



Management of gangrenous sigmoid volvulus at Tenwek Hospital in western Kenya

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Abstract

Background: Bowel gangrene has a negative impact on outcomes of patients with sigmoid volvulus (SV). This study aimed at evaluating the management and outcomes of patients with gangrenous sigmoid volvulus and assessing the utility of primary anastomosis as a management option.

Methods: An 11-year (January 2006-December 2016) descriptive retrospective chart review of patients managed for SV at Tenwek Hospital in Bomet, Kenya.

Results: A total of 46 cases were identified, representing 25.4% of all cases of SV noted during the study period. The group had a mean age of 47.3 years (range 15-81), mean symptom duration of 2.2 days (range 2 hours-7 days) and a male predominance of 87%. Primary anastomosis (PA) without a proximal diverting colostomy was performed in 24 cases and a Hartmann's procedure (HP) was performed in 22 cases. Patients who had a HP were noted to have had a longer duration of symptoms and a higher incidence of peritonitis than those who had a PA (2.7 vs 1.8 days, $P = 0.02$; and 72% vs 42%, $P = 0.04$). All patients with concurrent colonic perforation ($n = 3$) had a HP. Seven patients died, giving an overall mortality of 15.2%. There was an anastomotic leak rate of 4.2% and a mortality rate of 8.3% among the subset of patients who had a PA.

Conclusions: Primary anastomosis can be safely performed with good outcomes in patients with gangrenous SV, and the presence of bowel gangrene does not mandate a diverting colostomy.

Keywords: sigmoid volvulus, bowel gangrene, primary anastomosis, colostomy, bowel obstruction

Introduction

Sigmoid volvulus (SV) has been noted to be a common cause of bowel obstruction in Africa, accounting for 14% to 50% of bowel obstruction cases in some series.¹⁻⁵ Patients undergoing emergency surgery for SV have a high mortality rate, reported at 10% to 17%, compared to those having elective surgery, mainly owing to the presence of gangrenous bowel.^{1,2,5-7} The occurrence of bowel gangrene, reported in 16% to 75% of cases, is dependent upon the duration and severity of mesenteric torsion, as well as the degree of bowel distension.^{5,8} Shock, peritonitis, and endotoxaemia, frequently observed in this subset of patients, may be secondary to significant volume loss, bacterial translocation, and systemic toxin absorption.⁹

Apart from bowel gangrene, other factors associated with increased mortality include late admission, delayed diagnosis, advanced age (> 70 years), presence of severe comorbid illnesses, shock at admission, and presence of bowel perforation.^{2,3,7-11}

Management involves appropriate resuscitation to correct fluid and electrolyte derangements, nasogastric decompression, early commencement of appropriate antibiotic therapy, prompt surgery based on the intraoperative findings and the patient's condition, and effective postoperative care.^{9,10,12}



While the need for resection of the gangrenous sigmoid colon is undisputed, controversy exists regarding the optimal procedure following bowel resection. A Hartmann's procedure (HP), Mikulicz procedure, primary anastomosis (PA) alone, or primary anastomosis with a modified blow-hole colostomy have all been described.^{8,9,13} A short distal colon limb has been cited as a limitation in the use of the Mikulicz procedure.^{9,14}

A proximal diverting colostomy without an anastomosis has been recommended as the treatment of choice following resection of gangrenous sigmoid volvulus.^{1-3,6,11,15,16} This is to avoid the high rate of anastomotic leak that is associated with a high mortality rate. Bagarani et al. and Samuel et al. noted an anastomotic leak rate of 50% in patients with gangrenous SV undergoing a PA, with a subsequent mortality rate of 33% to 50% in those who had developed the anastomotic leaks.^{1,16}

On the other hand, Martin et al. emphasise the importance of appropriate assessment of the risk of an anastomotic leak versus the morbidity of a colostomy in the management of patients with gangrenous colon, thus making proximal diversion a choice and not a reflexive response.¹⁷ In addition, a stoma necessitates a second operation, adds financial and psychological burdens, and may be challenging in many resource-limited communities where appropriate stoma appliances are inadequate or in short supply.^{1,4,7,14,15}

This study aimed to evaluate the management of patients with gangrenous sigmoid volvulus and assess the utility of primary anastomosis at a single resource-limited institution in western Kenya.

Methods

This was an 11-year retrospective chart review of patients managed for SV at Tenwek Hospital in Bomet, Kenya from January 1, 2006 to December 31, 2016. Cases were defined as patients with an intraoperative diagnosis of gangrenous colon secondary to sigmoid volvulus. Patients with an unclear diagnosis, viable bowel at laparotomy, ileosigmoid knotting (compound volvulus), and incomplete medical records were excluded. The SV diagnoses were suspected on clinical and radiological findings and confirmed at laparotomy. All patients had correction of fluid deficits and electrolyte imbalances, gastric decompression, and broad-spectrum intravenous antibiotics, initiated prior to operative intervention. All cases were performed or immediately supervised by consultant surgeons. Decisions regarding the type of operative procedure and where to transfer the patient after the procedure (whether to the intensive care unit [ICU] or the recovery room) were made on a case-by-case basis by the consultant surgeon involved in the case.

Data collected from the individual case records included patient demographics, presenting symptoms, vital signs, physical findings, operative findings and procedure, number of operations, complications, outcome, and duration of hospitalisation. The main outcome measures were the presence of complications and mortality at discharge. The patients were divided into 2 groups, depending on whether they had a PA or HP following resection of the gangrenous colon. PAs were done without the addition of a proximal "protective" loop colostomy. In addition, no patient had on-table lavage. The data were abstracted using a standardised data collection form with the results entered into a Microsoft Excel spreadsheet. Analysis was done using Fisher's exact test and unpaired t-tests, as appropriate. P-values less than or equal to 0.05 were considered statistically significant.



Results

A total of 181 cases of SV were noted during the study period, with 49 cases suspected to have had gangrenous bowel. Three cases were excluded because of incomplete or conflicting documentation on bowel status, thus the 46 remaining cases (25.4% of all SV cases) formed the basis of this review. The group consisted of 42 males (87%) and 4 females, with a mean age of 47.3 years (range 15-81). Most of the patients (54.3%) were aged 30 to 60 years, while 21.7% were below 30 years and 23.9% were above 60 years.

The mean duration of symptoms prior to hospital presentation was 2.2 days (range 2 hours-7 days). Most patients had symptoms for 1 to 2 days (26 patients; 56.5%) and 3 to 4 days (15 patients; 32.6%) prior to presentation, while those with symptoms for < 1 day and > 5 days represented 4.3% and 6.5% of the cases, respectively. Abdominal pain (44 patients; 95.6%), abdominal distension (44 patients; 95.6%), abdominal tenderness (42 patients; 91.3%) and vomiting (29 patients; 63%) were the most common signs and symptoms recorded (Table 1).

At laparotomy, all 46 cases were noted to have gangrenous bowel, with only 3 cases of concurrent bowel perforation. Four patients underwent damage control surgery (DCS), in response to persistent hypotension despite adequate resuscitation, involving resection of the gangrenous bowel, proximal and distal bowel decompression, separate closure of both bowel ends with suture or staples, peritoneal lavage, and temporary abdominal closure. The patients were then transferred to the ICU, where resuscitation was continued. After a second-look laparotomy (undertaken in 24 to 48 hours), 2 patients underwent a colostomy and 2 had a colo-colonic anastomosis done. A total of 42 patients underwent a definitive procedure during the initial laparotomy, with 23 having a PA and 19 undergoing a HP.

Symptom/sign	n (%)
Abdominal pain	44 (95.7%)
Abdominal distension	44 (95.7%)
Abdominal tenderness	42 (91.5%)
Constipation	37 (80.4%)
Vomiting	29 (63%)
Peritonitis	26 (56.5%)
Empty rectal vault	24 (52.2%)

Antibiotics were started preoperatively in all cases, with the main combinations being ceftriaxone/metronidazole (60.9%) and ampicillin/gentamycin/metronidazole (26.1%). The median duration of antibiotic administration was 6.7 days (range 1-18 days), with the majority (54.3%) of patients receiving antibiotics for 7 to 8 days. The rest were distributed as 12 patients (26.1%) receiving antibiotics for < 5 days, 8 (17.4%) for > 9 days, and not indicated in 1 case (2.2%).



Twenty-eight patients (61%) were admitted to the ICU, for a median duration of 2.4 days (range 1-18). Most of the patients were admitted for 1 to 2 days (10 patients; 21.7%) or 3 to 4 days (10 patients; 21.7%), with the rest divided as 5 to 6 days (2 patients; 4.3%), > 6 days (4 patients; 8.7%), and not indicated (2 patients; 4.3%).

Table 2: Assessment of patients undergoing PA or HP

Variable	PA (N = 24)	HP (N = 22)	Statistical test	P-value
Mean age (years \pm standard deviation [SD])	43.5 \pm 3.22	51.6 \pm 4.2	Unpaired t-test	0.13
Female sex n (%)	2 (8%)	2 (9%)	Fisher's exact test	1.0
Mean arterial pressure (mmHg)	85.50 \pm 3.94	79.65 \pm 3.94	Unpaired t-test	0.303
Symptom duration (days \pm SD)	1.81 \pm 0.23	2.72 \pm 0.33	Unpaired t-test	0.025
Peritonitis n (%)	10 (42%)	16 (72%)	Fisher's exact test	0.042
Damage control surgery n (%)	2 (8%)	2 (9%)	Fisher's exact test	1.0
ICU stay (days \pm SD)	1.63 \pm 0.60	3.35 \pm 0.94	Unpaired t-test	0.12
Duration of antibiotics (days \pm SD)	5.75 \pm 0.72	7.43 \pm 0.86	Unpaired t-test	0.14
Antibiotic combination (ceftriaxone/metronidazole) n (%)	15 (62.5%)	12 (57.1%)	Unpaired t-test	0.77
Duration of hospitalisation (days \pm SD)	8.04 \pm 0.70	11.23 \pm 2.58	Unpaired t-test	0.22

The mortality rate was 15.2% (7 of 46) overall, 8.3% (2 of 24) for those having a primary anastomosis, 22.7% (5 of 22) for those undergoing a colostomy, 50% (2 of 4) for those having DCS with either PA or HA as a definitive procedure, and 66.7% (2 of 3) in those having bowel perforation (who subsequently had a HP). The cause of death was severe sepsis or septic shock in 4 patients, multisystem organ failure in 2 patients, and there was 1 suspected large pulmonary embolism. The deaths occurred within 2 to 5 days of admission in 4 cases, and within 10 to 18 days in 3 patients.

The mean duration of hospitalisation was 9.6 days (range 2-61), with most (29 patients; 73.9%) being admitted for 6 to 10 days. Those admitted for \leq 5 days and \geq 11 days represented 17.4% and 19.6% of the cases, respectively. Postoperative complications and morbidity were noted in 12 patients (26.1%), including surgical site infection in 10, fascial dehiscence in 4, anastomotic leak in 1, and intra-abdominal abscess in 1.

Assessment of the group of patients who underwent a PA (n = 24) or HP (n = 22) revealed that they were similar in terms of mean age, sex ratio, mean arterial pressure (MAP), antibiotics administered, antibiotic duration, and the proportion of patients undergoing DCS (Table 2). None of the patients with a concurrent colonic perforation had a PA. Patients undergoing a HP had a



longer duration of symptoms (2.7 vs 1.8 days; $P = 0.02$) and a higher incidence of peritonitis (72% vs 42%; $P = 0.04$) than those who had a PA (Table 2).

Discussion

The presence of bowel gangrene has a negative impact on outcomes of patients with SV. The rate of bowel gangrene (25%) and the overall mortality rate (15%) noted in this review were within the range of prior reports of bowel gangrene (16% to 75%) and mortality (10% to 17%) rates.^{1,2,5-8} A much higher mortality rate was noted in patients with bowel perforation and persistent hypotension necessitating DCS (67% and 50%, respectively), in agreement with other studies that have reported an association between the presence of bowel perforation, shock, and increased mortality.⁷⁻¹¹

Madiba et al. argue that the presence of gangrenous bowel is largely responsible for the high mortality associated with emergent operations rather than the choice of surgical procedure.¹⁵ In this series the higher mortality in patients having a HP, which was numerically impressive but not statistically significant (22.7% vs 8%; $P = 0.2$), may be attributed to the selection of sicker patients to undergo a HP. The patients who underwent HP clearly presented later (2.7 days vs 1.8 days; $P = 0.02$), had a higher incidence of peritonitis (72% vs 42%; $P = 0.04$), were admitted in the ICU for longer, and had a longer duration of hospitalisation. This is emphasised in the patients who had concurrent colonic perforation, who appropriately had a HP, with subsequent deaths from severe sepsis.

While this study did not evaluate the reasons behind the choice of surgical procedure (HP or PA), more than half of the patients were selected to undergo PA following resection of the gangrenous SV. The observed anastomotic leak rate of 4.2% and the mortality rate of 8% are all within the lower range of prior reported studies. The anastomotic leak rates in series with large numbers of patients with gangrenous colon undergoing RA range from 5% to 12%.^{4,7,13,18} A stable and healthy patient, the absence of gross contamination, the presence of viable and well-vascularised bowel ends after resection, and the ability to achieve a tension-free anastomosis have all been reported as prerequisites for safe anastomoses.^{7,9,10,12,14,17}

On the other hand, a diverting colostomy is appropriate when the risk of an anastomotic leak is felt to be too high to justify a PA.¹⁹ The presence of concurrent colonic perforation, with gross contamination that was seen in 3 patients, was a strong indicator for performing a HP. Other factors that may indicate the need to perform a HP include significant malnutrition, history of chronic steroid use, short distal colon limb, severe discrepancy in the diameter of the cut bowel ends, questionable bowel viability, severe bowel wall oedema, inadequate experience in performing colonic anastomosis, and presence of severe comorbid illness.^{9,10,16,17,19}

Patients presenting with sustained hypotension despite aggressive resuscitation, metabolic acidosis, and surgical coagulopathy secondary to sepsis, should be managed differently. A damage control approach with prioritisation of goals and attention to the patient physiology should be the default.¹⁷ Rapid resection of the volvulised segment should be performed with staplers or double closure of both ends with suture, followed by debridement of nonviable tissue, peritoneal lavage, and temporary abdominal closure. The patients should be transferred to an intensive care setting where resuscitation is continued, with a second-look laparotomy and definitive procedure undertaken in 24 to 48 hours. These subsets of patients have a high mortality, as seen in this series wherein mortality was 50%. Series with patients managed for gangrenous SV have reported an overall mortality rate between 11% and 38%, mean duration of symptoms of 2.7



days, mean age of 39 to 48 years, mean ICU stay of 3.5 days, mean duration of stay at 10 to 11 days, and an antibiotic combination of a cephalosporin and a aminoglycoside (with or without metronidazole).^{3,5-8,12,13,15,17,18} Similar findings were noted in this review.

Study limitations

This was a retrospective study, with a small number of patients who underwent HP or PA, and with few observed differences in outcome that could have occurred by chance. The cases were managed by various surgeons over the duration of the review; these surgeons had various reasons for their management choices, some of which were not recorded in the files evaluated.

Conclusions

The presence of bowel gangrene in patients with gangrenous SV does not mandate a diverting colostomy. Primary anastomosis can be safely undertaken in patients who are felt to have a low probability of developing an anastomotic leak.

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