Research Square

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Laser Hemorrhoidoplasty (LHP®) for Symptomatic Hemorrhoids: A 13-Year Retrospective Study of 1,270 Cases

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Research Article

Keywords: Hemorrhoidal disease, Laser Hemorrhoidoplasty, Diode laser, Mucopexy, Minimally invasive surgery

Posted Date: June 18th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-9187513/v1

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Additional Declarations: No competing interests reported.

Abstract

Background: Laser hemorrhoidoplasty (LHP®) is a tissue-preserving technique increasingly used for the management of symptomatic hemorrhoids. Evidence from large, real-world cohorts—particularly including advanced disease—remains limited. Herein, we report the outcomes of LHP® from a single center.

Methods:

The data of consecutive patients who underwent LHP® between July 2010 and December 2023 at a dedicated proctology center was retrospectively abstracted. The extent of hemorrhoidal disease was classified according to the Goligher classification and patients with grade II–IV disease were included for analysis. Outcome measures included: postoperative pain (VAS), early morbidity, and patient´s satisfaction, recurrence, reintervention and continence disturbance.

Results:

A total of 1270 patients (75.9% male) with a mean age of 41.97 ± 13.83 years underwent LHP® during the 13 - year study period. Disease severity included 264 patients (20.8%) with grade II, 504 cases (39.7%) with grade III, and 502 cases (39.5%) with grade IV hemorrhoids. Local anesthesia was used in 1,068 patients (84.1%). The mean duration of LHP® was 12 min for grade II, 16 min for grade III and 18 min for grade IV. The mean total energy delivered was 1016 ± 218 J for grade II, 1,339 ± 312 J for grade III and 2374 ± 639 J for grade IV. Mucopexy was performed in 721 patients (56.8%), including 4.9% of patients with grade II, 40.9% of patients with grade III and in all cases with grade IV hemorrhoids. Median VAS scores (day 1/3/7/15) were 3/1/0/0 for grade II, 4/2/1/0 for grade III, and 7/4/2.8/0 for grade IV; pain-free status (VAS=0) was achieved by day 15 in all grades. Postoperative edema was recorded in 11.8%, bleeding occurred in 3.4%, infection in 2.4%, urinary retention in 2.7%, and external thrombosis in 1.5%. At a mean follow-up of 16.46 ± 11.8 months, recurrence was 2.6% (32/1210), with an overall satisfaction rate of 95.3% among patients with available follow-up.

Conclusions:

In this study LHP® provided durable symptom control with low recurrence, low morbidity, and high patient satisfaction. LHP® in combination with mucopexy offers an effective and safe tissue-preserving option for symptomatic hemorrhoidal disease.

INTRODUCTION

Hemorrhoidal disease is among the most common anorectal conditions worldwide. Reported prevalence range from roughly 3% to 28%, with about 4% of adults experiencing symptomatic disease at any given time [1]. Hemorrhoids represent a component of the anal cushion apparatus and contribute meaningfully to continence. Thus, preserving this delicate component of the continence apparatus should be considered when selecting treatment options [2].

Management options for symptomatic hemorrhoids may include medical therapy, office procedures and surgery, selected according to disease burden. Low-grade disease (Goligher I–II) is often controlled conservatively and with office-based techniques, whereas advanced stages (grades III–IV) commonly require surgical treatment [3]. Over the past two decades, laser hemorrhoidoplasty (LHP®) has emerged as a minimally invasive, tissue-preserving option for the management of hemorrhoidal disease. The technique employs a probe that is placed in the submucosa to deliver laser energy to the hemorrhoidal vessel primarily causing a reduction in vascular inflow and shrinkage of the hemorrhoidal tissue, and subsequently inducing fibrosis of the submucosa with fixation of the hemorrhoidal cushion onto the bowel wall, while minimizing wounds in the sensitive anoderm [1–2].

Comparative evidence from randomized trials, cohort studies, and meta-analyses indicates that LHP® yields less postoperative pain and bleeding, quicker recovery, and similar 12-month symptom control compared to hemorrhoidectomy for grade II–III disease [3–8]. LHP® has also been associated with faster return to normal activities, while maintaining comparable mid-term recurrence when compared with rubber band ligation [9]. Contemporary single-center series further support favorable perioperative profiles and high patient satisfaction with LHP® [3, 8, 10–12].

Given the increasing adoption of the LHP® technique, the recently published LHP recommendations have recently outlined best practices for LHP®, including standard indications (primarily grades II–III), technical parameters (980- or 1470-nm wavelengths in pulsed mode), and when to consider adjuncts such as mucopexy and/or dearterialization for prominent prolapse or selected grade IV cases, particularly in experienced hands [13]. Within this framework, the present study reports a 13-year experience with the LHP® procedure, focusing on safety, pain trajectory, and durable symptom control in grade II–IV hemorrhoids.

MATERIALS & METHODS

This is a retrospective, single-center cohort of consecutive patients who underwent LHP® between July 2010 and December 2023. The study was performed in accordance with the Declaration of Helsinki. All patients provided a written consent for treatment and for anonymized use of their data for research /quality improvement purposes. Ethical approval was obtained from the local ethics committee (CCPSUD) under reference 0077/2018.

Adult patients (≥ 18 years) presenting with symptomatic internal hemorrhoids (Goligher grade II–IV) were retrospectively identified from institutional records and included in the study. Cases with concomitant anorectal malignancy; inflammatory bowel disease; pregnancy; as well as patients receiving antiplatelet or anticoagulant therapy were excluded.

Preoperative assessment included clinical evaluation with digital rectal examination and anoscopy in all cases, while colonoscopy was performed when indicated. Baseline variables including age, sex, hemorrhoid grade per Goligher classification, symptom profile (bleeding, prolapse, pain, pruritus), prior anorectal procedures, concomitant conditions and medications were documented prior to surgery.

Surgical technique

All procedures were performed in lithotomy position in local, regional, or general anesthesia, according to patient´s and surgeon´s preference. A preoperative enema was given in all cases, while perioperative antibiotic was not routinely used.

All procedures were performed using a 1470-nm diode laser system (Biolitec®, Jena, Germany). LHP® was conducted according to a standardized protocol using a radial 360°-emitting fiber. The fiber was introduced via a small incision / punction at the anocutaneous line and advanced submucosally within the hemorrhoidal cushion and laser energy applied to coagulate the vascular plexus, promote fibrosis, and achieve mucosal fixation while preserving the anoderm and sphincter complex (Figs. 1 & 2). Energy was delivered in short pulses with gradual fiber withdrawal; the number of pulses used was tailored to the size and circumferential extent of each pile (Fig. 3).

A short segment mucopexy was added in the cases with prominent or circumferential prolapse, particularly for grade IV disease (Fig. 4), in line with contemporary recommendations [13–14]. Minor associated procedures (e.g., skin-tag excision) were performed as needed and recorded. These procedures were carried out using conventional instruments or separate energy devices when indicated. The laser energy values reported in this study refer exclusively to the intrahemorrhoidal LHP® application and do not include energy delivered for associated procedures.

All patients received a standardized postoperative pathway including oral analgesia, stool softeners, and sitz baths. Patients were typically discharged the same day with written instructions regarding local hygiene, diet, and return to normal activities.

Follow-up consisted of routine visits, which were scheduled at 2, 4, 8 and 12 weeks post-surgery, with additional appointments as needed **(**Fig. 5**)**. Long-term surveillance was completed through clinic visits and/or structured telephone follow-up. Baseline characteristics and perioperative outcomes are reported for the entire cohort (n = 1270), while long-term outcomes (recurrence, satisfaction, continence) were analyzed in the subgroup with available follow-up data (n = 1210).

A priori defined primary outcomes included postoperative pain trajectory and 30-day morbidity. Pain was assessed using a 10-point visual analogue scale (VAS) on postoperative days 1, 3, and 7, as well as the time to pain-free status (VAS = 0) [1, 10, 15]. Early morbidity within 30 days included postoperative bleeding, oedema, thrombosis, mucosal necrosis, infections and urinary retention.

Secondary outcomes included anal stenosis, incontinence and recurrence were recorded after 30 days. Recurrence was defined as reappearance of hemorrhoid-related symptoms after initial recovery, with or without need for further treatment. Reintervention was defined as any additional office-based or surgical procedure performed for recurrent symptoms [2, 13, 16–18]. Additional, patient satisfaction (yes/no) and willingness to recommend LHP® were queried at last contact.

The data generated was put into a dedicated database for analysis. Statistical analysis was performed using IBM SPSS Statistics version 25.0 (IBM Corp., Armonk, NY). Central tendencies were reported as mean ± SD or median with range where necessary. Categorical variables were reported as absolute numbers and percentages. Given the descriptive single-arm design, analyses were primarily descriptive.

RESULTS

From July 2010 to December 2023, 1,270 consecutive patients, including 964 (75.9%) males and 306 (24.1%) females with a mean age of 41.97 ± 13.83 years underwent LHP®. According to Goligher's classification, 264 patients (20.8%) had grade II hemorrhoids, 504 (39.7%) grade III, and 502 (39.5%) grade IV, Table 1.

Table 1
– Demographic data – 1270 patients

Grade II	**N (%)**	**Gender N (%) – M**	**Gender N (%) – F**	**Age (mean ± SD)**
	264 (20.8)	**167 (63.26)**	**97 (36.74)**	**40.62 ± 13.95**
Grade III	504 (39.7)	395 (78.37)	109 (21.63)	40.85 ± 12,83
Grade IV	502 (39.5)	402 (80.08)	100 (19.92)	43.80 ± 13.01
Total	1270 (100)	964 (75.91)	306 (24.09)	41.97 ± 13.83
HD: hemorrhoidal disease				

Most procedures were performed under local anesthesia in 1,068 patients (84.1%). The mean operative time and the amount of energy used increased with increasing disease severity, Table 2. Also, mucopexy was added to LHP® in 721 patients (56.8%), the frequency of which increased with the grade of hemorrhoidal disease. Almost all procedures were performed as day cases 1,236 patients (97.3%) across the cohort. The intraoperative data of the study population is presented in Table 2, while the postoperative pain trajectory is presented in Fig. 6.

Table 2
– Operative parameters

Grade II (N = 264)	**Local anesthesia N (%)**	**Mean operative time (min) mean (min–max)**	**Laser energy delivered (Joules)**	**Mucopexy N (%)**	**Day case N (%)**
	237 (89.77)	**12 (8–15)**	**1016 ± 218**	**13 (4.92)**	**264 (100)**
Grade III (N = 504)	431 (85.52)	16 (12–20)	1339 ± 312	206 (40.87)	488 (96.83)
Grade IV (N = 502)	400 (79.68)	18 (13–26)	2374 ± 639	502 (100)	484 (96.41)
Total (N = 1270)	1068 (84.09)	17 (8–26)	1681 ± 712	721 (56.77)	1236 (97.32)

HD: hemorrhoidal disease

Associated procedures were frequent and mostly related to concomitant benign anal conditions. Removal of skin tags was performed in 158 cases (12.4%). Concomitant anal fissure was treated in 453 instances (35.7%), predominantly by laser sphincterolysis (434 procedures) and less often by laser fissurotomy (19 procedures). Anal fistula was addressed in 33 cases (2.6%), either by laser fistulotomy (n = 17) or combined seton placement with FiLaC® (n = 16), Table 3.

Table 3
– Associated procedures

Associated procedure	**Grade II (N: 264)**	**Grade III (N: 504)**	**Grade IV (N: 502)**	**Total N**
Harmonic or Enseal resection of piles	0	3	9	12
Removal of skin tags	37	49	72	158
Anal fissure				
– Laser sphincterolysis	*201*	*155*	*78*	*434*
– Laser fissurotomy	*7*	*12*	*0*	*19*
Total anal fissure procedures	208	167	78	453
Anal fistula				
– Laser fistulotomy	*4*	*9*	*4*	*17*
*– Seton + FiLaC©**	*3*	*12*	*1*	*16*
Total anal fistula procedures	7	21	5	33
Polypectomy	13	13	9	35
Wart resection	1	4	4	9
SiLaC© for pilonidal sinus*	1	3	1	5
FiLaC©: Fistula Tract Laser Closure				
SiLaC©: Laser treatment of pilonidal sinus				

Postoperative edema was the most frequent early postoperative complication which was seen in 150 patients (11.8%), predominantly in grade IV disease (115/502: 22.9%). Bleeding occurred in 43 patients (3.4%) and was mild in all cases. No patient required surgical reintervention, transfusion, or prolonged hospitalization. Infection occurred in 30 patients (2.4%), and external thrombosis in 19 (1.5%), Table 4.

Table 4
– Early postoperative complications

Grade II (N = 264)	**Necrosis N (%)**	**Oedema N (%)**	**Bleeding N (%)**	**Thrombosis N (%)**	**Infection N (%)**	**Urinary retention N (%)**
	0 (0)	**13 (4.92)**	**3 (1.14)**	**4 (1.52)**	**7 (2.65)**	**6 (2.27)**
Grade III (N = 504)	1 (0.20)	22 (4.37)	16 (3.17)	6 (1.19)	10 (1.98)	7 (1.39)
Grade IV (N = 502)	0 (0)	115 (22.91)	24 (4.78)	9 (1.79)	13 (2.59)	21 (4.18)
Total (N = 1270)	1 (0.08)	150 (11.81)	43 (3.39)	19 (1.50)	30 (2.36)	34 (2.68)
HD: hemorrhoidal disease						

At a mean follow-up of 16.46 ± 11.8 months, long-term outcomes were analyzed in 1210 patients (95.3%) with available follow-up, Table 5. Overall, 1,210 patients (95.3% of those with follow-up) reported being satisfied with the procedure (93.2% in grade II; 94.6% in grade III; 97.0% in grade IV). Recurrence was observed in 32 of 1210 patients (2.6%) and 30 patients (2.4%) required an additional procedure. Transient continence disturbance for flatus was observed in 14 elderly patients (1.1%), all with grade IV disease. These patients had received higher mean energy levels compared with the overall cohort. Symptoms resolved following pelvic floor rehabilitation (biofeedback). No permanent incontinence or anal stenosis was observed in any grade.

Table 5
– Outcomes after a mean follow-up of 16.46 ± 11 months (n = 1210)

Outcome	**Grade II**	**Grade III**	**Grade IV**	**Total (n = 1210)**
Patients satisfied n (%)	246 (93.2)	477 (94.6)	487 (97.0)	1210 (95.3%)
Recurrence n (%)	6	10	16	32 (2.6%)
New procedure n (%)	3	12	15	30 (2.5%)
Transient incontinence n (%)	1	7	6	14 (1.1%)
Permanent incontinence	0	0	0	0
Stenosis	0	0	0	0
HD: hemorrhoidal disease				
BR*: Biofeedback rehabilitation				

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DISCUSSION

This retrospective study investigated the safety and efficacy of laser hemorrhoidoplasty (LHP®) in a large collective of patients undergoing laser surgery for symptomatic hemorrhoidal disease. LHP® demonstrated efficacy for all stages of symptomatic hemorrhoids with rapidly resolving pain, low incidence of early morbidity, low rates of complications and high degree of patients´ satisfaction after a mean follow-up of over 16 months.

Postoperative pain is a major concern for patient undergoing surgery for hemorrhoids. In the present cohort, pain scores declined rapidly after LHP®. This downward trajectory was observed across all severity grades based on the Goligher´s classification, with freedom from pain being recorded within two weeks. This result is consistent with previously published pain trajectory following LHP® [4, 8, 10, 11, 21–23]. Besides less postoperative pain, reduced analgesic requirements, and faster return to normal activities has been reported following LHP® in comparison to hemorrhoidectomy (Milligan–Morgan or Ferguson) [3, 5–7, 18, 22, 24, 25]. Moreover, when compared with rubber band ligation (RBL) for grade II disease, laser treatment offers superior pain control and earlier functional recovery while maintaining comparable mid-term symptom control [9]. Taken together, the findings from this study reaffirms a favorable profile for postoperative pain using the validated VAS instruments [15].

Early postoperative morbidity remained low and was largely minor complications. Edema was the most frequent early complication, occurring 11.8% of cases. Not surprisingly, edema was most commonly observed in patients managed for grade IV disease. In fact, one out of five patients with grade IV hemorrhoids developed postoperative edema in this cohort. This clinically meaningful observation is easily explained by both the bulky prolapse associated with grade IV hemorrhoids and the systematic use of adjunctive mucopexy for a satisfactory management of this cohort. This finding, from the authors ´ perspective may support the routine use of cooling measures with e.g. ice packs or ice finger, as an integral aspect of the LHP® procedure to reduce the risk of edema development.

Bleeding occurred in 3.4% of patients, urinary retention in 2.7%, infection in 2.4%, and external thrombosis in 1.5%, while mucosal necrosis was extremely rate (0.08%). All these complications were managed conservatively and resolved without sequalae. Importantly, serious adverse events and life-threatening complications were not observed in this study. These results are in line with findings from previous LHP® cohorts and observational studies, which consistently report low rates of early complications and a favorable safety profile [4, 8, 10, 11, 13, 21–23].

Functional outcomes and the risk of anal stenosis or incontinence are major concerns when performing anorectal surgery. In this cohort, transient incontinence for flatus was documented in 14 patients (1.1%). Notably, all cases occurred in elderly patients treated for grade IV hemorrhoids, and resolved following pelvic floor rehabilitation. No episodes of liquid or solid stool incontinence were observed, and no permanent continence impairment or anal stenosis was recorded. These findings support the tissue-preserving nature of LHP®, even in advanced disease, while suggesting that transient functional alterations may occur in patients with bulky prolapse secondary to extensive tissue shrinkage. [2, 8, 11,

13, 14, 21–23]. By contrast, classical excisional hemorrhoidectomy has been associated with significant postoperative pain, wound complications, and a non-negligible risk of long-term functional disturbances, including stenosis and altered continence [16–18, 24–27].

Overall patient satisfaction reached 95.3%. Recurrence of symptomatic hemorrhoidal disease was low (2.6% overall), with a modest increase in grade IV compared with grades II–III. This finding is limited by the relatively short duration of follow-up of just about 16 months and therefore should be interpreted with caution. More so, the low rate of recurrence seen in our study may be secondary to the high proportion of cases with additive mucopexy.

An important aspect of this study is that it reflects real-life practice rather than a narrowly selected population. A considerable number of patients underwent LHP® in combination with treatment of concomitant benign anal conditions, including management of skin tags, laser-based treatment of anal fissure, and selected cases of fistula or pilonidal disease. Mixed pathology and complex presentations are common in routine practice [17, 26–27], yet many earlier LHP® studies either focused on lower-grade disease or excluded extensive associated pathology [4, 8, 10, 11, 13, 21]. In our study, associated procedures and adjunctive measures were more frequently required in advanced grades, increasing case complexity and plausibly contributing to higher early local symptoms. This observation may also argue for the high amounts of energy used with increasing disease severity.

An intriguing observation in this study was a possible association between the amount of energy delivered and postoperative pain. A progressive increase in energy was recorded with rising disease grades, with grade IV hemorrhoids needing higher energies than grade III, and grade II requiring the least amount of energy. Equally, a corresponding trend could be observed for postoperative pain trajectory, with the highest VAS being recorded in the group with grade IV, while the lowest VAS was registered in the group with grade II. This finding may suggest a direct relationship between the amount of energy and the risk of postoperative pain. We would be investigating this relationship further and would be happy to present on this in the near future.

Limitations

Although patients were recruited consecutively, this study is limited by its retrospective single-center design and the absence of a control group. Also, the mean follow-up duration of just 16 months is too short so that long-term results are not available. More so, the management of concomitant anorectal may have influenced the amount of energy used during surgery as well as postoperative outcomes, especially pain. Some limitations may apply to the means of follow-up, especially for the cases with telephone follow-up as patients may not be able to adequate recognize and identify recurrence.

Despite these limitations, the findings from this large cohort gathered over 13 years argue for the safety and efficacy of LHP® in the management of symptomatic hemorrhoids. When performed according to current recommendations and combined with mucopexy and associated procedures as indicated, LHP® offers a compelling balance between efficacy, safety, functional preservation, and patient comfort.

Going forward, multicenter studies and randomized comparisons with other tissue-preserving and excisional techniques will be valuable to further refine patient selection and to define the optimal place of LHP® within the therapeutic algorithm for hemorrhoidal disease [6, 7, 14, 29, 30].

CONCLUSION

In this study LHP® provided durable symptom control with low recurrence, low morbidity, and high patient satisfaction. LHP® in combination with mucopexy offers an effective and safe tissue-preserving option for symptomatic hemorrhoidal disease

Declarations

Conflict of interest: MO is an international trainer in laser proctology for Biolitec®, PCA is a trainer and consultant for Biolitec. No company had any role in the study design, data collection/analysis, manuscript preparation, or the decision to submit. The other authors declare no competing interests

Availability of data:

All datasets analyzed during this study are reported in the results section

Acknowledgement: Many thanks to Mr. Endrik Groenhoff and Thomas Rudolph from Biolitec for their support.

Authors 'contribution:

Data collection: MO

Data analysis: MO, PCA

Drafted the manuscript: MO, ND

Revised the manuscript: PCA, MO, ND

Final approval: all authors

Informed consent statement: Informed consent was obtained from all individual participants included in the study

Funding: This study received no external funding.

Role of the funder: Not applicable

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Figures



Figure 1

Excision of external hemorrhoidal tags/pile apex (when required).

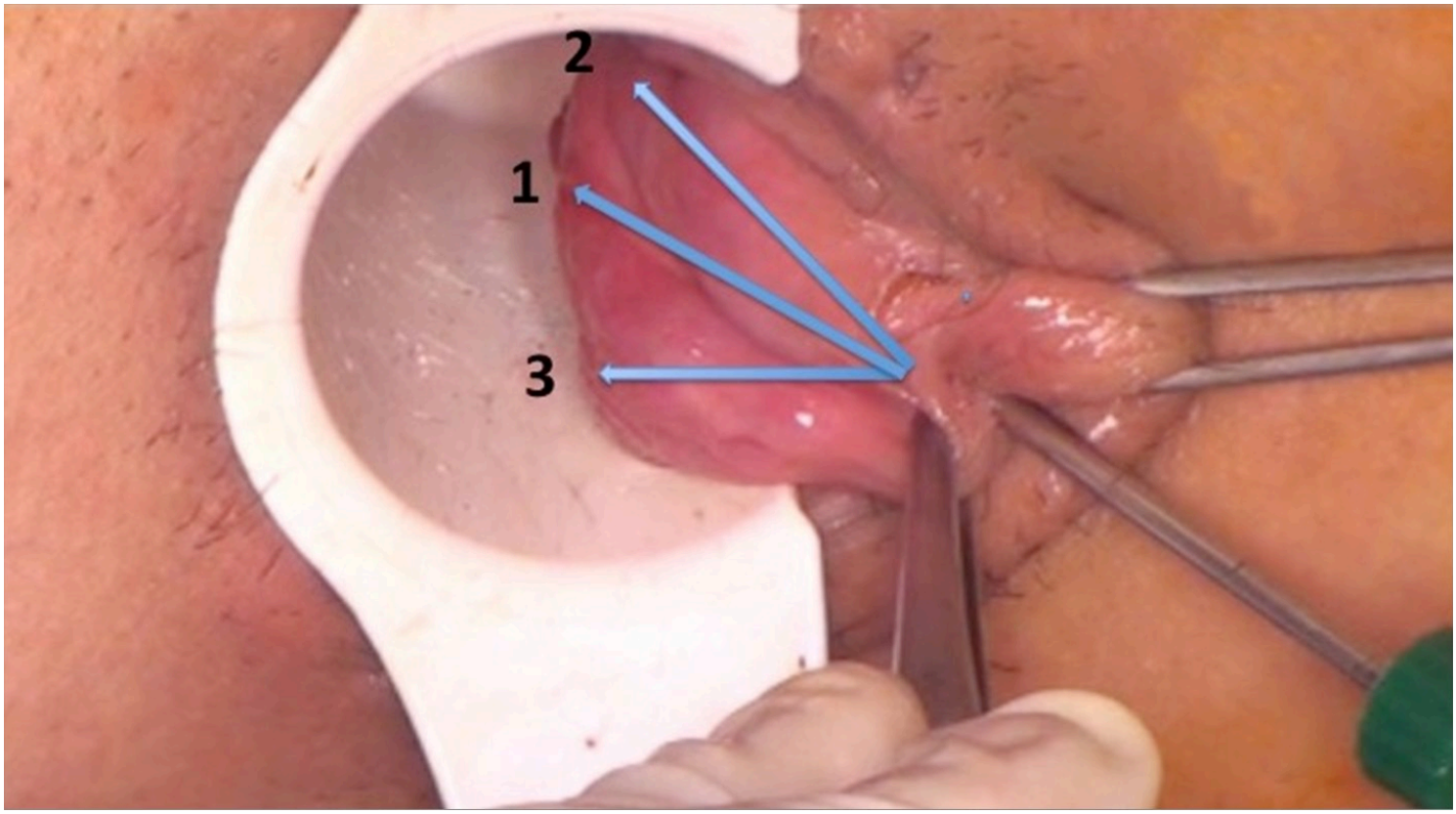


Figure 2

Laser firing pattern and fiber positioning within the hemorrhoidal cushion

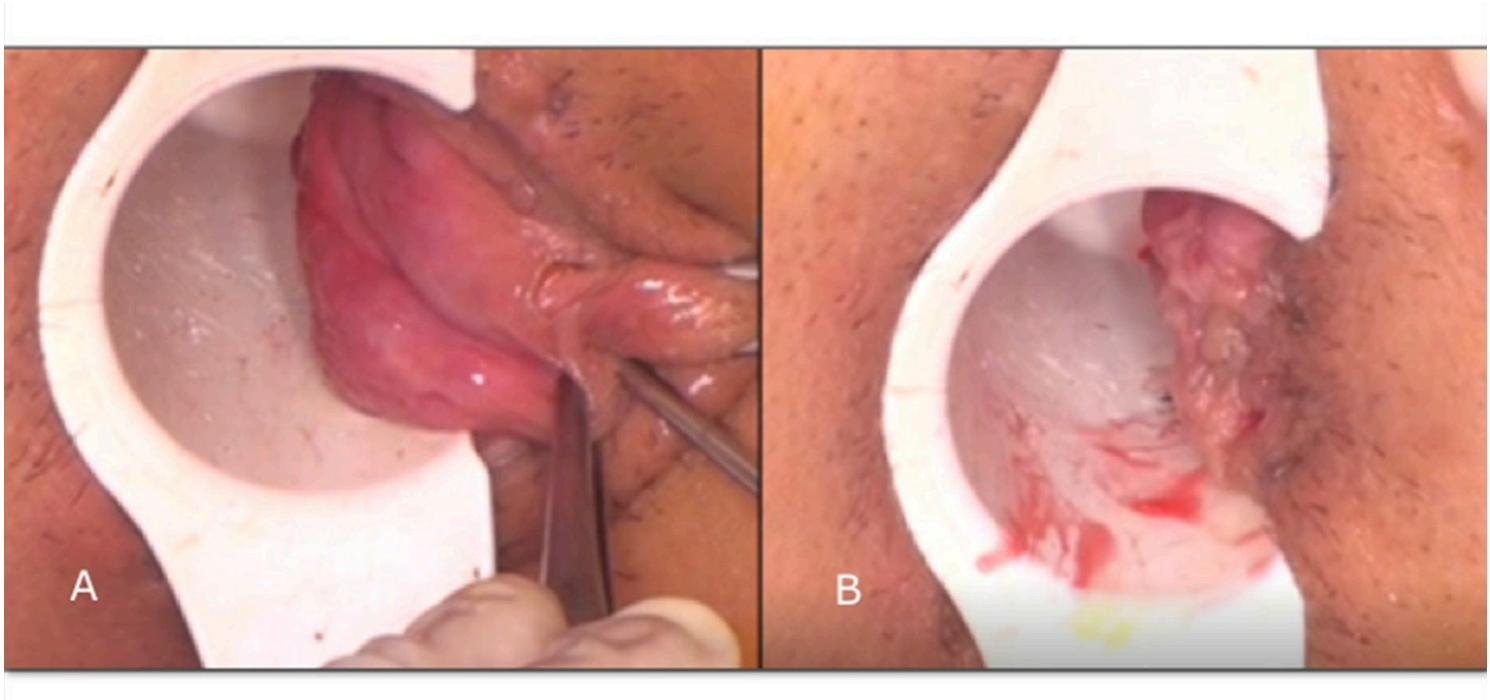


Figure 3

Steps of the LHP® procedure (submucosal fiber insertion and controlled withdrawal).

A: The Fiber is pushed directly in the hemorrhoid’s node submucosally and parallerlly to anal canal then we start shooting Laser.

B: Shrinkage of the hemorroidal tissue without any mucosal destruction

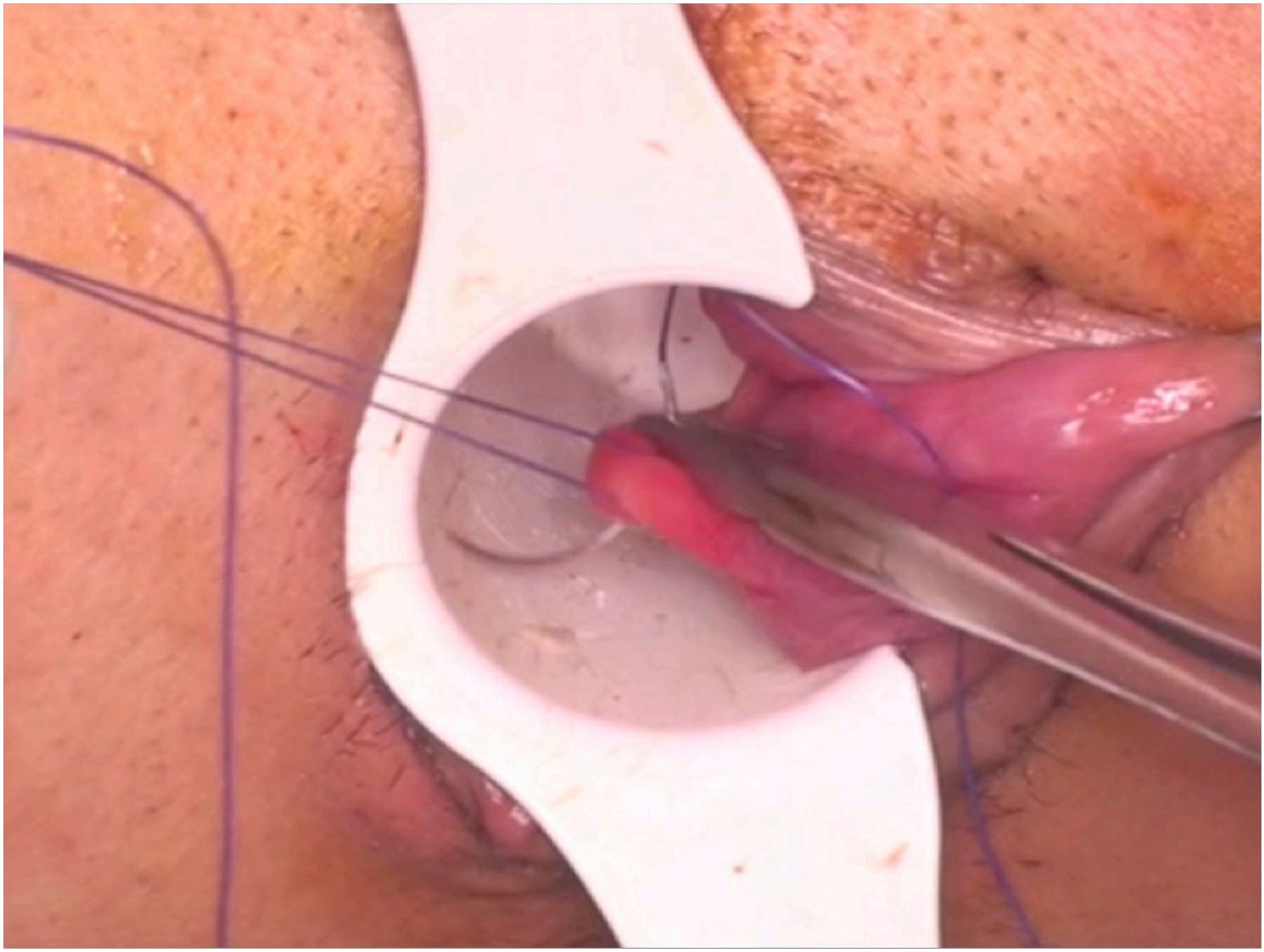


Figure 4

Short-segment mucopexy for prolapse reduction (grade IV).

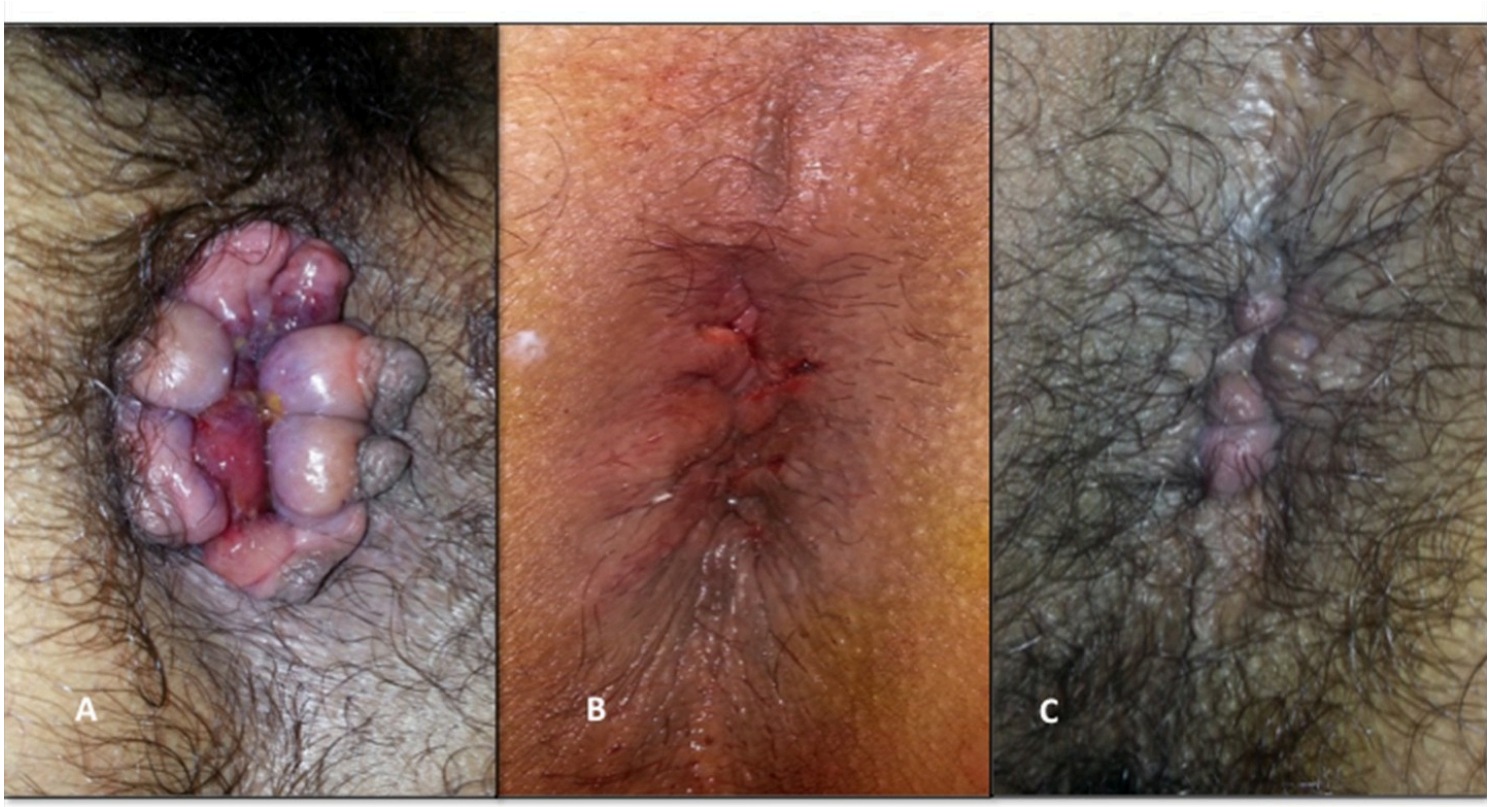


Figure 5

Postoperative result for hemorrhoid stage IV after LHP® Procedure

A: Preoperative view

B: Immediate postoperative view

C: View after 45 days

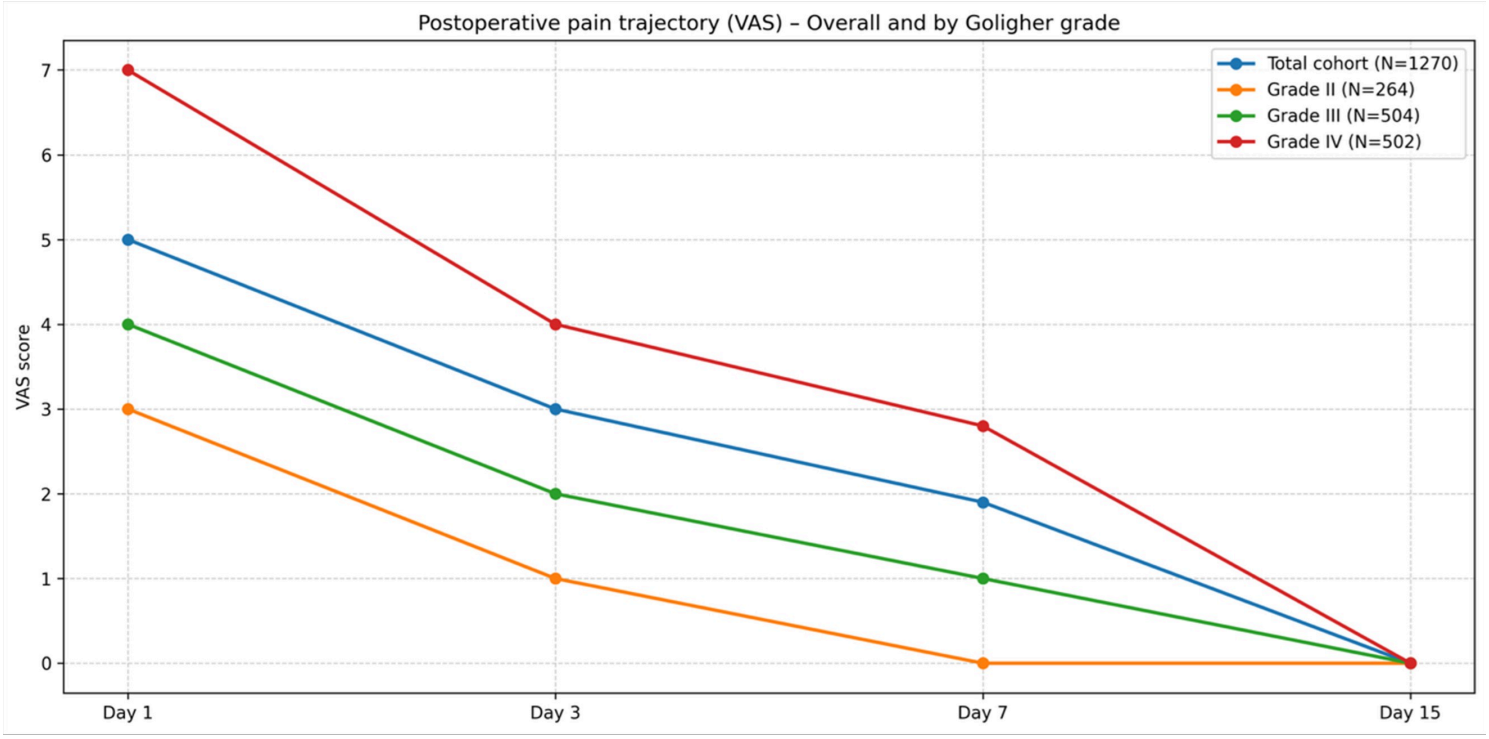


Figure 6

Postoperative pain trajectory (VAS) by grade.