

Ileal pouch anal anastomosis with modified double-stapled mucosectomy-the experience in China

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Abstract

AIM: To investigate the feasibility and long-term functional outcome of ileal pouch-anal anastomosis with modified double-stapled mucosectomy.

METHODS: From January 2002 to March 2011, forty-five patients underwent ileal pouch anal anastomosis with modified double-stapled mucosectomy technique and the clinical data obtained for these patients were reviewed.

RESULTS: Patients with ulcerative colitis ($n = 29$) and familial adenomatous polyposis ($n = 16$) underwent ileal pouch-anal anastomosis with modified double-stapled mucosectomy. Twenty-eight patients underwent one-stage restorative proctocolectomy, ileal pouch anal

anastomosis, protective ileostomy and the ileostomy was closed 4-12 mo postoperatively. Two-stage procedures were performed in seventeen urgent patients, proctectomy and ileal pouch anal anastomosis were completed after previous colectomy with ileostomy. Morbidity within the first 30 d of surgery occurred in 10 (22.2%) patients, all of them could be treated conservatively. During the median follow-up of 65 mo, mild to moderate anastomotic narrowing was occurred in 4 patients, one patient developed persistent anastomotic stricture and need surgical intervention. Thirty-five percent of patients developed at least 1 episode of pouchitis. There was no incontinence in our patients, the median functional Oresland score was 6, 3 and 2 after 1 year, 2.5 years and 5 years respectively. Nearly half patients (44.4%) reported "moderate functioning", 37.7% reported "good functioning", whereas in 17.7% of patients "poor functioning" was observed after 1 year. Five years later, 79.2% of patients with good function, 16.7% with moderate function, only 4.2% of patients with poor function.

CONCLUSION: The results of ileal pouch anal anastomosis with modified double-stapled mucosectomy technique are promising, with a low complication rate and good long-term functional results.

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Key words: Ileal pouch anal anastomosis; Stapled mucosectomy; Ulcerative colitis; Familial adenomatous polyposis; Surgical technique

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INTRODUCTION

Ileal pouch anal anastomosis (IPAA) is the operative approach for patients requiring restorative proctocolectomy (RPC) due to familial adenomatous polyposis (FAP) and ulcerative colitis (UC). There are two types of IPAA have been performed: a handsewn technique with mucosectomy^[1] and a stapling technique with the retention of the mucosa of the rectal stump^[2]. Both approaches have advantages and disadvantages. For handsewn technique with mucosectomy, all colorectal mucosa is removed which is thought freeing the patients from the risk of further inflammatory disease, dysplasia or cancer in UC and reducing the risk of polyposis or cancer in FAP, but the manipulation of the anal canal and the excision of the anal transition zone (ATZ) is associated with significant impairment in anal sensation, therefore results in the risk of postoperative problems with continence^[3]. For stapling technique with the retention of mucosa which is favoured as it is simpler and provides better functional results, the retention of the potentially diseased rectal mucosa exposes patients not only to disease recurrence but also to malignant degeneration^[4,5].

We modify double-stapled techniques by sparing 5 cm short rectal muscular cuff and retaining the mucosa only in ATZ. The aim of this study is to evaluate whether ileal pouch-anal anastomosis with modified double-stapled mucosectomy is a safe and feasible procedure and its long-term functional outcomes.

MATERIALS AND METHODS

Between January 2002 and March 2011, 16 FAP patients and 29 UC patients received IPAA in our hospital. There were 22 males and 23 females with a mean age of 42.4 years (range: 17-67 years). The study is approved by the institutional ethics committee. The main symptoms included diarrhea, mucus or blood in the stool, abdominal pain, and weight loss. Colonoscopic examinations were performed in all patients, and biopsy results were consistent with adenomatous polyposis and ulcerative colitis. Malignant adenomatous polyps were found in three patients diagnosed with FAP.

Surgical procedure and technique

All patients underwent 2-stage procedures. For patients underwent elective surgery, we performed restorative proctocolectomy, ileal J-pouch anal anastomosis and protective ileostomy. Ileostomy was closed 4-12 mo postoperatively.

For patients underwent urgent surgery, we performed colectomy and ileostomy in first stage. Six month later, the proctectomy and ileal J-pouch anal anastomosis were completed. No protective stoma was made.

The operative technique was performed as previously described^[6] and is modified. After completing mobilization of the colon, the rectum and the ileocecal region,



Figure 1 Resected specimen.

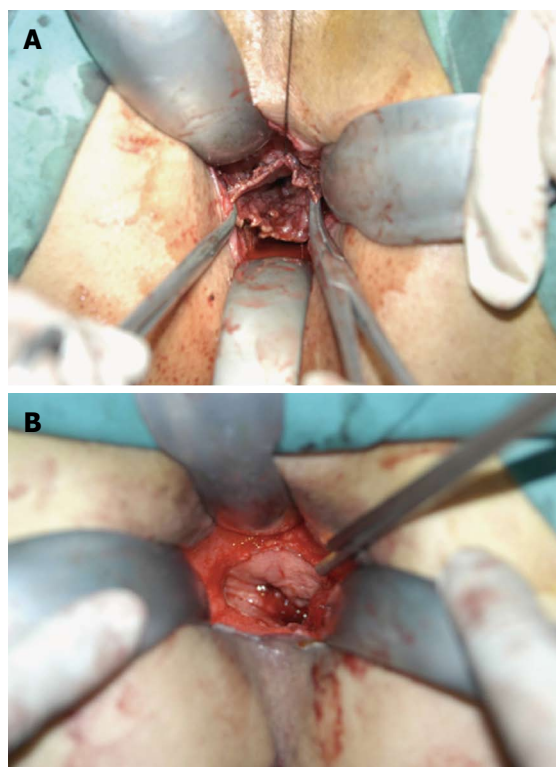


Figure 2 Surgical procedure. A: The mucosal and submucosal tube was incised; B: The end-to-end anastomosis was created by circular stapler.

the end of the ileum (5 cm from the ileocecal region for patient with FAP and more than 15 cm for patient with UC) was cut and closed, a J-shaped pouch with a length of 15 cm was made using a linear stapler (Ethicon, PROXIMATE® Linear Cutter 100). Then, the rectum was resected at the level above the seminal vesicle and the specimen was removed (Figure 1). The mesoileum was trimmed to mobilize the pouch and eliminate any tension on it. A 2 cm incision at the end of pouch was made, the anvil was inserted into it after creating a purse-string suture. The anus was effaced using Lone-Star Retractor, 1:100 000 adrenaline normal saline is injected under the rectal mucosa to separate it from the muscular

Table 1 Demographic and perioperative data

Age at operation (yr) (mean \pm SD)	42.4 \pm 12.5
Gender (male:female)	22:23
Diagnosis (UC:FAP)	29:16:00
Median hemoglobin at the time of admission, g/L [median (range)]	85 (38-148)
Operative time, min [median (range)]	225 (195-325)
Median volume of blood transfusion, mL [median (range)]	600 (0-1600)
Days to regular diet, d [median (range)]	6 (4-14)
Length of postoperative hospitalization, d [median (range)]	12 (9-35)
Interval to closure of the ileostomy, mo [median (range)]	5 (4-12)

UC: Ulcerative colitis; FAP: Familial adenomatous polyposis.

layer. The mucosal and submucosal tube was incised by needle diathermy from 2 cm above the dentate line to the apex of rectal cuff (Figure 2A). We performed trans-anal purse-string suturing of the rectum 2 cm above the dentate line using 2-0 monofilaments, the J-pouch was pulled down into the muscular cuff. Then, a circular stapler was inserted transanally, and the purse-string sutures were tightened to secure the stapler in place, the anvil was attached in position and the end-to-end anastomosis was created (Figure 2B).

The postoperative anal function was assessed by Kirwan classification^[7] and Pouch-specific function score (Oresland score^[8], range, 0-15, with a score of 15 denoting the poorest function). The Kirwan classification was graded as full continence, incontinence of gas, occasional minor soiling, frequent major soiling and incontinence. The Oresland score included items on number of daytime and nighttime bowel movements, seepage, pad usage, urgency, diet, medication, and social handicap. Individual items were summed to form an overall pouch-specific functional score (0 being the best score, 15 the worst) which was classified as indicating good functioning (score 0-4), moderate functioning (score 5-7) and poor functioning (score 8-15)^[9].

Pouchitis was diagnosed by symptoms of bloody diarrhea, urgent need to pass stool, incontinence, and pain or discomfort while passing stool^[10].

Data collected included patient demographics, operative time, operative blood loss, complications, mortality, re-operation rate, length of hospital stay, readmission rates and reasons for readmission, pouchogram details, time to ileostomy closure, follow-up and long-term functional outcome.

RESULTS

The study cohort included 29 UC patients and 16 FAP patients who were treated by ileal pouch anal anastomosis with modified double-stapled mucosectomy. Twenty-eight patients underwent a RPC + IPAA and protective

ileostomy in one stage, the ileostomy was closed 4-12 mo postoperatively. Seventeen patients underwent restorative proctectomy and IPAA after previous colectomy with ileostomy, all of whom were UC patients.

Demographic and operative data for the patients are presented in Table 1. The median operative time was 225 min, and in 15 patients, the operative time was more than 4 h. The median estimated blood loss was 550 mL, with a maximum estimated blood loss of 1200 mL, 36 patients requires transfusion and the median volume of blood transfusion was 600 mL. The median postoperative hospitalization was 12 d. The median interval to closure of the ileostomy was 5 mo.

There were no instances of operation-related mortality. Morbidity within the first 30 d of surgery occurred in 10 (22.2%) patients. Three patients developed an intestinal obstruction and could be treated conservatively, but one of the patient had a repeated attack of incomplete intestinal obstruction postoperatively. Two patients developed pelvic abscess and requires percutaneous puncture drainage guided by computed tomography. Six infectious complications occurred in five patients, four wound infection, one urinary tract infection and one pulmonary infection, and all could be treated with prolonged antibiotics or dressing change.

The patients were followed-up for a median period of 65 mo (range, 12-110 mo). After the closure of stoma, mild to moderate anastomotic narrowing was seen in 4 patients (8.8%), the majority being easily managed with digital dilation in the outpatient department. one patient developed persistent anastomotic stricture and require transanal endoscopic microsurgery dilatation. Sixteen patients developed at least 1 episode of pouchitis and the cumulative risk of pouchitis was 35.6%. Two patients with malignant adenomatous polyps died 2 years and 2.5 years after surgery and only 2 patients diagnosed dysplasia by biopsy in the remaining patients.

The median 24 h bowel movements was 7 evacuations per day, 4 evacuations per day and 4 evacuations per day at 1 year, 2.5 years and 5 years after closure of stoma, more than half of the patients reported more than five stools throughout the day 1 year after closure of stoma, but stool frequency decreased gradually, stabilizing at less than five evacuations per day at 2.5 years, and it was five or less in 70% of patients after 5 years. The proportion of patients that had stools every night decreased from 62.2% to 22.8% from 1 to 2.5 years, but this parameter did not improve further after 2.5 years. Urgency of defecation remained unchanged after 2.5 years although there was a tendency towards more patients being able to defer defecation for a longer time. There was no incontinence in our patients. Moreover, impaired continence, a frequent problem initially, also diminished with time, occurring in 33.3% of patients at 1 year. At 2.5 years, however, soiling or seepage occurred in only 5.7% patients during daytime and 20% patients at night, suggesting that improvement of continence can

Table 2 Stool frequency, urgency, pad usage, diet, medication in patients underwent ileal pouch-anal anastomosis at 1 year, 2.5 years and 5 years after closure of stoma *n* (%)

	Score	1 yr (<i>n</i> = 45)	2.5 yr (<i>n</i> = 35)	5 yr (<i>n</i> = 24)	<i>P</i> value ³
24-h stool frequency					0.014
< 5	0	10 (22.2)	19 (54.2)	14 (58.3)	
5-8	1	31 (68.8)	14 (40.0)	8 (33.3)	
> 8	2	4 (8.8)	2 (5.7)	2 (8.3)	
Night time defecation					0.001
Never	0	2 (4.4)	7 (20.0)	6 (25)	
Weekly	1	15 (33.3)	20 (57.1)	13 (54.2)	
Every night	2	28 (62.2)	8 (22.8)	5 (20.8)	
Urgency of defecation ¹					0.382
> 30 min	0	25 (55.5)	25 (71.4)	17 (70.8)	
10-30 min	1	16 (35.5)	8 (22.9)	7 (29.1)	
< 10 min	2	4 (8.8)	2 (5.7)	0 (0)	
Use of pad daytime	1	6 (13.3)	2 (5.7)	1 (4.2)	0.326
Use of pad at night	1	6 (13.3)	3 (8.6)	1 (4.2)	0.454
Soiling or seepage during daytime	1	8 (17.7)	2 (5.7)	2 (8.3)	0.210
Soiling or seepage at night	1	15 (33.3)	7 (20)	5 (20.8)	0.026
Peri-anal soreness					0.989
No	0	38 (84.4)	30 (85.7)	21 (87.5)	
Occasional	1	5 (11.1)	4 (11.4)	2 (8.3)	
Permanent	2	2 (4.4)	1 (2.9)	1 (4.2)	
Dietary restrictions	1	23 (51.1)	8 (22.8)	2 (8.3)	0.001
Regular medication for stool regulation	1	20 (44.4)	6 (17.1)	1 (4.2)	0.000
Social handicap ²	1	4 (8.8)	2 (5.7)	2 (8.3)	0.862
Functional Oresland score [median (range)]	15	6 (1-12)	3 (0-11)	2 (0-9)	

¹Urgency of defecation is inability to defer evacuation for more than 30 min; ²Social handicap is not able to resume full time occupation or to participate in social life; ³ χ^2 test of 45 patients.

be expected to occur even beyond one year. More than half patients mentioned dietary restrictions and 44% patients needed regular medication for stool regulation after 1 year, the rate decreased to 22.8% and 17.1% after 2.5 years and was 8.3% and 4.2% after 5 years. Less than 10% patients felt affected in their everyday life through the functional impairments after 5 years. The difference in 24-h stool frequency, night time defecation, Soiling or seepage at night, dietary restrictions and regular medication for stool regulation has statistical significance. Overall, the median functional Oresland score was 6, 3 and 2 after 1 year, 2.5 years and 5 years respectively. Nearly half patients (44.4%) reported “moderate functioning” (as described in Method), 37.7% reported “good functioning”, whereas in 17.7% of patients “poor functioning” was observed after 1 year. Five years later, 79.2% of patients with good function, 4 patients (16.7%) with moderate function, only 4.2% of patients with poor function (Tables 2 and 3). Despite defects in function, patients’ satisfaction was generally excellent. So far only one patients have preferred conversion to an ileostomy once more.

DISCUSSION

Restorative proctocolectomy, mucosectomy with ileal pouch-anal anastomosis has become widely accepted and is now considered the standard procedure for patients with ulcerative colitis as well as familial adenomatous polyposis since 1980s^[11].

Since both UC and FAP are mucosal diseases, mucosectomy has the advantage of removing the diseased colorectal mucosa, particularly if taken down to the dentate line^[12]. In both these conditions an ideal operation would remove all colonic and rectal mucosa thus exempting the patients from the risk of further inflammatory disease, dysplasia or cancer in UC and reducing the risk of polyposis or cancer in FAP. However, it has suggested that mucosectomy with a handsewn anastomosis results in poorer function, more than 50% of patients complained of seepage at night^[13] and incontinence were inevitable in some of patients. Moreover, Bullard^[14] looked at a 12 years long-term functional outcome using a questionnaire for 235 patients and found that most patients had stable pouch function over time, but a proportion (in 18% patients) suffered measurable deterioration particularly 12 or more years after surgery and improved function was found only in 1% patients. Without prophylactic surgical intervention, malignant transformation into carcinoma occurs in majority FAP patients in the fourth decade of life^[15]. Therefore, most patients undergoing pouch surgery are younger and have a long life expectancy. Thus, long-term morbidity and functional outcome is important for their quality of life after surgery.

In order to improve the anal function and prevent incontinence, stapled anastomosis without mucosectomy which confers functional benefit compared with handsewn anastomosis and mucosectomy is performed by many surgeons, but the retained rectal mucosa is

Table 3 Kirwan classification after surgery *n* (%)

Kirwan classification	1 yr (<i>n</i> = 45)	2.5 yr (<i>n</i> = 35)	5 yr (<i>n</i> = 24)	<i>P</i> value ¹
Stage I (full continence)	30 (66.7)	28 (80)	19 (79.1)	0.785
Stage II (incontinence of gas)	5 (11.1)	3 (8.6)	2 (8.3)	
Stage III (occasional minor soiling)	9 (20)	4 (11.4)	3 (12.5)	
Stage IV (frequent major soiling)	1 (2.2)	0 (0)	0 (0)	
Stage V (incontinence)	0 (0)	0 (0)	0 (0)	

¹ χ^2 test of 45 patients.

thought a disease-bearing tissue, if left untreated, may present a significant future risks for disease recurrence or malignant transformation^[16] and lifelong surveillance is required for these patients^[17].

The idea of the modified double-stapled mucosectomy technique was born as a result of the aforementioned disadvantages associated with the previous techniques. The characteristics of our technique is that we retain 5 cm short rectal muscular cuff, remove great part of rectal mucosa excluding the mucosa in ATZ which is usually commenced just above the dentate line and situated a median of 1.05 cm above the lower border of the internal sphincter^[18]. Because of the preservation of mucosa in ATZ which is important for anal sensation^[19,20], functional results are significantly improved in our series. There was no incontinence in our patients, soiling or seepage occurred in only 5.7% patients during daytime and 20% patients at night after 2.5 years. After 5 years, 24-h stool frequency was five or less in 70% of patients and only 4.2% patients needed regular medication for stool regulation. Most patients can restore normal life and patients' satisfaction was generally excellent. So far only one patients have preferred conversion to an ileostomy once more. Furthermore, retention of 5 cm short rectal muscular cuff has the advantage of making the ileal pouch fully dilate to replace the function of rectum.

The main debate of our technique is regarding the risk of dysplasia and ongoing inflammation in the retained rectum because this method leaves behind intact mucosa of the ATZ. Although residual mucosa can remain inflamed in patients and may become dysplastic, anal transitional zone dysplasia after ileal pouch-anal anastomosis is infrequent, Remzi reported the incidence of dysplasia after stapled RPC was 3%-4.5%^[21] and it had not been substantiated that preservation of ATZ lead to the development of cancer in the ATZ. We think it is a inspiring result and take the following measures to minimize the risk. Firstly, cancer risk may be reduced by ensuring that a minimal length of rectal mucosa to be retained. In carrying out our modified double-stapled IPAA, the anastomosis should be performed at a lower level just above the ATZ. Secondly, we recommended that long-term monitoring is necessary and it is easy to find lesions by digital rectal examination when the level of the anastomosis is lower. In such cases, trananal biopsy is convenient. In our study, only 2 patients (4.4%) diagnosed dysplasia by biopsy during the median follow-

up period of 65 mo and no patient finds development of adenocarcinoma in the ATZ.

Our study showed a better outcome regarding pelvic-related postoperative complications, only two of the patients (4.4%) developed a peripouch-localized abscess without systemic signs of infection and could be treated by percutaneous puncture drainage which are better than previously reported rates of pelvis sepsis following pouch surgery^[22,23]. Thus, we speculate that the retention of rectal muscular cuff has no relation with the pelvic-related infectious complications and retention of short rectal muscular cuff (only 5 cm) can reduce the operative time and the possibility of bleeding. Furthermore, we don't suture the J-pouch with the rectal cuff and the tissue space was blocked out by fibrin glue which can protect against pelvic sepsis, if there is anastomotic leakage, symptoms will be minimized.

On the other hand, the choice of IPAA technique should be based on the situation of patients to make a comprehensive consideration for both oncologic and functional outcome. When the patients at high risk of cuff dysplasia or inflammation, we think it is better to perform a handsewn technique with mucosectomy rather than attempting stapling technique with the retention of partial mucosa of the rectal stump in order to avoid carcinoma formation after IPAA.

Several limitations of our study should be noted. The design was retrospective and our modified technique was not compared with the handsewn technique or the standard stapling technique of the same surgeon. Another study limitation is the small number of patients. Despite being a modified technique of IPAA, small patient numbers precluded robust analysis of the association between clinical and postoperative outcome.

In conclusion, ileal pouch-anal anastomosis with modified double-stapled mucosectomy seems to be a technically feasible and clinically acceptable alternative procedure for the removal of potentially diseased rectal mucosa retained only in ATZ to achieve an improved anal function after surgery.

COMMENTS

Background

Ileal pouch anal anastomosis (IPAA) is the operative approach for patients requiring restorative proctocolectomy due to familial adenomatous polyposis and ulcerative colitis. But the conventional handsewn technique or stapling

technique have their disadvantages such as poor postoperative anal function or disease recurrence. Modify double-stapled techniques by sparing 5 cm short rectal muscular cuff and retaining the mucosa only in anal transition zone is designed to ameliorate aforementioned disadvantages and improve the clinical effects.

Research frontiers

Handsewn technique with mucosectomy and stapling technique with the retention of the mucosa of the rectal stump are the routine methods of IPAA. In the area of improving anal function and reducing the risk of disease recurrence, the research hotspot is to deeply understand the anatomy of anus and modify the surgical technique.

Innovations and breakthroughs

In the previous reports of IPAA, the most applicable methods are handsewn technique with mucosectomy and stapling technique with the retention of the mucosa of the rectal stump. The authors modify double-stapled techniques by sparing 5 cm short rectal muscular cuff and retaining the mucosa only in anal transition zone. This is the first study to report the long-term functional outcomes with this technique in China. Furthermore, the results of the modified technique are promising, with a low complication rate and good long-term anal function.

Applications

The study results suggest that ileal pouch anal anastomosis with modified double-stapled mucosectomy is a feasible surgical technique for patients with familial adenomatous polyposis and ulcerative colitis.

Terminology

Ileal pouch-anal anastomosis: IPAA is constructed for people who have had their large intestine surgically removed due to disease or injury. It is formed by folding loops of small intestine (the ileum) back on themselves and stitching or stapling them together. The internal walls are then removed thus forming a reservoir. The reservoir is then stitched or stapled with the anal mucosa. Familial adenomatous polyposis: Familial adenomatous polyposis is an inherited condition in which numerous polyps form mainly in the epithelium of the large intestine. While these polyps start out benign, malignant transformation into colon cancer occurs when not treated; Ulcerative colitis: Ulcerative colitis is a form of inflammatory bowel disease, a disease of the colon, that includes characteristic ulcers, or open sores. The main symptom of active disease is usually constant diarrhea mixed with blood, of gradual onset; Anal transition zone: Anal transition zone is usually commenced just above the dentate line and situated a median of 1.05 cm above the lower border of the internal sphincter. It is important for anal sensation.

Peer review

Interesting paper, some fine tuning is needed but certainly adds to the knowledge.

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