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Surgical Outcomes in Patients Undergoing Conventional Diathermy Haemorrhoidectomy Versus Ligasure Haemorrhoidectomy: A Comparative Study

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ABSTRACT

Background: Haemorrhoids are a common anorectal condition often requiring surgical intervention in advanced stages. Various surgical techniques exist, with ongoing debate regarding the optimal approach for minimizing postoperative complications and improving recovery.

Objective: To evaluate and compare the surgical outcomes between patients undergoing conventional diathermy haemorrhoidectomy and those receiving Ligasure haemorrhoidectomy.

Methods: This was a single centre, hospital based, prospective observational comparative study conducted in the Department of General Surgery, Chettinad Hospital And Research Institute, Chennai, Tamil Nadu among patients operated between January 2024 and December 2024.

Results: The study included 30 patients, equally divided into two groups. Baseline characteristics such as age, gender, BMI, and presence of comorbidities were comparable between the groups, with no statistically significant differences. Postoperative pain, assessed using the Visual Analogue Scale (VAS), showed a significant reduction over time in both groups. While immediate postoperative pain scores were similar, the Ligasure group reported significantly lower pain at 48 and 72 hours ($p < 0.001$ and $p = 0.001$, respectively). By day 5, pain had nearly resolved in both groups, with no significant difference. Intraoperative parameters also favoured Ligasure, with significantly shorter operative time (47.5 vs. 64.2 minutes, $p = 0.006$) and lower blood loss (10.8 vs. 24.7 ml, $p = 0.022$). Postoperative recovery was faster in the Ligasure group, as evidenced by a shorter hospital stay (4.6 vs. 6.8 days, $p = 0.007$) and earlier return to work (13.6 vs. 18.2 days, $p = 0.005$).
Conclusion: LigaSure haemorrhoidectomy demonstrated superior outcomes compared to conventional diathermy, with reduced pain, operative time, and faster recovery. These findings support its use as an effective and patient-friendly surgical option for advanced haemorrhoids

Keywords: *Haemorrhoidectomy, LigaSure, Conventional diathermy, Postoperative pain, Surgical outcomes, Recovery time*

1. INTRODUCTION

Haemorrhoids are one of the most common anorectal disorders, characterized by the distal displacement, enlargement, or prolapse of the anal cushions—vascular structures essential for maintaining continence.(1) The pathophysiology involves abnormal dilatation and distortion of the vascular channels, combined with degenerative changes in the supporting connective tissues of the anal cushions.(2) Inflammation and a hyperperfusion state of the anorectal region further contribute to the progression of the disease.(3)

Globally, haemorrhoids affect a significant proportion of the population. It is estimated that up to 50–85% of individuals will experience haemorrhoidal symptoms during their lifetime, with peak incidence between the ages of 45 and 65 years.(4) In India, the estimated prevalence ranges between 50% to 85%, making it one of the most frequently encountered anorectal conditions in surgical practice.(5) In the United States, haemorrhoids account for around 3.3 million outpatient visits annually, affecting roughly 4.4% of the population at any given time.(6) While both genders are equally affected, a higher incidence has been observed among individuals of Caucasian ethnicity and those from higher socioeconomic backgrounds. The typical clinical presentation includes pain, per rectal bleeding, itching, swelling, and discomfort in the anal region—symptoms that can severely impact the quality of life.(7) Despite this, many patients delay seeking medical attention due to embarrassment, stigma associated with anorectal conditions, or financial barriers, particularly in resource-constrained settings.

Surgical intervention becomes necessary for patients with grade III and IV haemorrhoids or for those who do not respond to conservative management. Conventional open haemorrhoidectomy using diathermy remains the gold standard for advanced cases but is associated with considerable postoperative pain, delayed recovery, and prolonged return to normal activities.(8) Recently, the LigaSure vessel sealing system—a bipolar electrothermal device designed to seal blood vessels with minimal lateral thermal spread is used. It has been shown to reduce operative time, intraoperative bleeding, and postoperative pain compared to conventional methods.(9, 10) A meta-analysis by Tan et al. supports these findings, highlighting the potential of LigaSure to enhance surgical outcomes in haemorrhoidectomy.(11)

Given the high prevalence of haemorrhoidal disease and the ongoing pursuit of improved surgical techniques, the aim of the present study was to evaluate and compare the surgical outcomes—including operative time, intraoperative blood loss, postoperative pain, length of hospital stay and time to return to work—between patients undergoing conventional diathermy haemorrhoidectomy and those receiving Ligasure haemorrhoidectomy.

2. MATERIALS AND METHODS

This was a single centre, hospital based, prospective observational comparative study conducted in the Department of General Surgery, Chettinad Hospital And Research Institute, Chennai, Tamil Nadu among patients operated between January 2024 and December 2024, and followed up for period of 3 months till March 2025. The study was approved by the Institutional Human Ethics Committee (IHEC). The participants (and their attenders) were given the Participant Information Sheet (PIS) in their native language, and its contents were verbally explained to ensure their understanding and satisfaction. Enrolment into the study proceeded upon receipt of written informed consent. Patients 18-75 years of age, of both gender, diagnosed with grade III or IV internal haemorrhoids were included. However, patients with malignancy, inflammatory bowel disease, fissure, fistula, cirrhosis, and portal hypertension; pregnant females; patients at a very high risk for surgery (ASA more than III) after anaesthetic evaluation were excluded.

Based on the findings of Muzi et al.,(12) which reported mean (SD) VAS pain scores of 1.5 (1.0) for LigaSure haemorrhoidectomy and 3.3 (1.7) for conventional diathermy haemorrhoidectomy, the minimum required sample size was calculated to be 15 patients per group at a 95% confidence level, accounting for a 5% alpha error, 20% beta error (80% power), and a 10% attrition rate. The patients were enrolled using nonprobability sampling – convenience sampling technique – divided into two groups, Ligasure haemorrhoidectomy and conventional diathermy haemorrhoidectomy. All patients were thoroughly evaluated preoperatively. Basic demographic information such as age, sex, and body mass index (BMI) was recorded. Clinical history, including comorbidities and relevant personal history, was documented. Patients presenting with Grade IV haemorrhoids were initially managed conservatively with a combination of magnesium sulfate and glycerine for one week, along with thrice daily sitz baths, prior to being scheduled for surgical intervention. Routine preoperative investigations were performed in accordance with standard institutional protocols. These included Complete Blood Count (CBC), Blood Urea Nitrogen (BUN), Serum Creatinine, Serum Electrolytes, Coagulation Profile, Chest X-ray, and Electrocardiogram (ECG). Echocardiography was conducted when deemed necessary based on the anaesthetic evaluation. All patients were kept nil per oral (NPO) for eight hours prior to surgery. Mechanical bowel preparation was achieved using two phosphate enemas—one administered the night before and another on the morning of the surgery. Prophylactic intravenous antibiotics were administered one hour prior to surgery and repeated six hours postoperatively. A five-day course of oral antibiotics was prescribed following discharge.

Operative details, including operative time and intraoperative blood loss were recorded. Patients in both groups received spinal anaesthesia. Once the spinal effect wore off, intravenous analgesics were administered on the night of surgery.

Postoperatively, all patients remained NPO for six hours, after which they were initiated on a liquid diet followed by a soft, high-fibre diet. The anal pack was removed six hours after surgery. Early ambulation was encouraged based on the patient's condition, and sitz baths were advised during the postoperative period to reduce the risk of infection. Postoperative outcomes were assessed in both groups. Postoperative pain was evaluated using the Wong-Baker FACES Pain Rating Scale and the Visual Analogue Scale (VAS), scored on a scale of 0 to 10. Pain scores were recorded at 48 hours, 72 hours, and on postoperative day 5.

Statistical analysis: The data obtained was manually entered into Microsoft Excel and analysed using Statistical Package for Social Sciences (SPSS) v23. All the categorical variables were summarised using frequencies and percentages. Continuous variables were summarized using mean (standard deviation) and/or median (interquartile range) (based on the results of data normality, tested using Kolmogorov–Smirnov test and the Shapiro–Wilk test). To test for statistical significance, Chi square test or Fisher exact test (for categorical variables) and independent 't' test (for continuous variables) was used. The before and after comparison within each study group was done using repeated measures ANOVA test. Statistical significance was considered at p value less than 0.05.

3. RESULTS

The baseline characteristics of the two groups—Ligasure haemorrhoidectomy (n=15) and conventional diathermy haemorrhoidectomy (n=15)—were comparable. The mean age was 52.1 ± 12.4 years in the Ligasure group and 50.2 ± 11.2 years in the conventional diathermy group (p=0.657). A slightly higher proportion of patients were over 50 years in the Ligasure group (66.7%) compared to the conventional group (53.3%), though this was not statistically significant (p=0.456). The gender distribution showed more males in the Ligasure group (53.3%) and more females in the conventional group (60.0%), with no significant difference (p=0.464). The mean BMI was similar between groups, at 27.4 ± 4.3 kg/m² in the Ligasure group and 28.2 ± 4.0 kg/m² in the conventional group (p=0.602). Comorbidities were present in 66.7% of patients in the Ligasure group and 73.3% in the conventional group, also showing no significant difference (p=0.690).

Postoperative pain, assessed using the VAS, showed notable differences between the Ligasure and conventional diathermy haemorrhoidectomy groups over time. Immediate postoperative pain scores were similar, with mean VAS scores of 8.2 ± 1.4 in the Ligasure group and 8.4 ± 1.8 in the conventional group (p=0.737). However, at 48 hours, pain was significantly lower in the Ligasure group (2.3 ± 0.5) compared to the conventional group (5.5 ± 1.0), with a highly significant p-value (<0.001). This trend continued at 72 hours, with mean pain scores of 0.3 ± 0.7 and 1.2 ± 0.6, respectively (p=0.001). By postoperative day 5, pain levels had nearly resolved in both groups, with no statistically significant difference (p=0.326). Repeated measures ANOVA confirmed a significant reduction in pain over time within both groups (p<0.001).

The mean intraoperative time was significantly shorter for Ligasure procedures (47.5 ± 13.8 minutes) compared to conventional diathermy (64.2 ± 16.6 minutes; p=0.006). Intraoperative blood loss was also significantly lower in the Ligasure group, with a mean of 10.8 ± 12.5 ml versus 24.7 ± 18.5 ml in the conventional group (p=0.022). Patients who underwent Ligasure haemorrhoidectomy had a shorter duration of hospital stay (4.6 ± 2.2 days) compared to those in the conventional group (6.8 ± 1.9 days; p=0.007). Furthermore, return to work was significantly earlier in the Ligasure group (13.6 ± 3.9 days) than in the conventional group (18.2 ± 4.5 days; p=0.005).

Table 1: Baseline characteristics of the study groups

		Haemorrhoidectomy		**P value**
		Ligasure N = 15	**Conventional diathermy N = 15**	
		n (%)	**n (%)**	
Age (in years), Mean (SD)		52.1 (12.4)	50.2 (11.2)	0.657
Age (in years)	≤50	5 (33.3)	7 (46.7)	0.456
	>50	10 (66.7)	8 (53.3)	
Gender	Male	8 (53.3)	6 (40.0)	0.464
	Female	7 (46.7)	9 (60.0)	
BMI (in kg/m2), Mean (SD)		27.4 (4.3)	28.2 (4.0)	0.602
Comorbidities	None	5 (33.3)	4 (26.7)	0.690

	Present	10 (66.7)	11 (73.3)	
*Statistically significant at p<0.05 SD, Standard deviation; BMI, Body mass index				

Table 2: Comparison of study groups, by pain (assessed using visual analogue scale)

		Haemorrhoidectomy		**P value**
		Ligasure N = 15	**Conventional diathermy N = 15**	
		Mean (SD)	**Mean (SD)**	
Pain (assessed using Visual Analogue Scale)	Immediate postoperative	8.2 (1.4)	8.4 (1.8)	0.737
	At 48 hours	2.3 (0.5)	5.5 (1.0)	<0.001*
	At 72 hours	0.3 (0.7)	1.2 (0.6)	0.001*
	At 5 days	0.0 (0.0)	0.1 (0.3)	0.326
RM-ANOVA		<0.001*	<0.001*	
*Statistically significant at p<0.05 SD, Standard deviation; RM-ANOVA, Repeated measures analysis of variance				

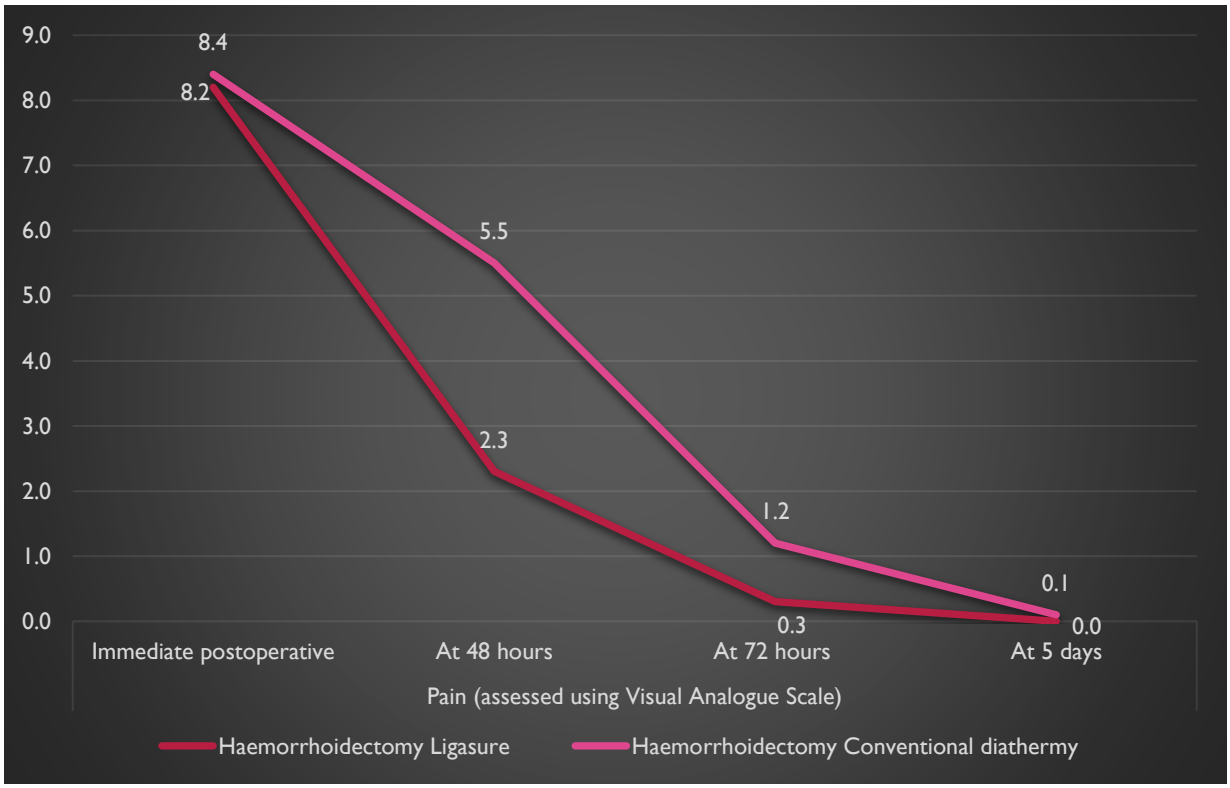

Figure 1: Comparison of study groups, by pain (assessed using visual analogue scale)

Table 3: Comparison of study groups, by intraoperative time, intraoperative bleeding, duration of hospital stay and time to return to work

	Haemorrhoidectomy		**P value**
	Ligasure N = 15	**Conventional diathermy N = 15**	
	Mean (SD)	**Mean (SD)**	
Intraoperative time (in minutes)	47.5 (13.8)	64.2 (16.6)	0.006*
Intraoperative bleeding (in ml)	10.8 (12.5)	24.7 (18.5)	0.022*
Duration of hospital stay (in days)	4.6 (2.2)	6.8 (1.9)	0.007*
Return to work (in days)	13.6 (3.9)	18.2 (4.5)	0.005*
*Statistically significant at p<0.05 SD, Standard deviation			

Case 1 – Preoperative

Case 1 – Intraoperative

Case 2 – Preoperative

Case 2 – Intraoperative

Case 3 – Ligasure used for grade 3 haemorrhoid

Figure 2: Clinical images

4. DISCUSSION

The present study aimed to evaluate and compare the surgical outcomes between patients undergoing LigaSure haemorrhoidectomy and those receiving conventional diathermy haemorrhoidectomy. The results demonstrated that the baseline characteristics, including age, gender distribution, BMI, and presence of comorbidities, were statistically comparable between the two groups, thus minimizing potential confounding effects. These findings align with existing literature that emphasises the importance of ensuring baseline homogeneity in comparative surgical studies to improve internal validity.(13) The comparable demographic and clinical profiles suggest that any observed differences in postoperative outcomes can be more reliably attributed to the surgical technique employed rather than patient-specific factors.

One of the most critical postoperative outcomes in haemorrhoidectomy is pain, which significantly influences patient satisfaction, recovery time, and overall morbidity, as noted by Bleday et al. in 1992.(14) In this study, postoperative pain assessed using the VAS demonstrated significantly lower scores in the LigaSure group compared to the conventional diathermy group at both 48 and 72 hours postoperatively, a difference that was statistically and clinically significant. These findings are consistent with Nienhuijs & de Hingh (2010) and Mastakov et al. (2008) that have reported reduced postoperative pain in patients undergoing LigaSure haemorrhoidectomy.(9, 15) Muzi et al. (2007), in a randomized controlled trial, reported significantly lower VAS pain scores in the LigaSure group (mean 1.5) compared to the conventional group (mean 3.3) on the second postoperative day,(12) in corroboration with the present study. Milito et al. (2010) and Virk et al. (2024) noted that this reduction in pain is likely due to the precision and minimal thermal spread associated with the LigaSure device, which results in less collateral tissue damage, decreased inflammatory response, and improved wound healing.(16, 17) Moreover, the reduced pain scores at 48 and 72 hours in the LigaSure group could potentially facilitate earlier mobilization and improved postoperative comfort, which are essential for decreasing the risk of complications such as urinary retention and deep vein thrombosis. While pain scores had nearly resolved in both groups by postoperative day 5, the early postoperative period is particularly critical, and the advantage of LigaSure during this window cannot be understated. Repeated measures ANOVA confirmed a significant reduction in pain over time within both groups, indicating the natural trajectory of postoperative recovery. However, the more rapid decline in pain levels observed in the LigaSure group further underscores its potential benefit over conventional methods.(18, 19)

The significantly shorter operative time observed in the LigaSure group (47.5 ± 13.8 minutes) compared to the conventional diathermy group (64.2 ± 16.6 minutes) suggests that LigaSure haemorrhoidectomy allows for a more efficient surgical workflow. This efficiency is likely attributed to the device's ability to simultaneously seal blood vessels and cut tissue with minimal need for instrument changes or additional haemostatic interventions, noted Milito et al. in 2010.(16) In contrast, conventional haemorrhoidectomy often requires multiple steps involving clamping, cutting, and ligation, which can be time-consuming. Previous studies including Muzi et al. (2007) have reported similar findings.(12) Intraoperative blood loss was also significantly lower in the LigaSure group (10.8 ± 12.5 ml) than in the conventional group (24.7 ± 18.5 ml; $p = 0.022$), reaffirming the superior haemostatic capabilities of the LigaSure system. Kennedy et al. (1998) noted that the device achieves vessel sealing through a combination of pressure and controlled bipolar energy, which denatures collagen and elastin in the vessel wall to create a permanent seal.(20) This mechanism results in minimal bleeding and reduces the likelihood of needing additional haemostatic measures during surgery. Reduced intraoperative bleeding is not only advantageous for operative

field visibility but also decreases the risk of postoperative complications such as haematoma formation and delayed bleeding, which can contribute to patient morbidity and extended hospital stays.(14)

The study also found that patients in the LigaSure group experienced significantly shorter hospital stays (4.6 ± 2.2 days) compared to those in the conventional group (6.8 ± 1.9 days). Shorter hospitalisation is often indicative of faster postoperative recovery and fewer complications, both of which were facilitated by lower pain levels and less intraoperative trauma in the LigaSure group. Shorter hospital stays also translate into reduced healthcare resource utilization and improved patient turnover in surgical units.(21) Another key postoperative outcome evaluated was the time to return to work. Patients in the LigaSure group resumed work significantly earlier (13.6 ± 3.9 days) compared to those in the conventional group (18.2 ± 4.5 days). Earlier return to work is a critical measure of postoperative functional recovery and is closely linked to pain, mobility, and overall wellbeing. Reduced pain, shorter hospital stays, and quicker wound healing all contribute to this outcome.(22) Milito et al. (2010) also observed a similar trend in their meta-analysis of randomized trials, reporting that LigaSure haemorrhoidectomy was associated with faster return to normal activities.(16) A more recent study by Nienhuijs & de Hingh echoed these findings, attributing quicker recovery to LigaSure's precise dissection and minimal thermal injury.(9)

The findings from this study underscore the clinical benefits of LigaSure in terms of reduced operative time, blood loss, hospital stay, and earlier return to work—all of which contribute to enhanced patient satisfaction and optimized resource allocation. However, several limitations should be acknowledged. Firstly, as a single-centre study conducted in a specific geographic and institutional setting, the results may not be universally applicable to other populations or healthcare systems. Additionally, the absence of randomisation may have introduced confounding factors that could influence outcomes, despite baseline characteristics being comparable. Pain, a key outcome measure, was assessed using subjective scales such as the VAS and Wong-Baker FACES, which are inherently influenced by individual pain tolerance and perception.

5. CONCLUSION

In conclusion, the present study demonstrates that LigaSure haemorrhoidectomy offers several advantages over conventional diathermy haemorrhoidectomy in the surgical management of grade III and IV internal haemorrhoids. Patients undergoing the LigaSure procedure experienced significantly lower postoperative pain at 48 and 72 hours, reduced intraoperative blood loss, shorter operative time, decreased length of hospital stay, and earlier return to work, all of which contribute to enhanced patient recovery and satisfaction. While both techniques are effective, the LigaSure method appears to provide superior clinical outcomes in the immediate postoperative period

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