Laser hemorrhoidoplasty for the treatment of second-degree and third-degree hemorrhoids, is it effective?

Original Article

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ABSTRACT

Background: Treatment of anorectal diseases has always been a challenge as there are many treatment options, and this multiplicity added more confusion about the best modality for treatment, which is still controversial. This work aimed to analyze the safety and efficacy of laser hemorrhoidoplasty therapy using the 1470 nm laser in patients with second-degree and third-degree hemorrhoids.

Patients and Methods: This prospective clinical study was carried out on 100 patients aged from 19 to 59 years, both sexes, with second-degree or third-degree hemorrhoids after failure of medical treatment. Endoscopic evaluation of the colon was performed on high-risk patients aged over 50 presenting with symptomatic hemorrhoids and rectal bleeding to exclude any associated pathology.

Results: A Intraoperative complications were hematoma in 15 (15%) patients and mucosal injury in four (4%) patients. Operative duration ranged from 7 to 22 min with a mean±SD value of 16.95±2.94 min. Postoperative pain score and discharge were significantly lower after 1 weak, 1 month, and 3 months compared to after 24 h ($P<0.05$). Postoperative bleeding and edema were insignificantly different between after 24 h and 1 weak and significantly lower after 1 and 3 months compared to after 24 h ($P<0.05$). Postoperative stenosis, incontinence, and recurrence were not reported in any patients.

Conclusion: We conclude that diode laser is a safe, minimally invasive method for treating second-degree and third-degree hemorrhoids with the advantages of low postoperative pain, short hospital stay, early return to normal activities, and short operative time. However, it is important to know that laser hemorrhoidoplasty costs more than conventional procedures.

Key Words: Laser hemorrhoidoplasty, second-degree hemorrhoids, third-degree hemorrhoids, visual analog scale.

Received: 13 June 2024, **Accepted:** 2 July 2024, **Published:** 4 October 2024

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ISSN: 1110-1121, October 2024, Vol. 43, No. 4: 1532-1539, © The Egyptian Journal of Surgery

INTRODUCTION

Every healthy person has naturally occurring cushions called hemorrhoids. These cushions encircle the anus in a layer of protection[1]. Nevertheless, rather than referring to the typical anatomical structure itself, the name "hemroids" generally refers to the diseased state of symptomatic hemorrhoid illness[2].

Hemorrhoidal tissue can be classified into two types: external and internal. External hemorrhoids are located below the dentate line, and internal hemorrhoids are situated above the dentate line. First-degree hemorrhoids protrude into the anal canal but do not protrude outside. Second-degree hemorrhoids may prolapse outside the anal canal during bowel movements or straining, but they spontaneously retract afterward. Third-degree hemorrhoids also prolapse during the mentioned activities but require manual reduction by the patient. Fourth-degree hemorrhoids, the most severe type, remain prolapsed outside the anus and cannot be reduced[3]. Prolapsed hemorrhoids are at risk of developing complications such as ischemia, thrombosis, or gangrene[4].

There are still numerous debates about the optimal surgical treatment for hemorrhoids, namely excision or ligation, which are considered the traditional procedures. Unfortunately, significant postoperative pain is frequently reported following these interventions. However, the introduction of minimally invasive surgical techniques has shown promising results in terms of symptom control and reduced postoperative pain, thereby providing an alternative to conventional procedures[5].

When the Nd : YAG laser was initially applied to anorectal surgery in the 1960s, proctology saw its first application of laser technology. These initial attempts had poor results. The CO_2 laser and the pulsed laser were developed in the 1980s as part of the advancement of laser technology, which improved the results[6]. The use

DOI: 10.21608/EJSUR.2024.297455.1100

of diode lasers for hemorrhoids was initially reported by Karahaliloglu[7]. When hemorrhoids were treated by coagulating the hemorrhoidal cushion using laser fibers with a 980 nm diode laser. Next, in 2009, Plapler *et al*.[8] reported treating second-degree and third-degree hemorrhoids with an 810 nm diode laser. Hemorrhoidal laser therapy using the 1470 nm laser unit was introduced in 2016, and it was given the name laser hemorrhoidoplasty (LHP). This approach aimed to provide a less invasive treatment option for hemorrhoids[9].

This work aimed to analyze the safety and efficacy of LHP therapy using the 1470 nm laser in patients with second-degree and third-degree hemorrhoids.

PATIENTS AND METHODS:

This prospective clinical study was carried out on 100 patients aged from 19 to 59 years, both sexes, with second-degree or third-degree hemorrhoids after failure of medical treatment. The study was done after approval from the Ethical Committee Tanta University Hospitals, Egypt, from January 2022 to December 2023. Informed written consent was obtained from all patients.

Inclusion criteria for the patients: adult patients aged 18 years or more, second-degree or third-degree hemorrhoids, and failure of medical treatment in third-degree hemorrhoids.

Exclusion criteria for the patients: patients younger than 18 years, fourth degree of hemorrhoids, severe mucosal prolapse, previous surgical intervention for hemorrhoids, associated anal conditions (fecal incontinence, anal stenosis, anal fissure, anal fistula, or anorectal mass), patients affected by IBD, patients having bleeding tendency or on anticoagulant therapy, and pregnant females.

All patients were subjected to history taking, clinical examination (by digital rectal examination), usual laboratory investigations, and endoscopic evaluation of the colon was performed on high-risk patients aged over 50 presenting with symptomatic hemorrhoids and painless rectal bleeding to exclude any associated pathology.

Operative procedure: enema was done the day before the operation. Single doses of prophylactic antibiotic before induction of anesthesia were administered: ceftriaxone (1 g i.v.) and flagyl (500 mg i.v. vial).

Anesthesia: patients were under spinal anesthesia, saddle block, or general anesthesia. Position: following induction of anesthesia, patients were positioned in a lithotomy position. Type of device and fibers: the device used is “GigaLaser diode laser” using bare fiber probes, which is suitable for piles using wavelength 1470 nm (Fig. 1).

The operative technique of LHP: starting with proper clinical examination with digital rectal examination in a lithotomy position. A dedicated transparent disposable anoscope (23 mm in diameter) was inserted in the anal canal (Fig. 2).

The procedure started by using continuous mode for the introduction of the probe at the mucocutaneous junction of the anus at the base of each hemorrhoid, taking into consideration that the fiber should be parallel to the anal canal (Fig. 3).

The red light from the laser should be used to guide the probe after the room light has been dimmed in order to prevent burns, hematoma development, and damage to the mucosa or internal anal sphincter. The submucosal tissue was penetrated by the probe until it reached the region beneath the distal rectal mucosa, as shown in (Fig. 4).

Wearing anti-laser glasses before laser firing is advised to shield the eyes from the diffusely reflected laser’s photocoagulation impact. To lessen undesirable periarterial normal tissue affection, laser pulses were pulsed via the optic probe. The laser beam’s power and duration may be adjusted to regulate the shrinking depth. A total of 250–350 J were produced for each hemorrhoidal cushion by firing 8 W laser beams via the optic probe for 3 s. An ice pack was placed within the anus for 1–2 min after each hemorrhoid was finished in order to lessen the heat impact and the possible postoperative irritation (Fig. 5).

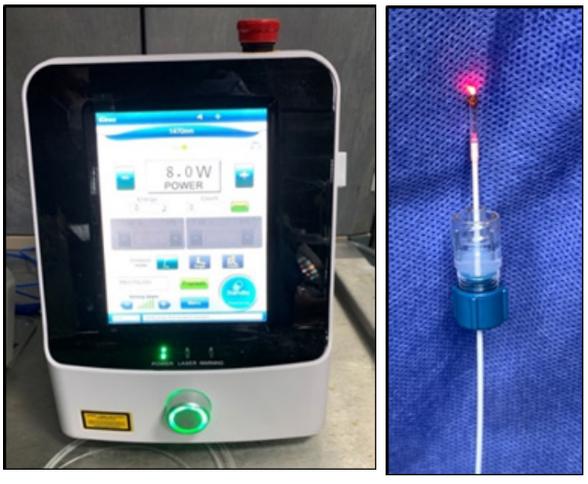

Fig. 1: GigaLaser diode laser demonstrating a power of 8 W, with the bare fiber probe.

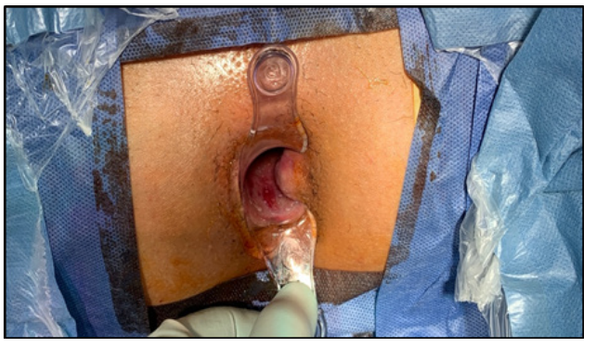

Fig. 2: Disposable anoscope inserted in the anal canal.

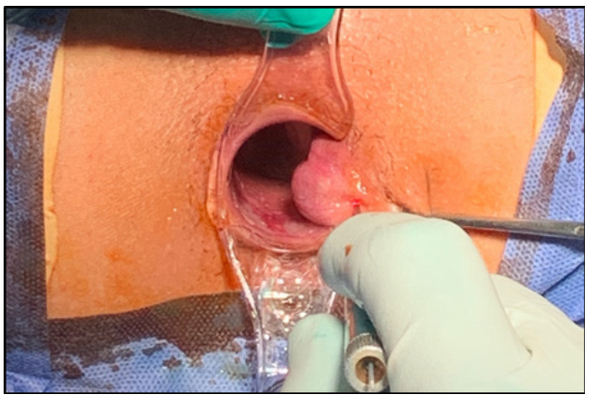

Fig. 3: Laser fiber was introduced into the hemorrhoidal plexus.

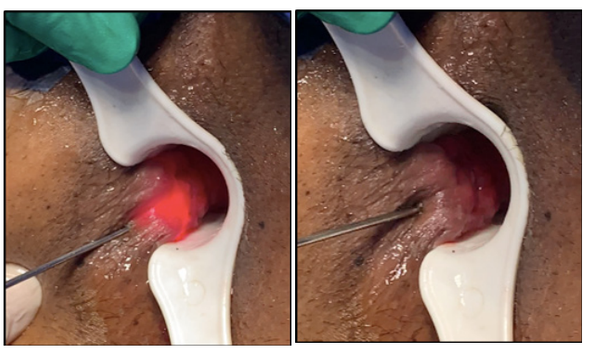

Fig. 4: Red light guidance during pulsed coagulation of hemorrhoidal plexus.

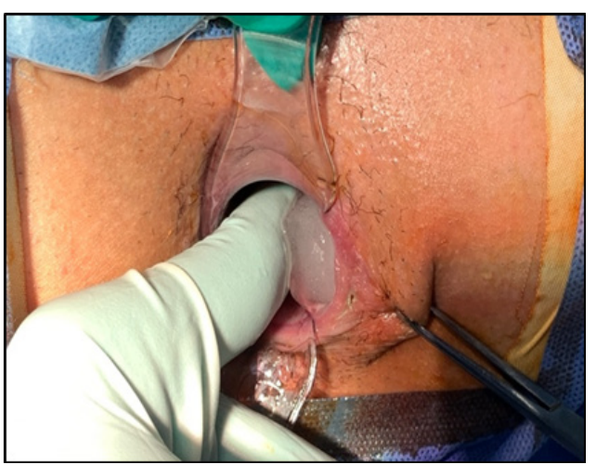

Fig. 5: An ice pack to decrease the heat effect of the laser.

Postoperative follow-up: follow-up of patients was performed at 24-h, 1 week, 1 month, and 3 months postoperatively in terms of postoperative pain, discharge, and or bleeding. Postoperative pain was assessed using the visual analog scale (VAS). Postoperative bleeding in the form of spontaneous postdefecatory spotting was assessed. Postoperative discharge in the form of serous or mucus discharge was recorded. Follow-up of other complications such as recurrence, stenosis, or incontinence were evaluated after 6-month interval. Patients were discharged the next day of operation to record the 24-h follow-up.

Statistical analysis

IBM Inc. (Chicago, IL, USA) used SPSS v26 for statistical analysis. The SD and mean were used to represent quantitative variables. The Wilcoxon test was used to compare quantitative nonparametric data that were given as the median and interquartile range. When applicable, the Fisher's exact test or the χ^2 test was used to examine the frequency and percentage (%) of the qualitative variables.

RESULTS:

The age of the studied patients ranged from 19 to 59 years, with a mean±SD values of 37.77±11.28 years. There were 59 (59%) males and 41 (41%) females. Medical history was diabetes and/or hypertension in 15 (15%) patients. Complaints were swelling in 100 (100%) patients, bleeding in 50 (50%) patients and pain in 32 (32%) patients. Hemorrhoids degree was second-degree in 23 (23%) patients and third-degree in 77 (77%) patients (Table 1).

Intraoperative complications were hematoma in 15 (15%) patients and mucosal injury in four (4%) patients. Operative duration ranged from 7 to 22 min with a mean±SD value of 16.95±2.94 min (Table 2).

Postoperative pain score (Fig. 6) and discharge were significantly lower after 1 week, 1 month, and 3 months compared to after 24 h ($P<0.05$). Postoperative bleeding and edema showed an insignificant difference between after 24 h and 1 week and were significantly lower after 1 and 3 months compared to after 24 h ($P<0.05$). Postoperative stenosis, incontinence, and recurrence were not reported in any patients (Table 3).

Regression analysis

Univariate regression analysis for several independent factors in relation to the dependent factor postoperative pain score at 24-h of operation revealed that the older age of the patient, preoperative bleeding, the higher degree of hemorrhoids, and the occurrence of intraoperative mucosal thermal injury were associated with a significantly higher score of postoperative pain. The meanwhile, multivariate regression analysis showed that only the occurrence

of intraoperative mucosal injury and the higher degree of hemorrhoids were significant predictors of higher postoperative pain scores (Table 4).

Case

Third-degree hemorrhoids are shown in (Fig. 7).

Table 1: Preoperative data of the studied patients

	N=100
Age (years)	37.8±11.28
Sex	
Male	59 (59)
Female	41 (41)
Medical comorbidities	
DM/HTN	15 (15)
Complaints	
Swelling	100 (100)
Bleeding	50 (50)
Pain	32 (32)
Hemorrhoids degree	
2nd degree	23 (23)
3rd degree	77 (77)

Data are presented as mean±SD or frequency (%).
DM, diabetes mellitus; HTN, hypertension.

Table 2: Intraoperative data of the studied patients

	N=100
Complications	
Hematoma	15 (15)
Mucosal injury	4 (4)
Operative duration (min)	17±2.94

Data are presented as mean±SD or frequency (%).

Table 3: Postoperative data of the studied patients

		P value
VAS [mean±SD (range)]		
24 h	4.58±1.79 (3–6)	
1 weak	2.44±1.32 (1–3)	<0.001*
1 month	1 (1–1.25)	<0.001*
3 months	1 (1–1)	<0.001*
Bleeding – *n* (%)		
24 h	11 (11)	
1 weak	7 (7)	0.458
1 month	0	0.007*
3 months	0	0.007*
Edema – *n* (%)		
24 h	22 (22)	
1 weak	14 (14)	0.07
1 month	0	<0.001*
3 months	0	<0.001*
Discharge – *n* (%)		
24 h	19 (19)	
1 weak	6 (6)	0.010*
1 month	0	<0.001*
3 months	0	<0.001*

VAS, visual analog scale.
*Significant as *P value* less than or equal to 0.05, *P value* compared to 24 h.

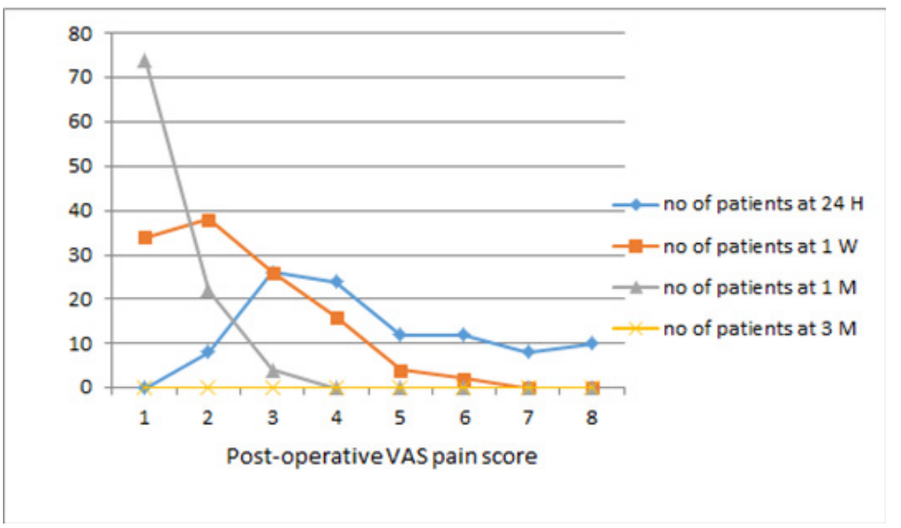

Fig. 6: Follow up on the number of patients with postoperative pain and their VAS scores. VAS, visual analog scale.

Table 4: Regression analysis of the studied factors in relation to 24-h postoperative pain score (predictors of more 24-h postoperative pain)

Univariate linear regression				
	Regression coefficient		95% confidence interval for *B*	
	B	*P* value	Lower	Upper
Age	0.066	0.004*	0.022	0.109
Sex	–0.263	0.612	–1.3	0.774
Preoperative swelling	0.604	0.646	–2.024	3.232
Preoperative bleeding	1.196	0.017*	–2.169	–0.222
Preoperative pain	0.25	0.651	–0.854	1.354
Degree of hemorrhoids	1.86	0.001*	0.778	2.941
Medical comorbidity	–0.28	0.724	–1.867	1.306
Operative time (min)	0.044	0.689	–0.176	0.265
Intraoperative hematoma	0.987	0.18	–0.473	2.447
Intraoperative mucosal injury	3.174	<0.001*	1.509	4.839
Postoperative bleeding 24 h	0.728	0.443	–1.163	2.619
Postoperative discharge 24 h	1.054	0.112	–0.254	2.362
Postoperative edema 24 h	0.508	0.337	–0.546	1.561
Multivariate linear regression				
	Regression coefficient		95% confidence interval for *B*	
	B	*P* value	Lower	Upper
Age	0.024	0.248	–0.017	0.064
Preoperative bleeding	–0.805	0.062	–1.651	0.041
Intraoperative mucosal injury	2.381	0.002*	0.885	3.876
Degree of hemorrhoids	1.429	0.004*	0.469	2.388

*Statistically significant.

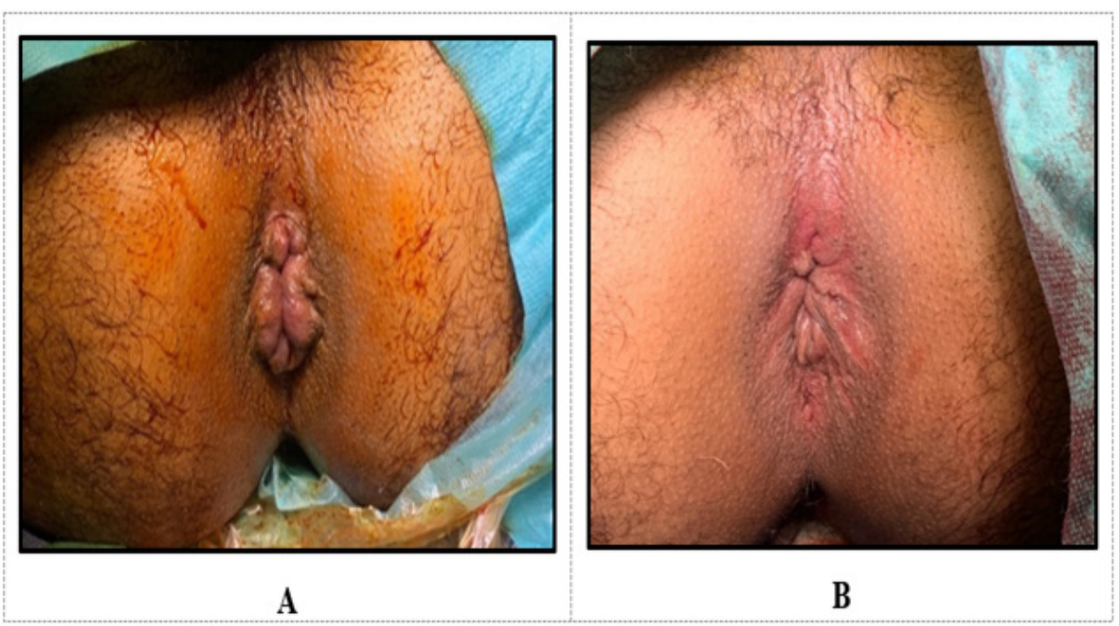

Fig. 7: (a) Preoperative third-degree hemorrhoids. (b) Shrinkage of hemorrhoids immediately after the procedure.

DISCUSSION

Treatment of anorectal diseases has always been a challenge as there are many treatment options, and this multiplicity added more confusion about the best modality for treatment, which is still controversial[10]. LHP has been available as a new modality of minimally invasive procedure alternative treatment of advanced hemorrhoid problems[11].

In terms of age and sex, 41 (41%) of the patients in the current research were female, and 59 (59%) were male. Their ages, with a mean of 37.77±11.28 years, varied from 19 to 59 years. The age distribution of the LHP group in Maloku *et al*.'s[12] research was 34.73±10.17 years. Eskandaros and Darwish[13] also stated that the average age of the LHP group was 40.8±8.8 years. Additionally, there were 35 (29.17%) female patients and 85 (70.83%) male patients.

As regard to the hemorrhoidal degree in our study, 23 (23%) patients experienced second-degree hemorrhoids, and 77 (77%) patients had third-degree hemorrhoids. Initial studies by De Nardi *et al*.[14] suggest that LHP is effective mostly for second-degree and third-degree hemorrhoids with minimal mucosal prolapse. Karahaliloglu[15], Jahanshahi *et al*.[16], Boarini *et al*.[17], and Giamundo *et al*.[18] included first-degree and fourth-degree hemorrhoids. However, they concluded that LHP should be considered for the treatment of second-degree and third-degree hemorrhoids unresponsive to conservative management. LHP has been usually recommended for treatment of second-degree and third-degree hemorrhoids in these studies.

In terms of the length of the operation, the current study's mean±SD of 16.95±2.94 min fell between 7 and 22 min. This was consistent with a study by Maloku *et al*.[19] that found a significant difference between the mean operative times of 15.94±3.5 min for the LHP group and 26.76±5.8 min for the open surgery group. Additionally, this was in line with the findings of the study by Eskandaros and Darwish[13], who discovered a substantial difference in the mean operation times between the groups: 22.8±3.9 min for group LHP and 27.5±5.3 min for group open hemorrhoidectomy. The operating duration in Loutfy *et al*.'s[20] trial varied from 13 to 20 min, with a mean±SD of 17.18±2.21 min in the LHP group.

In the present study, two undesirable intraoperative events due to tissue injury occurred in some patients, namely, intraoperative hematoma in 15 (15%) patients, and four (4%) of these patients had intraoperative mucosal thermal injury when the energy was applied for an extended period. Operative duration was longer, and the postoperative pain score was higher in patients with intraoperative hematoma or mucosal thermal injury, but it was not statistically significant in our study. In a systematic review of Longchamp *et al*.[21], mucosal injury rate during LHP was 0.9%, while intraoperative hemorrhage and/or hematoma ranged from 0 to 1.9%.

During follow-up visits, patients of our study experienced some postoperative troubles in terms of postoperative pain, bleeding, edema, and discharge.

In our study, postoperative pain score and discharge were significantly lower after 1 week, 1 month, and 3 months compared to after 24 h ($P<0.05$). Postoperative bleeding and edema were insignificantly different between after 24 h and 1 week and significantly lower after 1 and 3 months compared to after 24 h ($P<0.05$). Postoperative stenosis, incontinence, and recurrence did not occur in any patients.

The mean postoperative pain VAS score was 4.58±1.79 (range, 3–6) at 24 h and 2.44±1.32 (range, 1–3) in first week visits in the present study. Our study results were in accordance with Mohammed *et al*.[22], who found that post-LHP, 98.6% of patients developed mild pain after the procedure, controlled by injectable analgesia, which was replaced by oral analgesia on the second day. Also, 85.2% of their patients who had mild pain were kept on oral analgesia till fifth postoperative day, and all of the patients stopped analgesia at day 8. In the study of Loutfy *et al*.[20], LHP patients reported a range of 2–6 on the VAS score, with a mean±SD of 2.94±1.09 in 24-h evaluation, and a range of 1–3 on the VAS score, with a mean±SD of 1.18±0.53 in first week evaluation.

At 24 h in the present work, 11 (11%) patients had postoperative bleeding, 22 (22%) patients had postoperative edema, and 19 (19%) patients had postoperative discharge. Meanwhile, at first week visits, seven (7%) patients had bleeding, 14 (14%) patients had edema, and six (6%) patients had discharge.

In Agrawal and Chopra's[23] trial, which used LHP, only three (7.5%) patients experienced bleeding during week 1, and from week 2 onward, there was no bleeding. Additionally, in the Maloku *et al*.[19] trial, small-scale bleeding was experienced by 13% of patients in the LHP group and 77% of patients in the open hemorrhoidectomy group in the initial days following the intervention; this difference was statistically significant. A statistically significant difference was seen in the presence of bleeding on day 7, with 10% of patients in the LHP group and 33% of patients in the open hemorrhoidectomy group experiencing it. On day 60, following the intervention, not a single one of their groups was bleeding. According to Mohammed *et al*.[22], 89.8% of patients experienced light bleeding

in the form of spotting following defecation after receiving LHP. Just 6% continued to spot into the fifth day. One percent more experienced moderate to severe bleeding. After LHP, bleeding was far less common than after a conventional hemorrhoidectomy.

Poskus *et al*.[24] reported 10 (25%) cases suffered from postoperative discharge and itching. Also, Hassan and El-Shemy[25] reported that 5% of cases presented with postoperative discharge or abscess formation. Talaat *et al*.[26] reported that there was no postoperative discharge in the first 24 h after surgery, but two (8.3%) cases developed serous discharge after 3 days and continued to 1 week, then the discharge stopped after 2 weeks and up to 6 months of follow up. In the study of Loutfy *et al*.[20], the first day (100%) of cases showed no discharge in the LHP group. In the first week in the LHP group (11.8%) of cases had grade 1 minimal discharge. After the 1st week, 100% of cases reported no discharge.

In the study of Talaat *et al*.[26] postoperative edema was present in six (23.1%) patients and was treated conservatively by local and systemic anti-inflammatory medications.

Limitations

The small number of patients and short follow-up period were the only limitations of our study. The long-term results and recurrence rate should be evaluated in larger prospective studies.

CONCLUSION AND RECOMMENDATION

Our research leads us to the conclusion that diode laser is a safe, minimally invasive method for treating second-degree and third-degree hemorrhoids. It also has the advantage of low postoperative pain, a short hospital stay, an early return to normal activities, and a short operative time. The only limitation may be the procedure's high cost. We recommend the use of diode laser as a novel innovation for treating hemorrhoids. We advise using it on a wide number of patients and believe it to be a better option than traditional surgery for treating these patients.

CONFLICT OF INTEREST

There are no conflicts of interest.

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