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Original Research Article

Evaluation of Postoperative Pain and Recovery Following Laser Hemorrhoidoplasty: A Prospective Study

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Abstract

Background: Laser hemorrhoidoplasty (LHP) is a tissue preserving procedure for symptomatic hemorrhoidal disease that aims to minimize postoperative pain and promote functional recovery. The aim of this study was to prospectively assess pain trajectories, analgesic use, recovery milestones, early complications and factors related to delayed recovery after LHP.

Methods: Ninety-six adults with symptomatic grade II-III hemorrhoids refractory to conservative therapy underwent standardized 1470-nm diode LHP and were followed for 90 days. The visual analogue scale (VAS) was used to assess pain at 6 hours, 24 hours, day 3 and day 7. Secondary outcomes were analgesic use, return to normal activity and work, complications, symptom resolution, and patient satisfaction.

Results: Mean age was 44.7 ± 11.8 years and 60 (62.5%) participants were male. Mean VAS decreased from 3.1 ± 1.2 at 6 hours to 2.4 ± 1.0 at 24 hours, 1.5 ± 0.9 on day 3, and 0.6 ± 0.7 on day 7 ($p<0.001$). The mean time to normal daily activity was 3.2 ± 1.4 days and return to work was 5.6 ± 2.3 days. There was no anal stenosis or new fecal incontinence, and minor postoperative bleeding occurred in 4.2%, urinary retention in 3.1%, and thrombosed external hemorrhoid in 2.1%. 88.5% achieved full or almost full resolution of symptoms and 91.7% were satisfied or very satisfied at 90 days. On multivariable analysis, grade III disease (adjusted OR 2.72, 95% CI 1.08-6.85), 6-hour VAS ≥4 (OR 3.15, 95% CI 1.24-8.01), and total laser energy >1200 J (OR 2.46, 95% CI 1.01-5.98) independently predicted return to work after >7 days.

Conclusion: LHP was correlated with moderate postoperative pain, which was rapidly decreasing, low early morbidity and early functional recovery. Early pain intensity and disease burden may help to identify patients who need more tailored postoperative care.

Keywords: Laser Hemorrhoidoplasty; Hemorrhoids; Postoperative Pain; Recovery; Diode Laser; Visual Analogue Scale.

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Introduction

Hemorrhoidal disease is one of the most common benign anorectal conditions seen in surgical practice and is clinically significant when bleeding, prolapse, pain, pruritus or hygiene problems do not resolve with diet and office-based treatment. Treatment is based on the severity of the symptoms, the grade of prolapse, the patient's preferences, and the effectiveness of conservative treatment.

The 2024 guideline from the American Society of Colon and Rectal Surgeons (ASCRS) recommends individualized progression from medical and office therapies to operative therapies for persistent symptoms and/or advanced prolapse [1]. Excisional hemorrhoidectomy is still very successful, but pain, wound care, urinary retention, delayed activity, and the fear of stenosis or incontinence have spurred the development of less invasive alternatives. Laser hemorrhoidoplasty is a non-excisional method that uses laser energy to coagulate, obliterate and shrink the hemorrhoidal cushion without destroying anoderm and mucosa.

As the technique has become more widely adopted internationally, recent expert recommendations have tried to standardise patient selection, laser

parameters, peri-operative management and follow-up, although there is still variation in technique [2]. The clinical benefit proposed is not only the reduction of the hemorrhoids, but a different recovery profile with less tissue trauma and possibly less nociceptive stimulation. Overall, systematic reviews have shown that LHP has lower early postoperative VAS scores, shorter operative time, reduced bleeding, and earlier resumption of activity when compared with conventional hemorrhoidectomy [3]. Another meta-analysis of 12 studies and 1756 patients also showed reduced pain at 24 hours, shorter hospital stay, reduced urinary retention, and reduced anal stenosis, with no apparent difference in recurrence during follow-up available [4]. The results herewith confirm the theory that recovery (not just the elimination of hemorrhoidal tissue) is a significant result when evaluating laser treatment.

Randomized evidence also showed that LHP can offer a clinically significant pain reduction and quicker return to regular activity than excisional hemorrhoidectomy, but that recurrence of symptoms requiring treatment may be more common than with excision [5]. Previous comparative studies have found that laser procedures have shorter operative times and less early postoperative pain [6]. More recent randomized data have maintained the pain advantage in the immediate postoperative period, but have questioned the cost, energy delivery, residual disease, and if the amount of benefit is worth the treatment for all patients [7]. So, the short-term comfort benefit is now widely acknowledged, while the most reliable factors for a successful recovery from LHP are less well defined.

Prospective observational studies are valuable because they can provide a description of the day-to-day pain trajectory, the need for analgesics, and the real-world functional milestones following a standardized LHP technique. Low postoperative pain and good symptom improvement were reported with laser treatment in a prospective series of 100 patients, and high patient satisfaction and significant symptom reduction were reported with laser-assisted dearterialization in a multicenter experience [8,9]. But recovery following surgery is variable. The speed at which a patient returns to normal activity and work may be affected by baseline disease grade, energy delivered, early postoperative pain, bowel habit, and local edema.

The current prospective study was thus conducted to assess the postoperative pain and recovery after LHP in adults with symptomatic grade II-III hemorrhoids. The main goal was to measure the change in VAS pain in the first week after surgery. Secondary objectives were to measure analgesic consumption, return to normal activity and work, short-term complications, 90-day symptom control and satisfaction, and to identify independent predictors of delayed functional recovery.

Materials and Methods

Study design and setting: This was a prospective observational study in the Department of General Surgery of a tertiary care teaching hospital for a period of 14 months. Eligible adults who were scheduled to be LHP were enrolled after written informed consent.

Adults (18-70 years) who had Goligher grade II-III symptomatic internal hemorrhoids and who had failed to achieve resolution of bleeding and/or prolapse after 6 weeks of fiber optimization, hydration, bowel-habit modification, and appropriate office-based therapy were eligible, as were patients who preferred operative management. Exclusion criteria included grade IV circumferential prolapse requiring excision, acute thrombosed external hemorrhoids, anorectal malignancy, previous major anorectal surgery, pregnancy, uncontrolled coagulopathy, severe immunosuppression, and failure to follow up.

Preoperative assessment and procedure: Age, sex, body mass index (BMI), hemorrhoid grade, dominant symptoms, constipation, duration of symptoms, and previous office treatment were baseline data. Bowel regulation and routine pre-operative assessment were performed in all patients. LHP was performed under regional or short general anesthesia with a 1470-nm diode laser with a radial fiber. A small hole was created near the outside edge of each target cushion, the fiber was pushed in the submucosal plane toward the hemorrhoidal pedicle, and energy was applied in a controlled fashion as the fiber was slowly pulled back in multiple pulses. Routine removal of external components was not performed. The total laser energy was measured for each patient. Pre-discharge hemostasis was confirmed.

Postoperative care and outcome measures: Patients were given regular oral paracetamol with an NSAID, if not contraindicated; tramadol was available as a rescue drug for uncontrolled pain. Stool softener, fiber supplements, warm sitz baths and fluids were recommended. Pain was assessed at 6 hours, 24 hours, POD3 and day 7 with a 0-10 VAS. Change in VAS over time was the primary outcome. Secondary outcomes were total number of oral analgesics consumed over 7 days, need for rescue opioid, time to return to normal daily activity, time to return to work, postoperative bleeding, urinary retention, thrombosed external hemorrhoid, infection, readmission, stenosis, change in continence, symptom resolution at 30 and 90 days, and satisfaction on a 5-point Likert scale.

Delayed recovery was defined a priori as return to usual occupational activity after >7 postoperative

days. Follow-up visits were conducted at day 7, day 30 and day 90, with telephone review as needed. Complete symptom resolution was defined as no clinically significant bleeding or prolapse, and no requirement for further procedure; near-complete resolution allowed for rare, self-limited bleeding without prolapse or treatment.

Statistical analysis: Analyses were performed using SPSS version 29.0.

Results

Ninety-six patients completed the 90-day follow-up and were included in analysis. Mean age was 44.7 ± 11.8 years, 62.5% were men, and mean BMI was 25.8 ± 3.1 kg/m². Grade III disease was present in 60 patients (62.5%). Bleeding was the dominant symptom in 75.0%, prolapse in 67.7%, and troublesome pruritus or hygiene difficulty in 28.1%. Mean procedure time was 22.6 ± 6.8 minutes and mean delivered laser energy was 1,086 ± 248 J.

Pain decreased steadily across all postoperative observations. Mean VAS was 3.1 ± 1.2 at 6 hours, 2.4 ± 1.0 at 24 hours, 1.5 ± 0.9 on day 3, and 0.6 ± 0.7 on day 7. The overall within-subject change was highly significant ($p<0.001$), and each later assessment was significantly lower than the preceding assessment after multiplicity adjustment. Nine patients (9.4%) required at least one rescue opioid dose. The mean number of non-opioid analgesic doses during the first week was 7.3 ± 3.0, with most consumption occurring during the first 72 hours. Functional recovery was rapid in most participants. Mean time to normal household and personal activity was 3.2 ± 1.4 days, while mean return to work was 5.6 ± 2.3 days. Seventy-eight patients (81.3%) resumed occupational activity by day 7. Grade II patients returned to work earlier than grade III patients (4.8 ± 1.9 vs 6.1 ± 2.4 days, $p=0.006$). Patients with a 6-hour VAS <4 also returned earlier than those with VAS ≥4 (4.9 ± 1.8 vs 7.1 ± 2.6 days, $p<0.001$).

Postoperative morbidity was low and predominantly minor. Four patients (4.2%) reported self-limited bleeding that did not require intervention, three (3.1%) developed transient urinary retention requiring single catheterization, and two (2.1%) developed a thrombosed external hemorrhoidal component managed conservatively. One patient (1.0%) was readmitted for pain and constipation. There were no cases of pelvic sepsis, anal stenosis, clinically apparent sphincter injury, or new fecal incontinence.

At 90 days, 85 patients (88.5%) had complete or near-complete symptom resolution. Five patients (5.2%) had persistent prolapse or recurrent bleeding sufficient to discuss an additional office or operative intervention. Satisfaction was rated as satisfied or very satisfied by 88 patients (91.7%). In multivariable analysis, grade III hemorrhoids, early VAS ≥4, and laser energy >1200 J independently predicted return to work after more than seven days.

Table 1: Baseline and operative characteristics (n=96)

Variable	Value
Age, years	44.7 ± 11.8
Male sex	60 (62.5%)
BMI, kg/m²	25.8 ± 3.1
Grade II hemorrhoids	36 (37.5%)
Grade III hemorrhoids	60 (62.5%)
Bleeding symptom	72 (75.0%)
Prolapse symptom	65 (67.7%)
Constipation	39 (40.6%)
Procedure time, min	22.6 ± 6.8
Total laser energy, J	1086 ± 248

Table 2: Postoperative pain, recovery, and complications

Outcome	Result	p value
VAS pain at 6 h	3.1 ± 1.2	<0.001*
VAS pain at 24 h	2.4 ± 1.0	
VAS pain day 3	1.5 ± 0.9	
VAS pain day 7	0.6 ± 0.7	
Return to normal activity, days	3.2 ± 1.4	-
Return to work, days	5.6 ± 2.3	-
Minor bleeding	4 (4.2%)	-
Urinary retention	3 (3.1%)	-
Thrombosed external hemorrhoid	2 (2.1%)	-
Satisfied/very satisfied at 90 days	88 (91.7%)	-

Table 3: Multivariable predictors of delayed return to work (>7 days)

Predictor	Adjusted OR	95% CI	p value
Grade III vs grade II	2.72	1.08-6.85	0.034
6-hour VAS ≥4	3.15	1.24-8.01	0.016
Laser energy >1200 J	2.46	1.01-5.98	0.047
BMI ≥27.5 kg/m²	1.58	0.63-3.95	0.329
Constipation	1.41	0.58-3.44	0.448

Discussion

The present prospective study illustrates a characteristic recovery pattern following LHP: pain was mild in the immediate postoperative period, and reduced significantly during the first week, with most patients returning to normal activity within a few days, and over 4/5 returning to work by postoperative day 7. The low incidence of urinary retention, bleeding, readmission and anorectal functional complications confirms that tissue preservation may be associated with a good early recovery profile. Importantly, this study also determines clinical characteristics that correlate with slower recovery: grade III disease, higher early pain intensity, and higher delivered laser energy.

These results are in line with the comparative evidence. Meta-analysis of diode laser procedures recently revealed that there was a significant decrease in postoperative pain, bleeding, urinary retention, hospital stay, and time to daily activity when compared with Milligan-Morgan or Ferguson hemorrhoidectomy [10]. These benefits are plausible on a biological basis. As opposed to conventional excision, which leaves anodermal and mucosal wounds in an area of dense somatic innervation, LHP leaves a limited amount of external tissue disruption and produces internal coagulation. The smaller wound surface area may help to minimize nociceptive stimulation during defecation, and it will not have the prolonged open wound phase that occurs with excisional techniques.

Clinically relevant is the serial VAS pattern, which is the pattern of a single pain measurement that underestimates the patient's recovery burden. In this group, mean VAS decreased by over 2 points from 6 hours to day 3 and by day 7, the majority of patients had little or no pain. A randomized controlled trial of LHP versus Milligan-Morgan hemorrhoidectomy also reported a reduced early VAS and reduced requirement for rescue analgesics in the laser group [11]. The randomized study by Poskus et al. also demonstrated quicker return to normal activity following laser therapy, but the lowest recurrence rate for re-treatment was seen with excisional hemorrhoidectomy at 1 year [5]. These observations suggest an important counseling point: LHP may be best for short-term recovery, but patients should be aware that maximal durability for advanced prolapse may be best achieved with excisional surgery.

The complications were good. Bleeding and temporary urinary retention occurred in only a few patients, and no patient developed stenosis or new fecal incontinence. This is similar to the low morbidity rates seen in prospective laser series and multicenter laser dearterialization cohorts [8,9]. Theoretically, the risk of cicatricial narrowing can be minimized by preserving mucocutaneous bridges and avoiding wide excision. Likewise, the technique does not intentionally split the sphincter muscle, which could account for the low rate of new continence disturbance when the fiber is left in the proper submucosal plane.

One of the interesting observations was that early VAS ≥4 was correlated with delayed occupational recovery. Early pain is probably a combination of edema, personal pain sensitivity, disease extent, bowel movement discomfort, and inflammatory response. This may therefore be helpful as a simple bedside procedure for postoperative triage. Proactive multimodal analgesia, increased stool softening and earlier contact may be beneficial in patients with higher early VAS to avoid a pain-constipation-pain cycle. Delayed recovery was also independently associated with grade III disease, possibly due to a larger volume of tissue, more prolapse and more extensive energy application.

The correlation of total energy >1200 J and slower recovery does not imply that high energy is necessarily bad. Hemorrhoid number and volume make energy delivery difficult. However, it reiterates the concept that is stressed in modern LHP guidelines: to treat, not escalate, energy, and to monitor tissue response [2]. The clinical decision was described as a tradeoff between recovery durability, with LHP having consistent short-term recovery benefits and less robust certainty and duration of long-term recurrence data, in a 2026 systematic review of randomized trials [12]. This is especially important in grade III disease and in patients who are most concerned with definitive control of prolapse. Nearly 90% of participants had complete or near-complete symptom resolution and over 90% were satisfied at 90 days. The satisfaction may be related to low pain, rapid mobility, and avoidance of a large perianal wound, as well as anatomical improvement. Five, however, had

persistent or recurrent symptoms that warranted discussion of further treatment. LHP should therefore be offered as a tissue-reducing procedure, rather than as a definitive treatment in all cases for hemorrhoids.

There are some limitations to the study. This was a single-center, non-comparative cohort study, and the pain and recovery experienced cannot be directly attributed to LHP versus another technique. Follow-up was only for 90 days and is not long enough to assess late prolapse or recurrence. Occupational, employer flexibility and socioeconomic factors are important factors in patient-reported return to work. Opioid exposure was minimal and analgesic use was documented in terms of doses, not in terms of morphine equivalents. Lastly, the energy threshold found in regression should be validated outside of the study, not used as a universal procedural threshold. The strengths are that prospective data collection, standardized serial pain measurements, predefined functional outcomes, and multivariable analysis with recovery as the focus, rather than recurrence.

In summary, the findings are favorable for LHP as a surgical procedure for the recovery of suitable grade II-III hemorrhoids. It may be most useful in those who value early pain relief and early return to activity, but with counselling to include the potential for residual or recurrent prolapse and the need for longer-term follow-up.

Conclusion

In patients with symptomatic grade II-III hemorrhoids laser hemorrhoidoplasty was correlated with moderate and quickly resolved postoperative pain, low short-term morbidity and early return to normal activity and work. Delayed functional recovery was independently associated with grade III disease, higher early postoperative pain, and higher laser energy exposure. These results confirm the importance of structured pain assessment and individual postoperative counseling, and highlight the need for longer comparative follow-up to determine the durability.

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