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ORIGINAL ARTICLE

Postoperative functional outcomes and complications of partially intraanal canal anastomosis in stapled ileal pouch anal anastomosis for ulcerative colitis

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Abstract

Aim For ulcerative colitis (UC), stapled ileal pouch anal anastomosis (IPAA) reportedly results in better bowel function than does IPAA with mucosectomy. However, a potential cancer risk in the remnant mucosa has been observed. The clinical results of IPAA by double stapling technique (DS-IPAA) in which the anastomotic line was on the dentate line at posterior wall and the top of anal canal at anterior wall ("Partially intraanal canal anastomosis": PICA) to reduce the remnant mucosa were evaluated.

Methods Clinical results of PICA were retrospectively compared with those by DS-IPAA with anastomosis at above the anal canal on 1 year after open surgery. Of 211 UC cases that underwent DS-IPAA, 146 cases (69%) with PICA who were confirmed by the squamous epithelium on the posterior part of the distal donuts were included. Sixty-five cases with anastomosis above the anal canal were evaluated as the control. One stage surgery underwent in 95% of PICA and 93% of control.

Results One year after surgery, each group had six bowel movements daily. Nighttime evacuation was found in 16% of PICA and in 20% of control. Soiling was found in 1% of PICA and 4.8% of control. After one stage operation, anastomotic leakage that needed ileostomy was observed in 0.7% of PICA and 3% of control.

Conclusion Partially intraanal canal anastomosis (PICA) can reduce anal canal mucosa with the same postoperative bowel function and complication rate as DS-IPAA above the anal canal. This procedure may be feasible for UC patients who can tolerate this procedure in terms of decreasing postoperative cancer risk.

Keywords Ulcerative colitis · Stapled ileal pouch anal anastomosis · Partially intraanal canal anastomosis · Postoperative bowel function · Postoperative complications

Introduction

The standard surgical procedures for ulcerative colitis (UC) are ileal pouch anal anastomosis (IPAA) with mucosectomy (Handsewn IPAA: HS-IPAA) and stapled IPAA with preservation of the anal canal mucosa. For UC, HS-IPAA may lead to cure UC by complete removal of the diseased mucosa, but may cause postoperative soiling due to removal of the anal sensory zone. On the contrary, stapled IPAA preserves the anal canal mucosa and has less incidence of soiling, spotting. The rate of soiling at 1 year after stapled IPAA above the anal canal to be 0%, compared with 27% in HS-IPAA [1] and the incidence of nocturnal seepage was lower in stapled IPAA than HS-IPAA in a large-scale meta-analysis [2] (Lovegrove, RE, Constantinides VA, Heriot AG, et al.: A comparison of Hand-Sewn Versus stapled ileal pouch anal anastomosis (IPAA) following proctocolectomy-A meta-analysis of 4183 patients. Ann Surg 2006: 244, 18–26). However, remnant anal canal mucosa has the possibility of potential risk of cancer. Stapled IPAA was associated with cancer in 1% of patients with pouch surgery [3], as well as a relapse of inflammation. Therefore, there are still controversies on preservation of the anal canal mucosa during pouch surgery for UC.

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Double stapling technique (DST) with IPAA (DS-IPAA) has become a common procedure for stapled IPAA. Since 1994, we have employed this procedure by performing anastomosis at the lower part in the anal canal to reduce the extent of remnant mucosa with open surgery. In more than 50% of the patients, it was possible to perform "partially intraanal canal anastomosis" (PICA) at the dentate line on the posterior wall and at the top of anal canal at anterior wall on the dentate line (1–2 cm above dentate line) (Figs. 1 and 2). PICA can reduce mucosal remnant by 50% compared with that of DS-IPAA above the anal canal.

In this study, the technique for PICA with DS-IPAA for UC was described. Postoperative bowel function after 1 year and complications in PICA with DS-IPAA were also compared with those after DS-IPAA above the anal canal.

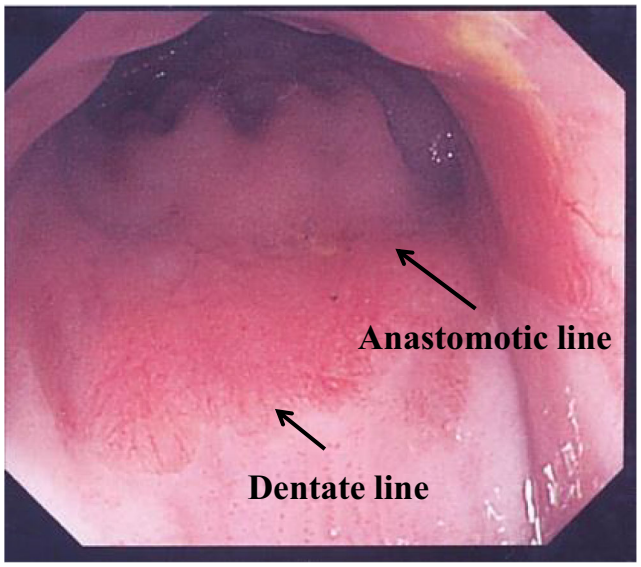

Fig. 2 Partially intraanal canal anastomosis (PICA): Anterior part

Patients and method

The histological findings on the distal donuts of 211 consecutive patients who underwent DS-IPAA with open surgery for UC between February, 1994 and December, 2006 were prospectively examined. No patients with Crohn's disease were included in this study by histological examination. Of these patients, 146 patients (69%) in whom the posterior part of the anastomosis confirmed to be on or below the dentate line by the presence of squamous epithelium were included in this study (Fig. 3). The anterior part of the anastomosis was confirmed to be at the top of the anal canal (1–2 cm above the dentate line). In terms of reducing remnant anal canal mucosa, removal of the posterior part while preserving the anterior part was technically easy and safe. Before transecting the rectum, the level of the anastomosis was confirmed by palpation of the stitches on the dentate line which were sutured anterior and posterior part of the dentate line in the operating room just before starting of the operation.

Among 211 patients, the control group comprised 65 patients who was performed DS-IPAA with anastomosis at both anterior and posterior above the anal canal (approximately 2 cm from dentate line).

A 15-cm-long J pouch was constructed in all patients.

The characteristics of the patients with UC are outlined in Table 1. In 13 patients, cancer or dysplasia was detected only in the colon, not the rectum. The median cumulative dose of preoperative prednisolone from the onset of UC to the date of the operation was 15,614 mg in patients in PICA group and 10,000 mg in patients in the control group. One stage DS-IPAA without diverting ileostomy was performed in 87% (127/146) and 93% (61/65) of the patients in the control group; total abdominal colectomy was previously performed on ten and three of these patients, respectively. There were no patients who were on preoperative infliximab, adalimumab, ustekinumab, golimumab, and vedlizumab because of the date

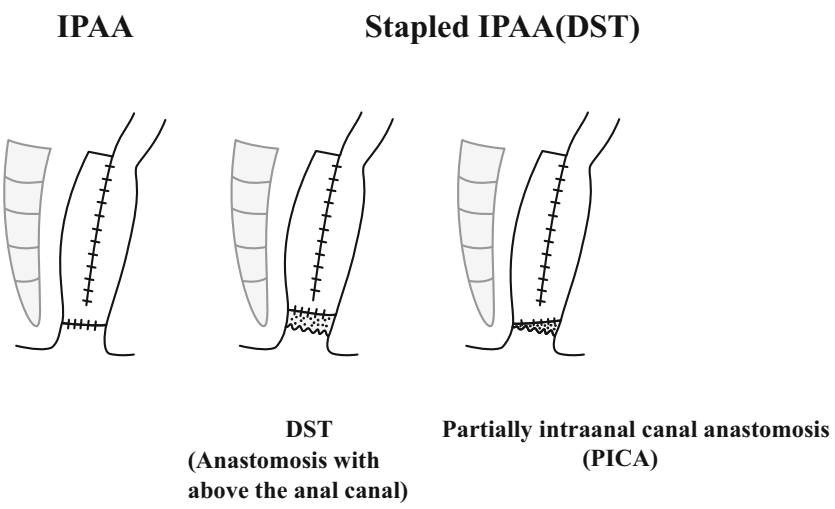

Fig. 1 Schema of pouch operation

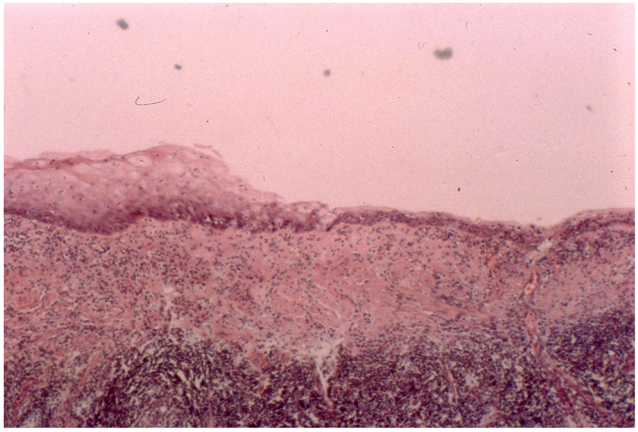

Fig. 3 Squamous epithelium in the distal donuts (Posterior portion of the anastomosis)

of this study. Median body mass index (BMI) was 19.1 in the PICA group and 19.6 in the control group; there was no significant difference between the groups. Postoperative median follow-up period was 16.0 months in the PICA group and 21.4 months in the control group.

Postoperative bowel function at 1 year after surgery and postoperative complications were compared between the two groups retrospectively. In patients with diverting ileostomy, postoperative results were evaluated at 1 year after closure of the ileostomy. 'Soiling' was defined as three times a week with fecal leakage of > 3 cm in diameter. In all patients, anastomotic leakage was examined after 5–7 days of the operation and was defined as "positive" when any kind of leakage from the anastomotic line was found by radiographic enema study.

Data of postoperative bowel functions were obtained by interview conducted doctors who were blinded to the procedure performed.

Technique for partially intraanal canal anastomosis by double stapling technique

As mentioned, DST enabled us to perform anastomosis at the lower part of the anal canal. To lessen postoperative cancer risk in patients with DS-IPAA, we supposed that the ileal level of anastomosis was the dentate line on the posterior and the top of the anal canal on the anterior wall.

Dissection of perirectal tissue towards the anal canal in the pelvic cavity was required to perform anastomosis on this level. In the lithotomy position, the diameter of the anal canal was examined by an instrument to select the optimal size of stapler for the anastomosis. We usually used ILS 33 mm (Ethicon®) to make a wide lumen on the anastomotic site. We added stitches on the anterior and posterior parts of the dentate line and confirmed the level of anastomosis by finger palpation before transection of the rectum (Fig. 4). By open surgery, the layer for the dissection around the rectum was similar to that of total mesorectal excision for rectal cancer surgery because easy identification of hypogastric and pelvic nerves lowered the possibility of damage and decreased the amount of bleeding. For the anastomosis in the anal canal, the rectosacral fascia was excised; it was very important to excise the posterior, lateral part of the hiatal ligament which was located between the puborectalis muscle and the lower part of rectum [4]. This procedure allowed us to

Table 1 Characteristics of UC patients who underwent stapled IPAA

	Pertially intraanal canal anastomosis ($n = 146$)	Control (DST)[c] ($n = 65$)	
Age in years at operation	35.0[a] (15–72)[b]	31.6[a] (11–69)[b]	
Sex (M/F)	88/58	42/23	
Indication for surgery			
Severe colitis	40	17	
Intractability	97	45	
Cancer, dysplasia (colon)	7	3	
Preoperative dose of prednisolone (mg)			
Total	12328[a] (0–82,000)[b] ($n = 86$)	10,000[a] (120–251,758)[b]	($n = 44$)
One month before op.	450[a] (0–3200)[b] ($n = 93$)	3000[a] (0–8500)[b]	($n = 47$)
One stage op. (initial operation)	87% (127/146)	93% (61/65)	
Body mass index (BMI)	19.1[a] (12.1–28.4)	19.6[a] (14.9–27.4)	
Follow-up period in months (after intestinal continuity)	16.0[a] (0.25[c]–120)[b]	21.4[a] (0.47–89)[b]	

[a] Median

[b] Anastomotic line at above the anal canal

[c] Three cases with data collection for only early leakage

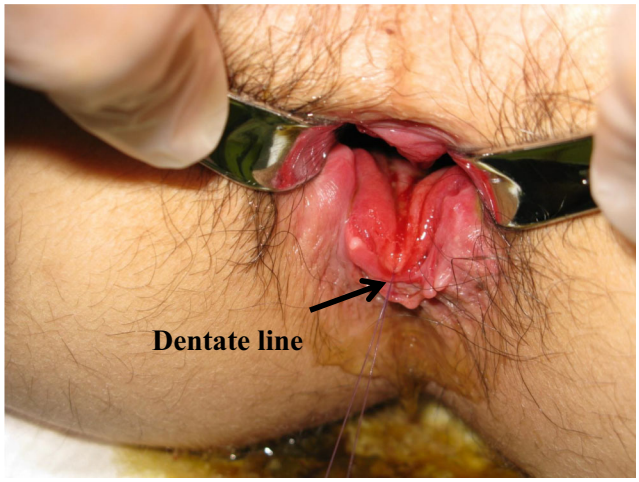

Fig. 4 Stitch on dentate line before the operation

dissect to the level of dentate line or 1 cm below the dentate line between rectal wall and the puborectalis muscle in the anal canal (Figs. 5 and 6). On the anterior part of the rectum, dissection was performed to 1–2 cm above the dentate line to preserve the sensory zone. After confirming the planned dissection line by the finger palpation to each stitch on the dentate from the anus, the anal canal was transected with TL 30 (Ethicon®) at 5 mm above the dentate line on the posterior wall and 15–20 mm above the dentate line on the anterior wall.

After construction of a 15-cm-long J pouch which had an anvil head that penetrated through the apex, the trocar of the ILS was punched on the suture line or on the posterior portion adjacent to the suture line of the rectum; thereafter, stapled IPAA was performed by DST. We generally performed one stage operation for patients in whom the donuts of proximal and distal part were confirmed to be complete. In patients with one stage operation, a 24 Fr. Foley catheter was inserted into the J pouch through the anus for decompression for 5 days

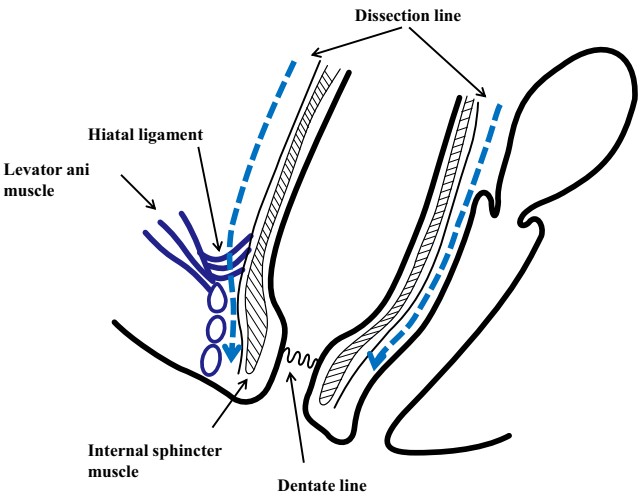

Fig. 5 Dissection line around rectum

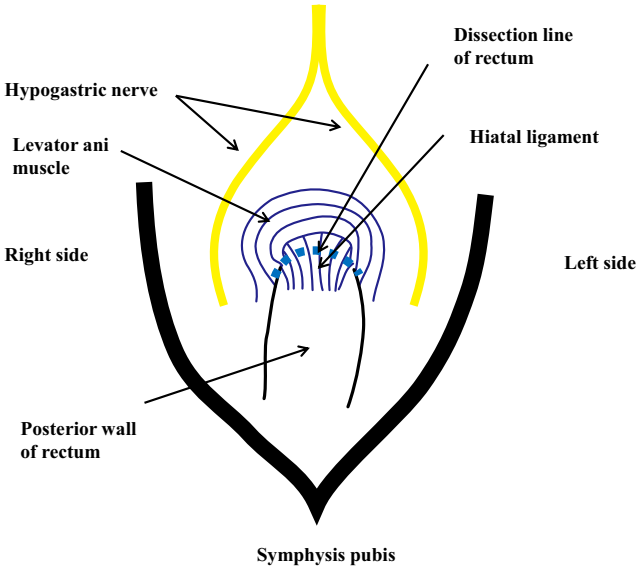

Fig. 6 Dissection line at posterior part of rectum (Excision of hiatal ligament)

after the operation. Diet was resumed when enema study confirmed the absence of an anastomotic leakage. We performed a diverting ileostomy for the patients who were found to have problems in their anastomotic site.

Results

Postoperative bowel function After surgery, the average daily bowel movement at 1 month, 6 months, and 1 year was 10, 6.7, 5.8 in the PICA group and 8.2, 6.7, 7.3 in the control group, respectively.

Night time evacuation at 6 months and 1 year after surgery was observed in 40% and 16% of the PICA group and in 42% and 20% of the control group, respectively.

The incidence of postoperative soiling at 1 month, 6 months, and 1 year after surgery was 37%, 8.3%, and 1%

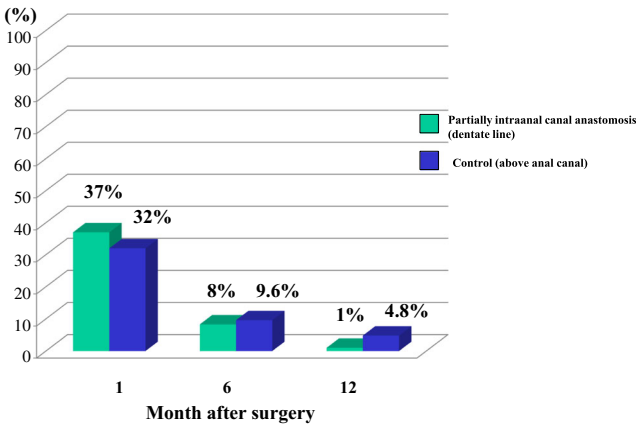

Fig. 7 Ratio of soiling in stapled IPAA for UC

in the PICA group and 32%, 9.6%, and 4.8% in the control group (Fig. 7).

There were no differences in postoperative bowel movement, rate of night evacuation, and soiling between the PICA and the control groups.

No patients in both groups had severe cuffitis which was required treatment.

Postoperative complications (Table 2) There was no postoperative mortality in the PICA group; however, there was one such case in the control group; this patient who had multiple vertebral bone fracture secondary to high cumulative preoperative steroid intake refused diverting ileostomy even after a major anastomotic leakage with panperitonitis. The incidence of postoperative anastomotic leakage, including minor and serious, was 8.9% (13/146) in the PICA group and 10.9% (7/65) in the control group. Serious anastomotic leakage was observed in 0.7% patients (1/146) of the PICA group and in 3% (2/65) of the control group; these three patients required diverting ileostomy because of those who were performed one stage operation. In the other patients (12 in the PICA and 5 in the control group) with minor leakage healed completely after 2 weeks by total parenteral nutrition without surgery. Late anal fistula, which occurred more than 3 months after surgery, was observed in 1.4% (2/146) of the patients in the PICA group but none of the patient in the control group. Thin and membranous anastomotic stricture, which was easy to improve by dilating 2 or 3 times with finger, was observed in 8% (11/146) of patients in the PICA group and in 3.1% (2/65) of the patients in the control group. Intestinal obstruction for which decompression tube or surgical treatment was required was the most common complication in both groups, 16.4% (24/146) in the PICA group and 10.7% (7/65) in the control group.

Upon interview of the patients, no urinary and sexual complications were reported in either group. There were no adequate data on sexual disturbance in female patients.

There was no significant difference in the incidence of postoperative complications between the two groups.

Discussion

Handsewn IPAA with rectal mucosal stripping for ulcerative colitis became a standard operation in the late 1970s [5–7]. Postoperative soiling was one of the uncomfortable problems that often occurred after the operation. Preservation of the anal transitional zone (ATZ) for better postoperative bowel function was firstly attempted by Martin et al. [8]; the same results were reported by several authors [9, 10] but some reported otherwise [11]. Based on own clinical results, stapled IPAA above the anal canal, which preserve the anal canal mucosa, had better postoperative bowel function than HS-IPAA in terms of less incidence of soiling [1]. Since then, we have performed stapled IPAA just above the anal canal, 1–2 cm above the dentate line, without diverting ileostomy as the standard surgical procedure for UC.

There have been controversies on preservation of the anal canal mucosa because of relapse of inflammation and potential cancer risk in the remnant mucosa. It was reported that preservation of ATZ, even in the presence of persistent

Table 2 Postoperative complications in UC patients who underwent stapled IPAA

	Pertially intraanal canal anastomosis		Control (DST)*		*P***
	(*n* = 146)		(*n* = 65)		
Anastomotic leakage	13	(8.9)	7	(10.7)	0.61
Serious leakage	1	(0.7)	2	(3)	
Minor leakage	12	(8.2)	5	(7.7)	
Pelvic sepsis	1	(0.7)	2	(3.5)	
Late leakage	2	(1.4)	0	(0)	
Anal stricture	11	(7.5)	2	(3.1)	0.11
Pouchvaginal fistula	0		0		
Intestinal obstruction	24	(16.4)	7	(10.7)	
Tube decompression	18	(12.3)	6	(9.8)	
Operation	6	(4.1)	1	(0.9)	
Anal fistula	1	(0.7)	0	(0)	
Anal fissure	2	(1.4)	0	(0)	

( ): %

*P*** Mann Whitney test

* Anastomotic line at above the anal canal

inflammation, improved incontinence and functional outcomes compared with HS-IPAA [12]. Mucosa in the cuff has always some degree of inflammation in patients with UC which is usually mild or moderate including patients in this study. In the group that underwent DS-IPAA with partially intraanal canal anastomosis (PICA), there were no patients with severe cuffitis who required treatment, such as topical mesalamine. Therefore, PICA did not have a disadvantage in regards to managing severe cuffitis.

The incidence of cancer in the anal canal in UC patients was reported 0–29% [13–18]. Previously, only a few cases who developed cancer after stapled IPAA in the anal canal or just above anal canal have been reported [19, 20]. Likewise, the incidence of dysplasia in ATZ after stapled IPAA for UC was 0.3% (8/289 cases) after a minimum of 10 years [21]. Among recent large-scale studies, one reported that the incidence of pouch or ATZ neoplasia was 0.99% (27/2707) after stapled IPAA without mucosectomy [3]; other reported that among 2040 cases, 1.13% developed dysplasia in the pouch, ATZ, or rectal cuff after HS-IPAA or stapled IPAA [22]. Although the potential cancer risk in the remnant anal canal is low after stapled IPAA, steps are still necessary to further reduce cancer risk.

Instead of stapled IPAA above the anal canal, we started performing one stage DS-IPAA since 1994 to perform at a lower part of the anal canal and reduce remnant mucosa and cancer risk. With respect to better postoperative functional results, the optimal level of stapled IPAA was reported to be at top of the anal canal compared with the dentate line [23]. In our series, the ideal levels of anastomosis were designed to be (1) the dentate line on the posterior wall and (2) the upper anal canal on the anterior wall to preserve the anterior mucosa of the anal canal (PICA). PICA removed approximately 50% of the mucosa at risk compared with stapled IPAA above the anal canal,

To perform PICA, several points of techniques must be followed such as preoperative stitching on the dentate line to confirm the level of anastomosis and sufficient dissection down to the dentate line between the anal canal and the puborectalis muscle with transection of the hiatal ligament. However, this procedure was difficult in patients who had narrow pelvis, or severely inflamed and fragile rectum with UC. BMI may influence on the success of this procedure, although this hypothesis remains to be proven.

There were a few serious complications such as anastomotic leakage in PICA. Postoperative bowel function was reported to be excellent with HS-IPAA or stapled IPAA despite the controversy. Many retrospective studies reported a lower rate of soiling, which influences patients' quality of life, after stapled IPAA patient group compared with that of HS-IPAA [24–26]. One study demonstrated that DS-IPAA had no early functional advantage over HS-IPAA in UC [27]. A meta-analysis of four studies also reported no significant difference in functional outcomes, including soiling, between HS-IPAA and DS-IPAA [28]. However, data on soiling were missing in two of the four studies in this analysis. It seems to be difficult to confirm same functional outcomes between two procedures because sufficient data about rate of postoperative soiling was lacking in this study. In a large-scale meta-analysis of 4183 patients with IPAA that showed the incidence of nocturnal seepage, pad usage was statistically lower in staples IPAA than in HS-IPAA which was reflected in higher anorectal measurements [2]. Another large-scale study of 3109 patients with IPAA also described that a greater proportion of patients with HS-IPAA had incontinence, seepage, pad usage, dietary, social, and work restriction than those with stapled IPAA [29].

The low incidence of postoperative soiling in patients who underwent PICA was similar to that of patients who underwent DS-IPAA above the anal canal, despite the smaller area of anal canal mucosa retained in PICA.

The limitation of this study was the lack of the data on anal manometry which should be performed simultaneously to examine sphincter function and the lack of specific questionnaires for urinary and sexual function.

Further investigations on a large number of UC patients are required to evaluate the precise effect of PICA.

Conclusion

For ulcerative colitis, DS-IPAA with partially intraanal canal anastomosis (PICA) could reduce anal canal mucosa with the same postoperative bowel function, complication rate as DS-IPAA with anastomosis at above the anal canal. PICA is expected to be feasible for UC from the standpoint of decreasing potential cancer risk in the remnant anal canal mucosa. However, PICA has a limitation to be performed for the patients with narrow pelvis or severely inflamed rectum. One stage PICA without diverting ileostomy could safely underwent in most patients.

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