

Simultaneous Meckel's diverticulitis and appendicitis: a rare complication in puerperium

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SUMMARY: Simultaneous Meckel's diverticulitis and appendicitis: a rare complication in puerperium.

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We report a case of a 24-year-old woman who was delivered via caesarean section at 39 weeks and presented in the puerperium with symp-

toms of worsening abdominal pain and septicaemia. Preoperative ultrasonography suggested the presence of a pelvic collection. Explorative laparotomy revealed the simultaneous presence of Meckel's diverticulitis and appendicitis without bowel perforation. The patient made an uneventful recovery following small bowel resection with end to end reanastomosis and appendicectomy.

KEY WORDS: Pregnancy - Puerperium - Meckel's diverticulitis - Appendicitis.

Introduction

Meckel's Diverticulum (MD) was first described by Fabricius Hildanus in the sixteenth century and was named after Johann Friedrich Meckel in 1809 (1). It is a remnant of the connection from the yolk sac to the small intestine present during embryonic development and results from failure of the omphalomesenteric duct to involute during the fifth to seventh week of gestation. It involves all layers of the intestinal wall and is the most common congenital abnormality of the gastrointestinal tract (2).

Pregnancy and puerperium can be complicated by common non-obstetric conditions such as appendicitis, cholecystitis, renal calculi or peptic ulcer disease. All these conditions can present with symptoms such as nausea, vomiting, abdominal distention and constipation that are also commonly found in pregnant women (2).

Meckel's diverticulum is an atypical cause of acute abdomen and is diagnostically challenging because its signs and symptoms mimic those of appendicitis. The dif-

ferential diagnosis can be difficult, with presenting symptoms similar to preterm labour, placental abruption, chorioamnionitis or endometritis. Mortality and morbidity rates can be significant because of complications such as bowel perforation and peritonitis, often as a result of a delay in diagnosis (3, 4).

Case report

A 24-year-old woman in her first pregnancy was admitted to our hospital's maternity unit, for a planned caesarean section at 39 weeks' gestation. Her past medical history was unremarkable apart from the presence of polycystic ovaries. She had an uneventful antenatal period and on admission her fundal height measurement was appropriate for dates and the fetal heart beat was heard and regular. A full blood count revealed the following: White Blood Cell count (WBC) 9002/ L, Haemoglobin (Hb) 10.9 g/dl, Haematocrit (Hct) 33.3%. The patient delivered a healthy male neonate weighing 3300 grams, with Apgar scores of 9 and 10 at 1 and 5 minutes, respectively. On the second day postpartum, she was passing flatus, eating and drinking but she had a single febrile episode of 38.5°C. The following day, she had two more febrile episodes of maximum temperature 38.6°C with rigors.

On examination, chest auscultation was clear, her abdomen was soft, not distended but slightly tender in the left iliac fossa. The wound was intact without evidence of wound infection or haematoma. Vaginal examination was unremarkable, normal lochia seen and breast examination also revealed no signs of infection or tenderness. The patient did not complain of any urinary symptoms such as dysuria or frequency. Blood and urine cultures collected during the febrile episodes were negative.

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On the fourth day postpartum, she remained febrile (39.5°C) and tachycardic (123 bpm). Increasing abdominal tenderness on palpation with absent bowel sounds was noted. She was then started on empirical intravenous antibiotic therapy with piperacillin/tazobactam and metronidazole. She was also given prophylactic dose of anticoagulation (sc fraxiparine injection) once daily to reduce the risks of thrombosis and treat a presumed pelvic septic thrombophlebitis.

A chest x-ray showed atelectasis of the right lung base and the abdominal ultrasound revealed a complex multi-cystic area in the pouch of Douglas measuring 91x44x90 mm with diffuse echogenic elements of hemorrhagic or inflammatory origin.

During the next day, the patient remained afebrile but she developed generalized rebound abdominal tenderness on palpation, anorexia, nausea and vomiting. Her WBC count had risen to 9160/ L with 82.2% neutrophils. Indices of inflammation such as C - reactive protein (CRP) and Lactate Dehydrogenase (LDH) were within normal limits. A surgical consultation confirmed diffuse abdominal tenderness on deep palpation and a presumptive diagnosis of appendicitis with postoperative pelvic collection or appendiceal mass was made. She was then taken to the operating theatre for evacuation of a presumed infected pelvic haematoma or abscess. A computed tomography (CT) scan of the abdomen was not performed because given the clinical status of the patient; it would not significantly alter the management.

At laparotomy, a large amount of pus was discovered in the peritoneal cavity and the presence of filmy pseudomembraneous deposits was noted. The involuted uterus was also covered with pseudomembranes and the caesarean scar was intact. An inflamed 4.5 cm long Meckel's diverticulum and a secondarily inflamed appendix were observed (Figure 1). Both large and small bowels were checked and there was no obvious perforation. Examination of the rest of the intra-abdominal organs revealed no abnormalities. Excision of the Meckel's diverticulum with small bowel resection and primary end to end reanastomosis, along with an appendicectomy was performed.

The histological report indicated the presence of suppurative inflammation and diffuse serositis. The Meckel's diverticulum mucosa was diffusely replaced by ectopic gastric mucosa and two small ulcers were observed with extension to the submucosa (Figures 2, 3). The postoperative course was uneventful and the patient was discharged on the seventh postoperative day.

Discussion

Meckel's diverticulum is referred to as the disease of the "2's" because it affects 2% of the general population, it is 2 to 3 cm long, it is most often symptomatic before the age of 2, complications occur in 2% of cases and it is twice as common in men. In half of the specimens examined there is ectopic tissue of gastric or pancreatic origin, with a frequency of 62% and 16% respectively (2, 5-8).

The lifetime risk of complications from a Meckel's diverticulum is 4.2% with the risk decreasing with age (38). In the general population, one of the most common complications in symptomatic patients is small bowel obstruction (frequency of 37%). Other complications include intussusception (14%), inflammation (13%), bleeding (12%), perforation (7%) and others (17%). Small bowel obstruction affects the adult population (9,10) and heterotopic mucosa is found in 90%



Fig. 1 - Inflamed Meckel's Diverticulum (4.5cm long) was found on small bowel.

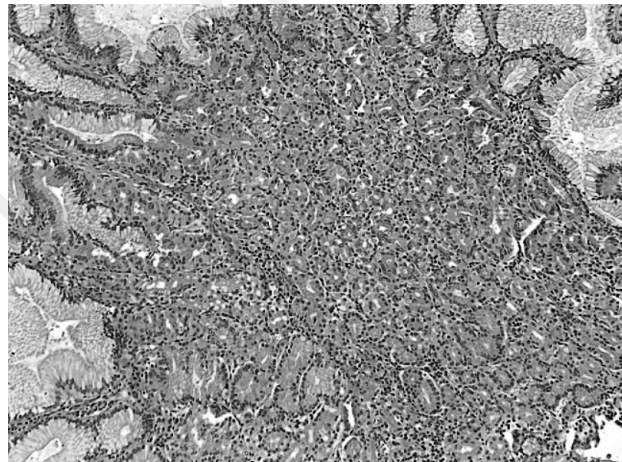


Fig. 2 - Microscopy of resected specimen demonstrating mucosal ulcer and ectopic gastric mucosa (high power view; H&E, x100 magnification).

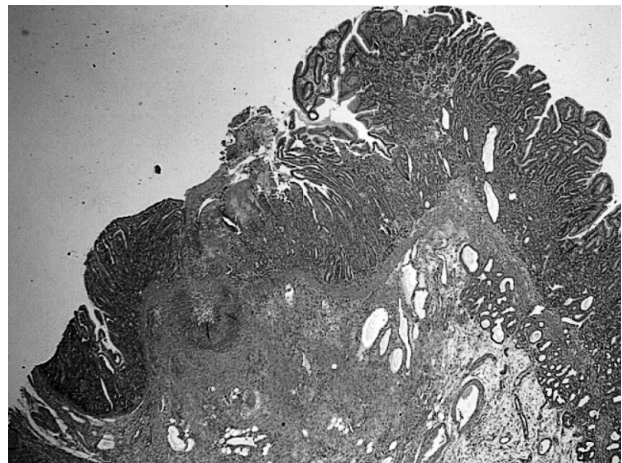


Fig. 3 - Microscopy of resected specimen demonstrating ectopic gastric mucosa (high power view; H&E, x20 magnification).

TABLE 1 - LIST OF THE REPORTED CASES DIAGNOSED WITH MECKEL'S DIVERTICULUM DURING PREGNANCY AND PUERPERIUM. NS - NOT STATED; NP - NOT PERFORMED; CS - CESAREAN SECTION; VD - VAGINAL DELIVERY; ETE - END TO END; U/S - ULTRASOUND; MRI - MAGNETIC RESONANCE IMAGING; CT - COMPUTED TOMOGRAPHY; GI - GASTROINTESTINAL; MD - MECKEL'S DIVERTICULUM; ICU - INTENSIVE CARE UNIT.

Author	Country	Gravidity/parity	Maternal Age	Gestational age/weeks	Preoperative diagnosis	Imaging studies	Complications	Surgical treatment	Mode/ time of delivery	Out-come maternal	Out-come neonatal
Borras (12) 1950	Spain	NS	27	3rd trimester	Obstruction/acute abdomen	NS	intestinal obstruction	Diverticulectomy	CS-preterm	Expired	Uneventful
Gay et al (13) 1953	Usa	NS	NS	puerperium	Obstruction	X-ray	Ileo-Cecal intussusception	Diverticulectomy/ ETE anastomosis	VD-term	Uneventful	Uneventful
Gibbins (14) 1953	UK	NS	NS	Puerperium	Obstruction	X-ray	Ileocecal intussusception	Diverticulectomy/ ETE anastomosis	CS-preterm	Uneventful	Twin 1 survived Twin 2 expired
Vlkov (15) 1956	Bulgaria	a) G1P0 b) G1P0	a) 21 b) 26	a) 3rd trimester b) 2nd trimester	a)Obstruction b)Obstruction	a)NP b)NP	a)Perforation b)Perforation	a)Diverticulectomy b)Diverticulectomy	a)VD-term b)CS-preterm	a)Uneventful b)Uneventful	a)Uneventful b)Stillbirth
Warwyk (16) 1957	Poland	G1P0	26	Puerperium	Acute abdomen	X-ray	Perforation, peritonitis	Diverticulectomy, ETE anastomosis	VD-term	Expired	Uneventful
Walser et al (17) 1962	USA	G1P0	23	18	GI-Hemorrhage	NP	Perforation Hemorrhage	Diverticulectomy	VD-term	Uneventful	Uneventful
Morris (18) 1965	UK	G1P0	NS	18	Obstruction	NP	Ileo- ileal intussusception	Diverticulectomy	VD-term	Uneventful	Uneventful
Dworski (19) 1969	Germany	NS	29	3rd trimester	Obstruction	NP	Perforation obstruction	Diverticulectomy	CS-preterm	Uneventful	Uneventful
McLean (20) 1969	UK	G1P0	22	23	Perforated appendicitis	NP	Perforation, Peritonitis	Diverticulectomy	VD-term	Uneventful	Uneventful
Wille (21) 1972	Germany	A) G1P0 B) G1P0	A) 20 B) 22	Term Term	Pyelonephritis Placental abruption	NS NS	Perforation, Peritonitis Perforation	Diverticulectomy Diverticulectomy	CS-term CS-term	Expired Expired	Uneventful Uneventful
Alaily (22) 1974	UK	G1P0	17	18	Appendicitis	NP	Gangrene of MD	Diverticulectomy	NS	Uneventful	NS
Walsh (23) 1980	UK	G3P2	31	10	Appendicitis, acute abdomen	NP	Gangrene of MD	Diverticulectomy	VD-term	Uneventful	Uneventful
Kaukonen (24) 1982	Finland	NS	23	31	Lower GI bleed	NS	Perforation, Hemorrhage	Diverticulectomy	VD-term	Uneventful	Uneventful
Martin (25) 1986	USA	G1P0	26	NS	Acute abdomen	NP	Ectopic pregnancy, Cecal volvulus	Diverticulectomy, salpingectomy	No	No	No

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Clark (26) 1992	USA	NS	26	23	GI- Hemorrhage	U/S	GI hemorrhage from MD	Diverticulectomy, ETE Anastomosis	CS-preterm	Uneventful	Uneventful, Neonate in ICU
Kitsuki (27) 1993	Japan	G1P0	19	24	GI hemorrhage	Endo-scopy, Angiography	GI hemorrhage from MD	Diverticulectomy	NS	Uneventful	Stillbirth
Morino (28) 1998	Kenya	NS	26	7	Ectopic pregnancy	No	Perforation, peritonitis	Diverticulectomy	VD-term	Uneventful	Uneventful
Chanrachakul (29) 2001	Thailand	G1P0	30	33	Partial intestinal obstruction	X-ray	Inflammation, adhesions	Diverticulectomy, ETE Anastomosis	CS-preterm	Uneventful	Uneventful
Hildebrand (30) 2002	Canada	G1P0	16	16	Peritonitis	NP	Perforation, peritonitis	Diverticulectomy	NS	Uneventful	NS
Rudloff (2) 2004	USA	G1P0	14	32	Perforated appendicitis	Ultrasound and CT scan	Perforation, peritonitis, appendicitis	Diverticulectomy, appendicectomy, ETE Anastomosis	VD-term	Uneventful	Uneventful
Garnizov (31) 2006	Bulgaria	G1P0	32	16	Appendicitis	NP	Inflammation, Appendicitis, Peritonitis	Diverticulectomy, appendicectomy	VD-preterm	Uneventful	Uneventful
Huerta (32) 2006	USA	G2P1	30	29	Appendicitis	Ultrasound and CT scan	Perforation, peritonitis	Diverticulectomy, enterectomy	VD-preterm	Uneventful	Uneventful Neonate in ICU
Zapardiel (33) 2010	Spain	G1P0	35	27	Appendicitis	Ultrasound and MRI	Obstruction	Diverticulectomy, ETE Anastomosis	VD-term	Uneventful	Uneventful
Wong (34) 2010	Hong Kong	NS	33	21	Appendicitis	Ultrasound	No	Diverticulectomy, appendicectomy	NS	Uneventful	NS
Lugo (35) 2011	Mexico	G2P1	27	40	No	No	No	Diverticulectomy, ETE Anastomosis	CS-term	Uneventful	Uneventful

of bleeding Meckel's diverticula (4). Inflammation of Meckel's diverticulum is the third most common complication in adults (3, 36-38).

Meckel's diverticulitis is difficult to diagnose because symptomatology is similar to acute appendicitis. In our case, the point of major tenderness initially, was on the left iliac fossa due to the inflamed diverticulum and there was no tenderness on the right side, despite the presence of appendicitis. In pregnancy, it can present with

symptoms mimicking preterm labour, placental abruption, chorioamnionitis or endometritis in the puerperium. That is why only 10% of cases are diagnosed preoperatively (11).

In addition, imaging studies such as computed tomography scan (CT scan) and ultrasound examination are not helpful in distinguishing a Meckel's diverticulum from adjacent bowel loops (12). In our patient, the abdominal ultrasound was not helpful in identifying the

actual cause, as the pelvic collection was not specific and there was no evidence of bowel perforation/obstruction. The most common detection method is technetium-99m pertechnetate scan.

A delay in the diagnosis can lead to significant maternal and fetal morbidity and mortality rates (12). For this reason prompt surgical management is crucial. In our case, there was a delay between presentation of initial symptoms and definitive management, but the decision to proceed with laparotomy was therapeutic.

In the review of the published cases with Meckel's diverticulum in pregnancy and puerperium since 1950 (Table 1), there were only two reported cases with a correct preoperative diagnosis of Meckel's diverticulum (16, 28). In the rest of the cases, intestinal obstruction and appendicitis were the most common diagnoses. In terms of surgical treatment, the most common procedure performed involved excision of the diverticulum in all the cases, with bowel resection and reanastomosis reported in 8 cases.

The most common preoperative clinical diagnosis was intestinal obstruction reported in 8 patients followed by appendicitis in 7 patients. The most common complication was bowel perforation (13 cases), and peritonitis (8 cases) with intussusception / volvulus, gastrointestinal bleeding and bowel obstruction being less common. All maternal mortalities (4 cases) were associated with bowel perforation and concomitant peritonitis. Three women that died were delivered via cesarean section and all of them were diagnosed late in the third trimester or in the puerperium. Interestingly enough, 17 of

the women were primiparous and the mean gestational age of diagnosis was 23.2 ± 8.9 weeks with only 4 cases, including ours, being diagnosed in the puerperium. Cesarean section was performed in 8 patients, while vaginal delivery was reported in 13 patients. In total 8 preterm deliveries were reported. With regard to maternal and neonatal outcomes, 4 maternal deaths, 2 stillbirths and 1 neonatal death were reported.

We believe that each case should be managed on an individual basis after taking into consideration the clinical status of the patient and her past medical history. It is also very important to realise the necessity of taking prompt action in cases of septicemia in the puerperium and not delaying the management of these patients, in order to lower maternal and fetal morbidity and mortality rates.

Conclusion

Symptomatic Meckel's diverticulum complicating pregnancy and puerperium is a rare disease. The diagnosis must be taken into consideration in cases of abdominal disease in which the diagnosis is not clear even with imaging techniques. It can cause significant morbidity and mortality if left undiagnosed. The mainstay of treatment includes surgical intervention with excision of the diverticulum and/or small bowel resection. If a Meckel's diverticulum is incidentally found at laparotomy, prompt removal to avoid the risk of developing complications is suggested in both pregnant and non-pregnant patients.

References

1. Meckel JF. Uber die Divertikel am Darmkanal. Arch Physiol 1809;9:421-453.
2. Rudloff U, Jobanputra S, Smith-Levitin M, et al. Meckel's diverticulum complicating pregnancy. Case report and review of the literature. Arch Gynecol Obstet 2005;271:89-93.
3. Cullen JJ, Kelly KA. Current management of Meckel's diverticulum. Adv Surg 1996;29:207-214.
4. Groebli Y, Bertin D, Morel P. Meckel's diverticulum in adults. Retrospective analysis of 119 cases and historical review. Eur J Surg 2001;167:518-524.
5. Pinero A, Martinez-Barba E, Canteras M, et al. Surgical management and complications of Meckel's diverticulum in 90 patients. Eur J Surg 2002;168:8-12.
6. Sader CN, Jaffe BM. Many faces of Meckel's diverticulum. Surg Rounds 2003;26:471-476.
7. Berman EJ, Schneider A, Potts WJ. Importance of gastric mucosa in Meckel's diverticulum. J Am Med Assoc 1954;156:6-7.
8. St-Vil D, Brandt ML, Panic S, et al. Meckel's diverticulum in children: a 20-year review. J Pediatr Surg 1991;26:1289-1292.
9. Yamaguchi M, Takeuchi S, Awazu S. Meckel's diverticulum. Investigation of 600 patients in Japanese literature. Am J Surg 1978;136:247-249.
10. Yahouchy EK, Marano AF, Etienne JC, et al. Meckel's diverticulum. J Am Coll Surg 2001;192:658-662.
11. Turgeon DK, Barnett JL. Meckel's diverticulum. Am J Gastroenterol 1990; 85:777-781.
12. Borras JA. Ileus due to Meckel's diverticulum in a pregnant woman. Rev Esp Obstet Ginecol 1950;9(49):46-8. Spanish.
13. Gay BB, Leigh TF, Rogers JV. Meckel's diverticulum as a cause of intussusception. J Med Assoc Georgia 1953;42:15-18.
14. Gibbins RE, Symmers WS. Chronic intussusception due to inversion of a Meckel's diverticulum containing a chronic peptic ulcer, heterotopic tissues, and a lipoma. Br J Surg 1953;40:500-505.
15. Vlkov T. Meckelsches Divertikel in der geburtshilflichen und gynäkologischen Praxis. Khirurgiya (Sofia) 1956;9:524-529. Bulgarian.
16. Wawryk R, Musiolik M. Pregnancy and labor complicated by peritonitis caused by Meckel's diverticulum. Ginekol Pol 1957;28(2):225-9. Polish.

17. Walser HC, Margulis RR, Ladd JE. Meckel's diverticulitis, a complication of pregnancy. *Obstet Gynecol* 1962;20:651-4.
18. Morris Ed. Intestinal Obstruction and pregnancy. *J Obstet Gynaecol Br Commonw* 1965; 72:36-44.
19. Dworski S. Meckel's diverticulum leading to resection of the small intestine intrapartum. *Zentralbl Gynakol* 1969 Jul;26;91(30):984-7. German.
20. McLean JG. Perforation of a peptic ulcer in a Meckel's diverticulum during pregnancy. *J Obstet Gynaecol Br Commonw* 1969 J;76(1):81-2.
21. Wille P. Perforation of Meckel's diverticulum during labor. *ZentralblGynakol.* 1972 Nov 4; 94(44):1496-501. German.
22. Alaily AB. Gangrene of Meckel's diverticulum in pregnancy due to iron tablet. *Br Med J* 1974;19;1(5898):103.
23. Walsh PV. Slow-release iron tablet and gangrene of meckel's diverticulum. *Br J Clin Pract* 1980;34(8-9):258.
24. Kaukonen JP. Peptic ulcer perforation in Meckel's diverticulum and intra-abdominal hemorrhage in pregnancy. *Duodecim* 1982;98(3):207-8. Finnish.
25. Martin RH, Doublestein GL, Jarvis MR. Concurrent ectopic pregnancy, Meckel's diverticulum with vitelline duct remnant, cecal volvulus, and congenital complete heart block: report of a case. *J Am Osteopath Assoc* 1986;86(9):589-91.
26. Clark KH, Lawson EA. Meckel's diverticulum and pregnancy. *J Tenn Med Assoc* 1992; 85(8):367-8.
27. Kitsuki H, Iwasaki K, Yoshitomi S, et al. An adult case of bleeding Meckel's diverticulum diagnosed by preoperative angiography. *Surg Today* 1993;23(10):926-8.
28. Morino GF, Ansaloni L, Galvagno S, Giaccardi S. Meckel's diverticulum in pregnancy: difficult differential diagnosis. *Trop Doct* 1998;28(4):242.
29. Chanrachakul B, Tangtrakul S, Herabutya Y, et al. Meckel's diverticulitis: an uncommon complication during pregnancy. *BJOG* 2001;108(11):1199-200.
30. Hildebrand HD. Generalized peritonitis. *CMAJ* 2002;166(5):632.
31. Garnizov T, Marinov B, Dukovski A, et al. A case report of two incidents of acute abdomen in a woman during pregnancy and in the early puerperium. *Akush Ginekol (Sofia)* 2006;45(2):57-60.
32. Huerta S, Barleben A, Peck MA, Gordon IL. Meckel's diverticulitis: a rare etiology of an acute abdomen during pregnancy. *Curr Surg* 2006;63(4):290-3.
33. Zapardiel I, De la Fuente-Valero J, et al. Large Meckel's diverticulum complicating pregnancy with an intestinal obstruction. *Acta Obstet Gynecol Scand* 2009;88(4):492-3.
34. Wong YS, Liu SY, Ng SS, et al. Giant Meckel's diverticulitis: a rare condition complicating pregnancy. *Am J Surg* 2010;200(1):184-5.
35. Luna-Lugo G, Guzmán-Sánchez C. Transcesarean ileal resection of double Meckel diverticulum. *Ginecol Obstet Mex* 2011;79(5):308-12. Spanish.
36. Leijonmarck CE, Bonman-Sandelin K, Frisell J, Raf L. Meckel's diverticulum in the adult. *Br J Surg* 1986;73:146-149.
37. Peoples JB, Lichtenberger EJ, Dunn MM. Incidental Meckel's diverticulectomy in adults. *Surgery* 1995;118:649-652.
38. Soltero JH, Bill AH. The natural history of Meckel's diverticulum and its relation to incidental removal. *Am J Surg* 1976;32:168-173.