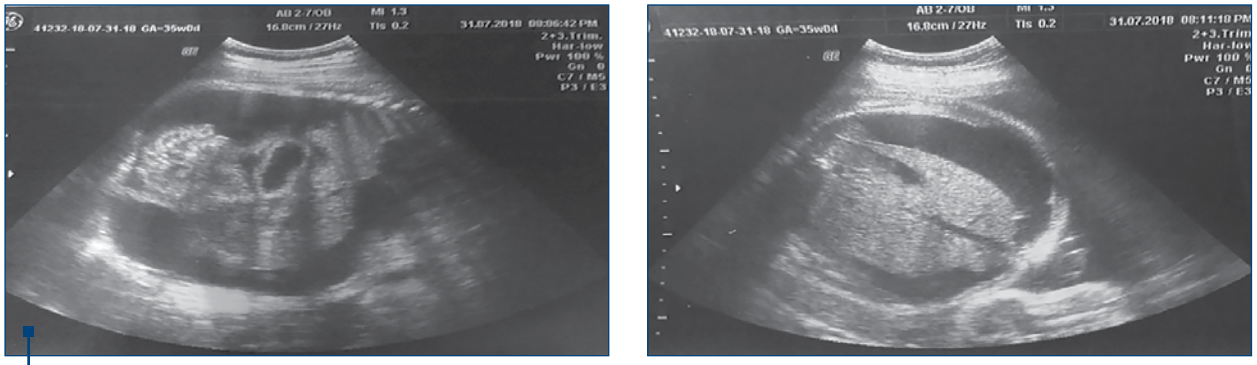

Figure 1 and Figure 2. *Ultrasound images with dilated appearing stomach, concentric small bowel, and voluminous fetal ascites*

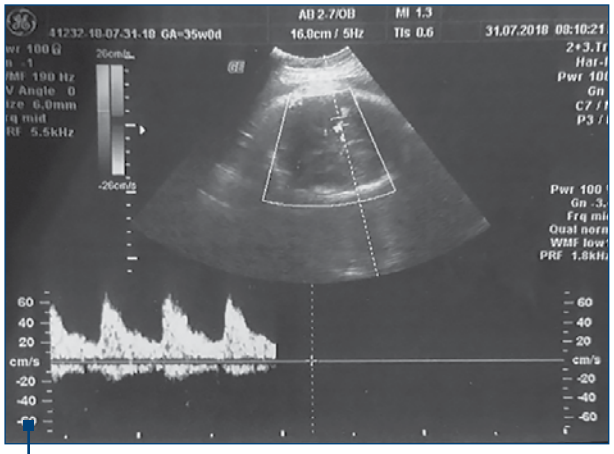

Figure 3. *RI MCA: 0.78; PSV – normal*

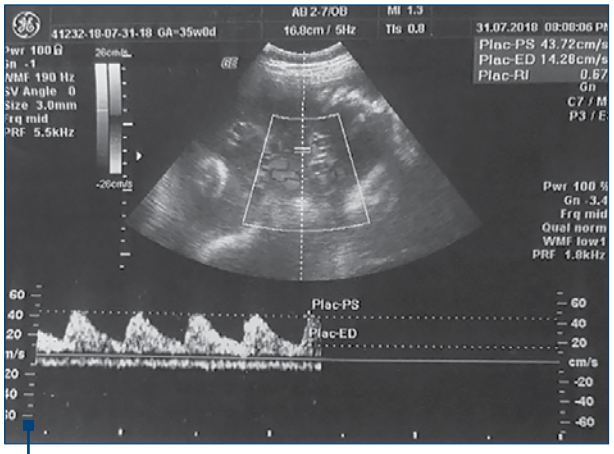

Figure 4. *RI AO: 0.67*

Figure 5. *The clinical appearance of the infant after one hour postpartum, with cianotic and distended abdomen*

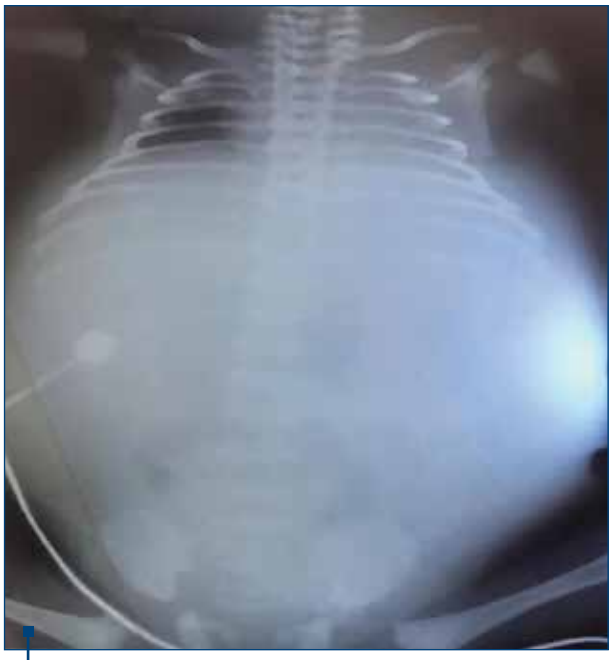

Figure 6. *Chest X-ray performed immediately after birth*

Initially, the neonate had spontaneous breathing, but subsequenly he presented episodes of apnea and desaturation, requiring orotracheal intubation, being admitted to the Neonatal Intensive Care Unit (NICU).

The umbilical venous blood showed a pH of 7.23, PCO_2: 43, PO_2: 50, bicarbonate: 17.1, a base deficit of 9, and the initial blood glucose level was 40 mg/dl. The initial complete blood count revealed no anemia (Hgb: 11.7 g/dl), normal platelet count (295,000/µl) and leukocytosis at 57,000 WBC/µl. The abdominal ultrasound showed dilated bowel loops with echogenic contents and free fluid, suggestive of meconium peritonitis.

The diagnosis was supported by the chest X-ray (Figure 6) and by the paracentesis, which revealed sanguinolent fluid.

The neonate was transferred to a quaternary neonatal intensive care unit for further specialized management. On the second day, a laparotomy was performed for the suspicion of intestinal malrotation. The surgical exploration revealed ileal volvulus with meconium peritonitis. This required resection of the necrotic small bowel volvulus segment with primary end-to-end ileo-colic anastomosis.The infant recovered well, with no major complications, and he was discharged from the hospital on the 20th day of life.

Discussion

The intestinal volvulus is a rare neonatal surgical emergency, and delays in diagnosis and management can lead to high morbidity and mortality rates. The prenatal diagnosis of this pathology was only suspected in 11 cases before 2001[9,10].

Volvulus with malrotation may result in variable degrees of ishemic necrosis, and the prognosis is very poor when it is involved the entire bowel from the ligament of Treitz to the mid-transverse colon[11].

The sonographic findings of intestinal volvulus were first reported in 1983[12]. The prenatal diagnosis is very important for the multidisciplinary planning at the time of delivery. For that reason, there are some sonographic findings pathognomonic of *in utero* volvulus: the "whirlpool sign" (bowel loops with accompanying mesentery and vessels wrapping around the main SMA) and the "coffe bean" (distension of a very short segment of bowel)[13].

Reported cases of fetal intestinal volvulus have been described in infants delivered vaginally or via caesarean section. The survival of these infants is influenced by the gestational age at birth, the size of compromised bowel and the ability to tolerate the neonatal surgery. Stillbirth has been reported in the literature in those cases. In 2004, Allahdin and Kay reported a case of fetal demise at 39 weeks of gestation where the autopsy revealed ischemic hemorrhagic necrosis secondary to intestinal volvulus[14]. In 2007, Trachsel et al. reported another case of fetal demise at 38 weeks of gestation, and in that case the autopsy also revealed intestinal volvulus with extended hemorrhagic infarction of the small bowel[15].

Recently, in 2016, Sciarrone et al. reported the most extensive retrospective case series which includes eight cases of fetal volvulus with their ultrasound findings that led to diagnosis[16]. In all eight cases, there were visualised dilated bowel loops, polyhydramnios was a notable finding in three of the eight cases, and ascites was present only in two cases[1].

Isolated fetal ascites is a separate entity from hydrops fetalis and has a better prognosis compared with that of hydrops fetalis. The diagnosis often requires an extensive evaluation to determine the etiology for an appropiate treatment, which will provide for successful outcome of the condition.

The third-trimester ultrasound performed at 32-34 weeks of amenorrhea, with a thorough assessment of fetal anatomy, can lead to the diagnosis of several late emergent pathologies, including intestinal malrotation and volvulus, followed by necrosis and meconium peritonitis. The refferal to third-level maternities, and the timely fetal delivery followed by surgical management have a good prognosis, while the neglection of these cases can lead to large intestinal damages or fetal demise. ■

Conflict of interests: The authors declare no conflict of interests.

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