

## Alimentary Tract

## Feasibility of laparoscopic restorative proctocolectomy without diverting stoma

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## ABSTRACT

**Aim:** Restorative proctocolectomy performed before the advent of laparoscopy had evolved to frequently omit a diverting stoma. Our aim was to assess the impact of a diverting stoma on postoperative outcomes following laparoscopic restorative proctocolectomy.

**Method:** Data on all patients undergoing a laparoscopic restorative proctocolectomy at our institution were prospectively collated in a database.

**Results:** Between November 2004 and February 2010, 71 patients (38 females) underwent laparoscopic restorative proctocolectomy. Indications included familial adenomatous polyposis ( $n=34$ ), ulcerative colitis ( $n=35$ ), indeterminate colitis ( $n=1$ ) and Lynch syndrome ( $n=1$ ). Laparoscopic restorative proctocolectomy was performed as a one-stage procedure in 49 patients, and after a sub-total colectomy in 22. Seven patients in each group underwent the formation of a diverting stoma. Nine patients required conversion to open surgery. Sixteen patients experienced at least one postoperative complication. The postoperative morbidity was 29% ( $n=4/14$ ) and 21% ( $n=12/21$ ) in patients with and without a stoma ( $p=0.8$ ), and the rate of fistula was 21% and 5%, respectively ( $p=0.08$ ). Seven percent of patients with a stoma and 16% without stoma had an intra-abdominal collection ( $p=0.7$ ). Nine patients required reoperation. The reoperation rate was not influenced by the presence or absence of a diverting stoma.

**Conclusion:** Laparoscopic restorative proctocolectomy can be performed safely without a diverting stoma in selected patients.

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## 1. Introduction

Restorative proctocolectomy (RPC) [1], first described by Parks in 1978 [2], is the gold-standard surgical treatment for ulcerative colitis (UC) [3] and familial adenomatous polyposis (FAP) [4]. Experienced centres have reported acceptable rates of morbidity and mortality coupled with good functional results and quality of life [5,6].

Laparoscopy is associated with improved postoperative outcomes, shorter hospital stay, and an improved cosmetic result [7]. Wexner reported the first laparoscopic RPC in 1992 [8]. Subsequently, high volume centres have reported on the feasibility and the safety of this approach [9–12] and the number of laparoscopic RPCs performed worldwide is increasing yearly.

In order to minimize the risk of septic complications, a temporary diverting ileostomy was systematically performed in the phase of initial experience. However, the high rate of

complications associated with stoma formation is well documented and has to be considered. Before the era of laparoscopy, the number of RPCs performed without stoma diversion had increased significantly [13,14] and performing a diversion-free RPC by laparoscopy is now accepted to be safe in selected patients [15]. Significantly reduced length of stay and hospital cost in patients without a diverting stoma following RPC by laparoscopy when compared to those with a diverting stoma, has been reported [16].

In parallel with the rising number of laparoscopic RPCs being performed in expert centres, the rate of ileal diversion has risen to become almost systematic. In our institution, we systematically perform an endoanal mucosectomy with a hand-sewn pouch-anal anastomosis, whilst electing to maintain a consistent set of indications for stoma formation [17].

The aim of this study was to present our experience of the feasibility of laparoscopic RPC without a diverting stoma.

## 2. Patients and methods

Data of all patients who underwent a laparoscopic RPC from November 2004 to February 2010 in our institution were entered retrospectively in an anonymous database. To avoid any missing patients, every RPC is collated in a prospective list. Therefore, all

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**Table 1**  
Patients' characteristics.

	Overall	Stoma (n = 14)	No stoma (n = 57)	p
Gender, M	33	10 (30.3%)	23 (69.7%)	0.0703
Age	28.4 ± 1.4	39.2 ± 3.9	25.7 ± 1.2	≤0.0001
Body Mass Index	22.7 ± 0.9	26.4 ± 3.2	21.8 ± 0.9	0.0592
ASA <sup>a</sup>				
1	39	2 (5.1%)	37 (94.9%)	
2	27	10 (37%)	17 (63%)	0.0023
3	4	1 (25%)	3 (75%)	
4	1	1 (100%)	0	
Aetiology				
Indeterminate colitis	1	0	1 (100%)	
Lynch	1	1 (100%)	0	0.0351
Polyposis	34	3 (8.82%)	31 (91.2%)	
UC	35	10 (28.6%)	25 (71.4%)	
Corticoids	27	7 (25.9%)	20 (74.1%)	0.3634
Previous abdominal surgery	24	7 (29.2%)	17 (70.8%)	0.2086
Previous STC <sup>b</sup>	22	7 (31.8%)	15 (68.2%)	0.1108
Conversion	9	5 (55.6%)	4 (44.4%)	0.0119
TME <sup>c</sup>	11	4 (36%)	7 (64%)	0.2093
Length of surgery	398.7 ± 8.8	411.4 ± 24.0	395.6 ± 9.3	0.4790
Transfusion	7	2 (28.6%)	5 (71.4%)	0.6180
Postoperative morbidity	16	4 (25%)	12 (75%)	0.7216
Abdominal sepsis	10	1 (10%)	9 (90%)	0.6743
Fistulae	6	3 (50%)	3 (50%)	0.0863
Reoperation	9	3 (33.3%)	6 (66.7%)	0.3663
Hospital stay	14.3 ± 0.7	13.9 ± 1.5	14.4 ± 0.8	0.7948

<sup>a</sup> ASA: American Society of Anaesthesiology score.

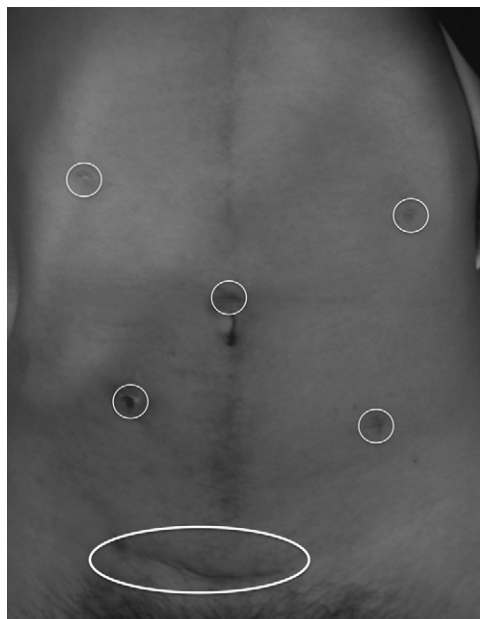
<sup>b</sup> STC: subtotal colectomy.

<sup>c</sup> TME: total mesorectal excision.

patients who underwent laparoscopic RPC were included in the study.

### 2.1. Surgical technique

The procedure entails a 6-port technique (Fig. 1), a technique previously described by our group [17]. Rectal resection was performed either through a Pfannenstiel incision or laparoscopically, at the surgeon's discretion. After the fashioning of a stapled 18 cm ileal J-pouch a complete endoanal mucosectomy was performed and the anastomosis was handsewn. A decision on a diverting stoma was taken intraoperatively, based on specific patient characteristics



**Fig. 1.** The 6-ports placement and the one-month cosmetic result. One port is placed on the future line of the pfannenstiell incision.

(concurrent corticosteroid therapy, presence of other risk factors for anastomotic leak, pelvic infection, and presence of a fistula), whilst intraoperative technical details were also considered (difficulty of dissection, extent of blood loss, and degree of anastomotic tension).

The ileal stoma was closed within two months after an antero-grade contrast study via the efferent limb, confirming anastomotic integrity.

### 2.2. Postoperative management

Patients undergoing RPC in our institution are not enrolled in a fast track recovery programme. They receive antibioprophyllaxis at the beginning of the procedure. Epidural anaesthesia is not offered to this patient cohort.

Long-term follow-up was based on a 1, 3, 6 and 12 months schedule. Following the first year patients were seen on a six-month basis.

### 2.3. Data and statistical analysis

Recorded data included all surgical and medical complications observed during the 90 postoperative days following RPC and closure of the diverting stoma.

Continuous variables were compared with the Mann–Whitney *U* test. Qualitative variables were compared with a contingency  $2 \times 2$  table, using the chi-square test with the Fisher correction as appropriate. A *p* value less than 0.05 was considered statistically significant. Due to a lack of significant result on the univariate analysis no multivariate analysis was performed. Statistical analysis was performed using SPSS 16.0 (SPSS Inc., Chicago, IL).

## 3. Results

### 3.1. Patients' characteristics

Seventy-one patients (38 women, 53%) underwent laparoscopic RPC at our institution between November 2004 and February 2010.

**Table 2**  
Univariate analysis of risk factors for postoperative complications.

	Postoperative complications		p-Value
	Yes (n = 16)	No (n = 55)	
Male gender	7 (44%)	26 (47%)	0.8
Inflammatory bowel disease	7 (44%)	29 (53%)	0.5
Previous abdominal surgery	6 (38%)	18 (33%)	0.7
Corticoid	6 (38%)	21 (38%)	0.9
Conversion	2 (13%)	7 (13%)	0.9
Transfusion	0 (0%)	7 (13%)	0.3
Previous STC	6 (37.5%)	16 (29%)	0.5
Ileostomy	4 (25%)	10 (18%)	0.7

STC: Subtotal colectomy.

Preoperative and operative characteristics are detailed in Table 1. Median age at surgery was 25 years old (15–72) and median BMI was 20 (15–42). More than one-half of the patients were ASA I (55%). The indications to perform RPC included FAP (n = 34, 48%), UC (n = 35, 50%), indeterminate colitis (n = 1) and Lynch syndrome (n = 1). Twenty-four patients (34%) had undergone previous abdominal surgery. Fourteen patients (20%) underwent emergency surgery for acute colitis failing maximal medical therapy. Twenty-seven patients (38%) were corticosteroid-dependent at the time of surgery.

Overall, a diverting stoma was fashioned in 14 (20%) patients. The surgical treatment was performed as a 1-, 2- and 3-stage procedure in 42 (59%), 22 (31%) and 7 (10%), respectively. Laparoscopic RPC was performed as an initial treatment in 49 (69%) patients, amongst whom 7 (14%) had a diverting stoma. RPC was performed as a second-stage procedure, after an initial sub-total colectomy, for acute colitis, in 22 (31%) patients, amongst whom 7 (32%) had a diverting stoma. Laparoscopic RPC was performed without a diverting stoma in 31 FAP patients (89%) and in 26 UC patients (72%).

The conversion rate was 13% (9 patients). Conversion was due to difficulties with exposure during colonic mobilization. No patients required conversion due to intraoperative complications or bleeding. Forty-eight patients (68%) underwent a complete laparoscopic procedure, which included the rectal dissection. All but one patient had a hand-sewn anastomosis. The median operative time was 394 min (240–570). Seven patients (10%) required red blood cell transfusion during the perioperative period.

### 3.2. Postoperative outcomes

Postoperative mortality was nil. Sixteen patients (23%) experienced at least one postoperative complication. The postoperative outcomes and the univariate analysis for risk factors of impaired outcomes are depicted in Table 2. Postoperative morbidity was 29% in the group of patients with a stoma (4 patients) and 21% (12 patients) in the group of patients without a stoma (p = 0.8). The results of the univariate analysis for risk factors of impaired outcomes depending on the presence of a stoma are detailed in Table 3.

Postoperative intra-abdominal abscess occurred in 10 patients (14%). The rate of pelvic abscess was 16% (9/57) in patients without a protective stoma and 7% (1/14) in patients with a diverting stoma. Four patients (40%) required reoperation, whilst 6 patients (60%) underwent conservative management (radiological drainage of the abscess and combined IV antibiotics (n = 3) or IV antibiotics only (n = 3)).

An anastomotic leak occurred in 6 patients (8%). The rate of anastomotic leak was 21% (n = 3) in patients with a diverting stoma and 5% (n = 3) in patients without a protective stoma (p = 0.08). All patients with an anastomotic leak underwent further surgery. Amongst the 3 patients with a diverting stoma, one patient underwent surgical drainage of a collection. One patient was treated with

**Table 3**  
Comparison of postoperative outcomes depending on the fashioning of a stoma.

Postoperative outcomes	Overall (n = 71)	Stoma (n = 14)	No stoma (n = 57)	p
Total morbidity	16 (23%)	4 (29%)	12 (21%)	0.8
Pelvic abscess	10 (14%)	1 (7%)	9 (16%)	0.7
Anastomotic leak	6 (9%)	3 (21%)	3 (5%)	0.08
Transfusion	7 (10%)	2 (14%)	5 (9%)	0.6
Peritonitis	2 (3%)	0	2 (4%)	0.99
Obstructive episode	2 (3%)	0	2 (4%)	0.99
Reoperation	9 (13%)	3 (21%)	6 (11%)	0.2
RPC stenosis	4 (6%)	3 (21%)	1 (2%)	0.02
Pouch reoperation	4 (6%)	0 (0%)	4 (7%)	0.6
Conversion	9 (13%)	5 (36%)	4 (7%)	0.01

RPC: restorative proctocolectomy.

**Table 4**  
Impact of learning curve on patients' characteristics and postoperative outcome.

	2004–2007	2008–2010	p
N	35	36	
Aetiology			
Indeterminate colitis	1	0	0.30
Lynch	0	1	0.32
Polyposis	21	14	0.07
UC	13	21	0.07
Corticoids	12	15	0.52
Previous STC	6	16	0.01
Conversion	4	5	0.75
Ileostomy	4	10	0.046
Length of surgery (min)	390	420	0.22
Transfusion	3	4	0.71
Post-operative morbidity	7	9	0.61
Reoperation	2	7	0.08
Hospital stay (days)	14	12	0.87

STC: subtotal colectomy.

a perineal approach and the last patient with a diverting stoma subsequently developed an ileo-vaginal fistula which was successfully treated by a Martius flap. In the 3 patients without a diverting stoma, a loop ileostomy with repair of the pouch was performed at reoperation.

The overall rate of reoperation (13%) was not influenced by the presence of a diverting stoma (p = 0.2). Two patients were reoperated laparoscopically. Indications for reoperation were: postoperative abdominal bleeding (n = 3) and anastomotic fistula (n = 6).

Stoma-related complications were observed in 3 patients (stomal prolapse, small bowel obstruction following stoma closure, and stoma overflow resulting in dehydration). Stenosis of the pouch-anal anastomosis occurred in 4 patients, of whom 3 had a diverting stoma. All these stenosis were successfully treated with repeated anal dilatation.

The median hospital stay was 12 days (with stoma 12 days, without stoma 13 days). The median hospital stay for stoma closure was 4 days.

### 3.3. Impact of learning curve on postoperative outcome

Analysis of the two periods of experience is detailed in Table 4. Comparison of aetiologies showed a trend towards a higher rate of RPC for UC in the second period of experience. Morbidity and reoperative rates remained equivalent during the two periods.

## 4. Discussion

Proctocolectomy with ileal pouch anal anastomosis is the gold-standard surgical treatment for patients with UC or FAP [1,3,4].

Surgical technique has evolved significantly during the last decade. Although the open approach is now standardized, the laparoscopic approach has yet to be refined. In particular, the need for a diverting stoma in laparoscopic RPC remains undefined. In the present series of laparoscopic RPC with mucosectomy, patients without a diverting stoma had similar outcomes compared to patients in whom a protective stoma was fashioned. These results rely on stringent selection of patients most likely to have good outcomes, and a standardized surgical technique [17].

One of the main limitations of this study is its retrospective design. To date this is the largest series suggesting that laparoscopic RPC can be safely performed without fashioning a protective ileostomy [18,19]. This series, as others, is limited by the heterogeneity of the study population, which combined patients with UC receiving immunosuppressant drugs and patients with FAP. This heterogeneity may confound analysis somewhat of risk factors for postoperative complications, but has the advantage of including the underlying disease in the univariate analysis. The results reported in this series are not biased by the high rate of patients with FAP in this series. Ninety percent of FAP patients did not have an ileostomy, compared to 70% of the patients with UC, which compares favourably with other series.

This series reports results that are comparable to those previously reported [15,18] without diverting stoma and in other series of laparoscopic RPC [19–21]. Although a diverting stoma was fashioned in only 20% of the study population, 59% of our patients underwent a one-stage procedure and the rates of postoperative morbidity (23%), pelvic sepsis (14%) and anastomotic leak (8%) are comparable to those reported by other groups. The success rate was 87% and only 3 patients (4%) required fashioning of a secondary temporary stoma. Kienle et al. [19] had previously assessed the role of a diverting stoma in 59 consecutive patients undergoing laparoscopically assisted RPC with mucosectomy. The success rate of the laparoscopic procedure was 91% and 54% patients underwent a one-stage procedure. The postoperative morbidity was 34% and major complications were reported in 18.6% of the patients but 9 patients (28%) required a secondary stoma for postoperative complications. This represents a tenfold increase as compared to our series. This difference may be explained by a higher rate of patients with UC in their series (63% vs. 50%). Indeed, increased BMI, immunosuppressant drugs, failure of the laparoscopic technique and the absence of a diverting stoma were associated with major postoperative complications. The authors concluded that an ileostomy could be safely omitted in carefully selected patients undergoing laparoscopic RPC in the absence of risk factors. This study confirms the results reported by Kienle et al.

Lefèvre et al. [21] reported a series of 82 totally laparoscopic RPCs. Only 10% did not have a diverting stoma and 95% had a stapled anastomosis. The conversion rate was 11%, postoperative morbidity 32% and the reoperation rate was 10%. The authors did not perform subgroup analysis to assess the role of a diverting stoma. Although the authors reported a higher rate of stoma formation, postoperative outcomes were comparable to those reported here.

The rationale for fashioning a diverting stoma was a postulated reduced rate of anastomotic leak and a better quality of life during the postoperative period [15,22–24]. Yet, these potential advantages may be counterbalanced by the morbidity related to the stoma itself [25,26], and an increasing number of studies have reported excellent outcomes after RPC without diverting stoma [14,26]. The rate of complications related to the stoma itself is not negligible [26]; it may be responsible for a delayed recovery of bowel function, reoperation, or readmission and therefore a non-negligible economic impact. Our technique of RPC is standardized and we perform mesentery-lengthening techniques if required in order to ensure a sufficient length of mesentery and a tension free anastomosis [17]. A sufficient length is obtained when the

antimesenteric side of the pouch can be pulled down at least 2 cm beyond the pubic symphysis [27]. Our technique remains the same in the laparoscopic approach and therefore the indication for a diverting stoma in patients undergoing an RPC does not differ between the open and the laparoscopic approach.

The importance of mucosectomy in RPC is unresolved. The rationale forwarded by groups performing stapled RPC is based on improved functional outcome in patients with a preserved anal transition mucosa [18,28,29] and a lower rate of diverting stoma [5,18]. Remzi et al. have reported that performing a stapled anastomosis was associated with a lower rate of temporary diversion in a retrospective series comparing outcomes after hand-sewn and stapled RPC in 119 FAP patients. The authors reported that all patients who had a mucosectomy needed a temporary diversion but did not detail the reasons [29]. A recent study confirmed that hand-sewn anastomosis with mucosectomy was associated with a significant reduction in the risk of adenomas in the anorectal segment following RPC (at 15 years 28.8% in the mucosectomy group vs. 85.2% in the mechanical anastomosis group,  $p < 0.001$ ) [30]. Our attitude is to systematically perform a mucosectomy, and we report similar rates of postoperative anastomotic complications.

Finally, with increasing experience, laparoscopic RPC has been offered to more complicated cases, confirmed by the presence of a higher proportion of patients with UC, previous subtotal colectomy or steroid therapy. The higher rate of ileostomy formation, operative time, and morbidity observed in the two periods of experience may be attributed to this.

In conclusion, we report that laparoscopic RPC with mucosectomy can be safely performed without a diverting stoma in selected patients. This selection relies on preoperative factors and on the capacity to perform a tension-free anastomosis after appropriate mesentery lengthening. Performing a systematic mucosectomy does not impact upon postoperative outcomes and the need for a diverting stoma.

#### Conflict of interest

None declared.

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