

Comparative Study between Laser Hemorrhoidoplasty Procedure versus Conventional Open Surgical Hemorrhoidectomy

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Abstract

Background: The Laser Hemorrhoidoplasty procedure is utilized in the management of 2nd- and 3rd-degree hemorrhoidal illness. The utilized energy must be minimized.

Aim: To compare the results of laser Hemorrhoidoplasty and open surgical Hemorrhoidectomy in cases with 2nd- and 3rd-degree piles, regarding complications, technical difficulties, and incidence of recurrence.

Patients and methods: This prospective research has been performed at Al-Azhar University Hospitals including forty cases with second and third degree hemorrhoids, who were categorized into two groups: Group A comprised twenty cases who underwent the Laser Hemorrhoidoplasty surgery, while Group B consisted of twenty cases who received open surgical Hemorrhoidectomy, throughout a period of twelve months beginning in May 2022.

Results: The open surgical Hemorrhoidectomy had a significantly longer operation than laser Hemorrhoidoplasty ($p < 0.001$). The open surgical Hemorrhoidectomy had a significantly increased blood loss compared to laser Hemorrhoidoplasty (p -value less than 0.001). The open surgical Hemorrhoidectomy had a significantly increased hospital stay when compared to laser Hemorrhoidoplasty (p -value less than 0.001). Duration of return to work was significantly greater in group B than in group A. There was a statistically significant rise in Morphine dose (mg) in group B compared to group A (p -value less than 0.05).

Conclusion: Laser Hemorrhoidoplasty demonstrated superior outcomes in terms of time of operation, blood loss, hospitalization, pain management, and postoperative recovery compared to traditional open surgical Hemorrhoidectomy. These findings support laser techniques as a promising minimally invasive approach for hemorrhoid management.

Keywords: Laser Hemorrhoidoplasty; Conventional Open Surgical Hemorrhoidectomy; Piles

1. Introduction

The mechanisms of formation of hemorrhoids can be classified into four categories: sliding anal cushions (loss of the fixation network), vascular anomalies, rectal redundancy, and elevated pressure on the anorectal vascular plexus.¹

Cases with hemorrhoids exhibit significant pathological alterations in their anal cushions. These alterations involve anomalous venous dilation, vascular thrombosis, degeneration of fibroelastic tissues and collagen fibers, as well as distortion and rupture of the anal subepithelial muscle. Furthermore, a pronounced inflammatory response affecting the arterial wall and around connective tissue was observed in hemorrhoidal specimens,

accompanied by mucosal ulcers, thrombosis, and ischemia.²

Hemodynamic research of the anorectal vascular plexus utilizing transperineal color Doppler ultrasound with spectral wave analysis revealed significantly elevated peak and acceleration velocities of afferent arteries in cases with hemorrhoids than in normal controls. Cases with hemorrhoids exhibited significantly increased arterial blood flow. The terminal branches of the superior rectal artery supplying the anal cushion in cases with hemorrhoids exhibited a significantly larger diameter compared to those in healthy participants. An elevation in artery diameter and flow was strongly linked with the severity of hemorrhoids.³

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Rubber band ligation, sclerotherapy, and infrared coagulation are the predominant techniques for internal hemorrhoids; nevertheless, there is no consensus regarding the ideal therapy. The primary objectives of each surgery are to diminish vascularity, eliminate excess tissue, and enhance stabilization of the hemorrhoidal rectal wall to reduce prolapse.⁴

Symptoms that persist in spite of conservative or minimally invasive treatments, surgical intervention is typically required. For cases with symptomatic grade IV hemorrhoids or strangulated internal hemorrhoids, operation is the recommended start of treatment. It may also be required in cases with thrombosed hemorrhoids and for symptomatic grade III hemorrhoids.⁵

The Laser Hemorrhoidoplasty procedure is utilized in the treatment of 2nd to 3rd-degree hemorrhoidal illness. The applied energy must be minimized. The complication rates are significantly analogous to those of other traditional minimally invasive techniques.⁶

This work aimed to compare the results of laser hemorrhoidoplasty and open surgical Haemorrhoidectomy in patients with 2nd- and 3rd-degree piles, regarding complications, technical difficulties, and incidence of recurrence.

2. Patients and methods

This prospective research has been performed at Al-Azhar University Hospitals. This research was conducted for 40 patients with 2nd and 3rd degree Hemorrhoids who were prospectively assigned to the two groups in this study over a period of 12 months starting in May 2022. The study was controlled prospectively. Cases have been separated randomly into two groups: Group (A) involved twenty cases that were treated by the Laser Hemorrhoidoplasty procedure, and Group (B) included twenty cases that were treated with open surgical hemorrhoidectomy

An ethical agreement was obtained from the Al-Azhar University Ethics Committee of the Surgery Department.

Inclusion Criteria: Cases with symptomatic second- and third-degree hemorrhoids unresponsive to medical therapy.

Exclusion Criteria: 1st and 4th degree piles, Pregnant female, associated anorectal pathology (abscess, fistula, rectal carcinoma, inflammatory bowel illness, etc.), patient unfit for surgery, and patient age below 18 y

Method:

Operative Assessment:

All cases have been exposed to: Complete history taking, physical examinations, and

investigational studies.

Procedures

All surgeries have been conducted under spinal anesthesia, with the case positioned supinely in lithotomy.

The same protocol has been adhered to for every group's operation by the same surgical team.

Group I: Open surgical Hemorrhoidectomy:

A V-shaped incision has been created in the skin around the hemorrhoid base. Submucosal dissection has been performed using cautery to detach the hemorrhoid from its base. The dissection proceeded cranially to the pedicle. The pedicle has been subsequently ligated utilizing a 2/0 Vicryl suture, and the distal portion of the hemorrhoid has been removed. The identical procedures have been performed on the other hemorrhoids, maintaining a skin bridge among them to prevent anal stenosis. The wounds remained open, with a mild dressing of topical gentamicin cream and gauze placed in the anal canal. The duration of surgery has been documented in minutes. Cases have been discharged within twenty-four hours if there were no surgical problems and if they urinate without difficulty.

Group B: Laser Hemorrhoidoplasty:

The laser procedure was conducted utilizing the Biolitec laser machine from Germany, commencing with an appropriate clinical evaluation of the lithotomy position. A specialized disposable proctoscope (twenty-three millimeters in diameter) has been introduced into the anal canal. The treatment commenced with a tiny incision approximately one centimetre from the anal edge. The laser fiber has been inserted at the base of each hemorrhoid into the hemorrhoidal plexus, ensuring that the fiber remains parallel to the anal canal to prevent damage or thermal harm to the mucosa or internal sphincter. Prior to utilizing a 1470-nanometer diode laser, it is imperative to don anti-laser glasses. The extent of shrinking can be regulated by the intensity and period of the laser beam. Laser pulses were produced through the optical fiber at a power of 8 W, each lasting three seconds, followed by a 0.5-second interval, resulting in tissue shrinking up to a depth of five millimeters. Following the completion of each haemorrhoid procedure, an ice finger has been inserted intra-anally for 0.5 to 1 minute to reduce thermal effects. Cases have been discharged 6 to 8 hours post-surgery, provided there were no further surgery complications, and the patient urinated without difficulty.

Postoperative care:

Spinal anesthesia typically requires several hours to wear off. The pack placed in the rectum post-operation has been extracted prior to discharge. Following surgery, analgesia consisting

of diclofenac sodium, one hundred milligrams, has been administered as needed, not to exceed three times daily. Metronidazole five hundred milligrams tablet given three times daily for 1 week to avoid infections and alleviate pain. A gentamicin cream has been recommended as needed, up to 3 times daily. Recommend laxatives (Duphalac) and stool softeners.

Ethical Considerations

The research protocol has been recommended for clearance to the Institutional Review Board (IRB) of the Faculty of Medicine (for boys) at Al-Azhar University. The hospital authorities provided informed consent. Informed verbal consent has been acquired from each participant regarding the research. Confidentiality and personal privacy have been respected throughout the research, and the obtained data weren't utilized for any other purpose.

3. Results

A statistically insignificant variance has been observed among both groups with regard to age and sex ($p>0.05$).

Table 1. Comparative analysis among group (A) and group (B) according to demographic Data

	GROUP A (NUMBER = TWENTY)		GROUP B (NUMBER = TWENTY)		TEST OF SIG.	P- VALUE
	No.	%	No.	%		
GENDER						
MALE	17	85.0%	15	75.0%	$\chi^2 = 0.625$	0.429
FEMALE	3	15.0%	5	25.0%		
AGE (YEARS) (MIN. - MAX.)	22-48		23-49		$t = 0.020$	0.984
MEAN \pm SD.	37.35 \pm 8.54		37.30 \pm 7.59			

(χ^2): Chi-square Test, t: Student T-Test, p: p value for comparing among the examined groups

A statistically insignificant variance has been observed among groups regarding hemorrhoids degree ($p>0.05$).

Table 2. Comparative analysis among group (A) and group (B) according to hemorrhoids degree

DEGREE OF THE HEMORRHOIDS	GROUPS				TOTAL		X ²	P- VALUE
	Group A (number = twenty)		Group B (number = twenty)		N	%		
	N	%	N	%				
2ND DEGREE OF HEMORRHOIDS	7	35.0%	6	30.0%	13	32.5%	0.114	0.736
3RD DEGREE OF HEMORRHOIDS	13	65.0%	14	70.0%	27	67.5%		
TOTAL	20	100.0%	20	100.0%	40	100.0%		

The open surgical hemorrhoidectomy had a significantly prolonged time of operation than laser Hemorrhoidoplasty ($p<0.001$). The open surgical hemorrhoidectomy had a significantly increased blood loss when compared to laser Hemorrhoidoplasty ($p<0.001$). The open surgical hemorrhoidectomy had a significantly increased hospital stay when compared to laser hemorrhoidectomy ($p<0.001$). Duration of return to work was significantly higher in group B

compared with group A. a statistically significant rise in Morphine dose (mg) in group B than group A ($p<0.05$).

Table 3. Comparative analysis among group (A) and group (B) according to Operative outcome

	GROUP A (NUMBER = TWENTY)			GROUP B (NUMBER = TWENTY)			T	P-VALUE
OPERATIVE TIME (MIN)								
MIN - MAX	12	-	19	23	-	33	-6.336	<0.001**
MEAN \pm SD	16.40	\pm	1.76	26.50	\pm	2.59		
BLOOD LOSS (ML)								
MIN - MAX	10	-	20	30	-	50	-14.17	<0.001**
MEAN \pm SD	14.00	\pm	3.48	39.75	\pm	7.34		
HOSPITAL STAY (HRS)								
MIN - MAX	2	-	6	12	-	36	-8.43	<0.001**
MEAN \pm SD	1.41	\pm	0.315	27.00	\pm	6.60		
DURATION OF RETURN TO WORK (DAYS)								
MIN - MAX	4	-	8	10	-	16	-10.35	<0.001**
MEAN \pm SD	6.15	\pm	1.50	12.60	\pm	2.35		
MORPHINE DOSE (MG)								
MIN - MAX	1	-	5	4	-	8	-6.266	<0.001**
MEAN \pm SD	2.80	\pm	1.28	5.90	\pm	1.80		

There was statistically significant rise in pain score in group B compared to group A at different follow up periods ($p<0.001$). The pain score 6 months after operation on visual analogue score became zero in group A and group B.

Table 4. Comparative analysis among group (A) and group (B) according to Pain score post-operative (VAS)

	GROUP A (NUMBER = TWENTY)			GROUP B (NUMBER = TWENTY)			U	P-VALUE
PAIN SCORE DAY 1 POST-OPERATIVE (VAS)								
MIN - MAX	4	-	6	5	-	9	43	<0.001**
MEAN \pm SD	5.30	\pm	0.80	6.95	\pm	1.00		
PAIN SCORE WEEK 1 POST-OPERATIVE (VAS)								
MIN - MAX	2	-	4	4	-	6	17.5	<0.001**
MEAN \pm SD	3.10	\pm	0.79	5.20	\pm	0.83		
PAIN SCORE WEEK 2 POST-OPERATIVE (VAS)								
MIN - MAX	1	-	3	2	-	5	13.5	<0.001**
MEAN \pm SD	1.70	\pm	0.57	3.30	\pm	0.66		
PAIN SCORE WEEK 4 POST-OPERATIVE (VAS)								
MIN - MAX	1	-	2	1	-	3	37.5	<0.001**
MEAN \pm SD	1.25	\pm	0.44	2.40	\pm	0.60		
PAIN SCORE WEEK 6 POST-OPERATIVE (VAS)								
MIN - MAX	0	-	0	0	-	2	40	<0.001**
MEAN \pm SD	0.00	\pm	0.00	1.10	\pm	0.72		
PAIN SCORE 6MONTH POST-OPERATIVE (VAS)								
MIN - MAX	0	-	0	0	-	0	0.00	1.00
MEAN \pm SD	0.00	\pm	0.00	0.00	\pm	0.00		

U: Mann-Whitney U-Test

Post-operative bleeding, urinary retention, and postoperative discharge affection occurred only in one case in the laser Hemorrhoidoplasty approach. Post-operative bleeding was identified in 3(15%) cases, urinary retention in (25%), and postoperative discharge affection occurred in 6(30%) cases in the conventional group statistically significantly higher than laser group ($p=0.037$).

Table 5. Comparative analysis among group (A) and group (B) according to early postoperative complications

EARLY POSTOPERATIVE COMPLICATIONS	GROUPS				TOTAL		X ²	P-VALUE
	Group A (number = twenty)		Group B (number = twenty)					
	N	%	N	%	N	%		
POST OPERATIVE BLEEDING	1	5.0%	3	15.0%	4	10.0%	1.111	0.292
URINARY RETENTION	1	5.0%	5	25.0%	6	15.0%	3.137	0.077
POSTOPERATIVE DISCHARGE AFFECTION	1	5.0%	6	30.0%	7	17.5%	4.329	0.037*

Infection was encountered in one case (5%) in group A and two cases (10%) in group B where one of them was fistula ($p = 0.548$). Stenosis has been experienced by two cases (10%) in group B only. One case (5%) in group B were complicated by Incontinence. Recurrence occurred in only 2 cases (10%) in group A.

Table 6. Comparative analysis among group (A) and group (B) according to long-term outcomes

LONG-TERM OUTCOMES	GROUPS				TOTAL		X ²	P-VALUE
	Group A (number = twenty)		Group B (number = twenty)					
	N	%	N	%	N	%		
INFECTION	1	5.0%	2	10.0%	3	7.5%	0.360	0.548
FISTULA	0	0.0%	1	5.0%	1	2.5%	1.026	0.311
STENOSIS	0	0.0%	2	10.0%	2	5.0%	2.105	0.147
INCONTINENCE	0	0.0%	1	5.0%	1	2.5%	1.026	0.311
RECURRENCE	2	10.0%	0	0.0%	2	5.0%	2.105	0.147

4. Discussion

In group A, the gender distribution was seventeen males (eighty-five percent) and three females (fifteen percent), while in group B, it was fifteen males (seventy-five percent) and five females (twenty-five percent), with no statistically significant variation (p -value above 0.05). A statistically insignificant variance in age has been observed among both groups ($p > 0.05$).

Comparable research by Yahya et al.⁷ has revealed similar baseline characteristics, including an age range of twenty-two to forty-seven, with a mean age of 36.03 ± 7.32 years in Group B and 35.73 ± 8.39 years in Group A, showing insignificant distinction between the two groups.

Furthermore, there were insignificant variations in the distribution of gender, as men constituted the majority in both groups.

Eskandaros and Darwish⁸ indicated that the mean age of the MMH group was 41 ± 8.8 years, while the LHP group had a mean age of 40.8 ± 8.8 years, with a statistically insignificant distinction among the two groups. 85 (70.83%) were male and 35 (29.17%) were female, with insignificant distinction between the groups.

In our study, the comparative analysis among group A and group B regarding degree of the hemorrhoids where 7(35%) cases had 2nd degree of hemorrhoids, and 13(65%) cases had 3rd degree of hemorrhoids in group A in comparison to 6(30%) cases had 2nd degree of hemorrhoids and 14(70%) cases had 3rd degree of hemorrhoids in group B.

In accordance, Naieem et al.⁹ reported that with regard to the hemorrhoidal degree, 23 (23%) patients experienced second-degree hemorrhoids, and 77 (77%) cases had third-degree hemorrhoids.

The laser hemorrhoidoplasty group demonstrated significantly shorter operative times (16.40 ± 1.76 minutes) compared to the open surgical group (26.50 ± 2.59 minutes, $p < 0.001$). This is due to precise tissue interaction and minimal dissection requirements.

This aligns with Naderan et al.¹⁰ where the Group B had a duration of 33.1 ± 7.3 minutes, compared to the LHP group, which had 15.6 ± 5.26 minutes. The operating duration decreased significantly in the laser group compared to the MMH group.

The mean operation time was recorded as twenty to forty minutes (29.43 ± 3.664) for Group A (open surgical (Milligan-Morgan) hemorrhoidectomy) and twenty to thirty minutes (22.57 ± 1.794) for Group B (laser hemorrhoidoplasty with DGHAL). Consequently, cases in Group B experienced a reduction in surgery duration relative to Group A.

The operating duration in Loutfy et al.,¹¹ trial varied from 13 to 20 min, with a mean \pm SD of 17.18 ± 2.21 min in the LHP group.

Remarkably, in our study, the laser group exhibited substantially lower blood loss (14.00 ± 3.48 ml) compared to the open surgical group (39.75 ± 7.34 ml, $p < 0.001$). This highlighted laser surgery's hemostatic properties and reduced vascular trauma.

In a systematic review and meta-analysis by Wee et al.¹² reported that, the LH group had less intraoperative blood loss (P -value below 0.001).

In our study, the laser hemorrhoidoplasty group demonstrated a significantly shorter hospital stay (1.41 ± 0.315 hours) compared to the open surgical group (27.00 ± 6.60 hours, $p < 0.001$).

Yahya et al.⁷ illustrated that the mean hospitalization duration for the Group B was 36.25 ± 6.58 hours, whereas for the LHP group it was 7.85 ± 2.11 hours, indicating a significant association of the MMH group with a longer duration of hospitalization.

In our study, patients undergoing laser hemorrhoidoplasty returned to work significantly faster (6.15 ± 1.50 days) compared to the open surgical group (12.60 ± 2.35 days, $p < 0.001$), demonstrating reduced functional impairment with laser techniques.

In a meta-analysis and systematic review by Wee et al.,¹² reported that the LH group had a quicker return to work or daily activities ($P = 0.002$).

In our study, the pain scores across different postoperative periods consistently showed lower intensity in the laser hemorrhoidoplasty group. At day 1 post-operation, the laser group reported a mean pain score of 5.30 ± 0.80 versus 6.95 ± 1.00 in

the open surgical group. This trend continued through subsequent weeks, with statistically significant differences ($p < 0.001$) suggesting that laser techniques minimize tissue trauma and inflammatory responses, consequently reducing pain perception.

In our study, the laser group required significantly lower morphine doses (2.80 ± 1.28 mg) compared to the open surgical group (5.90 ± 1.80 mg, $p < 0.001$). Reduced analgesic requirements correlate with less surgical tissue disruption, supporting the advantages of minimally invasive laser techniques.

Yahya et al.⁷ showed that, from week one to week six, the open group exhibited significantly greater pain levels; however, an insignificant distinction was observed between the groups following the 6th week.

Notably, in our study, the laser group experienced fewer early complications. Post-operative bleeding, urinary retention, and postoperative discharge affection occurred only in one case in the laser hemorrhoidectomy approach. Post-operative bleeding was identified in 3(15%) cases, urinary retention in 25%, and postoperative discharge affection occurred in 6(30%) cases in the conventional group, statistically significantly higher than the laser group ($p = 0.037$), highlighting reduced tissue manipulation in the laser procedure.

Yahya et al.⁷ discovered that Group B exhibited a significant rise in bleeding during the first and second weeks, but no bleeding was observed in either group following the second week.

Conversely, Yassin et al.¹³ discovered a significant variation in postoperative discharge incidence, with twenty cases (66.7 percent) in the LHP group than eleven cases (36.7%) in the EH group.

In our study, while long-term complications were relatively low in both groups, the open surgical group showed slightly higher rates of fistula, stenosis, and incontinence. Recurrence occurred in only 2 cases (10%) in group B. However, these distinctions were statistically insignificant, suggesting comparable long-term safety profiles.

Hassan and El-Shemy¹⁴ reported that in a study conducted on 40 patients, one case complained of recurrent/residual hemorrhoids postoperatively in the open surgical hemorrhoidectomy group and another case of anal stenosis within the same group, with no corresponding cases reported in the LHP group.

4. Conclusion

Laser Hemorrhoidoplasty demonstrated superior outcomes in operative time, blood loss, hospital stay, pain management, and postoperative recovery compared to traditional

open surgical Hemorrhoidectomy. These findings support laser techniques as a promising minimally invasive approach for hemorrhoid management.

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