

Hemorrhoidectomy in Patients with Grade III or IV Disease: Harmonic Scalpel Compared With Conventional Closed Technique

ORIGINAL

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Abstract

Background: Harmonic scalpel (Ultracision) is a device that simultaneously cuts and coagulates soft tissues through ultrasonic vibration. In this study we aimed to determine the operative and postoperative characteristics of hemorrhoidectomy using the harmonic scalpel compared with the conventional closed technique.

Methods and Findings: Patients with grade III or IV hemorrhoids, operated between 2010 and 2013, using the harmonic scalpel (n=21) or the conventional closed technique (n=42) were included in the study. Exclusion criteria were thrombosed or strangulated hemorrhoids, concomitant perianal disease, history of recurrent perianal surgery and known tendency for bleeding. Patient characteristics, duration of operation, complications, postoperative pain measured on a visual analog scale (VAS), hospital stay, and return to regular activity were compared between the two groups retrospectively.

Patient characteristics (female: male ratio, mean age, hemorrhoid grade, and symptom duration) were similar between the two groups. Harmonic scalpel and conventional hemorrhoidectomy patients did not differ significantly in terms of VAS score of pain, complications, hospital stay or return to regular activity. However, duration of operation was significantly shorter with harmonic scalpel (24.2 vs. 36.2 min, $p<0.05$).

Conclusion: There is no clear evidence to support the routine use of harmonic scalpel system in hemorrhoid surgery.

Keywords: The hemorrhoidectomy, harmonic scalpel.

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Introduction

Hemorrhoid disease can be defined as the symptomatic enlargement and protrusion of normal anal cushions [1]. It is a very common condition, occurring in 4.4% of adults with a peak prevalence between 45 and 65 years of age, according to an epidemiological study conducted in the USA [2]. Hemorrhoidectomy is the best treatment option for symptomatic grade III and grade IV hemorrhoid disease. However, protracted healing time and postoperative pain are major drawbacks of this seemingly minor surgery. In conventional hemorrhoidectomy hemorrhoid pedicles are removed using scalpel and electrocautery and the defect is either left open (Milligan-Morgan's open hemorrhoidectomy) or sutured (Ferguson's closed hemorrhoidectomy). Harmonic scalpel uses ultrasonic vibrations at 55.5 KHz to cut and coagulate small vessels of up to 2 mm [3]. Advantages of harmonic scalpel in surgery include reduced operative bleeding and effective hemostasis resulting in shorter operation times and less tissue damage than high-energy cautery devices such as diathermy or laser [3]. Thus, hemorrhoidectomy performed with harmonic scalpel is proposed as a faster and less painful alternative to conventional techniques. In this study we aimed to compare the outcome of patients with grade III or IV disease who were subjected to hemorrhoidectomy using harmonic scalpel or conventional closed technique.

Methods

Patient characteristics, operative variables, postoperative pain, complications and recovery data were collected prospectively in all patients undergoing hemorrhoidectomy for symptomatic grade III or IV disease in Ataturk Training Research Hospital, between 2010 and 2013. Pain was measured on a visual analog scale (VAS) at postoperative Week 2. Patients with thrombosed or strangulated hemorrhoids, concomitant perianal disease, a history

of recurrent perianal surgery and known tendency for bleeding were excluded. Data from 21 patients who had harmonic scalpel hemorrhoidectomy and 42 patients who had conventional closed hemorrhoidectomy were compared in the analysis.

Surgery

Surgical preparations were the same in both groups. No prophylactic antibiotic treatment was given. All patients received sodium biphosphate/sodium phosphate enema before the surgery. Anesthesia was either general or spinal according to surgeon, anesthesiologist and patient preference. Patients were placed in the lithotomy position for surgery. In conventional closed technique, hemorrhoid pedicles originating above the dentate line until above the hemorrhoidal plexus were removed using scalpel and electrocautery; 4/0 vicryl suture was used to close the wound. In harmonic scalpel hemorrhoidectomy, hemorrhoid pedicles were removed using the harmonic scalpel (Harmonic Generator 300 System; Ethicon Endo-Surgery, LLC, Guaynabo, Puerto Rico, USA) and the wounds were left open. In all patients, adjacent areas of perianal skin and rectal mucosa were left intact to prevent anal stricture.

In general, external hemorrhoids were not removed. Opioids (tramadol 1 mL TID) were given for postoperative analgesia. Patients were prescribed an oral analgesic (e.g., dexamethasone) at discharge.

Statistical analysis

Statistical analysis was conducted using SPSS Statistics for Windows, version 17.0 (SPSS Inc., Chicago, Illinois, USA). Patient characteristics were summarized using descriptive statistics. Continuous variables were expressed as mean and standard deviation; categorical variables were expressed as number and percentage. Level of statistical significance was set at $p < 0.05$.

Kolmogorov-Smirnow test was used to determine the distribution of variables. Variables with normal

distribution were compared using the parametric repeated measures ANOVA or independent sample t-test. Categorical variables were compared using Fisher's exact test.

Results

Conventional closed hemorrhoidectomy was used in 25 females and 17 males (mean age, 41.2 ± 3.6 years), while harmonic scalpel hemorrhoidectomy was used in 15 females and six males (mean age, 43.6 ± 3.2 years). There was no significant difference between patients subjected to conventional or harmonic scalpel hemorrhoidectomy in terms of age, gender, symptom duration, or hemorrhoid grade (**Table 1**). Spinal anesthesia was preferred in 86% of conventional (36 of 42) and 81% of harmonic

scalpel (17 of 21) hemorrhoidectomy groups. Duration of operation was significantly shorter with harmonic scalpel compared with conventional hemorrhoidectomy (36.2 min vs. 24.2 min, $p < 0.05$). In conventional hemorrhoidectomy group one patient had anal stenosis, two patients had bleeding and nine patients reported pain, while 30 patients had no complaints. In the harmonic scalpel group one patient had anal stenosis, one patient had bleeding and five patients reported pain (**Table 1**). Most patients were hospitalized overnight for observation and discharged the next day. Hospital stay and time to return to daily activities did not differ significantly between conventional and harmonic scalpel hemorrhoidectomy groups. According to VAS score of pain at postoperative Week 2, both techniques were similar in terms of postoperative pain.

Table 1: Characteristics of hemorrhoidectomy patients operated using harmonic scalpel vs. conventional closed technique.

	Closed technique	Harmonic scalpel
	n=42	n=21
Female/male, n (%)	25 (59.5) / 17 (40.5)	15 (71.4) / 6 (28.6)
Age (years), mean \pm SD	41.2 \pm 3.6	43.6 \pm 3.2
Symptom duration, n		
<12 months	9	5
12–24 months	12	6
>24 months	21	10
Hemorrhoid grade, n		
Grade III	32	16
Grade IV	10	5
Type of anesthetic, n		
Spinal	36	17
General	6	4
Duration of operation* (min), mean (range)	36.2 (10–65)	24.2 (15–75)
Complications (pain/anal stenosis/bleeding), n	9/1/2	5/1/1
VAS score for pain at week 2, mean \pm SD	7.8 \pm 0.5	7.6 \pm 0.4
Hospital stay (days), mean \pm SD	1.6 \pm 0.4	1.4 \pm 0.3
Return to work (days), mean (range)	9.1 (2–25)	8.2 (1–20)
* $p < 0.05$ for duration of operation. $p > 0.05$ for all other variables.	VAS, visual analog scale; SD, standard deviation.	

Discussion

Hemorrhoids are a very common anorectal condition defined as the symptomatic enlargement and distal displacement of the normal anal cushions. They affect millions of people around the world, and represent a major medical and socioeconomic problem. This disease is reported to affect around 10 million Americans per year with a prevalence of 4.4% [4]. Multiple factors have been claimed to be the etiologies of hemorrhoidal development, including constipation and prolonged straining. The abnormal dilatation and distortion of the vascular channel, together with destructive changes in the supporting connective tissue within the anal cushion, is a paramount finding of hemorrhoidal disease [5].

Hemorrhoids are highly vascular submucosal cushions that generally lie along the anal canal in three columns—the left lateral, right anterior, and right posterior positions. These vascular cushions are made up of elastic connective tissue and smooth muscle, but because some do not contain muscular walls, these cushions may be considered sinusoids instead of arteries or veins. Clinically evident bleeding arises from the perisinusoidal arterioles and are therefore arterial in nature [6]. Hemorrhoids play a significant physiologic role in protecting the anal sphincter muscles and augment closure of the anal canal during moments of increased abdominal pressure (e.g., coughing, sneezing) to prevent incontinence and contribute 15 to 20% of the resting anal canal pressure [6]. Increases in abdominal pressure increase the pressure in the inferior vena cava that cause these vascular cushions to engorge and prevent leakage. This tissue is also thought to help differentiate stool, liquid, and gas in the anal canal [6].

Therapeutic treatment of hemorrhoids ranges from dietary and lifestyle modification to radical surgery, depending on degree and severity of symptoms [7,8]. The current management of hemorrhoids is illustrated in **Table 2**.

Major drawbacks of hemorrhoid surgery are the postoperative pain and the protracted healing period. In recent years several new techniques have been tested in an attempt to ease the postoperative pain and improve healing, such as laser hemorrhoidectomy, stapled hemorrhoidopexy, bipolar diathermy, ligasure and harmonic scalpel.

Table 2: The current management of hemorrhoids.

Dietary and lifestyle modification
Medical treatment
Non-operative treatment
Sclerotherapy
Infrared coagulation
Radiofrequency ablation
Rubber band ligation
Operative treatment
Plication
DGHAL (Doppler-guided hemorrhoidal artery ligation)
Hemorrhoidectomy
Stapled hemorrhoidopexy

Johanson et al. analyzed the results of 863 patients that RBL had greater long-term efficacy, but led to a higher incidence of post-treatment pain [9] and in another study patient satisfaction and acceptance of the band ligation method and hemorrhoidectomy seemed to be similar [10]. In a study made by Nienhuijs et al, ligasure hemorrhoidectomy resulted in significantly shorter operative time, less early postoperative pain, earlier recovery, without any difference in recurrent bleeding or incontinence [11] and Bursch et al. found stapled hemorrhoidectomy had less postoperative pain, shorter operative time, shorter hospital stay, and shorter convalescence, but a higher rate of prolapse and reintervention for prolapse [12].

In this study we compared the outcome of patients subjected to hemorrhoidectomy using harmonic scalpel or conventional closed technique with

scalpel and electrocautery. We found that the use of harmonic scalpel resulted in significantly shorter operation time. However, the two groups were similar in all other variables, including postoperative pain, complications, duration of hospital stay, and return to daily activities.

The Harmonic Scalpel possesses the unique advantage of causing very little lateral thermal injury in the tissues. A decreased lateral thermal injury (<1.5 mm) at the surgical site is translated into decreased postoperative pain. The depth of thermal injury in porcine small bowel mesentery was found to be up to 15 mm with mono-polar electrocautery, up to 9mm with bipolar electrocautery, up to 4 mm when using CO2 laser and up to 4.2 mm using Nd-YAG laser [13].

Harmonic scalpel achieved favorable postoperative pain scores compared with open or closed hemorrhoidectomy with scissors and/or monopolar or bipolar electrocautery in a number of prospective randomized studies [14-19]. The difference in pain was attributed to avoidance of lateral thermal energy in harmonic scalpel as opposed to electrocautery. Most of these studies also reported less analgesic use and faster recovery with harmonic scalpel. However, other studies, including ours, found no significant difference in postoperative pain or other outcome-related variables between harmonic scalpel and conventional techniques [20-22].

Presence or absence of wound closure in comparative arms of hemorrhoidectomy studies may be a confounding factor affecting postoperative pain. In a four-arm trial, Ozer et al. [18] randomized patients to harmonic scalpel with open hemorrhoidectomy, harmonic scalpel with closed hemorrhoidectomy, conventional open hemorrhoidectomy and conventional closed hemorrhoidectomy. They reported that open technique with or without harmonic scalpel resulted in less postoperative pain and lower analgesic use, although harmonic scalpel fared better than conventional open hemorrhoidectomy on postoperative Days 2–6. However, when used

together with closed technique harmonic scalpel offered no advantage in terms of pain or analgesics. Although wounds were left open after hemorrhoidectomy with harmonic scalpel in our patients we still failed to notice a difference in pain scores compared to closed conventional technique involving catgut suture of the incision.

In a retrospective study, Haveran et al. [23] analyzed the results of 180 patients treated with harmonic scalpel hemorrhoidectomy in an ambulatory setting using intravenous sedation and local anesthesia. They suggested that this technique can be used safely and effectively in outpatient surgery, which would serve to cut expenses related to hospital stay. However, postoperative pain was not a consideration in their study. A comparative study of excisional techniques suitable for outpatient hemorrhoidectomy can address the safety concerns and patient satisfaction more objectively.

In two studies harmonic scalpel was tested against new incisional techniques. In one study patients with grade III or IV disease were randomized to receive hemorrhoidectomy using harmonic scalpel or ligasure, an electrocautery device resulting in minimal lateral thermal damage [24]. Postoperative pain score and analgesic use were determined to be significantly lower in the ligasure group. In another randomized controlled trial harmonic scalpel was compared with stapled hemorrhoidopexy, and patients in the latter group were shown to have significantly lower pain scores, shorter hospital stay and faster return to work [25]. Furthermore, operation time and intraoperative blood loss were similar in both groups.

Retrospective analysis of the results and absence of randomization are some limitations of this study. Evaluation of pain scores only at Week 2, instead of multiple time points of pain assessment could be regarded as a limitation. However, opioid analgesics used postoperatively affects pain assessment on Day 1, and further assessments at Week 2 and beyond is likely to measure pain that has already subsided

considerably; thus we opted for pain assessment at Week 2, when the pain was still at its peak.

Harmonic scalpel and conventional closed hemorrhoidectomy were similar on all outcome-related variables, including postoperative pain, complications, duration of hospitalization and return to daily activities. In our practice, shorter duration of operation was the only advantage of harmonic scalpel hemorrhoidectomy. Given the higher expense of harmonic scalpel system, we feel that its routine use in hemorrhoid surgery is not warranted; although it could be used in select cases opting for outpatient treatment.

Conflicts of Interest

None.

Acknowledgments

None.

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