Original Article

Laser Hemorrhoidopexy in Grade II–IV Hemorrhoids: A Retrospective Analysis of 621 Cases in 5 Years

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Abstract

Aim: A retrospective study aimed to determine the outcomes and postoperative complications of hemorrhoidal disease treated by laser hemorrhoidopexy. **Background:** The origin of the word "hemorrhoid" is seen in Greek literature as a combination of the words "hema" (blood) and "rhoos" (flowing). The flow of blood from the veins of the anus was named as hemorrhoid by Hippocrates. **Methodology:** A retrospective analysis was conducted on 621 patients with Grade II–IV hemorrhoids who underwent laser hemorrhoidopexy at a single tertiary center from November 2019 to July 2025. All procedures were performed using a 980 nm/1470 nm bare fiber diode laser, under either spinal or general anesthesia. Postoperative outcomes including pain scores (Visual Analog Scale), healing time, recurrence, quality of life, and complications were recorded. Statistical analysis included Chi-square, ANOVA, Kruskal–Wallis, Fisher's exact test, and logistic regression to evaluate the predictors of recurrence, with significance set at $P < 0.05$. **Results:** The majority of the patients resumed normal activity within 3 days, with significant reductions in pain scores over time ($P < 0.00001$). Complication and recurrence rates were low, though significantly associated with higher disease grades ($P < 0.00001$). **Conclusion:** Laser hemorrhoidopexy is a safe, effective, and minimally invasive option for treating Grade II–IV hemorrhoids. It offers rapid recovery, low postoperative pain, early return to activity, minimal complications, and preserves anorectal function, making it a strong alternative to conventional surgery across all disease grades.

Keywords: *5-year follow-up, early postoperative ambulation, early return to normal activity, Grade IV, hemorrhoidal disease, laser hemorrhoidopexy, minimally invasive surgery, postoperative outcomes, recurrence*

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Introduction

Hemorrhoidal disease (HD) is a common entity, with a worldwide prevalence of up to 27.9%.[1] HD is one of the most common anorectal conditions encountered in daily practice by general practitioners, general surgeons, and gastrointestinal surgeons in India. It has been projected that about 50% of the population would have hemorrhoids at some point in their life probably by the time they reach the age 50 of years, and approximately 5% of the population suffer from hemorrhoids at any given point of time.[2,3]

Anatomy and physiology

Hemorrhoids are clusters of vascular tissues, smooth muscles, and connective tissues that lie along the anal canal in three columns: left lateral, right anterior, and right posterior positions [Figure 1]. Because some do not contain muscular walls, these clusters may be considered sinusoids instead of arteries or veins.[4,5]

Clinical evaluation and diagnosis

Patient history and physical examination are the essential components in the diagnosis of HD. Bleeding per rectum, prolapse (something coming out per rectum), perianal swelling, and itching are the common symptoms

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of hemorrhoids. Pain occurs in cases with complicated hemorrhoids. Symptoms like feeling of incomplete evacuation, change in bowel habits, and weight loss need to be further evaluated to rule out other pathologies such as anal and rectal carcinomas, anal condylomata, and inflammatory bowel disease. A diagnosis is made using proctoscopy and sigmoidoscopy. Further, a full colonoscopy is recommended in selected patients with suspicious symptoms as above and in those with rectal bleeding, occult gastrointestinal bleeding, iron-deficiency anemia, positive fecal occult blood test, age ≥50 years, and not having a complete colon examination within the past 10 years (Grade A, Evidence Level 3).[3,6-9]

Classification

The consensus committee also proposed a new classification of hemorrhoids as presented in Table 1.[10]

The exact pathophysiology of symptomatic HD is poorly understood. Previous theories of hemorrhoids described as anorectal varices are obsolete now, as shown by Goenka *et al*., patients with portal hypertension and varices do not have an increased incidence of hemorrhoids.[11] Currently, the theory of sliding anal canal lining, which proposes that hemorrhoids occur when the supporting tissues of the anal cushions deteriorate, is more widely accepted. Advancing age and activities such as strenuous lifting, straining with defecation, and prolonged sitting are thought to contribute to this process. Hemorrhoids are, therefore, the pathological term to describe the abnormal downward displacement of the anal cushions causing venous dilatation.[12] On histopathological examination, changes seen in the anal cushions include abnormal venous dilatation, vascular thrombosis, degenerative process in the collagen fibers and fibroelastic tissues, and distortion and rupture of the anal subepithelial muscle. In severe cases, a prominent inflammatory reaction involving the vascular wall and surrounding connective tissue has been associated with mucosal ulceration, ischemia, and thrombosis.[13]

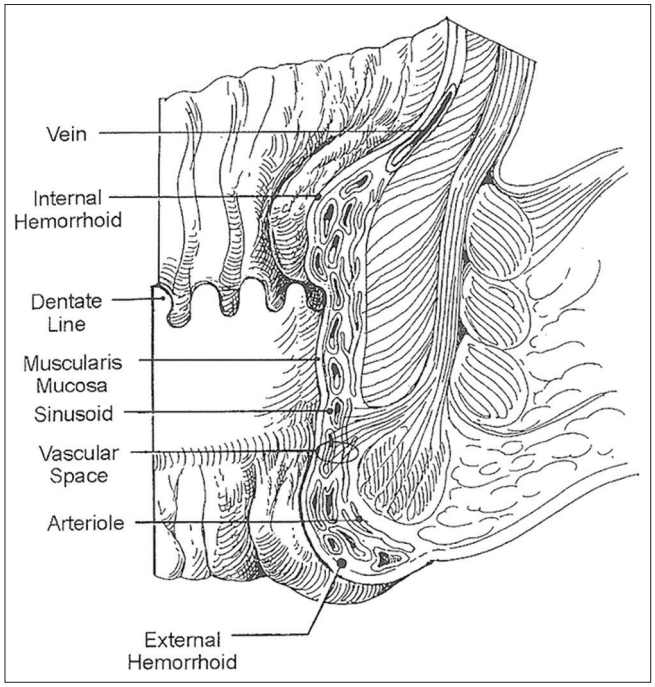

Figure 1: Anatomy of hemorrhoidal cushion

About 40% of individuals with hemorrhoids are asymptomatic.[14] For internal hemorrhoids, bleeding is the most commonly reported symptom. The occurrence of bleeding is usually associated with defecation and almost always painless. The blood is bright red and coats the stool at the end of defection. Blood can be found on the toilet paper, dripping into the bowl, or even dramatically spraying across the toilet bowl. Another frequent symptom is the sensation of tissue prolapse. Prolapsed internal hemorrhoids may accompany mild fecal incontinence, mucus discharge, sensation of perianal fullness, and irritation of perianal skin. Pain is significantly less common with internal hemorrhoids than with external hemorrhoids, but can occur in the setting of prolapsed, strangulated internal hemorrhoids that develop gangrenous changes due to the associated ischemia.

In contrast, external hemorrhoids are more likely to be associated with pain, due to activation of perianal

Table 1: Proposed combined classification of haemorrhoids

Grade	Characteristics	Suffix	Description
I	Remaining inside the anal canal		
II	Protrude during defecation and reduce spontaneously		
III	Need further manual reposition		
IV	Piles that remain prolapsed outside and external haemorrhoids		
		a	Single pile mass
		b	Two piles but <50% circumference
		c	Circumferential piles occupying more than half circumference of the anal canal
		d	Thrombosed or gangrenous piles (complicated)

innervations associated with thrombosis. Patients typically describe a painful perianal mass that is tender to palpation. This painful mass may be initially increasing in size and severity over time. Bleeding can also occur if ulceration develops from necrosis of the thrombosed hemorrhoid, and this blood tends to be darker and more clotted than the bleeding from internal disease. Painless external skin tags often result from previous edematous or thrombosed external hemorrhoids.[5]

The surgical technique of laser hemorrhoidopexy

In hemorrhoidopexy, laser energy is used on the surface of mucosa through the natural anal canal and the delivery of laser energy in submucosal plain.[15] In addition, suture mucopexy is done in cases associated with mucosal prolapse [Figure 2].

- Step 1: Insert the proctoscope under good vision. The laser fiber (bare fiber at 8 W/s connected to a 980 nm/1470 nm diode laser in continuous mode) is introduced intraluminal for partial coagulation of hemorrhoidal artery and plexus
- Step 2: The laser fiber is pierced through the intersphincteric groove and the energy is delivered above the apex of hemorrhoids to coagulate the remaining artery and plexus
- Step 3: The tip of laser fiber is withdrawn slowly and the laser energy is delivered homogenously within the hemorrhoidal mass
- Step 4: Only for patients with Grade IV hemorrhoidopexy. Suture mucopexy by 2-0 coated Vicryl at the summit of internal hemorrhoidal cushions
- Step 5: Excision of sentinel pile and excision of skin tag was done at 12 W/s with bare fiber in continuous mode.

20%–30% shrinkage of the hemorrhoids was observed on the table. The patients were followed up for 68 months with an average of 39 months.

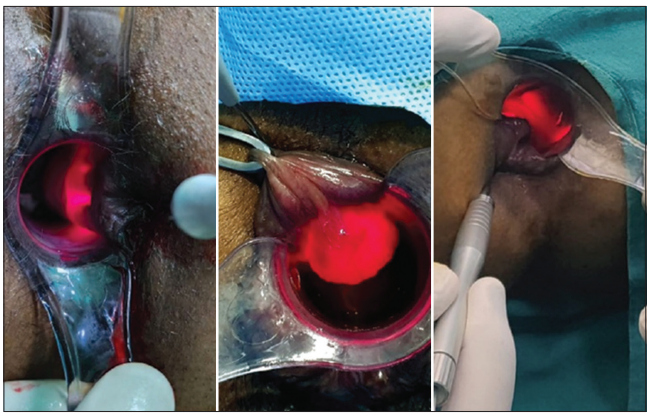

Figure 2: Spraying of laser energy at 3, 7 and 11 o' clock

Table 2: Summary of postoperative complications

Complication	Total cases	Details
Perianal abscess	16	7 required drainage; 9 managed conservatively
Fistula in ano	6	4 low (1 healed, 3 laser fistulotomy); 2 high (surgical intervention)
Hematoma	21	7 intraoperative (compression tamponade); 14 postoperative (conservative)
Scanty bleeding (6–8 weeks postoperative)	84	Self-limiting; 12 CAD patients; 6 required readmission (conservative)
Anal stenosis/ incontinence/ mucus discharge	0	None reported

CAD: Coronary artery disease

Table 3: Complications by grade

Complication	Grade II	Grade III	Grade IV
Bleeding	15	21	48
Perianal abscess	2	7	8
Hematoma	0	8	13
Anal stenosis	0	0	0
Fistula in ano	0	2	4

Methodology

This was a retrospective observational study conducted at a single tertiary care surgical center. The data were collected from the records of 621 consecutive patients who underwent laser hemorrhoidopexy between November 2019 and July 2025 for Grade II, III, or IV internal and external hemorrhoids.

Patient selection

Patients were included if they were as follows:

- Aged 18 years or older
- Diagnosed with symptomatic Grade II–IV hemorrhoids (Goligher classification)
- Treated with laser hemorrhoidopexy using a 980 nm/1470 nm diode laser
- Had complete clinical documentation and follow-up.

Exclusion criteria

- Coexisting anal pathologies (fistula, malignancy, Crohn's)
- Incomplete follow-up data or loss to follow-up before wound healing.

Perioperative considerations

In the coronary artery disease (CAD) patients on anticoagulants, the medications were stopped 3–5 days prior to the surgery depending on the dose and the drug they were on. No other medication required any kind of modification for our procedure.

Laser hemorrhoidopexy was performed under either spinal anesthesia (n = 402) or general anesthesia (n = 219).

The procedure was conducted as a day-care or short-stay surgery, with most patients mobilized within 4–24 h postoperatively. All patients received perioperative antibiotics (2 doses of cefuroxime, 1st dose 30 minutes prior to surgery and 2nd dose 8 hours post surgery and analgesic (1 dose of 50 mg diclofenac IV 8 hours postoperatively) as per protocol.

Data collection

Parameters recorded included:

- Demographic details and comorbidities (e.g. CAD)
- Hemorrhoid grade and number of affected quadrants
- Type of anesthesia
- Pain scores (Visual Analog Scale [VAS] at postoperative day [POD] 0, 6 h, 12 h, day 7, and day 21)
- Postoperative complications (bleeding, hematoma, urinary retention, and abscess)
- Functional outcomes (incontinence, stenosis, and fistulization)
- Recurrence (considered if the patient continues to bleed and has a hemorrhoidal cushion present after 3 months of procedure.)
- Healing time (days to resolution of symptoms and hemorrhoidal cushions).

Statistical analysis

Descriptive statistics were used to summarize patient characteristics and outcomes. Categorical variables were compared using Chi-square or Fisher's exact test. Continuous variables were assessed with Kruskal–Wallis test or one-way ANOVA as appropriate. Binary logistic regression was performed to identify predictors of recurrence. Receiver operating characteristic (ROC) curve analysis assessed the discriminatory accuracy of the model. $P < 0.05$ was considered statistically significant. All analyses were conducted using Python (v3.11) with SciPy, Statsmodels, and Matplotlib libraries.

Table 4: Patient Demographics

Characteristic	Value
Grade of hemorrhoids	Grade II: 175
	Grade III: 305
	Grade IV: 141
Mucopexy performed	Only in Grade IV (141 patients), using Vicryl 2–0
Thrombosed hemorrhoids	32 (5.15%) patients
Associated fissure-in-ano	249 (40%) patients
Sentinel pile	143 (23%) patients
Skin tag	218 (35.1%) patients
Gender distribution	Male: 397 (63.9%)
	Female: 224 (36.1%)
Surgical duration	Grade II and III: ~15 min
	Grade IV: ~23 min
Comorbidities	CAD: 48
	HTN: 284
	DM: 243
	Hypothyroid: 123
	Chronic liver disease: 25
	Others: 259

DM: Diabetes mellitus, HTN: Hypertension, CAD: Coronary artery disease

Results

A total of 621 patients underwent laser hemorrhoidopexy during the study period. The majority of cases were classified as Grade III hemorrhoids (n = 305; 49.1%), followed by Grade II (n = 175; 28.2%) and Grade IV (n = 141; 22.7%) [Figure 3]. Mucopexy using Vicryl 2 0 was performed exclusively in Grade IV patients (n = 141; 22.7%), in accordance with the standard surgical protocol. A subset of 32 (5.2%) patients presented with thrombosed hemorrhoids at the time of surgery. Fissure in ano was associated in 249 (40.1%) patients, and sentinel piles were noted in 143 (23%) patients, indicating a substantial symptomatic burden. Skin tags were also observed in 218 (35.1%) patients. The cohort exhibited a male predominance, with 397 male (63.8%) patients and 224 female (36.1%) patients [Figure 5]. The mean operative duration was approximately 15 min for Grade II and Grade III hemorrhoids, while surgeries involving Grade IV disease, including mucopexy, averaged around 23 min [Table 4].

A high burden of systemic comorbidities was documented [Figure 6]:

- Hypertension: 284 (45.7%) patients
- Diabetes mellitus: 243 (39.1%)
- Hypothyroidism: 123 (19.8%)
- CAD: 48 (7.7%)
- Chronic liver disease: 25 (4.0%)
- Other comorbidities: 259 (41.7%) patients.

These findings underscore the heterogeneous clinical spectrum and significant comorbidity burden among patients undergoing laser hemorrhoidopexy, reinforcing the importance of individualized surgical planning and vigilant postoperative monitoring.

Surgical details

A total of 621 patients underwent laser hemorrhoids surgery. Of these, 402 (64.7%) patients received spinal anesthesia, while the remaining 219 (35.3%) patients received general anesthesia. All spinal anesthesia patients were mobilized on POD 1, whereas general anesthesia patients were mobilized 4 h after surgery.

Postoperative complications [Tables 2 and 3]

Postoperative complications were observed in a subset of patients: [Figure 8].

- Perianal abscess formation in 16 patients out of which 7 required incision and drainage, remaining 9 were managed by conservative management. 6 patients developed fistula in ano. Out of these, 4 had low fistula in ano and 2 had high fistula in ano. 1 low fistula in ano healed spontaneously, remaining 3 healed by laser fistulotomy. 2 high fistulas patients required fistula surgery with seton.
- Hematoma was reported in 21 patients. Out of this, intraoperative hematoma was noted in seven patients, while the rest were reported during postoperative periods. Intraoperative hematomas were managed by compression tamponade. All postoperative hematomas were managed by conservative treatments
- 2-3 episodes of scanty bleeding occurred during 6–8 weeks of postoperative period in 84 patients which completely subsided without any active intervention. 12 patients, out of these 84 patients were known CAD(coronary artery disease) patients, 6 of whom required re-admission for bleeding. All of these 6 were managed by conservative treatment and discharged within 24 to 72 hours of admission.
- No patients developed anal stenosis, fecal/flatus incontinence, or persistent mucus discharge (n = 621, complications = 0).

Visual summary of postoperative complications

Recurrence

Recurrence was noted in 11 (1.8%) patients out of 621:

- 9 patients with Grade IV disease
- 2 patients with Grade III disease
- 0 recurrences in Grade II.

Chi-square test showed a significant association between grade and recurrence (χ^2 = 24.53, $P = 4.72 \times 10^{-6}$).

Odds ratio for recurrence in Grade IV vs. Grades II + III remains elevated, supporting higher recurrence risk in advanced disease.

Logistic regression (grade only): coefficient = 2.22, P = 0.0012. ROC area under the curve = 0.851.

Table 5: VAS Score recorded post operatively

Time point	VAS score (mean±SD)
POD-0	4.0±0.5
6 h	4.0±0.4
12 h	2.0±0.4
Day 7	1.0 (n=50)
Day 21	0.0 (all patients)

SD: Standard deviation, VAS: Visual Analog Scale, POD: Postoperative day

Pain scores

Postoperative pain assessment

All patients were assessed for postoperative pain using the VAS at multiple time points.

The table below summarizes the VAS scores recorded during the immediate and follow-up postoperative period [Table 5].

One-way ANOVA showed a significant decrease in pain scores over time (F = 4376.68, $P < 0.00001$), confirming that the reduction in postoperative pain was statistically significant across the various follow-up periods.

The F value is a ratio of two variances:

F = Variance between groups Variance within groups

F = {Variance between groups}/{Variance within groups}.

A larger F value indicates that the group means differ more than expected by chance.

In our case, F = 4376.68 is extremely large, suggesting that pain scores differ significantly across time points, meaning that patients experienced significantly less pain over time after the procedure.

Urinary retention

Seventeen patients required postoperative urinary catheterization (all were administered spinal anesthesia). No urinary retention was observed in the general anesthesia group. Fisher's exact test: P =0.0011.

Healing time

Average healing time differed significantly by disease grade: [Figure 4].

- Grade II: 42–56 days (mean ≈ 49.3)
- Grade III: 56–90 days (mean ≈ 65.8)
- Grade IV: 56–90 days (mean ≈ 72.8).

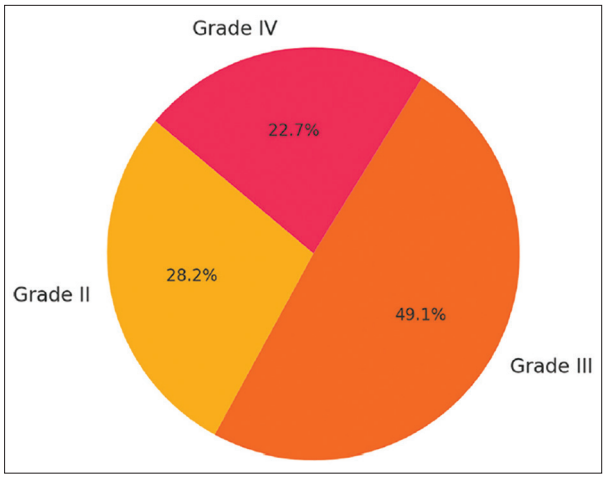

Figure 3: Distribution of hemorrhoid grades

Figure 4: The healing time after laser hemorrhoidopexy

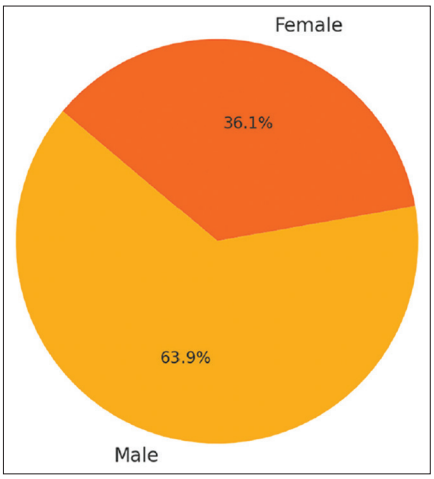

Figure 5: Gender distribution

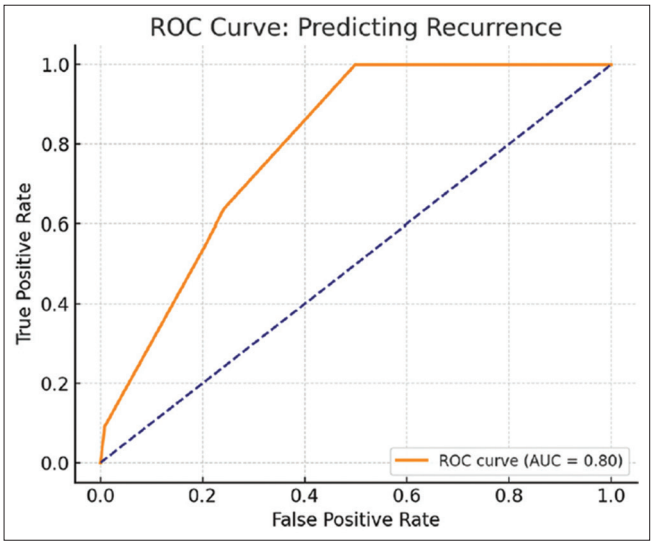

Figure 7: Roc curve: predicting recurrence

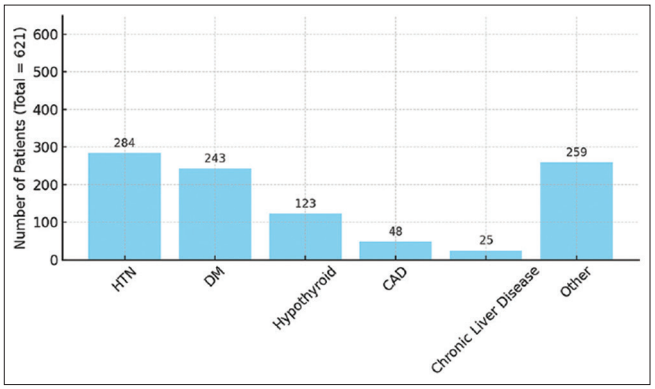

Figure 6: Comorbidity distribution

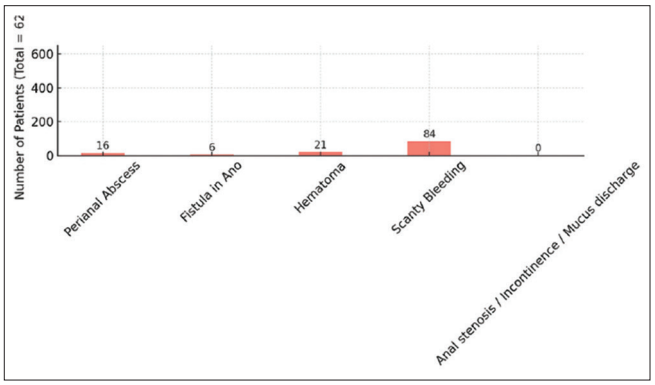

Figure 8: Bar chart representation of postoperative complications

Kruskal–Wallis test showed a significant difference across groups (H = 419.39, P < 0.00001). The H value is the test statistic in the Kruskal–Wallis test. It reflects how different the group rankings are. A higher H indicates a greater difference between group medians.

In this analysis, H = 419.39 with P < 0.00001, indicating a statistically significant difference in healing times across the grades, with longer healing in higher-grade disease.

Healing time comparison

Quality of life postsurgery

Postoperative recovery was rapid in the vast majority of patients. Over 95% of patients resumed normal daily

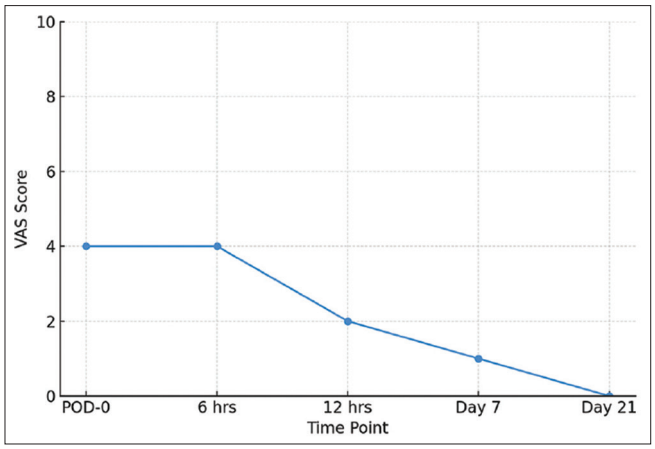

Figure 9: Trend of Visual Analog Scale pain scores over time

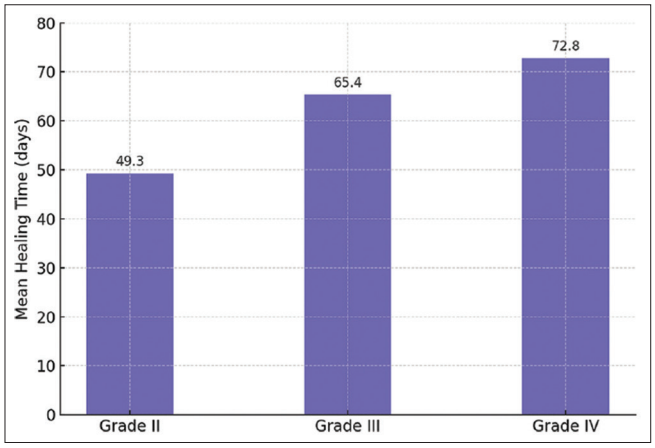

Figure 10: Average healing time by hemorrhoid grade

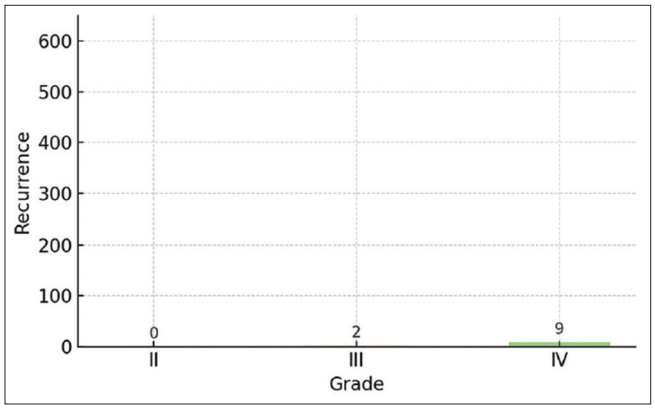

Figure 11: Number of recurrences categorized by disease grade

activities within 3 days of surgery, reflecting a swift return to function and an overall positive impact on quality of life following laser hemorrhoidopexy.

Predictive accuracy

The logistic regression model using disease grade alone to predict recurrence had an area under the ROC curve of 0.796, confirming good predictive capacity [Figure 7].

Summary of statistical results

Analysis	Test type	*P*	Significant?
Recurrence versus grade	Chi-square	<0.0001	Yes
Odds of recurrence (grade IV vs. others)	Fisher's exact	0.0003	Yes
Healing time by grade	Kruskal–Wallis	<0.0001	Yes
Pain score over time	ANOVA	<0.0001	Yes
Urinary retention versus Anesthesia	Fisher's exact	0.0314	Yes

Discussion

An effective, minimally invasive alternative for managing symptomatic Grade II–III HD. A systematic review and meta-analysis encompassing over 1700 patients found that LHP offered significantly shorter operative times, reduced hospital stays, lower incidence of urinary retention and anal stenosis, and substantially lower 24-h postoperative VAS pain scores compared to conventional Milligan–Morgan hemorrhoidectomy, although recurrence rates were similar ($P = 0.70$).[16]

The choice of laser wavelength (980 nm vs. 1470 nm) does not drastically alter outcomes, but evidence suggests slightly increased recurrence with 1470 nm systems, underscoring the importance of standardizing energy settings and technique.[17] In a randomized controlled trial (RCT) comparing LHP, sutured mucopexy, and excisional hemorrhoidectomy among 121 patients, LHP achieved shorter operative duration (~15 min vs. 29 min), lower pain scores, quicker return to activity (~15 days), and 10% symptom recurrence, compared to 0% for excisional surgery and 22% for mucopexy ($P < 0.001$).[18]

A prospective evaluation of HeLPexx (HeLP plus mucopexy) in 35 patients with Grade II–III hemorrhoids reported a marked reduction in postoperative VAS scores, from median 5 on day 0 to 0 at 6 months, with only 5 recurrences and no cases of anal stenosis or fistula formation.[19] Similarly, LHP augmented by hemorrhoidal artery ligation did not significantly affect bleeding rates compared to LHP alone, suggesting the sufficiency of standalone LHP in bleeding control.[20]

Comparative studies and propensity-matched analyses reveal that LHP provides improvements in operative time, blood loss, postoperative interventions, and complication profiles over stapled hemorrhoidopexy (Longo operation), with equivalent recurrence rates and patient-reported outcomes.[21] Hybrid hemorrhoidal artery ligation (HAL)-LHP approaches also report low pain, minimal bleeding, rapid symptom resolution, and a recurrence rate under 6% at mean follow-up of ~ 16 months.[22]

Evidence from practice guidelines recommends LHP for symptomatic hemorrhoids without active inflammation, emphasizing that patient satisfaction and return to daily activity are consistently higher with laser modalities.[23] Long-term outcomes suggest recurrence rates of 1%–10% at 12 months and up to 21% at 24 months for higher-grade disease, highlighting the importance of patient selection and postoperative counseling.[17,23]

Strengths of laser approaches include reduced tissue trauma, early recovery, and minimal anesthetic needs. Limitations include limited long-term data beyond 2–3 years, variability in protocols, and slightly higher recurrence for Grade III–IV disease. Future research should focus on RCTs with standardized energy protocols, extended follow-up, cost–utility analysis, and quality-of-life assessments to better delineate the role of laser hemorrhoidopexy in clinical algorithms.[24]

Conclusion

This retrospective analysis of 621 patients undergoing laser hemorrhoidopexy provides strong evidence that laser-based treatment is an effective, minimally invasive, and patient-friendly option for HD across all grades (Grade II–IV). The procedure was associated with low morbidity, excellent postoperative recovery, and functional preservation, reinforcing its role as a modern alternative to traditional hemorrhoidectomy. Laser therapy demonstrated several key advantages:

- Minimal postoperative pain with VAS scores reducing significantly within 12 h postsurgery [Figure 9]
- Early mobilization and rapid return to routine activities, with most patients ambulating on the same day or within 24 h
- Short healing times even in advanced disease, with Grade II healing within 42–56 days and Grade III and Grade IV within 56–90 days [Figure 10]
- Low recurrence rates, including in Grade IV patients, with overall recurrence below 2% [Figure 11]
- No cases of anal stenosis, fecal incontinence, or flatus incontinence, suggesting that laser treatment is sphincter-preserving and functionally superior to conventional excisional techniques
- Bleeding per rectum during defecation was reported after laser hemorrhoidopexy in 13.57% (n = 84) of patients, which is due to gradual ablative effect of laser, so this should not be considered a complication of the procedure and patients should be counseled about it accordingly
- Patients did not require any additional analgesia despite laser excision of sentinel pile.

Postoperative complications were infrequent and mild. Perianal abscess formation in 16 patients out of which 7 required incision and drainage, remaining 9 were managed by conservative management Hematoma was reported in 21 patients, which was managed conservatively. 2-3 episodes of scanty bleeding occurred during 6–8 weeks of postoperative period in 84 patients which completely subsided without any active intervention.

Laser hemorrhoidopexy is suitable across the disease spectrum. In Grade II hemorrhoids, it offers rapid symptom relief and healing with minimal intervention. In Grade III hemorrhoids, it avoids the morbidity of conventional excision while achieving durable results. In Grade IV hemorrhoids, it provides a less invasive alternative to open or stapled procedures, especially valuable for patients with bleeding risk or sphincter preservation concerns.

With a large cohort (n = 621), uniform technique, and detailed outcome tracking, this study adds meaningful evidence to the growing literature on laser therapy for hemorrhoids. However, the retrospective nature and absence of a control arm (e.g. conventional surgery) limit direct comparative conclusions. The relatively low number of recurrence events limits multivariate modeling beyond disease grade.

Prospective randomized trials comparing laser with open and stapled hemorrhoidectomy are warranted. Cost-effectiveness studies should assess long-term savings from shorter recovery and fewer complications. Inclusion of patient-reported outcomes and quality of life metrics would strengthen the case for widespread adoption.

Given its low pain, rapid recovery, low complication rates, and functional safety, laser hemorrhoidopexy should be considered a primary treatment modality across all grades of HD. With growing evidence and refinements in technique, it has the potential to redefine the standard of care in proctology.

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Author contribution

Dr. Neeraj Goyal-conceptualisation, methodology, supervision, final manuscript writing, correspondance with the journal, literature review Dr. Purvi Varma -manuscript editing, patient followup, clinical assistance, statistical analysis, literature review Dr. Nikhil Chaudhary-data collection, manuscript writing, prepartion of figures and table.

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Nil.

Conflicts of interest

There are no conflicts of interest.

Data availability statement

All data generated or analysed during this study are publicly available and can be provided by the corresponding author upon reasonable request.

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