
Applicability of an Established Management Algorithm for Destructive Colon Injuries after Abbreviated Laparotomy: A 17-Year Experience

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- BACKGROUND:** For more than a decade, operative decisions (resection plus anastomosis vs diversion) for colon injuries, at our institution, have followed a defined management algorithm based on established risk factors (pre- or intraoperative transfusion requirements of more than 6 units packed RBCs and/or presence of significant comorbid diseases). However, this management algorithm was originally developed for patients managed with a single laparotomy. The purpose of this study was to evaluate the applicability of this algorithm to destructive colon injuries after abbreviated laparotomy (AL) and to determine whether additional risk factors should be considered.
- STUDY DESIGN:** Consecutive patients over a 17-year period with colon injuries after AL were identified. Nondestructive injuries were managed with primary repair. Destructive wounds were resected at the initial laparotomy followed by either a staged diversion (SD) or a delayed anastomosis (DA) at the subsequent exploration. Outcomes were evaluated to identify additional risk factors in the setting of AL.
- RESULTS:** We identified 149 patients: 33 (22%) patients underwent primary repair at initial exploration, 42 (28%) underwent DA, and 72 (49%) had SD. Two (1%) patients died before re-exploration. Of those undergoing DA, 23 (55%) patients were managed according to the algorithm and 19 (45%) were not. Adherence to the algorithm resulted in lower rates of suture line failure (4% vs 32%, $p = 0.03$) and colon-related morbidity (22% vs 58%, $p = 0.03$) for patients undergoing DA. No additional specific risk factors for suture line failure after DA were identified.
- CONCLUSIONS:** Adherence to an established algorithm, originally defined for destructive colon injuries after single laparotomy, is likewise efficacious for the management of these injuries in the setting of AL. (J Am Coll Surg 2014;218:636–643. © 2014 by the American College of Surgeons)
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Contemporary management of multiply injured patients after abdominal trauma associated with shock involves initial control of hemorrhage and gastrointestinal contamination, followed by temporary abdominal closure and transfer to the ICU. This innovative strategy of an

“abbreviated laparotomy” (AL) was originally described by Stone and colleagues,¹ and 10 years later was referred to as “damage control laparotomy” by Rotondo and associates.² Abbreviated laparotomy has demonstrated improved survival in the face of coagulopathy, acidosis, and hypothermia.^{1–6} In fact, trauma surgeons now recognize that AL allows for optimal resuscitation in the ICU and return to the operating room under more favorable conditions.

Destructive colon injuries managed with AL are initially resected and the bowel is left in discontinuity. At subsequent laparotomy, after resuscitation, the surgeon is left with the decision regarding how to safely manage the resected segment (delayed anastomosis vs diversion). Unfortunately, existing management guidelines for these injuries were defined before the widespread use of AL and do not necessarily address the issue of delayed anastomosis after resuscitation. As a result, relatively limited data exist to specifically guide the management of these injuries after AL.^{7–13}

CME questions for this article available at
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Abbreviations and Acronyms

Abd-AIS	= abdomen Abbreviated Injury Scale
AL	= abbreviated laparotomy
DA	= delayed anastomosis
ISS	= Injury Severity Score
SD	= staged diversion

In fact, traditional management schemes for destructive colon injuries may not apply to patients managed with AL, putting them at a higher risk for suture line failure. In our institution, operative decisions for all colon injuries have followed a defined management algorithm based on established risk factors,¹⁴ originally identified for penetrating injuries and subsequently confirmed for blunt injuries,¹⁵⁻¹⁷ for patients undergoing single laparotomy (Fig. 1). The purpose of this study was to evaluate the applicability of that algorithm to destructive colon injuries after AL and to determine whether additional risk factors should be considered.

METHODS**Identification of patients**

After approval from the Institutional Review Board at the University of Tennessee Health Science Center, consecutive patients sustaining colon injuries over a 17-year period were identified from the trauma registry of the Presley Regional Trauma Center in Memphis, TN. Charts were reviewed for data regarding patient demographics, injury mechanism and location, operative management, associated injuries, and outcomes. Patients who

died within 24 hours of presentation, those with rectal injuries, and those who did not undergo AL were excluded.

Management

At the initial laparotomy, patients underwent primary repair of nondestructive wounds and resection of destructive injuries. After correction of hypothermia, coagulopathy, and acidosis, the patients returned to the operating room for either a staged diversion (SD) or a delayed anastomosis (DA). The decision for SD or DA was left up to the discretion of the surgeon at the subsequent operation, based on the amount of bowel wall edema and the patient's hemodynamic status.

Definitions

Determination of destructive injuries was based on intra-operative observational criteria, separate for penetrating and blunt mechanisms (Table 1). Indicators of penetrating destructive colon injuries were those involving greater than 50% of the colon wall circumference, complete transection of the colon, significant loss of tissue, and devascularized segments. For blunt injuries, indicators of destructive wounds were serosal wounds involving $\geq 50\%$ of the colon wall circumference, mesenteric devascularization, and full-thickness perforations.

Significant medical comorbidities were defined as those medical conditions that can reduce wound healing, including chronic renal failure, congestive heart failure, HIV, cirrhosis, and chronic use of steroids. Complications of interest for patients undergoing DA included intra-abdominal abscess formation (de novo fluid collections with positive culture for microorganisms), and suture line failure. Colon-related mortality was defined

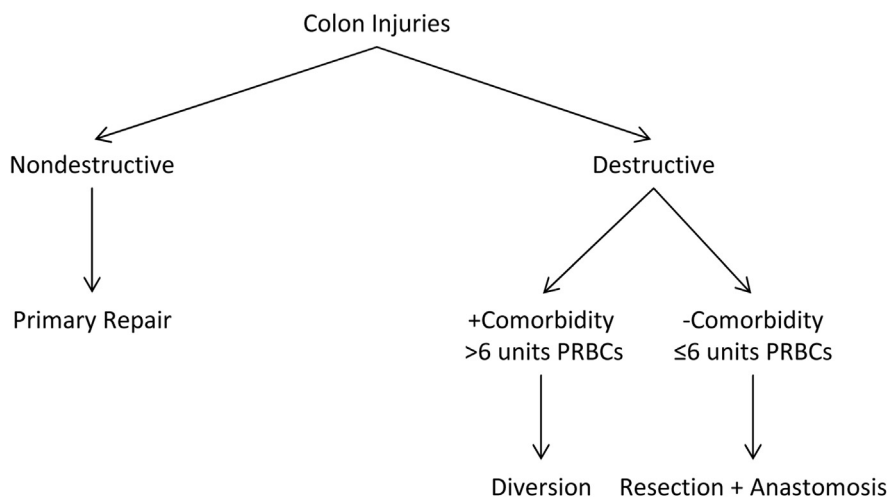


Figure 1. Defined management algorithm for colon injuries. PRBC, packed red blood cells.

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