

### INTRODUCTION

Volvulus of the colon was first described by a Viennese pathologist, von Rokitansky, in 1836

It is a condition where a loop of bowel and its mesentery twists on a fixed point at its base (Figure 1). This is an important cause of intestinal obstruction in Africa. Certain anatomical conditions must be present before a volvulus can be produced, i.e. a long mobile loop of bowel with close approximation of the points of attachment of its limbs which readily allows axial rotation to occur.

twisted segment of intestine forms a closed-loop obstruction, with simple obstruction at the proximal and distal end of the loop. The loop distends and may, to some extent, embarrass respiration (Figure 1). Spontaneous perforation at this stage is a rare occurrence. If the ileo-caecal valve is competent a double closed loop results. As obstruction persists, fluid and electrolyte loss may lead to significant deficits.

Two mechanisms are important in the progression to gangrene. One is obstruction to the mesenteric blood flow as a result of torsion and

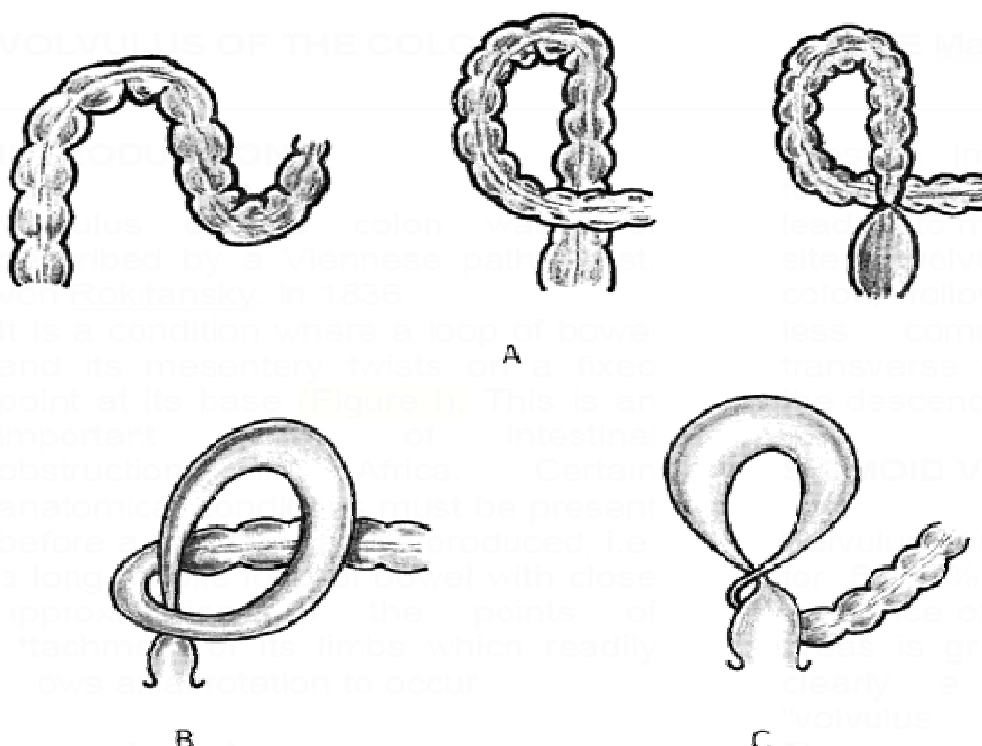


Figure 1 Colonic Volvulus Mechanism

### PATHOPHYSIOLOGY

Torsion occurs at the base of the loop, causing obstruction. Gas and fluid continue to be produced in the colon loop and are unable to escape. The

angulation. The second is venous and arterial obstruction when intraluminal pressure exceeds diastolic and then systolic blood pressure.

Interference with blood supply is indicated by subserosal petechiae, blood stained ascites, and finally, gangrene. The extent of gangrene varies. It may be patchy, confined to the neck of the volvulus or may involve the whole loop. Massive sequestration of blood in the long loops of the intestine implicated produces grave forms of oligaemic hypotension leading to mortality. The most common site for volvulus to occur is the sigmoid colon, followed by the caecum, the less common sites being the transverse colon, splenic flexure and the descending colon.

### **SIGMOID VOLVULUS**

Volvulus of the sigmoid colon accounts for 50-90% of colonic volvulus. The incidence of sigmoid volvulus in some areas is greater than in others, thus clearly establishing the so-called "volvulus belts" or endemic areas. These endemic areas are located in areas of Eastern Europe, Russia, India, Pakistan and Africa especially Ghana, Sudan and Uganda. A significantly lower incidence of volvulus is seen in non-endemic area such as the United States and Western Europe. On average patients in the non-endemic areas are older and represent 3-5% of the total intestinal obstructions, compared to 20-54% seen in endemic areas. In Africa the incidence of sigmoid volvulus has also been shown to differ in the different tribes in one country.

In many series from endemic areas males predominate and sometimes comprise 90% of reported cases 13 whereas sporadic volvulus shows a less marked male preponderance or an equal male to female ratio. Some series from the sporadic areas note an institutionalised elderly female preponderance with a history of chronic constipation. Endemic volvulus occurs in young patients (f 60 years)

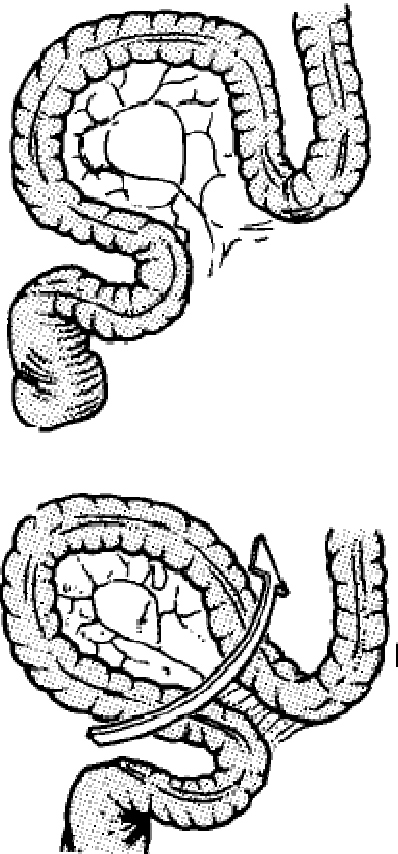
compared to the sporadic type where the most common age at presentation lies between 60-70. Figures for South Africa are no different from those in other developing countries; the age incidence is 42-46 with a male preponderance of 9:1 to 13:1.

### **Aetiology**

Sigmoid volvulus occurs in patients with long sigmoid colon and mesocolon and narrow mesentery attachments. The actual aetiology of sigmoid volvulus remains speculative. Many aetiological factors have been suggested including chronic constipation, bowel habit, high fibre diet, use of enemas and altitude and the inherent length of the sigmoid colon that is present in certain population groups as an important aetiological factor in sigmoid volvulus.

### **Pathology of sigmoid volvulus**

In the endemic type of sigmoid volvulus which is the common form seen among Africans the sigmoid colon is grossly enlarged and thickened and it tapers proximally and extends distally beyond the site of torsion into a normal rectum; there is no clearly demarcated lower limit. The circular muscle coat is hypertrophied and the longitudinal coat is thinned out over the surface of the tubular megacolon, the taeniae coli are often quite broad and spread out. The appendices epiploicae may be absent and there is complete lack of normal haustrations. The blood supply to the colon is increased as judged from the number of vessels in the thickened mesocolon. In some cases the base segments of the bowel are only a few centimeters apart



*Figure 2 Small base of mesentry*

The thickening of the mesocolon is thought to be due to recurrent torsion which may precede acute obstruction of the colon by many years and results in the limbs of the sigmoid being drawn down closer by the shrinking mesentery. Bruusgard has described this thickening as "shrinking mesosigmoiditis". Volvulus secondary to this type of megacolon is usually of the slowly progressive type and intestinal obstruction is seldom complete before some days have elapsed. The hypertrophy of the muscular wall of the sigmoid colon and its blood vessels is an anatomical adaptation due to recurrent partial obstruction of the sigmoid colon and it can be lifesaving by delaying gangrene in an established sigmoid volvulus. Occasionally the megacolon extends below the site of torsion, which lies above the pelvic inlet. The

most important secondary pathological effects of volvulus of this sort are gross abdominal distension and fluid loss.

In the sporadic type (10 - 15%) the enlargement of colon is not so marked and the normal external characteristics are preserved. The blood supply is not increased and the mesentery is thin and attenuated. The colon resembles that found in sigmoid volvulus in elderly Europeans. The sigmoid loop undergoes clockwise or anti-clockwise torsion with progressive distension with gas and to a lesser extent with liquid faeces. Varying degrees of proximal colonic and occasionally small intestinal distension occurs.

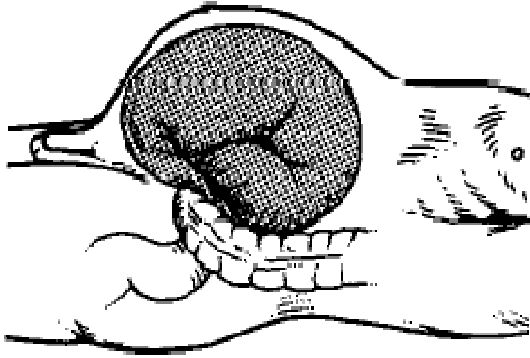
### **Clinical features**

#### ***History***

Recurrent attacks of abdominal distension, constipation and pain culminating in the patient's arrival at hospital are characteristic. The pain is generally of a mild colicky type, but should it be an outstanding feature with radiation into the back, gangrene of the loop or ileo-sigmoid knot should be seriously considered rather than an uncomplicated sigmoid volvulus. The attack may end with the passage of flatus rather than faeces from the rectum or the history may reveal that it has been relieved by an enema. Senility and psychiatric illnesses are more common in European patients than reported in African series.

#### ***Physical examination***

Abdominal distension is such a striking feature that the abdomen has been likened to a big drum



*Figure 3 Striking abdominal distension*

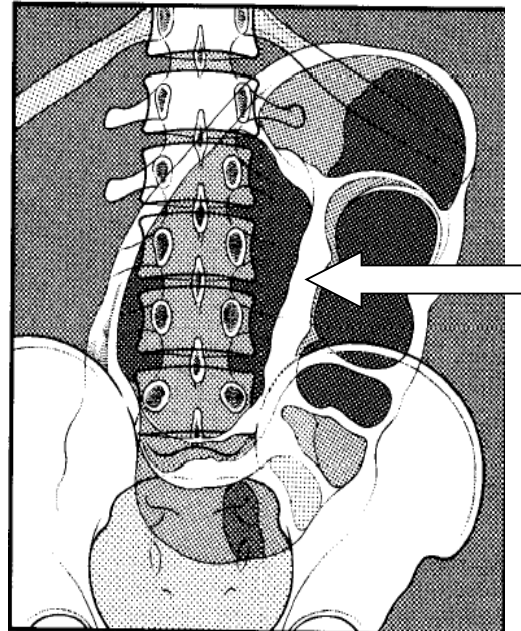
Distension is generalised but can be more marked on the left, on the right or centrally and it may be so pronounced that the patient is dyspnoeic from impaired movement of the diaphragm and the lower ribs. There is remarkably little tenderness except in the presence of gangrene. The abdomen is tympanitic on percussion and it is generally possible to palpate the outline of the distended large intestine like a 'motor-cycle tyre', although visible peristalsis is seldom seen. Rectal examination reveals an empty rectum.

The general condition of the patient with uncomplicated sigmoid volvulus is usually very good in spite of the long history and there is seldom much dehydration. This is because vomiting is uncommon and the patient continues to take fluids.

### **Diagnosis**

Plain radiographs are useful for revealing sigmoid volvulus. A radiograph of the abdomen with the patient in the upright position is often diagnostic of volvulus of the sigmoid colon. The plain radiographic findings are usually straightforward in two thirds of patients and in the remaining third there may be difficulty in distinguishing a volvulus from a distended loop of sigmoid or more proximal colon. The important radiological features are

- the bent inner tube (formed by a gas shadow that is looped on itself)
- the coffee bean sign
- the summation line i.e. a thickened soft tissue line formed by the oedematous walls of two gas filled loops when opposing each other



*Figure 4 Arrow pointing to summation line*

A disproportionately distended sigmoid colon rising from the left iliac fossa towards the right hypochondrium, which may elevate the diaphragm and overlap the liver outline (liver overlap sign) can sometimes be seen. The walls of the volvulus appear smooth with no haustrations.

In cases where the diagnosis is difficult or plain films are atypical a limited barium enema will confirm the diagnosis. The hooked beak appearance of the sigmoid obstruction with a twisted appearance to the mucosa is confirmatory and is called the 'Bird's beak sign' (Figure 5). In patients with suspected colon infarction or perforation, barium is contraindicated. A CT 'whirl' sign, caused by the twisted mesentery and the afferent and efferent limbs of the sigmoid colon, has been described, which lead to the point of torsion.



*Figure 5 Birds beak sign*

Sigmoid volvulus is clinical diagnosis that is confirmed on plain radiography. Barium enema and Computed tomography are rarely required.

### **SIGMOID VOLVULUS IN CHILDREN**

Volvulus of the colon is rare in the paediatric group with only 70 cases of sigmoid volvulus in children having been reported so far 2293. It occurs in all age groups (1-16 years) and it demonstrates male preponderance as occurs in adults. Although there is a group of patients in whom sigmoid volvulus may be due to chronic colonic obstruction such as in Hirschsprung's disease, in most children the redundant sigmoid colon with an elongated mesentery are the primary predisposing factors for sigmoid torsion.

### **Management**

The management of sigmoid volvulus is, first, the need to relieve the obstruction and, second, the prevention of recurrent attacks of volvulus.

#### ***Conservative management***

Sigmoidoscopy is the initial treatment and it is now the procedure of choice in patients with viable bowel. The aim

is to gently pass the sigmoidoscope through the constriction into the distended loop with a gentle push. The success of the manoeuvre is heralded by the instant release of a large quantity of flatus and fluid faeces, often in an explosive manner which obscures the view, with dramatic subsidence of the abdominal distension and the great relief to the patient. This procedure may therefore be diagnostic as well as therapeutic. Sudden decompression at rigid sigmoidoscopy is successful in 70-90% of cases.

The site of torsion is frequently encountered approximately 15 cm above the anal verge and within reach of the rigid sigmoidoscope. Where the twist is beyond this point flexible sigmoidoscopy or colonoscopy can be used.

This non-operative decompression is only a temporary measure, which allows further medical assessment, bowel preparation, and definitive surgery under improved circumstances during which no oral or physical restrictions are necessary.

The disadvantages of sigmoidoscopic decompression include the risk of reduction of gangrenous intestine and instrumental perforation (1-3%). Clinical signs of gangrene at sigmoidoscopy include devitalised mucosa following reduction and bloodstained effluent from the sigmoidoscope or rectal tube. When this is observed non-operative decompression should be abandoned for emergency surgery. Furthermore the presence of peritonitis suggests gangrenous bowel and is an indication for emergency surgery.

Contraindications to sigmoidoscopic decompression include:

- the presence of gangrene, which may be suggested by signs of peritonitis, such as rise in pulse and temperature, fall in blood

- pressure and abdominal tenderness
- the presence of a compound volvulus

Distension will recur if intubation is not prolonged and for this reason it is useful to pass a flatus tube and stitch it to the anal ring and leave it in for two to three days. However, patients resent this. Sigmoidoscopic detorsion without resection is accompanied by a high recurrence rate (18-90%) and a 5-14% mortality rate.

In children Barium enema may result in detorsion of the volvulus in about 5% of patients. In adults expectant management in the hope that volvulus will reduce spontaneously is not recommended.

### **Surgical management**

Indications for **urgent laparotomy** are

- failed attempt at decompression
- features suggestive of peritonitis
- the presence of gangrene as evidenced by devitalised mucosa following reduction evident at the time of sigmoidoscopy, blood-stained effluent from the sigmoidoscope or rectal tube and other clinical indications for intestinal ischaemia, perforation or peritonitis such as fever and leucocytosis persisting after decompression.

If decompression is successful and the above criteria are not fulfilled, surgery is scheduled electively. Operative detorsion alone has been described when non-operative reduction cannot be accomplished but cannot be recommended in view of the high recurrence rate (14-38%).

Gangrenous colon requires immediate resection. Untwisting under these circumstances is not advised as this can result in irreversible shock. In the presence of gangrene, resection is followed by a colostomy and Hartmann's procedure. This appears the best option, as these patients are

often shocked and acidotic. The mortality in patients with gangrene rate is eight times higher than when the colon is viable.

If sigmoid resection is undertaken intestinal continuity can be restored immediately by primary anastomosis or a colostomy with a Hartmann's procedure can be performed which can be closed within a few months.

### **Elective Surgery** for Decompressed Sigmoid Volvulus

Preoperative deflation allows surgery to be scheduled for the next available list. Although some authors suggest a delay of four weeks before definitive surgery, most do not as many patients may fail to return for elective operation and may present later with more severe disease which may be fatal.

Traditional opinion is that resection of at least the sigmoid colon is mandatory as lesser procedures have a high incidence of recurrence if sigmoid volvulus is associated with megacolon, however, as the condition is not cured by sigmoid resection alone.

### **Laparoscopic Resection**

Laparoscopic resection of the sigmoid colon for decompressed sigmoid volvulus may be a useful alternative with improvement in laparoscopic techniques. At present, however, reports of its use remain scant in the literature and it needs more critical appraisal.

### **Non-resectional Procedures**

A number of non-resectional options have been described for the management of a viable sigmoid colon, in the emergency as well as in the elective setting. The most commonly cited non-resectional procedures are colopexy and mesocolopexy.

### Colopexy (Sigmoidopexy):

In this procedure the redundant sigmoid colon is fixed by suturing it

into the anterior abdominal wall, thereby rendering it less likely to twist. There is no anastomosis and the risk of anastomotic leak is eliminated. It has a low mortality rate and a high recurrence rate.

#### Mesocoloplasty (mesosigmoidoplasty):

This is a procedure where one leaf of the long sigmoid mesocolon is incised longitudinally, the two flaps raised and sutured transversely, thus broadening the attachment.

#### **Surgical Mortality**

Mortality rates of between 4-50% have been reported, depending on the general condition of the patient and presence of concomitant disease and the condition of the bowel at surgery. Emergency resection carries a high mortality rate partly because of the poor general condition of the patient and toxæmia from necrosis. The mortality is higher for gangrenous bowel than for viable bowel.

#### **ILEO-SIGMOID KNOT**

Other terms used for this condition are 'knotting of the bowel', 'compound volvulus' or 'double volvulus'. In areas where volvulus of the sigmoid colon is common, it may be complicated by knotting of the bowel in up to 25% of cases, with 60% of them needing bowel resection. Patients formerly considered to have a 'double' volvulus implicating large and small intestine are now regarded as examples of ileo-sigmoid knotting.

The main anatomic prerequisites for the development of ileo-sigmoid knot are a hypermobile small intestine with an unduly elongated mesentery having a greater breadth and a narrow base, as well as an unusually redundant, omega-shaped sigmoid colon with a long mesocolon having a narrow base of attachment.

Although the diagnosis is made at surgery in the majority of cases, diagnosis can occasionally be made

pre-operatively. Many peripheral hospitals have X-ray equipment with which plain films of the abdomen can be taken in the supine and erect positions. Such films can play an important part in arriving at a diagnosis.

#### **Management**

Both small and large bowel involved in the knot should be resected. Resected small bowel should be followed by primary anastomosis regardless of the viability of the bowel. The management of resected sigmoid colon depends on the viability of the bowel. In the presence of gangrenous bowel, resection may be followed by primary anastomosis or colostomy and Hartmann's procedure depending on the experience and preference of the surgeon<sup>35</sup>.

#### **VOLVULUS OF THE CAECUM**

##### **Incidence and pathology**

Caecal volvulus accounts for 10 to 40 percent of colonic volvulus<sup>2</sup>. It can be divided into two subgroups: axial ileo-colic volvulus, which accounts for 90 percent of cases, and caecal bascule, which accounts for 10 percent of cases<sup>26</sup>. In the conventional ileocolic volvulus the torsion is usually a counter-clockwise rotation in an oblique fashion, also displacing the ileum<sup>26</sup>. In caecal bascule the caecum rotates in a horizontal plane anteriorly upward, with the obstruction at the point of folding. A prerequisite for caecal volvulus to occur is an abnormal mobility of the caecum that results from improper developmental fusion of the mesentery of the caecum and the ascending colon with the posterior parietal peritoneum in the right gutter.

Volvulus of the caecum is common in Eastern and Western Europe as well as the United States. It is very rare in Africa. The average age at presentation in the West is 53 years

and no clear-cut gender predisposition exists.

### **Diagnosis**

The clinical signs and symptoms are not specific, and they vary in intensity depending on the amount of bowel involved and on the degree and duration of the twist. Generalized abdominal pain (90 percent), abdominal distension (80 percent), constipation or obstipation (60 percent), and vomiting (28 percent) constitute the usual clinical presentation.

The diagnosis is rarely made on clinical grounds alone, and abdominal radiographs are the main adjuncts in diagnosis. A single fluid level may be seen in the dilated caecum located anywhere in the abdomen, depending on its original position, the degree of gaseous distension and duration of the twist. Distended small-bowel loops are often present and there is relative absence of gas in the distal colon. Other radiologic findings include a coffee bean sign and a CT whirl sign. Differential diagnosis includes gastric dilatation, sigmoid volvulus, small intestinal volvulus, and colonic obstruction with a competent ileo-caecal valve. Although successful non-operative decompression by colonoscopy has been reported, it has a high failure rate.

### **Management**

The majority of patients with caecal volvulus therefore will require urgent surgery. At laparotomy, determination of viability of the bowel is the initial step in the management. Nonviable bowel requires immediate excision of the involved loop, which can be achieved by right hemicolectomy. Untwisting under these circumstances is not advised, because it has been shown to result in irreversible septic shock. Some authorities favour primary anastomosis of healthy albeit dilated and unprepared terminal ileum

to a viable undilated transverse colon. Ileostomy and a mucous fistula remain an option.

When the bowel is clearly viable, further options are available to the surgeon. Operative detorsion alone is not recommended, however, because it is associated with high recurrence rates in different studies (20-75 percent). Most surgeons, therefore, will use an additional procedure, which may be resectional or non-resectional, to limit recurrence. Again, resection is achieved by right hemicolectomy followed by at primary anastomosis or occasionally an ileostomy and mucous fistula. The most commonly used non-resectional procedures are caecopexy and caecostomy.

Caecopexy involves the anchoring the right colon to the parietal peritoneum, the aim being prevention of recurrence of caecal volvulus by eliminating prerequisite hypermobility. Caecostomy involves the placement of a caecostomy tube through a small incision on the caecal wall, bringing the caecum to the anterior abdominal wall and bringing the tube through a small incision to the skin. It has the advantage of not only fixing the bowel but also decompressing the distended segment.

The feasibility and safety of laparoscopic caecopexy has been reported as case reports, with no recurrence after follow-up periods of between four months and four years. Further assessment of these promising results is required before it can be adopted more widely.

### **LESS COMMON SITES FOR COLONIC VOLVULUS**

#### **Transverse colon**

Volvulus of the transverse colon is an uncommon event accounting for 3-10% of colonic obstructions. Although the transverse colon is often quite mobile and redundant, its wide based



mesenteric attachments prevent frequent torsion. The prerequisites for the development of transverse colon volvulus are elongation of the mesentery with a freely movable bowel, closely approximated points of fixation at the hepatic and splenic flexure and adhesions from previous do surgery or congenital bands.

Treatment is always surgical. When viable bowel is found at laparotomy a resectional or non-resectional procedure can be performed. Detorsion with or without simple colopexy can be done but it has an appreciable recurrence rate. Resection is associated with less recurrence. Options include a transverse colectomy and a right or left extended hemicolectomy. In the presence of gangrene resection is the only option.

### **Splenic flexure**

Splenic flexure volvulus is very rare and only case reports have been reported in the literature.

Pre-operative diagnosis is not usually made because of the rarity of the condition 3°. Management is by resection.

### **Volvulus of the descending colon**

This condition is even rarer with only two cases having been reported. Although relatively fixed the descending colon may have a persistent mesentery. Treatment is resection.

## **CONCLUSION**

Colonic volvulus is predisposed to by an elongated loop of colon and mesentery with narrow base, emergency surgery and the presence of gangrenous bowel are associated with high mortality. Colonic volvulus with gangrenous bowel requires resection and most would favor restoring continuity at a later stage particularly in the elderly. Management in the elective of semi-elective situation has more options. The management of viable colon should be

by resection and primary anastomosis. This s associated with a low recurrence rate. Resection can be achieved either at open surgery or laparoscopically. Non-resectional options have been practiced sporadically but are associated with high recurrence rates. With the advent of the minimally invasive approach there is a need to re-appraise the efficacy and safety of such options as viable alternative to resection and anastomosis in high risk patients. The recurrence rate for resection is 1.2% compared to 22% for colopexy.



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