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ORIGINAL ARTICLE

Transanal ileal pouch-anal anastomosis for ulcerative colitis: a single-center comparative study

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Abstract

Background Ileal pouch-anal anastomosis (IPAA) is the procedure of choice in patients with ulcerative colitis (UC) requiring surgery. Advantages of laparoscopic IPAA (lap-IPAA) compared to open surgery have been investigated. However, laparoscopic dissection in the pelvis is still a challenge. A transanal approach provides better access to lower pelvis and avoids multiple staple firings, which could reduce the risk of anastomotic complications. The aim of this study was to compare short-term outcomes of transanal proctectomy with IPAA (ta-IPAA) with conventional lap-IPAA in patients with UC.

Methods A single-center retrospective study was conducted on consecutive UC patients, treated at Copenhagen University Hospital, Hvidovre, undergoing either laparoscopic or transanal IPAA in the period between January 2013 and December 2020. Exclusion criteria were Crohn's disease, previous extensive abdominal surgery and impaired sphincter function. Primary outcomes were overall postoperative complications. Secondary outcomes were length of hospital stay and re-admissions. For comparison between ta-IPAA and lap-IPAA, the Mann–Whitney *U* test was used for continuous variables, and Chi-square and Fisher's exact test for categorical variables.

Results A total of 65 patients with ta-IPAA (34 males, 31 females, median age 31 years [range 12–66 years]) and 70 patients with lap-IPAA (35 males, 35 females, median age 26 years [range 12–66 years]) were included. There was no difference between ta-IPAA and lap-IPAA regarding age, sex, body mass index or American Society of Anesthesiologists class. The primary colectomy procedure was performed laparoscopically in 95% of the ta-IPPA and 91% of the lap-IPAA patients ($p=0.493$). The mean time between total colectomy and IPAA was 15 and 9 weeks for ta-IPAA and lap-IPAA, respectively ($p=0.048$). A higher proportion of patients with ta-IPAA were treated with biologics preoperatively (98 vs. 82%; $p=0.002$). Patients with ta-IPAA had a significantly higher mean operative time compared to lap-IPAA (277 min vs. 224 min; $p=0.001$). There was no difference in the overall postoperative complication rate (ta-IPAA: 23% vs. lap-IPAA: 23%; $p=0.99$). Pouch-related complications occurred in 13% of the ta-IPAA patients and 29% of lap-IPPA patients ($p=0.402$). There was no difference in the anastomotic leakage rates. Readmission rates were similar in the ta-IPAA and lap-IPAA group (26 vs. 29%; $p=0.85$), including IPAA-related readmissions. The mean follow-up time was 24 and 75 months for ta-IPAA and lap-IPAA, respectively ($p=0.001$), and the ileostomy closure rate was similar in both groups of patients ($p=0.96$).

Conclusions The ta-IPAA approach for UC is a safe procedure and offers acceptable short-time outcomes.

Keywords Ulcerative colitis · Ileal pouch anal anastomosis · Transanal pouch · ta-IPAA · Restorative proctocolectomy · Transanal proctectomy

Introduction

Restorative proctocolectomy with ileal pouch-anal anastomosis (IPAA) is the treatment of choice for most patients with ulcerative colitis (UC) when medical therapy is not sufficient. Up to 32% of patients with UC undergo surgical treatment [1–4]. Laparoscopic surgery has developed into the preferred surgical technique for most colorectal procedures. In patients with UC, laparoscopic restorative

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proctocolectomy has improved the short-term outcomes [5]. Furthermore, when compared with open surgery, patients with inflammatory bowel disease (IBD) operated on with laparoscopy have significantly better cosmesis, body image and improved long-term defecatory function [6–8]. In female patients, infertility rates seem to be reduced when IPAA is performed laparoscopically [9, 10].

However, laparoscopic dissection in the pelvis is still a challenge due to the bony confinement of the pelvis with challenges in visualization and instrumentation in the deep pelvic dissection. This is especially problematic in male patients with a narrow pelvis. In an attempt to reduce conversion rates and improve short- and long-term outcomes, a transanal approach to rectal dissection has developed. The transanal approach was initially described with a total mesorectal excision (ta-TME) in patients with rectal cancer, showing potential technical and oncological advantages compared to transabdominal approach [11].

Initial reports have demonstrated the feasibility and safety of ta-IPAA in patients with UC. Postoperative morbidity and conversion rates to open surgery seem low [12–15]. However, since most studies included limited number of patients, the current data on transanal proctectomy with IPAA (ta-IPAA) in patients with UC are much too small to analyze risk factors for intra- and postoperative complications. Currently, there are only three published studies comparing the transanal approach with either laparoscopic or open approach [16–18].

The aim of this study was to compare short-term outcomes of ta-IPAA with conventional laparoscopic IPAA (lap-IPAA) in patients with UC.

Materials and methods

A single-center retrospective study was conducted on consecutive UC patients treated at our institution. We included all patients with UC undergoing either lap-IPAA or ta-IPAA in the period between January 2013 and December 2020. Indications for surgery were medically refractory disease in all patients. Therefore, all of the patients underwent proctectomy with close rectal dissection in this series. Exclusion criteria were Crohn's disease, previous extensive abdominal surgery and impaired sphincter function.

Laparoscopic colectomy with an end ileostomy had previously been performed in all patients. Data from patients were retrieved from a prospectively maintained database, and patient's medical records were reviewed for data on surgical outcomes.

Patient's demographics included sex, age, body mass index (BMI), American Society of Anesthesiologists (ASA) class and preoperative medication (steroids and biologics/immunomodulators) (Table 1).

Table 1 Patient characteristics

	Ta-pouch $n=65$	Lap-pouch $n=70$	P
Sex, male *n* (%)	34 (52)	35 (50)	0.864
Age, years, mean ± SD	32 ± 12	30 ± 12	0.234
BMI (kg/m^2) mean ± SD	23 ± 4.5	22 ± 3.3	0.445
BMI (kg/m^2) *n* (%)			0.081
< 25	43 (66.2)	56 (80)	
≥ 25	22 (33.8)	14 (20)	
ASA class *n* (%)			0.141
ASA I	10 (15.4)	19 (27.1)	
ASA II	55 (84.6)	51 (72.9)	
Preoperative steroids *n* (%)	59 (93.7)	64 (97)	0.433
Preoperative biologics/immunomodulators *n* (%)	62 (98.4)	54 (81.8)	0.002

Data for age, BMI and time between colectomy and IPAA are presented as mean (S.D.). ASA score, colectomy operation, preoperative steroids and biologics are presented as *n* (%). A higher proportion if patients with ta-IPAA were treated with biologics preoperatively. Otherwise there were no significant differences between the groups

Ta-pouch transanal pouch, *Lap-pouch* laparoscopic pouch, *BMI* body mass index, *ASA* American society of anesthesiologists

Primary outcomes were postoperative complications. Complications were defined as adverse event requiring treatment occurring as a result of surgery. All postoperative complications within 30 days were taken into consideration. The Clavien–Dindo classification [19] was used to grade postoperative complications. Complications were divided into pouch related and non-pouch related. Anastomotic leaks were diagnosed by computed tomography (CT) scan or clinically at the time of reoperation or rectal examination under anesthesia identifying an anastomotic defect.

Secondary outcomes were conversion rates, length of hospital stay (LOS), re-admissions within 30 days and surgical characteristics (Table 2).

Conversion was defined as any change in operative strategy to open or hand-assisted technique. Transanal dissection converted to transabdominal was also considered as conversion.

Surgical technique

All patients were treated with a three-stage approach. Basically, colectomy was performed by a standard multiport procedure, and the ileostomy site or suprapubic incision was used as an extraction site for the resected colon.

ta-IPAA with close rectal dissection and single stapled anastomosis has been described by some of the authors [12]. All operations were performed by two experienced colorectal surgeons. Briefly, patients were placed in the modified lithotomy position. The ileostomy was taking down, and a

Table 2 Postoperative complications, readmission and ileostomy closure

	Ta-pouch $n=65$	Lap-pouch $n=70$	*P*
Total 30-day morbidity (complications), *n* (%)	15 (23.1)	16 (22.9)	0.99
Pouch related, *n* (%)	2 (13.3)	5 (29.4)	0.402
Non-pouch related, *n* (%)	13 (86.7)	11 (68.8)	
Clavien-Dindo grade, *n* (%)			0.413
CD 1	4 (26.7)	1 (6.3)	
CD 2	1 (6.7)	2 (12.5)	
CD 3	10 (66.7)	13 (81.3)	
Clavien-Dindo grade, *n* (%)			0.433
CD 1–2	5 (33.3)	3 (18.8)	
CD 3	10 (66.7)	13 (81.3)	
Anastomotic leakage, *n* (%)	1 (1.5)	3 (4.3)	0.62
Reoperation, *n* (%)	13 (20)	13 (18.6)	0.99
LOS, days mean ± *SD*	8 ± 5	9 ± 7	0.059
Readmission, *n* (%)	17 (26.2)	20 (28.6)	0.85
Pouch-related readmission, *n* (%)	1 (5.9)	2 (10)	0.99
Non-pouch related, *n* (%)	16 (94.1)	18 (90)	
Ileostomy closure, *n* (%)	64 (98.4)	69 (98.6)	0.96
Follow-up, months mean ± *SD*	24 ± 13	75 ± 14	0.001

Data for LOS and follow up are presented as mean (S.D.). Total 30-day morbidity, Clavien-Dindo grade, anastomotic leak, reoperation, readmission and ileostomy closure are presented as *n* (%)

Ta-pouch transanal pouch, *Lap-pouch* laparoscopic pouch, *LOS* length of hospital stay

camera port for the laparoscopy was introduced at the ileostomy site. By using a multiport technique, the small bowel and mesenteric root was fully mobilized. Next, the rectal stump was identified, and a close rectal dissection was performed. The posterior and lateral aspects of the dissection stayed close to the rectal wall all the way down to the pelvic floor. The abdominal phase of the operation was stopped at this level. Then a stapled pouch was created through the ileostomy site or suprapubic incision, with a rubber tube attached to the anvil.

Exposure of the anus was achieved by using circumferential perianal traction sutures to efface the anal canal followed by the introduction of a transanal port. The transanal part of the procedure was started with a purse-string suture that was placed and tied approximately 3 cm above the dentate line. A circular incision was then made just distal to the purse-string. After transmural incision of the distal rectal wall, insufflation was obtained with a TEO electronic CO2 ENDOFLATOR® (Karl Storz GmbH, Tuttlingen, Germany) followed by close rectal dissection. The rectal dissection was continued using both monopolar hook and vessel-sealing device upward all the way around the rectum until the pelvic peritoneal cavity was entered and all aspects of the rectal wall were free. The muscular tube of the rectum was then extracted transanally. The rubber tube attached to the anvil was grasped and retrieved through the anus. Then another purse-string suture was placed at the free edge of the remaining distal rectal cuff, and after the anvil on the shaft of the stapler was connected, a single stapled anastomosis was performed. We confirmed visually that almost all anastomoses were located at the dentate line or a few millimeters above the line in the group of ta-IPAA.

In cases of air leakage or doughnut defects, some additional stitches were placed transanally to reinforce the anastomotic line. A low suction drain was placed presacrally, and a 24-Fr Foley catheter was left in the pouch for decompression. A protective loop ileostomy was created after the transanal procedure.

In patients operated on with a lap-IPAA approach, the proctectomy was performed using a multiport technique. The surgical dissection for proctectomy was the same (close rectal dissection) using monopolar cautery and energy devices. A double-stapled technique was used for anastomosis. There was no handsewn anastomosis in either group.

Statistical analysis

Categorical data are presented as absolute numbers and percentages, and continuous data as mean with standard deviation, unless stated otherwise. Differences between ta-IPAA and lap-IPAA were calculated using a Chi-square test or Fisher's exact test, as appropriate, for categorical variables, and Student's *t* test or Mann–Whitney *U* test, as appropriate, for continuous variables. A p value < 0.05 was considered

statistically significant. Data were collected and analyzed using the statistical package IBM® SPSS® Statistics version 26.0 for Windows.

Results

A total of 135 patients with ulcerative colitis were included in the study, 65 of the patients underwent ta-IPAA (34 males, 31 females, median age 31 years [range12–66 years+) and 70 underwent lap-IPAA (35 males, 35 females, median age 26 years [range 12–66 years]). There was no significant difference between patients with ta-IPAA and lap-IPAA regarding age, sex, BMI or ASA class. A higher proportion of patients with ta-IPAA were treated with biologics/immunomodulators preoperatively (98 vs. 82%; $p=0.002$) (Table 1). The primary colectomy procedure was performed laparoscopically in 95% of the ta-IPPA and 91% of the lap-IPAA patients ($p=0.493$). The mean time between total colectomy and IPAA was 15 ± 25 weeks and 9 ± 8 weeks for ta-IPAA and lap-IPAA, respectively ($p=0.048$) (Table 3).

Patients with ta-IPAA had a longer mean operative time compared to lap-IPAA (277 ± 55 min vs. 224 ± 80 min; $p=0.001$). Intraoperative complications occurred in 1 patient in the lap-IPAA group (Table 3).

No difference was observed in the overall postoperative complication rate (ta-IPAA: 23% vs. lap-IPAA: 23%; $p=0.99$) (Table 2). In the ta-IPAA group, a total of 15 (23.1%) patients had complications within 30 days. In the lap-IPAA group, the total number of patients with 30-day morbidity was 16 (22.9%).Overall pouch-related complications occurred in 2 (13%) of the ta-IPAA patients and 5 (29%) of the lap-IPAA patients ($p=0.402$).In the ta-IPAA group, 13 (86.7%) were not-pouch related vs. 11 (68.8%) in the lap-IPAA group (Table 2).

Anastomotic leak occurred in 1 patient in the ta-IPAA group and in t3 patients in the lap-IPAA group (1.5 vs. 4.3%, $p=0.62$), (Table 2).

Reoperations rates were similar in the ta-IPAA group and the lap-IPAA group ($p=0.99$). The same readmission rates were seen in the ta-IPAA and lap-IPAA group (26 vs. 29%; $p=0.85$), including IPAA-related readmissions. Mean postoperative length of hospital stay was 8 ± 5 days vs. 9 ± 7 for ta-IPAA and lap-IPAA, respectively ($p=0.059$) (Table 2).

The mean follow-up time for the lap-IPAA group was longer than for the ta-IPAA group (75 ± 14 months vs

Table 3 Surgical characteristics

	Ta-pouch $n=65$	Lap-pouch $n=70$	*P*
Colectomy operation *n* (%)			0.493
Laparoscopic	61 (95.3)	61 (91)	
Conversion from STC laparoscopic surgery	1 (1.6)	0 (0)	0.488
Time between STC and J-pouch operation, weeks mean ± *SD*	15 ± 25	9 ± 8	0.048
Time between STC and J-pouch operation, weeks median,range	8 [3–190]	7 [3–39]	
≥ 8 weeks between STC and J-pouch	35 (54.7)	28 (41.8)	0.163
Pouch creation site, *n* (%)			0.001
Suprapubic	15 (23)	0 (0)	
Ileostomy site	48 (74)	70 (100)	
Midline	2 (3)	0 (0)	
Operating time, minutes, mean ± SD	277 ± 55	224 ± 80	0.001
EBL, ml mean ± SD	56 ± 90	81 ± 146	0.225
Anvil size, mm mean (range)	31 (28–33)	30 (28–31)	0.003
Anvil size, mm *n* (%)			0.013
28 mm	3 (4.6)	11 (15.7)	
29 mm	8 (12.3)	12 (17.1)	
31 mm	48 (73.8)	47 (67.1)	
32 mm	1 (1.5)	0 (0)	
33 mm	5 (7.7)	0(0)	
Anvil size, mm *n* (%)			0.047
< 31	11 (16.9)	23 (32.9)	
≥ 31	54 (83.1)	47 (67.1)	
Conversion to open surgery, *n* (%)	0	0	
Intraoperative complications, *n* (%)	0 (0)	1 (1.4)	1

Ta-pouch transanal pouch, *Lap-pouch* laparoscopic pouch, *STC* stoma closure, *EBL* estimated blood loss

24 ± 13 months, $p = 0.001$), and the ileostomy closure rate was similar in both group of patients ($p = 0.96$). (Table 2).

There was no conversion to open surgery in either of the groups.

Discussion

Based on our experience with ta-TME since 2013, we started using the ta-IPAA approach in IBD patients. We predicted that the advantages of improved visualization and absence of multiple staple firings in the transanal approach would lead to fewer conversions to open surgery and reduce the risk of anastomotic complications. Application of a transanal platform to the lower rectal dissection during an IPAA to negate the operative challenges in the deep, narrow pelvis and allow a precise low rectal transection and safe pouch-anal anastomosis was investigated. The findings of our study support our hypothesis and show that ta-IPAA is a safe procedure in patients with UC. We found that the rate of postoperative complications at lap-IPAA and ta-IPAA including anastomotic leak and pouch-related complications was also comparable. In our study, there was no conversion to open surgery in either of the groups. We found comparable anastomotic leak rates and no difference in postoperative complications.

De Buck van Overstraeten et al. compared the outcomes of 97 patients who underwent ta-IPAA with 119 patients who underwent minimally invasive transabdominal IPAA. They found a lower conversion rate and that short-term postoperative complication is 0.52 times lower in the ta-IPAA group, together with a shorter postoperative length of stay and a lower probability of ileus, They concluded that ta-IPAA is a safe procedure resulting in less morbidity [16]. Another study looking at short-term outcomes in ta-IPAA vs. transabdominal IPAA found comparable anastomotic leak rates and 30-day morbidity [17].

A single stapled anastomosis was performed in all the patients with ta-IPAA. This is different from the double-stapled technique used in the laparoscopic approach, where the circular stapler is put in through the anus to perform the anastomosis. One potential benefit of the ta-IPAA is that it gives better control of the rectal cuff. The better visualization and the use of the single-stapled technique could have a positive impact on the anastomotic leak rate or pouch-related complications. Also, the surgeon can evaluate the rectal mucosa closely and make a decision about the precise level of rectal transection and anastomosis. Therefore, this approach also has the potential of reducing the risk of cuffitis in the long-term follow-up period.

The mean operative time was higher in the ta-IPAA group compared to lap-IPAA. This could be because of more experience with laparoscopic surgery. ta-IPAA has a steep learning curve and needs special focus on procedure-specific risks such as rectal perforation or urethral injuries. In addition, the same team performs both transabdominal and transanal dissections consequently, which is a time-consuming procedure together with the accommodation of equipment and staff in operating theatre. The use of a two-team approach, which has been suggested and practiced for ta-TME [20], can decrease operative times because the transanal approach for IBD patients is later introduced in our department and the mean follow-up time for the lap-IPAA group is therefore longer than for the ta-IPAA group.

Patients with UC who undergo restorative proctocolectomy with IPAA are unique because they are typically young people with a chronic disease motivated to get back to a normal life without a stoma and with an improved quality of life. Chandrasinghe et al. did the first study comparing long-term outcomes on ta-IPAA vs. abdominal IPAA including both open and laparoscopic approach in patients with UC. They found comparable quality of life and improved quality of health and energy level in the ta-IPAA group [17].

The improved visualization of the distal rectal dissection in the transanal approach could also be an advantageous in sparing the pelvic autonomic nerves and may, although not investigated yet, improve postoperative functional outcomes. Some studies have suggested that better nerve preservation and close rectal dissection may contribute to better genitourinary function, less pelvic sepsis and greater awareness of pouch filling [21, 22]. At present, there are no prospective randomized controlled studies available and the number of comparative reports that evaluate the outcome of ta-IPAA are limited. A recent comparative study reported a high portion of pouch related complications in ta-IPAA patients [18]. Our results suggest that evolving experience with the transanal approach together with careful patient selection, standardization of rectal dissection and anastomotic technique may improve surgical outcome.

The limitations of this study are its non-randomized nature and retrospective design, creating a risk of selection bias. However, the patients were operated on and followed-up by the same surgical team with a predefined follow-up protocol. Although our study includes no comparison of opioid use or pain scores, all patients had a standardized enhanced recovery

program in the postoperative period. The small number of patients may mask differences between groups and generate a type II statistical error. Furthermore, we have not analyzed the long-term functional results. Minimally invasive IPAA is still being evaluated with introduction of various techniques including, recently, use of a robotic platform.

Conclusions

The present study shows that the ta-IPAA approach for UC is a safe procedure and offers acceptable short-term outcomes. Further large-scale controlled studies are needed to analyze long-term functional outcomes.

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Data availability The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Conflict of interest The authors have no conflicts of interest or financial ties.

Ethical approval The Regional Counsel of Copenhagen (R-21016186) and the Danish Data Protection Agency (P-2021-455) approved this study.

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