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Comparative Clinical Outcomes of V-NOTES and Total Laparoscopic Hysterectomy: A One-Year Retrospective Cohort Study at a Tertiary Center

V-NOTES ve Total Laparoskopik Histerektominin Klinik Sonuçları: Üçüncü Basamak Bir Merkezde Bir Yıllık Retrospektif Kohort Çalışması

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ABSTRACT

Aim: To compare the perioperative and postoperative clinical outcomes of transvaginal natural orifice transluminal endoscopic surgery (V-NOTES) and total laparoscopic hysterectomy (TLH) in patients undergoing surgery for benign gynecological indications.

Materials and Methods: This retrospective cohort study included patients who underwent hysterectomy at a tertiary referral center between October 1, 2024, and October 1, 2025. Patients with histopathologically confirmed malignancy, emergency procedures, and incomplete clinical data were excluded. A total of 711 patients were analyzed, including 38 in the V-NOTES group and 673 in the TLH group. Demographic, perioperative, and postoperative data were obtained from medical records and compared between groups.

Results: Baseline characteristics were similar between the groups. Operative time was significantly longer in the V-NOTES group than in the TLH group (101.47±17.89 vs. 82.46±12.86 minutes, p<0.001). Hemoglobin decline and hospital stay were comparable between the groups (p=0.646 and p=0.279, respectively). Uterine weight was significantly lower in the V-NOTES group (187.87±36.63 vs. 212.26±61.66 g, p<0.001). Postoperative pain scores at 6 and 24 hours were significantly lower in the V-NOTES group (p=0.003 and p=0.012, respectively). Intraoperative and postoperative complication rates did not differ significantly between the groups.

Conclusion: V-NOTES may be a feasible minimally invasive alternative to TLH in selected patients with benign gynecological conditions, with lower postoperative pain scores in this cohort. However, the findings should be interpreted cautiously given the marked imbalance between groups.

Keywords: V-NOTES; total laparoscopic hysterectomy; minimally invasive surgery; postoperative pain; hysterectomy

ÖZ

Amaç: Bu çalışmanın amacı, benign jinekolojik endikasyonlarla opere edilen hastalarda vajinal doğal orifis transluminal endoskopik cerrahi (V-NOTES) ile total laparoskopik histerektominin (TLH) perioperatif ve postoperatif klinik sonuçlarını karşılaştırmaktır.

Gereç ve Yöntemler: Bu retrospektif kohort çalışmaya, 1 Ekim 2024 ile 1 Ekim 2025 tarihleri arasında üçüncü basamak bir merkezde histerektomi uygulanan hastalar dahil edildi. Histopatolojik olarak malignite saptanan hastalar, acil cerrahi uygulananlar ve klinik verileri eksik olan olgular çalışma dışı bırakıldı. Toplam 711 hasta analiz edildi; bunların 38'i V-NOTES, 673'ü TLH grubundaydı. Demografik, perioperatif ve postoperatif veriler tıbbi kayıtlardan elde edilerek gruplar arasında karşılaştırıldı.

Bulgular: Gruplar arasında başlangıç özellikleri açısından anlamlı fark yoktu. Operasyon süresi V-NOTES grubunda TLH grubuna göre anlamlı olarak daha uzundu (101.47±17.89 vs. 82.46±12.86 dakika, p<0.001). Hemoglobin düşüşü ve hastanede kalış süresi açısından gruplar arasında anlamlı fark saptanmadı (sırasıyla p=0.646 ve p=0.279). Uterus ağırlığı V-NOTES grubunda anlamlı olarak daha düşüktü (187.87±36.63 vs. 212.26±61.66 g, p<0.001). Postoperatif 6. ve 24. saat ağrı skorları V-NOTES grubunda anlamlı olarak daha düşüktü (sırasıyla p=0.003 ve p=0.012). İntraoperatif ve postoperatif komplikasyon oranları açısından gruplar arasında anlamlı fark yoktu.

Sonuç: V-NOTES, benign jinekolojik hastalıklarda TLH'ye uygulanabilir minimal invaziv bir alternatif olabilir ve bu grupta ameliyat sonrası ağrı skorları daha düşüktür. Bununla birlikte, gruplar arasındaki belirgin dengesizlik göz önüne alındığında, bulgular ihtiyatlı bir şekilde yorumlanmalıdır.

Anahtar Kelimeler: V-NOTES; total laparoskopik histerektomi; minimal invaziv cerrahi; postoperatif ağrı; histerektomi

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INTRODUCTION

Hysterectomy is one of the most commonly performed surgical procedures in gynecology worldwide and is frequently indicated for benign conditions such as uterine fibroids, abnormal uterine bleeding, and adenomyosis (1,2). Minimally invasive surgical approaches have increasingly replaced open techniques due to their association with reduced postoperative pain, shorter hospital stay, and faster recovery (3,4).

Total laparoscopic hysterectomy (TLH) is widely utilized because it allows adequate visualization of pelvic anatomy and facilitates surgical management of adnexal structures (5). However, laparoscopic approaches still require abdominal incisions, which may contribute to postoperative discomfort and delayed recovery compared to vaginal approaches (1,6).

Transvaginal natural orifice transluminal endoscopic surgery (V-NOTES) has emerged as a minimally invasive alternative that combines vaginal access with endoscopic visualization. This technique eliminates abdominal incisions and has been associated with favorable cosmetic outcomes and reduced postoperative pain (1,7). Comparative studies have demonstrated that V-NOTES may result in lower postoperative pain scores compared to laparoscopic hysterectomy (1,7,8).

In addition to pain outcomes, V-NOTES has been associated with improved recovery parameters. Prospective data indicate shorter time to recovery of bowel function and earlier return to work following V-NOTES compared with laparoscopic approaches (9). Similarly, retrospective analyses have shown shorter hospitalization and improved postoperative recovery profiles in patients undergoing V-NOTES (2,8).

Despite these advantages, some studies have reported longer operative times and greater hemoglobin decline associated with V-NOTES procedures (7,8). These findings have been attributed to the technical complexity of the procedure and the learning curve required for its adoption (10,11).

Moreover, the current literature remains heterogeneous regarding perioperative outcomes and complication rates. While several studies have demonstrated comparable safety profiles between V-NOTES and laparoscopic hysterectomy, differences in study design, patient selection, and surgeon experience limit direct comparisons (6,12).

Furthermore, although the vaginal route is considered one of the least invasive approaches, it remains underutilized in clinical practice. V-NOTES has been proposed as a technique that may increase the utilization of the vaginal approach by overcoming visualization limitations associated with conventional vaginal hysterectomy (13).

Importantly, most available studies are based on relatively small sample sizes or single-center experiences. Large-scale and multicenter studies evaluating postoperative recovery and safety outcomes are still limited (14,15).

Therefore, the present study aimed to compare the perioperative and postoperative clinical outcomes of V-NOTES and total laparoscopic hysterectomy in patients undergoing surgery for benign gynecological indications over a one-year period at a tertiary care center.

MATERIALS AND METHODS

This retrospective cohort study was conducted at a tertiary referral center. Medical records of patients who underwent hysterectomy between October 1, 2024, and October 1, 2025, were reviewed.

All patients who underwent hysterectomy during the study period were initially screened. Patients who underwent surgery for benign gynecological indications and were treated with either transvaginal natural orifice transluminal endoscopic surgery (V-NOTES) or total laparoscopic hysterectomy (TLH) were included in the study. Patients with histopathologically confirmed malignancy (n=11), those who underwent emergency surgery, and those with incomplete clinical data were excluded from the analysis.

Patient data were obtained from the hospital electronic medical record system, operative reports, and postoperative follow-up records. Demographic variables included age, body mass index (BMI), parity, smoking status, history of previous abdominal surgery, and presence of comorbidities. Surgical parameters included operative time, intraoperative complications, and uterine weight. Postoperative variables included hemoglobin decline, postoperative pain scores assessed using the visual analog scale (VAS) at the 6th and 24th hours, and length of hospital stay.

The primary outcomes of the study were perioperative and postoperative clinical parameters, including operative time, hemoglobin decline, postoperative pain scores, and hospital stay. Secondary outcomes included intraoperative complications and postoperative complications requiring hospitalization. Postoperative complications were defined as complications requiring hospital admission.

Statistical analyses were performed using SPSS software (version 22, IBM Corp., Armonk, NY, USA). Continuous variables were expressed as

mean ± standard deviation, and categorical variables were presented as frequencies and percentages. Comparisons between groups were performed using the independent samples t-test or Mann–Whitney U test for continuous variables, and the chi-square test or Fisher's exact test for categorical variables, as appropriate. A p-value of <0.05 was considered statistically significant.

The study was conducted in accordance with the principles of the Declaration of Helsinki and was approved by the University of Health Sciences Tepecik Training and Research Hospital Ethics Committee (approval no: 2025/10-11, date: November 3, 2025).

RESULTS

A total of 722 patients were initially screened during the study period. After excluding 11 patients with histopathologically confirmed malignancy and those who did not meet the inclusion criteria, 711 patients were included in the final analysis. Of these, 38 patients underwent V-NOTES and 673 underwent TLH.

The baseline characteristics of the patients are presented in Table 1. There were no statistically significant differences between the groups in terms of age, parity, body mass index (BMI), smoking status, history of previous abdominal surgery, or presence of comorbidities (p>0.05 for all).

Perioperative and postoperative outcomes are summarized in Table 2. The mean operative time was significantly longer in the V-NOTES group compared to the TLH group (101.47±17.89 vs. 82.46±12.86 minutes, p<0.001). Hemoglobin decline was similar between the two groups (1.51±0.56 vs. 1.55±1.22 g/dL, p=0.646). There was no significant difference in hospital stay between the groups (31.07±10.51 vs. 29.19±5.83 hours, p=0.279).

The mean uterine weight was significantly lower in the V-NOTES group compared to the TLH group (187.87±36.63 vs. 212.26±61.66 g, p<0.001). Postoperative pain scores were significantly lower in the V-NOTES group at both the 6th and 24th hours (VAS 6 hours: 3.15±1.15 vs. 3.79±1.78, p=0.003; VAS 24 hours: 1.86±0.99 vs. 2.30±1.30, p=0.012).

Intraoperative complications occurred in 2 patients (5.3%) in the V-NOTES group and 11 patients (1.6%) in the TLH group, with no statistically significant difference between the groups (p=0.150). In the V-NOTES group, all intraoperative complications were bladder

Table 1. Baseline demographic and clinical characteristics of the study groups

	V-NOTES (n=38)	TLH (n=673)	p Value
Age (years)	51.86±5.47	51.33±8.02	0.574
Parity	2.92±1.38	2.57±1.16	0.142
BMI (kg/m²)	27.48±1.96	28.03±1.53	0.098
Smokers	14 (36.8%)	223 (33.1%)	0.637
Previous abdominal surgery	Yes:21(55.3%) No:17(44.7%)	Yes:329 (48.9%) No:344 (51.1%)	0.444
Comorbidity	Yes:25 (65.8%) No:13 (34.2%)	Yes: 471 (70.0%) No: 202 (30.0%)	0.584

BMI: Body mass index

Table 2. Perioperative and postoperative outcomes of the study groups

	V-NOTES (n=38)	TLH (n=673)	p Value
Operation time (min)	101.47±17.89	82.46±12.86	<0.001
Hemoglobin decline (g/dL)	1.51±0.56	1.55±1.22	0.646
Hospital stay (hours)	31.07±10.51	29.19±5.83	0.279
Uterine weight (g)	187.87±36.63	212.26±61.66	<0.001
VAS 6 hours	3.15±1.15	3.79±1.78	0.003
VAS 24 hours	1.86±0.99	2.30±1.30	0.012
Intraoperative complication **No complication** **Bladder injury** **Bowel injury** **Ureter injury**	2(5.3%) 36 2 0 0	11(1.6%) 662 8 1 2	0.150
Postoperative complication requiring hospitalization	3(7.9%)	14(2.1%)	0.057

VAS: Visual analogue scale

injuries, whereas in the TLH group, complications included bladder injury (n=8), bowel injury (n=1), and ureteral injury (n=2).

Postoperative complications requiring hospitalization were observed in 3 patients (7.9%) in the V-NOTES group and 14 patients (2.1%) in the TLH group, without a statistically significant difference (p=0.057). In the V-NOTES group, complications were limited to vaginal cuff hematoma (n=2) and fistula (n=1). In contrast, the TLH group demonstrated a broader spectrum of complications, including vaginal cuff hematoma (n=5), trocar site hernia (n=1), wound infection (n=2), acute urinary retention requiring catheterization (n=1), pelvic abscess (n=2), delayed ureteral injury (n=1), urinary tract infection (n=1), and fistula (n=1).

DISCUSSION

In this retrospective cohort study, we compared perioperative and postoperative outcomes of V-NOTES and total laparoscopic hysterectomy and found that V-NOTES was associated with significantly lower postoperative pain, while most other clinical outcomes were comparable between the two techniques.

Reduced postoperative pain following V-NOTES has been consistently reported in the literature. Several comparative studies have shown that patients undergoing V-NOTES experience lower postoperative pain scores compared to laparoscopic hysterectomy (1,7,8). This finding is generally attributed to the absence of abdominal incisions, which reduces abdominal wall trauma and may decrease postoperative analgesic requirements.

In addition to pain outcomes, previous studies have suggested that V-NOTES may be associated with favorable recovery profiles. Earlier mobilization, shorter hospitalization, and faster return to daily activities have been reported in both prospective and retrospective analyses (2,9,12). Although we did not observe a statistically significant difference in hospital stay, our findings are consistent with the overall trend reported in the literature.

Operative time was significantly longer in the V-NOTES group in our study. This observation is in line with previous reports indicating that V-NOTES may be associated with longer operative times, particularly during the early phases of adoption (7,8). The technical complexity of the transvaginal approach and the learning curve are commonly cited as contributing factors (10,11,16). Previous studies have also indicated that operative time tends to decrease with increasing surgical experience.

With regard to hemoglobin decline, no significant difference was observed between the groups in our cohort. Similar findings have been reported in systematic reviews and comparative studies, suggesting that blood loss and hemoglobin changes are generally comparable between V-NOTES and laparoscopic hysterectomy (3,4).

The rates of intraoperative and postoperative complications were comparable between the groups. Previous studies have demonstrated that V-NOTES is a safe and feasible approach with complication rates similar to those of laparoscopic hysterectomy (6,12). However, variability in complication rates across studies has been noted and is often related to differences in patient selection and surgical expertise.

Although postoperative complications requiring hospitalization were numerically higher in the V-NOTES group, this difference was not statistically significant. Importantly, the distribution of complications differed between the groups, suggesting that the evaluation of surgical techniques should consider not only the frequency but also the type of complications.

Another important factor is the learning curve associated with V-NOTES. Several studies have emphasized that surgical outcomes may vary during the early experience period, which can influence operative time and perioperative results (10,11). This highlights the importance of surgical training and experience in achieving optimal outcomes.

From a broader perspective, V-NOTES may contribute to increasing the utilization of the vaginal route in gynecologic surgery. Despite being considered a minimally invasive approach, the vaginal route has historically been underused, and V-NOTES has been proposed as a technique that may help overcome some of its limitations (13).

The strengths of this study include its real-world design and relatively large sample size. However, several limitations should be acknowledged. First, the study had a retrospective design, which introduces an inherent risk of selection bias. Second, the marked imbalance in group size, with a substantially smaller V-NOTES cohort than the TLH cohort, may have reduced the statistical power of comparisons, particularly for relatively infrequent outcomes such as intraoperative and postoperative complications. Third, the significantly lower uterine weight in the V-NOTES group suggests that the two groups may not have been fully comparable in terms of surgical complexity, which may have influenced perioperative outcomes. In addition, although the longer operative time observed in the V-NOTES group may reflect the learning curve associated with the adoption of this technique, we did not evaluate surgeon-specific experience, temporal distribution of cases, or case selection over time. Therefore, this interpretation should be considered cautious rather than definitive.

CONCLUSION

V-NOTES may represent a feasible minimally invasive alternative to total laparoscopic hysterectomy for selected patients with benign gynecological conditions. In the present study, V-NOTES was associated with lower postoperative pain scores, while other perioperative outcomes were broadly comparable between the groups. However, the marked imbalance in group size, the lower uterine weight in the V-NOTES group, and the limited number of complications require cautious interpretation of these findings. Further prospective studies with more balanced groups are needed to better define the comparative safety and effectiveness of V-NOTES.

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