

## Case Report

# Small bowel volvulus in mid and late pregnancy: can early diagnosis be established to avoid catastrophic outcomes?

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**Abstract:** Volvulus in pregnancy is rare and difficult to diagnose. Delayed diagnosis would result in high maternal and fetal mortality. Here we present an unusual case of small bowel volvulus in late pregnancy timely managed by emergency Cesarean section and derotation with excellent maternal and fetal outcomes. Volvulus should be considered in patients complaining ongoing abdominal pain, nausea, vomiting, constipation even diarrhea. Imaging is essential for early and precise diagnosis, including plain abdominal film, MRI and/or ultrasound. Once highly suspected or diagnosed of volvulus or ileus, emergency laparotomy should be performed immediately to avoid catastrophic outcomes, because the maternal and fetal prognosis is dependent on the interval from volvulus to operation apart from the degree of volvulus.

**Keywords:** Small bowel volvulus, pregnancy, early diagnosis

## Introduction

The incidence of volvulus in pregnancy has been described as 1/1,500-66,000 deliveries [1]. Abdominal pain, nausea and vomiting are most common symptoms of volvulus, which happen to be common complaints in pregnancy. Uterine enlargement gradually displaces the bowel and make the signs of volvulus untypical. Thus, volvulus in pregnancy is rare and difficult to diagnose. Delayed diagnosis would result in high maternal and fetal mortality. Here we present an unusual case of small bowel volvulus in late pregnancy timely managed by emergency Cesarean section and derotation with excellent maternal and fetal outcomes.

## Case report

A 26-year-old, Gravida 1, Para 0, woman at 37 weeks plus 2 days of gestation was admitted to our emergency room, with a history of continuous abdominal pain in epigastrium while sitting in the chair 2 hours ago. Nausea, vomiting and soreness of the loins and normal defecation

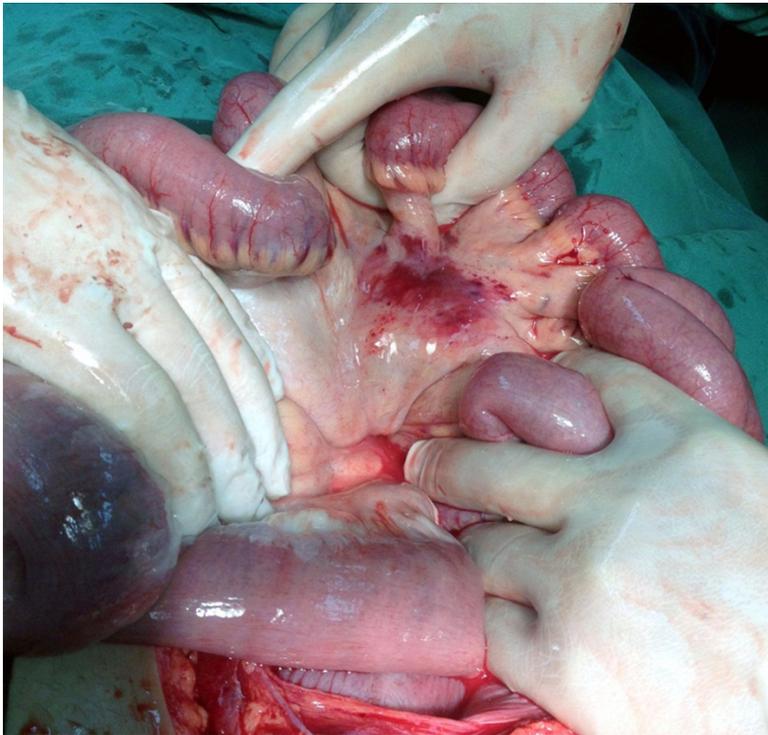
were reported. On admission, physical examination revealed normal bowel sounds, weakly positive percussion pain in renal region, occasionally tangible uterine contraction, negative abdominal tenderness or rebound tenderness. History included appendectomy 14 years ago and no systemic diseases existed. Abdominal ultrasound revealed normal images in uterus, fetus, placenta, liver, gallbladder, pancreas, spleen, kidney, ureter and no free fluids in abdominal cavity. Electronic fetal monitoring was normal. Laboratory examination (**Table 1**) revealed WBC  $10.2 \times 10^9/L$ , Neutrophil 77%, elevated procalcitonin (PCT) 0.39 ng/mL (0-0.25 ng/mL) and normal C-reactive protein (CRP), urine protein 1+, hepatic, renal, coagulation function, blood and urine amylase, and blood glucose, lipid levels. Rechecked urine routine by urethral catheterization showed negative urine protein. Fasting, fluid replacement, antibiotics and antispasmodics were given. Upper abdominal pain temporarily slightly relieved but consistently existed. Three hours later, laboratory examination showed WBC  $13.64 \times 10^9/L$ , Neutrophil 93%, elevated pro-

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**Table 1.** Laboratory examinations results were listed as follows

Admission Time	Blood routine					Urine routine			PCT (ng/mL)	CRP (mg/L)
	WBC ( $\times 10^9/L$ )	N (%)	L (%)	Hb (g/L)	PLT ( $\times 10^9/L$ )	Protein	WBC	RBC		
0 h	10.2	77	19	130	97	1+	(-)	(-)	0.39	/
3 h	13.64	93	5	117	90	(-)	0-1	0-1	0.28	< 10
6 h	14.33	94	5	120	93	/	/	/	/	/
24 h/P1	17.04	88	6	109	86	(-)	(-)	8-10	0.15	/
96 h/P4	12.12	82	12	114	157	/	/	/	/	33

P: postoperative day, WBC: white blood cells count, N: neutrophils, L: lymphocytes, Hb: hemoglobin, PLT: platelets count, PCT: procalcitonin, CRP: C-reactive protein, /: not examined.



**Figure 1.** Adhesiolysis and de-rotation of small intestine were performed and small intestine restored blood supply in 1 minute. No necrosis or perforation was seen.

cultures were obtained. Cesarean section was unremarkable and a healthy female baby was delivered with a weight of 3180 g and Apgar score 9' and 9' in 1<sup>st</sup> and 5<sup>th</sup> minute. Greater omentum adherent to right pelvic wall and volvulus of small intestine around the mesentery were observed. The small intestine showed slightly ischemic changes and no necrosis or perforation was seen. Adhesiolysis and de-rotation of small intestine were performed and small intestine restored blood supply in 1 minute (**Figure 1**). Postoperative plain abdominal radiograph was normal and placenta pathology revealed chorioamnionitis. The patient was discharged uneventfully on the 7<sup>th</sup> postoperative day.

calcitonin (PCT) 0.28 ng/mL (0-0.25 ng/mL) and normal C-reactive protein (CRP), urine protein. Six hours later, WBC increased to  $14.33 \times 10^9/L$ , Neutrophils up to 94%. In condition of persistent abdominal pain and invalid conservative treatment, we determined to perform emergency exploratory laparotomy to identify the diagnosis for maternal and fetal safety. Although not obstetrically indicated, Cesarean section at term was first performed through a midline incision for convenience of the following exploratory laparotomy. Upon entering the abdominal cavity, a small quantity of chyliform peritoneal fluid was noticed. Peritoneal fluid

### Discussion

The incidence of volvulus in pregnancy has been described as 1/1,500-66,000 deliveries [1]. Volvulus accounts for 25% of small bowel obstructions in pregnant women, but only 3-5% in nonpregnant women [2]. Other causes of gestational intestinal obstruction include adhesions, intussusceptions, hernia and cancer [3, 4].

Volvulus in mid and late pregnancy can happen in most sites of gastrointestinal tract, including stomach [5], duodenum [6], small bowel [7], cecum [8], ascending colon [3], transverse colon [9], sigmoid [10]. Among them, sigmoid

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**Table 2.** Clinical characteristics of volvulus in pregnancy of cases in the past 20 years

Clinical characteristics	No./Sum	Proportion
<b>Predisposing factor</b>		
Abdominal operation	15/28	53%
Intestinal operation	5/15	33%
Laparoscopic Roux-en-Y gastric bypass	3/15	20%
Long-term gastrointestinal discomfort	3/28	11%
Unremarkable history	10/28	36%
<b>Gestational stages</b>		
2 <sup>nd</sup> trimester	10/29	34%
3 <sup>rd</sup> trimester	19/29	66%
<b>Symptoms</b>		
Abdominal pain	21/23	91%
Vomiting	19/23	83%
Nausea	10/23	48%
Constipation	5/23	22%
Diarrhea	2/23	9%
<b>Signs</b>		
Abdominal tenderness	10/23	43%
Hypoactive bowel sounds	6/23	26%
No bowel sounds	2/23	9%
Normal bowel sounds	3/23	13%
<b>Lab tests</b>		
Blood WBC counts		
Progressively elevated or $> 15 \times 10^9/L$	9/16	56%
$< 15 \times 10^9/L$	7/16	44%
CRP		
Elevated	2/5	40%
Normal ( $< 10 \text{ mg/L}$ )	3/5	60%
Elevated PCT ( $> 0.25 \text{ ng/mL}$ )	1/1	100%
<b>Imaging</b>		
Ultrasound		
Dilated bowel loops	4/9	44%
Intraperitoneal or pelvic free fluid	4/9	44%
No abnormal lesion	1/9	12%
Conclusive plain abdominal film	5/5	100%
Conclusive CT	6/6	100%
Conclusive MRI	2/2	100%
<b>Operations</b>		
Resection of bowel		
Multiple operations	2/28	7%
Re-look laparotomy	2/28	7%
Derotation	4/28	14%
Reducing internal hernia	2/28	7%
Ladd's band incision	1/28	4%
Laparotomy	1/28	4%
Endoscopy	1/28	4%
<b>Fetal outcomes</b>		

volvulus is the most frequent cause of intestinal obstruction during pregnancy accounting for 25% to 44% of published cases [1, 11, 12]. Since midgut comprises the portion from the distal half of 2<sup>nd</sup> part of duodenum to the proximal 2/3 of transverse colon, volvulus in these sites is also called midgut volvulus. The mortality rate of midgut volvulus in pregnancy is significantly higher (3-15%) with respect to the general population [3, 13, 14]. It is a surgical emergency and if not diagnosed early carries a high mortality rate for both mother (6-20%) and fetus (20-26%) [1, 15]. Small bowel volvulus is rare and part of midgut volvulus. The most common predisposing factors of volvulus include presence of congenital malrotation as well as adhesions from previous operations [7] and our case belongs to the latter.

We search “((volvulus pregnancy) OR volvulus pregnant) AND English” without other restriction in PubMed and acquired 299 articles. Apart from our case, there are 22 reports about small bowel volvulus in mid and late pregnancy during the past 20 years. Clinical characteristics are summarized in **Table 2**.

Abdominal operation history and long-term gastrointestinal discomfort are the main predisposing factors, with the incidence of 53% (15/28) and 11% (3/28), respectively. In addition, 33% (5/15) of abdominal operations belong to intestinal operation. However, 36% (10/28) have unremarkable history. In accordance with the increasing impact of enlarged uterus on the anatomy of gastrointestinal tract, 66% (19/29) of volvulus occur in the 3<sup>rd</sup> trimester, while 34% (10/29) in the 2<sup>nd</sup> trimester.

The most frequent symptoms include abdominal pain, vomiting and nausea with the incidence of

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Good	21/27	78%
mild asphyxia	2/27	7%
severe asphyxia	2/27	7%
Dead	6/27	22%
Maternal outcomes		
Uneventful	20/28	72%
Short bowel syndrome	6/28	21%
Expired	2/28	7%

91% (21/23), 83% (19/23), and 48% (11/23), respectively. Constipation and diarrhea are uncommon with the incidence of 22% (5/23) and 9% (2/23). Different from the intermittent, paroxysmal, regular pain of uterine contraction, abdominal pain of volvulus is ongoing and mostly epigastric. Due to impact of the pregnancy uterus, the incidence of positive signs is much lower with abdominal tenderness 43% (10/23), hypoactive bowel sounds 26% (6/23), no bowel sounds 9% (2/23). Notably, normal bowel sounds exist in 13% (3/23) of cases. That is, normal bowel sounds simply fail to exclude volvulus. With respect to laboratory tests, 50% (8/16) of blood WBC counts are progressively elevated over time or  $> 15 \times 10^9/L$ , and 50% (8/16) are tested one time and normal. The rapidly, progressively elevated inclination of blood WBC counts within 1 day implies the necessity of following up blood routine every several hours. C-reactive protein (CRP) are elevated in 40% (2/5) and normal in the rest. The 116-aminoacid polypeptide procalcitonin (PCT), a precursor to a hormone involved in calcium metabolism, is described as "the champion so far" when it comes to identifying bacterial infections [16]. In addition, PCT is a helpful biomarker for early diagnosis of sepsis in critically ill patients [17]. In our case, PCT shows earlier elevation than blood WBC and decreases but remains abnormally rising after antibiotics injection. However, blood WBC gradually rises despite antibiotics therapy. Thus, combination examination of blood WBC counts, CRP and PCT periodically may help early detection of bacteremia and septicemia.

Imaging is essential for early and precise diagnosis. One hundred percent of plain abdominal film (5/5), CT (6/6) and MRI (2/2) provide conclusive evidence of volvulus or occlusion. In addition, ultrasound reveal dilated bowel loops occur in 44% (4/9), intraperitoneal or pelvic free fluid in 44% (4/9), no abnormal lesion in

12% (1/9). The mean dose of abdominal plain film is 1.4 mGy and the maximum dose is 4.2 mGy; the mean dose of abdominal CT is 8 mGy and the maximum dose is 49 mGy [18]. There is no evidence in either humans or animals that radiation exposure in the diagnostic ranges (i.e.  $< 50$  mGy) is associated with an increased incidence of any significant congenital malformation [19]. Thus, both abdominal plain film and CT are safe for fetus, with the former much safer. Furthermore, MRI may offer significant advantages in such cases without the risk of ionizing radiation [20]. MR imaging may be used in pregnant women if other nonionizing forms of diagnostic imaging are inadequate or if the examination provides important information that would otherwise require exposure to ionizing radiation (e.g., fluoroscopy, computed tomography). Pregnant patients should be informed that, to date, there has been no indication that the use of clinical MR imaging during pregnancy has produced deleterious effects [21]. In sum, plain abdominal film, MRI and/or ultrasound belong to the first choice, while CT can be chosen if necessary.

The rate of bowel resection is high to 68% (19/28) and the rate of derotation, reducing internal hernia, Ladd's band incision is 14% (4/28), 7% (2/28), 4% (1/28), respectively. In one (1/28) laparotomy, surgical intervention was deferred and the abdomen was closed again because of the extensive bowel infarction and the patient expired due to septicemic shock within a few hours [3]. Notably, upper gastrointestinal endoscopy is applied in 1 case to diagnose and manage of placing a naso-jejunal feeding tube beyond the obstruction from 20w till spontaneous delivery at 34 w. As regards to fetal prognosis, fetal mortality is 22% (6/27) while both the rate of mild asphyxia and severe asphyxia are uniformly 7% (2/27). For maternal outcome, maternal mortality is 7% (2/28) and 21% (6/28) suffer from short bowel syndrome with catastrophic complications caused by massive small bowel resection.

Notably, postoperative placenta pathology revealed chorioamnionitis though a well-appearing newborn was delivered with Apgar score 9' and 9' in 1<sup>st</sup> and 5<sup>th</sup> minute. Histologic

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chorioamnionitis (HCA) is associated with pre-term delivery, neonatal morbidity and mortality [22] and increased risk for early onset clinical sepsis among term infants admitted to the NICU for suspected sepsis [23]. Because HCA is usually subclinical, histologic examination of the placenta is essential for confirmatory diagnosis [23]. In our case, HCA reveals the potential early onset sepsis in mother and fetus and demonstrates the necessity of timely exploratory laparotomy.

In conclusion, volvulus should be considered in patients complaining ongoing abdominal pain, nausea, vomiting, constipation even diarrhea. Blood routine, CRP and PCT can be repeatedly examined in one day. Imaging is essential for early and precise diagnosis, including plain abdominal film, MRI and/or ultrasound. Once highly suspected or diagnosed of volvulus or ileus, emergency laparotomy should be performed immediately to avoid catastrophic outcomes, because the maternal and fetal prognosis is dependent on the interval from volvulus to operation apart from the degree of volvulus.

### Disclosure of conflict of interest

None.

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### References

- [1] Connolly MM, Unti JA, Nora PF. Bowel obstruction in pregnancy. *Surg Clin North Am* 1995; 75: 101-113.
- [2] Ventura-Braswell AM, Satin AJ, Higby K. Delayed diagnosis of bowel infarction secondary to maternal midgut volvulus at term. *Obstet Gynecol* 1998; 91: 808-810.
- [3] Gaikwad A, Ghongade D, Kittad P. Fatal midgut volvulus: a rare cause of gestational intestinal obstruction. *Abdom Imaging* 2010; 35: 288-290.
- [4] Damore LJ 2nd, Damore TH, Longo WE, Miller TA. Congenital intestinal malrotation causing gestational intestinal obstruction. A case report. *J Reprod Med* 1997; 42: 805-808.
- [5] Agarwal P, Ash A. Gastric volvulus: a rare cause of abdominal pain in pregnancy. *J Obstet Gynaecol* 2007; 27: 313-314.
- [6] Siwatch S, Noor MT, Dutta U, Kochhar R, Behera A, Singh K. Endoscopic management of a pregnant lady with duodenal obstruction due to malrotation with midgut volvulus. *Trop Gastroenterol* 2011; 32: 339-341.
- [7] Boland E, Thompson JS, Grant WJ, Botha J, Langnas AN, Mercer DF. Massive small bowel resection during pregnancy causing short bowel syndrome. *Am Surg* 2011; 77: 1589-1592.
- [8] Bade K, Omundsen M. Caecal volvulus: a rare cause of intestinal obstruction in pregnancy. *ANZ J Surg* 2014; 84: 298-299.
- [9] Sharma D, Parameshwaran R, Dani T, Shetty P. Malrotation with transverse colon volvulus in early pregnancy: a rare cause for acute intestinal obstruction. *BMJ Case Rep* 2013; 2013.
- [10] Ahmad A, Shing KK, Tan KK, Krasu M, Bickle I, Chong VH. Sigmoid volvulus in pregnancy: early diagnosis and intervention are important. *Am J Emerg Med* 2014; 32: 491.
- [11] De U, De KK. Sigmoid volvulus complicating pregnancy. *Indian J Med Sci* 2005; 59: 317-319.
- [12] Kulusari A, Kurdoglu M, Adali E, Yildizhan R, Sahin HG, Kotan C. Sigmoid volvulus in pregnancy and puerperium: a case series. *Cases J* 2009; 2: 9275.
- [13] Unal A, Sayharman SE, Ozel L, Unal E, Aka N, Titiz I, Kose G. Acute abdomen in pregnancy requiring surgical management: a 20-case series. *Eur J Obstet Gynecol Reprod Biol* 2011; 159: 87-90.
- [14] Kuwahata T, Iwamoto I, Fujino T, Douchi T. Mechanical ileus in a pregnant woman at term pregnancy accompanied by labor pains. *J Obstet Gynaecol Res* 2007; 33: 549-551.
- [15] Singla SL, Kadian YS, Goyal A, Sharma U, Kadian N. Caecal volvulus in pregnancy: is delay in diagnosis avoidable? *Asian J Surg* 2005; 28: 52-54.
- [16] Moyer MW. New biomarkers sought for improving sepsis management and care. *Nat Med* 2012; 18: 999.
- [17] Wacker C, Prkno A, Brunkhorst FM, Schlattmann P. Procalcitonin as a diagnostic marker for sepsis: a systematic review and meta-analysis. *Lancet Infect Dis* 2013; 13: 426-435.
- [18] Lowe SA. Diagnostic radiography in pregnancy: risks and reality. *Aust N Z J Obstet Gynaecol* 2004; 44: 191-196.
- [19] Brent RL. Utilization of developmental basic science principles in the evaluation of reproductive risks from pre- and postconception environmental radiation exposures. *Teratology* 1999; 59: 182-204.
- [20] Birchard KR, Brown MA, Hyslop WB, Firat Z, Semelka RC. MRI of acute abdominal and pelvic pain in pregnant patients. *AJR Am J Roentgenol* 2005; 184: 452-458.
- [21] Shellock FG, Kanal E. Policies, guidelines, and recommendations for MR imaging safety and patient management. *SMRI Safety Committee. J Magn Reson Imaging* 1991; 1: 97-101.

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- [22] Wu HC, Shen CM, Wu YY, Yuh YS, Kua KE. Subclinical histologic chorioamnionitis and related clinical and laboratory parameters in preterm deliveries. *Pediatr Neonatol* 2009; 50: 217-221.
- [23] Cuna A, Hakima L, Tseng YA, Fornier B, Islam S, Quintos-Alagheband ML, Khullar P, Weinberger B, Hanna N. Clinical dilemma of positive histologic chorioamnionitis in term newborn. *Front Pediatr* 2014; 2: 27.