

Comparative study between conventional hemorrhoidectomy and electrothermal bipolar vessel sealer for Grade IV hemorrhoids



Devendra Chaudhary¹, Vijay Kumar Tekam², Sourabh Mishra³, Priyanka Singh⁴

^{1,2}Associate Professor, ³Resident Surgical Officer, Department of General Surgery, ⁴Assistant Professor, Department of Microbiology, Gandhi Medical College and Associated Hamidia Hospital, Bhopal, Madhya Pradesh, India

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ABSTRACT

Background: Hemorrhoids are vascular formations in the anal canal that is also known as piles. They serve as a cushioning of anterior venous channels and connective tissue in its natural condition, which aids in stool management. During defecating, internal hemorrhoids are frequently accompanied by painless, bright crimson rectal discharge. External hemorrhoids can cause discomfort and edema in the anus region. **Aims and Objectives:** The objectives of this study are to “compare between electrothermal bipolar vessel sealer hemorrhoidectomy versus conventional hemorrhoidectomy in patient of Grade IV hemorrhoids. **Materials and Methods:** The present study conducted in patients admitted in Gandhi medical college associated Hamidia Hospital, Bhopal carried out in the Department of General Surgery from April 2015 to September 2017. A total of 80 patients were included in the study with comparison between conventional hemorrhoidectomy (n = 36) and electrothermal bipolar vessel sealer (ETBVS) (n = 44) and comparison of recurrence of complications in them. **Results:** The mean surgical time was much shorter in ETBVS, as was post-operative pain, which was primarily reduced on the third and 4th post-operative days: discomfort also vanished quicker in ETBVS than in conventional procedure. ETBVS patients had less time off work, a shorter hospital stay, and a reduced risk of total problems. When compared to conventional procedures, the average length of operation in ETBVS was also much shorter (P<0.0001). **Conclusion:** When a considerable amount of tissue needs to be removed, ETBVS hemorrhoidectomy is a good option. This research confirms its usage as a first-line therapy for Grade IV hemorrhoids.

Key words: ETBVS; Hemorrhoids; Hemorrhoidectomy; Post-operative pain score

INTRODUCTION

Hemorrhoids are component of the anal canal and are composed predominantly of vascular tissue supported by smooth muscle and connective tissue. It functions as a compressible lining allows the anus to close completely. Hemorrhoids, also called piles, are vascular structures in the anal canal.¹ In their normal state, they act as cushion of anterior venous channels and connective tissue that help with stool control.² They become a disease when swollen or inflamed; the unqualified term “hemorrhoid” is often used to refer to the disease. The signs and symptoms of hemorrhoids depend on the type present.^{1,2}

Internal hemorrhoids are usually present with painless, bright red rectal bleeding when defecating.^{2,3} External hemorrhoids often result in pain and swelling in the area of the anus. If bleeding occurs that it is usually darker. Symptoms frequently get better after a few days. A skin tag may remain after the healing of an external hemorrhoid. They become symptomatic through bleeding or prolapse. Hemorrhoid can be mucosal or vascular. Vascular type is seen in young; mucosal is seen in old.^{2,3}

The general approach to the treatment of the disease in Phases 1 and 2 is medical, while surgical hemorrhoidectomy is used in Phases 3 and 4.⁴ “Open” Milligan Morgan

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Address for Correspondence:

Dr. Priyanka Singh, Assistant Professor, Department of Microbiology, Gandhi Medical Collage and Associated Hamidia Hospital, Bhopal - 462 001, Madhya Pradesh, India. **Mobile:** +91-9424723491. **E-mail:** priyankasingh27031982@gmail.com

and “closed” Ferguson method are the most common conventional hemorrhoidectomy techniques.^{5,6} Although hemorrhoidectomy is the most effective treatment, the presence of post-operative pain and complications is the main reason why patients do not want the operation.⁷ Although the presence of post-operative pain is common, its cause is not clear. Tissue damage and inflammatory response during surgery cause pain, while rapid healing and minimizing tissue damage can reduce pain.^{7,8} It has also been reported that third-degree burn injury in the wound area terminates pain sensation in the nerves.⁹ Other factors that can affect the initiation of pain, such as age, phase of disease, complaint period, working, and the number of excised bundles, may also affect the severity of pain. However, most of the major studies have shown that these parameters are insignificant.⁷ In addition, early and late post-operative complications (e.g., urinary retention, bleeding, fecal and/or flatus incontinence, perianal wetness, anal stenosis, and recurrence) can affect patient satisfaction and success of the surgery.

In recent years, several pieces of surgical equipment have been developed due to advances in technology, and now, hemorrhoidectomies are being performed with new devices, such as bipolar electrothermal devices, ultrasonic scalpels, and circular staplers. Hemorrhoidectomies performed with these devices which have recently been reported to result in better pain relief and less bleeding postoperatively compared to hemorrhoidectomies performed using the previous conventional surgical methods.¹⁰⁻¹³

Using electrothermal bipolar vessel sealer (ETBVS) hemorrhoidectomy, we can close that the vascular structures up to 7 mm fully and permanently with minimal adhesion, burning, and thermal damage have been reported. Thermal damage was reported to be up to 2 mm, causing rapid healing and is effective, fast, and safe technique.^{14,15}

It has several advantages, including less damage to tissues, better hemostasis, less stimulation to neuromuscular tissues, and local control of the surgical site, compared to a conventional hemorrhoidectomy performed with surgical scissors or monopolar electric cauterly.^{10,11} The aim of the present study is to analyze and compare outcomes between hemorrhoidectomies performed with an ETBVS versus conventional method in patient of Grade IV hemorrhoids.

Aims and objectives

This study was conducted with the aim to compare the Conventional Haemorrhoidectomy and Electrothermal bipolar vessel sealer to assess the performance and find a better surgical strategies for Grade IV hemorrhoids.

MATERIALS AND METHODS

The 80 patients who underwent a hemorrhoidectomy for Grade IV internal hemorrhoids (Figure 1) admitted in Gandhi medical college associated with Hamidia Hospital, Bhopal carried out in the Department of General Surgery from April 2015 to September 2017. Thirty-six patients underwent a hemorrhoidectomy performed with conventional hemorrhoidectomy method (Figure 2) and the other 44 patients underwent a hemorrhoidectomy performed with an ETBVS. Patients having no signs of sphincter damage (no signs of fissure or anal tear) and no other mass/growth assessed during digital rectal examination were included in the study. All patients with internal hemorrhoids and with uncertain diagnosis were also excluded from the study.

Operative technique

Detailed history was taken and complete physical and locoregional examination of patients were performed. All patients underwent pre-operative laboratory tests, chest X-rays, electrocardiography, and urinalysis. The patients were called a day before admission for surgery and were



Figure 1: Hemorrhoids



Figure 2: Electrothermal bipolar vessel sealer device

kept on liquid orally for 24 h if planned for local anesthesia and nil orally 8 h before surgery if planned for spinal anesthesia. The patient is given one proctolysis enema 2 h before commencement of procedure. All patients were operated in Lithotomy position with steep head low position. The patient positioned in with the help of leggings support. The procedure done in either spinal anesthesia/saddle block or local anesthesia using 2% lidocaine diluted in normal saline in ratio of 1:3. The procedure started with the examination of the hemorrhoid with proctoscope/anoscope to view the position and plan for the procedure. Two constituted groups, conventional, and ETBVS hemorrhoidectomy groups were operated using either a standard open or closed hemorrhoidectomy technique. The protocol was approved by an ethics committee and patients written consent was also taken. The hemorrhoidectomy in the conventional group was performed according to the either Milligan-Morgan or Ferguson technique. The base of the hemorrhoid was excised and either left open or the wound was sutured with a 3.0 polyglactin thread. In bipolar electrothermal device which offers an optimized combination of pressure and radiofrequency, sealing blood vessels and generating energy tailored to the tissue impedance, with a thermal injury confined to 2 mm over the surgical site. This limited spread reduces anal spasm and allows performing a bloodless hemorrhoidectomy with reduced post-operative pain and fast healing. Finally, in both groups, a hemostatic endoanal dressing was applied. The operating time was defined as the time from the beginning of the operation until the application of the endoanal dressing. After the procedure, the patient was kept in ward for 24 h of observation for detail assessment of post-operative course and then discharged home. All patients were subjected to proper per rectal and proctoscopic examination on follow-up.

Statistical analysis

The data were compiled and entered into a Microsoft Excel spreadsheet. SPSS Version 20.0 (SPSS Inc. Chicago, Illinois, USA) was used for statistical analysis. Continuous and categorical variables were expressed as mean (standard deviation) and as frequencies and percentages, respectively. Student's t-test was used for comparing continuous variables. Categorical variables compared using either the Chi-square test or Fisher's exact test. $P < 0.05$ was considered statistically significant.

RESULTS

A total of 80 patients with Grade IV hemorrhoids were included in the study and were randomly divided into two groups. Thirty-six patients underwent conventional procedure and 44 were treated by ETBVS procedure.

The two groups were comparable for age (mean age: 47.65 for conventional, 48.86 for ETBVS patients; overall range 21–65), gender (male/female ratio not statistically significant), spinal anesthesia ($P=0.3191$), general anesthesia ($P=0.3170$), and other symptoms (bleeding [%] [$P=0.8180$] and pain [%] [$P=0.9054$]) (Table 1). The mean duration of surgery for the conventional method group was 38.76 min compared to 11.09 for conventional group, with a statistically significant difference ($P < 0.0001$) (Table 2).

There was significant difference in hospital stay among two groups. The mean duration of hospital stay was less in ETBVS group (3.05 ± 0.42) when compared to conventional (6.23 ± 1.10) after the operation ($P < 0.0001$) (Table 2).

Initially, the overall incidence of complications was not different between the two groups. The post-operative pain was wisely managed after the surgeries by continuous infusion in two groups and no statistically significant was observed due to this effective administration within the first 12 h in both groups ($P=0.0857$).

After successful completion of the surgeries, during follow-up the increases in number of cases with pain-free condition were comparatively higher in ETBVS group. Pain score was lower in ETBVS group as compared to conventional also was statistically significant ($P < 0.001$) during follow-up at 48 and 96 h (Figure 3).

Patients were operated by ETBVS procedure returned to their normal work activities, 9.4 ± 0.55 days after the operation as compared to 20.6 ± 2.2 days of conventional group, and this showed strongly significant difference

Table 1: Patients characteristics between the two groups

	Conventional	ETBVS	P value
Age (years) (range)	47.65 (18–66)	48.86 (18–75)	NS
Male/female ratio	4.1	6.3	NS
Spinal anesthesia	29	39	0.3191
General anesthesia	7	5	0.3170
Bleeding (%)	34 (94.44%)	41 (93.18%)	0.8180
Pain (%)	33 (91.66%)	40 (90.90%)	0.9054

Table 2: Comparison of two groups with different durations

Groups	Conventional	ETBVS	P Value
Number of cases	36	44	NS
Mean duration of surgery	38.76 ± 11	11.09 ± 3.40	< 0.0001
Mean duration of hospital stay	6.23 ± 1.10	3.05 ± 0.42	< 0.0001
Mean duration of return to work	20.6 ± 2.2	9.4 ± 0.55	< 0.0001

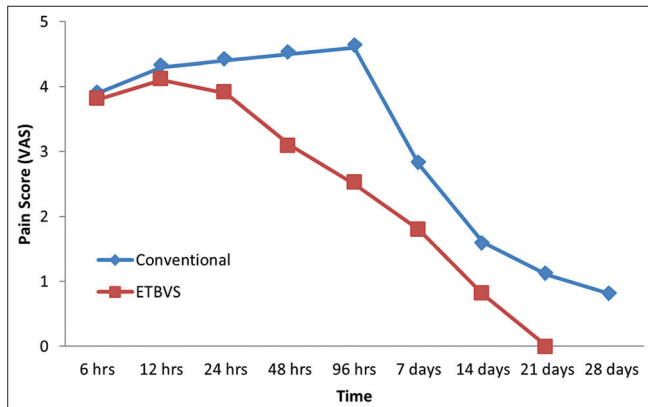


Figure 3: Pain score after surgery in the two groups

($P < 0.0001$). Among other complications, it was observed that two patients of conventional treatment were showing prolapse and out of them one patient also showed wound infection in the 1st month, whereas in case of ETBVS, just one patient with prolapse was found in the 1st month.

DISCUSSION

The pathophysiologic background for the treatment of hemorrhoidal disease by ETBVS is different than the pathophysiologic basis for excision hemorrhoidectomy.

Among hemorrhoidectomy, post-operative pain and complications are major cause of unhappiness. As a nutshell, the most critical aspect of hemorrhoidectomy is pain reduction to minimize early and late complications. Various new treatment modalities have developed with the aim of overcoming post-operative pain. None is clearly superior to the other, and the primary concern remains reduction of post-operative pain and operative time.¹⁶ Hence, the present study aimed to compare conventional hemorrhoidectomy with ETBVS technique. The shorter duration of the surgery, the pace with which the incision healed, and the speedy returning to normal activities may all be seen as evidence of the excellence of the hemorrhoidectomy technique. Further, limited spread reduces anal spasm and allows performing a bloodless hemorrhoidectomy recommended as the ideal technique due to the potential reduction in tissue trauma.

The ETBVS hemorrhoidectomy is a typical electrothermal bipolar vessel sealing system consists of an electric current generator and an instrument for grasping blood vessels. During surgery, a surgeon first grasps a blood vessel to be sealed with the instrument that is usually designed as a clamp. A surgeon, then, initiates a sealing cycle controlled by the generator. The generator produces an electric current across the blood vessel wall. Electromagnetic wave surrounding the current energizes the electrons within the

blood vessel. These electrons release their energy as heat. As the blood vessel is heated, the collagen and elastin found in the blood vessel wall denature. The generator precisely controls the amount of energy delivered to the tissue through a computer algorithm that varies depending on the manufacturer. The majority of the generator systems monitors the impedance in the circuit and as it begins to rise automatically break the current. This prevents charring and burning of the vessel wall. The sealing cycle is complete with a period of cool-down during which the elastin and collagen form a seal.³

In multiple published clinical trials, the ETBVS technology has been compared to conventional diathermy and closed hemorrhoidectomy to minimize the principal concerns associated with hemorrhoidectomy.^{10,14,17-19}

Mastakov et al.,⁸ reported that LigaSure hemorrhoidectomy is effective tool and is better in the radiofrequency group and showed shorter duration of surgery and reduced pain. Milito et al.,¹⁴ reviewed and observed a significant enhancement in post-operative pain relief, wound repair, and operation time in a study of eleven randomized studies, but no difference in post-operative bleeding and complications between the two groups.

Similarly, the significantly lower intraoperative time and blood loss in LigaSure hemorrhoidectomy explained by the effective hemostatic control achieved by the use of LigaSure device significantly in LigaSure group, patients achieved lower pain score post-operative week ($P = 0.026$) compared to conventional group. Similarly, the efficient hemostatic management obtained by the use of the LigaSure device explains the greatly reduced intraoperative time and blood loss in LigaSure hemorrhoidectomy.¹⁷ Patients in the LigaSure group had a reduced post-operative pain score ($P = 0.026$) than those in the conventional group. Further, Kraemer et al.,²⁰ also paralleled LigaSure with stapled hemorrhoidopexy, which effectively control post-operative pain, with a faintly encouraging inclination of radiofrequency in the outcome of patients with 4th grade piles. Jóhannsson et al.,²¹ and Wang et al.,²² also demonstrate reduction in post-operative pain between the LigaSure and conventional groups designed based study.

In a randomized clinical trial, Muzi et al.,²³ also reported that LigaSure hemorrhoidectomy demonstrates, a low complication rate, fast wound healing, a quick return to work, and reduced post-operative pain. They give reason for decreased pain in the ETBVS group as a result of coagulation with high frequency current, active feedback control over the power output results in minimal thermal spread, and limited tissue charring, while excisional hemorrhoidectomy is associated with

significant post-operative pain due to trauma of the sensitive anal mucosa (anoderm). Furthermore, the patients have to maintain a precise wound dressing to prevent local infection. Because local wound exposure may lead to fecal contamination and prolonged wound healing. Furthermore, there is no significant difference between closed and open techniques in terms of post-operative pain, although conventional procedure is associated with increase pain during first defecation after surgery compared to ETBVS. Similarly, the removal of either a skin tag or an isolated pile at the same time as in both groups did not seem to exacerbate pain.

Khanna et al.,²⁴ also found that LigaSure hemorrhoidectomy is an safe and effective procedure, which has less blood loss, post-operative pain and complications compared to conventional hemorrhoidectomy also stated that, technically, it is much simpler, because suturing is not required and hemostasis is easy to achieve. It has the potential of making hemorrhoidectomy in to a day-care procedure.

No any complains of incontinence present and only one patient of open hemorrhoidectomy complains of not passing motion until 2 days which was relieved by laxatives.

Xu et al.,²⁵ and Tan et al.,²⁶ also reported in their studies that ETBVS hemorrhoidectomy had a significantly shorter operative time and hospital stay and earlier return to work in comparison to conventional techniques.

The LigaSure is effective according to most studies and our finding is concordant with these previous studied. The use of this device allows a shorter operating time with a statistically significant difference. Moreover, the system is simple and easy to learn and the smaller operation time.

In our study, there was no significant difference between both groups as regard recurrence as there were no cases of recurrence in both groups, the same results reported by Chung and Wu,²⁷ and Wang et al.,²² The present study also showed that after EBVS, return to work and normal activities was significantly faster than after conventional hemorrhoidectomy due to reduced post-operative pain and faster wound healing. Although ETBVS electrodes has higher cost but it may compensate for the reduced operative time.

Limitations of the study

A shortcoming of the current study is the small sample population and the inadequate follow-up; consequently, the advantages of the Electrothermal bipolar vessel sealer must be assessed in a larger sample size.

CONCLUSION

This study confirms ETBVS hemorrhoidectomy advantages over conventional hemorrhoidectomy. ETBVS has decreased operating time, low pain score, hospital stay, and duration of return to work as compared to conventional hemorrhoidectomy. There is no significant difference found in terms of recurrence in both the procedures. Hence, ETBVS is better procedure in the treatment of Grade IV hemorrhoid in comparison to conventional hemorrhoidectomy.

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Authors Contribution:

DC- Concept and design of the study, prepared first draft of manuscript; **VKT-** Interpreted the results; **SM-** Collection and compilation of data, Reviewed the literature, statistical analysis and interpretation and manuscript preparation; **PS-** Concept, coordination, preparation of manuscript and revision of the manuscript.

Work attributed to:

Gandhi Medical College and Associated Hamidia Hospital, Bhopal - 462 001, Madhya Pradesh, India.

Orcid ID:

Dr. Devendra Chaudhary -  <https://orcid.org/0000-0001-5702-3842>
 Dr. Vijay Kumar Tekam -  <https://orcid.org/0000-0003-3938-6986>
 Dr. Sourabh Mishra -  <https://orcid.org/0000-0001-9542-8146>
 Dr. Priyanka Singh -  <https://orcid.org/0000-0003-2376-5148>

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