



COMPARATIVE EVALUATION OF LASER HEMORRHOIDOPLASTY VERSUS CONVENTIONAL OPEN HEMORRHOIDECTOMY IN GRADE II AND III HEMORRHOIDS: A PROSPECTIVE RANDOMIZED STUDY

General Surgery

Dr. Rajkamal Kanojiya	Professor and Unit head, Department of General Surgery, Mahatma Gandhi Medical College and Hospital, Jaipur
Dr. Dhruv Choudhary*	PG Resident, Department Of General Surgery, Mahatma Gandhi Medical College And Hospital, Jaipur*Corresponding Author
Dr. Rajat Goyal	Assistant Professor, Department Of General Surgery, Mahatma Gandhi Medical College And Hospital, Jaipur
Dr. Rishi Deep Jain	Senior Resident, Department Of General Surgery, Mahatma Gandhi Medical College And Hospital, Jaipur

ABSTRACT

Background: Hemorrhoidal disease commonly requires surgery when symptoms persist despite conservative treatment. Conventional Milligan–Morgan hemorrhoidectomy is effective but often associated with significant postoperative pain and delayed recovery. Laser hemorrhoidoplasty has emerged as a minimally invasive alternative with the potential for improved postoperative outcomes. **Aim:** To compare laser hemorrhoidoplasty with conventional open hemorrhoidectomy in patients with grade II and III hemorrhoids. **Materials and Methods:** This prospective randomized comparative study included 50 patients with grade II or III hemorrhoids. Patients were equally divided into two groups: Group A underwent laser hemorrhoidoplasty and Group B underwent open hemorrhoidectomy. Operative time, postoperative pain using the Visual Analog Scale (VAS), hospital stay, recovery period, and postoperative complications were evaluated. **Results:** The laser group had a significantly shorter operative time than the open surgery group (17.4 ± 2.6 vs 29.1 ± 3.8 minutes; $p < 0.001$). Postoperative pain scores on day 1 were lower following laser hemorrhoidoplasty (2.9 ± 0.7 vs 6.8 ± 1.1 ; $p < 0.001$). Hospital stay and recovery time were also significantly reduced in the laser group. Postoperative complications occurred less frequently after laser treatment. **Conclusion:** Laser hemorrhoidoplasty is a safe and effective minimally invasive alternative to open hemorrhoidectomy, offering reduced postoperative pain, shorter hospitalization, and faster recovery.

KEYWORDS

Hemorrhoids; Laser Hemorrhoidoplasty; Open Hemorrhoidectomy; Postoperative Pain; Recovery; Minimally Invasive Surgery

INTRODUCTION

Hemorrhoidal disease represents one of the most prevalent benign disorders affecting the anorectal region and is routinely encountered in surgical practice. The condition develops due to pathological enlargement and distal displacement of normal anal cushions, producing symptoms such as rectal bleeding, prolapse, pruritus, mucus discharge, discomfort, and pain during defecation⁽¹⁾. Increasing prevalence has been associated with sedentary habits, obesity, chronic constipation, low dietary fiber intake, and prolonged sitting⁽²⁾. Adults between 45 and 65 years are affected most commonly, and the disease can markedly interfere with quality of life and daily functioning⁽³⁾.

The pathogenesis of hemorrhoids is considered multifactorial. Degeneration of supporting connective tissue, venous dilatation, vascular congestion, and raised intra-abdominal pressure all contribute to disease development⁽⁴⁾. Additional contributing factors include pregnancy, chronic diarrhea, excessive straining, prolonged toilet use, and heavy physical activity⁽⁵⁾. Internal hemorrhoids are categorized into four grades according to prolapse severity. Grade I hemorrhoids present with bleeding only, grade II prolapse during straining with spontaneous reduction, grade III require manual reduction, while grade IV remain irreducibly prolapsed⁽⁶⁾. Surgical intervention is frequently considered in grade II and III disease when conservative measures fail to relieve symptoms adequately.

Management depends on symptom severity and disease stage. Initial treatment generally consists of dietary modification, increased fluid intake, fiber supplementation, stool softeners, and topical medications⁽⁷⁾. Minimally invasive outpatient procedures such as rubber band ligation, infrared coagulation, and sclerotherapy are useful in selected patients⁽⁸⁾. Persistent prolapse, recurrent bleeding, thrombosis, or failure of conservative therapy may necessitate operative management.

Milligan–Morgan open hemorrhoidectomy remains a widely practiced surgical procedure for advanced hemorrhoids because of its favorable long-term outcomes and low recurrence rates^(9,10). Despite its effectiveness, the procedure is often associated with significant postoperative pain due to extensive tissue handling and exposure of the sensitive anoderm⁽¹¹⁾. Additional complications such as urinary retention, bleeding, infection, delayed wound healing, and prolonged recovery may further reduce patient satisfaction⁽¹²⁾.

To reduce postoperative morbidity, newer minimally invasive techniques have been introduced. Laser hemorrhoidoplasty has emerged as one such alternative for symptomatic hemorrhoids⁽¹³⁾. In this method, laser energy is applied directly into hemorrhoidal tissue, resulting in coagulation and shrinkage of vascular cushions without extensive tissue excision. Preservation of the surrounding mucosa and anoderm may decrease postoperative inflammation, edema, and pain⁽¹⁴⁾.

Several recent studies have demonstrated encouraging outcomes with laser hemorrhoidoplasty, including shorter operative duration, reduced blood loss, lower postoperative pain, decreased hospital stay, and earlier return to routine activities compared with conventional hemorrhoidectomy⁽¹⁵⁾. Considering these potential benefits, the present study was undertaken to compare laser hemorrhoidoplasty and conventional open hemorrhoidectomy in terms of operative duration, postoperative pain, blood loss, hospital stay, recovery, and postoperative complications.

AIMS AND OBJECTIVES

Aim- To compare the clinical outcomes of laser hemorrhoidoplasty and conventional open hemorrhoidectomy in patients with grade II and III hemorrhoids.

Objectives

- To compare operative duration between the two procedures.
- To evaluate postoperative pain using the Visual Analog Scale (VAS).
- To compare intraoperative blood loss.
- To assess duration of hospital stay.
- To compare time required for resumption of routine activities.
- To evaluate postoperative complications including bleeding, urinary retention, wound infection, and anal discomfort.
- To assess short-term postoperative outcomes and recurrence during follow-up.

MATERIALS AND METHODS

Study Design- This investigation was conducted as a prospective randomized comparative study to assess and compare outcomes following laser hemorrhoidoplasty and conventional open hemorrhoidectomy in patients diagnosed with grade II and III hemorrhoids.

Study Centre- The study was carried out in the Department of General Surgery at Mahatma Gandhi Medical College and Hospital, Jaipur, Rajasthan, India.

Study Duration- The research was conducted over a one-year period from March 2025 to March 2026.

Study Population- Fifty patients diagnosed with grade II or grade III internal hemorrhoids and requiring operative treatment were enrolled in the study. Eligible patients attending both outpatient and inpatient surgical services during the study period were evaluated for inclusion.

Sample Size

The study population consisted of 50 patients who were randomly distributed into two equal groups:

- Group A: Laser Hemorrhoidoplasty (LHP)
- Group B: Conventional Open Hemorrhoidectomy (Milligan–Morgan technique)

Sample Size Calculation- Sample size estimation was based on previously published studies comparing postoperative pain and recovery outcomes between laser hemorrhoidoplasty and open hemorrhoidectomy. Using a confidence level of 95%, statistical power of 80%, and margin of error of 5%, the minimum required sample size was calculated as 25 patients in each group.

Sample Technique

Simple random sampling technique was used.

Randomization

Patients fulfilling eligibility criteria were randomly assigned into two groups using computer-generated random numbers with equal allocation. Group A underwent laser hemorrhoidoplasty, whereas Group B underwent conventional open hemorrhoidectomy.

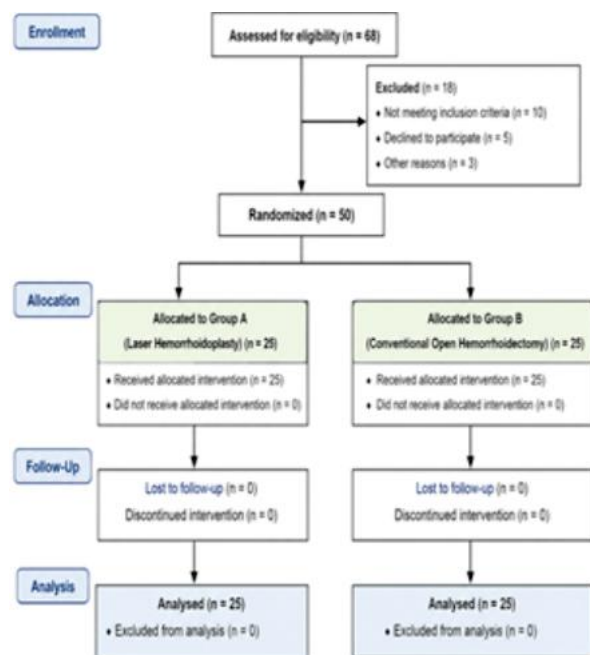


Figure 1: CONSORT Flow Diagram Showing Patient Enrollment, Allocation, Follow-up, and Analysis

Inclusion Criteria

- Patients aged 18–65 years
- Diagnosed cases of grade II or grade III internal hemorrhoids
- Patients presenting with bleeding per rectum, prolapse, pain, or discomfort requiring operative treatment
- Patients willing to participate and provide written informed consent

Exclusion Criteria

- Grade I or grade IV hemorrhoids
- Thrombosed external hemorrhoids
- Associated anorectal disorders such as fistula-in-ano, fissure-in-ano, anorectal abscess, or malignancy

- Coagulation abnormalities or severe systemic illness making surgery unsafe
- Pregnant women
- Patients unwilling to participate in the study

Preoperative Assessment

All patients underwent detailed history taking, general examination, and anorectal evaluation. Routine investigations including complete blood count, blood sugar profile, renal function tests, coagulation profile, viral markers, electrocardiography, and chest radiography were performed whenever indicated. Proctoscopic examination was used to confirm the grade and extent of hemorrhoidal disease.

Surgical Procedure

Laser Hemorrhoidoplasty

Patients assigned to Group A underwent laser hemorrhoidoplasty under spinal anesthesia or short general anesthesia. A diode laser probe was inserted into the hemorrhoidal tissue, and controlled laser energy was delivered circumferentially to coagulate feeding vessels and shrink the hemorrhoidal mass without tissue excision. Adequate hemostasis was achieved intraoperatively, and suturing was not required.



Figure 2. Intraoperative laser application during hemorrhoidoplasty Conventional Open Hemorrhoidectomy

Patients in Group B underwent conventional Milligan–Morgan hemorrhoidectomy under spinal anesthesia. Hemorrhoidal tissue was excised using the standard open technique while preserving mucocutaneous bridges to minimize the possibility of anal stenosis. Hemostasis was secured, and the surgical wounds were left open to heal by secondary intention.



Figure 3. Conventional Milligan–Morgan open hemorrhoidectomy procedure

Postoperative Management

Standard postoperative care was provided to all patients and included analgesics, antibiotics, stool softeners, sitz baths, and dietary counseling. Patients were observed for postoperative pain, urinary retention, bleeding, wound-related complications, and other adverse events.

Parameters Evaluated

The following variables were assessed and compared between the two groups:

- Operative duration (minutes)

- Intraoperative blood loss
- Postoperative pain using the Visual Analog Scale (VAS)
- Duration of hospital stay
- Time required to resume routine daily activities
- Postoperative complications including bleeding, urinary retention, wound infection, and anal discomfort
- Recurrence during follow-up

Follow-up

Patients were reviewed postoperatively at 1 week, 3 weeks, 1 month, 3 months, and 6 months after surgery. During follow-up visits, assessment included pain, wound healing, bleeding, urinary retention, anal discomfort, infection, and recurrence of symptoms.

Ethical Consideration

The study protocol received approval from the Institutional Ethics Committee of Mahatma Gandhi Medical College and Hospital, Jaipur before commencement of the research. The study was conducted according to the ethical principles outlined in the Declaration of Helsinki.

Informed Consent

Written informed consent was obtained from all participants after explaining the objectives, benefits, and possible complications of the study in their own language. Confidentiality of patient information was maintained throughout the study period.

Statistical Analysis

Collected data were entered into Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) software version 25.0. Quantitative variables were expressed as mean $\pm$ standard deviation, while qualitative variables were presented as frequencies and percentages. Continuous variables were compared using Student's unpaired t-test. Categorical variables were analyzed using Chi-square test or Fisher's exact test whenever appropriate. A p-value <0.05 was considered statistically significant.

Results and Observations

A total of 50 patients diagnosed with grade II and grade III hemorrhoids were included in the present study. The patients were randomly divided into two equal groups comprising 25 patients each. Group A underwent Laser Hemorrhoidoplasty (LHP), while Group B underwent Conventional Open Hemorrhoidectomy (Milligan-Morgan procedure). The demographic profile, operative findings, postoperative recovery, and complications were analyzed and compared between the two groups.

Table 1: Demographic Characteristics of Study Population

Variable	Group A (LHP) (n=25)	Group B (Open) (n=25)	p-value
Mean Age (Years)	44.8 $\pm$ 9.2	46.1 $\pm$ 8.7	0.62
Male	16 (64%)	17 (68%)	0.76
Female	9 (36%)	8 (32%)	0.76
Grade II Hemorrhoids	11 (44%)	10 (40%)	0.77
Grade III Hemorrhoids	14 (56%)	15 (60%)	0.77

The demographic profile and distribution of hemorrhoid grades were statistically comparable between the two groups with no significant difference observed.

Table 2: Comparison of Operative Parameters

Parameter	Group A (LHP)	Group B (Open)	p-value
Mean Operative Time (Minutes)	17.4 $\pm$ 2.6	29.1 $\pm$ 3.8	<0.001
Mean Intraoperative Blood Loss (mL)	18.6 $\pm$ 5.2	42.3 $\pm$ 8.4	<0.001

The mean operative duration and intraoperative blood loss were significantly lower in the laser hemorrhoidoplasty group compared with the conventional open hemorrhoidectomy group.

Table 3: Comparison of Postoperative Pain Scores (VAS)

Postoperative Period	Group A (LHP)	Group B (Open)	p-value
Postoperative Day 1	2.9 $\pm$ 0.7	6.8 $\pm$ 1.1	<0.001
Postoperative Day 3	1.8 $\pm$ 0.5	5.1 $\pm$ 0.9	<0.001
1 Week Follow-up	0.9 $\pm$ 0.4	3.2 $\pm$ 0.8	<0.001

Patients undergoing laser hemorrhoidoplasty experienced significantly less postoperative pain during all follow-up periods compared with patients undergoing open hemorrhoidectomy.

Table 4: Comparison of Postoperative Recovery

Parameter	Group A (LHP)	Group B (Open)	p-value
Mean Hospital Stay (Days)	1.2 $\pm$ 0.5	3.1 $\pm$ 0.7	<0.001
Mean Time to Resume Routine Activities (Days)	4.6 $\pm$ 1.4	10.2 $\pm$ 2.3	<0.001

Patients treated with laser hemorrhoidoplasty had significantly shorter hospitalization and earlier return to routine activities.

Table 5: Postoperative Complications

Complication	Group A (LHP) n (%)	Group B (Open) n (%)	p-value
Mild Postoperative Bleeding	1 (4%)	4 (16%)	0.15
Urinary Retention	1 (4%)	5 (20%)	0.08
Wound Discomfort	2 (8%)	7 (28%)	0.06
Wound Infection	0 (0%)	2 (8%)	0.14
Anal Edema	1 (4%)	4 (16%)	0.15

Postoperative complications were observed more frequently in the conventional open hemorrhoidectomy group; however, individual complications did not reach statistical significance.

Table 6: Recurrence During Follow-up

Recurrence	Group A (LHP)	Group B (Open)	p-value
Present	0 (0%)	0 (0%)	1.00
Absent	25 (100%)	25 (100%)	

No clinically significant recurrence was observed in either group during the 6-month follow-up period.

Overall Observations

The present study demonstrated that laser hemorrhoidoplasty was associated with significantly shorter operative duration, minimal intraoperative blood loss, lower postoperative pain scores, reduced duration of hospital stay, and earlier return to daily activities when compared with conventional open hemorrhoidectomy. Although postoperative complications were more frequent in the open surgery group, no major complications or recurrence were observed in either group during the follow-up period.

DISCUSSION

Hemorrhoidal disease is among the most frequently encountered anorectal disorders requiring surgical management, particularly in patients with symptomatic grade II and grade III hemorrhoids. Conventional open hemorrhoidectomy has traditionally been regarded as the standard operative treatment because of its effectiveness and low recurrence rates. However, considerable postoperative pain, delayed wound healing, and prolonged recovery continue to remain important disadvantages associated with the procedure⁽¹⁰⁾. In recent years, minimally invasive techniques such as laser hemorrhoidoplasty have gained increasing acceptance because they aim to provide effective symptom control with reduced postoperative morbidity.

The present study compared laser hemorrhoidoplasty with conventional open hemorrhoidectomy in terms of operative duration, intraoperative blood loss, postoperative pain, duration of hospital stay, recovery period, and postoperative complications. Baseline demographic variables including age, gender distribution, and hemorrhoid grade were comparable in both groups, thereby ensuring uniformity between study populations and minimizing selection bias. Similar demographic findings have been reported in earlier studies evaluating minimally invasive hemorrhoidal procedures⁽¹⁴⁾.

A significant reduction in operative duration was observed in patients undergoing laser hemorrhoidoplasty compared with conventional open hemorrhoidectomy. The shorter operative time associated with laser treatment may be attributed to minimal tissue handling, better hemostatic control, and the absence of tissue excision or suturing. Comparable observations were reported by Maloku et al., who demonstrated reduced operative duration in laser hemorrhoidoplasty when compared with open hemorrhoidectomy (13). Likewise, Naderan et al. noted that laser-assisted hemorrhoidal procedures were

technically simpler and associated with less operative trauma than conventional surgery⁽¹⁵⁾.

The present study also demonstrated significantly lower intraoperative blood loss in the laser group. Laser energy produces coagulation of hemorrhoidal vessels, thereby providing effective hemostasis during surgery. Reduced bleeding associated with laser procedures has also been documented by Crea et al., who reported minimal tissue trauma and improved vascular sealing during laser hemorrhoidoplasty⁽¹³⁾. Better intraoperative hemostasis may contribute to improved postoperative recovery and reduced surgical stress.

Postoperative pain remains one of the major factors influencing patient satisfaction following hemorrhoid surgery. In the current study, patients treated with laser hemorrhoidoplasty experienced substantially lower Visual Analog Scale (VAS) scores during the postoperative period compared with patients undergoing conventional hemorrhoidectomy. Preservation of the anoderm and surrounding mucosa during laser procedures likely reduces exposure of pain-sensitive tissue, thereby minimizing postoperative discomfort. Similar findings were reported by Faes et al., who observed significantly lower pain scores in patients undergoing laser hemorrhoidoplasty (14). Giamundo et al. also concluded that laser-based hemorrhoidal procedures were associated with less postoperative pain and reduced analgesic requirement⁽¹⁵⁾.

Hospital stay was significantly shorter among patients treated with laser hemorrhoidoplasty in the present study. Most individuals in the laser group were discharged within 24 hours because of early mobilization and minimal postoperative discomfort. In contrast, patients undergoing open hemorrhoidectomy required longer hospitalization owing to postoperative pain and wound-related morbidity. Comparable results were reported by Bruscianno et al., who found shorter hospitalization and faster recovery in patients managed with laser hemorrhoidoplasty⁽¹⁶⁾. Reduced hospital stay may also decrease healthcare expenditure and improve patient convenience.

An important observation in the present study was the earlier return to routine activities among patients undergoing laser hemorrhoidoplasty. Faster postoperative recovery may be explained by limited tissue destruction, reduced edema, and lower pain intensity associated with the laser technique. Filingeri et al. similarly reported quicker resumption of occupational and social activities following minimally invasive hemorrhoidal procedures compared with conventional surgery⁽¹⁷⁾. Early recovery is particularly advantageous in working individuals and contributes positively to postoperative quality of life. Postoperative complications including urinary retention, wound discomfort, postoperative bleeding, and anal edema were observed more frequently in the conventional hemorrhoidectomy group. Although the differences in individual complications were not statistically significant, the overall complication profile favored laser hemorrhoidoplasty. Reduced tissue trauma and preservation of perianal structures during laser procedures may explain the lower incidence of postoperative morbidity. Similar trends have been reported in previous comparative studies evaluating minimally invasive hemorrhoidal surgeries⁽¹¹⁾.

No recurrence was identified in either group during the six-month follow-up period. Conventional hemorrhoidectomy is already recognized for low recurrence rates, and recent evidence suggests that laser hemorrhoidoplasty may also provide satisfactory short-term disease control. Emile et al., in a systematic review, concluded that minimally invasive hemorrhoidal procedures including laser hemorrhoidoplasty achieve acceptable recurrence rates with improved postoperative outcomes⁽¹⁸⁾. Nevertheless, studies with longer follow-up are required to establish long-term durability and recurrence patterns associated with laser procedures.

The findings of the present study support the growing evidence favoring laser hemorrhoidoplasty as a safe and effective minimally invasive alternative to conventional open hemorrhoidectomy. Reduced postoperative pain, shorter operative duration, minimal blood loss, decreased hospitalization, and faster recovery make laser hemorrhoidoplasty an attractive option in modern surgical practice. Similar conclusions were drawn by Poskus et al., who emphasized the advantages of minimally invasive hemorrhoidal procedures in improving patient-centered outcomes⁽¹⁹⁾. Despite its advantages, laser hemorrhoidoplasty may be associated with increased procedural cost and limited availability in resource-constrained centers.

Limitations

The present study had certain limitations. The sample size was relatively small and the study was conducted at a single tertiary care center, which may limit generalizability of the findings. Although patients were followed for a period of 6 months, longer follow-up studies are still required to assess long-term recurrence rates and durability of laser hemorrhoidoplasty. Larger multicentric studies with extended follow-up periods are recommended to further validate the long-term efficacy and safety of the procedure.

CONCLUSION

The present study demonstrated that laser hemorrhoidoplasty is a safe and effective minimally invasive alternative to conventional open hemorrhoidectomy for grade II and III hemorrhoids. The procedure was associated with significantly reduced postoperative pain, shorter operative duration, minimal intraoperative blood loss, reduced hospital stay, and earlier return to routine daily activities. Although both procedures achieved satisfactory short-term disease control, laser hemorrhoidoplasty provided superior postoperative recovery and patient comfort. However, larger multicentric studies with longer follow-up are required to further evaluate long-term recurrence rates, cost-effectiveness, and overall clinical outcomes.

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