



A Comparative Analysis of Surgical Approaches for Grade III/IV Hemorrhoids: Non-Doppler Hemorrhoidal Artery Ligation (HAL) combined with Milligan-Morgan Hemorrhoidectomy (MMH) versus MMH Alone

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ABSTRACT

This prospective comparative study was conducted with 106 cases at a single referral center to compare the outcomes of two surgical approaches for the treatment of grade III/IV hemorrhoids: Non-Doppler hemorrhoidal artery ligation (HAL) combined with Milligan-Morgan hemorrhoidectomy (MMH) versus MMH alone. The combination of HAL+MMH demonstrated several advantages over MMH alone. Intraoperative bleeding (5.64 vs 7.35 mL), postoperative bleeding (1.89% vs 13.2%), perianal edema (5.66% vs 18.87%), and recovery time (15.3 vs 19.5 days) was significantly reduced in the HAL+MMH group. Patients in the HAL+MMH group reported significantly lower pain at various time points postoperatively ($p < 0.05$). These findings contribute to the growing body of evidence supporting the use of HAL+MMH as an effective surgical strategy for managing grade III/IV hemorrhoids.

Keywords: Grade III/IV hemorrhoids, non-doppler hemorrhoidal artery ligation, Milligan Morgan Hemorrhoidectomy, postoperative outcome.

Abbreviations: HAL, Hemorrhoidal artery ligation; MMH, Milligan Morgan Hemorrhoidectomy; VAS, Visual Analogue Scale;

I. INTRODUCTION

Hemorrhoids, characterized by the swelling and inflammation of blood vessels in the anal canal and rectum, are a prevalent medical condition affecting a significant portion of the population.^{1,2} Grade III and IV hemorrhoids

represent advanced stages with symptoms such as prolapse, bleeding, and manual reduction, often necessitating surgical intervention for effective management.³ In this prospective comparative study conducted at a single referral center, we aimed to evaluate and compare the outcomes of two surgical approaches commonly employed for the treatment of grade III/IV hemorrhoids: Milligan-Morgan hemorrhoidectomy (MMH) alone versus MMH combined with non-Doppler hemorrhoidal artery ligation (HAL).

MMH, considered as the gold standard surgical technique for advanced hemorrhoids, involves the excision of hemorrhoidal tissue.⁴ This procedure has demonstrated long-term effectiveness in providing symptom relief and achieving low recurrence rates.⁵ However, postoperative pain, prolonged recovery time, and complications such as anal stenosis are recognized concerns associated with MMH.⁴

In contrast, HAL is a minimally invasive procedure that aims to reduce blood flow to the hemorrhoidal cushions by ligating the hemorrhoidal arteries.⁶ It has shown promise in reducing postoperative pain, facilitating early recovery, and resulting in shorter hospital stays.⁷ However, HAL may not effectively address the issue of prolapsed hemorrhoidal tissue, which remains a significant challenge in grade III/IV hemorrhoids.⁶

The integration of MMH with HAL presents an opportunity to combine the advantages of both techniques. By employing this combined approach, surgeons can potentially address both the



prolapsed tissue and the blood supply to the hemorrhoids, leading to improved surgical outcomes.⁸ The synergistic effect of MMH combined with HAL may result in reduced postoperative pain, enhanced early recovery, minimized complications, and improved patient satisfaction.^{9,10}

The findings from this study will contribute to the growing body of knowledge regarding the comparative effectiveness of these surgical approaches. Ultimately, our research endeavor aims to improve patient care, optimize treatment outcomes, and enhance patient satisfaction in the surgical management of grade III/IV hemorrhoids.

II. METHOD:

Study Design:

This study is a prospective comparative analysis of 106 cases who underwent either MMH or MMH+HAL at a tertiary care hospital (CMH Chattogram) between January 2021 and June 2023. The patients were divided into two groups: MMH (n=53) and MMH+HAL (n=53).

Inclusion Criteria:

1. Diagnosis of grade III or IV hemorrhoids based on clinical evaluation and confirmed by proctoscopy.
2. Aged >18 years.
3. Nonpregnant patients.
4. Patients of American Society of Anesthesiologists (ASA) class 1 and 2.
5. Patients with informed written consent.

Exclusion Criteria

1. Previous history of hemorrhoidal surgery.
2. Bleeding disorders or coagulopathy.

Procedure:

Patient selection was done by the operating surgeon through a lottery method to prevent selection bias. Patients were explained about the risks and benefits of both the procedures and written informed consents were obtained. Surgeries were performed by four different surgeons with similar skills in colorectal surgery. All patients received an intravenous dose of third-generation cephalosporin and metronidazole at the time of induction of spinal anesthesia. Proper

exposure was obtained in the lithotomy position. MMH was performed by the standard traditional open technique. In the case of HAL+MMH, the hemorrhoidal arterial pulsation was felt about 2–3 cm above the dentate line near the pedicle of the hemorrhoids. Then ligation of the artery was done by 2-0 vicryl. The depth of the needle was up to the submucosa. The rest of the procedure was the same as usual MMH.

Data Collection:

Data were collected prospectively and included patient demographics, preoperative proctoscopy findings, operative details, peri and post-operative bleeding, and postoperative pain as per visual analog scale (VAS) on Day 1, Day 3, and Day 7. Incidences of acute urinary retention, perianal edema, anal stenosis, incontinence, recovery time, and recurrence rate were also recorded. The patients were followed up at the end of 1st and 4th week after the surgery.

Statistical Analysis:

Statistical analysis was performed using SPSS software version 29.0. Descriptive statistics were used to summarize the data, and the chi-square test or Fisher's exact test was used to compare categorical variables. The independent samples t-test was used to compare continuous variables. A p-value of <0.05 was considered statistically significant.

Ethical Considerations:

The study was conducted in accordance with the principles of the Declaration of Helsinki and approved by the Institutional Review Board. All patients provided written informed consent, and all patient data were kept confidential and anonymous.

III. RESULT

A total of 106 patients diagnosed with grade III/IV hemorrhoids were enrolled in the study. There were 53 patients in each group. The mean age of the participants was 42 years in the MMH group and 39 years in the HA group, with a comparable distribution of gender between the two groups (Table 1). The degree of hemorrhoids is also comparable among both groups.

Table 1 Demographic and preoperative clinical data

Parameters	MMH (n=53)	HAL+MMH (n=53)	P value
Gender			
Male	36 (67.9%)	31 (58.5%)	0.42
Female	17 (32.1%)	22 (41.5%)	
Age (mean±SD)	42.32±7.92	39.71±9.78	0.134
Grade of hemorrhoids (III/IV)	41/12	37/16	



Table 2 shows various peri and post-operative data comparisons between each group. Primary hemorrhage during the operations was significantly lower in the HAL+MMH group ($p=0.018$). Post-operative pain was assessed by

recording as per VAS pain score. It was measured at day 1, day 3, and day 7 respectively. MMH group encountered significantly more pain at any stage of the postoperative period. P value was less than 0.05 in any stage of the follow-up period.

Table 2 Operative and postoperative clinical data

Parameters	MMH (n=53)	HAL+MMH (n=53)	P value
Peri-operative bleeding in mL	7.35±3.4	5.64±3.9	0.018
Post-operative VAS pain score at 24 hours (mean±SD)	5.8±0.88	5.4±0.78	0.015
Post-operative VAS pain score at 48hours (mean±SD)	4.5±0.65	4.1±0.46	<0.001
Post-operative VAS pain score at 7days(mean±SD)	3.5±0.78	2.9±0.28	<0.001
Post-operative bleeding	7 (13.2%)	1 (1.89%)	0.028
Acute retention of urine	5 (9.4%)	2 (3.8%)	0.247
Perianal edema	10 (18.87%)	3 (5.66%)	0.039
Recovery time in days	19.5±4.72	15.3±3.45	<0.001
Recurrence	0	0	-
Anal stenosis	0	0	-
Anal incontinence	0	0	-

Post-operative bleeding was significantly higher (13.2%) in the MMH group than in the HAL+MMH group (1.89%) (Table 2). There were no significant differences between the two groups in terms of developing acute retention of urine ($p = 0.247$). There were 10 cases (18.87%) of perianal edema in the MMH group compared with only 3 (5.66%) in the HAL+MMH group ($p=0.039$). Recovery time following operation was significantly shorter in the HAL+MMH group (15.3±3.45 days) than in the MMH group (19.5±4.72 days). There was no reported case of recurrence, anal stenosis, and incontinence 1 year following the surgery.

IV. DISCUSSION

The management of grade III/IV hemorrhoids remains a challenge due to the complex nature of the disease. Surgical interventions, such as Milligan-Morgan hemorrhoidectomy (MMH), closed

hemorrhoidectomy, stapled hemorrhoidopexy, and hemorrhoidal artery ligation (HAL), have been widely employed to achieve symptomatic relief and improve patients' quality of life.^{11,12,13} In this prospective comparative study conducted at a single referral center, we aimed to evaluate and compare the outcomes of MMH alone versus MMH combined with HAL in the treatment of grade III/IV hemorrhoids.

Our findings provide valuable insights into the effectiveness of these surgical approaches for grade III/IV hemorrhoids. MMH alone, which has long been considered the gold standard technique, demonstrated favorable outcomes in terms of long-term symptom relief and low recurrence rates. These results align with previous studies that have consistently supported the efficacy of MMH in managing advanced hemorrhoids.^{4,5}

However, it is crucial to acknowledge the potential drawbacks associated with MMH.



Postoperative pain and discomfort, prolonged recovery time, and complications such as anal stenosis have been recognized as significant concerns.^{3,9}Haksal et al. reported 12.9% cases of bleeding symptoms within 7 days of the operation among 206 patients who underwent MMH.

In contrast, HAL represents a minimally invasive procedure that aims to reduce blood flow to the hemorrhoidal cushions by ligating the hemorrhoidal arteries. HAL has shown promise in reducing postoperative pain, facilitating early recovery, and fewer cases of postoperative bleeding, but the recurrence rate is high.^{15,16}This is supported by previous studies that have demonstrated the analgesic benefits of HAL. However, HAL may not effectively address the issue of prolapsed hemorrhoidal tissue, which remains a significant challenge in the management of grade III/IV hemorrhoids.

In the Hemorrhoidal Artery Ligation (HAL) procedure, the hemorrhoid artery can be identified and ligated using a Doppler probe or by palpation and ligation with fingers without the use of ultrasound guidance. Schuurman et al. conducted a blinded randomized clinical trial comparing HAL with and without a Doppler transducer in patients with grade II and III hemorrhoids.¹⁷Their findings demonstrated that HAL significantly reduced signs and symptoms of hemorrhoid disease, with no additional benefit observed from the Doppler transducer. Similarly, Naqvi et al. reported that HAL without Doppler guidance effectively treated hemorrhoids, showing favorable outcomes in terms of postoperative pain, bleeding, and patient satisfaction.¹⁸ These studies suggest that Doppler guidance may not significantly impact symptom improvement, pain, bleeding, prolapse, or other complications when compared to HAL under direct vision.

Notably, HAL without Doppler guidance offers advantages such as lower equipment requirements and relative simplicity of the procedure. During the operation, attention should be given to preventing rectal stenosis by carefully selecting the HAL points, avoiding alignment in the same plane, and limiting the number of ligation points (typically 3, 7, or 11 points). Overall, these findings indicate that HAL without Doppler guidance can be an effective and practical approach for the treatment of hemorrhoids.

The integration of MMH with HAL presents an opportunity to combine the advantages of both techniques. By employing this combined approach, surgeons can potentially address both the prolapsed tissue and the blood supply to the hemorrhoids, leading to improved surgical

outcomes. The synergistic effect of MMH combined with HAL may result in reduced postoperative pain, enhanced early recovery, minimized complications, and improved patient satisfaction.

Our study findings reveal that the intraoperative bleeding was significantly reduced in the MMH+HAL group (5.64 ± 3.9 mL), indicating that the ligation of hemorrhoidal arteries by HAL effectively blocked the blood supply to the hemorrhoids, thereby reducing bleeding during the surgery. The result is similar to Qing et al who observed a mean blood loss of 7.43 ± 2.65 mL for the HAL+MMH group compared with the 8.69 ± 3.33 mL in the MMH group.¹⁹ Furthermore, Qing et al also showed that the HAL+MMH group exhibited significantly lower VAS scores for pain at the first defecation and at various time points postoperatively (12 hours, 1 day, 2 days, 3 days, and 7 days) compared to the MMH group. Additionally, the total analgesic consumption within 7 days was significantly lower in the HAL+MMH group, indicating that the combination of procedures effectively alleviated postoperative pain and reduced the need for painkillers.¹⁹

Qing et al also demonstrated that the combined procedure can effectively reduce the occurrence of postoperative bleeding (1.87% Vs 12.9%) and perianal incision edema (7.55% Vs 22.58%), facilitate smooth urine excretion (3.77% Vs 16.13%) and have minimal impact on anal function. Li et al. also reported similar findings, indicating that MMH combined with HAL significantly reduced intraoperative bleeding, postoperative bleeding, and anal edema compared to traditional MMH.²⁰ Furthermore, at the 12-month follow-up, the HA+MMH group exhibited a lower recurrence rate and higher patient satisfaction compared to the MMH group.¹⁹ Although, in our study, there was no significant difference in recurrence rate between the two procedures. These results suggest that the combined procedure, by blocking the blood supply to the hemorrhoids and inducing local chronic inflammatory reaction and tissue fibrosis, reduces the risk of postoperative recurrence and improves patient satisfaction.

The reduction in postoperative pain observed in our study may be attributed to the lifting of the rectal mucosa above the internal hemorrhoids during HAL, which reduces the degree of prolapse and subsequently minimizes the extent of the surgical incision required for MMH. This combined approach presents a valuable strategy for effectively managing grade III/IV



hemorrhoids while minimizing postoperative pain and promoting favorable long-term outcomes.

V. LIMITATIONS:

This study has several limitations. Firstly, being a single referral center study, the generalizability of the findings to other settings may be limited. Secondly, the small sample size may affect the statistical power and precision of the results. Additionally, the relatively short follow-up period may not capture long-term outcomes. The potential for selection bias and the exclusion of other surgical approaches limit the study's scope. Patient-reported outcomes and quality-of-life measures were not assessed. Future studies with larger sample sizes, longer follow-ups, multi-center designs, and comprehensive assessments are needed to address these limitations and validate the findings.

VI. CONCLUSION:

In conclusion, our prospective comparative study evaluating Milligan-Morgan hemorrhoidectomy (MMH) alone versus MMH combined with non-Doppler hemorrhoidal artery ligation (HAL) provides important insights into the surgical management of grade III/IV hemorrhoids. Our findings suggest that while MMH alone remains an effective technique with proven long-term efficacy, the integration of MMH with HAL presents a promising approach to optimize outcomes in the surgical management of grade III/IV hemorrhoids. By combining the advantages of both techniques, surgeons can potentially achieve reduced postoperative pain, enhanced early recovery, minimized complications, and improved patient satisfaction. The synergistic effect of MMH combined with HAL addresses the shortcomings of each procedure individually, providing a comprehensive approach to the management of this challenging condition.

REFERENCES:

- [1]. Johanson JF, Sonnenberg A. The prevalence of hemorrhoids and chronic constipation. An epidemiologic study. *Gastroenterology*. 1990 Jun;98(6):380-6.
- [2]. Riss S, Weiser FA, Schwameis K, Riss T, Mittlböck M, Steiner G, Stift A. The prevalence of hemorrhoids in adults. *Int J Colorectal Dis*. 2012 Apr;27(4):215-20.
- [3]. Lohsiriwat V. Hemorrhoids: from basic pathophysiology to clinical management. *World J Gastroenterol*. 2012 May 28;18(20):2009-17.
- [4]. Milligan ETC, Morgan CN, Jones LE, Officer R. Surgical anatomy of the anal canal and operative treatment of haemorrhoids. *Lancet*. 1937;229(5924):1119-1124.
- [5]. MacRae HM, McLeod RS. Comparison of hemorrhoidal treatments: a meta-analysis. *Can J Surg*. 1997 Oct;40(5):14-7.
- [6]. Giamundo P, Cecchetti W, Esercizio L, Fantino G, Geraci M, Lombezzi R, Mascagni D, Minetti M, Murru L, Pistilli R, Pontone P, Saitta G, Tonizzo CA. Doppler-guided transanal hemorrhoidal dearterialization for hemorrhoids: results in a series of 400 consecutive patients. *Updates Surg*. 2011 Jun;63(2):89-95.
- [7]. Bursics A, Morvay K, Kupcsulik P, Flautner L. Comparison of early and 1-year follow-up results of conventional hemorrhoidectomy and hemorrhoid artery ligation: a randomized study. *Int J Colorectal Dis*. 2004 Nov;19(6):176-80.
- [8]. Rowsell M, Bello M, Hemingway DM. Circumferential mucosectomy (stapled haemorrhoidectomy) versus conventional haemorrhoidectomy: randomised controlled trial. *Lancet*. 2000 Jun 17;355(9226):779-81.
- [9]. Jayaraman S, Colquhoun PH, Malthaner RA. Stapled hemorrhoidopexy is associated with a higher long-term recurrence rate of internal hemorrhoids compared with conventional excisional hemorrhoid surgery. *Dis Colon Rectum*. 2007 Feb;50(2):129-36.
- [10]. Giamundo P, Cecchetti W, Esercizio L, Fantino G, Geraci M, Lombezzi R, Mascagni D, Minetti M, Murru L, Pistilli R, Pontone P, Saitta G, Tonizzo CA. Doppler-guided transanal hemorrhoidal dearterialization for hemorrhoids: results in a series of 400 consecutive patients. *Updates Surg*. 2011 Jun;63(2):89-95.
- [11]. Van Tol RR, Kleijnen J, Watson AJM, Jongen J, Altomare DF, Qvist N, Higuero T, Muris JWM, Breukink SO. European Society of Coloproctology: guideline for haemorrhoidal disease. *Colorectal Dis* 2020;22(6):650-662.
- [12]. Davis BR, Lee-Kong SA, Migaly J, Feingold DL, Steele SR. The American Society of Colon and Rectal Surgeons Clinical Practice Guidelines for the Management of Hemorrhoids. *Dis Colon Rectum*. 2018;61(3):284-292.



- [13]. Gallo G, Martellucci J, Sturiale A, Clerico G, Milito G, Marino F, Cocorullo G, Giordano P, Mistrangelo M, Trompetto M. Consensus statement of the Italian society of colorectal surgery (SICCR): management and treatment of hemorrhoidal disease. *Tech Coloproctol* 2020;24(2):145-164.
- [14]. Haksal MC, Çiftci A, Tiryaki Ç, Yazıcıoğlu MB, Özyıldız M, Yıldız SY. Comparison of the reliability and efficacy of LigaSure hemorrhoidectomy and a conventional Milligan-Morgan hemorrhoidectomy in the surgical treatment of grade III and IV hemorrhoids. *Turkish Journal of Surgery* 2017;33(4):233-236.
- [15]. De Nardi P, Capretti G, Corsaro A, Staudacher C. A prospective, randomized trial comparing the short- and long-term results of doppler-guided transanal hemorrhoid dearterialization with mucopexy versus excision hemorrhoidectomy for grade III hemorrhoids. *Dis Colon Rectum*. 2014;57(3):348-353.
- [16]. Ferrandis C, De Faucal D, Fabreguette JM, Borie F. Efficacy of Doppler-guided hemorrhoidal artery ligation with mucopexy, in the short and long terms for patients with hemorrhoidal disease. *Tech Coloproctol* 2020;24(2):165-171.
- [17]. Schuurman JP, BorelRinkes IH, Go PM. Hemorrhoidal artery ligation procedure with or without Doppler transducer in grade and hemorrhoidal disease: a blinded randomized clinical trial. *Ann Surg*. 2012;255(5):840-845.
- [18]. Qamar Naqvi SR, Qamar Naqvi SS, Rashid MM, Sheikh IA, Ali M, Nafees AUA. Haemorrhoidal Artery Ligation Operation Without Doppler Guidance. *J Ayub Med Coll Abbottabad*. 2018;30(Suppl 1):S664-S667.
- [19]. Long Qing, Wen Yong, Li Jun. Milligan-Morgan hemorrhoidectomy combined with non-Doppler hemorrhoidal artery ligation for the treatment of grade III/IV hemorrhoids: A single centre retrospective study.2023. doi: 10.21203/rs.3.rs-3035146/v1.
- [20]. Li B, Li X, Zhang Q, Zhao WB. Milligan-Morgan procedure combined with hemorrhoidal artery ligation in the treatment of - degree mixed hemorrhoids. *China Medicine and Pharmacy* 2022;12(8):133- 136.