Colorectal Trauma: Primary Repair or Anastomosis with Intracolonic Bypass vs. Ostomy

Robert E. Falcone, M.D.,*‡ Steven R. Wanamaker, M.D.,* Steven A. Santanello, D.O.,* Larry C. Carey, M.D.§

From the *Grant Medical Center, Columbus, Ohio, ‡Ohio State University, Columbus, Ohio, and §Department of Surgery, University of South Florida, Tampa, Florida

This prospective, randomized, controlled study was undertaken to compare primary repair or anastomosis with intracolonic bypass vs. ostomy in severe colon and intraperitoneal rectal injury. Patients were randomized at surgery following confirmation of injury. Data collected included demographics, mechanism and location of injury, trauma score (TS), injury severity score (ISS), penetrating abdominal trauma index (PATI), complications, length of hospital stay, and hospital charges. Twenty-two patients were studied: 11 with intracolonic bypass and 11 controls. The experimental and control groups were statistically similar in demographics and mechanism of injury, severity of injury (TS = 13.8 vs. 12.8; ISS = 27.5 vs. 24.2; PATI = 40.5 vs. 35.0), and complication rate. Length of stay (12.2 days vs. 20.7 days) and charges $27,885 vs. $53,599) tended to be greater in controls, and the comparison did not include subsequent colostomy closure. This study supports intracolonic bypass as a safe alternative to ostomy in severe colon and intraperitoneal rectal trauma. [Key words: Colorectal injury; Primary repair; Intracolonic bypass]


At the outbreak of World War II, Ogilvie advocated the exteriorization or diversion of all colorectal injuries, and by 1943 the United States Surgeon General made colostomy mandatory for all colorectal injury. 2 At the war's end, combat-trained surgeons returned to civilian life, and colostomy remained the gold standard for the management of colorectal injury.3 With the advent of better preoperative and postoperative care, early definitive treatment, and newer antibiotics, civilian surgeons began to advocate primary closure in selected cases, 4 a trend that has continued to the present.

Although there are few prospective, randomized, controlled studies in the literature,5,6 there is a current consensus that most minor colon injuries can be repaired primarily.5-10 Generally, the criteria for primary repair describe a stable patient with minimal contamination, little operative delay, and few associated injuries. Controversy continues to surround primary repair in moderate-to-severe colorectal injury. Recent advances in the primary anastomosis of the unprepared colon on an emergency basis using intracolonic bypass may be applicable to injury.11-15 The following study was undertaken to address this question in a randomized, controlled fashion.

METHODS

Patient Population. All patients with suspected colon or intraperitoneal rectal injury undergoing operative intervention at the study center provided the basic patient pool. Consent for study inclusion was obtained preoperatively.

Exclusion Criteria. The following were excluded: patients dying within 24 hours of injury, patients presenting more than eight hours after injury, patients initially operated on elsewhere, and patients not deemed admissible by the operating surgeon.

Management. Patients underwent standard resuscitation and evaluation. The decision for randomization was made intraoperatively based on inclusion criteria (Table 1).

Study patients were randomly assigned to Group 1—primary repair or anastomosis with intracolonic bypass—or Group 2—colostomy. The Coloshield™ (Deknatel, Inc., Fall River, MA) was used in stand-
ard fashion. Techniques of repair or anastomosis were at the discretion of the operating surgeons. Drains were not used for colonic injury, and skin wounds were closed by delayed primary closure.

All patients received a broad-spectrum antibiotic (cefoxitin) preoperatively and for 24 hours postoperatively. Subsequent antibiotic therapy was individualized based on clinical course and cultures.

Postoperative care was individualized to include ventilatory support, nutritional support, and a careful surveillance for complications including fever, intra-abdominal phlegmon, intra-abdominal abscess, fecal fistula, wound infection, pneumonia, urinary tract infection, phlebitis, and any other systemic complication.

Participating surgeons were limited to five trauma surgeons working at the study center. Each surgeon was required to complete an animal workshop on intracolonic bypass before clinical participation.

Randomization was provided by a central independent party using a random number table and a card system. Ultimate outcome, length of stay, hospital cost, basic demographics, mechanism of injury, TS, ISS, and PATI were obtained on study patients.

Statistical analysis was performed using a two-tailed Student's t-test for continuous variables, a chi-squared test for proportions, and Fisher's exact test for proportions with a cell size <5, as appropriate. Significance was established at \( P < 0.05 \).

DEFINITIONS

Fever. Temperature >37.5°C.

Intra-abdominal phlegmon. Nondrainable intra-abdominal infection associated with fever, leukocytosis, or positive cultures and diagnosed by CAT scan, ultrasound, or re-exploration.

Intra-abdominal abscess. Drainable intra-abdominal collection associated with fever, leukocytosis, or positive cultures and diagnosed by CAT scan, ultrasound, or re-exploration.

Fecal fistula. Fecal drainage from the colon into the abdominal cavity, wound, or other organ system.

Wound infection. Wound not closed after five days, wound reopened or treated with antibiotics following closure, or wound draining pus.

Pneumonia. X-ray evidence of infiltrate associated with fever, leukocytosis, or pathogenic Gram's stain of bronchial aspirate.

Urinary tract infection. Culture-proven urinary tract infection with colonies >100,000.

Phlebitis. Deep venous thrombosis proven by venogram.

Leukocytosis. White blood cell count >15,000/mm³.

Positive culture. Bacterial growth from blood, abdominal cavity, abscess cavity, wound, or other body fluid.

Shock. Systolic blood pressure < 90 mmHg.

RESULTS

The study population was composed of 22 patients. There were 14 men and 8 women averaging 26.7 years of age (range, 15–44 years). The mechanisms of injury were primarily penetrating, with 13 gunshot wounds, 2 shotgun wounds, one stab wound, and six motor vehicle accidents. The average scores were: TS 14, ISS 25.5, and PATI 32.

There were 11 patients in Group 1 (intracolonic bypass) and 11 patients in Group 2 (control). Four patients were not randomized (two in each group) because informed consent could not be obtained. They were otherwise treated per the protocol and included in data analysis. Two control patients underwent primary repair (HB and FP). They were included for completeness but were not included in data analysis for complications. Table 2 provides a patient summary.

The two populations were remarkably similar. Group 1 patients were younger than Group 2 patients (22.9 years vs. 30.5 years; \( P < 0.04 \)). However, there were no statistically significant differences in gender distribution, criteria for study inclusion (Table 3), or severity of injury (Table 4).

Outcomes were also similar (Table 5), although there was a trend toward longer hospitalization and higher hospital costs for the control patients. Hospital cost did not include subsequent readmission for colostomy closure in control patients, which averaged 7.7 hospital days and $7,116.00 per patient (Table 6). Additionally, three patients were