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Original Article

Comparison of Postoperative Bleeding Incidence in Laser Haemorrhoidoplasty with and without Hemorrhoidal Artery Ligation: A Prospective Observational Study

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ABSTRACT

Background: Laser Haemorrhoidoplasty (LHP) is a minimally invasive technique for treating symptomatic haemorrhoids. Hemorrhoidal Artery Ligation (HAL) targets vascular supply to reduce bleeding. This study compared postoperative bleeding incidence in patients undergoing LHP alone versus LHP combined with HAL.

Materials and Methods: This prospective observational study was conducted at SMS Medical College, Jaipur from 2024-2025. One hundred ten patients with Grade II-III haemorrhoids were randomized into two groups: Group A (LHP alone, n=55) and Group B (LHP+HAL, n=55). LHP was performed using 1470 nm diode laser with radial fiber delivery. In Group B, additional digital-guided HAL was performed using absorbable sutures. Postoperative bleeding was assessed using Verbal Rating Score (VRS) on Days 1, 3, 7, and 14. Secondary outcomes included pain (VAS), perianal swelling, hospital stay, and patient satisfaction.

Results: Both groups showed low postoperative bleeding rates with no significant difference. On Day 1, 94.5% (LHP) and 90.9% (LHP+HAL) had no bleeding (p=0.463). By Day 14, bleeding had nearly resolved in both groups (p=0.558). Mean pain scores were comparable (Day 1: 1.67±0.77 vs 1.96±0.88, p=0.068). Hospital stay averaged 1.04 days in both groups. Complete recovery at 6 weeks was 96.4% (LHP) and 100% (LHP+HAL). Patient satisfaction was high (4.53 vs 4.58 out of 5, p=0.690).

Conclusion: Both LHP alone and LHP with HAL are effective and well-tolerated for Grade II-III haemorrhoids. Adding HAL did not significantly reduce postoperative bleeding, suggesting LHP alone may be sufficient for most patients.

Keywords*: Laser Haemorrhoidoplasty; Hemorrhoidal Artery Ligation; Postoperative bleeding; Haemorrhoids; Minimally invasive surgery.*

INTRODUCTION

Haemorrhoidal disease, commonly referred to as piles, is among the most frequently encountered anorectal disorders in surgical practice worldwide. It refers to the symptomatic enlargement and distal displacement of the anal cushions, which are normal anatomical structures involved in maintaining continence.[1,2] Globally, the prevalence of hemorrhoidal disease ranges from 2.9% to over 50% depending on study design and population.[3] In India, the burden is rising steadily, particularly in urban populations where low-fiber diets and sedentary habits are common.[4,5]

Traditional surgical options include Milligan-Morgan (open) and Ferguson (closed) haemorrhoidectomy, considered gold standards for Grades III and IV haemorrhoids.[6] However, these are associated with significant postoperative pain (VAS scores 7-8/10), prolonged recovery, and complications such as bleeding, stricture, and incontinence.[7] This has driven interest in less morbid alternatives.

Laser Haemorrhoidoplasty (LHP) using diode lasers (typically 1470 nm) delivers controlled thermal energy to coagulate and shrink haemorrhoidal tissue while preserving the anoderm.[8] It offers advantages including minimal postoperative pain, shorter recovery, and day-case feasibility.[9,10] Hemorrhoidal Artery Ligation (HAL) involves identifying and ligating terminal branches of the superior rectal artery, theoretically reducing vascular supply and bleeding risk.[11]

The rationale for combining LHP and HAL lies in complementary mechanisms—laser energy for tissue ablation and artery ligation for vascular control. This hybrid approach could theoretically reduce postoperative bleeding, a key concern following haemorrhoid surgery. However, evidence comparing these approaches remains limited. This study aimed to compare postoperative bleeding incidence in patients undergoing LHP alone versus LHP combined with HAL for Grade II-III haemorrhoids.

MATERIALS AND METHODS

Study Design and Setting

This prospective, hospital-based, observational comparative study was conducted at the Department of General Surgery, SMS Medical College and Attached Hospitals, Jaipur, Rajasthan, a tertiary care referral centre. The study was approved by the Institutional Ethics Committee and written informed consent was obtained from all participants.

Study Population and Sample Size

One hundred ten patients with Grade II or III internal haemorrhoids (Goligher classification) were enrolled. Sample size was calculated based on 80% power, 95% confidence level, and expected 25% difference in bleeding incidence, yielding 55 patients per group. Patients were randomized using simple chit-based method into Group A (LHP alone, n=55) and Group B (LHP+HAL, n=55).

Inclusion Criteria

1. Age ≥18 years
2. Diagnosed with Grade II or III internal haemorrhoids
3. Willing to undergo laser haemorrhoidoplasty with or without artery ligation
4. Provided written informed consent for participation

Exclusion Criteria

1. Grade I or IV haemorrhoids
2. Inflammatory Bowel Disease involving rectum and anal canal
3. Acute thrombosed haemorrhoids
4. Chronic liver disease, portal hypertension, or known coagulopathies
5. History of prior surgical intervention for hemorrhoidal disease

Surgical Technique

Laser Haemorrhoidoplasty was performed using a 1470 nm diode laser with energy delivered intramucosally via radial fiber to coagulate the hemorrhoidal plexus. In Group B, additional digital-guided Hemorrhoidal Artery Ligation was performed using 2-0 absorbable sutures to ligate arterial branches supplying the haemorrhoids. All procedures were conducted by experienced colorectal surgeons under standardized anesthesia protocols.

Outcome Measures

The primary outcome was postoperative bleeding assessed using Verbal Rating Score (VRS: 0=no bleeding, 1=mild, 2=moderate, 3=severe) on Days 1, 3, 7, and 14. Secondary outcomes included pain (Visual Analog Scale 0-10), perianal swelling, hospital stay, readmission rate, recovery status at 6 weeks, and patient satisfaction score (1-5 scale).

Statistical Analysis

Data were analyzed using IBM SPSS version 26.0. Categorical variables were compared using Chi-square test; continuous variables using independent t-test or Mann-Whitney U test based on normality (Shapiro-Wilk test). $p<0.05$ was considered statistically significant.

RESULTS

One hundred ten patients completed the study with mean age of 46.65±13.07 years (LHP) and 47.40±13.93 years (LHP+HAL) (p=0.773). Males predominated in both groups (63.6% vs 67.3%, p=0.824). Baseline characteristics were comparable between groups (Table 1).

Table 1: Baseline Characteristics of Study Groups

Parameter	LHP (n=55)	LHP+HAL (n=55)	p-value
Age (years), Mean ± SD	46.65 ± 13.07	47.40 ± 13.93	0.773

Parameter	LHP (n=55)	LHP+HAL (n=55)	p-value
Sex (Male/Female)	35/20	37/18	0.824
Grade II, n (%)	27 (49.1%)	25 (45.5%)	0.534
Grade III, n (%)	28 (50.9%)	30 (54.5%)	0.534
Symptom duration (months)	30.31 ± 16.43	32.31 ± 15.80	0.408
BMI (kg/m²)	26.01 ± 2.32	26.07 ± 2.78	0.891

LHP: Laser Haemorrhoidoplasty; HAL: Hemorrhoidal Artery Ligation; BMI: Body Mass Index

Postoperative Bleeding

Postoperative bleeding was low in both groups throughout follow-up. On Day 1, 94.5% of LHP and 90.9% of LHP+HAL patients had no bleeding (VRS=0). By Day 14, bleeding had nearly resolved with only 2 LHP and 1 LHP+HAL patients having mild bleeding (Table 2). No moderate or severe bleeding occurred on Days 1 or 14.

Table 2: Postoperative Bleeding (VRS) at Different Time Points

VRS	Day 1 LHP	Day 1 LHP+HAL	Day 7 LHP	Day 7 LHP+HAL	p-value
0 (None)	52 (94.5%)	50 (90.9%)	40 (72.7%)	45 (81.8%)	-
1 (Mild)	3 (5.5%)	5 (9.1%)	14 (25.5%)	6 (10.9%)	-
2 (Moderate)	0 (0%)	0 (0%)	1 (1.8%)	4 (7.3%)	-
p-value (Day)	-	0.463	-	0.071	-

VRS: Verbal Rating Score; Day 1 and Day 7 comparisons shown; Day 14: p=0.558

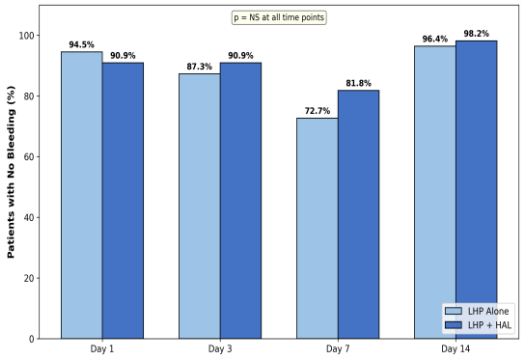

Figure 1: No Bleeding (VRS=0) Over Time

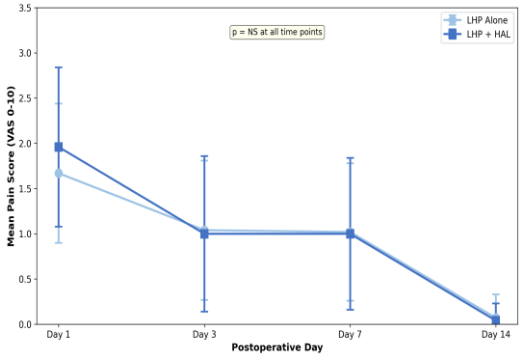

Figure 2: Pain Score (VAS) Over Time

Pain, Swelling, and Recovery Outcomes

Mean pain scores (VAS) were comparable between groups at all time points. On Day 1, VAS was 1.67±0.77 (LHP) versus 1.96±0.88 (LHP+HAL), p=0.068. By Day 14, both groups had minimal pain (0.07±0.26 vs 0.04±0.19, p=0.398). Perianal swelling was observed in 40.0% (LHP) and 38.2% (LHP+HAL) on Day 1 (p=0.845), resolving completely by Day 14 (Table 3).

Table 3: Pain (VAS) and Clinical Outcomes

Parameter	LHP (n=55)	LHP+HAL (n=55)	p-value
VAS Day 1	1.67 ± 0.77	1.96 ± 0.88	0.068
VAS Day 3	1.04 ± 0.77	1.00 ± 0.86	0.816
VAS Day 7	1.02 ± 0.76	1.00 ± 0.84	0.893
VAS Day 14	0.07 ± 0.26	0.04 ± 0.19	0.398
Perianal swelling Day 1	22 (40.0%)	21 (38.2%)	0.845
Hospital stay (days)	1.04 ± 0.19	1.05 ± 0.23	0.777
Readmission, n (%)	4 (7.3%)	3 (5.5%)	0.696
Complete recovery at 6 weeks	53 (96.4%)	55 (100%)	0.154
Satisfaction score (1-5)	4.53 ± 0.72	4.58 ± 0.60	0.690

VAS: Visual Analog Scale (0-10); Values are Mean ± SD or n (%)

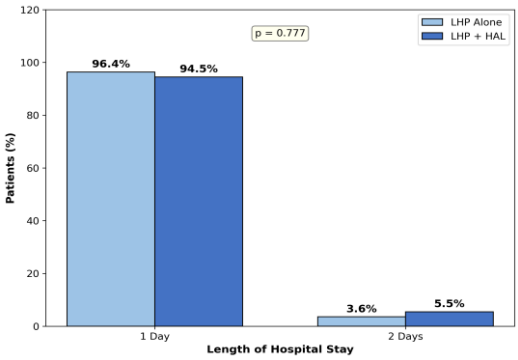

Figure 3: Hospital Stay Distribution

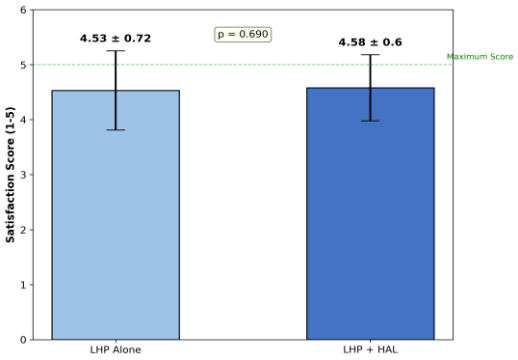

Figure 4: Patient Satisfaction Score

DISCUSSION

This prospective observational study demonstrates that both Laser Haemorrhoidoplasty alone and LHP combined with Hemorrhoidal Artery Ligation are effective and well-tolerated techniques for Grade II-III haemorrhoids. Importantly, adding HAL to LHP did not significantly reduce postoperative bleeding at any time point, suggesting that LHP alone provides adequate hemostasis for most patients.

Our findings are consistent with the double-blinded RCT by Lim et al. (2022)[12] who compared LHP alone versus LHP with HAL in 76 patients and found no significant difference in postoperative bleeding, perianal swelling, or pain. Similarly, De A. et al. (2021)[13] reported excellent outcomes with hybrid HAL-LHP in 75 patients, with 72% achieving complete symptom resolution and zero recurrence at 6 months follow-up.

The low postoperative bleeding rates observed in our study (94.5% and 90.9% with no bleeding on Day 1) compare favorably with published literature. Brusciano et al. (2020)[10] reported complication-free outcomes with 1470-nm diode laser in 50 patients, with minimal pain (VAS ~2) and no recurrence at 12 months. Longchamp et al. (2021)[14] in their systematic review of 1,570 patients found pooled success rates of 90.7% for laser haemorrhoidoplasty.

The comparable pain scores between groups (VAS 1.67 vs 1.96 on Day 1) suggest that adding HAL does not increase postoperative discomfort. This is important as patient experience is a key consideration in minimally invasive surgery. Maloku et al. (2014)[9] demonstrated that LHP produces significantly shorter operating times, less postoperative pain, and quicker return to daily activities compared to open haemorrhoidectomy.

Recent evidence supports the effectiveness of LHP across various settings. Chen et al. (2024)[15] compared LHP with feeding vessel suture ligation versus Milligan-Morgan haemorrhoidectomy in 323 patients, finding significantly lower postoperative pain and shorter recovery with LHP. Jin et al. (2024)[16] demonstrated superiority of LHP over rubber band ligation for Grade II haemorrhoids in terms of pain, bleeding, and recurrence rates.

The high patient satisfaction scores in both groups (4.53 and 4.58 out of 5) reflect the acceptability of laser-based treatments. Islam et al. (2024)[17] reported 97.7% patient satisfaction with LHP in 86 patients with Grade II-IV haemorrhoids. Similarly, Tümer and Ağca (2023)[18] found LHP resulted in significantly shorter hospital stay and quicker recovery compared to LigaSure haemorrhoidectomy.

The near-complete recovery at 6 weeks (96.4% LHP, 100% LHP+HAL) aligns with reports by Gupta et al. (2021)[19] who found 94% symptom resolution with finger-guided HAL followed by LHP in 346 patients. The slightly higher complete recovery in the LHP+HAL group, though not statistically significant, may warrant further investigation in larger studies.
This study has several limitations. As a single-center study, results may not be generalizable. The 6-week follow-up may not capture long-term recurrence. Subjective assessment tools (VRS, VAS) introduce inherent variability. The lack of blinding may introduce observation bias. Additionally, cost-effectiveness was not analyzed, which is relevant in resource-limited settings.

CONCLUSION

Both Laser Haemorrhoidoplasty alone and LHP combined with Hemorrhoidal Artery Ligation are effective, safe, and well-tolerated techniques for Grade II-III haemorrhoids. Adding HAL to LHP did not significantly reduce postoperative bleeding, pain, or improve recovery outcomes. LHP alone may be sufficient for most patients, offering a simpler approach with equivalent efficacy. Larger multicenter trials with longer follow-up are warranted to confirm these findings and evaluate long-term recurrence rates.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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