



Original Article

Three-stage Laparoscopic Ileal Pouch-anal Anastomosis Is the Best Approach for High-risk Patients with Inflammatory Bowel Disease: An Analysis of 185 Consecutive Patients

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Abstract

Background: There are very few studies and no consensus concerning the choice between two- and three-stage ileal pouch-anal anastomosis [IPAA] in inflammatory bowel diseases [IBD]. This study aimed to compare operative results between both surgical procedures.

Methods: Only patients who underwent a laparoscopic IPAA for IBD were included. They were divided into two groups: two-stage [IPAA and stoma closure] [Group A] and three-stage IPAA [subtotal colectomy, IPAA, stoma closure] [Group B].

Results: From 2000 to 2015, 185 patients (107 men, median age of 42 [range, 15–78] years) were divided into Groups A [$n = 82$] and B [$n = 103$]. Patients in Group B were younger than in Group A (39 [15–78] vs 43 [16–74] years; $p = 0.019$), presented more frequently with Crohn's disease [16% vs 5%; $p < 0.04$], and were more frequently operated in emergency for acute colitis [37% vs 1%; $p < 0.0001$]. Cumulative operative time and length of stay were significantly longer in Group B (580 [300–900] min, and 19 [13–60] days) than in Group A (290 [145–490] min and 10 [7–47] days; $p < 0.0001$). Cumulative postoperative morbidity, delay for stoma closure, and function were similar between the two groups. Long-term morbidity was similar between Group A [13%] and Group B [21%; $p = 0.18$].

Conclusions: Our study suggested that postoperative morbidity was similar between two- and three-stage laparoscopic IPAA. It suggested that the three-stage procedure is probably safer for high-risk patients [ie in acute colitis].

Key Words: Ileal pouch-anal anastomosis; inflammatory bowel diseases

1. Introduction

Today, ileal pouch-anal anastomosis [IPAA] is the operation of choice for refractory ulcerative colitis and indeterminate colitis,¹ and for selected patients with Crohn's disease.²

The IPAA procedure is usually performed electively in two stages. In the first stage, patients undergo restorative total proctocolectomy with IPAA and J-pouch and a temporary diverting loop ileostomy. In the second stage, performed 6 to 8 weeks later, the stoma is reversed

and bowel continuity is restored.³ We and others have suggested that laparoscopy is today the best approach for two-stage IPAA,^{4,5} with lower postoperative morbidity⁶ and infertility rates^{7,8} than after open IPAA.

A three-stage procedure, including subtotal colectomy with double-end ileostomy and sigmoidostomy at the first operation, followed by IPAA, and then stoma closure, can also be proposed, especially in patients with acute colitis, or unclear diagnosis of inflammatory bowel disease [IBD], or in high-risk patients with recent steroid therapy and/or poor nutritional status.^{9,10} As for the two-stage procedure, the laparoscopic approach is increasingly proposed for the three-stage IPAA. We previously demonstrated the possible benefit of laparoscopy for subtotal colectomy,¹¹ which was recently confirmed by a meta-analysis.¹² Furthermore, we observed that performing both subtotal colectomy and second-step IPAA by laparoscopy¹³ can significantly reduce cumulative hospital stay, with lower cumulative postoperative severe morbidity than following an open approach.¹⁴

Although the three-stage is generally proposed mainly in high-risk patients with complicated acute colitis or refractory to medical treatment, under recent steroids or anti-tumour necrosis factor [TNF] therapy, or with poor nutritional status, some authors prefer the two-stage approach because it reduces the number of procedures, and probably overall hospital stay and costs, which can be important in young, active patients.^{3,15} However, today among the majority of the authors, there is no consensus with regard to choosing either two- or three-stage IPAA in IBD patients.

To the best of our knowledge, only five studies have been devoted to date to the comparison between two- and three-stage IPAA.^{3,15,16,17,18} In two of them, both IBD and polyposis patients were included.^{15,18} IPAA was performed by open approach in three studies^{15,16,17} and by laparoscopy in only 17% of the cases, in one series.³

Thus, the aim of this study was to compare operative results of two- vs three-stage IPAA in a homogeneous series of IBD patients all operated by laparoscopy [for both subtotal colectomy and IPAA].

2. Patients and methods

2.1. Study population

All patients who underwent laparoscopic restorative proctocolectomy with IPAA for IBD [ulcerative colitis, undetermined colitis, or selected cases of Crohn's disease] were identified from our prospective single-centre institutional review board-approved database. Patients with familial adenomatous polyposis and those with one-stage IPAA [without temporary stoma] were not included. Furthermore, those with previous ileorectal anastomosis who underwent later completion proctectomy and IPAA and those with an incomplete first stage, or with a 'modified two-stage' [first, subtotal colectomy; and second, IPAA without stoma] were also excluded.

Two groups of patients were constituted according to the surgical procedure:

- two-stage IPAA [Group A]: first, laparoscopic total restorative proctocolectomy with IPAA; and second, stoma closure;
- three-stage IPAA [Group B]: first, laparoscopic subtotal colectomy with double-end ileostomy and sigmoidostomy; second, laparoscopic completion proctectomy and IPAA; and third, stoma closure.

A comparative study was performed between Group A and Group B for the following findings: patient features [gender, age, body mass index, nutritional status, past medical history, past surgical history, type of inflammatory bowel disease, duration of disease before

surgery]; preoperative treatment in the past 3 months (steroids, 5-aminosalicylic acid [5-ASA], antitumour necrosis factor agents, immunomodulators [azathioprine, methotrexate, 6-mercaptopurine, cyclosporine]); intraoperative features [indications, number of stages, type of anastomosis, conversion into laparotomy, defined as an unplanned abdominal incision longer than 5cm, intraoperative incident, and operative time]; postoperative outcomes [length of hospital stay, in-hospital and 30-day postoperative morbidity and mortality] and long-term results [functional results, pouchitis and anastomotic stenosis rates, definitive stoma for failure]. Acute colitis was defined by frequent bloody bowel motions, fever, tachycardia, and anaemia. Its diagnosis was clinical, biological, endoscopic and radiological. Acute colitis can be complicated by toxic megacolon, bowel perforation, or haemorrhage.

2.2. Surgical procedure

All the procedures were performed by two surgeons [YP, LM].

For two-stage IPAA, a total laparoscopic approach, as previously described, was used.¹⁸ Briefly, using a five-trocar technique, total restorative proctocolectomy and IPAA were performed during the same operation, with temporary ileostomy at the site of specimen extraction, in the right iliac fossa.

For three-stage IPAA, laparoscopic subtotal colectomy with double-end ileostomy and sigmoidostomy in the right iliac fossa were first performed, as previously described.^{5,11,19} Both ileostomy and sigmoidostomy were opened. After 2-3 months, laparoscopic completion proctectomy with IPAA was performed, and temporary ileostomy was performed at the same site of the former double-end ileostomy and sigmoidostomy.¹⁴

Total mesorectal excision, and/or carcinologic mesocolic excision, was only performed in case of associated colorectal cancer or high-grade dysplasia.

The temporary ileostomy was closed if a systematic CT scan performed at 2 months with contrast enema did not show any suspicion of anastomotic leakage or stenosis. Through elective incision in the right iliac fossa, a hand-sewn end-to-end anastomosis was performed using a single-layer interrupted sero-submucosal 5-0 PDS® [Ethicon Inc., NJ, USA] suture. Fascia was closed using 1-0 Vicryl® [Ethicon Inc., NJ, USA]. The wound was partially closed according to purse-string closure.²⁰

2.3. Outcome measures

Postoperative morbidity was defined as any complication occurring during the hospital stay or within 30 days after surgery. We distinguished non-septic surgical complications [haemorrhage, haematoma, ileus or small bowel obstruction, stoma-related complications such as dis-insertion, necrosis, or bleeding], septic surgical complications [peritonitis, anastomotic leakage at the site of IPAA, intra-abdominal wound, or peristomal abscess], and medical complications [urinary/pulmonary infection, cardiac/neurological troubles, etc]. Complications were classified according to Clavien-Dindo's classification.²¹ Major complications were defined as those requiring surgical or radiological intervention [Clavien-Dindo III] and life-threatening complications requiring intensive care management [Clavien-Dindo IV].

In order to compare morbidity rates between two- and three-stage IPAA, postoperative morbidity included all the complications observed after the first operation for two-stage IPAA and, for three-stage IPAA, morbidity observed after both first [subtotal colectomy] and second [completion proctectomy and IPAA] operations. Because postoperative morbidity after stoma closure was expected to be similar after two- and three-stage IPAA, it was not included in

the morbidity study. Similarly, length of hospital stay included first operation only after two-stage IPAA and first and second operation after three-stage IPAA. A separate analysis of postoperative morbidity after stoma closure was performed.

For long-term functional results, number of stool per day and per night, faecal incontinence episodes per 24h, and need for antidiarrhoeal medication were assessed at the end of follow-up.

2.4. Statistical analysis

Quantitative data were reported as the median and range, and qualitative data were reported as the number of patients [percentage of patients]. Normally distributed quantitative data were analysed with Student's *t* test, and the Mann-Whitney test was used otherwise. Qualitative data were compared using Pearson's χ^2 test or Fisher's exact test, as appropriate. Multivariate analysis of postoperative morbidity risk factors after two- and three-stage IPAA was performed according to a logistic regression model, which included all variables with a *p*-value of less than 0.2 in univariate analysis. All tests were two-sided, with a level of significance set at *p*-value of less than 0.05. All analyses were performed using the GraphPad Prism software [CA, USA] and the Statistical Package for the Social Sciences [SPSS] software [SPSS Inc., version 22.0, Chicago, IL, USA]. This study was conducted according to the ethical standards of the Committee on Human Experimentation of our institution, and reported according to the Strengthening the Reporting of Observational Studies in Epidemiology [STROBE] guidelines.²²

3. Results

3.1. Patient characteristics

From 2000 to 2015, 202 patients with IBD underwent laparoscopic IPAA in our institution, but 185 patients were definitively included [Figure 1].

In all, 82 patients underwent a two-stage procedure [Group A] [44%] and 103 patients a three-stage procedure [Group B] [56%]. Patients' characteristics are detailed in Table 1.

Patients from the two groups did not show any difference regarding gender, body mass index, anaesthesiology grade, or comorbidities. However, patients from Group B were younger (39 [15–78] vs 43 [16–74] years, *p* = 0.019) and presented more

frequently with Crohn's disease [*n* = 16, 16%, vs *n* = 4, 5%, *p* < 0.0001] than those from Group A. Moreover, patients from Group B were more frequently operated not electively, for an acute colitis, [*n* = 38, 37% vs *n* = 1, 1%, *p* < 0.0001] and in early disease stage (4.7 [0.2–30] vs 10 [0–41] years, *p* < 0.0001) than those from Group A. The subgroup of 38 patients presenting with acute colitis in Group B included: clinical and endoscopic acute colitis [*n* = 28], sepsis [*n* = 6], colonic perforation [*n* = 3], and toxic megacolon [*n* = 1]. No case of haemorrhage was observed. Total mesorectal excision was performed for cancer or dysplasia in 30 patients in Group A [37%] and 6 patients in Group B [6%]; *p* < 0.0001].

3.2. Operative results

Cumulative median operative time and hospital stay were significantly longer in Group B (580 [300–900] min, and 19 [13–60] days, respectively) than in Group A (290 [145–490] min, and 10 [7–47] days; *p* < 0.0001), as shown in Table 2. There was no significant difference regarding rates of conversion into laparotomy and of blood transfusion, type of anastomosis, or presence of pelvic closed suction drain.

Overall morbidity did not differ between groups: 51% in Group A and 53% in Group B [*p* = 0.88]. No significant difference between groups was noted for surgical, medical, or major morbidity rates. However, patients from Group B presented more frequently defunctioning ileostomy-related complications than those from Group A [*n* = 9 vs 0, *p* = 0.006]: peristomal abscess [*n* = 6], bleeding [*n* = 2], or dis-insertion [*n* = 1] of ileostomy. Preoperative steroid treatment during the past 3 months was the only risk factor for postoperative morbidity [odds ratio = 4.9, confidence interval 95% 1.6–15.1, *p* = 0.006], whereas the two- or three-stage approach was not associated with postoperative morbidity [odds ratio = 0.8, confidence interval 95% = 0.3–2.4, *p* = 0.691].

No significant difference was noted between groups regarding stoma closure rates [74/75, 99% vs 76/81, 94%, *p* = 0.21] and median time for stoma closure (2.3 [1.3–11.3] vs 2.2 [0.3–12.2] months, *p* = 0.32). No difference was noted between groups regarding complications from the closure of the diverting stoma: anastomotic leakage occurred and required surgery in two and three patients from Group A [3%] and Group B [4%], respectively [*p* = 0.67].

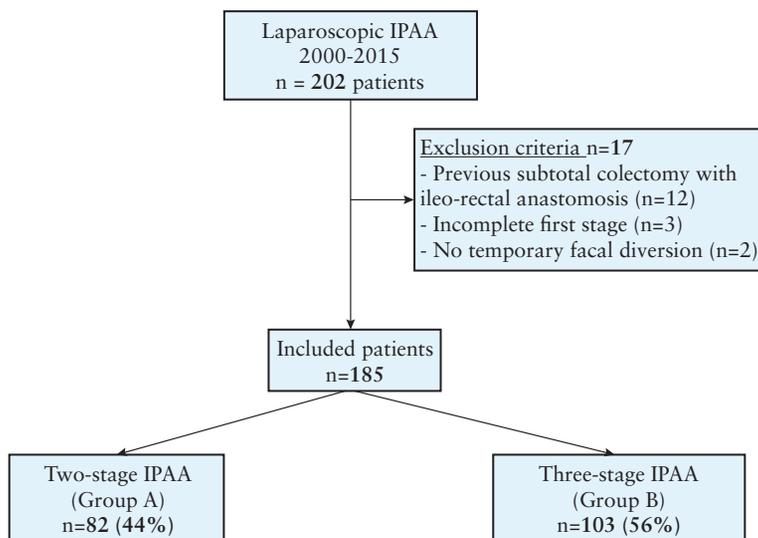


Figure 1. Flow chart of patients undergoing total colectomy with ileal pouch-anal anastomosis [IPAA].

Table 1. Characteristics of 185 patients undergoing restorative proctocolectomy with ileal pouch-anal anastomosis for inflammatory bowel disease.

	Group A two-stage <i>n</i> = 82	Group B three-stage <i>n</i> = 103	<i>p</i> -Value
Gender			0.67
Male	46 [56] ^a	61 [59]	
Female	36 [44]	42 [41]	
Age [years]	43 [16–74] ^b	39 [15–78]	0.019
Nutritional status			
BMI ^c	23 [15–32]	22 [14–31]	0.41
Weight loss > 10% [*]	9/75 [12]	20/88 [23]	0.09
Albumin [g/l] ^{**}	33 [12–49] ^b	29.5 [6–46]	0.14
Poor nutritional status ^d	27/49 [55]	47/69 [68]	0.18
ASA grade ^{e*}			0.51
I	17/70 [24]	14/83 [17]	
II	49/70 [70]	63/83 [76]	
III	4/70 [6]	6/83 [7]	
Diabetes mellitus	5 [6]	4 [4]	0.51
Active smoker	8 [10]	11 [11]	0.81
Past surgical history	22 [27]	15 [15]	0.06
Ulcerative colitis	77 [94]	87 [84]	0.044
Crohn's disease	4 [5]	16 [16]	
Undetermined colitis	1 [1]	-	0.99
Previous duration of symptoms [years]	10 [0–41] ^b	4.7 [0.2–30]	< 0.0001
Recent preoperative treatment ^{f*}			
Steroids	36/58 [62]	50/82 [61]	1.00
5-ASA	30/57 [53]	43/77 [56]	0.72
Anti-TNF α	30/55 [55]	50/72 [69]	0.09
Immunomodulators ^g	24/69 [35]	40/84 [48]	0.14
Main indication for surgery			< 0.0001
Failure of medical treatment	51 [62]	59 [57]	
Acute colitis	1 [1]	38 [37]	
Dysplasia	19 [23]	5 [5]	
Cancer	11 [14]	1 [1]	
Elective surgery	82 [100]	65 [63]	< 0.0001

^aNumber of patients [percentage]; ^bmedian [range]; ^cbody mass index; ^dBMI < 18.5, weight loss > 10%, or albumin < 30 g/l; ^eAmerican Society of Anesthesiology grade; ^fin the past 3 months; ^gincludes azathioprine, methotrexate and ciclosporin; 5-ASA, 5-aminosalicylic acid; TNF, tumour necrosis factor.

*Results from available data only; **results from 37 [Group A] and 62 [Group B] patients; *p* < 0.05 was considered significant [in bold].

3.3. Long-term results

After a median follow-up of 2.4 [0.1–11] years in Group A and 3 [0.3–14] years in Group B, long-term morbidity rate was similar between groups [Table 3]. Rates of redoing IPAA for failed anastomosis were similar between groups: 1% [*n* = 1] in Group A vs 5% [*n* = 5] in Group B [*p* = 0.23].

Regarding functional results, no significant difference was observed between groups concerning median number of stools per day and night, rates of faecal incontinence, or use of antidiarrhoeal drugs.

4. Discussion

Our study suggested that postoperative overall morbidity was similar between two- and three-stage laparoscopic IPAA for IBD patients. This result was observed despite a higher rate of non-elective operation for acute colitis in patients with three-stage IPAA, suggesting patients at higher risk of postoperative morbidity. For this reason, we believe that two-stage IPAA must be reserved for elective low-risk patients without recent steroids or anti-TNF therapy, and without ongoing acute or severe colitis. In all the other patients [56% in the

present study], and in opposition to a recent series³, we consider that laparoscopic subtotal colectomy followed by laparoscopic completion proctectomy and IPAA remains the safer option in IBD patients.

IPAA can be performed in either two or three stages, with no consensus about the indications and advantages of the two approaches. The two-stage approach is often preferred, especially in young active patients, because of obvious advantages such as decreased number of procedures under general anaesthesia, shorter cumulative hospital stay, reduced total costs,²³ and probably faster recovery.¹⁵ On the other hand, three-stage IPAA is preferred in high-risk patients [with poor nutritional status and/or under high dose of steroids or anti-TNF, or with acute colitis]²⁴ and in those with suspicion of Crohn's disease for which the pathological examination of the subtotal colectomy specimen can help to decide for the next operation [between ileorectal anastomosis and IPAA].^{17,25}

Beside these two standard approaches, two other procedures have been suggested but are not to date performed routinely in the majority of centres. First, a few authors have proposed one-stage IPAA [without diverting ileostomy] in selected patients with ulcerative colitis.^{26,27,28} Even if this presented some theoretical

Table 2. Operative findings and postoperative morbidity in 185 patients undergoing restorative proctocolectomy with ileal pouch-anal anastomosis for inflammatory bowel diseases.

	two-stage <i>n</i> = 82	Group B three-stage <i>n</i> = 103	<i>p</i> -Value
Operative findings			
Conversion into laparotomy	1 [1] ^a	1 [1]	1.00
Anastomosis			0.38
Hand-sewn	1 [1]	4 [4]	
Stapled mechanical	81 [99]	99 [96]	
Pelvic closed suction drain	78 [95]	101 [98]	0.41
Blood transfusion*	6/62 [10]	6/78 [8]	0.77
Cumulative operative time [min]** ^c	290 [145–490] ^b	580 [300–900]	< 0.0001
Cumulative morbidity	42 [51]	55 [53]	0.88
Surgical morbidity	28 [34]	26 [25]	0.19
Anastomotic leakage	13	13	0.53
Ileosigmoidostomy-related complications	-	5	0.06
Ileostomy-related complications	-	9	0.006
Wound complications	2	5	0.47
Pouch haemorrhage	4	5	1.00
Intra-abdominal bleeding	-	3	0.26
Ileus ^c	17	22	1.00
Medical morbidity	20 [24]	24 [23]	1.00
Urinary infection	8	3	0.06
Venous thromboembolism ^d	5	6	1.00
Electrolytic disorder	3	3	1.00
Others ^e	6	10	0.60
Clavien-Dindo classification			0.66
III	30 [71]	36 [65]	
III-IV	12 [29]	19 [35]	
Unplanned reoperation	6 [7]	13 [13]	0.33
Cumulative length of stay [days]	10 [7–47] ^b	19 [13–60]	< 0.0001

^aNumber of patients [percentage]; ^bmedian [range]; ^cileus or small bowel obstruction defined by abdominal distension and pain, and vomiting in the postoperative period; ^dconcerned pulmonary embolism or portal vein thrombosis; ^econcerned acute urinary obstruction, adrenal insufficiency, pulmonary infection, troubles of cardiac rhythm, ascites, sepsis, or lymphangitis.

*Results from available data; **results from 75 [Group A] and 84 [Group B] patients; *p* < 0.05 was considered as significant [in bold].

advantages, such as absence of stoma-related complications, shorter overall hospital stay, and less long-term risk of small bowel obstruction, it exposes the patient to possible pelvic sepsis due to anastomotic leakage, with the potential risk of re-operation with secondary ileostomy. A meta-analysis highlighted an increased rate of anastomotic leakage in the non-diverted group, raising some concerns about this strategy.²⁹ Second, more recently some authors proposed a two-stage modified IPAA based on initial subtotal colectomy, followed by completed proctectomy and IPAA without defunctioning ileostomy. This approach allowed reduction of length of stay and overall costs, with similar morbidity and functional results compared with the standard three-stage approach. However, very few data are available to date on two-stage modified IPAA, and it seems that it was proposed in selected low-risk patients.³⁰

Laparoscopic approach is more and more used for two- and three-stage IPAA. We and others have suggested that it reduced significantly the overall length of stay of three-stage IPAA observed after open surgery,¹⁴ with a trend towards lower postoperative morbidity.^{6,31} The benefit of the laparoscopic approach for subtotal colectomy in acute colitis was recently demonstrated by a meta-analysis,¹² with significantly reduced wound infection and intra-abdominal abscess rates, and shorter hospital stay. Concerning IPAA, two studies with multivariate analysis

have observed that laparoscopy significantly reduced both minor and major postoperative morbidity rates.^{6,31} All these short-term benefits were associated with long-term reduction of adhesions³² and increased fertility rates in young women, as we and others reported recently.^{7,8} For all these reasons, the laparoscopic approach is becoming the standard approach for IPAA in IBD patients.⁴

To date, there is no randomized trial concerning two-stage vs three-stage IPAA, and only five heterogeneous series with conflicting results have been published so far.^{3,15,16,17,18} Indications for IPAA, rates of two- and three-stage IPAA, and use of laparoscopy were different between series. In the most recent series,³ including 144 patients with ulcerative colitis, outcomes were similar between two- and three-stage IPAA. The authors concluded that steroid use and anti-TNF therapy alone do not justify the choice of three-stage IPAA, as long as the operation is performed by a high-volume IBD surgeon. First however, several studies have clearly demonstrated that recent high-dose steroid therapy^{24,33,34} and anti-TNF agents^{35,36,37,38} increased the risk of pelvic sepsis after IPAA. Second, 80% of patients were operated on using the two-stage approach [by 10 different surgeons]³ suggesting a possible bias and absence of standardised procedures; and less than 20% of patients underwent the laparoscopic approach. In the present study, all the patients were operated by only two colorectal surgeons, with a

Table 3. Long-term results in 185 patients undergoing restorative proctocolectomy with ileal pouch-anal anastomosis for inflammatory bowel diseases.

	Group A two-stage n = 82	Group B three-stage n = 103	p-Value
Follow-up [years]	2.4 [0.1–11] ^a	3 [0.30–14]	0.08
Long-term results			
Surgical morbidity ^b	11 [13] ^c	22 [21]	0.18
Anastomotic stenosis	8	10	1.00
Incisional hernia	2	10	0.069
Small bowel obstruction	2	3	1.00
Reoperation ^d	9 [11]	19 [18]	0.21
Pouchitis	14 [17]	19 [18]	0.85
Definitive stoma	3 [4]	7 [7]	0.51
Functional results			
Stools per day**	5.5 [1.5–15]	5.5 [1–20]	0.76
Stools per night**	0 [0–6]	0 [0–5]	0.53
Faecal incontinence*	9/58 [16]	15/75 [20]	0.65
Antidiarrhoeal drug*	26/47 [55]	20/50 [40]	0.15

^aMedian [range]; ^bsome patients presented with several complications; ^cnumber of patients [percentage]; ^dfor any reason.

* Results from available data; **results from 58 [Group A] and 75 [Group B] patients; $p < 0.05$ was considered as significant.

standardised laparoscopic IPAA in 100% of cases.^{5,11} Similar conclusions in favour of two-stage IPAA were also reached in an older series including 871 patients with ulcerative colitis, all operated by open surgery with 89% of two-stage IPAA, and without any anti-TNF pre-treatment.¹⁶ All the other three studies^{15,17,18} comparing two- and three-stage IPAA were more in favour of three-stage in high risk patients, with significantly lower overall morbidity, pelvic sepsis, and ileus rates in one study.¹⁷ A similar anastomotic leak rate between two- and three-stage IPAA was observed in the two other series despite patients at higher risk of complications after three-stage IPAA.^{15,18} Although no comparison was performed between two- and three-stage IPAA in a large series of 588 patients, Gu *et al.* reported that preoperative anti-TNF treatment was significantly associated with pelvic sepsis in the case of the two-stage procedure, whereas this association was not observed after the three-stage procedure. Such result indicate a three-stage IPAA in case of preoperative anti-TNF treatment.³⁷ Conversely, Lau *et al.* reported in a prospective series on surgical management of IBD, that there was no significant difference in adverse postoperative outcomes between the detectable and undetectable serum anti-TNF α drug level groups in cases of ulcerative colitis. When two- and three-stage IPAA were analysed separately to standardise the results according to the complexity of ulcerative colitis surgery performed, no significant difference was observed.³⁸

No definitive conclusion can be reached from these five previous comparative studies. Finally, the present study is the first to compare two- vs three-stage with 100% of laparoscopic IPAA in IBD patients. By reducing not only overall length of stay, postoperative morbidity, and adhesions, but also the severity of the operations, we believe that laparoscopy today has modified the debate between two- and three-stage open IPAA. Furthermore, patients with the three-stage procedure had more stoma complications than those in two-stage IPAA, probably because the double-end ileostomy and sigmoidostomy is performed at the same site of the defunctioning

loop ileostomy. At this site, there is thus a frail wall and healing difficulties.

Although this study is limited by its retrospective nature, we have tried to minimise the selection bias by including all patients with IBD who underwent laparoscopic IPAA in our institution. The tendency of more incisional hernia in Group B than in Group A could become significant in a wider sample.

In conclusion, a low risk of pelvic sepsis, and a good or acceptable function and quality of life is today much more important than the number of procedures for IPAA. Because pelvic sepsis and anastomotic leakage are known to alter long-term functional results after IPAA, by anastomotic stenosis and/or pouch sclerosis, and expose the patient to a higher risk of ultimate pouch failure, we consider that any situation exposing the patient to a potential higher risk of pelvic sepsis after IPAA must favour three-stage instead of two-stage IPAA. It included for us all the patients with acute colitis refractory to intensive medical therapy, patients under recent and high dose of steroids, and patients recently treated anti-TNF agents. For all these situations, which represent to date approximately half of our patients, laparoscopic three-stage IPAA continues to be our preferred option.

Conflict of Interest

None.

Author Contributions

DM: acquisition of data, drafting the article, analysis and interpretation of data. MNF: acquisition of data, analysis and interpretation of data. GM: analysis and interpretation of data. LM: analysis and interpretation of data. YP: concept and design of the study, drafting the article, approval of the final version.

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