Original Article

Laparoendoscopic single site surgery for extravesical repair of vesicovaginal fistula using conventional instruments: Our initial experience

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Abstract

Objective: Vesicovaginal fistula (VVF) is a major complication with psychosocial ramifications. In literature, few VVF cases have been managed by laparoendoscopic single site surgery (LESS) and for the 1st time we report VVF repair by LESS using conventional laparoscopic instruments. We present our initial experience and to assess its feasibility, safety and outcome.

Patients and Methods: From March 2012 to September 2015, LESS VVF repair was done for ten patients aged between 30 and 65 (45.6 ± 10.15) years, who presented with supratrigonal VVF. LESS was performed by modified O'Conor technique using regular trocars with conventional instruments. Data were collected regarding feasibility, intra- or post-operative pain, analgesic requirement, complication, and recovery.

Results: All 10 cases were completed successfully, without conversion to a standard laparoscopic or open approach. The mean operative time was 182.5 ± 32.25 (150–250) min. The mean blood loss was 100 mL. The respective mean visual analog score for pain on day 1, 2, and 3 was 9.2 ± 1, 5 ± 1, and 1.4 ± 2.3. The analgesic requirement in the form of intravenous tramadol on days 1, 2, and 3 was 160 ± 51.6, 80 ± 63.2, and 30 ± 48.3, mgs respectively. No major intra- or post-operative complications were observed. The mean hospital stay was 2.6 ± 0.7 (2–4) days.

Conclusion: In select patients, LESS extravesical repair of VVF using conventional laparoscopic instruments is safe, feasible with all the advantages of single port surgery at no added cost. Additional experience and comparative studies with conventional laparoscopy are warranted.

Key Words: Extravesical repair of vesicovaginal fistula, laparoendoscopic single site surgery, vesicovaginal fistula

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INTRODUCTION

For decades, vesicovaginal fistula (VVF) has been a significant challenge for surgeons and for patients as it causes psychosocial and hygienic problems, especially when repair fails or is associated with complications.[1] This can result in isolation from the society especially in third world countries like India.

In many underdeveloped countries, the most common cause of VVF is obstructed labor due to poor obstetric care, but in developed countries this is commonly an iatrogenic complication of gynecological surgery. This occurs once in every 1800 hysterectomies.[2-4] Usually, VVF occurs 1–6 weeks after gynecological or obstetric surgery.[2]

Currently, the proper timing and ideal type of corrective surgery is controversial.[5] The early or delayed repair of VVF has been questioned. In select uncomplicated cases, early reconstruction is favorable.[6] In certain uncomplicated small fistulas, a trial of conservative therapy of continuous bladder drainage for few weeks, treatment with antibiotics when required and in few select cases, a fulguration of a epithelized fistulous tract can be tried, but the chances of spontaneous closure of VVF is low (7–12.5%).[3,4]

For VVF, which is large or associated with other complication or failed with conservative measures surgical correction is indicated with a success rate of 75–97%.[3-5] Depending on the etiology, location, associated complication, and surgeon's experience different surgical techniques have been explained for repair of VVF. Open abdominal approach is advocated in patients with a large (>3 cm) fistula, supratrigonal fistula, a fistula in close proximity to ureteric orifices and especially in patients with complicated or recurrent VVF after transvaginal repair[7,8] but it is associated with all the morbidities of open surgery.

Recently, laparoscopic repair of VVF has been used, is associated with minimal surgical trauma, lesser morbidity resulting rapid convalescence, and similar success rates.[9,10] However, in laparoscopic surgery, each port inserted has a risk of complications such as bleeding, infection, pain, hernia, visceral injury, and compromised cosmetic outcome.[11]

Recently, many innovations in standard laparoscopic surgery have been tried to decrease parietal trauma, patient discomfort, and hospital stay with early convalescence and to improve visible scars. One of these is laparoendoscopic single site surgery (LESS).[12] For the past few years, LESS has been tried in variety of urological surgeries such as nephrectomy,[13,14] pyeloplasty,[14] donor nephrectomy,[14] radical nephrectomy,[14,15] and simple prostatectomy.[16]

Till now, only 2 published reports are there on VVF repair by LESS surgery. They utilized specialized custom made ports, reticulating instruments, and specialized laparoscope[17,18] to avoid instrument clashing and achieve triangulation of conventional laparoscopy. In this case series, we present our initial experience of VVF repair by LESS using conventional laparoscopic instruments.

PATIENTS AND METHODS

Since March 2012 to September 2015, ten patients presented to us with VVF after undergoing either abdominal hysterectomy or vaginal hysterectomy elsewhere for various causes as shown in Table 1. After clinical examination, all patients were investigated using ultrasonography of abdomen, intravenous urography and diagnostic cystoscopy apart from basic investigations. Patients with single, naive, high supratrigonal VVF of <3 cm with good bladder capacity, which were not accessible by vaginal approach, and with no significant comorbidities were included in this study. Institutional Review Board approval was taken for this pilot study of LESS repair of select cases of VVF using conventional laparoscopic instruments. After explaining the LESS procedure in detail, with an option for conversion to conventional laparoscopy or laparotomy, informed written consent was taken. As a protocol, LESS repair of VVF was done 3 months after the initial surgery. Single surgeon with experience in conventional laparoscopy and LESS was involved in all cases.

General surgical procedure

Under general anesthesia, patient was placed in the low lithotomy position with adequate padding of pressure points. Prophylactic antibiotic was given half an hour before the induction. Depending on the size of fistula, either 6 Fr ureteric catheters or 10 Fr Foley catheter was passed across the fistula tract under cystoscopic guidance. This helps in the identification and accurate excision of fistula. Retrograde uretrogram was done only in one case where fistula was near to left ureteric orifice. Gas leak during the procedure was avoided by plugging the vagina with Vaseline gauze. LESS extravesical repair of VVF done by modified O'Conor technique in following steps.

Port insertion

A 2–3 cm semicircular incision was made in the groove between umbilicus and lower abdominal wall. Flap was raised in the subcutaneous level, adequate enough to accommodate the ports. Pneumoperitoneum was established by inserting Veress needle. Three conventional ports (one 10 mm and two 5 mm ports) were inserted through this single incision at different levels. Final ports alignment would be as per Figure 1. Intraperitonial CO_2 maintained at 13–15 mm Hg. Patient was placed in full Trendelenburg position, to displace bowel away from operating

Table 1: Demographic and operative data of patients undergone laparoendoscopic single-site surgery extravesical repair of vesicovaginal fistula

Patient number	Age	Fistula etiology	Duration (months)	Size (cm)	Operative time	Drain	Hospital stay (days)	Complication (clavien classification)	Follow-up in (months)
1	38	Abdominal hystrectomy for DUB*	3	1	250	No	4	Surgical emphysema (grade I)	28
2	30	Abdominal hystrectomy for uterine rupture	3	3	150	No	3	Nil	21
3	40	Abdominal hystrectomy for DUB*	4	1	180	Yes	3	Nil	15
4	65	Vaginal hystrectomy for prolapse uterus	6	1	200	No	2	Surgical emphysema and port site infection (Grade I)	11
5	45	Abdominal hystrectomy for DUB*	3	2	220	No	3	Nil	8
6	57	Vaginal hystrectomy for prolapse uterus	3	2	180	No	2	Nil	6
7	46	Abdominal hystrectomy for large fibroid uterus	3	2	170	Yes	2	Nil	7
8	52	Vaginal hystrectomy for DUB*	4	1	160	No	2	Postoperative fever	10
9	39	Abdominal hystrectomy for uterine rupture	3	1	150	No	2	Nil	14
10	44	Abdominal hystrectomy for large fibroid uterus	4	1.5	165	Yes	3	Nil	12
Mean±SD	45.6±10.15		3.6±0.96	1.55±0.685	182.5±32.25		2.6±0.7		13.2±6.8

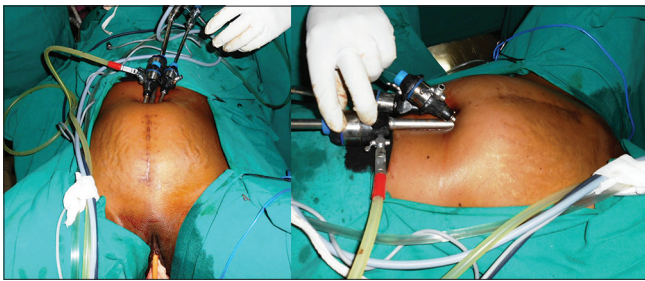*Dysfunctional uterine bleeding. SD: Standard deviation

Figure 1: Port insertion method - conventional one central camera port (10 mm), two working ports (5 mm) were inserted after creating 2–3 cm periumbilical subcutaneous flap and final arrangement of working ports

site. For surgery, 10 mm 30° Storz rigid laparoscope and conventional working instruments were used.

Adhesiolysis

VVF is usually associated with lot of omental, small intestinal or sigmoid colon adhesion to bladder and vaginal wall near fistula tract and also to anterior abdominal wall as in most of our cases [Figure 2a]. Initial part of our dissection was to release these adhesions to expose both posterior bladder wall and vaginal vault. This was done by sharp and blunt dissection along with judicious use of harmonic and monopolar electrocautery to avoid inadvertent damage to intestines.

Fistula dissection

Approximate fistula site was identified by a gentle tug on the catheter, which was passed through the fistula. A minimal cystotomy in the midline was done [Figure 2b] above this adherent area till one edge of the fistula. The vaginally placed Foley catheter was pulled across the cystotomy and was used to retract the anterior bladder wall, splinting open the cystotomy to allow better visualization of the fistula and ureteral orifices. The fistula was circumscribed and the complete separation of the fistulous tract from the bladder was done using sharp dissection by curved sharp scissors [Figure 2c]. Care was taken to avoid inadvertent injury to ureteral orifices which lie in close proximity and to avoid button hole in bladder or vaginal wall, which may complicate subsequent closure.

Repair of the fistula

The vagina was then sutured using 3–0 polyglactin in a single layer either transversely or vertically depending on the size of the gap and the orientation that allows less tension on the suture line [Figure 2d]. Similarly, the bladder was sutured starting from below in a vertical manner using 3–0 polyglactin in a single layer taking care of ureteric orifices [Figure 2f]. After final closure of limited cystostomy, the bladder was moderately distended with saline to assess the integrity of closure. In the event of any minor leakage, additional enforcing interrupted sutures were applied.

Tissue interposition

Between the bladder and the vaginal suture lines, a well vascularized pedicled omentum was interposed in four cases. In two cases where omentum was not coming easily in spite of mobilization, the epiploic appendices of the sigmoid colon [Figure 2e] was interposed. A drain was then placed in the rectovaginal pouch in four cases. Bladder was catheterized with 20 Fr three-way Foleys for continuous drainage. At the end of the procedure, vagina was packed with betadine soaked roller gauze and this was removed the next day morning.
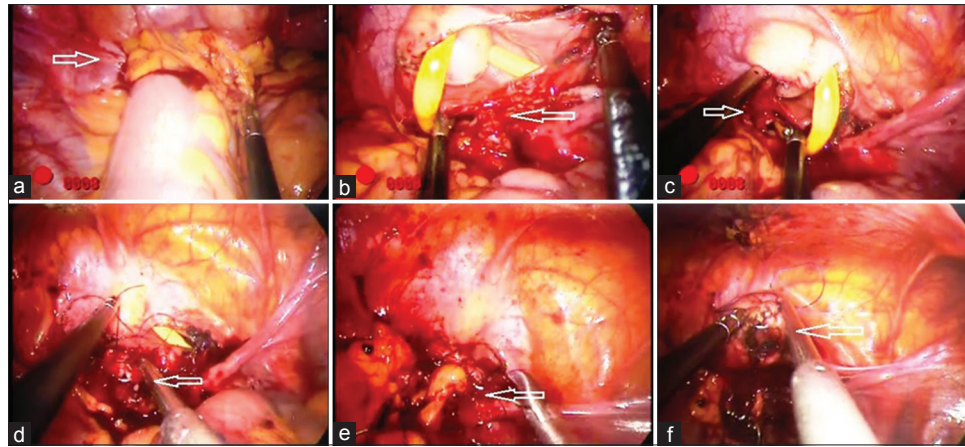
Figure 2: (a) Adhesiolysis of adherent sigmoid colon, (b) separating posterior vaginal wall, (c) dissecting off the fistula, (d) suturing of the vagina, (e) epiploic appendixes interposed, (f) cystotomy closure

Postoperative care and follow-up

When drainage was <50 mL, the drain was removed and in all our cases, we were able to take it out by 24 h. The important aspect of the postoperative course after VVF repair was to maintain urethral catheter patency by preventing clot obstruction causing retention and leakage through the repair. Catheter was flushed only if there was any suspicion of catheter block. Ambulation was encouraged from the next postoperative day and antibiotics were given empirically to prevent infection. Patients were discharged home with an indwelling urethral catheter after educating them regarding catheter care and need to report urgently if it was not draining properly. Catheter was removed at 3 weeks, after cystogram. Anticholinergics were given to all patients to prevent bladder spasm.

The outcomes of all 10 cases of LESS VVF repair were evaluated by determining the surgical complications, the operative time, number of cases requiring conversion to conventional laparoscopy or open abdominal surgery, postoperative analgesic requirement, the duration of hospital stay, the time taken to return to routine life, and finally outcome after catheter removal. Safety of the procedure was evaluated by assessing the overall complications that occurred either during or after surgery. The pain experienced by the patients was analyzed using the postoperative 10-point visual analog score (VAS), where no pain and the worst pain were scored at 0 and 10 points, respectively. Success of the procedure was evaluated by cystogram at the end of 3 weeks before per urethral catheter removal as per the institution protocol and by enquiring the patient about urinary continence during follow-up visits.

RESULTS

A total of 10 patients had undergone LESS extravesical repair of VVF [Table 1]. Mean age at presentation was 45.6 ± 10.15 (30–65) years, and body mass index was 19.5 ± 2.48 kg/m². All patients had high supratrigonal VVF with approximate size of VVF ranging from 1 to 3 cm. Mean duration of fistula was 3.6 ± 0.96 months (3–6 months). None of the patients had associated ureteral injury or previous attempts of VVF repair. The mean operation time was 182.5 ± 32.25 (150–250) minutes. During surgery, the maximum estimated blood loss was approximately 100 mL. All cases were completed successfully, without conversion to standard laparoscopic or open approach. The final aesthetic outcome was as shown in Figure 3. None of the patients required blood transfusion. There were no major intra- or post-operative complications. Two patients had surgical emphysema of lower abdomen, one had port site wound infection, and one patient had postoperative fever, all of which were managed conservatively. For all patients, the respective postoperative mean VAS scores for pain on day 1, 2, and 3 were 9.2 ± 1, 5 ± 1, and 1.4 ± 2.3. Similarly analgesic requirement in the form of intravenous tramadol on days 1, 2, and 3 was 160 ± 51.6, 80 ± 63.2, and 30 ± 48.3 mgs, respectively [Table 2]. All patients began oral intake by next day. Mean duration of hospital stay was 2.6 ± 0.7 days. Although all patients had returned to routine life on average 5.16 ± 1.16 days after surgery, it took on an average 4–5 weeks to return to normal life due to presence of catheter for 3 weeks. During the mean follow-up of 13.2 ± 6.8 (6–30) months, all patients had successful outcome with normal voiding with no VVF recurrence.

DISCUSSION

Urinary incontinence due to genitourinary fistula is associated with significant psychological trauma for the patient with social ramifications. Treating such a demoralized patient is challenging, as the surgeon has to ensure no recurrence with decrease the morbidity.

Currently, it is still debatable as to whether the abdominal or vaginal route is most suitable for VVF repair. But approach to repair VVF depends on several factors such as the size, number and location of fistulas, previous history of repair, and concomitant pathological conditions.[6] While the proponents of the vaginal approach have argued because of its lower patient morbidity, blood loss, and postoperative bladder irritability, similarly the proponents of the abdominal approach argue that it is reproducible and associated with durable success rate.[19] The limited cystotomy has decreased the morbidity of the historic O'Conor procedure[20] in which the bladder is bivalved to the level of the fistula. In addition, some advocate abdominal limited transvesical approach for the high lying

Figure 3: Final wound closure with cosmetic outcome with and without drain

fistulas, a narrow introitus, poorly estrogenized or scarred tissue, or morbid obesity are the indications.[4,6] However, choice of approach for majority of surgeons is depends on their training and experience.

Irrespective of the approach selected, the principles of surgical repair for VVF include favorable tissue conditions (good vascularity, and freedom from infection and inflammation), complete separation of the fistulous tract, tension-free and watertight multilayered closure avoiding overlapping suture lines, interposition of vascularized tissue between the bladder and the vaginal suture lines, and continuous postoperative bladder drainage.[21]
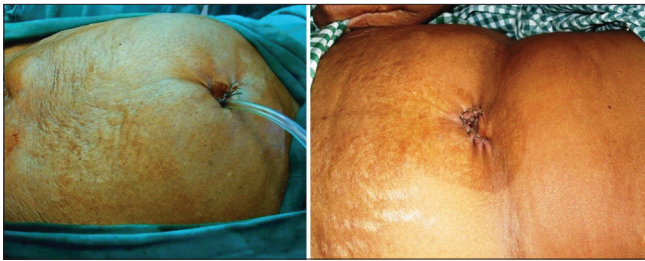
While most VVF are managed by the vaginal approach which has a least morbidity, for those cases requiring an abdominal approach, many surgeons with laparoscopic experience managing VVF repair laparoscopically as an alternative for open approach with comparable success rates [Table 3]. Since it was first reported in 1994 by Nezhat *et al.*,[22] there had been several case reports and a few case series of laparoscopic VVF repair as shown in Table 3. The author Sotelo *et al.*[9] published the largest series of laparoscopic VVF repair confirming its

Table 2: Analysis of pain and analgesic requirement

Patient number	Visual analog score±SD				Intravenous tramadol reqirement (mg)±SD			
	Day 1	Day 2	Day 3	Mean±SD	Day 1	Day 2	Day 3	Mean±SD
1	10	6	4	6.6±3	200	100	100	133.3±57.7
2	8	4	0	4±4	100	0	0	33.3±57.7
3	10	6	0	5.3±5	200	100	0	100±100
4	8	4	6	6±2	100	100	100	100
5	10	6	0	5.3±5	200	200	0	133.3±115.4
6	10	6	0	5.3±5	100	100	0	66.6±57.7
7	8	6	4	6±2	200	100	100	133±57.7
8	10	4	0	4.66±5	200	100	0	66.6±57.7
9	10	4	0	4.66±5	200	0	0	33.3±57.7
10	8	4	0	4±4	100	0	0	33.3±57.7
Overall	9.2±1	5±1	1.4±2.3	5.2±3.9	160±51.6	80±63.2	30±48.3	90±65.57

SD: Standard deviation

Table 3: Case reports of laparoscopic and laparoendoscopic single-site surgery vesicovaginal fistula repair

References	Patient Number	Laparoscopc modality	Mean operative time (minutes)	Mean blood loss (cc)	Mean hospital stay (days)	Mean catheter duration (days)	Mean follow-up in months	Successful outcome (%)
Nezhat *et al.*[22]	1	Conventional	85	100	1	10	Data NA	100
Phipps[26]	2	Conventional	160	Data NA	1	10	Data NA	100
Von Theobald *et al.*[23]	1	Conventional	70	100	8	7	6	100
Ou *et al.*[10]	2	Conventional	Data NA	Data NA	2-12	14-20	Data NA	100
Qi Zhang *et al.*[27]	18	Conventional	135	Data NA	1	15	22.7	100
Chibber *et al.*[28]	8	Conventional	220	Data NA	3	14-20	3-40*	87.5
Sotelo *et al.*[9]	15	Conventional	170	Data NA	3	10.4	26.2	93
Rizvi *et al.*[29]	8	Conventional	145	60 ml	2	14	29	100
Abdel-Karim *et al.*[30]	15	Conventional	171.6	110±17	3±1	21	18.9±8.6	100
Abdel-Karim *et al.*[17]	5	LESS	198±27	90±25	2	Data NA	8±3.2	100
Roslan *et al.*[18]	1	LESS	170	Data NA	5	14	6	100
Our series	10	LESS by conventional instruments	182.5±32	100	2.6±0.7	14	13.2±6.8	100

*Value is in range. LESS: Laparoendoscopic single-site surgery, NA: Not available

feasibility and efficacy. von Theobald et al.[23] described omental fiap interposition during laparoscopic VVF repair to prevent recurrence. Laparoscopic VVF repair decreases the morbidity of open surgery, while success rates are as comparable to those of transabdominal open repair.[9,10]

Since Rane et al.[13] first reported LESS nephrectomy, many centers have reported this modality for various urological problems and its advantages over conventional laparoscopy in terms of better aesthetic outcome, early return to normal life, lesser analgesic requirement and hospital stay with lesser port site-related complications, such as hernia, hemorrhage, and infection.[13-20]

However, till date, only one published case series[17] and one case report[18] were present on LESS repair of VVF. In both, the authors had used specialized access ports such as the TriPort (Olympus, Tokyo, Japan), prebent instruments (HiQ LS hand instruments, Olympus, Tokyo, Japan), and EndoEYE LTF VP camera (Olympus, Tokyo, Japan). In comparison, we have used conventional laparoscopic instruments and laparoscope for VVF repair, thereby decreasing the amount of investment required. Our technique of port insertion which we already described in our earlier published series,[24] is similar to the one described by Raman et al.[25] where 5 or 10 mm standard working ports are directly inserted through the rectus fascia, under the periumbilical skin flap. To increase ergonomic maneuverability and to decrease clashing of instruments, ports are inserted at different levels and assistant does the navigation of endocamera at a distance.

All our patients had a single, naive, high supratrigonal VVF of <3 cm with good bladder capacity and minimal adhesions, which were not accessible by vaginal approach and with no significant comorbidities. In majority of our cases (80%), the cause for VVF was hysterectomy for gynecological cause. In our view, these are the ideal indications for laparoscopic either conventional or LESS extravesical repair of VVF. Operative time needed in our series is more in comparison to other published series [Table 3]. This is reasonable because we are exploring newer modalities of management of VVF and in comparison to other series,[17] we are not using additional port for intracorporeal suturing. With increase in experience, the operative time has decreased from 240 min in the first case to 150 min for the last case. However, many factors such as the presence of intra-abdominal adhesions caused by previous abdominal surgery, the skills and experience of the laparoscopic surgeon, the type and location of the VVF fistula contribute to operative time.

Surgical procedure of LESS repair of VVF by extravesical approach with limited cystotomy is similar to conventional laparoscopic repair of VVF. Advantage of limited cystotomy as compared to classical O'Connor procedure,[17] is that it allows direct access to the fistula without bladder mobilization and hence allows quick bladder repair with no suprapubic cystostomy and its associated morbidity.

LESS VVF repair using conventional instruments is associated with several advantages. First, one small periumbilical incision of LESS repair increases the patient esthetic satisfaction and decreases the postoperative pain. In the present study, the postoperative VAS scores for pain and analgesic requirement, which we objectively studied, revealed a substantial reduction of pain after surgery [Table 2]. This is similarly to study by Abdel-Karim et al.,[17] where they compared their conventional laparoscopic repair of VVF[30] with LESS repair of VVF, found that both the postoperative pain and the hospital stay were significantly less in the LESS group. The duration of stay and the early return to routine activities in our series was less or comparable to published reports on conventional laparoscopic VVF repair [Table 3]. Second, by using conventional instruments, no additional expenditure is required to start LESS program. Third, surgeon who is proficient with standard laparoscopy can very well and quickly adapt to LESS surgery.

There are certain drawbacks using conventional instruments in LESS surgery like, first there will be clashing of instruments but it can be decreased by inserting the ports at different planes and the camera person doing the navigation at a distance. Second, there may be gaseous leak from port sites hindering the surgical progress and sometime leads to surgical emphysema.

In our patients, there were no major intra- or post-operative complications similar to other series of conventional laparoscopic repair of VVF.[9,10,30] There was no recurrence of the fistula indicating the effectiveness of watertight closure of the bladder during LESS repair of VVF.

In our study, patients follow-up ranged from 6 to 30 months. It showed complete continence in all patients and is comparable to conventional laparoscopic repair of VVF [Table 3]. The success of LESS repair of VVFs in our series may be due to many factors such as, selection of patients, imitating the principles of open surgical repair of VVF. However, our series consist of only 10 select patients, so it is difficult to rationalize the outcome of LESS repair and compare with that of conventional laparoscopic repair.

CONCLUSION

In select patients, LESS repair of supratrigonal VVF using conventional laparoscopic instruments is safe and feasible with

no added cost. As with any LESS surgery, it is associated with less morbidity and early convalescence. In experienced hands, the technique may be considered a good alternative to conventional laparoscopic repair of VVF but additional experience with prospective comparative studies with conventional laparoscopy by a larger group of patients are needed.

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Conflicts of interest
There are no conflicts of interest.

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