Comparative Study of Electrosurgical Bipolar Vessel Sealing Using Ligasure Versus Conventional Clamping and Suturing for Total Abdominal Hysterectomy and Bilateral Salpingoophrectomy

Thesis

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Abstract

Background: Hysterectomy is one of the most commonly performed gynecological surgical procedure. In 2010, over 430,000 inpatient hysterectomies were performed in the United States. Abdominal hysterectomy refers to removal of the uterus via a laparotomy. Either total hysterectomy (uterus including cervix) or subtotal (supracervical) hysterectomy may be performed. The ovaries may or may not be removed at the time of hysterectomy. The choice of surgical approach depends upon clinical circumstances, the surgeon's technical expertise, and patient preference.

Aims: The aim of this study is to assess the safety and efficacy of using the electrosurgical bipolar vessel sealing (EBVS) system using ligasure for securing the pedicles during abdominal hysterectomy in comparison with the conventional method of securing the pedicles by clamping and suture ligation.

Methodology: Study design: It is a prospective randomized controlled trial.

Study setting: The study was conducted at Ain Shams University Maternity Hospital.

Period of the study It was conducted since August 2015 to April 2017.

Results:

The study population was randomizdly divided into 2 groups. Each group included 70 patients.

Group A: This group included women have performed total abdominal hysterectomy and bilateral salpingoophrectomy using electrosurgical bipolar vessel sealing by ligasure.

Group B: This group included women have performed total abdominal hysterectomy and bilateral salpingoophrectomy using conventional sutures.

Conclusion: Electrosurgical bipolar vessel sealing is an effective alternative to sutures in abdominal hysterectomy, resulting in significantly reduced operative time and blood loss, postoperative pain without increasing the rate of occurrence of complications.

Recommendations: EBVS is an effective method not only in abdominal hysterectomy but also in vaginal and laparoscopic approaches. EBVS if available in many medical institutes it will not only benefit the patient but also it will benefit the country and will increase the financial resources.

Keywords: Electrosurgical Bipolar Vessel, Ligasure Versus, Conventional Clamping, Abdominal Hysterectomy, Bilateral Salpingoophrectomy

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Ahmed Mohamed Zeinhom
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List of Abbreviations

AH	:	Abdominal Hysterectomy
EBVS	:	Electrosurgical bipolar vessel sealing
LAVH	:	Laparoscopic Assisted Vaginal Hysterectomy
LCS	:	Laparosonic Coagulating Shears
LSH	:	Laparoscopic supracervical hysterectomy
RF	:	Radio frequency
TAH	:	Total abdominal hysterectomy
VAS	:	Visual analogue scale
VH	:	Vaginal hysterectomy

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Introduction

Hysterectomy is one of the most commonly performed gynecological surgical procedure. In 2010, over 430,000 inpatient hysterectomies were performed in the United States. Abdominal hysterectomy refers to removal of the uterus via a laparotomy. Either total hysterectomy (uterus including cervix) or subtotal (supracervical) hysterectomy may be performed. The ovaries may or may not be removed at the time of hysterectomy. The choice of surgical approach depends upon clinical circumstances, the surgeon's technical expertise, and patient preference ***(Wright et al., 2013).***

From 1998 to 2010, the distribution of the surgical approach was: abdominal (65 percent), vaginal (20 percent), conventional laparoscopic (13 percent), robotic (0.9 percent), and radical (1.2 percent). In another United States study, 6 percent of all hysterectomies were supracervical ***(Wu et al., 2003).***

Abdominal hysterectomy provides the surgeon a good visibility and an easy access to the pelvic organs, it Enables removal of a very large uterus or large areas of endometriosis, adenomyosis , or scar tissue (adhesions). Cervix can be removed or left in place. It requires less time under anesthesia and in surgery than a laparoscopic hysterectomy ***(Garry et al., 2004)***.

Electrothermal Bipolar Vessel Sealing (EBVS) systems have been developed to seal large tissue bundles and blood vessels, up to 7 mm diameter for some models. The technology was pioneered by Valleylab in the 1990s, primarily for use in laparoscopy. Several manufacturers have produced similar systems that are available in the UK ***(Peirce et al., 2007).***

Across the range of procedures including ENSEAL, harmonic ACE, LigaSure™ technology delivers a unique combination of pressure and energy to create a consistent seal with each application.

- Provides a combination of pressure and energy to create vessel fusion
- Permanently fuses vessels up to and including 7 mm in diameter and tissue bundles without dissection or isolation
- Average seal cycle is 2 to 4 seconds, when used with the ForceTriad™ energy platform
- Seals withstand three times normal systolic blood pressure
- Feedback-controlled response system automatically discontinues energy delivery when the seal cycle is complete, eliminating the guesswork
- Have the highest burst pressure, fastest sealing time and were highest rated overall compared to Gyrus PK™*, Harmonic ACE™* and ENSEAL™*1

(Lamberton et al., 2008)

- Reduce blood loss compared to sutures and clips, reduce procedure time compared to sutures and Reduce patient length of stay compared to sutures ***(Ding et al., 2005).***
- In a study by ***Tamussino et al. (2005)*** to compare mechanical ligation techniques to ligasure, ligasure was found to significantly reduce operative blood loss and perioperative blood transfusion.

RESEARCH QUESTION

- Is electrosurgical bipolar vessel sealing system (ligasure) more efficient in securing the pedicles during abdominal hysterectomy than conventional methods by suture clamping and ligation.

RESEARCH HYPOTHESIS

- We hypothesis that the use of electrosurgical bipolar vessel sealing (ligasure) more efficient in securing the pedicles.

Aim of the Work

The aim of this study is to assess the safety and efficacy of using the electrosurgical bipolar vessel sealing (EBVS) system using ligasure for securing the pedicles during abdominal hysterectomy in comparison with the conventional method of securing the pedicles by clamping and suture ligation.

Secondary objectives

1. Operative time (starting from clamping of round ligament or the use of ligasure till closure of the vaginal vault and achieving good haemostasis)

2. Intra-operative complications.

    a. Blood loss and need for blood transfusion that measured by counting the towels where semisoaked towel. 75cc while soaked towel.150cc, calculating amount of blood in the suction device and measuring haemoglobin pre and postoperative.

    b. Bowel or urinary tract injuries.

3. Postoperative complications.

    a. Infected hematoma.

    b. Wound dehiscence.

    c. Pneumonia.

    d. Fever of unknown origin.

    e. Thromboembolism.

    f. Ileus requiring reoperation.

4. Postoperative pain assessment using the visual analogue scale, and need for analgesics.

5. Post-operative hospital stay.

Anatomy of the uterus

The uterus is essential in sexual response by directing blood flow to the pelvis and to the external genitalia, including the ovaries, vagina, labia, and clitoris. The reproductive function of the uterus is to accept a fertilized ovum which passes through the utero-tubal junction from the fallopian tube (uterine tube). It implants into the endometrium, and derives nourishment from blood vessels which develop exclusively for this purpose. The fertilized ovum becomes an embryo, attaches to a wall of the uterus, creates a placenta, and develops into a fetus (gestates) until childbirth. Due to anatomical barriers such as the pelvis, the uterus is pushed partially into the abdomen due to its expansion during pregnancy. Even during pregnancy the mass of a human uterus amounts to only about a kilogram (2.2 pounds) ***(Takacs et al., 2005)***.

The uterus is a hollow, thick-walled, fibromuscular organ situated in the true pelvis between the urinary bladder and rectum. The shape, weight, and dimensions vary considerably with estrogenic stimulation and previous parturition. It is divided into two main parts: upper two thirds form the body, which is mainly muscular, and the lower third forms the fibrous cervix. In the reproductive years, the body is considerably larger than the cervix. In the premenarcheal and

postmenopausal years, the ratio of the size of body to cervix is 1:1 or even 1:2. The area where the fallopian tubes enter the body of the uterus is the vascular cornual end **(Smith et al.,2001).**

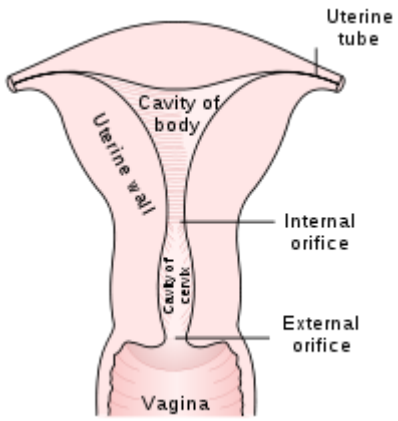

Fig. (1): Diagram showing regions of the uterus ***(Guyton et al., 2006).***

The round ligament of the uterus and ovarian ligament are also attached to the cornua inferior to the fallopian tube, the former anteriorly and the latter posteriorly. The part of the uterus superior to the entry point of the uterine tube is the fundus. The body of the uterus extends from the fundus to the cervix. Within the body or corpus, there is a triangular-shaped potential space, the endometrial cavity. Nearly half of the cervix is inserted into the vagina through the uppermost part of its anterior wall and is called portio vaginalis. The supravaginal part of the cervix joins the body at the isthmus. The cervix contains dense fibrous connective tissue with a small amount of muscular tissue (about 10 %). The scanty smooth muscle is distributed at the periphery of the cervix and is continuous with the body of the uterus and the vagina. It is into this layer that the cardinal, uterosacral ligament and the

pubocervical fascia are inserted. This layer is easily stripped off while doing an intrafascial hysterectomy ***(DeLancey et al.,1997).***

Relations and Position

Anteriorly, the uterus is separated from the urinary bladder and uterovesical space by loose connective tissue. Posteriorly, it is related to the rectum and rectouterine pouch. Laterally, it is continuous with the broad ligaments ***(DeLancey et al .,1997)***.

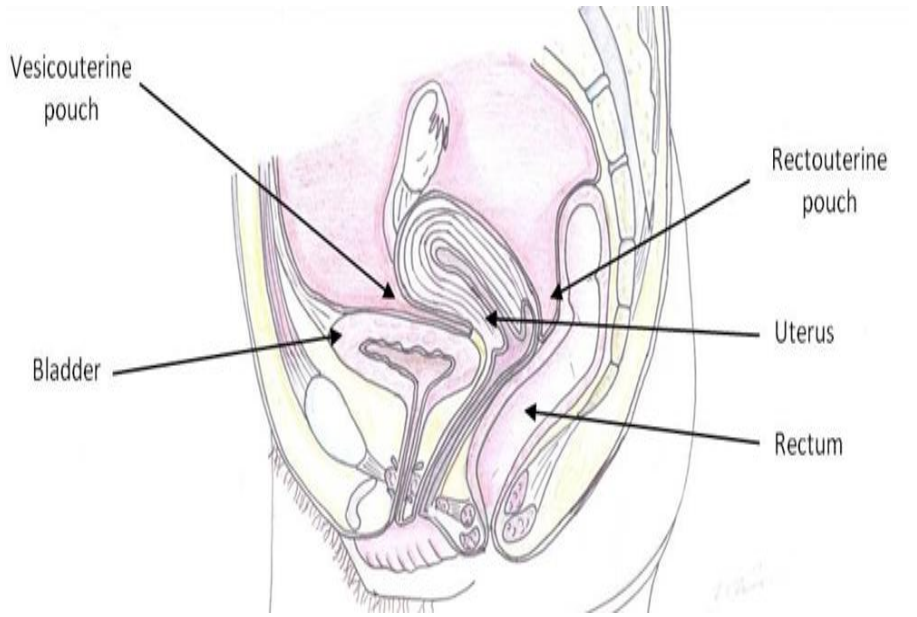

Fig. (2): Anatomical relation of uterus ***(Ranee et al., 2002).***