Clinical Efficacy of Automatic Ruiyun Procedure for Hemorrhoids and Procedure for Prolapse and Hemorrhoids in the Treatment of Mixed Hemorrhoids: A Comparative Study

Ann. Ital. Chir., 2025 96, 2: 205–212
https://doi.org/10.62713/aic.3746

Hao Xu[1], Xinyong Yan[1], Dongpeng Hao[1], Jieliang Hu[2], Yan Wang[1]

[1]Department of Proctology, The Third Affiliated Hospital of Gansu University of Chinese Medicine/The 1st People's Hospital of Baiyin, 730900 Baiyin, Gansu, China
[2]Department of Basic Laboratory, The Third Affiliated Hospital of Gansu University of Chinese Medicine/The 1st People's Hospital of Baiyin, 730900 Baiyin, Gansu, China

AIM: The occurrence of mixed hemorrhoids becomes increasingly more frequent with age, posing psychological pressure and distress to affected patients. This retrospective study aims to compare the clinical efficacy of automatic Ruiyun procedure for hemorrhoids and procedure for prolapse and hemorrhoids in the treatment of mixed hemorrhoids.
METHODS: A retrospective cohort study of patients with mixed hemorrhoids who visited the Third Affiliated Hospital of Gansu University of Chinese Medicine (The 1st People's Hospital of Baiyin) from January 2019 to December 2023 was conducted using propensity score matching (PSM) with a ratio of 1:1 for nearest neighbor matching grouping. In this study, 60 cases were grouped under the Ruiyun procedure for hemorrhoids (RPH) group, and the other 60 cases were categorized in the procedure for prolapse and hemorrhoids (PPH) group. The postoperative medical humanistic evaluation, clinical efficacy evaluation, subjective evaluation of patients, the occurrence of complications and the rate of unplanned readmission were compared between the two groups.
RESULTS: Surgical time, intraoperative blood loss, duration of postoperative pain, length of hospital stay and hospitalization expenses between the two groups presented statistically significant differences ($p < 0.001$). There were statistically significant intra-group and between-group differences between RPH group and PPH group in the visual analogue scale (VAS) scores on the 4th and 6th postoperative days ($p < 0.001$). The European Quality of Life-5 Dimensions, 5-Level Version (EQ-5D-5L) score in the RPH group was lower than that in the PPH group at the 12th week of follow-up ($p < 0.001$), signifying an improved level of quality of life. There was no difference in Vaizey's Fecal Incontinence Rating Scale score between the RPH group and the PPH group at the 12th week of follow-up ($p > 0.05$). The rate of unplanned postoperative readmission was higher in the PPH group than in the RPH group, although the difference was not of statistical significance ($p > 0.05$).
CONCLUSIONS: RPH outperforms PPH in the treatment of mixed hemorrhoids with a shortened surgical time.

Keywords: Ruiyun procedure for hemorrhoids; procedure for prolapse and hemorrhoids; complication; clinical efficacy

Introduction

Hemorrhoids are benign diseases occurring around the anus [1]. The results of an epidemiological survey conducted in Taiwan, China, showed that patients with hemorrhoids had a significantly higher risk of developing colorectal cancer [2]. Essentially, hemorrhoids are accompanied by a series of clinical symptoms due to a variety of factors contributing to poor venous return and the varicose veins formed by dilation and flexion of the submucosal venous plexus at the end of the rectum and under the skin of the anal canal. Hemorrhoids can be divided into external hemorrhoids, internal hemorrhoids and mixed hemorrhoids with the dentate line as the boundary, among which the clinical symptoms of mixed hemorrhoids are the most complex, rendering the treatment challenging [3,4].

Depending on the severity, mixed hemorrhoids can be treated by either conservative and surgical means. Conservative treatment usually encompasses palliative therapy, using a combination of drugs and cleaning therapy. Surgical treatment is suitable for mixed hemorrhoids compounded by severe thrombotic external hemorrhoids and bleeding, which can negatively affect the quality of life [5]. The inception of minimally invasive medicine has driven more and more scholars to explore ways to reduce the surgical trauma as much as possible while preserving normal tissue. This has led to the gradual acceptance and clinical adoption of the minimally invasive concept such as "restrictive hemorrhoidectomy" [6]. The past decades have seen a paradigm shift in the hemorrhoid treatment concept focusing on minimizing pain and complications following com-

Submitted: 14 September 2024 Revised: 8 November 2024 Accepted: 13 December 2024 Published: 10 February 2025
Correspondence to: Yan Wang, Department of Proctology, The Third Affiliated Hospital of Gansu University of Chinese Medicine/The 1st People's Hospital of Baiyin, 730900 Baiyin, Gansu, China (e-mail: wangyanby227@163.com).

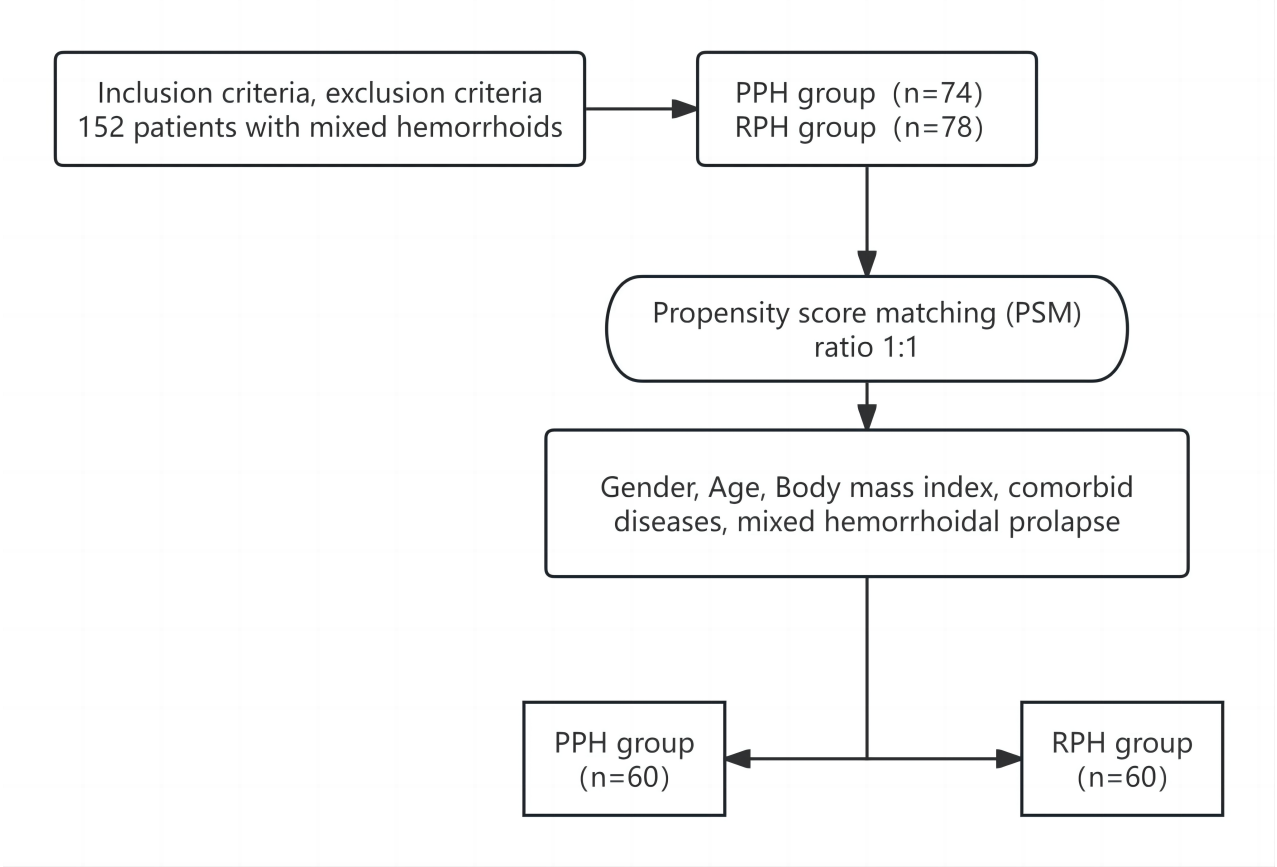

Fig. 1. Propensity score matching flow chart. Abbreviations: RPH, Ruiyun procedure for hemorrhoids; PPH, procedure for prolapse and hemorrhoids.

plete anatomic resection of hemorrhoids, while controlling hemorrhoid symptoms using less invasive techniques [7]. Meanwhile, how to effectively prevent and treat the complications occurring after a surgery for mixed hemorrhoids remains an important challenge throughout the treatment course.

This retrospective study involving a series of patients with mixed hemorrhoids aims to compare the automatic Ruiyun procedure for hemorrhoids and procedure for prolapse and hemorrhoids, and analyze their clinical effect.

Materials and Methods

Study Design and Subjects

This retrospective cohort study was approved by the ethics committee of the Third Affiliated Hospital of Gansu University of Chinese Medicine (The 1st People's Hospital of Baiyin) (ethical approval number: YL-KY-2019-031). Informed consent was obtained from all patients in the study cohort, and patient data were obtained entirely from the hospital medical record system. In this study, the clinical information of patients who visited the Third Affiliated Hospital of Gansu University of Chinese Medicine (The 1st People's Hospital of Baiyin) from January 2019 to December 2023 were collected. Initially, 152 patients with mixed hemorrhoidal prolapse were considered, including 74 in the procedure for prolapse and hemorrhoids (PPH) group and 78 in the Ruiyun procedure for hemorrhoids (RPH) group. To minimize disparity in the study, we applied propensity score matching (PSM) in a 1:1 ratio, and a total of 120 patients with mixed hemorrhoid prolapse were finally included in this study, of which 60 were in the PPH group and 60 in the RPH group. All the selected patients met the diagnostic criteria of mixed hemorrhoids stipulated in the Guidelines for the Diagnosis and Treatment of Hemorrhoids [8]; Fig. 1 shows the matching flow of this study. Given the retrospective nature of this study, we did not directly survey and examine the patients included, but we ensured complete adherence to the principles of the Declaration of Helsinki at every step and procedure.

The inclusion criteria are summarized as follows: (1): presence of blood in the stool and anal mass, with anal distention, foreign body sensation, pain, and possibly localized discharge or pruritus; (2) tumors in the same direction above and below the dentate line of the anal canal (there can also be skin folds under the dentate line); and (3) complete clinical data.

Exclusion criteria of this study are as follows: (1) patients with rectal prolapse; (2) patients with moderate or higher rectal protrusion; (3) patients with anal stenosis, anal fissure

and anal impotence; (4) pregnant women and children; (5) patients with rectal or anorectal space-occupying lesions; (6) patients with severe liver and kidney dysfunction, intestinal nerve dysfunction, and mental abnormalities that hamper normal communication.

Surgical Methods

Preoperative Care

Before the operation, the patient should complete the digital anal examination, anoscopy examination, blood routine, coagulation function, liver and kidney function, electrolytes, electrocardiogram and other necessary examinations, and complete the anesthesia evaluation. Preoperatively, the patients were educated about the operations and informed of the related precautions prior to signing the consent form for surgery. The patients were admitted to the hospital on empty stomach the next day, and instructed to clean their enema and empty urine. Prophylactic intravenous infusion of antibiotics was implemented 30 minutes before surgery.

Methods of Anesthesia

All patients were treated with sacral canal block anesthesia, and 1%–1.5% lidocaine hydrochloride (Shiyao Yinhu Pharmaceutical Co., Ltd., Shijiazhuang, China, H14024045) was injected with 15–20 mL of local anesthetic for perianal infiltration anesthesia.

Surgical Method of PPH

Each patient was demanded to assume the "prone folding knife position" to allow for anal dilatation, and then an appropriate type of anoscope was used to observe the hemorrhoidal area. The mixed, external hemorrhoids were clamped under tension-free conditions to reveal the internal hemorrhoids. A "V" incision was made at the external hemorrhoid using curved scissors. The thrombus and variose vein tissue in the hemorrhoidal nucleus between the skin and the sphincter were completely peeled off, freeing the flap to about 5 mm above the dentate line. Then, the basal part of the internal hemorrhoids was clamped with hemostats, and the excess hemorrhoidal nucleus tissue was cut off after the silk suture. According to the position marked by methylene blue, a windowed anoscope was inserted into the anus. The anoscope was rotated, so that the suprahemorhoidal mucosa marked by methylene blue entered the opening window of the anoscope. A 10-second stint is required to fully expose the protruding hemorrhoidal tissue, the procedure involves suturing the submucosa in a double layer using interrupted purse-string sutures, positioned 2–3 cm above the dentate line, with surgical sutures Double-layer submucosal intermittent purse suture was performed at 3 cm. Note that the suture must be performed in the submucosa and between the mucosa to avoid injury to the muscles. The TST stapler was unscrewed completely. The head of the stapler was fully incorporated into the rectum above the suture along the axis of the anoscope, the purse was tightened around the center rod with the knot tied using a knot-pusher, and the thread was used to pull the purse line out of the lateral holes on both sides of the stapler before traction. The anoscope and the stapler were stabilized at the same level, and the tail of the stapler was tightened so that the prolapsed suprahemorrhoidal mucosa was pulled into the slot of the stapler with the help of the anoscope window. Note that female patients need to be checked for whether the mucosa in the posterior vaginal wall is accidentally sutured or clamped into the stapler slot if the stapler pointer has reached the firing range. After waiting for 30 seconds for the stapler to be fixed, the tail wing was loosened and the stapler removed, if there is suture bypass between the two anastomoses.

A direct shearing treatment was implemented. Sutures and ligation were performed at the protrusions at both ends of the broken bridge. If active bleeding is detected upon a careful inspection of the anastomosis, an "8"-shaped suture should be made to stop the bleeding; while there is no active bleeding, the anoscope would be withdrawn. The anus area of each patient was applied with petroleum jelly gauze and compressed bandage.

Surgical Method of RPH

Each patient was demanded to assume the "prone folding knife position" for anal dilatation. Then, anal speculum was inserted to aid in revealing the size and distribution of the dentate line and hemorrhoidal nucleus. The banding point and sequence was determined. The muzzle of the banding device was aimed at 3 cm on the dentate line at 3 o'clock position at the hemorrhoidal nucleus and the base. The negative pressure suction button was turned off to lower the negative pressure to between 0.08 and 0.09 kPa, to facilitate automatic covering of the hemorrhoid root by the rubber ring. Afterward, tandem banding on the mucosa of the hemorrhoids at 3 cm above the root of the dentate line was performed. Hemorrhoidal nuclei and mucous membranes were treated same as surgical method of PPH. If the external hemorrhoids are large, the hemorrhoids are completely peeled off from the outside to the inside.

Postoperative Management

The patients were allowed to drink water 2 hours after the surgery, consume fluid-based food after 4 hours, and resume normal diet the next day. One intravenous infusion of reasonably chosen antibiotics was administered to each patient to prevent infections. Patients who showed no obvious bleeding from the incision, no difficulty urinating, and a visual analogue scale (VAS) pain score of less than 4 after taking painkillers were discharged.

Discharge Guidance

The patients were advised to eat a reasonable diet with increased portion of crude fiber-based food such as vegetables

and fruits to ensure smooth defecation and avoid diarrhea or constipation. Patients with constipation were given daily 10–15 mL lactulose (Beijing Hanmei Pharmaceutical Co., Ltd., Beijing, China, H20065730) to soften the stool. After the operation, the dressing should be changed every 2 days after defecation to promote wound healing, and a hot steam-smoked sitz bath at a moderate water temperature of 40 °C can be used for 20 min each time. Patients were advised to seek medical attention in time if they experience postoperative bleeding, urinary retention, and unbearable pain in the surgical area.

Observe Indicators

Medical Humanistic Evaluation

Surgical time, intraoperative blood loss, postoperative pain time (self-rated visual analogue scale [VAS] >4 points), length of hospital stay and hospitalization expenses of the two groups were recorded.

Evaluation of Clinical Efficacy

The clinical efficacy investigated in this work is categorized into several classifications, namely "cure", "significantly effective", "effective", and "ineffective" [9]. Their descriptions are as follows:

(i) Cure: The symptoms of bleeding and prolapse disappear completely, with only a few or no residual varices of hemorrhoids under anoscopy, and there was no recurrence within 12 weeks of follow-up.

(ii) Significant effective: The symptoms of bleeding and prolapse were significantly reduced compared with the preoperative period, and the hemorrhoids underwent an atrophy by 50% at 12 weeks as compared to their size before treatment.

(iii) Effective: The symptoms of bleeding and prolapse were alleviated, and the hemorrhoidal nucleus was observed to have atrophied by <50% at 12 weeks under anoscopy as compared to their size before treatment.

(iv) Ineffective: The symptoms of bleeding and prolapse were not relieved compared to the preoperative period, and the hemorrhoidal nucleus under anoscopy did not shrink.

The difference in clinical efficacy between the two groups was compared.

Total effective rate (%) = (Cure + Significant effective + Effective)/Total number of cases × 100.

Evaluation of Subjective Feelings

The surgical incision VAS [10] on the 1st, 2nd, 4th, and 6th postoperative days in the two groups was recorded, along with the European Quality of Life-5 Dimensions, 5-Level Version (EQ-5D-5L) [11], and Vaizey's Fecal Incontinence Rating Scale score [12].

(i) VAS is used for the assessment of pain. 0 means painless and 10 represents the most unbearable pain.

(ii) EQ-5D-5L includes 5 questions, including mobility, self-care, daily action, pain sensation, and anxiety state. A 1–5 point scoring method is adopted; the higher the score, the worse the health status of the patient.

(iii) The Vaizey's Fecal Incontinence Rating Scale includes 7 questions: the first to fourth questions are scored on a 0–4 scale, and the fifth to seventh questions are scored on a dichotomous scale, with the lowest score being 0 points and the highest score being 22 points; a higher score indicates higher severity of constipation.

Comparison of Postoperative Complications and Unplanned Readmission Rates

At the end of the 12th week of follow-up, the rates of complications such as postoperative bleeding, infection, urinary retention and rectal stricture, as well as unplanned readmission rates, were compared between the two groups during this period.

Statistical Methods

The collected data were statistically analyzed using SPSS 25.0 (IBM Corporation, Armonk, NY, USA) statistical software. Data were analyzed using the Shapiro–Wilk test to determine whether they showed a normal distribution. The normally distributed continuous data are expressed as mean ± standard deviation, and the *t*-test of two independent samples was used for comparing the groups. Categorical data are expressed as rates; the chi-square test was used for comparison. In order to address the difference in general data, a PSM with a ratio of 1:1 for nearest neighbor matching was applied, with a caliper width set to 0.2, to ensure matching between the baseline data of the PPH group and the RPH group. A difference with $p < 0.05$ was considered statistically significant.

Results

Comparison of Overall Clinical Information of Patients

In this study, 152 patients with mixed hemorrhoidal prolapse were initially considered, including 74 in the PPH group and 78 in the RPH group. Before PSM, there were significant differences in some variables between the two groups ($p < 0.05$). A total of 120 patients with mixed hemorrhoidal prolapse were finally included in this study after applying a 1:1 ratio in PSM, with 60 patients assigned to the PPH group and the other 60 patients to the RPH group. In this study, general data were collected, including sex, age, body mass index, presence or absence of comorbid diseases, and the degree of mixed hemorrhoidal prolapse. Comparison of these general data showed no statistically significant differences between groups ($p > 0.05$; Table 1).

Medical Humanistic Evaluation of Patients

The two groups were compared in terms of surgical time, intraoperative blood loss, duration of postoperative pain, length of hospital stay and hospitalization expenses from the perspective of medical humanities ($p < 0.001$; Table 2).

Table 1. Overall comparison of clinical information between the PPH and RPH groups.

Baseline data	Before matching		t/χ^2	p	After matching		t/χ^2	p
	PPH group (n = 74)	RPH group (n = 78)			PPH group (n = 60)	RPH group (n = 60)		
Age (year)	46.19 ± 3.11	51.22 ± 3.10	9.983	<0.001*	48.37 ± 2.18	48.11 ± 2.51	0.605	0.545
Sex								
Male	44 (59.46)	47 (60.26)	0.010	0.920	37 (61.67)	40 (66.67)	0.326	0.567
Female	30 (40.54)	31 (39.74)			23 (38.33)	20 (33.33)		
BMI (kg/m^2)	24.19 ± 2.02	24.47 ± 1.94	0.871	0.384	23.83 ± 1.74	24.03 ± 1.67	0.642	0.521
Comorbid diseases [a]								
Yes	14 (18.92)	30 (38.46)	7.051	0.007*	12 (20.00)	16 (26.67)	0.745	0.388
No	60 (81.08)	48 (61.54)			48 (80.00)	44 (73.33)		
Degree of mixed hemorrhoid prolapse								
I	13 (17.57)	11 (14.10)			8 (13.33)	7 (11.67)		
II	10 (13.51)	13 (16.67)	0.579	0.901	7 (11.67)	7 (11.67)	0.165	0.982
III	34 (45.95)	37 (47.44)			28 (46.67)	30 (50.00)		
IV	17 (22.97)	17 (21.79)			17 (28.33)	16 (26.66)		

Note: [a] Comorbid diseases including hypertension, diabetes, coronary heart disease, and cancer; * $p < 0.05$.

Abbreviations: BMI, body mass index.

Table 2. Medical humanistic evaluation between the PPH and PRH groups.

Group	Surgical time (min)	Intraoperative blood loss (mL)	Duration of postoperative pain (days)	Length of hospital stay (days)	Hospitalization expenses (CNY)
PPH group (n = 60)	20.11 ± 2.10	7.01 ± 0.37	10.22 ± 1.53	11.10 ± 2.10	7210.94 ± 501.11
RPH group (n = 60)	10.39 ± 2.30	3.17 ± 0.11	6.12 ± 1.94	7.11 ± 1.38	5709.33 ± 475.10
t	24.174	77.057	12.853	12.299	16.844
p	<0.001*	<0.001*	<0.001*	<0.001*	<0.001*

Note: * $p < 0.05$; The exchange rate is 1 USD = 6.48 CNY.

Table 3. Comparison of clinical efficacy between the PPH and RPH groups.

Constituencies	Cure	Significantly effective	Effective	Ineffective	Total effective rate
PPH group (n = 60)	48 (80.00)	5 (8.33)	6 (10.00)	1 (1.67)	59 (98.33)
RPH group (n = 60)	52 (86.67)	6 (10.00)	2 (3.33)	0 (0.00)	60 (100.00)
χ^2					3.251
p					0.355

Table 4. Comparison of VAS scores between the PPH and RPH groups at different postoperative time points.

Group	VAS score			
	1 day	3 days	4 days	6 days
PPH group (n = 60)	7.11 ± 1.66	6.93 ± 1.17	5.22 ± 0.51	4.10 ± 1.41
RPH group (n = 60)	7.39 ± 1.38	6.77 ± 1.15	4.12 ± 0.37	3.14 ± 0.35
t	1.004	0.755	13.523	5.118
p	0.317	0.451	<0.001*	<0.001*

Note: *$p < 0.05$.

Abbreviations: VAS, visual analogue scale.

Comparison of Clinical Efficacy

Our analysis showed that the cure rate was higher in the RPH group than in the PPH group, but the difference is of no statistical significance ($p > 0.05$; Table 3).

Comparison of Subjective Feelings

There was no difference between the two groups in terms of VAS scores at 1 and 3 days postoperatively, but a statistically significant difference in the VAS scores between the two groups was noted in the 4 to 6 days postoperatively ($p < 0.001$; Table 4). Table 5 shows that there was no significant difference in the EQ-5D-5L and Vaizey's Fecal In-

Table 5. Comparison of EQ-5D-5L and Vaizey's Fecal Incontinence Rating Scale scores between the PPH and RPH groups.

Group	EQ-5D-5L			Vaizey fecal incontinence score		
	Before surgery	Day 1 after surgery	Week 12 of follow-up	Before surgery	Day 1 after surgery	Week 12 of follow-up
PPH group (n = 60)	17.13 ± 3.67	22.20 ± 2.11	16.11 ± 2.83	7.24 ± 1.29	16.40 ± 2.48	11.22 ± 2.10
RPH group (n = 60)	17.39 ± 3.38	22.75 ± 2.01	11.27 ± 2.03	7.12 ± 1.37	16.44 ± 2.35	10.87 ± 2.37
t	0.403	1.461	10.764	0.494	0.090	0.856
p	0.687	0.146	<0.001*	0.622	0.927	0.393

Note: *$p < 0.05$.

Abbreviations: EQ-5D-5L, European Quality of Life-5 Dimensions, 5-Level Version.

Table 6. Comparison of postoperative complications and unplanned readmission rates between the PPH and RPH groups.

Constituencies	Postoperative complications					Unplanned readmission rate
	Postoperative bleeding	Infection	Urinary retention	Rectal stricture	Overall incidence	
PPH group (n = 60)	2 (3.33)	2 (3.33)	1 (1.67)	2 (3.33)	7 (11.67)	7 (11.67)
RPH group (n = 60)	1 (1.67)	1 (1.67)	1 (1.67)	1 (1.67)	4 (6.67)	1 (1.67)
χ^2		-			0.901	3.348
p		-			0.343	0.067

continence Rating Scale scores between the two groups before and on the first day after surgery; however, the EQ-5D-5L scores at the 12th week of follow-up were significantly lower in the RPH group than in the PPH group ($p < 0.001$), but there was no difference in the Vaizey's Fecal Incontinence Rating Scale scores between the RPH group and the PPH group at the same time point ($p > 0.05$).

Comparison of Postoperative Complications and Unplanned Readmission Rates

There was no significant difference in the total incidence of postoperative complications between the two groups ($p > 0.05$), and the rate of unplanned readmission was higher in the PPH group than in the RPH group, but there was no statistical significance between the two groups ($p > 0.05$, Table 6).

Discussion

Mixed hemorrhoids are often treated by means of surgical methods. Based on the "anal cushion theory", Italian scholar Longo conceptualized the framework and workflow of PPH surgery for the treatment of internal hemorrhoids in 1998. This surgical method involves circumcising and ligating the rectal mucosa at 3–4 cm above the dentate line and fixing the prolapsed anal pad by lifting the prolapsed anal pad as well as fixing the scar, while blocking the blood supply of the anal pad, so as to protect the normal physiological function of the anal pad and alleviate the symptoms of hemorrhoids [13]. With the prevailing dissemination of the "functional protection" concept, minimally invasive surgery has become the dominant surgical mode, and under the influence of this concept, RPH surgery has become one of the safe, effective and convenient treatment techniques for the treatment of hemorrhoids [14]. RPH is developed from the ligation therapy of hemorrhoids in traditional medicine. Through the ligation of ischemic, necrotic and sloughing hemorrhoids or rectal mucosa featuring local fibrosis and scarring, the prolapsed anal cushion is lifted to eliminate hemorrhoidal bleeding and prolapse symptoms [15]. The objective the current research was based on this treatment philosophy.

In this study, the RPH group exhibited shorter surgical time, postoperative pain duration and length of hospital stay, and lower intraoperative blood loss and hospitalization expenses, than the PPH group. The patients in the RPH group experienced shorter period of postoperative pain compared to their counterparts in the PPH group, and therefore, they were allowed to be discharged from the hospital earlier, to cut down the medical expenses incurred from this more expensive form of treatment. The average length of hospital stay is one of the most important evaluation indicators of "efficient medical care" [16]. For patients, implementing early surgery and expedited recovery and discharge from the hospital can help them return to normal life efficiently. Of note, crowds of patients in the hospitals, together with longer hospital stay, can precipitate greater risk of infection; thus, allowing for active rehabilitation, early discharge, and home recuperation presents a more conducive way for surgical wound healing and recovery of physical functions, while greatly reducing medical costs [17].

RPH and PPH were both surgical methods suitable for the treatment of mixed hemorrhoids, and there was no difference in clinical efficacy between the two groups ($p > 0.05$) as noted in this study. According to the study of He *et al.* [18], RPH can effectively preserve the structure of the anal cushion and the skin around the anus, causing minimal tissue trauma and postoperative pain while promoting fast wound recovery. At the same time, Zhang *et al.* [19] found that patients who have been treated with PPH are at increased risk of rare but more serious complications

such as anastomotic bleeding, rectal perforation, rectovaginal fistula, and anoperineal chronic pain. These published findings were also observed in this study.

Regarding the subjective feeling evaluation in the two groups, there was no difference in the VAS scores between the groups at 1 and 3 days postoperatively, but a statistically significant difference in this score was observed between the RPH group and the PPH group from 4 to 6 days postoperatively. PPH surgery is an open operation that removes part of the pain-sensitive anal canal skin, accounting for the conspicuous postoperative pain, whereas the RPH surgery involves resecting anastomosis in the area above the dentate line where the pain is relatively dull, causing milder and shorter duration of postoperative pain. The EQ-5D-5L score of the RPH group was better than that of the PPH group at the 12th week of follow-up, but there was no difference in Vaizey's Fecal Incontinence Rating Scale score between the RPH group and the PPH group at the 12th week of follow-up. The main reason is that RPH removes the prolapsed internal hemorrhoids or rectal mucosa through negative pressure, releases the rubber trap to tie the root or mucosal tissue of the hemorrhoidal nucleus, and uses the elasticity of the rubber ring to block the blood supply of the internal hemorrhoids, without resulting in surgical wounds and bleeding. This procedure is also known to be simple in terms of operations and less time-consuming.

There was no significant difference in the total occurrence of postoperative complications between the two groups, and the unplanned readmission rate of the PPH group was higher than that of the RPH group, despite no statistically significantly difference. Clinically, PPH surgery is associated with postoperative anastomotic bleeding, urethral stenosis, chronic pain, postoperative recurrence, which present considerable management challenges [20]. Complications such as residual titanium nails and annular stenosis are extremely difficult to deal with after PPH surgery, especially annular stenosis, which makes it difficult for patients to defecate and urinate, causing the affected patients to be readmitted into the hospitals [21]. On the other hand, RPH procedure entails simpler operation, does not result in surgical scars, does not destroy the normal structure of the anal canal and rectum, and allows repeated operation, which enhances the likelihood of follow-up treatment among patients. So far, the rubber snare ligation method is also the preferred method for the treatment of hemorrhoids and rectal mucosal prolapse in Europe and United States, especially for mild mixed hemorrhoids as a first-line treatment option. Compared to other options, RPH has a wider range of clinical indications, suitable for treatment of all stages of hemorrhoids [22].

This study has several limitations. Although this study has been carefully planned, the evaluations conducted using a selection of scales in this study may be subjective, causing possible discrepancies between these subjective evaluations and the actual conditions. But for most patients with the same hemorrhoids after surgery, if they have roughly the same subjective feelings of satisfaction or dissatisfaction, the reliability and validity of the results of the scale evaluation are more convincing. Additionally, the follow-up time of this study was relatively short. Another limitation is that the current investigation only focused on evaluating relief of somatic symptoms and assessing short-term quality of life, without comprehensively evaluating the long-term quality of life and long-term recurrence rate in the patients surveyed.

Conclusions

In summary, both RPH and PPH procedures are safe and effective methods for the treatment of mixed hemorrhoids, with the RPH procedure featuring shorter surgical time.

Availability of Data and Materials

The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

Author Contributions

HX and XY designed the study. HX, XY, DH, JH, and YW conducted the study. HX and DH and JH collected and analyzed the data. HX and YW participated in drafting the manuscript, and all authors contributed to critical revision of the manuscript for important intellectual content. All authors gave final approval of the version to be published. All authors participated fully in the work, took public responsibility for appropriate portions of the content, and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or completeness of any part of the work were appropriately investigated and resolved.

Ethics Approval and Consent to Participate

This study has been approved by the Third Affiliated Hospital of Gansu University of Chinese Medicine (The 1st People's Hospital of Baiyin) with the approval number YL-KY-2019-031. This study was performed in accordance with the principles of the Declaration of Helsinki. Informed consent has been obtained from all participants involved in the study.

Acknowledgment

Not applicable.

Funding

This research received no external funding.

Conflict of Interest

The authors declare no conflict of interest.

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