

# World Journal of *Clinical Cases*

*World J Clin Cases* 2021 January 6; 9(1): 1-290



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The *WJCC* is now indexed in Science Citation Index Expanded (also known as SciSearch®), Journal Citation Reports/Science Edition, PubMed, and PubMed Central. The 2020 Edition of Journal Citation Reports® cites the 2019 impact factor (IF) for *WJCC* as 1.013; IF without journal self cites: 0.991; Ranking: 120 among 165 journals in medicine, general and internal; and Quartile category: Q3.

**RESPONSIBLE EDITORS FOR THIS ISSUE**

Production Editor: Yan-Xia Xing; Production Department Director: Yun-Xiaojuan Wu; Editorial Office Director: Jin-Lai Wang.

**NAME OF JOURNAL**

*World Journal of Clinical Cases*

**ISSN**

ISSN 2307-8960 (online)

**LAUNCH DATE**

April 16, 2013

**FREQUENCY**

Thrice Monthly

**EDITORS-IN-CHIEF**

Dennis A Bloomfield, Sandro Vento, Bao-gan Peng

**EDITORIAL BOARD MEMBERS**

<https://www.wjgnet.com/2307-8960/editorialboard.htm>

**PUBLICATION DATE**

January 6, 2021

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**ARTICLE PROCESSING CHARGE**

<https://www.wjgnet.com/bpg/gerinfo/242>

**STEPS FOR SUBMITTING MANUSCRIPTS**

<https://www.wjgnet.com/bpg/GerInfo/239>

**ONLINE SUBMISSION**

<https://www.f6publishing.com>

## Retrospective Cohort Study

## Modified procedure for prolapse and hemorrhoids: Lower recurrence, higher satisfaction

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**Author contributions:** Chen YY performed most of the data analysis and wrote this paper; Huang CJ, Zhou CJ and Cai M performed the clinical therapy, advised the performance of the study and provided the curative effect evaluation system; Cheng YF and Wang QP completed the postoperative follow-up; Ye B performed the final data review and was responsible for the data's reliability; Ye YK performed the clinical treatment work; Liu CB designed the study, completed the majority of clinical treatment work and was responsible for the reliability of the paper.

**Institutional review board**

**statement:** The study was reviewed and approved for publication by the Ethics Committee of the 2nd Affiliated Hospital and Yuying Children's Hospital of Wenzhou Medical

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**Abstract****BACKGROUND**

Hemorrhoidal prolapse is a common benign disease with a high incidence. The treatment procedure for prolapse and hemorrhoids (PPH) remains an operative method used for internal hemorrhoid prolapse. Although it is related to less postoperative pain, faster recovery and shorter hospital stays, the postoperative recurrence rate is higher than that of the Milligan-Morgan hemorrhoidectomy (MMH). We have considered that recurrence could be due to shortage of the pulling-up effect. This issue may be overcome by using lower purse-string sutures [modified-PPH (M-PPH)].

**AIM**

To compare the therapeutic effects and the patients' satisfaction after M-PPH, PPH and MMH.

**METHODS**

This retrospective cohort study included 1163 patients (M-PPH, 461; original PPH, 321; MMH, 381) with severe hemorrhoids (stage III/IV) who were admitted to The 2<sup>nd</sup> Affiliated Hospital and Yuying Children's Hospital of Wenzhou Medical University from 2012 to 2014. Early postoperative complications, efficacy, postoperative anal dysfunction and patient satisfaction were compared among the three groups. Established criteria were used to assess short- and long-term postoperative complications. A visual analog scale was used to evaluate

University.

**Informed consent statement:**

Written informed consent was obtained from the study participants.

**Conflict-of-interest statement:** All of the authors have no conflict of interest related to the manuscript.

**Data sharing statement:** No additional data are available.

**STROBE statement:** The authors have read the STROBE statement—checklist of items, and the manuscript was prepared and revised according to the STROBE statement—checklist of items.

**Open-Access:** This article is an open-access article that was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution NonCommercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>

**Manuscript source:** Unsolicited manuscript

**Specialty type:** Surgery

**Country/Territory of origin:** China

**Peer-review report's scientific quality classification**

Grade A (Excellent): 0  
Grade B (Very good): B  
Grade C (Good): C  
Grade D (Fair): 0  
Grade E (Poor): 0

**Received:** July 29, 2020

**Peer-review started:** July 29, 2020

**First decision:** September 30, 2020

**Revised:** October 27, 2020

**Accepted:** November 9, 2020

**Article in press:** November 9, 2020

**Published online:** January 6, 2021

**P-Reviewer:** Quesada BM, Rosen

postoperative pain. Follow-up was conducted 5 years postoperatively.

**RESULT**

Length of hospital stay and operating time were significantly longer in the MMH group ( $8.05 \pm 2.50$  d,  $19.98 \pm 4.21$  min;  $P < 0.0001$ ) than in other groups. The incidence of postoperative anastomotic bleeding was significantly lower after M-PPH than after PPH or MMH (1.9%, 5.1% and 3.7%;  $n = 9, 16$  and  $14$ ; respectively). There was a significantly higher rate of sensation of rectal tenesmus after M-PPH than after MMH or PPH (15%, 8% and 10%;  $n = 69, 30$  and  $32$ ; respectively). There was a significantly lower rate of recurrence after M-PPH than after PPH (8.7% and 18.8%,  $n = 40$  and  $61$ ;  $P < 0.0001$ ). The incidence of postoperative anal incontinence differed significantly only between the MMH and M-PPH groups (1.3% and 4.3%,  $n = 5$  and  $20$ ;  $P = 0.04$ ). Patient satisfaction was significantly greater after M-PPH than after other surgeries.

**CONCLUSION**

M-PPH has many advantages for severe hemorrhoids (Goligher stage III/IV), with a low rate of anastomotic bleeding and recurrence and a very high rate of patient satisfaction.

**Key Words:** Hemorrhoids; Milligan-Morgan hemorrhoidectomy; Postoperative complications; Procedure for prolapse and hemorrhoids; Recurrence; Patient satisfaction

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**Core Tip:** In total, 1163 patients were treated for severe prolapsed hemorrhoids using modified procedure for prolapse and hemorrhoids (M-PPH), conventional hemorrhoidectomy, or Milligan-Morgan hemorrhoidectomy. The short-term postoperative complications, postoperative anal dysfunction and therapeutic effects of the three treatment methods were compared. M-PPH has many advantages compared to traditional surgical treatments, including a higher degree of effectiveness, a significantly lower recurrence rate than the original PPH, and a higher rate of patient satisfaction.

**Citation:** Chen YY, Cheng YF, Wang QP, Ye B, Huang CJ, Zhou CJ, Cai M, Ye YK, Liu CB. Modified procedure for prolapse and hemorrhoids: Lower recurrence, higher satisfaction. *World J Clin Cases* 2021; 9(1): 36-46

**URL:** <https://www.wjgnet.com/2307-8960/full/v9/i1/36.htm>

**DOI:** <https://dx.doi.org/10.12998/wjcc.v9.i1.36>

**INTRODUCTION**

Hemorrhoidal prolapse is a common benign condition with a high prevalence. The prevalence of hemorrhoids is reported to be about 40%, as high as 80% in asymptomatic hemorrhoids<sup>[1,2]</sup>. The incidence rate of anorectal diseases in adults is about 50.1%. Approximately 520 million people were found to suffer from anorectal disease to different degrees in China's 2015 anorectal disease epidemiology survey; 98.08% of these individuals had hemorrhoid symptoms<sup>[3]</sup>.

On the basis of the severity of the clinical features, the Goligher classification divides hemorrhoids into four grades<sup>[4]</sup>. Treatment of hemorrhoids requires selective treatment based on individual symptoms and complications, and most patients with hemorrhoid (grade I/II) can be treated conservatively, including dietary changes with sufficient fluids and fiber while limiting prolonged toilet use. Surgery is still the treatment of choice for patients who fail conservative treatment and those who have grade III or IV hemorrhoids with active bleeding or persistent prolapse. There are currently many types of surgical treatments for hemorrhoids, with traditional hemorrhoid operations consisting of Milligan-Morgan<sup>[5]</sup> or Ferguson procedures and diathermy hemorrhoidectomy<sup>[6,7]</sup>. However, severe postoperative pain and a high rate of postoperative recurrence are the main reasons for low patient satisfaction and why

SA

**S-Editor:** Zhang L**L-Editor:** Filipodia**P-Editor:** Zhang YL

the traditional surgical techniques are not highly recommended.

In an effort to reduce postoperative pain, Longo<sup>[8]</sup> introduced the procedure for prolapse and hemorrhoids (PPH) in 1998. It is a new procedure that has become widely accepted and recommended as a treatment for hemorrhoids. Over the past two decades, numerous systematic reviews and randomized controlled trials have reported that PPH results in a shorter length of inpatient stay, less postoperative pain and greater patient satisfaction rate than the conventional hemorrhoidectomy<sup>[9-12]</sup>. However, in terms of the long-term outcomes, there is a higher incidence of recurrence or serious complications after PPH, such as anal incontinence, anal stenosis and even rectovaginal fistulae<sup>[13-17]</sup>. Hence, a growing number of surgeons and patients are rejecting PPH.

We consider that one of the reasons for the persistent recurrence of hemorrhoid prolapse may be that purse-string sutures are placed too high to provide the pull-up effect. Consequently, we have designed a modified PPH (M-PPH) with lower purse-string sutures. In this study, we retrospectively studied different surgical techniques for the treatment of severe hemorrhoids, including MMH, conventional PPH and M-PPH with a 5-year follow-up period.

## MATERIALS AND METHODS

### *Patient population*

We retrospectively studied 1163 inpatients who underwent surgery for grade III/IV hemorrhoid prolapse at The 2<sup>nd</sup> Affiliated Hospital and Yuying Children's Hospital of Wenzhou Medical University from January 2012 to December 2014. We compared groups of patients treated with MMH, traditional PPH or M-PPH. None of the patients had a history of previous perianal surgery. Patients who had grade I/II hemorrhoids and those who had previous surgery for perianal disease, affected by other anal pathologies (*e.g.*, anal fissure), inflammatory bowel disease, anal stenosis and/or coexistent bleeding disorders were not included in this study. Patients who died during the follow-up or who refused the 5-year follow-up examination were excluded from the analysis.

The study was approved by the Ethics Committee of the 2<sup>nd</sup> Affiliated Hospital and of Wenzhou Medical University.

### *Preoperative management*

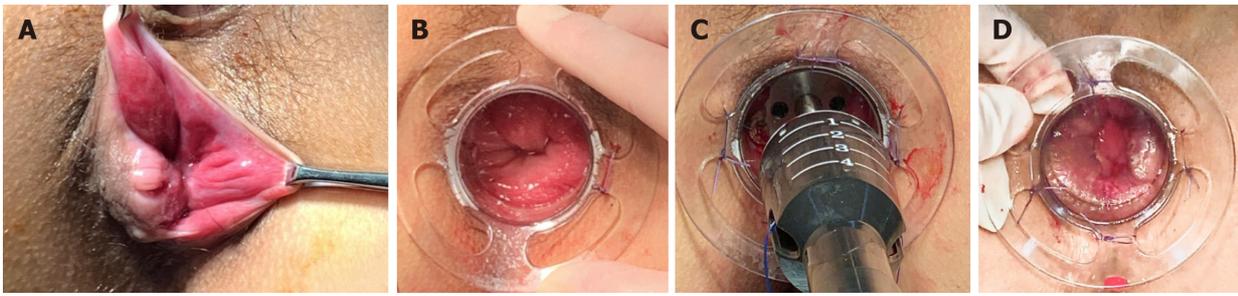
Preoperative assessment included clinical data collection and rectal examination. During the examination, the following variables were assessed: Sex, age, previous treatment (*e.g.*, drugs), local symptoms (*e.g.*, pain, bleeding, prolapse or anal stenosis) and defecation habits. Specialist examination was also performed, including digital anal examination and anoscopy. Colonoscopy was recommended for patients over 50-years-old or who were at risk for colorectal disease. The anatomical grade of hemorrhoids was recorded according to the Goligher classification<sup>[3]</sup>.

### *Surgery*

For M-PPH (Figure 1), double purse-string sutures were inserted: One was 0.5-1.0 cm above the dentate line, and the other was 0.5 cm from the distal of the first purse-string suture. For original PPH, purse-string sutures were applied 4 cm from the dentate line<sup>[8]</sup>. A PPH03 hemorrhoidal circular stapler (Ethicon hemorrhoidal circular stapler, Cincinnati, OH, United States) was used for both the original PPH and M-PPH procedures. Furthermore, conventional Milligan-Morgan hemorrhoidectomy was performed as described by Goligher<sup>[4]</sup>. MMH was performed under Yaoshu point anesthesia, while the other procedures were performed mainly under spinal anesthesia. Perioperatively, all patients received two doses of a second-generation cephalosporin. Postoperative analgesia consisted of ketorolac tromethamine (60 mg, twice a day) and celecoxib (200 mg, twice a day). Patients were advised to wash their perianal wound with water after defecation and use mupirocin ointment for external application.

### *Assessment and postoperative follow-up*

Short-term postoperative complications were recorded during hospitalization: (1) Patients' postoperative pain was recorded at four timepoints after the operation (first defecation, day 1, day 3, day 5), as assessed by the visual analogue scale<sup>[18]</sup> (VAS; 0 indicating no pain and 10 indicating the worst pain); (2) Operative time (min); (3)



**Figure 1** Patients with prolapsing hemorrhoids treated with a modified procedure for prolapse and hemorrhoids. A: Preoperative hemorrhoids status; B: The hemorrhoids were exposed; C: Absorbable sutures were fixed in a modified location, the circular stapler was tightened, and the gun was fired; D: The mucosa was dissected.

Postoperative hospital stay (days); (4) Anastomotic bleeding (anastomotic hemorrhage found by anoscopy); and (5) Sensation of rectal tenesmus (a feeling of defecating even when the rectum is empty). Postoperative review was conducted at our outpatient department at 1, 2 and 4 wk after surgery. Thereafter, regular examinations were performed according to the patient's wishes. All of the patients were contacted by telephone during the 5-year follow-up. The mean follow-up period was  $5 \pm 0.5$  (range: 4–6) years. Patients were invited to the clinic for the final evaluation if the following symptoms appeared during follow-up: (1) Postoperative anal discharge (wet anus or anal discharge caused by the scar left by the surgery)<sup>[19]</sup>; (2) Postoperative sensory anal incontinence (lack of control over defecation resulting in unconscious discharge of gas or stool); (3) Postoperative anal stenosis (a condition involving narrowed stool and/or only liquid stools); and (4) Postoperative recurrence of hemorrhoids (continuous prolapse of perianal mass or hematochezia recurred after hemorrhoidectomy).

#### **Patients' satisfaction**

Five years after the operation, telephonic follow-up was used to investigate patient satisfaction. A scale of 1–4 (1 = dissatisfied, 2 = poorly satisfied, 3 = satisfied, 4 = very satisfied) was provided to the patient.

#### **Statistical analysis**

SPSS for Windows (version 22.0) was used for all statistical analyses. Continuous variables are presented as means  $\pm$  standard deviation or medians (range). Statistical analyses were performed using the chi-square test and ANOVA. Kruskal-Wallis *H* tests were used for variables with non-normal distributions to assess differences in the VAS between the MMH, PPH and M-PPH groups (all pairwise for multiple comparisons). The data processing and graphics produced were carried out using R statistics software (The R Foundation, Vienna, Austria). *P* values  $< 0.05$  were considered statistically significant. The statistical methods of this study were reviewed by Bo Ye from the Department of Biostatistics, School of Public Health, State University of New York at Albany.

## **RESULTS**

#### **Patient characteristics**

Patients' characteristics are shown in [Table 1](#). There were no significant differences among the patient groups in terms of sex, age or grade of hemorrhoids.

#### **Length of hospital stay and operating time**

The mean length of hospital stay and operating time were markedly greater after MMH ( $8.05 \pm 2.50$  d,  $19.98 \pm 4.21$  min; respectively) than after the other surgeries ( $P < 0.0001$ ; [Figure 2](#)). On the other hand, there was a significant difference between M-PPH ( $7.24 \pm 1.30$  d,  $15.55 \pm 3.27$  min; respectively) and PPH ( $6.13 \pm 1.93$  d,  $13.30 \pm 2.74$  min; respectively) in terms of the mean length of hospital stay and the mean operating time ( $P < 0.0001$ ; [Figure 2](#)).

#### **Postoperative pain**

Postoperative pain VAS scores for the three groups are presented in [Table 2](#). On

**Table 1 Demographic and clinical characteristics of patients**

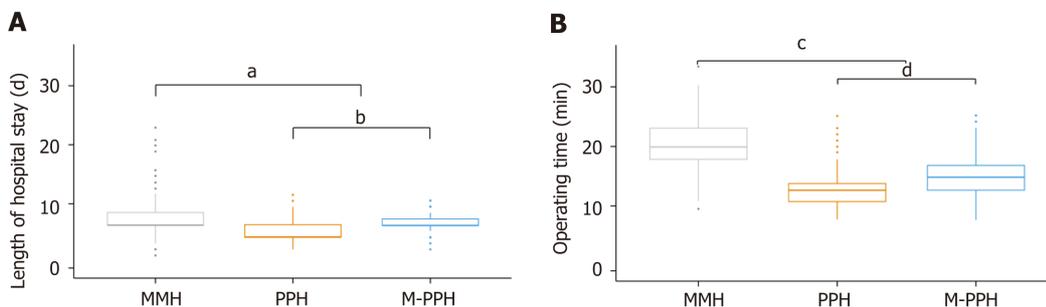
Variable	MMH, n = 381	PPH, n = 321	M-PPH, n = 461	P value
Male/Female	190/191	153/168	261/200	0.770
Age in yr	46 (17-84)	46 (18-87)	46 (17-86)	0.357
Grade of hemorrhoids				
III	321 (81.9)	263 (81.9)	394 (85.5)	0.219
IV	69 (18.1)	58 (18.1)	67 (14.5)	0.152

Age is shown as median (range) and grade of hemorrhoids is shown as a number (percentage). MMH: Milligan-Morgan hemorrhoidectomy; M-PPH: Modified procedure of prolapse and hemorrhoids; PPH: Procedure of prolapse and hemorrhoids.

**Table 2 Comparison of visual analog score for pain between the Milligan-Morgan hemorrhoidectomy, procedure of prolapse and hemorrhoids, and modified procedure of prolapse and hemorrhoids groups**

Variable	MMH, n = 381	PPH, n = 321	M-PPH, n = 461	P value <sup>1</sup>
First defecation	5 (4-6)	3 (2-6)	4 (3-7)	< 0.001
Day 1	3 (2-6)	2 (1-5)	3 (2-7)	< 0.001
Day 3	3 (2-5)	2 (1-4)	2 (2-5)	< 0.001
Day 5	2 (2-5)	1 (1-3)	2 (2-5)	< 0.001

<sup>1</sup>Among each group at each time period after operation, the differences were statistically significant. Visual analog scale scores are expressed as medians (ranges). MMH: Milligan-Morgan hemorrhoidectomy; M-PPH: Modified procedure of prolapse and hemorrhoids; PPH: Procedure of prolapse and hemorrhoids.

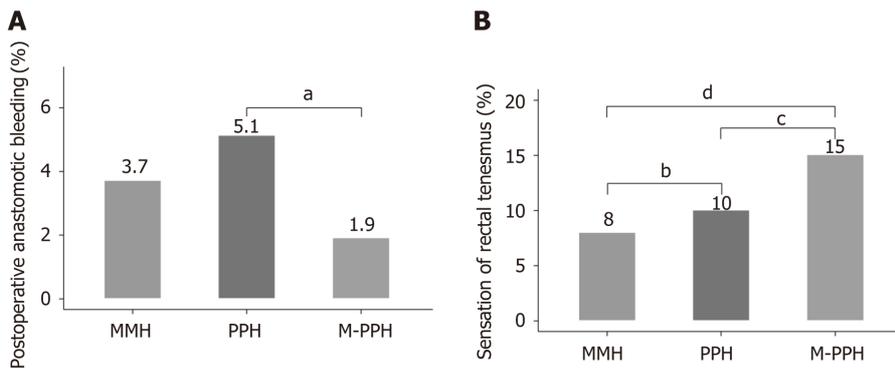


**Figure 2 Length of hospital stay and operating time.** A: Mean length of hospital stay was significantly longer after Milligan-Morgan hemorrhoidectomy ( $8.05 \pm 2.50$  d) than after any of the other procedures ( $^aP < 0.0001$ ) and was significantly longer than after the modified procedure for prolapse and hemorrhoids ( $7.24 \pm 1.30$  d) and after the procedure for prolapse and hemorrhoids ( $6.13 \pm 1.93$  d) ( $^bP < 0.0001$ ); B: Mean operating time was significantly greater in Milligan-Morgan hemorrhoidectomy ( $19.98 \pm 4.21$  min) than in any of the other procedures ( $^cP < 0.0001$ ) and was significantly shorter in the procedure for prolapse and hemorrhoids ( $13.30 \pm 2.74$  min) than in the modified procedure for prolapse and hemorrhoids ( $15.55 \pm 3.27$  min) ( $^dP < 0.0001$ ). MMH: Milligan-Morgan hemorrhoidectomy; M-PPH: Modified procedure for prolapse and hemorrhoids; PPH: Procedure for prolapse and hemorrhoids.

Kruskal-Wallis H analysis at all timepoints, the postoperative VAS scores in the MMH group were significantly higher than in the other two groups (all  $P < 0.0001$ ). Among the two PPH procedures, the postoperative pain scores in the PPH was significantly lower than in the M-PPH group ( $P < 0.0001$ ).

**Short-term postoperative complications**

The rate of postoperative anastomotic bleeding was low in all procedures (M-PPH: 1.9%, PPH: 5.1%, MMH: 3.7%), and the incidence in the M-PPH group was significantly lower than in the PPH group ( $P < 0.0001$ ; Figure 3A). Five patients who failed to respond to conservative treatment who repeatedly experienced anastomotic bleeding after M-PPH were treated with an 8-shape suture in an outpatient operation, after which bleeding ceased.



**Figure 3 Early postoperative complications.** A: Postoperative anastomotic bleeding rate after the modified procedure for prolapse and hemorrhoids (M-PPH) was significantly lower than that after the procedure for prolapse and hemorrhoids ( $^aP < 0.0001$ ); B: Sensation of rectal tenesmus rate after procedure for prolapse and hemorrhoids was significantly higher than that after the Milligan-Morgan hemorrhoidectomy ( $^bP = 0.005$ ). The rate after the modified procedure for prolapse and hemorrhoids was significantly higher than that after the procedure for prolapse and hemorrhoids ( $^cP = 0.008$ ) or Milligan-Morgan hemorrhoidectomy ( $^dP < 0.0001$ ). MMH: Milligan-Morgan hemorrhoidectomy; M-PPH: Modified procedure for prolapse and hemorrhoids; PPH: Procedure for prolapse and hemorrhoids.

Among the various procedures, the rate of sensation of rectal tenesmus after M-PPH was significantly higher than after MMH (15% and 8%, respectively;  $P < 0.0001$ ) or PPH (10%,  $P = 0.008$ ; Figure 3B).

### Recurrence of prolapsed hemorrhoids

The postoperative recurrence rates of the MMH, PPH and M-PPH groups are summarized in Figure 4. It is noteworthy that the postoperative recurrence rate was significantly lower in the M-PPH group than that in the PPH group (8.7% and 18.8%, respectively;  $P < 0.0001$ ). The postoperative recurrence rate in the MMH group was significantly lower than in the PPH group (5.8%,  $P < 0.0001$ ). However, no significant difference was found between the M-PPH and MMH groups.

Recurrent prolapse was successfully treated using MM surgery in 5 of 22 patients (22.7%) of the MMH group. The remaining 17 patients (77.3%) with recurrent symptomatic second-degree hemorrhoids were treated with sclerotherapy. In the PPH group, 15 of the 60 patients (25.0%) had a recurrent symptomatic third-degree hemorrhoids and underwent MM surgery. Forty-five patients (75.0%) with recurrent second-degree hemorrhoids were treated with sclerotherapy. Thirteen patients (67.5%) in the M-PPH group had recurrent symptomatic third-degree hemorrhoids and underwent MM surgery. The remaining 27 of 40 patients (32.5%) with recurrent second-degree hemorrhoids were treated with sclerotherapy.

Overall, the reoperation rates were 1.3%, 4.7% and 2.8% in the MMH, PPH and MMH groups, respectively ( $P < 0.001$ ). None of these patients experienced any further recurrences during the follow-up period.

### Postoperative anal dysfunction

The incidence of postoperative anal discharge was higher in the PPH group (6.2%) than in the other groups, but the differences were not statistically significant (Figure 5A). The rate of postoperative anal incontinence differed significantly only between the MMH and M-PPH groups (1.3% and 4.3%, respectively;  $P = 0.04$ ; Figure 5B). During the follow-up period, anal discharge or incontinence improved after 6 mo in all of these patients. The incidence of anal stenosis after MMH was significantly higher than after the other two types of surgeries (10%,  $P < 0.0001$ ; Figure 5C).

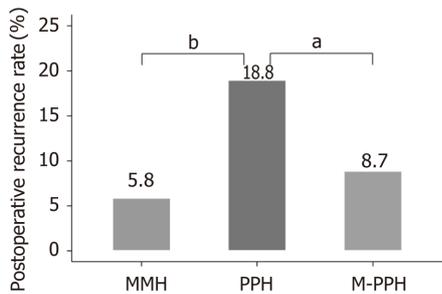
### Patients' satisfaction

The majority of patients in all groups were satisfied with their surgery. Overall, 83% (383) of the patients in the M-PPH group, 65% (200) of those in the PPH group, and 76% (290) of those in the MMH group reported being very satisfied or satisfied (score  $\geq 3$ ) with their procedures. Patient satisfaction for the three groups is presented in Table 3.

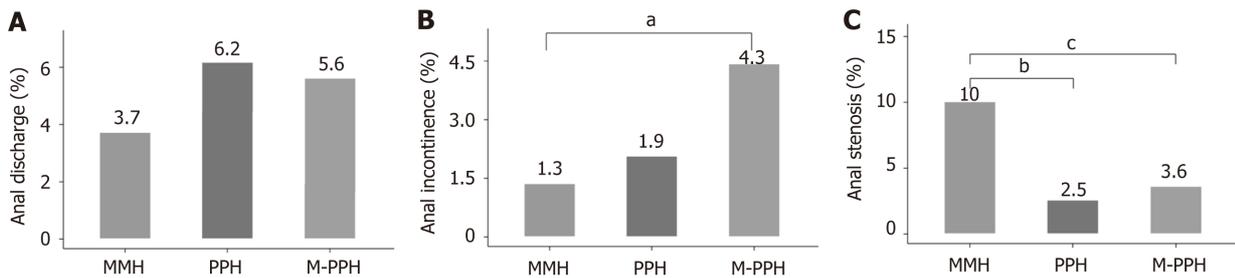
**Table 3 Results of the preoperative patient satisfaction survey, n (%)**

Group	Very satisfied	Satisfied	Poorly satisfied	Dissatisfied
MMH, n = 381	236 (61.9)	54 (14.2)	38 (10.0)	53 (13.9)
PPH, n = 321	105 (32.7)	95 (29.6)	89 (27.7)	32 (10.0)
M-PPH, n = 461	266 (57.7)	117 (25.4)	46 (10.0)	32 (6.9)

MMH: Milligan-Morgan hemorrhoidectomy; M-PPH: Modified procedure of prolapse and hemorrhoids; PPH: Procedure of prolapse and hemorrhoids.



**Figure 4 The rate of postoperative recurrence.** The rate after the procedure for prolapse and hemorrhoids was significantly higher than that after the modified procedure for prolapse and hemorrhoids (<sup>a</sup>*P* < 0.0001) or the Milligan-Morgan hemorrhoidectomy (<sup>b</sup>*P* < 0.0001). MMH: Milligan-Morgan hemorrhoidectomy; M-PPH: Modified procedure for prolapse and hemorrhoids; PPH: Procedure for prolapse and hemorrhoids.



**Figure 5 Further postoperative anal dysfunction.** A: The incidence of postoperative anal discharge in the Milligan-Morgan hemorrhoidectomy, procedure for prolapse and hemorrhoids and modified procedure for prolapse and hemorrhoids group was 3.7%, 6.2% and 5.6%, respectively; B: The rate of postoperative anal incontinence after the modified procedure for prolapse and hemorrhoids was significantly higher than that after the Milligan-Morgan hemorrhoidectomy (<sup>a</sup>*P* = 0.001); C: The postoperative anal stenosis rate after Milligan-Morgan hemorrhoidectomy was significantly higher than that after the procedure for prolapse and hemorrhoids (<sup>b</sup>*P* < 0.0001) or the modified procedure for prolapse and hemorrhoids (<sup>c</sup>*P* < 0.0001). MMH: Milligan-Morgan hemorrhoidectomy; M-PPH: Modified procedure for prolapse and hemorrhoids; PPH: Procedure for prolapse and hemorrhoids.

## DISCUSSION

PPH offers unique advantages over traditional hemorrhoidectomy, such as shorter length of hospital stay, less postoperative pain and fewer lost workdays<sup>[9-12]</sup>. However, high postoperative recurrence and serious long-term postsurgical complications have been reported<sup>[2,13-17]</sup>. To address these complications, we have devised a new M-PPH procedure characterized by lower placement of the double purse-string sutures. Here, we compared the effects and postoperative complications of the M-PPH, PPH and MMH. We showed that the M-PPH is superior to traditional surgery for severe hemorrhoids (stage III/IV) in the rate of anastomotic bleeding, recurrence and patient satisfaction.

The time of hospitalization was mainly related to the duration of postoperative pain, with the length of hospitalization in the M-PPH group being significantly longer than that in the PPH group. One probable reason for this is that the lower level of resection and lower placement of double purse-string sutures might have reduced the blood flow from the internal iliac artery to the anal anastomosis<sup>[18]</sup>. Another possible reason is that postoperative inflammatory stimulation affected the anal spinal nerve because the anastomotic site of the M-PPH procedure is closer to the dentate line. On

the other hand, as reported in other previous research papers, there was a significant increase in the length of hospitalization and lost work days following MMH<sup>[9-12]</sup>. Prolonged pain after MMH appears to be due to mechanical irritation of the open anal wound from fecal transport and inevitable thermal damage from the electric knife.

The postoperative pain of the MMH group was significantly higher at each timepoint than in the other groups. Similar results have previously been reported in the literature<sup>[10,20,21]</sup>. There was also a difference in the types of pain experienced by patients after the MMH or PPH. After open hemorrhoidectomy, the pain felt by patients tended to be cutting and sharp, while that after PPH involved a distended discomfort or more vague pain. This was not surprising because the PPH technique does not involve excision of the perianal skin. However, for M-PPH, placement of the purse-string suture closer to the dentate line resulted in more severe postoperative pain<sup>[9,22]</sup>.

The lower stapling height used for M-PPH resulted in full exposure of the operative field; thus, it was easy to find the bleeding point and stop bleeding during the operation. Another possible reason for the significant reduction in anastomotic bleeding after M-PPH compared to PPH is that the height of the load suture caused the removal of the hemorrhoidal vascular plexus, resulting in low blood flow to the anus through the collateral circulation of the inferior rectal artery<sup>[16]</sup>.

The rate of the postoperative sensation of rectal tenesmus was significantly higher after M-PPH than after PPH. One possible reason is that the area in the rectum ampulla that controls defecation was affected by the purse-string sutures, thereby causing the anal cushions to more easily create a sense of defecation<sup>[23]</sup>. To address the high rate of sensation of rectal tenesmus after M-PPH, we teach and encourage patients to perform levator ani muscle training early after surgery, and the symptoms gradually disappear 1-2 mo after surgery.

Recurrence of hemorrhoids is a major concern for patients and indicates failure of surgery; thus, it is a matter of great concern among both patients and surgeons. M-PPH had a significantly lower recurrence rate than PPH. This recurrence rate is comparable to that reported in previous research on the M-PPH<sup>[20]</sup>. The most plausible reasons are the lower level placement of the purse-string sutures and the use of double purse-string sutures. The closer the anastomosis is to the dentate line, the better the result with the lower anastomosis pulling up the hemorrhoids more effectively. With the anastomosis scarring, the anal cushions near the dentate line are turned inward and are better fixed, while the double purse-string sutures also allow for more tissue traction towards the rectum for more effective lifting by the anal cushions<sup>[24]</sup>. On the other hand, because of patients' misperceptions regarding recurrence, we think that the relapse rate may be overestimated. It is hard for patients to distinguish between skin tags and prolapse recurrence. Among the 50 patients examined by Ganio *et al*<sup>[25]</sup>, only 6 of the 9 patients who reported recurrent hemorrhoidal prolapse in telephone interviews were found to have recurrence on proctologic examination. A recent meta-analysis on the identification of residual skin tags and recurrence concluded that the high recurrence rates in the literature are often attributed to the misrecognition of residual skin tags<sup>[26]</sup>. We confirmed this at the post-operative outpatient follow-up. The incidence of skin tags and hemorrhoid prolapse is significantly higher after PPH than after conventional techniques<sup>[11]</sup>. It is unclear whether skin tag removal reduces the incidence of symptomatic recurrent prolapse. Larger, well-designed clinical studies are needed to validate the usefulness of respecting the M-PPH postoperative skin tags.

Anal incontinence is a potential complication of hemorrhoidectomies. The progression of anal incontinence after hemorrhoidectomy seems to be multifactorial<sup>[27,28]</sup>. In this study, the rate of anal incontinence in M-PPH was higher than in the other procedures. Damage to the dentate line and anal cushions may play a role in anal incontinence likely due to lower anastomosis<sup>[24,29]</sup>. However, normal sphincter systolic pressure and rectoanal inhibitory reflexes are actually necessary to ensure anal homeostasis<sup>[30]</sup>. After hemorrhoidectomy, the integrity and sensitivity of the anal cushions are not sufficient to ensure bowel control<sup>[31]</sup>. Hence, complete retention of the anal cushions during surgery is not crucial; it is possible to remove some of the tissue if necessary. No serious loss of anal control was observed in our study. Patients only exhibited perianal moist discomfort or decreased control of gas and fluids, and the frequency and severity of the symptoms gradually disappeared 6 mo after surgery. Because we did not have any data assessing anorectal function by anorectal manometry, anal action potentials or intra-anal ultrasound, we could not define the underlying mechanism of anorectal incontinence after hemorrhoid surgery. On the other hand, the rate of anal incontinence is also high after MMH, which may be due to the need to remove part of the perianal skin intraoperatively. After MMH, the skin of the anal canal forms a poorly elastic scar and results in poor anal closure.

The rate of postoperative anal stenosis in the MMH group was significantly higher than in the other two groups. It is understandable, considering that the skin of the anal canal formed a scar with poor elasticity after MMH due to excision of the anal cushions and perianal skin.

We have found that “success” is not the only criterion for determining patient satisfaction after surgery. Patients’ satisfaction is affected by numerous elements, including their subjective perceptions. Most patients were satisfied with the postoperative efficacy, although there were some postoperative complications in all three groups. The M-PPH group had a high rate of patient satisfaction, but they had an obvious sensation of rectal tenesmus and a high incidence of anal incontinence.

A potential limitation of this study is its retrospective nature; hence, a prospective randomized controlled study is needed to confirm these findings. Another limitation is that, although a phone interview is a convenient and easy method of data collection, a direct clinical examination of all patients and a full clinical evaluation during the follow-up is lacking. Patients are often not able to distinguish skin tags from real hemorrhoids, and thus, the recurrence rate may be overestimated.

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## CONCLUSION

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In summary, this study found that, within the follow-up period of 5 years, M-PPH has many advantages, including a lower recurrence rate and a higher patient satisfaction rate than conventional PPH. Nevertheless, M-PPH is associated with higher rates of sensation of rectal tenesmus and of anal incontinence.

## ARTICLE HIGHLIGHTS

### **Research background**

Hemorrhoidal prolapse is a common benign disease with a high incidence. The procedure for prolapse and hemorrhoids (PPH) remains the first-line therapy for hemorrhoids. Although it is related to less post-operative pain, faster recovery and shorter hospital stays, the postoperative recurrence rate is higher than that of the Milligan-Morgan hemorrhoidectomy (MMH).

### **Research motivation**

This retrospective cohort study included 1163 patients [modified-PPH (M-PPH), 461; original PPH, 321; MMH, 381] with severe hemorrhoids (stage III/IV) who were admitted to The 2<sup>nd</sup> Affiliated Hospital and Yuying Children’s Hospital of Wenzhou Medical University from 2012 to 2014. We wanted to compare the early postoperative complications, efficacy, postoperative anal dysfunction and patient satisfaction after M-PPH, PPH and MMH.

### **Research objectives**

To assess the clinic efficacy and patient satisfaction towards treating severe hemorrhoids through M-PPH, PPH and MMH.

### **Research methods**

This retrospective cohort study included 1163 patients with severe hemorrhoids who were admitted to The 2<sup>nd</sup> Affiliated Hospital and Yuying Children’s Hospital of Wenzhou Medical University from 2012 to 2014. Early postoperative complications, efficacy, postoperative anal dysfunction and patient satisfaction were compared among the three groups. Established criteria were used to assess short- and long-term postoperative complications. A visual analog scale was used to evaluate postoperative pain. Follow-up was conducted 5 years postoperatively.

### **Research results**

M-PPH has many advantages for patients with severe hemorrhoids (Goligher stage III/IV) with a low rate of anastomotic bleeding and recurrence while gaining a very high rate of patient satisfaction.

### **Research conclusions**

The lower anastomosis can pull up the rectal mucosa more effectively resulting in a

lower the recurrence rate.

### Research perspectives

The prospective randomized controlled trial is a more scientific and rigorous research method and is the best method for the future research.

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## ACKNOWLEDGEMENTS

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We gratefully thank the patients and their families for participating in this study.

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