Original Article

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The Effect of Vaginal Cuff Closure Technique on Postoperative Vaginal Length and Sexual Function: A Prospective Randomized Study

Vajinal Kaf Kapatma Tekniğinin Postoperatif Vajinal Uzunluk ve Cinsel İşlev Üzerine Etkisi: Prospektif Randomize Bir Çalışma

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ABSTRACT

Objective: After laparoscopic hysterectomy, vaginal cuff closure may lead to shortening of vaginal length and negatively affect sexual function. This prospective randomized study aimed to compare the effects of different vaginal cuff closure techniques on postoperative vaginal length (primary outcome) and female sexual function (secondary outcome).

Methods: This study included 63 patients who underwent total laparoscopic hysterectomy at the Department of Obstetrics and Gynecology, Bolu Abant İzzet Baysal University Training and Research Hospital. Patients were randomized into two groups according to vaginal cuff closure technique: laparoscopic suturing (n=32) and vaginal suturing (n=31). Vaginal length was measured preoperatively and at the 3rd postoperative month using a graduated metal ruler (Hegar bougie with scale) from the hymenal ring to the vaginal vault apex, with the patient in the lithotomy position and without anesthesia. Sexual function was evaluated at the same time points using the Arizona Sexual Experience Scale (ASEX).

Results: The mean reduction in vaginal length was 0.67±0.22 cm in the laparoscopic suturing group and 0.92±0.30 cm in the vaginal suturing group, with a statistically significant difference favoring laparoscopic suturing. The mean change in ASEX scores between preoperative and postoperative assessments was 1.38±1.5 in the laparoscopic group and 1.1±1.1 in the vaginal suturing group, with

ÖZ

Amaç: Laparoskopik histerektomi sonrası vajinal kaf kapatma işlemi vajinal uzunlukta kısalmaya yol açabilir ve cinsel işlevi olumsuz etkileyebilir. Bu prospektif randomize çalışmada, farklı vajinal kaf kapatma tekniklerinin postoperatif vajinal uzunluk (primer sonlanım) ve kadın cinsel işlevi (sekonder sonlanım) üzerindeki etkilerinin karşılaştırılması amaçlandı.

Yöntemler: Bu çalışmaya Bolu Abant İzzet Baysal Üniversitesi Eğitim ve Araştırma Hastanesi Kadın Hastalıkları ve Doğum Kliniği'nde total laparoskopik histerektomi uygulanan 63 hasta dahil edildi. Hastalar vajinal kaf kapatma tekniğine göre laparoskopik sütürasyon (n=32) ve vajinal sütürasyon (n=31) gruplarına randomize edildi. Vajinal uzunluk ölçümü, preoperatif dönemde ve postoperatif 3.ayda, dereceli metal cetvel (skalalı Hegar buji) kullanılarak, himenal halkadan vajinal kaf apeksine kadar, litotomi pozisyonunda ve anestezi uygulanmadan yapıldı. Aynı zaman noktalarında cinsel işlev Arizona Cinsel Yaşantılar Ölçeği (ACYÖ) ile değerlendirildi.

Bulgular: Laparoskopik sütürasyon grubunda ortalama vajinal uzunluk kısalması 0,67±0,22 cm, vajinal sütürasyon grubunda ise 0,92±0,30 cm olarak saptandı ve gruplar arasında istatistiksel olarak anlamlı fark bulundu. Preoperatif ve postoperatif ACYÖ skor farkı laparoskopik grupta 1,38±1,5, vajinal sütürasyon grubunda 1,1±1,1 olup gruplar arasında anlamlı fark saptanmadı. Vajinal uzunluk ve

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ABSTRACT

no statistically significant difference between groups. No significant correlation was found between changes in vaginal length or ASEX scores and demographic variables.

Conclusion: Laparoscopic vaginal cuff suturing results in less postoperative vaginal shortening compared with vaginal suturing. However, vaginal cuff closure technique does not have a significant effect on postoperative sexual function. Further prospective studies with larger sample sizes are warranted.

Keywords: Laparoscopic hysterectomy, vaginal cuff, vaginal length, sexual function, suturing

ÖZ

ACYÖ skor değişimleri ile demografik değişkenler arasında anlamlı korelasyon bulunmadı.

Sonuç: Laparoskopik vajinal kaf sütürasyonu, vajinal sütürasyona kıyasla daha az postoperatif vajinal kısalmaya neden olmaktadır. Bununla birlikte, vajinal kaf kapatma tekniğinin postoperatif cinsel işlev üzerine anlamlı bir etkisi bulunmamaktadır. Daha geniş örneklemli ileri çalışmalara ihtiyaç vardır.

Anahtar Kelimeler: Laparoskopik histerektomi, vajinal kaf, vajinal uzunluk, cinsel işlev, sütürasyon

Introduction

Hysterectomy is defined as the surgical removal of the uterus using various approaches. Laparoscopic hysterectomy, in particular, involves the removal of the uterus through the vagina with laparoscopic assistance. It offers advantages such as shorter hospital stay, faster postoperative recovery, less postoperative pain, and better visualization of pelvic structures.

Following hysterectomy, anatomical changes such as vaginal shortening due to vaginal cuff closure can result in sexual dysfunction, including dyspareunia and decreased sexual satisfaction (1). In addition to structural changes, hysterectomy may impact female sexual function through physiological, hormonal, and psychological mechanisms. Physiologically, disruption of pelvic nerve supply and reduced pelvic blood flow may impair arousal and lubrication (2). Hysterectomy may also lead to hormonal imbalances, particularly when oophorectomy is performed or ovarian blood flow is disrupted, resulting in reduced estrogen and progesterone levels (3). Psychologically, changes in body image, mood, and perception of femininity can further contribute to sexual dysfunction. Body image has a determining effect on an individual's eating behaviors, social anxiety levels, sexual behaviors, social relationships, and emotional states, in addition to their self-esteem (4).

Despite these concerns, the impact of hysterectomy on sexual function is often under-addressed during preoperative counseling. Furthermore, the surgical technique used for vaginal cuff closure-vaginal or laparoscopic-may influence postoperative outcomes including vaginal length and sexual function, yet few studies have directly compared these techniques.

In this prospective study, we aimed to compare the effects of two vaginal cuff closure techniques-laparoscopic versus vaginal-on postoperative vaginal length and female sexual function following laparoscopic hysterectomy. Sexual function was assessed using the Arizona Sexual Experience Scale (ASEX), a validated tool frequently used in gynecologic research.

Methods

This was a prospective clinical study conducted at Bolu Abant İzzet Baysal University Ethic Committee after obtaining ethics approval (decision no: 2021/104, date: 01.02.2023). All participants provided written informed consent. A total of 63 patients who underwent laparoscopic hysterectomy for benign gynecologic conditions were included. The vaginal cuff was closed using one of two techniques: laparoscopic intracorporeal suturing or vaginal suturing. Only patients operated on by a single experienced surgeon were included to minimize operator-related variability. Vaginal cuff in patients operated for benign reasonswas closed using a laparoscopic intracorporeal technique using 1/0 vycril or vaginally using 1/0 vycril.

Operation time, vaginal complications, and postoperative outcomes were compared between the two groups. The primary outcome of the study was the difference in baginal length measured preoperatively and at 3 months postoperatively.

Seconder outcomes included changes in sexual function as assessed by ASEX scores, operation time, and postoperative complications.

Operation time, vaginal complications, vaginal length, and postoperative sexual functions were compared between these two groups.

Patients who were operated on at an external center, patients who were operated by other surgeons, patients who developed intraoperative complications, patients who delayed their follow-up and treatment, patients who did not want to participate in the study, patients who were operated on for malignant reasons, patients with presence of a large adnexal mass (>10 cm in ultrasonography, >10 cm myoma on frozen section), patients who were operated on with indications, patients who were not sexually active, patients without a partner, and illiterate patients were not included in the study. Additionally, patients who could not tolerate the high Trendelenburg position, who were not suitable for laparoscopic surgery (patients with chronic obstructive pulmonary disease, restrictive lung disease), and

who underwent laparotomy were excluded from the study. A total of 70 patients participated in the study during the planned 2-year period. However, 3 patients in the 1st group and 4 patients in the 2nd group were excluded from the study because they did not meet the study criteria.

CONSORT flow diagram summary: enrollment: 70 patients assessed for eligibility.

- Excluded: 7 (did not meet criteria or withdrew)

- Randomized: 63 (laparoscopic group: 32, vaginal group: 31)

- Follow-up: No loss to follow-up

- Analysis: 63 included (32+31)

A total of 63 patients were included in the study, 32 in the first group and 31 in the second group. A power analysis was performed based on previously published data showing a minimum expected mean difference of 0.25 cm in vaginal length and 1.5 points in ASEX scores between groups. To achieve 80% power at a 5% significance level (α=0.05), a minimum of 28 participants per group was required. We enrolled 63 patients in total to account for potential dropouts and maintain statistical power.

Patients were randomly assigned to the laparoscopic or vaginal cuff closure group using a computer-generated simple randomization sequence. Allocation was concealed in sequentially numbered, opaque, sealed envelopes that were opened in the operating room after anesthesia induction. This ensured minimization of selection bias.

Sexual function was assessed using the ASEX preoperatively and at 3 months postoperatively. Although several scales are available for evaluating female sexual function, ASEX was chosen for its brevity, ease of use, validation in Turkish populations, and its ability to quantify changes across domains such as sexual drive, arousal, lubrication, orgasm, and satisfaction. Sexual function was assessed using the ASEX, which has demonstrated reliability and validity in Turkish hemodialysis patients (5).

Vaginal length was assessed both preoperatively and at 3 months postoperatively. The measurement was performed with a graduated metal ruler (Hegar dilator with scale), introduced from the hymenal ring up to the vaginal cuff apex. Patients were placed in the lithotomy position without anesthesia during the procedure. All measurements were carried out by the same experienced gynecologist, who was blinded to the patient's cuff closure technique to reduce bias. Although POP-Q parameters were recorded, the total vaginal length (TVL) measurement was used as the reference standard. To improve reproducibility, each measurement was performed twice, and the mean value was recorded. Trial registration: this study was registered at ClinicalTrials.gov (registration number: NCT07228351).

Statistical Analysis

Statistical analyses were performed using IBM SPSS statistics (version 25.0, IBM Corp., Armonk, NY, USA).While evaluating the study data, descriptive statistical methods were evaluated as mean, standard deviation and frequency. Student's t test was used to compare normally distributed parameters between two groups, and Mann-Whitney U test was used to compare non-normally distributed parameters between two groups. Pearson correlation test was used to examine the relationships between parameters. Chi-square test was used to compare qualitative data. The results were evaluated within the 95% confidence interval and the significance level was $p<0.05$.

Results

Our study was conducted with a total of 63 patients, 32 of whom underwent laparoscopic suturing and 31 of whom underwent vaginal suturing. The groups showed comparable characteristics in terms of most demographic variables. However, body mass index (BMI) values were found to be statistically higher in the vaginal suturing group.

As seen in Table 1, the average age of the patients was 46.59±2.80 (years) in the patient group with laparoscopic suturing and 44.74±3.89 (years) in the patient group with vaginal suturing. When the groups were examined, it was determined that the average ages in both groups ranged between 35 and 51 years, and the average ages were close to each other.

As seen in Table 1, the average height of the patients in the patient group with laparoscopic suturing was 161.78±4.79 cm, and the average height of the patients in the patient group with vaginal suturing was 160.74±5.50 cm. When the average weight of the patients in both groups was compared, it was determined that the average weight in the patient group with laparoscopic suturing was 72.09±13.23 kg, and in the patient group with vaginal suturing it was 77.48±12.11 kg. While the highest weight was 102 kg in the patient group with vaginal suturing, the lowest weight was 50 kg in the laparoscopic suturing group. As seen in Table 2 when the operation times between the groups were compared, the average of the laparoscopic suturing group was 81.36±12.5 minutes, and the average of the vaginal suturing group was 88.46 min (minimum)±13.7 min.

As seen in Table 3; in the patient group that underwent laparoscopic suturing, the average pre-operative (pre-op) vaginal length was 8.63±0.97 cm, while the average post-operative vaginal length was 8.00±0.89 cm. The average difference in vaginal length was 0.67±0.22 cm.

In the patient group who underwent vaginal suturing, the average pre-op vaginal length was 8.60±0.90 cm, while the average post-operative vaginal length was 7.67±0.75 cm. The average difference in vaginal length was 0.92±0.30 cm. When the vaginal lengths of the two groups were compared, it was determined that the vaginal length was shortened more in the patient group who underwent vaginal suturing. A statistically significant difference was detected between the two groups (Table 3).

As seen in Table 4; when the complications were compared between the two groups, no vaginal vault hematoma was detected in the patient group with laparoscopic suturing,

while vaginal vault hematoma was detected in 1 patient in the patient group with vaginal suturing. When compared in terms of vaginal vault infection; while infection was detected in 2 patients in the laparoscopic suture group, infection was detected in 4 patients in the vaginal suture group. When compared in terms of vaginal vault dehiscence, one patient in each group was followed up with vaginal vault dehiscence. When evaluated in terms of complications; while vaginal vault hematoma and vaginal vault infection were more common in the patient groups that underwent vaginal suturing, no significant difference was detected between the two groups in terms of dehiscence.

As seen in Table 5; pre-op score in the patient group with laparoscopic suturing was 17.53±3.68, post-op score was found 18.53±3.56. The average ASEX score in the surveys conducted in the pre-operative and post-operative periods in patients who underwent laparoscopic suturing was 1.38±1.5. In this group, the lowest score in pre-op patients was 10, while the highest score was 24. The lowest score of post-operative patients were 11 and the highest score was 25. The lowest ASEX score difference measured in pre-op and post-op patients was 0, while the highest was 6. There was no statistically significant difference between the groups in terms of the difference between pre-op and post-op measurements. This showed that the suturing technique in laparoscopic hysterectomy had no effect on the ASEX.

In the patient group who underwent vaginal suturing, the pre-op score was 16.52±4.29 and the post-op score was 17.16±4.98. The average ASEX score in the surveys conducted in the pre-op and post-operative periods in patients who underwent vaginal suturing was 1.1±1.1. In this group, the lowest score in pre-op patients was 8, while the highest score was 26. The lowest score of post-op patients was 8 and the highest score was 29. The lowest ASEX score difference measured in pre-op and post-op patients was 0, while the highest was 4 (Table 5).

As seen in Table 6, there was no significant correlation between the vaginal length and age (r=-0.185, p=0.146), height (r=- 0.04, p=0.975), weight (r=0.008, p=0.949), BMI (demographic factors such as r=0.003, p=0.979), smoking history (r=0.038, p=0.768), comorbidity history (r=0.124, p=0.335), and previous operation history (r=-0.043, p=0.736).

Discussion

Although the specific advantages and disadvantages of laparoscopic hysterectomy have been gradually defined today, it is still not widely applied due to insufficient technical equipment and the lack of well-trained laparoscopically trained personnel.

We know that after hysterectomy, vaginal length shortens due to the removal of the uterus, andas a result, conditions such as dyspareunia and sexual dysfunction may occur. When the literature was examined, it was seen that few studies evaluated vaginal

Table 1. Demographic findings of the laparoscopic suturing and vaginal suturing groups

	Patients who had laparoscopic suturing	Patients who had vaginal suturing	p-value
Age	46.59±2.80 (year)	44.74±3.89 (year)	0.073
Height	161.78±4.79 cm	160.74±5.50 cm	0.373
Weight	72.09±13.23 kg	77.48±12.11 kg	0.097
BMI	27.50±4.71	30.04±4.81	0.039
Cigarette (+)	11 (34.4%)	7 (22.6%)	0.304
Comorbidity DM (+)	2 (6.3%)	5 (16.1%)	0.385
Comorbidity HT (+)	7 (21.9%)	5 (16.1%)	
Comorbidity DM+HT+	1 (3.1%)	2 (6.5%)	
No comorbidities	22 (68.8%)	19 (61.3%)	
Previous operation history+	11 (34.4%)	9 (29.0%)	0.651

BMI: Body mass index, DM: Diabetes mellitus, HT: Hypertension

Table 2. Comparison of operation times of patient groups

	Patients who underwent laparoscopic suturing	Patients who underwent vaginal suturing	p-value
Operation time average	81.36 min±12.5 min	88.46 min±13.7 min	0.651
Operation time min	55 min	65 min	
Operation time max	110 min	130 min	

Table 3. Comparison of vaginal length between groups

	Patients who underwent laparoscopic suturing	Patients who underwent vaginal suturing	p-value
Pre-op vaginal length average	8.63±0.97 cm	8.60±0.90 cm	0.98
Min	7 cm	7 cm	
Max	11 cm	12 cm	
Post-op vaginal length average	8.00±0.89 cm	7.67±0.75 cm	0.125
Min	6.6 cm	6.4 cm	
Max	10.5 cm	10.5 cm	
Average vaginal length difference	0.67±0.22 cm	0.92±0.30 cm	**<0.005***
Min	0.2 cm	0.2 cm	
Max	1.1 cm	1.7 cm	

Data; Shown as mean ± standard deviation, p= Significance level, *: p<0.05, Was considered statistically significant, Pre-op: Pre-operative, Post-op: Post-operative

Table 4. Comparison of complications of patient groups

Complication	Patients who underwent laparoscopic suturing	Patients who underwent vaginal suturing	p-value
Vaginal cuff hematoma	0 (0%)	1 (3.2%)	>0.05*
Vaginal cuff infection	2 (6.3%)	4 (12.9%)	>0.05*
Vaginal cuff dehiscence	1 (3.1%)	1 (3.2%)	>0.05*

*: Comparisons were performed using chi-square or Fisher's exact test as appropriate; no statistically significant difference was observed between groups (p>0.05)

Table 5. Comparison of sexual function between groups

Survey results	Patients who underwent laparoscopic suturing	Patients who underwent vaginal suturing	p-value
Pre-op ASEX	17.53±3.68	16.52±4.29	0.318
Post-op Arizona score	18.53±3.56	17.16±4.98	0.213
Arizona score difference	1.38±1.5	1.1±1.1	0.672

Pre-op: Pre-operative, Post-op: Post-operative, ASEX: Arizona Sexual Experience Scale

length after laparoscopic hysterectomy. Most of these studies evaluated vaginal lengths in different hysterectomy surgeries (vaginal hysterectomy, laparoscopic hysterectomy, abdominal hysterectomy) rather than different cuff closure methods. In some studies in the literature, vaginal cuff closure techniques were compared. In these studies, postoperative complications and operation times of both methods were compared. In a study, preoperative and postoperative vaginal length and sexual function scales were compared (6). In this study, the vaginal length in patients who underwent laparoscopic suturing was found to be longer than the vaginal length in patients who underwent vaginal suturing. In our study, the average pre- operative vaginal length in the patient group who underwent laparoscopic suturing was 8.63±0.97 cm, while the average post-operative vaginal length was 8.00±0.89 cm. The average difference in vaginal length was 0.67±0.22 cm. In the patient group who underwent vaginal suturing, the average pre-op vaginal length was 8.60±0.90 cm, while the average post-operative vaginal length was 7.67±0.75 cm. The average difference in vaginal length was 0.92±0.30 cm. When the vaginal lengths of the two groups were compared, it was determined that the vaginal length was shortened more in the patient group who underwent vaginal suturing. Our data, consistent with the literature, revealed that postoperative vaginal length was shortened regardless of the cuff closure method.

When choosing the patients we included in the study, we made sure that they were similar groups. There was no significant difference in terms of demographic characteristics and surgery indications of the patients in both groups included in the study. This showed that the patients in the groups had a homogeneous structure. In addition, the fact that no significant difference was detected between the groups in terms of previous abdominal and pelvic surgical operations eliminated any possible differences between the groups.

When we looked at the operation times in our study, we noticed that the total operation time was shorter in the patient group who underwent laparoscopic suturing. In patients with laparoscopic suturing, although cuff suturing takes longer; we thought that the shortness of the total operation time was caused by the time loss during the examination of the abdomen with a camera after vaginal cuff suturing. We observed that there were time-consuming steps such as ensuring sterilization in accordance with the abdomen again after vaginal suturing, starting intra-abdominal gas inflation again, setting the appropriate pressure value, and rearranging the camera and other technical elements. Again, since we started working after gaining a certain amount of experience on this subject before laparoscopic suturing, we believed that the operation time of patients who underwent laparoscopic suturing was shorter.

Table 6. Correlation analysis of vaginal length difference with demographic data variables

		Age	Height	Weight	BMI	Cigarette use	Had a disease	Operation
Vaginal length difference	r	-0.185	-0.04	0.008	0.003	0.038	0.124	-0.043
	p	0.146	0.975	0.949	0.979	0.768	0.335	0.736

BMI: Body mass index

In our study, postoperative total ASEX scores were higher in both groups compared to preoperative ASEX scores. (17.5-18.5/16.5-17.1). When all patient groups were examined, it was seen that the ASEX score was high. In our country, 53.1% of women aged 31-45 and 67.9% of women aged 46-55 have sexual dysfunction (7). However, the number of patients admitting for treatment is less. On sexual function; there are influencing factors that cannot be changed, such as the patient's comorbid disease, menopause, and socioeconomic level. The postoperative ASEX form was filled out alone in a private room by the patients in our study, after their vaginal length was measured, when they came for their 3rd month follow-up. The answers here may be considered more realistic. Average ASEX score at the 3rd postoperative month in the patient group who underwent laparoscopic suturing was 18.5, and it was 17.1 in the patient group with vaginal suturing. However, the statistical difference was not significant ($p>0.05$).

One negative aspect of vaginal cuff closure is the increased risk of infection due to vaginal contamination. In our study, vaginal cuff infection was detected in 6.3% of the patient group who underwent laparoscopic suturing, while vaginal cuff infection was detected in 12.9% of the patients who underwent vaginal suturing. However, similar postoperative infection rates are reported in the literature in endoscopic and vaginal cuff closures (8). Infectious factor is an important risk factor for vaginal cuff detachment. When compared in terms of vaginal vault hematoma, no hematoma was detected in any patient in the patient group with laparoscopic suturing, while vaginal vault hematoma was detected in one patient in the patient group with vaginal suturing.

Study Limitations

This study has several limitations:

1. Short follow-up duration: The postoperative evaluation was limited to 3 months. As sexual function may continue to evolve beyond this period, longer follow-up is warranted.
2. Sample size: While powered to detect moderate differences, the relatively small cohort size limited the generalizability of findings.
3. Randomization method: Although computer-based randomization was used, the single-center design and inclusion of only one surgeon might limit external validity.
4. Selection bias: Despite randomization, baseline psychological and relationship factors influencing sexual function could not be fully controlled.
5. Measurement bias: Self-reported ASEX scores might be affected by sociocultural factors or underreporting due to embarrassment or stigma.
6. Choice of assessment tool: While ASEX is validated and practical, more detailed instruments such as the Female Sexual Function Index could offer broader insights into sexual domains. The use of ASEX was chosen for feasibility, but this might be seen as a limitation.

Conclusion

The purpose of our study was to investigate whether vaginal cuff closure techniques commonly used in total laparoscopic hysterectomy had an effect on vaginal length and sexual life, and to determine their superiority over each other, if any. For this purpose, we sutured the vaginal cuff using two different techniques: laparoscopic and vaginal. We found that laparoscopic vaginal cuff suturing shortened the vaginal length less. In terms of sexual life, we found that the vaginal cuff closure technique had no effect on postoperative results.

In terms of complications, although complications were less common in the patient group who underwent laparoscopic suturing in our study, the number of complications was quite low in both patient groups. We think that our findings should be supported by studies with a larger number of cases.

When we compare the two groups in terms of operation times; we found that the operation time was shorter in patients who underwent laparoscopic suturing. We believe that prospective, randomized, larger case series studies are needed to support our findings.

Ethics

Ethics Committee Approval: This was a prospective clinical study conducted at Bolu Abant İzzet Baysal University Ethic Committee after obtaining ethics approval (decision no: 2021/104, date: 01.02.2023).

Informed Consent: All participants provided written informed consent.

Footnotes

Authorship Contributions

Surgical and Medical Practices: M.E.A., M.A.T., Concept: M.E.A., M.A.T., Design: M.E.A., M.A.T., Data Collection or Processing: M.E.A., Analysis or Interpretation: M.E.A., M.A.T., Literature Search: M.E.A., M.A.T., Writing: M.E.A.

Conflict of Interest: No conflict of interest was declared by the authors.

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