VOLVULUS OF THE SIGMOID COLON*

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Volvulus of the sigmoid colon is an intestinal obstruction arising from torsion of this segment of the bowel upon its mesentery or upon itself.[1]

INCIDENCE

Because of its relatively rare incidence in this country, few reports of volvulus of the sigmoid in the American literature present a sufficiently large number of cases to permit a clear picture of the symptoms, diagnosis and treatment. Hinton and Steiner[11] reported an incidence of 1 per cent of volvulus of the sigmoid in their cases of acute intestinal obstruction; Campbell and Smith,[4] 4 per cent; and Griffin, Bartron and Meyer an incidence of 2.2 per cent of intestinal obstructions as a whole and 8 per cent of large bowel obstructions. Although these figures vary, they are all materially lower than those reported in several foreign countries, *i.e.*, Finland, Russia, Germany and the Baltic States. Of 215 cases of intestinal obstruction reported from Russia by Perlmann,[13] 111, or more than 50 per cent, were due to volvulus. Of 102 cases of intestinal obstruction reported from Berlin by Brauna and Wortmann,[2] 31 (33 per cent) were due to this condition.

At the John Gaston Hospital, which is a teaching institution connected with the University of Tennessee Medical School in Memphis, volvulus of the sigmoid was encountered 16 times in 14 patients between January 1, 1945, and January 1, 1950. During this same period, 522 cases of intestinal obstruction were observed. Of the 522, 48 were obstructions of the colon. Sixteen of these 48 were produced by volvulus of the sigmoid, comprising 3 per cent of all the intestinal obstructions and 33 per cent of the colon obstructions.

Volvulus of the sigmoid is observed more often in men than in women. Of our 16 cases, 12 were in men. It is also more common among Negroes. Fifteen of our 16 cases, or 93.8 per cent, were in Negroes, while 72 per cent of the total number of patients admitted to the hospital during the same period were Negroes. Most authors state that the condition is uncommon in children and in elderly individuals, yet the majority of our patients were over 50 years of age, as shown below:

10–30 years	1
31–50 years	4
51–70 years	8
71–90 years	2
Above 90 years	1

ETIOLOGY

According to Bacon, certain anatomic and pathologic conditions predispose to torsion of the sigmoid flexure. Anatomically, a redundant or long loop of the sigmoid with a short mesenteric base or attachment which holds the two limbs of the sigmoid in close approximation tends to produce volvulus by allowing an easy rotation of the loop. Narrowing of the base of the mesentery by inflammatory changes, adhesions and scarring of the peritoneum also encourage rotation. That congenitally longer sigmoid flexures are more common in men than in women may account for the larger number of cases of

* Read before the Southern Surgical Association, Hollywood, Florida, December 6, 1950.

volvulus of the sigmoid observed in men. The higher incidence reported from Europe and that encountered in the Negro race may be due to long sigmoidal flexures secondary to a diet high in vegetables and other foods, which leave a large residue and produce bulky stools; this segment, being a reservoir, is elongated by the weight of its contents.[1]

Of the pathologic conditions which predispose to volvulus, megacolon is generally recognized as important. Tumors and inflammatory processes may also be responsible.

Although every factor involved in the etiology of volvulus of the sigmoid is not clearly understood, one feature is outstanding: A redundant sigmoid is common to all cases. This redundancy may be congenital or acquired, and in either type may increase over a period of years. Metheny and Nichols[12] report a case in a three-months-old child, the redundancy apparently having been congenital. In contrast, one of the patients in our group was a 97-year-old male. Presumably, the redundancy in this case was progressive, incident to the relaxation of old age and repeated pressure and trauma from the bulky colon contents.

PATHOLOGY

Torsion of the sigmoid may vary from 180 to more than 360 degrees. Groth[9] demonstrated that every torsion of the sigmoid on its mesenteric axis is combined with an axial rotation of the bowel itself, since the sigmoid is more or less fixed to the posterior peritoneal wall. The twist of the mesenteric base and the axial rotation of the sigmoid are together responsible for the obstruction. The axial rotation is twice that of the mesenteric twist; thus, the axial rotation is 360 degrees in a volvulus of 180 degrees. The rotation may be either clockwise or counter-clockwise.

The amount of rotation necessary to produce obstruction varies; it was at least 180 degrees in all of our cases. The degree of obstruction depends upon whether the axial torsion is evenly distributed throughout the sigmoid or is limited to one short area.

Volvulus of the sigmoid usually consists of a simple closed loop obstruction, and the pathologic changes are caused by distention of the bowel by gas and fluid. The distention is produced, in turn, by increased peristalsis, which forces air and fluid into the closed loop, the torsion serving as a valve which allows air and fluid to enter but not to escape. Occasionally, however, air and fluid are forced from the closed loop, giving rise to diarrhea despite the obstruction. Even though a closed loop obstruction is present, the blood supply usually remains adequate for a few days. This is explained by the fact that the sigmoid tolerates a high intraluminal pressure. With strangulation, the venous circulation becomes impaired and, sooner or later, depending upon the degree of torsion, thrombosis of the mesenteric vessels, gangrene, perforation and peritonitis ensue. As the obstruction persists, the proximal colon is gradually distended, at times even the cecum being involved to an extreme degree. If the ileocecal valve is patent, the small bowel may also become distended.

DIAGNOSIS

The preoperative diagnosis of volvulus of the sigmoid was made in most of our cases by the history, physical examination and scout film of the abdomen.

Some authors[5-8] divide volvulus of the sigmoid into different stages: acute, subacute and chronic, and indicate that the acute form is usually seen in young individuals, while the chronic form is observed chiefly in older persons. All our patients presented the clinical picture of complete sigmoid obstruction, the different degrees of acuteness or chronicity being due to the variations in the degrees of obstruction.

There was no correlation between the acuteness or chronicity of the condition and the age groups of the patients. Our youngest patient was a man 28 years old and his volvulus had evidently been present for eight days. He had been treated at home, his only symptoms having been distention, obstipation and slight abdominal cramps. One of our oldest patients had been sick only three days and expired on the way to the ward; autopsy revealed a volvulus of the sigmoid with gangrene. We see no advantage in dividing the volvulus into different stages.

Symptoms and Physical Findings. The symptoms which bring these patients to the hospital vary widely. In most of our group, the onset was insidious, with slight abdominal pain followed by obstipation and distention. One-third of the patients had previously experienced similar attacks, these having been relieved at home by enemas and purgatives. Two described the pain as severe and cramping in nature from the onset; in the interval before they were admitted to the hospital the pain became more generalized across the lower abdomen and increased in severity as distention increased. An occasional patient has little or no pain, either at the onset or at any other time. One of our patients complained only of obstipation and distention of three days' duration; the receiving ward intern made a diagnosis of volvulus of the sigmoid from the history and a scout film of the abdomen.

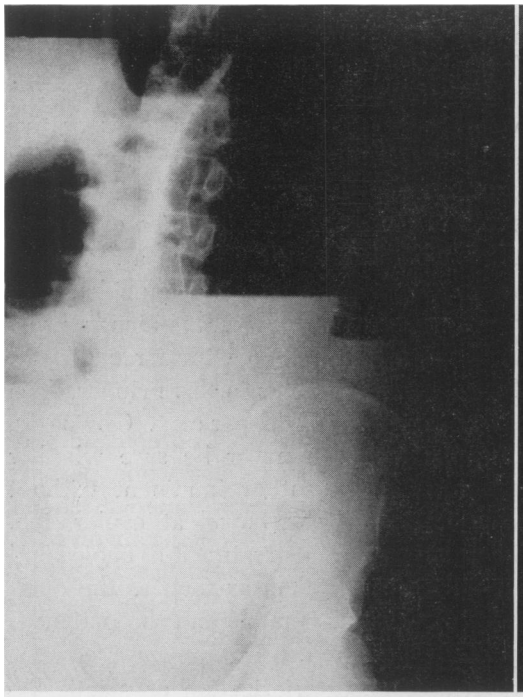

FIG. 1

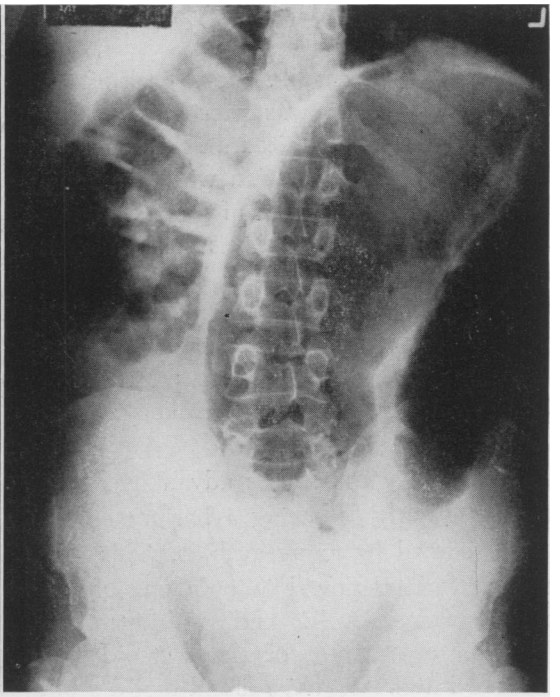

FIG. 2

FIG. 1.—Gas and fluid in the ascending and descending segments.
FIG. 2.—The "bent inner tube" appearance of the distended loop.

In our cases, the average time between the onset of symptoms and the patients' admission to the hospital was about five days. In the majority of 91 cases reported by Bruusgaard,[3] the duration of symptoms before the patients' admission to the hospital was 12 to 72 hours.

Four patients were acutely ill, presenting the picture of strangulation on admission to the hospital. One of these died en route to the ward and another died six hours after admission; at autopsy, both were found to have a volvulus of the sigmoid with gangrene and peritonitis. Those with gangrene complained of constant but not severe pain. Tenderness and rebound tenderness, indicating peritoneal involvement, was associated. Pain was not pronounced in those without gangrene and usually was not the chief symptom.

In all the 16 cases, some degree of abdominal distention was present. Tenderness was generally elicited, but was not extreme except in association with gangrene. The presence or absence of peristalsis was of little value in the diagnosis; it was absent in five, normal in three and hyperactive in four. In four it was not recorded. Only the patients with gangrene had fever. All those with gangrene and about 75 per cent of those without gangrene had leukocytosis of some degree.

Roentgenograms. The advantages of a roentgen study following a barium enema are discussed by many authors. This procedure was employed in only one of our cases preoperatively, and nothing other than an obstruction of the sigmoid was demonstrated. We have found that a scout film of the abdomen is adequate for the diagnosis when combined with the history and physical examination.

Two roentgen signs were observed in 13 of our 16 cases. First, the sigmoid was tremendously distended, more than is ordinarily associated with other types of obstruction, while the remainder of the colon was only moderately distended. The distention was so extreme that the sigmoid extended upward and usually to the right, reaching to the edge of the liver or diaphragm. Second, the distended colon contained large quantities of fluid and gas (Fig. 1). The "bent inner tube" picture (Fig. 2) was observed in eight cases, *i.e.*, the ascending and descending segments were adjacent and were filled with fluid and gas.

TREATMENT

A variety of operative and nonoperative procedures have been described for the treatment of volvulus of the sigmoid. With respect to the nonoperative treatment, admittedly, a spontaneous untwisting of the volvulus is possible if the torsion is less than 360 degrees. This may explain some of the cures reported by the use of enemas in the "home treatment." In one of our cases, the volvulus was untwisted by conservative methods. Hinton and Steiner[11] reported a case wherein the volvulus was released on several occasions by the insertion of a rectal tube into the sigmoid through a sigmoidoscope. If there is no clinical evidence of gangrene, Bruusgaard[3] recommends proctoscopy and intubation with a rectal tube. He treated 91 patients in this manner, with a mortality rate of 14.2 per cent. Obviously, however, one can never be sure whether gangrene is present or imminent without visualization of the bowel at exploration. Thus, surgery is the treatment of choice and should be undertaken as soon as the diagnosis of volvulus is made and the patient is properly prepared.

Resection, exteriorization or plastic fixation of the sigmoid and mesentery at the primary operation for the cure of volvulus of the sigmoid without gangrene have been advocated by several surgeons. All of these procedures have been unsuccessful, however, or the mortality rate has been high. Metheny and Nichols,[12] Griffin, Bartron and Meyer,[8] Hays[10] and others suggest a primary resection at the time of the release of the volvulus. Even though the volvulus is recurrent, the patient's condition usually does not warrant such extensive surgery. A primary resection was performed for one of our patients without gangrene, but his postoperative course was stormy and was

complicated by evisceration. Metheny and Nichols[12] reported five cases wherein a primary resection was successful, although a study of these cases revealed that they were all redundant sigmoids following attacks of volvulus, rather than true volvulus with obstruction.

We do not agree with Griffin *et al.*,[8] that an exteriorization at the original operation executed in the presence of a viable bowel gives the best recovery rate. Likewise, plastic operations on the mesentery and sigmoid nearly always fail. The surgeon is often astounded at a second operation to find no evidence of the previous painstaking procedure.[6]

In view of the generally poor condition of these patients, we believe surgical release of the obstruction is best accomplished by the simplest procedure, namely, untwisting of the volvulus and deflation of the colon per rectal tube. To insure continued deflation during the first 24 hours, we also recommend dilatation of the rectal sphincter while the patient is still under the anesthetic. We have had no deaths in the ten cases wherein this treatment was employed. To effect a cure, the redundant sigmoid should be resected later, preferably with an end-to-end anastomosis. The most suitable time for such a resection is six to 12 weeks after the original operation. In two of our cases, a severe inflammatory reaction was still present about the redundant sigmoid 12 weeks following the primary release of the volvulus. If one waits longer than 12 weeks, however, recurrence is likely. Two of our patients who failed to return for resection at the appointed time developed a recurrence within three months.

Since volvulus of the sigmoid is a closed loop obstruction, cecostomy or transverse colostomy has no place in its treatment except as a complementary procedure when primary resection with end-to-end anastomosis is performed.

In the presence of gangrene of the bowel, primary resection is obligatory. We prefer the Mikulicz type of resection. In one of our patients with gangrene who came to operation, we were able to decompress the distended loop by untwisting the volvulus and inserting a large tube per rectum, without rupture or spillage, before the obstructive resection was undertaken. The patient recovered.

MORTALITY

In the past, the mortality rate of volvulus of the sigmoid has been high. Especially is the mortality high in the presence of gangrene. Bacon[1] reports a mortality of 55 per cent in cases complicated by impairment of the mesenteric circulation, and 25 per cent mortality in those without circulatory interference. Of our 13 patients who came to operation, two had gangrene. One of these died postoperatively, constituting a surgical mortality of 50 per cent in the gangrenous cases. In non-gangrenous cases, we believe the mortality can be reduced to almost zero by simple untwisting of the volvulus primarily and subsequent resection of the redundant sigmoid, after the patient has been rehabilitated.

In 12 of our cases the sigmoid was viable. In ten of these a simple surgical reduction was performed, and in three of the ten this procedure was followed several weeks later by an elective resection. All these patients recovered. Another, who had a primary resection with end-to-end anastomosis at the time of reduction of the volvulus, also recovered; as already stated, however, this patient had a stormy postoperative course. In addition, one patient recovered without operation. The mortality in the 14 treated cases, including the one wherein the obstruction was relieved without operation, is shown below. Neither of the two patients with gangrene of the sigmoid who died on admission to the hospital is included.

Mortality in 14 Cases of Volvulus of the Sigmoid

Treatment	Cases	Deaths	Percent
Viable sigmoid			
Operative	11	0	0
Non-operative	1	0	0
Gangrenous sigmoid			
Operative	2	1	50
Total	14	1	7.14

SUMMARY

A review of the incidence, etiology, pathology, diagnosis and treatment of volvulus of the sigmoid is presented, with the findings, treatment and results in 16 cases in 14 patients from the John Gaston Hospital, Memphis, Tennessee. From this study, we are convinced that if the involved sigmoid is viable, the safest treatment is simple release of the obstruction as a primary operation, followed several weeks later by resection and end-to-end anastomosis. If the sigmoid is gangrenous, the Mikulicz exteriorization operation is the treatment of choice.

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DISCUSSION.—DR. HARWELL WILSON, Memphis: Dr. Pool has called attention to a very interesting and to what at times can be a very difficult surgical problem. Since all these patients were seen on the teaching service of the University of Tennessee Medical School Hospital, I have personally observed a number of the cases and simply want to call attention to and emphasize a few points Dr. Pool mentioned.

First, I think it is particularly interesting to note that almost all these patients, if we go into the history carefully, show a history of having had repeated difficulty over a period of years. Frequently when patients are admitted to the hospital we do not obtain this history immediately because they may be relatively sick, but on going into the history carefully we can find that they have had similar attacks before. It is difficult to realize, unless attention is focused on the slides just shown, the tremendous distention exhibited by these patients. It is also difficult to realize that the patients can feel as well as they do with such enormous distention. The last patient in the series drove a truck in the morning and came into the hospital in the afternoon. The main reason he came in was because he didn't feel well and also he found his clothes suddenly were too small. He knew there was something wrong because he hadn't passed gas for several days, according to his story. The very fact that the distention is so enormous makes it necessary to make an incision from the pubes to the costal margin in certain instances. Because of the fact that it is necessary to have the bowel outside of the abdomen frequently before one can tell whether the twist is clockwise or counter clockwise, it is necessary to have adequate exposure. Also, we feel it is difficult to determine during the interim between the time the primary reduction is done and resection is done—six to 12 weeks usually—whether or not the patient is having dangerous symptoms. Most patients during this time will have symptoms of pain, some have had fever, and we have wondered whether or not they were about to perforate, or whether or not ulceration was present.

We have also been unable to predict exactly what the bowel will look like at the second stage. In some instances a difficult technical problem is presented at the time of resection, the bowel being surrounded by adhesions, and some edema may still be present. In other operations, for instance