

ORIGINAL ARTICLE

Combined laser hemorrhoidoplasty and mucopexy for grade 4 piles: Is it the way forward?

Abdullah Bin Saeed¹, Shaukat Ali², Kashif Nawaz³

ABSTRACT... **Objective:** To evaluate the efficacy, safety, and outcomes of combined laser hemorrhoidoplasty and mucopexy in the management of grade IV hemorrhoidal disease. **Study Design:** Prospective Observational Cohort study. **Setting:** Aziz Fatimah Medical and Dental College, Faisalabad, Pakistan. **Period:** January 1, 2023, to January 1, 2026. **Methods:** A total of 193 patients with grade IV hemorrhoids underwent combined laser hemorrhoidoplasty (LHP) using a 1470-nm diode laser system and mucopexy with absorbable 2-0 polyglactin sutures. Non-probability consecutive sampling was employed. Operative parameters, symptom resolution, complications, and patient outcomes were systematically recorded and analyzed. Follow-up assessments were conducted at 2 weeks, 6 weeks, 3 months, and 6 months postoperatively to evaluate complete symptom resolution, partial improvement, and postoperative complications including hemorrhage, fistula formation, fecal soiling, and pain. **Results:** The mean operative time was 19 ± 3.8 minutes (range: 16–35 minutes). Complete resolution of symptoms was achieved in 85.5% of patients ($n=165$), while 14.5% ($n=28$) experienced partial improvement. Among patients with complete resolution, 32.1% ($n=53$) encountered postoperative complications: secondary hemorrhage ($n=10$, 5.2%), fistula-in-ano ($n=3$, 1.6%), transient fecal soiling ($n=17$, 8.8%), and pain/discomfort ($n=23$, 11.9%). All patients with partial resolution had residual mucosal prolapse despite alleviation of other symptoms. The mean age was 45.2 ± 8.6 years, mean BMI was 27.5 ± 3.4 kg/m², and mean symptom duration was 18.3 ± 6.7 months. **Conclusion:** Combined laser hemorrhoidoplasty and mucopexy demonstrates high efficacy for grade IV hemorrhoidal disease with short operative time and acceptable complication rates. However, residual mucosal prolapse in 14.5% of patients suggests that patient selection and surgical technique refinement remain critical for optimal outcomes.

Key words: Hemorrhoids, Laser Therapy, Minimally Invasive Surgical Procedures, Operative, Postoperative Complications, Rectal Prolapse, Surgical Procedures, Treatment Outcome.

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INTRODUCTION

Hemorrhoidal disease represents one of the most prevalent anorectal conditions, affecting millions of individuals worldwide and significantly impacting quality of life.¹ Grade IV hemorrhoids, characterized by irreducible prolapsed tissue with associated bleeding, pain, and mucous discharge, pose particular therapeutic challenges requiring definitive surgical intervention.² Traditional excisional hemorrhoidectomy techniques, including Milligan-Morgan and Ferguson procedures, have long been considered the gold standard for advanced disease, yet they are associated with significant postoperative pain, prolonged recovery, and potential complications.^{3,4}

The evolution of minimally invasive hemorrhoid surgery has introduced several innovative

approaches aimed at reducing perioperative morbidity while maintaining therapeutic efficacy. Laser hemorrhoidoplasty (LHP), utilizing diode laser energy for hemorrhoidal tissue ablation and vascular coagulation, has emerged as a promising alternative with reported advantages of reduced postoperative pain, shorter operative time, and faster recovery compared to conventional excisional surgery.^{5,6} Systematic reviews have demonstrated that LHP confers lower early complication rates and improved patient satisfaction in selected populations.⁷

However, laser hemorrhoidoplasty alone may be insufficient for managing the significant mucosal prolapse characteristic of grade IV disease. The addition of mucopexy—either suture-based or stapled—addresses the mechanical component of prolapse by repositioning and fixating redundant

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rectal mucosa, theoretically enhancing the durability of symptom resolution.^{8,9} Combined approaches integrating LHP with mucopexy have been described in recent literature, with preliminary evidence suggesting synergistic benefits.^{10,11}

Despite these theoretical advantages, comprehensive outcome data for combined laser hemorrhoidoplasty and mucopexy specifically in grade IV hemorrhoidal disease remain limited. Questions persist regarding optimal patient selection, procedural standardization, complication profiles, and the management of residual prolapse. Furthermore, comparative efficacy data against established surgical modalities are needed to guide evidence-based treatment algorithms.

This study aims to evaluate the efficacy, safety, and outcomes of combined laser hemorrhoidoplasty and mucopexy in a consecutive series of patients with grade IV hemorrhoidal disease. By systematically analyzing operative parameters, symptom resolution rates, and complication profiles, we seek to determine whether this combined approach represents a viable and potentially superior alternative to traditional hemorrhoidectomy for advanced hemorrhoidal disease.

METHODS

Setting

This prospective observational cohort study was conducted at Aziz Fatimah Medical and Dental College, Faisalabad, Pakistan, from January 1, 2023, to January 1, 2026. The study protocol was approved by the institutional ethics committee (Approval Number: AFM & DC/HR/PF-1245, Date: [12 December-2022]), and all patients provided written informed consent prior to enrollment.

Sampling Technique

Non-probability consecutive sampling technique was used where all eligible patients fulfilling inclusion criteria were enrolled prospectively until the required sample size was achieved.

Patient Selection

Inclusion Criteria

- Adults aged 18–75 years

- Clinical diagnosis of grade IV hemorrhoidal disease confirmed by physical examination and proctoscopy
- Symptomatic disease (bleeding, prolapse, pain, or mucous discharge) refractory to conservative management
- American Society of Anesthesiologists (ASA) physical status classification I–III

Exclusion Criteria

- Previous hemorrhoidal surgery
- Concurrent anorectal pathology (fissure, fistula, abscess, malignancy)
- Inflammatory bowel disease
- Coagulopathy or anticoagulant therapy that could not be safely interrupted
- Pregnancy or lactation
- Inability to provide informed consent or comply with follow-up

Surgical Technique

All procedures were performed under saddle anesthesia with patients in the lithotomy position.

Laser Hemorrhoidoplasty Technique

A 1470-nm diode laser system with a radial fiber was employed. The laser fiber was inserted into each hemorrhoidal cushion under direct visualization. Laser energy (10 watts pulse mode) was delivered in a circumferential pattern to achieve tissue shrinkage and vascular coagulation. Energy delivery ranged from 200–600 joules per hemorrhoidal complex (mean: 400 ± 85 joules).

Mucopexy Technique

Following laser ablation, mucopexy was performed using absorbable 2-0 polyglactin sutures in a running or interrupted fashion. Three to six plication sutures (mean: 4 ± 0.8 sutures) were placed circumferentially to elevate and fix prolapsed mucosa to the underlying internal sphincter and perirectal tissue at approximately 2–3 cm above the dentate line.

Postoperative Management

All patients received standardized postoperative care including oral analgesics, stool softeners and fiber supplementation, instructions for sitz baths, and dietary counseling. Patients were typically

discharged on the same day or the following morning and instructed to return for follow-up at 2 weeks, 6 weeks, 3 months, and 6 months postoperatively.

Outcome Measures

Primary Outcomes

- Complete symptom resolution (absence of bleeding, prolapse, pain, and discharge)
- Partial improvement (improvement in some but not all symptoms)
- Operative time

Secondary Outcomes

- Postoperative complications classified according to Clavien-Dindo classification
 - Secondary hemorrhage requiring intervention
 - Fistula-in-ano formation
 - Transient fecal soiling
 - Pain/discomfort requiring additional analgesia
 - Urinary retention
 - Wound infection
- Residual mucosal prolapse
- Patient satisfaction (assessed by visual analog scale)
- Return to normal activities

Statistical Analysis

Data were analyzed using SPSS version 25.0. Continuous variables were expressed as mean $\pm$ standard deviation (SD) or median with range, as appropriate. Categorical variables were presented as frequencies and percentages. Comparisons between groups were performed using Student's t-test or Mann-Whitney U test for continuous variables and chi-square or Fisher's exact test for categorical variables. A p-value <0.05 was considered statistically significant.

RESULTS

Patient Demographics and Baseline Characteristics
A total of 193 patients with grade IV hemorrhoidal disease underwent combined laser hemorrhoidoplasty and mucopexy during the study period. Baseline demographic and clinical characteristics are presented in Table-I.

TABLE-I

Patient demographics and baseline characteristics

Parameter	Value
Total Patients (n)	193
Mean Age (years)	45.2 $\pm$ 8.6 years
Gender Distribution	
- Male, n (%)	100 (51.8%)
- Female, n (%)	93 (48.2%)
Mean BMI	27.5 $\pm$ 3.4 kg/m ²
Mean Symptom Duration	18.3 $\pm$ 6.7 months
ASA Classification	
- ASA I, n (%)	78 (40.4%)
- ASA II, n (%)	92 (47.7%)
- ASA III, n (%)	23 (11.9%)

Operative Parameters

The operative parameters and procedural details are summarized in Table-II. The mean operative time was 19 $\pm$ 3.8 minutes (range: 16–35 minutes), demonstrating procedural efficiency. All procedures were completed successfully without conversion to alternative techniques.

TABLE-II

Operative parameters and procedural details

Parameter	Value
Mean Operative Time	19 $\pm$ 3.8 minutes
Operative Time Range	16–35 minutes
Mean Laser Energy Delivered	400 $\pm$ 85 joules
Laser Energy Range	300–600 joules
Mean Number of Mucopexy Sutures	4 $\pm$ 0.8 sutures
Mucopexy Suture Range	3–6 sutures
Procedure Completion Rate	193/193 (100%)
Conversion to Alternative Technique	0 (0%)

Symptom Resolution and Efficacy

Primary outcomes regarding symptom resolution are presented in Table-III. Complete resolution of all hemorrhoidal symptoms was achieved in 165 patients (85.5%), while 28 patients (14.5%) experienced partial improvement. Among those with partial improvement, the predominant residual complaint was persistent mucosal prolapse, despite resolution of bleeding, pain, and discharge.

TABLE-III		
Primary outcomes - symptom resolution		
Outcome Category	n	%
Complete Resolution of All Symptoms	165	85.5%
Partial Improvement	28	14.5%
Total Patients	193	100%

Symptom-Specific Resolution Rates

Symptom	Resolved	%
Bleeding	193/193	100%
Pain	193/193	100%
Mucous Discharge	193/193	100%
Complete Prolapse Resolution	165/193	85.5%
Residual Prolapse	28/193	14.5%

Postoperative Complications

Among the 165 patients who achieved complete symptom resolution, 53 patients (32.1%) encountered postoperative complications of varying severity. Detailed complication data are presented in Table-IV.

Detailed Complication Management

Secondary Hemorrhage (n=10, 5.2%): Seven patients were managed conservatively with local hemostatic measures and observation, with bleeding resolving within 3–7 days. Three patients required return to the operating room for suture ligation under anesthesia.

Fistula-in-Ano (n=3, 1.6%): Three patients developed low transsphincteric fistulas detected at 4–6 weeks postoperatively during routine follow-up. All were managed successfully with fistulotomy without

compromise of continence function.

Transient Fecal Soiling (n=17, 8.8%): Seventeen patients reported episodes of minor fecal soiling or urgency during the first 4 weeks postoperatively. All cases resolved spontaneously by 8 weeks with conservative management including pelvic floor exercises and dietary modification.

Pain/Discomfort (n=23, 11.9%): Twenty-three patients experienced pain or discomfort requiring additional analgesia beyond the standard protocol. Pain was typically localized to the anal canal and resolved within 2–3 weeks with conservative management using oral analgesics and topical agents.

Residual Mucosal Prolapse

All 28 patients (14.5%) with partial improvement demonstrated residual mucosal prolapse on physical examination at 3-month follow-up (Table-V). These patients reported significant improvement in bleeding, pain, and discharge, but persistent prolapse ranging from small mucosal tags to moderate circumferential redundancy.

DISCUSSION

This study presents comprehensive outcomes of combined laser hemorrhoidoplasty and mucopexy in a substantial cohort of patients with grade IV hemorrhoidal disease. Our findings demonstrate high efficacy with 85.5% complete symptom resolution and efficient operative time averaging 19 ± 3.8 minutes, supporting the potential of this combined approach as a viable alternative to

TABLE-IV			
Postoperative complications			
Complication Type	Number of Patients	Percentage of Complete Resolution Group (n=165)	Percentage of Total Cohort (n=193)
Any Complication	53	32.1%	27.5%
Secondary Hemorrhage	10	6.1%	5.2%
Managed Conservatively	7	4.2%	3.6%
Required Surgical Intervention	3	1.8%	1.6%
Fistula-in-Ano	3	1.8%	1.6%
Transient Fecal Soiling	17	10.3%	8.8%
Pain/Discomfort	23	13.9%	11.9%
No Complications	112	67.9%	58.0%

traditional excisional hemorrhoidectomy.

Table-V	
Characteristics of partial resolution group	
Parameters	Value
Total Patients with Partial Resolution	28 (14.5%)
Residual Mucosal Prolapse	28/28 (100%)
Bleeding Resolution	28/28 (100%)
Pain Resolution	28/28 (100%)
Discharge Resolution	28/28 (100%)

The 85.5% complete resolution rate observed in our series compares favorably with published outcomes of laser hemorrhoidoplasty for advanced disease (Table-VI). Islam et al. reported 97.7% patient satisfaction at 6 weeks following LHP with mucopexy for grade IV cases, though longer-term follow-up data were limited.¹ Elsheikh et al. documented recurrence rates of 17.6% for grades II–III and 50% in a small grade IV subgroup, highlighting the particular challenge posed by advanced prolapse.² Our residual prolapse rate of 14.5% falls within this spectrum and underscores the importance of adequate mucopexy technique and patient selection.

The rapid operative time of 19 ± 3.8 minutes aligns with efficiency data from other laser hemorrhoid series, which report mean procedural times of 14.7 ± 4.7 to 17.9 ± 5.2 minutes.^{1,3} This efficiency translates to reduced anesthesia exposure, lower perioperative costs, and enhanced patient throughput—significant advantages in resource-limited settings.

Our overall complication rate of 32.1% among patients with complete resolution requires careful interpretation. While this figure may initially appear high, the majority of complications were minor

(Clavien-Dindo grade I-II) and self-limiting. The secondary hemorrhage rate of 5.2% is comparable to or lower than rates reported for traditional hemorrhoidectomy, which range from 0.6% to 10% in various series.^{4,5} Importantly, only 1.6% required return to the operating room—a rate substantially lower than the 3–5% reported for Milligan-Morgan hemorrhoidectomy.⁶

The occurrence of fistula-in-ano in 1.6% of patients warrants discussion. While laser procedures are generally not associated with high fistula rates, the addition of deep mucopexy sutures may theoretically increase this risk if sutures inadvertently traverse the sphincter complex or create tissue planes susceptible to infection.⁷ Careful suture placement in the submucosal plane, avoiding muscle incorporation, is critical to mitigate this complication. The fistula rate in our series is comparable to the 1–2% reported for other hemorrhoid procedures involving tissue manipulation.⁸

Transient fecal soiling, affecting 8.8% of patients, is a recognized sequela of procedures involving internal sphincter manipulation or mucosal plication. Tan et al. reported improvement in soiling symptoms following LHP in their recent cohort, suggesting that this complication is typically temporary and resolves with conservative management.⁹ Our observation that all soiling resolved by 8 weeks supports this conclusion and emphasizes the importance of preoperative counseling regarding temporary functional disturbance.

Pain and discomfort requiring additional analgesia occurred in 11.9% of patients, which is significantly lower than the 30–50% reported for conventional excisional hemorrhoidectomy.^{10,11}

TABLE-VI							
Comparison with published literature							
Study	Year	n	Grade	Technique	Operative Time (minutes)	Success Rate (%)	Complication Rate (%)
Current Study	2026	193	IV	LHP + Mucopexy	19 ± 3.8 (16–35)	85.5	27.5
Islam et al.	2024	86	II-IV	LHP + Mucopexy	14.7 ± 4.7	97.7*	Not reported
Elsheikh et al.	2023	103	II-IV	LHP	17.9 ± 5.2	82.4 (II-III), 50 (IV)	Not reported
Kalaskar et al.	2021	104	II-IV	LHP + Mucopexy	Not reported	96.2	3.8 recurrence
Abdelhamid et al.	2023	66	II-III	LHP + HAL	Not reported	100 (1-year)	Lower than MM**

Based on patient satisfaction at 6 weeks MM = Milligan-Morgan hemorrhoidectomy; HAL = Hemorrhoidal artery ligation.

Abdelhamid et al. demonstrated in a randomized trial that LHP combined with hemorrhoidal artery ligation resulted in significantly lower postoperative pain scores compared to Milligan-Morgan hemorrhoidectomy, with faster return to activities.¹² Our findings corroborate these observations and support the minimally invasive nature of the combined laser-mucopexy approach.

The persistent mucosal prolapse in 14.5% of patients represents the primary limitation of this technique and raises important questions about patient selection and procedural adequacy. Several factors may contribute to residual prolapse:

1. **Inadequate Mucopexy:** Insufficient number or placement of plication sutures may fail to adequately elevate and fix prolapsed mucosa. Contemporary literature suggests that 3–6 circumferential sutures are typically required for effective mucopexy in grade IV disease.^{13,14}
2. **Tissue Quality:** Chronic prolapse may result in attenuated, friable mucosa that holds sutures poorly, leading to early suture pull-through and recurrent descent.
3. **Disease Severity:** Patients with massive circumferential prolapse extending beyond 4 cm may require more aggressive excisional components that laser ablation and mucopexy alone cannot adequately address¹⁵

Several management strategies have been proposed for residual prolapse. Delgadillo et al. described a combined approach using stapled mucopexy with selective Milligan-Morgan excision for circumferential grade IV hemorrhoids, reporting faster recovery and low rates of stenosis.¹⁶ This hybrid strategy may be particularly valuable for patients with bulky, irreducible prolapse. Alternatively, planned staged procedures—initial laser ablation and mucopexy followed by selective excision of residual prolapse—may optimize outcomes while minimizing morbidity.

When compared to traditional excisional hemorrhoidectomy, combined LHP and mucopexy offers several advantages:

- **Reduced Postoperative Pain:** Multiple studies demonstrate significantly lower pain scores with laser procedures compared to excisional surgery.^{12,17}

- **Shorter Operative Time:** Mean operative time of 19 ± 3.8 minutes versus 30–45 minutes for hemorrhoidectomy.¹⁸
- **Faster Recovery:** Earlier return to work and normal activities.¹⁹
- **Lower Immediate Morbidity:** Reduced rates of urinary retention, severe bleeding, and wound complications.²⁰

However, excisional hemorrhoidectomy maintains advantages in definitive tissue removal and potentially lower long-term recurrence for massive prolapse. The optimal approach likely involves individualized decision-making based on disease characteristics, patient preferences, and surgeon expertise.

Transanal hemorrhoidal dearterialization (THD) with mucopexy represents another minimally invasive alternative. Randomized data show similar medium-term symptom recurrence between THD with mucopexy and device hemorrhoidectomy for grade III–IV disease, with THD offering reduced early morbidity.²¹ The choice between LHP-mucopexy and THD-mucopexy may depend on available technology, cost considerations, and institutional experience.

LIMITATIONS

Several limitations of this study merit acknowledgment:

1. **Single-Center Design:** Results reflect the experience and technique of surgeons at a single institution and may not be generalizable to all practice settings.
2. **Lack of Randomized Comparison:** Without a concurrent control group undergoing alternative treatments, direct comparative efficacy cannot be definitively established.
3. **Follow-Up Duration:** The 6-month follow-up period, while adequate for assessing immediate outcomes and early complications, is insufficient to evaluate long-term recurrence rates, which may not manifest for 1–2 years.
4. **Selection Bias:** Patients with particularly severe or complex disease may have been preferentially offered traditional hemorrhoidectomy, potentially enriching our cohort with more favorable anatomy.

CONCLUSION

Combined laser hemorrhoidoplasty and mucopexy demonstrates high efficacy for grade IV hemorrhoidal disease, achieving complete symptom resolution in 85.5% of patients with short operative time (19 ± 3.8 minutes) and a predominantly minor complication profile. The procedure offers significant advantages over traditional excisional surgery in terms of reduced pain, faster recovery, and procedural efficiency. However, persistent mucosal prolapse in 14.5% of patients indicates that careful patient selection and potential technical modifications are necessary to optimize outcomes. While this combined approach represents a promising advancement in hemorrhoid surgery, long-term comparative studies are needed to definitively establish its role in the therapeutic algorithm for advanced hemorrhoidal disease. For appropriately selected patients, combined laser hemorrhoidoplasty and mucopexy may indeed represent a viable way forward in the minimally invasive management of grade IV hemorrhoids.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

1	Abdullah Bin Saeed: Principal investigator.
2	Shaukat Ali: Data collection.
3	Kashif Nawaz: Data analysis.