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Comparative Study of Endosuturing Versus Transvaginal Suturing of Vault After Total Laproscopic Hysterectomy in aTertiary Care Hospital

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ABSTRACT

Introduction: *Hysterectomy is the second most commonly performed gynecological procedure worldwide, with total laparoscopic hysterectomy (TLH) increasingly favored for its minimally invasive nature, faster recovery, and reduced morbidity. However, vaginal cuff dehiscence (VCD) remains a rare but serious complication, particularly following TLH. The optimal method for vaginal cuff closure (VCC) is still debated, with both endoscopic and transvaginal techniques in use. This study aimed to compare the safety and efficacy of endoscopic versus vaginal suturing for vault closure during TLH.*

Materials and Methods: *A prospective interventional single-blinded study was conducted at Adichunchanagiri Institute of Medical Sciences, Adichunchanagiri University from May 2023 to November 2024. Sixty women undergoing TLH for benign gynecological conditions were randomized into two groups: endoscopic closure (n=30) and vaginal closure (n=30). Demographic, clinical, intraoperative, and postoperative parameters were assessed. Primary outcomes included vault closure time, operative duration, and vault-related complications. Secondary outcomes included recovery time, ICU stay, and length of hospitalization. Data were analyzed using independent t-tests and Chi-square tests, with $p<0.05$ considered significant.*

Results: *Baseline characteristics were comparable between groups. Mean vault closure time was significantly longer in the endoscopic group (13.78 ± 4.06 min) than the vaginal group (4.41 ± 0.80 min, $p<0.001$). Total operative duration was higher in the endoscopic group, but the difference was not statistically significant ($p=0.071$). Postoperative recovery, hospital stay, and complication rates were similar across groups. Only one case of minor vaginal bleeding occurred in the vaginal closure group.*

Conclusion: *Both endoscopic and vaginal vault closure techniques following TLH are safe and effective. Although endoscopic suturing requires longer closure time initially. Once technical expertise and proficiency is attained, it offers a secure closure with comparable safety to vaginal suturing, supporting its use as a reliable option in minimally invasive hysterectomy.*

Keywords: *Total laparoscopic hysterectomy, Vaginal cuff closure, Endoscopic suturing*

INTRODUCTION

Hysterectomy is one of the most frequently performed gynecological surgeries worldwide, second only to cesarean section [1]. Owing to its high demand, even relatively uncommon complications may affect a considerable number of women and represent a significant healthcare concern. The procedure can be carried out through different approaches, including abdominal, vaginal, subtotal, radical, and laparoscopic techniques. Among these, total laparoscopic hysterectomy (TLH) has gained increasing popularity due to its minimally invasive nature and associated advantages [2].

The clinical indications for hysterectomy are diverse and include abnormal uterine bleeding, uterine fibroids, adenomyosis, endometriosis, pelvic organ prolapse, and premalignant or malignant gynecological conditions [3]. Despite advances in surgical techniques, hysterectomy remains associated with perioperative and postoperative risks such as hemorrhage, infection, ureteral or bladder injury, bowel injury, and thromboembolic events. Of particular concern in TLH is vaginal cuff dehiscence, a rare but potentially life-threatening complication, which may present with bowel or omentum evisceration, sepsis,

or intestinal perforation. While its incidence is estimated at 0.1–0.2% following abdominal or vaginal hysterectomy, the risk is reported to be five to ten times higher in laparoscopic procedures [4-6].
Since Harry Reich performed the first TLH in 1989, minimally invasive hysterectomy has significantly reduced the need for open abdominal approaches, providing benefits such as shorter hospital stays, faster recovery, reduced postoperative pain, and overall cost-effectiveness [7]. However, these benefits have been accompanied by a disproportionate rise in vaginal cuff-related complications. Although multiple factors have been implicated in the pathogenesis of cuff dehiscence, including surgical technique, thermal injury, and suture method, the evidence remains limited [8]. Retrospective series and meta-analyses suggest that transvaginal vault closure may decrease the incidence of dehiscence compared with laparoscopic endosuturing, yet these findings are inconsistent, often hampered by small sample sizes and lack of prospective randomized data [9-11].
In light of these limitations, there remains a pressing need for well-designed prospective studies to evaluate the optimal method of vaginal cuff closure in TLH. Addressing this knowledge gap may help reduce morbidity and improve patient outcomes following hysterectomy. Therefore, the present study was undertaken to compare laparoscopic endosuturing with transvaginal suturing of the vaginal vault during TLH, with particular focus on postoperative complications, operative outcomes, and recovery.

MATERIALS AND METHODS

This prospective interventional study with single blinding was conducted in the Department of Obstetrics and Gynecology, Adichunchanagiri Institute of Medical Sciences, Adichunchanagiri University, B.G. Nagara, Mandya District, over a period of 18 months from May 2023 to November 2024. Women admitted for laparoscopic hysterectomy and fulfilling the eligibility criteria were recruited. The required sample size was estimated based on a previously published study using standard formulae, yielding 58 participants. For convenience, 60 patients were enrolled and equally allocated into two groups of 30 each. Ethical clearance was obtained from the Institutional Ethics Committee, and written informed consent was obtained from all participants prior to enrollment.
Women undergoing total laparoscopic hysterectomy for benign gynecological conditions such as fibroid uterus, adenomyosis, perimenopausal abnormal uterine bleeding, unresponsive perimenopausal hemorrhage, or complicated endometrial hyperplasia without atypia were included. Patients with known or suspected gynecological malignancy, active pelvic infection, significant cardiopulmonary disease, or those deemed unfit for pneumoperitoneum and Trendelenburg positioning were excluded. Demographic details, obstetric history, and presenting complaints were documented through direct interview. Randomization into either the endoscopic suturing group (Group A) or the transvaginal suturing group (Group B) was performed by the lottery method, with baseline matching for diabetes, hypertension, body mass index, and dyslipidemia.
All procedures were performed under general anesthesia in the low lithotomy position. After standard aseptic preparation, laparoscopic access was obtained. The uterus was mobilized with a myoma screw, and systematic coagulation and transection of the adnexal structures, was done bladder flap was created, once the uterus was deskeletonized from the adjacent structures, circumferential colpotomy was performed and the specimen removed vaginally.
Vault closure was performed according to group allocation. In Group A, endoscopic suturing was carried out using No.1 Vicryl with continuous interlocking sutures in a single layer. In Group B, closure was performed vaginally, with interrupted Vicryl No.1 sutures placed using Allis forceps for vault edge approximation. Hemostasis was ensured, and port sites were closed with Ethilon No.1 sutures.
Outcome measures included total operative time (from initial port incision to vault closure), vault closure duration, hospital stay, ICU stay, and vault-related complications such as dehiscence, bleeding, discharge, infection, or dyspareunia. Patients were followed up at one week, one month, and three months postoperatively to assess recovery and detect any late complications
All outcomes were analyzed using appropriate statistical tests using SPSS (v26). Continuous variables were compared using independent t-test, while categorical variables were analyzed using Chi-square test. A p-value <0.05 was considered statistically significant.

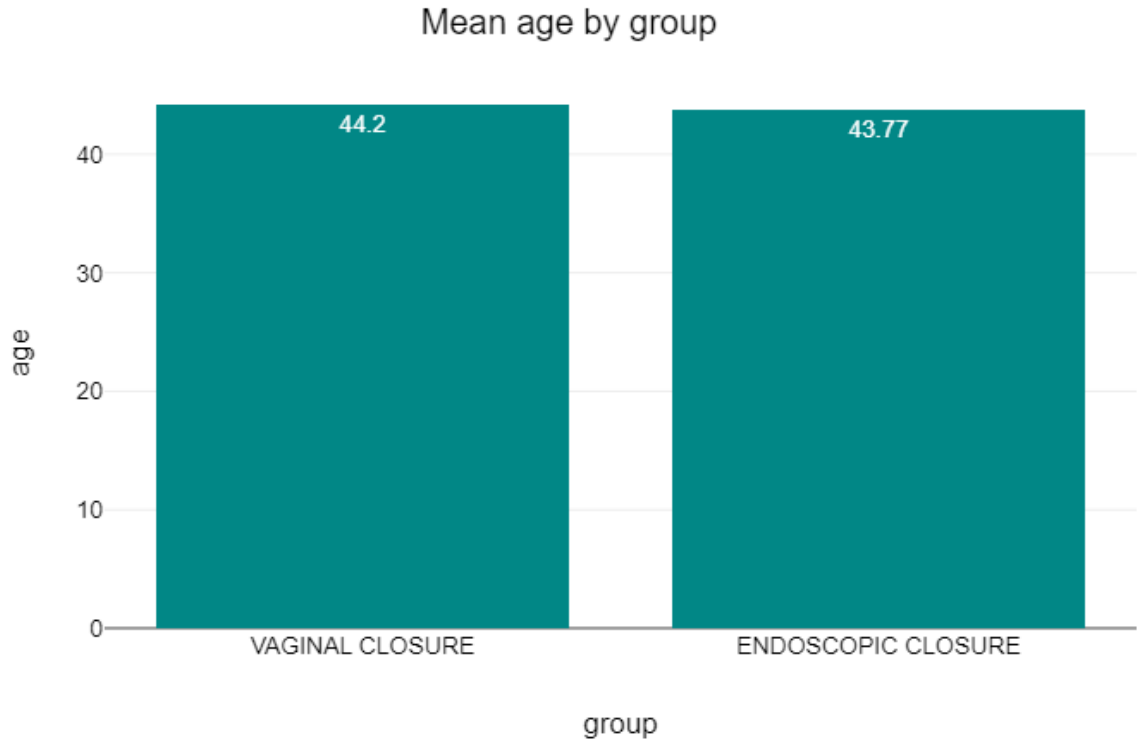
RESULTS

A total of 60 women undergoing total laparoscopic hysterectomy were included, with 30 participants each in the endoscopic closure and vaginal closure groups. Baseline demographic and clinical characteristics

were comparable between the two groups, ensuring homogeneity of study populations before comparison of operative and postoperative outcomes. The mean age was 43.77 ± 4.30 years in the endoscopic closure group and 44.20 ± 4.65 years in the vaginal closure group. Educational background, parity distribution, and comorbidities such as hypertension, diabetes, and thyroid disorders were evenly distributed, with no statistically significant differences observed ($p > 0.05$). This ensured that both groups were well matched prior to intervention (Table 1).

Table 1. Baseline Characteristics of Study Participants (n=60)

Variable		**Endoscopic Closure (n=30)**	**Vaginal Closure (n=30)**	**p-value**
Age (years)	mean ± SD	43.77 ± 4.30	44.20 ± 4.65	0.709
Education level	Primary	2 (6.7%)	0 (0%)	0.344
	SSLC	14 (46.7%)	14 (46.7%)	
	PUC	14 (46.7%)	16 (53.3%)	
Parity	0	0 (0%)	1 (3.3%)	0.600
	1	2 (6.7%)	2 (6.7%)	
	2	25 (83.3%)	23 (76.7%)	
	3	2 (6.7%)	4 (13.3%)	
	4	1 (3.3%)	0 (0%)	
Comorbidities	Nil	25 (83.3%)	27 (90.0%)	0.492
	Hypertension	2 (6.7%)	1 (3.3%)	
	Hypothyroid	1 (3.3%)	0 (0%)	
	Others (DM, Asthma, Hyperthyroid)	2 (6.7%)	2 (6.7%)	



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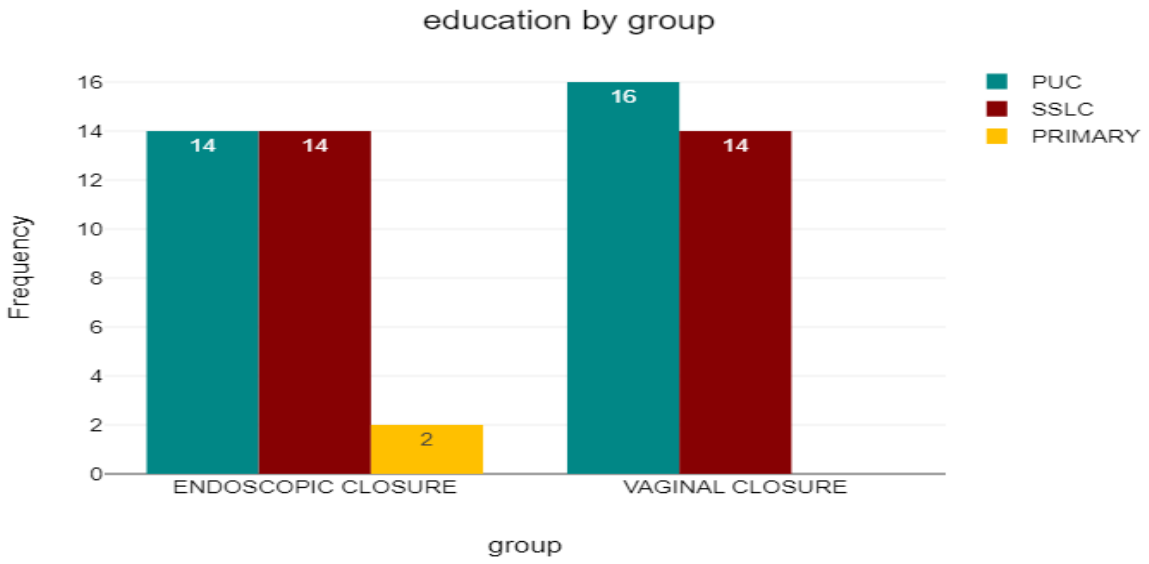

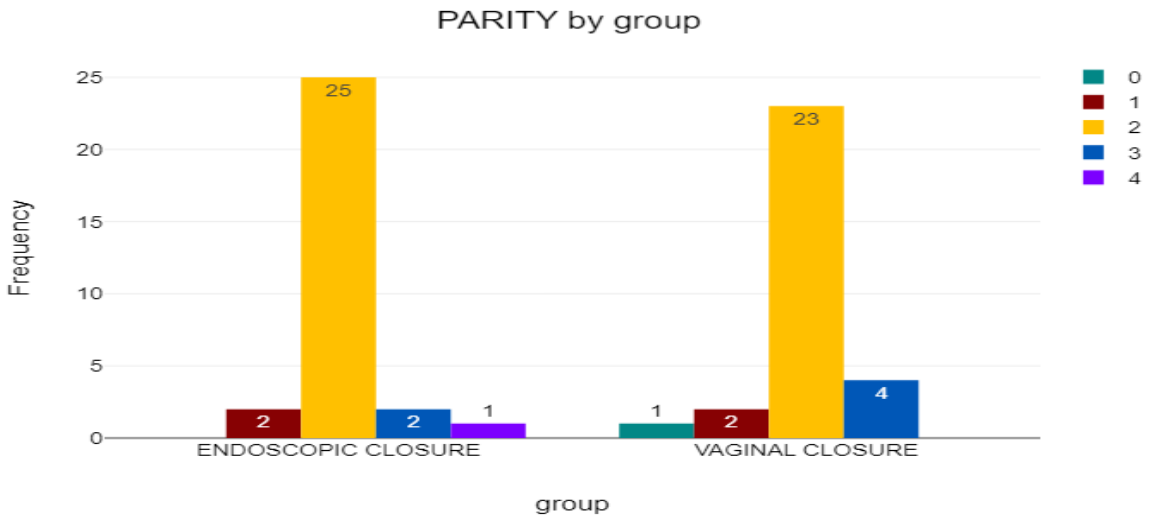

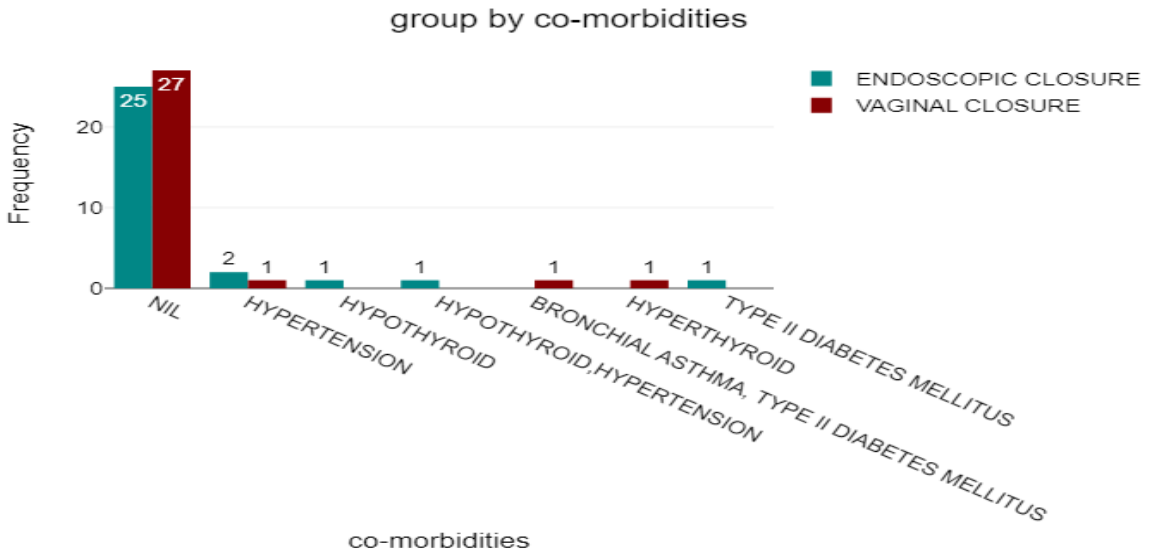

Analysis of intraoperative parameters revealed that the mean vault closure duration was significantly longer in the endoscopic closure group (13.78 ± 4.06 minutes) compared to the vaginal closure group (4.41 ± 0.80 minutes, $p < 0.001$). In contrast, the mean total operative duration was higher in the endoscopic group (139.63 ± 36.58 minutes) compared to the vaginal group (119.47 ± 47.77 minutes),

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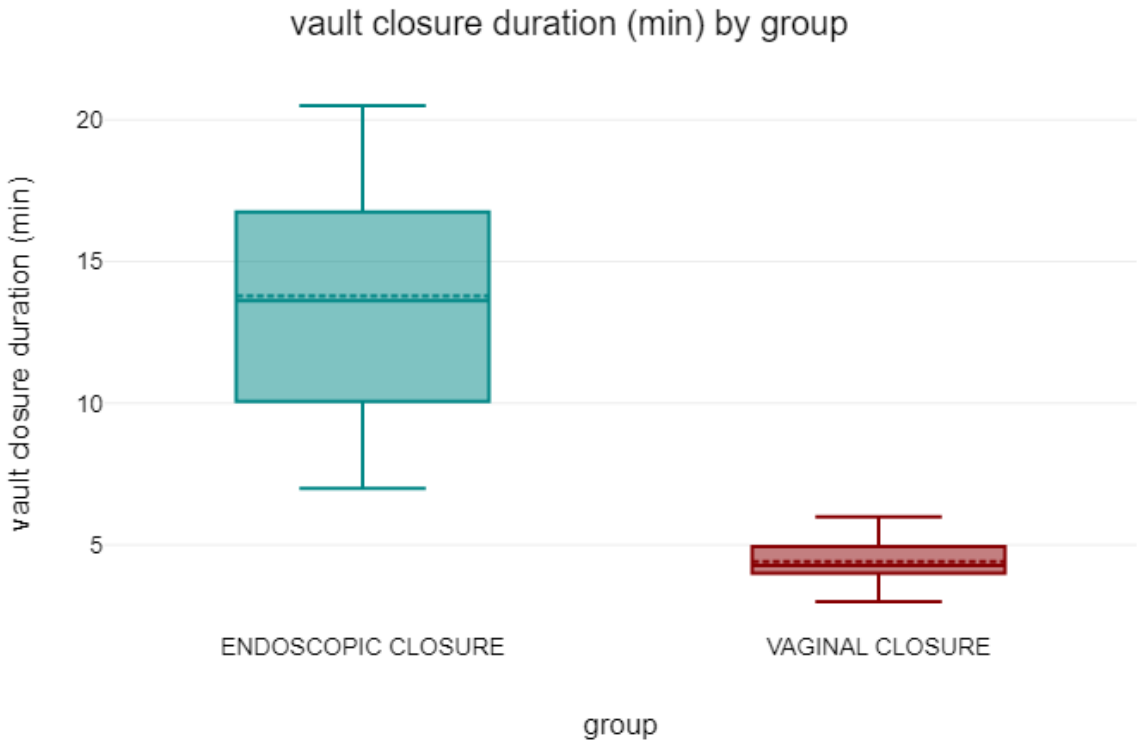
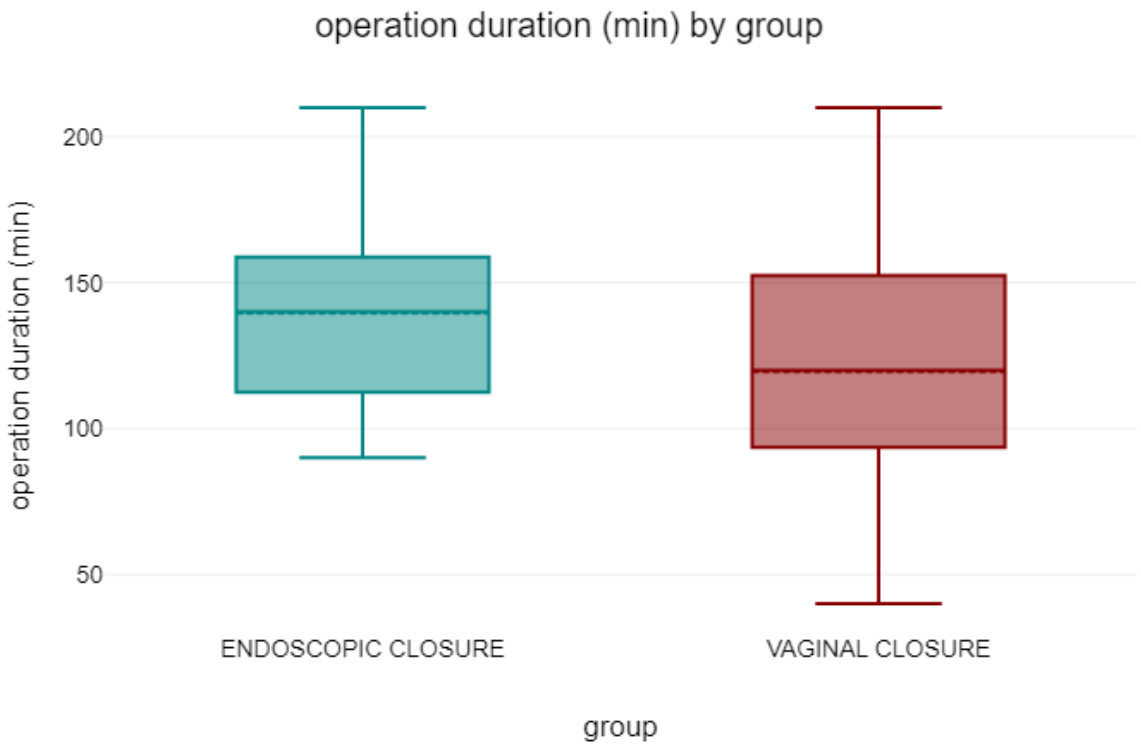
though this difference did not reach statistical significance (p = 0.071). These findings highlight the technical time burden associated with endoscopic suturing (Table 2).

Table 2. Operative Parameters Between Groups

Parameter	Endoscopic Closure (n=30)	Vaginal Closure (n=30)	t-value	p-value
Vault closure duration (min)	13.78 ± 4.06	4.41 ± 0.80	12.41	<0.001
Total operative duration (min)	139.63 ± 36.58	119.47 ± 47.77	1.84	0.071



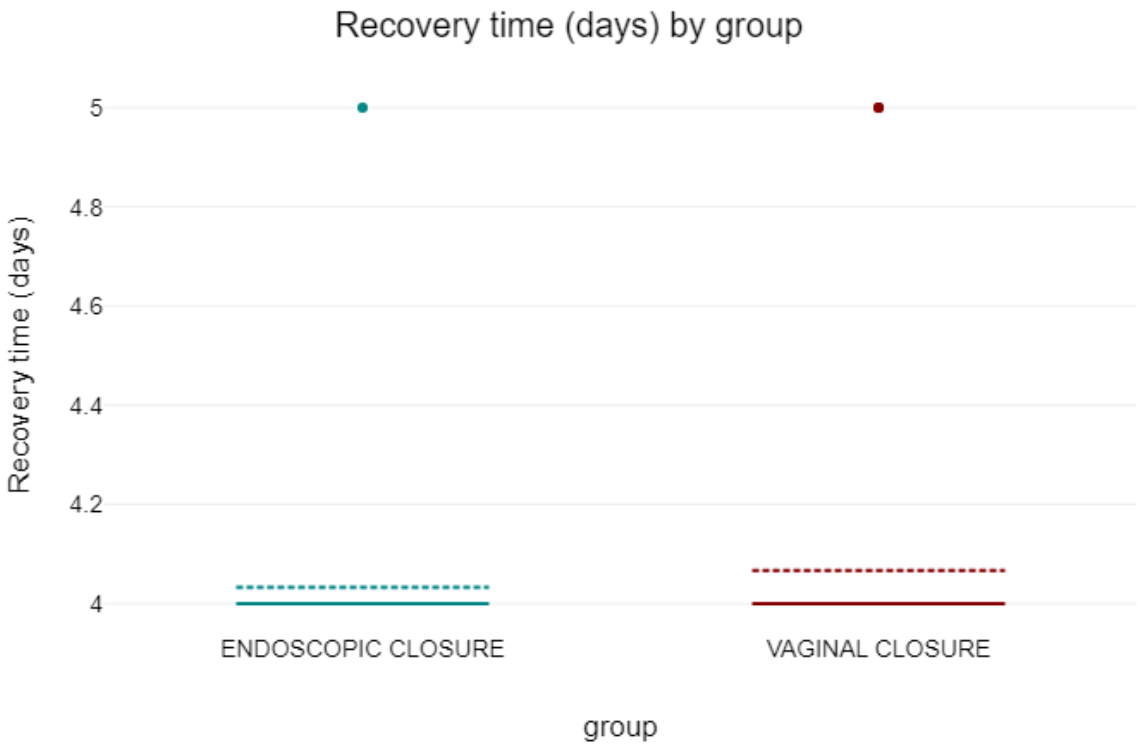


Postoperative recovery parameters were largely similar between groups. ICU stay was uniformly 2 days

across both groups. Recovery time averaged 4.03 ± 0.18 days in the endoscopic group and 4.07 ± 0.25 days in the vaginal group, showing no significant difference (p = 0.561). Similarly, mean hospital stay was comparable at 6.83 ± 0.38 days for endoscopic closure and 6.77 ± 0.43 days for vaginal closure (p = 0.527). These results indicate that recovery outcomes were unaffected by the technique of vault closure (Table 3).

Table 3. Postoperative Recovery Outcomes

Outcome	Endoscopic Closure (n=30)	Vaginal Closure (n=30)	t-value	p-value
ICU stay (days)	2.0 ± 0	2.0 ± 0	–	–
Recovery time (days)	4.03 ± 0.18	4.07 ± 0.25	-0.58	0.561
Hospital stay (days)	6.83 ± 0.38	6.77 ± 0.43	0.64	0.527



Follow-up assessment of vault complications showed minimal adverse events. No complications were observed intraoperatively or by day 30 in either group. On day 7, a single case of vaginal discharge and bleeding was noted in the vaginal closure group, whereas no such events occurred in the endoscopic closure group. However, this difference was not statistically significant (p = 0.355), suggesting that both techniques are largely safe with respect to postoperative vault complications (Table 4).

Table 4. Vault Complications at Follow-Up

Time Point	Complications	Endoscopic Closure (n=30)	Vaginal Closure (n=30)	χ^2	p-value
Day of surgery	None	0	0	–	–
Day 7	Vaginal discharge/bleeding	0	1 (3.3%)	2.07	0.355
Day 30	None	0	0	–	–

DISCUSSION

Hysterectomy continues to be one of the most commonly performed gynaecological procedures, with a progressive shift toward minimally invasive approaches, particularly total laparoscopic hysterectomy (TLH). In many developed countries, including Switzerland, almost half of benign hysterectomies are now performed laparoscopically, reflecting global trends toward minimally invasive surgery [12]. This evolution aligns with recommendations from the American Congress of Obstetricians and Gynaecologists, which advocate for the least invasive approach whenever feasible, as this optimizes patient recovery, minimizes complications, and reduces overall healthcare costs [13]. Despite these advantages, the laparoscopic

approach carries a higher risk of vaginal cuff dehiscence (VCD), largely attributed to the electrosurgical techniques employed during colpotomy. Reported incidences of VCD range between 0.64% and 4.93% following laparoscopic hysterectomy, compared with only 0.12% for abdominal and 0.29% for vaginal hysterectomies [14].

The technique of vaginal cuff closure (VCC) plays a crucial role in mitigating this risk. Evidence from prior studies indicates that laparoscopic intracorporeal cuff closure may reduce the likelihood of dehiscence compared with transvaginal suturing. Variations in outcomes have been attributed to differences in suture material, closure method, and surgeon expertise. Our findings are consistent with previous reports by Singh et al. and Uccella et al., which highlighted a significant association between the technique of cuff closure and subsequent complications [15,16]. Notably, while our study found longer vault closure times in the laparoscopic group, the overall complication rates were not significantly different, echoing results from Naseef et al. and Karunanda et al. [11,17] These comparisons suggest that although transvaginal closure may be faster, laparoscopic suturing ensures comparable safety profiles.

Another important consideration is the impact of operative time, as this directly affects both patient outcomes and healthcare costs. Operating room (OR) time represents one of the most expensive hospital resources, and efficiency gains are crucial, particularly in the context of rising costs and declining reimbursements.

While our study demonstrated longer operative and vault closure times for laparoscopic suturing, other reports, such as those by Bastu et al. and Hwang et al., have yielded mixed results [18,19]. Bogliolo et al. reported in a meta-analysis that barbed sutures were both safe and efficient, findings corroborated by other studies comparing traditional and barbed suture techniques [20].

When comparing perioperative complications, our study found no statistically significant difference between the groups, with only minor events such as vaginal discharge and bleeding observed. This contrasts with reports by Agarwal et al. and Singh et al., which noted higher complication rates, particularly dehiscence and vault infections, in transvaginal closure groups [15,21]. Uccella et al. also reported a significantly higher incidence of cuff-related complications with vaginal suturing [16]. These discrepancies may be related to variations in sample size, surgical expertise, patient characteristics, and follow-up duration across studies. Importantly, our study benefitted from well-matched groups with comparable baseline demographics, parity, and comorbidities, reducing the risk of confounding factors.

Despite its strengths, this study has certain limitations. The relatively small sample size (30 participants per group) may have reduced the power to detect rare complications such as vault dehiscence. Being a single-center study, the findings may not be generalizable across diverse surgical settings and patient populations. Operator expertise in endosuturing could also have influenced outcomes. Additionally, the lack of long-term follow-up limited assessment of late complications such as vault prolapse, stress urinary incontinence, or dyspareunia. Larger multicentric randomized trials with extended follow-up are needed to validate these findings and guide clinical practice.

CONCLUSION

Total laparoscopic hysterectomy (TLH) has emerged as a widely adopted minimally invasive technique that reduces the need for open abdominal hysterectomy and offers advantages such as shorter hospital stay, faster recovery, and cost-effectiveness. Vaginal vault complications, though uncommon, remain a significant concern due to their potential severity. The present study demonstrates that both endoscopic and vaginal approaches for vault closure after TLH are safe and effective. While the endoscopic approach may initially require longer closure time, increasing surgical expertise improves efficiency, reduces operative duration, and minimizes postoperative complications. Overall, laparoscopic suturing for vault closure provides a secure seal with comparable safety to the vaginal method, supporting its role as a reliable and efficient technique in TLH.

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