



Outcomes after transanal proctectomy with ileal pouch–anal anastomosis in adolescents

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Abstract

Purpose The aim of this study was to describe our initial surgical and functional outcomes of transanal ileal pouch anastomosis (Ta-IPAA) in adolescents.

Methods A total of 16 adolescents' age ≤ 19 underwent consecutive Ta-IPAA on the indication ulcerative colitis (UC) or familial adenomatous polyposis (FAP), between January 2018 and September 2022. Primary outcomes were postoperative complications. Secondary outcomes were conversion rates, intraoperative complications, length of hospital stay (LOS), morbidity within 30 days, surgical characteristics, and functional outcomes.

Results Thirteen adolescents with UC and three with FAP underwent Ta-IPAA. The median age of UC patients was 16. They had a colectomy on the indication UC followed by a Ta-IPAA. Median operating time was 247 min, and there were no conversion or intraoperative complications. Median LOS was 7 days. No anastomotic leakage was observed, and three patients had complications within the first 30 days. Three had late complications. The median bowel movements were 5, and 50% had bowel movements during the night. Three children were operated on the indication FAP with proctocolectomy and Ta-IPAA. There were no conversion or intraoperative complications, and the median bowel movements was 4.

Conclusion Ta-IPAA approach in children seems to be feasible, safe and offers acceptable functional results.

Keywords Ulcerative colitis · FAP · Ileal pouch–anal anastomosis (IPAA) · Transanal pouch (Ta-IPAA) · Restorative proctocolectomy · Adolescents

Introduction

The natural course of pediatric ulcerative colitis (UC) is considered aggressive, with up to 18% of patients undergoing a colectomy [1]. Proctocolectomy with ileal pouch–anal anastomosis (IPAA) is the preferred option for the surgical treatment of UC, because it removes the diseased bowel, reduces the risk of cancer, and preserves a natural route for defecation while maintaining fecal continence and avoiding the need for a permanent stoma [2]. Familial adenomatous polyposis (FAP) is characterized by the development of

thousands of adenomas and the high risk of colorectal cancer if untreated, which leads to total proctocolectomy with ileoanal pouch or ileorectal anastomosis [3].

Patients with an ileal pouch constructed at a pediatric age tend to have a higher rate of postoperative pouch procedure-related complications. However, the long-term pouch retention rate is comparable for pediatric and adult patients after IPAA, and the data support the consideration of IPAA in pediatric patients [4]. However, laparoscopic dissection in the deep pelvis is still a challenge due to the bony confinement of the pelvis, with challenges in visualization and instrumentation. This is especially problematic in patients with a narrow pelvis [5].

The transanal approach offers a new option for minimally invasive pouch surgery, aimed at improving some challenging technical steps in a complex operation. Its main features (good visualization in the lower pelvis, controlled transection of the level of rectum, and single-stapled anastomosis) overcome some limitations of traditional minimally invasive techniques

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[6]. At present, data on transanal proctectomy with IPAA (Ta-IPAA) in the pediatric age group are very limited [7].

The aim of this study was to describe our initial surgical and functional outcomes of Ta-IPAA in adolescents.

Method

This was a single-center retrospective study on consecutive children age ≤ 19 , operated for UC or FAP with colectomy and Ta-IPAA at our institution. We included all 16 patients who underwent a Ta-IPAA in the period between January 2018 and September 2022. Indications for surgery were medically refractory UC or FAP. Exclusion criteria for pouch surgery 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 with UC. Data from patients were retrieved from a prospectively maintained database, and patients' medical records were reviewed for data on surgical and functional outcomes. Patients' demographics included gender, age, body mass index (BMI), American Society of Anesthesiologists score (ASA score), and preoperative medication (steroids and biologics/immunomodulators). Medical treatment, evaluation, and recording of functional outcomes were performed by pediatric gastroenterologists on an outpatient basis (registered on the patients' records), supplemented by a telephone consultation from one of the operating team members.

Primary outcomes were postoperative complications. Complications were defined as adverse events requiring treatment occurring after surgery. All postoperative complications within 30 days were taken into consideration and categorized according to the Clavien–Dindo score.

Secondary outcomes were conversion rates, intraoperative complications, length of hospital stay (LOS), readmissions within 30 days, surgical characteristics, and functional outcomes.

Statistical analysis

Continuous data were summarized by median and interquartile range (IQR). Categorical data were presented by their observed frequencies and percentages. All data management was performed using the statistical package IBM® SPSS® Statistics version 26.0 for Windows.

Surgical technique

All patients with UC were treated with a standardized three-stage approach. 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.

All Ta-IPAA operations were performed by two experienced colorectal surgeons [8]. A brief overview of the procedure is as follows: the UC group of patients were placed in the modified lithotomy position. The ileostomy was taken down and a camera port for the laparoscopy was introduced at the ileostomy site, Fig. 1.

Using a multiport technique, the small bowel and mesenteric root were fully mobilized. Next, the rectal stump was identified and all blood vessels lying between the superior rectal vessels, middle rectal vessels, and rectal wall were divided. The longitudinal muscle fibers of the rectum then were visible, and a close rectal dissection, staying close to the rectal wall, was performed down to the pelvic floor until the seminal vesicles in men and the posterior wall of the vagina in women were visible. The abdominal phase of the operation was stopped at this level. Afterward, a stapled J-pouch, approximately with the limbs of 15 cm, was created through the ileostomy site or suprapubic incision, with a rubber tube attached to the anvil, Fig. 2a, b.

Then, the operative team continued with the perineal part of the procedure. Exposure of the anus was achieved using circumferential perianal traction sutures to efface the anal canal followed by the introduction of a transanal port



Fig. 1 Port placement of laparoscopic part of the Ta-IPAA

(GelPOINT® Path, Applied Medical®, Rancho Santa Margarita, USA), Fig. 3a, b.

The transanal part of the procedure was started with a purse-string suture that was placed and tied approximately 2–3 cm above the dentate line. A circular incision was then made distal to the purse-string suture. After the circular transmural incision of the distal rectal wall, insufflation was obtained, followed by perimuscular dissection, which involved the division of all vessels lying between the distal mesorectum and rectal wall. The rectal dissection was

continued using both a monopolar hook and a vessel-sealing device upward all the way around the rectum, first posteriorly and then anteriorly, pushing the prostate or posterior wall of the vagina forward and the muscular rectal tube backwards until the pelvic peritoneal cavity was entered. When all parts of the rectal wall were free, the muscular tube of the rectum was extracted transanally, Fig. 4a.

The rubber tube attached to the anvil was grabbed and retracted through the anus. Next, another purse-string suture was placed at the free edge of the remaining distal rectal

Fig. 2 **a** Creating of J-pouch ileal reservoir outside the ileostomy site. **b** The anvil shaft of circular stapler is placed in the J-pouch at the ileostomy site before insertion back to the abdominal cavity

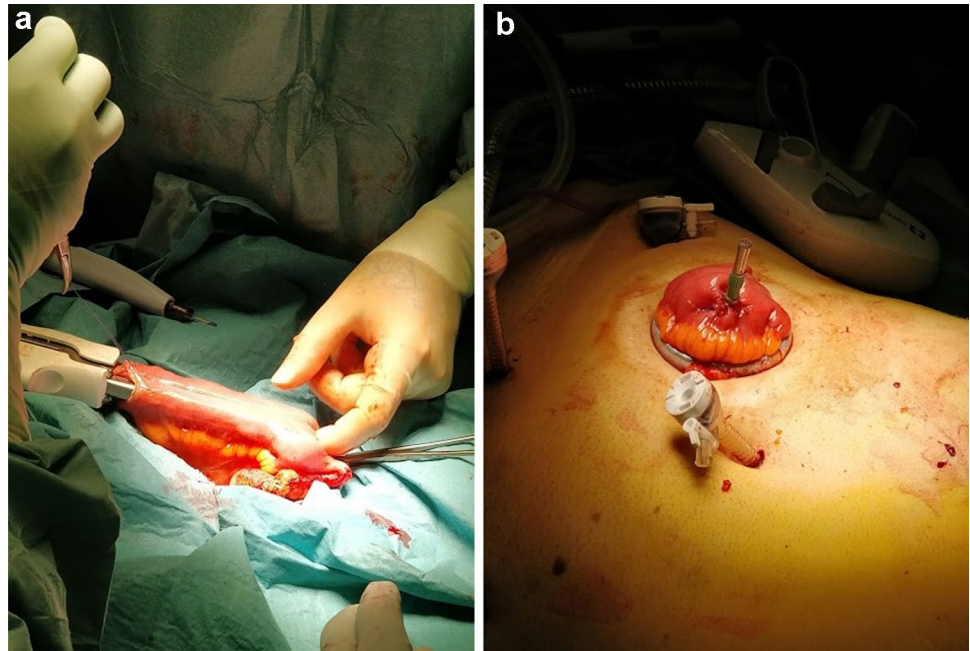
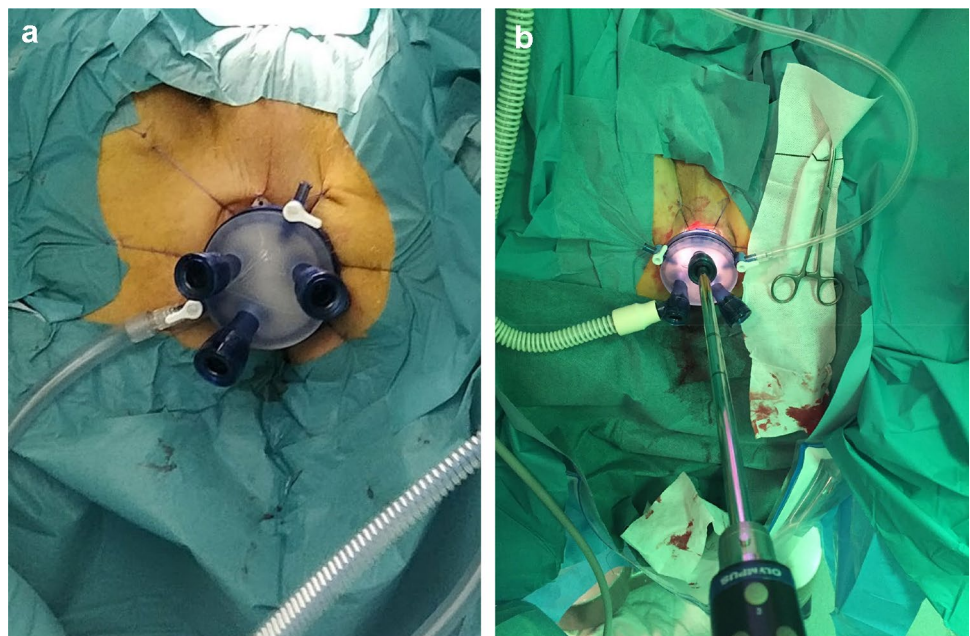


Fig. 3 **a** View of transanal placement of the GelPOINT. **b** A 3-D camera introduced through the GelPOINT



cuff, and after the anvil on the shaft of the stapler was connected, a single-stapled anastomosis was performed, and the anastomoses were located at the dentate line or a few millimeters above the line, Fig. 4b.

Before the stapling procedure of the pouch, the anastomosis orientation was checked laparoscopically. We had also checked laparoscopically the ileostomy site before constructing to be sure that there is no rotation of the small bowel. 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 presacral, and a 24-Fr Foley catheter was left in the pouch for decompression for approximately 5 days. A protective loop ileostomy, approximately 20 cm. above the pouch, was created under laparoscopic view after all pouch procedures, which was reverted after 3 months.

FAP patients had a two-stage operation. Colectomy was performed by a standard multiport procedure, followed by the Ta-IPAA procedure as described above. The ileostomy site was used as an extraction site for the resected colon and rectum.

Results

Thirteen children with UC, with a median age of 16, were included. They each had a colectomy on the indication ulcerative colitis followed by a Ta-IPAA. Steroids (prednisolon/solu-medrol) 1 mg/kg, up to 40 mg was used, if possible, the dose was tapered off before the colectomy, which in most cases was performed in an acute or subacute setting. Different types of biologics were used, starting with infliximab,

and non-responders went on to other types (Vedolizumab and Tofacitinib), Table 1.

The Ta-IPAA was performed median 11 months after the colectomy. All patients had the pouch created at the stoma site. The median operating time was 247 min in the UC group, and there were no conversion or intraoperative complications, Table 2.

Median LOS was 7 days, and no anastomotic leakage was observed. Three patients had complications during the first 30 days—one with a urinary tract infection, one with dehydration, and one stoma rotation—which led to a reoperation, Table 3.

All patients had their stoma closed during the study period. Contrast radiography of the pouch was performed 2 months after the pouch operation. If there was any suspected complication in contrast radiography, an endoscopy was performed.

Follow-up after the stoma closure was median 26 months. Three had experienced late complications, one was

Table 1 Patient characteristics of UC patients

	Ta-IPAA <i>n</i> = 13
Gender, female <i>n</i> (%)	11 (85)
Age median (range)	16 [12–19]
BMI median (range)	19 [14–25]
ASA score <i>n</i> (%)	
ASA II	13 (100)
Preoperative steroids, colectomy, <i>n</i> (%)	13 (100)
Preoperative biologics, colectomy, <i>n</i> (%)	12 (92)

Fig. 4 **a** Transanal extraction of rectum as a muscular tube. **b** The circular stapler is introduced through the anus for performing of stapled anastomosis.

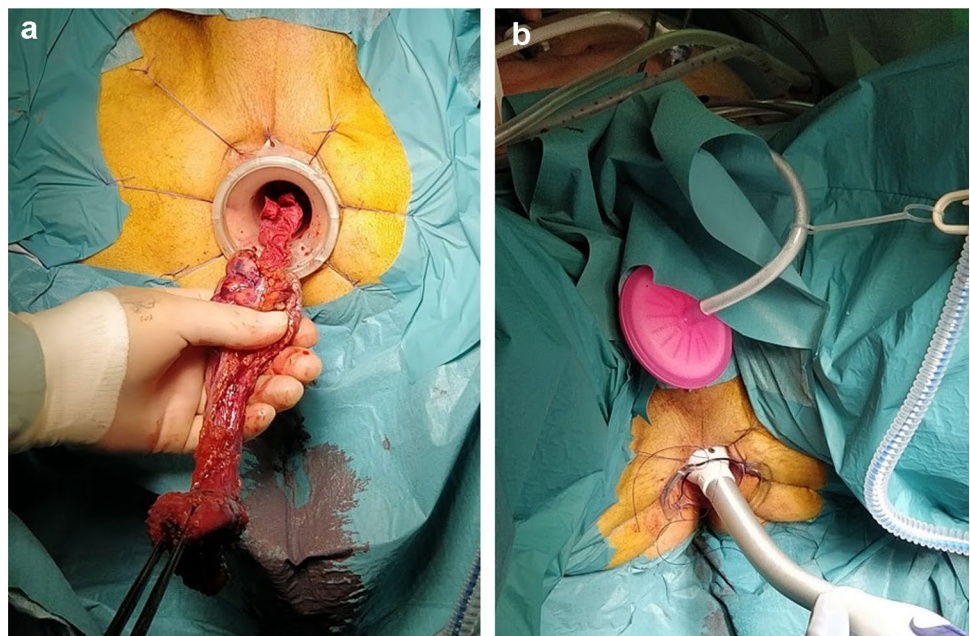


Table 2 Surgical characteristics of UC patients

	Ta-IPAA <i>n</i> = 13
Colectomy operation, <i>n</i> (%)	
Laparoscopic	13 (100)
Conversion from STC laparoscopic surgery, <i>n</i> (%)	0 (0)
Time from STC to Ta-IPAA operation weeks median (range)	11 [3–72]
Pouch creation site, <i>n</i> (%)	
Suprapubic	0
Ileostomy site	13 (100)
Midline	0
Operating time, min. median (range)	247 [190–328]
EBL, ml median (range)	0 [0–300]
Anvil size, mm median (range)	30 [28–33]
Conversion to open surgery, <i>n</i> (%)	0
Intraoperative complications, <i>n</i> (%)	0

STC Standard colectomy, EBL estimated blood loss

Table 3 Post-operative complications and follow-up of UC patients

	Ta-IPAA <i>n</i> = 13
LOS days, median (range)	7 [4–12]
Readmission, <i>n</i> (%)	3 (23)
30-Day morbidity (complications), <i>n</i> (%)	3 (23)
Pouch related, <i>n</i> (%)	1 (8)
Non-pouch related, <i>n</i> (%)	2 (15)
Clavien–Dindo grade, <i>n</i>	
CD 1	1
CD 2	1
CD 3	1
Anastomotic leakage, <i>n</i> (%)	0
Reoperation, <i>n</i> (%)	1 (8)
Ileostomy closure, <i>n</i> (%)	13 (100)
Follow-up, months, median (range)	26 [2–39]
Bowel movements per day, median (range)	5 [4;12]
Patient with bowel movement night, <i>n</i> (%)	6 (46)
Incontinence, <i>n</i> (%)	1 (8)

diagnosed with Crohn’s disease well treated with golimumab, one developed a stenosis at the pouch–anal anastomosis treated with dilatation, and one had pouchitis that responded to antibiotic treatment. Median bowel movements were five, and 50% had bowel movements during the night. Nearly all were totally continent, and the one patient with incontinence reported that it was less than once a week and only during the night. Three used the anti-diarrhea medication loperamide. It seems that almost all patients were satisfied with their pouch except one with Crohn’s disease, who had late complications, and all would recommend it for others.

Three children were operated on the indication FAP with laparoscopic proctocolectomy and Ta-IPAA. There were no conversion or intraoperative complications, and the operation time was median 312 min. LOS was 7 days, and no anastomotic leakage was observed. Two of them had a short period of stoma dysfunction that resolved spontaneously. Besides that, there were no other postoperative complications. All the FAP patients had their stoma closed in the study period (Table 4), and median bowel movements were four.

Discussion

A large series by Özdemir et al. showed that IPAA is well tolerated in the pediatric population, with more than 92% of patients (292 of 315) saying they would undergo IPAA again, and 95.2% (300 of 315) would recommend surgery to other patients [9]. The application of the transanal technique to proctectomy as a part of laparoscopic surgery is a recent step in the surgical treatment of UC and FAP. A recently published consensus paper from ECCO guidelines recommends laparoscopic surgery as a preferred approach [10]. Ta-IPAA is an emerging, minimally invasive surgical technique with promising results [6]. To date, more than 100 patients with Ulcerative Colitis and Familial Adenomatous Polyposis have undergone Ta-IPAA at our institution. A recent meta-analysis has shown no difference in risk for anastomotic leak or other complications when comparing Ta-IPAA to transabdominal IPAA, and functional outcomes and quality of life were satisfying [7]. Until now, there is only one publication describing the initial experience with Ta-IPAA in children and adolescents [11]. Our initial experience, which is the largest series up to date, suggests that

Table 4 Individual patient demographics, surgical data, and follow-up after stoma closure

Patient N	Age at pouch surgery	Gender	BMI	Intraoperative complications	Post-operative complications	Surgical time	LOS	Follow-up months	Bowel movements	Late complications
1	13	F	15.1	Non	Urinary tract infection (CD II)	190	10	39	4	Crohn
2	16	F	25.0	Non		262	7	39	5	
3	19	M	15.3	Non		210	7	37	12	Stenosis
4	19	F	19.8	Non		217	8	36	10	
5	13	M	16.9	Non	Dehydration (CD I)	238	11	34	5	
6	19	F	19.3	Non		328	8	32	4	
7	17	F	21.9	Non		267	5	26	5	
8	19	F	18.5	Non	Small bowel rotation close to the stoma (CD IIIa)	214	12	20	8	
9	19	F	18.9	Non		258	4	8	8	
10	12	F	15.7	Non		279	7	3	5	Pouchitis
11	14	F	19.0	Non		247	8	2	4	
12	15	F	14.0	Non		248	7	2	5	
13	14	F	18.0	Non		217	5	2	5	
FAP										
14	12	F	17.4	Non	Stoma dysfunction (CDI)	291	9	3	4	
15	9	F	17.9	Non		340	6	3	5	
16	11	M	17.6	Non		312	7	2	4	

CD Clavien–Dindo, F female, M male, FAP familial adenomatous polyposis

the technique is feasible and safe, with no cases requiring conversion to a more invasive approach, and there were no anastomotic leaks or other pouch complications.

A single-stapled anastomosis is performed in all patients with Ta-IPAA. This is different from the double-stapled technique used in the laparoscopic approach, where the rectum is transected from above with a stapler. The IPAA leak rate is approximately 10% in high-volume centers [10]. Performing a single-stapled anastomosis and avoiding a multiple-stapled procedure have the potential to reduce anastomotic complications, which is obvious in this series. The other potential benefit of the Ta-IPAA is that it gives better control of the rectal cuff in CU and FAP patients. The better visualization and the use of the single-stapled technique could have a positive impact on the anastomotic leak rate and 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, which is different from the standard laparoscopic IPAA, where the level of transection of the rectum most often is guided by rectal palpation, and the cuff size can vary. Therefore, we expect that this approach has also the potential of reducing the risk of cuffitis in the long-term follow-up period. We did not have a need for mucosectomy or hand-sewn anastomosis in any of our patients.

Our rectal dissection plane was close rectal dissection (CRD) in all patients, and the rectum was removed as a muscular tube. The expected results of this dissection plane were a decreased risk of both injuries to lower urinary tract and sexual dysfunction due to pelvic nerve lesions. In addition, preserving the mesorectal fat might be beneficial in limiting pelvic septic complications. Another issue about the dissection's planes (TME or CRD) is the malignancy risk in UC and FAP patients. However, the disease duration, which is related to early onset of UC and FAP in children, is relatively short and overall risk of malignant transformation is low.

Some might have concerns about stretching the sphincters during the transanal procedure, but our results of bowel function in children who had a Ta-IPAA appear satisfactory, and only one patient reported light incontinence less than once a week during the night. This is comparable with findings among children who had a standard IPAA [9]. In our study, all children were satisfied with the result. These findings were also supported by two recently published studies about functional outcomes and quality of life in adult pouch patients [12, 13]. Long-term pediatric follow-up studies of IPAA suggest that the laparoscopic approach is a preferred option for pediatric patients [14], and the functional outcomes in these patients are better than the outcomes for adults [15]. Their results support our small series, in which both pure laparoscopic and Ta-IPAA performed in adult patients have comparable results [16]. Uncomplicated surgery is crucial for better functional

outcomes. In this context, it is important that the ileostomy site is checked laparoscopically before construction to be sure that there is no rotation of the small bowel. In addition, routine extraction of the colon through the ileostomy site might be very dangerous in the acute setting and the ileostomy opening will be too wide, resulting in a bad stoma. Therefore, every patient needs individual consideration, including the size of the colon, frail gut, close colon dissection, and extracting the cecum initially. When in doubt, a short suprapubic incision should be used. Advanced procedures like transanal proctectomy may be technically more challenging with longer operative times. However, reducing the risk of potential complications should be weighed against that. The three FAP patients have been separated from the UC patients in the data, while their disease is different from UC and their operations were two steps instead of three steps. Although the restorative proctocolectomy procedure with Ta-IPAA took longer operative time, LOS and the functional outcomes were about the same.

The main limitations of the present study are the small patient sample and retrospective design, but the surgical treatment of UC in children and adolescents is not common. The relatively short-term follow-up may give some uncertainty about the final functional outcomes. In addition, medical treatment of these patients could evolve and may contribute with some other confounding factors in surgical and functional outcomes.

Conclusion

Our initial experience with Ta-IPAA approach in adolescents seems to be feasible, safe, and offers acceptable functional results. Further large-scale studies and a long-term follow-up in pediatric patients are needed in the future.

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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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