

# Transanal Proctocolectomy and Ileal Pouch-anal Anastomosis (Taipaa) for Ulcerative Colitis: Medium Term Functional Outcomes in a Single Centre.

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# Abstract

**Background:** Transanal dissection of the rectum has been recently introduced for ileal pouch-anal anastomosis (IPAA) in UC showing promising results. Thanks to the precise identification of the rectotomy site the risk of long rectal stump is avoided, and a single stapled anastomosis is performed easily.

The aim of this study is to analyze our initial experience of transanal IPAA (Ta-IPAA), considering postoperative complications and medium-term functional outcomes.

**Methods:** Our Center has experienced the transanal approach for proctectomy and IPAA since October 2018. All patients underwent Enhanced Recovery After Surgery (ERAS) protocol. Postoperative complications occurring within 30 days after surgery were taken into consideration.

**Results:** Until March 2019, 8 patients underwent Ta-IPAA. In all cases the laparoscopic approach was performed during the transabdominal phase; abdominal drainage was never used. At the time of the pouch construction a defunctioning ileostomy was created in all patients. Stoma closure was performed in all cases at a median time of 6 months after surgery. Postoperative complications occurred in only one patient, who showed rectal bleeding. There were no cases of anastomotic leakage.

Medium-term functional outcomes were determined prospectively by a validated questionnaire (Cleveland Global Quality of Life). Fecal incontinence for liquid or solid stool, restriction in work and social genitourinary and sexual functions were also investigated.

**Conclusions:** In our experience, Ta-IPAA provided good short and medium-term functional results in UC.

## Background

Restorative proctocolectomy is widely adopted in the treatment of ulcerative colitis, as well as in other inflammatory and neoplastic conditions, requiring an ileal pouch-anal anastomosis (IPAA) to reconstruct gastrointestinal continuity to the anus.

Conventionally, either the laparoscopic or the open approach can be employed to gain rectal dissection and creation of ileal pouch-anal anastomosis. Pouch-anal anastomosis is usually made using a stapler, leaving a 2 cm rectal cuff in order to preserve continence and to reduce the risk of inflammatory recurrence or dysplasia. The dissection of the last centimeters of the rectum, rectum resection and ileal pouch-anal anastomosis could be demanding from a technical point of view due to narrow pelvic space and cross stapling of the distal part of the rectum is often challenging for surgeons.

Transanal total mesorectal excision (TaTME) has been recently described in rectal cancer treatment, with potential technical and oncologic advantages compared to transabdominal approach.

The transanal approach for the proctectomy has been described also in IPAA since 2015, showing feasibility and potential technical advantages; some series<sup>1,2</sup> and initial comparative studies have been published<sup>3</sup>, showing a not increased rate of postoperative morbidity, equivalent quality of life and functional results.

The aim of our study is to analyze a single centre experience of transanal IPAA (Ta-IPAA), examining early postoperative complications, medium-term functional outcomes and quality of life.

## Methods

In our Center the transanal approach for restorative proctocolectomy has been performed since August 2018. All epidemiological data were extrapolated from the hospital information system; a unique IBD database was set up. Baseline epidemiological characteristics of the patients were examined; the Mayo Score for UC was used to define the disease activity index. The score, from 0 to 12, includes a measure of stool frequency, rectal bleeding, a physician's global assessment and a measure of mucosal inflammation at endoscopy. Enhanced Recovery After Surgery (ERAS) protocol was applied to all patients. Clavien-Dindo classification was employed to determine postoperative complications. Preliminary functional outcomes were assessed in the outpatient clinic, from 1 to 6 months after ileostomy reversal. Anal continence and quality of life were investigated preoperatively and at 1 and 6 months follow-up.

## Surgical technique

A detailed description about the surgical technique and its variations is reported in the paper from Borja de Lacy. We report here a summary of the surgical procedure. The operation can be performed in two-steps (subtotal colectomy and transanal proctectomy with IPAA and stoma + stoma closure) or three-steps (subtotal colectomy + transanal proctectomy with IPAA and stoma + stoma closure) according to the clinical conditions and choice of the patient<sup>4</sup>.

The abdominal phase can be performed using the laparoscopic or the open approach. The transanal phase starts with the introduction of a GelPoint Path with three working Ports and a standard 10 mms 30° laparoscopic camera to access the rectal lumen. Carbon dioxide is insufflated at a pressure of 12 mmHg. A 0 Polypropylene purse-string suture is placed for rectal lumen closure, 4 cm above the dentate line and the proctotomy is started 1 cm distally. The specimen quality is not a performance indicator in proctectomy for UC, giving the chance to make close rectal dissection or intra-mesorectal dissection close to the bowel wall. This latest approach has the potential advantage to reduce the risk of pelvic nerve and urethral injury but could cause a more relevant blood loss.

Mesorectal dissection continues until the rectal surgeon "meets" the abdominal surgeon from the opposite direction. The specimen should be brought out through the Pfannenstiel mini laparotomy, transanally or through the stoma site, according to the surgeon evaluation. A 12 cm long J-pouch is created with two loops of the small bowel. Another 0 Polypropylene purse-string suture is hooked on the

distal rectal cuff. The end-to-end ileal pouch-anal anastomosis is created with a single circular stapler. The integrity of the anastomosis is evaluated through the reverse air leak test and ICG angiography can be performed to assess adequate mucosal and anastomotic perfusion. A loop ileostomy is created. The stoma closure represents the last phase of surgical treatment and it is performed after endoscopic evaluation of the pouch and pouch-anal anastomosis.

## Results

Between October 2018 and March 2019, in our Colorectal Surgery Unit, 8 patients affected by ulcerative colitis (UC) underwent laparoscopic restorative proctocolectomy (RPC) with combined transanal access (Ta-IPAA).

The median age was 54 years (range 28–79) (Table 1).

Six patients presented at the operation with moderate disease (6–10 Mayo score). Two patients presented at the operation with severe disease and required urgent surgery.

**Table 1.** Clinical details

<i>Patient</i>	<i>Gender</i>	<i>Age</i>	<i>BMI</i>	<i>ASA</i>	<i>Mayo score</i>
<i>1</i>	<i>1</i>	<i>50-60</i>	<i>20-25</i>	<i>3</i>	<i>8</i>
<i>2</i>	<i>1</i>	<i>70-80</i>	<i>20-25</i>	<i>3</i>	<i>9</i>
<i>3</i>	<i>2</i>	<i>50-60</i>	<i>30-35</i>	<i>3</i>	<i>9</i>
<i>4</i>	<i>1</i>	<i>60-70</i>	<i>20-25</i>	<i>3</i>	<i>10</i>
<i>5</i>	<i>1</i>	<i>20-30</i>	<i>20-25</i>	<i>2</i>	<i>9</i>
<i>6</i>	<i>2</i>	<i>50-60</i>	<i>25-30</i>	<i>2</i>	<i>12</i>
<i>7</i>	<i>2</i>	<i>50-60</i>	<i>20-25</i>	<i>2</i>	<i>12</i>
<i>8</i>	<i>1</i>	<i>50-60</i>	<i>25-30</i>	<i>2</i>	<i>9</i>

Six patients underwent three-steps and two patients two-steps procedure. In all cases the multi-portal laparoscopic approach was employed to achieve the subtotal colectomy. We had no cases of conversion from laparoscopy to open surgery. The specimen was brought out through the Pfannenstiel mini laparotomy or through the stoma site in a single case. All patients had a single circular-stapled ileo-anal pouch anastomosis as described above. All patients received a defunctioning skin bridge loop right ileostomy (Table 2).

**Table 2.** Surgical details.

<i>Patient</i>	<i>Operation</i>	<i>Conversion</i>	<i>Anastomosis</i>	<i>Diverting stoma</i>
1	Three-stage RPC	No	Circular Stapler	Yes
2	Three-stage RPC	No	Circular Stapler	Yes
3	Two-stage RPC	No	Circular Stapler	Yes
4	Three-stage RPC	No	Circular Stapler	Yes
5	Three-stage RPC	No	Circular Stapler	Yes
6	Three-stage RPC	No	Circular Stapler	Yes
7	Three-stage RPC	No	Circular Stapler	Yes
8	Two-stage RPC	No	Circular Stapler	Yes

Three-stage RPC [subtotal colectomy + proctectomy and ileal pouch-anal anastomosis (IPAA) + closure of ileostomy]; Two-stage RPC (total proctocolectomy and IPAA + closure of ileostomy).

All patients were enrolled in Enhanced Recovery After Surgery (ERAS) protocol.

### Early post-operative complications

According to Clavien-Dindo classification, postoperative complications were determined occurring within 30 days after surgery. One patient had urinary infection treated with antibiotic therapy after the second phase of surgery (Clavien-Dindo Grade II). One patient had ileus after both operations; fasting was the only therapy used (Clavien-Dindo Grade I). One patient, presented with toxic megacolon at the operation, had pulmonary infection (Clavien-Dindo Grade II). Only one patient required surgical intervention for a large parastomal hernia seven days after surgery (Clavien-Dindo Grade IIIb) (Table 3).

No cases of anastomotic leakage were found.

**Table 3.** Clavien-Dindo classification of post-operative complications.

<i>Patient</i>	<i>Operation</i>	<i>1<sup>st</sup> step surgery Clavien-Dindo</i>	<i>2<sup>nd</sup> step surgery Clavien-Dindo</i>
1	Three-stage RPC	-	II
2	Three-stage RPC	-	IIIb
3	Two-stage RPC	-	-
4	Three-stage RPC	-	-
5	Three-stage RPC	I	I
6	Three-stage RPC	-	-
7	Three-stage RPC	II	-
8	Two-stage RPC	-	-

The median Length Of Stay (LOS) for the first phase of the three-stage surgery was 6,8 days (range 3–16). The LOS for the second phase of the three-stage surgery was 7 days (range 2–14). The LOS for the restaurative proctocolectomy in two step surgery was 5,5 days. Pathological examination showed low-grade dysplasia in all patients. The loop ileostomy was closed at a median time of 6 months after RPC.

**Medium-term functional outcomes**

Medium-term functional outcomes were determined prospectively by a validated questionnaire (Cleveland Global Quality of Life). Fecal incontinence for liquid or solid stool, restriction in work and social life were investigated. Genitourinary and sexual functions were also assessed through the International Erectile Function Score (IEFS-5) for males and Female Sexual Function Index (FSFI) for females.

**Quality of Life Scale**

The Cleveland Global Quality of Life (CGQL) is a simple score specifically designed for patients who underwent pelvic pouch surgery. We investigated three items: the quality of life, quality of health and energy level according to Sample Cleveland Global Quality of Life. The scores were added and the final CGQL utility score was calculated dividing this result by thirty:

**Table 4.** Sample Cleveland Global Quality of Life.

Patient	Quality of life	The quality of health	Energy level	Final Score
1	7	5	5	0.56
2	7	6	8	0.70
3	4	8	4	0.53
4	7	7	6	0.66
5	7	6	6	0.63
6	8	7	7	0.73
7	8	7	6	0.70
8	7	7	6	0.66

We also evaluated patients’ satisfaction about surgery. We asked patients to determine their “happiness after surgery” on a scale from 0 to 10, where 10 was the maximum. Happiness-with-surgery scores ranged from 7 to 10 (median 8) <sup>25</sup>.

**Discussion**

The transanal approach represents the newest option for restorative proctocolectomy (RPC), improving the technical steps of a complex operation and the surgical outcomes. Health-related quality of life for this type of patients is very important, considering their young age and life expectancy.

The technique was first described in human by the Barcelona team in 2015 after the initial animal and cadaveric experiences, with a first case series involving 16 cases<sup>8</sup>. Since then, we found in literature 5 single-case reports<sup>9</sup>, 4 further case series ranging from 8 to 18 cases<sup>9,10,11,12</sup> and three multicentric experiences, reporting partially overlapping cohorts of 97<sup>13</sup>, 62 and 100<sup>14</sup> cases. Described cases vary in indication from IBD to FAP.

The transanal approach can be employed, both in cancer and IBD surgery, to overcome some limitations of the traditional minimally invasive techniques, thus allowing better visualization in the low pelvis and easier dissection of the distal 5 cm of the rectum.

Reported experiences agree that Ta-IPAA allows a better visualization of the distal 5 cm of rectum, making easier the identification of a < 2 cm rectal cuff and a more precise pelvic dissection.

Stapled anastomosis is considered the gold standard<sup>5</sup> and the length of the rectal cuff is one major determinant of quality of life after operation. A cuff length > 2 cm is related to symptomatic inflammatory disease recurrence or neoplastic risk, while a complete mucosectomy requests a colo-anal hand-sewn anastomosis which is associated with poorer continence, lower anal resting pressures and permanent loss of the recto-anal inhibitory reflex with consequent night-time soiling.

Moreover, Ta-IPAA permits the identification of the site for rectal section and the realization of a transanal distal pursestring, avoiding multiple stapler firings for rectal stump closure and lowering the risk of anastomotic leakage.

This technique in IBD treatment was employed only by few expert surgeons; moreover solid data concerning long term functional outcomes are still restricted.

First functional data in a series of TaTME performed for rectal cancer showed preserved urinary and sexual function and low incidence and severity of LARS.

De Buck van Overstraeten A. et al.<sup>13</sup> published short-term outcomes of 97 patients from 3 Institutions who underwent a single incision surgery combined with TaTME for ileoanal pouch construction, compared with 119 cases in which a trans-abdominal approach was employed. They demonstrated the safety of Ta-IPAA for UC and showed a lower rate of 90 days postoperative complications in ulcerative colitis, comparing Ta-IPAA to Trans-abdominal approach.

A more recent paper<sup>14</sup> reported a multicentric experience evaluating the long-term outcomes of Ta-IPAA against Abd-IPAA in restorative proctocolectomy, in 100 vs 274 cases. It shows that there are no statistically significant differences between Ta-IPAA and Abd-IPAA considering quality of life and that Ta-IPAA is associated with higher quality of health and energy level. Furthermore, severe complication rate was significantly reduced, whereas anastomotic leak rate was non significantly lower with Ta-IPAA.

## Conclusion

In conclusion, our small experience confirms preliminary data available showing that Ta-IPAA provides very good short- and medium-term functional results for ileoanal pouch surgery. The major limitation of our study is related to the small number of cases operated in a single center. More studies are needed to confirm our results.

## Abbreviation

(TaIPAA) transanal proctocolectomy and ileal pouch-anal anastomosis, (TaTME) transanal total mesorectal excision, (ERAS) Enhanced Recovery After Surgery, (UC) ulcerative colitis, (RPC) restorative proctocolectomy, (RPC) restorative proctocolectomy, (IBD) inflammatory bowel disease, (CGQL) Cleveland Global Quality of Life

## Declarations

**Ethics Approval and consent to participate:** This study was reviewed and approved by the ethics committee of Campus Bio-Medico University of Rome. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Informed written consent was obtained from all individual participants included in this study

**Consent for publication:** Not applicable.

**Availability of data and materials:** The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

**Competing interests:** The authors declare that they have no competing interests

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**Authors' contributions:** GTC, FC and ME contributions to study conception and design, data analysis and interpretation, and preparation of the manuscript. GM and SL participated in data collection and analysis. MC proofread and revised the manuscript. All authors read and approved the final manuscript.

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## References

1. Kornbluth A, Sachar DB. Ulcerative colitis practice guidelines in adults: American College of Gastroenterology, Practice Parameters Committee. *Am J Gastroenterol* 2010;105: 501–23.

2. Seah D, De Cruz P. Review article: the practical management of acute severe ulcerative colitis. *Aliment Pharmacol Ther* 2016;43: 482–513.
3. Randall J, Singh B, Warren BF, et al. Delayed surgery for acute severe colitis is associated with increased risk of postoperative complications. *Br J Surg* 2010; 97:404–9.
4. Parks AG, Nicholls RJ (1978) Proctocolectomy without ileostomy for ulcerative colitis. *Br Med J* 2:85–88
5. Øresland T, Willem A. Bemelman, Gianluca M. Sampietro, Antonino Spinelli, Alastair Windsor, Marc Ferrante et al. European evidence-based consensus on surgery for ulcerative colitis. *Journal of Crohn's and Colitis*, 2015, 4–25
6. Sylla P, Rattner DW, Delgado S, Lacy AM (2010) NOTES transanal rectal cancer resection using transanal endoscopic microsurgery and laparoscopic assistance. *Surg Endosc* 24:1205–1210;
7. Penna M, Hompes R, Arnold S, Wynn G, Austin R, Warusavitarne J, Moran B, Hanna GB, Mortensen NJ, Tekkis PP, TaTME Registry Collaborative (2017) Transanal total mesorectal excision: international registry results of the first 720 cases. *Ann Surg* 266:111–117.
8. Tasende MM, Delgado S, Jimenez M, Del Gobbo GD, Fernández-Hevia M, DeLacy B, Balust J, Lacy AM. Minimal invasive surgery: NOSE and NOTES in ulcerative colitis. *Surg Endosc*. 2015 Nov;29(11):3313-8
9. Leo CA, Samaranayake S, Perry-Woodford ZL, Vitone L, Faiz O, Hodgkinson JD, Shaikh I, Warusavitarne J. Initial experience of restorative proctocolectomy for ulcerative colitis by transanal total mesorectal rectal excision and single-incision abdominal laparoscopic surgery. *Colorectal Dis*. 2016 Dec;18(12):1162-1166
10. de Buck van Overstraeten A, Wolthuis AM, D'Hoore A. Transanal completion proctectomy after total colectomy and ileal pouch-anal anastomosis for ulcerative colitis: a modified single stapled technique. *Colorectal Dis*. 2016 Apr;18(4): O141-4.
11. Ambe PC, Zirngibl H, Möslin G. Initial experience with taTME in patients undergoing laparoscopic restorative proctocolectomy for familial adenomatous polyposis. *Tech Coloproctol*. 2017 Dec;21(12):971-974.
12. Souzani KL, Nielsen CB, Bulut O. Transanal completion proctectomy with close rectal dissection and ileal pouch-anal anastomosis for ulcerative colitis. *Asian J Endosc Surg* 2018; DOI: 10.1111/ases.12646
13. de Buck van Overstraeten A, Mark-Christensen A, Wasmann KA, Bastiaenen VP, Buskens CJ, Wolthuis AM, Vanbrabant K, D'Hoore A, Bemelman WA, Tottrup A, Tanis PJ (2017) Transanal versus transabdominal minimally invasive (completion) proctectomy with ileal pouch-anal anastomosis in ulcerative colitis: a comparative study. *Ann Surg* 266(5):878–883.
14. Chandrasinghe P, Carvello M, Wasmann K, Transanal ileal pouch-anal anastomosis for ulcerative colitis has comparable long-term functional outcomes to transabdominal approach: a multicentre comparative study. *J Crohns Colitis*. 2019 Oct 22

15. Schroeder KW, Tremaine WJ, Ilstrup DM. Coated oral 5-aminosalicylic acid therapy for mildly to moderately active ulcerative colitis. A randomized study. *N Engl J Med* 1987;317: 1625–9.
16. Dindo D, Demartines N, Clavien PA. Classification of surgical complications - A new proposal with evaluation in a cohort of 6336 patients and results of a survey. *Annals of Surgery*. 2004;240(2):205-213.
17. F. Borja de Lacy, Deborah Susan Keller, Beatriz Martin-Perez, Sameh Hany Emile · Manish Chand, Antonino Spinelli, Antonio M. Lacy (2019) The current state of the transanal approach to the ileal pouch-anal Anastomosis. *Surgical Endoscopy*.
18. Hyman NH, Cataldo P, Osler T. Urgent subtotal colectomy for severe inflammatory bowel disease. *Dis Colon Rectum* 2005; 48:70–3.
19. Bitton A, Buie D, Enns R, et al. Treatment of hospitalized adult patients with severe ulcerative colitis: Toronto consensus statements. *Am J Gastroenterol* 2012; 107:179–94.
20. Alves A, Panis Y, Bouhnik Y, et al. Subtotal colectomy for severe acute colitis: a 20-year experience of a tertiary care center with an aggressive and early surgical policy. *J Am Coll Surg* 2003; 197:379–85.
21. Carannante F, Mascianà G, Lauricella S, Caricato M, Capolupo G.T. Skin bridge loop stoma: outcome in 45 patients in comparison with stoma made on a plastic rod. *Int J Colorectal Dis*. 2019 Dec;34(12):2195-2197.
22. Gustafsson Guidelines for Perioperative Care in Elective Colorectal Surgery: Enhanced Recovery After Surgery (ERAS) Society Recommendations: 2018 *World J Surg* <https://doi.org/10.1007/s00268-018-4844-y>.
23. Rhoden EL, Telöken C, Sogari PR, Vargas Souto CA. The use of the simplified International Index of Erectile Function (IIEF-5) as a diagnostic tool to study the prevalence of erectile dysfunction. *International Journal of Impotence Research*. 2002;14(4):245-250.
24. Carpenter JS, Jones SMW, Studts CR, et al. Female Sexual Function Index Short Version: A MsFLASH Item Response Analysis. *Arch Sex Behav*. 2016;45(8):1897-1905.
25. Fazio VW, O'Riordain MG, Lavery IC, et al. Long-term functional outcome and quality of life after stapled restorative proctocolectomy. *Annals of surgery*. 1999;230(4):575-584; discussion 584-576.
26. Coffey JC, Winter DC, Neary P, Murphy A, Redmond HP, Kirwan WO. Quality of life after ileal pouch-anal anastomosis: an evaluation of diet and other factors using the Cleveland Global Quality of Life instrument. *Diseases of the colon and rectum*. 2002;45(1):30-38.
27. Coffey JC, Dillon MF, O'Driscoll JS, Faul E Transanal total mesocolic excision (taTME) as part of ileoanal pouch formation in ulcerative colitis—first report of a case. *Int J Colorectal Dis*. 2016 Mar;31(3):735-6.
28. Hanke LI, Bartsch F, Förtsch S, Heid F, Lang H, Kneist W. Transanal total mesorectal excision for restorative coloproctectomy in an obese high-risk patient with colitis-associated carcinoma. *Minim Invasive Ther Allied Technol*. 2017 Jun;26(3):188-191
29. Warusavitarne J, Kotze PG Double single-port transanal pouch surgery: a novel technique for rectal excision and ileo-anal pouch anastomosis for ulcerative colitis *J Coloproctol (Rio J)* 37(4):328-331

30. Spinelli A, Cantore F, Kotze PG, David G, Sacchi M, Carvello M Fluorescence angiography during transanal trans-stomal proctectomy and ileal pouch anal anastomosis: a video vignette. *Colorectal Dis.* 2017 20(3):262-263
31. Carvello M, David G, Sacchi M, Di Candido F, Spinelli A Restorative proctocolectomy and ileal pouch-anal anastomosis for right-sided colonic adenocarcinoma in familial adenomatous polyposis: an abdominal laparoscopic approach combined with transanal total mesorectal excision – a video vignette *Colorectal Dis.* 2018 20(4)355-356
32. Zaghiyan K, Warusawitarne J, Spinelli A, Chandransinghe P, Di Candido F, Fleschner P. Technical variations and feasibility of transanal ileal pouch-anal anastomosis for ulcerative colitis and inflammatory bowel disease across continents. *Tech Coloproctol.* 2018;
33. Michelassi F, Lee J., Rubin M., Fichera A., Kasza K., Karrison T. et al. Long-term functional results after ileal pouch anal restorative proctocolectomy for ulcerative colitis: a prospective observational study. *Ann Surg* 2003;238(3): 433–445.
34. Roumen RM, Rahusen FT, Wijnen MH, Croiset van Uchelen FA (2000) “Dog ear” formation after double-stapled low anterior resection as a risk factor for anastomotic disruption. *Dis Colon Rectum* 43:522–52.
35. Keller DS, Reali C, Spinelli A, Penna M, Di Candido F, Cunningham C, Hompes R. Patient-reported functional and quality-of-life outcomes after transanal total mesorectal excision. *Br J Surg.* 2019 Mar;106(4):364-366.