Standardization Reduces Recurrence and Overall Complication Rate in Laser Hemorrhoidoplasty: A Retrospective Cohort Study

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Abstract

Background: The laser hemorrhoidoplasty procedure is a minimally invasive technique for treating symptomatic hemorrhoids. This study aimed to assess the safety of laser hemorrhoidoplasty and to study long-term recurrence rates and other complications.

Methods: In this retrospective, single-center study, 250 consecutive symptomatic patients of internal hemorrhoids of grade I-IV underwent laser hemorrhoidoplasty. The procedure was done using a 15 W, 1470 nm diode laser machine (Lasotronix). All the preoperative and postoperative variables were analyzed, with special emphasis on post-procedural pain, complications, and recurrence rate. Follow-up was scheduled on the 4th, 7th, and 30th day, then at 3, 6, and 12 months, and once a year thereafter. Complications were recorded.

Results: There were 250 patients (134 male and 116 female; mean age: 43.72±18.34 years, range 16-85 years). Short-term follow-up was achieved for all patients. Patient satisfaction in terms of pain at rest and post-defecation pain was 100%. Twenty eight patients (11.2%) had complications: 10 (4%) had postoperative bleeding, 3 (1.2%) had infection, 1 (0.4%) developed a fistula-in-ano, 1 (0.4%) developed a thrombosed hemorrhoid, 1 (0.4%) had a prolapsed hemorrhoid, 5 (2%) had incomplete regression, and 1 patient (0.4%) had a fissure in ano. Ulceration occurred in 1 patient (0.4%), while 2 patients (0.8%) developed recurrence. No anal stenosis or fecal incontinence occurred in any of the patients.

Conclusion: This study shows that laser hemorrhoidoplasty gave 100% patient satisfaction in terms of post-procedure pain at rest and post-defecation pain. With standardization, laser hemorrhoidoplasty is a safe procedure with good short-term and long-term results and minimal recurrence.

Keywords: Hemorrhoids, Pain, Bleeding, Prolapse, Laser hemorroidoplasty

Introduction

Hemorrhoidal disease is common, affecting around 40% of the adult population and 50% of the population over 50 years of age (1, 2). Many surgical procedures have evolved, with conflicting opinions on the most effective and least harmful technique. Excisional procedures for hemorrhoidal disease are accepted as the gold standard for complete eradication of disease but have a high incidence of post-procedure pain, which sometimes lasts for more than a month (3). Anal stenosis is a dreaded

sequel in some cases of excisional hemorrhoidal procedures (4-6). The optimal technique for the treatment of hemorrhoids would be associated with minimal pain and postoperative complications as well as a low long-term recurrence rate. Laser hemorrhoidoplasty represents one of the latest techniques for providing optimal therapy to patients with hemorrhoidal disease. The principle of this minimally invasive technique is the coagulation of the hemorrhoidal plexus through submucosal laser application. This study aimed to **assess the safety of** laser hemorrhoidoplasty and to study long-term recurrence rates and other complications.

Material and Methods

This was a retrospective cohort study of 250 symptomatic patients of grade I to grade IV Internal hemorrhoids who underwent laser hemorrhoidoplasty from 17th February 2017 to 18th March 2020 at a single center: Junankar Surgical Nursing Home, Nagpur, India. All operated patients were included in the study. Written informed consent was obtained from all the patients after providing them with full details of the surgical treatment.

Laser Hemorrhoidoplasty Procedure

The patient's position was standard lithotomy with the legs extended vertically to make space for the assistant. The procedure was done under spinal anesthesia. Proctoscopy was done with a 22 mm, half-circle, transparent, disposable anoscope. Laser hemorrhoidoplasty was done using a 15 W, 1470 nm diode laser machine (Lasotronix). A 400-micron bare fiber was used in a curved mantle and introduced from the anoderm in a plane similar to the plane of dissection of the Milligan-Morgan procedure, just in front of the internal sphincter and behind the pile mass. The exact plane was confirmed by switching off the operation theatre lights to visualize the aiming beam's glow. A very bright glow indicates the superficial plane and the possibility of thermal damage to the mucosa, leading to bleeding. In such situations, the fiber is withdrawn and readjusted. Similarly, if no glow or very faint glow is seen, it indicates a deeper plane, and fiber has to be readjusted to the correct plane. The length of the bare fiber outside the tip of the mantle was measured and adjusted according to the length of the pile mass from the anal verge to the apex of the pile mass, so that the tip of the bare fiber should reach up to the arterial pedicle of the pile mass at the apex. Continuous waveform energy was delivered at 8 W and with 100% aiming beam in the range of 151-889 J, depending on the size of pile mass. 70-80 J were delivered at the hemorrhoid apex to coagulate the arterial pedicle. Then, the fiber was withdrawn slowly with rotating movement and continuous delivery of energy so as to avoid sticking of fiber to tissues. This also reduces the incidence of undesired degeneration of peri-arterial normal tissues, reducing the chances of fibrosis and stenosis. In this way, all the advantages of pulsed wave energy can be obtained using continuous-wave energy. The energy delivered to each pile mass ranged from 151 to 889 J. After fiber withdrawal, the anal canal was packed with an ice cube for one minute to prevent lateral thermal spread. The mean duration of operation was 15 minutes. No bowel preparation or enema was given prior to the procedure. One dose of intravenous metronidazole (500 mg) was administered prophylactically during the procedure. Postoperatively, oral metronidazole (400 mg TDS) was prescribed for five days and lactulose (20 ml HS) for one month.

Colonoscopy was done preoperatively in all patients above 50 years of age and or when there was a personal or family history of colorectal neoplasm or documented advanced adenoma, inflammatory bowel disease (IBD), history of altered bowel habits, or recent significant weight loss. In all other patients, sigmoidoscopy was done. Preoperative and postoperative variables, including clinical and technical data, were analyzed postoperatively. All patients were followed up physically on the 4th, 7th, and 30th day, then at 3, 6, and 12 months after the procedure. Subsequent annual follow-up was done. Short-term follow-up parameters included reduction of hemorrhoidal volume, recurrence, complications, incontinence and pain, improvement of symptoms, incapacity for work, satisfaction, and benefit from the operation. Postoperative pain was recorded using a ten-point visual analog scale (VAS), on which 0 represents no pain and 10 represents the worst pain imaginable.

Statistical Analysis

Statistical analysis was performed using STATA software. Continuous variables are presented as mean±standard deviation (SD), and categorical variables are given as frequencies with percentages. To compare continuous variables, the student's t-test was applied. The chi-squared test was used to compare the frequencies. All P-values < 0.05 were considered statistically significant.

Results

The study included 116 females and 134 males with a mean age of 43.72±18.34 (range 16–85) years. Out of 250 patients, 10 (4%) patients were habituated to daily consumption of alcoholic drinks, 15 (6%) were diabetic and well-controlled on oral hypoglycemic drugs, 38 (15.2%) were hypertensive, 12 (4.8%) had ischemic heart disease, and 4 (1.6%) patients had cirrhotic liver disease. All four grades of hemorrhoids were included in the study. Overall, 8 (3.2%) patients had grade I hemorrhoid, 156 (62.4%) had grade II, 77 (30.8%) had grade III, and 9 (3.6%) had grade IV. The most frequently reported symptoms were anal

pain in 73 (29.2%) patients, followed by bleeding in 44 (17.6%) and itching in 20 (8%) patients. Out of 73 anal pain patients, 48 (19.2%) had fissure in ano. In bleeding symptoms, 39 (15.6%) had mild to moderate bleeding, whereas 5 (2%) patients had severe rectal bleeding requiring preoperative blood transfusions. Only symptomatic patients underwent the procedure. No intraoperative complications were observed.

Follow-up

All 250 patients completed the short-term follow-up (up to day 30). The minimum follow-up period was two months, and the maximum was 39 months.

Postoperative Pain

Postoperative pain on day 1 was low in 60 patients (VAS 0-1). VAS scores for the remaining 190 patients did not exceed 5 (Table 1). The mean VAS scores were 2.23±1.24 on day 1, 0.64±0.64 on day 4, and 0.27±0.45 on day 7. Pain decreased significantly from day 1 onwards (day 4: P=0.04; day 7: P=0.0001). The box plot of the VAS score according to the postoperative days is shown in Figure 1. Patient satisfaction in terms of pain at rest and post-defecation pain was 100%.

Postoperative Complications

The complication rate was 11.2% (28/250). Table 2 shows the complication according to the grading of hemorrhoids. Ten (4%) patients had bleeding. Out of these, 8 (3.2%) patients had early bleeding (between 7-10 days). Only one out of these eight cases of early bleeding needed intervention; the others were managed conservatively. Two (0.8%) patients had late bleeding after 9 and 10 months. Out of these, one could be managed conservatively, and the other required intervention. Infection at the point of entry of the fiber occurred in 3 patients (1.2%) on the fourth postoperative day. Of these, one (0.4%) patient developed a local abscess followed later by fistula formation requiring a fistulotomy procedure. The other two patients were managed conservatively with antibiotics alone. One (0.4%) patient developed thrombosed hemorrhoid after seven days, which regressed spontaneously after 45 days. One

(0.4%) patient developed asymptomatic prolapse of the hemorrhoid after 26 months and needed no treatment. A residual pile mass was observed in 5 (2%) patients, of whom one was symptomatic, had bleeding, and needed intervention. The other four needed only counseling. No systemic complications were observed.

Improvement of Symptoms

At three months, 92% of patients indicated a considerable improvement in symptoms. At six months, 97% of the patients indicated that their symptoms had significantly improved. No patient indicated a deterioration of symptoms at 30 or 60 days.

Recurrence

There was recurrence in 2 patients (0.8%) after two years. They were asymptomatic except for itching. One patient (0.4%) developed a fissure-in-ano after 16 months. Ulceration occurred in one patient (0.4%) after 14 days.

Discussion

The standard Milligan-Morgan and Fergusson techniques of hemorrhoidectomy were accepted as the first line of treatment from 1937 and 1952, respectively, achieving complete eradication of the
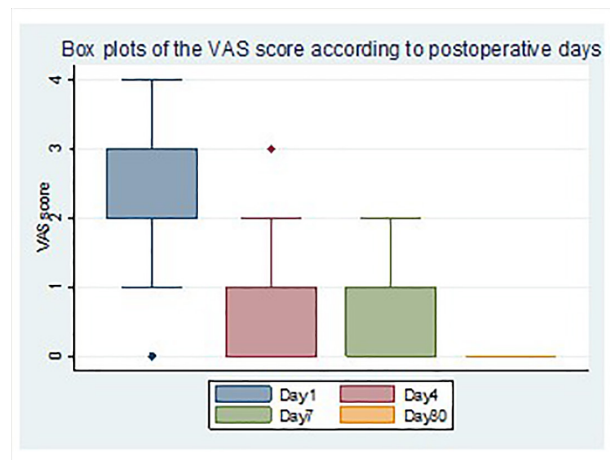

Figure 1: Box plot of the VAS score

Table 1: Visual analog scale (VAS) scores on follow-up visits

VAS score	Day 1 (n=250)	Day 4 (n=250)	Day 7 (n=250)	Day 30 (n=250)
0-1	60	240	249	250
2-5	190	10	1	0
≥6	0	0	0	0

Table 2: Complications according to the grading of hemorrhoids

Complication	Hemorrhoid grade				P value
	Grade I (n=8)	Grade II (n=156)	Grade III (n=77)	Grade IV (n=9)	
Bleeding	0/8	6/150	4/73	2/7	0.081
Infection	0/8	1/155	2/75	0/9	0.596
Residual pile mass	0/8	0/156	4/73	1/8	0.011

disease. However, these techniques have the drawback of a painful and stormy postoperative course. The search for a painless, non-excisional alternative led to Minimally Invasive Procedure for Hemorrhoids (MIPH), Doppler Guided Hemorrhoidal Artery Ligation (DGHAL), suture rectopexy, plication, mucopexy and now lasers.

The pathophysiology of piles is multifactorial: sliding anal cushion, hyperperfusion of hemorrhoidal plexus, vascular abnormality, tissue inflammation, and internal rectal prolapse (rectal redundancy) are some of the proposed theories (7). In laser hemorrhoidoplasty, the V-shaped delivery of laser energy by bare fiber coagulates the arterial pedicle first, thus minimizing the chances of bleeding and hematoma formation while withdrawing the fiber. Another advantage of the bare fiber over the radial fiber is that it can be reused after disinfection, reducing the cost of the procedure.

The vascular theory states that arterial overflow in the superior hemorrhoidal artery leads to dilatation of the hemorrhoidal venous plexus. In laser hemorrhoidoplasty, hemorrhoidal arterial flow feeding the hemorrhoidal plexus is stopped by laser coagulation (3). The laser also destroys venous epithelium and induces fibrotic reconstruction, thereby generating new connective tissue and fixing prolapsed piles (8). Thus, laser is useful in grade III and grade IV prolapsed hemorrhoids. Most of the pathophysiological factors responsible in formation of hemorrhoids are dealt with this technique. The depth of shrinking can be regulated by the power and duration of the laser beam (3).

Complete regression of pile mass occurs after 21-22 days. In this series, 5 patients (2%) had incomplete regression after 30 days. Proper energy delivery to each pile mass is crucial to avoid residual pile mass, which can later present as recurrence. Fes S et al. (8) reported a high recurrence rate of 34% in their series. However, it is not clear whether this was incomplete regression or actual recurrence. In our study, we observed complete regression in 245 patients (98%) after one month, and incomplete regression in 5 patients (2%). There were two patients (0.8%) with recurrence after 9 and 10 months, respectively. These two patients initially had complete regression of the pile mass after 30 days. Eight patients (3.2%) had early bleeding due to mucosal injury leading to ulceration. All of these patients had received more than 500 J of energy to each pile mass. Two patients (0.8%) had delayed bleeding after 9 and 10 months, respectively, possibly due to constipation leading to recurrence. Proper selection of the entry point, fiber plane, and

energy delivery are crucial to prevent bleeding.

Though laser is stated to be bactericidal, infections do occur. All three (1.2%) patients who developed infection were non-diabetic. The common factor in these three patients was that the energy delivered to each pile mass was more than 500 J, and all were grade III hemorrhoids. Proper sterilization of fiber (preferably with ETO after each procedure), proper cleaning of the entry point with povidone-iodine and alcohol or quaternary ammonium compound-based disinfectants, and use of metronidazole are the keys to minimizing infection rates. In people with diabetes and immunocompromised patients, gut cleansing antibiotics (rifaximin) should be started three days prior to surgery to minimize infection. Infection, if uncontrolled, may lead to abscess formation and even fistula formation, which occurred in one patient (0.4%) in this series and needed a fistulotomy. The idea behind the first review after four days is to detect early signs of infection and manage them promptly. All complications were more common in patients receiving more than 500 J of energy (9).

In this study, there was no anal stenosis in the postoperative period. In fact, there is no wound and no healing time is required, so the laser hemorrhoidoplasty procedure is not associated with any risk of anal stenosis (8, 10). Pain is the predominant problem associated with all surgical excisional techniques in treating hemorrhoidal disease. Postoperative pain is the most important complication that bothers patient and makes them reluctant to undergo surgical treatment (3). In laser hemorrhoidoplasty, healing and recovery are excellent, fast, and practically imperceptible due to the absence of cuts, open wounds, and sutures, eliminating the risk of post-procedure stenosis (10). This also eliminates the post-procedure pain, clearly reflected in the table and graph. This minimal pain completely disappears after one month.

Conclusion

Laser hemorrhoidoplasty is a safe procedure with minimal early complications, and patients fare well in the long-term follow-up. Recurrence can be minimized by proper energy delivery. Similarly, appropriate energy delivery and a proper plane of introduction of the fiber can reduce the chances of post-procedure bleeding. Most importantly, postoperative comfort and low pain scores make this procedure attractive to patients.

Conflicts of interest: None declared.

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