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Long-Term Outcomes of Laparoscopic *vs* Open Vesicovaginal Fistula Repair

Nurupa Ramkissoon[1], Rawan M. B. Elkomi[1], Azure Erskine[1], Mikal Abraha[1], Kiara Lowery[1], Kamdili Ogbutor[2], Elijah McMillan[3], Da'Jhai Monroe[3], Elizabeth Beyene[5],Mekdem Bisrat[5], Ryan Mitchell[4], Tajah Lewter[1], Samrawit Zinabu[5] and Miriam Michael[5,6]*

[1]Department of Obstetrics and Gynecology, Howard University, Washington, DC, USA

[2]Department of Otolaryngology, Howard University, Washington, DC, USA

[3]Department of Anesthesia, Howard University, Washington, DC, USA

[4]Department of Surgery, Howard University, Washington, DC, USA

[5]Department of Internal Medicine, Howard University, Washington, DC, USA

[6]Department of Internal Medicine, University of Maryland, Baltimore, MD, USA

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Author : Dr. Mekdem Bisrat, MD

Abstract

Introduction: Vesicovaginal fistula (VVF) is a debilitating condition that can lead to urinary incontinence and impaired quality of life. Laparoscopic repair has emerged as a minimally invasive alternative to traditional approaches, but its impact on postoperative continence remains unclear. This study evaluates the one-year outcomes of incontinence in patients undergoing laparoscopic versus non-laparoscopic VVF repair.

Methods: A retrospective cohort study was conducted on 768 propensity-matched patients who underwent VVF repair, with 384 receiving laparoscopic repair and 384 undergoing non-laparoscopic repair. Groups were matched by age and race. Risk analysis, Kaplan-Meier survival analysis, and t-tests were performed to compare incontinence rates, time-to-incontinence, and severity between cohorts.

Results: Patients in the laparoscopic group had a significantly lower incontinence rate (3.6%) compared to the non-laparoscopic group (10.2%, p = 0.000). The risk ratio (0.359) and odds ratio (0.335) indicated a substantial reduction in incontinence risk with laparoscopic repair. Kaplan-Meier analysis showed a significantly higher continence survival probability (96.1% vs. 88.98%, p = 0.000). The hazard ratio (0.353) suggested a 65% lower risk of incontinence over time, though proportionality testing was non-significant (p = 0.466). Incontinence severity was also significantly lower in the laparoscopic group (p = 0.007).

Conclusion: Laparoscopic VVF repair is associated with a significantly lower risk and severity of incontinence, with prolonged continence survival. These findings suggest that laparoscopic repair should be considered the preferred approach when feasible. Further studies are needed to assess long-term outcomes and patient quality of life.

Keywords: Vesicovaginal Fistula; Laparoscopic Repair; Urinary Incontinence; Pelvic Surgery; Reconstructive Urology; Urogenital Fistula

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Correspondence:
Dr. Mekdem Bisrat, MD, MPH, Department of Internal Medicine, Howard University, Washington, DC, USA, Tel: 240-425-2256; E-mail: mekdembisrat21@gmail.com

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Introduction

A vesicovaginal fistula (VVF) is an abnormal connection between the bladder and vagina, resulting in uncontrolled urinary leakage through the vagina. These fistulas may arise due to prolonged obstructed labor, pelvic malignancies, radiotherapy, infection, foreign bodies, or surgical complications [1, 2]. In high-income countries, VVFs are most commonly iatrogenic, with approximately 1 in 1,000 women who undergo a hysterectomy developing a fistula [3]. Risk factors for iatrogenic VVFs include longer operative duration, obesity, smoking, and excessive intraoperative blood loss. In low-resource settings, prolonged obstructed labor remains the predominant cause, affecting an estimated 1 in 1,000 deliveries, with risk factors including petite maternal body frame, early age of marriage, low socioeconomic status, and geographic isolation [2].

The burden of VVF extends beyond physical health, as women frequently experience social isolation, stigma, and reduced quality of life due to constant leakage [4]. Surgical repair is essential

to alleviating the physical, emotional, and psychosocial consequences.

Surgical Techniques

VVF repair can be achieved by several approaches. Vaginal repair is often used for small, low-lying fistulas and may involve layered closure or the use of tissue interposition flaps such as the Martius flap. Open abdominal repair is performed through a transverse or vertical infraumbilical incision, providing direct visualization of the fistula and permitting use of an omental or peritoneal flap for reinforcement [5]. Laparoscopic repair, which may be performed transvaginally or transabdominally, involves separating the bladder from the vagina and completing a layered closure, often with an interposition flap. Techniques include simple layered closure, three-layer repair (vaginal wall, bladder wall, and flap), or flap interposition with omentum [6, 7]. Robotic-assisted laparoscopy has also been increasingly reported as a minimally invasive option.

Global and Clinical Relevance

Globally, the etiology and demographics of VVFs highlight disparities in access to care: in low-resource regions, obstetric causes predominate, while in higher-resource settings, iatrogenic surgical injuries are more common [1–3]. Regardless of cause, VVFs remain a devastating condition with significant health and social consequences. Prior research has shown laparoscopic repair to be associated with decreased blood loss, shorter operative time, reduced hospitalization, faster recovery, and less postoperative pain compared with open repair [7, 8]. However, there is limited evidence on long-term continence outcomes across large populations.

Study Aim

This study seeks to evaluate whether laparoscopic versus non-laparoscopic (abdominal or vaginal) repair of vesicovaginal fistula is associated with differences in postoperative continence at one year. By leveraging a large multicenter federated database, this analysis aims to provide insight into real-world outcomes and inform surgical decision-making.

Methods

Data Source

We utilized the TriNetX Global Collaborative Network, a federated database with access to electronic medical records from 136 healthcare organizations across North America, Europe, the Middle East, and Africa. The database includes inpatient and outpatient encounters, diagnoses, procedures, medications, and laboratory data.

Cohort Definitions

- **Laparoscopic repair cohort:** Patients with a diagnosis of VVF who underwent laparoscopic or hysteroscopic procedures on the bladder or uterus.
- **Non-laparoscopic cohort:** Patients with VVF who underwent vaginal or abdominal closure procedures, including transvesical, vaginal, or combined abdominal-vaginal repairs.

Inclusion/Exclusion Criteria

Patients were included if they were diagnosed with VVF and underwent repair between 2000 and 2024. Patients with more than 20 years since index repair were excluded. The database does not consistently capture etiology (e.g., obstetric *vs.* iatrogenic), fistula size, or perioperative adjuncts such as stenting, catheterization, or antibiotic use.

Propensity Score Matching

Propensity score matching was performed 1:1 on age, race, and sex. After matching, 384 patients remained in each cohort. While additional clinical covariates were unavailable, we acknowledge this as a limitation.

Outcomes

The primary outcome was urinary incontinence within one year, defined by ICD-10 codes for continuous leakage (N39.45) and other specified urinary incontinence (N39.498). Secondary outcomes included severity (measured by number of recorded instances) and continence survival time.

Statistical Analysis

Analyses included risk difference, risk ratio, Kaplan-Meier survival, and t-tests for severity. Analyses were performed within TriNetX.

Results

Risk Analysis

Patients who underwent laparoscopic repair had a significantly lower risk of incontinence (3.6%) compared to those who did not (10.2%). The calculated risk difference is -0.065 ($p = 0.000$), indicating a 6.5% absolute reduction in incontinence with laparoscopic repair. The risk ratio of 0.359, suggests a 64% lower risk of incontinence in the laparoscopic group. The odds ratio is 0.335, reinforcing that laparoscopic repair is associated with a significantly lower likelihood of incontinence.

Survival Analysis

Patients in the laparoscopic group had a higher survival probability (96.10%) compared to the non-laparoscopic group (88.98%). The log-rank test yielded $\chi^2 = 12.285$, $p = 0.000$, indicating a statistically significant difference in time-to-incontinence. The Hazard Ratio of 0.353 ($p = 0.466$), suggesting a 65% lower risk of developing incontinence over time, though not statistically significant in hazard proportionality testing.

Mean Differences

The mean incontinence score was significantly lower in the laparoscopic group (mean = 2.143) than in the non-laparoscopic group (mean = 1.359). The calculated t-test showed $t = 2.817$, $p = 0.007$, indicating a significant difference in incontinence severity between the two groups (Table 1).

Cohort Characteristics

Before matching, 387 patients underwent laparoscopic repair and 1,044 underwent non-laparoscopic repair. After matching, each group contained 384 patients. Mean age was 48 years. Racial composition: 70% White, 12% Black, remainder other/unspecified. Nearly all patients were female (>97%).

Risk of Incontinence

Incontinence occurred in 3.6% of laparoscopic patients *vs.* 10.2% of non-laparoscopic patients (risk difference -0.065, 95% CI -0.101 to -0.030; $p = 0.000$). Risk ratio was 0.359 (95% CI 0.198–0.650).

Survival Analysis

Kaplan-Meier analysis demonstrated higher continence survival at one year for laparoscopic patients (96.1%) *vs.* non-laparoscopic patients (88.98%; log-rank $\chi^2 = 12.285$, $p = 0.000$). Hazard ratio was 0.353 (95% CI 0.192–0.651), though proportionality testing was

Table 1: Summary of Surgical Outcomes by Procedure Type.

Outcome	Laparoscopic Repair	Non-Laparoscopic Repair	Effect Estimate	Test Statistic/p-value
Incontinence Rate (%)	3.6%	10.2%	RD: -0.065 RR: 0.359 OR: 0.335	p = 0.000
Survival Probability (%)	96.10%	88.98%	HR: 0.353	Log-Rank χ^2 = 12.285, p = 0.000 HR p = 0.466
Mean Incontinence Score	2.143	1.359	Mean Difference: 0.784	t = 2.817, p = 0.007

Abbreviations: RD = Risk Difference; RR = Risk Ratio; OR = Odds Ratio; HR = Hazard Ratio.
Comparative table showing incontinence rates, survival probabilities, and mean incontinence scores between laparoscopic and non-laparoscopic repair groups, including statistical measures.

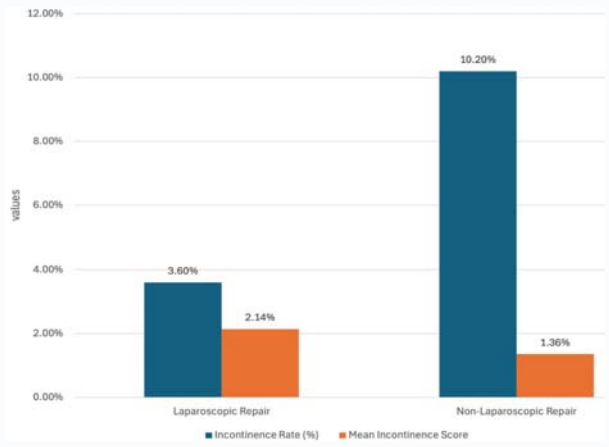

Figure 1: Comparison of Risk Metrics Between Surgical Groups.
Bar chart visualizing the incontinence rate and mean incontinence score between laparoscopic and open repair cohorts.

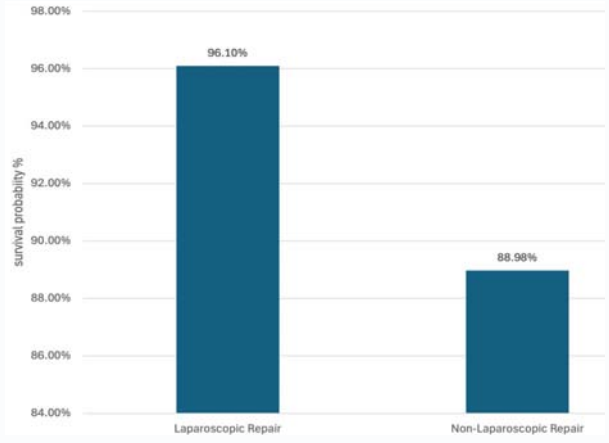

Figure 2: Survival Probability by Surgical Group.
Bar graph comparing the final survival probabilities (%) between the two surgical approaches, illustrating higher survival in the laparoscopic cohort.

nonsignificant (p = 0.466).

Severity of Incontinence

Mean severity was lower in the laparoscopic group (2.14 *vs.* 1.36 episodes; t = 2.817, p = 0.007).

Discussion

This study found that laparoscopic repair of vesicovaginal fistula was associated with significantly lower rates of postoperative incontinence (3.6% *vs.* 10.2%), reduced severity of leakage, and longer continence survival at one year compared to non-laparoscopic repair. The absolute risk reduction of 6.5% underscores a meaningful clinical benefit, while Kaplan-Meier analysis confirmed superior continence preservation in the laparoscopic group. These findings suggest that, when feasible, laparoscopic repair may offer not only faster recovery but also better long-term functional outcomes.

Pathophysiological Considerations

The improved outcomes seen with laparoscopic repair can be attributed to several mechanisms. Laparoscopy allows for enhanced visualization and magnification, permitting more meticulous dissection of scar tissue and precise layered closure. This minimizes trauma to surrounding tissues and helps preserve the vascular supply critical for healing [7]. Minimally invasive approaches also reduce peritoneal disruption and fibrosis, which can otherwise compromise bladder elasticity and continence mechanisms. In contrast, open abdominal surgery is associated with more extensive tissue handling and adhesions, potentially increasing risk of recurrent leakage. Vaginal repairs, while less invasive, may be technically limited for high or complex fistulas, where limited visualization hampers adequate closure.

Clinical Relevance of Incontinence Severity

Our analysis demonstrated that not only were incontinence rates lower in laparoscopic repairs, but the severity of incontinence—measured by recorded episodes—was also significantly reduced. This suggests that, even in cases where continence is not fully restored, patients benefit from reduced symptom burden. In the context of VVF, where stigma and social isolation are common, a reduction in severity has significant quality-of-life implications [5]. Preservation of continence also plays a critical role in reducing secondary complications such as recurrent urinary tract infections, dermatitis, and depression, which are well-documented sequelae of persistent leakage.

Comparison with Prior Literature

The findings align with smaller single-center studies. Ghosh et al. found that laparoscopic repair resulted in shorter hospitalization and fewer complications compared to open repair [8]. Miklos and Moore demonstrated long-term success rates above 90% with laparoscopic extravesical repair [9]. However, literature also emphasizes that outcomes depend on etiology: radiation-induced VVFs and recurrent fistulas often require open abdominal approaches due to extensive fibrosis and poor tissue quality [10]. By leveraging a large multicenter database, this study expands the evidence base, showing real-world generalizability of laparoscopic superiority across diverse populations.

Implications for Surgical Decision-Making

These findings may guide clinicians in tailoring surgical approach. For first-time, iatrogenic VVFs in otherwise healthy tissue, laparoscopic repair may provide the optimal balance of minimally

invasive recovery and durable continence outcomes. For obstetric fistulas, particularly in resource-limited settings, laparoscopic expertise and equipment availability remain barriers, though our findings highlight the need for expanding access. For radiation-associated or recurrent fistulas, open or combined approaches may remain necessary. Thus, while laparoscopic repair demonstrates clear benefits, careful patient selection and surgical expertise remain essential.

Limitations and Bias Considerations

The retrospective design and reliance on electronic records inherently limit granularity. Critical variables such as fistula size, duration, prior repair attempts, stenting, catheterization duration, and flap usage were not available. This limitation may bias comparisons, as more complex cases are likely represented in the non-laparoscopic group. Propensity score matching adjusted for demographics but not for these clinical variables, leaving potential confounding. Furthermore, the non-laparoscopic group combined abdominal and vaginal approaches, which may differ in outcomes and ideally should be analyzed separately.

Future Directions

Future studies should stratify outcomes by etiology, surgical complexity, and specific non-laparoscopic techniques. Prospective registries with standardized reporting of complications, length of stay, catheter management, and quality-of-life metrics are needed. Randomized controlled trials, though challenging, would provide the highest level of evidence. Expanding laparoscopic training and resource availability, particularly in regions with high obstetric fistula burden, could help translate these benefits globally.

Conclusion

Laparoscopic VVF repair is associated with lower postoperative incontinence rates, reduced severity, and prolonged continence survival compared to non-laparoscopic repair. These findings support laparoscopic repair as the preferred approach when feasible. Future studies should integrate detailed clinical and etiological data, stratify surgical techniques, and assess long-term functional and quality-of-life outcomes.

Declaration

Use of Generative AI

Generative artificial intelligence (AI), specifically OpenAI's ChatGPT, was used to assist in refining the language, grammar, and clarity of the manuscript. All content was reviewed, validated, and approved by the authors to ensure accuracy, originality, and adherence to ethical standards. No AI tool was used to generate data, perform analysis, or draw scientific conclusions.

References

1. Chinthakanan O, Sirisreetreerux P, Saraluck A. Vesicovaginal fistulas: prevalence, impact, and management challenges. Medicina (Kaunas). 2023; 59(11): 1947. doi:10.3390/medicina59111947.
2. El-Azab AS, Abolella HA, Farouk M. Update on vesicovaginal fistula: a systematic review. Arab J Urol. 2019; 17(1): 61-68. doi:10.1080/2090598X.2019.1590033.
3. McKay E, Watts K, Abraham N. Abdominal approach to vesicovaginal fistula. Urol Clin North Am. 2019; 46(1): 135-146. doi:10.1016/j.ucl.2018.08.011.
4. Mazuran B, Hrkac A, Habek D. Impact of the surgical approach, considering Goh classification, on long-term results in patients with vesicovaginal fistula repair. Afr J Urol. 2022; 28: 22. doi:10.1186/s12301-022-00289-4.
5. Farid FN, Azhar M, Samnani SS, et al. Psychosocial experiences of women with vesicovaginal fistula: a qualitative approach. J Coll Physicians Surg Pak. 2013; 23(10): 828-829. PMID:24169399.
6. Sharma A, Sharma R, Sharma M. Early bladder dysfunction after vesicovaginal fistula repair. Int J Urol. 2024; 31(1): 45-50. doi:10.1111/iju.15000.
7. Ghosh B, Wats V, Pal DK. Comparative analysis of outcome between laparoscopic versus open surgical repair for vesico-vaginal fistula. Obstet Gynecol Sci. 2016; 59(6): 525-529. doi:10.5468/ogs.2016.59.6.525.
8. Miklos JR, Moore RD. Laparoscopic extravesical vesicovaginal fistula repair: our technique and 15-year experience. Int Urogynecol J. 2015; 26(3): 441-446. doi:10.1007/s00192-014-2458-y.
9. Tuncay L, Kucuk HF. Laparoscopic extravesical vesicovaginal fistula repair: our technique and 15-year experience. Int Braz J Urol. 2015; 41(1): 120-125. doi:10.1590/S1677-5538.IBJU.2014.0015.
10. Miklos JR, Moore RD. Management of radiation-induced vesicovaginal fistula. Eur Urol. 2008; 54(1): 235-236. doi:10.1016/j.eururo.2008.04.029.