Laparoscopic Colon Surgery for Benign Disease: A Comparison to Open Surgery

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ABSTRACT

Backgrounds and Objectives: There remains a debate in the literature about the advisability of laparoscopic surgery for malignant disease of the colon. Current prospective studies will hopefully answer this question. However, for benign diseases of the colon, we believe laparoscopic surgery offers many advantages including decreased postoperative pain, early discharge from the hospital, and early return to normal activities. We retrospectively reviewed our experience with laparoscopic colectomies for benign disease to see whether these procedures could be done safely and if the proposed advantages could be realized.

Methods: Thirty-eight laparoscopic colon resections performed for benign disease were compared to 39 open colon resections with respect to operating times, length of hospital stay, estimated blood loss, days until first postoperative bowel movement, and complications.

Results: The laparoscopic colon resection group had decreased length of stay, less blood loss, earlier return of bowel function, and an equivalent number of complications. Laparoscopic cases did take an average of 24 minutes longer.

Conclusion: The use of laparoscopic colon surgery for benign disease not only affords the patient the advantage of the laparoscopic approach, but also allows the surgeon to gain experience while awaiting the results of ongoing trials for laparoscopic colon surgery in malignant disease.

Key Words: Laparoscopy, Colon resection.

INTRODUCTION

Laparoscopic-assisted colon resections were first reported in 1991. Initial enthusiasm for these procedures was high, and it was hoped that the benefits of laparoscopic cholecystectomies would also apply to laparoscopic colon surgery. However, port-site recurrences in laparoscopic colon resections for malignant disease have created concern about laparoscopic surgery for colon cancer. Current prospective studies on laparoscopic surgery in colon cancer will hopefully determine the incidence of port-site recurrence and whether this can be prevented. Until the question is answered, we believe laparoscopic colon resections should be reserved for benign disease.

In this setting, laparoscopic colon resection offers many advantages including decreased postoperative pain, decreased hospital stay, and an earlier return to normal activities.

Our report is the result of a study of a series of 38 patients who underwent laparoscopic colon surgery; 33 patients had benign conditions including diverticulitis, villous adenomas, and large adenomatous polyps, while five patients had colostomy closures. This group of patients was compared to 39 patients undergoing open colon resections for both benign (15) and malignant (24) disease.

MATERIALS AND METHODS

From October 1992 to October 1997, 38 patients had laparoscopic-assisted colon resections for benign disease (Group A). During this same period, 39 patients had elective open colon resections: 15 for benign disease (Group B) and 24 patients for malignant disease (Group C). Patients who underwent laparoscopic colon resections for known malignant disease and all patients who had emergent colon resections were excluded. Patients who had resections for polyps that subsequently were shown to have invasive cancer were included.

Group A included resections of the right colon (16), left colon (1), sigmoid (10), and transverse colon (2), as well
as three subtotal colectomies, one low anterior resection (LAR), and five colostomy takedowns.

Group B consisted of resections of the right colon (6), left colon (2), sigmoid colon (3), and four colostomy takedowns.

Group C included resections of the right colon (10), left colon (3), sigmoid colon (6), transverse colon (1), as well as two subtotal colectomies and two LARs.

All of the removed lesions were localized preoperatively by colonoscopy and/or barium enema. In five patients undergoing laparoscopic resection, intraoperative colonoscopy was also performed. All patients had a standard mechanical bowel preparation plus oral and intravenous antibiotics.

The majority of operations were performed by surgical residents, and all laparoscopic cases were under the supervision of one surgeon (MEF).

Patients undergoing laparoscopic-assisted right hemicolectomy were placed in the supine position. The initial port was placed by open technique and subsequent ports were placed under direct vision. Port sites varied with the location of the tumor but were generally placed 2–3 cm to the left of midline in a line between the xiphoid and the symphysis pubis. Three 12 mm ports (including the camera port) were used in the majority of cases. Additional ports were placed if needed. Most of the dissection was carried out by the harmonic scalpel (Ethicon Endo-Surgery), and atraumatic clamps were used to manipulate the bowel. Once adequate mobilization was achieved, a 10 cm transverse incision was made to the right of the umbilicus and the colon externalized. The resection, ligation of the blood supply, anastomosis, and closure of the mesenteric defect were performed extracorporeally. Pneumoperitoneum was recreated, and the abdomen was inspected for bleeding.

Left colon resections were performed with the patient in a modified lithotomy position. The ports were placed in a mirror image of port placement for a right hemicolectomy and were all 12 mm ports. The dissection and division of the bowel distally was performed intracorporeally, as was the ligation of much of the blood supply. A small, left lower-quadrant transverse incision was made, the segment of bowel externalized, amputated, and the anvil of a circular stapler placed in the end of the proximal colon. The bowel was reintroduced into the abdomen, the incision was closed, and the pneumoperitoneum was recreated. The anastomosis was performed extracorporeally using a circular stapler placed transrectally.

A similar technique was used for colostomy takedowns.

Laparoscopic patients started a clear liquid diet as soon as they recovered from anesthesia. Patients were discharged when they were tolerating their diet and pain was adequately controlled with oral analgesics. Patients undergoing open procedures were fed when their ileus resolved and were discharged when tolerating their diet and pain was controlled with oral analgesics.

Retrospective analysis was performed on the following information: operating room time (from time in to time out of room), operating time (from skin incision to skin closure), estimated blood loss, length of hospital stay (LOS), days until first bowel movement, intraoperative complications, postoperative complications and deaths (within 30 days), and readmissions.

**RESULTS**

The three groups of patients had similar demographic characteristics with regard to age and gender (Table 1). Types of resections performed, as well as surgical indications, were well matched between Group A and Groups B and C (Table 2, 3). Mean operating room time was 162 minutes for Group A, 132 minutes for Group B, and 130 minutes for Group C. Mean operating time was

| Table 1. Patient Demographics. |
|--------------------------------|
| Laparoscopic Colon Resection (Group A) | Open Resection Benign (Group B) | Open Resection Cancer (Group C) | Open Total (B & C) |
| - # Patients | 38 | 15 | 24 | 39 |
| Age Range (Mean) | 32–87 (61.9) | 38–82 (57.3) | 37–91 (68.7) | 37–91 (64.3) |
| Male/Female | 17/21 | 8/7 | 11/13 | 19/20 |
Table 2.
Types of Procedures.

| Location of Resection | Group A | Group B | Group C | B & C |
|-----------------------|---------|---------|---------|-------|
| Right                 | 16      | 6       | 10      | 16    |
| Left/Sigmoid          | 11      | 5       | 9       | 14    |
| Subtotal Colectomy    | 3       | 0       | 2       | 2     |
| Colsomy Closure       | 5       | 4       | 0       | 4     |
| Other                 | 3       | 0       | 3       | 3     |
| Total                 | 38      | 15      | 24      | 39    |

Table 3.
Indications for Surgery.

| Diagnosis            | Group A | Group B | Group C | B & C |
|----------------------|---------|---------|---------|-------|
| Diverticulosis       | 8       | 6       | 0       | 6     |
| Polyphs              | 22      | 2       | 0       | 2     |
| S/P Colectomy        | 5       | 4       | 0       | 4     |
| Crohns               | 3       | 1       | 0       | 1     |
| Cancer               | 0       | 0       | 24      | 24    |
| Other                | 0       | 2       | 0       | 2     |
| Total                | 38      | 15      | 24      | 39    |

122 minutes for Group A, 99 minutes for Group B, and 95 minutes for Group C. Mean estimated blood loss was 134 milliliters (ml) for Group A, 210 ml for Group B, and 203 ml for Group C. The average length of stay (LOS) was 3.4 days for Group A, 7.5 days for Group B, and 7.4 days for Group C (Table 4), and excluded preoperative days. The average time to the first postoperative bowel movement was 2.4 days for Group A, 5.2 days for Group B, and 5.3 days for Group C.

Group A had three intraoperative and seven postoperative complications: two small bowel enterotomies and one colotomy (secondary to passing a circular staple in the rectum), which were recognized intraoperatively and repaired without sequelae. Three wound infections, two postoperative bleeding episodes (one requiring 4 units packed red blood cells (PRBCs) and 2 units of fresh frozen plasma (FFP) for a previously undiagnosed coagulation defect), one intra-abdominal abscess (requiring readmission) and one prolonged ileus (greater than 7 days) also occurred.

Group B had no intraoperative complications and two postoperative complications: one prolonged ileus and a single instance of urinary incontinence (requiring two additional hospital days before resolution).

Group C had two intraoperative complications and seven postoperative complications: two enterotomies, two anastomotic leaks, two wound infections (one leading to wound dehiscence), one intra-abdominal abscess, one prolonged ileus and one death. The death resulted from respiratory complications. Two patients required readmission: one for pneumonia and one for a pelvic abscess. These are summarized in Table 5.

DISCUSSION

The role of laparoscopy in colon surgery is currently being debated. While the initial enthusiasm for this procedure was high, numerous reports of port-site recurrences when done for malignant disease have discouraged many surgeons from performing laparoscopic colon resections for cancer. Our series demonstrates that laparoscopic colon resections for benign disease can be done safely and with many benefits to the patient. One of the advantages is a decrease in hospital stay. In our series, the average LOS for laparoscopic resections was four days fewer than the open group. This has been a consistent finding when others have looked at this variable.

Estimated blood loss averaged 70 cc less in the laparoscopic cases when compared to the open cases.

We and other investigators have shown an earlier return to bowel function. Most studies comparing laparoscopic colon resections to open resections show that the laparoscopic patients tolerate their diet earlier. Some argue that patients undergoing laparoscopic colon resec-
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Table 4.
Outcome Comparison for OR Time (Patient Time In to Time Out); Op Time (Skin Incision to Skin Closure); EBL (Estimated Blood Loss—as Determined by Anesthesia); Los (Length of Stay—Day of Surgery to Day of Discharge); and Time to First Postoperative Bowel Movement.

| Parameters                  | Group A | Group B | Group C | B & C |
|-----------------------------|---------|---------|---------|-------|
| OR Time—Mean (Range)        | 161     | 132     | 131     | 131   |
| Op Time—Mean (Range)        | 121     | 99      | 95      | 97    |
| EBL—Mean                    | 122     | 210     | 180     | 192   |
| Los—Mean (Range)            | 3.3     | 7.5     | 7.4     | 7.4   |
| Time to First Bowel Movement (Average) | 2.4 days | 5.2 days | 5.3 days |       |

Tons tolerate their diet earlier because they are fed earlier, but other data support earlier return of bowel function in laparoscopic cases. Bohm et al. demonstrated that the normal myoelectric activity of the stomach, small bowel, and colon returned faster in dogs that underwent laparoscopic right colon resections than in those receiving a traditional open procedure. In addition, median time to the first postoperative bowel movement was 26 hours in the laparoscopic group versus 36 hours in the open group.

Other factors that may contribute to a faster return of bowel function in laparoscopic patients are decreased narcotic analgesic usage and less intraoperative manipulation of the bowel.

Theoretical advantages to laparoscopy include less intraoperative fluid loss and thus less postoperative fluid shifts, fewer adhesions leading to fewer postoperative bowel obstructions, and less immunosuppression, possibly resulting in improved survival.

One disadvantage has been the increased duration of the operation. Operating time for laparoscopic cases was longer than for open cases (24 minutes). Others have noted a 30 to 40 minute increase in operating time for segmental resections and even longer for total abdominal colectomies. Patients undergoing laparoscopic resections had an equivalent number of localization studies preoperatively but were more likely to have an intraoperative colonoscopy due to the loss of tactile sensation in identifying lesions. Complication rates are comparable between laparoscopic and open procedures in this study and others. This study compares favorably with others comparing laparoscopic colon resections to open procedures in terms of complication rates, operating times, and lengths of stay. However, studies that include more extensive resections will have higher complication rates and longer operating times. These studies have also documented the safety of laparoscopic colon resection.

There is a learning curve associated with performing laparoscopic colon resections. In a study by Simons et al., 11 to 15 cases were needed to reach a consistent and predictable operating time that did not vary by more than 30 minutes. Others have felt the learning curve to require as many as 70 cases, and clearly there is a more pronounced learning curve than with other laparoscopic procedures. Since laparoscopic colon resections for malignant disease can be more difficult, the procedures necessary to gain these skills should be performed first on patients with benign disease.
Table 5.  
Comparison of Intraoperative and Postoperative Complications.

|                      | Group A | Group B | Group C | B & C |
|----------------------|---------|---------|---------|-------|
| Anastomotic Leak     | None    | 0       | 2       | 2     |
| Organ Injury         | 3       | 0       | 2       | 2     |
| Postop Bleeding      | 2       | 0       | 0       | 0     |
| Wound Infection      | 3       | 0       | 2       | 2     |
| Abdominal Abscess    | 1       | 0       | 1       | 1     |
| Prolonged Ileus      | 1       | 1       | 0       | 1     |
| Readmissions         | 1       | 0       | 2       | 2     |
| Death                | 0       | 0       | 1       | 1     |

CONCLUSION

Our series demonstrates that laparoscopic colon resections for benign disease can be done safely and result in fewer days in the hospital with an earlier return of bowel function than open colon resections. In addition, we believe that surgeons should gain laparoscopic experience on benign disease while awaiting the results of ongoing trials to determine the safety of resections in malignant colon disease.

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