

# Ligasure versus Traditional Suturing in Total Abdominal Hysterectomy: A Retrospective Observational Study

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## ABSTRACT

**Introduction:** Gynaecological procedures may be performed via vaginal, abdominal, or minimally invasive approaches, such as laparoscopy, hysteroscopy, and robotic surgery. Abdominal hysterectomy, a prevalent major surgical intervention, is linked to significant complications, notably bleeding and postoperative pain. The invention of Ligasure represents a pivotal milestone in the field of gynaecology.

**Aim:** To compare the effectiveness of Ligasure and traditional suturing during total abdominal hysterectomy.

**Materials and Methods:** A retrospective observational study was conducted in Dr. D. Y. Patil Hospital, Pimpri, Pune, Maharashtra, India, from March 2022 to September 2023. A total of 34 patients scheduled for elective abdominal hysterectomy were enrolled and divided into two equivalent groups comprising Ligasure (group A) and conventional suturing (group B). Comprehensive preoperative assessments and preparations were done for all participants. Subsequent documentation and comparison of operative and postoperative outcomes, focusing

primarily on parameters such as surgical duration, blood loss, and postoperative complications, were done between the two groups. Student's t-test was used to compare surgical time and blood loss between group A and group B.

**Results:** The mean age of participants in the Ligasure group was  $43 \pm 4.5$  years, and in the suture group was  $45 \pm 5$  years. The difference in BMI between the two groups was not significant. The surgical duration in the Ligasure group was significantly shorter ( $p\text{-value}=0.0002$ ) compared to the conventional suturing group ( $53.8 \pm 6.7$  minutes and  $64.3 \pm 7.62$  minutes, respectively). Furthermore, the Ligasure group showed a significant reduction ( $p\text{-value}<0.0001$ ) in blood loss ( $156.4 \pm 31.3$  mL and  $261.6 \pm 36.8$  mL, respectively). There was no significant difference ( $p\text{-value}=0.2990$ ) in postoperative haemoglobin levels ( $11.6 \pm 1.2$  g/dL and  $11.2 \pm 1$  g/dL, respectively).

**Conclusion:** The use of Ligasure proves to be an efficient approach in abdominal hysterectomy. A reduced duration of surgery and a significant decrease in blood loss were observed with this procedure.

**Keywords:** Blood loss, Operative time, Robotic surgery

## INTRODUCTION

The prevalence of hysterectomy in India stands at 3.2%, with higher rates observed in rural areas (3.4%) compared to urban regions (2.7%) [1]. There are several causes underlying the need for hysterectomy; however, common reasons for hysterectomy include excessive bleeding, uterine disorders, myomas/cysts, and uterine prolapse, among other unspecified causes [2]. Given that bleeding is a frequent surgical complication, employing effective haemostatic techniques is crucial. Efficient, painless, and thorough vascular sealing remains a critical consideration during abdominal hysterectomy, especially when dealing with the extraction of large vessels. Various techniques are employed to secure the vascular pedicle in this procedure, encompassing traditional suturing and mechanical ligation utilising the electrothermal bipolar vascular sealing system, known as Ligasure [3]. While surgical suturing and ligation are the conventional approaches for stabilising the vascular pedicle, the suturing process involves clamping, cutting, and ligation, leading to prolonged hysterectomy durations and increased blood loss. In contrast, Ligasure utilises a regulated high-power current at a lower voltage for liquefying collagen and elastin to ensure the fusion of the vascular layers permanently [4-6]. This instrument is also equipped with a feedback control, featuring an automatic "off" switch, to safeguard the tissue from burning due to overcoagulation when impedance reaches a hazardous level [4].

The comparison of Ligasure and traditional suturing in total abdominal hysterectomy is a multifactorial research question that has been widely studied, with results being inconclusive. This

study was done to analyse the application of Ligasure against traditional suturing during total abdominal hysterectomy, evaluating parameters such as the duration of the procedure, blood loss during the procedure, and the occurrence of intraoperative complications and postoperative pain. This study adds to the repertoire of studies regarding the efficacy of Ligasure.

## MATERIALS AND METHODS

This retrospective observational study was conducted at Dr. D. Y. Patil Medical College, Hospital, and Research Centre in Pune, Maharashtra, India, spanning from March 2022 to September 2023. The study was approved by the Institute's Ethical Committee (IEC) (Reference No. I.E.S.C./W/48/2024). The study encompassed patients admitted and scheduled for an elective hysterectomy.

**Inclusion criteria:** Females with benign uterine pathology, uterine size  $<14$  weeks, age between 40 and 50 years, Body Mass Index (BMI) equal to or less than  $35 \text{ kg/m}^2$  were included in the study.

**Exclusion criteria:** Females with malignant uterine pathology, pelvic inflammatory disease, uterine size  $>14$  weeks, history of diabetes mellitus, history of using anticoagulant drugs, haemoglobin  $<10 \text{ g/dL}$ , patients with implanted electronic devices were excluded from the study.

**Data collection:** The population under study included two groups, each comprising 17 patients: Group A (Ligasure) included participants who benefited from bipolar vessel sealing with Ligasure; group B (conventional suturing) included the participants who underwent hysterectomy with conventional suturing.

## Study Procedure

Comprehensive preoperative assessment was done, which included taking a history followed by a clinical evaluation, and subsequent routine laboratory investigations to ensure suitability for the procedure. All hysterectomies were performed under general anaesthesia by the same surgeon. Povidone iodine solution was used to disinfect the vulva and perineum after the patients were positioned in the supine position. A Foley catheter was inserted, and the abdomen was prepped up to the xiphoid process.

In group A, abdominal hysterectomy was conducted through a Pfannenstiel incision in a slight Trendelenburg position. The round ligament, tubo-ovarian ligament (if bilateral salpingo-oophorectomy was planned), or infundibulopelvic ligament (if ovaries were to be retained), along with the cardinal ligament and uterosacral ligament, were clamped, relaxed for tissue traction, sealed, and then divided using Ligasure. The closure of the vaginal cuff was secured with a single-layer continuous running suture.

In group B, the same procedural steps were executed using conventional clamping and suturing techniques with Kocher clamps and sterile synthetic absorbable braided polyglactin 910 sutures. The closure of the vaginal cuff was secured with a single-layer continuous running suture.

Upon achieving haemostasis, the rectus muscle was closed with simple interrupted sutures using polyglactin 910, followed by the closure of the rectus sheath. The skin was closed with Ethilon 2-0 sutures.

**Outcomes assessed:** This study provides insightful information on the safety and efficacy of Ligasure in comparison to traditional suturing by assessing key outcomes such as operation time, blood loss, and postoperative complications. The reduction of intraoperative blood loss is crucial for enhancing patient recovery. In this study, blood loss was measured by the difference in preoperative and postoperative haemoglobin levels, a standard method for assessing intraoperative blood loss.

## STATISTICAL ANALYSIS

Student's t-test was used to compare the surgical time and blood loss between group A and group B. A chi-square test was used to analyse the postoperative complications in group A and group B. The data were analysed using GraphPad Prism 10. The p-value was considered significant at  $<0.05$ .

## RESULTS

The mean age of participants in the Ligasure group was  $43 \pm 4.5$  years, while the mean age of participants in the suture group was  $45 \pm 5$  years. There was also no significant difference in the BMI between the two groups [Table/Fig-1].

Demographic parameters	Group A	Group B	p-value
Mean age (years)	$43 \pm 4.5$	$45 \pm 5$	0.22
Body Mass Index (BMI) (kg/m <sup>2</sup> )	$29.3 \pm 0.6$	$28.98 \pm 0.8$	0.19

[Table/Fig-1]: Demographic parameters.

Abnormal Uterine Bleeding (AUB) was the most frequent (41%) indication for hysterectomy in the study population, accounting for 35% in group A and 47% in group B, followed by fibroids, accounting for 29% in the total population, with 35% in group A and 23% in group B [Table/Fig-2].

Indication for hysterectomy	Group A	Group B	Total
	n (%)	n (%)	n (%)
Abnormal uterine bleeding	6 (35)	8 (47)	14 (41)
Adnexal pathology	1 (6)	2 (12)	3 (9)
Postmenopausal bleeding	4 (24)	3 (18)	7 (21)
Fibroid	6 (35)	4 (23)	10 (29)

[Table/Fig-2]: Indication for hysterectomy.

Surgery time in group A was significantly less when compared to group B (p-value 0.0002). The loss of blood during the surgery was also significantly reduced in group A when compared with group B (p-value<0.0001) [Table/Fig-3].

Variables	Group A	Group B	p-value
Preoperative Hb (g/dL)	$12.5 \pm 0.8$	$12.8 \pm 1.3$	0.4237
Surgery time (minutes)	$53.8 \pm 6.7$	$64.3 \pm 7.62$	0.0002
Blood loss (mL)	$156.4 \pm 31.3$	$261.6 \pm 36.8$	<0.0001
Postoperative Hb (g/dL)	$11.6 \pm 1.2$	$11.2 \pm 1$	0.2990

[Table/Fig-3]: Blood loss and surgical duration with ligasure. T-test was used to compare the difference among groups. Significance level was set at 0.05

There were no significant complications during the procedures in both groups. There was a single instance of bladder injury in group B, while no instances were reported in group A. However, one event of ligature slippage was reported in group A, and no such cases were reported in group B [Table/Fig-4].

Intraoperative complications	Group A	Group B	Total
	n (%)	n (%)	n (%)
Bladder injury	0	1 (6)	1 (3)
Slippage of ligature	1 (6)	0	1 (3)

[Table/Fig-4]: Intraoperative complication associated with ligasure.

It was observed that 24% of patients in group B had wound dehiscence, while only 6% of patients in group A had this complication [Table/Fig-5]. However, the association was tested using a Chi-square test and was not found to be statistically significant.

Postoperative complications	Group A	Group B	p-value
	n (%)	n (%)	
Fever	0	3 (18)	0.3095
Pain abdomen	2 (12)	3 (18)	
Wound dehiscence	1 (6)	4 (24)	
Frequency of micturition	2 (12)	1 (6)	

[Table/Fig-5]: Postoperative complication associated with ligasure.

## DISCUSSION

Total abdominal hysterectomy is a common surgical procedure performed for various gynaecological indications, such as uterine fibroids, endometrial cancer, and uterine prolapse. However, the success of the procedure is attributed to the effective surgical methodology. Recently, Ligasure has evolved to be a safe and effective approach over the traditional suturing method in such cases [7,8]. Present study found that the surgery time in group A was significantly less compared to group B (p-value 0.0002). The blood loss during the surgery was also significantly reduced in group A compared with group B (p-value=<0.0001). Several other studies have explored the effectiveness of Ligasure and traditional suturing. A study by Ulubay M et al., showed a significant decrease in intraoperative time in Ligasure group compared to the conventional suturing method (p-value=0.016) [7]. Another study by Singh H et al., found that Ligasure significantly reduced operative time compared to traditional suturing [8]. Furthermore, in a study by Essadi F et al., the Ligasure group had a mean procedure time of 39.6 minutes, while the conventional suturing group had a mean operative time of 62.7 minutes (p-value=0.05) [9]. A randomised trial by Dubey P et al., reported that the Vessel Sealing Arm had a significantly reduced mean operative time of  $26.97 \pm 8.92$  minutes compared to  $33.67 \pm 8.62$  minutes in the Suture Ligature Arm (p-value=0.005). Additionally, there was a significant reduction in intraoperative blood loss, with  $111 \pm 53.31$  mL in the vessel sealing arm compared to  $320 \pm 193.90$  mL in the suture ligature arm (p-value=0.001) [10]. Several other studies concur with the findings that vessel sealing may offer advantages over traditional suture ligature techniques in

terms of both operative time and blood loss during surgery [11,12]. Present results were in concurrence with these results.

The efficacy of Ligasure is attributed to its simultaneous cut and seal ability, and faster haemostasis which not only reduces operative time but also prevents excessive blood loss. Consistent with present study results, Essadi F et al., and Singh H et al., showed that patients undergoing a Ligasure procedure had significantly less blood loss compared to the conventional suturing method when securing the pedicle during a hysterectomy. Singh H et al., showed that in the Ligasure group, 76% of patients experienced significantly less blood loss (<50 mL) compared to 60% of patients in the conventional suture group [8]. The results from the study by Essadi F et al., indicated that in the Ligasure group, the mean blood loss was significantly less, with an average of 80.6 cc compared to 126.7 cc in the other group (p-value<0.05) [9].

A randomised clinical trial conducted by Shady NW et al., found no significant difference in complications during the surgery. However, the study revealed that Ligasure effectively reduced postoperative pain compared to the conventional suturing group [13]. In contrast, Essadi F et al., reported fewer complications in the Ligasure group than those found in the conventional suturing group [9]. This difference needs to be carefully investigated to have a clear understanding of associated complications.

This study provides insightful information on the safety and efficacy of Ligasure compared to traditional suturing. Ligasure has garnered attention for its potential advantages in surgical procedures. Present study data strongly agrees with existing literature indicating that Ligasure can offer benefits such as reduced operative time, decreased blood loss, and fewer postoperative complications. However, while these advantages are promising, future follow-up studies are necessary to evaluate the intricate parameters of Ligasure further. Specific aspects that require more research include long-term outcomes, cost-effectiveness, and its efficacy in different surgical contexts and patient populations.

### Limitation(s)

High BMI (>25 kg/m<sup>2</sup>) of patients, large uterine size, and a history of previous pelvic surgery with possible intraperitoneal adhesions, which can theoretically increase the operative time, were not considered in this study. The small sample size was also one of the main limitations of this study. The retrospective nature of the study was an inherent limitation.

## CONCLUSION(S)

Although procedure time and blood loss have consistently been shown to be reduced in the Ligasure method compared to traditional suturing, it is imperative to meticulously assess the associated complications of the procedure. Various factors, including the size of the study population, institutional resources, and the proficiency of the surgeon, significantly influence the study's outcomes. Consequently, well-structured clinical trials conducted across multiple institutions would be more efficacious in providing a definitive assessment of the safety and efficacy of the Ligasure procedure in comparison to the traditional suturing method.

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