



Sexual function and surgical outcomes after vaginal natural orifice transluminal endoscopic surgery versus total laparoscopic hysterectomy

Vajinal doğal orifis transluminal endoskopik cerrahi ile total laparoskopik histerektomi sonrası cinsel fonksiyon ve cerrahi sonuçlar

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Abstract

Objective: To examine whether vaginal natural orifice transluminal endoscopic surgery (vNOTES) and total laparoscopic hysterectomy (TLH) differ in postoperative sexual health, patient-reported recovery measures, and perioperative outcomes.

Materials and Methods: Sexually active women treated with vNOTES or TLH for benign gynaecological indications between January 2023 and January 2026 were included in this ambispective cohort. Clinical and operative information was retrieved retrospectively, while patient-reported postoperative data were obtained prospectively a minimum of six months after surgery. Sexual function was measured with the Female Sexual Function Index (FSFI). Additional outcomes included dyspareunia, time to resumption of sexual intercourse, return to work, postoperative satisfaction, and willingness to undergo the same procedure again. Selected outcomes were further examined using multivariable regression models incorporating clinically relevant confounding variables.

Results: The analysis comprised 159 women, of whom 105 underwent TLH and 54 underwent vNOTES. Compared with TLH, vNOTES was associated with a shorter operative duration [160 (60) vs. 198 (90) minutes, $p<0.01$], earlier return to sexual intercourse [8 (3) vs. 9 (4) weeks, $p<0.01$], and higher postoperative satisfaction [10 (9-10) vs. 9 (8-10), $p<0.01$]. In adjusted analyses, the associations with shorter operative time [$\beta=-27.24$, 95% confidence interval (CI): -50.62 to -3.86; $p=0.02$] and earlier resumption of intercourse ($\beta=-1.60$ weeks, 95% CI: -2.93 to -0.27; $p=0.01$) persisted. No significant differences were identified in FSFI-based sexual function, dyspareunia, time to return to work, or composite adverse events.

Conclusion: vNOTES and TLH showed comparable postoperative sexual function and dyspareunia outcomes. vNOTES was associated with an earlier return to sexual intercourse, greater postoperative satisfaction, and shorter operative duration. Further prospective multicentre research is required to clarify longer-term sexual outcomes after these procedures.

Keywords: vNOTES, total laparoscopic hysterectomy, sexual function, Female Sexual Function Index, patient-reported outcomes

PRECIS: Postoperative sexual function was similar after vaginal natural orifice transluminal endoscopic surgery (vNOTES) and total laparoscopic hysterectomy, while vNOTES was associated with earlier resumption of sexual intercourse, higher satisfaction, and shorter operative time.

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Öz

Amaç: Vajinal doğal orifis transluminal endoskopik cerrahi (vNOTES) ile total laparoskopik histerektominin (TLH) postoperatif cinsel sağlık, hasta bildirimli iyileşme ölçütleri ve perioperatif sonuçlar açısından farklılık gösterip göstermediğini değerlendirmek.

Gereç ve Yöntemler: Ocak 2023 ile Ocak 2026 tarihleri arasında benign jinekolojik endikasyonlar nedeniyle vNOTES veya TLH uygulanan, cinsel olarak aktif kadınlar bu ambispektif kohort çalışmasına dahil edildi. Klinik ve operatif veriler retrospektif olarak elde edilirken, hasta bildirimli postoperatif veriler cerrahiden en az altı ay sonra prospektif olarak toplandı. Cinsel işlev, Kadın Cinsel İşlev İndeksi (*Female Sexual Function Index*, FSFI) ile değerlendirildi. Ek sonuçlar arasında disparoni, cinsel ilişkiye yeniden başlama süresi, işe dönüş süresi, postoperatif memnuniyet ve aynı cerrahi işlemi yeniden tercih etme isteği yer aldı. Seçilmiş sonuçlar, klinik açıdan anlamlı karıştırıcı değişkenleri içeren çok değişkenli regresyon modelleri ile ayrıca değerlendirildi.

Bulgular: Analize 105'i TLH ve 54'ü vNOTES uygulanan toplam 159 kadın dahil edildi. TLH ile karşılaştırıldığında vNOTES; daha kısa operasyon süresi [160 (60) ve 198 (90) dakika, $p<0,01$], cinsel ilişkiye daha erken dönüş [8 (3) ve 9 (4) hafta, $p<0,01$] ve daha yüksek postoperatif memnuniyet [10 (9-10) ve 9 (8-10), $p<0,01$] ile ilişkililiydi. Düzeltilmiş analizlerde, daha kısa operasyon süresi [$\beta=-27,24$, %95 GA: -50,62 ile -3,86; $p=0,02$] ve cinsel ilişkiye daha erken başlama ($\beta=-1,60$ hafta, %95 GA: -2,93 ile -0,27; $p=0,01$) ile olan ilişkiler devam etti. FSFI'ya dayalı cinsel işlev, disparoni, işe dönüş süresi veya bileşik advers olaylar açısından anlamlı farklılık saptanmadı.

Sonuç: vNOTES ve TLH, postoperatif cinsel işlev ve disparoni sonuçları açısından benzerdi. vNOTES; cinsel ilişkiye daha erken dönüş, daha yüksek postoperatif memnuniyet ve daha kısa operasyon süresi ile ilişkililiydi. Bu yöntemlerin uzun dönem cinsel sonuçlarını daha ayrıntılı olarak ortaya koymak için ileriye dönük, çok merkezli çalışmalara ihtiyaç vardır.

Anahtar Kelimeler: vNOTES, total laparoskopik histerektomi, cinsel fonksiyon, Kadın Cinsel İşlev İndeksi, hasta tarafından bildirilen sonuçlar

Introduction

Hysterectomy remains a frequently performed surgical treatment for a wide range of benign gynaecological disorders⁽¹⁾. In contemporary practice, however, there has been a progressive move from conventional abdominal surgery toward less invasive techniques, largely because these approaches are associated with lower perioperative morbidity, reduced postoperative pain, shorter hospitalization, and more rapid recovery⁽²⁾. Total laparoscopic hysterectomy (TLH) is now an established minimally invasive option, whereas vaginal natural orifice transluminal endoscopic surgery (vNOTES) represents a newer alternative in which pelvic surgery is performed endoscopically through the vaginal route without the need for abdominal incisions⁽³⁾.

Evidence from comparative studies indicates that vNOTES hysterectomy is technically achievable and yields perioperative results that are broadly similar to those of conventional laparoscopic hysterectomy⁽⁴⁾. A randomised trial demonstrated that vNOTES was non-inferior to laparoscopic hysterectomy with respect to completing hysterectomy without conversion⁽³⁾. Later systematic reviews and meta-analyses have also reported possible benefits of vNOTES, particularly regarding shorter operative duration, reduced hospital stay, and faster early postoperative recovery^(4,5). Its applicability outside controlled trial settings has additionally been supported by prospective observational studies conducted in routine clinical practice⁽⁶⁾.

Although evidence on perioperative performance has expanded, most comparisons between vNOTES and laparoscopic hysterectomy have centred on surgical and short-term postoperative outcomes⁽⁴⁻⁶⁾. Measures that reflect the patient's own postoperative experience—such as sexual function, dyspareunia, return to usual activities, and overall satisfaction—are also relevant when comparing hysterectomy approaches^(7,8). This issue may be of particular interest to vNOTES because pelvic surgery is performed via the vaginal

route, which could prompt concerns about subsequent sexual function or discomfort during intercourse. Sexual function is commonly assessed with the Female Sexual Function Index (FSFI), a validated 19-item instrument covering desire, arousal, lubrication, orgasm, satisfaction, and pain⁽⁹⁾. A number of recent comparative and prospective studies have evaluated sexual outcomes after vNOTES, but the evidence currently available is still limited in volume and heterogeneous in design and findings^(7,10,11).

The present study compared postoperative sexual function and related patient-reported outcomes in sexually active women who underwent vNOTES or TLH for benign gynaecological indications. We also assessed patient satisfaction and perioperative outcomes, and explored whether the surgical approach remained associated with selected outcomes after adjustment for clinically relevant confounding factors.

Materials and Methods

Study Design and Patient Population

We conducted an ambispective comparative cohort study of women treated with vNOTES or TLH for benign gynaecological indications from January 1, 2023, to January 1, 2026. Eligibility for the postoperative assessment required an interval of at least six months since surgery. The Göztepe Prof. Dr. Süleyman Yalçın City Hospital Non-Interventional Clinical Research Ethics Committee approved the study (approval no: 2026/0171, date: 26.03.2026). The research was conducted in accordance with the Declaration of Helsinki. After ethical approval was obtained, perioperative characteristics, operative details, and histopathological findings were retrieved retrospectively from electronic medical records. In contrast, postoperative outcomes reported directly by the participants, including sexual function measured with the FSFI, were collected prospectively. Written informed consent was obtained from each participant before collection of these postoperative patient-reported data.

Eligibility Criteria

Women were eligible if they had undergone vNOTES or TLH for a benign gynaecological indication, had reached at least six months postoperatively, and had been sexually active postoperatively, defined as having had sexual intercourse during the previous four weeks. Participation also required consent to postoperative sexual function evaluation and to providing complete responses to all FSFI items.

Exclusion criteria were: a diagnosis of gynaecological malignancy, endometriosis, or active genital or pelvic infection at the time of the operation; unavailable or incomplete clinical or follow-up records; refusal to participate; and failure to complete the FSFI questionnaire.

Operative Procedures and Perioperative Care

The hysterectomy route was selected individually before surgery. Factors considered in this decision included uterine size and mobility, feasibility of vaginal access, suspected pelvic adhesions, anticipated concomitant procedures, the surgeon's clinical judgement, and the patient's preference after counselling regarding the available approaches. All operations were performed at a single institution by the same minimally invasive gynaecologic surgical team with experience in both TLH and vNOTES. Routine institutional protocols were followed for perioperative care.

For TLH, patients received general anaesthesia and were positioned in the Trendelenburg position. A 30° laparoscope was introduced through a 10 mm umbilical port, and two or three 5 mm working ports were placed in the lower abdomen. Pneumoperitoneum was maintained with carbon dioxide at an intra-abdominal pressure of 12–15 mmHg. Uterine manipulation was performed using a uterine manipulator. After inspection of the abdominal and pelvic cavities, the surgical pedicles were managed according to the planned extent of the hysterectomy. The round ligaments, adnexal or utero-ovarian pedicles, uterine vessels, and uterosacral ligaments were sequentially coagulated and divided as required. Once circumferential colpotomy had been completed, the uterus was extracted vaginally. Closure of the vaginal cuff was then performed laparoscopically with absorbable sutures⁽¹²⁾.

For vNOTES, general anaesthesia was administered with the patient in the dorsal lithotomy position. After the cervix had been exposed, anterior and posterior colpotomies provided access through the vesicouterine and rectouterine spaces to the pelvic cavity. The transvaginal access platform was subsequently placed, and carbon dioxide was insufflated to create a pneumoperitoneum at 8–10 mmHg. Surgery was continued under endoscopic visualization with a 5 mm 30° laparoscope and standard minimally invasive instruments. The parametrial tissues, uterine vessels, and adnexal or utero-ovarian pedicles were sealed and divided according to surgical requirements. Vaginal extraction was used for specimen removal, after which the vaginal cuff was sutured vaginally with absorbable material⁽¹³⁾.

Perioperative antibiotic prophylaxis was given routinely to all patients. Prophylaxis against venous thromboembolism was provided, when clinically indicated, according to institutional practice. Postoperative pain management and decisions regarding discharge followed the standard care pathway of the study centre.

Study Variables and Outcome Definitions

Electronic medical records were used to obtain the demographic, clinical, and perioperative variables required for the analysis. Recorded baseline characteristics included age, gravidity, parity, body mass index (BMI), menopausal status, Charlson comorbidity index, smoking status, history of abdominal surgery, indication for hysterectomy, uterine weight, and concomitant oophorectomy status. Perioperative assessment focused on operative duration, postoperative hospitalization, and changes in haemoglobin level. Operative duration was recorded in minutes from commencement of the surgical procedure until the completion of the final closure; postoperative hospital stay was measured in hours. Haemoglobin change was calculated as the preoperative haemoglobin value minus the value measured within the first 24 hours after surgery. Safety was assessed by recording intraoperative complications, conversion to laparotomy, transfusion requirements, postoperative complications, unplanned readmissions within 30 days, and reoperation. The composite adverse-event endpoint was classified as positive when one or more of these events occurred. Postoperative sexual function was quantified with the 19-item FSFI, which provides assessments across the domains of desire, arousal, lubrication, orgasm, satisfaction, and pain. Sexual dysfunction was classified using a total FSFI cut-off of ≤ 26.55 ^(9,14). Dyspareunia was rated on a 0–10 visual analogue scale, with higher values denoting greater pain during intercourse⁽¹⁵⁾. Postoperative satisfaction was also rated from 0 to 10, with increasing scores indicating greater satisfaction. The interval from surgery to the first postoperative sexual intercourse was recorded in weeks. Return-to-work time was recorded in weeks and assessed only among women who were actively employed.

Statistical Analysis

Statistical analyses were performed using Jamovi 2.6.45 (The Jamovi Project, Sydney, Australia). Numerical variables are reported as median values and interquartile ranges, while categorical variables are reported as counts and percentages. Differences in numerical measures between the two surgical groups were examined with the Mann-Whitney U test. For categorical comparisons, the chi-square test was applied unless the distribution of observations required Fisher's exact test.

Because assignment to vNOTES or TLH was observational rather than random, selected perioperative and functional outcomes were additionally examined using adjusted models. Operative time, the interval from surgery to resumption of sexual intercourse, and total FSFI score were entered as dependent variables in separate multivariable linear regression models.

Adjusted effects from these models are expressed as regression coefficients with 95% confidence intervals (CIs). Postoperative hospital stay was analysed separately because of its right-skewed distribution; therefore, a gamma regression model with a log-link function was fitted, with estimates presented as relative mean ratios and corresponding 95% CIs. Covariates entered into the perioperative models were age, BMI, uterine weight, previous abdominal surgery, concomitant oophorectomy, and surgical indication. The functional outcome models included the same variables, together with menopausal status.

The study cohort consisted of all eligible patients available within the prespecified surgical period; consequently, sample size was not determined prospectively. Instead, a sensitivity power analysis was performed using the final group sizes (TLH, $n=105$; vNOTES, $n=54$). With a two-sided α of 0.05 and 80% statistical power, the available sample allowed detection of a standardized difference of approximately Cohen's $d=0.47$ for a continuous outcome.

All hypothesis tests were two-sided, with $p<0.05$ used as the threshold for statistical significance.

Results

The analysis included 159 women: 105 in the TLH group and 54 in the vNOTES group. Figure 1 outlines patient screening and exclusions leading to the final analytical groups.

Baseline demographic and clinical data are reported in Table 1. Age, BMI, gravidity, parity, menopausal status, smoking, previous abdominal surgery, indication for hysterectomy, concomitant oophorectomy, and uterine weight were similar between the two groups; none of these variables showed a statistically significant difference.

Table 2 summarizes perioperative and safety outcomes. Operative duration was shorter with vNOTES than with TLH [160 (60.0) vs. 198 (90.0) minutes, $p<0.01$]. Before adjustment, women undergoing vNOTES also had shorter postoperative hospital stays [46.0 (25.8) vs. 48.9 (24.2) hours, $p=0.01$]. No significant group differences were identified for perioperative haemoglobin decrease, transfusion requirement, intraoperative complications, conversion to laparotomy, postoperative complications, readmission, reoperation, or the composite adverse-event endpoint.

Postoperative recovery, sexual outcomes, and other patient-reported measures are shown in Table 3. The interval to resumption of sexual intercourse was shorter following vNOTES [8 (3) vs. 9 (4) weeks; $p<0.01$]. Dyspareunia scores were comparable between the groups ($p=0.31$). Likewise, total FSFI scores [19.1 (14.4) vs. 19.4 (11.9), $p=0.93$], individual FSFI domain scores, and the proportion classified as having sexual dysfunction according to the FSFI cut-off (70.4% vs. 76.2%, $p=0.61$) did not differ significantly. Return-to-work time was also comparable ($p=0.27$). In contrast, satisfaction scores were higher after vNOTES [10 (9-10) vs. 9 (8-10), $p<0.01$].

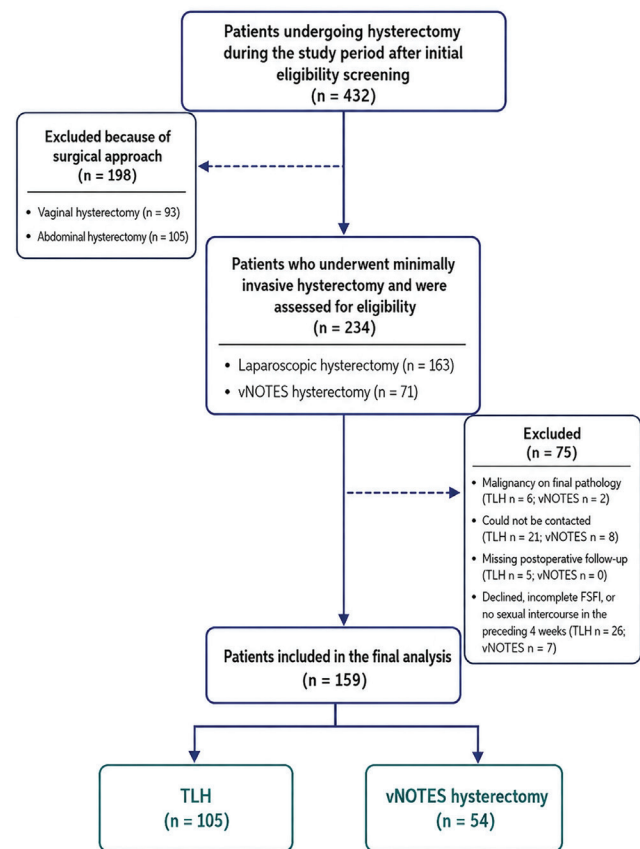


Figure 1. Study flowchart depicting patient identification, exclusions, and formation of the final analysis groups

TLH: Total laparoscopic hysterectomy, vNOTES: Vaginal natural orifice transluminal endoscopic surgery, FSFI: Female Sexual Function Index

Willingness to undergo the procedure again was similar between groups (85.2% vs. 81.9%, $p=0.39$).

Adjusted estimates are reported in Table 4. After accounting for age, BMI, uterine weight, previous abdominal surgery, concomitant oophorectomy, and surgical indication, operative time with vNOTES was 27.24 minutes shorter than with TLH ($\beta=-27.24$ minutes, 95% CI: -50.62 to -3.86, $p=0.02$). The unadjusted difference in postoperative hospital stay was not statistically significant in the multivariable gamma regression model. For functional outcomes, menopausal status was additionally included in the adjustment set; in this model, vNOTES corresponded to a 1.60-week earlier resumption of sexual intercourse ($\beta=-1.60$ weeks, 95% CI: -2.93 to -0.27, $p=0.01$). Total FSFI score showed no independent association with surgical approach ($\beta=-0.52$, 95% CI: -3.71 to 2.67, $p=0.74$).

Discussion

In this ambispective comparative cohort study, postoperative FSFI scores and dyspareunia were comparable between women treated with vNOTES and those undergoing TLH. Compared

Table 1. Baseline characteristics of women undergoing TLH or vNOTES

Variable	TLH (n=105)	vNOTES (n=54)	p-value
Age, years	51 [7]	51 [10.75]	0.24
BMI, kg/m ²	27.6 [6.25]	26.5 [8.0]	0.51
Gravida	3 [2]	3 [2]	0.43
Parity	2 [2]	2 [1]	0.19
Charlson comorbidity index	1 [2]	1 [3]	0.11
Menopausal status, n (%)			
Premenopausal	62 (59.0)	26 (48.1)	0.19
Postmenopausal	43 (41.0)	28 (51.9)	
Smoking, n (%)	38 (36.2)	16 (29.6)	0.40
Previous abdominal surgery, n (%)	58 (55.2)	23 (42.5)	0.13
Surgical indication, n (%)			
Myoma	25 (23.8)	15 (27.8)	0.12
Adenomyosis	4 (3.8)	2 (3.7)	
AUB-O	27 (25.7)	9 (16.7)	
CIN	9 (8.6)	3 (5.6)	
Prolapse	15 (14.3)	17 (31.5)	
Endometrial hyperplasia	25 (23.8)	8 (14.8)	
Concomitant oophorectomy, n (%)			
No oophorectomy	26 (24.8)	12 (22.2)	0.94
Unilateral oophorectomy	4 (3.8)	2 (3.7)	
Bilateral oophorectomy	75 (71.4)	40 (74.1)	
Uterine weight, g	113 [60.0]	128 [89.2]	0.17
Surgery to questionnaire interval, months	11 [8-17]	11 [9-16]	0.72

Numerical data are summarized as median [interquartile range], while categorical data are shown as n (%). Between-group differences were assessed with the Mann-Whitney U test for numerical variables; categorical variables were evaluated using the chi-square test or Fisher's exact test, according to data distribution

TLH: Total laparoscopic hysterectomy, BMI: Body mass index, AUB-O: Abnormal uterine bleeding associated with ovulatory dysfunction, CIN: Cervical intraepithelial neoplasia, vNOTES: Vaginal natural orifice transluminal endoscopic surgery

with TLH, vNOTES was associated with an earlier return to sexual intercourse and greater postoperative satisfaction, whereas the time required to resume work did not differ between the two approaches. In addition, vNOTES was associated with a shorter operative duration.

Sexual health warrants particular consideration after vNOTES because the vaginal route of access may generate concern about subsequent sexual function and pain during intercourse⁽¹⁰⁾. In our cohort, however, the two surgical groups showed no significant differences in total FSFI score, any FSFI domain, the proportion meeting the FSFI criterion for sexual dysfunction, or dyspareunia. This pattern is in line with accumulating evidence indicating broadly similar postoperative sexual function after vNOTES and laparoscopic hysterectomy^(11,16). Nevertheless, a

Table 2. Perioperative and safety outcomes of patients undergoing vNOTES hysterectomy and TLH

Outcome	TLH (n=105)	vNOTES (n=54)	p-value
Operative time, min	198 [90.0]	160 [60.0]	<0.01
Postoperative hospital stay, hours	48.9 [24.2]	46.0 [25.8]	0.01
Hemoglobin decrease, g/dL	2.10 [1.32]	1.70 [1.35]	0.25
Composite adverse event, n (%)	11 (10.5)	1 (1.9)	0.06*
Blood transfusion, n (%)	0 (0.0)	1 (1.9)	0.33*
Intraoperative complication, n (%)	3 (2.9)	1 (1.9)	1.00*
Conversion, n (%)	3 (2.9)	1 (1.9)	1.00*
Postoperative complication, n (%)	6 (5.7)	0 (0.0)	0.18*
Readmission, n (%)	2 (1.9)	1 (1.9)	1.00*
Reoperation, n (%)	1 (1.0)	1 (1.9)	1.00*

Continuous outcomes are reported as median [interquartile range], and categorical outcomes as n (%). The Mann-Whitney U test was used for numerical comparisons, while Fisher's exact test was applied to categorical variables when required. The composite adverse-event endpoint was considered positive if any of the following occurred: intraoperative complication, blood transfusion, conversion, postoperative complication, readmission, or reoperation. *: Fisher's exact test

TLH: Total laparoscopic hysterectomy, vNOTES: Vaginal natural orifice transluminal endoscopic surgery

Table 3. Postoperative sexual outcomes and patient-reported outcomes according to surgical approach

Outcome	TLH (n=105)	vNOTES (n=54)	p-value
Time to first sexual intercourse, weeks	9.0 [4.0]	8.0 [3.0]	<0.01
Return to work, weeks*	3.0 [5.0]	3.0 [2.0]	0.27
Dyspareunia VAS score	0.0 [3.0]	0.0 [2.0]	0.31
FSFI desire domain	3.0 [2.4]	3.0 [1.2]	0.72
FSFI arousal domain	3.3 [2.17]	3.0 [2.33]	0.56
FSFI lubrication domain	3.3 [1.88]	3.3 [2.33]	0.78
FSFI orgasm domain	2.8 [2.80]	2.8 [2.70]	0.47
FSFI satisfaction domain	3.6 [2.90]	3.6 [2.80]	0.72
FSFI pain domain	3.6 [4.10]	5.0 [2.80]	0.53
FSFI total score	19.4 [11.9]	19.1 [14.4]	0.93
FSFI dysfunction, [†] n (%)	80 (76.2)	38 (70.4)	0.61
Willingness to undergo the same procedure again, n (%)	86 (81.9)	46 (85.2)	0.39
Patient satisfaction score, 0-10	9 (8-10)	10 (9-10)	<0.01

Numerical outcomes are reported as median [interquartile range], while categorical outcomes are given as n (%). Comparisons between groups were conducted with the Mann-Whitney U test for numerical data and the chi-square test for categorical data. *: Return-to-work analyses were restricted to participants who were employed at the time of assessment (TLH, n=46; vNOTES, n=21). [†]: An FSFI total score of ≤26.55 was used to classify sexual dysfunction

TLH: Total laparoscopic hysterectomy, VAS: Visual analogue scale, FSFI: Female Sexual Function Index, vNOTES: Vaginal natural orifice transluminal endoscopic surgery

Table 4. Adjusted multivariable analyses of selected perioperative and functional outcomes

Outcome	Effect of vNOTES compared with TLH	95% CI	p-value
Operative time, min	$\beta = -27.24$ min	-50.62 to -3.86	0.02
Postoperative hospital stay, hours	Relative mean ratio=0.83	0.66 to 1.04	0.10
Time to first intercourse, weeks	$\beta = -1.60$ weeks	-2.93 to -0.27	0.01
FSFI total score	$\beta = -0.52$	-3.71 to 2.67	0.74

For operative time, time to resumption of sexual intercourse, and total FSFI score, adjusted associations were estimated with separate multivariable linear regression models. Postoperative hospital stay was analysed using a gamma model with a log link to account for its right-skewed distribution. Perioperative models included age, BMI, uterine weight, previous abdominal surgery, concomitant oophorectomy, and surgical indication as covariates. The functional outcome models used the same adjustment set with the addition of menopausal status.

TLH: Total laparoscopic hysterectomy, CI: Confidence interval, FSFI: Female Sexual Function Index, BMI: Body mass index, vNOTES: Vaginal natural orifice transluminal endoscopic surgery

non-significant comparison does not establish equivalence or non-inferiority between the procedures. The results indicate only that this cohort did not show a detectable difference in postoperative FSFI outcomes between the two surgical approaches.

The high proportion of women in both groups meeting the FSFI threshold for sexual dysfunction should be interpreted with caution. Sexual function in women is shaped by numerous factors, including age, menopausal and hormonal status, oophorectomy, coexisting medical conditions, psychological health, partner-related and relationship characteristics, and sociocultural influences⁽⁸⁾. As preoperative FSFI data were not available, changes in sexual function after hysterectomy could not be assessed at the individual level. Therefore, the postoperative FSFI values observed in this study cannot be attributed directly to either surgical approach.

Women undergoing vNOTES resumed sexual intercourse sooner than those treated with TLH. This difference may be related to several aspects of postoperative recovery, including pain perception, self-confidence, body image, and individual readiness to restart sexual activity; however, its magnitude was relatively small. Its clinical importance should therefore be interpreted cautiously^(7,10). The timing of sexual resumption may also be influenced by personal, relational, and cultural factors not assessed in this study.

The shorter operative duration associated with vNOTES in our cohort is in keeping with previous comparative studies and meta-analyses that have described possible perioperative benefits of the transvaginal approach^(3,5). This advantage may partly be due to the elimination of the need for abdominal trocar insertion and the possibility of removing specimens through the vaginal route. Operative time, however, is determined by multiple

factors, including procedural complexity, surgical indication, pelvic anatomy, adhesions, surgeon experience, and progression along the learning curve. Since all operations in this study were performed at a single institution by a specialised minimally invasive gynaecologic surgery team, the observed difference in operative time may not be directly transferable to centres with less experience in vNOTES.

Postoperative satisfaction scores were higher among women who underwent vNOTES; however, the proportion of women willing to choose the same procedure again remained high and similar across both groups. Previous studies have likewise described favourable satisfaction after vNOTES, often in the context of postoperative recovery and the absence of abdominal incisions^(17,18). In our study, however, satisfaction was measured with a single non-validated 0-10-point item and could have been affected by preoperative expectations, counselling, postoperative symptoms, cosmetic perceptions, and individual preferences. This result should therefore be viewed as exploratory and not be taken to indicate the overall superiority of vNOTES.

Recent studies from Türkiye provide further context for our findings. In a comparative study, vNOTES was associated with shorter operative time and similar complication rates compared with TLH, consistent with our perioperative findings; lower postoperative pain and earlier return to daily activities were also reported⁽¹⁹⁾. Another recent study evaluating patient-centered outcomes demonstrated favorable postoperative sexual function after both vNOTES and laparoscopic hysterectomy, in line with our finding of comparable postoperative FSFI scores between the two approaches⁽²⁰⁾. More recently, a randomized controlled trial from Türkiye reported advantages of vNOTES in early postoperative recovery, including lower pain and shorter hospitalization⁽²¹⁾. In our cohort, vNOTES was associated with shorter operative duration and, importantly, earlier resumption of sexual intercourse; postoperative sexual function and dyspareunia remained comparable between the two approaches. Several aspects of this study strengthen its contribution. Postoperative sexual health was characterized using not only the validated FSFI but also measures of dyspareunia and the interval to resumption of sexual intercourse, thereby allowing sexual outcomes to be examined from multiple perspective. Patient-reported measures of recovery and satisfaction were considered alongside perioperative outcomes. Furthermore, multivariable modelling was applied to adjust for clinically relevant measured confounding factors.

Study Limitations

Interpretation of the findings should take into account several methodological constraints. First, the ambispective, non-randomized, single-center nature of the study restricts both causal inference and external generalizability. Although the multivariable models incorporated clinically relevant measured covariates, residual confounding may persist because the surgical approach was not randomly assigned and

some patient-level factors were not available for adjustment. Second, the lack of preoperative FSFI measurements precluded evaluation of within-patient changes in sexual function following hysterectomy. Sexual function is also shaped by psychosocial, hormonal, relational, and cultural influences, many of which could not be comprehensively assessed in the present cohort. Selection and response biases are additional considerations because women who were unreachable, declined participation, had incomplete follow-up information, failed to complete the FSFI, or had not engaged in sexual intercourse during the preceding four weeks were not included in the final analysis. Although postoperative sexual health was evaluated through the FSFI, dyspareunia scores, and time to first sexual intercourse, no instrument specifically designed to measure sexual quality of life was administered. Finally, postoperative satisfaction was assessed using a non-validated numerical rating scale.

Conclusion

Postoperative sexual health and patient-reported outcomes were compared between women undergoing vNOTES and those undergoing TLH. FSFI scores and dyspareunia were similar for the two surgical approaches, whereas vNOTES was associated with earlier resumption of sexual intercourse and greater postoperative satisfaction. Further prospective multicentre studies are warranted to clarify the long-term effects of these procedures on sexual function and other patient-reported outcomes.

Ethics

Ethics Committee Approval: The Göztepe Prof. Dr. Süleyman Yalçın City Hospital Non-Interventional Clinical Research Ethics Committee approved the study (approval no: 2026/0171, date: 26.03.2026).

Informed Consent: Written informed consent was obtained from each participant before collection of these postoperative patient-reported data.

Footnotes

Authorship Contributions

Concept: H.B.C., M.A.İ., M.H., A.T., Design: H.B.C., Data Collection or Processing: Ş.T., Analysis or Interpretation: H.B.C., N.A., Literature Search: H.B.C., B.K., Writing: H.B.C.

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

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