Prevalent practices and changing trends in the management of vesicovaginal fistula: a cross-sectional study from a nationwide questionnaire-based survey of urologists from a developing country

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Abstract

Vesicovaginal fistula (VVF) management is primarily backed by evidence from retrospective studies and expert opinions and therefore lacks standardization. Newer generations of surgeons are more proactive toward changing clinical practices in domains lacking good-quality evidence. This survey-based cross-sectional study aims to elicit consensus on management practices regarding various domains of VVF management and look for any changes in clinical practice trends. A nationwide survey of urologists was conducted, and responses were grouped into 3 categories (overall response, response from young urologists, and response from experienced urologists) and compared. Based on the level of overall consensus, the responses were categorized as highly preferred, preferred, and somewhat preferred. Consensus was noted in conservative and endoscopic management of VVF, timing of VVF repair, definition of simple/complex VVF, approach for surgical repair for trigonal and supratrigonal VVF, use of interposition tissue for repair, and patient positioning in the postoperative period. A lack of consensus was noted in other domains. Changing trends in clinical practices were noted in attempts at conservative and endoscopic management, investigations considered mandatory for evaluation, surgical approach for complex VVF with bladder neck involvement and radiation-induced fistulas, the use of interposition grafts during surgical repair, the use of cystograms during follow-up, and the definition of a successful repair. There is uniformity in practices regarding many domains of VVF management. Those areas, where discordance in opinions is noted, require further research to bring standardization into practice. Regarding certain aspects of VVF management, there appears to be a change in trends among the younger generation of urologists.

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Introduction

Vesicovaginal fistulas (VVFs) are the most commonly acquired fistulas of the urinary tract, but we lack a standardized algorithm for their management.[1] While VVFs have been managed for many years, much of the evidence for their management is of low quality, with few published trials. We have to rely mainly on large retrospective case series and expert opinions;[2] timing, technique, and approach to VVF management remain controversial. Surgeons must consider the size, location, patient co-morbidities, available resources, and level of bother when determining a management approach. Patients with VVF typically present with continuous vaginal urine drainage, and the degree of urinary incontinence is generally proportional to the size of the fistula tract.[3] In the developing world, this is often associated with severe social isolation, as patients are often abandoned by their loved ones because they smell of urine.[4] Regardless of the degree of incontinence, VVFs can be debilitating and negatively impact the quality of life. Despite being a problem of such great magnitude, poor quality of evidence and variability in the management approaches of different surgeons have led to a lack of proper guidelines. Evaluation and management options are chosen depending on sur-

geons' individual preferences and thus lead to a lack of consensus.

In the past, there has been a debate over the timing of managing a VVF caused by iatrogenic surgical injury. Some authors recommended delaying repair for up to 6 months, especially for larger fistula defects,[5] while others have suggested that iatrogenic surgical injuries noted at the time of index surgery may be repaired "immediately" or within 2 to 6 weeks of injury.[5] Variability also lies in the decision between a conservative management trial or upfront surgery. Many surgeons have attempted multiple endoscopic approaches but have failed to achieve consensus and universal acceptance. Imaging protocols for evaluation also vary from surgeon to surgeon. Various systems have been devised for the anatomical classification of VVFs, but surgeons have varying preferences, and there has not been universal acceptance. The choices for diagnostic modalities for evaluation of VVFs and treatment options are very subjective, depending on the surgeon's own expertise and preference, and thus not backed by good-quality evidence. These variable practices in the past are expected to bring a change in trends among the newer generation of surgeons, who are more proactive toward changing clinical practices.[6]

A nationwide survey was conducted among urologists regarding the preferred treatment option and the changing trends, if any, in the management of VVFs among younger urologists. The survey's primary objective was to highlight the most preferred practices concerning these areas of VVF management. The secondary objective was to look for any change in trends among the newer generation of surgeons with respect to these domains.

Materials and Methods

Pilot study

A group of urologists with expertise in female reconstructive surgeries were surveyed to obtain their opinions on the practices that varied across surgeons in managing VVFs. Experts' feedback was used to develop a questionnaire consisting of 30 questions, categorized into 5 sections. Disagreements in responses were resolved by giving greater importance to surgeons with more experience.

Questionnaire development

The survey included questions on the following: i) demographic details (4 questions); ii) preoperative and endoscopic management (10 questions); iii) approach for surgical treatment (5 questions); iv) surgical techniques and use of interposition tissues (5 questions); v) postoperative management, follow-up and definition of success (7 questions).

Response elicitation

The final questionnaire was incorporated into an online survey using the SurveyMonkey platform (SurveyMonkey, San Mateo, CA, USA). Personalized emails were sent to urologists registered with the Urological Society of India, providing study details, instructions, and a link to the questionnaire. Responding to the survey was voluntary, and participants were asked to complete the questionnaire within 30 days.

Participant selection

Only urologists who consented to participate and had an annual VVF caseload of two or more cases were included in the analysis. Demographic details of participants, including experience, type of practice, and annual VVF workload, were recorded.

Data collection and analysis

The respondents were classified into 2 groups depending on the number of years of experience in managing VVFs. Group 1 was labeled as "young urologists" and consisted of surgeons with up to 10 years of experience. Group 2 was labeled as "experienced urologists" and consisted of surgeons with more than 10 years of experience. Responses collected for each item of the questionnaire were tabulated under 3 broad subheadings, *i.e.*, overall response, response from young surgeons, and response from experienced surgeons. The collected responses were categorized as per the following "preference levels": i) score of ≥75% aggregate response (highly preferred); ii) 50-74% aggregate response (preferred); iii) highest overall aggregate but response <50% (somewhat preferred). For analyzing trends of clinical practice among experienced and young urologists, responses from both groups were compared, and appropriate statistical tests were applied. Any significant difference in the responses from both groups was noted and assessed.

Statistical analysis

The statistical analysis for this study utilized IBM SPSS Statistics, version 20, released in 2011 (IBM, Armonk, NY, USA). The data was initially entered into an Excel spreadsheet (Microsoft, Redmond, WA, USA) for organization and preparation purposes. Descriptive statistics were calculated to summarize the explanatory and outcome variables. For qualitative variables, frequencies and proportions were computed to provide a clear understanding of the distribution and patterns within the data. Inferential statistics were then employed to investigate the relationships between variables. Specifically, the chi-square test was used to examine the association between qualitative variables and the experience of the participants. A significance level of 5% was chosen to determine statistical significance, indicating that any observed differences or associations with a $p<0.05$ were considered statistically significant.

Ethical considerations

Institutional ethics committee approval (IEC:554/2020) was obtained before data collection. The study's purpose, academic nature, assurance of anonymity and confidentiality, and voluntary participation were communicated to participants through email.

Results

Of the total 120 respondents, 71 (59.2%) had less than or equal to 10 years of experience managing VVF cases, while 49 (40.8%) had more than 10 years of experience. Additionally, 57 (47.5%), 37 (30.8%), and 26 (21.7%) worked in teaching institutes, individual practices, and corporate hospitals, respectively. Only respondents with an annual caseload of two or more cases were included in the survey. Conservative management was preferred by 64 (53.3%) surgeons for VVF sizes less than 1 cm and by 13 (10.8%) surgeons for VVF sizes up to 2 cm. For conservative management, 36 (30%) preferred a bladder catheter in place for 4 weeks, while 29 (24.2%) preferred it for 6 weeks. Endoscopic management was not preferred for VVF patients with an epithelialized tract (90.8%), a long fistula tract (94.2%), and those with most of the urine not draining through a per-urethral catheter (87.5%).

Regarding surgical management, delayed repair (>12 weeks) was preferred by 73 (60.8%) surgeons, while 52 (43.3%) preferred not removing the bladder catheter until the day of surgery. A computerized tomography (CT) urogram and pan-cystoscopy were con-

sidered mandatory investigations by 74 (61.7%) and 84 (70%) surgeons, respectively. For the classification of VVFs, 66 (55%) surgeons preferred the World Health Organization (WHO) classification system. Large size, multiple in number, history of prior failed repair, involvement of the urethra/continence mechanism, associated malignancy, and radiation-induced fistula were highly preferred as conditions that make a fistula complex. The open abdominal approach was the most preferred approach for supra-trigonal VVFs, fistulas with ureteral involvement, and radiation-induced fistulas, while the vaginal approach was preferred for trigonal VVFs. The combined abdominal and vaginal approach was preferred for fistulas with urethral/bladder neck involvement. Interposition grafts were preferred by 64 (53.3%) surgeons for all fistula types, with the omentum and martius flap being the most preferred tissues for interposition in the abdominal and vaginal approaches, respectively. Excision of the fistula tract during surgical repair was preferred by 59 (49.89%) surgeons. Supine was the most preferred patient position in the postoperative period, being preferred by 99 (82.5%) surgeons. Both the suprapubic catheter and the per-urethral catheter were preferred by 52 (43.3%) surgeons, while 47 (39.2%) surgeons opted for the per-urethral catheter only. In terms of the duration of postoperative catheterization, 40 (33.3%), 27 (22.5%), and 24 (20%) surgeons opted for 3 weeks, 2 weeks, and 4 weeks, respectively. A cytogram prior to catheter removal was not preferred by 57 (47.5%) surgeons, while 40 (33.3%) surgeons preferred it to be done. Finally, 43 (35.8%) surgeons considered complete anatomical closure with no stress leak as the definition of successful repair, while 36 (30%) considered the absence of a vaginal urinary leak after catheter removal as the definition of success. Detailed responses for each question are presented in Table 1, and a graphical representation of the summary of responses to the questions is shown in Figures 1-3.

Table 2 presents the results of differences in practice patterns among young urologists compared to experienced urologists. Young urologists were less likely to attempt conservative management prior to definitive surgical repair of small-size fistulas (<2 cm) compared to experienced urologists (83.1% *versus* 98%; p=0.01), and for non-epithelialized fistulas (56.3% *versus* 81.6%; p=0.004). Young urologists were also more likely to attempt endoscopic management of small-size fistulas (<1 cm) than experienced urologists (70.4% *versus* 85.7%; p=0.05). The study also found that experienced urologists were more likely to perform a mandatory investigation [voiding cystourethrogram (VCUG)] prior to surgical repair compared to young urologists (21.1% *versus* 6.5%; p=0.02). Additionally, experienced urologists were more likely to indicate complex fistulas (with severe induration/scarring around the fistulous opening) and perform a combined abdominal and vaginal approach (65.3% *versus* 39.4%; p=0.001), while young urologists preferred an open abdominal approach (38.0% *versus* 8.2%; p=0.001). In cases of radiation-induced fistulas, experienced urologists were more likely to use a conventional abdominal approach (63.4% *versus* 44.9%; p=0.016) and perform urinary diversion (26.5% *versus* 14.1%; p=0.05) than young urologists. For successful repair, the definition of success was "complete dry" (anatomical closure + no stress leak) for 29.6% of young urologists and 44.9% of experienced urologists (p=0.01). Finally, a cystogram was considered mandatory prior to catheter removal after surgical repair for 36.6% of young urologists and 28.6% of experienced urologists (p=0.03).

Discussion

Definition and choice of classification system

A total of 66 (55%) surgeons preferred the WHO classification system to define VVFs. Other classification systems include the Waaldijk and Goh classifications.[7] It suggests that the WHO classification system is widely recognized and accepted by surgeons as a reliable and practical tool to define and categorize VVFs as compared to the other classification systems. If the majority of surgeons is using the WHO classification system, it may be beneficial for researchers to also use this classification system when reporting on VVF cases to facilitate comparison and synthesis of findings across studies. This could lead to a more standardized approach to reporting on VVF cases and ultimately improve our understanding of this condition and how to treat it best. The WHO classifies the fistula as simple or complex, with a simple fistula being defined as mid-vaginal with minimal scarring and a diameter of less than 4 cm.[8]

Definition of simple fistula

No uniform consensus was reached regarding the definition of a simple fistula. Fistula size less than 1 cm was the somewhat preferred definition for a simple fistula, with 41 (34.2%) surgeons going for this definition in the absence of other complicating factors, while 25 (20.8%) surgeons considered it to be simple if the size was less than 2 cm. The lack of a uniform consensus on the definition of a simple fistula among surgeons indicates the need for further standardization and clarification in the classification of VVFs. This finding could potentially impact patient care and outcomes, as the classification of a fistula as simple or complicated can affect treatment decisions and surgical approaches. The variation in definitions of a simple fistula among surgeons also highlights the need for better communication and collaboration among healthcare providers in the management of VVF.

Definition of complex fistula

Opinions did not vary significantly regarding factors that make a fistula complex. History of prior failed repair, malignancy-associated fistula, radiation-induced fistula, involvement of the urethra or continence mechanism, multiple in number, and size greater than 3 cm were highly preferred to define a fistula as complex.

Conservative management

Conservative VVF management was preferred by 64 (53.3%) surgeons only for fistulas of size <1 cm. 13 (10.8%) surgeons would opt for a trial of conservative management for fistulas with a size of 1-2 cm, while none of them would opt for it for fistulas that are >2 cm in size. Opinions regarding the duration of catheterization for urinary diversion away from the fistulous tract varied among most of the surgeons. 65 (54.2%) surgeons would prefer catheterization for 4-6 weeks. 10 (8.3%) surgeons would prefer catheterization for more than 6 weeks, while 15 (12.5%) surgeons would opt for 2-3 weeks of catheterization as a part of conservative management.

The literature describes conservative management for small VVFs uncomplicated by ischemia, radiation, or malignancy. Continuous urethral catheter drainage plus oral antimuscarinics and antibiotics have been associated with an 11% and 15% closure rate, respectively.[9] It is postulated that a period of catheter drainage allows necrotic tissue to slough and local inflammatory responses to subside.[10] Hilton has reported a small series of 24 patients where spontaneous successful closure occurred in 6.9% of patients following 6-8 weeks of catheter drainage.[11] It was observed that spon-

Table 1. Summary of demographic details, overall responses, and categorization as per the preference level.

Demographic details			
Experience (n=120)	Less than or equal to 10 years	71 (59.2%)	
	More than 10 years	49 (40.8%)	
Type of practice	Teaching institute	57 (47.5%)	
	Private practice	37 (30.8%)	
	Corporate hospital	26 (21.7%)	
Annual VVF workload	2-5	53 (44.2%)	
	6-10	38 (31.7%)	
	11-20	23 (19.2%)	
	>20	6 (5.0%)	
Responses			
Category	**Response**	**Response rate (%)**	**Preference level**
Conservative and endoscopic management for VVF			
Size of fistula	<1 cm	64 (53.3)	Preferred
Duration of catheterization during conservative management	4 weeks	36 (30)	Somewhat preferred
Contraindications for Endoscopic management	Epithelialized fistula	109 (90.8)	Highly preferred
	Long fistula tract	113 (94.2)	Highly preferred
	When most of the urine does not drain through a catheter	105 (87.5)	Highly preferred
	Do not prefer endoscopic management	68 (56.7)	Preferred
Timing of VVF repair (non-radiation associated VVF)	Delayed repair (>12 weeks)	73 (60.8)	Preferred
Definition of "early repair"	<1 week	47 (39.20)	Somewhat preferred
Timing of catheter removal before surgery	Not to remove	52 (43.3%)	Somewhat preferred
Investigations considered "mandatory" prior to repair	CT urogram	74 (61.7)	Preferred
	Pan-cystoscopy	84 (70.0)	Preferred
Choice of classification system	WHO (simple/complex)	66 (55)	Preferred
Definition of "simple" as per size	<1 cm	41 (34.2)	Somewhat preferred
Factor whose presence makes a fistula "complex"	Large size	87 (72.5)	Highly preferred
	Multiple	91 (75.8)	Highly preferred
	Prior failed repair	96 (80)	Highly preferred
	Involvement of urethra/ continence mechanism	93 (77.5)	Highly preferred
	Malignancy associated fistula	95 (79.2)	Highly preferred
	Radiation-induced fistula	90 (75.2)	Highly preferred
	Mixed fistula (associated ureterovaginal fistula-UVF)	78 (65)	Preferred
	Severe induration/scarring around	48 (40)	"No" predominant
	Chronic infection	24 (20)	"No" predominant
	High fistula	20 (16.7)	"No" predominant
Approach for surgical repair			
Supra-trigonal VVF	Open abdominal	69 (57.5)	Preferred
Trigonal VVF	Vaginal	69 (57.5)	Preferred
VVF with ureteral involvement	Abdominal approach	80 (66.7)	Preferred
VVF with urethral/bladder neck involvement	Combined abdomino-vaginal approach	60 (50.0)	Preferred
Radiation-induced fistula	Conventional abdominal approach	67 (55.7)	Preferred
Indication for use of interposition flaps	Yes, for all fistula types	64(53.3)	Preferred
Choice of material for interposition flap in abdominal approach	Omentum	92 (76.7)	Highly preferred
Choice of material for interposition flap in vaginal approach	Martius flap	90 (75.0)	Highly preferred
Preference for fistula tract excision	Yes	59 (49.8)	Somewhat preferred
Postoperative care and follow-up			
Patient position in the postoperative period	Supine	99 (82.5)	Highly preferred
Routine placement of suprapubic catheter along with per-urethral catheter	Yes	52 (43.3)	Somewhat preferred
Timing of per-urethral catheter removal	3 weeks	40 (33.3)	Somewhat preferred
Cystogram prior to foley's catheter removal	No	57 (47.5)	Somewhat preferred
Duration of prolonged catheterization if cystogram suggestive of leak	2 week	35 (29.2)	Somewhat preferred
Definition of successful repair	Complete dry (anatomical closure+no stress leak)	43 (35.8)	Somewhat preferred
Recommended duration of mandatory follow-up	12 month	35 (29.2)	Somewhat preferred
Mandatory follow-up evaluation by	Patient symptoms only	80 (66.7)	Preferred

VVF, vesicovaginal fistula; WHO, World Health Organization; CT, computed tomography; UVF, ureterovaginal fistula.

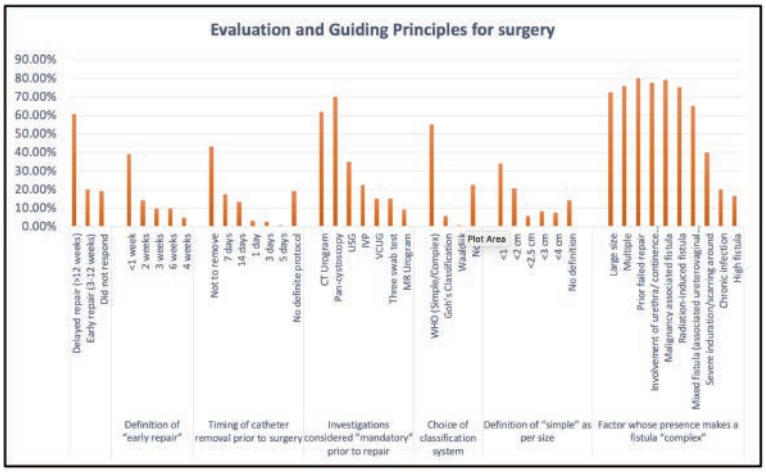

Figure 1. Graphical representation of summary of responses to domains of evaluation and principles of surgery for vesicovaginal fistulas. CT, computed tomography; USG, ultrasound sonography; IVP, intravenous pyelogram; VCUG, voiding cystourethrogram; WHO, World Health Organization; MR, magnetic resonance.

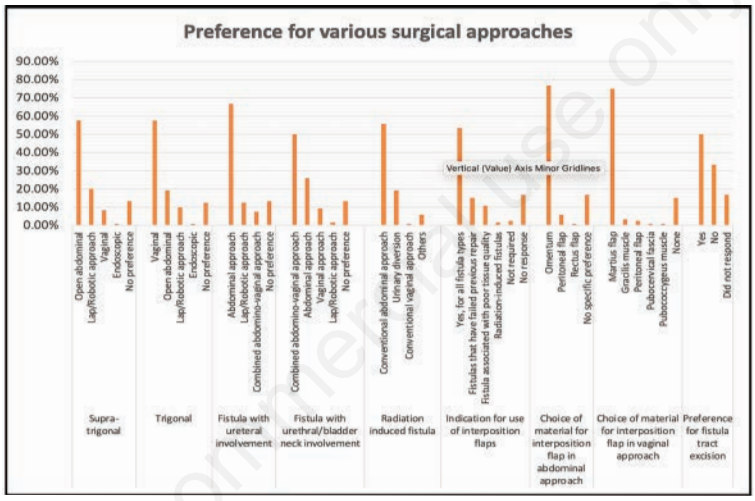

Figure 2. Graphical representation of summary of responses to preferences for various surgical approaches for repair of vesicovaginal fistulas.

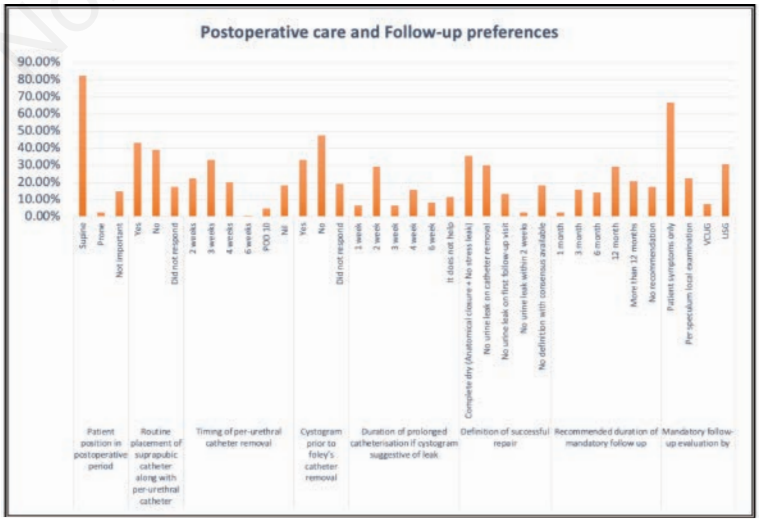

Figure 3. Graphical representation of summary of responses to domains of postoperative care and follow-up of vesicovaginal fistulas. USG, ultrasound sonography; VCUG, voiding cystourethrogram

taneous closure was not encountered in any case of VVF induced by radiotherapy. Other studies have reported that successful conservative management was achieved in 15% of patients.[12] These findings suggest that while spontaneous closure may occur in a small percentage of patients following catheter drainage, it is unlikely to occur in cases of VVF caused by radiotherapy.

Endoscopic management

A trial of endoscopic management would not at all be preferred for fistulas with epithelialized fistulous tract, long fistulous tract >2-3 cm, radiation-induced fistulas, and scarred fistulous openings. In the absence of these factors, success rates of up to 73% have been documented with electrofulgration when combined with

Table 2. Changing practice patterns in the management of vesicovaginal fistulas.

		Response	Young Urologists (%) (n=71)	Experienced urologists (%) (n=49)	χ^2 value (p value)	Inference suggestive of a changing trend in management
Any attempt at conservative management prior to definitive surgical repair (p=0.01)	Small-size fistula <2 cm	No	83.1	98	χ^2=6.62	Although most urologists still do not favor an attempt at conservative management for small fistula <2 cm, the proportion of young urologists who would give a trial of conservative management is increasing.
	Non epithelialized fistula	No	56.3	81.6	χ^2=8.34 (p=0.004)	This proportion is further increased in cases of fistulas with non-epithelialized tracts
Attempt of endoscopic management	Small-size fistula <1 cm	No	70.4	85.7	χ^2=13.39 (p=0.05)	Most young urologists are not in favor of an attempt at endoscopic management for small uncomplicated fistulas; the proportion of urologists who would prefer an attempt at endoscopic management is increasing
Mandatory investigation prior to surgical repair	VCUG	Yes	21.1	6.5	χ^2=5.1 (p=0.02)	Although few but increasing proportion of young urologists are in favor of considering VCUG to be a mandatory investigation for evaluation of VVF prior to surgical repair
Indication to label as "complex fistula"	Severe induration/scarring around fistulous opening	Yes	32.5	51.0	χ^2=4.19 (p=0.04)	Unlike experienced urologists, there is a greater fraction of young urologists who do not consider severe induration or scarring around the fistulous opening should be a factor to label the fistula as 'complex'.
Approach for surgical repair						
Complex fistula with bladder neck/urethral involvement?	Combined abdominal and vaginal approach		39.4	65.3	χ^2=18.25 (p=0.001)	Significant discordance was noted in the approach for surgical repair of VVF with bladder neck or urethral involvement. Unlike the group of experienced urologists where the preferred approach would be combined abdominal and vaginal, a greater proportion of young urologists would prefer only the abdominal approach for surgical repair.
	Lap/robotic approach		0.0	4.1		
	Open abdominal approach		38.0	8.2		
	Vaginal approach		7.0	12.2		
Radiation-induced fistula?	Convention vaginal approach		0.0	2.0	χ^2=12.14 (p=0.016)	Significant discordance was noted in the preferred surgical approach for radiation-induced fistulas. An increasing number of young urologists prefer going for a conventional abdominal approach for repair. A significantly higher number of experienced urologists would opt for urinary diversion alone.
	Conventional abdominal approach		63.4	44.9		
	Other	1.4	12.2			
	Urinary diversion	14.1	26.5			
Interposition tissue is considered important for a successful repair	Fistula associated with poor tissue quality		11.3	10.2	χ^2=19.51 (p=0.002)	Few young urologists would not prefer any interposition tissue at all. This approach was not opted by any experienced urologist. The majority in both categories would opt for interposition tissue for all cases.
	Fistulas that have failed previous repair		24.2	30.6		
	Not required		4.2	0.0		
	Radiation-induced fistulas		1.4	2.0		
	Yes, for all fistula types		56.3	49.0		
Cystogram is considered mandatory prior to catheter removal after surgical repair	Yes		36.6	28.6	χ^2= 7.31 (p=0.03)	A significantly higher number of young urologists believe cystograms to be mandatory prior to catheter removal after surgical repair.
What is the definition of success?	Complete dry (anatomical closure + no stress leak)		29.6	44.9	χ^2=12.65 (p=0.01)	The majority of experienced urologists consider anatomical closure along with the absence of any stress leak to be the preferred definition of uccessful repair. However, the majority of young urologists consider the absence of urine leak after catheter removal to be the preferred definition of a successful surgical outcome.
	No urine leak on catheter removal	36.6	20.4			
	No urine leak on the first follow-up visit		7.0	22.4		
	No urine leak within 2 weeks	2.8	2.0			

VVF, vesicovaginal fistula; VCUG, voiding cystourethrogram.

continuous bladder drainage.[11] In a small series of 18 patients by Evans *et al*., success rates of up to 94% have been reported with the use of fibrin glue injections combined with continuous bladder drainage.[12]

Evaluation of vesicovaginal fistulas for surgical treatment

Timing of repair (for non-radiation-induced fistula)

Delayed repair (>12 weeks) was preferred by 73 urologists (60.8%) in our study. Traditionally, the timing of VVF repair is influenced by various factors, such as the etiology of the fistula, the patient's nutritional status, and the presence of foreign bodies. Some surgeons prefer to repair the VVF when there is no active inflammation, infection, and necrosis, while others advocate for early intervention.[13] Most surgeons would prefer to repair the VVF when there is no active inflammation, infection, and necrosis. Whereas others advocated intervening as soon as the VVF was diagnosed and achieved similar results.[14] The timing of repair is of paramount importance, as it has been known that the first attempt at repair is the best attempt at it. For obstetrical and post-surgical iatrogenic fistulas, delaying the repair by up to 12 weeks has been the general approach, with the rationale of providing adequate time for the inflammation to subside and the necrotic tissue to slough out.[2] For radiation-induced fistulas, the repair is delayed for as long as 6 months.[15]

Definition of "early repair"

There was no consensus on the definition of "early repair". However, the somewhat preferred definition for it was "repair performed within the first week of injury", with 47 (39.2%) surgeons opting for it. Opinions for other definitions were almost equally distributed, with 2 weeks, 3 weeks, and 6 weeks opted for by 17 (14.2%), 12 (10%), and 12 (10%) surgeons, respectively.

Timing of catheter removal for operative preparation

Regarding preoperative catheter removal, opinions varied widely, with various options varying from 1 day to 2 weeks preop. The somewhat preferred option was to not remove the catheter at all until the day of surgery, which was opted for by 43.3% of the surgeons. However, 23 (19.2%) surgeons did not have a specific protocol for it, as they were of the opinion that the timing of catheter removal does not have much influence on postoperative outcomes.

Mandatory investigations for workup

A total of 84 (70%) surgeons considered pan-cystoscopy to be mandatory for the evaluation of VVFs. CT urogram was also the preferred choice, along with cystoscopy, which was considered mandatory for the evaluation of VVFs, being preferred by 74 (61.7%) surgeons. The workup for VVFs has traditionally included a pelvic exam with a speculum and a cystoscopic exam to aid in the identification of the location, size, severity, and number of fistula tracts.[16] Vaginoscopy may make it easier to identify anterior vaginal wall cuff defects that may occur following hysterectomy. Tampon dye tests may also aid in the diagnosis. Most importantly, upper tract imaging should be performed in cases of iatrogenic VVF if concomitant ureteral injury is suspected, as may be the case in up to 12% of patients.[17] Furthermore, in cases involving pelvic malignancy, it is generally advisable to take a biopsy of the fistula tracts to rule out recurrence.

Approach for surgical repair

The choice of surgical approach is determined by the surgeon's familiarity with the approach, the location of the fistula, the amount of available space in the vaginal cavity, the need for ancillary procedures such as ureteric reimplantation, and the feasibility of obtaining the necessary interposition flaps. Hillary *et al*. showed that the success rate was higher for the transvaginal repair (90.8%) when compared to the transabdominal repair (83.9%).[18] Kapoor *et al*., in their series, have preferred the transvaginal route for simple fistulas and the transabdominal route for complex fistulas and achieved successful outcomes in most of the VVFs repaired transvaginally.[19] There are certain situations where a specific surgical approach may be preferred. The vaginal route has certain specific advantages: it avoids abdominal and bladder incisions, is associated with less blood loss, there are plenty of options for interposition flaps, operative time is shorter, recovery is rapid, and as a result, hospital stay is reduced.[19] This approach is often used when the abdominal wall has been scarred by previous surgeries. There are certain contraindications for vaginal approach, such as the presence of a narrow or scarred vagina, a post-radiation fistula, and the presence of a concomitant rectovaginal fistula. The abdominal route is preferred when the vaginal route is contraindicated. It is also often advocated if concomitant procedures such as ureteric reimplantation and augmentation cystoplasty are required if there are vesical stones present and if the fistula is highly placed with a narrow vagina.[19]

In our study, 69 (57.5%) surgeons preferred an open abdominal approach for supratrigonal fistula repair. 24 (20%) surgeons preferred a laparoscopic or robotic approach for repair. Only 10 (8.3%) surgeons preferred the vaginal approach for supratrigonal fistulas. Unlike the supratrigonal fistula, the vaginal approach was the most preferred route of repair for trigonal fistulas, being preferred by 69 (57.5%) surgeons, while the open abdominal approach was preferred by only 23 (19.5%) surgeons. Laparoscopic or robotic approaches were preferred only by 12 (10%) surgeons for trigonal fistulas. 80 (66.7%) surgeons preferred an open abdominal approach for fistulas with ureteral involvement. Laparoscopic or robotic approaches were preferred by 27 (12.5%), while 9 (7.5%) surgeons preferred the combined abdomino-vaginal approach. 60 (50%) surgeons preferred the combined abdomino-vaginal approach for repair of fistulas with urethral or bladder neck involvement, while 31 (25.8%) surgeons preferred the abdominal approach only. The vaginal approach was preferred by 11 (9.2%) surgeons, while very few surgeons preferred laparoscopic or robotic repair. The conventional abdominal approach was the preferred route for radiation-induced fistulas, with 67 (55.7%) surgeons favoring this approach. 23 (19.2%) surgeons would opt for urinary diversion alone for fistulas associated with radiation exposure. The conventional vaginal approach was not preferred by almost all the surgeons, with only 1 (0.8%) surgeon in favor of the vaginal approach for the repair of radiation-induced fistulas.

A total of 64 (53.3%) of the surgeons preferred using interposition flaps for all fistulas, irrespective of other factors. The omental flap was the most preferred material for use in the abdominal approach, being preferred by 92 (76.7%) surgeons. Other material options, like the peritoneal flap and the rectus flap, were preferred by 7 (5.8%) and 1 (0.8%) surgeons, respectively, in the abdominal approach. In the vaginal approach for repair, the most preferred choice was the martius flap, which was preferred by 90 (75%) surgeons.

There is no high-level evidence to confirm the benefit of tissue interposition, particularly as the decision is usually based on specific fistula characteristics.[2] Many fistulas can be repaired adequately without an interposition layer, thus avoiding the risks and time associated with tissue interposition.[20] This principle would apply, especially if the bladder tissues appear well vascularized.[21] The martius flap was used almost routinely in vaginal fistula

repairs until relatively recently. However, when many fistula surgeons stopped using it routinely, their success rates did not change.[22]

In their study, Evans *et al*. concluded that because the creation of an omental flap is a simple procedure that results in no significant morbidity, it should be routine if a transperitoneal repair is performed.[23] However, for cases managed through an abdominal approach where the omental flap is unavailable or cannot be accessed, the rectus abdominis flap can be the alternative.[24]

Postoperative care

The preferred postoperative patient position was supine, which was opted for by 99 (82.5%) surgeons. Regarding the placement of suprapubic catheters along with per-urethral catheters for urinary drainage, opinions somewhat varied, with 52 (43.3%) surgeons preferring both suprapubic and per-urethral catheters while 48 (39.9%) preferring only per-urethral drainage.

The ideal duration of bladder catheterization in post-fistula repair patients is unknown.[25] Although widely used in practice, the traditional 14-day duration has been recently challenged. Nardos *et al*. showed that the outcome of postoperative catheterization for 10 days was not inferior to that of 14 days of drainage.[26] However, this randomized trial excluded repeat repairs and circumferential defects. In another randomized trial, Barone *et al.* showed that 7 days of bladder catheterization were not inferior to 14 days.[27] However, this trial only included simple fistulas, and even then, no clear definition of a simple fistula was given. In our study, the opinion regarding the duration of postoperative per-urethral catheterization was variable, with the most preferred duration being 3 weeks, as indicated by 40 (33.3%) surgeons. 27 (22.5%) surgeons preferred 2 weeks, and 24 (20%) surgeons preferred 4 weeks of postoperative per-urethral catheterization. Only 1 (0.8%) surgeon preferred postoperative catheterization lasting as long as 6 weeks. 57 (47.5%) surgeons would not go for a cystogram prior to catheter removal, while 40 (33.3%) surgeons would prefer a cystogram prior to catheter removal.

Definition of "successful repair"

The definition of "successful repair" varied among surgeons, with "completely dry state" of the patient (absence of continuous and stress leak) being preferred by 43 (35.8%) surgeons to define a successful repair. A total of 36 (30%) surgeons preferred to define a successful outcome if there were no symptoms of continuous leak after catheter removal, while 16 (13.3%) surgeons defined it as the absence of a leak at the first follow-up visit after catheter removal. 22 (18.3%) surgeons did not suggest a specific definition of successful repair.

Follow-up

A total of 35 (29.2%) surgeons recommended a mandatory follow-up duration of 1 year, while 25 (20.8%) surgeons recommended that the duration extend beyond a year. 19 (15.8%) surgeons recommended a follow-up duration of 3 months, while 17 (14.2%) surgeons recommended 6 months. Only 3 (2.5%) surgeons preferred a follow-up duration of 1 month. As evidenced by these figures, the majority of surgeons preferred to have a follow-up duration of at least 3 months. 80 (66.7%) surgeons preferred follow-up assessments to be done based on patients' histories of symptoms suggestive of urinary leaks. 27 (22.5%) surgeons would also like to have a per-speculum examination of the patient along with a history and general examination. 37 (30.8%) surgeons would prefer for evaluation to be done by clinical examination along with ultrasonography. 9 (7.5%) surgeons preferred to have VCUG as the preferred tool for follow-up evaluation.

Changing trends between young and experienced urologists

The study found that there is an increasing trend toward conservative management for small-sized fistulas <2 cm and non-epithelialized fistulas, with a higher proportion of young urologists opting for this approach. There is also an increasing trend towards an attempt at endoscopic management for small, uncomplicated fistulas among young urologists. Additionally, a small but increasing number of young urologists consider VCUG to be a mandatory investigation prior to surgical repair. The study also revealed that there is significant discordance between experienced and young urologists in the approach to surgical repair, especially for complex fistulas with bladder neck or urethral involvement and radiation-induced fistulas. While experienced urologists preferred a combined abdominal and vaginal approach for surgical repair of complex fistulas, a greater proportion of young urologists opted for only the abdominal approach. Similarly, a significant number of young urologists preferred a conventional abdominal approach for the repair of radiation-induced fistulas. The definition of success after surgical repair of VVF also varied between the 2 groups, with most experienced urologists considering anatomical closure along with the absence of stress leaks to be the preferred definition of success. However, the majority of young urologists believed that the absence of urine leaks after catheter removal was a more suitable definition for a successful outcome.

This study provides valuable insights into the variable trends in the management of VVF and highlights the areas of consensus and disparity in the opinions of urologists regarding the various domains. The areas of disparity in opinions should be standardized with the help of better-quality evidence, and these areas should be prioritized for aggressive clinical research in the future. The study also highlights the changing trends in the practice of VVF management among the younger generation of urologists. It is important to note that the management approach to VVF lacks uniformity among urologists, unlike most other urological conditions. These findings have important implications for the development of standardized approaches to VVF management and for future research in this field.

The present study has certain limitations that need to be acknowledged. Firstly, the inherent limitations of a survey-based study design cannot be ignored. Secondly, although a large sample of the national population of urologists was targeted, the response rate was less than 50%, which may have impacted the representativeness of the sample. Thirdly, there is a possibility of response bias, as it is assumed that urologists with a high workload may not have responded to the survey due to time constraints. Consequently, the input of urologists with more experience and expertise may have been missed, potentially impacting the results of the study. These limitations should be considered while interpreting the findings of the study.

Conclusions

This study concludes that despite the lack of high-quality evidence on various aspects of VVF management, most urologists agree on several aspects, such as trial of endoscopic management, timing of VVF repair, mandatory investigations, classification system, surgical approach, patient positioning, and follow-up. However, there are differences in opinions regarding certain aspects of VVF management, such as conservative management for small fistulas, use of VCUG prior to surgical repair, approach for complex fistulas, use of interposition tissue, and defining successful repair. The study also observed a changing trend in clinical practice among

younger urologists, with a higher proportion favoring conservative management for smaller fistulas, endoscopic management for very small fistulas, and avoiding interposition tissue during surgical repair. These findings suggest the need for standardized approaches and further research to optimize VVF management.

References

1. Oakley SH, Brown HW, Greer JA, et al. Management of vesicovaginal fistulae: a multicenter analysis from the fellows' pelvic research network. Female Pelvic Med Reconstr Surg 2014;20:7-13.
2. Hillary CJ, Osman NI, Hilton P, Chapple CR. The aetiology, treatment, and outcome of urogenital fistulae managed in well- and low-resourced countries: a systematic review. Eur Urol 2016;70:478-92.
3. Angioli R, Penalver M, Muzii L, et al. Guidelines of how to manage vesicovaginal fistula. Crit Rev Oncol Hematol 2003;48:295-304.
4. Ahmed S, Holtz SA. Social and economic consequences of obstetric fistula: life changed forever? Int J Gynaecol Obstet 2007;99:S10-5.
5. Lee JH, Choi JS, Lee KW, et al. immediate laparoscopic non-transvesical repair without omental interposition for vesicovaginal fistula developing after total abdominal hysterectomy. JSLS 2010;14:187-91.
6. Cho GE, Kim SW, Kang SW, Korean Retina Society. Changing trends in surgery for retinal detachment in Korea. Korean J Ophthalmol 2014;28:451-9.
7. Capes T, Stanford EJ, Romanzi L, et al. Comparison of two classification systems for vesicovaginal fistula. Int Urogynecol J 2012;23:1679-85.
8. WHO. Obstetric fistula : guiding principles for clinical management and programme development; 2006. Available from: https://iris.who.int/bitstream/handle/10665/43343/9241593679_eng.pdf?sequence=1.
9. Wang Y, Hadley HR. Nondelayed transvaginal repair of high lying vesicovaginal fistula. J Urol 1990;144:34-6.
10. Obi SN, Ozumba BC, Onyebuchi AK. Decreasing incidence and changing aetiological factors of vesico-vaginal fistula in south-east Nigeria. J Obstet Gynaecol 2008;28:629-31.
11. Stovsky MD, Ignatoff JM, Blum MD, et al. Use of electrocoagulation in the treatment of vesicovaginal fistulas. J Urol 1994;152:1443-4.
12. Evans LA, Ferguson KH, Foley JP, et al. Fibrin sealant for the management of genitourinary injuries, fistulas and surgical complications. J Urol 2003;169:1360-2.
13. Singh O, Gupta SS, Mathur RK. Urogenital fistulas in women: 5-year experience at a single center. Urol J 2010;7:35-9.
14. Blaivas JG, Heritz DM, Romanzi LJ. Early versus late repair of vesicovaginal fistulas: vaginal and abdominal approaches. J Urol 1995;153:1110-2;discussion 1112-3.
15. Pushkar DY, Dyakov VV, Kasyan GR. Management of radiation-induced vesicovaginal fistula. Eur Urol 2009;55:131-7.
16. Redman JF. Female urologic diagnostic techniques. Urol Clin North Am 1990;17:5-8.
17. Goodwin WE, Scardino PT. Vesicovaginal and ureterovaginal fistulas: a summary of 25 years of experience. J Urol 1980;123:370-4.
18. Abdel-Karim AM, Moussa A, Elsalmy S. Laparoendoscopic single-site surgery extravesical repair of vesicovaginal fistula: early experience. Urology 2011;78:567-71.
19. Rizvi SJ, Gupta R, Patel S, et al. Modified laparoscopic abdominal vesico-vaginal fistula repair—"mini-O'Conor" vesicotomy. J Laparoendosc Adv Surg Tech A 2010;20:13-5.
20. Pshak T, Nikolavsky D, Terlecki R, Flynn BJ. Is tissue interposition always necessary in transvaginal repair of benign, recurrent vesicovaginal fistulae? Urology 2013;82:707-12.
21. Tatar B, Oksay T, Cebe FS, et al. Management of vesicovaginal fistulas after gynecologic surgery. Turk J Obstet Gynecol 2017;14:45-51.
22. Browning A. Lack of value of the martius fibrofatty graft in obstetric fistula repair. Int J Gynaecol Obstet 2006;93:33-7.
23. Evans DH, Madjar S, Politano VA, et al. Interposition flaps in transabdominal vesicovaginal fistula repairs: are they really necessary? Urology 2001;57:670-4.
24. Reynolds WS, Gottlieb LJ, Lucioni A, et al. Vesicovaginal fistula repair with rectus abdominus myofascial interposition flap. Urology 2008;71:1119-23.
25. Gedik A, Deliktas H, Celik N, et al. Which surgical technique should be preferred to repair benign, primary vesicovaginal fistulas? Urol J 2015;12:2422-7.
26. Nardos R, Menber B, Browning A. Outcome of obstetric fistula repair after 10-day versus 14-day Foley catheterization. Int J Gynaecol Obstet 2012;118:21-3.
27. Barone MA, Widmer M, Arrowsmith S, et al. Breakdown of simple female genital fistula repair after 7 day versus 14 day postoperative bladder catheterisation: a randomised, controlled, open-label, non-inferiority trial. Lancet 2015;386:56-62.