The Ochsner Journal 11:282–285, 2011

Surgical Management and Outcome in Acute Ischemic Colitis

David E. Beck, MD, FACS, FASCRS,*† Jose Eduardo de Aguilar-Nascimento, MD, PhD‡

**Department of Colon and Rectal Surgery, Ochsner Clinic Foundation, New Orleans, LA*
† Professor, Department of Surgery, The University of Queensland School of Medicine, Ochsner Clinic School, Brisbane, Australia
‡ University of Mato Grosso, Cuiabá, Brazil

ABSTRACT

Background: Ischemic colitis is the most common form of gastrointestinal ischemia. Patients usually present with abdominal discomfort and bloody diarrhea. Treatment is contingent on the severity of disease. Mucosal/nongangrenous ischemia requires only supportive measures and medical management, whereas transmural/gangrenous ischemia may require prompt surgical intervention. The purpose of this study was to review the surgical management of ischemic colitis in a tertiary referral center.

Methods: Retrospective chart review of patients with ischemic colitis managed from 1995 to 2000 at the Ochsner Foundation Hospital.

Results: Forty-eight patients were identified. Ten of these had disease significant enough to require surgery (21%) and are the basis of this review. Eight were women, and the mean age was 71.4 years (range 43-85 years). Distribution of the disease was the right colon in 4 cases, pancolitis in 3, sigmoid in 2, and the left colon in 1. Nine patients underwent bowel resection: primary anastomosis in 3 and creation of a stoma in the other 6 (5 ileostomies and 1 transverse colostomy). Follow-up ranged from 3 days to 13.8 years. One patient died perioperatively.

Conclusion: Surgical management produced good results.

Address correspondence to
David E. Beck, MD
Department of Colon and Rectal Surgery
Ochsner Clinic Foundation
1514 Jefferson Highway
New Orleans, LA 70121
Tel: (504) 842-4060
Fax: (504) 842-3032
Email: dbeckmd@aol.com

Keywords: Colonoscopy, gastrointestinal bleeding, ischemic colitis, surgery

The authors have no financial or proprietary interest in the subject matter of this article.

INTRODUCTION

Ischemic colitis, a well-recognized entity generally associated with nonocclusive ischemic injury to the large bowel, is the most prevalent cause of ischemia of the gastrointestinal tract.[1,2] Large series focusing on the surgical management of ischemic colitis are rare, and most reports include interrelated chronic and acute cases.[3-5] This study evaluated the diagnosis and outcome of patients with ischemic colitis requiring surgery.

METHODS

We reviewed the records of all patients admitted with ischemic colitis at the Ochsner Foundation Hospital, New Orleans, LA, from January 1995 to December 2000, confirming diagnosis by colonoscopy, operative notes, or pathology examination. The following variables were evaluated: age, sex, race, symptoms, physical examination, diagnostic work-up, operative procedure, complications, and outcome.

Forty-eight consecutive patients with ischemic colitis were admitted to the hospital during the study period: 8 (16.7%) men and 40 (83.3%) women. The mean age was 67 years (range 43 to 88 years). Ten (20.8%) of the patients required emergency surgery and were thus included in the study. In this subset, 8 were women, and the mean age was 71.4 years (range 43-85 years).

RESULTS

Diagnosis

Abdominal pain was the most prevalent complaint (9/10 patients), followed by diarrhea (5/10) and blood in feces (4/10). Four patients were hospitalized when symptoms appeared. Physical examination of patients found abdominal tenderness (9/10) and distension (4/10). Two patients had rebound tenderness. Eight patients showed signs of systemic inflammatory response syndrome (SIRS). Mild tachycardia (90-100 beats per minute) was present in 8 cases and fever ($> 101^{\circ}$F) in only 2. An elevated white blood cell count (mean 17,700 [9,300-34,100]/mm^3) was the most frequent sign of SIRS, found in

9 patients. All patients had good nutritional status, as evaluated by serum albumin (mean 3.8, range 3.1-4.6 mg/dL).

All but one patient had previous conditions related to ischemic bowel. Diabetes, peripheral vascular disease, hypertension, and coronary disease were the most common. Eight patients had the following precipitating factors: 3 patients had shock (diastolic blood pressure ≤ 90 mmHg) from upper gastrointestinal bleeding; 3 patients had recently undergone coronary bypass, cholecystectomy, and aortic abdominal repair; 1 patient each reported hypovolemia and nonsteroidal antiinflammatory drug (NSAID) abuse.

Preoperatively, low levels of hemoglobin and hematocrit were noted in 4 patients, hyperglycemia and elevated serum blood-urea nitrogen and creatinine in 5, and severe coagulopathy in 1.

Eight patients had plain abdominal x-rays. Three patients showed inconclusive abnormalities. Computed tomography (CT) in 2 cases showed thickening and distension of the large bowel wall. Three patients underwent colonoscopy, which established the ischemic colon diagnosis in 2. Among all cases, a preoperative diagnosis was possible in 4 patients. However, 8 patients were admitted to the operative room with a suspect ischemic bowel. Acute appendicitis and cancer were the preoperative diagnoses in the other 2.

Treatment

Four patients underwent immediate surgery, whereas 6 were initially managed medically. Median American Society of Anesthesiology (ASA) classification, as scored by the anesthesiologist, was 4 (range 2-5). At surgery, 2 patients had total colonic ischemia, and 8 had segmental ischemic colitis (right colon in 4, left colon in 2, and sigmoid colon in 2). Four of the 10 had gangrene; perforation was identified in 3 patients and peritonitis in 6. A resection was necessary in all but 1 patient, who underwent only an exploratory laparotomy. Operative procedures included 5 segmental resections (3 right and 2 left), 3 total colonic resections, 1 small bowel resection with diverting loop ileostomy and suture closure of a small rectal perforation, and 1 diagnostic laparotomy. Primary anastomosis was performed in 3 of the 9 cases of resection, and a stoma was created in the other 6 (5 ileostomies and 1 transverse colostomy). Mean operative time was 135 minutes (range 60-220 minutes). Ischemia was diagnosed intraoperatively in 8 cases and confirmed by pathologic review of 7 patients with a resected specimen. In the remaining 2 patients of the 9 resections, pathologic review alone established the ischemia diagnosis.

Outcome

All patients survived but one. A 74-year-old female with severe coagulopathy and acute renal failure who underwent total colectomy and end ileostomy for ischemic pancolitis died postoperatively from multiple organ failure. Three patients underwent a second-look laparotomy; 2 received an additional resection. Major or minor complications developed in 7 patients, but there were no anastomotic leaks. The mean hospital stay was 13 days (range 4-28). Mean follow-up was 5.3 years (range 3 days to 13.8 years). Only 2 of the 6 patients with a stoma had their stomas closed, at 3.2 and 4.5 months after their index surgery.

DISCUSSION

Boley et al[6] described ischemic colitis in the 1960s, but Marston et al[7] coined the term ischemic colitis. Although ischemic colitis may develop spontaneously, a broad spectrum of multifactorial conditions is often present. Typically, the patient is elderly and has a consistent past history compatible with arteriosclerosis, low flow states of any nature, and congestive heart failure. Ischemic colitis is also frequently seen after aortic surgery, especially abdominal aortic aneurysm repair.[8] However, ischemic colitis has also been reported in younger patients without any precipitating factors or with conditions such as vasculitis, cocaine abuse, marathon running, coagulopathies, and drugs such as digitalis, nasal decongestants, oral contraceptives, and some NSAIDs, and rarely as a result of barium enema and colonoscopy.[5,9,10]

Using univariate analysis, Flobert and colleagues[11] evaluated the predisposing factors associated with severe outcome in patients with ischemic colitis. They found that chronic renal failure, hemodialysis, short delay between symptoms and diagnosis, and right side involvement were significantly associated with unfavorable outcome. Five of the patients in this series had impaired renal function before surgery, and the right side was the most frequent location of segmental disease. The pathogenesis of the connection between renal failure and hemodialysis needs to be better explained but is beyond the scope of this paper.

The left colon, especially the splenic flexure, is the most frequent site of presentation, although reports of right side involvement are increasing in the literature.[12] The splenic flexure of the colon has a potential disadvantage because it is located in a watershed area between the two mesenteric arteries. Nonocclusive bowel ischemia is possibly caused by low flow states or small vessel disease. The process may only superficially reach the mucosa and resolve without sequelae, or it may advance transmurally to reach the

submucosa or muscle layers, eventually causing strictures. However, a fulminant course may happen and progress rapidly to gangrene.

Ischemic colitis patients commonly complain of acute onset abdominal pain, diarrhea frequently containing blood, and vomiting. Signs of SIRS associated with distension and tenderness of the abdomen are common on clinical examination. Clinically, 2 distinct forms of acute presentation occur: a benign transient form that responds to clinical management and a more severe form requiring surgery.[13] Because of a lack of randomized trials and limited series and case reports, it is difficult to identify the percentage of patients with acute ischemic colitis that demands emergency surgery. The reported rate of surgical management varies from 2% to 51%,[11,14,15] a range that includes the 21% (10 of 48 patients) found in this series.

Patients requiring emergency operation often lack an accurate preoperative diagnosis because time for investigational procedures is limited. Barium enema, a gold standard diagnostic study some decades ago, has been disregarded in favor of CT and colonoscopy.[3] However, despite the accuracy of these tests, the decision about surgical intervention is frequently based on clinical findings. A correct diagnosis was made in only 40% of the presented cases by either CT scan or endoscopy; 80% of the patients underwent surgery with a suspect diagnosis of ischemic colitis.

Systemic signs of sepsis or SIRS are commonly seen in severe ischemic colitis. Although 2 patients had fever, tachycardia and leukocytosis occurred in the vast majority of the cases. The loss of mucosal barrier in ischemic colitis may determine a chronic state of bacterial translocation, and continuing SIRS may develop into multiple organ failure. Taking into account the age and the intervenient conditions of these patients, a high mortality rate would be expected.

The pattern of acute ischemic colitis dictates proper management and prognosis. Transient ischemic colitis—the most common form of presentation, accounting for 80% to 85% of all cases—is generally managed nonoperatively with good prognosis.[3] In gangrenous type, encompassing the remaining 15% to 20% of cases, surgery is mandatory and mortality is much higher. Surgery is also required in nongangrenous ischemic colitis when clinical measures fail.

Conservative treatment was successful in almost 80% of our patients with ischemic colitis, similar to figures seen in the current literature. The splenic flexure of the colon has been pointed out as the most prevalent site of ischemia in the large bowel. However, right colonic involvement is increasing in recent reports.[10] In 4 of our 7 patients with segmental colitis, the right colon was the site of the process. Right-sided colitis has been related to a more severe presentation of the disease; thus, this may reflect the distribution observed in the present series.

Primary anastomosis seems to be performed with caution in colonic resection to treat ischemic colitis. In most series, a stoma is preferred. Poor patient conditions and insecurity about the proper blood supply on the anastomotic edges are reasonable rationales for this policy. Intraoperative assessment of colonic viability may be achieved by Doppler, tonometric measurement of intramural pH, and intravenous fluorescein.[16] However, it is rarely used. Guttormson and Bubrick,[4] based on an unacceptable 100% mortality in their patients undergoing primary anastomosis, always recommend a stoma after resection in patients with ischemic colitis. Although an ileostomy was the first option in our cases, we performed primary anastomosis in 3 cases without any leak.

Second-look laparotomy is advisable in selected cases depending on the clinical picture. Three of our patients required a second operation, and resections were performed in 2. This result implies that apprehensions about residual or continuing ischemia should indicate a laparotomy. Operative mortality in acute ischemic colitis is high, ranging from 10% to 65% in most series, but can be as high as 75% in the subset of patients with total colitis. Longo and Oliver[3] found that patients older than 70 years and those who had undergone aortic surgery have higher mortality risk. In our series, the 30-day mortality rate was 10% despite the unfavorable preoperative conditions as indicated by the median ASA score.[5] According to other research, age does not represent a risk of mortality. Clearly, a large amount of interlinked factors may contribute to the deterioration of a patient with ischemic colitis. Renal failure is possibly a factor related to more severe presentation that requires prompt surgery. Timely surgery associated with pre-, trans-, and postoperative intensive care of patients should be emphasized to diminish the mortality rate.

Improvements in perioperative surgical care have improved overall results.[3] A high index of suspicion and prompt management are essential for optimum outcomes in patients with intestinal ischemia.

REFERENCES

1. Williams LF Jr, Bosniak MA, Wittenberg J, Manuel B, Grimes ET, Byrne JJ. Ischemic colitis. *Am J Surg*. 1969;117(2):254-264.
2. Gandhi SK, Hanson MM, Vernava AM, Kaminski DL, Longo WE. Ischemic colitis. *Dis Colon Rectum*. 1996;39(1):88-100.
3. Longo WE, Oliver GC. Less common benign disorders of the colon and rectum. In Wolff BG, Fleshman JW, Beck DE, Pemberton JH, Wexner SD, eds. *ASCRS Textbook of Colorectal Surgery*. New York: Springer-Verlag, 2007:601-621.
4. Guttormson NL, Bubrick MP. Mortality from ischemic colitis. *Dis Colon Rectum*. 1989;32(6):469-472.

5. Longo WE, Ballantyne GH, Gusberg RJ. Ischemic colitis: patterns and prognosis. *Dis Colon Rectum*. 1992;35(8):726-730.
6. Boley SJ, Schwartz S, Lash J, Sternhill V. Reversible vascular occlusion of the colon. *Surg Gynecol Obstet*. 1963;116:53-60.
7. Marston A, Pheils MT, Thomas ML, Morson BC. Ischaemic colitis. *Gut*. 1966;7(1):1-15.
8. Gordon PH, Bubrick MP. Mesenteric vascular diseases. In Gordon PH, Nivatvongs S, eds. *Principles and Practice of Surgery for the Colon, Rectum, and Anus*. St. Louis, MO: Quality Medical Publishing, 1999:1067-1093.
9. Bynum TE, Jaconson ED. Vascular disorders of the large bowel. In Kirsner JB, Shorter RG, eds. *Diseases of the Colon, Rectum, and Anal Canal*. Baltimore: Williams and Wilkins, 1988:537-549.
10. Stamos MJ. Intestinal ischemia and infarction. In Mazier WP, Levien DH, Luchtefeld MA, Senagore AJ, eds. *Surgery of the Colon, Rectum and Anus*. Philadelphia: WB Saunders, 1995:685-718.
11. Flobert C, Cellier C, Berger A, et al. Right colonic involvement is associated with severe forms of ischemic colitis and occurs frequently in patients with chronic renal failure requiring hemodialysis. *Am J Gastroenterol*. 2000;95(1):195-198.
12. Beck DE, Hicks TC. Other conditions: colonic volvulus, ischemia, radiation injury, and trauma. In Beck DE, ed. *Handbook of Colorectal Surgery*. 2nd ed. New York: Marcel Dekker, 2003:483-507.
13. Paterno F, McGillicuddy EA, Schuster KM, Longo WE. Ischemic colitis: risk factors for eventual surgery. *Am J Surg*. 2010;200(5):646-650.
14. Boley SJ, Brandt LJ, Veith FJ. Ischemic disorders of the intestines. *Curr Probl Surg*. 1978;15(4):1-85.
15. Hagihara PF, Ernst CB, Griffen WO Jr. Incidence of ischemic colitis following abdominal aortic reconstruction. *Surg Gynecol Obstet*. 1979;149(4):571-573.
16. Bulkley GB, Zuidema GD, Hamilton SR, O'Mara CS, Klacsmann PG, Horn SD. Intraoperative determination of small intestinal viability following ischemic injury: a prospective, controlled trial of two adjuvant methods (Doppler and fluorescein) compared with standard clinical judgment. *Ann Surg*. 1981;193(5):628-637.

This article meets the Accreditation Council for Graduate Medical Education competencies for Patient Care and Medical Knowledge.