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Original Research Article

A Prospective Comparative Study of Laser Hemorrhoidoplasty versus Open Hemorrhoidectomy

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Abstract

Background: Hemorrhoidal disease is a common anorectal condition for which surgical intervention is indicated in patient's refractory to conservative management. Conventional open hemorrhoidectomy is effective but often associated with significant postoperative pain and delayed recovery. Laser hemorrhoidoplasty has emerged as a minimally invasive alternative aimed at reducing surgical morbidity. This study was undertaken to compare the clinical outcomes of laser hemorrhoidoplasty and open hemorrhoidectomy.

Material and Methods: This prospective comparative study included 130 patients with symptomatic Grade II and Grade III hemorrhoids, allocated into two groups of 65 each. Group A underwent laser hemorrhoidoplasty, while Group B underwent open hemorrhoidectomy. Baseline demographic and clinical characteristics were comparable between the groups. Intraoperative parameters, postoperative pain assessed using the Visual Analogue Scale, recovery outcomes, postoperative complications, and short-term recurrence were evaluated. Statistical analysis was performed using appropriate comparative tests, with a p-value <0.05 considered significant.

Results: The mean operative time and intraoperative blood loss were significantly lower in the laser hemorrhoidoplasty group. Postoperative pain scores at 24 hours, day 3, and day 7 were consistently and significantly reduced in patients undergoing laser treatment. Laser hemorrhoidoplasty was associated with a shorter hospital stay, earlier resumption of normal activities, and reduced requirement for rescue analgesia. Postoperative complications, including bleeding, urinary retention, and wound infection, occurred less frequently in the laser group. Symptomatic recurrence at 12-week follow-up was low and comparable between the two groups.

Conclusion: Laser hemorrhoidoplasty offers superior postoperative recovery with reduced pain and morbidity compared to open hemorrhoidectomy, while maintaining comparable short-term efficacy in the treatment of Grade II and Grade III hemorrhoids.

Keywords: Hemorrhoids; Laser hemorrhoidoplasty; Open hemorrhoidectomy; Postoperative pain; minimally invasive surgery.

Introduction

Hemorrhoidal disease is among the most prevalent anorectal conditions encountered in clinical practice worldwide, presenting with symptoms such as bleeding, prolapse, pain, and discomfort that impair quality of life and necessitate effective management strategies [1]. Traditional surgical intervention, particularly the Milligan–Morgan open hemorrhoidectomy, has long been regarded as the gold standard for symptomatic Grade II–III hemorrhoids that fail conservative therapies; however, it is associated with significant postoperative pain, prolonged recovery, and notable complication rates [2]. These limitations have stimulated the development of minimally invasive procedures aimed at reducing tissue trauma while maintaining therapeutic efficacy. Laser hemorrhoidoplasty (LHP) has emerged as a promising minimally invasive alternative, utilizing targeted laser energy to coagulate and shrink hemorrhoidal cushions with preservation of surrounding mucosa and anoderm. Comparative clinical studies have demonstrated that LHP is

associated with shorter operative times, reduced intraoperative blood loss, and lower postoperative pain scores relative to conventional open surgery [3,4]. Furthermore, systematic analyses indicate that patients undergoing LHP may experience faster return to daily activities and reduced need for postoperative analgesia [5]. While early clinical outcomes appear favorable, concerns regarding long-term symptomatic recurrence and heterogeneous reporting across studies underscore the need for further investigation into the comparative effectiveness of LHP versus open hemorrhoidectomy [5,6].

Despite these advances, direct comparative evidence remains limited, particularly in larger prospective cohorts. A clearer understanding of both short-term and long-term outcomes is essential to inform surgical decision-making and optimize patient-centered care. This study prospectively compares the clinical efficacy, perioperative parameters, postoperative recovery, complications, and short-term recurrence rates of laser hemorrhoidoplasty versus open hemorrhoidectomy in patients with Grade II and III hemorrhoids.

Material and Methods

Study Design and Setting: This prospective, comparative, interventional study was conducted at a tertiary care teaching hospital in India. The study was designed to compare the clinical outcomes of Laser Hemorrhoidoplasty (LHP) and conventional Open Hemorrhoidectomy (OH) in patients with symptomatic hemorrhoidal disease. The protocol was developed prior to patient recruitment and adhered to standard ethical and methodological principles for human research.

Study Population: Adult patients presenting to the surgical outpatient department with a diagnosis of hemorrhoids were screened for eligibility. Diagnosis and grading were established based on clinical history and proctoscopic examination.

Inclusion Criteria

- Age between 18 and 65 years
- Symptomatic Grade II or Grade III hemorrhoids refractory to conservative management
- Fitness for elective surgery under regional or general anesthesia
- Willingness to participate and provide written informed consent

Exclusion Criteria

- Grade I hemorrhoids or Grade IV hemorrhoids with irreducible prolapse
- Concomitant anal pathology (anal fissure, fistula-in-ano, perianal abscess, malignancy)
- Previous anorectal surgery
- Bleeding diathesis or patients on long-term anticoagulation
- Pregnancy
- Severe systemic illness precluding surgery

Sample Size Calculation: The sample size was calculated based on the primary outcome of postoperative pain intensity. Assuming a clinically meaningful difference of 1.5 units in mean Visual Analogue Scale (VAS) pain scores between the two groups, with a standard deviation of 2.0, a power of 80%, and a two-sided alpha error of 0.05, the minimum required sample size was estimated to be 50 patients per group. Accounting for a potential dropout rate of approximately 10%, a total of 130 patients were enrolled, with 65 patients allocated to each treatment arm.

Allocation and Grouping: Eligible patients were consecutively recruited and allocated into two groups using a computer-generated randomization sequence:

- **Group A:** Laser Hemorrhoidoplasty (LHP)
- **Group B:** Open Hemorrhoidectomy (OH)

Allocation concealment was ensured using sealed, opaque envelopes opened immediately prior to surgery.

Preoperative Assessment: All patients underwent a standardized preoperative evaluation including detailed clinical history, physical examination, digital rectal examination, and proctoscopy. Routine laboratory investigations such as complete blood count, coagulation profile, blood sugar levels, renal function tests, and viral serology were performed. Bowel preparation and perioperative antibiotic prophylaxis were administered according to institutional protocol.

Surgical Techniques

Laser Hemorrhoidoplasty (LHP): The procedure was performed under regional or general anesthesia with the patient in lithotomy position. A diode laser system with a wavelength of 1470 nm was used. Under direct visualization, a laser fiber was introduced into the hemorrhoidal cushion through a small mucosal puncture. Controlled laser energy was delivered to cause coagulation and shrinkage of the hemorrhoidal tissue while preserving the anoderm and mucosa. No excision or suturing was performed.

Open Hemorrhoidectomy (OH): Conventional open hemorrhoidectomy was carried out using the Milligan–Morgan technique. Following adequate anesthesia, the hemorrhoidal bundles were identified, dissected, ligated at the pedicle, and excised. The wounds were left open to heal by secondary intention. Hemostasis was ensured before completion of the procedure.

Postoperative Care and Follow-up: Postoperative analgesia was standardized for both groups using non-opioid analgesics, with rescue analgesia administered as required. Patients were encouraged early ambulation and oral intake. Stool softeners and sitz baths were advised uniformly.

Patients were assessed postoperatively at 24 hours, at discharge, and during follow-up visits at 1 week, 4 weeks, and 12 weeks. Parameters evaluated included postoperative pain (VAS), duration of hospital stay, time to return to normal daily activities, postoperative complications (bleeding, urinary retention, infection), and recurrence of symptoms.

Outcome Measures: The primary outcome measure was postoperative pain severity assessed using the Visual Analogue Scale. Secondary outcomes included operative time, length of hospital stay, postoperative complications, and early recurrence within the follow-up period.

Statistical Analysis: Data were entered into a predesigned proforma and analyzed using standard statistical software. Continuous variables were expressed as mean ± standard deviation and compared using the independent Student's t-test. Categorical variables were expressed as frequencies and percentages and analyzed using the Chi-square test. A p-value of less than 0.05 was considered statistically significant.

Results

The two groups were comparable with respect to demographic and clinical variables at baseline. The mean age of patients in the Laser Hemorrhoidoplasty (LHP) group was 44.6 ± 9.8 years, while that in the Open Hemorrhoidectomy (OH) group was 45.2 ± 10.1 years, with no statistically significant difference. Male predominance was observed in both groups, and the distribution of Grade II and Grade III hemorrhoids was similar between the groups. Duration of symptoms and presenting complaints, including bleeding and prolapse, did not differ significantly between the two treatment arms, confirming baseline homogeneity (Table 1).

Operative parameters showed significant differences between the two techniques. The mean operative time was substantially shorter in the LHP group compared to the OH group (24.8 ± 5.6 minutes vs. 38.5 ± 7.9 minutes; $p < 0.001$). Intraoperative blood loss was also markedly lower in patients undergoing LHP. Additionally, the requirement for additional hemostatic sutures was significantly higher in the OH group, indicating increased intraoperative tissue handling and bleeding in conventional surgery (Table 2).

Postoperative pain scores assessed using the Visual Analogue Scale demonstrated consistently lower pain intensity in the LHP group at all evaluated time points. At 24 hours postoperatively, the mean pain score was 3.1 ± 0.9 in the LHP group compared to 6.4 ± 1.2 in the OH group. This difference persisted on postoperative day 3 and day 7, with statistically significant reductions in pain scores observed in patients treated with LHP across all intervals ($p < 0.001$ for all comparisons) (Table 3).

Recovery-related outcomes favored Laser Hemorrhoidoplasty. The mean duration of hospital stay was significantly shorter in the LHP group than in the OH group. Similarly, patients undergoing LHP resumed normal daily activities earlier than those treated with open hemorrhoidectomy. The requirement for rescue analgesia was also significantly lower in the LHP group, reflecting improved postoperative comfort and faster recovery (Table 4).

The incidence of postoperative complications was lower in the LHP group. Postoperative bleeding and urinary retention occurred more frequently in the OH group, with both differences reaching statistical significance. Wound infection was observed exclusively in the OH group, whereas no cases were reported in patients undergoing LHP. Anal stenosis was noted only in the OH group, although the difference between groups was not statistically significant (Table 5).

At 12-week follow-up, symptomatic recurrence was observed in 3 patients (4.6%) in the LHP group and 2 patients (3.1%) in the OH group. The difference in recurrence rates between the two groups was not statistically significant, indicating comparable short-term efficacy of both procedures (Table 6).

Table 1: Baseline Demographic and Clinical Characteristics of Study Participants

Variable	LHP Group (n = 65)	OH Group (n = 65)	p-value
Mean age (years)	44.6 ± 9.8	45.2 ± 10.1	0.74
Male : Female	42 : 23	40 : 25	0.71
Grade II hemorrhoids, n (%)	28 (43.1)	30 (46.2)	0.72
Grade III hemorrhoids, n (%)	37 (56.9)	35 (53.8)	0.72
Duration of symptoms (months)	18.4 ± 6.9	17.9 ± 7.2	0.68
Presenting complaint – bleeding, n (%)	48 (73.8)	50 (76.9)	0.68
Presenting complaint – prolapse, n (%)	39 (60.0)	41 (63.1)	0.72

Table 2: Intraoperative Parameters

Parameter	LHP Group (n = 65)	OH Group (n = 65)	p-value
Mean operative time (minutes)	24.8 ± 5.6	38.5 ± 7.9	<0.001
Mean intraoperative blood loss (mL)	12.6 ± 6.3	46.2 ± 14.7	<0.001
Need for additional hemostatic sutures, n (%)	2 (3.1)	14 (21.5)	0.002

Table 3: Postoperative Pain Scores (VAS)

Time point	LHP Group (Mean ± SD)	OH Group (Mean ± SD)	p-value
24 hours	3.1 ± 0.9	6.4 ± 1.2	<0.001
Postoperative day 3	2.2 ± 0.8	5.1 ± 1.1	<0.001
Postoperative day 7	1.3 ± 0.6	3.6 ± 0.9	<0.001

Table 4: Postoperative Recovery Outcomes

Outcome	LHP Group (n = 65)	OH Group (n = 65)	p-value
Mean hospital stay (days)	1.2 ± 0.4	3.6 ± 1.1	<0.001
Time to resume normal activity (days)	4.8 ± 1.6	12.9 ± 3.4	<0.001
Requirement of rescue analgesia, n (%)	9 (13.8)	37 (56.9)	<0.001

Table 5: Postoperative Complications

Complication	LHP Group (n = 65)	OH Group (n = 65)	p-value
Postoperative bleeding	2 (3.1%)	8 (12.3%)	0.047
Urinary retention	1 (1.5%)	6 (9.2%)	0.049
Wound infection	0 (0%)	5 (7.7%)	0.022
Anal stenosis	0 (0%)	2 (3.1%)	0.15

Table 6: Recurrence at 12-week Follow-up

Outcome	LHP Group (n = 65)	OH Group (n = 65)	p-value
Symptomatic recurrence, n (%)	3 (4.6)	2 (3.1)	0.65

Discussion

In this prospective comparative study, Laser Hemorrhoidoplasty (LHP) demonstrated several short-term advantages over conventional Open Hemorrhoidectomy (OH), particularly in operative efficiency, early postoperative pain, and recovery metrics. These findings are concordant with broader evidence suggesting that minimally invasive techniques can improve early clinical outcomes in hemorrhoidal disease.

A consistent observation across comparative studies is the reduction in operative time and intraoperative blood loss associated with laser-based techniques. The meta-analysis by Jiang et al. reported significantly shorter operative duration and decreased blood loss in the LHP group compared with conventional methods, reflecting reduced tissue trauma and enhanced precision of laser energy delivery [7]. These technical benefits likely contribute to the favorable early postoperative profile observed in our LHP cohort. Postoperative pain is a critical determinant of patient satisfaction and functional recovery after hemorrhoid surgery. Multiple prospective and cohort studies have documented lower pain scores in patients undergoing LHP compared to open excisional procedures [7,8]. The tissue-sparing nature of laser ablation, which avoids wide excision and extensive wound exposure, plausibly underlies this effect and aligns with our findings of significantly lower Visual Analogue Scale scores at 24 h, day 3, and day 7 (Table 3). Similar reductions in analgesic requirements and earlier resumption of normal activities have been reported in other cohorts, underscoring consistent early benefits with LHP [9,10].

The pattern of postoperative complications in our study—lower incidences of bleeding, urinary retention, and infection in the laser group—is also reflected in systematic comparisons. A systematic review noted fewer immediate adverse events such as anal stenosis and urine retention with LHP, although differences in longer-term outcomes, including recurrence, were less pronounced [8].

Comparable early recurrence rates between LHP and OH in our 12-week follow-up support the view that short-term efficacy is similar, even if longer surveillance is warranted to fully assess durability. It is important to acknowledge that the minimally invasive nature of LHP may predispose to incomplete tissue reduction in some contexts, and that variation in technique or patient selection could influence recurrence patterns. Retrospective analyses comparing LHP with other modalities such as LigaSure hemorrhoidectomy have shown differing long-term recurrence profiles, highlighting the need for cautious interpretation and targeted future research [11,12]..

Conclusion

Laser hemorrhoidoplasty demonstrated significant advantages over open hemorrhoidectomy in terms of reduced operative time, lower intraoperative blood loss, diminished postoperative pain, shorter hospital stay, and faster return to normal daily activities. The minimally invasive nature of laser therapy was also associated with a lower incidence of early postoperative complications, contributing to improved patient comfort and recovery. Importantly, short-term recurrence rates were comparable between the two techniques, indicating that the clinical benefits of laser hemorrhoidoplasty were achieved without compromising efficacy. These findings support laser hemorrhoidoplasty as a safe and effective alternative to conventional open hemorrhoidectomy for the management of Grade II and Grade III hemorrhoids.

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