

## Partial stapled hemorrhoidopexy versus circular stapled hemorrhoidopexy for grade III–IV prolapsing hemorrhoids: a two-year prospective controlled study

H.-C. Lin · D.-L. Ren · Q.-L. He · H. Peng ·  
S.-K. Xie · D. Su · X.-X. Wang

Received: 12 September 2011 / Accepted: 12 February 2012  
© Springer-Verlag 2012

### Abstract

**Background** Circular stapled hemorrhoidopexy (CSH) is an effective technique for treating prolapsing hemorrhoids; but urgency and anal stenosis are common postoperative complications. The aim of this study was to assess the efficacy and postoperative outcomes of partial stapled hemorrhoidopexy (PSH), compared with CSH.

**Methods** Seventy-two consecutive patients with grade III and IV hemorrhoids who met the inclusion/exclusion criteria were divided in a non-randomized manner to undergo either PSH ( $n = 34$ ) or CSH ( $n = 38$ ). Intraoperative and postoperative parameters in both groups were collected and compared.

**Results** The postoperative visual analog score for pain at first defecation was significantly lower in the PSH group than that in the CSH group ( $P = 0.001$ ). Fewer patients in the PSH group experienced postoperative urgency, compared with those in the CSH group at 12 h, 1 day, and 7 days after surgery ( $P = 0.025$ ,  $P = 0.019$ , and  $P = 0.043$ , respectively). Gas incontinence occurred in 3 patients (7.9%) in the CSH group, but in none of patients in the PSH group ( $P = 0.242$ ). Postoperative anal stenosis developed in one patient (2.6%) in the CSH group, but in

none of the patients in the PSH group ( $P = 1.0$ ). The 2-year recurrence rate was 2.9 and 5.3%, respectively, in the PSH and CSH groups ( $P = 1.0$ ).

**Conclusions** The 2-year recurrence rate is similar in patients with grade III–IV hemorrhoids treated with PSH or CSH. However, PSH is associated with less postoperative pain, fewer episodes of urgency, and no anal incontinence or anal stenosis.

**Keywords** Prolapsing hemorrhoids · Partial stapled hemorrhoidopexy · Circular stapled hemorrhoidopexy · Recurrence

### Introduction

Hemorrhoidal disease is one of the most common benign anorectal problems. Approximately 10–20% of patients with symptomatic hemorrhoids require surgery [1]. However, traditional procedures for treating hemorrhoids, including Whitehead hemorrhoidectomy and Milligan-Morgan hemorrhoidectomy, are associated with significant postoperative pain, anal stenosis, and impairment of anorectal function [2, 3]. Closed hemorrhoidectomy was designed to leave a less painful perianal wound; however, randomized controlled trials demonstrated that this closed method has no advantage in postoperative pain reduction [4, 5].

Circular stapled hemorrhoidopexy (CSH), characterized by a circular incision of the rectal mucosa [6], has gained popularity as it enables a faster recovery and much less postoperative pain [7, 8]. Based upon our 12-year experience, we confirmed that CSH is a very effective technique for treating prolapsing hemorrhoids. However, urgency and anal stenosis after CSH have been encountered in our practice (unpublished data). The incidence of postoperative

H.-C. Lin · D.-L. Ren (✉) · H. Peng · S.-K. Xie · D. Su ·  
X.-X. Wang

Department of Colorectal Surgery, The Sixth Affiliated Hospital  
of Sun Yat-sen University (Gastrointestinal and Anal Hospital),  
26 Yuancun Er Heng Rd, Guangzhou 510655,  
People's Republic of China  
e-mail: dredifice1983@yahoo.com.cn

Q.-L. He  
Department of Anesthesia, The First Affiliated Hospital  
of Sun Yat-sen University, Guangzhou 510080,  
People's Republic of China

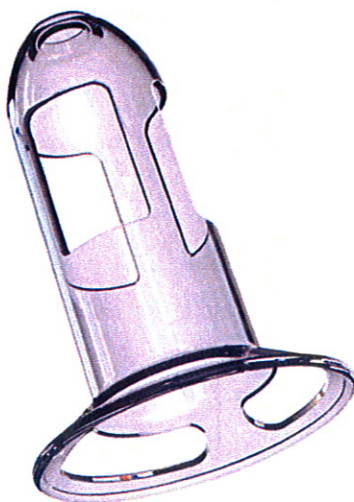
urgency and anal stenosis was reported to be as high as 40% [9] and 6% [10], respectively. We assume that these complications are due to the presence of too many staples in the sensitive lower rectum and the nature of the staple line (full circumference). Thus, we postulate that circular suspension of prolapsing hemorrhoids is not imperative, and partial suspension may be feasible and effective for treating hemorrhoids and can reduce these potential complications.

We developed a modified CSH technique, namely partial stapled hemorrhoidopexy (PSH), to overcome the limitations and weaknesses of CSH. PSH is characterized by a tri-window anoscope (Fig. 1), with which the rectal mucosa above the prolapsing hemorrhoids was partially resected to spare the mucosal bridges between the mucosectomies. Due to removal of the target tissue and preservation of the normal tissue, PSH is also called tissue-selecting technique (TST) in China. This study was carried out to compare the efficacy and postoperative outcomes of PSH and CSH in the treatment of patients with grade III–IV hemorrhoids.

## Materials and methods

### Patients

Seventy-two consecutive adult patients who were admitted to the Sixth Affiliated Hospital of Sun Yat-sen University and diagnosed with grade III and IV hemorrhoids between November 2008 and March 2009 were included in the study. A total of 76 patients were eligible for the study during the study period, but 4 patients declined to participate. The severity of hemorrhoidal disease was graded



**Fig. 1** The tri-window anoscope used in partial stapled hemorrhoidopexy

according to Goligher classification [11], as grade I (bleeding but without prolapse), grade II (prolapse during defecation but reduce spontaneously), grade III (prolapse and require manual reduction), and grade IV (permanently prolapsed and cannot be reduced). Acute thrombosed or strangulated hemorrhoids were excluded. Patients with concomitant anorectal diseases (fistula, abscess, fissure, inflammatory bowel disease, polyps, and carcinoma), previous anal procedures, or on immunosuppressant or anti-coagulants were ineligible. The primary outcome was the rate of recurrent prolapsing hemorrhoids during the two-year follow-up period. The secondary outcomes were postoperative pain, urgency, anal stenosis, and anal incontinence. Thirty-four underwent PSH and 38 underwent CSH. As defined by the inclusion criteria, prolapsing mass, which was reported by all patients preoperatively, was the most common major complaint (PSH vs. CSH = 94.1% vs. 92.1%,  $P = 1.0$ ). Other complaints included frequent anal bleeding (PSH vs. CSH = 50% vs. 47.4%,  $P = 0.824$ ) and itching (PSH vs. CSH = 38.2% vs. 31.6%,  $P = 0.554$ ). An external component was presented in 25 patients (73.5%) in the PSH group and 23 (60.5%) in the CSH group ( $P = 0.243$ ). The baseline clinical data were comparable in both groups with respect to gender, age, degree of the hemorrhoids, and presence of an external component (Table 1).

Approval was obtained from the Ethics Committee at Sun Yat-sen University, and written informed consent was obtained from each patient prior to his/her inclusion into the study.

### Preparations and surgical procedure

Patients were assigned to undergo PSH or CSH based on patient preference. Digital rectal examination and colonoscopy were performed in all the patients before

**Table 1** Demographic and clinical characteristics of patients receiving partial stapled hemorrhoidopexy and circular stapled hemorrhoidopexy

Characteristic	PSH ( $n = 34$ )	CSH ( $n = 38$ )	$P$ value
Age (years)	42.5 (25–68)	49 (25–76)	0.144
Male/female	23/11	25/13	0.867
Grade of hemorrhoids <sup>a</sup>			0.842
III	24 (70.6%)	26 (68.4%)	
IV	10 (29.4%)	12 (31.6%)	
External component	25 (73.5%)	23 (60.5%)	0.243

Age is expressed as median with range in parentheses while numbers with percentages in parentheses for grade of hemorrhoids and external component

PSH partial stapled hemorrhoidopexy, CSH circular stapled hemorrhoidopexy

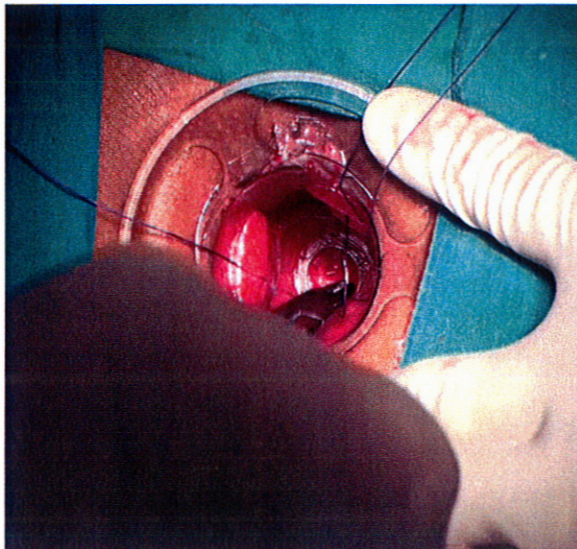
<sup>a</sup> Graded by Goligher classification

assignment to the surgical procedure. All patients received an enema for bowel preparation before surgery.

All patients were operated on in the prone jackknife position under combined spinal-epidural anesthesia, and under the same conditions except for the surgical procedures.

CSH was performed according to the generally accepted technique described by Longo [6] using the PPH-03 Kit (Ethicon, Cincinnati, OH, USA). The purse string in the CSH was placed approximately 3 cm above the dentate line.

PSH was performed using a tri-window anoscope and a stapler (Both manufactured by Touchstone, Suzhou, China). A lubricated tri-window anoscope (Fig. 1) was inserted into the anus together with an introducer. The anoscope was adjusted until the window of the anoscope was aligned with the mucosa above the prolapsing hemorrhoids. The introducer was then withdrawn and the mucosa protruded through the windows of the anoscope. A 2/0 Vicryl suture (Ethicon, Cincinnati, OH, USA) purse string was placed approximately 3 cm above the dentate line, and the needle only caught the mucosa and/or sub-mucosa that protruded through the window (Fig. 2). The stapler was opened to the maximum. Its anvil was introduced and positioned above the purse-string suture, which was secured to the rod, and three pieces of mucosa were pulled into the case of the stapler by the traction suture to form fan-shaped mucosal flaps (Fig. 3). After the gun was fired and the stapler was removed, mucosal bridges were left between mucosectomies. The mucosal bridges were dissected using electrocautery. Free ends of the dissected mucosal bridges formed "dog ears"; and the "dog ears"



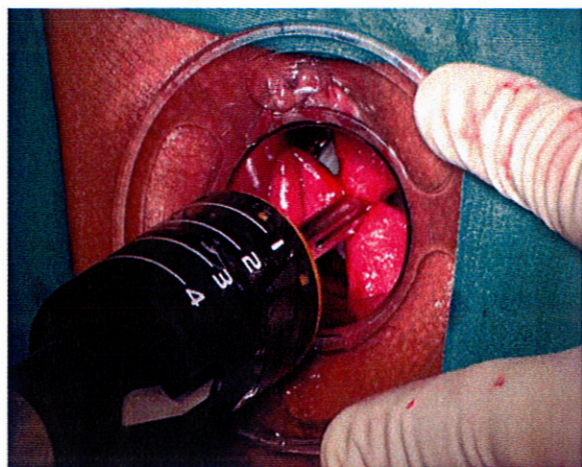
**Fig. 2** Placement of the purse string through the tri-window anoscope

were ligated. Then, circumferential inspection of the anus was performed. Occasionally, bleeding occurred along the staple line, and an absorbable suture was applied to ensure hemostasis. The stapler was checked to confirm that pieces of mucosa, rather than a circular column of mucosa, were removed. In some circumstances in which hemorrhoids did not completely disappear after PSH or CSH and residual skin tags remained, minimal excision of the skin tags was performed.

#### Intraoperative and postoperative management

Operative time was defined as the interval between the beginning of the operation and the application of the dressing. Intraoperative blood loss was estimated based on the net weight of the gauzes used. The average vertical height of three pieces of the resected specimens was recorded in the PSH group while the height for the circular column of the resected specimen in the CSH group was measured. The resected tissue removed from the stapler was always evaluated macroscopically.

Postoperative management consisted of standard nursing care, dietary modifications, and sitz baths. Postoperative outcomes were evaluated, including pain, urgency, hemorrhage, anal stenosis and anal incontinence. A visual analog scale (VAS) was used for pain scoring in the postoperative period (0, no pain; 10, most severe pain) and assessed during defecation. Urgency was assessed in patients who were unable to defer defecation for more than 15 min [12]. The number of patients who experienced urgency was also recorded. VAS and urgency were evaluated at 12 h, and 1, 2, 3, and 7 days after the operation. In addition, the VAS at the first postoperative defecation was



**Fig. 3** Representative image illustrating partial stapled hemorrhoidectomy for prolapsing hemorrhoids. Fan-shaped (3 pieces) mucosal flaps are drawn into the case of the stapler

also recorded. Anal stenosis was defined as the loss of compliant natural elasticity of the anal opening, which then became abnormally tight and fibrous [13]. The overall costs including surgical expenses, medication expenses, and the costs of the stapler kit (PSH stapler kit: EUR 565; PPH stapler kit: EUR 547) were calculated.

#### Follow-up

Return visits to the hospital for follow-up were required at 1, 4 weeks, 2, 6 months, 1 and 2 years after surgery. Additional follow-up visits were required when some symptoms such as severe pain, severe urgency, difficult evacuation, and other severe discomfort were encountered. Patients who could not attend these follow-up visits were contacted by telephone. The follow-up was done by blinded investigators. At follow-up visits or telephone interviews, patients were checked or questioned about the presence or absence of recurrent prolapsing hemorrhoids, postoperative hemorrhage, pain, urgency, anal incontinence, and anal stenosis. Recurrence of symptoms after a period of at least 2 months during which the patient was symptom-free was considered an indication of recurrence of prolapsing hemorrhoids. At the 2-year follow-up visit, on the basis of the presence and severity of the symptoms mentioned above, overall satisfaction was categorized as “excellent” if no symptom was present, “good” if one or more moderate symptoms were present, and “poor” if at least one severe symptom was present.

#### Statistical analysis

Quantitative parameters were expressed as the mean  $\pm$  standard deviation or median (range), where appropriate. To determine the difference in the variables between the two groups, two sample *t* tests were used for parametric quantitative variables, and the Mann–Whitney *U* test was used for the nonparametric variables. The Chi-squared test was used to determine the difference in the qualitative variables. A two-sided *P* value of  $<0.05$  was considered statistically significant. SPSS version 13.0 (SPSS Inc., Chicago, IL) was used.

## Results

#### Intraoperative variables of patients receiving PSH and CSH

In the PSH group, 28 (82.4%) patients had intraoperative bleeding of the staple line and hemostatic sutures were placed. “Z” sutures were also used in 26 (68.4%) of the CSH group ( $P = 0.173$ ). The operative time was similar in PSH and CSH groups [17 min (range, 8–25 min) vs.

16 min (range, 8–25 min),  $P = 0.198$ ], and there was no significant difference in the estimated blood loss between the two groups [5 ml (range, 5–15 ml) vs. 5 ml (range, 5–15 ml),  $P = 0.826$ ]. The height of the resected specimen was 3.0 cm (range, 2.5–3.5 cm) in the PSH group and 2.5 cm (range, 2.5–3.0 cm) in the CSH group ( $P = 0.001$ ). Skin tags were removed in 13 patients (38.2%) in the PSH group and 14 (36.8%) in the CSH group ( $P = 0.903$ ). No epithelium was found in the resected tissue in either group. No particular events occurred in any of the cases during the operation.

#### Early postoperative outcomes of patients receiving PSH and CSH

Postoperative pain scores and fecal urgency in the two groups are presented in Table 2. The pain scores in the PSH group were lower than those in the CSH group at the first postoperative defecation ( $P = 0.001$ ). There was no significant difference in the VAS between those who required skin tag excision and those who did not at 12 h, 1, 2, 3, and 7 days and during first postoperative defecation ( $P = 0.697$ ,  $P = 0.161$ ,  $P = 0.920$ ,  $P = 0.913$ ,  $P = 0.466$ , and  $P = 0.217$ , respectively) (Table 3). Fewer patients in the PSH group experienced urgency, compared with those in the CSH group at 12 h, 1 day, and 7 days postoperatively ( $P = 0.025$ ,  $P = 0.019$ , and  $P = 0.043$ , respectively). Four patients (two in each group,  $P = 1.0$ )

**Table 2** Pain scoring and fecal urgency associated with partial stapled hemorrhoidopexy and circular stapled hemorrhoidopexy in the early postoperative period

Variable	PSH ( <i>n</i> = 34)	CSH ( <i>n</i> = 38)	<i>P</i> value
Visual analog scale for pain			
During first defecation	2 (2–4)	4 (2–6)	0.001*
12 h	3 (1–4)	3 (1–5)	0.286
Day 1	2.5 (2–6)	2 (2–6)	0.693
Day 2	3 (2–4)	4 (2–6)	0.106
Day 3	2 (0–2)	1 (0–4)	0.570
Day 7	1 (0–2)	1 (0–2)	0.145
Urgency			
12 h	4 (11.8%)	13 (34.2%)	0.025*
Day 1	5 (14.7%)	15 (39.5%)	0.019*
Day 2	8 (23.5%)	13 (34.2%)	0.320
Day 3	6 (17.6%)	12 (31.6%)	0.173
Day 7	4 (11.8%)	12 (31.6%)	0.043*

Visual analog scale is expressed as median with range in parentheses, while urgency is expressed as numbers with percentages in parentheses

PSH partial stapled hemorrhoidopexy, CSH circular stapled hemorrhoidopexy

\*  $P < 0.05$ : statistically significant

**Table 3** Comparison of visual analog scale for pain between those with skin tag excision and those without

Variable	Excision of skin tags (n = 27)	No excision of skin tags (n = 45)	P value
Visual analog scale for pain			
During first defecation	4 (2–6)	3 (2–6)	0.217
12 h	3 (1–5)	3 (1–5)	0.697
Day 1	3 (2–6)	2 (2–6)	0.161
Day 2	4 (2–4)	3 (2–6)	0.920
Day 3	1 (0–4)	2 (0–4)	0.913
Day 7	1 (0–2)	1 (0–2)	0.466

Visual analog scales are expressed as median with range in parentheses

developed postoperative hemorrhage. All instances of hemorrhage occurred within 8 h after surgery and were successfully stopped by pressure with gauze or local adrenaline enema without any subsequent operation. No patient in the PSH group developed anal incontinence, and three patients (7.9%) in the CSH group developed gas incontinence ( $P = 0.242$ ). The average overall costs for PSH and CSH were EUR 1, 299 ± 147 and EUR 1, 311 ± 131, respectively ( $P = 0.717$ ).

#### Outcomes of patients receiving PSH and CSH after 2-year follow-up

All patients were followed up for 2 years. Anal stenosis developed in one patient (2.6%) in the CSH group 6 months after the operation, but in none of patients in the PSH group ( $P = 1.0$ ). The symptoms of stenosis were effectively relieved with manual anal dilation. One patient (at 4 months) in PSH group and two (one at 3 months and one at 20 months) in the CSH group developed recurrent prolapsing hemorrhoids after the operation. At subsequent follow-up visits, no more cases with recurrent prolapsing hemorrhoids were observed. Thus, the 2-year rates of recurrent prolapsing hemorrhoids were 2.9% (1/34) and 5.3% (2/38), respectively, in the two groups ( $P = 1.0$ ). No chronic pain or fecal urgency was encountered in any of the patients at follow-up from 4 weeks postoperatively on. In addition, the overall rates for “excellent” satisfaction were 94.1 and 84.2%, respectively, in the PSH and CSH groups ( $P = 0.267$ ), while “good” satisfaction was selected by all remaining patients.

#### Discussion

The present study demonstrates that PSH (three-point suspension) achieved the same effect as CSH (circular

suspension) did in the management of prolapsing hemorrhoids. Ortiz et al. [14] reported that the incidence of recurrent prolapsing hemorrhoids after CSH was as high as 25.9%. It is speculated that the cause of the high recurrence rates in the study may be due to an insufficient resection (the stapler which does not allow adequate resection). Hence, Naldini and his colleagues used a double stapled hemorrhoidopexy in the management of prolapsing hemorrhoids to obtain a sufficient resection and obtained satisfactory results [15]. In the present study, the height of the resected specimen was significantly greater in the PSH group than that in the CSH group ( $P = 0.001$ ). The 2-year recurrence rate of prolapsing hemorrhoids after PSH was slightly lower than that after CSH (2.9 vs. 5.3%), although it did not reach statistical significance. We therefore believe that PSH, compared with CSH, excises more prolapsing rectal mucosa longitudinally, resulting in a possible reduction in the recurrence rate. However, further investigation with a larger sample size is necessary to clarify this point.

It has been shown that stapled techniques are associated with acute and chronic pain [7, 8]. The mechanism for this pain is not clear. We believe that the causes of postoperative pain in patients operated on using stapled techniques are a purse string placed too deep and close to the levators, low-grade inflammation at the site of the staple ring at rest, and a staple line too close to the sensitive epithelium of the anal canal. A procedure called agraffectomy which includes removal en bloc of the staple line has been shown to provide relief from fecal urgency as well as stenosis after stapled hemorrhoidopexy but its benefits for chronic pain are questionable [16].

In the present study, the VAS pain score during the first postoperative defecation in the PSH group was significantly less than that in the CSH group. We postulate that in patients with CSH, the whole staple ring was stretched in response to rectal distention during the first defecation. At this time, the stapled ring was fixed and lacked compliance, which resulted in harder straining especially during the first postoperative defecation and thus more in stimulation of the sensitive epithelium causing in more postoperative pain. On the other hand, PSH was associated with partial resection of the rectal mucosa to spare the mucosal bridges, forming an elastic ring like a rubber band at the anastomotic plane to get better rectal compliance during defecation, and resulting in less postoperative pain at the first postoperative defecation.

Residual skin tags were found after CSH in 13.9–80% of patients as reported in the literature [17, 18]. In our hospital we prefer to remove skin tags after the operation as they may cause anal discomfort and pruritus [17]. However, the excision of skin tags leaves a wound in the perianal skin that may cause a significant increase in postoperative pain,

which may override the benefit of using the stapled procedure. We therefore compared patients who underwent skin tag excision with those who did not. In this series, skin tags were removed in 13 patients (38.2%) in the PSH group and 14 (36.8%) in the CSH group. The present study showed that there was no significant difference in pain between patients with and those without skin tag excision. This finding was in accordance with findings reported previously in the literature [18, 19].

The reported incidence of postoperative urgency after CSH ranges from 3 to 40% [9, 20]. The cause of the urgency is unclear. It has been reported that foreign bodies at the site of the staple ring may cause fecal urgency [9]. In the present study, the patients who underwent PSH had less urgency frequency than those in the CSH group. We speculate that the reduction in the number of staples which act as foreign bodies might be responsible for the fewer episodes of fecal urgency after PSH.

In the present study, anal incontinence was not encountered in any patients in the PSH group, while three patients (7.9%) in the CSH group were found to have gas incontinence. A reasonable explanation for less anal incontinence in the PSH group is that a partial mucosectomy, which preserves the normal tissue and requires fewer staples in the lower rectum where sensory receptors are expressed [21], can lead to minor injuries to the fine control of anal continence and reduce the low-grade inflammation of sensory receptors. These findings indicate that, in patients with PSH, sparing mucosal bridges between the mucosectomies and reducing the number of staple appear to result in less anal incontinence.

The incidence of anal stenosis after CSH reported in the literature is 0.8–6% [10], and it occurs, on average,  $125 \pm 5$  days [22] postoperatively. In general, removal of large areas of the anoderm and hemorrhoidal rectal mucosa, without the sparing of adequate mucocutaneous bridges, can lead to scarring and a progressive chronic stricture [10, 23]. In the present study, postoperative anal stenosis developed in one patient (2.6%) in the CSH group, but in none in the PSH group during the average follow-up duration of 24 months. Although the difference in the incidence of anal stenosis was not statistically significant, the PSH procedure may reduce the incidence of this complication because it is a partial, not full circumference CSH. However, a large study is required to further clarify this issue.

We acknowledge that its non-randomized nature is a limitation of this preliminary study. However, it should be noted that it is very difficult to perform a clinical study in a random way in a surgical setting in China because only few Chinese patients are willing to “try” a new surgical procedure or technique in a clinical trial. In the present study, the patients were divided into two groups based on the

patients’ preference, which might have caused selection bias. However, we observed that the baseline demographic and clinical characteristics (gender, age, degree of hemorrhoids, and presence of external component) were similar. Nevertheless, randomized controlled trials that compare the PSH and CSH procedures are required to confirm the results of this preliminary trial.

## Conclusions

The 2-year recurrence rate after PSH and CSH for grade III–IV prolapsing hemorrhoids is similar. However, PSH is associated with less postoperative pain, fewer episodes of urgency, and no postoperative anal incontinence or anal stenosis. Therefore, based on our experience, PSH appears to be a minimally invasive technique in the treatment of grade III–IV prolapsing hemorrhoids.

**Conflict of interest** None of the authors declares any conflict of interest.

## References

- Bleday R, Pena JP, Rothenberger DA, Goldberg SM, Buls JG (1992) Symptomatic hemorrhoids: current incidence and complications of operative surgery. *Dis Colon Rectum* 35:477–481
- Wolff BG, Culp CE (1988) The Whitehead hemorrhoidectomy. An unjustly maligned procedure. *Dis Colon Rectum* 31:587–590
- Ommer A, Wenger FA, Rolfs T, Walz MK (2008) Continence disorders after anal surgery—a relevant problem? *Int J Colorectal Dis* 23:1023–1031
- Arbman G, Krook H, Haapaniemi S (2000) Closed vs. open hemorrhoidectomy—is there any difference? *Dis Colon Rectum* 43:31–34
- Ho YH, Seow-Choen F, Tan M, Leong AF (1997) Randomized controlled trial of open and closed haemorrhoidectomy. *Br J Surg* 84:1729–1730
- Longo A (1998) Treatment of hemorrhoidal disease by reduction of mucosa and hemorrhoidal prolapse with a circular suturing device: a new procedure. In: *Proceedings of the 6th world congress of endoscopic surgery*. Bologna: Monduzzi Editore, pp 777–784
- Shao WJ, Li GC, Zhang ZH, Yang BL, Sun GD, Chen YQ (2008) Systematic review and meta-analysis of randomized controlled trials comparing stapled haemorrhoidopexy with conventional haemorrhoidectomy. *Br J Surg* 95:147–160
- Laughlan K, Jayne DG, Jackson D, Rupprecht F, Ribaric G (2009) Stapled haemorrhoidopexy compared to Milligan-Morgan and Ferguson haemorrhoidectomy: a systematic review. *Int J Colorectal Dis* 24:335–344
- Fueglistaler P, Guenin MO, Montali I et al (2007) Long-term results after stapled hemorrhoidopexy: high patient satisfaction despite frequent postoperative symptoms. *Dis Colon Rectum* 50:204–212
- Brisinda G, Vanella S, Cadeddu F et al (2009) Surgical treatment of anal stenosis. *World J Gastroenterol* 15:1921–1928
- Goligher JC (1980) *Surgery of the anus rectum and colon*, 4th edn. Bailliere, Tindall, London, pp 93–149

12. Z'graggen K, Maurer CA, Birrer S, Giachino D, Kern B, Büchler MW (2001) A new surgical concept for rectal replacement after low anterior resection. *Ann Surg* 234:780–787
13. Katdare MV, Ricciardi R (2010) Anal stenosis. *Surg Clin North Am* 90:137–145
14. Ortiz H, Marzo J, Armendariz P (2002) Randomized clinical trial of stapled haemorrhoidopexy versus conventional diathermy haemorrhoidectomy. *Br J Surg* 89:1376–1381
15. Naldini G, Martellucci J, Talento P, Caviglia A, Moraldi L, Rossi M (2009) New approach to large haemorrhoidal prolapse: double stapled haemorrhoidopexy. *Int J Colorectal Dis* 24:1383–1387
16. Petersen S, Jongen J, Schwenk W (2011) Agraffectomy after low rectal stapling procedures for hemorrhoids and rectocele. *Tech Colopectol* 15:259–264
17. Gao XH, Fu CG, Nabieu PF (2010) Residual skin tags following procedure for prolapse and hemorrhoids: differentiation from recurrence. *World J Surg* 34:344–352
18. Gerjy R, Nyström PO (2007) Excision of residual skin tags during stapled anopexy does not increase postoperative pain. *Colorectal Dis* 9:754–757
19. Gravié JF, Lehur PA, Hutten N et al (2005) Stapled hemorrhoidopexy versus Milligan-Morgan hemorrhoidectomy: a prospective, randomized, multicenter trial with 2-year postoperative follow up. *Ann Surg* 242:29–35
20. Mlakar B, Kosorok P (2003) Complications and results after stapled haemorrhoidopexy as a day surgical procedure. *Tech Colopectol* 7:164–168
21. Ruhl A, Thewissen M, Ross HG, Cleveland S, Frieling T, Enck P (1998) Discharge patterns of intramural mechanoreceptive afferents during selective distension of the cat's rectum. *Neurogastroenterol Motil* 10:219–225
22. Yao LQ, Zhong YS, Xu JM et al (2006) Rectal stenosis following procedure for prolapse and hemorrhoids. *Zhonghua Wai Ke Za Zhi* 44:897–899
23. Brisinda G (2000) How to treat hemorrhoids. Prevention is best; haemorrhoidectomy needs skilled operators. *BMJ* 321:582–583