

Diagnosis and management of intestinal obstruction during pregnancy

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ABSTRACT

Acute intestinal obstruction in pregnancy is a rare, unusual, and very challenging non obstetric surgical pathology linked with great fetal-maternal morbidity and mortality. It is estimated that a surgeon may encounter and resolve 1 to 2 cases in his career.

Bowel obstruction is difficult to diagnose because signs and symptoms such as pain, vomiting, abdominal distention, and constipation are frequently attributed to normal pregnancy. On the other hand, gravidity requires immediately, in case of suspicion of grave abdominal pathology, such as bowel obstruction, that surgery should not be delayed.

Keywords: obstruction, bowel, pregnancy, volvulus, adhesions, malignancy

BACKGROUND

Acute intestinal obstruction in pregnancy is a rare, unusual, and very challenging non obstetric surgical pathology linked with great fetal-maternal morbidity and mortality, with an incidence ranging from 1 in 1,500 to 1 in 66,431 deliveries [1]. It is estimated that a surgeon may encounter and resolve 1 to 2 cases in his career. Half of the reported cases during pregnancy are caused by postoperative adhesions (including previous cesarean section) and the other half are caused by volvulus, internal hernia, mesenteric band and others [2].

Bowel obstruction is difficult to diagnose because signs and symptoms such as pain, vomiting, abdominal distention, and constipation are frequently attributed to normal pregnancy. On the other hand, gravidity requires immediately, in case of suspicion of grave abdominal pathology, such as bowel obstruction, that surgery should not be delayed [3]. Some cases can be successfully delayed in order to allow the fetus to mature, but in the end the operative rate of these pregnant patients is greater than 90% [2].

The first case of acute intestinal obstruction (IO) in pregnancy due to sigmoid volvulus was reported in 1885 with a stillborn infant delivery and death of the mother 2 days later [4]. The common causes of IO in pregnancy are adhesions bands [1] from previous abdominal surgery, including previous caesarean section (54.6%) [5], volvulus not caused by adhesions (24.5%), intussusception (5.1%), malignant causes [1], such as colorectal cancer (3.7%) [3], herniation (1.4%), and others (10.7%) [1]. Adhesive obstructions are more common in advanced pregnancy, with 45% of cases occurring in the third trimester, as compared to first trimester (6%), second trimester (28%) and puerperium (21%). Common symptoms of intestinal obstruction in pregnancy (IOP) are abdominal pain (98%), vomiting (82%) and constipation (30%). Abdominal tenderness occurs in 71% and abnormal peristalsis is found in 55% of the cases [5]. Radiological investigations are limited due to the fetal radiation hazards [6]. If diagnosis is delayed or missed, it can lead to complications such as intestinal strangulation, with a high incidence of maternal morbidity, mortality, and fe-

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tal demise, all of which can be reduced with early detection, but different obstacles and limitations are present in pregnancy [1]. The need for prompt laparotomy in all cases of bowel obstruction is emphasized due to the great risk of fetal loss and maternal mortality [7]. Maternal death always results in fetal death [2].

MATERIALS AND METHODS

A systematic search of the literature was conducted in the database of PubMed, in order to select articles published in peer-reviewed journals up to 28th December 2021. The keywords along with respective combinations included were obstruction, bowel, pregnancy, volvulus, adhesions, malignancy.

Using the search algorithm based on specific keywords on PubMed, we found 269 relevant articles, published between 2014 and 2021, selecting only articles with studies performed on a population of adult females with age ranging from 19 to 44 years old, published in the last 7 years in trusted journals, written by experts in the field.

The inclusion criteria for the study were at first the keywords used in the search strategy. Furthermore, we included only articles published in the last 7 years, that were guided specifically on the topic at hand, each of them studying different diagnostic methods and treatments for intestinal obstruction in pregnancy. We excluded articles older than 7 years, that did not detail diagnostic methods and treatments for intestinal obstruction in pregnancy and did not focus on the topic at hand or had significant or clear conclusions. In the final analysis we included 21 articles, published between 2014 and 2021.

DIAGNOSIS AND TREATMENT OF INTESTINAL OBSTRUCTION IN PREGNANCY

The diagnosis and management of intestinal obstruction in pregnancy (IOP) is similar to non-pregnant patients [5]. Bowel obstruction is difficult to diagnose because signs and symptoms such as pain, vomiting, abdominal distention, and constipation are frequently attributed to normal pregnancy [3]. Radiological investigations are limited due to the fetal radiation hazards [6]. Ultrasound has minimal utility in the diagnosis of IOP. It has minimal risks associated, but cannot accurately diagnose the transition point, complications, and etiology of IOP [8]. Abdominal X-ray is used to distinguish large from small bowel obstruction during pregnancy. However, it cannot provide a definitive diagnosis for the etiology of IOP and cannot detect ischemic complications or partial bowel obstruction [8]. When using a single plain X-ray of the abdomen, the fetal expo-

sure to radiation is around 100 millirads (mrad) while that from a CT scan of the abdomen is around 3.5 rads [5] (estimated fetal ionizing radiation dose - EFIRD from a single abdominal X-ray is 1-3 mGy) [8]. Exposures up to 0.05 Gy do not increase the risk of developing fetal anomalies or pregnancy loss, making the abdominal X-ray an acceptable and cost-effective radiological diagnostic tool [5], that can be offered to pregnant women when the benefits outweigh the risks [7].

The American College of Obstetricians and Gynecologists recommend the use of CT as second line to MRI for IOP. A single-phase abdominal-pelvic CT has EFIRD of 25 mGy which is below the threshold dose for deterministic effects. CT offers rapid multiplanar identification of the transition point, etiology and potential complications of IOP and it is also accessible [8].

American College of Safety Radiology Guidance Document on MR clearly states that MRI (Magnetic resonance imaging) should be indicated in pregnancy when: (1) non-ionizing tools cannot acquire the information requested from the MRI study; (2) the information needed potentially affects the care of the patient/fetus; and (3) it is not safe to wait until the end of pregnancy. MRI is indicated when the diagnosis is difficult to be obtained [6].

MRI offers multiplanar images with no exposure to ionizing radiation. It is less accessible, time consuming and requires expert interpretation. The magnetic field can in theory disturb cell migration, proliferation, and differentiation. For these reasons, MRI should be avoided in the first trimester of pregnancy [8].

Iodinated contrast theoretically affects fetal thyroid function and neonates with fetal exposure should be tested for thyroid function. Gadolinium dissociates in amniotic fluid into toxic free ions; no hazardous effects have been showed when using clinical doses [8]. The management algorithm of IOP does not differ significantly from the general population. When imaging modalities/ contrast agents have adverse effects, discussion with the radiology team is needed to minimize risk without lowering diagnostic accuracy [8].

Delaying surgical treatment is not advised. Medical treatment (NPO-nil per os, nasogastric suction, fluid, and electrolyte repletion) should be the first step, unless there are clinical, paraclinical or imaging signs of gravity. Failure of medical treatment or deterioration of the clinical status, with onset of severe abdominal pain, combined with signs of gravity such as tachycardia, fever and marked leukocytosis are justification for rapid surgical intervention. A midline laparotomy is recommended adapted to uterine size [9].

VOLVULUS

A volvulus is an abnormal rotation of a part of the intestine around the axis of its blood supply and mesentery that leads to obstruction. The most frequent site is the sigmoid colon. During pregnancy it is a rare and life-threatening condition with high mortality rates (maternal mortality rates of 5% to 12%; fetal mortality rates of 20% to 26%). It leads to progressive distention of the bowel, ischemia and bacterial translocation that leads to necrosis and perforation [10].

Sigmoid volvulus

Common causes include adhesions, malignancies, intussusception, hernia [11] and appendicitis [12]. The outcome depends on accurate and rapid diagnosis and management [11]. It often occurs in the third trimester of pregnancy, when the large uterus misplaces the sigmoid colon out of the pelvis [10], leading the colon to twist around its fixation points [12]. Delayed diagnosis leads to severe maternal outcomes such as intestinal ischemia and perforation (with 50% maternal mortality) [10], peritonitis, sepsis, and fetal complications (with 30% mortality) include preterm delivery, intrauterine fetal death, and neonatal sepsis [11]. In uncomplicated volvulus, early endoscopic decompression is a safe alternative to surgery [10].

Clinical symptoms are represented by abdominal pain and constipation, accompanied by cramps and vomiting. The abdomen could be tense, hyper-sonic on percussion and auscultation reveals no bowel sounds [11].

The best imaging investigation is plain abdominal X ray, which has a sensitivity of 90% in the diagnosis of IO.

Treatment consists in emergency laparotomy through a midline vertical incision and cesarean section will be the first surgery performed. It will be followed by inspection of bowel in order to detect the site of the volvulus and to decide its surgical treatment which could consist in de-rotation or resection and anastomosis. Sometimes anastomosis could not be performed due to the dilation of the sigmoid colon or poor quality of intestinal wall (edema, ischemia, or necrosis) [11]. In this case a Hartmann's colostomy could be considered and stoma could be closed some months later [12].

Recurrent sigmoid volvulus

It is possible that the same gravida has a recurrence of sigmoid volvulus during the same pregnancy. Clinical symptoms are represented by cramping abdominal pain, abdominal distension, and constipation. Physical examination reveals distended abdomen, mildly tender with no signs of re-

bound tenderness or abdominal guarding. A history of sigmoid volvulus is the key element of the diagnosis [13]. In the 3rd trimester of pregnancy, the recommended imaging investigation is plain abdominal X-ray. It shows an enlarged and twisted bowel loops described as "coffee-bean" sign [13].

When available, the use of MRI is highly valuable showing large bowel distension, an abrupt transition point at the level of torsion and the collapse of distal sigmoid and rectum, image considered pathognomonic for sigmoid volvulus [10].

A non-operative treatment with rigid sigmoidoscope could be attempted with the intention of partial decompression of the volvulus and a rectal tube placement. If the procedure is not successful or volvulus recur, early surgery is the treatment of choice. The use of flexible sigmoidoscopy is easier and safer. It shows aspect of colonic mucosa that could be decisive for surgical decisions.

There is a case report in the literature when, after successful endoscopic decompression and steroid administration for fetal lung maturation, labor was induced, and patient delivered vaginally. Elective laparoscopic sigmoid colectomy was planned after 8 weeks postpartum [10].

As a conclusion of the case reports in the literature, endoscopic decompression is recommended in the first trimester as first attempt, sigmoid colectomy in the second trimester as procedure of choice, while in the 3rd trimester, if the patient is stable, a short follow-up of 24 h could be considered to give corticosteroids for fetal lung maturation, followed by cesarean section and appropriate surgical treatment according to local situation [13].

Cecal volvulus

Cecal volvulus is a rare and often life-threatening cause of IOP. Symptoms occur usually secondary to ischemia or obstruction. Prognosis is strongly influenced by early diagnosis. Usual symptoms and signs include nausea, vomiting, lack of stool or flatus, colicky abdominal pain, bloating or distension of the abdomen. Clinical examination reveals abdominal tenderness. When ischemia and perforation occur, signs of peritonitis with a clinic picture of septic shock may be present [14].

The most recommended imaging investigation are MRI and plain abdominal X-ray which show dilated bowel loops located lateral to the midline [14]. When MRI is not available and in case of a clinically unstable patient, CT should be used irrespective the radiation risk.

Treatment of choice is emergency surgery and it consists in the resection of the affected segment. Conservative treatment is associated with an increased risk of recurrence [14].

A very rare clinical condition is the cecal volvulus post-appendectomy in pregnancy. It is a difficult clinical diagnosis. It is an intraoperative surprise and

a conservative surgery could be recommended consisting in cecopexy [15].

Midgut volvulus

Midgut volvulus (MV) in pregnancy is very rare. It is almost always an intraoperative surprise. It has unspecific symptoms (back pain, nausea, vomiting). Blood tests could reveal leukocytosis, high value of creatinine, metabolic acidosis [4].

Imaging diagnosis of MV (MRI, plain abdominal X-ray) could reveal “whirlpool sign” of the superior mesenteric pedicle. Intestinal malrotation could be suggested by: the duodenojejunal flexure situated to the right of the spinal column; colon found predominately in the left side of the abdomen; cecum to the left of the spinal column; the location of the superior mesenteric artery to the right of its associated vein; small bowel loops in the right side of the abdomen and [4].

The decision of surgical intervention is taken in emergency due to an acute abdomen. If pregnancy is around term, cesarean section will be performed first, followed by inspection of the abdominal cavity and surgical diagnosis. In case of bowel infarction resection is recommended.

In case of an early diagnosis, with no sign ischemia, necrosis or peritonitis, conservative attitude should be tempted, consisting in de-rotation and warming of bowels. Conservative treatment has the risk of recurrence.

ADHESION BANDS

Clinical signs are common to intestinal IO, but the key element of the diagnosis is history of multiple abdominal surgeries.

Plain abdominal X-ray show multiple dilated bowels and air-fluid levels surrounding the uterus.

Surgical intervention is mandatory. Intraoperative identification of the adhesion bands is followed by their release and the inspection of the affected bowel. In the case when color is recovered, together with pulsations of the mesenteric artery and peristalsis, a conservative approach is recommended. Otherwise, in case of necrosis, resection and anastomosis is necessary [5].

INTUSSUSCEPTION

It is also a very rare diagnosis. Symptoms and signs are nonspecific, but MRI could orient the diagnosis. Laparotomy is confirming the diagnosis and intussusception is reduced manually [16].

SMALL BOWEL OBSTRUCTION AFTER LAPAROSCOPIC GASTRIC BYPASS

Another cause of IOP is laparoscopic gastric bypass, requiring secondary surgical intervention. No

high risk was observed during the first trimester of pregnancy, but the second and third are associated with increased risk. [17]. The incidence rate of IOP was 42.9 for women with closed mesenteric defects during the primary procedure, and 53.2 for women with mesenteric defects that were left open [17]. CT scan and MRI scan are diagnostic options, but very few radiologists and surgeons are experienced in diagnosing internal hernia in late pregnancy. Exposure of the mother and fetus to radiation during CT may be discouraged, although it was proven many times to be safe [17].

MALIGNANT ETIOLOGY

Colorectal cancers and myxoid liposarcoma are extremely rare cases of IO during pregnancy [3,18]. Diagnosis is established during surgery and attitude is complex, managed by the multidisciplinary team. In a case report tumor was successfully resected and pregnancy continued until term followed by a vaginal delivery of twins [18].

ABDOMINAL PREGNANCY

It is the rarest anatomical localization of all ectopic pregnancies. Extremely rare it could be associated with IO [19]. Rarely pregnancy is detected in the first trimester when diagnosis is the easiest. If the correct diagnosis is missed in the first trimester pregnancy is considered with intrauterine location. In most of the cases fetus is dead and even calcified [19]. The clinical signs of IO could be associated with signs of peritoneal infection and even septic shock.

Diagnosis is established intraoperatively and is followed by segmental bowel resection and anastomosis. Placenta could be gently removed or leave in situ, depending on the degree of adhesion and the organ to which is attached. Prognostic could be poor [19].

In exceptional cases fetus could be alive and could survive [1].

MECKEL'S DIVERTICULUM IN PREGNANCY

Meckel's diverticulum is the most frequent congenital malformation in the gastrointestinal tract.

A series of twenty-seven cases were analyzed. Average age was 26.9 years. Average gestation age was 25.1 weeks. Low incidence was found in the first trimester (3.7%), with similar incidences in the second trimester (48.1%) and third trimester (48.1%). Abdominal pain was present in 88.9% of cases, nausea/vomiting in 59.3%, fever in 18.5%, abdominal distension in 18.5%, hematochezia in 11.1%, constipation in 11.1%, hematemesis in 3.7%,

diarrhea in 3.7% and 3.7% of cases were asymptomatic.

Imaging investigations (US, MRI, CT, abdominal X-ray) have not a specific accuracy [20].

The lowest incidence was detected in the first trimester and the highest in the second and third trimesters (13/27).

Conservative management was initially tried in 13 cases out of 27 but it failed in all reported cases. All cases required surgical management by resection via laparoscopy (4 cases, one converted to laparotomy), laparotomy (17 cases) or after cesarean section (5 cases). The main intraoperative complications were perforation, intussusception, bleeding, inflammation, gangrene, obstruction and volvulus [20].

CONCLUSIONS

Because symptoms of IOP such as abdominal pain, nausea, vomiting and constipation are shared with most normal pregnancies, emergency physicians should not consider obstructive symptoms as pregnancy-related and not hesitate to recommend radiologic investigations, as it may contribute to delayed diagnosis.

Intestinal obstruction during pregnancy is an uncommon and serious non-obstetric surgical condition, most frequently occurring in the third trimester, often due to adhesion bands from previous abdominal surgeries, including previous cesarean sections.

Sigmoid volvulus complicating pregnancy is a very rare condition with increased maternal and fetal morbidity and mortality. A high index of suspicion and early surgical intervention in sigmoid volvulus are key for favorable maternal and fetal outcomes. MD and associated conditions are difficult to diagnose in the pregnant population. MD

should be considered once appendicitis has been excluded.

Pregnancy was associated with an increased risk for small bowel obstruction after laparoscopic gastric bypass surgery, with increased risk during the second and third trimesters. Bowel intussusception is a rare pathology that is more frequent after gastric bypass.

Pregnancy is not an absolute contraindication to ionizing radiation from X-ray or CT scans. Pregnant women should be properly informed that the radiation exposure is below 10 rad (the current maximum radiation dose that a fetus can be safely exposed to). Safety analyses have not been done regarding the use of gastrointestinal contrast in pregnancy, and those on IV contrast agents are limited. All patients with clinical suspicion of IOP should have urgent MRI to determine the etiology of IOP. Expedited investigations of the acute abdomen in pregnancy are advised.

The diagnosis of midgut volvulus and congenital malrotation in pregnancy is difficult and not apparent until surgery is performed. Current imaging practices for MD reflects low diagnostic accuracy.

Indications for urgent operative management do not differ from nonpregnant adults. Where diagnosis is unclear, surgical intervention should be considered as both a diagnostic and therapeutic tool.

In cases of adhesions causing obstruction, patients may be managed conservatively, with a low threshold for laparotomy. Surgery for partial or incomplete adhesive IOP could be delayed for 24-48 h, in order to achieve fetal maturity only if there is no clinical evidence of a complication. In cases such as small bowel volvulus or internal hernia, prompt laparotomy following resuscitation is recommended. Surgery is the definitive management of obstruction caused by MD, with both open and laparoscopic techniques being utilized.

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