



## Original Article

# Harmonic Scalpel Hemorrhoidectomy—Open versus Closed: A Comparative Study

Jagdeesh Nagaraju<sup>1</sup>, Dileep S. Thakur<sup>1</sup>, Uday Somashekar<sup>1</sup> , Amrendra Verma<sup>1</sup>, Reena Kothari<sup>1</sup>, Dhananjay Sharma<sup>1</sup>

<sup>1</sup>Department of General Surgery, Netaji Subhash Chandra Bose Medical College, Jabalpur, Madhya Pradesh, India.

### \*Corresponding author:

Amrendra Verma, MBBS, MS, DNB,  
Department of General Surgery,  
Netaji Subhash Chandra Bose  
Medical College,  
Garha Jabalpur, 482003,  
Madhya Pradesh, India.

[verma.amrendra4@gmail.com](mailto:verma.amrendra4@gmail.com)

### Epub Ahead of Print:

14 July 2022

Published: 22 August 2023

### DOI

10.1055/s-0042-1743441

## ABSTRACT

**Background:** Hemorrhoids are one of the frequent presenting complaints in the surgical outpatient department of any hospital. Multiple options are available for the treatment of these based on the grade. Recently, there are many varieties of energy devices being tried for hemorrhoidectomy to decrease the postoperative pain and achieve better hemostasis intraoperatively. This study represented an effort to compare open versus closed method of harmonic scalpel hemorrhoidectomy to determine the differences in terms of operative time, hospital stay, postoperative bleeding, pain, and other complications.

**Method:** A total of 40 patients, 20 each in open and closed method harmonic scalpel hemorrhoidectomy, were followed up for 6 weeks postoperatively. Early and late outcomes were compared. Incontinence if any was measured with Vaizey incontinence score.

**Result:** There was significant prolonging of operative time in closed method ( $30.25 \pm 5.49$  vs.  $22.0 \pm 4.70$ ). Postoperative pain was significantly more in open method group compared with closed on days 1, 3, 7, and 21. There was no significant difference between groups in terms of hospital stay, postoperative bleeding, and complications.

**Conclusion:** Leaving mucosa open after hemorrhoidal tissue excision is comparable to closed in terms of safety complication and is cost effective in terms of operative times and utility of suture materials at the expense of need for analgesics.

**Keywords:** Harmonic scalpel hemorrhoidectomy, Vaizey's incontinence score, Visual analog scale

## INTRODUCTION

Hemorrhoids are the downward displacement of submucosal connective tissue containing venules and smooth muscle fibers of anal cushions, caused due to venule dilatation.<sup>[1]</sup> Patients with hemorrhoids and related symptoms account for most of the patient population in general surgery clinics.<sup>[2]</sup> Three important points need to be considered while deciding management options for hemorrhoids. First, it is crucial to determine patient's symptoms such as protrusion, pain, or bleeding. Second point is lowering the postoperative pain. Third point is to reduce the recurrence rate. For the management of hemorrhoids, various modalities<sup>[2,3]</sup> have been tried ranging from dietary and lifestyle modifications to surgeries. Numbers of surgical procedures<sup>[4]</sup> are available for management of hemorrhoids, namely banding, sclerotherapy, and hemorrhoidectomy, like Milligan–Morgan (open)<sup>[5]</sup> and Fergusson's (closed)<sup>[6]</sup> hemorrhoidectomy and stapled hemorrhoidopexy.<sup>[7]</sup> Hemorrhoidectomy is further classified based on the energy device used to resect the tissue, namely scissors, simple cautery, laser, harmonic scalpel.<sup>[8]</sup> Each procedure has its own complications and advantages.

This is an open-access article distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

©2023 Published by Scientific Scholar on behalf of International Journal of Recent Surgical and Medical Sciences

Although hemorrhoidectomy is one of the most common anorectal operations,<sup>[9]</sup> it has long been known as a potentially morbid procedure fraught with lengthy recovery, pain, and recurrent disease.<sup>[10,11]</sup> Modern advances in technology of instrument have provided various new alternatives in hemorrhoidectomy. Harmonic scalpel (Ethicon Endo-Surgery, Inc., Cincinnati, Ohio, United States) excision of hemorrhoid is a more modern technique used in symptomatic third- and fourth-degree hemorrhoids.<sup>[12]</sup>

The harmonic scalpel is an ultrasonically activated instrument that vibrates at a rate of 55,000 Hz per second. This works through the denaturation of proteins by breaking hydrogen bonds, thereby forming a coagulum to seal small vessels at lower temperatures, and decreasing thermal damage to surrounding tissue.<sup>[8,13]</sup> After excision, a mucosal defect is created, which is then left open or closed by suture depending on surgeon preference.<sup>[12]</sup>

Even with the superfluity of surgical interventions available, the outcome varies from patient to patient and no one technique can be called as the gold standard. Randomized prospective trials and meta-analyses have been performed with the aim of finding the same. This is a step toward comparing the open versus closed technique of hemorrhoid excision using the harmonic scalpel to resect the hemorrhoidal tissue.

## MATERIALS AND METHODS

This prospective study is conducted on patients presenting with hemorrhoids at general surgery outpatient department, Netaji Subhash Chandra Bose Medical College, Jabalpur, Madhya Pradesh, India, during the period of September 2019 to August 2021. After approval by the hospital Ethics committee, total of 40 patients with grades 3 and 4 were included in the study. Other lower grades and patients with associated anorectal pathologies/neurological deficits were excluded. First patient was selected by lottery and then every alternate patient was allocated into open or closed method harmonic scalpel hemorrhoidectomy. All cases were done by single surgeon.

**Surgery:** Surgery was done in lithotomy position with saddle block. Hemorrhoidal tissue was excised in a retrograde fashion starting with external component by sequential coagulation with the harmonic scalpel blade on the power mode-3. After excising the hemorrhoid tissue, the overlying mucosal defect was left open (open method) or reapproximated with a running absorbable suture.

Postoperatively, all patients were given bulk laxative, antibiotics (ofloxacin + ornidazole, bi-daily [BD]), and analgesics (diclofenac 50 mg, BD) and instructed to keep perianal area hygienic by warm sitz bath four times a day.

Follow-up examination was done on postoperative day 1, day 3, day 7, day 21, and day 42. Postoperative pain was assessed

**Table 1:** Demographic data and patient distributions.

Variable		Closed method	Open method
1. Age (y)	Mean	47	45
	Range	30–80	25–80
2. Gender	Male	16	15
	Female	4	5
3. Grade	3	13	13
	4	7	7

by visual analog scale (VAS) score of 0 (no pain) to 10 (very severe pain). Postoperative bleeding was assessed by verbal rating system score of 0 (no bleeding) to 3 (severe bleeding). Vaizey's scoring system was used for evaluating incontinence to solid/liquid/gas with a score of 0 (perfect continent) to 24 (totally incontinent).

**Analysis:** Comparison tables were made with closed and open procedures as two groups. Statistical analysis was performed with a *t*-test for continuous variables, and a chi-squared or Fisher's exact test was used for nominal data, wherever appropriate, with significance at  $p \leq 0.05$ .

## RESULTS

Out of total of 40 patients of internal hemorrhoids, 20 of them underwent closed method while other 20 underwent open method of harmonic scalpel hemorrhoidectomy. Patient demographics are summarized in Table 1.

Both groups were comparable in terms of length of hospital stay and postoperative bleeding. There was significant increase in operative time for closed method when compared with open. Postoperative pain was significantly less in closed group in all follow-up. This can be inferred from Table 2.

Table 3 shows the incidence of complications in the two groups. No patients from either of the group developed incontinence to solid/liquid/gas. All of them had a Vaizey's score of 0 postoperatively. Five patients (three from closed and two from open method group) developed urinary retention postoperatively. There were no patients from both the groups who developed abscess, prolapse, anal stenosis, or recurrence postoperatively, up to 6 weeks of follow-up.

**Table 2:** Duration of surgery and hospital stay.

		Closed method	Open method	<i>p</i> -Value
1. Hospital stay (d)	Mean	1.45	1.40	0.757
	Standard deviation	0.51	0.50	
2. Operative time	Mean	30.25	22.0	0.001
	Standard deviation	5.49	4.70	

**Table 3:** Complications.

Complication	Closed method (n=20)	Open method (n=20)
1. Urinary retention	3	2
2. Abscess	–	–
3. Prolapse	–	–
4. Anal stenosis	–	–
5. Recurrence	–	–

**Table 4:** Postoperative pain and bleeding.

			Closed method	Open method	p-Value
1. Bleeding (VRS score)	Mean	Day 1	2.0	2.0	1.000
		Day 3	1.5	1.7	0.251
		Day 7	0.9	1.1	0.259
		Day 21	0.5	0.75	0.108
		Day 42	0	0	–
2. Pain (VAS score)	Mean	Day 1	2.2	2.6	0.044
		Day 3	1.55	2.35	0.001
		Day 7	0.90	1.70	0.001
		Day 21	0.65	1.1	0.001
		Day 42	0	0	–

Abbreviations: VAS, visual analog scale; VRS, verbal rating system.

Table 4 shows the comparison of the variables used in study namely postoperative pain and bleeding. Postoperative pain was significantly less in closed method group on day 1, day 3, day 7, and day 21. Also, the amount of postoperative bleeding was comparable among two groups on day 1 but it significantly reduces in closed method from postoperative day 3.

## DISCUSSION

In this study, outcomes were measured in the form of operative time, hospital stay, postoperative pain and bleeding, incontinence, abscess, prolapse, anal stenosis, urinary retention, and recurrence.

Upon scrupulous search in PubMed, Research Gate, Elsevier, Libgen, etc. with key words as “harmonic scalpel,” “open versus closed,” and “hemorrhoidectomy,” we found only one study by Sohn *et al.*<sup>[12]</sup> that compared the open versus closed hemorrhoidectomy by using harmonic scalpel. We compared results of our study with this study.

In Sohn *et al.*<sup>[12]</sup> study of 42 patients, 13 patients underwent closed method and 29 patients underwent open method of harmonic hemorrhoidectomy. Mean follow-up was 16.9 months (range: 12–27 months). In this study, operating surgeon decided to allocate the patient in either group intraoperatively. In our study, allocation of first patient was done by lottery and then every alternate patient was allocated into open or closed harmonic scalpel hemorrhoidectomy group.

In Sohn *et al.*<sup>[12]</sup> study, mean operative time for closed and open method were 40.6 and 22.1 minutes, respectively ( $p$ -value of 0.001). In our study, the mean operative time for closed and open method were  $30.25 \pm 5.49$  and  $22.00 \pm 4.70$  minutes, respectively ( $p=0.001$ ) [Table 2]. Hence, we conclude that operative time taken for open method is significantly less compared with closed method. This is obvious, as closing the mucosa involves extra steps and time. By reducing the operation time, major cost of operation is cut down and utilization of reduced suture material length adds to cost-effectiveness of open method.<sup>[12]</sup>

Duration of hospital stay was comparable in both groups in our study and also in Sohn *et al.*<sup>[12]</sup> study [Table 2]. They discharged all patients on the same evening of surgery. Only one patient of open hemorrhoidectomy in their study reported to emergency with severe pain. In our study, after evaluating postoperative pain using VAS scoring system, we found that pain is significantly more in open method compared with closed method on day 1, day 3, day 7, and day 21 postoperatively [Table 4]. Skin approximation to close the exposed nerve endings and hence avoidance of repeated trauma to the wound may be a possible explanation for this.

In Sohn *et al.*<sup>[12]</sup> study, mean estimated blood loss in closed and open method were 2.3 cc and 2.5 cc, respectively, with  $p$ -value of 0.24. One patient in open group required emergency surgery within 12 hours for bleeding. No patients developed late bleeding. We compared blood loss postoperatively using verbal rating system. We infer here that as above study, in our study also there is no significant difference between the groups in terms of postoperative bleed.

In previous study, there was no mention of use of any scoring system for measuring incontinence. We assessed postoperative incontinence using Vaizey’s scoring system. In our study also, no patients developed incontinence to solid/liquid/gas (Vaizey’s score = 0). The results were comparable to the previous study.

In both the studies, urinary retention rate was within the expected incidence of postoperative urinary retention after spinal/saddle anesthesia for benign anorectal surgeries.<sup>[13,14]</sup> In Sohn *et al.*<sup>[12]</sup> study, 7% of patients (one patient from closed and one from open method group) developed urinary retention postoperatively and both these patients had received spinal anesthesia. In our study, 12.5% of patients (three from closed and two from open method group) developed urinary retention postoperatively. All patients were given saddle block. This complication was unaffected by the method used.

No patients developed long-term complications postoperatively in either study.

## CONCLUSION

From the present study we can conclude that hemorrhoid excision with the help of harmonic scalpel is safe, effective, and easy without serious complications. Leaving the mucosal defect unsutured (open method) following the harmonic scalpel hemorrhoidectomy significantly reduces the operative time.

Our study data support that leaving the mucosa open is comparable to closed method in terms of safety and complications, and is cost effective than closed method in terms of operative time and utility of suture material, at the expense of need for analgesics.

Further evaluation with a prospective trial in large scale and long-term follow-up is needed to ensure patient safety in terms of postoperative bleeding, pain, and long-term complications.

## Conflict of Interest

None.

## REFERENCES

- Bernstein WC. What are hemorrhoids and what is their relationship to the portal venous system?. *Dis Colon Rectum* 1983;26:829-34.
- Lohsiriwat V. Treatment of hemorrhoids: a coloproctologist's view. *World J Gastroenterol* 2015;21:9245-52.
- Hollingshead JR, Phillips RK. Haemorrhoids: modern diagnosis and treatment. *Postgrad Med J* 2016;92:4-8.
- Agbo SP. Surgical management of hemorrhoids. *J Surg Tech Case Rep* 2011;3:68-75.
- Di Bella F, Giordano M, Blanco GF. Lemorroidectomia secondo Milligan e Morgan [Hemorrhoidectomy: Milligan and Morgan technique]. *Ann Ital Chir* 1995 Nov-Dec;66:791-799 Italian.
- Guenin MO, Rosenthal R, Kern B, Peterli R, von Flüe M, Ackermann C. Ferguson hemorrhoidectomy: long-term results and patient satisfaction after Ferguson's hemorrhoidectomy. *Dis Colon Rectum* 2005;48:1523-7.
- Bellio G, Pasquali A, Schiano di Visconte M. Stapled hemorrhoidopexy: results at 10-year follow-up. *Dis Colon Rectum* 2018;61:491-8.
- Dutta DK, Dutta I. The harmonic scalpel. *J Obstet Gynaecol India* 2016;66:209-210.
- Cataldo PA, Maizer WP. *Current Surgical Therapy*, 4th ed. Cameron JL, editor. St. Louis, MO: Mosby-Yearbook; 1992. p. 218-22.
- Carapeti EA, Kamm MA, McDonald PJ, Phillips RK. Double-blind randomised controlled trial of effect of metronidazole on pain after day-case haemorrhoidectomy. *Lancet* 1998;351:169-72.
- Pfenninger J. Modern treatments for internal hemorrhoids: scalpel surgery is now rarely needed. *BMJ* 1997;314:1211-2.
- Sohn VY, Martin MJ, Mullenix PS, Cuadrado DG, Place RJ, Steele SR. A comparison of open versus closed techniques using the Harmonic Scalpel in outpatient hemorrhoid surgery. *Mil Med* 2008;173:689-92.
- Baldini G, Bagry H, Aprikian A, Carli F. Postoperative urinary retention: anesthetic and perioperative considerations. *Anesthesiology* 2009;110:1139-57.
- Zaheer S, Reilly WT, Pemberton JH, Ilstrup D. Urinary retention after operations for benign anorectal diseases. *Dis Colon Rectum* 1998;41:696-704.

**How to cite this article:** Nagaraju J, Thakur DS, Somashekar U, Verma A, Kothari R, Sharma D. Harmonic scalpel hemorrhoidectomy—Open versus closed: A comparative study. *Int J Recent Sur Med Sci* 2023;9:SI-S4.