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Laparoscopic reintervention for anastomotic leakage after primary laparoscopic colorectal surgery; a comparative study

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Abstract

Introduction
Anastomotic leakage is associated with high morbidity and mortality. Aim of this study was to assess potential benefits of a laparoscopic reintervention for anastomotic leakage after primary laparoscopic surgery.

Methods
From January 2003 to January 2006, patients who underwent laparoscopic colorectal resection and subsequently developed anastomotic leakage underwent a laparoscopic reintervention (laparoscopic group, n=10). Relaparotomy was performed in patients who had primary open surgery (open group, n=15).

Results
Patient characteristics in both groups were comparable, including pre- and postoperative APACHE II scores. Median length of time from first operation to reintervention was six days in both groups. There were no conversions. Intensive Care Unit (ICU) stay was shorter in the laparoscopic group (1 vs. 3 days; p=0.002). Resumption of a normal diet (3 vs. 6 days, p=0.03) and first stoma output (2 vs. 3 days, p=0.04) occurred earlier in the laparoscopic group. Postoperative 30-day morbidity was lower (40% vs. 80%, p=0.09), and hospital stay shorter (9 vs. 13 days, p=0.06) in the laparoscopic group. The incidence of incisional hernia was 0% in the laparoscopic group versus 33% in the open group (p=0.06).

Conclusions
These data suggest that a laparoscopic reintervention for anastomotic leakage after primary laparoscopic surgery is feasible and safe. It tends to be associated with less morbidity, a faster recovery and fewer abdominal wall complications as compared to relaparotomy.
Introduction

Anastomotic leakage is the most important surgical complication following colorectal resection with intestinal anastomosis. The reported clinical leakage rate after colorectal resection depends on the site of anastomosis and ranges from 2 to 21 per cent.\textsuperscript{1-6} Anastomotic leakage after colorectal surgery is associated with high morbidity and even mortality. Morbidity includes prolonged Intensive Care Unit (ICU) admittance, sepsis and several abdominal wall complications due to reinterventions and wound infections. Furthermore, the risk of permanent stoma ranges from 10 to 100 per cent. In colorectal surgery, mortality due to anastomotic leakage is considerable. Moreover, the main cause of postoperative mortality are anastomotic complications.\textsuperscript{1-6}

Elective laparoscopic colectomy was introduced in the early nineties.\textsuperscript{7} Since then several randomised controlled trials have reported favourable results of laparoscopic colorectal surgery as compared to open surgery. Laparoscopic surgery offers several advantages including a faster postoperative recovery and a shorter hospital stay.\textsuperscript{8-10} Laparoscopic colorectal surgery is associated with a similar anastomotic leak rate as compared to open surgery.\textsuperscript{8}

Massive anastomotic leakage and peritonitis generally requires prompt reintervention by relaparotomy. Despite the short term benefits of laparoscopic colorectal resections and the high implementation rate, reintervention for suspect anastomotic leakage is generally done by an open approach. Most authors consider peritonitis to be a contraindication for laparoscopic approach due to the risk of enhanced bacteraemia by pneumoperitoneum, risk of bowel injury due to distended bowel, and presumed better visualization and irrigation possibility of the abdomen by open surgery.\textsuperscript{10-13} In theory, laparoscopic reintervention for anastomotic leakage after primary laparoscopic surgery might be beneficial when considering abdominal wall complications and postoperative recovery. However, laparoscopic reintervention in case of anastomotic leakage is not current practice yet, and comparative data does not exist in the literature.

Therefore, the objective of this study was to evaluate whether a laparoscopic reintervention for anastomotic leakage after primary laparoscopic surgery is technically feasible and safe. Postoperative morbidity and recovery is assessed, and compared with patients that had open surgery and open reintervention for anastomotic leakage in the same period.

Methods

The present study consists of a consecutive series of patients with anastomotic leakage after open or laparoscopic colorectal resection operated on in the period January 2003 to January 2006. Data were assessed in a retrospective manner. All patients who underwent laparoscopic colorectal resection and subsequently developed anastomotic leakage were reoperated laparoscopically (laparoscopic group). Relaparotomy was performed in patients who had primarily open surgery (open group). One patient underwent a laparotomy
for anastomotic leakage after primary laparoscopic surgery, this patient was excluded. Furthermore, all patients in which anastomotic leakage was managed by conservative treatment were excluded. The decision to perform the initial operation laparoscopically or open was based on referral to a surgeon capable of performing laparoscopic resection and on patients’ and surgeons’ preference. Referral patterns for all surgeons were similar throughout the whole study period.

Charts of the included patients were reviewed and the following data were extracted using a preformatted sheet: age, gender, co-morbidity, previous midline laparotomy, Body Mass Index (BMI, kg/m²) measured prior to primary surgery, ASA classification, indications for the primary procedure, performed surgical procedure at the primary operation, time-span between the primary intervention and the reintervention, “Acute Physiology and Chronic Health Evaluation II” (APACHE II ) scores before and 24 hours after the reintervention, abdominal cavity cultures and postoperative recovery including ICU stay, resumption of a normal diet, first stoma output, wound complications including incisional hernia, postoperative mortality, and morbidity. Outcome and complications were noted during clinical and out-patient clinic follow-up.

Operative procedures
In all patients the suspicion of anastomotic leakage was established on clinical examination, laboratory test and/or CT-scanning. Operative procedure consisted of inspection and exploration, followed by culturing and rinsing of the abdominal cavity. Ileoanal, coloanal and low colorectal anastomosis were diverted by creating a loop ileostomy and rinsing of the rest colon. In case of major breakdown the afferent loop was exteriorized as an end stoma. In case of anastomotic leakage after intra-abdominal resections, the anastomosis was dismantled and an end colostomy was created in case of anastomotic leakage after left-sided resections. An end ileostomy was created after right-sided resections.

During laparoscopic reintervention the prior trocar wounds were used for insertion of a blunt TrocDoc® trocar establishing the pneumoperitoneum. The total reintervention was performed laparoscopically and the mini-laparotomy, which was used for specimen retrieval the first operation, was only opened when necessary. Wound closure and postoperative wound care were at the discretion of the attending surgeon. All open procedures were performed or supervised by one of the two colorectal surgeons. All laparoscopic procedures and laparoscopic reinterventions were performed by a single laparoscopic trained colorectal surgeon.

Definitions
The presence of anastomotic leakage was defined by clinical criteria and operative findings: laboratory abnormalities and clinical deterioration with signs of peritonitis at physical examination, with or without radiologically confirmed leakage. Operative finding had to include a collection of pus or faecal material related to an insufficient anastomosis and signs of (general) peritonitis. Furthermore, there had to be a positive culture indicating intestinal bacteria. Morbidity was defined as all complications within 30 days after the
reintervention. Incisional herniation was assessed at long term follow up during a survey in September 2006. ICU and hospital stay are given as the total number of days patients stayed at the ICU or in the hospital respectively, after the reintervention.

Statistics
Data are presented as median values with ranges for continuous data, unless otherwise specified. Categorical data are presented as frequencies or percentages. Differences between groups were tested using Mann-Whitney U test for continuous data. The Fisher’s exact test was used to test for differences between groups in case of categorical data. A p-value <0.05 was considered statistically significant for all tests. Statistical analysis was done using the SPSS v.12.0 package (SPSS, Chicago, Illinois, USA).

Results

Patient characteristics
Between January 2003 and January 2006, 398 consecutive patients underwent colorectal resection with intestinal anastomosis and without diverting stoma. Two hundred fifty one (63%) patients underwent open resection and 147 (37%) underwent a laparoscopic resection. Subsequently, 26 (6.5%) patients were reoperated for anastomotic leakage. In 11 (7.5%) patients the anastomotic leakage developed after a prior laparoscopic colorectal resection. Ten patients were reoperated on laparoscopically and were included in the laparoscopic group. The remaining patient was excluded from the analysis because this patient underwent an open reintervention on postoperative day six after an initial laparoscopic left colectomy. In this patient the anastomosis was dismantled and a colostomy was constructed. Postoperatively, there was an episode of dyspnoea due to cardiac decompensation. On postoperative day 14 the patient was discharged. No wound or abdominal wall complications were observed. Relaparotomy for anastomotic leakage was performed in 15 (6.0%) patients who had primary open surgery (open group).

Primary operations of the 25 included patients consisted of 16 segmental colonic resections, five restorative proctocolectomies and four other procedures (Table 1). The number of included open and laparoscopic procedures was comparable between the first and second study period. Five patients participated in different randomised trials in which patients were randomised between open and laparoscopic surgery. Although, previous abdominal surgery was not an absolute contraindication there was a non significant trend to more patients with a history of midline laparotomy in the open group (p=0.09). Furthermore, patients in the laparoscopic- and open group were comparable for age, gender, ASA classification, surgical indication, type of initial procedure, and preoperative APACHE II score (Table 1). Median length of time from the primary operation to reintervention was six days in both groups.
Table 1. Patients characteristics of the 25 patients included in this study

<table>
<thead>
<tr>
<th></th>
<th>laparoscopic group (n=10)</th>
<th>open group (n=15)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)†</td>
<td>45 (17-71)</td>
<td>45 (20-79)</td>
<td>0.78</td>
</tr>
<tr>
<td>Sex (male: female)</td>
<td>3:7</td>
<td>7:8</td>
<td>0.68</td>
</tr>
<tr>
<td>BMI (kg/m²)†</td>
<td>22.4 (16.6-28.1)</td>
<td>22.2 (16.8-32)</td>
<td>0.96</td>
</tr>
<tr>
<td>ASA I/II/III</td>
<td>5/5/0</td>
<td>6/8/1</td>
<td>0.67</td>
</tr>
<tr>
<td>Previous midline laparotomy*</td>
<td>1 (10%)</td>
<td>7 (47%)</td>
<td>0.09</td>
</tr>
<tr>
<td>Indication for surgery</td>
<td></td>
<td></td>
<td>0.40</td>
</tr>
<tr>
<td>- Inflammatory bowel disease</td>
<td>6</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>- Malignancy</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>- Diverticulitis</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>- Other</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Initial procedure</td>
<td></td>
<td></td>
<td>0.83</td>
</tr>
<tr>
<td>- Right sided colonic resection</td>
<td>3</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>- Left sided colonic resection</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>- (Low) anterior resection</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>- Restorative proctocolectomy</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>- Other procedures</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Length to reintervention (days)†</td>
<td>6 (3-9)</td>
<td>6 (2-11)</td>
<td>0.74</td>
</tr>
<tr>
<td>APACHE II score prior to reintervention†</td>
<td>10 (7-15)</td>
<td>10 (5-17)</td>
<td>0.89</td>
</tr>
</tbody>
</table>

†Median (range); *Absolute number (percentage); ASA: American Society of Anaesthesiologists; APACHE II: Acute Physiology and Chronic Health Evaluation II; BMI: Body mass index

Reintervention

There were no conversions in the laparoscopic group. The minilaparotomy needed to be opened in two (20%) patients, both after right sided resection in order to exteriorize the afferent loop as an ileostomy and to exteriorize the efferent loop for closure or mucus fistula creation.

In the laparoscopic group no intra-operative morbidity was reported. In the open group there was one iatrogenic bowel perforation requiring an additional bowel resection. Median operation time was not significantly different in the laparoscopic group as compared to the open group (116 versus 105 minutes; p=0.52).

Four patients (27%) in the open group underwent a second reoperation compared to none in the laparoscopic group (p=0.13). In two patients the reoperation was a planned second look operation as part of a randomised trial comparing relaparotomy on demand or planned laparotomy, one patient was reoperated for a blow out of the ascending colon, and one patient was reoperated for a dehiscent fascia.

Short term outcome

Median length of ICU admission was shorter in the laparoscopic group compared to the open group. There was less postoperative morbidity within the first 30 days after reintervention in the laparoscopic group, although this difference was not statistically different (p=0.087). In the laparoscopic group four (40%) patients had one or more complications. Complications in the laparoscopic group consisted of abscesses (n=3), wound healing disorders (n=1), cardiovascular complications (n=1), psychiatric complications
(n=1), and prolonged postoperative ileus (n=1). In the open group 12 (80%) patients had one or more complications. Complications in the open group consisted of abscesses (n=5), wound healing disorders (n=3), (ongoing) sepsis (n=3), cardiovascular complications (n=2), and respiratory complications (n=1). First stoma output and return to a normal diet occurred significantly earlier in the laparoscopic group compared to the open group. Median hospital stay in the laparoscopic group was nine (range 6-28) days compared to 13 (range 7-38) days in the open group (p=0.06). One patient (10%) in the laparoscopic group and two (13%) patients in the open group were readmitted within 30 days (p=1.0). Furthermore, in both the laparoscopic group and open group one patient was readmitted after 30 days, respectively for abdominal abscesses and dehydration (see Table 2).

Table 2. Operative data of the reintervention and postoperative course of the 25 patients included in this study.

<table>
<thead>
<tr>
<th></th>
<th>laparoscopic group (n=10)</th>
<th>open group (n=15)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation duration (minutes)†</td>
<td>116 (59-181)</td>
<td>105 (59-328)</td>
<td>0.52</td>
</tr>
<tr>
<td>Procedure:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- end ileostomy</td>
<td>3</td>
<td>9</td>
<td>0.25</td>
</tr>
<tr>
<td>- diverting ileostomy</td>
<td>6</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>- end colostomy</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>- diverting colostomy</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>APACHE II score postoperatively†</td>
<td>14 (8-20)</td>
<td>13 (11-19)</td>
<td>0.70</td>
</tr>
<tr>
<td>ICU stay (days)†</td>
<td>1 (0-1)</td>
<td>3 (0-15)</td>
<td>0.002</td>
</tr>
<tr>
<td>Postoperative 30 day morbidity*</td>
<td>4 (40%)</td>
<td>12 (80%)</td>
<td>0.09</td>
</tr>
<tr>
<td>Resumption normal diet (days)†</td>
<td>3 (1-6)</td>
<td>6 (1-11)</td>
<td>0.03</td>
</tr>
<tr>
<td>First stoma output (days)†</td>
<td>2 (1-4)</td>
<td>3 (1-8)</td>
<td>0.04</td>
</tr>
<tr>
<td>Hospital stay (days)†</td>
<td>9 (6-28)</td>
<td>13 (7-38)</td>
<td>0.06</td>
</tr>
<tr>
<td>Readmissions within 30 days*</td>
<td>1 (10%)</td>
<td>2 (13%)</td>
<td>1.0</td>
</tr>
<tr>
<td>Incisional hernia*</td>
<td>0</td>
<td>5 (33%)</td>
<td>0.06</td>
</tr>
<tr>
<td>Stoma closure rate*</td>
<td>8 (80%)</td>
<td>9 (60%)</td>
<td>0.40</td>
</tr>
</tbody>
</table>

†Median (range); *Absolute number (percentage); APACHE II: Acute Physiology and Chronic Health Evaluation II; ICU: Intensive Care Unit

Long term outcome

There were less patients with incisional hernias in the laparoscopic group; zero versus five (33%), although this difference was not statistically significant (p=0.06). In eight (80%) patients in the laparoscopic group the stoma had been closed. This was done after a median of five (range 2-12) months. In nine (60%) patients in the open group the stoma had been closed. This was done after a median six (range 3-16) months (p=0.40). Two patients in the open group underwent an extensive abdominal wall reconstruction during the same procedure the stoma was closed. In the laparoscopic group one patient underwent a surgical correction of a post-stoma scar. There were no other abdominal wall reconstructions in both groups during the study period. Median follow-up was 22 (range 12-28) months in the laparoscopic group and 22 (range 10-48) months in the open group (p=0.72). None of the patients was lost to follow up.
Discussion

Laparoscopy has gained widespread acceptance in common surgical practice as a diagnostic and therapeutic tool. Over the past years abdominal emergencies have been increasingly managed by laparoscopy, including those patients with peritonitis. The present study showed that a laparoscopic reintervention after primary laparoscopic surgery for anastomotic leakage is feasible and may be safe in terms of conversions, intra-operative morbidity, necessity of opening the minilaparotomy, and operating time. In addition, laparoscopic reintervention may be associated with less postoperative morbidity, a faster recovery and fewer abdominal wall complications as compared to open reintervention after primary open surgery.

Reintervention for anastomotic leakage is generally done by an open approach mainly because of the fear of causing bowel injury due to distended bowel and lack of exposure for cleaning the abdominal cavity. After primary laparoscopic surgery the previously used trocar incisions can easily be re-used. In this series of patients the pneumoperitoneum was established through a prior trocar wound by an open entry technique using a blunt trocar. This technique minimizes the risk of bowel injury, even in case of distended bowel. A laparoscopic reintervention after open surgery might be appealing avoiding wound problems and incisional hernia. However, installation of the pneumoperitoneum is more difficult, because the trocars need to be inserted in open manner or blindly after using the Veress needle.

The morbidity observed in our study is comparable with the percentage reported in literature. However, in our series of patients no mortality was observed in both groups. In part, this can be explained by the fact that in our series patients were relatively young, since a great part of these patients were operated because of inflammatory bowel diseases. Nonetheless, this observation is limited due to a small sample size. APACHE II scores preoperatively and within 24 hours after surgery were moderately elevated, indicating mild peritonitis and a non delayed diagnosis and reintervention for anastomotic leakage in both the laparoscopic and the open group.

Laparoscopic reintervention after primary laparoscopic surgery can be initiated as an early diagnostic tool to confirm the anastomotic leakage or to explore and identify other causative pathology if patients do not improve as expected after laparoscopic surgery.

Recovery after laparoscopic surgery is generally fast. If the patient is not able to tolerate a normal diet within a couple of days in combination with signs of infection, anastomotic leakage must be suspected. For this reason, it could be hypothesized that patients after laparoscopic surgery might have there reintervention earlier than after open surgery. This earlier reintervention might prevent severe generalized peritonitis and systemic sepsis. However, long standing peritonitis with pus pockets and inflammatory adhesions is probably not amenable for laparoscopic treatment.

Following open surgery the systemic immunological function is depressed with adverse alterations in cytokine levels and changes in the function of cellular components of the systemic immune response. Furthermore, functions of the peritoneal macrophages are
better preserved when laparotomy is avoided. Others suggests that a laparoscopic approach might be beneficial in the surgical management of intra-abdominal sepsis and results in fewer postoperative septic complications. However, further research is warranted on the effect of laparoscopy and the pneumoperitoneum on the intra-abdominal immune system in the presence of peritonitis.

Another important advantage of laparoscopic reintervention might be a reduction in wound complications such as early dehiscence and incisional herniation. However, the results of the present study must be interpreted carefully because of several limitations. First of all it comprises a small single centre retrospective study. Secondly, the surgical indications and primary procedure were variable. Although patient characteristics were comparable between both groups and considering the fact that the indication to perform the initial procedure laparoscopically was mainly based on referral pattern, selection bias could not be ruled out completely. Furthermore, the included patients were not representative for the typical selection of laparoscopic surgery. While the majority of laparoscopic resections are currently performed for diverticular disease, adenoma and early stage cancer the majority of the laparoscopic patients in the present study were operated on for inflammatory bowel disease.

The severity of the anastomotic leakage; i.e. the extent of peritonitis and severity of sepsis were only assessed with the APACHE II scoring system and positive cultures. Although in both groups patients had there reintervention at the same time after the first operation and the APACHE II scores before and after the reintervention were the similar, we do not have other objective data on the extent and severity of the peritonitis such as the Mannheim peritonitis index or other scoring systems for severity of disease. Furthermore, all laparoscopic procedures were performed by an experienced laparoscopic surgeon and potentially this may have influenced the outcome.

Nonetheless, these preliminary data suggest that a laparoscopic reintervention for anastomotic leakage after primarily laparoscopic surgery is probably feasible and might be safe. While no conversions and intra-operative complications were observed. Furthermore, a laparoscopic reintervention tends to be associated with less postoperative morbidity, a faster recovery and fewer abdominal wall complications.

Ideally, a prospective trial should confirm these data. To evaluate the effect of laparoscopic reintervention after primary laparoscopic surgery, it has to be part of a very large study randomising patients for a laparoscopic or open initial procedure.

Reference List


(6) Alberts JC, Parvaiz A, Moran BJ. Predicting risk and diminishing the consequences of anastomotic dehiscence following rectal resection. Colorectal Dis 2003;5:478-482.


