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Original Research Article

Comparative Study of Conventional Scissor Excision-Ligation Hemorrhoidectomy (Milligan-Morgan) and Harmonic Scalpel Hemorrhoidectomy

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ABSTRACT

Background: For grade III and IV haemorrhoids, the traditional Milligan-Morgan haemorrhoidectomy is a proven surgical procedure; nonetheless, it is linked to considerable postoperative pain and morbidity. An alternate method that may lessen surgical blood loss, postoperative pain, and recovery time is harmonic scalpel haemorrhoidectomy. Comparing the perioperative and postoperative results of the two methods was the goal of this investigation.

Methods: A prospective randomized study was conducted at Durgapur Steel Plant Hospital, Durgapur, West Bengal, for a period of one and half years. 66 patients with grade III and IV haemorrhoids that were symptomatic were included and divided into two groups at random: Milligan-Morgan haemorrhoidectomy (n = 33) and harmonic scalpel haemorrhoidectomy (n = 33). The length of the procedure, intraoperative blood loss, postoperative complications, length of hospital stay, and postoperative pain measured using the VAS (Visual Analogue Scale) were all compared. For three months, patients were monitored.

Results: The harmonic group's mean operating time was significantly less than that of the traditional group (18.67 ± 2.99 vs. 24.73 ± 2.96 minutes; $p<0.001$). Additionally, there was a considerably decreased mean intraoperative blood loss (10.06 ± 1.92 vs. 20.82 ± 4.5 ml; $p<0.001$). On postoperative days 0, 1, 2, and 7, the Harmonic group had significantly decreased postoperative pain levels ($p<0.001$). The harmonic group's mean hospital stay was 3 days, while the conventional group's was 3.73 ± 0.91 days ($p<0.001$). Postoperative bleeding, discharge and urinary retention were more frequent in the conventional group. No postoperative complications were reported in the Harmonic group during follow-up.

Conclusion: Compared to traditional Milligan-Morgan haemorrhoidectomy, Harmonic Scalpel haemorrhoidectomy has several advantages, including shorter operating times, less blood loss, less pain and hospital stays following surgery, and fewer problems. For the surgical treatment of grade III and IV haemorrhoids, it offers a secure and efficient substitute.

Keywords: Hemorrhoids, Milligan–Morgan Hemorrhoidectomy, Harmonic Scalpel, postoperative Pain, Operative Blood Loss, Surgical Outcome.

INTRODUCTION

Hemorrhoids are among the most common benign anorectal disorders worldwide. Surgical treatment is generally recommended for symptomatic grade III and IV hemorrhoids, with hemorrhoidectomy being one of the most frequently performed anorectal procedures.[1,2] Among the various surgical techniques, the Milligan–Morgan hemorrhoidectomy, introduced in 1937, remains one of the most widely practiced methods.[3] However, conventional hemorrhoidectomy is associated with considerable postoperative pain, often requiring 3–4 days of hospitalisation and a prolonged recovery period of approximately one month.[4,5]

Several surgical techniques have been developed to reduce postoperative morbidity while maintaining effective treatment. These procedures primarily aim to reduce blood flow to the hemorrhoidal plexus and remove redundant anoderm and mucosa.[6] The Ferguson or closed hemorrhoidectomy involves excision of hemorrhoidal tissue followed by closure of the wound using absorbable sutures, whereas the Milligan–Morgan or open hemorrhoidectomy involves leaving the excision wounds open to heal by secondary intention.[6] Although Milligan–Morgan hemorrhoidectomy provides definitive treatment for advanced hemorrhoids, postoperative pain, bleeding and mucous discharge remain significant concerns.[7,8]

Various modifications have been introduced to improve surgical outcomes. Diathermy hemorrhoidectomy offers advantages such as reduced intraoperative bleeding, shorter operating time and decreased analgesic requirements; however, it does not significantly reduce postoperative pain.[9] Stapled hemorrhoidopexy, introduced by Antonio Longo, has emerged as an alternative to conventional hemorrhoidectomy, with several studies reporting reduced postoperative pain and faster recovery.[10,11] Nevertheless, certain limitations remain. Similarly, laser hemorrhoidectomy has gained popularity, although its superiority over conventional techniques has not been conclusively established.[12]

The Harmonic Scalpel is an advanced surgical instrument that uses ultrasonic energy to achieve simultaneous cutting and coagulation, producing minimal lateral thermal injury (80°C; 0–1.5 mm depth). This limited tissue damage is believed to contribute to reduced postoperative discomfort, while effective haemostasis is achieved through protein coagulation within blood vessels.[13]

Although several randomised controlled trials have compared Harmonic Scalpel hemorrhoidectomy with conventional open and closed techniques, their findings remain inconsistent. Some studies have demonstrated benefits in terms of operative time, blood loss, postoperative pain, hospital stay and return to normal activities, whereas others have reported no significant advantages.[13,14] Therefore, the present study aims to evaluate the role of Harmonic Scalpel hemorrhoidectomy in improving surgical outcomes and reducing postoperative morbidity.

Aims and Objectives

The aim of this study was to compare and evaluate the perioperative and postoperative outcomes of harmonic scalpel hemorrhoidectomy with the conventional scissors excision and ligation technique (Milligan–Morgan) in patients with hemorrhoids, with particular emphasis on postoperative pain, duration of surgery, intraoperative blood loss, duration of hospital stay and postoperative complications.

MATERIALS AND METHODS

Study Design

The present study was designed as a prospective, randomized study with consecutive sampling, conducted at Durgapur Steel Plant Hospital, Durgapur, West Bengal, over a period of one and half year.

Inclusion and Exclusion Criteria

The study included male and female patients of any ethnic group aged above 18 years who were diagnosed with symptomatic Grade III and Grade IV hemorrhoids. Patients with Grade I and Grade II hemorrhoids, pregnant women, those who refused to provide written informed consent, and individuals referred to a higher centre or absconded during the course of treatment were excluded. Patients with inflammatory bowel disease (Crohn's disease or ulcerative colitis), acutely thrombosed hemorrhoids, anal stricture, associated anorectal pathologies such as fistula-in-ano and anal fissure, prolapse of a single anal cushion, and those with a history of previous hemorrhoidectomy were also excluded from the study.

Sample Size Calculation

Power analysis was used to determine the sample size, taking into account a statistical power of 90%, an alpha error of 5%, and an effect size of 2.8. As a result, each group needed 33 people, for a total sample size of 66 patients. 66 consecutive individuals with symptomatic Grade III and Grade IV haemorrhoids were enrolled in this study. They were divided into two groups at random. Group II comprised 33 patients who underwent traditional scissors excision and ligation (Milligan–Morgan haemorrhoidectomy), whereas Group I consisted of 33 individuals who received harmonic scalpel haemorrhoidectomy.

Data Collection Procedure

Patients presenting to the outpatient department with complaints of bleeding per rectum or mass per rectum were evaluated through detailed history taking, including the presenting symptoms and duration of illness. Clinical assessment included digital rectal examination and anoscopy to determine the grade and position of internal hemorrhoids, along with a general systemic examination. Baseline investigations included hematological parameters, renal and liver function tests, fasting and postprandial blood sugar levels, 12-lead electrocardiography, urine routine and microscopic examination, ultrasonography of the abdomen, and chest X-ray. All eligible patients were admitted one day prior to surgery, kept nil per oral overnight, and administered a phosphate enema on the morning of surgery. Prophylactic antibiotics (cephalosporin and metronidazole) were administered at the time of anaesthesia. Patients were randomized using a computer-generated schedule to undergo either harmonic scalpel hemorrhoidectomy or conventional scissors excision and ligation (Milligan–Morgan hemorrhoidectomy). Under spinal anaesthesia, every procedure was carried out in the lithotomy position. Operative time was measured from the start of the first haemorrhoidal excision to the end of the final excision, and blood loss was calculated by weighing the wet gauze pads before and after operation. These intraoperative observations were documented. At the conclusion of the procedure, an anal pack made of paraffin gauze was put and taken off on the first postoperative morning. Postoperative follow-up was carried out through detailed history taking, digital rectal examination, and anoscopy to assess treatment response and complications, including pain, bleeding, and discharge per anus.

Statistical Analysis

Descriptive and inferential statistical techniques were used to evaluate the gathered data. The study variables were summarised using descriptive statistics, such as mean, standard deviation, frequency, and percentage. For suitable statistical comparisons across groups, the Student's t-test and Analysis of Variance (ANOVA) were employed. SPSS software, version 16, was used for statistical analysis. A p-value of less than 0.05 was considered statistically significant, and a 5% level of significance was taken into account.

RESULTS

Variable	Category/Measure	MM group (n=33)	HH group (n=33)	Total (n=66)	P value	Significance
Age (years)	Mean ± SD	52.48 ± 14.62	57.15 ± 15.51	—	0.213	Not significant
Sex	Female, n (%)	16 (48.48)	15 (45.45)	31 (46.97)	0.805	Not significant
Sex	Male, n (%)	17 (51.52)	18 (54.55)	35 (53.03)		
Grade of hemorrhoids	Grade III, n (%)	25 (75.76)	23 (69.70)	48 (72.73)	0.580	Not significant
Grade of hemorrhoids	Grade IV, n (%)	8 (24.24)	10 (30.30)	18 (27.27)		

Table 1. Baseline Demographic and Clinical Characteristics of the Study Groups

The baseline clinical and demographic features of the 66 individuals that were part of the trial are shown in Table 1. The mean age was 52.48 ± 14.62 years in the MM group and 57.15 ± 15.51 years in the HH group. Additionally, the groups' haemorrhoid grades and sex distribution were similar. No statistically significant differences were identified in age (p = 0.213), sex (p = 0.805) or hemorrhoid grade (p = 0.580), showing that the two groups were comparable at baseline.

Operative Parameter	MM Group (n=33)	HH Group (n=33)	P-value	Significance
Duration of surgery (minutes), mean ± SD	24.73 ± 2.96	18.67 ± 2.99	<0.001	Significant
Operative blood loss (mL), mean ± SD	20.82 ± 4.50	10.06 ± 1.92	<0.001	Significant

Table 2. Comparison of Operative Parameters between the Study Groups

Table 2 demonstrates the comparison of operative duration and intraoperative blood loss between the two groups. The mean duration of surgery was shorter in the HH group (18.67 ± 2.99 minutes) than in the MM group (24.73 ± 2.96 minutes). Similarly, mean operative blood loss was lower in the HH group (10.06 ± 1.92 mL) than in the MM group (20.82 ± 4.50 mL). Both differences were statistically significant ($p < 0.001$).

Assessment Time	MM Group (mean ± SD)	HH Group (mean ± SD)	P value	Significance
Day 0 (6 hours postoperatively)	6.76 ± 0.50	4.06 ± 0.24	<0.001	Significant
Postoperative day 1	5.24 ± 0.71	3.03 ± 0.17	<0.001	Significant
Postoperative day 2	3.30 ± 0.73	2.00 ± 0	<0.001	Significant
Postoperative day 7	1.36 ± 0.49	1.03 ± 0.17	<0.001	Significant
Table 3. Comparison of Postoperative Pain Scores (VAS) between the Study Groups				

Table 3 illustrates the postoperative pain scores assessed using the VAS on day 0 (6 hours after surgery), and on postoperative days 1, 2 and 7. The HH group had lower mean pain scores than the MM group at every assessment point. The differences were reported as statistically significant ($p < 0.001$), indicating lower postoperative pain following Harmonic Scalpel hemorrhoidectomy.

Complication	Outcome	MM Group (n=33), n (%)	HH Group (n=33), n (%)	P value	Significance
Urinary retention	Present	4 (12.12)	1 (3.03)	0.163	Not significant
Urinary retention	Absent	29 (87.88)	32 (96.97)		
Bleeding per rectum (BPR)	Present	6 (18.18)	0 (0)	0.010	Significant
Bleeding per rectum (BPR)	Absent	27 (81.82)	33 (100)		
Discharge per rectum (DPR)	Present	7 (21.21)	0 (0)	0.005	Significant
Discharge per rectum (DPR)	Absent	26 (78.79)	33 (100)		
Table 4. Comparison of Immediate Postoperative Complications					

Table 4 compares the immediate postoperative complications in the two groups. Urinary retention was observed in four patients (12.12%) in the MM group and one patient (3.03%) in the HH group; this difference was not statistically significant ($p = 0.163$). Postoperative bleeding per rectum occurred in six patients (18.18%) and discharge per rectum in seven patients (21.21%) in the MM group, while neither complication was recorded in the HH group. The reported differences were statistically significant for bleeding ($p = 0.010$) and discharge ($p = 0.005$).

Parameter	MM group (n=33)	HH group (n=33)	P value	Significance
Hospital stay (days), mean ± SD	3.73 ± 0.91	3.00 ± 0	<0.001	Significant
Table 5. Comparison of Duration of Postoperative Hospital Stay				

Table 5 demonstrates the comparison of postoperative hospital stay between the two groups. The mean duration of hospital stay was 3.73 ± 0.91 days in the MM group, compared with 3.00 ± 0 days in the HH group. The duration of hospital stay was significantly shorter in the HH group ($p < 0.001$).

Follow-Up Assessment	Finding	MM Group (n=33), n (%)	HH Group (n=33), n (%)	P value	Significance
Postoperative day 7	Discharge per rectum	7 (21.21)	0 (0)	0.005	Significant
Postoperative day 7	No discharge/complication recorded	26 (78.79)	33 (100)		

Weekly follow-up up to 1 month	Discharge per rectum	1 (3.03)	0 (0)	0.314	Not significant
Weekly follow-up up to 1 month	No discharge recorded	32 (96.97)	33 (100)		

Table 6. Comparison of Follow-Up Findings at Postoperative Day 7 and at 1 Month

Table 6 illustrates the follow-up findings at postoperative day 7 and during weekly assessment up to one month. On day 7, discharge per rectum was recorded in seven patients (21.21%) in the MM group, whereas no such finding was reported in the HH group; the difference was statistically significant (p = 0.005). At the one-month follow-up, discharge per rectum was noted in one patient (3.03%) in the MM group and none in the HH group. This difference was not statistically significant (p = 0.314).

Follow-Up Finding	MM Group (n=33), n (%)	HH Group (n=33), n (%)	Total (n=66), n (%)	P value	Significance
No anal stenosis recorded	32 (96.97)	33 (100)	65 (98.48)	0.314	Not significant
Anal stenosis	1 (3.03)	0 (0)	1 (1.52)		
Total	33 (100)	33 (100)	66 (100)		

Table 7. Comparison of Outcomes at the 3-Month Follow-Up

Table 7 demonstrates the findings at the third-month follow-up. Anal stenosis was observed in one patient (3.03%) in the MM group, while no cases were reported in the HH group. No anal stenosis was recorded in 32 patients (96.97%) in the MM group and all 33 patients (100%) in the HH group. The difference was not statistically significant (p = 0.314).

DISCUSSION

Hemorrhoidectomy is an established and widely accepted surgical procedure for the treatment of large, symptomatic hemorrhoids. Conventional hemorrhoidectomy techniques, particularly the Milligan–Morgan procedure, have stood the test of time and remain effective treatment options. However, postoperative pain continues to be one of the major drawbacks of conventional excisional hemorrhoidectomy. The severity of postoperative pain, associated morbidity and prolonged recovery often make patients reluctant to undergo definitive surgical treatment, sometimes leading them to postpone surgery for several years.

Recent advances in surgical instruments, including stapling devices,[15] ultrasonic scalpel[14] and bipolar electrothermal devices, have renewed interest in developing surgical techniques that provide effective treatment with reduced postoperative pain and morbidity. Several randomized controlled trials have compared harmonic scalpel hemorrhoidectomy with conventional open and closed hemorrhoidectomy techniques. The results, however, have been mixed. In terms of operative time, intraoperative blood loss, postoperative pain, length of hospital stays, and return to normal activities, some research has shown substantial benefits using Harmonic Scalpel haemorrhoidectomy; however, other studies have found no significant improvements. The current prospective, randomised trial was conducted to evaluate the perioperative and postoperative results of harmonic scalpel haemorrhoidectomy with traditional scissors excision and ligation haemorrhoidectomy (Milligan–Morgan procedure) in light of these findings.[13,14]

Demographic Characteristics and Grade of Hemorrhoids

In the present study, the distribution of patients according to the grade of hemorrhoids was comparable between the two groups. Grade III hemorrhoids were observed in 69.7% of patients in the harmonic group and 75.76% in the conventional group, whereas Grade IV hemorrhoids were observed in 30.3% and 24.24% of patients, respectively. The difference was statistically insignificant (p = 0.580), indicating that both groups were comparable with respect to the severity of hemorhoidal disease.

Patients in the Harmonic group were 57.15 (15.51) years old on average, whereas those in the conventional group were 52.48 (14.62) years old. Despite the harmonic group's slightly greater mean age, the difference was not statistically significant (p = 0.213), indicating that the age distribution of the two groups was similar.

Regarding gender distribution, males constituted 54.55% and females 45.45% of the harmonic group, whereas males constituted 51.52% and females 48.48% of the conventional group. The difference in gender distribution was statistically insignificant ($p = 0.805$), demonstrating that both groups were comparable with respect to gender.

Duration of Surgery

In the current study, the harmonic group's mean (SD) surgical time was 18.67 (2.99) minutes, while the conventional group's was 24.73 (2.96) minutes. Comparing harmonic scalpel haemorrhoidectomy to traditional scissors excision and ligation haemorrhoidectomy, the difference was statistically highly significant ($p < 0.001$), indicating a considerable reduction in operating time.

Our findings are consistent with those of Peker K et al. (2013), who reported a mean operative time of 12.6 ± 2.5 minutes in the harmonic scalpel hemorrhoidectomy group compared to 22.3 ± 4.5 minutes in the conventional hemorrhoidectomy group.[16]

Similarly, Di Vita G et al. (2003) reported a mean duration of surgery of 16 ± 8 minutes for conventional Milligan–Morgan hemorrhoidectomy and 13 ± 5 minutes for Harmonic Scalpel hemorrhoidectomy.[17] These findings support the advantage of the harmonic scalpel in reducing operative time, which may be attributed to its simultaneous cutting and coagulation properties, thereby reducing the need for repeated instrument exchanges and separate ligation procedures.

Intraoperative Blood Loss

In the present study, the mean (SD) intraoperative blood loss was 10.06 (1.92) ml in the Harmonic group, whereas it was 20.82 (4.5) ml in the conventional group. The difference was statistically highly significant ($p < 0.001$), indicating significantly lower intraoperative blood loss with Harmonic Scalpel hemorrhoidectomy.

This reduction in blood loss may be attributed to the ultrasonic energy produced by the harmonic scalpel, which facilitates simultaneous tissue dissection and coagulation of blood vessels. Consequently, it provides better hemostasis during tissue excision and reduces intraoperative bleeding compared to conventional scissors excision and ligation.

Postoperative Pain

Postoperative pain is one of the most important factors influencing patient satisfaction and recovery following hemorrhoidectomy. The VAS was used in this study to measure postoperative pain. According to the WHO (World Health Organization) analgesic approach, the goal was to keep the VAS score below 3 while providing sufficient analgesia. On postoperative days 0 (6 hours after surgery), 1, 2, and 7, pain levels were measured.

The mean (SD) postoperative VAS scores on day 0, day 1, day 2 and day 7 in the Harmonic group were 4.06 (0.24), 3.03 (0.17), 2 and 1.03 (0.17), respectively. In comparison, the corresponding scores in the conventional group were 6.76 (0.5), 5.24 (0.71), 3.3 (0.73) and 1.36 (0.49), respectively. At the evaluated postoperative intervals, the Harmonic group had significantly decreased postoperative pain levels ($p < 0.001$). This finding demonstrates that harmonic scalpel hemorrhoidectomy provides better postoperative pain control compared to the conventional Milligan–Morgan technique.

As demonstrated by decreased pain scores on postoperative days 0 and 1, as well as a decrease in the need for analgesics, our results are in line with those of Peker K et al. (2013), who reported significantly less postoperative pain following harmonic scalpel haemorrhoidectomy.[16]

Similarly, Ivanov D et al. (2007) reported that the postoperative VAS pain score in patients undergoing harmonic scalpel hemorrhoidectomy ranged from 3 to 8, with an average of 5.11 on the first postoperative day; from 2 to 5, with an average of 3.03 on the second day; and from 0 to 3, with an average of 1.03 on the seventh day. In patients undergoing conventional Milligan–Morgan hemorrhoidectomy, the corresponding pain scores ranged from 5 to 9, with an average of 7.12 on the first day; from 3 to 7, with an average of 4.52 on the second day; and from 2 to 4, with an average of 2.88 on the seventh day. The authors reported statistically significantly lower postoperative pain scores in the harmonic scalpel group.[17]

These findings are in agreement with the present study and suggest that the Harmonic Scalpel may reduce postoperative pain, possibly due to reduced tissue trauma, improved hemostasis and limited thermal spread during tissue dissection.

Duration of Hospital Stay

In the current study, the harmonic group's mean hospital stay was 3 days, while the conventional groups were 3.73 ± 0.91 days. Patients receiving harmonic scalpel haemorrhoidectomy had a considerably shorter hospital stay, according to the statistically significant difference ($p < 0.001$).

The shorter duration of hospitalization in the harmonic group may be related to reduced postoperative pain, better intraoperative hemostasis and fewer postoperative complications, which may facilitate earlier recovery and discharge.

Postoperative Complications

In the present study, postoperative complications were compared between the two groups. Postoperative bleeding per rectum was observed in 6 patients in the conventional group, while discharge per rectum was reported in 7 patients in the same group. Urinary retention was observed in 4 patients in the conventional group and 1 patient in the harmonic group. The occurrence of postoperative bleeding and discharge was higher in the conventional group, indicating a comparatively less favourable postoperative outcome with the conventional technique.

Overall, the findings of the present study suggest a lower incidence of postoperative complications following harmonic scalpel hemorrhoidectomy, although the difference between the two groups was not statistically significant.

Similar findings were reported by Ivanov D et al. (2007), who observed urinary retention in 3 patients undergoing harmonic scalpel hemorrhoidectomy compared to 9 patients undergoing conventional hemorrhoidectomy. One patient in the harmonic group and seven patients in the conventional group experienced postoperative haemorrhage. Although the difference was not statistically significant, the scientists found that the harmonic scalpel group experienced less postoperative problems.[17]

These findings are in agreement with the present study and suggest that harmonic scalpel hemorrhoidectomy may be associated with a lower incidence of postoperative morbidity compared to conventional Milligan–Morgan hemorrhoidectomy.

Limitations

The present study had certain limitations. Firstly, it was not a double-blind study, which may have introduced the possibility of investigator-related detection bias. Secondly, the study did not include long-term follow-up, limiting the assessment of late postoperative complications and long-term outcome.

CONCLUSION

In comparison to traditional scissors excision and ligation (Milligan–Morgan) haemorrhoidectomy, harmonic scalpel haemorrhoidectomy was found to be associated with significantly less postoperative pain, shorter operative time, reduced intraoperative blood loss, shorter hospital stays, and fewer postoperative complications. Furthermore, no major postoperative complications were observed during the three-month follow-up period. Thus, harmonic scalpel hemorrhoidectomy appears to be a safe and effective technique with several short-term benefits and can be considered a promising alternative to the conventional Milligan–Morgan hemorrhoidectomy, which has long been regarded as the gold standard for the surgical management of hemorrhoids.

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