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Research Article

Comparison between bipolar vessel sealer (LigaSure vessel sealer) and harmonic scalpel in total laparoscopic hysterectomy

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ABSTRACT

Background: The aim of the present study was to compare the use of bipolar Vessel Sealer with Harmonic Scalpel (HS) during total laparoscopic hysterectomy with respect to estimated blood loss and related postoperative complications.

Methods: A retrospective study was conducted in the Jeevan Jyoti hospital and Guru Gobind Singh Memorial Vanadana Women's hospital, Allahabad, U.P., India. Two forty two patients were enrolled who underwent total laparoscopic hysterectomy and were randomized into two homogenous groups: bipolar vessel sealer and harmonic scalpel.

Results: Estimated blood loss was significantly less in bipolar vessel sealer when compared with harmonic scalpel. No significant difference was observed in postoperative complications.

Conclusions: The bipolar vessel sealer is a reliable and safe tool for reducing intraoperative blood loss in patients undergoing total laparoscopic hysterectomy. More randomized studies need to be done to confirm the advantages of this technique.

Keywords: Bipolar vessel sealer, Laparoscopy, Harmonic scalpel, Hysterectomy

INTRODUCTION

A conventional hysterectomy involves removing the uterus through an abdominal incision or through the vagina. The cervix may be removed along with the uterus (total hysterectomy) or it can be left in situ (subtotal or supracervical hysterectomy). A minimally invasive and tissue respectful technique with minimal tissue damage is the aim of all surgical techniques. Colpotomy in total laparoscopic hysterectomy is generally done using an energy source; the most common ones being monopolar energy or harmonic.

Hysterectomy is the most commonly performed major gynecologic procedure around the world. Benign diseases

are responsible for more than 70% of the indications for hysterectomy and include menstrual disorders, fibroids, pelvic pain and uterine prolapsed.¹

Total Laparoscopic Hysterectomy (TLH) was first proposed in the early 1990's by Reich & Liu. The aim was for a clear, precise approach with reduced blood loss and hospital stay compared to Laparoscopically-Assisted Vaginal Hysterectomy (LAVH).

In TLH, all the procedure is performed by laparoscopic techniques. A hemostatic cutting device such as monopolar or bipolar diathermy scissors, stapling gun, or harmonic scalpel is used to detach the uterus completely from surrounding and supporting structures including

ligaments and blood vessels. The uterus is then removed through the vagina, or may be cut into small pieces, and removed through one of the abdominal ports.

The advantages of the laparoscopic approach compared to open surgery include less intraoperative bleeding, shorter hospital stay, faster recovery and lower rates of wound and/or abdominal wall infections, at the expense of a longer surgery.²

The incidence of vaginal scar dehiscence is found to be higher in total laparoscopic hysterectomy than either abdominal or vaginal hysterectomy.³

All coagulation devices have a distinct thermal spread which is dependent on the type of mode, the application time and the power setting. Hefermehl et al. found that monopolar mode causes thermal spread of 3.5 mm when applied for 1 second and after 2 seconds the spread was more than 20 mm. For bipolar mode it was 2.2 mm for 1 second and 3.6 mm at 2 seconds, for PK and LigaSure it was 3.9 mm and 2.8 mm respectively. For ultrasound the thermal spread was 2.9 mm.⁴

The harmonic scalpel is a high frequency ultrasonic transducer. The active titanium blade vibrates at 55000 cycles per second. The resulting mechanical energy causes a breakdown of protein in tissues which creates a coagulum. Vessel and tissue sealing is dependent on the power setting as well as the pressure exerted, the formation of the coagulum and tissue tension. The harmonic scalpel performs at lower temperatures (50-100 degrees Celsius) while other devices work at higher temperatures (150 to 400 degrees Celsius), causing desiccation and charring.

In this study we compare Total Laparoscopic Hysterectomy (TLH) with the harmonic scalpel with bipolar diathermy (LigaSure vessel sealing) TLH.

METHODS

This study was a randomized clinical trial conducted in the obstetrics and gynecology department of Jeevan Jyoti Hospital, Allahabad, U.P. India, from March 2012 till April 2014.

Fifty subjects for TLH were randomly divided into two groups. Group (I) was assigned for TLH using the Harmonic scalpel and group (II) was assigned for bipolar diathermy. Each one of the two techniques used in the study was written in a card and was put in an envelope; the fifty one envelopes were all identical. Serially numbered sealed envelopes were held securely by trained nurse. The circulating nurse was asked to pull any card just before preparation for surgery. The patients were aware of the treatment methods and signed an informed consent, and they had equal chances of entering any of the trial groups.

An informed consent was taken from all patients; all women were subjected to the following examination: clinical history, physical examination, abdominal examination, vaginal examination, cervical Pap smear and ultrasound examination.

Inclusion and exclusion criteria

All the patients who gave the consent and the gynecologist give the opinion for the hysterectomy, with negative Pap smear were included in the study. Those patients having suspected or confirmed malignancy in any part of the genital system, uterine size greater than the 12 week pregnancy, contraindication of the laparoscopic surgery and if not given the consent were excluded from the study.

All operations were done by the same surgeon and surgical team followed by standard procedure. Post-operative care included vital sign like temperature, blood pressure, pulse and respiratory rate on every 6 hours. The blood loss was estimated by drop of Hb% from preoperative condition.

Data about the patients' characteristics, operation time, estimated blood loss, related complications and length of hospital stay were registered and compared.

Statistical analysis

Data were collected and entered into the SPSS version 12 for Windows. Qualitative variables were expressed as number and percentage while quantitative variables were expressed as mean and standard deviation and the significance (P value) was also calculated.

RESULTS

This study comprised 51 patients divided into 2 groups. Group (I) underwent TLH operation using the Harmonic Scalpel (HS). Group (II) patients had the TLH operation using the electro-thermal bipolar vessel sealer technique. The demographic data are present in Table 1.

Table 1: Character of the study group.

	Group I (N=121)	Group II (N=121)	P value
Age (year)	44.17 ± 5.34	45.67 ± 4.15	0.067
Parity	9	13	0.082
Body mass index (BMI)	29.47 ± 2.17	32.28 ± 3.26	0.063
Preoperative Hb	12.41 ± 1.75	11.85 ± 1.25	0.079
Preoperative hematocrit	36.20 ± 3.46	35.75 ± 2.85	0.104

During the procedure it was observed that bipolar vessel sealer method of TLH consume less time (76.16 ± 12.14) than the HS (115.35 ± 18.25). Blood loss during

operation was significantly lower in group (II) patients compared to group (I). There was significant greater drop in hemoglobin and hematocrit in the latter compared to the former group. The mean hemoglobin drop in group (I) patients was (3.12 ± 0.85) and in group (II) was (0.54 ± 0.29) . The mean hematocrit drop was (3.62 ± 0.72) in group (I) and (0.85 ± 0.37) in group (II). The mean hospital stay time for group (I) patients was 1.13 ± 0.12 days and in group (II) it was 1.55 ± 0.27 days which was not statistically significant ($P > 0.005$) (Table.2).

Table 2: Operative and post-operative details.

Factors	No.	Mean \pm SD	P value
Operation time	Group I	121	115.35 ± 18.25
	Group II	121	76.16 ± 12.14
Blood loss (ml)	Group I	121	140.84 ± 48.92
	Group II	121	88.74 ± 24.46
Haemoglobin drop%	Group I	121	3.12 ± 0.85
	Group II	121	0.54 ± 0.29
Haematocrit drop %	Group I	121	3.62 ± 0.72
	Group II	121	0.85 ± 0.37
Hospital stay	Group I	121	1.13 ± 0.12
	Group II	121	1.55 ± 0.27

Complication

The rate of complication was higher among group (I) patients 7 (28%) as compared to group (II) patients 3 (12%); however the difference was not statistically significant. Complications were noted as intra-operative bleeding from larger vascular stumps or uterine vessels.

DISCUSSION

Over the last ten years, gynecologists have been obtaining the necessary skills to perform Laparoscopically Assisted Vaginal Hysterectomies (LAVH) or Total Laparoscopic Hysterectomies (TLH) in order to convert an abdominal procedure into a laparoscopic/vaginal procedure.⁵

It provides a high degree of safety by heating tissue to form a protein coagulum, which gives excellent hemostasis at a significantly lower temperature than standard electrosurgery, thus decreasing the risk of thermal injury to surrounding tissue than the diathermy method of hysterectomy.

Bipolar diathermy was found to be less time-consuming and less bleeding when compared to harmonic scalpel. Mean procedure time was $(115.35 \pm 18.25$ min) in harmonic scalpel and was $(73.16 \pm 12.14$ min) in diathermy which was statistically significant. The estimated blood loss were significantly less in the bipolar diathermy compared to the harmonic scalpel $(88.74 \pm 24.46$ vs. 140.84 ± 48.92 mL; $P < 0.005$, respectively). The changes in hemoglobin and hematocrit values were found to be more significant in the harmonic scalpel

group. Our study demonstrated similar results when compared to Campagnacci et al.,⁶ Demirturk et al. work,⁷ and Ashraf TA et al.⁸ Akira Tsunoda also stated that bipolar diathermy is quick and bloodless and, although as painful as compared with the ultrasonic scalpel, is associated with a reduced analgesic requirement immediately after operation.⁹

Our work revealed that blood loss during operation was significantly lower in bipolar vessel sealer group compared to HS group demonstrated by significant greater drop in hemoglobin and hematocrit in the latter compared to the former group. This could be attributed to the limited ability of HS technique to deal with larger vascular stumps such as the infundibulo-pelvic and large uterine stumps.

Bleeding stumps were manifested intraoperatively in 26 out of 121 (21.49%) patients in the HS group, compared to 9 out of 121 (7.44%) in the bipolar Vessel Sealer group the difference was not statistically significant similar result was observed by Demirturk F et al.⁷ and Ashraf TA et al.⁸

CONCLUSION

The bipolar vessel sealer technique seems to be less time-consuming and less blood loss during operation when compared with harmonic shears. Further studies with larger number of patients are required for stronger evaluation of the technique.

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Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

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