**Management of the colonic volvulus in 2016**

L. Perrot\(^a,\)\(^*,\) A. Fohlen\(^b,\) A. Alves\(^a,\) J. Lubrano\(^a\)

\(^a\) Service de chirurgie viscérale et digestive, centre hospitalier régional et universitaire, avenue de la Côte-de-Nacre, 14000 Caen, France

\(^b\) Service de radiologie, centre hospitalier régional et universitaire, avenue de la Côte-de-Nacre, 14000 Caen, France

Available online 28 April 2016

**Summary**
Colonic volvulus is the third leading cause of colonic obstruction worldwide, occurring at two principal locations: the sigmoid colon and cecum. In Western countries, sigmoid volvulus preferentially affects elderly men whereas cecal volvulus affects younger women. Some risk factors, such as chronic constipation, high-fiber diet, frequent use of laxatives, personal past history of laparotomy and anatomic predispositions, are common to both locations. Clinical symptomatology is non-specific, including a combination of abdominal pain, gaseous distention, and bowel obstruction. Abdominopelvic computerized tomography is currently the gold standard examination, allowing positive diagnosis as well as detection of complications. Specific management depends on the location, patient comorbidities and colonic wall viability, but treatment is an emergency in every case. If clinical or radiological signs of gravity are present, emergency surgery is mandatory, but is associated with high morbidity and mortality rates. For sigmoid volvulus without criteria of gravity, the ideal strategy is an endoscopic detorsion procedure followed, within 2 to 5 days, by surgery that includes a sigmoid colectomy with primary anastomosis. Exclusively endoscopic therapy must be reserved for patients who are at excessive risk for surgical intervention. In cecal volvulus, endoscopy has no role and surgery is the rule.

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**Introduction**

The term ''volvulus'' comes from the Latin ''volvere'' meaning twist. It was first described by Rokitansky in 1836 [1]. Colonic volvulus is the third leading cause of colonic obstruction in the world, following colorectal cancer and complicated sigmoid diverticulitis [2]. Any mobile segment of the colon can be affected by volvulus [3]. According to various series in the literature, the sigmoid is involved in 60–75% of cases, cecum in 25–40% of cases, transverse colon in 1–4% of cases and splenic flexure in 1% of cases. There are numerous publications in the literature, but many of these are dated, have low numbers of patients and inadequate follow-up. The aim of this review is to build a decision algorithm for diagnostic and therapeutic management of colon volvulus. After a brief review of the epidemiology and etiology of colon volvulus, we discuss common and specific points of the diagnosis and treatment of sigmoid and cecal volvulus.

**Epidemiology**

The incidence of colon volvulus varies in different regions of the world. Thus, in the so-called “volvulus belt”, an endemic area that includes Africa, South America, Russia, Eastern Europe, the Middle East, India and Brazil, colonic volvulus represents 13 to 42% of all intestinal obstructions.
[4–7]. In "Western" countries where the incidence is low (North America, Western Europe, Australia), colonic volvulus represents less than 5% of all intestinal obstruction. The latest large-scale epidemiological study, published by Halabi et al. [8], reported on 63,749 cases of colonic volvulus among 3,351,152 cases of intestinal obstruction over a 9-year period. During this period, the authors observed a stable incidence of sigmoid volvulus, however, the incidence of cecal volvulus increased by 5% per year.

Similarly, the volvulus location and its clinical setting vary by region. In the "volvulus belt" countries, sigmoid volvulus usually occurs in young men (from the 4th decade onward with a male:female sex-ratio of 4:1). For this reason, some authors consider that endemic sigmoid volvulus is a different clinical entity than sporadic volvulus [9]. In Western countries, sigmoid volvulus preferentially affects elderly males (age > 70) while cecal volvulus affects somewhat younger females (age ≤ 60), as highlighted in the study by Halabi et al. [8].

**Etiology**

The etiology of colon volvulus is probably multifactorial. Some factors are common to all locations of volvulus, such as chronic constipation, high fiber diet, frequent use of laxatives, history of laparotomy and anatomical predisposition.

Dolicho-sigmoid, the presence of an elongated sigmoid colon on a narrow mesenteric base, is the most commonly cited predisposing factor for sigmoid volvulus. An anatomical study performed on 590 cadavers demonstrated ethnic anatomical differences [10]. The length and height of the sigmoid were significantly longer and the root of the mesosigmoid narrower in Africans, with no difference between men and women. In the case-control study of Akinkuotu et al. [11], there was a significant increase in the length of the mesosigmoid, the maximum width of the mesosigmoid and the luminal circumference of the colon in patients who underwent surgery for sigmoid volvulus. However, there was no significant difference in the maximal width of the mesosigmoid root. The authors concluded that the combination of a high and wide mesosigmoid with a narrow root predisposed to sigmoid volvulus. While there are clearly anatomical predispositions, it remains unclear whether they are congenital or acquired [12].

Anatomical predispositions have also been reported for cecal volvulus. Thus, cecal volvulus may be linked to failure of parietal fixation of the ileocecal region during embryological counter-clockwise cecal rotation from the left side of the abdomen towards the right iliac fossa. In an autopsy series of 125 cadavers, Ballantyne et al. observed a complete absence of ileocecal attachment in 11% of cases and cecal hypermobility allowing rotation in 26% of cases [2].

Some risk factors are more specific to cecal volvulus such as history of previous colonoscopy, laparoscopy and pregnancy [13]. Other risk factors favor the development of sigmoid volvulus, such as diabetes, neuropsychiatric history leading to reduced autonomy, institutional placement and prolonged bed rest. Finally, in younger patients, sigmoid volvulus is often associated with megalocolon due to such causes as Hirschsprung’s or Chagas disease [4].

**Pathophysiology**

In sigmoid volvulus, mesosigmoid twisting of up to 180° is considered physiological. In approximately 2% of cases, the volvulus reduces spontaneously [2]. Torsion beyond 180° leads to complications such as colonic obstruction, ischemia or necrosis with perforation. For unknown reasons, the twist preferentially occurs in the counterclockwise direction in 70% of cases [14]. Fibrosis of the mesosigmoid, seen in 86% of operated patients, is more a result than a cause of the torsion, due to cicatrization after reversible ischemia in the relaxing forms of volvulus [15]. During sigmoid volvulus, colonic distension causes an increase in intraluminal pressure, which results in decreased capillary perfusion; this mural ischemia is aggravated by mesocolic vessel occlusion by mechanical phenomena of compression and axial rotation [16]. Early mucosal ischemia promotes bacterial translocation and bacterial gas production, further increasing colonic distension and toxic phenomena. If colonic torsion is not promptly reversed, this creates a vicious circle leading to colonic necrosis and ischemia-reperfusion. These phenomena result in a state of mixed septic and cardiovascular shock. Figs. 1 and 2 describe the two mechanisms of torsion in sigmoid volvulus, with axial mesocolic volvulus being more common than organo-axial volvulus (75% vs. 25% [17]).

There are two distinct anatomical types of cecal volvulus (Fig. 3): axial rotation of the ileocecal region around its mesentery, generally in a clockwise direction (90%) and anterior-superior folding of the cecum without axial rotation, commonly called cecal bascule [4]. Cecal bascule is less common than true rotation of the ileocecal region and causes less vascular compromise since there is no true mesenteric torsion [18].
Clinical symptomatology

At whatever site colonic volvulus occurs, clinical symptomatology is non-specific. Sigmoid volvulus presents with a clinical triad of abdominal distension, low abdominal crampy pain with constipation, and vomiting (usually a late symptom). In 30–41% of cases, patients report previous episodes of abdominal distention [4]. This triad is more common in endemic than sporadic volvulus (88% versus 33%) [19]. In the “volvulus belt” countries, the clinical presentation may be acute with peritonitis and shock. In this fulminant clinical presentation, the prognosis is poor because colonic necrosis and perforation have already occurred by the time the patient first presents for care [20].

Conversely, in Western countries, the patient usually presents 3 to 4 days after the onset of symptoms [21]. The classic patient is elderly, institutionalized, and under psychotropic medications that cause chronic constipation. The history should elicit the above-mentioned risk factors, including a personal history of previous sigmoid volvulus, which is present in 30–40% of cases. Initial clinical examination is often difficult due to abdominal distension associated with colonic obstruction of several days duration; if there are no signs of peritoneal irritation, as is often the case, this may result in a delay in diagnosis. Classically, asymmetric gaseous abdominal distention associated with emptiness of the left iliac fossa is pathognomonic for sigmoid volvulus [6].

In cecal volvulus, the clinical presentation is also non-specific, combining in varying degrees: intermittent episodes of abdominal distension, crampy abdominal pain, constipation, nausea and vomiting. In the “mobile cecum syndrome”, these episodes may spontaneously resolve and then recur [22]. Typically, the pain resolves along with resumption of intestinal transit. In other cases, cecal volvulus may present with a picture of acute intestinal obstruction.

Laboratory tests do not point specifically to the diagnosis. They are only a reflection of bowel obstruction and/or sepsis: fluid and electrolyte disorders, hypokalemia, azotemia, leukocytosis, inflammatory syndrome, or even bleeding disorders when bowel necrosis is present.

Imaging

In the past, abdominal plain X-rays (Fig. 4) and water-soluble contrast enema were the key diagnostic examinations. Currently, these two techniques have been virtually abandoned in favor of CT scan, particularly for the initial episode where CT will confirm the diagnosis with near
100% sensitivity and >90% specificity [23,24]. Due to its volume acquisition, CT allows multiplanar reconstruction that facilitates definitive diagnosis. It also eliminates other possibilities from the differential diagnosis, particularly obstructing colorectal carcinoma at the rectosigmoid junction.

Numerous characteristic findings on CT scan have been described in the literature, including the “bird’s beak” appearance created by the two limbs of the twisted colonic segment joining at the point of torsion, or a “coffee bean” image on the frontal reconstruction (Fig. 5), which is also often evident on abdominal plain films (Fig. 4), corresponding to the loop of the volvulized sigmoid.

A “swirl” or “whirl” sign has also been described, corresponding to the point of torsion around which the bowel loops and mesenteric vessels are wrapped (Figs. 5 and 6), and the “X-marks-the-spot sign”, corresponding to transition points of each limb crossing at the same place, and the “split wall sign” linked to a tomographic image of the sigmoid loop wrapped around its mesentery that sometimes gives the impression of two separate digestive structures.

CT can also show indirect signs such as dilated proximal intestine and colon when the ileocecal valve is incompetent, and an absence of air in the distal colon and rectum. It can identify the transition zone between dilated and empty intestine.

A final but crucial benefit of CT is its ability to detect signs of gravity, which may modify the therapeutic management approach:

- degree of colonic distension;
- especially, direct signs of intestinal ischemia in the wall of the twisted loop: spontaneous hyperdensity, enhancement defect after contrast injection with or without pneumatosis intestinalis (arterial ischemia), or wall thickening (venous ischemia);
- indirect signs of intestinal ischemia: free peritoneal fluid or mesenteric or portal venous air;
- mesenteric injury with hyperemia or mesenteric hematoma;
- pneumoperitoneum, signaling perforation of the twisted loop.

**Treatment strategy**

Therapeutic strategy depends on the location of the volvulus, clinical presentation and initial paraclinical findings. Complicated forms must be quickly diagnosed and brought promptly to surgery regardless of location. For complicated forms of volvulus, the therapeutic strategy differs depending on the location of the volvulus and patient condition; the medium-term challenge is to limit recurrent episodes of volvulus.

**Complicated forms of volvulus**

What is the appropriate gesture?

Whatever the location of colon volvulus, criteria of clinical severity and/or radiological evidence of a colonic necrosis or perforation, with or without signs of shock, demand surgical treatment from the outset. After correction of fluid and electrolyte deficits, clotting abnormalities, and stabilization of the patient’s condition (restoration of vascular volume...), surgery consists of midline laparotomy with resection of the necrotic bowel segment. Whether or not to restore intestinal continuity depends on local conditions and the patient’s hemodynamic status.

The incidence of colonic necrosis varies depending on the series. Thus, in a Turkish series [25], 271 patients (61%) had a sigmoid volvulus complicated by colonic necrosis.

**Figure 5.** CT signs of sigmoid volvulus: a: arrow: “‘bird’s beak’” sign at the junction of the torsed loop and the point of torsion; b: arrow: “‘bird’s beak’” sign at the junction of the dilated loop and the zone of torsion: 1: air-filled dilated left colon proximal to the volvulus; 2: copious fecal loading of the cecum; c: arrow: “‘whirl sign’”: 1: air-filled volvulized loop, with a virtual wall; 2: dilated left colon upstream from the volvulus with air-fluid levels.
Colonic necrosis and peritonitis are the two main risk factors for mortality [6,8,27,28].

Should intestinal continuity be restored at the initial intervention? For cecal volvulus, immediate restoration of intestinal continuity can be performed by a stapled side-to-side ileocolic anastomosis, as long as there is no peritoneal contamination [29].

The strategy differs for sigmoid volvulus. Restoration of continuity is controversial even in the absence of peritoneal contamination. Indeed, the presence of a dilated and stool-laden proximal colon increases the risk of postoperative anastomotic leak. Some studies have nevertheless argued in favor of restoration of continuity in the absence of peritoneal contamination. In the series of Oren et al. [30], there was no significant difference in mortality after Hartmann procedure (22%) versus resection with anastomosis (19%) among patients who underwent surgery for complicated volvulus.

Moreover, the performance of intraoperative colonic lavage resulted in a decreased 9% mortality in the segmental resection group. Caution still seems to be the rule and it seems legitimate to encourage colostomy if there are adverse local or systemic conditions, or if the surgeon’s experience in colorectal surgery is limited.

If sigmoid resection with colostomy is performed, two techniques are possible: a Hartmann procedure or a double-barrel colostomy in the left iliac fossa as described by Bouilly-Volkman and Mikulicz-Radecki. The advantage of the double-barrel colostomy is that it allows monitoring of the downstream colonic segment in the acute phase and allows a simpler restoration of continuity as a delayed elective procedure. Sigmoid resection at the rectosigmoid junction seems not to be effective in preventing further recurrence of volvulus, which is why the double-barrel colostomy seems to be the ideal gesture when technically feasible. The Hartmann procedure should be reserved for cases of low volvulus with colonic necrosis extending to the rectosigmoid junction making it impossible to bring the distal colonic segment up to the skin level.

Uncomplicated volvulus

If there are no criteria of gravity, the therapeutic strategy for cecal volvulus is different from that for sigmoid volvulus.

Uncomplicated sigmoid volvulus

Initial management

For uncomplicated sigmoid volvulus, colonoscopy is the initial gesture for both diagnosis and treatment. Endoscopy allows one to not only assess the viability of the sigmoid but also to achieve detorsion of the volvulus. If colonic necrosis is present, the patient undergoes immediate surgery. In the absence of colonic necrosis, endoscopy can convert an urgent situation into an elective situation. Colonoscopic detorsion is a relatively simple, minimally invasive procedure associated with a success rate of 70 to 95% with a 4% morbidity. However, mortality is not zero and has been almost 3% in recent series [27,30,31]. A successful procedure results in decompression of gas and evacuation of stool.

The literature favors flexible endoscopy over rigid endoscopy because of its superior diagnostic performance, particularly in assessing ischemia and because of its lower perforation rate [31]. Indeed rigid sigmoidoscopes can fail to diagnose sigmoid volvulus and especially ischemia in up to

Severe comorbidities (chronic obstructive pulmonary disease, hypertension, ischemic heart disease, heart failure, diabetes, chronic renal failure, hemiplegia, Parkinsonism), the presence of shock, prolonged duration of symptoms, and combined colonic and ileal volvulus were significantly associated with risk of colonic necrosis. However, no correlation was found between patient age and/or prior history of sigmoid volvulus and colonic necrosis [6,25,26].

Figure 6. CT signs of complications due to cecal volvulus: a: black arrow: “whirl sign” , hollow arrow: pneumatosis intestinalis of the volvulized loop, considered a precursor sign of perforation; b: white arrow: spontaneous hyperdensity corresponding to a mesenteric hematoma; c: 1: dilated volvulized loop in an ectopic position, riding up into the left subcostal area; star: peri-hepatic free fluid indicative of intestinal ischemia, white arrow: stomach displaced posteriorly by the volvulized loop.
24% of cases. After endoscopic decompression, a Faucher rectal tube is left in place for a variable period from 36 to 72 hours.

The favorable impact of colonoscopy is perfectly illustrated in Turkey’s very large retrospective series that compiled 952 patients over a period of 46.5 years [30]. Colonic decompression has evolved from initial use of barium enema (1966–1968), to rigid sigmoidoscopy (1968–1988), to the introduction of the flexible endoscope in 1988, and exclusive use of flexible endoscopic decompression from 2003 onward. In the Turkish experience, barium enema resulted in successful decompression in 69% of cases but was burdened with a morbidity of 23%, a mortality of 8% and early recurrence in 11% of cases. With rigid sigmoidoscopy, the authors observed successful decompression, morbidity, mortality and early recurrence rates of 78%, 3%, 1% and 3%, respectively. With the advent of flexible endoscopy, rates of successful decompression, morbidity, mortality and early recurrence were 76%, 2%, 0.3% and 6%, respectively.

Barium enema should no longer be considered because it has been replaced by flexible endoscopy.

Is there a need for total colonoscopy?

There seems to be little place for screening colonoscopy before surgery, mainly because of its technical difficulty. Indeed, bowel preparation is usually not feasible and the colon is often extremely long due to the presence of a mega-colon or dolichocolon with angulations that are difficult to traverse. Preoperative total colonoscopy should be offered only if there is clinical or radiological suspicion of underlying neoplasia [32–34].

Endoscopy is therefore limited in most cases to short flexible colonoscopy performed during endoscopic detorsion, which also rules out neoplastic obstruction the rectosigmoid junction, the other principal entity in the differential diagnosis. In case of diagnostic uncertainty, a virtual colonography can be performed instead of total colonoscopy.

What treatment after endoscopic detorsion?

After colonoscopic detorsion followed by conservative management, the recurrence rate of sigmoid volvulus varies from 45% to 71% [27,32–35]. This tendency persists in recently published studies both in France (67% in the experience of the Saint-Antoine hospital [21]), Turkey (nearly 2 out of 3 patients with follow-up exceeding 40 years), New Zealand (61% at 3 months [36]) or in the Danish registry with recurrence probability of 63%, 47%, 41% and 24%, respectively at 3, 6, 12 and 24 months [37]. In addition, the mortality after conservative treatment in the literature varies between 9 and 36% [27,32–35]. In the Danish registry, survival was significantly lower after conservative treatment [38]. However, these results must be qualified since patients considered non-surgical from the start were significantly older and had a significantly higher ASA score (82 vs. 71, P = 0.004; ASA 3 vs. ASA 2, P = 0.012).

In the absence of a randomized study, the current consensus is to perform colonic resection within 2 to 5 days of endoscopic detorsion after the first episode of sigmoid volvulus, because of the high risk of recurrence [39]. For example, only 17% of patients in the study by Halabi et al. had exclusively conservative treatment [8].

Recently, development of percutaneous endoscopic colostomy has been proposed in order to avoid recurrence after decompression and several authors have reported its feasibility [40–43]. This minimally invasive technique has been performed mainly in elderly patients with severe comorbidity or institutionalized patients [21]. Although the reported morbidity and mortality is low, these results must be qualified because of the small number of patients included. However, percutaneous endoscopic colostomy appears as an attractive minimally invasive alternative for debilitated patients that does not require general anesthesia.

What surgical management?

In the absence of a randomized study, the type of surgical treatment remains controversial, although colonic resection with restoration of continuity is the standard treatment [4,8,44].

Whatever the location of the colonic volvulus, several alternatives to resection exist such as detorsion without resection, colopexy, and colostomy. However, these gestures all entail a high risk of recurrence as highlighted in several studies in the literature. Thus, the risk of recurrence varied from 9% to 44% after detorsion without resection volvulus [20,30,45-46] and 20–30% after colopexy [30,44,47].

In France, the mortality risk after elective colonic surgery is close to 2% with a morbidity between 20 and 30%. Two French multicenter studies evaluated the mortality risk factors. Both studies found the same four risk factors: urgent surgery, age > 70 years, malnutrition (weight loss > 10% of body weight in less than 6 months), and neurological impairment. These factors are included in the score developed by the French Association of Surgery (AFC) [48]. Knowledge of these risk factors is used to assist practitioners in the management of operative risk.

Several series have reported the results of surgical treatment of colon volvulus but these figures are difficult to analyze because of the age of the studies, low numbers and heterogeneous procedures. The recent study by Halabi et al. [8] compiling 63,749 cases illustrates the evolution of surgical practices in the treatment of colon volvulus. Among surgical patients (83%), detorsion without colonic fixation was performed in 4% of surgical cases and was associated with 8% mortality. Colonic fixation (colopexy) was used in 3% of cases and was associated with 3% mortality; cecostomy or sigmoid colostomy was used in 3% of cases and was associated with a mortality of 13%. Colonic resection was the most frequently performed procedure (89% of cases), with a mortality of 9% for sigmoid volvulus and 6% for cecal volvulus. In 16% of cases, a subtotal colectomy was performed because of either a double volvulus, a volvulus of the transverse colon, or extensive colonic ischemia, with a 15% mortality. The main risk factors for mortality after surgical treatment of sigmoid volvulus were peritonitis and colonic necrosis. Outside the emergency setting, other risk factors were age > 70 years, coagulopathy, cardiorespiratory disease and renal comorbidities (8).

These elevated complication rates should be put into perspective with other recent publications. Thus, the group of the Saint-Antoine hospital [21] had a mortality rate of zero and a 6% morbidity in 33 patients who underwent sigmoid resection for sigmoid volvulus.

Finally, the recurrence rate is strongly linked to the type of procedure: it can be up to 44% after detorsion alone and 30% after detorsion with colopexy [8], while it is less than 10% after colonic resection [21]. This confirms the superiority of resection compared to other surgical techniques.
Extension of the colonic resection
Non-oncologic resection of the sigmoid loop is generally sufficient, completed by colorectal anastomosis without mobilization of the splenic flexure. But an extended resection may be necessary in the case of extension of colonic necrosis or in the case of associated colonic atony or megacolon [49]. Some authors recommend performance of a subtotal colectomy in case of associated megacolon because of the high risk of recurrence [13,50,51]. In the experience of Morrissey and Deitch [52], the mean rate of recurrence after left colonic resection was 37%; it was only 6% when only the sigmoid was involved vs. 82% if there was associated megacolon. Such an extensive resection may also be necessary in case of double volvulus [8]. In all cases, there is no need for oncologic resection of the root of the mesentery and lymph node dissection.

Which surgical approach?
For elective surgical therapy for sigmoid volvulus, a left-sided McBurney incision or a Pfannenstiel incision seem to be the incisions of choice, although a low midline laparotomy is an alternative.

Scant data are currently available in the literature concerning the role of laparoscopy. However, the absence of fixation of the sigmoid colon and its excessive length often make laparoscopic exposure and dissection difficult, and its interest is further limited since resection with or without anastomosis does not require mobilization of the descending colon.

One retrospective study compared the results of laparoscopy and laparotomy in the management of sigmoid volvulus [53]. Morbidity, the rate of anastomotic leakage and length of hospital stay were similar between the two groups. Only the rate of recurrent volvulus was higher in the laparoscopic group (12 vs. 0%). In the US study by Halabi et al. [8], laparoscopy was performed in 4% of surgical procedures, but with increasing frequency over the past 3 years, especially in young patients with low comorbidity scores. In all cases, whether involving coloectomy, colostomy, or resection, the observed mortality was lower for laparoscopy than for laparotomy (3.0% vs. 3.3% for coloectomy, 7 vs. 13% for colostomy, 5 vs. 7% for right colectomy, 2 vs. 10% for sigmoid colectomy, 12 vs. 15% for total colectomy). We cannot yet recommend the laparoscopic approach for colonic volvulus, due to the small number of studies.

Cecal volvulus
In cecal volvulus, colonoscopy is not recommended due to its low efficacy of about 30% [29,54].

Cecal volvulus should be considered a surgical emergency, even when there are no clinical or radiological criteria of gravity. Treatment consists of midline laparotomy with a non-oncological colecotomy of the volvulated segment (i.e., usually an ileocecal resection) and immediate restoration of continuity. Depending on the extent of right colon ischemia, the resection may need to be extended to include the right colon. A side-to-side stapled anastomosis seems to be ideal because it accommodates the lumenal disparity between the ileum and right colon.

Detorsion and coloectomy fixation without resection is associated with a high recurrence rate and significant morbidity and mortality; it seems to have no place [8].

Laparoscopy is technically impractical due to bowel obstruction, often with significant distension of the volvulated loop and proximal intestine; it is not a recommended approach.

The surgical management of colonic volvulus is summarized in an algorithm (Fig. 7).

Special cases
Colonic volvulus and pregnancy
Colonic volvulus is the first or second leading cause of organic bowel obstruction in pregnant women, although very few cases have been reported in the literature (about a hundred). Both diagnosis and treatment pose problems that may threaten both the maternal and especially the fetal prognosis. It typically occurs in a multiparous woman (in 75% of cases), and in the 3rd trimester in two-thirds of cases [24].

The clinical and laboratory abnormalities are non-specific. Maternal and fetal prognosis are both worsened by delay in diagnosis that can lead to colonic necrosis in 23% of cases [55]. Choice of imaging modalities depends on the term of the pregnancy but magnetic resonance imaging may be an attractive option [56]. For uncomplicated sigmoid volvulus, endoscopic detorsion is recommended but may be ineffective especially in the third trimester because of the volume of the uterus.

The multidisciplinary strategy will therefore depend on the term of pregnancy and the fetal prognosis. In ideal circumstances, definitive surgery is recommended after...
childbirth, but can be performed without significant impact from the second trimester onward.

The reported rates of maternal and fetal mortality are 6–12% and 20–26% respectively [55].

**Uncommon types: volvulus of the transverse colon and splenic flexure**

These types of volvulus are extremely rare. They affect mostly young patients in the second or third decade, preferentially women [4].

Transverse colon volvulus is favored by chronic constipation, resulting in colonic elongation, and by defects in mesenteric fixation. Volvulus of the splenic flexure is favored by chronic constipation, history of abdominal surgery and the Chilaiditi syndrome, (interposition of a colonic segment [usually transverse] between the liver and the right diaphragm). The clinical picture is one of acute colonic obstruction. An episode can resolve spontaneously or can evolve with intermittent episodes of obstruction. Diagnosis currently relies on abdominopelvic CT. The rarity of volvulus at these locations and difficulties in diagnosis often lead to delays in management with a high mortality rate of 33% [57].

Treatment consists of resection, typically an extended right hemicolectomy or segmental transverse colectomy, with performance of an anastomosis if local conditions and patient comorbidities permit [4].

Simple detorsion has no place since it is associated with a significant recurrence rate and a high mortality.

**Exceptionally rare: ileosigmoid volvulus**

Ileosigmoid volvulus is exceptional, although near endemic in the “volvulus belt” of Africa, Asia and the Middle East. Affected patients are usually young men (4th to 5th decade) [58]. Three types of ileosigmoid volvulus have been described:

- **type I**: the ileum wraps around the sigmoid clockwise or anti-clockwise (about 55% of cases);
- **type II**: sigmoid wraps around the ileum clockwise or counterclockwise (about 5% of cases);
- **type III**: the ileocecal region wraps around the sigmoid (less than 5% of cases).

There are some unclassifiable variants; the rotation is clockwise in about 2/3 of cases [58].

The clinical picture is an acute onset of bowel obstruction, often with systemic toxicity and frequently, there is treatment delay. Indeed, the diagnosis is made in only 20% of cases and intestinal necrosis of the ileum and/or sigmoid colon is observed in 70% of cases. Diagnosis currently relies on abdominopelvic CT. The therapeutic management requires fluid and electrolyte resuscitation followed by surgery: double resection with or without restoration of continuity depending on the operating findings. Mortality is high, reaching 73% in some series [59].

**Conclusions**

Colonic volvulus, the third most common cause of colonic obstruction, is a medical and surgical emergency; in Western countries, it usually occurs in the elderly, institutionalized patient with a neuropsychiatric history, and is often associated with diagnostic and therapeutic delay. Abdominopelvic CT is essential for definitive diagnosis and detection of signs of severity. When signs of complications such as necrosis or peritonitis are present, immediate surgical treatment consists of colonic resection usually without restoration of continuity. In the absence of criteria of severity, the therapeutic strategy depends on the location of volvulus.

For cecal volvulus, right colectomy is currently recommended; the decision for or against immediate restoration of continuity depends on the operating findings and the patient’s general condition (comorbidities, AFC score).

For uncomplicated sigmoid volvulus, colonoscopy is the first-line procedure for both diagnosis and therapy; it allows assessment of colon viability and detorsion of the volvulus. Staged sigmoid resection is performed within 2 to 5 days of endoscopic detorsion. Currently, surgical detorsion without resection, colopexy, and/or colostomy are no longer recommended because of the high risk of recurrence and mortality. However, the treatment strategy remains controversial for high-risk patients; the innovative technique of percutaneous endoscopic colostomy could be a minimally invasive alternative that reduces not only the risk of recurrence but also of mortality.

**Key points**

- Colonic volvulus is a medical and surgical emergency that involves the sigmoid colon in 60–75% of cases and the cecum in 25–40% of cases.
- In Western countries, sigmoid volvulus usually occurs in the elderly, institutionalized patient with neuropsychiatric history.
- Abdominopelvic CT scan is the essential test for definitive diagnosis and assessment of gravity.
- In colonic volvulus with signs of complication (colonic necrosis, perforation, shock), immediate colectomy is required, usually without restoration of continuity.
- In cecal volvulus, right colectomy is recommended; the timing of restoration of continuity depends on the operative findings and the patient’s general condition.
- In uncomplicated sigmoid volvulus, colonoscopy is the first-line procedure to assess colon viability and detorse the volvulus. Staged sigmoid resection is performed within 2 to 5 days of endoscopic detorsion.
- Other surgical strategies (detorsion without resection, colopexy and/or colostomy) are contraindicated because of their high risk of recurrent volvulus and mortality.
- For high-risk patients, the treatment strategy is still controversial; percutaneous endoscopic colostomy may be a minimally invasive alternative to surgery that could reduce the risk of recurrence and mortality.

**Disclosure of interest**

The authors declare that they have no competing interest.

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