Surgery 174 (2023) 808–812

Contents lists available at ScienceDirect

Surgery

journal homepage: www.elsevier.com/locate/surg

Transanal transection and single-stapling techniques are associated with shorter rectal cuff and lower urgency rate after pouch surgery compared with the double-stapled approach

Antonino Spinelli, MD, PhD[a,b,*], Caterina Foppa, MD, PhD[a,b], Annalisa Maroli, PhD[b], Matteo Sacchi, MD[b], Alessandro Armuzzi, MD, PhD[a,c], Silvio Danese, MD, PhD[d], Willem Bemelman, MD, PhD[d], Michele Carvello, MD[a,b]

[a] Department of Biomedical Sciences, Humanitas University, Via Rita Levi Montalcini 4, Pieve Emanuele, Milan, Italy
[b] Division of Colon and Rectal Surgery, Institute for Treatment and Research (IRCCS) Humanitas Research Hospital, via Manzoni 56, Rozzano, Milan, Italy
[c] Department of Gastroenterology, Inflammatory Bowel Disease Unit (IBD Unit), Institute for Treatment and Research (IRCCS) Humanitas Research Hospital, via Manzoni 56, Rozzano, Milan, Italy
[d] Department of Gastroenterology, Inflammatory Bowel Disease Unit (IBD Unit), San Raffaele Hospital, Milan, Italy

ARTICLE INFO

Article history:
Accepted 18 June 2023
Available online 28 July 2023

ABSTRACT

Background: Ileal pouch-anal anastomosis is most commonly performed by double-stapling technique after rectal transection with a linear stapler. Double-stapling is increasingly criticized for the uneven longer cuffs and potential weak points. A transanal rectal transection and single-stapled anastomosis may potentially overcome the limitations of double-stapling. A single-stapled anastomosis may be accomplished through a transanal rectal transection followed by bottom-up dissection (transanal-ileal pouch-anal anastomosis) or through an abdominal, rectal dissection and subsequent transanal transection and single-stapled anastomosis. The purpose of this study is to compare short-term and functional outcomes of double-stapling versus single-stapled techniques for ileal pouch-anal anastomosis.
Methods: This is a single-institution, ambidirectional study. Patients with ulcerative colitis undergoing ileal pouch-anal anastomosis between 2014 and 2021 were included in the study and allocated into 2 groups: group 1, including double stapled ileal pouch anal anastomosis, and group 2, including single-stapled-ileal pouch-anal anastomosis. The primary endpoint was the difference in functional parameters.
Results: A total of 130 patients were included, 46 undergoing double-stapling-ileal pouch-anal anastomosis and 84 receiving single-stapled ileal pouch-anal anastomosis. Rectal-cuff length (defined as the distance between the dentate line and ileal pouch-anal anastomosis) was shorter after single-stapled compared with double-stapling ileal pouch-anal anastomosis (1.98 ± 0.21 vs 2.20 ± 0.53 cm, $P = .01$). Anastomotic leak rate was comparable between group 1 and group 2 (6% vs 5%, $P = .69$). Functional parameters were comparable except for urgency, which was lower for single-stapled compared with double-stapling ileal pouch-anal anastomosis (8%, vs 30%, $P = .002$).
Conclusion: Single-stapled ileal pouch-anal anastomosis was associated with a shorter rectal cuff and lower urgency than double-stapling ileal pouch-anal anastomosis. In our opinion, these results warrant a prospective multicentric trial to scrutinize and confirm these benefits on a larger scale.

Introduction

Pouch surgery still accounts for technical challenges and high morbidity. It implies 3 well-defined technical steps: rectal dissection, rectal transection, and ileal pouch-anal anastomosis (IPAA).[1,2]

Dissection

As for cancer, rectal dissection can be achieved by open, laparoscopic, robotic, and transanal approaches.[3,4] However, although cancer surgery implies a total mesorectal excision (TME), a close rectal dissection (CRD) is an alternative option with the potential

* Reprint requests: Antonino Spinelli, MD, PhD, Director, Division of Colon and Rectal Surgery, Professor of Surgery, Humanitas University, Institute for Treatment and Research (IRCCS), Humanitas Research Hospital, Via Alessandro Manzoni, 56, 20089, Rozzano, Milan, Italy.
E-mail address: antonino.spinelli@hunimed.eu (A. Spinelli);
Twitter: @AntoninoSpin

https://doi.org/10.1016/j.surg.2023.06.027
0039-6060/

advantages of being nerve-preserving and reducing the risk of postoperative pelvic collection.[5-8]

Transection

A precise rectal transection of the distal rectum near the anorectal junction is not always achievable with minimally invasive staplers due to angulation restraints and pelvic anatomy,[9-11] often leading to oblique staple-line and longer rectal cuff. A rectal cuff longer than 2 cm ("retained rectum") is associated with a higher rate of cuffitis or proctitis.[12,13] An alternative way is to transect the rectum with direct visual control by electrocautery at the desired height with a transanal approach, as described in transanal-ileal pouch-anal anastomosis and, more recently, transanal transection and anastomosis (TTSS)-IPAA.[14]

Anastomosis

The so-called "dog ears" resulting from the double stapled ileal pouch anal anastomosis (DS) technique have been associated with an increased risk of anastomotic leak.[15] Conversely, SS-IPAA showed a lower morbidity[16] and comparable functional outcomes[17] compared with the DS technique. Single-stapled IPAA techniques comply with the recent warning from the US Food and Drug Administration about the increased leak risk resulting from crossed-staple lines.[18] Indeed, a recent study from our group reported a lower anastomotic leak rate after a single-stapling technique in rectal cancer surgery.[19] This study aimed to compare short-term and functional outcomes of SS- and DS-IPAA techniques.

Methods

Design

This is an ambidirectional, single-center cohort study. The included patients were allocated to 2 comparison cohorts according to the type of rectal transection and anastomosis:

- Group 1, including DS-IPAA, which consist of a transabdominal rectal cross-stapling transection and a double-stapled anastomosis.
- Group 2, including SS-IPAA, which consist of a transanal rectal transection and double purse-string single-stapled anastomosis.

Patients were followed regularly until stoma closure; a complete clinical assessment was performed 1 and 6 months after stoma closure. Six months after stoma closure, patients were asked to complete the Pouch Functional Score[20] to assess functional parameters.

The primary endpoint of the study was to compare functional outcomes (number of bowel movements in 24 hours, urgency rate, minor/major incontinence rate) at 6 months after stoma closure, the rate of pouch defunction at 6 months after stoma closure, and the rate of pouchitis after 6 months from stoma closure.

The secondary endpoint included comparing the 30-day and 90-day postoperative complications rates classified according to the Clavien–Dindo scale between group 1 and group 2.

The main comparison analysis was performed between group 1 and group 2. A further sub-analysis performed according to the surgical techniques (DS-, ta-, and TTSS-IPAA procedures) has been included in the supplementary section (Supplementary Tables S1–4).

The study was approved by the local ethical committee and was conducted following the Good Clinical Practices and the ethical principles of the Declaration of Helsinki.

Eligibility criteria

All patients with UC undergoing DS-IPAA and SS-IPAA between January 2014 to August 2021 at a single referral center were included. Patients undergoing IPAA without covering stoma (as in modified 2-stage restorative proctocolectomy) and patients diagnosed with Crohn's disease or familial polyposis syndrome were excluded from the analysis.

Surgical procedures

Pouch construction

The ileal pouch was constructed by a standardized technique: after superior mesenteric pedicle mobilization and further elongation maneuvers, a J pouch was constructed on the most dependent distal ileal loop, with 2 fires of a 100 mm linear stapler. Indocyanine green fluorescence angiography, as previously described,[21] was used to repeatedly evaluate the perfusion of the ileal loop designed for pouch construction after the elongation maneuvers, pouch construction, and creation of the IPAA.

Proctectomy and anastomosis

Details of the surgical steps are summarized in Figure 1.

DS-IPAA

A conventional proctectomy was carried-out transabdominally using an open or laparoscopic (multi-/single-port) approach. The dissection was performed with a monopolar hook for TME or an energy device for CRD. A DS-IPAA was fashioned after anterior distal rectum transection by a laparoscopic linear stapler with a transanal circular stapler.[2]

SS-IPAA

Single-stapled IPAA was accomplished after transanal transection and subsequent rectal dissection from below (ta-IPAA) or after rectal dissection from above with subsequent TTSS-IPAA. Details on both techniques are available in dedicated videos.[22,23]

The rectal cuff was defined as the distance between the dentate line and the anastomosis and was measured intraoperatively for all patients after IPAA creation.

Plane of rectal dissection

In all the groups, a TME was performed for the patients diagnosed with rectal cancer or dysplasia, whereas all other patients underwent a CRD or an "improper TME."

Statistical analysis

Categorical and dichotomous variables are reported as frequencies and percentages; continuous variables were tested for normal distribution using the Shapiro–Wilks test (with $P < .05$ indicating non-normal distribution) and are presented as mean ± SD if normally distributed or as median and IQR if skewed. Categorical and dichotomous variables were analyzed using Pearson's χ^2 statistic with Fisher exact test. Depending on the distribution, continuous variables were analyzed using an unpaired Student's t test or Mann–Whitney U test. Multiple comparisons of normally distributed variables were performed with a one-way analysis of variance with Tukey's correction; skewed variables were compared with Kruskal–Wallis tests using Dunn's correction. Statistical

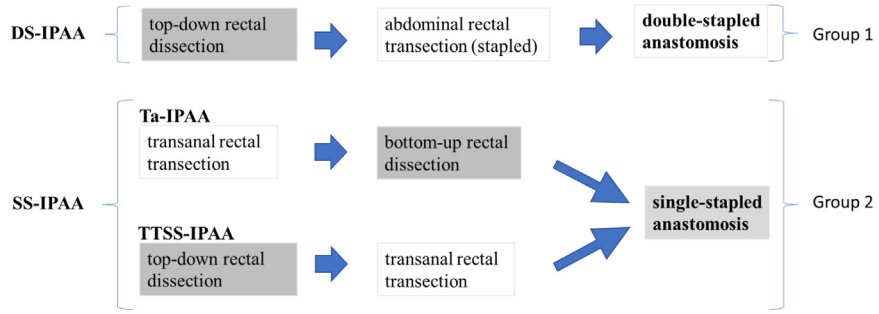

Figure 1. Schematic representation of the surgical steps involved in the procedures. *DS-IPAA*, double-stapling ileal pouch-anal anastomosis; *SS-IPAA*, single-stapled ileal pouch-anal anastomosis; *TTS-IIPA*, transection and single-stapled anastomosis ileal pouch-anal anastomosis.

analysis was performed using SPSS Statistic version 25.0 (IBM SPSS, Inc, Armonk, NY).

Results

After excluding patients undergoing a modified 2-stage proctocolectomy and patients with FAP or CD, a total of 130 patients were included in the study: 46 (35%) patients underwent DS-IPAA and were allocated to group 1; 84 (65%) patients underwent SS-IPAA, 43 (33%) with a Ta-IPAA approach and 41 (32%) with a TTSS-IPAA approach and were allocated to group 2.

Demographic data and baseline characteristics of the patients are reported in Table I.

Patients showed a comparable BMI. Medically refractory UC was the main indication in both the study groups (67% and 77%). Cancer and dysplasia were diagnosed in 34 patients, 15 (32%) in the DS-IPAA group and 19 (23%) in the SS-IPAA group.

The entire study population was followed for 29 (15-57) months. The median follow-up for group 1 was 71 (18-83) months, and for group 2, 25 (15-39) months ($P < .0001$) (for DS-IPAA 71 [18–83], for Ta-IPAA 37 [27–49], and for TTSS-IPAA 15 [12–23] months; $P < .0001$).

Operative data

Table II summarizes the operative data. The percentages of staged procedures (2- and 3-stage restorative proctocolectomy), the operative time, and the rate of minimally invasive surgeries were similar. Close rectal dissection and TME were applied equally among the study groups (43% and 57% in group 1 and 32% and 68% in group 2, respectively). In the DS technique, 1 or a maximum of 2 fires of linear stapler were used, except for the open approach where a TA stapler (one fire) was applied. Group 2 patients had a significantly shorter cuff than group 1 (1.98 ± 0.21 vs 2.20 ± 0.53; $P = .01$).

Postoperative outcomes

The duration of hospital stay was significantly shorter in group 2 compared with group 1 (6 [5–7] vs 7 [6–8]; $P = .02$). The rate of 30- and 90-day complications, including anastomotic leaks and reoperations was comparable (19% and 4% for group 1 and 12% and 7% for group 2, respectively; Table III). Within 90 days from surgery, 7 (5%) anastomotic leaks were reported, 3 occurring in the DS-IPAA group (3/46, 6%), 4 in the SS-IPAA group (4/84, 5%; $P = .69$).

Table I
Demographics and baseline characteristics, mean ± SD, *n* (%)

	Group 1 (DS)	Group 2 (SS)	*P* value
Characteristics			
No. of patients	46	84	
Sex, females	24 (52%)	37 (44%)	.46
Age, y	46 ± 15	45 ± 14	.29
BMI, kg/m^2	23.68 ± 3.27	23.00 ± 3.34	.34
Surgical indication			.27
UC	31 (67%)	65 (77%)	
UC and CRC/dysplasia	15 (33%)	19 (23%)	
Comorbidities	14 (30%)	30 (36%)	.57
Smoking	2 (4%)	7 (8%)	.49
ASA grade			.90
ASA I	15 (33%)	27 (32%)	
ASA II	29 (63%)	54 (64%)	
ASA III	2 (4%)	3 (4%)	

Dichotomous and categorical variables are analyzed using a Pearson's χ^2 statistic; continuous variables are analyzed using a 2-sided Student's *t* test and 1-way analysis of variance with Tukey's correction.
ASA, American Society of Anesthesiologists; *BMI*, body mass index; *CRC*, colorectal cancer; *FAP*, familiar adenomatous polyposis; *UC*, ulcerative colitis.

Table II
Operative data, median (IQR), *n* (%)

	Group 1 (DS)	Group 2 (SS)	*P* value
Characteristics			
No. of patients	46	84	
Staged procedure			.34
2-stage	19 (41%)	27 (32%)	
3-stage	27 (59%)	57 (68%)	
Operative time, min	298 (259-363)	284 (230-347)	.17
Surgical approach			.07
Laparoscopic	40 (87%)	81 (96%)	
Open	6 (13%)	3 (4%)	
Conversion to laparotomy*	2 (5%)	3 (4%)	1.00
Mesorectal dissection			.25
Close rectal	20 (43%)	27 (32%)	
TME	26 (57%)	57 (68%)	
Rectal cuff length, cm	2.20 ± 0.53	1.98 ± 0.21	.01

Dichotomous and categorical variables are analyzed using a Pearson's χ statistic; continuous variables are analyzed using a 2-sided Student's *t* test or Mann-Whitney *U* test and 1-way analysis of variance with Tukey's correction or Kruskal-Wallis analysis of variance test.
TME, total mesorectal excision.
* Percentage calculated on the number of laparoscopic procedures.

Functional outcomes

Functional data were retrieved from the Pouch Functional Score questionnaires collected 6 months after stoma closure. Six patients were excluded from the analysis: 2 patients died before stoma

Table III
Early postoperative outcomes, median (IQR), % (*n*)

	Group 1	Group 2	*P* value
Outcomes			
No. of patients	46	84	
Duration of hospital stay, d	7 (6–8)	6 (5–7)	.02
30-d complications	9 (19%)	10 (12%)	.30
Clavien–Dindo I	1 (2%)	3 (3%)	
Clavien–Dindo II	5 (11%)	5 (6%)	
Clavien–Dindo IIIa	3 (6%)	1 (1%)	
Clavien–Dindo IIIb	-	1 (1%)	
90-d complications	2 (4%)	6 (7%)	.71
Clavien–Dindo I	-	1 (1%)	
Clavien–Dindo II	-	3 (3%)	
Clavien–Dindo IIIa	1 (2%)	-	
Clavien–Dindo IIIb	1 (2%)	2 (2%)	
Anastomotic leak	3 (6%)	4 (5%)	.69
Reintervention	1 (2%)	3 (3%)	1.00
Readmission	2 (4%)	4 (5%)	1.00

Dichotomous and categorical variables are analyzed using a Pearson's χ^2 statistic; continuous variables are analyzed using a 2-sided t-test or Mann-Whitney *U* test and 1-way analysis of variance with Tukey's correction or Kruskal-Wallis analysis of variance test.
IQR, interquartile range.

Table IV
Stoma closure and functional parameters, median (IQR), *n* (%)

	Group 1 (DS)	Group 2 (SS)	*P* value
Outcomes			
No. of patients	42	82	
Time to stoma closure, mo	4 (3–7)	5 (3–8)	.32
Overall follow-up, mo	71 (18–83)	25 (15–39)	< .0001
Pouch defunction	2 (4%)	2 (2%)	.60
Pouchitis	13 (31%)	25 (30%)	1.00
Functional outcomes*			
No. of evacuations per day	6 (5–8)	7 (6–9)	.02
Urgency	12 (30%)	6 (8%)	.002
Antidiarrheal medications	18 (45%)	14 (17%)	.002
Minor incontinence	9 (22%)	8 (10%)	.09
Major incontinence	-	2 (2%)	.55

Dichotomous and categorical variables are analyzed using a Pearson's χ^2 statistic; continuous variables are analyzed using a Mann-Whitney *U* test and Kruskal-Wallis test.
IQR, interquartile range.
* Calculation performed on patients with a functional pouch: group 1 = 40; group 2 = 80; double-stapling ileal pouch-anal anastomosis = 40; transanal transection and subsequent rectal dissection from ileal pouch-anal anastomosis = 42; transection and single-stapled anastomosis ileal pouch-anal anastomosis = 38.

reversal due to cancer progression (1 in group 1 and 1 in group 2), and 4 patients (3 in group 1 and 1 in group 2) decided not to close the ileostomy for a personal decision, in the absence of any contraindication to stoma closure. Four pouch failures due to refractory pouchitis were recorded, 2 in group 1 and 2 in group 2. A significantly higher rate of urgency (30% vs 8%; $P = .002$) with higher consumption of constipating medication (45% vs 17%; $P = .002$) was registered for group 1 compared with group 2 patients. The rate of patients reporting minor or major incontinence was comparable in the study groups (22% and 0% in group 1 and 10% and 2% in group 2, respectively; $P = .09$ and $P = .59$; Table IV).

Discussion

Our results show that SS-IPAA is associated with a significantly shorter rectal cuff and a lower urgency rate than DS while allowing comparable short-term outcomes.

We found a lower urgency rate when SS was adopted compared with DS. Peculiar aspects of transanal techniques might explain this result. As already hypothesized for stapled hemorrhoidectomy, cross-stapling of the lower rectum (especially in the case of multiple firings and oblique stapling) may increase the chances of incorporating parts of the proprioceptive nerves of the pelvic floor, potentially resulting in increased urgency.[24] Moreover, the double-stapled approach may lead to an uneven rectal transection (with different heights on transection sides and different lengths from the dentate line), and the use of circular stapling may produce a 3-dimensional distorted anastomosis conformation as a result of the cross-stapling. Conversely, transanal approaches allow the precise access and decision of the rectal cuff length, decreasing the risk of the long cuff and cuffitis,[13] which might explain the lower urgency rate reported in our study and less antidiarrheal drug consumption. We are aware of concerns over the potential anal stretching with a transanal approach. However, we did not find a difference in terms of continence in our study

After excluding the nondiverted patients, we found a comparable leak rate in the study groups, probably due to the limited sample size and the overall low rate of anastomotic leaks, which might have prevented a conclusive comparison analysis.

Study limitations

Some important limitations in our study need to be acknowledged. The inclusion window of the study spans about 10 years when an enhanced postoperative protocol has been implemented, and surgical expertise has been consolidated. Additionally, although DS-IPAA (historical cohort) was performed mostly in the early period of the study, SS-IPAA techniques have been mostly applied in the past years since their introduction. The time-stratification of surgical approaches likely justifies the significant reduction in duration of stay and duration of surgery and the increased rate of laparoscopic and single-port adoption. Similarly, the shorter follow-up of patients with an SS-IPAA should be considered when interpreting long-term function and pouch failure rates and may prevent a firm conclusion on long-term results. On the other hand, the high rate of stoma closure (≤90%) confirms the safety of the SS-IPAA.

In conclusion, our study shows that the adoption of transanal transection and single-stapling techniques reduces the length of the rectal cuff in pouch surgery compared with the double-stapling approach and may represent one of the factors accounting for the reduced rate of urgency observed. In our opinion, these results warrant a prospective multicentric trial to scrutinize and, eventually, confirm these benefits on a larger scale.

Funding/Support

This research did not receive any specific funding from any agencies in the public, commercial, or not-for-profit areas.

Conflict of interest/Disclosure

Antonino Spinelli was a consultant for Takeda, Johnson & Johnson, and Sofar; Michele Carvello was speaker for Pfizer and Takeda; the other authors have nothing to disclose.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at https://doi.org/10.1016/j.surg.2023.06.027.

References

1. Spinelli A, Carvello M, D'Hoore A, Foppa C. Integration of transanal techniques for precise rectal transection and single-stapled anastomosis: a proof of concept study. *Colorectal Dis*. 2019;21:841–846.
2. Kirat HT, Remzi FH. Technical aspects of ileoanal pouch surgery in patients with ulcerative colitis. *Clin Colon Rectal Surg*. 2010;23:239–247.
3. Flynn J, Larach JT, Kong JCH, Warrier SK, Heriot A. Robotic versus laparoscopic ileal pouch-anal anastomosis (IPAA): a systematic review and meta-analysis. *Int J Colorectal Dis*. 2021;36:1345–1356.
4. Ahmed Ali U, Keus F, Heikens JT, et al. Open versus laparoscopic (assisted) ileo pouch anal anastomosis for ulcerative colitis and familial adenomatous polyposis. *Cochrane Database Syst Rev*. 2009;1:CD006267.
5. Bartels SA, Gardenbroek TJ, Aarts M, et al. Short-term morbidity and quality of life from a randomized clinical trial of close rectal dissection and total mesorectal excision in ileal pouch-anal anastomosis. *Br J Surg*. 2015;102:281–287.
6. Carvello M, Bellato V, Maroli A, et al. A multidisciplinary approach to rectal cancer treatment in ulcerative colitis results in high rate of restorative minimally invasive surgery. *J Crohns Colitis*. 2022;16:244–250.
7. Moslein G. Surgical considerations in FAP-related pouch surgery: could we do better? *Fam Cancer*. 2016;15:457–466.
8. Akiyoshi T, Kuroyanagi H, Oya M, et al. Factors affecting the difficulty of laparoscopic total mesorectal excision with double stapling technique anastomosis for low rectal cancer. *Surgery*. 2009;146:483–489.
9. Braunschmid T, Hartig N, Baumann L, Dauser B, Herbst F. Influence of multiple stapler firings used for rectal division on colorectal anastomotic leak rate. *Surg Endosc*. 2017;31:5318–5326.
10. Zhou S, Zhou H, Zheng Z, Liang J, Zhou Z, Wang X. Predictive risk factors for anastomotic leakage after anterior resection of rectal cancer in elderly patients over 80 years old: an analysis of 288 consecutive patients. *World J Surg Oncol*. 2019;17:112.
11. Brannigan AE, De Buck S, Suetens P, Penninckx F, D'Hoore A. Intracorporeal rectal stapling following laparoscopic total mesorectal excision: overcoming a challenge. *Surg Endosc*. 2006;20:952–955.
12. Nobel T, Khaitov S, Greenstein AJ. Controversies in J pouch surgery for ulcerative colitis: a focus on handsewn versus stapled anastomosis. *Inflamm Bowel Dis*. 2016;22:2302–2309.
13. Kayal M, Plietz M, Rizvi A, et al. Inflammatory pouch conditions are common after ileal pouch anal anastomosis in ulcerative colitis patients. *Inflamm Bowel Dis*. 2020;26:1079–1086.
14. de Lacy FB, Keller DS, Martin-Perez B, et al. The current state of the transanal approach to the ileal pouch-anal anastomosis. *Surg Endosc*. 2019;33:1368–1375.
15. Roumen RM, Rahusen FT, Wijnen MH, Croiset van Uchelen FA. "Dog ear" formation after double-stapled low anterior resection as a risk factor for anastomotic disruption. *Dis Colon Rectum*. 2000;43:522–525.
16. de Buck van Overstraeten A, Mark-Christensen A, Wasmann KA, et al. Transanal versus transabdominal minimally invasive (completion) proctectomy with ileal pouch-anal anastomosis in ulcerative colitis: a comparative study. *Ann Surg*. 2017;266:878–883.
17. Bislenghi G, Denolf M, Fieuws S, Wolthuis A, D'Hoore A. Functional outcomes of transanal versus transabdominal restorative proctectomy with ileal pouch-anal anastomosis in ulcerative colitis-a monocentric retrospective comparative study. *Langenbecks Arch Surg*. 2022;407:3607–3614.
18. US Food & Drug Administration. Surgical staplers and staples for internal use: labeling recommendations. Available from: https://www.fda.gov/regulatory-information/search-fda-guidance-documents/surgical-staplers-and-staples-internal-use-labeling-recommendations. Accessed October 21, 2021.
19. Spinelli A, Foppa C, Carvello M, et al. Transanal transection and single-stapled anastomosis (TTSS): a comparison of anastomotic leak rates with the double-stapled technique and with transanal total mesorectal excision (TaTME) for rectal cancer. *Eur J Surg Oncol*. 2021;47:3123–3129.
20. Lovegrove RE, Fazio VW, Remzi FH, Tilney HS, Nicholls RJ, Tekkis PP. Development of a pouch functional score following restorative proctocolectomy. *Br J Surg*. 2010;97:945–951.
21. Spinelli A, Carvello M, Kotze PG, et al. Ileal pouch-anal anastomosis with fluorescence angiography: a case-matched study. *Colorectal Dis*. 2019;21:827–832.
22. 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 [e-pub ahead of print] *Colorectal Dis*; 2017. https://doi.org/10.1111/codi.13992.
23. Spinelli A, Foppa C, Carrano FM, Sacchi M, Carvello M. Transanal transection and single-stapled anastomosis for ileo-anal pouch surgery: a video vignette. *Colorectal Dis*. 2021;23:2483–2484.
24. Cheetham MJ, Mortensen NJ, Nystrom PO, Kamm MA, Phillips RK. Persistent pain and faecal urgency after stapled haemorrhoidectomy. *Lancet*. 2000;356:730–733.