



Transvaginal approach for rectovaginal fistula: experience from a single institution

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Abstract

Transvaginal (TV) repair, featuring its feasibility, effectiveness, safety, and technically less demandingness, is one of the surgical approaches for management of rectovaginal fistula (RVF). However, there are limited numbers of publications available on the transvaginal approach for RVF repair. To this end, the purpose of this study is to evaluate the preliminary outcomes of the transvaginal approach performed by the team, and to further assess its feasibility, safety and effectiveness in the management of RVF. A retrospective analysis was conducted at a single institution. Patients with RVF who had undergone three transvaginal surgical techniques, i.e. *transvaginal fistulectomy and stratified suture*, *transvaginal flip and ligation fistula tract* and *transvaginal fistula stapled closure* were included. Besides, the demographics, operative data, postoperative complications and follow-up outcomes of the patients were collected prospectively. A total of 49 female patients (mean age, 35.76 ± 13.97 years) underwent transvaginal approach, 42 of which were followed up with a median follow-up of 26 months (range 3–82 months), and 29 had closure of the fistula (successful closure rate of 59.1%). The successful closure rates were only significantly different between previous repair times ($p = 0.031$), and several minor complications including postoperative pain ($n = 3$), constipation ($n = 1$), and lower urinary tract infection ($n = 1$) were observed. Symptomatic improvement was reported in all patients with failed closure. Transvaginal approach for RVF repair is effective, safe, and feasible, and is therefore considered an alternative to transrectal advancement flap for low and mid-level traumatic RVF with normal sphincter function. With the advantage of better surgical access, transvaginal approach is recognized as the initial choice for the surgical repair of RVF.

Keywords Rectovaginal fistula · Transvaginal approach · Repair procedure

Introduction

Rectovaginal fistula (RVF) is defined as the abnormal epithelium-lined connection between the rectum and the vagina, the symptoms of which include passage of air, stools and/or purulent discharge through the vagina [1]. Although it is a benign condition with no high morbidity, the distressing symptoms do exert a long-term potential detrimental impact on psychological health. Successful management remains a major surgical challenge for surgeons [2]. The etiologies of RVF include congenital defect, obstetric injury, chronic inflammatory bowel disease (most commonly Crohn's disease), local infection, surgery, radiation therapy, etc. [3, 4],

and the primary cause is obstetric injuries [5]. Secondary causes, such as Crohn's disease, pelvic surgery, and radiation have received much attention for their more challenging management [6]. Evaluation and diagnosis of RVF is based on symptoms and physical examinations with or without methylene blue dye test. Imaging, such as ultrasound and magnetic resonance imaging (MRI) can be performed for a more objective assessment. There are multiple ways to classify RVF according to etiology, location, and size of the fistula, such as the "simple or complex" RVF, or the "low/mid/high" RVF, etc. However, there lacks a standard classification of RVF, making it difficult to compare different surgical techniques, and there is still no standard clinical guidelines for the management of RVF until now [7, 8].

Surgical repair of RVF can be approached from the transrectal, transvaginal, transperineal, and abdominal approach. For traumatic simple low RVF without a history of incontinence, advancement flaps repair, which can be performed

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by raising either the vaginal mucosa (transvaginal) or endoanal advancement flap (transrectal) to cover the fistula tract, is recommended [9]. Transperineal approach is mainly for recurrent and complex RVF, performed by creating a tissue plane in the rectovaginal septum, closing both openings and restoring the perineal space with a layered closure or interposition with a healthy well-perfused tissue [10]. Muscle flap includes Martius flap and Gracilis muscle flap transposition, which is mainly used for introducing healthy vascularized tissues between the rectum and vagina [11]. However, this technique is relatively more demanding and aggressive with higher morbidity. Transabdominal approach that can be performed open or laparoscopically is mainly for high RVF. In addition, other reported techniques include endoscopic repair, mesh repair and biomaterial repair.

Even though various surgical techniques have been reported and developed, there is still no standard algorithm on technique selection for RVF patients. The choice of surgical techniques is primarily determined by the surgeon's personal experience and judgment based on the etiologies, features of fistulae and surrounding tissue conditions. It is reported that colorectal surgeon favors transanal approaches, whereas gynecologist prefers transvaginal or transperineal approaches as a method of choice [12]. However, the colorectal surgeons in question seem to prefer transvaginal approach for simple low and mid RVF. This report retrospectively reviewed the transvaginal surgical techniques performed by this colorectal team for simple low- and mid-level RVF, presented the outcomes and described the experience from the colorectal surgeon's perspective.

Patients and methods

Patients

The present study was approved by the Ethics Committee of Guang'anmen Hospital of China Academy of Chinese Medical Sciences and received the informed consent from all the patients. Patients having undergone transvaginal repair for symptomatic low- and mid-RVF between January 2015 and December 2021 from the institution where the authors worked were identified from a prospectively maintained database. The analyzed data included the age, disease course, BMI, comorbidities, etiologies, the status of sphincter involvement, fistula type, previous repair time, operative data, and postoperative complication of the patients.

Patients without complete medical records, secondary to chronic inflammatory bowel disease and those repaired by alternative techniques were excluded from this study. The vaginal opening of the fistula was categorized as high when it is located at or just above the dentate line, but within the

vaginal fourchette, and as low if it is below the dentate line and between both as the middle [13].

Preparation and intraoperation

After an informed consent, the patients were admitted on the day before surgery and received preoperative bowel preparation. Following spinal or general anesthesia, they were placed in a lithotomy position, and an indwelling urinary catheter was inserted.

Careful exploration on the vaginal site was performed. A probe was inserted into the fistula to identify the location and the size; followed by local infiltration of saline. The surgical field was then fully exposed and the index finger of the left hand was inserted into the rectum to fix the fistula orifice on the rectal side. The detailed transvaginal techniques were described as *transvaginal techniques*.

A suction drain was postoperatively inserted into the rectum for drainage and a gauze-pack was inserted into the vagina for hemostasis. The operative time and estimated blood loss were recorded.

Transvaginal techniques

Transvaginal fistulectomy and stratified suture (Fig. 1) The fistula tract was circumferentially dissected of 1.0~1.5 cm distance from the fistula opening with sharp dissection, and the sclerotic fistula tract and surrounding scar tissue was then completely excised. Afterwards, the defect was separately closed in layers from the rectal posterior wall, rectovaginal septum to the vaginal muscular layer and the vaginal mucosa with vertical interrupted sutures using 3–0 Vicryl.

Transvaginal flip and ligation fistula tract (Fig. 2) The fistula tract was circumferentially dissected of 1.0~1.5 cm distance from the fistula opening with sharp dissection, and the surrounding scar tissue was then completely excised. Afterwards, a purse-string suture was placed along with the fistula opening using 3–0 Vicryl at the vaginal side, and an artery forceps was inserted from the rectum into the vagina opening to hold both ends of the purse-string suture, which was then withdrawn from the rectum to flip the fistula into the rectal side and ligated. Another purse-string suture was performed to close the rectovaginal septum using 3–0 Vicryl. Finally, the vaginal muscular layer and the vaginal mucosa were closed with vertical interrupted sutures using 3–0 Vicryl.

Transvaginal fistula stapled closure (Fig. 3) The fistula tract was circumferentially dissected of 1.0~1.5 cm distance from the fistula opening with sharp dissection, and the surrounding scar tissue was then completely excised

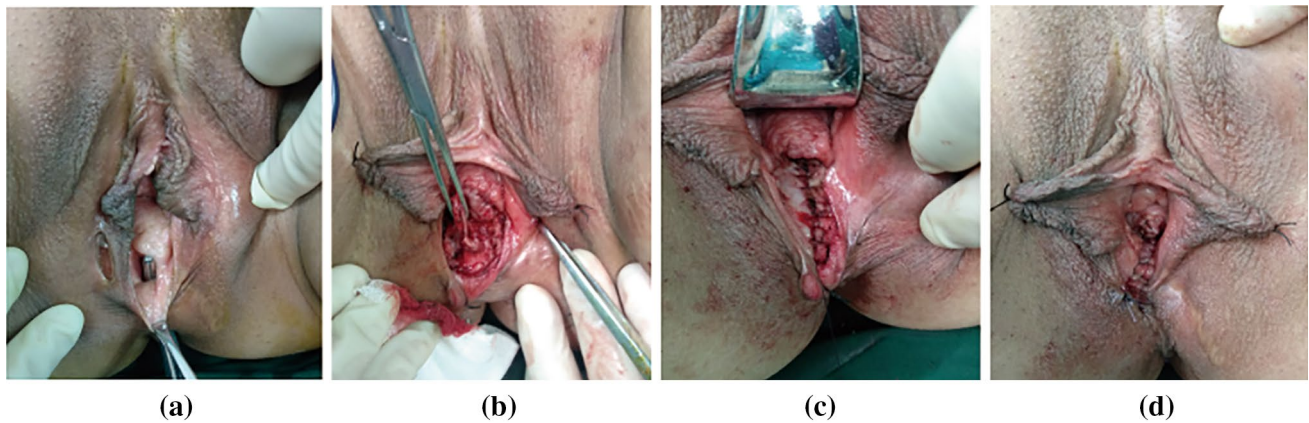


Fig. 1 Steps of *Transvaginal fistulectomy and stratified suture*. **a** clearly identified the fistula **b** completely dissected and excised the sclerotic fistula tract and the surrounding scar tissue **c, d** stratified suture

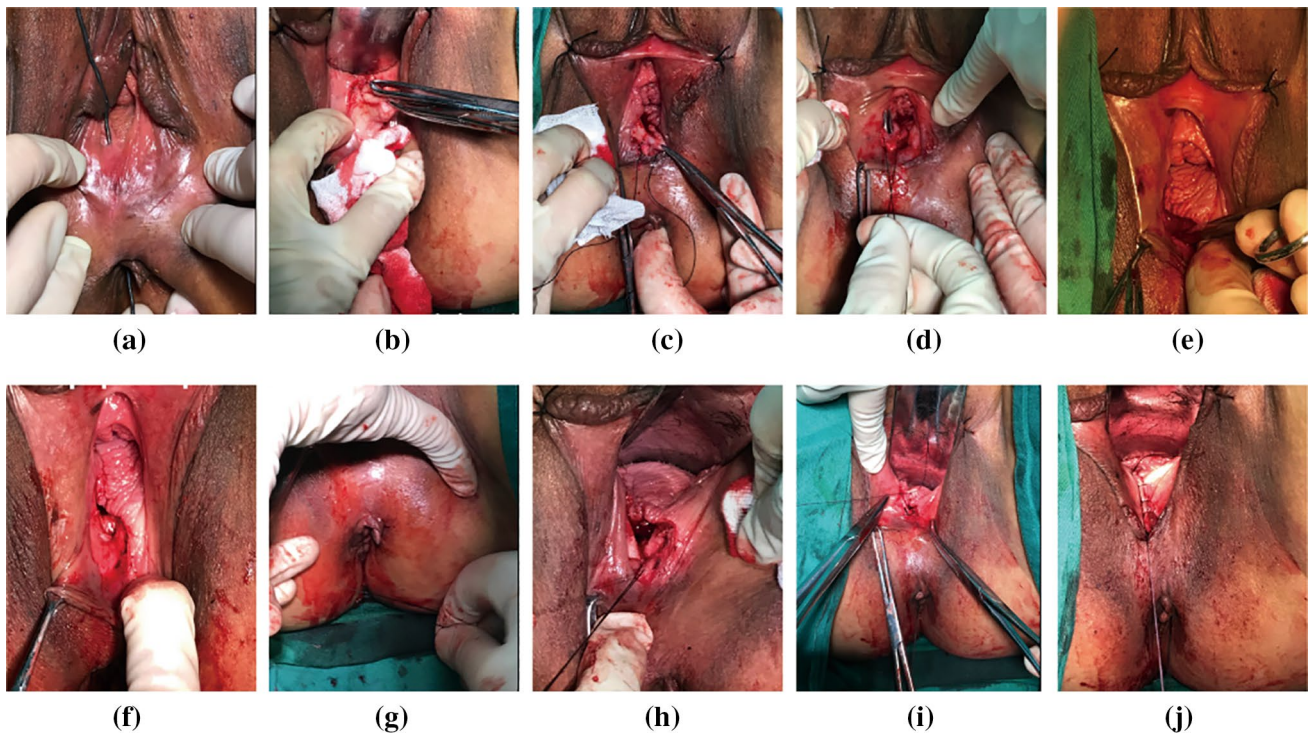


Fig. 2 Steps of *Transvaginal flip and ligation fistula tract*. **a** clearly identified the fistula **b** completely dissected the fistula tract and excised the the surrounding scar tissue **c** a purse-string suture along with the fistula opening performed **d** clamped the suture transrectally

across the fistula by the blood-vessel forceps **e, f** flip the fistula into the rectal side **g** ligate the fistula on the rectal side and cut off the free end **h, i, j** stratified suture

to expose the healthy tissues. Afterwards, the free end of the fistula was closed using the Endoscopic Linear Cutting Staplers (Reach Surgical, Inc.). After checking for the completeness of the staple line, a purse-string suture with 3–0 Vicryl was then used to close the rectovaginal septum, and the vaginal muscular layer and the skin were closed with vertical interrupted sutures using 3–0 Vicryl.

Postoperation management

The patients were postoperatively put on bed rest, and were kept a shortly fasted. Full diet was initiated on Day 7. Intravenous antibiotics were continued for 3 days followed by oral antibiotics for 7 days, and bowel movements were controlled with oral loperamide hydrochloride capsules for

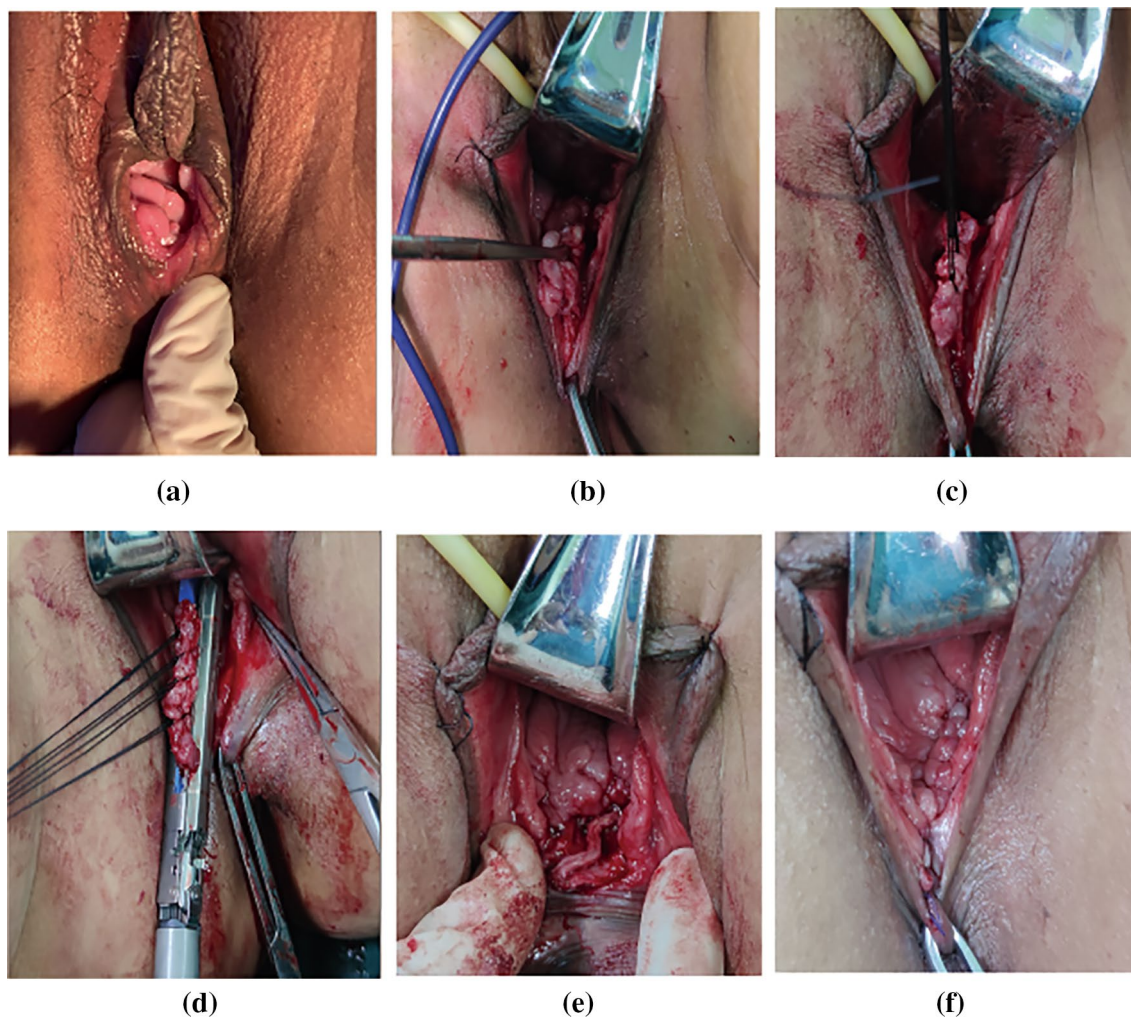


Fig. 3 Steps of *Transvaginal fistula stapled closure*. **a** clearly identified the fistula **b** completely dissected the fistula tract and excised the surrounding scar tissue **c, d, e** completely clamp the free end of the fistula and stapler closed **f** stratified suture

7 days. The anal suction drainage was kept up to 7 days and the urinary catheter indwelled for 4–6 days.

Postoperative pain and complications (e.g., infection, hematoma or anal incontinence) were correspondingly evaluated. Patients were routinely followed up after discharge. Besides, successful closure was defined as the absence of flatus, mucus or fecal discharge from the vagina, which can be confirmed by physical examination and imaging studies, including ultrasound and MRI for the evaluation of complications [14]. The successful closure rate was the primary outcome of the present study.

Statistical methods

Statistical analysis was performed using the SPSS software, version 19.0 (IBM, Armonk, NY), with continuous parameters shown as the means \pm standard deviation or median (Q_{25} – Q_{75}), where appropriate and categorical variables were

expressed as percentages. A *t* test was used for 2 groups, whereas the χ^2 test or the Fisher exact test (as appropriate) or the Kruskal–Wallis test and an one-way analysis of variance were used for comparing the 3 groups. Logistic regression models were used for univariate analysis of the three different techniques evaluated for an association with success. A *p* value < 0.05 was considered statistically significant.

Results

A total of 49 patients were included in this study, 15 (30.6%) of which underwent *transvaginal fistulectomy and stratified suture*; 23 (46.9%), *transvaginal flip and ligation fistula tract*; and 11 (22.4%), *transvaginal fistula stapled closure*. The demographic and operative characteristics were detailed in Table 1. The mean age at the time of surgery was 35.76 ± 13.97 years, and the median disease course

Table 1 The demographic and operative characteristics of included patients

Characteristic	Overall (n = 49)	Transvaginal surgical techniques			P
		Transvaginal fistulectomy and stratified suture (n = 15, 30.6%)	Transvaginal flip and ligation fistula tract (n = 23, 46.9%)	Transvaginal fistula stapled closure (n = 11, 22.4%)	
Age at surgery (years)	35.76 ± 13.97	36.93 ± 11.12	35.74 ± 14.96	34.18 ± 16.34	0.487
Course of disease (months)	114 (6–258)	9 (6–48)	12 (4–264)	240 (16–336)	0.093
BMI (Kg/m ²)					0.499
< 18.5	5 (10.2%)	2 (13.3%)	2 (8.7%)	1 (9.1%)	
18.5 ≤ BMI < 25	29 (59.2%)	10 (66.7%)	15 (65.2%)	4 (36.4%)	
25 ≤ BMI < 30	12 (24.5%)	3 (20%)	4 (17.4%)	5 (45.5%)	
≥ 30	3 (6.1%)	0 (0%)	2 (8.7%)	1 (9.1%)	
Vaginal parity					0.199
0	19 (38.8%)	3 (20.0%)	11 (47.8%)	5 (45.5%)	
≥ 1	30 (61.2%)	12 (80.0%)	12 (52.2%)	6 (54.5%)	
Etiologies					0.088
Obstetric injury	18 (36.7%)	7 (46.7%)	9 (39.1%)	2 (18.2%)	
The congenital	8 (16.3%)	1 (6.7%)	3 (13.0%)	4 (36.4%)	
Surgery	9 (18.4%)	5 (33.3%)	4 (17.4%)	0 (0%)	
Trauma	3 (6.1%)	0 (0%)	1 (4.3%)	2 (18.2%)	
Unclear	9 (18.4%)	1 (6.7%)	6 (26.1%)	2 (18.2%)	
Infection	2 (4.1%)	1 (6.7%)	0 (0%)	1 (9.1%)	
Fistula type					0.494
Low- fistula	28 (57.1%)	8 (53.3%)	12 (52.2%)	8 (72.7%)	
Mid-fistula	21 (42.9%)	7 (46.7%)	11 (47.8%)	3 (27.3%)	
Previous repair times					0.814
0	33 (67.3%)	10 (66.7%)	16 (69.6%)	7 (63.6%)	
1–2	13 (26.5%)	4 (26.7%)	5 (21.7%)	4 (36.4%)	
≥ 3	3 (6.1%)	1 (6.7%)	2 (8.7%)	0 (0%)	
Diversion stoma					0.610
No	46 (93.9%)	14 (93.9%)	21 (91.3%)	11 (100%)	
Yes	3 (6.1%)	1 (6.7%)	2 (8.7%)	0 (0%)	

was 9.5 years (range, 0.5 ~ 21.5 years). All patients were nonsmokers and nondrinkers, and 4 suffered from diabetes. More than half of the patients had normal BMI (n = 29, 59.2%) and a history of vaginal delivery (n = 30, 61.2%). Obstetric injuries were hereby found to be the main cause of RVF (n = 18, 36.7%), followed by surgery (n = 9, 18.4%), trauma (n = 3, 6.1%), and infection (n = 2, 4.1%). In addition, 8 patients (16.3%) were affected by the congenital cause, while 9 (18.4%) were subject to unclear etiology, and the distribution did not differ significantly by techniques.

In this study, 28 patients (57.1%) had low fistula; 21 (42.9%) presented with mid-fistula; 33 (67.3%), initial repair; 3 (6.1%), a history of the previous repairs (range 3 to 6 times); and 3, a diversion stoma from the previous rectal surgery. There was no significant difference observed between the techniques. The median operating time was 50 min (range, 30 ~ 90 min), while the median fasting time and the first defecation time after the operation were

3 days (range, 1 ~ 5 days) and 3 days (range, 2 ~ 6 days), respectively, without distribution differed significantly by techniques.

Patients were followed up as outpatient for at least 2 months, followed by subsequent phone follow-up, with 42 remaining to be followed up with a median follow-up of 26 months (range 3 ~ 82 months) and 7 lost to follow-up.

Among the 42 patients who were successfully followed up, the overall success rate was 59.1%, and 29 had successful repairs. Factors associated with the successful repair rate were evaluated in Table 2, and it was found that only the outcomes of patients with a history of the previous repair (P = 0.007) differed significantly. For those with failed repairs, most of them reported improved symptoms after operation and no future interventions were required. In addition, even though the sample size of 3 different transvaginal techniques was rather limited, an association with success was evaluated in Table 3. The success rate of

Table 2 The evaluation of the factors in association with success

Characteristics	Success <i>n</i> = 29 (59.1%)	Fail <i>n</i> = 13 (26.5%)	<i>P</i>
Age at surgery (years)	38.21 ± 14.73	34.31 ± 14.61	0.540
Course of disease (months)	80.11 (6, 84)	149.38 (9, 330)	0.105
BMI (Kg/m ²)			0.720
< 18.5	2 (6.8%)	2 (15.3%)	
18.5 ≤ BMI < 25	17 (58.6%)	8 (61.5%)	
25 ≤ BMI < 30	9 (31.0%)	3 (23.0%)	
≥ 30	1 (3.4%)	0 (0%)	
Vaginal parity			0.720
0	8 (27.5%)	6 (46.1%)	
≥ 1	21 (72.4%)	7 (53.8%)	
Etiologies			0.206
Obstetric injury	12 (41.3)	4 (30.7%)	
The congenital	4 (13.7%)	3 (23.1%)	
Surgery	4 (13.7%)	5 (38.4%)	
Trauma	3 (10.3%)	0 (0%)	
Unclear	5 (17.2)	0 (0%)	
Infection	1 (3.4%)	1 (5.2%)	
Fistula type			0.426
Low- fistula	14 (48.2%)	8 (61.5%)	
Mid-fistula	15 (51.7)	5 (38.4%)	
Previous repair times			0.031
0	23 (79.3%)	6 (46.1%)	
1–2	6 (20.8%)	5 (38.4%)	
≥ 3	0 (0%)	2 (15.3%)	
Diversion stoma			0.926
No	27 (93.1%)	12 (92.3)	
Yes	2 (6.8%)	1 (7.6%)	
Transvaginal techniques			0.189
Transvaginal fistulectomy and stratified suture	8 (27.5%)	5 (38.4%)	
Transvaginal flip and ligation fistula tract	11 (37.9%)	7 (53.8)	
Transvaginal fistula stapled closure	10 (34.4%)	1 (7.6%)	
Operative time (minutes)	63.10 (30,90)	48.46 (30,60)	0.159
Postoperative fasting time (days)	3.93 (3,5)	3.85 (3,5)	0.988
Postoperative defecation time (days)	4.24 (2,6)	4.31 (2.5,6)	0.698
Postoperative urinary catheter indwelled days (days)	6.03 (5.5,7)	5.38 (4.5,7)	0.550

Table 3 Univariate analysis of 3 different techniques evaluated for an association with success

	Number of success	Success rate	Univariate analysis	
			OR (95%CI)	<i>P</i>
Surgical techniques				0.25
Transvaginal fistulectomy and stratified suture (<i>n</i> = 13)	8	53.3%	Referent	
Transvaginal flip and ligation fistula tract (<i>n</i> = 18)	11	47.8%	0.98 (0.22, 4.25)	
Transvaginal fistula stapled closure (<i>n</i> = 11)	10	90.9%	6.25 (0.60, 64.86)	

transvaginal fistulectomy and stratified suture, transvaginal flip and ligation fistula tract, and transvaginal fistula stapled closure was 53.3% (*n* = 8), 47.8% (*n* = 11) and 90.9% (*n* = 10), respectively, not identified as being significantly

associated with success (*P* = 0.25). Several minor complications, including postoperative pain (*n* = 3), constipation (*n* = 1) and lower urinary tract infection (*n* = 1), were reported.

Discussion

RVF is a distressing medical condition for women, the successful treatment of which remains a challenge. According to the published studies, successful repair is closely associated with factors including the age, BMI, history of vaginal delivery, etiologies, feature of the fistula and history of the previous repair [15]. In the present study, only a history of previous repair demonstrated significant difference in outcomes, which is in line with previously reported conclusion that the successful closure rate will be reduced by the number of previous repair attempts [16]. Obviously, history of previous repair was also an important factor to be strictly controlled in prospective studies. Patients' age, BMI and the course of the disease were considered associated with the successful closure rate, but the correlation has not been observed probably owing to the limited sample size.

Vaginal parity will increase the risk of obstetric trauma (especially, third- and fourth-degree perineal lacerations) [5], which is still the primary etiology of RVF in this study. To our knowledge, the etiology of the fistula is an important factor that may contribute to operative outcomes. Paradoxically, Jenifer N Byrnes, et al. [17] performed a retrospective cohort study in Mayo clinic and concluded that the recurrence rate did not differ by fistula etiology. In the present study, no difference was observed in terms of etiology and the RVF secondary to inflammatory bowel disease was excluded.

The classification of RVF matters considerably in determining the type of repair intervention. Distal fistula is more feasibly approached through the rectum, vagina and perineum, whereas a transabdominal approach is preferred for high fistula. In this study, the low and middle fistulae were both transvaginally repaired and the outcomes did not differ by the fistula type.

The role of diverting stoma in the treatment of RVF remains controversial. In theory, a diverting stoma can help control symptoms and promote the healing, but may cause more burdens for patients with unclear effectiveness [18]. In this practice, it was considered unnecessary to have a protective diverting stoma for traumatic RVF, especially for the first repair attempt.

In addition, postoperative management plays an important role in surgery, but few publications mentioned the association between postoperative management and the successful closure rate. Moreover, no obvious correlation was hereby found as well. Although no definitive studies on the postoperative management are available, there exists a consensus that avoid the passage of the stool through the fresh wound benefits the healing process [1]. According to the clinical practice experiences,

postoperative fasting and medication prolonging the first postoperative defecation by controlling bowel movements appear to give rise to the same short-term condition as a diverting stoma. The pressure on the rectal side of the fistula is higher than on the vaginal side, which may interfere with the healing of the fistula. In this case, the anal suction drainage for a few days was hereby applied to reduce the effect of the rectal high pressure, and a similar postoperative practice was coincidentally found at another medical institution in China [13].

The number of publications on transvaginal approach for RVF repair is limited, so that this approach is rarely recommended based on currently available literature [1], though the transvaginal approach seems to be feasible, effective, safe, and technically less demanding. Indeed, C. Ruffolo [19] ever reported a success rate of 69.4% of transvaginal advancement flap for RVF with Crohn's disease and R. Bhome [12] described a transvaginal approach for RVF with a 67% success rate with varying etiologies. In contrast, numerous researches on transrectal approach can be found. Transrectal advancement flap, with a reported successful closure rate varying between 41 and 100%, is the most typical transrectal technique for RVF surgical repair, and is recommended as the first surgical attempt for low-lying and simple RVF [20]. However, its actual successful closure rate is probably between 50 and 70%, with an average successful closure rate of 60%, as is demonstrated in a systematic review [1, 14]. Recently, a 57.9% successful closure rate with varying etiologies has been reported by a single center with 25 years of experience [21]. Complications, such as poor flap quality, incontinence, postoperative bleeding and urinary tract infection are found as well. The overall success closure rate of different transvaginal techniques observed in the present study is 59.1% for low- and mid-RVF without incontinence or any major complication, which is indeed acceptable, broadly in line with the collectively heterogeneous published literature, and is equivalent to that reported for endorectal advancement flap with fewer postoperative complications.

Transperineal repair is a local repair approach for RVF, especially recommended for patients with concomitant anterior sphincter defect and fecal incontinence, with a reported varying success rate ranging from 64.7% to 100% [7]. Conversely, for RVF with normal sphincter function, transperineal repair will lead to unnecessary perineal surgical trauma and damage. Some publications on the reconstruction of RVF through interposition of autologous tissue, such as Martin flaps and Gracilis muscle are found as well, although the number is rather limited [14]. It was reported that there were over 100 patients who underwent Martin flap for RVF presenting a reported success rate between 65 and 100%. Besides, A. Hotouras et al. performed a systematic review of the literature on Gracilis muscle interposition and

found a healing rate ranging from 33 to 100% with the biggest study in the literature reporting a rate of approximately 80%, while that in literature on RVF with Crohn's disease was approximately 33% [22]. Given the aggressive incision, tissue damage, prolonged hospital stay and protective stoma diversion routinely required, such approaches, however, are not easily accepted by patients with traumatic RVF, but it is definitely not wise to neglect the significance of these approaches for complex situations and repeatedly failing local repair [11].

RVF can be treated by colorectal surgeons or gynecologists. Technical familiarity tends to persuade the colorectal surgeon into choosing transrectal approach as the first option [23], while transvaginal access is preferred by the gynecologists. In this practice, the transvaginal approach is preferred as it gives a better surgical access. Because a flapless repair is considered the key point related to successful closure rate, flap repair was not hereby performed. The flapless technique appears to be less technically demanding and avoids the risk of tissue necrosis and defects associated with flap surgery. When compared with transrectal approach, the lithotomy position needed for transvaginal access provides adequate exposure, allowing for wilder operation space and more precise dissection of the fistula. Besides, it is reported that the transvaginal approach allows the reconstitution of the perineal body and enables wider separation between the rectum and vagina, making it much easier to exclude the fistula and sclerotic tissue when compared with transperineal approaches without any incision in the perineal area to avoid traumatic damages [13].

Moreover, proponents of transvaginal approach claim that when compared with endorectal advancement flap which usually fails due to inadequate vascularized tissue [9], transvaginal advancement flap is better vascularized, is less likely to cause a larger fistula, and has a better recovery. Moreover, not only can the fistula opening be closed, but also plastic surgery of the vagina can be performed in the presence of scarring deformities if necessary, which seemingly benefits the sexual function [12]. In addition, transvaginal approach is also considered a better option for local approach in case of anorectal stenosis, Crohn's disease or ulcerative colitis [19].

Although the overall successful closure rate of the hereby mentioned transvaginal surgical techniques is satisfying, the statistical power is still insufficient and the evidence level remains low due to its retrospective nature and limited sample size with a heterogeneous state. The transrectal approach and transvaginal approach are two possible surgical approaches to RVF repair, but it is difficult to conduct prospective research to identify which one is superior or which transvaginal technique is superior because of the heterogeneity of the sample and the limited number of subgroups. Different transvaginal surgical techniques for RVF

Table 4 Technical Notes of the transvaginal techniques for RVF repair

Transvaginal techniques	Technical notes	Indication
Transvaginal fistulectomy and stratified suture (without sphincteroplasty)	Normal sphincter function preference (with or without sphincteroplasty)	Short, shallow, fresh fistula; single-tract fistula; low-level fistula; initial repair better
Transvaginal ligation and flip fistula tract	Fistula careful dissection and surrounding scar tissue complete excision	Completely removal of the fistula tract, together with the surrounding scarred tissues; reconstruction with good blood supply
Transvaginal fistula stapled closure	Complete fistula isolated; a purse-string suture along the fistula, flipped the whole fistula into anus or rectum, supplemented ligation applied for the long free end of the fistula remained after the flip	Short or long fistula; not much feasible in large fistula; low- or mid-level fistula
	Fistula preferably longer than the height of stapler device; stapled at the base of the fistula; make sure completely stapled close	Longer fistula; low- or mid-level fistula; available in large diameter fistula, feasible in recurrence and complex RVF

repair have been performed for many years, and the notes and experience are summarized in Table 4.

On the one hand, even though it is reported that the *transvaginal fistula stapled closure* is promising for recurrent and complex RVF [13], the indications of the hereby mentioned transvaginal surgical techniques and a standard algorithm of transvaginal management for RVF is still in the process of developing. Therefore, a trend towards improved outcomes has been anticipated as the model grows. On the other hand, the techniques are still worth further exploring and more attention should be paid to the components of mental health and sexual function. This retrospective study has forged a solid foundation for the future prospective research of the present team.

Conclusion

The transvaginal approach is a flapless technique with a low learning curve for RVF surgical management, the preliminary outcomes of which are acceptable, and is an effective, safe and feasible alternative to transrectal advancement flap for low and middle level traumatic RVF without sphincter dysfunction. The multiple advantages appear to make it a superior surgical access, qualified as the initial selection for colorectal surgeons.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s13304-022-01366-7>.

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Declarations

Conflict of interest No conflicts of interest or financial ties to disclose.

Human participants and Informed consent Disclosure of Research involving human participants and Informed consent The present study was approved by the Ethics Committee of Guang'anmen Hospital of China Academy of Chinese Medical Sciences and received the informed consent from all the patients.

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