

Ileal Pouch Anal Anastomosis with Close Rectal Dissection Using Automated Vessel Sealers for Ulcerative Colitis: A Promising Alternative

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Key Words

Ulcerative colitis · Ileal pouch anal anastomosis ·
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Abstract

Background: Despite decennia of experience, ileal pouch anal anastomosis for ulcerative colitis is still associated with high complication rates. The development of automatic vessel sealers has resulted in the revival of a promising surgical alternative to the conventional procedure: close rectal dissection. By preserving the mesorectal layer it is hypothesized that nerve-related and other postoperative complications can be reduced. **Methods:** All patients with ulcerative colitis with indication for restorative proctocolectomy at our institution during the pilot study underwent the close rectal pouch procedure with temporary diverting ileostomy. Standardized clinical history, anorectal physiology measurements, and endoscopic and histological examination were carried out before and after surgery. **Results:** The procedure was technically successful in all 10 patients, with a median age of 41 years and a median postoperative follow-up period of 16 months. There were no cases of pelvic sepsis and bladder or sexual dysfunction. The median daytime defecation frequency was 6.0. Endoscopic and histological examination showed no abnormalities. The anorectal physiology supported the good functional results. **Conclusion:** The prelim-

inary results of the close rectal pouch procedure are promising, with good functional results and a low complication rate after 1 year.

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Introduction

Surgery is an essential modality in the treatment of ulcerative colitis (UC). In UC the most common surgical indication is severe refractory colitis. The side effects associated with chronic medical therapy, in particular corticosteroids, are another reason for patients and doctors to seek a more definitive solution. Eventually, up to 30% of all UC patients will undergo surgery after 10 years of disease onset [1, 2].

The ability to restore oral-anal continuity has been an important milestone in the surgical management of UC [3]. Two surgical restorative options gained wide acceptance. Ileorectal anastomosis proved useful in certain patient subgroups, mainly in UC patients with mild proctitis. The downside is the residual rectal mucosa and the associated risk of malignant degeneration. The second option, restorative proctocolectomy by means of an ileal pouch anal anastomosis (IPAA), progressed to become the gold standard for restorative surgery for the majority of UC patients [3].

Table 1. Questions regarding sexual and bladder dysfunction

Bladder dysfunction
Do you experience any problems with urination?
Sexual dysfunction for women
Do you experience pain during sexual intercourse?
Sexual dysfunction for men
Do you experience a problem with getting an erection?
Do you suffer from retrograde ejaculation?

Despite decennia of experience, IPAA is still associated with high complication rates. Adoption of the double-stapled approach for the anastomosis by most surgeons has arguably resulted in an improvement in functional results [4]. Studies regarding the routine use of a defunctioning ileostomy did not show any reliable differences in terms of complication rates [5], especially pelvic sepsis. The use of ileostomy therefore remains a matter dependent on the surgeon's preference and experience [6].

Currently, major complications still pose an important challenge for restorative surgery. Pelvic sepsis occurs in up to 12% of all cases [7–10], sexual dysfunction occurs in 4% [11], and the rate of pouch failure varies up to 8% [10, 11].

Close rectal or perimuscular dissection (CRD) [12] was first described in 1972. Despite promising preliminary results, the technique was found to be laborious and few surgeons adopted it. With the development of the electrothermal bipolar vessel sealer (EBVS) and ultrasound dissection [13] the technique has been substantially simplified. Several series have since shown that this technique is safe and promising [14–18]. The main distinction of the CRD technique is in the way the dissection of the rectum is performed. In this technique the rectum is dissected through the nonanatomic perimuscular plane in an effort to avoid damage to the pelvic autonomic nerves, which lie immediately outside the mesorectal plane. This is hypothesized to reduce nerve-related postoperative complications like sexual dysfunction. In addition, with preservation of the mesorectal fat it is hypothesized that there will be less room in the pelvis for postoperative hematoma or fluid collections. This can reduce the risk of subsequent infection and abscess formation in the deep pelvis. Finally, in case of potential leakage of the anastomosis, the mesorectal fat can help contain such leakage, protecting the remainder of the pelvis and potentially avoiding pelvic sepsis.

The goal of this pilot study is to evaluate whether CR-IPAA is a safe procedure that could potentially reduce the complication rate, especially in terms of pelvic sepsis and autonomic nerve damage.

Material and Methods

Ethics and Patient Selection

The medical ethics committee of the Radboud University Nijmegen Medical Centre approved this study. Ten patients, all with UC, with an indication for surgical treatment by means of an IPAA procedure during this pilot study were suitable candidates for the study. Written informed consent was obtained before the inclusion of any patient.

Surgical Technique

Patients were admitted to the hospital 1 day before surgery to undergo preoperative assessment and preparations. Antibiotic prophylaxes were administered to all patients immediately before surgery. The patients were placed in the lithotomy position. The procedure was performed through a Pfannenstiel or a low midline incision. (Laparoscopic) subtotal colectomy with end ileostomy was in most cases performed as a staged procedure prior to proctectomy and IPAA. This was the case for both elective and acute (e.g. toxic mega colon) procedures. During pouch formation, the rectum was dissected according to the CRD technique [12]. The dissection was conducted circular to the mesorectum, in the nonanatomic perimuscular plane, thereby preserving the mesorectum fat layer just outside the rectum. The dissection was aided by EBVS (Ligasure®; Covidien, USA). Subsequently, a J-pouch was constructed from the distal ileum in a conventional manner. The anastomosis was performed as a stapled pouch-anal anastomosis. Because the mesorectal thickness is minimized to almost zero at the level of the pelvic floor, the pouch-anal anastomosis is at the same level and identical to the anastomosis of the conventional IPAA procedure. A diverting ileostomy was performed routinely in all patients. Oral-anal continuity was restored approximately 3 months after clinical and radiological assessment of a healed pouch and pouch-anal anastomosis.

Follow-Up

Patients were seen in the outpatient clinic at 3 weeks and 3, 6, and 12 months after surgery. At every visit a standardized history was taken, with emphasis on defecation frequency and level of continence. Any complications were recorded. Pelvic sepsis was defined as a pelvic abscess, anastomotic leakage or dehiscence or a pelvic or perineal wound infection.

Functional Results

Defecation frequency and questions about incontinence were scored. Physical examination was performed, including inspection of the anus and digital rectal examination. There were four questions addressing sexual and bladder dysfunction (table 1).

Anorectal Physiology

Evaluation of anorectal function was performed preoperatively and at 1 year postoperatively. Anal sphincter pressure was measured by circular 4-channel low compliance water fusion manom-

etry (Mui Scientific, Mississauga, Ont., Canada). Volume capacity was measured by means of balloon distention. All measurements were performed in the left supine position [19–21].

Endoscopy

Endoscopy was performed at 3 months and 1 year to evaluate the pouch mucosa and inflammatory activity and to take multiple biopsies.

Pathology

The proctocolectomy specimens were processed for histopathology to examine the dissection planes and confirm the diagnosis of colitis ulcerosa. Biopsies of the mucosa, taken at endoscopy, were processed for detailed routine histopathological evaluation.

Mesorectal Evaluation

To support the close rectal dissection principle, we performed MRI scans pre- and postoperatively. To our knowledge, there is no objective measurement for the volume of the mesorectum. The mesorectum is mobile and adapts its shape to every change in the rectum or pouch volume. Therefore, we determined the presence of the mesorectum at three levels on the MRI scans.

Statistical Analysis

Descriptive statistics were used to summarize patient demographics, clinical data, surgical details, morbidity, and fecal incontinence. Continuous data were tested using a paired t test, and otherwise the Wilcoxon signed-rank test was used. $p < 0.05$ was considered statistically significant. SPSS® version 16.0 (SPSS, Chicago, Ill., USA) was used for all statistical analyses.

Results

All patients referred to our institution for an IPAA procedure during the study period consented to participate in this study and were thus included. In total 10 consecutive patients underwent an IPAA procedure with CRD. The group consisted of 6 men and 4 women, all diagnosed with UC. Six of 10 patients suffered severe colitis (Mayo score of 3 points [22]), and the other patients suffered medical refractory mild-to-moderate colitis. Half of the patients were operated on in an acute stage (e.g. toxic colitis). None of the subtotal colectomy specimens showed evidence of dysplasia. The median age at surgery was 41 years (range 21–53). Surgical data and preoperative medication specifications are listed in table 2.

Surgical Parameters

The procedure was technically successful in all patients. The median surgical time was 247 min (range 133–332). The median blood loss was 425 ml (range 200–900). The median hospital stay was 9 days (range 6–16). The median interval to closure of the ileostomy was 4.5 months.

Table 2. Surgical data of the patient population (n = 10)

Immunomodulating medication preoperative to subtotal colectomy, n	5
Immunomodulating medication preoperative to construction of pouch, n	0
First-stage surgery in primary hospital before reference to our hospital, n	5
Two-stage procedure, n	1
Three-stage procedure, n	9

Follow-Up

All patients completed the direct postoperative follow-up. The median follow-up period was 16 months (range 7–37).

Postoperative Complications

One patient developed a 5-cm presacral abscess 1 month postoperatively which was drained radiologically. This patient suffered minimal systemic symptoms and had an uneventful recovery.

Five patients had minor complications. Two patients had gastroparesis, for which conservative treatment was sufficient. Three infectious complications occurred in three patients, i.e. two urinary tract infections and one pulmonary infection, and all could be treated with antibiotics.

None of the patients suffered bladder or sexual dysfunction preoperatively, and postoperatively there were no cases of bladder dysfunction or sexual dysfunction.

Functional Results

The recorded daily defecation frequency had a median of 6.0 in all patients (range 3–8.5). The median nocturnal frequency after 1 year was 1.5 (range 0.5–3.5). Three patients reported occasional nocturnal soiling. Passive and urge incontinence was not reported.

Anorectal Physiology

Anorectal manometry was performed in all patients to objectively assess anorectal function. For the seven patients with at least 1 year of follow-up the preoperative and 1-year follow-up manometry results were compared. The maximal tolerated volume increased from 68 ml (preoperative rectum measurements) to a median of 193 ml after 1 year (postoperative pouch measurement) ($p = 0.03$). The first sense and first urge volumes also increased significantly after 1 year ($p = 0.01$ and $p = 0.02$). All of the results are shown in table 3.

Table 3. Pre- and postoperative anal sphincter manometry and reservoir function

	Normal values	Median preoperative values (range)	Median postoperative (1 year) values (range)	p
Anal sphincter				
Maximal resting pressure, mm Hg	43–89	60 (30–70)	60 (23–90)	0.63
Maximal squeeze pressure, mm Hg	58–122	123 (38–225)	129 (38–360)	0.89
Reservoir function				
First sense volume, ml	35	30 (9–40) (rectum)	50 (15–200) (pouch)	0.01
First urge volume, ml	80–120	43 (24–60) (rectum)	73 (60–200) (pouch)	0.02
Maximal tolerated volume, ml	200	68 (27–80) (rectum)	193 (82–203) (pouch)	0.03

Endoscopy

Endoscopy results after 1 year revealed signs of inflammation in the two patients. One patient had symptoms of pouchitis at the moment of endoscopy.

Pathology

Microscopic examination of the proctocolectomy specimens confirmed the diagnosis of UC in all patients. Histopathology confirmed the diagnosis of pouchitis on the basis of the biopsies taken in two patients. No dysplasia or carcinoma was present in any specimen or at follow-up.

Mesorectal Evaluation

All postoperative MRI scans showed the presence of vital mesorectum tissue in situ. This supports the principle of close rectal dissection. Figure 1 presents the MRI scans of a patient, showing the mesorectum at three levels in the pelvis, preoperatively, and 6 months after surgery. This indicates the presence of viable mesorectum postoperatively comparable to preoperatively without any objective differences in volume.

Discussion

The surgical principles of the IPAA technique originate from total mesorectal excision (TME). The TME technique is based on oncological principles for rectal carcinomas. TME removes the entire rectum including the mesorectum [23]. In patients with oncological diseased rectums the mesorectum has to be removed because of possible lymphatic involvement. This is where the discrepancy comes in: proctectomy for UC is no oncologic surgery. There is no reason to go along with the TME principle. CRD is a well-known 'old' technique but

used to be too laborious to gain support [12]. It leaves the mesorectum in situ. With the advent of automated vessel sealers, CRD has gained renewed interest.

This pilot study aimed to assess the feasibility and evaluate the potential of CR-IPAA with automated vessel sealers to offer an alternative to conventional IPAA. Several important findings have been made.

First, the new CR-IPAA technique is a safe procedure which can easily be learned and performed with the aid of new technical developments like the EBVS or ultrasound dissection. This straightforward technique is reflected in a short operative time and low blood loss, comparable to the open IPAA procedure [24].

In addition, the theoretical advantage of more space after mesorectal excision for the pouch does not seem to last; the defecation frequency after CR-IPAA remains the same compared to the IPAA after TME principles. The mesorectum seems to function as a kind of 'communicating vessel' together with the pouch in the pelvis. The MRI scans confirm this theory.

This pilot study showed a promising tendency regarding pelvic-related postoperative complications. Only one of the patients developed a retropouch-localized abscess without systemic signs of infection and therefore no pelvic sepsis. This is in line with the hypothesis that the remnant mesorectum can protect against pelvic sepsis if there is anastomotic leakage; symptoms will be minimized. Preoperative high dose steroid use has negative influences on the morbidity [25]. For this reason, we performed so many three-stage procedures. The immunomodulating medication could be reduced after the first stage.

In addition, there were no signs of autonomic nerve damage in the ten patients; no sexual dysfunction or bladder dysfunction was reported. This also contributes to the hypothesis that close rectal dissection protects against nerve damage.

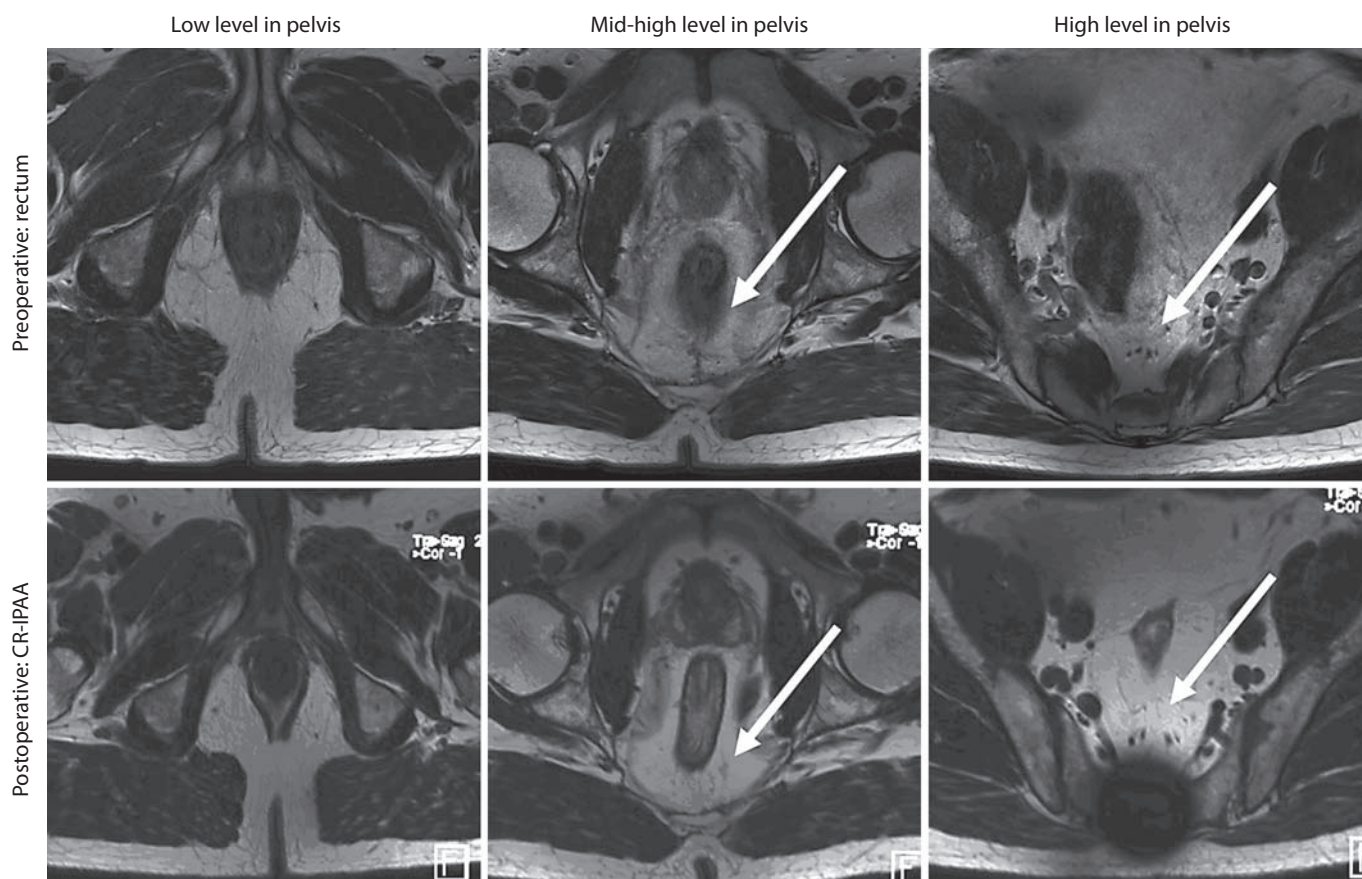


Fig. 1. Comparison of the mesorectum preoperatively surrounding the rectum versus postoperatively surrounding the ileo-anal pouch. Arrows indicate the mesorectum. Very low in the pelvis, just above the anal sphincter, there is physically no mesorectum in situ. At middle-high and high levels in the pelvis the mesorectum is shown. There are no objective differences in mesorectum volume.

The functional outcome at 1 year of follow-up after the CR-IPAA was comparable to that of the conventional IPAA observed in the literature. In an extensive review about the long-term outcome of conventional IPAA, Hueting et al. [11] observed that an average daytime frequency of 5.2 and a nocturnal frequency of 1.0 was achieved. Tekkis et al. [10] reported a daytime frequency of 5 and a nocturnal frequency of 1.0. Whether in the long term the retained mesorectum will hamper the reservoir function of the pouch needs to be researched.

The first sense, first urge, and maximum tolerated volumes of the pouch are closely related to the functional outcome [26]. Therefore, the significantly increased volumes of these parameters in our population support a good functional outcome. Our results of maximal anal resting pressure are comparable to those of a study of Sel-

vaggi et al. [27], while the maximum tolerated volume of Selvaggi et al. [27] seems to be higher. However, the functional results in terms of defecation frequency are comparable. Anorectal manometry measurements should only be used as a contribution to the overall results. Defecation frequency and continence are the most important parameters in terms of functional results.

A limitation of this pilot study is the small sample size. A larger study with long-term follow-up will be needed to reliably assess the hypothesized benefits of CR-IPAA. There are twelve studies reporting to have used the close rectal dissection technique [14–18, 28–34]. One study [34] has a population with both close rectal and TME, so the results of this study cannot be analyzed. However, the five largest studies, with over 100 patients, show contradictory results; Rink et al. [18] and Berry et al. [14] show a very low leakage rate and no autonomic nerve damage,

respectively, due to close rectal dissection. However, Jarvinen and Luukkonen [15], Araki et al. [28], and Régimbeau et al. [33] present a normal leakage rate and sexual dysfunction percentage comparable to those found with the conventional technique. The reason for these varying results can be different use of the technique (partial vs. complete and circular close rectal dissection). None of the studies specify the technique. Another reason for the difference in results is the use of conventional versus new diathermic instruments.

However, with the recently developed automated vessel sealers, the traditional laborious CR-IPAA technique has been greatly simplified. Circular close rectal dissection with automated vessel sealers is technically easy and results in minimal blood loss and a vital, dry mesorectal bedding, which in these 10 patients functioned as a shield in case of pelvic sepsis and protected the autonomic nerves.

Conclusion

Given the ease of the CRD technique, the absence of oncological arguments, and potential advantages with regard to complications, the question of whether CR-IPAA should replace the TME technique in case of an IPAA for UC patients should be raised. The results of CR-IPAA obtained thus far need further investigation to substantiate the potential benefits of this technique in a large well-conducted trial.

Disclosure Statement

None.

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