



## THE EFFECT OF VERTICAL VERSUS HORIZONTAL VAGINAL CUFF CLOSURE ON VAGINAL LENGTH AFTER LAPAROSCOPIC HYSTERECTOMY

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### ABSTRACT

**Background:** Hysterectomy can result in a number of problems, including vaginal cuff dehiscence, genitourinary, gastrointestinal tracts, and nerves injuries, bleeding, infections, and thrombosis. In addition to these recognized morbidities, its implications on females' sexuality and reproductive functioning are debatable irrespective of the surgical strategy.

**Aim of the Work:** to compare the effects of vertical against horizontally vaginal cuff closures on postoperatively vaginal length following complete laparoscopic hysterectomy.

**Patients and Methods:** This prospective interventional investigation was carried out at a tertiary care hospital at Ain Shams University Maternity Hospital from January 2022 to February 2023 on a total of 20 women who arranged to endure an overall laparoscopic hysterectomy with or without the removal of adnexal constructions after receiving ethics committees authorization and informed consent from the participants.

**Results:** This analysis revealed no discernible differences in the retention of vaginal length following laparoscopic hysterectomy among horizontal and vertical cuffs closures.

**Conclusion:** Thus, the surgeon's preferred approach for vaginal cuffs closures should be used. Further number of patients enrolled with a greater number of participants and the use of a structured questionnaire in a more sexually active patients could clarify as to if horizontal or vertical vaginal cuffs closures are superior for conserving vaginal length and healthy sexual operation, even though we do not currently have enough capacity to identify distinctions among groups.

**Keywords:** Vaginal Cuff - Laparoscopy - Hysterectomy

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### INTRODUCTION

The elimination of the cervix can reduce the vagina, causing dyspareunia; pelvis nerve damage can cause vaginal dryness; and the disruption of the orgasmic cycles can cause anorgasmic sexual problems, which could be the root cause of post-hysterectomy sexual dysfunctions.<sup>1</sup>

Postoperatively vaginal length and its relationship to the cuffs closures method, "vertical versus horizontal," present additional tough topic regarding the consequences of hysterectomy on females libido.

Many research examined the effect of horizontal vs. vertical vaginal cuffs closures on TVL within the previous ten years.

After vaginal hysterectomy for pelvic organs prolaps, the effects of horizontal and vertical vaginal cuffs closures were compared. It was found that there wasn't any variation in females sexuality between the two closures methods.<sup>2</sup>

Yet, a different research examining the impact of the vaginal cuffs closures procedure following laparoscopic hysterectomy found that the laparoscopic treatment improved females sexuality.<sup>3</sup>

Although there is little data to draw conclusions about how the surgical treatment impacts sexual functioning, using the vaginal routes to manage benign illnesses appears to be related with a much lower vaginal length.<sup>3</sup>

There are studies that compare the effects of vertical against horizontal vaginal cuffs closures on vaginal length following vaginal hysterectomy, and the results show that vertical closures preserves vaginal length.<sup>4</sup>

Due to the colpotomy incisions and the proximal vagina's proximity, a reduction of some vaginal length is unavoidable after hysterectomy.

Only one study comparing horizontal and vertical laparoscopic closures of the vaginal cuffs after laparoscopic hysterectomy resulted to the discovery that these procedures significantly

improved vaginal length and other POP-Q scorings. In one series following laparoscopic hysterectomy for benign indications other than prolapses, the results showed a 0.36 cm total reduction.<sup>5</sup>

In comparison to the conventional abdomen technique, laparoscopy hysterectomy has become more common over the past ten years and is linked to quicker recovery times, shorter stays in the hospital, lower blood loss, and fewer problems.<sup>6</sup>

Malignant and benign disorders such irregular uterine haemorrhage, leiomyoma, adnexal tumours, endometriosis, and earlier gynecological cancers are among the contraindications for laparoscopic hysterectomy.<sup>7</sup>

The primary objective of the current experiment is to compare the degree of vaginal shortening with vertical and horizontal cuffs closures upon laparoscopy hysterectomy.

#### **PATIENTS AND METHODS**

This prospective interventional research was carried out at a tertiary care facility at Ain Shams University Maternity Hospital from January 2022 to February 2023 on a total of 20 Participants who arranged to undertake an overall laparoscopic hysterectomy with or without the discharge of adnexal structures after receiving ethics committees authorization and informed consent from the participants.

##### **Study population:**

Individuals undergoing a complete laparoscopy hysterectomy at the Ain Shams University Maternity Hospital, either with or without the ablation of adnexal tissues.

##### **Inclusion criteria:**

being 18 years of age or older, having a laparoscopic hysterectomy, and intending to follow up in the gynaecology department at the Ain Shams University Maternity Hospital.

##### **Exclusion criteria:**

a vaginal closures of the cuffs, a radical hysterectomy, vaginal brachytherapy, concurrent pelvic floor or vaginal suspensions surgery, and all of these procedures together.

##### **Study procedure:**

subjects were split into two groups at random: Group A (10 respondents) received a vertical vaginal cuffs closures, whereas Group B (10 subjects participated) received a horizontal vaginal cuffs closure.

##### **Study intervention:**

Initial POP-Q grades and vaginal length were assessed during their preoperative assessment.

According to the Pelvic Organs Prolapses Quantization (POP-Q) scheme, the correct method for determining the overall vaginal length when the cervix was observable was to record the spacing from the hymenal ring to the posterolateral vaginal fornix. The measurement

was performed from the posterior fornix to the hymens and rounding to the closest half centimetre.

The envelope with their research registration number was opened in the surgery room during the induction of anaesthesia to show the designated cuffs closure method.

The length of the vagina was evaluated once again in the operation room using an uterus sound probe because muscular contraction can have an impact on it.

Conventional laparoscopic equipment by (KARL STORZ) needles holders were utilised for the laparoscopic hysterectomy, and a VCare Uterines Manipulator/Elevator (ConMed Endosurgery, Utica, NY) was employed to outline the vaginal fornices.

The very same primary surgeons underwent all hysterectomies with help from an obstetrics and gynaecology residents. (O Vicryl) (Ethicon Inc., Cincinnati, Ohio, United States), including the uterosacral tendons into the closures, was used in all instances to close the wound in a running manner.

Beginning when the needles loaded and continuing until the thread was snipped, the time taken to accomplish vaginal cuffs closure was noted. After cuffs closure, the measurement was performed once more with the individual remaining sedated.

Two to four weeks and three to four months after surgery, the clinic evaluated the vaginal length and POP-Q levels. Any surgical complications were noted at each consultation.

Participants were questioned about any sexual problems they encountered at the second postoperative appointment, and their account was documented.

##### **Allocation:**

Each participant received a serial identifying code, and each identity card was at randomly allocated to either the vertical or horizontal vaginal cuffs closure arm of the trial.

##### **Randomization:**

simple random assignment utilising produced randomized integers from a computer.

##### **Concealment:**

Group assignments were kept secret in a sealed envelope with a sequence number that matched the participant's allocated identifying code.

##### **Study outcome:**

**1ry outcome:** By using the standardized POP-Q measures, the vaginal length [Time Frame: 1-3 weeks post-op] was evaluated in centimeters.

**2ry outcomes:** Vaginal length was assessed using the POP-Q standard method at 3–4 months after surgery.

The circulation nurse noted the number of seconds it took for the cuff to close during the

intraoperative period. Symptoms [Up to 4 months after surgery]: hematoma production, cuffs dehiscence, cuffs bleeding needing additional treatments or cauterization, ureteral damage, urinary retention, and sexual performance (inquire about the participant's recurrence, pain, and the necessity of lubrication).

**Statistical analysis:**

IBM SPSS statistics (Statistical Package for Social Sciences), version 22.0, IBM Corp., Chicago, USA, 2013, and Microsoft Office Excel 2007 were used to encode, summarise, and statistically analyse the acquired data.

Descriptive statistics were performed on quantitatively normal distributed data as lowest and

maximum of the ranges, means and SD (standard deviations), while it was performed on qualitatively normal distributed data as numbers and percentages.

Shapiro-Wilk tests were used to check for normality in inferential procedures for numerical variables, and independent t-tests were used when there were two independent subgroups and standard normal distribution data. Chi square tests for proportional variances and Fisher's Exact tests for factors with tiny anticipated values were used in inferential analysis for independent factors in qualitative data. If the P value is less than 0.05, the significance score was considered to be significant.

**RESULTS**

**Table (1):** baseline traits in the research groups

Variables		Vertical (Total=10)	Horizontal (Total=10)	p-value
Age (years)	Mean±SD	51.4±7.8	53.1±10.8	^0.691
	Range	43.0–69.0	31.0–65.0	
Parity	Median (1st–3rd IQ)	3.0 (0.0–4.0)	4.0 (3.0–5.0)	Δ0.175
	Range	0.0–6.0	3.0–6.0	
Menopause (n, %)	Pre	5 (50.0%)	4 (40.0%)	§0.999
	Post	5 (50.0%)	6 (60.0%)	
Clinical presentation (n, %)	Bleeding	10 (100.0%)	9 (90.0%)	§0.999
	Adenomyosis	2 (20.0%)	3 (30.0%)	§0.999
	Hyperplasia	1 (10.0%)	2 (20.0%)	§0.999
	Polyp	1 (10.0%)	0 (0.0%)	§0.999
	Malignancy	1 (10.0%)	1 (10.0%)	§0.999

^Independent t-test. ΔMann Whitnet test. §Fisher's Exact test.

Table (1) showed that: No statistical significant difference between the study groups regarding **age, parity, menopause and clinical presentation.**

**Table (2):** Cuff closure time (minutes) among the study groups

Measure	Vertical (Total=10)	Horizontal (Total=10)	p-value
Mean±SD	8.6±2.5	8.8±2.4	^0.858
Range	5.0–12.0	5.0–12.0	

^Independent t-test.

Table (2) showed that: No statistical significant difference between the study groups regarding **Cuff closure time.**

**Table (3):** Vaginal length (cm) among the study groups

Time		Vertical (Total=10)	Horizontal (Total=10)	p-value
Preoperative	Mean±SD	10.5±0.7	10.4±1.3	^0.827
	Range	9.0–11.0	9.0–13.0	
Immediately postoperative	Mean±SD	10.1±0.6	10.0±1.1	^0.901
	Range	8.5–10.5	8.5–12.0	
Week 1-3 postoperative	Mean±SD	9.9±0.6	9.9±0.9	^0.890
	Range	8.5–10.5	8.5–11.5	

^Independent t-test.

Table (3) showed that: No statistical significant difference between the study groups regarding **vaginal length; preoperative, immediately postoperative and week 1-3 postoperative.**

**Table (4):** Intraoperative complication among the study groups

Complications	Horizontal (Total=10)	Vertical (Total=10)	p-value
<b>Cuff bleeding</b>	1 (10.0%)	0 (0.0%)	§0.999
<b>Ureter injury</b>	0 (0.0%)	0 (0.0%)	NA
<b>Bladder injury</b>	1 (10.0%)	0 (0.0%)	§0.999

NA: Not applicable. §Fisher's Exact test.

Table (4) showed that: **Bladder injury and Cuff bleeding** occurred only in horizontal group, the differences were statistically non-significant. **Ureter injury** did not occur in either group.

**Table (5):** Postoperative complication among the study groups

Complications	Vertical (Total=10)	Horizontal (Total=10)	p-value
<b>Hematoma</b>	0 (0.0%)	1 (10.0%)	§0.999
<b>Urine retention</b>	0 (0.0%)	0 (0.0%)	NA

NA: Not applicable. §Fisher's Exact test.

Table (5) showed that: **Hematoma** occurred only in horizontal group, the differences were statistically non-significant. **Urine retention** did not occur in either group.

**Table (6):** Postoperative worsening in sexual function among the study groups

Sexual domains	Vertical (Total=10)	Horizontal (Total=10)	p-value
<b>Frequency</b>	1 (10.0%)	2 (20.0%)	§0.999
<b>Pain</b>	0 (0.0%)	1 (10.0%)	§0.999
<b>Lubrication</b>	0 (0.0%)	0 (0.0%)	NA
<b>Orgasm</b>	0 (0.0%)	1 (10.0%)	§0.999
<b>Overall satisfaction</b>	1 (10.0%)	2 (20.0%)	§0.999

NA: Not applicable. §Fisher's Exact test.

Table (6) showed that: **Worsening in frequency, pain, orgasm and overall satisfaction** were non-significantly more frequent in horizontal group. Worsening in lubrication did not occur in either group.

## DISCUSSION

The surgical removal of the uterus, or a hysterectomy, is among the most frequent gynecological procedures performed worldwide. Many gynecologic surgeons are now providing patients with the choice of a laparoscopic hysterectomy as laparoscopy has become more widely utilised physicians in numerous medical specialties and throughout the world.<sup>3</sup>

In comparison to the conventional abdomen technique, laparoscopic hysterectomy has become more common over the past ten years and is linked to a quicker recovery, lower hospitalisations, lower blood loss, and fewer problems.<sup>8</sup>

Hysterectomy will inevitably result in some vaginal length reduction because of the colpotomy incisions and the proximate vaginal approaches. In one cohort, there was a loss of 0.36 cm following laparoscopic hysterectomy for benign causes other than prolapses. There is at least some correlation between vaginal length and sexual performance, albeit its therapeutic importance has not yet been shown.<sup>5</sup>

Evaluating whether the horizontal or vertical closures of the vaginal cuffs has a directly impact on post-hysterectomy vaginal duration and on postoperative sexual problems because shortening of the vaginal duration after laparoscopic hysterectomy constitutes an important conflict that can be affiliated with pelvic health problems of pain and prolapse. was emphasised as the primary topic of emphasis.<sup>8</sup>

Studies on the effects of vertical versus horizontal vaginal cuffs closure following a vaginal hysterectomy on vaginal length are available, indicating vertical closures in maintaining vaginal length. Unfortunately, there are no studies contrasting horizontal with vertical vaginal cuffs closure following laparoscopic hysterectomy.<sup>5</sup>

The objective of this research was to compare the effects of horizontal as well as vertical vaginal cuffs closure on postoperative vaginal length following complete laparoscopic hysterectomy.

From January 2022 to February 2023, this prospective interventional research was carried out at Ain Shams University Maternity Hospital, a tertiary care facility, on a total of 20

participants who intended to undertake a total laparoscopic hysterectomy with or without the excision of adnexal tissues.

In this trial, eligibility for 36 participants was determined, and 20 individuals were enrolled (10 in each group). Of the total number of eligible individuals, 14 were denied participation in the trial due to inclusion criteria, and 2 individuals declined to take part.

In the end, the study was conducted using the information of 20 Participants who were split into two groups and scheduled to have a total laparoscopic hysterectomy with or without the elimination of adnexal tissues; 10 patients patients were divided into group A, which had vertical vaginal cuffs closure, and 10 patients were divided into group B, which received horizontally vaginal cuffs closure.

Age, parity, menopausal, and clinical manifestations did not significantly differ across the analysed subgroups, according to the present research (p values = 0.691, 0.175, 0.999, and 0.999, respectively).

**As regard the vaginal length**, the current research study revealed that preoperatively, the vaginal length was  $10.5 \pm 0.7$  cm in the Vertical group and  $10.4 \pm 1.3$  cm in the Horizontal group and postoperatively,  $10.1 \pm 0.6$  cm in the Vertical group and  $10.0 \pm 1.1$  cm in the Horizontal group with no statistically significant difference between the study groups regarding vaginal length; preoperative, immediately postoperative and week 1-3 postoperative with no significant difference regarding the time needed for cuff closure.

As most of the prior literatures evaluated the vaginal length following vaginal and abdominal methodology of hysterectomy, to the highest of our understanding, there are few research publications that contrast the outcomes of the laparoscopic approaches versus the vaginal routes for the administration of vaginal cuffs closure during overall laparoscopic hysterectomy, and that reflects a power of our research.

These findings are in line with those of past studies. Hill et al. 5 invited 43 women for the prospectively randomised controlled experiment to examine the effects of vertical versus horizontal vaginal cuffs closures throughout laparoscopic hysterectomy on postoperatively vaginal length and pelvic organs prolapses. The results showed that there was no substantial differences in menopausal state, the number of vaginal deliveries, or nulliparity between cohorts. The average change in vaginal length was  $-0.89 \pm 1.03$  cm in the 143 Horizontal cohort and  $-0.68 \pm 1.19$  cm in the Vertical cohort (p=0.57) with no notable differences at 4 months postoperatively (p=0.88). Postoperative vaginal length was  $8.42 \pm 1.05$  cm in the Horizontal group and  $8.14 \pm 1.19$  cm in the Vertical group (p=0.44).

Tan et al. 10 found that hysterectomy contributed to a loss in vaginal length of 0.63 cm with no statistically significant variance found between vaginal and abdomen hysterectomy. Shiber et al. 9 found that laparoscopic hysterectomy had a mean reduction in vaginal lengths of 0.18 cm. Previous studies have shown that hysterectomy shrinks the vaginal to varying degrees.

It's noteworthy to note that the outcomes vary depending on the hysterectomy method. Both the application of a colpotomy rings throughout laparoscopic hysterectomy and variations in the volume of tissues within the sutures could account for these variations.<sup>5</sup>

Our results are consistent with those of Tower et al. 11 who performed a prospectively randomised controlled trial on 17 patients receiving robotic-assisted laparoscopic full hysterectomy for benign or malignant disorder to assess the impact of vertical versus horizontal closure of the vaginal cuffs on vaginal length found that there was no significantly distinction in the average period of vaginal cuffs closure between the horizontal and vertical groups (P=0.35), and that the average change in vaginal length was -1.25 cm (SD 0.29) in the horizontal cohort and -1.00 cm (SD 0.32) in the vertical cohort.

Contrarily, Pergialiotis et al. 8 performed a meta-analysis on 223 subjects to determine whether horizontal or vertical closure of the vaginal cuffs has a directly impact on post-hysterectomy vaginal length and on postoperatively sexual dysfunctions. They found that preoperatively average vaginal length was marginally relatively short in the horizontal cohort, however this result did not reach statistical significance, and that postoperatively, the horizontal closures of the vaginal cuffs was associated with. The horizontal approach drastically reduced the average vaginal length. The vertical closure of the vaginal vaults did not significantly influence vaginal length in individuals who undergoing laparoscopic or surgical techniques, according to the subgroup analysis, which could have been described by the larger sample size particularly in comparison to our research. Vertical closure was only linked to greater vaginal length in individuals diagnosed with vaginal hysterectomy.

Moreover, Pacis et al. 12 carried out a single-blinded, randomised, controlled trial with 69 females undergoing full laparoscopy hysterectomy (TLH) for benign causes to determine whether vaginal cuffs closure method better conserved vaginal length (TVL): horizontally (HC) against vertically (VC) and evaluate how the cuffs closure technique affects females sexual functioning, and found that the average change in postoperatively TVL in the HC group was -0.43 cm (95% CI -0.86-

0.01) and in the VC group was -0.01 cm (95% CI -1.42--0.59). Both the HC and VC groups experienced a statistically substantial change in preoperative to postoperative TVL ( $p < 0.0001$  and  $p < 0.05$ , respectively), even though the variation in TVL between the groups was rather slight ( $p < 0.06$ ).

Furthermore, Ryan and Guan<sup>13</sup> conducted a prospectively research study in which 56 women were enrolled to ascertain the effect of the vaginal cuffs closures form on vaginal length following TLH with either a horizontal or vertical vaginal cuffs closures. They found that the difference in vaginal length from pre- to post-surgery was substantial for both the horizontal (mean, -1.0 cm, SD=0.79,  $p < 0.0001$ ) and the vertical group (mean, +0.5 cm SD=0.78;  $p = 0.002$ ). Also, a t-test revealed a significant difference between the two groupings in the improvement from before to after surgery ( $p < 0.01$ ). The vagina of women who underwent horizontally closure was 1.5 cm lower on mean than that of those who received vertical closures. Hence, vertical vaginal cuffs closure during TLH considerably maintains vaginal length compared to horizontal closures.

**As regard the complications**, our study results revealed that the intraoperative complications of bladder injury and Cuff bleeding occurred only in horizontal group, the differences were statistically non-significant. Ureter injury did not occur in either group and the postoperative complication of Hematoma occurred only in horizontal group, the differences were statistically non-significant ( $p$  value= 0.999). Urine retention did not occur in either group.

Pergialiotis et al.<sup>8</sup> found complications from the vaginal cuffs suture approach were mostly limited to the early postoperatively period, including bleeding from granulation tissues, vaginal cuffs cellulitis, and vaginal cuff lacerations. This conclusion agrees with our own.

According to Hill et al.<sup>5</sup>, just one serosal injury to the bladders occurred during the deconstruction of scarred bladders flap, which is consistent with our findings that the time it took for vaginal cuffs to close was the sole intraoperative challenging feature in the horizontal closures sample. In the postoperative phase, minor complications such vaginal cuffs cellulitis, bleeding granulating tissues, pelvic abscesses two weeks after the procedure, transitory obturator neuralgia, temporary urinating difficulty, and a hernia at a trochar site were reported. The vaginal cuffs closure was not responsible for any of these problems, and there was no statistically significant distinction between them. No occurrences of ureteral harm or kinking occurred, and no bladders harm from cuffs closure occurred. This is in line with the findings of Tower et al.<sup>11</sup>, who

documented no intraoperative problems caused by the closure of the vaginal cuffs.

According to the results of our investigation, the horizontal group experienced worsening in incidence, pain, orgasms, and overall satisfaction at a non-significantly higher rate. In none of the group did lubricating deteriorate.

Whereas earlier studies comparing sexual performance and vaginal length after vaginal versus robotic hysterectomy with pelvic floor adjustments failed to identify a relationship between the two outcomes, a subsequent findings indicate decreased vaginal length and worse sexual functioning after all routes of total hysterectomy, in particular compared to no hysterectomy.<sup>15</sup>

Similar to our observations, Pergialiotis et al.<sup>8</sup> noted that postoperatively sexually functioning was assessed and no significant variations were seen, and the researchers stated that the primary cause of poor sexual performance postoperatively was new-onset dyspareunia and/or incontinences.

Pacis et al.<sup>12</sup> mentioned that standard female sexual activity was evaluated before the operation using the Females Sexual Functioning Index (FSFI) and readministered at six and 12-months after TLH to reevaluate sexual performance; they revealed that the alteration in FSFI total score from baseline to 6 months and 12 months after TLH failed to achieve statistical significance ( $p = 0.47$  and  $p = 0.2$ , respectively). This result is consistent with our results.

#### **The strength points of this study:**

The prospectively research methodology, the setting in a single tertiary treatment center, the incorporation and assessment of two different standardised surgical intervention, from vault closure to accomplish hysterectomy, and the lack of patient populations lost to follow-up throughout the duration of the study are the article's main strengths. Also, the research was carried out at a single facility by an identical surgical team, which probably strengthened the reliability of our findings.

#### **The limitations of the study:**

The article has some drawbacks that are important to note, such as a relatively small sample size compared to other studies and the lack of a multicentric research, which increases the potential of publication bias. The research population's tendency to be elderly and less reproductive health is another drawback, which could cause the result regarding the impact of the closure on sexual problems to be understated. Instead of employing a standardized sexual health survey, sexual dysfunction was evaluated by asking the respondents if they had any challenges with their sexuality.

#### **CONCLUSION**

The present research did not identify a variation between both vertical and horizontal cuffs closure in maintaining vaginal length following laparoscopic hysterectomy, as is seen from the findings obtained.

The surgeon's recommended method should therefore be used to close the vaginal cuffs.

Additional researches might also compare the effects of horizontal versus vertical closure on patients quality of life, evaluate rates of sexual disorder using the Females Sexual Functioning Index (FSFI) affirmed survey, and lengthen the follow-up period to precisely ascertain whether this consequence has clinical relevance in menstruation given that vaginal atrophy evolution is likely at this phase.

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