

**Comparative Study of Open Haemorrhoidectomy using Ultrasonic Energy Device (Harmonic Scalpel) Versus Electrodiathermy**Arunkumar Chawan<sup>1</sup>, Abhishek Prasad<sup>2</sup>, Pogaku Sai Sharan<sup>3</sup>, Roshani Damor<sup>4</sup>, Rishav Kumar<sup>5</sup>, Srinivas Thimmasarthi<sup>6</sup><sup>1</sup>Senior Resident, Dept. of Surgery, ESIC Medical College and Hospital, Kalaburagi<sup>2</sup>Assistant Professor, Dept. of Surgery, ESIC Medical College and Hospital, Kalaburagi<sup>3</sup>Senior Resident, Dept. of Surgery, ESIC Medical College and Hospital, Kalaburagi<sup>4</sup>Senior Resident, Dept of Surgery, BJ Medical College, Ahmedabad<sup>5</sup>Senior Resident, Dept of Surgery, BJ Medical College, Ahmedabad<sup>6</sup>Senior Resident, Dept of Surgery, BJ Medical College, Ahmedabad

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Corresponding Author: Dr. Arunkumar Chawan

Conflict of interest: Nil

**Abstract:****Aim:** This study aimed to compare preoperative and postoperative courses of open haemorrhoidectomy using ultrasonic energy device (harmonic scalpel) versus electrodiathermy.**Materials and Methods:** 50 patients undergoing haemorrhoidectomy were equally divided into two groups: 25 patients in group A (conventional method) treated with monopolar electrocautery and 25 patients in group B treated with ultrasonic scalpel. The resting pain and the post defecation pain was recorded using the visual analogue scale (VAS), as well as the amount of bleeding and urinary retention.**Result:** Intraoperative bleeding was less in the ultrasonic scalpel group in comparison to the conventional hemorrhoidectomy and this was statistically significant ( $p < 0.05$ ). There was a high statistical difference between both groups according to wound healing duration ( $p < 0.05$ ). There was statistically significant reduction ( $p = 0.006$ ) in wound infection and discharge in the ultrasonic scalpel group compared to the conventional hemorrhoidectomy group. Postoperative pain in day 1 and day 2 was significantly less in the ultrasonic scalpel group compared to the conventional hemorrhoidectomy group but no difference was noticed after 1 week.**Conclusion:** This study concluded that ultrasonic scalpel technique is better in treating haemorrhoidectomy than the conventional hemorrhoidectomy using electrodiathermy in terms of postoperative pain, intraoperative bleeding, wound healing, wound infection and discharge.**Keywords:** Haemorrhoidectomy, Ultrasonic Scalpel, Harmonic Scalpel, Conventional Hemorrhoidectomy, Electrodiathermy.

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**Introduction**

Hemorrhoidal disease is a prevalent condition that significantly impacts the quality of life of affected individuals, often necessitating surgical intervention when conservative treatments fail. Among the surgical options, open hemorrhoidectomy is a commonly performed procedure, with various energy sources employed for tissue dissection and hemostasis. The Harmonic Scalpel operates by generating ultrasonic vibrations that facilitate precise cutting and coagulation of tissues with minimal thermal damage, potentially leading to reduced postoperative pain and quicker recovery times. Studies have indicated that patients undergoing hemorrhoidectomy with the Harmonic Scalpel experience less intraoperative bleeding and a lower incidence of postoperative complications compared to those treated with electrodiathermy [1,2]. Furthermore, the advantages of using

ultrasonic energy include shorter operation times and improved patient satisfaction due to less postoperative discomfort [3,4]. Conversely, electrodiathermy, while effective, is associated with greater thermal spread and potential collateral damage to surrounding tissues, which can result in increased postoperative pain and longer recovery periods. The choice of surgical technique can thus significantly influence patient outcomes, including pain management, wound healing, and overall satisfaction. Goligher recalls a patient describing a bowel motion as "like passing bits of broken glass" [5]. This reputation in combination with high prevalence of hemorrhoid disease has generated much interest in outpatient and painless treatment of haemorrhoids. So, there is the invention of the harmonic shears device that simultaneously cuts and coagulates soft tissues through ultrasonic

vibrations. In this study there is comparative analysis between conventional haemorrhoidectomy versus haemorrhoidectomy with harmonic shears. Several studies have shown that long-term outcomes for patients undergoing hemorrhoidectomy with the Harmonic Scalpel are generally more favourable compared to those treated with electrodiathermy, particularly concerning postoperative pain, recovery time, complication rates, and wound healing [1,6,7]. This study aims to compare the preoperative and postoperative courses of open hemorrhoidectomy using two distinct modalities: the harmonic scalpel, which utilizes ultrasonic energy, and electrodiathermy, a traditional electrosurgical method.

**Materials and Methods:** This prospective, interventional study was conducted in the Department of General Surgery, ESIC Medical College and hospital, Gulbarga from November 2023 to October 2024. Ethical approval was obtained prior to the commencement of the study. Informed written consent was collected from all the patients.

**Inclusion criteria:**

- Patients with grade III or IV internal haemorrhoids
- Patients with Age > 18 years
- Patients willing to participate in study and giving informed and written consent.

**Exclusion criteria:**

- Age < 18 years
- Patients with liver cirrhosis, diabetes, haemorrhagic diseases, or HIV were excluded from the present study.
- Patients not willing to participate in study or not giving informed and written consent.

**Sample size:** 50 patients undergoing a haemorrhoidectomy for grade III or IV internal Hemorrhoids were randomized in Group A and Group B.

Group A: Twenty-five patients of haemorrhoidectomy performed with monopolar electrocautery, which was defined as the conventional method.

Group B: Twenty-five patients underwent haemorrhoidectomy performed with an ultrasonic scalpel®.

**Data collection:** All of the patients' records were prospectively collected from a database.

**Preoperative preparation:** All patients underwent preoperative lab tests, chest X-rays, electrocardiography, and urinalysis and were admitted to the hospital the day before surgery. All patients were given proctoclysis enema the night before

surgery, and prophylactic antibiotics were injected before entrance to the surgical room. All patients were given spinal anesthesia and placed in the lithotomy position.

**Operative procedure:** Tape was attached to both sides of the buttocks to expose the anus, and an anoscope was inserted into the anal canal in order to obtain the surgical field. The haemorrhoidal stems were lifted with forceps to separate them from the anal sphincter during surgery. The conventional method performed was the Ferguson closed haemorrhoidectomy using monopolar electrocautery, and resection of haemorrhoidal tissue from the anal sphincter was performed with surgical scissors or a monopolar electrocautery device. Vicryl 2-0 surgical sutures were placed after the hemorrhoid mucosal resection. The haemorrhoidectomy performed using ultrasonic scalpel® excise haemorrhoidal tissue and pedicle to the apex region without damaging the internal sphincter with the help of vascular forceps. The haemorrhoidal mucosa and coagulated blood vessels of the hemorrhoid were excised with an ultrasonic scalpel, and mucosal sutures placed with 2-0 Vicryl. A haemostat was inserted into the anal canal after surgery.

**Postoperative care:** For postoperative pain control, each patient was prescribed Diclofenac injection three times a day for the first day after surgery, and sitz baths taken at least three times a day. The resting pain and the post defecation pain was recorded using the visual analogue scale (VAS), as well as the amount of bleeding and urinary retention. Regarding pain day before surgery, the patients were instructed how to complete the 0 to 10 visual analog scale (VAS). The intensity of postoperative pain was measured every 8 hours during the first 24 hours by means of a 0 to 10 visual analog scale (VAS: 0...no pain and 10...maximum pain experienced) and during weekly follow up visits. Thus, pain was assessed before the operation or intervention and again immediately after the operation; it was subsequently measured at regular intervals. Patients of both groups received both local anesthesia before the operation and NSAIDs at regular intervals (every 8 hours).

**Complications:** Occurrence of any anal abscess or gangrene, an anal stricture, and fecal incontinence was noted. Major bleeding was defined as that requiring intensive treatment (including blood transfusion, reoperation) or close monitoring. Minor bleeding was defined as no need of monitoring with minimal bleeding after defecation.

**Statistical Analysis:** All statistical analyses were done by statistician. Categorical variables were analyzed using the chi-square or Fisher exact test, and continuous variables were analyzed using the

student t-test. P-value of less than 0.05 was considered statistically significant.

**Results:** Patients were divided according to blood loss in each group as shown in table 1. There was

statistical significance between the two methods as the p value was 0.007.

**Table 1: amount of blood loss in the two groups.**

			Group	
			Harmonic	Conventional
Blood loss	Mild blood loss	Count	10	17
		% within Group	40.0%	68.0%
	Moderate blood loss	Count	0	8
		% Within Group	0.0%	32.0%
	No blood loss	Count	15	0
		% Within Group	60.0%	0.0%

Ultrasonic coagulation results in less intraoperative bleeding in comparison to the conventional hemorrhoidectomy in which there was a high statistical difference between both groups p value (0.007)

Patients of both groups were sorted according to hospital stay and the duration of stay with the same in the two groups ranging from 1 to 2 days with no statistical difference as the P value could not be calculated as the hospital stay was constant in the

two groups. Patients within both groups were divided according to wound healing duration as shown in table 2 and there was a high statistical difference between both groups according to wound healing duration (*P* value < 0.05).

Complete wound healing occurred by the end of 3 weeks in patients treated with harmonic scalpel while in those treated by conventional surgery healing completed by the end of the 6 weeks.

**Table 2: duration of post hemorrhoidectomy wound healing.**

			Group	
			Harmonic	Conventional
Wound healing Duration	2 weeks	Count	10	0
		% Within Group	40.0%	0.0%
	3 weeks	Count	15	0
		% Within Group	60.0%	0.0%
	4 weeks	Count	0	13
		% Within Group	0.0%	52.0%

Patients within both groups were divided according to wound discharge and infection as shown in table 3. Chi-square test shows statistical difference between both groups regarding wound infection and discharge (*P* value 0.006).

**Table 3: wound infection and discharge.**

			Group	
			Harmonic	Conventional
Discharge & inf.	Mild discharge & infection	Count	10	15
		% Within Group	40.0%	60.0%
	Moderate discharge & infection	Count	0	10
		% Within Group	0.0%	40.0%
	No discharge and infection	Count	15	0
		% Within Group	60.0%	0.0%

Both groups are sorted according to postoperative pain after 1 day, 2 days and 1 week.

There was statistical difference between both groups in postoperative pain in which the group, which performed ultrasonic coagulation hemorrhoidectomy, experiences less postoperative pain in day 1 and day 2 than the group which

performed conventional hemorrhoidectomy. There was no difference in both groups in postoperative pain after 1 week.

#### Discussion

In 2002, E. Ramadan, T. Vishne and Z. Dersnic described decreased postoperative pain, less postoperative stay and decreased time of surgery

with ultrasonic coagulation procedure compared to conventional Milligan and Morgan hemorrhoidectomy [8]. Also in 2002, Chung CC et al conducted a study, using different excision techniques: Harmonic Scalpel hemorrhoidectomy, bipolar diathermy hemorrhoidectomy, and regular scissors. The study was conducted upon 89 patients with grade 4 hemorrhoids. The study showed that the Harmonic Scalpel and bipolar scissors were efficient in reducing postoperative hemorrhage. Harmonic Scalpel was superior in reducing postoperative pain thus improving patient satisfaction. Recovery time was similar with all the techniques [2].

In 2001, David N Armstrong et al conducted a prospective randomized study on the same topic which demonstrates significantly reduced postoperative pain after harmonic scalpel hemorrhoidectomy compared to the electrocautery controls. They claimed that the prevention of the lateral thermal injury during ultrasonic coagulation hemorrhoidectomy probably accounts for the decreased postoperative pain [6].

In 2008, A.A. Abohashem, A. Sarhan, AM Aly conducted a single randomized trial at Zagazig University hospital during the period from July 2007 to December 2008, Patients underwent surgical excision of complex grade III or grade IV hemorrhoids. They were divided into two groups: (A) ultrasonic coagulation Hemorrhoidectomy group and (B) Bipolar Electro-cautery Hemorrhoidectomy group. This study demonstrates significantly reduced postoperative pain after ultrasonic coagulation Hemorrhoidectomy compared with bipolar electro-cautery Hemorrhoidectomy. Most likely, this result came from the avoidance of excessive lateral thermal injury caused by bipolar electrocautery [9].

Analysis of the results obtained of our study showed that the ultrasonic coagulation hemorrhoidectomy is better than the conventional Milligan & Morgan hemorrhoidectomy regarding Intraoperative time which was ranging between 15 to 20 minutes in the ultrasonic coagulation hemorrhoidectomy while it ranges between 30 to 35 minutes in the conventional hemorrhoidectomy. Also ultrasonic coagulation results in less Intraoperative bleeding in comparison to the conventional hemorrhoidectomy in which there was a high statistical difference between both groups p value (0.007). Regarding wound healing duration, the ultrasonic coagulation leads to more rapid wound healing ranging between 2 to 3 weeks while in conventional hemorrhoidectomy wound healing duration ranges between 4 to 5 weeks p value (<0.05). Regarding wound infection and discharge, ultrasonic coagulation hemorrhoidectomy shows much less wound

infection and discharge in comparison to the conventional hemorrhoidectomy (P value 0.006).

Regarding postoperative pain, patients who undergo ultrasonic coagulation hemorrhoidectomy experience less postoperative pain in day 1 and day 2 compared to patients who undergo conventional hemorrhoidectomy. There was high statistical difference between both groups in postoperative pain during day 1 and 2 but there was no clear difference in postoperative pain after 1 week from the operation. The results of this study appeared to be nearly the same as other studies. On contrary to our results, Khan S, et al found that ultrasonic coagulation hemorrhoidectomy did not show any advantage in postoperative pain, fecal incontinence, operative time, quality of life, or other complications compared with traditional closed hemorrhoidectomy in their study comparing harmonic scalpel hemorrhoidectomy with traditional closed hemorrhoidectomy [10]. In a prospective randomized experiment conducted in 2001, Tan JJ and Soew-choen F compared diathermy and ultrasonic coagulation hemorrhoidectomy and found no statistically significant difference in the pain scores recorded by the two groups [11].

### Conclusion

Patients treated with ultrasonic coagulation hemorrhoidectomy experienced less postoperative pain in day 1 & 2 but no difference after 1 week. Faster wound healing occurs with ultrasonic coagulation hemorrhoidectomy. Ultrasonic coagulation hemorrhoidectomy has less intraoperative bleeding time. This research provides valuable insights that could guide clinical decision-making in the management of hemorrhoidal disease by elucidating the differences between open hemorrhoidectomy utilizing the harmonic scalpel versus electrodiathermy.

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