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Original Article

Clinical relevance and treatment outcomes of vesicovaginal fistula (VVF) after obstetric and gynecologic surgery

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ABSTRACT

Objective: Vesicovaginal fistulas (VVF) are consequences from obstetric and gynecologic surgery. Treatment approach from either abdominal or vaginal route have its own pros and cons. The study aims to present the anatomical, clinical and lower urinary tract symptom outcomes of women with VVF.
Materials and methods: A retrospective case series conducted patients with VVF. Data regarding preoperative evaluation, surgical treatment, and post-operative follow-ups were collected. Surgical approach depended on the cause, type, number, size, location, and time of onset of the fistula. Postoperatively, foley catheter was maintained for at least 1 week with cystoscopy performed prior to removal. Follow-up evaluation included cystoscopy, bladder diary, UDI-6 and IIQ-7 questionnaires and multi-channel urodynamic study.
Results: Of the 15 patients that were evaluated, 1 had spontaneous closure, 8 were repaired vaginally and 6 abdominally. Patients repaired vaginally were significantly noted to have a mean age of 50.3 ± 7.1 years with VVFs located adjacent the supra-trigone area having a mean distance of 1.7 ± 0.5 cm from the ureteric orifice. Its operative time and hospital stay were significantly shorter. In contrast, abdominally repaired patients had mean age of 38.0 ± 8.2 years and VVFs with mean distance of 0.4 ± 0.4 cm from the ureteric orifice. Post-operatively, 2 cases (14.2%, 2/14) of VVF recurrence and de novo urodynamic stress incontinence (USI) (25%, 2/8) were noted after vaginal repair and 3 cases (50%, 3/6) of concurrent ureteric injury and overactive bladder after abdominal repair.
Conclusion: Treatment outcomes for vaginal and abdominal repair yielded good results. Though the vaginal route had higher incidence of recurrence and de novo USI, its less invasiveness, faster recovery period, and no association with post-op overactive bladder made it more preferable than the abdominal approach.

Introduction

Vesicovaginal fistulas (VVFs) are devastating consequences resulting from obstetric labor and trauma for developing countries and from pelvic surgeries or radiotherapy for developed countries [1]. Incidence for obstetric fistula from demographic health survey ranges 0.16%–4.7% in Sub-Sahara Africa and 0.08–2.7% in South

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Asia [2] while gynecologic fistula approximates 1 in 1200 from gynecologic procedures [3].

Currently, comparative assessment of fistulas within published literature is impossible since there is no accepted standardized method to classify them. Previous classifications were prone to subjective variations, which prompted Goh to make an objective classification utilizing the external urinary meatus as a reference point for measuring the distance of the distal edge of the fistula. Further sub-classifications were also included which covered the size of the fistula, extent of scarring, and vaginal length [4].

Associated functional abnormality of the lower urinary tract has been reported prior to repair of urogenital fistulas. In a study conducted by Browning and Menber persistence and development of stress urinary incontinence was significantly noted after surgical closure of fistula especially if the urethra was involved [5]. Likewise Dolan et al. also demonstrates lower urinary tract symptoms after successful anatomical closure of urogenital fistula of surgical etiology with no significant difference in urodynamic abnormalities in different types of fistula [6]. Since the association of the type of surgical procedure and lower urinary tract symptoms has not been explored, it became the main interest of the present study. Thus, the study aimed to evaluate the anatomical, clinical and lower urinary tract symptom outcomes of women with VVF after obstetric and gynecologic surgery.

Materials and methods

This was a retrospective case series study conducted in the Urogynecology department of Chang Gung Memorial Hospital from January 2004 to February 2017 with Institutional Review Board approval (IRB-No.201700798B0). A total of fifteen patients diagnosed VVF were evaluated. Pre-operative work-ups such as detailing of medical history, physical exam, and pelvic exams assessing vaginal caliber, length and mobility were done. Laboratory tests included urinalysis, urine culture, renal function and coagulation studies. Imaging studies performed were intravenous pyelogram and computed tomography to assess the actual extent of injury. Cystoscopy was done using a flexible cystoscope with instillation of methylene blue to assess the size, number, location and proximity of the fistula from ureteric orifices and bladder neck.

Surgical treatment commenced when the fistula site and adjacent tissues were pliable, non-inflamed, scarred, and free of granulation tissue and necrosis. Speculum exam was performed every 3–4 weeks to monitor tissue changes. While awaiting surgery, patients were temporarily inserted with Foley catheter for continuous bladder drainage. Surgical approach depended on the cause, size, number, and location of the fistula. The transvaginal approach was preferred when possible. The abdominal approach through laparotomy was considered when a potential ureteric injury was anticipated, the fistula was close to the ureteric orifice, complex type, multiple in number, and access thru the vagina was unyielding.

Post-operatively, Foley catheter was frequently checked for adequate drainage and maintained for at least 1 week. Prior to removal a cystoscopy was performed to ascertain tissue integrity. Follow-ups were done at 1 week, 2 weeks, 1 month, 3 months, 6 months and yearly thereafter. Evaluation included pelvic exam, cystoscopy using a flexible cystoscope on an out-patient basis [7], 1-h pad test, bladder diary, Incontinence Impact Questionnaire (IIQ-7) [8] and Urogenital Distress Inventory (UDI-6) [9]. An urodynamic test was offered to patients with urine leakage.

Urodynamic Stress Incontinence (USI) was diagnosed to patients who demonstrated involuntary leakage of urine during increased abdominal pressure in the absence of detrusor contraction observed during filling cystometry. Overactive bladder (OAB) was defined as patients presenting with urinary urgency, frequency of $\geq$10 voids per day as reflected in the bladder diary, or an index score of $\geq$1 on UDI-6 question #2 for a duration of 1 month or longer.

Surgical procedure

Transvaginal

Patient was placed in a dorsal lithotomy position under general anesthesia. Cystoscopy was done before the start of procedure to visualize the fistula and ureteric orifices. Retrograde placement of ureteric stent was placed for fistula close to the ureteral orifice. A self-retaining retractor was placed inside the vagina exposing the fistula. French-8 sized Foley catheter was inserted into the fistula providing traction and stability during dissection. A circumscribing incision on the vaginal epithelium was then made around the fistula. The vaginal epithelium was dissected off from the underlying fibromuscularis layer until healthy tissues were obtained. The fibrosed fistula edges were excised with care. Once the fistula was adequately mobilized, layered closure was performed. The first layer, bladder mucosa, was closed with interrupted delayed absorbable sutures then a second layer of fibromuscular connective tissue was closed in a perpendicular fashion. Water-tightness was ensured by retrofilling the bladder with sterile water. Lastly, the vaginal flap was closed over the repair in a perpendicular fashion to avoid overlapping of suture lines. Cystoscopy was repeated at the end to ensure patency of ureteric orifices. Transurethral Foley catheter was inserted for continuous bladder drainage.

Transabdominal

The patient was placed in a low lithotomy position under general anesthesia. Either a midline or a pfannenstiel incision was made. The bladder was distended with normal saline solution for easy identification then bisected from the dome down to the fistula posteriorly. Ureteral stents were placed for fistula close to the ureteral orifice. A plane was created between the bladder and vagina, dissecting until adequate tissue can be mobilized for tension-free closure. The fistula was completely excised. The vaginal muscularis was closed using absorbable suture then the bladder in two layers. No flaps were done. A transurethral Foley catheter was left in place.

Statistical analysis

Descriptive statistics were used for demographics and perioperative data. Paired-samples t-test, chi-square or Fisher exact test were applied for comparison of pre- and post-operative continuous and categorical data, respectively. Values of $p < 0.05$ were considered statistically significant for all comparisons. All statistical methods were performed using the commercial software SPSS, version 17. All methods, definitions, and units conform to the standards recommended by the IUGA/ICS, except where specifically noted [10].

Results

Table 1 illustrates the demographic data of the patients. Patients who developed fistula from pelvic procedures were aged 40–65 years old. Those from obstetric causes were aged 28–37 years old. All patients were parous. Eleven of the patients had VVF due to hysterectomy and four patients due to cesarean section. One patient had spontaneous closure of the fistula following continuous bladder drainage with a VVF size of 0.2 cm located in the supra-

Table 1
Patients characteristics.

	Age y/o	BMI kg/cm^2	Parity	Medical & Surgical History	Cause of VVF	VVF duration (days)	Surgical method	VVF size, distance to ureter and location	OP-time (min), blood loss (ml) Hb-change (g/dl)	Post-OP Foley maintained (day)	Hospital stay (day)	FU period (month)	Complication& post-OP LUTS	Post-OP UDI-6, IIQ-7
1	46	22.2	P2	C/Sx2; MYO	AH	210	Vaginal	0.5 cm, 2 cm to left-ureter orifice, Supra-trigon	101, 50, 0.4	12	4.00	120	USI	6, 7
2	43	21.5	P3	C/Sx3; MYO	AH	150	Vaginal	1 cm, 1.5 cm to left-ureter orifice, Supra-trigon	155, 300, 2.0	20	7.00	24	USI Failure	13, 14
3	49	21.4	P3	MYO	LV	45	Vaginal	0.5 cm, 2 cm to left-ureter orifice, Supra-trigon	75, 50, 0.5	13	5.00	60	UTI	6, 6
4	49	23.4	P3		LH	180	Vaginal	1 cm, 2 cm to right-ureter orifice,Supra-trigon	137, 200, 0.3	10	8.00	12		8, 7
5	65	25.6	P4	DM	LH	71	Vaginal	1 cm, 1 cm to right-ureter orifice, Supra-trigon	184, 50, 0.2	12	7.00	24		10, 7
6	49	22.0	P3		AH	190	Vaginal	1 cm, 2 cm to left-ureter orifice, Supra-trigon	113, 15, 0.9	12	4.00	48		7, 8
7	56	26.0	P2	HT	AH	120	Vaginal	0.5 cm, 2 cm to left-ureter orifice, Supra-trigon	72, 100, 1.5	12	4.00	48		10, 7
8	45	26.0	P1	C/Sx1	AH	30	Vaginal	1.5 cm, 1 cm to left-ureter orifice, Supra-trigon	55, 50, 0.9	21	4.00	6	Failure	12, 14
9	28	26.0	P2	C/Sx1	C/S	18	Abdominal	1 cm, 1 cm to left-ureter orifice, Supra-trigon	362, 800, 3.3	57	12.00	10		12, 6
10	33	24.2	P1	C/Sx1	C/S	157	Abdominal	1 cm, 0.1 cm to left-ureter orifice, Trigon	139, 30, 1.1	20	8.00	8	OAB	12, 6
11	35	26.8	P1		C/S	20	Abdominal	1 cm, 0.5 cm to left-ureter orifice, Supra-trigon	161, 150, 0.5	14	8.00	12	OAB	15, 13
12	37	34.2	P2	C/Sx1	C/S	30	Abdominal	1 cm, 0.5 cm to right-ureter orifice, Supra-trigon	121, 50, 2.3	10	7.00	7	OAB, UTI	14, 9
13	51	21.9	P2	HT	AH	20	Abdominal	1 cm, 0.1 cm to left-ureter orifice, Trigon	224, 150, 2.3	10	8.00	72		14, 14
14	44	22.9	P2		AH	200	Abdominal	1 cm, 0.1 cm to left-ureter orifice, Trigon	218, 100, 0.5	45	9.00	24		13, 11
15	40	19.6	P1	MYO	LH	40	x	0.2 cm,2 cm to left-ureter orifice, Supra-trigon	spontaneous recover	x		12		10, 6

BMI, body mass index; VVF, vesicovaginal fistula; AH, abdominal hysterectomy; MYO, myomectomy; LH, laparoscopy hysterectomy; C/S, caesarean section; DM, diabetic mellitus; HT, hypertension; OP, operation; Hb, haemoglobin; SUI, stress urinary incontinence; OAB, overactive bladder; UTI, urinary tract infection; Obj., objective; LUTS, lower urinary tract symptoms; UDI-6, Urinary Distress Inventory (score 0–24); IIQ-7, Incontinence Impact Questionnaire (score 0–28).

trigone area. Fourteen patients underwent surgical repair, 8 through the vaginal route and 4 through the abdominal route. Retrograde placement of ureteric stent was placed for fistula close to the ureteral orifice in 3 patients for vaginal route. All VVF repair cases were primarily closed. Fistula remained for 18–210 days from diagnosis to commencement of anatomical closure. Three patients had their fistula in the trigone area and 11 patients in the supra-trigone area. VVF size ranged from 0.5 to 1.5 cm. Post-operatively, Foley catheter was maintained for 10 days to a maximum of 57 days. Follow-up period ranged from 6 to 120 months. Post-operative complications such as recurrent fistula, urodynamic stress incontinence (USI), urinary tract infection and overactive bladder were noted in 7 patients. Post-operative subjective assessment of lower urinary symptoms through UDI-6 and IIQ-7 questionnaires showed significant improvement of UDI-6 with the vaginal route as compared to abdominal route.

Comparative data between surgical procedures were detailed in Table 2. Patients repaired vaginally were significantly older with a mean age of 50.3 ± 7.1 years while those abdominally repaired aged 38.0 ± 8.2 years old. Eight patients had prior pelvic surgeries with no significant impact to surgical route of repair. Significant difference was noted between the etiology of VVF and route of repair. VVF resulting from hysterectomy were repaired vaginally ($p = 0.015$) while those from cesarean section were repaired abdominally. VVF remained for 124.5 ± 69.1 days before commencement of vaginal repair in contrast to 74.2 ± 82.1 days with abdominal repair with no significant difference. Mean size of VVF with vaginal repair was 8.8 ± 3.5 mm while abdominal repair was 11.2 ± 1.3 mm with no significant difference when compared ($p = 0.408$). The vaginal route had 2 cases of recurrence (14.2%, 2/14) while the abdominal route had none. Leakage of urine from the vagina occurred on the 10th and 12th day post surgery. It was then surgically managed through the abdominal route by an urologist. At present, these 2 patients remained continent. Concurrent ureteric injury was significantly noted in 3 patients (50%, 3/6) who underwent abdominal repair. VVFs that were located adjacent to the supra-trigone area were significantly repaired through the vaginal route ($p = 0.055$). Distance of VVF from the ureteric orifice significantly affects repair procedure ($p = <0.001$). The vaginal route was undertaken for mean distance of 1.7 ± 0.5 cm and the abdominal route for mean distance of 0.4 ± 0.4 cm from the ureteric orifice. Mean operative time was significantly longer ($p = 0.023$) with the

Table 2
The patient's characteristics and VVF operation.

	VVF, n = 15	Vaginal, n = 8	Abdominal, n = 6	P value
Mean age (year)	44.7 ± 9.4 (39.5–49.8)	50.3 ± 7.1 (44.3–56.2)	38.0 ± 8.2 (29.3–46.7)	**0.011**[a]
Median parity	2 (1–4)	3 (1–4)	2 (1–3)	0.074[a]
Mean BMI (kg/m2)	24.3 ± 3.5 (22.3–26.2)	23.5 ± 2.1 (21.8–25.2)	26.0 ± 4.4 (21.4–30.7)	0.179[a]
Prior pelvic surgery (n %)	8 (53.3%)	4	3	0.608[b]
Cause of VVF (n %)				
Hysterctomy AH/LH	11 (7 + 4) (73.3%)	8 (5 + 3)	2 (2 + 0)	**0.015**[b]
C/S	4 (26.7%)	0	4	
VVF duration (days)	98.7 ± 74.4 (58.9–141.3)	124.5 ± 69.1 (66.7–182.3)	74.2 ± 82.1 (11.9–160.3)	0.237[a]
Mean size of VVF (mm)	8.8 ± 3.2 (7.0–10.6)	8.8 ± 3.5 (5.8–11.2)	11.2 ± 1.3 (4.0–6.8)	0.408[a]
Recurrent VVF (n %)	2 (13.3%)	2	0	0.473[b]
Concurrent Ureter injury (n %)	3 (13.4%)	0	3	0.055[b]
Supra-trigon VVF (n %)	12 (80.0%)	8	3	0.055[b]
Distance to ureter orifice (cm)	1.2 ± 0.8 (0.8–1.6)	1.7 ± 0.5 (1.3–2.1)	0.4 ± 0.4 (0.1–0.8)	**<0.001**[a]
Medical disease				
DM	1 (6.7%)	1	0	0.571[b]
HT	2 (13.4%)	1	1	0.473[b]
Post-menopause	3 (20.0%)	2	1	0.615[b]
Mean OP time (min)	151.2 ± 79.4 (105.4–197.1)	111.5 ± 44.7 (74.1–148.9)	204.1 ± 87.8 (112.1–296.3)	**0.023**[a]
Mean OP blood loss (ml)	149.6 ± 202.9 (32.5–466.8)	101.8 ± 98.0 (20.0–283.8)	213.3 ± 291.7 (52.7–519.4)	0.328[a]
Mean Hb difference (g/dl)	1.2 ± 1.0 (0.6–1.7)	0.8 ± 0.6 (0.3–1.4)	1.6 ± 1.2 (0.2–2.9)	0.184[a]
Foley maintained post-repair (days)	15.4 ± 4.9 (12.5–18.2)	14.0 ± 4.1 (10.6–17.4)	26.0 ± 20.1 (7.9–47.1)	**0.021**[a]
Mean hospital stay (days)	7.4 ± 2.8 (5.7–9.0)	5.4 ± 1.6 (4.0–6.8)	8.7 ± 1.8 (6.8–10.5)	**0.004**[a]
Median follow-up (months)	33.9 ± 32.7 (15.0–52.8)	42.8 ± 36.5 (12.2–73.3)	22.1 ± 25.2 (6.3–48.9)	0.260[a]
Complications,				
Ureter injury	0 (0%)	0	0	
USI	2 (13.3%)	2 (25.0%)	0	0.473[b]
OAB	3 (20.0%)	0	3 (50.0%)	0.055[b]
UTI	2 (13.3%)	1 (12.5%)	1 (16.7%)	0.692[b]
Failure	2 (13.3%)	2 (25.0%)	0	0.473[b]
Obj. cure (n, %)	15 (100%)	6 (75.0%)	6 (100.0%)	0.473[b]

Data listed as mean ± standard deviation with 95% confidence interval in parentheses.
BMI, body mass index; VVF, vesicovaginal fistula; AH, abdominal hysterectomy; LH, laparoscopy hysterectomy; C/S, caesarean section; DM, diabetic mellitus; HT, hypertension; OP, operation; Hb, haemoglobin; USI, urodynamic stress incontinence; OAB, overactive bladder; UTI, urinary tract infection; Obj., objective.
*P < 0.05 statistically significant.
**One patient has spontaneous recovery after Foley maintained for 40 days.
[a] Student t test.
[b] Fisher's exact test.

abdominal route consuming 204.1 ± 87.8 min while vaginal repair took up 111.5 ± 44.7 min. Mean operative blood loss was also noted to be higher with abdominal repair loosing 213.3 ± 291.7 ml compared to 101.8 ± 98.0 ml with vaginal repair, however the difference was not significant. At the same time, patients who underwent abdominal repair stayed significantly longer in the hospital (p = 0.004) at a mean of 8.7 ± 1.8 days while vaginally repaired patients stayed 5.4 ± 1.6 days. Post-operatively, Foley catheter was maintained longer for abdominal repair at a mean of 26.0 ± 20.1 days in contrast to the 14.0 ± 4.1 days with vaginal repair with no significant difference (p = 0.121) noted. De novo urodynamic stress incontinence (USI) was observed in 2 patients (25%, 2/8) who underwent vaginal repair while abdominally repaired patients had none. Anti-incontinence surgery was not performed, as symptoms were tolerable. Overactive bladder was significantly noted in 3 patients abdominally repaired (50%, 3/6; p = 0.05). Lastly, 2 patients also had urinary tract infection with each surgical route having one patient.

Discussion

The case series describes the outcome of VVF repair over a period of 12 years. We have demonstrated that route of VVF repair depends on several factors, such as distance from ureteric orifice, patient's condition, accessibility from vagina and the type of fistula either simple or complex. Most obstetric causes of VVF tend to be low-lying located near the bladder base, trigone, and urethra, since it results from impacted head and/or instrumental delivery [11]. They are complex, multiple in number, and closer to the ureteric orifice, thus were repaired abdominally. Whereas, gynecologic causes of VVF are high-lying resulting from hysterectomies [11] and tend to be simple, single in number, located farther from the ureteric orifice easy access through the vagina.

Controversy exists as to the timing of VVF repair. Conventional teaching dictates a waiting period of at least 3 months for the fistula tract to mature and tissue quality to improve. Yet, several studies have recommended early repair within 72 h or when tissues are deemed suitable [12] to spare the patient of devastating physical, psychological and social stress. Following the recommendation, VVF remained on an average of 98.7 ± 74.4 days prior to surgical repair awaiting maturity of fistula with no significant correlation to surgical route of repair.

Most review articles have agreed that the bladder should be continuously drained after surgical repair of fistula, however, optimal duration of drainage remains unclear. Longer duration of bladder catheterization increases the risk of urinary tract infections and other associated morbidities. In the current study, foley catheter is removed once cystoscopy shows good tissue integrity, which resulted to a minimum of 10 days and maximum of 57 days prior to removal.

The present study preferred the vaginal route whenever possible for these reasons: shorter operating time, lesser blood loss and hospital stay, and shorter maintenance of Foley catheter. However, failure rate for vaginal repair is at 14% and 0% for abdominal route. Relatively, a large cohort prospective study done by Frazyngier et al. shows failure rate for vaginal repair at 18.8% and abdominal route at 10.5% [13]. Re-operation of recurrent fistulas should be approached with care. Success rate for subsequent repair

attempts decreases to 79% then to 53% with more than 2 attempts [14]. In our study, subsequent repair of the recurrent fistula was done through the abdominal route with success.

Factors that contribute to failure includes small bladder with complete urethral destruction, urethral involvement, circumferential fistula, severe vaginal scarring [15] and fibrosis in the vaginal epithelium [16]. Most characteristic studies have included age as a factor affecting surgical outcomes. With majority of the vaginally repaired patients being post-menopausal, the hormonal changes that occurred lead to vaginal atrophy contributing to failure of repair. However, Frajzyngier V. et al. proves our theory otherwise, stating that patient characteristics such as age, parity, duration of leakage and surgical approach for repair have weak impact on repair prognosis [17].

Influence of route of repair on fistula closure

Almost one-fifth (18.8%) of those repaired vaginally experienced repair failure, compared with 10.5% of those repaired abdominally. In bivariable analysis, a vaginal route of repair was associated with 1.42 (95% CI, 1.11–1.81) times the risk of failure to close the fistula relative to the abdominal route.

Another pitfall to vaginal repair is the occurrence of de novo USI at 25%. Zambon et al. had no cases of USI with the vaginal route but had 1 case (16.6%) with the abdominal route [18]. Dolan et al. reports 16.1% of patients with USI after fistula repair [6]. The reason for such occurrence is defunctionalisation of the detrusor muscle due to prolonged VVF exposure [19]. The substantial loss of bladder tissue from scarring leads to a smaller functional bladder capacity. The bladder then becomes stiff and non-compliant leading to stress incontinence or de novo urge incontinence [20]. Vaginal scarring and shortening would obliterate the vagina, making the urethra open and lose its physiologic function [20].

Abdominal repair has been reserved for special cases due to increased morbidity from greater amount of blood loss, longer operating time, hospital stay and maintenance of Foley catheter. Failure rate approximates to zero as no recurrence was noted. Unlike the vaginal repair, post-operative overactive bladder syndrome was more prominent occurring in 50% of the study group. The opening of the bladder wall during the surgical procedure led to the loss of bladder tissue, nerve denervation, and a smaller bladder capacity. These alterations affect the neural regulatory circuit and detrusor muscle which lead to changes in sensory function yielding symptoms of overactive bladder [21]. Likewise, Zambon et al. [18] reports 16.6% of patients having urgency after abdominal repair and 12.5% after vaginal repair. Dolan et al. [6] also reports 12.9% of patients with detrusor overactivity after fistula repair.

Development of fistula could lead to conflicts between the patient, primary surgeon, and referral surgeon. The decision making process on fistula management not only relies on the anatomical defect but also on the capability and acceptance of the complication by the primary surgeon. Patients are usually referred to close colleagues of Urogynecologist. And urogynecologist would tend to favor the less invasive approach, which is the transvaginal route even though the criteria set for such procedure could not be met. The intention is to lessen the anxiety of the patient for another laparotomy procedure. However, the primary surgeon's highest duty is acceptance of direct personal responsibility of care for the patient whom he has operated on, from pre to post-operative period. A fistula surgeon must restrict his practice to which he is competent to deliver and not hesitate to refer patients needing higher level of care. He should never take advantage of a patient nor allow anyone to take advantage [22]. He should safeguard themselves and the best interest of the patient [22].

The strengths of the study include management perspective by the Urogynecologist and the standard institutional protocol that echoes a prospective evaluation. The retrospective study design, single center and small sample size limited the study. A good sample size was difficult to achieve even in a span of 13 years since VVF is not common in a country with good medical practice and facility.

To summarize, management of VVF is individualized and dependent on the surgeon's experience and expertise. Fundamental treatment principles involve adequate exposure, tension-free approximation of edges, non-overlapping suture lines, good hemostasis, watertight closure and adequate post-operative bladder drainage. Achievement of cure from abdominal and vaginal repair yields good outcomes. The downside of abdominal repair includes overactive bladder symptoms, longer operating time, hospital stay and maintenance of Foley catheter. Though vaginal repair has been associated with higher failure rate and occurrence of de novo USI its less invasiveness, faster recovery period and no association with post-op overactive bladder made this approach more preferable.

Disclosure

None.

Conflict of interest

The authors had no conflict of interest.

Authors' contribution

TS Lo: Protocol/Project development, Data collection, Data analysis, Manuscript editing.
S Chua: Data analysis, Manuscript writing.
T Wijaya: Data analysis; Manuscript editing.
CC Kao: Data collection; Data collection/Data analysis.
MC Uy-Patrimonio: Data collection/Data analysis.

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