Complications of Hartmann takedown in a decade of preferred primary anastomosis

Ari Garber, M.D., Neil Hyman, M.D.*, Turner Osler, M.D.

Department of Surgery, University of Vermont College of Medicine, Burlington, VT, USA

KEYWORDS: Diverticulitis; Surgery; Colostomy; Anastomosis

Abstract

BACKGROUND: Primary anastomosis with or without proximal diversion is increasingly applied to patients requiring urgent colectomy for complicated disease of the left colon. As such, the Hartmann procedure is now often restricted to patients who are unstable or otherwise poor candidates for primary anastomosis. We sought to define the complication rate of Hartmann takedown in a contemporary setting.

METHODS: Consecutive adult patients undergoing colostomy takedown with colorectal anastomosis at an academic teaching hospital from January 1, 2001, to December 31, 2010, were included in the study. Complications were captured prospectively by a single trained nurse practitioner. Demographics, body mass index, American Society of Anesthesiologists (ASA) classification, interval between Hartmann procedure and subsequent takedown, surgical indication, duration of surgery, surgeon volume and specialty, length of stay, and complications were recorded.

RESULTS: One hundred three patients underwent Hartmann reversal by 16 different surgeons; 7 of these surgeons performed 4 or fewer procedures during the study period. During the same time period, 334 patients underwent a Hartmann procedure at our institution. Seventy-seven of 104 patients (74%) had their index resection for complicated diverticulitis; an anastomotic leak was the second most common indication. The median age was 61 years (range 31 to 84 years), and the interval from Hartmann procedure to reversal ranged from 87 to 1,489 days. Only 8 patients (7.7%) had an ASA of 1. Thirty patients (29.1%) had postoperative complications, and 12 (11%) had 2 or more complications. There were 2 deaths and 4 anastomotic leaks, and 7 patients had inadvertent enterotomies. Only ASA status predicted postoperative complications (P = .01).

CONCLUSIONS: Hartmann takedown is a morbid operation with a substantial risk of inadvertent enterotomy and serious complications. Excluding cases referred from elsewhere, there were more than 5-fold the number of Hartmann procedures than takedowns performed during the study period. This suggests that Hartmann procedures are typically restricted to patients who are also poor candidates for takedown and that their colostomy is likely to be permanent.

© 2014 Elsevier Inc. All rights reserved.

Primary anastomosis with or without proximal diversion is increasingly applied to patients requiring urgent colectomy for complicated disease of the sigmoid colon. Multiple case series have shown that primary anastomosis is at least as safe as the Hartmann procedure (HP) in this setting and obviates the need for a second major laparotomy to restore gastrointestinal continuity. However, these comparative studies are typically plagued by selection bias because
it seems likely that the sickest patients with the most advanced pathology undergo HP, whereas better risk patients undergo colorectal anastomosis.

The patients who survive after HP often have multiple serious comorbidities and/or a challenging local situation in their pelvis and may not be comparable with HP patients from earlier times. As such, patients who request colostomy reversal are commonly at an increased operative risk, and considerable judgment is often required for optimal patient selection. Carefully delineating the complications that occur after Hartmann takedown would be a valuable aid to medical decision making and forthright patient counseling in an environment where this procedure is typically restricted to higher risk settings. We sought to define the complication rate of Hartmann takedown in a contemporary practice.

Methods

A prospective complication database was searched for consecutive adult patients undergoing colostomy takedown with colorectal anastomosis (Current Procedural Terminology code 44126) at Fletcher Allen Healthcare (FAHC), the teaching hospital of the University of Vermont College of Medicine, Burlington, VT, from January 1, 2001, through December 31, 2010. Age, sex, body mass index (BMI), date of surgery, American Society of Anesthesiologists (ASA) classification, operating surgeon, surgical indication, and the interval between HP and subsequent takedown were noted. Patients who had their original HP performed at an outside institution and were referred to FAHC for colostomy takedown were identified separately. The length of stay and complications were derived from the Surgical Activity Tracking System. In brief, all patients admitted to the surgery service were seen daily by a specially trained nurse practitioner who rounded with house staff. Complications were recorded in real time and validated at a biweekly meeting of the surgical team including the attending surgeons based on standardized definitions.4 Outpatient complications were captured by a routine follow-up data form completed for all patients at their first postoperative visit.

Colorectal surgeon specialty (based on fellowship training) and the volume of cases during the study period were recorded. Performing more than 10 cases during the study period was considered “high volume.” Operative reports were reviewed for the method of peritoneal access (open vs laparoscopic), intraoperative complications, and the length/location of the rectal stump. If the stump closure was located below the sacral promontory and/or the rectal pouch was less than 12 cm in length, it was considered a “difficult” stump. The decisions to perform the procedure open or laparoscopically, mobilize the splenic flexure, to perform high ligation of the mesenteric vessels, and to use ureteral stents were entirely based on the discretion of the operating surgeon. In general, ureteral stents were used infrequently and typically restricted to patients with both a low stump and advanced pelvic sepsis (eg, reoperation to restore gastrointestinal continuity in a patient who had suffered a leak after a low anterior resection).

The operative time was obtained from the anesthesia record; the time from incision to closure was considered the surgical time. Any time used for ancillary procedures such as the placement of an epidural catheter, ureteral stents, or an arterial catheter was excluded.

We used simple univariate analysis to seek risk factors for any postoperative complications (the Fisher exact test). The association of surgeon specialty with operative time and the length of stay were tested using the nonparametric Kruskal-Wallis test. The association of BMI on the operative time and length of stay was explored using 2 linear regression models. The effect of any complication on the length of stay was tested using the Kruskal-Wallis test. The association of surgeon specialty with operative time and the length of stay were tested using the nonparametric Kruskal-Wallis test. The association of BMI on the operative time and length of stay was explored using 2 linear regression models. The effect of any complication on the length of stay was tested using the Kruskal-Wallis test. The study was approved by the Institutional Review Board of the University of Vermont College of Medicine.

Results

One hundred three patients underwent Hartmann reversal during the study period. The median age was 61 years (range 31 to 84 years), and 56 (53.8%) of the patients were women. Most patients were ASA class 2 or 3 (Table 1). The median BMI was 31.1 (range 15.6 to 50.0 kg/m²). Sixteen different surgeons performed Hartmann takedown (range 1 to 19); 7 performed 4 or fewer procedures, including 3 who performed only 1. Three high-volume surgeons accounted for 47% of the takedowns (range 12 to 19). Only 5 reversals were performed laparoscopically.

Seventy-seven of 103 had their index HP for complicated diverticulitis (74.7%), whereas an anastomotic leak was the second most common indication (Table 2). The interval from HP to takedown ranged from 87 to 1,489 days (median = 157 days). Forty-eight of the procedures (46.6%) were performed by 1 of the 3 high-volume surgeons, 2 of whom were colorectal surgeons. Overall, 44 of 103 (42.7%) of the takedowns were performed by a colorectal surgeon. Thirty-nine patients had their original HP performed elsewhere and were referred to FAHC for closure. During the same time period, 334 patients had an HP at our institution (Current Procedural Terminology code 44143).

Seventeen patients (16%) had a short rectal stump, 14 of whom had their HP for an anastomotic leak from a
colo/rectal anastomosis. Eleven of these patients (64%) had their index HP at an outside institution. The operative time for the whole group varied greatly from 46 to 407 minutes (mean = 173 minutes, median = 179 minutes). Twenty-two cases (21.1%) took longer than 4 hours. Seven patients were given a protective loop ileostomy. Thirty-one of the patients (30.1%) had a documented incisional hernia from their initial HP.

Forty-nine complications occurred in the 30 patients (29%) who had a postoperative complication (range 0 to 5); 12 had 2 or more complications (Table 3). There were 2 deaths, 4 anastomotic leaks, and 7 patients with inadvertent enterotomies. Of the 3 urinary complications, there was 1 bladder injury, 1 case of urinary retention, and 1 patient who developed a urinary tract infection. Of the 2 deaths, 1 was caused by a postoperative myocardial infarction and 1 from an anastomotic leak.

The mean length of stay was 7.2 days (range 2 to 55 days, median = 6 days). ASA status strongly predicted postoperative complications ($P = .01$). BMI, surgeon volume, surgeon specialty, laparoscopy, and interval from HP to takedown were not predictive. The complication rate for patients with a short rectal stump was similar to those with a “normal” length Hartmann pouch (43% vs 26%, $P = .23$).

Colo/rectal surgeons had significantly shorter operative times (mean = 123 vs 210 minutes, $P < .0001$) as did high-volume surgeons (mean = 134 vs 207 minutes, $P < .001$); however, neither colorectal nor high-volume surgeons had fewer complications ($P = 1.0$) or a decreased length of stay compared with noncolo/rectal or low-volume surgeons, respectively (6.6 vs 7.7 days, $P = .38$). Interestingly, in a linear regression model, an increased BMI was not associated with a longer surgical time ($P = .30$) or increased length of stay ($P = .61$). Predictably, complications were associated with an increase in length of stay ($P < .003$).

## Comments

Hartmann takedown is a morbid operation with a substantial risk of inadvertent enterotomy and serious complications. In our series, the overall complication rate was 29%, and the in-hospital mortality rate was 2%. Furthermore, the operative time was as long as almost 7 hours, reflecting the challenge of reoperative pelvic surgery in some patients, especially those who are left with a short rectal stump after HP for an anastomotic leak. In addition, almost 7% required further fecal diversion with a loop ileostomy with the subsequent need for still another operation to restore intestinal continuity. All of this occurs in the setting of patients who typically have the option of no further surgery and living with their intestinal stoma. Only 8 of our patients were without concomitant systemic illness, and more than a third had serious comorbidities. Because ASA classification predicted surgical complications, particular caution is required in these higher-risk patients.

Excluding cases referred from other institutions for colostomy reversal, there were more than 5-fold the number of HPs than takedowns performed at our institution during the study period. We typically prefer resection with anastomosis and loop ileostomy in hemodynamically stable patients with complicated perforative disease of the left colon and usually reserve HP for patients who are in shock or those whose quality of life would seem preferable with a colostomy (eg, patients with fecal incontinence or severe functional restriction). As such, HP is now most commonly performed in patients who are also poor candidates for takedown, and their colostomy tends to be permanent.

Nonetheless, there remain many patients who do reasonably well after HP and are eager to have a colostomy reversal. In some circumstances, there is little doubt about their suitability for further surgery, and takedown can proceed after recovery from the septic insult. However, in other patients with serious comorbidities, the decision is far more challenging because the degree of complexity and local conditions in the pelvis can be difficult to predict, particularly in patients with a short stump after an anastomotic leak. Many patients who appear to be a suitable candidate for colorectal anastomosis may not do well with a prolonged operation.

We wondered whether outcomes would be better with a high-volume surgeon and/or colorectal specialist. Indeed, these surgeons were able to complete the operation in slightly more than half the time it took surgeons who

### Table 2

Indications for HP (N = 103)

<table>
<thead>
<tr>
<th>Complication</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complicated diverticulitis</td>
<td>77</td>
<td>74.7</td>
</tr>
<tr>
<td>Anastomotic leak</td>
<td>19</td>
<td>18.4</td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
<td>6.8</td>
</tr>
</tbody>
</table>

**HP** = Hartmann procedure.

### Table 3

Complications after Hartmann takedown (n = 30 patients)

<table>
<thead>
<tr>
<th>Complication</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSI</td>
<td>7</td>
</tr>
<tr>
<td>Inadvertent enterotomy</td>
<td>7</td>
</tr>
<tr>
<td>Need for blood transfusion</td>
<td>6</td>
</tr>
<tr>
<td>Anastomotic leak</td>
<td>4</td>
</tr>
<tr>
<td>Arrhythmia</td>
<td>4</td>
</tr>
<tr>
<td>Urinary</td>
<td>3</td>
</tr>
<tr>
<td>MI</td>
<td>2</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>2</td>
</tr>
<tr>
<td>Death</td>
<td>2</td>
</tr>
<tr>
<td>Other (major)*</td>
<td>6</td>
</tr>
<tr>
<td>Other (minor)†</td>
<td>6</td>
</tr>
</tbody>
</table>

* Cardiac arrest, anoxic encephalopathy, acute renal failure, pulmonary embolism, rhabdomyolysis, and dehiscence (these occurred in 2 distinct patients).
† Wound hematoma (2), ileus, wound seroma, stress incontinence, and medication error.
performed a low volume of procedures and/or were not specialty trained. However, most importantly, there was no difference in the complication rate based either on volume or training. It might be noted that 38 of 39 cases that were referred from other institutions had their takedown performed by a colorectal surgeon, and 14 of 17 “low stump” cases were performed by 1 of these surgeons. This would seem to imply greater complexity in this subgroup, but there was marked heterogeneity among the cases overall, which can be difficult to capture in an objective manner. The importance of case complexity in predicting complications after bowel resection has been highlighted. None-}

theless, our data do not provide a sound basis for concluding that surgeon volume or specialty improves outcomes or safety in Hartmann takedowns.

The ratio of HP to Hartmann takedown was approximately 5 to 1 at our institution during the study period because there is a strong institutional preference for primary anastomosis (typically with loop ileostomy) in the emergent setting. Although it is possible that patients who had an HP at our institution went elsewhere for their takedown, this seems unlikely because FAHC is the only tertiary care hospital in our broad geographic region. As such, most colostomies created at our institution at the time of HP during the past decade were likely permanent. A high incidence of permanent colostomy after HP has been reported by others.11,12

Surprisingly, little data exist in the literature specifically referring to the morbidity associated with colostomy takedown and colorectal anastomosis.13–15 The applicability of historic data to current practice might be questioned because many of the lower-risk patients who underwent HP in years past now may undergo primary anastomosis in many centers. However, the majority of patients requiring acute surgery for diverticulitis in the United States continue to undergo resection with colostomy.16,17 As such, our data may only be applicable to institutions with an aggressive stance toward primary anastomosis in the setting of complicated disease.

The priority in patients with free diverticular perforation needs to be to control sepsis and to save the patient’s life. We do not wish to denigrate the role of HP in this setting.18,19 However, one must also consider the later morbidity and disability associated with Hartmann takedown compared with ileostomy takedown. Furthermore, although up to one half of patients who undergo HP historically end up with a permanent colostomy, approximately 90% of patients who undergo primary anastomosis with loop ileostomy are able to undergo closure.20–22 Although safe and effective surgery is the first priority in patients with complicated disease, the considerable risk and morbidity of Hartmann takedown must also be carefully considered. Resection and anastomosis with or without proximal stoma and with or without lavage would seem to have significant benefits in this regard.23–25

In summary, our data show the considerable morbidity associated with Hartmann takedown in patients who have undergone and operation for complicated disease of the left colon. Particular caution is warranted in patients with higher ASA classification. HP remains a valuable and lifesaving operation for patients with septic complications associated with diverticulitis and/or anastomotic leak. However, in light of the abundant literature documenting the safety of primary anastomosis in otherwise stable patients, the high rate of permanent stomas after HP, and the considerable risks of Hartmann takedown we observed, a more liberal approach to primary anastomosis appears to be desirable.

References