



Repair of Rectovaginal Fistulas with Martius Flap and Concomitant Levatoroplasty: A Ten-year Experience in a Tertiary Center

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What's Known

- Martius flap is a surgical procedure for recurrent rectovaginal fistulas.
- It is used to repair low-complex rectovaginal fistulas.

What's New

- The Martius flap effectively repairs mid-complex and early RVFs.
- An ostomy is not always required, and pelvic radiation is the primary cause of recurrence.

Abstract

Background: In the treatment of low- and mid-complex rectovaginal fistulas (RVF), the use of the Martius flap between the vagina and rectum following fistula repair was shown to enhance healing rates. This study reported long-term outcomes from a referral colorectal center, focusing on the use of the Martius flap for managing low- and mid-complex RVFs.

Methods: This study included eligible patients who underwent Martius flap repair at Shahid Faghihi Hospital (Shiraz, Iran), between 2013 and 2023. Continence status and sexual function were assessed using the Cleveland Clinic Incontinence Score (CCIS) and the female sexual function index (FSFI) score. Fistula recurrence was defined as the postoperative passage of gas, feces, or mucosal discharge from the vagina. Statistical analyses were performed using SPSS software. Within-group comparisons were conducted using Wilcoxon signed-rank tests, and between-group analyses were performed using independent samples *t* tests, Mann–Whitney U tests, and Fisher's exact tests. $P < 0.05$ was considered statistically significant.

Results: Of the 27 cases, 37% were classified as low RVF and 63% as mid RVF. Recurrent RVF was observed in 63% of patients, with a median of 2.00 previous fistula surgeries (interquartile range [IQR]=1.50–4.50). After a median follow-up of 48 months (IQR=24.00–84.00), the total success rate was 88.9%. The CCIS significantly decreased postoperatively compared to preoperative levels ($P=0.003$). Postoperative FSFI scores were within an acceptable range (22.2 ± 4.22).

Conclusion: The Martius flap procedure was safe, with low morbidity and favorable functional and cosmetic outcomes. It could be considered a first-line treatment option for low- and mid-complex RVFs.

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Introduction

Rectovaginal fistula (RVF) is a rare surgical condition that poses significant management challenges. It accounts for approximately 5% of all anorectal fistulas,¹ with obstetric trauma being the most common cause. Patients often present with anal sphincter injury,

necessitating concurrent sphincteroplasty during fistula repair.² Additional causes of RVF include rectal surgeries, particularly low rectal anastomosis performed using staplers, as well as anorectal and gynecologic trauma, malignancy, pelvic radiation, inflammatory bowel diseases (IBD), cryptoglandular abscesses, and congenital factors.^{1, 3, 4} In approximately 90% of cases, RVF can be diagnosed through a thorough history and physical examination, including anoscopy and vaginal examination. In some cases, the only presenting symptoms may be vaginal passage of gas and mucosal discharge, even in the absence of an identifiable fistula orifice during examination. In such cases, particularly in situations where the cause is unclear or potentially malignant, further workup using computed tomography (CT) scans, magnetic resonance imaging (MRI) with rectal contrast, and endoanal ultrasonography is warranted.^{5, 6} Treatment selection for RVF depends on the location (low, mid, or high), size, origin of fistula, and surgeon's experience. Repairing complex RVFs using local transrectal, transvaginal, or transperineal approaches, as well as a local advancement flap, was associated with high recurrence rates.^{7, 8} For patients with high RVFs, a transabdominal approach is recommended.^{5, 9, 10} In the management of low- and mid-complex RVFs, the use of vascularized transposition tissue flaps (muscle or fat pads) between the vagina and rectum following fistula repair was proven to enhance healing rates. These flaps promote healing by filling dead space, strengthening the suture line, increasing blood supply, and facilitating granulation tissue formation.¹ One such flap technique is Martius flap, which utilizes a pedicled labia majora fat pad flap supplied by the perineal branch of the pudendal artery.^{1, 11, 12} However, scientific studies are limited. This study presented the long-term experience of a referral colorectal center in treating low- and mid-complex RVFs using the Martius flap.

Patients and Methods

This retrospective cohort study included patients who underwent RVF surgery at Shahid Faghihi Hospital, a tertiary referral colorectal center (Shiraz, Iran), between 2013 and 2023. The exclusion criteria were active malignancy, inflammatory bowel diseases, a lack of routine postoperative follow-up, and other types of surgical techniques. All surgeries were performed by a single expert colorectal surgeon. Postoperative follow-ups were routinely scheduled at 3, 6, and 12 months, with annual visits thereafter. Each

visit included a comprehensive medical history, physical examination, and imaging studies as needed. Fistula recurrence was defined as the passage of gas, feces, or mucosal discharge from the vagina postoperatively. If the patient's history and physical examination did not confirm recurrence, CT or MRI with rectal contrast was performed. We collected demographic information, past medical history, the site, size, and cause of the fistula, the status of the anal sphincter, the operation time, the duration of hospital stay, previous surgeries for fistula repair, and ostomy status from medical records. Additionally, postoperative complications were recorded using the Clavien-Dindo classification.¹³ For the present investigation, the required data were collected using standard questionnaires via phone interviews. Continence status and sexual function were evaluated using the Cleveland Clinic Incontinence Score (CCIS) and the female sexual function index (FSFI), respectively.^{14, 15} The CCIS evaluated incontinence to gas, liquid, or solid, pad use, and lifestyle alteration. Each item had five levels of severity (ranging from 0 to 4, signifying never to always). The validated Persian version of the FSFI questionnaire was used. It had 19 questions and the total score ranged from 2 to 36.¹⁶ Higher scores of CCIS and lower scores of FSFI indicated severe fecal incontinence and sexual dysfunction, respectively.

Prior to data collection, written informed consent was obtained from the patients. The study was approved by the Ethics Committee of Shiraz University of Medical Sciences (code: IR.SUMS.REC.1403.149).

Surgical Technique

Complete mechanical bowel preparation was performed prior to the surgery. A single dose of prophylactic antibiotics was administered preoperatively, and a Foley catheter was inserted. Following the induction of general or spinal anesthesia, the patient was positioned in the lithotomy position. A transverse perineal incision was placed. In cases of narrow perineum, a bilateral V-shaped incision was utilized for Z-plasty. To minimize bleeding, 1% lidocaine (Lignodic; Caspian, Iran) with epinephrine (Darou Pakhsh Co., Iran) in a 1:200000 dilution was injected into the rectovaginal septum. Sharp dissection was performed to separate the posterior wall of the vagina from the anterior wall of the rectum. The dissection was continued until the fistula tract was completely released, extending at least 2 cm proximal to the cervix. After refreshing the edges of the fistula, the rectal defect was closed transversely using 3-0 PDS

sutures (Ethicon, Cincinnati, USA). Subsequently, the vaginal defect was closed with 3-0 vicryl sutures (Ethicon, Cincinnati, USA). Levatoroplasty was performed as follows: A vertical incision was made on the right labia majora. After exposing the bulbocavernosus fat tissue, a posteroinferiorly based vascularized flap was released from the anterior, lateral, and finally medial borders. The flap was released from Colles' fascia posteriorly and from the labia minor and bulbocavernosus muscle medially. Once harvested, the flap was delivered to the rectovaginal space through a subcutaneous tunnel. The tip of the flap was secured to the proximal part of the fistula repair site. In all patients included in the present study, the procedure was performed using the following technique: After closing the rectal and vaginal defects, levatoroplasty was performed. Then, the Martius flap was placed over the levatoroplasty site and positioned behind the vagina. Levatoroplasty was incorporated into the technique to enhance the outcomes of the flap procedure. Hemostasis was meticulously achieved, and a Hemovac drain was placed in the rectovaginal site, along with a small Penrose drain in the labial wound.

Postoperative Care

Following the surgery, the patients were admitted to the surgical ward and received intravenous ceftriaxone (Exir Pharmaceutical Co., Iran) and metronidazole (Shahid Ghazi Pharmaceutical Co., Iran) for antibiotic prophylaxis. Pain management was provided with apotel and ketorolac (Caspian Tamin Pharmaceutical Co., Iran). Additionally, diphenoxylate (Kharazmi Pharmaceutical Co., Iran) was administered to reduce bowel movements for 72 hours. The Foley catheter was maintained during this period. Wound care involved dressing changes every 12 hours, during which mupirocin ointment (Emad Darman Pars, Iran) and a dry sponge were applied to prevent maceration and minimize the risk of infection.

Statistical Analysis

The statistical analyses were performed using IBM SPSS software (version 21; SPSS Inc., Chicago, IL, USA). The normality of data distribution was evaluated using the Kolmogorov-Smirnov test. Parametric quantitative variables were reported as mean \pm SD, nonparametric variables were reported as median (interquartile range [IQR]), and qualitative data were expressed as frequency and percentage. Within-group comparison of nonparametric data before and after the study was conducted using Wilcoxon signed-ranks tests. Between-group

comparisons were conducted using independent samples *t* test, Mann-Whitney U test, and Fisher's exact test, for parametric, nonparametric, and qualitative data, respectively. *P*<0.05 was considered statistically significant.

Table 1: Characteristics of the included patients

Characteristics	Value (n=27)
Current age (year, mean \pm SD)	39.74 \pm 11.50
BMI (Kg/m ² , mean \pm SD)	23.94 \pm 2.55
Time since surgery (months, median [IQR])	48.00 (24.00-84.00)
NVD number, median (IQR)	2.00 (1.00-3.00)
Previous episiotomy, n (%)	
Never	21 (77.8)
One time	5 (18.5)
Two times	1 (3.7)
Previous history of fistula surgery (yes), n (%)	17 (63.0)
Number of previous fistula surgeries (among those with positive history), median (IQR)	2.00 (1.50-4.50)
Comorbidities, n (%)	13 (48.1)
Rectal cancer	4 (14.81)
Diabetes	3 (11.1)
Hypertension	2 (7.4)
Ulcerative colitis	2 (7.4)
Hypothyroidism	1 (3.7)
Arthritis rheumatoid	1 (3.7)
Convulsion	1 (3.7)
Uterine cancer	1 (3.7)
Medical treatments, n (%)	11 (40.7)
Chemo-radiotherapy	4 (14.8)
Insulin or anti-diabetic drugs	3 (11.1)
Radiotherapy	1 (3.7)
Losartan	1 (3.7)
Levothyroxine	1 (3.7)
ASA	1 (3.7)
Prednisolone	1 (3.7)
Lamotrigine	1 (3.7)
RVF cause, n (%)	
Obstetric injury	11 (40.7)
VLAR rectal cancer	4 (14.8)
Trauma	1 (3.7)
Abscess	2 (7.4)
Vaginoplasty	2 (7.4)
Bladder surgery	1 (3.7)
Bartholin gland cyst	2 (7.4)
Uterine cancer	1 (3.7)
IPAA in UC patients	2 (7.4)
Hemorrhoidectomy	1 (3.7)
Stoma before surgery (yes), n (%)	10 (37.0)
Fistula location, n (%)	
Low	10 (37.0)
Middle	17 (63.0)
Concurrent anal sphincter injury, n (%)	5 (18.5)
CCIS value before surgery (median [IQR])	2.00 (0.00-7.00)

BMI: Body mass index; CCIS: Cleveland Clinic Incontinence Score; IPAA: Ileal pouch-anal anastomosis; IQR: Interquartile range; NVD: Normal vaginal delivery; RVF: Rectovaginal fistula; SD: Standard deviation, UC: Ulcerative colitis; VLAR: Very low anterior resection.

Results

Upon reviewing the operation notes and patient charts of 83 patients who underwent RVF surgery, some patients were excluded for the following reasons: active malignancy (n=3), Crohn's disease (n=3), lack of routine postoperative follow-up (n=6), and other types of surgical techniques (n=44). Finally, 27 patients who underwent RVF surgery with the Martius flap procedure were included in the study. The baseline characteristics of these patients are summarized in table 1.

According to table 1, 37% of the cases were low RVF, and 63% were mid RVF. The most common causes of RVF were obstetric injury and low rectal anastomosis. A history of recurrent RVF was present in 63% of the patients, with a median number of previous fistula surgeries of 2.00 (IQR=1.50-4.50). The prior surgeries included procedures such as local advancement flap or seton insertion. Preoperative diverting stoma was present in 37% of cases. The CCIS was significantly reduced postoperatively compared to the preoperative score (median=1.00, IQR=0.00-2.75 vs. median=2.00, IQR=0.00-7.00; $P=0.003$). The median time of operation was 80 min (range=60-90 min), and the median length of hospital stay was 4 days. The overall complication rate was 14.8%, with all of the complications being minor (Clavien-Dindo grade I, II) and not requiring surgical intervention. After a median follow-up of 48 months (IQR=24.00-84.00), the total success rate was 88.9% (24/27 patients).

Among the three patients who experienced recurrence, two cases were attributed to very low anterior resection (VLAR) for low rectal cancer, and one case was associated with post-hysterectomy complications. All three patients had a documented history of pelvic radiation therapy. The postoperative FSFI score was deemed acceptable, with a mean score of 22.2 ± 4.22 . Patient satisfaction regarding the flap donor site in the major labium was reported

Table 2: Surgery details and outcomes

Variables	Value
Surgery duration (min), median (IQR)	80.00 (60.00-90.00)
Hospital stay (days), median (IQR)	4.00 (3.00-4.00)
Complication rate*, n (%)	4 (14.8)
CCIS value after surgery, median (IQR)	1.00 (0.00-2.75)
FSFI score after surgery (mean \pm SD)	22.20 \pm 4.22
Fistula recurrence†, n (%)	3 (11.1)
Satisfaction with the appearance of the surgical site (%), mean \pm SD	79.26 \pm 9.27

CCIS: Cleveland Clinic Incontinence Score; FSFI: Female sexual function index; IQR: Interquartile range; SD: Standard deviation; *Infection (n=2), seroma (n=1), and hematoma (n=1) were observed complications. †Occurred in 2nd, 3rd, or 4th month after surgery in different patients.

at $79.26 \pm 9.27\%$ (table 2). Stoma closure was performed in 70% of patients after a mean period of 5.5 months (range=3.0-7.5). Prior to closure, all patients underwent evaluation for confirmation of fistula healing using the tampon test. There were no significant differences in the postoperative outcomes, including complication rate ($P=0.613$), CCIS value ($P=0.166$), FSFI score ($P=0.646$), and satisfaction with the appearance of the surgical site ($P=0.914$), between patients with and without stoma. Similarly, no significant differences were detected between those with lower versus mid RVF regarding these outcomes, as presented in table 3 ($P>0.05$ for all).

Discussion

According to the findings of the present study, the Martius flap was an effective technique for repairing mid-complex and early RVFs, demonstrating an acceptable success rate and a reduction in fecal incontinence. The management of complex RVFs poses significant challenges for colorectal surgeons, with recurrence rates post-surgery reported to be as high as 80% in some studies.^{7, 17, 18} RVFs are classified into three types based on their anatomical location. Low type, which occurs between the distal anal

Table 3: Comparison of outcomes between subgroups of patients

Variables	With stoma	Without stoma	P value	Lower fistula	Middle fistula	P value*
Complication rate*, n (%)	2 (20.0)	2 (11.8)	0.613	1 (10.0)	3 (17.6)	>0.999
CCIS value after surgery, median (IQR)	2.00 (1.00-3.00)	1.00 (0.00-2.00)	0.166	0.50 (0.00-1.25)	2.00 (1.00-3.00)	0.064
FSFI score after surgery (mean \pm SD)	21.57 \pm 4.47	22.47 \pm 4.23	0.646	22.80 \pm 4.37	21.78 \pm 4.23	0.573
Fistula recurrence†, n (%)	3 (30.0)	0 (0.0)	0.041	0 (0.0)	3 (17.6)	0.274
Satisfaction with the appearance of the surgical site (%), mean \pm SD	79.00 \pm 9.66	79.41 \pm 9.33	0.914	79.50 \pm 8.64	79.12 \pm 9.88	0.920

CCIS: Cleveland Clinic Fecal Incontinence Severity Scoring System; FSFI: Female sexual function index; IQR: interquartile range; SD: standard deviation; *Independent samples t test, Mann-Whitney U test, and Fisher's exact test were used respectively. $P<0.05$ was considered significant.

canal (below the dentate line) and the posterior fourchette; high type, located between the rectum and the upper vagina at the level of the cervix; and mid type, which is situated between the low and high types.¹⁹ Complex RVFs are typically characterized by a diameter exceeding 2 cm and may result from causes such as radiation therapy, malignancy, or complications following pelvic surgeries.^{9, 20, 21}

Selecting the most appropriate treatment method for these complex fistulas is crucial, as treatment failure can lead to fibrosis, necessitating subsequent surgical interventions. Currently, there is no established gold standard or clear algorithm for managing complicated RVFs. Among the recommended techniques, the Martius transposition flap has emerged as a viable option. However, the effectiveness rates vary significantly across studies.^{22, 23}

The literature on the outcomes of the Martius flap procedure remains limited, with studies often involving small sample sizes. For instance, McNevin and others reported a 94% success rate in a cohort of 16 patients with low RVFs.¹² In contrast, Pitel and colleagues observed a success rate of 60% in a study of 20 patients with low RVFs followed for 35 months.²⁴ Similarly, Trompetto conducted a study on 24 patients and found a success rate of 91.3% with fistulas located 1.5 to 4 cm from the vaginal entry.¹⁸ The present study represented the largest series documented in the literature, both in terms of the number of cases and the duration of follow-up, reporting an overall success rate of 88.9%. Notably, this study included mid RVFs, which provided a unique dimension to the findings.

While it is theoretically suggested that the absence of fecal passage through a diverting stoma may facilitate fistula repair, the impact of a stoma on RVF healing remains controversial.^{7, 25} In the present study, the presence of a stoma had no correlation with an increased recurrence rate. Among the three cases of recurrence, one patient underwent pull-through surgery following lower rectal anastomosis, while the other two were managed with local endorectal advancement flaps.

Although the Female Sexual Function Index (FSFI) could not be assessed prior to surgery, the findings of the present study demonstrated a postoperative FSFI score of 22.2 ± 4.22 . This result closely aligned with findings from Trompetto's study and indicated significant improvement in sexual function.¹⁸ Postoperative continence was observed to be enhanced compared to preoperative levels, particularly in cases where simultaneous sphincteroplasty was performed, which showed significant

improvement in the CCIS.

Importantly, none of the patients required intervention at the flap donor site in the labia majora. However, a few patients expressed interest in fat injections for cosmetic enhancement due to flattening and relative dissatisfaction with the appearance of the donor site. The findings of the present study indicated a higher recurrence rate in the mid-RVF group than in the low RVF group. Although this difference was not statistically significant, it might hold clinical relevance in larger cohorts.

In general, a comprehensive examination under anesthesia should be conducted prior to surgical intervention to evaluate the size, and location of the fistula, and the condition of the surrounding tissues. If purulent material is present, drainage via seton placement should be performed, deferring surgical correction to a later stage. In cases where the tissue surrounding the fistula is fibrotic and ischemic, particularly following radiotherapy, the Martius flap is recommended.

The main limitations of this study were the absence of a control group, its retrospective nature, and its single-center design. It is recommended that further research be conducted as a prospective clinical study to compare this method with alternative methods, such as levatoroplasty alone.

Conclusion

The Martius flap procedure was a safe surgical option characterized by low morbidity and favorable functional and cosmetic outcomes. Thus, it is recommended as a first-line treatment for both low- and mid-complex RVFs. While the procedure demonstrated significant efficacy in recurrent cases, it was recommended to consider it as an initial approach for early cases, provided that a thorough examination under anesthesia be conducted prior to surgery. This recommendation is particularly relevant in centers with extensive experience and those employing a multidisciplinary decision-making process. Notably, the effectiveness of the Martius flap remains high even in cases where an ostomy is not employed.

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Authors' Contribution

A.Z: Study concept, study design, and drafting; A.M: Study design, drafting, and reviewing the manuscript; A.R.S: Data Gathering, data analysis, project administration, validation, drafting, and reviewing the manuscript; S.Sh.Z: Data gathering, data analysis, and drafting; S.S.Sh: Study design, drafting, and reviewing the manuscript; S.V.H: Study concept, study design, project administration, validation, drafting, and reviewing the manuscript. All authors have read and approved the manuscript and agree to be accountable for all aspects of the work, ensuring that any questions related to the accuracy or integrity of any part of the manuscript are appropriately investigated and resolved.

Conflict of Interest

Seyed Vahid Hosseini, as the Editorial Board Member, was not involved in any stage of handling this manuscript. A team of independent experts was formed by the Editorial Board to review the article without his knowledge.

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