

Retrospective Cohort Study

Clinical efficacy of integral theory-guided laparoscopic integral pelvic floor/ligament repair in the treatment of internal rectal prolapse in females

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Abstract

BACKGROUND

Internal rectal prolapse (IRP) is one of the most common causes of obstructive constipation. The incidence of IRP in women is approximately three times that in men. IRP is mainly treated by surgery, which can be divided into two categories: Abdominal procedures and perineal procedures. This study offers a better procedure for the treatment of IRP.

AIM

To compare the clinical efficacy of laparoscopic integral pelvic floor/ligament repair (IPFLR) combined with a procedure for prolapse and hemorrhoids (PPH) and the laparoscopic IPFLR alone in the treatment of IRP in women.

METHODS

This study collected the clinical data of 130 female patients with IRP who underwent surgery from January 2012 to October 2014. The patients were divided into groups A and B. Group A had 63 patients who underwent laparoscopic IPFLR alone, and group B had 67 patients who underwent the laparoscopic IPFLR combined with PPH. The degree of internal rectal prolapse (DIRP), Wexner constipation scale (WCS) score, Wexner incontinence scale (WIS) score, and Gastrointestinal Quality of Life Index (GIQLI) score were compared between groups and within groups before surgery and 6 mo and 2 years after surgery.

RESULTS

All laparoscopic surgeries were successful. The general information, number of bowel movements before surgery, DIRP, GIQLI score, WIS score, and WCS score

in studies involving human participants were conducted in accordance with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

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before surgery were not significantly different between the two groups (all $P > 0.05$). The WCS score, WIS score, GIQLI score, and DIRP in each group 6 mo, and 2 years after surgery were significantly better than before surgery ($P < 0.001$). In group A, the DIRP and WCS score gradually improved from 6 mo to 2 years after surgery ($P < 0.001$), and the GIQLI score progressively improved from 6 mo to 2 years after surgery ($P < 0.05$). In group B, the DIRP, WCS score and WIS score significantly improved from 6 mo to 2 years after surgery ($P < 0.05$), and the GIQLI score 2 years after surgery was significantly higher than that 6 mo after surgery ($P < 0.05$). The WCS score, WIS score, GIQLI score, and DIRP of group B were significantly better than those of group A 6 mo and 2 years after surgery (all $P < 0.001$, Bonferroni) except DIRP at 2 years after surgery. There was a significant difference in the recurrence rate of IRP between the two groups 6 mo after surgery ($P = 0.011$). There was no significant difference in postoperative grade I-III complications between the two groups ($P = 0.822$).

CONCLUSION

Integral theory-guided laparoscopic IPFLR combined with PPH has a higher cure rate and a better clinical efficacy than laparoscopic IPFLR alone.

Key Words: Internal rectal prolapse; Integral theory; Integral pelvic floor/Ligament repair; Procedure for prolapse and hemorrhoids; Clinical efficacy; Minimally invasive surgery for treatment of constipation

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Core Tip: Internal rectal prolapse (IRP) is one of the most common causes of obstructive constipation. The incidence of IRP in women is approximately three times that in men. From January 2012 to October 2014, we collected the clinical data of 130 female patients with IRP who underwent surgical treatment. We compared the clinical efficacy of laparoscopic integral pelvic floor/ligament repair (IPFLR) combined with a procedure for prolapse and hemorrhoids and the laparoscopic IPFLR alone. Integral theory-guided laparoscopic IPFLR combined with procedure for prolapse and hemorrhoids has a higher cure rate and a better clinical efficacy than laparoscopic IPFLR alone.

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INTRODUCTION

Functional defecation disorder refers to constipation caused by pelvic floor dysfunction or outlet obstructive constipation (OCC), accounting for 60% of chronic constipation cases. Internal rectal prolapse (IRP) is one of the most common causes of OCC. It often occurs along with pelvic floor relaxation and pelvic organ prolapse, such as rectocele, descending perineum, and pelvic floor hernias^[1-3]. The incidence of IRP in women (mainly middle-aged women) is approximately three times that in men. IRP is mainly treated by surgery, which can be divided into two categories: Abdominal procedures and perineal procedures. The traditional surgical procedures have their pros and cons. For example, the transanal procedures have low invasiveness but high recurrence rates, and the transabdominal procedures, which offer better efficacy than the transanal procedures, have high rates of complications and recurrence (up to 50%), which seriously affect quality of life^[4-8]. In early times, due to an insufficient understanding of pelvic floor anatomy and function, the vagina was thought to be the main structure supporting the pelvic organs, or the pelvic muscle laxity and the

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enlarged levator hiatus were considered to be the cause of pelvic organ prolapse. Therefore, the surgical procedures aimed to strengthen the vaginal support, use transvaginal plication for repair, narrow the lumen, close the weak area by suture, enhance the repair using prosthetic patches, or resect the overly large intestinal canal. However, these procedures resulted in high rates of recurrence and complications, and low quality of life^[9-19]. In 2008, Petros and Woodman^[3] first proposed the integral theory, which holds that the laxity of pelvic floor ligaments and muscles causes imbalanced forces among the suspensory ligaments, leading to urination and defecation disorders. The treatment should focus on strengthening the vital structures of the ligamentous system and balancing forces. Surgical procedures based on the integral theory, such as posterior sling, simple uterosacral ligament repair, and posterior suspension of the vaginal vault, were developed to treat defecation disorders caused by pelvic floor relaxation^[20]. However, these procedures still have unsatisfactory efficacy due to lack of attention to the integral repair of the pelvic floor structure and function. Pelvic floor dysfunction-induced constipation involves multiple areas, including the anterior compartment (bladder and urethra), the middle compartment (uterus and vagina), and the posterior compartment (anus and rectum). The pathological changes in the anatomical structure caused by long-term IRP occur mostly in the middle and posterior compartments, and the prolapse and dysfunction of pelvic organs mainly manifest as rectal prolapse, rectocele, and enterocele at different levels (heights) caused by the imbalanced forces that result from the laxity of the fascias and ligaments that attach to the rectum or vagina. Therefore, surgical procedures should be designed to comply with the principle of the tissue fixation system, focus on integral reconstruction and repair based on symptoms and examination results, and involve various levels at different heights, with an emphasis on the uterosacral ligament, rectovaginal fascia, and perineal body^[21]. The surgery should construct a tension-free balanced system of supporting ligaments to achieve the integral reconstruction of pelvic floor function.

Under the guidance of the integral theory, we performed laparoscopic integral pelvic floor/ligament repair (IPFLR), which included integral pelvic floor repair and the strengthening of the ligament suspension of the rectum. The pelvic floor was raised, and the uterosacral ligament and rectovaginal fascia were strengthened to suspend the prolapsed rectum, resolving the problems of abnormal pelvic floor structure and imbalanced ligament forces and restoring the anatomy of the rectum. We also jointly performed the procedure for prolapse and hemorrhoids (PPH) to restore the normal anatomy of the anal canal by pulling the anal canal upward and strengthening the perineal body. The clinical efficacies of IPFLR combined with PPH and IPFLR alone were compared.

MATERIALS AND METHODS

General information

We retrospectively analyzed 140 female patients with IRP who underwent surgical treatment in the 989 Hospital of the Joint Logistic Support Force of the PLA, Luoyang city, from January 2012 to October 2014 and grouped them according to the surgical time and surgical procedure. Seventy patients admitted between January 2012 and November 2012 received laparoscopic IPFLR alone, and were included in group A. Since the desired efficacy was not achieved in a few patients in group A, we further improved the procedure according to the principle of PPH, *i.e.*, we started combining laparoscopic IPFLR with PPH. Seventy patients admitted from December 2012 to October 2014 received the laparoscopic IPFLR combined with PPH, and were included in group B. Among the 140 patients included in this study, 10 patients, including seven in group A and three in group B, were lost to follow-up. Eventually, the number of analyzable cases was 130, including 63 cases in group A and 67 cases in group B.

The inclusion criteria for patients with IRP were as follows: (1) Patients who met the Rome III diagnostic criteria for functional constipation^[22]; (2) Patients with apparent symptoms of OOC and IRP confirmed by defecography; (3) Patients with grades II and III IRP in the grading scheme of Pescatori and Quondamcarlo^[23] and a degree of internal rectal prolapse ≥ 3.1 cm; and (4) Patients who were ≥ 18 years old, signed the informed consent forms, voluntarily accepted the treatment methods, were operated on by the same group of surgeons, and were followed up after surgery for at least 2 years.

The exclusion criteria were as follows: (1) Patients with endocrine diseases, such as

hypothyroidism and diabetes; (2) Patients with psychiatric diseases, such as depression and schizophrenia; (3) Patients who had undergone abdominal or perianal surgery for any cause; (4) Patients with space-occupying lesions of the intestine or inflammatory bowel disease; (5) Patients with other types of constipation, such as atonic constipation; (6) Patients with anal incontinence; and (7) Patients with other types of organ prolapse, such as uterine prolapse.

Treatment methods

The preoperative preparation, postoperative treatment, and discharge instructions were the same for all enrolled patients. The patients were divided into two groups according to surgical procedure used. All surgeries were performed by the same surgical team.

The specific surgical procedure for group A was as follows. Each patient was placed in the supine position. After the establishment of pneumoperitoneum, a 10-mm trocar was placed on the umbilicus as the observation port. A total of four trocars were placed at the lateral borders of the rectus abdominis muscles at the umbilicus level and 3-4 cm below the umbilicus. The 12-mm trocar on the right lower abdomen was used as the main operating port, and the other three (5-mm) trocars were used as the auxiliary operating ports. The surgical assistant first used a three-finger fan retractor to push the uterus upward, grasped the colonic wall using a pair of intestinal forceps at the boundary between the rectum and the sigmoid colon, and pulled it towards the left shoulder to expose the right edge of the pouch of Douglas and the right uterosacral ligament. The surgeon inserted the needle at the site where the middle and lower 1/3 of the right uterosacral ligament attached to the right rectal wall, sutured continuously the right uterosacral ligament to the right side of the mesorectum using a 3-0 VLOCL0614 V-20 absorbable suture (Covidien) along the rectal wall (approximately 0.5-1 cm from the edge of the rectum) towards the pelvic floor to the origin of the right uterosacral ligament, sutured the right uterosacral ligament to the right side of the rectovaginal fascia at the right bottom of the pouch of Douglas, fused the origin of the uterosacral ligament at the cervix with the rectovaginal fascia at the pelvic floor, closed the right side of the pouch of Douglas, and pulled the sigmoid colon towards the right shoulder using the forceps to expose the origin of the left uterosacral ligament at the cervix. The left uterosacral ligament was sutured following the same steps. The origin of the left uterosacral ligament at the cervix was sutured to the left side of the rectovaginal fascia, and the left side of the pouch of Douglas was closed, so that the entire pelvic floor and the rectum were straightened and pulled up. Then, the origin of the left uterosacral ligament was sutured to the left side of the mesorectum (0.5-1 cm from the bowel edge) towards the head side to the level of the sacral promontory. After no bleeding was observed in the surgical area, the pneumoperitoneum was stopped, the trocars were removed, and the incisions were closed by suture.

The surgery in group B was performed in two steps. In the first step, each patient was first placed in the lithotomy position and received laparoscopic IPFLR. The surgical procedure of the first step was the same as that for group A. In the second step, each patient underwent PPH. The specific surgical procedure of PPH was as described previously^[24].

Efficacy assessment

We collected and systematically analyzed the general information of patients (age and body mass index), surgical parameters (operating time and intraoperative blood loss), the information about postoperative recovery (time to first passage of flatus, length of hospital stay, and postoperative complications), and the degree of internal rectal prolapse (DIRP), Wexner constipation scale (WCS) score, Wexner incontinence scale (WIS) score, and Gastrointestinal Quality of Life Index (GIQLI) score before surgery and 6 mo and 2 years after surgery. The DIRP was the measured vertical distance between the deepest point of rectal mucosal prolapse or intussusception and the upper edge of the contour of the telescoped rectum during the defecation phase of defecography^[25]. The WCS score ranges from 0-30. The higher the score, the more severe the constipation. The WCS score of a healthy individual is < 8^[26]. The WIS score ranges from 0-20, with 0 being the best and 20 representing complete incontinence^[27]. The GIQLI score ranges from 0-144, and the GIQLI score of a healthy individual is 125.8 ± 13.00^[28]. Surgical complications were graded using the Clavien-Dindo classification^[29], and grade I-III complications were recorded. Postoperative changes in various indices were monitored. The DIRP, WCS score, GIQLI score, WIS score, and other indices before surgery were compared with those 6 mo and 2 years after surgery.

Statistical analysis

SPSS18.0 statistical software was used for statistical analysis. The measurement data were presented as mean \pm SD. The potential differences between different surgical modalities and the changes of efficacy with time were analyzed using the generalized linear mixed effect model, with age, time and baseline data as covariables. The baseline data of the two groups were compared by the *t* test and χ^2 test. The recovery conditions of the two groups were compared by post-hoc comparisons (Bonferroni's correction was applied for multiple comparisons).

RESULTS

Comparison of the preoperative basic information and surgical conditions between groups A and B (Table 1)

The differences in sex, age, body mass index, number of bowel movements before surgery, DIRP, GIQLI, WIS, and WCS were not statistically significant between the two groups (all $P > 0.05$). All laparoscopic surgeries were performed successfully. The operating time, intraoperative blood loss, and length of hospital stay in group A were all lower than those in group B (all $P < 0.05$). The time to first passage of flatus after surgery was not significantly different between the two groups ($P = 0.144$).

Comparison in functional recovery of patients in groups A and B after surgery

Functional recovery compared at different time points within the same group (Table 2). The WCS score, WIS score, GIQLI score, and DIRP were significantly improved in the two groups 6 mo and 2 years after surgery compared with those before surgery ($P < 0.001$). In group A, the DIRP and WCS score gradually improved from 6 mo to 2 years after surgery ($P < 0.001$), and the GIQLI score gradually improved from 6 mo to 2 years after surgery ($P < 0.001$). In group B, the DIRP and WIS score also improved from 6 mo to 2 years after surgery ($P < 0.05$), the GIQLI score 2 years after surgery was significantly higher than that 6 mo after surgery ($P < 0.05$).

Functional recovery compared between groups (Table 3). The WCS score, WIS score, GIQLI score, and DIRP of group B were significantly better than those of group A 6 mo and 2 years after surgery (all $P < 0.001$, Bonferroni) except DIRP at 2 years after surgery, and the improvement became more obvious over time.

Comparison of IRP recurrence and surgical complications between groups A and B

Six mo after surgery, six patients in group A had recurrence of IRP, and no patient in group B had recurrence of IRP. The difference in IRP recurrence between these two groups was statistically significant ($P = 0.011$).

The seven cases had complications in group A, including one case of fever, four cases of pernicious vomiting, and two cases of urinary retention, all were grade I. Among the eight cases of complications in Group B, four cases had complications of grade I (two cases of urinary retention, and two cases of rectal tenesmus), and four cases had complications of grade III associated with anastomotic bleeding after PPH, which recovered after transanal hemostasis under local anesthesia. There were no life-threatening grade IV-V complications in either group, and the incidence of grade I-III complications was not significantly different between the two groups ($P = 0.882$).

DISCUSSION

IRP is the most common type of OCC. It often occurs along with pelvic floor relaxation and pelvic organ prolapse, such as rectocele, descending perineum, and pelvic floor hernias. Surgery is the main method of treating IRP, and numerous surgical procedures have been developed^[5-8]. However, due to an insufficient understanding of pelvic floor anatomy and function, the long-term surgical efficacies of these procedures are not satisfactory, such as high rates of IRP recurrence and various complications which seriously reduce the quality of life of the patients^[12-19,30,31]. In 2008, Petros *et al*^[3] proposed the integral theory, which holds that pelvic floor organ prolapse and dysfunction are mainly caused by the laxity of the fascias and related ligaments that attach to the rectum, vagina, or bladder. IRP involves the pelvic floor and the pelvic organs in the posterior compartment, and the treatment should focus on strengthening the vital structures of the ligamentous system and forcing balance in the

Table 1 Comparison of the general information between patients with internal rectal prolapse in groups A and B

		Group A (n = 63)	Group B (n = 67)	P value
Patient information	Age (yr)	50.46 ± 13.95	49.90 ± 14.25	0.820
	BMI (kg/m ²)	24.70 ± 3.71	24.46 ± 3.24	0.700
Preoperative data	DIRP (cm)	3.41 ± 0.27	3.50 ± 0.33	0.093
	WCS (0-30)	8.41 ± 3.06	8.30 ± 3.20	0.853
	WIS (0-20)	8.75 ± 2.43	8.76 ± 2.28	0.962
	GIQLI (0-144)	100.90 ± 5.83	101.16 ± 6.13	0.796
	BM (number of times/d)	3.35 ± 1.15	3.49 ± 1.05	0.459
Intraoperative and postoperative data	Operating time (min)	40.35 ± 5.96	50.45 ± 6.52	< 0.001
	Intraoperative blood loss (mL)	4.63 ± 1.35	8.22 ± 3.67	< 0.001
	Time to first passage of feces/flatus (d)	2.22 ± 1.01	2.48 ± 0.98	0.144
	Length of hospital stay (d)	4.87 ± 1.20	5.58 ± 1.76	0.009
	Complications (Dindo > I) n (%)	7 (11.11%)	8 (11.94%)	0.882

BMI: Body mass index; DIRP: Degree of internal rectal prolapse; WCS: Wexner constipation scale; GIQLI: Gastrointestinal Quality of Life Index; WIS: Wexner incontinence scale.

Table 2 Preoperative and postoperative functional recovery (mean ± SD)

		Before surgery	6 mo after surgery	2 yr after surgery	P value (Bonferroni)		
					Before surgery vs 6 mo after surgery	Before surgery vs 2 yr after surgery	6 mo after surgery vs 2 yr after surgery
Group A (63)	DIRP	3.41 ± 0.27	0.54 ± 0.56	0.75 ± 0.63	< 0.001	< 0.001	< 0.001
	WCS	8.41 ± 3.06	1.33 ± 1.00	2.41 ± 1.16	< 0.001	< 0.001	< 0.001
	WIS	8.75 ± 2.43	5.63 ± 1.80	5.33 ± 1.32	< 0.001	< 0.001	0.011
	GIQLI	100.90 ± 5.83	104.05 ± 5.88	103.06 ± 5.99	< 0.001	< 0.001	0.003
Group B (67)	DIRP	3.50 ± 0.33	0.18 ± 0.44	0.61 ± 0.72	< 0.001	< 0.001	< 0.001
	WCS	8.30 ± 3.20	0.51 ± 0.89	1.33 ± 1.11	< 0.001	< 0.001	< 0.001
	WIS	8.76 ± 2.28	3.58 ± 1.22	2.37 ± 0.89	< 0.001	< 0.001	< 0.001
	GIQLI	101.1 ± 6.13	109.67 ± 5.61	117.72 ± 15.29	< 0.001	< 0.001	< 0.001

DIRP: Degree of internal rectal prolapse; WCS: Wexner constipation scale; GIQLI: Gastrointestinal Quality of Life Index; WIS: Wexner incontinence scale.

middle and posterior compartments^[20]. Due to the complex role of the ligamentous system in pelvic balance, according to the surgical principle of tissue fixation system (TFS), we focused on the integral reconstruction of the prolapse at different levels based on imaging findings and symptom presentation^[17]. In female patients with defecation disorders, the uterosacral ligament, rectovaginal fascia, and perineal body are the major targets for the integral repair.

According to the integral theory, from the pathological and anatomical points of view, the main manifestation of IRP is the laxity of the structures supporting the pelvic floor, mainly including fascias and ligaments that attach to the rectum, vagina, or bladder. The laxity results in imbalanced forces of the suspensory ligaments and the deviation of the rectum from their original anatomical position, leading to rectal prolapse or enterocele at different levels, which are the main causes of constipation and difficult defecation^[32-34]. According to the surgical principle of TFS, the IPFLR used in this study raised the pelvic floor and rectum by fusing the uterosacral ligament and rectovaginal fascia to correct the IRP and pelvic floor hernias and restore the anatomy of the rectum, and the strength and stability of the structures supporting the pelvic floor were restored by fusing the mesorectum and uterosacral ligament. The results of

Table 3 Comparison of postoperative functional recovery between the two groups (mean ± SD)

		Group A (n = 63)	Group B (n = 67)	P (time treatment)	P value (Bonferroni)
DIRP	6 mo after surgery	0.54 ± 0.56	0.18 ± 0.44	0.144	< 0.001
	2 yr after surgery	0.75 ± 0.63	0.61 ± 0.72		0.235
WCS	6 mo after surgery	1.33 ± 1.00	0.51 ± 0.89	0.284	< 0.001
	2 yr after surgery	2.41 ± 1.16	1.33 ± 1.11		< 0.001
WIS	6 mo after surgery	5.63 ± 1.80	3.58 ± 1.22	0.004	< 0.001
	2 yr after surgery	5.33 ± 1.32	2.37 ± 0.89		< 0.001
GIQLI	6 mo after surgery	104.05 ± 5.88	109.67 ± 5.61	< 0.001	< 0.001
	2 yr after surgery	103.06 ± 5.99	117.72 ± 15.29		< 0.001
Postoperative recurrence	6 mo after surgery	6 (9.5%)	0		0.011
	2 yr after surgery	13 (20.63%)	8 (11.94%)		0.178

DIRP: Degree of internal rectal prolapse; WCS: Wexner constipation scale; GIQLI: Gastrointestinal Quality of Life Index; WIS: Wexner incontinence scale.

this study showed that the DIRP, WIS score, WCS score, and GIQLI score 6 mo and 2 years after surgery were significantly improved compared with those before surgery in both groups, which confirmed the effectiveness of IPFLR.

Another pathological change of the anatomical structure caused by long-term IRP is the rectocele due to the laxity of the perineal body and the structures supporting the anal canal and the downward displacement of the pectinate line caused by the compression of the anal canal by the prolapsed rectum, which affected the rectoanal inhibitory reflex and reduced the strength of the anal sphincter. The clinical manifestations were anal wetness, anal itching, passage of small amounts of stool, incomplete evacuation, and mixed hemorrhoids^[35-37].

It is difficult to resolve the pathological changes to the anatomical structure of the anal canal by abdominal suspension alone. We combined the IPFLR with transanal PPH to lift the perineal body and anal canal, strengthen the perineal body and the suspensory ligaments of the anal canal, and restore the normal anatomy of the anal canal. The DIRP, WCS score, WIS score, and GIQLI score were compared between the two groups 6 mo and 2 years after surgery. The improvement of each index in group B was significantly better than that in group A ($P < 0.001$), indicating that the clinical efficacy of IPFLR combined with PPH was significantly higher than that of IPFLR alone. The number of recurrent cases and the recurrence rate in group B 6 mo after surgery were significantly lower than those in group A. From the statistical point of view, laparoscopic IPFLR combined with PPH not only restored the anatomy of the anal canal and strengthened the perineal body and the structures supporting the anal canal but also resected the distal prolapsed rectum, which was not performed in the laparoscopic IPFLR alone group, thus it reduced the risk of postoperative recurrence of IRP. Moreover, female patients with constipation often have rectal prolapse and rectocele simultaneously^[38-40]. In the present study, the structures supporting the rectum were strengthened and restored by fusing the uterosacral ligament and the rectovaginal fascia. The combined use of PPH ameliorated the distal IRP while strengthening the anterior rectal wall and eliminated or relieved the rectocele, thus reducing the degree of constipation and the recurrence rate of IRP^[41].

The integral theory-guided IPFLR used in this study did not involve the immobilization of the rectum or the resection of the excessive intestinal canal. It directly repaired the pelvic floor in an integral way and strengthened the ligament suspension of the rectum. Therefore, the operation was simple and fast. IPFLR avoided any damage to the pelvic nerves and reduced the wound area in the pelvic operation, thus reducing the occurrence of complications. In this study, the comparison of postoperative complications between groups A and B showed that the complications following PPH in group B were mainly anastomotic bleeding. No serious complications, such as rectal perforation or severe infection, occurred. The cause of anastomotic bleeding might be that when we extended and pulled the anal canal up, the PPH was operated on close to the upper edge of the pectinate line, which was rich in blood vessels and prone to bleeding. In addition, since the operation did not involve the transanal resection of the prolapsed intestinal canal or the dissection of the

prolapsed mucosa, surgical injury was reduced, thus reducing the likelihood of complications. Although the types of complications following the two procedures were different, they were mostly short-term complications during the hospitalization. Over the 2-year postoperative follow-up, there were no complications that affected quality of life. Since the patients in group B also underwent transanal PPH, the operating time and length of hospital stay were longer in group B than in group A, and the intraoperative blood loss was greater in group B. However, given the long-term treatment efficacy and long-term improvement of quality of life, the longer operating time, greater intraoperative blood loss, and longer hospital stay in group B were acceptable.

During the entire surgical procedure, caution should be given to the following aspects to ensure the success of the surgery and the postoperative outcomes. (1) The uterosacral ligament and rectovaginal fascia should be adequately exposed; (2) The continuous suture should be initiated from the middle and lower 1/3 of the right uterosacral ligament and ended at the left uterosacral ligament at the level of the sacral promontory, so that a bilateral high suture, which would affect rectal contraction and thus aggravate constipation, can be avoided; (3) At the bottom of the pelvic floor, the origins of the left and right uterosacral ligaments at the cervix level should be tightly sutured to the rectovaginal fascia to restore the anatomical structure of the pelvic floor and suspend the rectum; (4) The suture of the uterosacral ligaments and the mesorectum should not be too close to the rectal wall and should be kept 0.5-1 cm away; and (5) To ensure that the anal canal is pulled up, the PPH should be operated on close to the upper edge of the pectinate line, meaning that the suture of the rectal mucosa should be 0.2-0.5 cm above the pectinate line.

This work is a retrospective non-randomized single-center study and has certain limitations, such as not accounting for potential post-baseline covariates. We will further develop a multicenter randomized controlled study. Meanwhile, we will enlarge the sample size and conduct a randomized trial with blinded patients and assessors to further evaluate the efficacy of integral theory-guided laparoscopic IPFLR combined with PPH.

CONCLUSION

In summary, laparoscopic IPFLR according to the surgical principle of TFS restored the anatomical abnormalities caused by IRP and relieved the symptoms. Moreover, it had low invasiveness and a low rate of complications. When it was combined with PPH, the normal anatomical position and function of the anal canal were recovered, thus reducing the recurrence of IRP and constipation. Therefore, the clinical efficacy of the laparoscopic IPFLR combined with PPH is better than that of laparoscopic IPFLR alone.

ARTICLE HIGHLIGHTS

Research background

Functional defecation disorder refers to constipation caused by pelvic floor dysfunction or outlet obstructive constipation, accounting for 60% of chronic constipation cases. Internal rectal prolapse (IRP) is one of the most common causes of obstructive constipation. The incidence of IRP in women is approximately three times that in men. IRP is mainly treated by surgery, which can be divided into two categories: Abdominal procedures and perineal procedures. This study offers a better procedure for the treatment of internal rectal prolapse.

Research motivation

The traditional surgical procedures have their pros and cons. Therefore, surgical procedures should be designed to comply with the principle of the tissue fixation system, should focus on integral reconstruction and repair based on symptoms and examination results, and should involve various levels at different heights, with an emphasis on the uterosacral ligament, rectovaginal fascia, and perineal body. The surgery should establish a tension-free balanced system of supporting ligaments to achieve the integral reconstruction of pelvic floor function.

Research objectives

To compare the clinical efficacy of laparoscopic integral pelvic floor/ligament repair (IPFLR) combined with a procedure for prolapse and hemorrhoids (PPH) and the efficacy of laparoscopic IPFLR alone in the treatment of internal rectal prolapse (IRP) in women.

Research methods

Between January 2012 and October 2014, we collected the clinical data of 130 female patients with IRP who underwent surgical treatment. The patients were divided into groups A and B. Group A had 63 patients who underwent laparoscopic IPFLR alone, and group B had 67 patients who underwent the laparoscopic IPFLR combined with PPH. The degree of internal rectal prolapse (DIRP), Wexner constipation scale (WCS) score, Wexner incontinence scale (WIS) score, and Gastrointestinal Quality of Life Index (GIQLI) score were compared between groups and within groups before surgery and 6 mo and 2 years after surgery.

Research results

All laparoscopic surgeries were successful. The general information, number of bowel movements before surgery, DIRP, GIQLI score, WIS score, and WCS score before surgery were not significantly different between the two groups (all $P > 0.05$). The WCS score, WIS score, GIQLI score, and DIRP in each group 6 mo and 2 years after surgery were significantly better than before surgery ($P < 0.001$). In group A, the DIRP and WCS score gradually improved from 6 mo to 2 years after surgery ($P < 0.001$), and the GIQLI score progressively improved from 6 mo to 2 years after surgery ($P < 0.05$). In group B, the DIRP, WCS score and WIS score significantly improved from 6 mo to 2 years after surgery ($P < 0.05$), and the GIQLI score 2 years after surgery were significantly higher than that 6 mo after surgery ($P < 0.05$). The WCS score, WIS score, GIQLI score, and DIRP of group B were significantly better than those of group A 6 mo and 2 years after surgery (all $P < 0.001$, Bonferroni) except DIRP at 2 years after surgery.

Research conclusions

Laparoscopic IPFLR according to the surgical principle of tissue fixation system restored the anatomical abnormalities caused by IRP and relieved the symptoms. Moreover, it had low invasiveness and a low rate of complications. When it was combined with PPH, the normal anatomical position and function of the anal canal were recovered, thus reducing the recurrence of IRP and constipation. Therefore, the clinical efficacy of the laparoscopic IPFLR combined with PPH is better than that of laparoscopic IPFLR alone.

Research perspectives

This work is a retrospective non-randomized single-center study and has certain limitations, such as not accounting for potential post-baseline covariates. We will further develop a multicenter randomized controlled study. Meanwhile, we will enlarge the sample size and conduct a randomized trial with blinded patients and assessors to further evaluate the efficacy of integral theory-guided laparoscopic IPFLR combined with PPH.

REFERENCES

- 1 **Rao SS**, Rattanakit K, Patcharatrakul T. Diagnosis and management of chronic constipation in adults. *Nat Rev Gastroenterol Hepatol* 2016; **13**: 295-305 [PMID: [27033126](#) DOI: [10.1038/nrgastro.2016.53](#)]
- 2 **Owais AE**, Sumrien H, Mabey K, McCarthy K, Greenslade GL, Dixon AR. Laparoscopic ventral mesh rectopexy in male patients with internal or external rectal prolapse. *Colorectal Dis* 2014; **16**: 995-1000 [PMID: [25175930](#) DOI: [10.1111/codi.12763](#)]
- 3 **Petros PE**, Woodman PJ. The Integral Theory of continence. *Int Urogynecol J Pelvic Floor Dysfunct* 2008; **19**: 35-40 [PMID: [17968480](#) DOI: [10.1007/s00192-007-0475-9](#)]
- 4 **Lu M**, Yang B, Liu Y, Liu Q, Wen H. Procedure for prolapse and hemorrhoids vs traditional surgery for outlet obstructive constipation. *World J Gastroenterol* 2015; **21**: 8178-8183 [PMID: [26185392](#) DOI: [10.3748/wjg.v21.i26.8178](#)]
- 5 **Bridoux V**, Michot F, Tuech JJ. The STARR operation with the Contour 30® (Transtar®) stapler for the treatment of obstructed defecation syndrome associated with rectocele and internal rectal prolapse.

- J Visc Surg* 2011; **148**: e361-e365 [PMID: 22070909 DOI: 10.1016/j.jvisurg.2011.09.012]
- 6 **Naldini G**, Fabiani B, Menconi C, Giani I, Toniolo G, Mascagni D, Martellucci J. Treatment of obstructed defecation syndrome due to rectocele and rectal intussusception with a high volume stapler (TST STARR-plus). *Tech Coloproctol* 2018; **22**: 53-58 [PMID: 29063219 DOI: 10.1007/s10151-017-1696-7]
 - 7 **Mari FS**, Pezzatini M, Gasparrini M, Antonio B. STARR with Contour Transtar for Obstructed Defecation Syndrome: Long-Term Results. *World J Surg* 2017; **41**: 2906-2911 [PMID: 28600694 DOI: 10.1007/s00268-017-4084-6]
 - 8 **Festen S**, van Geloven AA, Gerhards MF. Redo procedure for prolapse and haemorrhoids (PPH) for persistent and recurrent prolapse after PPH. *Dig Surg* 2009; **26**: 418-421 [PMID: 19923831 DOI: 10.1159/000236011]
 - 9 **Collinson R**, Cunningham C, Lindsey I. Surgery for internal rectal prolapse. *Colorectal Dis* 2009; **11**: 11-12 [PMID: 18462231 DOI: 10.1111/j.1463-1318.2008.01565.x]
 - 10 **Wijffels NA**, Collinson R, Cunningham C, Lindsey I. What is the natural history of internal rectal prolapse? *Colorectal Dis* 2010; **12**: 822-830 [PMID: 19508530 DOI: 10.1111/j.1463-1318.2009.01891.x]
 - 11 **Penninckx F**. Surgery for internal rectal prolapse revisited. *Colorectal Dis* 2010; **12**: 83-84 [PMID: 20438491 DOI: 10.1111/j.1463-1318.2009.02155.x]
 - 12 **Franceschilli L**, Varvaras D, Capuano I, Ciangola CI, Giorgi F, Boehm G, Gaspari AL, Sileri P. Laparoscopic ventral rectopexy using biologic mesh for the treatment of obstructed defaecation syndrome and/or faecal incontinence in patients with internal rectal prolapse: a critical appraisal of the first 100 cases. *Tech Coloproctol* 2015; **19**: 209-219 [PMID: 25577276 DOI: 10.1007/s10151-014-1255-4]
 - 13 **Gosselink MP**, Joshi H, Adusumilli S, van Onkelen RS, Fourie S, Hompes R, Jones OM, Cunningham C, Lindsey I. Laparoscopic ventral rectopexy for faecal incontinence: equivalent benefit is seen in internal and external rectal prolapse. *J Gastrointest Surg* 2015; **19**: 558-563 [PMID: 25412861 DOI: 10.1007/s11605-014-2696-9]
 - 14 **Gosselink MP**, Adusumilli S, Gorissen KJ, Fourie S, Tuynman JB, Jones OM, Cunningham C, Lindsey I. Laparoscopic ventral rectopexy for fecal incontinence associated with high-grade internal rectal prolapse. *Dis Colon Rectum* 2013; **56**: 1409-1414 [PMID: 24201396 DOI: 10.1097/DCR.0b013e3182a85aa6]
 - 15 **Sileri P**, Franceschilli L, de Luca E, Lazzaro S, Angelucci GP, Fiaschetti V, Pasecenic C, Gaspari AL. Laparoscopic ventral rectopexy for internal rectal prolapse using biological mesh: postoperative and short-term functional results. *J Gastrointest Surg* 2012; **16**: 622-628 [PMID: 22228202 DOI: 10.1007/s11605-011-1793-2]
 - 16 **Pescatori M**. Surgery for internal rectal prolapse: a word of caution. *Colorectal Dis* 2009; **11**: 430 [PMID: 19425212 DOI: 10.1111/j.1463-1318.2009.01795.x]
 - 17 **Yang SJ**, Yoon SG, Lim KY, Lee JK. Laparoscopic Vaginal Suspension and Rectopexy for Rectal Prolapse. *Ann Coloproctol* 2017; **33**: 64-69 [PMID: 28503518 DOI: 10.3393/ac.2017.33.2.64]
 - 18 **Foppa C**, Martinek L, Arnaud JP, Bergamaschi R. Ten-year follow up after laparoscopic suture rectopexy for full-thickness rectal prolapse. *Colorectal Dis* 2014; **16**: 809-814 [PMID: 24945584 DOI: 10.1111/codi.12689]
 - 19 **van Iersel JJ**, Paulides TJ, Verheijen PM, Lumley JW, Broeders IA, Consten EC. Current status of laparoscopic and robotic ventral mesh rectopexy for external and internal rectal prolapse. *World J Gastroenterol* 2016; **22**: 4977-4987 [PMID: 27275090 DOI: 10.3748/wjg.v22.i21.4977]
 - 20 **Van Geluwe B**, Wolthuis A, D'Hoore A. Laparoscopy for pelvic floor disorders. *Best Pract Res Clin Gastroenterol* 2014; **28**: 69-80 [PMID: 24485256 DOI: 10.1016/j.bpg.2013.11.009]
 - 21 **Wagenlehner FM**, Del Amo E, Santoro GA, Petros P. Live anatomy of the perineal body in patients with third-degree rectocele. *Colorectal Dis* 2013; **15**: 1416-1422 [PMID: 23819818 DOI: 10.1111/codi.12333]
 - 22 **Bharucha AE**, Wald A, Enck P, Rao S. Functional anorectal disorders. *Gastroenterology* 2006; **130**: 1510-1518 [PMID: 16678564 DOI: 10.1053/j.gastro.2005.11.064]
 - 23 **Pescatori M**, Quondamcarlo C. A new grading of rectal internal mucosal prolapse and its correlation with diagnosis and treatment. *Int J Colorectal Dis* 1999; **14**: 245-249 [PMID: 10647634 DOI: 10.1007/s003840050218]
 - 24 **Lim YK**, Eu KW, Ho KS, Ooi BS, Tang CL. PPH03 stapled hemorrhoidopexy: our experience. *Tech Coloproctol* 2006; **10**: 43-46 [PMID: 16528484 DOI: 10.1007/s10151-006-0249-3]
 - 25 **Mahieu P**, Pringot J, Bodart P. Defecography: II. Contribution to the diagnosis of defecation disorders. *Gastrointest Radiol* 1984; **9**: 253-261 [PMID: 6468863 DOI: 10.1007/bf01887846]
 - 26 **Agachan F**, Chen T, Pfeifer J, Reissman P, Wexner SD. A constipation scoring system to simplify evaluation and management of constipated patients. *Dis Colon Rectum* 1996; **39**: 681-685 [PMID: 8646957 DOI: 10.1007/bf02056950]
 - 27 **Jorge JM**, Wexner SD. Etiology and management of fecal incontinence. *Dis Colon Rectum* 1993; **36**: 77-97 [PMID: 8416784 DOI: 10.1007/bf02050307]

- 28 **Eypasch E**, Williams JI, Wood-Dauphinee S, Ure BM, Schmülling C, Neugebauer E, Troidl H. Gastrointestinal Quality of Life Index: development, validation and application of a new instrument. *Br J Surg* 1995; **82**: 216-222 [PMID: [7749697](#) DOI: [10.1002/bjs.1800820229](#)]
- 29 **Clavien PA**, Barkun J, de Oliveira ML, Vauthey JN, Dindo D, Schulick RD, de Santibañes E, Pekolj J, Slankamenac K, Bassi C, Graf R, Vonlanthen R, Padbury R, Cameron JL, Makuuchi M. The Clavien-Dindo classification of surgical complications: five-year experience. *Ann Surg* 2009; **250**: 187-196 [PMID: [19638912](#) DOI: [10.1097/SLA.0b013e3181b13ca2](#)]
- 30 **Roman H**, Michot F. Long-term outcomes of transanal rectocele repair. *Dis Colon Rectum* 2005; **48**: 510-517 [PMID: [15875294](#) DOI: [10.1007/s10350-004-0800-z](#)]
- 31 **Adusumilli S**, Gosselink MP, Fourie S, Curran K, Jones OM, Cunningham C, Lindsey I. Does the presence of a high grade internal rectal prolapse affect the outcome of pelvic floor retraining in patients with faecal incontinence or obstructed defaecation? *Colorectal Dis* 2013; **15**: e680-e685 [PMID: [23890098](#) DOI: [10.1111/codi.12367](#)]
- 32 **Grossi U**, Knowles CH, Mason J, Lacy-Colson J, Brown SR; NIHR CapaCiTY working group; Pelvic floor Society. Surgery for constipation: systematic review and practice recommendations: Results II: Hitching procedures for the rectum (rectal suspension). *Colorectal Dis* 2017; **19** Suppl 3: 37-48 [PMID: [28960927](#) DOI: [10.1111/codi.13773](#)]
- 33 **Milsom J**, Trencheva K, Pavoov R, Dirocco J, Shukla PJ, Kawamura J, Sonoda T. Endoscopic fixation of the rectum for rectal prolapse: a feasibility and survival experimental study. *Surg Endosc* 2011; **25**: 3691-3697 [PMID: [21643879](#) DOI: [10.1007/s00464-011-1778-y](#)]
- 34 **Renzi A**, Brillantino A, Di Sarno G, D'Aniello F, Giordano A, Stefanuto A, Aguzzi D, Daffinà A, Ceci F, D'Oriano G, Mercuri M, Alderisio A, Perretta L, Carrino F, Sernia G, Greco E, Picchio M, Marino G, Goglia A, Trombetti A, De Pascalis B, Panella S, Bochicchio O, Bandini A, Del Re L, Longo F, Micera O. PPH-01 versus PPH-03 to perform STARR for the treatment of hemorrhoids associated with large internal rectal prolapse: a prospective multicenter randomized trial. *Surg Innov* 2011; **18**: 241-247 [PMID: [21737467](#) DOI: [10.1177/1553350611412794](#)]
- 35 **Harmston C**, Jones OM, Cunningham C, Lindsey I. The relationship between internal rectal prolapse and internal anal sphincter function. *Colorectal Dis* 2011; **13**: 791-795 [PMID: [20345968](#) DOI: [10.1111/j.1463-1318.2010.02266.x](#)]
- 36 **Sammarco G**, Ferrari F, Carpino A, Russo E, Vescio G, Ammendola M, Sacco R. PPH vs Milligan-Morgan: early and late complications in the treatment of haemorrhoidal disease with circumferential prolapse. *Ann Ital Chir* 2014; **85**: 464-469 [PMID: [23857997](#)]
- 37 **Wijffels NA**, Jones OM, Cunningham C, Bemelman WA, Lindsey I. What are the symptoms of internal rectal prolapse? *Colorectal Dis* 2013; **15**: 368-373 [PMID: [22823279](#) DOI: [10.1111/j.1463-1318.2012.03183.x](#)]
- 38 **Collinson R**, Harmston C, Cunningham C, Lindsey I. The emerging role of internal rectal prolapse in the aetiology of faecal incontinence. *Gastroenterol Clin Biol* 2010; **34**: 584-586 [PMID: [21051166](#) DOI: [10.1016/j.gcb.2010.09.007](#)]
- 39 **Collinson R**, Wijffels N, Cunningham C, Lindsey I. Laparoscopic ventral rectopexy for internal rectal prolapse: short-term functional results. *Colorectal Dis* 2010; **12**: 97-104 [PMID: [19788493](#) DOI: [10.1111/j.1463-1318.2009.02049.x](#)]
- 40 **Pescatori M**, Gagliardi G. Postoperative complications after procedure for prolapsed hemorrhoids (PPH) and stapled transanal rectal resection (STARR) procedures. *Tech Coloproctol* 2008; **12**: 7-19 [PMID: [18512007](#) DOI: [10.1007/s10151-008-0391-0](#)]
- 41 **Festen S**, Molthof H, van Geloven AA, Luchters S, Gerhards MF. Predictors of recurrence of prolapse after procedure for prolapse and haemorrhoids. *Colorectal Dis* 2012; **14**: 989-996 [PMID: [21951513](#) DOI: [10.1111/j.1463-1318.2011.02837.x](#)]



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