

Characteristics of circumferential vesico-vaginal fistulas: A cross-sectional and multicentric study

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Abstract

The objective of the study was to determine the risk factors for development of circumferential fistula. We carried out a cross-sectional, multicentric and analytical study over 7 years period, from 1st January, 2010 to 31 December, 2016. We compared circumferential and non-circumferential fistula patients in order to determine the risk factors for circumferential fistula development. Circumferential fistula accounted for 20% (91/456) of all vesico-vaginal fistulas. The mean age of the 456 patients was 35.9 years±12.15 (min 15 years; max 72 years). On univariate analysis, factors associated with the risk of circumferential fistula were: residence (P=0.039; OR=1.7), parity (P=0.04; OR=0.47), marital status before fistula (P=0.002; 4.3), duration of labor (P=0.041; OR=2.7) and fistula aetiology (P=0.038; OR=2.54). In a logistic regression model, two factors remained significant: marital status before fistula (P=0.029; OR=0.13) and duration of labor (P=0.017; OR=0.26). Circumferential fistula occurs in urban, primiparous, unmarried women who have been in labor for more than 41 hours.

Introduction

Vesico-Vaginal Fistula (VVF) is an abnormal communication between the bladder and the vagina leading to involuntary loss of urine through the vagina.¹ Obstetric fistulas are predominant in developing countries and affects approximately 2 millions women worldwide.² They represent a major public health problem with a devastating socio-economic and psychological impact on affected women. A significant improvement in access to emergency

obstetric care has led to the eradication of obstetric fistula in developed countries. Obstetric fistula can be divided into two categories: low fistula involving the bladder neck and urethra, and high fistula involving the cervix, uterine body, ureter, or vaginal vault.³

Circumferential fistula is a severe form of low fistula where the lower pole of the bladder and the proximal part of the urethra are completely destroyed in a circular fashion. So the urethra and bladder are completely separated.⁴ What characterizes circumferential fistula is the damage of the urinary continence mechanism. Therefore the real challenge in the management of circumferential fistula is not the closure of the fistula but the risk of Residual Stress Urinary Incontinence (RSUI). The RSUI rate is reported to be higher in patients with circumferential fistula compared to those without.⁵⁻⁷

Despite the complexity and the severity of these types of fistula, there are few studies in the literature about this issue.⁵ The aim of this study was to determine the risk factors for the occurrence of circumferential fistula. Knowing these risk factors could allow practitioner to identify women at risk to develop circumferential fistula and to plan the prevention strategies. We hypothesized that circumferential fistula differ from non-circumferential fistula in patients' sociodemographics, fistulas characteristics and surgery outcomes.

Materials and Methods

Study design and period

We carried out a cross-sectional, multicentric and analytical study over 7 years period, from January 1st, 2010 to December 31st, 2016.

Study site and population

The study has been carried out in seven fistula treatment centers in Burkina Faso: University Hospital Yalgado Ouedraogo of Ouagadougou, Regional Hospital of Fada N'Gourma, Regional Hospital of Dori, Saint Camille Hospital in Ouagadougou, New Polyclinic of the Center in Ouagadougou, Medical Center with Surgical Antenna in Boromo, and Medical Center with Surgical Antenna of Schiphra in Ouagadougou. These seven centers are referral centers for the treatment of urogenital fistulas in Burkina Faso. Women who underwent VVF surgery during the study period were included. Transvaginal route was used to repair all the fistulas.

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Key words: Circumferential fistula; risk factors; urinary incontinence; Burkina Faso.

Conflict of interest: The authors have no conflict of interest to declare.

Availability of data and materials: The data analyzed for this study are available from the corresponding author.

Ethics approval and consent to participate: The Ethics Committee of the Urological Society of Burkina Faso approved this study (SUBF/CEM/003/2020). The study is conformed with the Helsinki Declaration of 1964, as revised in 2013, concerning human and animal rights.

Informed consent and consent to participate: Since the study design was a retrospective cross-sectional chart review, the institutional review board did not require patient's informed consent. However patient information have been anonymized to be published in this article.

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Definition of variables

Patient's sociodemographic and obstetric characteristics (age, residence, weight, height, marital status before fistula, parity, duration of labor), fistulas characteristics (etiology of fistula, size of defect, presence of fibrosis, previous repair, duration of urine leakage).

Analysis and measures

All statistical analyses were performed using Statistical Package for the Social Sciences (SPSS) software in version 21.0. Qualitative variables were presented in terms of numbers and percentages. Quantitative variables were presented as percentage (%), number (n), mean, with their Standard Deviation (SD), maximum

(Max) and minimum (Min). On univariate analysis, the Chi-Square test was used to compare the frequencies in the two groups (circumferential fistula versus non-circumferential fistula). For the comparison of the averages in the two groups, we used the independent t-test. Some quantitative variables were dichotomized to enter the logistic regression model. A p-value < 0.05 was considered to be significant. A multivariable logistic regression was used to identify risk factors that predict the development of circumferential fistula (P<0.05 for entry into the model and P<0.10 for retention in the model).

A dye test was performed whenever the patients reported for continuous urine leaking to determine the outcome of repair. Patients were followed for 3 months. Three surgical outcomes were considered: unclosed fistulas, closed fistula without RSUI, and closed fistula with RSUI.

Ethics

After approval of the local staff (SUBF/CEM/003/2020), this study have been performed in accordance with the eth-

ical standards as laid down in the Declaration of Helsinki. All data have been anonymized.

Results

During the study period, 456 women were repaired for VVF in the seven centers. Circumferential fistula accounted for 20% (91/456) of all VVF. The mean age of the 456 patients was 35.9 years±12.15 (Min 15 years; Max 72 years). In Table 1 we presented the baseline sociodemographic characteristics of patients and fistulas characteristics. On univariate analysis, factors associated with the risk of circumferential fistula were: residence, parity, marital status before fistula, duration of labor, and fistula aetiology (Table 2). When we enter these factors in a logistic regression model, two factors remain significant: marital status before fistula and duration of labor (Table 3). Women living in urban areas were most often primiparous while those who live in rural areas were most often multiparous [p=0.046;

OR=2.1 (1.02; 4.17)]. The clinical characteristics of circumferential fistula and non-circumferential fistula are presented in (Table 4).

The overall success rate of fistula closure at three months follow-up was 88.6% (404/456). Among patients with circumferential fistula, success rate was 74.7% (68/91) versus 92% (336/365) for patients without circumferential fistula. The failure rate of fistula closure at three months follow-up was almost 4 times more higher in circumferential fistula [p<0.001; OR=3.9 (2.1 ; 7.2)].

The overall rate of RSUI at three months follow-up was 14.5% (66/456). At three months follow-up, among patients with successful fistula closure (n=404), 66 (16.3%) experienced RSUI. RSUI was 2.5 times more frequent after surgery of circumferential fistula [p=0.002; OR=2.5 (1.4; 4.5)]. For all fistula type (circumferential fistula and non-circumferential fistula), RSUI was 3 times more common in patients who had undergone at least one previous fistula repair surgery [p<0.001; OR=3.02 (1.75; 5.22)].

Table 1. Patients' baseline sociodemographics characteristics and fistulas characteristics.

Variables	Mean [Min ; Max]	Standard Deviation	Number	Percentage (%)
Age (years)	35.9	12.15 [15; 72]		
Residence				
Rural			243	58.4
Urban			173	41.6
Parity	3.9	2.7 [0; 11]		
Weight (kg)	52.43	8.8 [35;86]		
Height (m)	152.47	7.03 [137; 170]		
Aetiology of fistula				
Obstetrical			384	85.9
Iatrogenic			63	14.1
Duration of labor (hours)	41.9	34.7 [1; 196]		
Fibrosis				
Yes			106	76.8
No			350	23.2
Size of defect (cm)	1.85	1.5 [0; 10]		
Type of fistula				
Circumferential			91	20
Non circumferential			365	80
Duration of leakage (months)	94.93	96.14 [1;504]		
Previous urine repair				
Yes			192	42.1
No			264	57.9
Waldijk's classification				
I			354	77.6
IIAa			8	1.7
IIAb			0	0
IIBa			3	0.7
IIBb			91	20
III			0	0

Discussion

Circumferential fistula is the most severe form of low urogenital fistula. Despite efforts in the area of access to emergency obstetric cares for pregnant women, these types of fistula still occupy an important place in developing countries. In the

present study, circumferential fistula accounted for 20% of all VVF. Our finding is similar to that reported by Browning⁵ in Ethiopia (24%). Already in 2014, Kaboré *et al.*⁸ in Burkina Faso reported a proportion of 9.4% for cervico-urethral transections in a cohort of 170 patients. Therefore we could say that there is a trend towards an increase in the frequency of circumferential fistula in

Burkina Faso.

Circumferential fistula cause total separation of the urethra from the bladder. The urethra is almost always involved in circumferential fistula. There is only a small proportion of circumferential fistula that occurs just above the urethra.⁵ Thus in our series, all patients with circumferential fistula are classified in type IIBb of Waaldijk's

Table 2. Univariate analysis of risk factors for circumferential fistula.

Variables	Circumferential fistula	Non circumferential fistula	P value	OR [IC 95%]
Age (years)	35.35±12.10	36.04±12.16	0.62	
Residence				
Urban	46	127	0.039	1.7 [1.05; 2.7]
Rural	43	200		
Parity				
≥4	16	78	0.04	0.47 [0.23; 0.93]
<4	29	66		
Marital status before fistula				
Not Married	10	11	0.002	4.3 [1.7; 10.5]
Married	62	291		
Weight (kg)	51.76±7.98	52.6±9	0.51	-
Height (m)	152.15±6.8	152.55±7.09	0.69	-
Duration of labor (hours)				
≥41	16	44	0.041	2.7 [1.07; 6.9]
<41	8	60		
Aetiology of fistula				
Obstetrical	81	303	0.038	2.54 [1.06; 6.1]
Iatrogenic	6	57		

Table 3. Multivariable analysis of risk factors for circumferential fistula.

Variables	Circumferential fistula	Non circumferential fistula	P value	OR [IC 95%]
Residence				
Urban	46	127	0.7	0.86 [0.36; 2.05]
Rural	43	200		
Parity				
≥4	16	78	0.7	1.16 [0.49; 2.77]
<4	29	66		
Marital status before fistula				
Married	62	291	0.029	0.13 [0.02; 0.81]
Not married	10	11		
Duration of labor				
<41	8	60	0.017	0.26 [0.088; 0.783]
≥41	16	44		
Aetiology of fistula				
Obstetrical	81	303	0.825	1.8 [0.16; 19.3]
Iatrogenic	6	57		

Table 4. Comparison of clinical characteristics between circumferential and non-circumferential fistula.

Variables	Circumferential fistula	Non circumferential fistula	P value	OR [IC 95%]
Fibrosis				
Yes	42	64	<0.001	4.031 [2.463; 6.597]
No	49	301		
Size of defect (cm)				
≥2	74	121	<0.001	5.16 [2.4; 10.9]
<2	9	76		
Duration of leakage (months)	114.67±102.143	88.35±93.48	0.097	-
Previous urine repair				
Yes	50	142	0.006	1.915 [1.205-3.044]
No	41	223		

classification. That means bladder neck and midurethra are involved with a circumferential defect.

On univariate analysis, factors associated with the risk of circumferential fistula were: residence, parity, marital status before the fistula, duration of labor, and fistula cause. Women residing in urban areas have a higher risk of developing circumferential fistula (OR=1.7; $p=0.039$). This finding seems paradoxical because women living in rural areas do not always have access to healthcare facilities for pregnancy monitoring. Consequently, it was expected that the risk of circumferential fistula would be higher in patients living in rural areas. To explain this finding, we showed that women living in urban areas are most often primiparous while those who live in rural areas are most often multiparous [$p=0.046$; OR=2.1 (1.02; 4.17)]. In addition, we also found that a parity greater than or equal to 4 protects against the risk of circumferential fistula [$p=0.04$; OR=0.47 (0.23; 0.93)]. For Barry *et al.*,⁹ among patients suffering from vesico-vaginal fistula with transection, 50% were primiparous and 26.56% were multiparous. Browning⁵ and Wright *et al.*¹⁰ reported that women with circumferential fistula were significantly primiparous than those with non-circumferential fistula in their series. So in reality it is not the rural residence that protects against the risk of circumferential fistula but rather parity.

In fact, during obstructed labor, multiparous women are more likely to experience a uterine rupture than primiparous women.⁵ In case of uterine rupture the pressure on urethra may decrease and therefore the extended necrosis risk decrease. Finally we can understand why circumferential fistula is more common among urban women than rural women. Rural women are generally multiparous and multiparity protects against risk of circumferential fistula.

Patients with circumferential fistula are 2.7 times more likely to have a labor duration of more than 41 hours ($p=0.041$). Indeed, the longer the labor lasts, the greater the risk of ischemia and the greater the defect, increasing the risk of circumferential fistula. In the present study, circumferential fistulas were at least 5 times more likely to have a defect greater than or equal to 2cm ($p<0.001$). In fact, circumferential fistulas are fistulas that are characterized by a significant loss of tissue.⁵

The risk of developing a circumferential fistula is 2.5 times higher for obstetric fistula than for iatrogenic fistula ($p=0.038$). Indeed, on the contrary to obstetric causes, iatrogenic causes lead to high fistulas, circumferential fistula being the most severe forms of low fistulas.⁴

Finally, the two independent risk factors were marital status before fistula and duration of labor. Married women are protected against circumferential fistula ($p=0.029$, OR=0.13). Generally unmarried women are primiparous while married patients are multiparous. We showed that multiparity protects against the risk of circumferential fistula. As for the duration of labor, this is a well-established risk factor for fistula occurrence. At the end, the most important risk factor for circumferential fistula occurrence remains the duration of labor.

According to fistula characteristics, circumferential and non-circumferential fistulas differ on the degree of fibrosis, the size of defect and the presence or not of a previous surgery on univariate analysis. Fibrosis was 4 times more frequent in circumferential fistula ($p<0.001$). Browning⁵ found that significant scarring is more frequent in circumferential fistula compared to non-circumferential fistula ($p<0.001$).

The failure closure rate at three months was almost 4 times higher in patients with circumferential fistula compared to those without ($p<0.001$). RSUI was 2.5 times more frequent in circumferential fistula ($p=0.001$). It's well known in the literature that women suffering from circumferential fistula are at higher risk ongoing urinary incontinence following successful surgical closure of the fistula.¹¹ Indeed, the urinary continence mechanism is more severely affected in circumferential fistula. This incontinence can affect the quality of life of these patients.¹² In Browning's series, 47.2% patients suffering from circumferential fistula had experienced a RSUI.⁵ For Kayondo *et al.*,¹³ patients with circumferential fistulae were 10 times more likely to have RSUI upon successful closure of their fistula. The prognosis for postoperative urinary continence in patients with circumferential fistula is pejorative because continence mechanisms are seriously damaged.

In the present study, urinary incontinence was 3 times more common in patients who had undergone at least one previous fistula repair surgery ($p<0.001$). The risk of RSUI in Kayondo *et al.* series was 4.8 times more frequent in patients with prior surgery.¹³ Some risk factors for RSUI fistula identified in the literature are involvement of the urethra, a small functional bladder capacity, increasing diameter of the fistula and the need for vaginal reconstruction.¹⁴ In circumferential fistula, the loss of tissue and damage to the continence mechanism increase the rate of failure to close the fistula and, above all, the rate of postoperative urinary incontinence. The greater the damage is, greater the risk of failure. Loposso *et al.*¹⁵ is showed that the continence rate

decreased according to the type of cervico-urethral transection: 83.7% in type IIBa 51.2% in type IIBb where the midurethra and bladder neck are destroyed and urethra completely separated from bladder.

Our results cannot be generalized to the entire population of Burkina Faso. It is a hospital-based study. All urogenital fistula treatment centers were not considered in this study. Only patients who were operated on in the seven referral centers were included in the study. Also some data were missing due to the retrospective nature of the study.

Conclusions

This study showed an increasing trend in the prevalence of circumferential fistula in Burkina Faso. Yet enormous efforts are being made to prevent obstetric fistula. Circumferential fistula occurs in urban, primiparous, unmarried women who have been in labor for more than 41 hours. However, the duration of labor at delivery seems to be the determining risk factor in the development of a circumferential fistula. Also circumferential fistulas are characterized by significant tissue loss, significant fibrosis with impairment of bladder continence mechanisms. This explains the high rate of postoperative urinary incontinence. The essential issue in circumferential fistula management is the risk of RSUI after surgical repair. In view of the high rate of RSUI, the question should be asked whether a technique to prevent incontinence should not be associated intraoperatively at the time of surgical repair of the fistula.

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