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TRANSCOLONIC SPECIMEN REMOVAL IN LAPAROSCOPIC IEOCOLIC RESECTION FOR CROHN’S DISEASE

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Abstract

Background
Ileocolic resections for Crohn’s disease can be performed entirely laparoscopically. However, an incision is needed for specimen extraction. This prospective observational study assessed the feasibility of endoscopic transcolonic specimen removal.

Patients and methods
Endoscopic specimen removal was attempted in a consecutive series of ten patients scheduled for laparoscopic ileocolic resection. Primary outcomes were feasibility, operating time, reoperation rate, pain scores, morphine requirement and hospital stay. To assess applicability, outcomes were compared with previous data from patients who had laparoscopically assisted operations.

Results
Transcolonic removal was successful in eight of ten patients; it was considered not feasible in two patients because the inflammatory mass was too large (7–8 cm). Median operating time was 208 minutes and median post-operative hospital stay was 5 days. After surgery two patients developed an intra-abdominal abscess, drained laparoscopically or percutaneously, and one patient had another site-specific infection. The operation took longer than conventional laparoscopy, with no benefits perceived by patients in terms of cosmesis or body image.

Conclusion
Transcolonic removal of the specimen in ileocolic Crohn’s disease is feasible in the absence of a large inflammatory mass but infection may be a problem. It is unclear whether the technique offers benefit compared with conventional laparoscopic surgery.
INTRODUCTION

Crohn’s disease (CD) is a chronic inflammatory bowel condition that can affect the entire gut. The disease concentrates in the terminal ileum in approximately 30% of patients. Despite medical therapy, which is the first line of treatment at present, 70 – 90% of those with CD will need a surgical intervention once during their lifetime 1,2.

An ileocolic resection can be performed by an open technique or a laparoscopic approach. Studies comparing the two techniques have concluded that both procedures are safe, with a shorter hospital stay 3-6 and better cosmetic outcome 7 after a laparoscopic approach. Studies with long-term follow-up found a lower rate of incisional hernia after a laparoscopic procedure, but the numbers were too small to detect a significant difference 7-9. The initial presentation of CD is often early in life and these advantages are of particular interest to young patients.

As the whole operation, including mobilization, devascularization, transection and anastomosis can be done laparoscopically, the only reason to widen a port incision is for specimen removal. An alternative might be transanal extraction using a colonoscope such that the abdominal wall remains intact apart from the trocar sites, the risk of incisional hernia is reduced and cosmesis is maximized. Further possible advantages are fewer wound infections, less postoperative pain and shorter hospital stay. Potential pitfalls of this method of specimen extraction are the need for bowel preparation, risk of bowel perforation during colonoscopy, abdominal contamination and the time expenditure. The aim of this prospective study was to assess the feasibility of transcolonic specimen removal in laparoscopic ileocolic resection.

PATIENTS AND METHODS

A consecutive series of patients who had an indication for a laparoscopic ileocolic resection were invited to participate. All patients had small bowel series or magnetic resonance enterocolysis and colonoscopy to confirm CD in the terminal ileum and coecum, and to preclude disease activity elsewhere. Patients eligible for inclusion were patients with CD located in the terminal ileum requiring an elective ileocolic resection. Transcolonic specimen removal was attempted in all patients. The medical ethical committee approved this observational study. Written informed consent was obtained from each patient to use and analyse data collected from questionnaires and medical charts.

Operative Procedure

Preoperative bowel preparation was carried out with 4 litres of Klean-Prep® (Norgine, Amsterdam, the Netherlands). Surgery was performed under general anaesthesia, and patients received antibiotics for 24 hours as is the standard of care in this centre.
Patients were placed in French position, with the legs abducted. A four-trocar approach (subumbilical, 10 mm; right fossa, 5 mm; suprapubic, 12 mm; left fossa, 5 mm) and a 30° videoscope were used, with the surgeon standing between the legs of the patient (Figure 1). A surgeon’s assistant stood to the left of the patient. Photographs of the procedure are shown in Figure 2.

The right colon was mobilized fully and the mesentery was devascularized close to the bowel using ultrasonic dissection in order to minimize the diameter of the specimen. The large bowel and ileum were transected using endoscopic staplers (Echelon™ 60 ENDOPATH® stapler; Ethicon Endo-Surgery, Cincinnati, Ohio, USA). After laparoscopic bowel division, the gastroenterologist advanced the colonoscope (Olympus CF-Q160AL®, Olympus Medical Systems Europe, Hamburg, Germany), assisted by the laparoscopist. When the colonoscope reached the cross stapled large bowel, the terminal ileum and large bowel were opened to introduce the Echelon™ 60 ENDOPATH® stapler. The small bowel was clamped to avoid spillage of content into the abdominal cavity. Using the endostapler a 60-mm side-to-side anastomosis was created. After retraction of the stapler, the colonoscope was advanced through the remaining gap in the anastomosis. The specimen was grasped using a 3-cm endoscopic snare (Boston Scientific®, Boston, Massachusetts, USA) at the end of the staple line. While retracting, the laparoscopist facilitated the passage of the specimen through the anastomosis for transcolonic retrieval. After passing the anastomosis, the endoscopist further pulled the specimen through the bowel. The laparoscopist carefully inspected its progression and, when indicated, held the proximal bowel to prevent invagination. After this, the remaining anastomotic gap was sutured laparoscopically in two layers to ensure the integrity of the anastomosis.

**Outcome parameters**

Primary outcome measures were the feasibility of transcolonic removal of the resected specimen, operating time, reoperation rate, postoperative pain scores, morphine requirement and length of hospital stay. Postoperative pain was assessed by means of a visual analogue scale (VAS), where 0 represented no pain and 10 the worst pain.
This VAS was filled out on days 1-3, 7 and 28 after operation. To put the clinical outcomes into perspective, data on some variables from the present study were compared with those from a published series of 30 laparoscopically assisted procedures with a transumbilical minilaparotomy or a small Pfannenstiel incision.

Secondary endpoints were quality of life (QOL), body image and cosmesis. These parameters were assessed using questionnaires. QOL was measured before and at 1, 2, 4 and 12 weeks after operation using the general Short Form 36 (SF-36®; Medical Outcomes Trust, Waltham, Massachusetts, USA) health survey and the disease-specific Gastro-intestinal Quality of Life index (GIQLI). Body image and cosmesis were measured before and 3 months after surgery using the Body Image Questionnaire (BIQ). The BIQ calculates two scales: the body image scale and the cosmesis scale. The body image scale ranges from 5 (lowest) to 25 (highest score) and defines the patients' perception of, and satisfaction with, the appearance of his or her own body. The cosmetic scale (ranging from 3 to 24) measures the patients' satisfaction with the cosmetic result of the scar.

**Statistical analysis**

Results for continuous data were expressed as median (range). Analyses of VAS data and the questionnaires included only responding patients; area under the curve were calculated and compared by means of the nonparametric Mann-Whitney U test. To test for differences between quantitative variables within a group, the nonparametric Wilcoxon's signed rank test was used. Other data were compared by Mann–Whitney U and chi-squared or Fisher’s exact tests. In all analyses, $p < 0.05$ was considered statistically significant.
RESULTS

Between February and September 2008, all ten patients who were eligible for this study were counselled and gave their informed consent. No other patients with ileocolonic disease had surgery during this time period. Nine patients underwent a primary ileocolic resection and one patient had a repeat resection of the neoterminal ileum. There were three men and seven women, with a median age of 31 (range 19–61) years and body mass index 23.7 (range 18–31) kg/m2.

Clinical outcomes

Clinical outcomes are summarized in Table 1. Transcolonic removal was successful in eight patients (overall success rate 80%). In two patients a large inflammatory mass was detected during surgery (7 and 8 cm in diameter) and transcolonic removal was not considered feasible. Such infiltration was already suspected on magnetic resonance enteroclysis, but a proper estimate of the exact size of the bowel was difficult to make. In the first of these patients, it was decided during laparoscopy to extract the specimen via a Pfannenstiel incision because of the large size of the inflammatory mass. In the second, an attempt was made to remove the specimen transcolonically, but the specimen was too large. Median operation time in all ten patients was 208 (range 157-327) minutes and the median length of resected ileocolonic bowel segment was 25.5 (range 16-64) cm. Median postoperative hospital stay was 5 (range 2-10) days.

After operation one patient developed an abscess in the pouch of Douglas that was drained laparoscopically. This patient was readmitted within 30 days for pain of unknown origin and for which no cause has since been found. The patient in whom transcolonic specimen removal was attempted but considered not possible was also readmitted within 30 days for percutaneous drainage of a sub hepatic abscess. Minor postoperative complications occurred in two patients; one developed a small abscess at the umbilical port site and another had fever of unknown origin that was treated with broad-spectrum antibiotics.

Comparison of the results for the transcolonic procedure with published data for laparoscopically assisted resection revealed that operating time was significantly longer in the transcolonic group but post-operative hospital stay was comparable. There were significantly more site-specific complications that required readmission and reintervention in the transcolonic group (site-specific infections overall: three of ten versus one of 30; p = 0.042) (Table 1).

Postoperative pain scores and morphine requirement

Pain scores quickly decreased after surgery. Pain scores and morphine use in the transcolonic group were no different from those in the 30 patients who had a laparoscopically assisted operation (p = 0.385 and p = 0.892 respectively). The median pain score in the transcolonic group was 3.9 and 2.5 on days 1 and 3 respectively after operation, decreasing to 0.5 by one month.
### TABLE 1: OPERATIVE OUTCOMES

<table>
<thead>
<tr>
<th></th>
<th>Transcolonic (N=10)</th>
<th>Laparoscopically assisted (N=30)*</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Successful transcolonic specimen removal</td>
<td>8</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Operating time (minutes)†</td>
<td>208 (157-327)</td>
<td>115 (70-225)</td>
<td>&lt;0.001 ‡</td>
</tr>
<tr>
<td>Length of removed specimen (cm) †</td>
<td>25.5 (16-64)</td>
<td>28.3 (13-51)</td>
<td>0.750 ‡</td>
</tr>
<tr>
<td>Post-operative hospital stay (days) †</td>
<td>5 (2-10)</td>
<td>5 (3-13)</td>
<td>0.179 ‡</td>
</tr>
<tr>
<td>Surgical site-specific complications</td>
<td>3</td>
<td>1</td>
<td>0.042 §</td>
</tr>
<tr>
<td>- Intra abdominal abscess</td>
<td>-2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>- Trocar site abscess</td>
<td>-1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>- Ileus</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>General complications</td>
<td>1</td>
<td>3</td>
<td>1.000 §</td>
</tr>
<tr>
<td>- Urinary tract infection</td>
<td>-1</td>
<td>-2</td>
<td></td>
</tr>
<tr>
<td>- Pneumonia</td>
<td>0</td>
<td>-1</td>
<td></td>
</tr>
<tr>
<td>- Fever of unknown origin</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Readmission within 30 days</td>
<td>2</td>
<td>0</td>
<td>0.058 §</td>
</tr>
</tbody>
</table>

*Data reported previously 10; † Values are median (range); ‡ Mann-Whitney U test; § Fisher’s exact test

### Quality of life, body image and cosmesis

Nine of the ten patients completed and returned all questionnaires (response rate 90%). Following an initial fall in the first few weeks after surgery, QOL was better at 3 months than before the operation. This was similar to findings for laparoscopically assisted resections 10.

The median body image score improved from 17.0 before operation to 19.0 3 months after transcolonic ileocolic resection (p = 0.072). Results for postoperative body image were similar to those reported following a laparoscopically assisted approach 10. Thus, patients’ attitudes towards bodily appearance were not influenced by the surgical approach. After 3 months, the cosmesis score was 22.0, again similar to that reported for the laparoscopically assisted procedure 10.

### DISCUSSION

This study has shown that transcolonic removal of the specimen in ileocolic CD is feasible in the absence of a large inflammatory mass. Post-operative recovery, QOL, cosmesis and body image were similar to those after a standard laparoscopically assisted resection 10. However, the transcolonic approach took almost twice as long as the laparoscopically assisted procedure and was associated with a higher rate of site-specific infections.

There are several explanations for the longer operating time for the transcolonic procedure. First, the gastroenterologist had to be called to the operating room to introduce the colonoscope and to remove the specimen transcolonically, although it is conceivable that the surgical team could do this instead. Second, a totally laparoscopic approach with intracorporeal suturing takes longer. Finally, these were the first such procedures performed in this hospital and the ‘learning curve’ effect needs to be taken into account.

Three of ten patients developed site-specific infections after the transcolonic approach. In this procedure the colonoscope, which is certainly not sterile, is introduced into the peritoneum via a staple-line gap that remains
open until the specimen has passed through. This might cause contamination and bowel content leakage, leading to abscess formation. In spite of bowel clamps and mechanical bowel preparation, a relatively high rate of septic problems was observed. Those considering natural orifice transluminal endoscopic surgery (NOTES) via the colon should be aware of this serious risk.

Transcolonic retrieval of the specimen was not possible in two patients with large inflammatory masses. These infiltrations were noted on preoperative imaging, but it was unclear whether the size of the specimen after close bowel dissection would preclude transcolonic extraction. Based on the present experience, the authors advocate performing transcolonic extraction of specimens with a maximum diameter of 5 cm only in patients without inflammatory masses. While extracting the specimen, there is a tendency for invagination, particularly in the descending and sigmoid colon, which immediately hampers specimen extraction. It is of utmost importance to avoid this by stretching the bowel laparoscopically.

In this series the totally laparoscopic approach required four ports, including one more suprapubic 12 mm port than is used in the laparoscopically facilitated approach. It should be appreciated that patients with a small specimen suitable for transcolonic extraction require only a limited incision for transabdominal extraction. An up-and-down transumbilical incision is hardly visible after a while. The cosmetic advantage of transcolonic extraction over conventional extraction is probably limited.

This small series did not show any benefit of the transcolonic approach compared with a laparoscopically assisted procedure. A possible long-term advantage could be a further reduction in small bowel obstruction and incisional hernia with laparoscopic (versus open) procedures. However, larger populations are needed to show significant differences as these problems are relatively uncommon.

Since the introduction of laparoscopy in abdominal surgery, reducing scar size has been an important objective. With the development of NOTES at the beginning of the 21st century, this area of research has gained impetus. The technique of laparoscopic ileocolic resection with colonoscopic specimen removal presented in this study can be seen within the context of NOTES. The transanal routing for specimen removal has been described several times, including laparoscopic high anterior resection for a T1 tumour with natural orifice specimen extraction (NOSE procedure), laparoscopic sigmoid resection with proctoscopic specimen removal for endometriosis and other variations on the theme.

A new aspect of the present study is the proximal location of the resection specimen, requiring a flexible colonoscope for specimen retrieval. The colonoscopy makes bowel preparation inevitable, a procedure which is no longer standard required in bowel surgery.

The present study demonstrated the feasibility of transcolonic specimen removal in most ileocolic resections for CD and it can therefore be considered as an alternative technique. However, before implementing this approach in general surgical practice, further research should be performed at specialist centres with close surveillance and proper audit. Future developments in closure techniques and preoperative insertion of over the-scope-tubes might facilitate preoperative transcolonic extraction. Although this might save time, it is inevitable that consumable costs will rise. Whether such progress can be afforded remains to be seen.
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