

Hemorrhoidectomy Using the Harmonic Scalpel versus the Ferguson Technique

Mustafa Abdullah Aldawoodi¹  Raed Esttaifan Rezqallah² 

¹ Alkindy Teaching Hospital, Baghdad, Iraq

² Department of Surgery, Alkindy College of Medicine, University of Baghdad, Baghdad, Iraq

Address for correspondence Raed Esttaifan Rezqallah, FICMS, Department of Surgery, Alkindy College of Medicine, University of Baghdad, 8CW5 + FP4, Baghdad, Iraq (e-mail: raid.rassam@gmail.com).

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Abstract

Introduction Hemorrhoidal disease is an anorectal condition commonly encountered in the clinical practice. Various instruments, such as circular staplers, harmonic scalpels, lasers, and bipolar electrothermal devices, are used in different modalities of hemorrhoidectomy in cases of high-grade hemorrhoids.

Objective To compare the results of hemorrhoidectomy using the Ferguson technique and the harmonic scalpel.

Materials and Methods The present is a randomized prospective study involving 60 patients submitted to hemorrhoidectomy from February 2022 to January 2024. The patients were randomly grouped: group I was composed of 30 patients who underwent the operation through the conventional Ferguson technique, and group II was composed of 30 patients submitted to hemorrhoidectomy with the use of the harmonic scalpel.

Results The demographic and clinical features of the patients in the two groups were identical. We found a significant difference in the mean operative time: for the Ferguson technique, it was of 21.9 ± 4.6 minutes, while for the harmonic scalpel, it was of 17.9 ± 3.1 minutes ($p = 0.003$). The mean postoperative pain scores on the Visual Analog Scale (VAS) were of 7.1 ± 1.2 points for group I, and of 6.5 ± 0.5 points for group II ($p = 0.024$). And the mean hospital stay was of 1.23 ± 2.1 days for group I, and of 1.03 ± 0.1 for group II ($p = 0.023$). No statistical significance was observed regarding the other parameters.

Keywords

- harmonic scalpel
- hemorrhoids
- Ferguson procedure

Conclusion Hemorrhoidectomy using the harmonic scalpel seems to be a superior approach to treat high-grade hemorrhoids; it has the advantage of reduced hospital stay, decreased postoperative pain, and shorter operative time.

Introduction

Hemorrhoids are a common disease, with a prevalence of approximately 40% among the general population.¹ Hemorrhoids are cushions of submucosal venules, arterioles, and smooth muscle fibers of the anal canal that are found in the left lateral, right anterior, and right posterior positions.²

External hemorrhoids are below the dentate line, covered by the anoderm, and they may cause pain. Internal hemorrhoids are painless, above dentate line, and are covered by columnar epithelium.³

Internal hemorrhoids are classified according to severity into four grades: I – prominent hemorrhoidal vessels without prolapse; II – hemorrhoids that spontaneously reduce after

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the Valsalva maneuver; III – prolapsed hemorrhoids that require manual reduction after the Valsalva maneuver; and IV – hemorrhoids in which manual reduction is ineffective.⁴

Open hemorrhoidectomy (a procedure devised by Milligan and Morgan) or closed hemorrhoidectomy (a procedure devised by Ferguson) are the gold standard operations to treat high-grade hemorrhoids.^{5,6} However, both procedures may yield complications such as considerable postoperative pain, urinary retention, constipation, postoperative bleeding, anal incontinence, and anal stenosis.⁷

Milligan and Morgan open hemorrhoidectomy is performed as follows: The mucosal and cutaneous parts of each hemorrhoid is grasped with an artery forceps. A V-shaped incision is made beneath the external skin over the hemorrhoid, which was dissected from under the internal sphincter. The proximal mucosal and submucosal pedicles are transected, ligated and excised.

Ferguson closed hemorrhoidectomy is performed through the same steps used in Milligan and Morgan open hemorrhoidectomy, but the mucosa and skin are sutured with absorbable material, so hemostasis must be meticulous as hematoma can develop deep into the closure and may get infected.⁸

Posthemorrhoidectomy pain is related to the type of device used, the type of incision made, suturing of the anal mucosa, and the development of infection.⁹

The harmonic scalpel (HS) is a modern surgical device used for excision of symptomatic third-degree and all cases of fourth-degree hemorrhoids. In contrast to electrocautery, the use of the HS causes fewer thermal injuries to the lateral tissue.¹⁰ The consequent mucosal defect is left open or closed at the surgeon's discretion.¹¹

By cutting and coagulating using ultrasonic energy, the HS outweighs the traditional electrosurgical technique in the following aspects: it causes less damage to the lateral tissue (1–3 mm wide), the procedure yields fewer fumes, and it results in better local effect, more controlled bleeding, and neuromuscular preservation.^{12,13}

The HS can cause fewer postoperative locoregional edemas, since it coagulates small and medium-sized vessels, and, in colorectal surgery, it has been found to be effective in larger blood vessels.^{14,15}

The HS vibration ranges from 20,000 to 50,000 Hz, and it cuts through tissues, securing hemostasis by protein denaturation sealing vessels and tissues caused mainly by vibration (similar to whisking an egg white). Moreover, even when cutting through thickened scar tissue, the HS is precise, and the lower amount of fumes generated by the device enhances visibility compared with the routine electrosurgery.¹⁶ The present study aims to compare the outcomes of hemorrhoidectomy through the Ferguson technique and through the use of the HS.

Materials and Methods

Study Design

The present is a randomized prospective study involving 60 patients submitted to hemorrhoidectomy from Febru-

ary 2022 to January 2024. The patients were randomly grouped: group I was composed of 30 patients who underwent the operation through the conventional Ferguson technique, and group II was composed of 30 patients submitted to hemorrhoidectomy with the use of the HS. A total of 7 patients were excluded due to reasons that will be subsequently explained.

All patients were submitted to preoperative laboratory investigations, chest X-rays, and electrocardiography, and they were hospitalized one day before the procedure. Comprehensive information regarding the procedure and potential complications was provided to all patients, and written consent was obtained.

Inclusion Criteria

The 67 patients who were enrolled during the study period had to meet the following criteria: age over 18 years and presence of internal/external hemorrhoids or grade-IV hemorrhoids. In total, 7 patients were excluded: 2 patients with associated anorectal disease (such as fissure or fistula-in-ano), 4 patients with diabetes, and 1 patient with HIV infection; therefore, the final sample was composed of 60 patients.

Preoperatively, all patients received prophylactic antibiotics: intravenous (IV) ceftriaxone 1 g or an alternative in case of allergy.

All patients were in the lithotomy position under spinal or general anesthesia. The anus was exposed using tapes placed on both buttocks. An anoscope was used to determine the location of the hemorrhoids. All patients were operated on through a standardized hemorrhoidectomy technique.

In group I, the hemorrhoids were elevated from the stems with the aid of forceps, the resection was performed through the Ferguson technique, and the skin was closed with absorbable sutures after ligation of the pedicles. On the other hand, in group II, the resection was performed using an HS (Ethicon, Inc., Raritan, NJ, United States), and a scissor configuration was used after the hemorrhoids were lifted from the stems.

Pain levels at rest were recorded using the Visual Analog Scale (VAS), whose score ranges from 0 to 10 points. The operative time was measured in minutes since the first incision. The patients underwent assessments to monitor wound healing and identify any early or late complications, including hemorrhage (intraoperatively and postoperatively), urinary retention, and anal verge stenosis through a rectal examination at week 4. Bleeding was classified as significant in three situations; if it required blood transfusion, reoperation, or close monitoring of vital signs. The hospital stay was recorded in days, and the healing time, in weeks.

Statistical Analysis

The data were gathered and analyzed using the Statistical Package for the Social Sciences (SPSS) for Windows (SPSS Inc., Chicago, IL, United States), version 2.0. Group comparisons were performed using the Chi-squared test and the Student *t*-test, and values of *p* lower than 0.05 were deemed statistically significant.

Table 1 Demographics of the study groups

Variables	Ferguson technique group (N = 30)	Harmonic scalpel group (N = 30)	p-value
Age (years): mean $\pm$ standard deviation	42.8 $\pm$ 8.8	45 $\pm$ 10.3	0.379
Sex: male/female: n (%)	13 (43%)/17 (57%)	11 (36%)/19 (64%)	0.2
Operative time (minutes): mean $\pm$ standard deviation	21.9 $\pm$ 4.6	17.9 $\pm$ 3.1	0.003*
Significant intraoperative blood loss: n (%)	5 (16%)	1 (3%)	0.088

Note: *Statistically significant.

Results

The mean age of the patients in groups I and II was of 42.8 $\pm$ 8.8 and 45.0 $\pm$ 10.3 years respectively. Regarding gender, there was an insignificant difference between the two groups ($p = 0.167$).

There was a statistically significant correlation between the type of procedure performed and the operative time: in group II, the operative time was significantly shorter, with a mean of 17.9 $\pm$ 3.1 minutes compared with 21.9 $\pm$ 4.6 minutes in group I ($p = 0.003$). There was no statistically significant correlation between the type of procedure and intraoperative bleeding ($p = 0.088$) (**Table 1**), but there was a statistically insignificant correlation between the type of procedure and postoperative bleeding ($p = 1.00$).

The mean postoperative pain scores (VAS) on postoperative day 1 were of 6.5 $\pm$ 0.5 points in group II and of 7.1 $\pm$ 1.2 points in group I; these differences observed were statistically significant ($p = 0.024$).

There was a statistically significant correlation between the type of procedure and the mean postoperative length of hospital stay, which was of 1.03 $\pm$ 0.1 day in group II and of 1.23 $\pm$ 0.4 day in group I ($p = 0.023$); a statistically insignificant correlation was also found between the type of procedure and the healing time ($p = 0.058$). However, there was a statistically insignificant correlation between the type of procedure and urinary retention ($p = 0.456$), and no statistically significant correlation between the type of

procedure and the incidence of stenosis ($p = 0.456$) (**Table 2**).

Discussion

Hemorrhoidectomy is considered the most successful and conclusive treatment for symptomatic hemorrhoids.

The present study showed a statistically significant improvement in the mean operative time with the use of the HS when compared with the conventional Ferguson method ($p = 0.003$). It also showed statistically significant improvements in the pain scores in group II compared with group I ($p = 0.024$).

The postoperative length of hospital stay was significantly shorter in group II compared with group I ($p = 0.023$). There were no statistically significant differences between the two methods regarding intraoperative ($p = 0.088$) and postoperative ($p = 1$) bleeding.

Urinary retention was observed in 3 patients (10%) in group II and in 5 patients (16%) in group I, but this difference was not statistically significant ($p = 0.456$). Regarding anal stenosis, neither were there statistically significant differences between the two groups ($p = 0.561$). The healing time was slightly faster after the HS procedure than after the Ferguson procedure, but this difference was not statistically significant either ($p = 0.058$).

In 2016, Lim et al.,¹⁷ conducted a study with 50 patients: in 25 of them, the procedure was performed using 3–0

Table 2 Associations between the type of procedure and postoperative variables

Variables	Ferguson technique group (N = 30)	Harmonic scalpel group (N = 30)	p-value
Significant postoperative blood loss: n (%)	1 (3%)	1 (3%)	1.0
Pain score on the Visual Analog Scale at day 1: mean $\pm$ standard deviation	7.1 $\pm$ 1.2	6.5 $\pm$ 0.5	0.024*
Postoperative length of hospital stay (days): mean $\pm$ standard deviation	1.23 $\pm$ 0.4	1.03 $\pm$ 0.1	0.023*
Urinary retention: n (%)	5 (16%)	3 (10%)	0.456
Stenosis: n (%)	2 (6%)	1 (3%)	0.561
Healing time (weeks): mean $\pm$ standard deviation	8.5 $\pm$ 2.1	7.7 $\pm$ 0.9	0.058

Note: *Statistically significant.

VICRYL suture (Ethicon, Inc.) after excision; in the other 25 the procedure was performed using the HS, and similar significant results were observed regarding pain ($p=0.02$) and operative time ($p=0.005$). In the present study, there were statistically significant differences regarding pain ($p=0.024$) and operative time ($p=0.003$), which makes our results very similar to those found by Lim et al.¹⁷

Hussein¹⁸ conducted a study in 2020 with 20 patients: 10 subjects underwent conventional hemorrhoidectomy, and the other 10, hemorrhoidectomy using the HS. The author observed lower levels of postoperative pain and bleeding in the HS group compared with the electrocautery group, results that are like those of the present study.

In 2019, Zeinalinejad et al.¹⁹ conducted a study on 53 patients comparing hemorrhoidectomy with the HS and through electrocautery and found significant results regarding operative time and postoperative pain ($p=0.045$). They also found statistical significance regarding the lower levels of postoperative bleeding in the HS group ($p=0.023$), while no statistical significance regarding this parameter was found in the present study ($p=1$).

In 2013, Bulus et al.²⁰ also conducted a study comparing HS and electrocautery; similarly, they found significant results regarding operative time ($p=0.001$), postoperative pain ($p=0.001$), and length of hospital stay ($p=0.001$).

Conclusion

Hemorrhoidectomy using the HS proved to be a secure and efficient procedure, resulting in fewer complications compared with Ferguson hemorrhoidectomy.

Ethical Approval

Ethical approval was obtained from the Scientific Committee of the Iraqi Board for Medical Specializations, Alkindy College of Medicine.

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Conflict of Interests

The authors have no conflict of interests to declare.

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