

The mothers were quite unselected, and one of the nursing sisters felt that it would be a good idea to screen mothers before admission and omit the likely trouble-makers. In practice it would be difficult to do this without considerable knowledge of the mother and child; furthermore, 22 out of the 27 mothers in the experimental group who were thought to be emotionally disturbed when the first home visit was made stayed in hospital with their children and caused no trouble whatsoever.

### Summary

In this clinical trial 197 children were admitted to hospital for three days and underwent tonsillectomy and/or adenoidectomy. An experimental group of 101 were admitted with their mothers and there was a control group of 96 unaccompanied children. The incidence of emotional and infective complications was significantly lower in the experimental group.

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## Treatment of Volvulus of Sigmoid Colon: a Review of 425 Cases\*

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The treatment of volvulus of the sigmoid colon is a subject of controversy. With the dual objective of relieving obstruction and preventing recurrence, immediate laparotomy and resection of the redundant loop is recommended by Aylett (1954), Douglas (1956), Ahsan and Rahman (1967), and Rains and Capper (1965).

Hall-Craggs (1960) submitted that recurrence could be prevented by plication of the mesentery and fixation of the sigmoid loop, and Souttar (1956) thought that fixation was sometimes of value.

The development of a non-operative method of treatment by sigmoidoscopy and intubation was credited by Anderson (1956) to Schilling, of Oslo, and was described in detail by Bruusgaard (1947). The major objections to conservative management are as follows: (1) the deflated colon may be or may become gangrenous (Aylett, 1954; Hinshaw and Carter, 1957); (2) intubation may damage the oedematous bowel wall (Douglas, 1956); and (3) an opportunity of preventing recurrence is lost (Hall-Craggs, 1960; Ahsan and Rahman, 1967; Andersen, 1967).

Few British surgeons have much practical experience of the management of this condition, as major British hospitals admit an average of only one case a year (Bolt, 1956). Apart from a previous report from Uganda (Hall-Craggs, 1960) no review in the British literature has been based on more than 40 cases. In this paper the results of treatment in 425 cases at one hospital are presented, including 140 cases seen by me at some stage of treatment.

### Treatment of Sigmoid Volvulus at Mulago Hospital, Kampala

Most reported series of sigmoid volvulus either present the results of one type of management or involve small numbers treated in a variety of ways. Comparison between two series

at different centres involves comparing surgeons and hospitals as well as techniques. In Mulago Hospital, Kampala, Uganda, during the period 1949–65 a total of 425 cases of sigmoid volvulus were treated by more than 30 surgeons of varying seniority and experience, and every type of treatment was carried out by both senior and junior staff. There are therefore grounds for submitting that the varying results achieved are attributable to the different techniques rather than to the different abilities of the clinicians concerned.

It should be emphasized that all the cases reviewed occurred in patients with no known neurological or psychological abnormality. Cases of volvulus in patients from mental institutions or in children with Hirschsprung's disease have been excluded. In reviewing sigmoid volvulus some authors have included cases of a disorder described as "compound volvulus" or "double volvulus" (Hall-Craggs, 1960; Easmon and Lahiri, 1963). The prognosis of this condition is very different from that of primary sigmoid volvulus, and the clinical features and treatment have been presented separately in a previous publication (Shepherd, 1967).

### Spontaneous Remission

In nine cases of this series spontaneous relief occurred while awaiting operation and no further treatment was given. The diagnosis was established either by radiology or by laparotomy in another attack. In two personal cases the positioning of a patient in the knee–elbow position preparatory to sigmoidoscopy was instantly followed by the escape of an enormous quantity of flatus.

Two other patients classified as having spontaneous relief (Table I) refused operation and discharged themselves, to return

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years later with an attack which had failed to respond to such remedies as had evidently proved effective on previous occasions.

TABLE I.—*Management of 425 Cases of Sigmoid Volvulus*

Management	Cases	Deaths
Enema/spontaneous remission .. ..	11	0
Successful intubation .. .. .	78	0
Laparotomy, detorsion .. .. .	49	8 (16%)
"    fixation .. .. .	213	17 (8%)
Resection .. .. .	65	16 (25%)
Moribund on admission .. .. .	7	7
Died in theatre .. .. .	2	2
<b>Total .. .. .</b>	<b>425</b>	<b>50</b>
Unsuccessful intubation/laparotomy ..	11	3

### Sigmoidoscopy and Intubation

Intubation by a technique similar to that described by Bruusgaard (1947) was used in 89 cases. In 78 cases (88%) this was regarded as successful on the following criteria: (1) passage of the rectal tube resulted in the immediate release of large quantities of gas and fluid, (2) there was immediate and lasting improvement of the patient's condition, and (3) there was no evidence of damage to the bowel. On these criteria conservative treatment was unsuccessful in 11 out of 89 cases (Table I).

One patient who had initial relief underwent laparotomy 12 hours later after developing symptoms suggestive of peritonitis. The bowel, however, was found to be untwisted and viable. The abdomen was simply closed and the patient made a good recovery.

On 10 occasions intubation was regarded as unsuccessful because it was impossible to manoeuvre the tube into the sigmoid, including one occasion when the attempt was abandoned because bleeding and pain indicated that the bowel wall had been damaged. At laparotomy one of these 10 cases was found to have previously unsuspected gangrene. After resection this patient recovered, but three of the nine with viable bowel died after laparotomy.

On the occasion on which the rectum was damaged this complication was immediately recognized. The abdomen was opened, the colon (which was viable) was untwisted, and a tear found in the rectosigmoid region was repaired. A defunctioning transverse colostomy was established and the patient recovered.

### Intubation of Gangrenous Bowel

In the years 1963–5, when conservative management was being adopted at Mulago, 10 cases of gangrenous sigmoid volvulus were seen. In nine of these the presence of gangrene was diagnosed on clinical grounds and intubation was not attempted (Table II). The other patient and two patients with gangrenous ileosigmoid knotting (Shepherd, 1967) had a trial of intubation, but this failed and was recognized as a failure.

TABLE II.—*Diagnosis of Gangrene in Mulago Patients and in Mentally Abnormal Patients*

Patients with Gangrenous Sigmoid Volvulus	Mentally Normal, Mulago, 1962–5	60% Mentally Abnormal, Philadelphia (Wuepper <i>et al.</i> , 1966)
Diagnosed clinically .. .. .	9	1
"    at laparotomy .. .. .	1	7
<b>Total .. .. .</b>	<b>10</b>	<b>8</b>

### Conservative Treatment

**Recurrence Rate.**—After conservative treatment of the acute obstruction most patients are advised to remain in or return to Mulago for resection of the pelvic colon, which is carried

out about one week later. On 43 occasions the patients either were not offered or did not return for operation, and 18 of them (42%) came later to the same hospital with a subsequent attack (Table III).

TABLE III.—*Recurrence After Different Forms of Treatment of Sigmoid Volvulus*

	Total		Recurrence	
	Cases	Patients	Cases	Patients
Liable to recur:				
Conservative treatment	43	37	18 (42%)	15 (40%)
Laparotomy, detorsion	33	30	14 (42%)	12 (40%)
"    fixation	195	158	81 (41%)	60 (38%)
Died or resected .. .. .	271	154	113 (42%)	

**Mortality.**—Three deaths occurred in patients given a preliminary trial of conservative management. None of these can be attributed directly to choice of this method in preference to laparotomy, since in each case surgery was performed after obvious failure to pass a flatus tube. On no occasion did a patient return to die in the ward after apparently successful intubation.

### Laparotomy and Detorsion

On 49 occasions laparotomy was carried out with simple untwisting, and no attempt was made to prevent recurrence by fixation. The usual incision was a lower left paramedian, and the bowel was deflated either by a flatus tube guided up from the anus by an assistant or by Lowdon's (1951) manoeuvre. After deflation it was gently untwisted. In every case a flatus tube should be left in place for 48 hours. On two occasions when this step was omitted the abdomen was reopened a few days later in the belief that volvulus had recurred. It was then found that, although untwisted, the loop had remained grossly distended.

There were eight deaths in this group; this was a higher mortality than for the longer and more difficult operation of fixation (Table I) and as high as after resection of viable bowel (Table IV). The basis of this anomaly is that in patients whose general condition deteriorated after laparotomy, and whose bowel was viable, the surgeon confined himself to the shortest possible procedure.

TABLE IV.—*Results of Immediate Resection of Obstructed or Gangrenous Sigmoid Volvulus*

	Patients	Deaths
Total No. .. .. .	65	16 (25%)
Obstructed but viable .. .. .	35	5 (14%)
End-to-end anastomosis .. .. .	6	1 (16%)
Paul-Mikulicz .. .. .	29	4 (14%)
Obstructed and gangrenous .. .. .	30	11 (38%)
End-to-end anastomosis .. .. .	2	1 (50%)
Paul-Mikulicz .. .. .	20	9 (45%)
Hartmann's operation .. .. .	8	1 (12%)

In eight cases a second laparotomy for resection was carried out a few weeks after simple untwisting. Out of 33 cases discharged without resection 14 (42%) returned to Mulago with a recurrent attack (Table III).

### Laparotomy and Fixation

A loop twists easily if its roots are close together but much less easily if it has a broad base. Hall-Craggs (1960) described an operation to prevent recurrence by alteration of these mechanical factors. Since that procedure appeared to offer an opportunity to use the patient's agreement to operation both to relieve obstruction and to prevent recurrence it was the most frequent form of treatment in Mulago in the years under review (Table I). It was used on 213 occasions and there were 17 deaths (8%).

### Recurrence after Fixation

On one occasion the more radical operation of resection was carried out shortly after a fixation operation. Of the other 195 patients discharged alive 81 (41%) returned to Mulago with a recurrence (Table III). This figure is almost identical with the recurrence rate after conservative treatment or after simple untwisting. Several patients underwent multiple attempts at fixation, and it seemed possible that this might have prejudiced an analysis of recurrence based on cases rather than on patients. Table III, however, shows that the recurrence rate did not vary significantly after different methods of treatment, whether expressed in terms of cases or of patients.

On many occasions no trace of the previous fixation could be seen at laparotomy for a recurrence. In a few cases where it was necessary to reopen an abdomen a matter of weeks or even days after a fixation operation, the colon was found to have torn free already from the abdominal wall, to which it had been anchored.

### Immediate Resection for Volvulus with Obstruction (Table IV)

Resection with end-to-end anastomosis, exteriorization, or Hartmann's (1923) operation was carried out on 65 occasions with 16 deaths (25%).

In 30 cases this was mandatory because of the presence of gangrene, and 11 (38%) of these patients died. The most frequently used procedure was to establish a double-barrelled colostomy by the Paul-Mikulicz technique. Two hazards were often noted in this operation. On several occasions it was difficult or impossible to mobilize all of the gangrenous loop which involved the upper rectum. In the second place, the superior rectal vessels which normally lie behind the peritoneum were found to be running a looping course into the mesocolon and were in danger if the two limbs of the colostomy were sutured together. Unless these vessels were carefully identified it was quite possible to pass a retaining glass rod beneath them and exteriorize them along with the colon.

In gangrenous cases Hartmann's operation carried a lower mortality than immediate resection, but the numbers involved were too small for one to form a definite opinion on the value of this procedure.

On 35 occasions immediate resection, with or without colostomy, was carried out for volvulus with viable gut at the same operation as for relief of the obstruction. There were five deaths (14%) in this group.

### Elective Resection of the Sigmoid Colon

Interval resection was usually recommended to patients after conservative treatment or after laparotomy and simple untwisting. After intubation most patients agreed to surgery if this was carried out in a few days, but few returned to hospital for surgery if they were sent home in the interval. The majority of resections were therefore performed five to eight days after conservative treatment. In the last four years 74 elective resections have been carried out, with two deaths.

*Death in Theatre.*—Two patients died soon after induction of anaesthesia (Table I). As no definitive treatment had been completed they cannot be included under any one form of operative treatment, but such deaths must be included when comparing the results of operative with conservative measures. In both of these patients the bowel was viable.

*Death without Treatment.*—Seven patients were moribund on admission to hospital and died before any form of treatment could be instituted (Table I). In six of these the bowel was gangrenous at necropsy.

*Overall Mortality.*—There were 50 deaths among the 425 cases of this series (Table I). In 17 of the fatal cases the bowel

was gangrenous and one other death occurred immediately after admission. The remaining 32 deaths occurred in 290 laparotomies for sigmoid volvulus with viable bowel. Three of these deaths occurred in cases where sigmoidoscopic intubation had failed to relieve the obstruction, and there were 29 deaths in cases in which conservative treatment was not given a trial.

### Recurrent Volvulus after Resection of Pelvic Colon

It is widely assumed that resection of the sigmoid is a complete guarantee against recurrent volvulus. It has been possible to trace only two patients who underwent resection at Mulago 10 or more years ago. One of these patients died 15 years later, during his third attack of volvulus of the splenic flexure. In the other patient a barium enema showed marked dilatation of the descending and part of the transverse colon. It is clear that we must follow up a series of these patients for many years in Uganda before accepting that "there is no argument as to the ultimate therapy, which is the removal of the sigmoid colon" (Campbell and Smith, 1950).

### Discussion

#### Difficulties of Diagnosis

In enumerating the dangers of conservative treatment one hazard not considered was the possibility of attempting this technique on a patient with some other disorder wrongly diagnosed as sigmoid volvulus. The 89 cases of volvulus given a trial of non-operative treatment were all cases in which the diagnosis did not rest on clinical grounds alone but was supported by radiology or subsequent operation. A considerable number of other cases have been clinically diagnosed and treated at Mulago but are omitted for lack of supporting investigations. The appearances of the plain x-ray film of the abdomen in sigmoid volvulus are easily recognized and virtually diagnostic (Essenson and Ginzburg, 1949). Provided this invaluable ancillary investigation is performed errors are unlikely. Neoplasm of the sigmoid colon or rectosigmoid with obstruction is an uncommon disorder in Uganda. Even should the radiological features be misinterpreted, a trial of conservative treatment should not be detrimental to such patients, since the sigmoidoscopy should establish the true diagnosis. The distinctive clinical and radiological findings in ileosigmoid knotting have been discussed elsewhere (Shepherd, 1967).

#### Entity of Sigmoid Volvulus

It must be emphasized that the features of sigmoid volvulus as seen in one country may differ from those encountered elsewhere.

None of the cases included in this series had any known neurological or psychological disorder. In America and in most European series, one-quarter to three-quarters of all cases of sigmoid volvulus come from mental institutions. Such patients are difficult to evaluate clinically (Wuepper *et al.*, 1966) and the colon may be thin-walled and atrophic (Lockhart-Mummery, 1923). Only four cases with this background were seen at Mulago in the years reviewed, forming less than 1% of all cases. Two of these patients died, and it is possible that the prognosis differs in these cases from that in patients with a normal background. The inclusion of cases of Hirschsprung's disease, Chagas's disease, and ileosigmoid knotting in reviews of the clinical course and results of treatment of sigmoid volvulus will also lead to a distorted picture.

In Uganda the majority of cases occur in males of the Baganda tribe, and in most of these patients the distal limb of the pelvic colon is not only long but dilated, thick-walled, and vascular (Shepherd and Wright, 1967). Gross distension

may occur in such a loop of colon with little rise of intraluminal pressure (Shepherd and Wright, 1968). Aylett (1954) suggested that obliteration of intramural vessels due to rising intraluminal pressure was an important factor in the development of gangrene. In Uganda this complication is seen in only 7% of male Baganda with volvulus, though the incidence is over 40% in females and in patients from some other tribes.

From a perusal of the literature it is uncertain how often volvulus as seen elsewhere occurs in a sigmoid colon showing the features noted in male Baganda. The case described by Bloodgood (1909) with 32 recurrences showed many similarities, including a high level of fusion of the taeniae coli. Hilton and Waugh (1951) reported that in 7 out of 16 cases of volvulus at the Mayo clinic, the colon could be described as a megasigmoid. On the other hand, the high incidence of gangrene in some series suggests that many surgeons deal with volvulus of pelvic colons which are thin-walled and lack a rich blood supply.

### Principles of Treatment

The concept of volvulus of any viscus is commonly of a twist occurring to an abnormal position. This may apply to other organs, but in the case of the pelvic colon radiologists have long recognized that a degree of torsion is not uncommon in normal patients (Wilms, 1906). The clinical diagnosis of volvulus implies the presence of obstruction. In the majority of cases in Uganda volvulus is associated with torsion of the sigmoid of 360 degrees or less, and many cases are seen with obstruction after a twist of only 180 degrees. Little attention has been paid to the factors which transform a physiological rotation to a clinical episode of obstructive volvulus. It is possible that unusual activity producing further torsion is less important than the onset of *distension* in the loop. A sigmoid colon of wide diameter requires only a small degree of additional distension to become trapped between the anterior and posterior abdominal walls. This may account for the frequency with which volvulus complicates the various forms of megacolon. Increasing distension forces the axial torsion, previously distributed throughout the loop, to the fixed ends, to produce obstruction (Groth, 1934). Waterhouse (1909) reported that once the abdominal wall had been opened he had observed a sigmoid volvulus to untwist itself without further assistance. Many cases may represent a failure to untwist from a normal position rather than an exaggerated twist into an abnormal position. If this concept is valid then the primary principle of treatment is the relief of distension and not the correction of position. In two cases in this series where laparotomy was not implemented by decompression of the loop, symptoms of obstruction persisted despite the untwisting of the volvulus. In every one of the 78 cases in which the sigmoid was deflated without laparotomy obstruction was relieved.

Holmgren (1941) passed a rectal tube under radiological control and observed that untwisting occurred almost immediately after relief of distension. Carayon *et al.* (1966), however, reported one case in which torsion persisted for many hours after deflation, and it seems wise to leave the tube in place for 48 to 72 hours.

It is concluded that in the type of case with which we are dealing in Kampala laparotomy is justified only if there is doubt about the viability of the bowel, if conservative methods fail, or on the questionable grounds that we are taking the opportunity to carry out a curative operation which the patient would refuse if we relieved his immediate distress by non-operative measures.

Survival of every patient with obstructed volvulus is unlikely whatever the treatment, and as our series of patients managed conservatively continues we are likely to encounter fatalities in patients treated without laparotomy. Even one such case may raise uneasy doubts about whether surgical intervention would have had a happier outcome. Our experience suggests that the potential dangers of deflating an unrecognized gangrenous

volvulus have been overemphasized perhaps by workers dealing mainly with patients from mental institutions. Little investigation has been done on the cause of death in non-gangrenous cases. Forward (1966) has suggested that a fall of serum potassium is an important factor. In the absence of gangrene there seems no reason why the prognosis of volvulus should ever be improved by the addition of a period of anaesthesia and a laparotomy to the essential step of deflating the sigmoid.

### Conclusions

There are probably no simple rules for the management of all cases of sigmoid volvulus, as the course of this disorder varies with pre-existing abnormalities of the colon and the clinical picture may be confused by mental factors. In Mulago Hospital, where patients are almost always of normal mentality and have a long dilated thick-walled vascular pelvic colon, a review of 425 cases indicates that conservative management along the lines described by Bruusgaard (1947) is the treatment of choice. The recognition of vascular impairment has not been difficult and is an indication for immediate laparotomy. The diagnosis should always be established by x-ray examination, and sigmoidoscopy should be performed without anaesthetic with the patient in the knee-elbow position. After careful inspection of the site of the twist the sigmoidoscope must not be advanced further, but a *soft* well-lubricated rectal tube should be gently manipulated beyond the obstruction. Failure of intubation is an indication for immediate laparotomy, as is the drainage of blood-stained fluid or the development of pain, tenderness, or pyrexia.

Attempts at fixation at laparotomy have proved useless. Resection of obstructed bowel has carried a mortality of 14% in the absence of gangrene, and in one case was followed by recurrent volvulus of the proximal colon. Advances in management must await a better understanding of the origin of colonic enlargement.

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