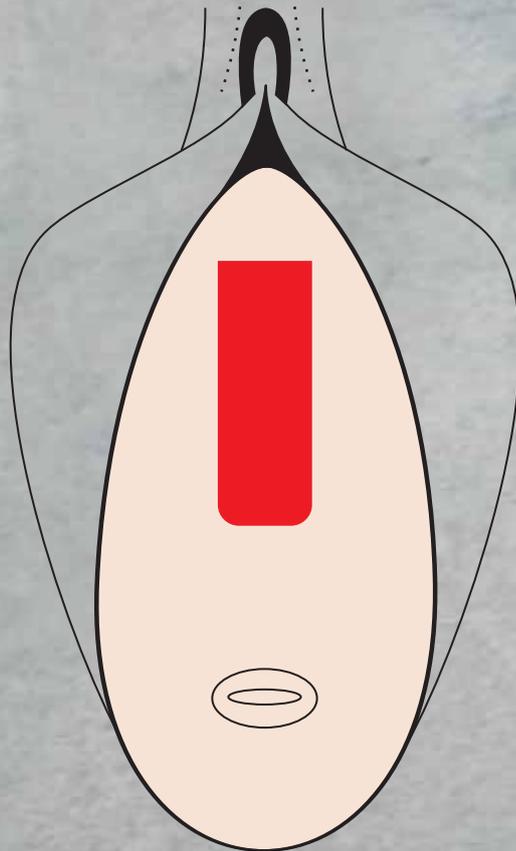


# **obstetric trauma surgery**

## **art and science**

### **yankan gishiri fistula**

continent urethra reconstruction



sponsored and financed by



**ISBN/EAN:** 978-94-90917-11-1

**pages:** 92

**color pages:** 35

**drawings** by the author  
technical assistance by mark

**copyright 2018** by the author

national obstetric fistula center babbar ruga  
katsina  
nigeria

# **obstetric trauma surgery art and science**

**yankan gishiri fistula**

**kees continent urethra reconstruction**

step-by-step

based on

findings and outcome

758 yankan gishiri urine/stool fistulas

over 3,000 personal urethra reconstructions

kees waaldijk

# obstetric trauma surgery art and science

series of textbooks each with a specific topic

## setting evidence-based standards

this series has been developed for setting evidence-based standards in the training and management of the obstetric trauma in all its forms in the developing as well as in the industrialized world

the name of the series has been changed from obstetric fistula to obstetric trauma surgery since the fistula is only one aspect of the complex obstetric trauma

though a systematic approach is being followed this seems to be a utopia since the material is too extensive and it would take too long

each time a specific topic has been finalized it will be published as a separate entity; with later on an update if needed

then somewhere along the line a comprehensive summary will be produced in order to have a representative overview

the emphasis is placed on the functional anatomy of pelvis, pelvis floor and pelvis organ(s), the female urine and stool continence mechanisms, the mechanism of action and the principles of reconstructive and septic surgery

for training reasons it will follow a step-by-step approach and repetition; together with schematic drawings and photographs

the whole series is based on **kees archives of obstetric trauma** with so far 25,000 reconstructive and conservative procedures in 20,000 patients with a rare "complete" documentation of each procedure and results as to healing and continence by electronic reports with 150 parameters, over 100,000 pre/intra/postoperative digital photographs and a comprehensive database as personal experience over a 30-year period from 1984 up till now

as such it is considered to be a full **scientific** evidence-based report; though it has not followed the "you peer me, i peer you" doctrine

it is also not following the strict protocol of the international scientific journals or the so-called established theories; since only dead fish follow the flow of the river; and strict protocols kill any creativity; the message is not in the format

since it is the life work of the author it is written in his own words and in his own style

writing things down helps the author in organizing his own understanding and ideas

# foreword

from ancient times till today, all over the world and in all cultures, people are obsessed by their appearance and a whole industry of body culture has sprung up as cosmetics, body building, botox, cosmetic surgery in all its forms, anabolics, tattooing, piercing, painting, tribal marks etc

however, all with serious life threatening complications

and there is a lot of practice, interest and debate about surgical and nonsurgical genital manipulation either as part of culture or for cosmetic reasons in males and females

pulling onto clitoris and/or labia in childhood, different types of scratching, pricking with needle, cutting, excision, piercing, tattooing, labia reduction, mammoplasty etc

most of the procedures are being performed by traditional health workers or the person him/herself but also by highly specialized plastic surgeons

with the strange hypocritical reaction that it is harmful in females and beneficial in males

though it may result, in both males and females, in severe complications like bleeding, infection, loss of tissue (eg clitoris in females and glans in males) etc or even death

the author witnessed one boy asking/telling his father “what kind of father he was since a real father would not allow this severe suffering to his son”

however, most of the people involved, males and females, are very proud of the fact that they underwent these single or multiple procedures

there is one kind of female genital cutting which besides mentioning has received little attention, viz the **yankan gishiri** which is performed exclusively in the hausa/fulani population of northern nigeria and southern niger **because of health problems**

since the yankan gishiri may result in a fistula, and mostly a type IIBa urethra loss, the author would like to describe a **continent urethra reconstruction** as devised personally by him over the years during a long intensive **innovative** process

and to present his own evidence-based experience as one textbook within the series **obstetric trauma surgery; art and science**

wondering how this very mutilating procedure has evolved and still exists up till today in a society where **female circumcision is not practiced**

and hoping this book will inspire somebody to undertake anthropologic research

what is the difference

**yankan gishiri**

mutilating longitudinal cut/incision and excision of tissue

by

traditional surgeon/barber/midwife  
using aska/razor

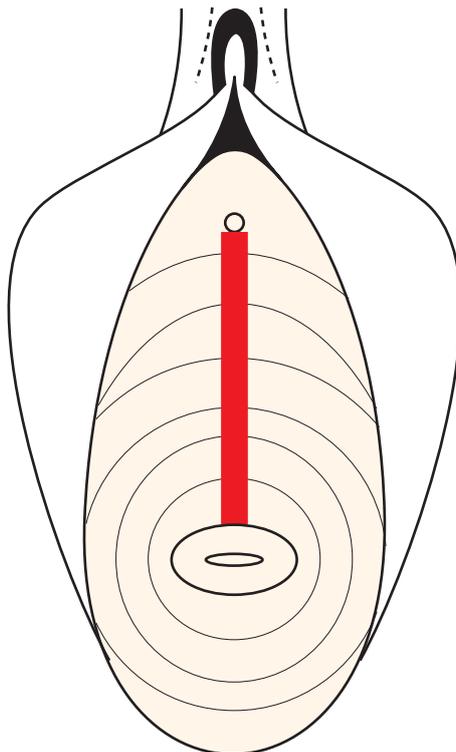
**anterior colporrhaphy**

mutilating longitudinal incision/cut and excision of tissue

by

modern surgeon/gynecologist  
using scalpel

in terms of  
rationale, execution and complications  
functional pelvis anatomy

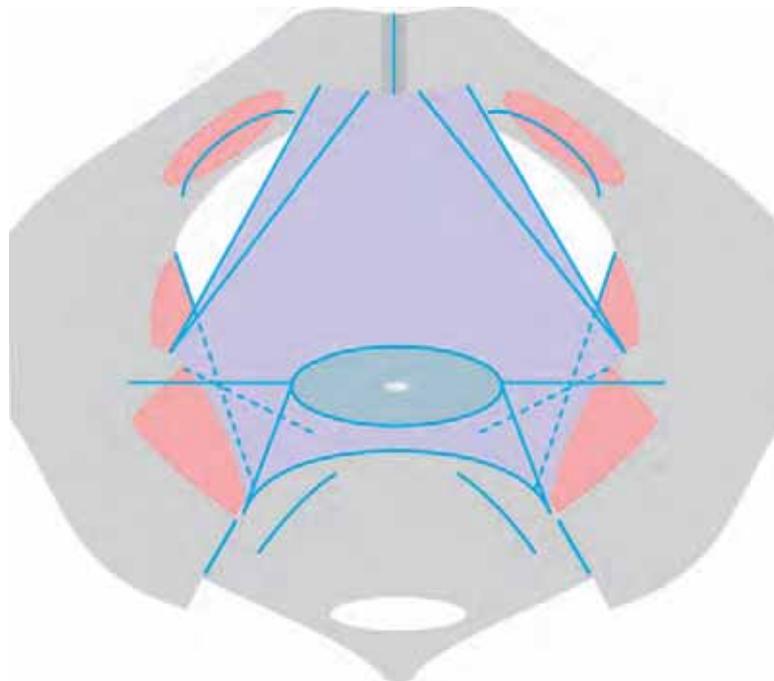
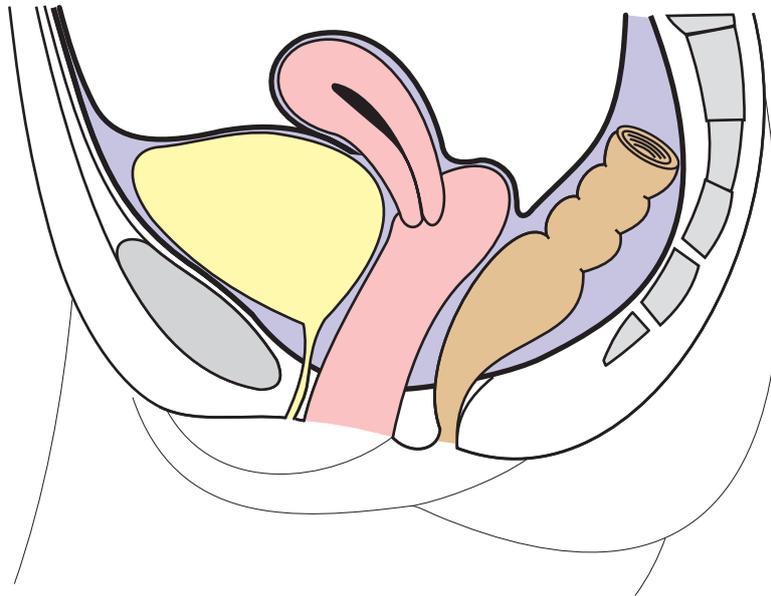


mutilating incision

# table of contents

foreword	3
<b>introduction</b>	
introduction	7
essentials yankan gishiri	9
urine fistula classification essentials	11
stool fistula classification essentials	13
<b>yankan gishiri fistula</b>	
procedure, name, results	16
anecdotal stories	22
personal 25 year experience in figures	28
discussion	33
female genital mutilation modern vs traditional	34
<b>continent urethra reconstruction</b>	
type kees IIBa fistulas	42
chronology of technique	44
continent urethra reconstruction	49
discussion	72
<b>basic science</b>	
urine continence mechanism	74
management of vvf	82
management of rvf	86
<b>postscriptum</b>	89
<b>abbreviations etc</b>	90

# pelvis anatomy



# introduction

the **yankan gishiri** fistula is a fascinating subject and though being mentioned in many publications still **terra incognita**

resulting in myths and assumptions without any substantial evidence-based back-up

the author had his first contact with the yankan gishiri (fistula) in 1984 with his fistula operation no 25

he had never heard of it, never seen a urethra fistula and never read something about how to reconstruct a urethra

over the years it became one of his favorite topics

and like all the other fistula problems he had to find out himself by his own research and by personally developing a **continent urethra reconstruction** since the author worked/works in total isolation

what kept him from publishing was the fact that all his efforts to find an anthropologist to undertake common research failed; also since no organization, ngo or university was found willing to fund anthropologic research

the yankan gishiri is a **traditional surgical procedure** in the hausa/fulani population of northern nigeria and southern niger because of **health problems**

**nb** in a muslim society where female circumcision is not practiced

it is performed by the traditional barber/surgeon (wanzami) or by the traditional birth attendant (ungozoma) but also by the woman herself or somebody else for a variety of reasons

by longitudinal scratching, cutting or excision of anterior vagina wall or to a lesser extent posterior vagina wall tissue using a sharp instrument, knife or razor blade

and may lead to severe mutilation with mostly a type **IIBa** urethra fistula

the incidence is unknown since only women with (severe) complications come forward for treatment

though this may seem primitive, especially in the eyes of the arrogant vocal westerners, exactly the same is done by the modern healers/doctors, even consultant gynecologists, or so called wanzamai with medical license, resulting in the same type of mutilation

yankan gishiri is the common name though there are many local synonyms

the hausa terminology will be used

the author

april 2018



# essentials yankan gishiri

## **yankan gishiri**

a traditional surgical procedure in the hausa/fulani population of northern nigeria and southern niger affecting only the females

literally meaning salt (=gishri) cutting (= yankan) though it cannot be translated since the term gishiri has a variety of meanings

## **procedure and actors**

whereby with a sharp instrument the anterior and/or posterior vaginal wall is scratched, incised or excised mostly longitudinally either by the traditional barber (wanzami) or by the traditional midwife (ungozoma); and even by the woman herself or somebody else

### **scarification**

only scratching or superficial cutting which may lead to urine incontinence

### **-tomy**

deep cutting leading to fistula formation without tissue loss

### **-ectomy**

excision of variable amounts of tissue leading to fistula formation with tissue loss

## **reason**

for a variety of **health problems** like ba hanya, itching, infertility, chest pain, prolapse, headache, bladder stone etc etc

## **ba hanya**

literally meaning road block or no road, though it stands for ba hanyar aure meaning block to the road of marriage (= vagina) in 2 forms

real anatomic ba hanya

congenital vagina malformation or gynatresia after obstetric trauma

ba hanya as psychoconversion

in young girls who refuse to have sex with their husband since they are afraid or do not like the man; by psychoversion to ba hanya no one is blamed or insulted

## **incidence**

not known since only women with (severe) complications come forward for treatment

## **complications**

(severe) bleeding, infection, fistula formation and even death

## **yankan gishiri fistula**

one complication is fistula formation as vesicovaginal fistula and/or rectovaginal fistula though the majority present as **type kees IIBa urethra fistula**

## **reconstructive surgery**

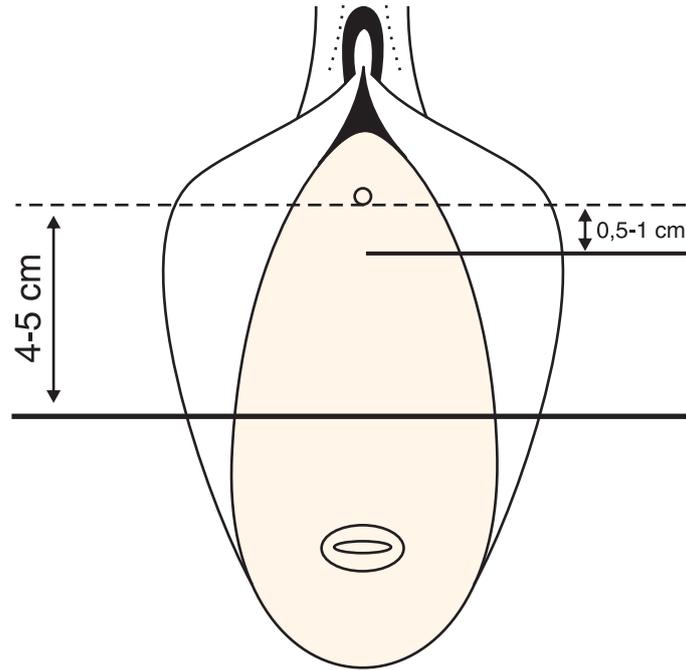
once there is fistula formation, the fistula has to be repaired according to the principles of reconstructive surgery valid for fistulas due to other causes

## **anthropologic research**

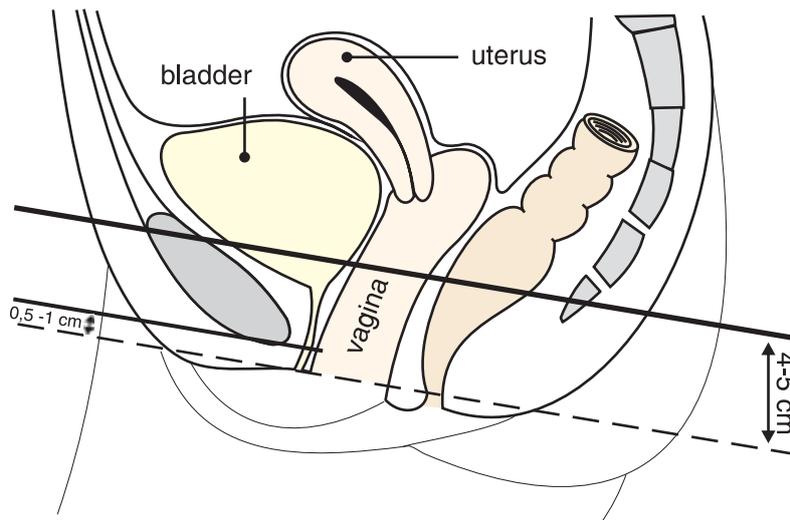
## **long overdue**

and needed to answer some questions like how did this (potential mutilating) procedure evolve and still exists in a society where female circumcision is not practiced at all why do the traditional surgeons continue though they see the complications where does the name come from etc etc

urine continence mechanism



continence/closing mechanism: frontal



continence/closing mechanism: sagittal

# kees vvf classification essentials

as based on tissue loss, continence mechanism, operation technique and outcome

## introduction

based on a retrospective analysis in 775 consecutive patients a scientific classification was developed and recommended in a **phd thesis** in 1989, university of utrecht this classification has been used prospectively and refined by the author in over 25,000 personal fistula and obstetric trauma related operations during a 35-year period of (surgical) management of the obstetric fistula mainly in nigeria, but also in burkina faso, ethiopia, kenya, niger, uganda, tanzania and pakistan from 1984 up till today

## classification

the following classification is presented according to the anatomic/physiologic location with consequences for operation technique and prognosis; see table I

**type I** fistulas not involving the continence/closing mechanism

**type II** fistulas involving the continence/closing mechanism

**type III** miscellaneous

and of course **postpartum urine incontinence**

## table I

classification of fistulas according to anatomic/physiologic location

**type I** fistulas not involving the continence/closing mechanism

**type II** fistulas involving the continence/closing mechanism

**A** without (sub)total urethra involvement

**a** without circumferential defect

**b** with circumferential defect

**B** with (sub)total urethra involvement

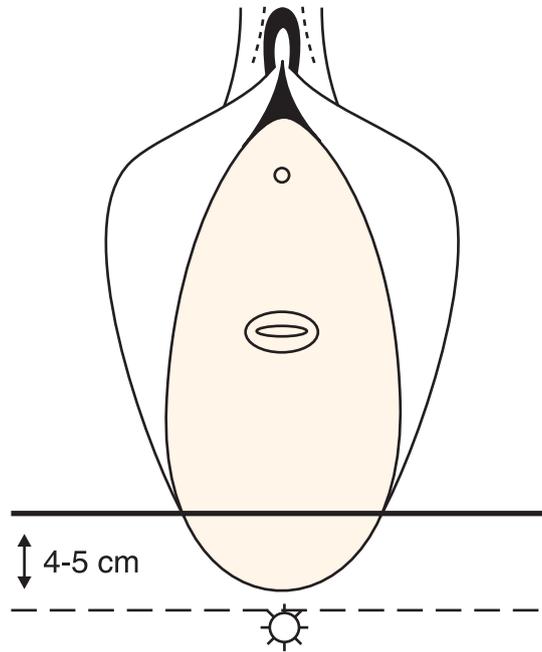
**a** without circumferential defect

**b** with circumferential defect

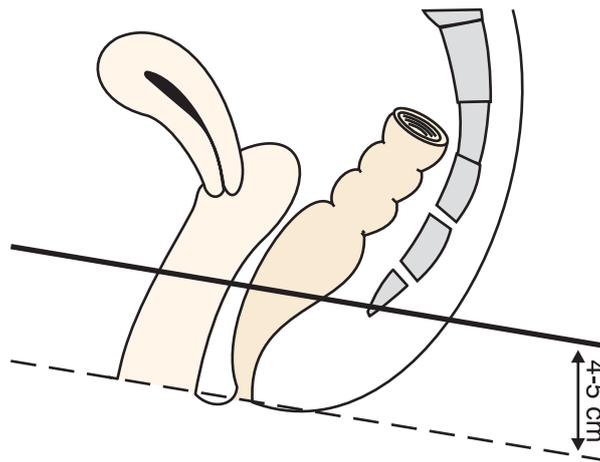
**type III** miscellaneous, e.g. ureter fistulas and other exceptional fistulas

fluid transition from **type I** into **type II** fistulas is at 4-5 cm whilst transition from **type IIA** into **type IIB** fistulas is at 0.5-1 cm from the external urethra opening

# stool continence mechanism



continence/closing mechanism: frontal



continence/closing mechanism: sagittal

# kees rvf classification essentials

as based on tissue loss, continence mechanism and operation technique

## introduction

in order to compare results and different operation techniques it is important to have a scientific classification which makes sense

## classification

the following classification is presented according to the anatomic/physiologic location with consequences for operation technique but not for prognosis; see table I

**type I** fistulas not involving the continence/closing mechanism

**type II** fistulas involving the continence/closing mechanism

**type III** miscellaneous

and of course **postpartum stool/flatus incontinence**

## table I

### classification of fistulas according to anatomic/physiologic location

<b>type I</b>	not involving continence mechanism	proximal fistulas
	<b>a</b> without rectum stricture	
	<b>b</b> with rectum stricture	
	<b>c</b> with circumferential defect	not common
<b>type II</b>	involving continence mechanism	distal fistulas
	<b>a</b> without sphincter ani involvement	
	<b>b</b> with sphincter ani involvement	
<b>type III</b>	miscellaneous, e.g. ileouterine fistulas after instrumental abortion	

fluid transition from **type I** into **type II** fistulas is at 4-5 cm from external anus opening



# yankan gishiri fistula

procedure

anecdotal stories

25 year experience 1984-2009

discussion

female genital mutilation

modern vs traditional

# yankan gishiri fistula

**gishiri = salt**

**yankan = cutting**

procedure + health reasons + name

based on

history, findings and evidence-based practice

758 yankan gishiri fistulas

## introduction

in times of special interest in female genital cutting and raised awareness of traumatic/obstetric fistula, there is one form in the hausa/fulani population of northern niger and southern niger which has received little attention except for mentioning so far it has only been mentioned in the literature by vocal verbal “surgeons” not involved in obstetric fistula work and not living in northern niger who have never seen a yankan gishiri fistula in their life; expressing myths and assumptions without any evidence-based back-up

especially the myth/assumption that these fistulas are simple to repair with good results has to be contradicted

besides fistula formation there may be other serious complications like **severe** bleeding as reported by some patients (not systematically asked during history taking), infection and even death

though far more local names are given to the procedure yankan gishiri seems to be the generally accepted term

it is not possible to give an incidence or prevalence rate as only the females ending up with a fistula come forward for treatment

## myth **form of female circumcision**

the yankan gishiri is a form of female circumcision with only a cut somewhere inside the vagina by a sharp instrument resulting in a fistula though it is a **traditional surgical procedure for health problems**

this comes from the arrogance of the verbal “surgeons” who due to their “superiority complex” think they know everything and know it better than the real experts

## assumption **easy to repair since only cut**

this cut is simple to repair with good results since no tissue loss; this already shows the poor knowledge and poor surgical expertise of the verbal “surgeons”

though the continent urethra reconstruction is the **most complicated** of all the fistula repair procedures; with up to extensive **-ectomy**

## yankan gishiri procedure

the **yankan gishiri** (literally **salt cut**) is a traditional practice whereby a longitudinal cut/scratch is made into the anterior and/or posterior vagina wall (avw/pvw) using a sharp instrument as performed by the traditional barber (**wanzami**) using a knife or by the traditional birth attendant (unguwar zoma = **ungozoma**) using a razor blade with the patient in lying, sitting or squatting position, for a variety of conditions; most times local herbs or a concoction of them are put into the vagina for blood loss, pain and healing; sometimes other persons perform it like the woman herself, her relative or somebody else; even doctors seem to do exactly the same during their operation

### **wanzami**

when performed by the traditional barber other people may be around to keep the patient under control; and most of the time some form of (up to extensive) excision is performed using his shaving knife (**aska**) which he is using for shaving his male clients and also for other small surgical procedures like opening an abscess

### **ungozoma**

when performed by the ungozoma for obstetric reasons the procedure is performed in the sitting position with no other people around; only cutting is performed using a razor blade

### **woman herself**

when performed by the woman herself this is in the squatting position with a mirror and candle in front and then she cuts/incises/excises herself with a razor blade

### **wanzami with medical license**

when performed by the "wanzami with medical license" (up to extensive) excision of tissue is performed using a surgical scalpel

there are **3 forms**: scratching/superficial cut (scarification) not resulting in fistula, deep cut (-tomy) and excision of tissue (-ectomy), the latter two resulting in fistulas from small to extensive

### **scarification**

### **scratching/superficial cut**

normally this heals but in some instances the resulting longitudinal scar contracts and pulls the posterior urethra wall towards the cervix/sacrum resulting in intrinsic urine stress incontinence by anatomic distortion of the urethra architecture  
this will need correction by reconstruction of the functional pelvis anatomy

### **-tomy**

### **only deep cutting**

this results in a clean median longitudinal defect of the posterior urethra wall without tissue loss whereby the posterolateral urethra wall(s) retract bilaterally  
this needs longitudinal urethra repair with reconstruction of functional pelvis anatomy

### **-ectomy**

### **excision of tissue**

depending upon the amount of tissue excised the variety is enormous from small up to extensive and some may even be inoperable right from the beginning  
this needs meticulous reconstruction of the urethra, the anatomic urine continence mechanism and the functional pelvis anatomy

## name yankan gishiri

yankan gishiri means literally salt (=gishiri) cutting (=yankan) and there are several explanations for its name though it is not possible anymore to find out exactly where the name generates from

the term **gishiri** (literally **salt**) seems to symbolize many conditions in hausa culture and language; which makes translation into other languages impossible

there are two explanations for its name which make sense though more anthropologic research is needed and long overdue

### **first**

the cutting is performed in the same way as in ancient times the handler in the market was cutting the salt blocks brought by camel caravans; straight with a long knife

### **second**

the vagina is considered to be the “salt of life” and women do refer to some unhealthy conditions in the vagina as gishiri

since we always ask the woman how the procedure is called in her own community there is a long list of local synonyms, see table at end of chapter

## reason for yankan gishiri

the reasons for yankan gishiri are a magnitude varying from ba hanya, dyspareunia, itching, infertility, prolapse, headache, bladder stone, chest pain to even the husband complaining about pain during sexual intercourse

the ba hanya issue is a famous one among the patients and staff since the patient will come forward telling the health staff only one thing, viz ba hanya

**ba hanya (no road or road block)      hanyar aure (road of marriage = vagina)**  
somehow everybody seems to understand the term immediately and accepts it is some thing which needs surgical intervention; and there are 2 forms

### **real anatomic ba hanya**

these are patients with congenital mayer-rokitansky-küster-hauser syndrome or some kind of gynatresia due to obstetric trauma

### **ba hanya as psychoconversion**

the most common reason for yankan gishiri is the **ba hanya** in young girls who refuse to have sex with their husbands probably because they either are afraid or do not like the man; then by psychoconversion they claim there is **no road** so no one is insulted or blamed

even one woman told that her grandmother said she had ba hanya though she herself had not felt/noted anything; but since the grandmother, one of the most influential persons within the family, said so she went for yankan gishiri

and some women go for repeat yankan gishiri even though they experienced already one fistula which had been repaired successfully

## types of yankan gishiri fistula

once the yankan gishiri results in fistula formation, the majority are urine fistulas (693) against stool fistulas (63) with a ratio **urine : stool** fistulas of **11 : 1**

the majority by far are the **type IIBa** urine fistulas (roughly 75% of the urine fistulas)

the other urine fistula types were **type I**, **type IIAa** and even **type IIBb**

the type stool fistulas were **type Ia**, **type IIa** and **type IIb**

## reconstructive surgery

all the yankan gishiri fistulas were repaired according to the same surgical principles valid for the different types with the same good results whilst the operation technique was customized to each specific fistula

see chapter 25-yr experience with figures

## discussion

the yankan gishiri is a traditional procedure in the hausa/fulani population of northern niger and southern niger which may result in severe urogenital and/or digestogenital mutilation in females

it is performed by the traditional barber/surgeon (wanzami) and by the traditional birth attendant (ungozoma) because of **health problems** and not as a sociocultural practice like female circumcision

for a variety of health conditions like ba hanya, itching, prolapse, obstetric problems, chest pain, infertility, headache etc

this is the first evidence-based essay about the yankan gishiri, the yankan gishiri fistula, the reasons, the actors, the victims, the reconstructive surgery and the results

however, anthropologic research is needed and long overdue

since the predominant yankan gishiri fistula is a **type IIBa** fistula which needs a urethra reconstruction the author would like to present the reconstructive principles in the second part as

kees continent urethra reconstruction; step-by-step

## yankan gishiri

<b>yankan gishiri</b>	=	salt cut	
<b>yankan belu</b>	=	urethra cut, uvula cut	
<b>yankan beli</b>	=	cut for hymen	
<b>yankan dankali</b>	=	cut for cystocele (potato)	
<b>yankan anguriya</b>	=	ritual scratch by knife into “hymen” of newborn girls	
<b>yankan farce</b>	=	nail of baby cutting vagina up	
<b>yankan guriya</b>	=	hymen cut	
<b>yankan gyara</b>	=	cut to repair	
<b>yankan hantsaki</b>	=	cut with sharp metal instrument	nguru vvf 72
<b>yankan jini</b>	=	blood cut	kano_vvf_2978
<b>yankan kakanda</b>	=	cut for something blocking the place	
<b>yankan koko</b>	=	calabash (?cystocele?)	kebbi_vvf_72
<b>yankan kari</b>	=	episiotomy in hospital	
<b>yankan tsatstsefa</b>	=	salt cut (different dialect)	
<b>yankan tsigai</b>	=	cutting of pointed boil (like arrow)	
<b>yankan yinere</b>		(fulani)	
<b>yankan zir-zir</b>	=	salt cut (different dialect)	kano_vvf 4112
<b>yankan zul-zul</b>	=	salt cut (different dialect)	
<b>tsagar gishiri</b>	=	salt cut	
<b>wanzami</b>	=	traditional barber	
<b>ungozoma</b>	=	traditional birth attendant	= <b>unguwar zoma</b>
<b>ba hanya</b>	=	no road	= <b>ba hanyar aure</b>
<b>ba kofar</b>	=	no gate	= <b>ba kofar aure</b>

**wanzami** comes from a family tradition of wanzamai where the traditional surgery is being taught from father to son

**ungozoma** is self educated unless she comes from a family of wanzamai, and then she can call herself wanzami as well

it takes three adult men to hold the woman, one holding each leg and one keeping her torso down whilst the wanzami stands between the opened legs and the woman is lying on her back

why/how does the yankan gishiri (still) exist in a culture where female circumcision is not being practiced?

yankan anguriya by wanzami a **ritual** to open her up for her husband later in life?

is it still possible to trace the origin of yankan gishiri in a culture with only verbal history until it was islamized?

how frequent is fistula (in %) after yankan gishiri as not all of them end up with a fistula?

how frequent is excessive blood loss in yankan gishiri?

how frequent is severe infection/inflammation after yankan gishiri?

why do the wanzami and ungozoma continue this practice though they are aware of its complications?

is **ba hanya** a psychosomatic conversion of these young girls who do not like their mostly elderly husbands?; by saying this they have an excuse to refuse sex with him which is understandable to anybody

there is real **ba hanya** as well in congenital vagina atresia, and these girls end up also with yankan gishiri.

it is done for ba hanya, infertility, cystocele, pain, dysuria, urine retention, bladder stone, gishiri, kakanda, itching, dyspareunia, obstructed labor, boil, fistula with urine leakage, congenital vagina atresia, because the **husband** experienced pain during intercourse

## **nb modern-day female genital mutilation**

what about the very **mutilating** longitudinal **incision** and **excision of valuable vagina tissue** by “modern-day” gynecologists during their so called anterior colporrhaphy and what about the implantation of heterologous **tvf** and **mats** into the vagina by the highly specialized urogynecologists though they all know the serious complications but still continue their malpractice **no difference whatsoever**

first edition            april 1996

last edition            may 2018

## anecdotal graphic stories

in one patient the yankan gishiri was performed because of infertility and she became pregnant within a month; so for her it really worked though she started to leak

in one patient the yankan gishiri was performed because of headache; and the wanzami told her this was due to the fact that there was so much salt in the vagina it sucked up all the blood so that the blood could not reach the head; very plausible explanation for the headache; and really no headache anymore but instead leaking

one woman told she was visited at night by a djin who shot an arrow into her vagina and then she started to leak; to the author it looked like a yankan gishiri fistula

one patient prepared herself for a yankan gishiri since something came out by putting a mirror and candle on the floor, then she squatted with mirror and candle in front; and started cutting herself with a razor blade; she fainted and could not continue; so she called her elder brother to do it and ended up with a 5 cm hole between the bladder and vagina which was repaired successfully

one patient had 4x yankan gishiri by 4 different wanzamai but she was not satisfied and then went to the fifth one who performed another resulting in a large fistula

one patient cut herself 4x but she was not satisfied, then went to a wanzami for a real yankan gishiri ending up with a fistula

one patient returned after successful repair for yankan gishiri urine fistula now with a rectovaginal fistula by the same wanzami; all for ba hanya

one girl had a yankan gishiri by her own father annex wanzami resulting into a fistula; it is not known if her father/wanzami still continues this practice

one woman had an operation in hospital for prolapse, she was not satisfied with the result, went to the wanzami for a yankan gishiri ending up with a large fistula

one woman told us upon asking why she went to the wanzami since the gishiri was too much so it had to be cut away, no way out

one woman who had no complaints went for yankan gishiri because her grandmother said she had ba hanya

one woman had yankan gishiri because her husband complained about pain during sexual intercourse

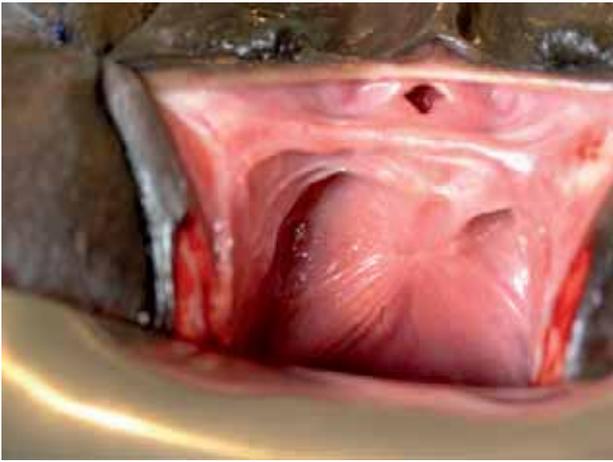
one woman had yankan gishiri because of chest pain which disappeared after the procedure though now she was leaking; so also successful

one girl came with an "inoperable" fistula after extensive excision of urethra/avw by a real western educated consultant gynecologist from the middle east; all because of ba hanya due to vagina septum (with still cryptomenorrhea); so wanzami with specialist medical license; no difference whatsoever with a traditional wanzami

**scarification**

**-tomy**

**-ectomy**



scarification with incontinence



scarification with proximal fistula



-tomy



-tomy / -ectomy

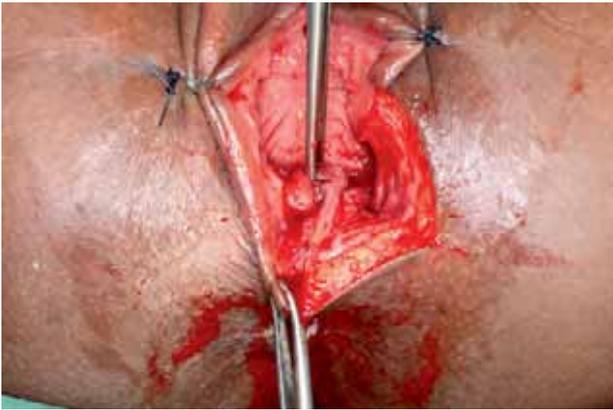


-ectomy



extensive -ectomy

# rectovaginal fistula



distal rvf IIa



distal rvf IIa



distal rvf IIa



distal rvf IIa



sphincter trauma IIb

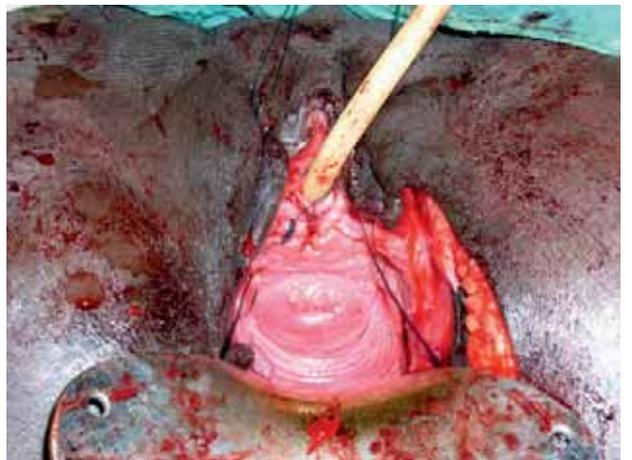
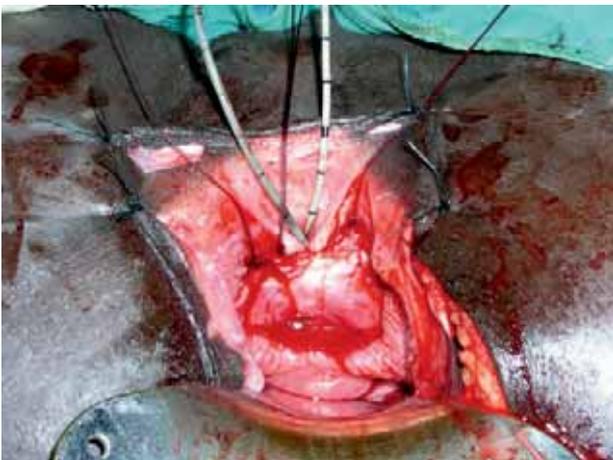
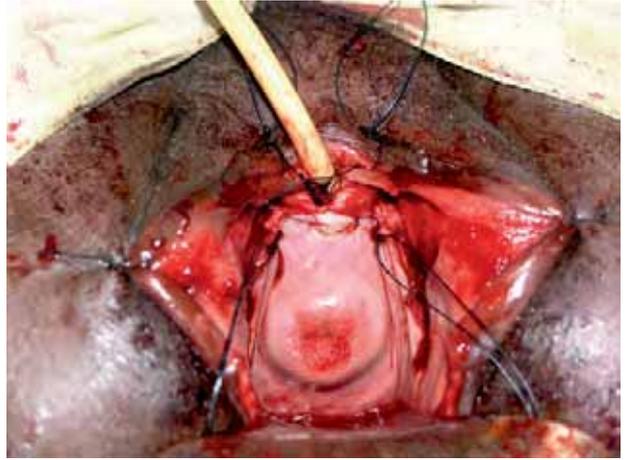


vvf + rvf  
ba hanya

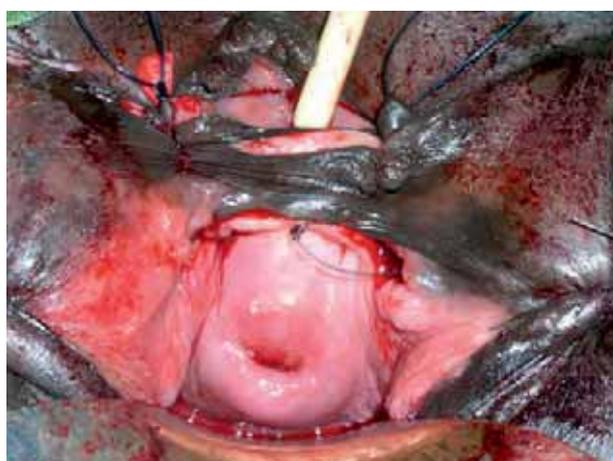
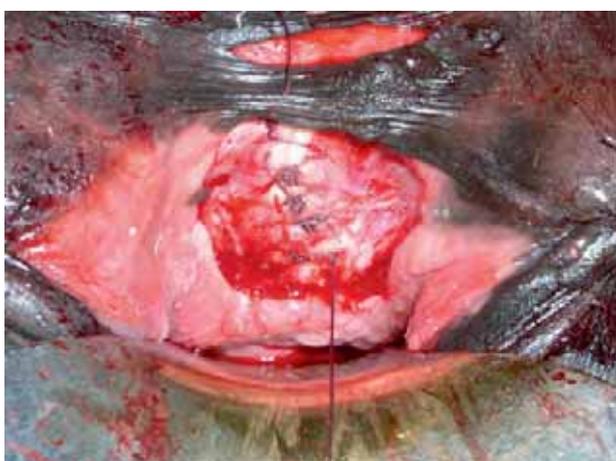
# ba hanya



# yankan gishiri urethra fistula IIBa



**yankan gishiri + already operated elsewhere**



# yankan gishiri fistula

personal 25 year experience 1984-2009 in figures

with a report on 577 patients

## introduction

in times of special interest in female genital cutting and raised awareness of traumatic/obstetric fistula, there is one form in the hausa/fulani population of northern nigeria and southern niger which has received little attention except for mentioning

since there are no scientific reports available as written by surgeons who operated themselves, the author would like to present the evidence-based figures of his personal 25-yr experience 1984-2009

as **first** scientific study about the yankan gishiri and the yankan gishiri fistula and its reconstructive surgery management

## materials and methods

during the 25-year period 1984-2009 a total of 577 patients (3.75%) out of the 15,389 fistula patients who were operated upon by the author in hausa land presented with a yankan gishiri fistula: 523 (3.8%) out of the 13,793 vvf patients and 54 (3.4%) out of the 1,596 rvf patients

yankan gishiri as cause constitutes 3.75% from all patients

## practice of yankan gishiri

it had been performed by wanzami in 439 (76.1%), by ungozoma in 89 (15.4%), by doctor in 23 (4.0%), by herself in 19 (3.3%) and by others in 7 (1.2%) see table 1

**table 1 practice of yankan gishiri in 577 patients**

In northern nigeria and southern niger

by traditional barber (wanzami) using knife lying position	<b>439 (76.1%)</b>
by tba (ungozoma) using razor blade sitting position during labor	<b>89 (15.4%)</b>
by patient herself using razor blade squatting, mirror in front, candle	<b>19 (3.3%)</b>
by doctor as operation procedure	<b>23 (4.0%)</b>
by others like mother, sister etc	<b>7 (1.2%)</b>

## reason for yankan gishiri

the reason for yankan gishiri was: ba hanya in 346 (60.0%) (psychoconversion 221, malformation 125), obstetric in 80 (13.9%), prolapse in 63 (10.9%), pain/itching/boil/abscess in 27 (4.7%), infertility in 24 (4.2%), urine retention etc in 16 (2.8%) and miscellaneous, e.g. headache, in 21 (3.6%); 4 patients had an obstetric yankan gishiri fistula combined with a caesarean section fistula; see table 2

**table 2 reason for yankan gishiri in 577 patients**

ba hanya		<b>346</b>	<b>60.0%</b>
psychoconversion	<b>221 (38.3%)</b>		
congenital malformation	<b>125 (22.4%)</b>		
obstetric		<b>80</b>	<b>13.9%</b>
prolapse		<b>63</b>	<b>10.9%</b>
pain/itching etc		<b>27</b>	<b>4.7%</b>
infertility		<b>24</b>	<b>4.2%</b>
urologic problems		<b>16</b>	<b>2.3%</b>
miscellaneous		<b>21</b>	<b>3.6%</b>
headache, chest pain, abdominal pain etc			

## fistula type

### vesicovaginal fistula

the majority of the vvf patients, 402 (76.9%), had longitudinal urethra loss type IIBa or even IIBb; 84 (16.1%) had type IIAa fistula and 18 (3.4%) had type I fistula whilst 19 (3.6%) reported with post IIBa repair total incontinence

### rectovaginal fistula

of the 54 patients with a rvf 44 (81.5%) had distal type Ila fistula, 6 (11.1%) had sphincter ani trauma as well type I Ib and 4 (7.4%) had proximal fistula type Ia

### combination vvf/rvf

whilst 31 patients had both rvf and vvf

**table 3 fistula type**

### vvf in 523 patients

urethra loss IIBa or IIBb	<b>402</b>	<b>76.9%</b>
type IIAa	<b>84</b>	<b>16.1%</b>
type I	<b>18</b>	<b>3.4%</b>
post IIBa incontinence	<b>19</b>	<b>3.6%</b>

### rvf in 54 patients

distal type Ila	<b>44</b>
distal type I Ib	<b>6</b>
proximal type Ia	<b>4</b>

## fistula age

the age at yankan gishiri varied from 7 days up to 72 years with the majority 266 (47.8%) at 11-15 yr

## fistula size

the resulting fistula was small in 122 (21.1%), medium in 200 (34.7%), large in 125 (21.7%) and extensive in 111 (19.2%), whilst 19 patients (3.3%) presented with post IIBa repair total incontinence III as presented in table 4

**table 4 fistula size**

small	<b>122</b>	<b>21,1%</b>
medium	<b>200</b>	<b>34.7%</b>
large	<b>125</b>	<b>21.7%</b>
extensive	<b>111</b>	<b>19.2%</b>
total incontinence	<b>19</b>	<b>3.3%</b>

## difficulty grading

to demonstrate the fact that fistula surgery is **never simple**, 125 patients (22.4%) had been operated already from 1 to 6 times

## reconstructive surgery

all operations were carried out under spinal anesthesia with the patient lying on her back with the legs flexed in holders in the exaggerated lithotomy position

all the yankan gishiri fistulas were repaired according to the same surgical principles valid for the different types with the same good results whilst the operation technique was customized to each specific fistula

since the majority of the patients had urethra loss and needed a continent urethra reconstruction the technique was as following

### **continent urethra reconstruction**

**a** suturing labia to the inner side of the legs to keep operation field open

**b** insertion of self-retaining weighed auvard speculum

**c** exact examination of all the individual lesions and final plan of action devised as customized to the individual needs

**d** wide H incision along fistula and thru avw with distance between H ledges at least 3 cm wide distally and becoming wider proximally

**e** sharp dissection of avw from pubocervical fascia/bladder in order to prepare an advancement flap for (neo)urethra covering

**f** if needed paraurethral dissection/mobilization of tissue; often urethral arteries are cut then as well and hemostasis may be needed

**g** tension-free longitudinal urethra reconstruction by single layer of inverting polyglycolic acid sutures starting proximally with repositioning of urethrovesical (uv) junction checking patency with hegar 6 after each suture

**h** make sure no urethra/bladder mucosa is sticking out between the sutures

**i** bilateral refixation of fascia onto paraurethral/euo atf by 2x polyglycolic sutures each side in order to reconstruct the support

**j** check for urine loss thru suture line for leaking and thru euo for continence by asking the patient to cough with suprapubic pressure over bladder

**k** insertion of foley ch 16 or 18 catheter and fixing catheter by nylon suture

**l** check of longitudinal bladder diameter and urethra length in cm

**m** transverse hemostatic avw reconstruction by 4-point fixation of already mobilized avw/cervix advancement flap onto paraurethral arcus tendineus fasciae/symphysis by nylon sutures

**n** loose vagina pack to end the operation

**o** if everthing ok patient was transferred to the postoperative ward

remarks

if the distance between the H incision ledges is too small (circumference of tube = 2 pr) the urethra will become too narrow with outflow obstruction; and also possibility of rupture by catheter and or developing a stricture

it is better a bit too wide than a bit too narrow since the first will be corrected under physiologic stress/wound healing and if not can be corrected surgically but the latter can only be managed by (repeat) dilatation

reconstructing the urethra over a catheter in situ is more complicated and will place more tension on the tissues than first reconstruct and check patency later after each suture and at the end insert catheter

start with reconstruction of uv junction by special suture; first pick up lateral proximal urethra tissue on one side, then posterior bladder neck and again lateral proximal urethra tissue on the other side and then tie; otherwise a stricture will develop since the bladder neck has been pulled towards the cervix by traction (since pubocervical fascia no longer connected distally to parametatal arcus tendineus fasciae); so that the total longitudinal reconstruction should look like inverted T

make sure no urethra/bladder mucosa sticks out in between the sutures since then it cannot heal

in order to promote continence the functional pelvis anatomy has to be reconstructed by bilateral paraurethra\_meatus fixation of the pubocervical fascia in order to support the urine continence mechanism by securing the neourethra in its anatomic position

## results

since reliable follow-up exists in only 3 out of the 11 centers in hausa land the results are given for 494 patients consecutively operated in these 3 centers; see table 5

### table 5 final postoperative results in 494 patients

out of **449 patients with urine fistula** after 1 or more (up to 7) operations

fistula healed		<b>438</b>	<b>97.6%</b>
with full continence	<b>404</b>	<b>92.2%</b>	
with stress I-II	<b>21</b>	<b>4.8%</b>	
with total incontinence III	<b>13</b>	<b>3.0%</b>	
residual fistula		<b>10</b>	<b>2.3%</b>
mortality due to native medicine		<b>1</b>	<b>0.2%</b>

out of **45 patients with stool fistula** after 1 or more (up to 2) operations

fistula healed with continence		<b>45</b>	<b>100%</b>
--------------------------------	--	-----------	-------------

out of 449 patients with urine fistula 438 (97.6%) had healed with in 404 (92.2%) full continence, 10 (2.3% had residual fistula and 1 patient (0.2%) died 2 days after repair due to native medicine; after 1 or more (up to 7) operations

out of 45 patients with stool fistula 45 (100%) had healed after 1 or more (up to 2) operations

## discussion

cutting into the vulva or the vagina to widen it because of dyspareunia is an old-standing belief that even in modern gynecology existed until recently (some 40 years ago), and perhaps still exists

the low incidence of 3.75% of all fistulas in this study is due to the fact that it is based upon the actual findings; in sharp contrast to the far higher figures in other publications where the author(s) were either not involved in obstetric fistula surgery and/or never saw a yankan gishiri fistula

contrary to what one might belief the yankan gishiri fistula is not easy to manage since most of the time a continent urethra has to be reconstructed in a situation with some kind of (up to extensive) -ectomy

the incidence of yankan gishiri fistula is not known since only when the procedure results in a fistula the woman will come forward for surgical repair

how is it possible that this very mutilating procedure exists in the hausa/fulani culture where female circumcision is not being practiced

anthropologic research into this highly interesting phenomenon is long overdue

first edition                      january 1993

last edition                        january 2017

# yankan gishiri fistula

## discussion

the **yankan gishiri** is a fascinating subject from a cultural, sociomedical, psychologic, economic, reconstructive surgery and anthropologic viewpoint

this essay is the **first scientific approach** with clinical research into the yankan gishiri fistula as a serious complication of the yankan gishiri

it has nothing to do with female circumcision since the intention is to surgically cure the woman of her “sickness”; nb in a society where female circumcision is not practiced

though the patient may end up with severe urogenital or digestogenital mutilation like vesicovaginal and/or rectovaginal fistula(s)

when the author came across it in 1984 he had never heard of it, never seen a urethra loss and never read an article about how to reconstruct the urethra

though this practice had been around for quite some time he was surprised that he could not find a clear description of it nor a clear surgical operation technique for it but a lot of assumptions/myths by yankan gishiri illiterate “surgeons”/ngo’s for their own personal publishing career/glorify and/or political agenda with all the rest copying and then twisting it again to their advantage

everyone talking/publishing nonsense since no personal exposure/experience; without any evidence-based back-up, claiming credit for things they had never seen or done

so he started his own research by refining the history taking, by meticulous examination of the trauma, by developing operation principles for a continent urethra reconstruction and by asking his staff to approach their own people, wanzamai and ungozoma about the origin of the name etc

nowadays we ask the woman systematically for what reason it was done, by whom it was done, how it was done lying/sitting/squatting, which instrument was used aska or razor blade, how many persons were around and if tissue was removed or not

and we ask the woman how she calls this procedure or how it is called in her community which gave some interesting responses like yankan dankali (potato cut) for cystocele since it looks like potato (dankali)

and the yankan gishiri fistula became a favorite topic to the author

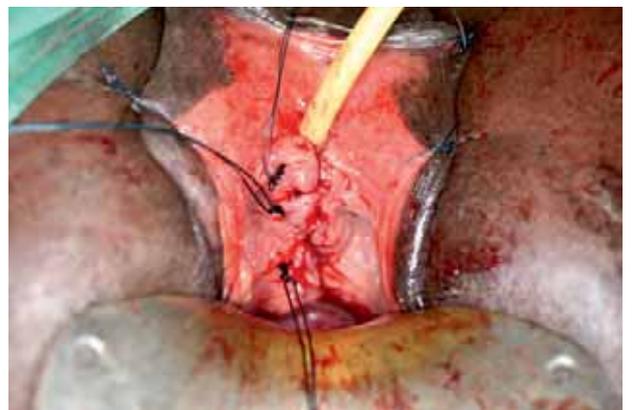
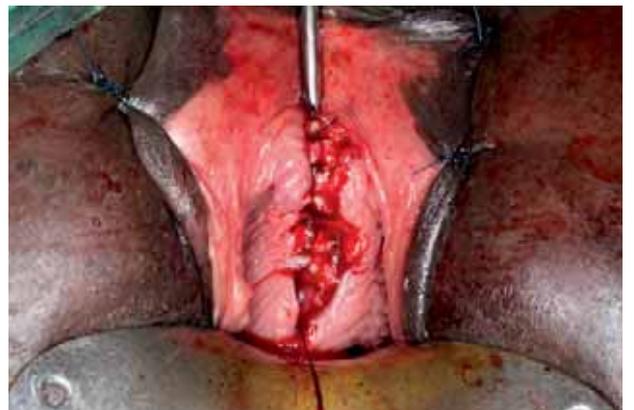
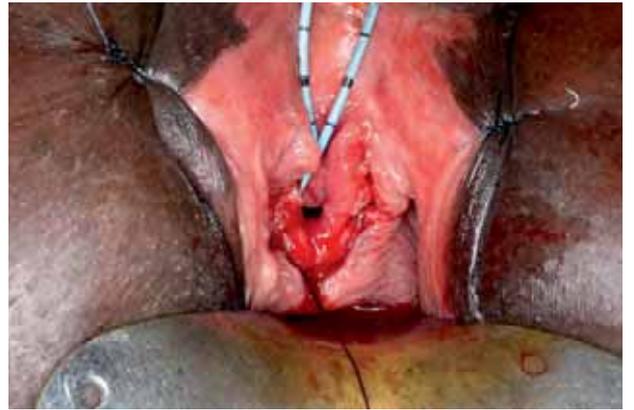
though the reconstructive surgery has been solved there remain many questions like

how is it possible this potentially mutilating procedure evolved and still remains in a community where female circumcision is not practiced etc etc

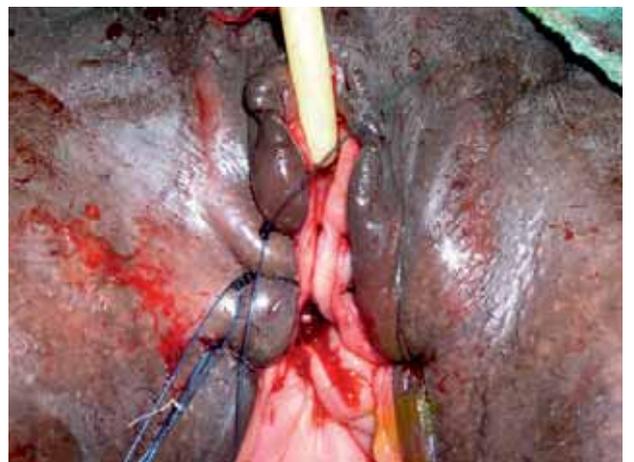
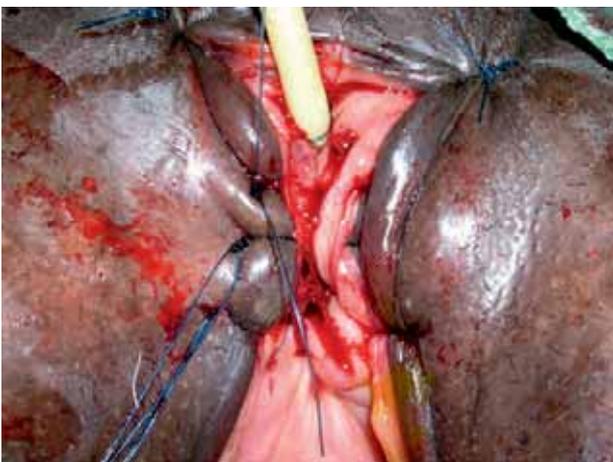
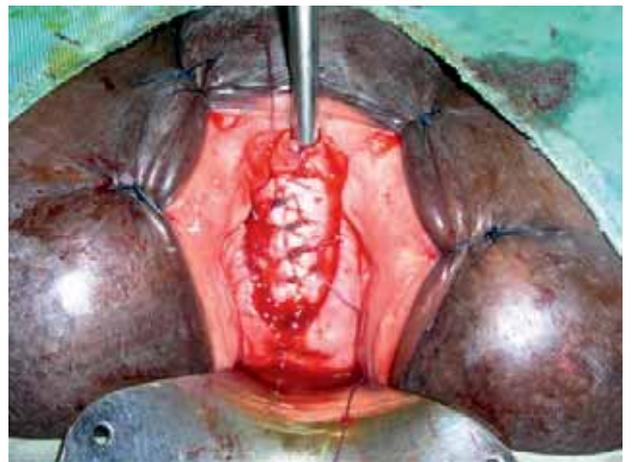
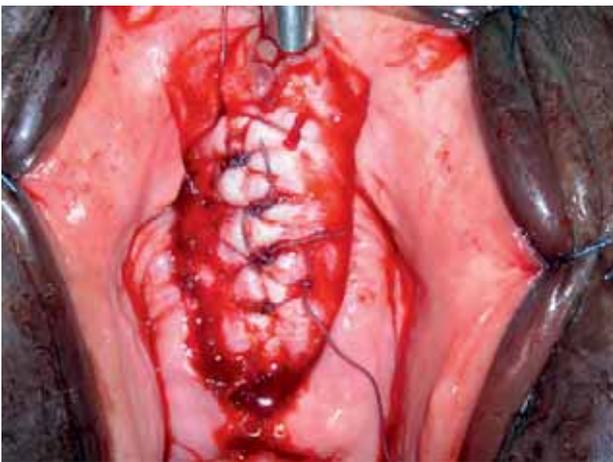
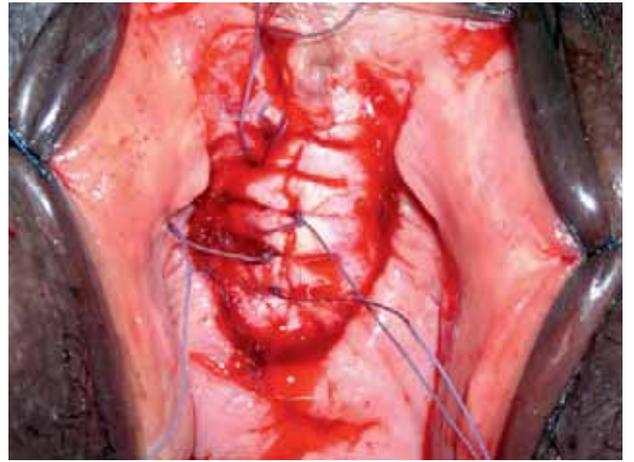
anthropologic research is long overdue



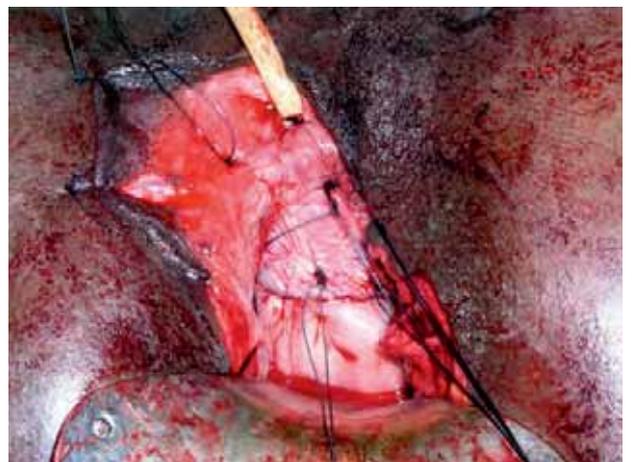
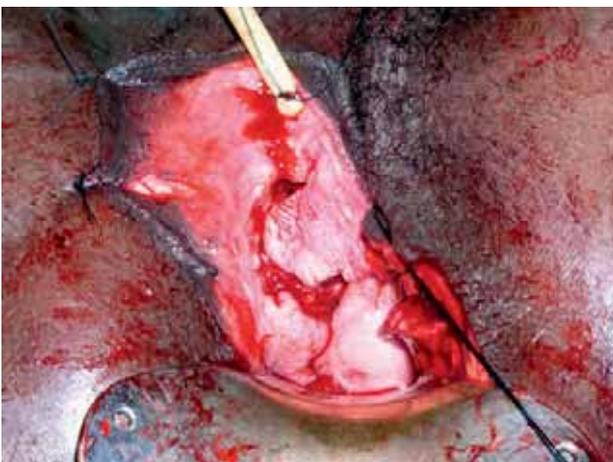
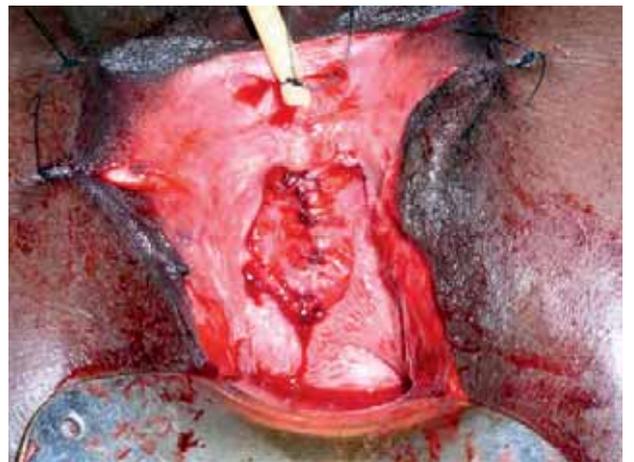
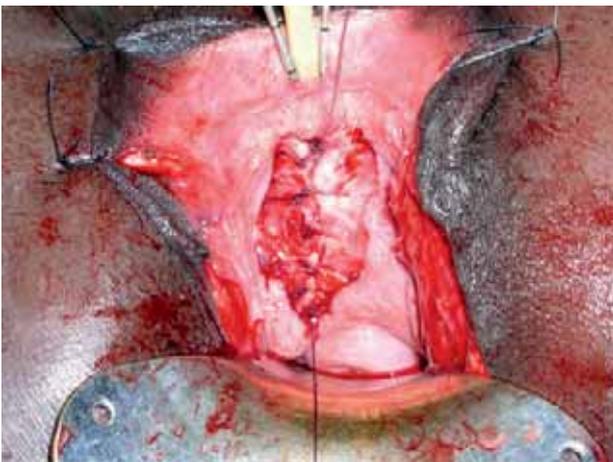
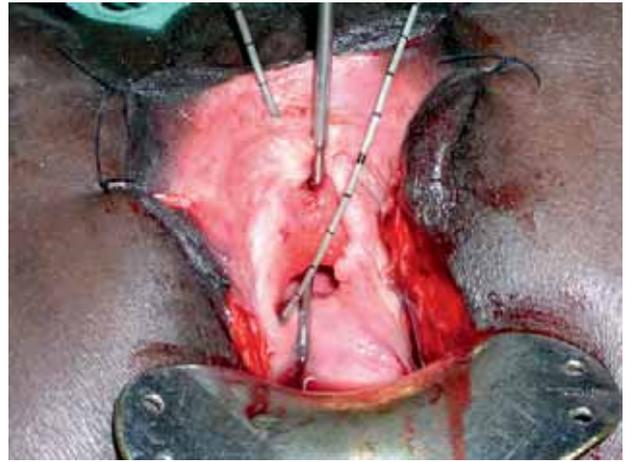
**-tomy**



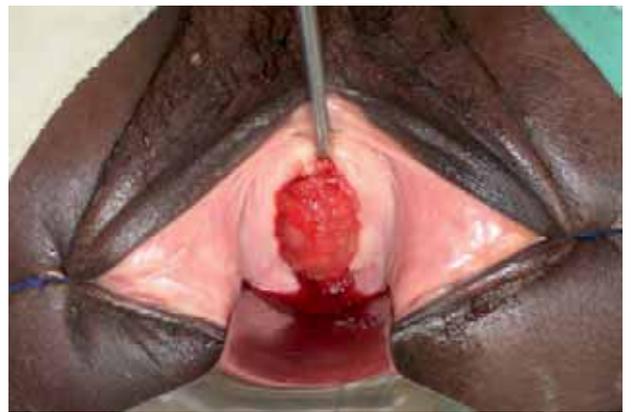
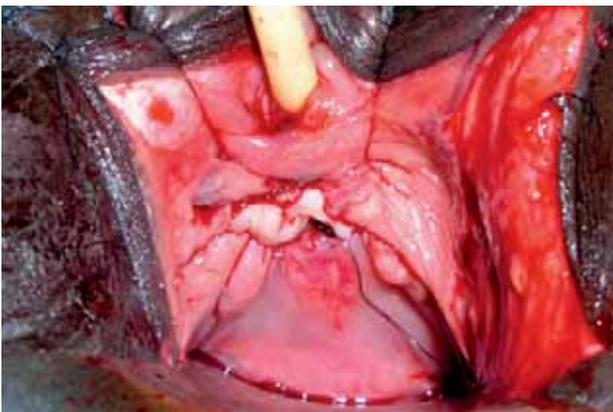
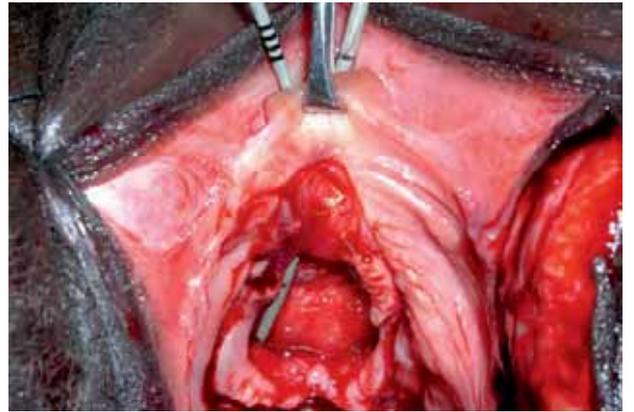
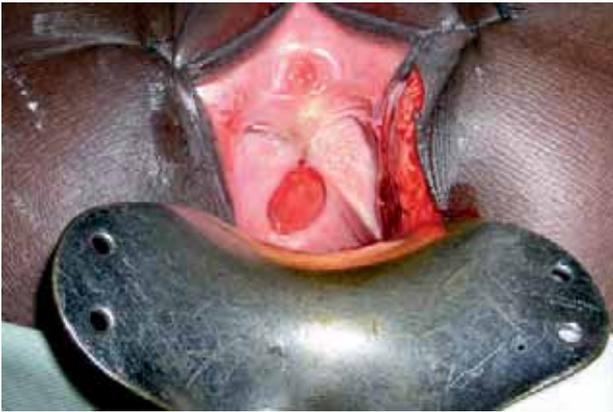
# -tomy / -ectomy



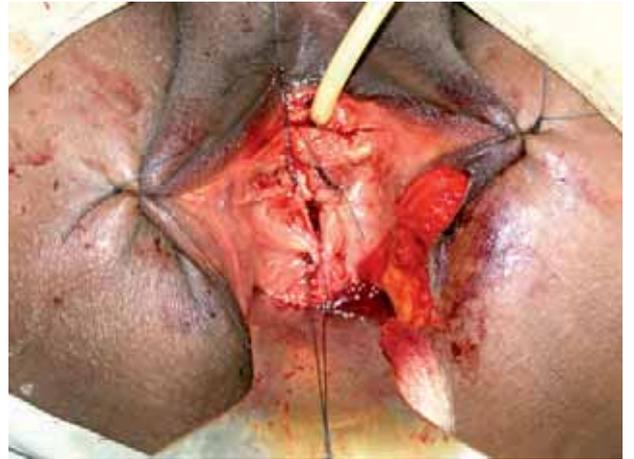
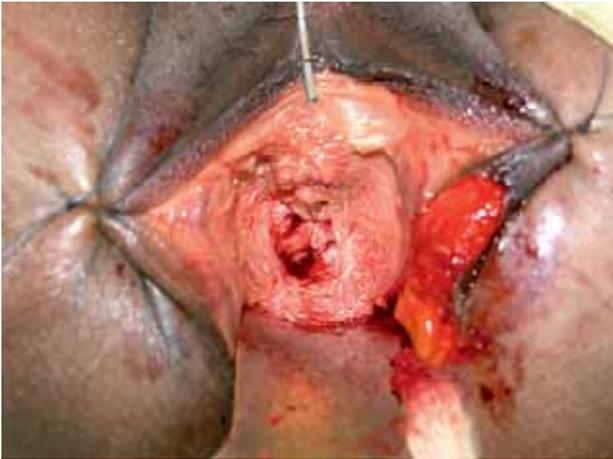
# extensive -ectomy



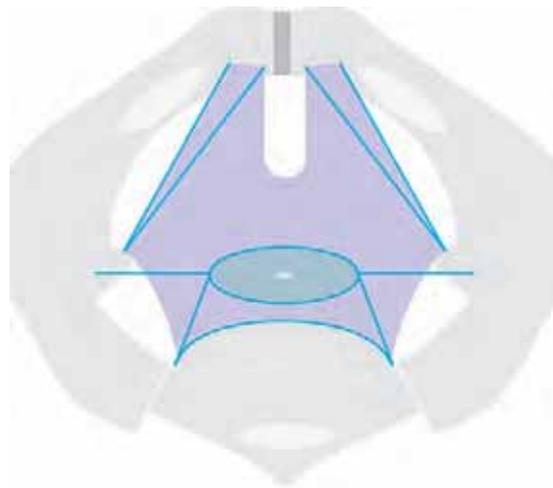
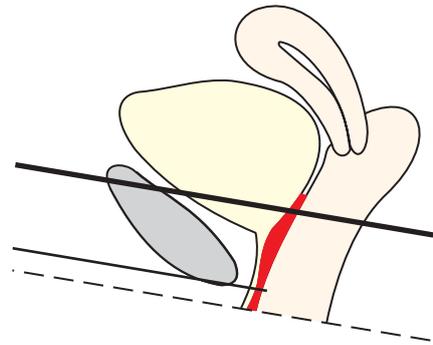
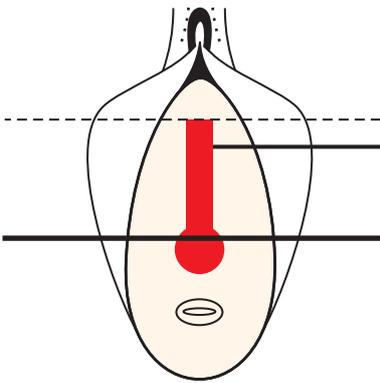
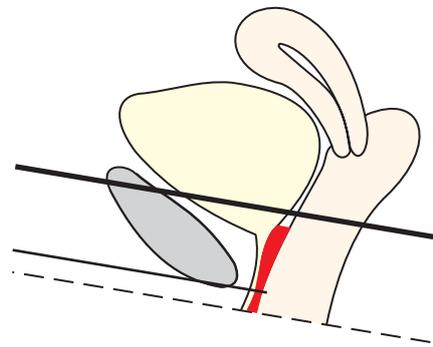
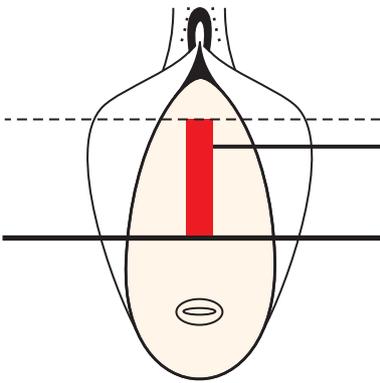
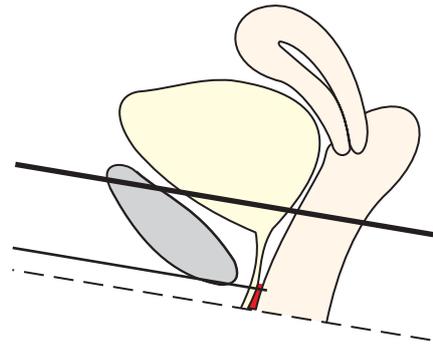
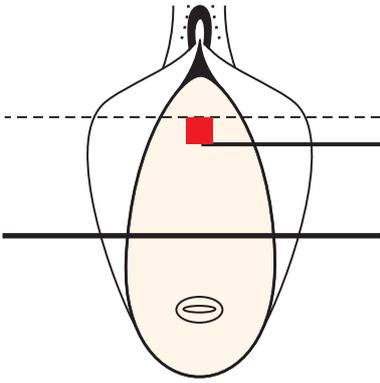
# type II Aa fistula



# fistula after gynecologic surgery



# type IIBa fistulas



# **continent urethra reconstruction**

step-by-step

based on

**over 3,000 personal urethra reconstructions**

type kees IIBa urethra fistula

chronology/development of operation technique

kees continent urethra reconstruction

discussion

## **type kees IIBa urethra fistulas**

- II** fistulas involving continence mechanism
  - B** with (sub)total urethra involvement
  - a** without circumferential defect

### introduction

within the **kees** classification system the fistula which involves the urine continence mechanism **II** with (sub)total urethra involvement **B** without circumferential defect **a** is a **type kees IIBa fistula**

also within this type kees IIBa class the variety is enormous

and it poses a major challenge since the urethra as main continence mechanism has to be reconstructed together with reconstruction of the uv-junction and its support by the endopelvic diaphragm

and the urethra tissue is of delicate structure; once the remaining tissue is traumatized during surgery the result will be poor and from operable it may become inoperable

so the better the mechanism of action is understood the better the functional anatomy may be reconstructed

it looks so simple to start and then turns out to be so difficult since it needs excellent tissue and instrument handling with special insight

and how to cover the reconstructed urethra with viable dynamic tissue in line with the natural tissue forces

the major challenge in urethra reconstruction is how to ensure continence

### special mechanism of action and trauma

- aj** substantial avw tissue loss
- aa** tissue loss of the urethra (main continence mechanism)
- ab** the anterior urethra wall is intact and in its anatomic position as fixed/adherent to posterior/caudad symphysis
- ac** anterior euo is still intact and in anatomic position as fixed to anterior symphysis by anterior pubourethral ligament of perineum outlet diaphragm
- ad** the posterior urethra wall is traumatized with tissue loss

- ae** remaining posterolateral urethra tissue has retracted bilaterally by the intrinsic tissue forces
- af** the remaining urethra becomes flat (no longer tube like) against the symphysis and flush laterally with the remaining avw
- ag** tissue loss of the endopelvic diaphragm
- ah** defective fixation of endopelvic diaphragm anteriorly and anterobilaterally to para-uro and para-urethra pubis bones/atf
- ai** dorsal retraction of the uv-junction towards cervix/sacrum since
  - the fixation of endopelvic diaphragm is loose anteriorly with
  - traction by the remaining endopelvic diaphragm
  - intrinsic tissue forces of the bladder/detrusor muscle

## reconstructive principles

reconstruction of a tube-like structure poses some specific hurdles since circumference of a tube is  $2\pi r$  ( $2 \times 3.14 \dots \times \text{radius}$ ); and even more tissue is needed for placement of the adaptation sutures on each side (at least in total 6 mm); this has to be calculated before the incision is made

for a ch18 urethra a tissue width of at least  $2 \times 3.14 \times 3 \text{ mm} + 6 \text{ mm}$  is needed or in total 25 mm; on the safe side something between 25-30 mm

it is better to make the tube a bit too wide than too narrow since the latter may give rise to dysuria (+ stone formation) whilst the first will be adapted spontaneously

then the urethra is delicate tissue which need careful handling; once it is further traumatized by dissection or needle/suture the chance of reconstruction and healing will be seriously compromised

then the uv-junction has to be reconstructed with repositioning/reduction of the retracted posterior bladder neck wall otherwise a uv-stricture may develop

however, successful reconstruction of the urethra alone will not work since the posterior urethra wall, posterior uv-junction and posterior bladder neck need dynamic support by a functioning endopelvic diaphragm; otherwise postrepair intrinsic-stress incontinence may develop

so after the urethra and uv-junction reconstruction the loose endopelvic diaphragm has to be refixed anteriorly and anterobilaterally onto the pubis bones/atf

at last the substantial tissue loss of the anterior vagina wall has to be repaired either by an avw advancement flap or by a unilateral skin-mucosa rotation/advancement flap from labium minus/labium majus

as will be explained step-by-step in a special chapter

# kees continent urethra reconstruction

## chronology/development of technique

### introduction

the reconstruction of a continent urethra is a highly complicated procedure and requires insight into the urine continence mechanism, the support by the endopelvic diaphragm, the mechanism of action and trauma and advanced skills in reconstructive surgery

when confronted with a type IIBa urethra fistula in 1984 with operation no 25 the author had never seen this type of fistulas nor had he read something about how to reconstruct a urethra

so he had to find out himself and over the years 1984 to 2002 he developed a personal technique

the author thinks it is appropriate to present the chronology about the development of **kees** continent urethra reconstruction

since nobody will come up with a “final” solution straight away and the whole process of developing this solution with **repeat falling and standing up** is as important as the final solution itself

learning a trick is not sufficient though it may work but it is **insight** which **counts**

### chronology urethra reconstruction

the very first time the author had to reconstruct a urethra was when he identified the type IIBa fistula for the first time in his life during eua at the beginning of a repair no 25 in 1984 as due to native surgery (yankan gishiri) for “opening up” by male traditional barber (wanzami)

since he had never seen a urethra fistula and never read about a urethra reconstruction and he was working totally isolated

he had to devise a solution on the spot by using common sense in combination with the general surgery principles of his already extensive surgery expertise in other fields

all the rest he had to develop himself in total isolation by an **innovative** process

right from the beginning some measures were taken during operation to contribute to postrepair continence

- 1984 vvf-repair no 25** wide U incision around the fistula, wide dissection, tension-free longitudinal urethra reconstruction over a foley catheter, bilateral transverse fixation of martius fibrofatty pad graft to reinforce continence mechanism + inverted T avw closure over urethra  
already right from the start an **inverted T longitudinal** urethra reconstruction but its theoretical and practical importance not realized at that time  
the urethra healed at first attempt; however, with total incontinence for which in **1985 vvf-repair no 174** an elevation of the bladder neck by using pubococcygeus muscles was performed **securing** total continence
- 1985 first bilateral transverse fixation and then longitudinal covering of the urethra with the free ending of the fibrofatty pad graft for better healing
- 1986 small bilateral transverse contra-incisions at distal U incision towards the midline in order to better dissect the urethra tissue and to better reconstruct the euo
- 1987 bilateral skin\_mucosa advancement flaps from both labia to cover urethra since less tension on avw closure
- 1989 rhaphy of bladder neck before or after the real urethra reconstruction in order to reinforce the continence if needed
- 1992 H incision + bilateral fixation of pubocervical musculofascia onto symphysis + avw fixation + stop with fibrofatty graft (since no additional value)  
**this was in line with the functional pelvis anatomy in line with the author's developing insight into urine continence mechanism**  
however, not yet para-euo fixation of endopelvic diaphragm since the author still in the process of figuring out the functional pelvis anatomy and urine continence mechanism in the female
- 1992 perforate + tunneling anterior bladder to create neo-urethra  
this was only performed in few patients since no other option mixed results
- 1992 no longer urethra reconstruction over catheter but **free** urethra reconstruction  
checking with hegar no 8 after every suture since  
**reconstruction over catheter requires extra tension so suture may cut thru the delicate urethra tissue at tying the knot**  
and only after reconstruction insertion of catheter  
**longitudinal anterior urethrotomy by scalpel if urethra too narrow half way urethra reconstruction**  
**and also if uv-junction too narrow after urethra reconstruction**
- 1993 unilateral skin-mucosa rotation/advancement flap from labia to cover urethra  
dissection up to bulbospongiosus muscle fascia so with adherent fibrofatty pad  
transverse 4-point fixation of skin-mucosa flap over urethra onto symphysis  
this type of flap is still being used especially when there is (sub)total loss of avw tissue or when everything is fixed by severe fibrosis  
the functional and cosmetic results were ok
- 1993 systematic measuring bladder capacity by sound and catheter  
distance euo to bladder dome euo/bw minus urethra length euo/b

- 1993 **avw (with cx) advancement flap to cover urethra**  
 with 4-point fixation over urethra onto pubis bones periost  
 this has become the method of choice in covering the urethra  
 however, if not possible a unilateral skin-mucosa flap from labium minus/labium  
 majus is used
- 1995 systematic assessment of **urethra tissue quality**  
**good, medium, poor** for better evaluation of results as to healing
- 2000 **systematic longitudinal inverted T urethra reconstruction with anatomic  
 repositioning of retracted posterior uv-junction by first proximal suture**  
 In order to reconstruct the uv-junction anatomically correct and so preventing  
 postrepair uv-stricture  
 now mechanism of posterolateral retraction fully understood by the author
- 2001 transverse fixation of free fascia lata strip over urethra onto bilateral pubis bones  
 /atf, however with mixed results  
 so after 6x no longer used since no additional value
- 2002 **vuf 5576 continent urethra reconstruction** with dynamic fasciocolposuspen  
 sion whereby after urethra reconstruction pubocervical musculofascia/avw is  
 fixed bilaterally onto paraurethra atf and para-euo pubis bones  
**in line with continuously improving insight**
- 2002- today (continuous technical perfection of) **technique in line with functional  
 pelvis anatomy see kees continent urethra reconstruction**

it is also good to describe the chronology of the **type kees IIBb fistulas** with circum  
 ferential defect from an initial **one-stage** to **final two-stage** procedure whereby the **first  
 stage converts the type kees IIBb into kees IIBa fistula**

tanagho principles: circumferential bladder neck dissection, preparing flap from  
 anterior bladder wall, advancement and fixation of this flap onto symphysis up to “euo”,  
 longitudinal inverted T urethra reconstruction and unilateral skin\_mucosa rotation/advan  
 cement flap from both labia however, mixed results  
 then preparing flap from posterior bladder wall in between ureters, inverted T longitudi  
 nal urethra reconstruction, fixation of neourethra onto symphysis and covering by unila  
 teral skin\_mucosa rotation/advancement flap from labia also mixed results

### **final two stage approach**

**first stage** wide H incision, circumferential dissection of bladder neck, advancement  
 and “circumferential” fixation of bladder neck onto para”euo” pubis bones into “euo” with  
 interrupted rhapsy sutures so bladder neck opening becomes “euo”

with following results

**aa** healing with total continence in small proportion of patients

**bb** healing with incontinence whereby anterior bladder neck stays fixed into anterior  
 “euo” and posterior urethra wall retracts into type kees IIBa fistula

**second stage** and then continent urethra reconstruction as second stage according to  
 the same principles as if it were a type kees IIBa fistula right from the beginning

pt 25

katsina

vvf 25

**development of urethra reconstruction and incontinence surgery  
actually already here inverted T urethra reconstruction**

rsm (katsina)

female

25 yr

14.05.84

surgeon: kees waaldijk

assistant: dr rao

diagnosis: P0, **multiple**  $\pm$  6x3 cm urethrovesicovaginal fistula with 3 cm open bladder neck and  $\pm$  0.3 cm 0 vesicovaginal fistula, type **IIBa** leaking urine for 12 yr which started immediately following **native surgery** (yankan gishiri) **by wanzami for opening up** (ba hanya), not living with husband  
euo/f 0 cm, f/f 2 cm operated at least 2x

operation: vvf repair + bladder neck/urethra reconstruction and fibrofatty pad graft R

duration: 90 min

anesthesia: spinal L3/L4 with 2 ml lignocaine 5%

wide U incision at  $\pm$  5 mm from fistula edge, sharp/blunt dissection, avw excision up to vvf, foley ch 12, a tension-free vvf closure by inverting purse string chromic catgut, mobilization of tissue, tension-free transverse bladder closure/longitudinal urethra reconstruction by a double layer of inverting chromic catgut, gv check, incision R labium majus, sharp dissection/mobilization of bulbocavernosus fibrofatty tissue, tunneling under R lateral vagina wall, fixation of this fibrofatty pad over repair, inverted T avw closure, skin closure, pressure pad, vagina pack; free urine flow

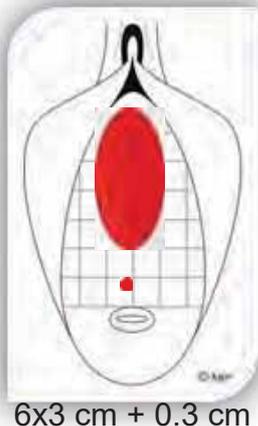
30.05 + 06.06 not leaking/labium healed gv/ no leakage cath out blad drill  
07.06.84 not leaking at all, no incontinence, normal miction  
insp/ healed, no stress incontinence

21.06 + 03.07.84 idem

12.09 + 14.02.85 not leaking, incontinence +, mictionhealed, stress +

**31/05-85 operation: bladder neck elevation using pc muscles vvf 174**

04/07-85 not leaking at all, no incontinence, normal miction  
insp/ healed, no stress incontinence



RR  
 preanesthesia: 150/110 mm Hg  
 5": 150/110  
 10": 145/110  
 15": 145/110  
 postoperation: 135/95

pt 7160

katsina

vvf 9066

**trauma; iatrogenic  
innovative training workshop**

bak (katsina)

female

14 yr

01.06.15

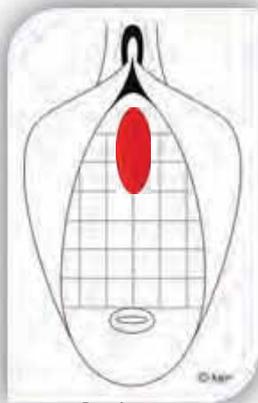
surgeon: kees waaldijk  
assistant: bilkisu

diagnosis: P0, ± 3x1 cm urethrovesicovaginal fistula type **IIBa, leaking urine for 41 days** which started immediately following yankan gishiri by wanzami bco refusing sex with husband, native medicine, married 4 mth ago post(men arche 5 mth earlier), not living with husband, still menstruation, drop foot R (grade 5) and L (grade 5), no rvf; normal ap diameter/pubis arch 85°, ar pos, cervix mobile, 3 cm pcmuf defect, **long perineum lying/2 persons/aska/tissue removed (-ectomy)**  
euo/f 0 cm, f/c 4 cm, i/v 12 cm 161 cm 56 kg

operation: continent urethra/fascia/avw reconstruction + widening introitus plasty  
duration: 50 min (**step-by-step teaching**) healing 95% continence 95%  
anesthesia: spinal by anesthetic staff

median epi, wide H incision around fistula, sharp dissection, sharp mobilization of (para) urethra tissue, tension-free longitudinal inverted T urethra reconstruction over 3 cm with repositioning of retracted uv-junction by single layer of inverting interrupted serafit, bilate ral fixation of pc mufascia onto paraurethra\_euo atf/symphysis by 2x serafit each side, euo/b 2.0 cm, **no** urine thru suture line/euo on rest/cough/pressure, triple fixation of foley ch 18, avw reconstruction by avw advancement flap by 4-point fixation onto paraurethra atf/symphysis by everting seralon, check on hemostasis, transverse closure of median epi; free urine flow, euo/bw 12 cm, good anterior elevation, euo/b 2.0 cm normal bladder capacity (longitudinal diameter 12-2.0 = 10 cm) good mufascia plate acceptable position uv-junction **against** middle/caudad third symphysis normal-width 2 cm good-quality urethra\_euo in anatomic position

30.06.15 not leaking at all cath removed bladder drill  
07.07.15 not leaking at all, no incontinence, normal miction so  
insp/ healed, good elevation, no stress incontinence  
04.08.15 idem  
24.11.15 not leaking at all, no incontinence, normal miction healed, no stress



3x1 cm

# kees continent urethra reconstruction

## step-by-step principles

as one stage for type kees IIBa fistulas

or

as second stage for type kees IIBb fistulas

## introduction

the reconstruction of a continent urethra poses a major challenge since the urethra as main continence mechanism has to be reconstructed together with the uv-junction and its support by the endopelvic diaphragm

and the urethra tissue is of delicate structure; once the remaining tissue is traumatized during surgery the result will be poor and from operable it may become inoperable

so the better the mechanism of action is understood the better the functional anatomy may be reconstructed; see previous chapters

it looks so simple to start and then turns out to be so difficult since it needs excellent tissue and instrument handling with special insight

and how to cover the reconstructed urethra with viable dynamic tissue in line with the natural tissue forces

the major challenge in urethra reconstruction is how to ensure continence

## step-by-step reconstruction

this is divided into different parts

- i anesthesia, position, examination etc
- ii wide H incision and dissection
- iii longitudinal inverted T urethra/uv-junction reconstruction
- iv endopelvic diaphragm reconstruction
- v avw reconstruction
- vi documentation

## **i anesthesia, position, examination etc**

### **000**

spinal anesthesia with long-acting agent

### **001**

the patient is placed in the exaggerated lithotomy position with the legs flexed and slightly abducted in stirrups and her buttocks over the end of the operation table; this is the position of choice

### **002**

a careful inspection and systematic examination (under anesthesia!) of the whole obstetric trauma and of the fistula as to size, location and texture of the fistula in relation to (presumed) external urethra opening and cervix or vagina vault, as to the condition of the vagina such as stricture, stenosis or even atresia, if there is a rectovaginal fistula as well, if the fistula is accessible, if there is a circumferential defect etc

### **003**

based upon this examination the fistula is classified, and the surgeon makes up his definite plan of action how to handle this specific fistula as its own unique entity

### **004**

the labia minora are sutured onto the inside of the upper legs to keep the vagina open bilaterally

### **005**

in order to improve the accessibility a uni- or bilateral episiotomy is performed at 4-5 and/or 7-8 o'clock or a small median episiotomy at 6 o'clock

### **006**

then an auvard self-retaining weighted speculum is placed inside the vagina with underneath a gauze covering the anus to keep the vagina open posteriorly; no more specula.

### **007**

if necessary an effort is made to identify and catheterize the ureters for 15-20 cm

## **ii wide H incision + dissection**

the surgical incision is an important part of any operation which should be chosen carefully in line with the natural tissue forces and executed carefully in order to obtain good access to the real operation field

### **008**

a **2.5-3 cm** wide H aww incision is made with the horizontal part at the proximal fistula edge and the distal ledges of the incision through the paraurethra tissue parallel to the fistula edge with small bilateral transverse contra-incisions at distal H incision

**remember:** circumference of tube =  $2pr$  ( $2 \times 3.14.. \times$  radius) see **discussion**

### 009

the anterior vagina wall is dissected sharply from the endopelvic diaphragm (with the adherent bladder and/or urethra) using the sharply curved **thorek** scissors in order to prepare an avw advancement flap for later covering the reconstructed urethra

### 010

the paraurethra tissue is sharply mobilized bilaterally by scalpel and/or dissecting **thorek** scissors in order to perform a tension-free urethra reconstruction from the mobilized retracted urethra tissue

**nb** at this point the urethral arteries may be traumatized which need proper attention

## iii inverted T longitudinal urethra reconstruction

with

### reconstruction/repositioning of uv-junction

**nb** do not reconstruct the urethra over catheter but check patency/width after each suture by hegar h6 or h8  
overhead handling of instruments is a sine qua non

### 011

start with **reconstruction of the uv-junction** with repositioning/reduction of retracted posterior bladder neck wall by

first suture thru mobilized urethra tissue at R side, then picking up the median pcmuf/ endopelvic diaphragm over bladder neck and then thru the mobilized urethra tissue at L side so that upon tying the suture the retracted posterior uv-junction will be reduced/repositioned into its anatomic position and the uv-junction is wide enough

**nb** by proceeding like this a postrepair uv-stricture will be prevented

### 012

completion of **longitudinal** urethra reconstruction by **single layer** of interrupted inverting polyglycolic acid sutures up to **anatomic euo** but not distally beyond this point

### 013

**nb** please do not reconstruct over an inserted catheter since this catheter is hindering and more force is needed on tying the suture with chance of cutting thru the delicate urethra tissue and/or insufficient tissue adaptation

### 014

but check urethra width/patency after each suture by hegar h6 or h8

### 015

closure is from proximal (uv-junction) towards distal with last suture to reconstruct the external urethra opening = euo whereby **neo-euo** should be **in anatomic position**

**016**

after urethra reconstruction, especially in fistulas with a bladder defect, the endopelvic diaphragm (with adherent bladder) is adapted transversely onto the paraurethra at/ neourethra bilaterally from reconstructed uv-junction by at least 1x inverting polyglycolic acid suture each side as the proximal horizontal part of the inverted T

**017**

good bites are taken to get broad adaptation of the raw urethra/epd tissue

**018**

care is taken only to adapt the tissues and not to apply tension on the sutures as then they may cut through; remember sutures cannot heal, only adapt

**019**

care is taken not to go through the urethra/bladder mucosa as theoretically this might lead to stone formation, but once in a while this cannot be prevented

**020**

**cave** do not cut the sutures too short since then the knot(s) will slip and loosen up

**021**

a **one-layer repair** is the method of choice; a second layer is not necessary and actually would be harmful; double closure is an illusion

**022**

with urine or water inside the bladder ask patient to cough (+ suprapubic pressure push onto anterior abdominal wall) and look if there is leakage thru suture line (closure not complete) and/or urine coming out thru euo (stress incontinence)

**a** when there is leakage thru suture line apply additional suture(s)

**b** when there is stress incontinence this will be corrected by the reconstruction of the endopelvic diaphragm

**023**

no need to check with dye; far more important is to make sure the tissue are inverted and broadly adapted and that there is no piece of urethra/bladder mucosa sticking out which will interfere negatively with healing

**024**

check/measure urethra length and longitudinal bladder diameter in cm and document this in operation report

**025 optional at this stage see 031**

at this point an indwelling bladder catheter nelaton ch 14 (no balloon) or foley ch 16 (but do not balloon) may be inserted and fixed by nylon suture thru periost of supra-euo pubis symphysis;

if the catheter is inserted at this point a final evaluation of urethra length at operation ending cannot be made

inserting catheter later **031** may be a bit troublesome due to the fact that by refixation of the endopelvic diaphragm the urethra as a straight tube may be slightly distorted

## **iv** endopelvic diaphragm reconstruction

by

refixation pcmuf/endopelvic diaphragm onto pubis bones/atf

since the reconstructed urethra is not supported by the pubocervical musculofascia = pcmuf/endopelvic diaphragm = epd and the epd loose anteriorly from the paraurethra atf and para-euo pubis bones

this has to be corrected, otherwise postrepair intrinsic-stress incontinence may develop

### **026**

in identifying the pubocervical musculofascia (anterior part of the endopelvic diaphragm) do not look for fascia but look for **smooth muscle layer** which is **shiny**

pull the pubocervical musculofascia/endopelvic diaphragm transversely over the neo-urethra and fix it bilaterally onto the paraurethra atf and para-euo pubis bone periost by interrupted glycolic acid sutures; so 2 sutures each side

### **027**

first, fix the pcmuf/epd bilaterally onto the paraurethra atf/pubis bone periost

### **028**

second, fix the pcmuf/epd onto the para-euo pubis bones periost/atf

### **029**

now the endopelvic diaphragm has been reconstructed by anterior and anterobilateral refixation to the pelvis wall and as such is contributing to the normal physiology

this will make the reconstruction continent due to good support of the posterior urethra wall so the posterior urethra wall is adapted to the anterior urethra wall with good out flow resistance

### **030**

check again for incontinence and measure urethra length again in cm

try to get an impression of the bladder capacity by measuring the longitudinal bladder diameter by measuring the distance euo to bladder wall (euo/bw) by calibrated metal sound, then insert foley catheter and determine urethra length by measuring distance euo to balloon (euo/b)

$euo/bw \text{ minus } euo/b = \text{longitudinal bladder diameter (in cm)}$

### **031**

insert nelaton ch 14, fix it and check for urine drainage thru catheter

if urine is draining this means 3 things:

- a) the catheter is inside bladder,
- b) at least one ureter is draining into the bladder and
- c) the patient is not in shock

if no draining of urine, check for the cause and correct it

### **indwelling bladder catheter choice**

the author prefers a nelaton catheter since it has a big bore; so better drainage than foley catheter with small bore; if foley catheter is used do not balloon but fix it

## **V anterior vagina wall reconstruction**

by

**avw advancement flap by 4-point fixation**

or

**skin\_mucosa rotation/advancement flap from labia**

to reconstruct the anterior vagina wall an **avw advancement flap** (already mobilized) is used as **method of choice**

however, if this is not possible due to fibrosis or extensive tissue loss a uni lateral skin-mucosa rotation/advancement flap from both labia is used since there is always some tension on the flap in picking up the avw flap the underlying epd is picked up as well to prevent cutting thru of the suture

### **avw advancement flap**

#### **032**

first, the proximal avw (+ underlying epd tissue) is fixed onto paraurethra atf/pubis bone periost by 1x nylon suture each side with adaptation of avw

#### **033**

second, the distal avw (+ underlying pcmuf/epd tissue) is fixed onto the para-euo pubis bone periost/atf by 1x nylon suture each side with adaptation of avw

the anterior vagina wall is only adapted or half closed to allow free spontaneous evacuation of small blood clots, tissue debris and bacteria according to the principles of septic surgery; since the vagina is never sterile

### **((skin\_mucosa rotation/advancement flap))**

#### **(032a)**

preparing unilateral flap from labium minus/labium majus full-thickness with adherent fibrofatty pad (martius) up to/from bulbospongiosus muscle fascia; followed by rotation/advancement

#### **(033a)**

transverse 4-point fixation of this flap onto the same points of pubis bone periost/atf

#### **034**

if episiotomies have been performed they are adapted

#### **035**

the vagina is packed tightly with gauze (soaked in antiseptic or not) to help hemostasis though normally complete hemostasis is secured due to compression by the avw flap onto the underlying tissue

#### **036 cave**

if there is no urine flow, not even after attempts at forced diuresis, this is an indication that both ureters have been traumatized and the whole repair has to be undone

037

if the patient is in good condition with good urine flow she is transferred to the post operative ward.

## VI documentation

since documentation is an important part of any type of surgery

an operation report has to be written in detail including complications; with prediction of healing and continence on a 5% scale from 5% to 95%

however, by writing an operation report the surgeon's action becomes fully transparent and open to criticism by others, especially by the verbal "surgeons" who have to prove their value by being vocal

### discussion

the reconstruction of a urethra as a tube looks simple but in practice once started turns out to be highly complicated due to a variety of factors

even if the urethra itself is successful resulting in a tube-like structure most of them are nonfunctioning and after successful repair postrepair intrinsic-stress incontinence is the major problem

this is the **first** time a continent urethra reconstruction has been presented/described step by step as developed personally by the author during an **intensive innovative** theoretic and practical process

the circumference of a tube (circle) is  $2\pi r = 2 \times 3.14 \dots \times \text{radius}$

for a ch18 urethra (= outer diameter 6 mm) the tissue width has to be **at least**

$$2 \times 3.14 \times 3 = 19 \text{ mm} + 6 \text{ mm (sutures)} = 25 \text{ mm}$$

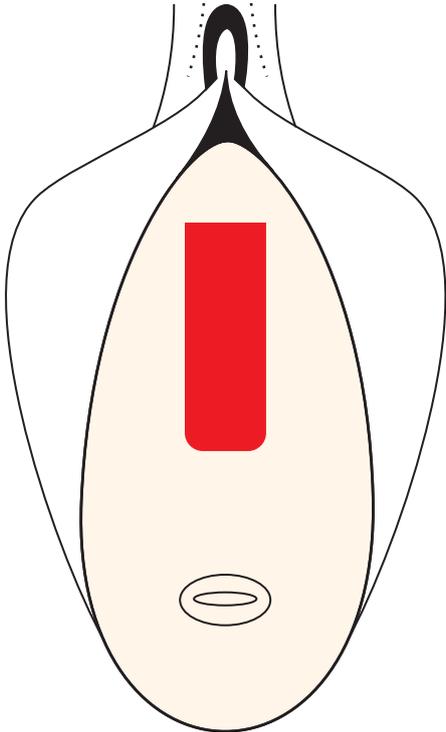
so the width between the **distal** two longitudinal **H** incisions should be **2.5-3 cm**

though theoretically the longer the urethra the better the chance of continence, do **not** reconstruct the urethra beyond the **anatomic euo position** since distal lengthening will not contribute to continence; only good support by the endopelvic diaphragm

though the aim is to reconstruct a urethra of at least 2.5 cm length, this is not always possible and even shorter ones from 1.5 to 2.5 cm are totally continent once there is good support by the endopelvic diaphragm

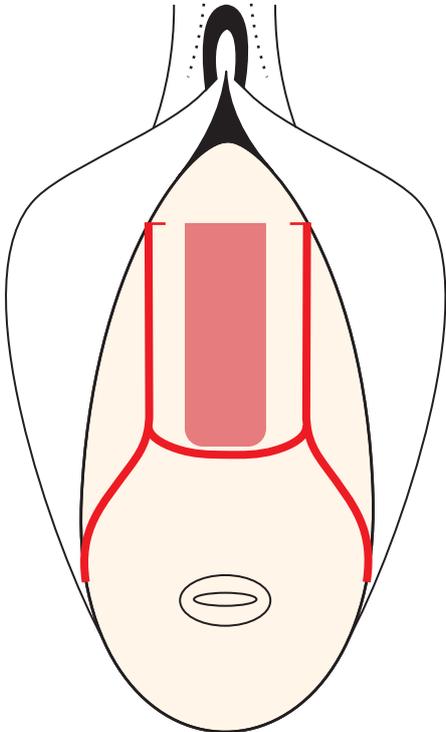
though the principles have been outlined step by step, each fistula constitutes its own unique entity and the operation technique has to be customized to that specific fistula

# continent urethra reconstruction



000

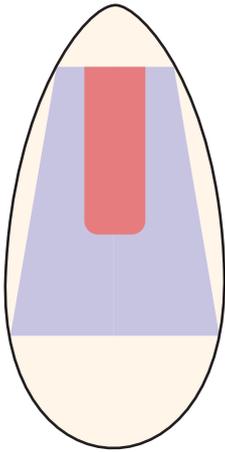
urethra fistula IIBa



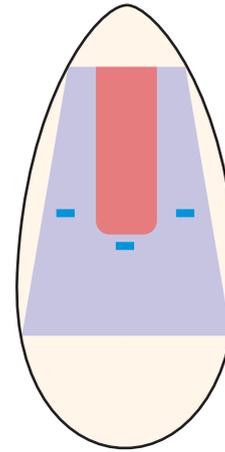
008

wide H incision

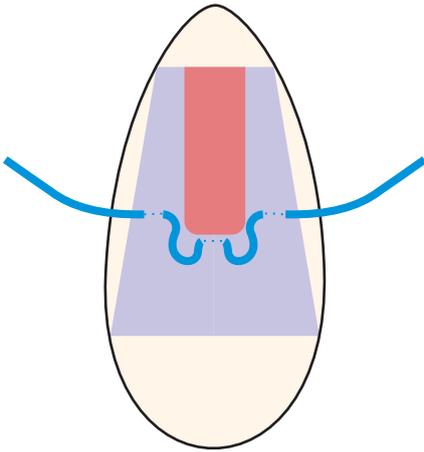
# continent urethra reconstruction



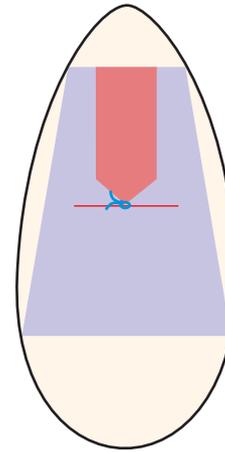
009 avw dissected/reflected



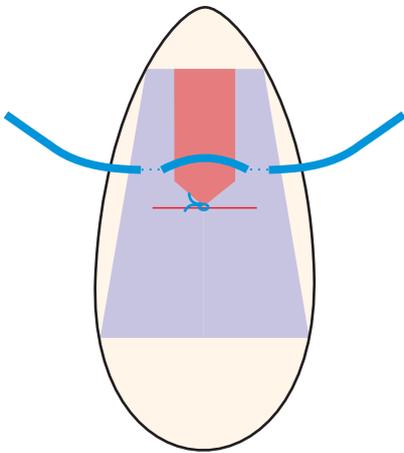
011 3-point uv-junction reconstruction



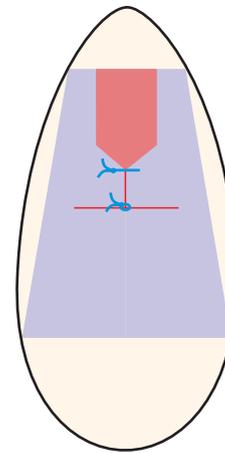
011 3-point suture



011 uv-junction reconstruction

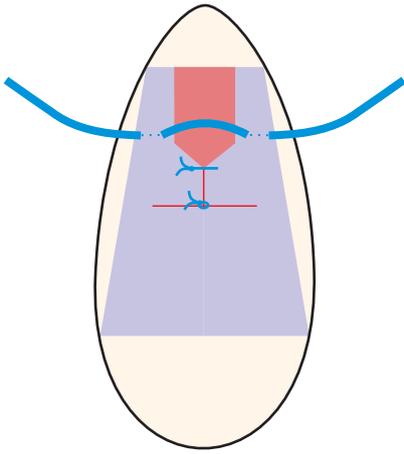


012-015 urethra reconstruction

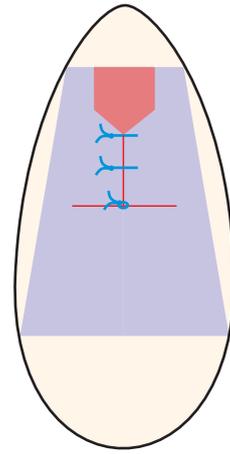


012-015 urethra reconstruction

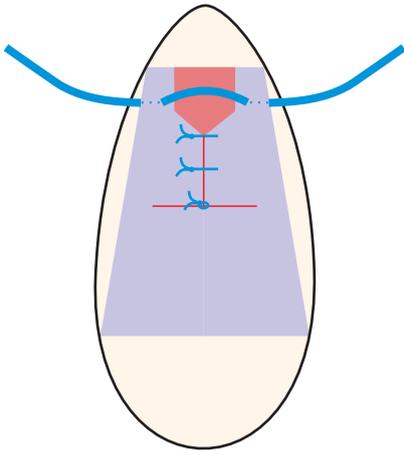
# continent urethra reconstruction



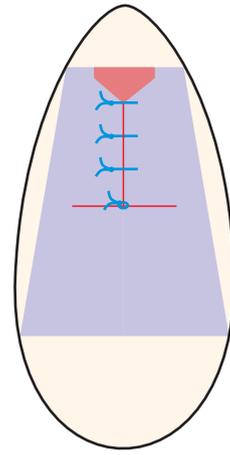
012-015



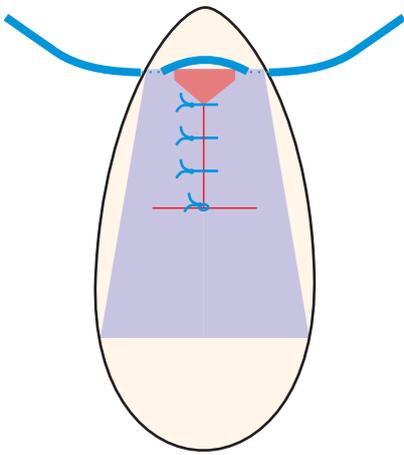
012-015



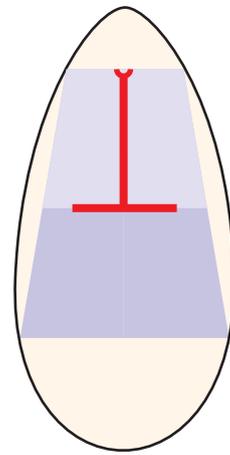
012-015



012-015



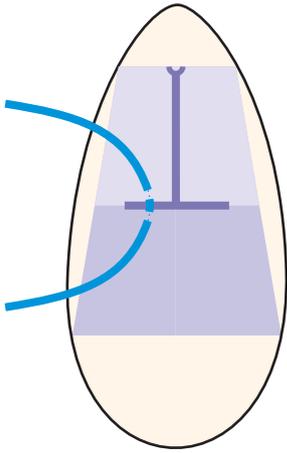
012-015



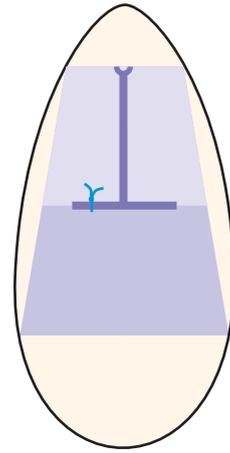
015

inverted T urethra

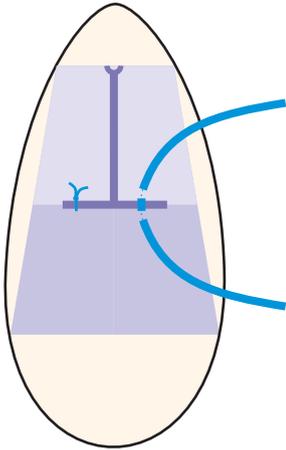
# continent urethra reconstruction



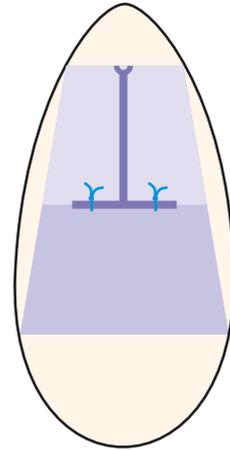
016 reinforcement uv-junction



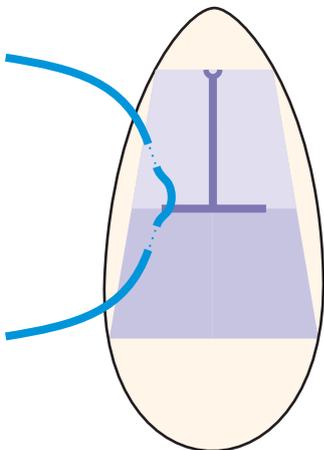
016



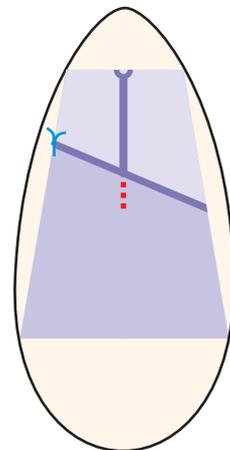
016



016 urethra reconstructed  
no epd covering

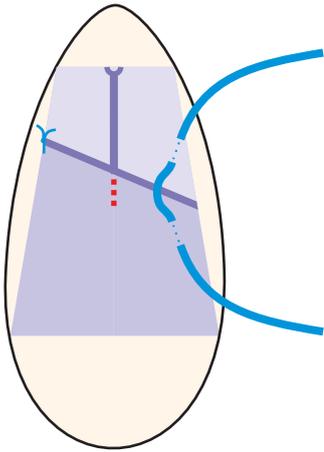


027 epd refixation onto  
paraurethra atf

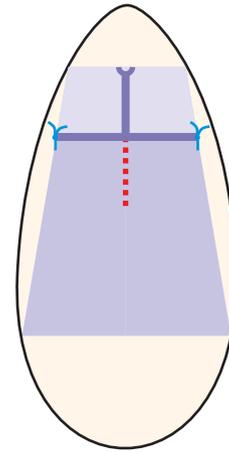


027

# continent urethra reconstruction

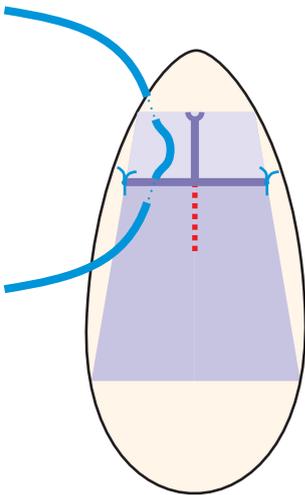


027



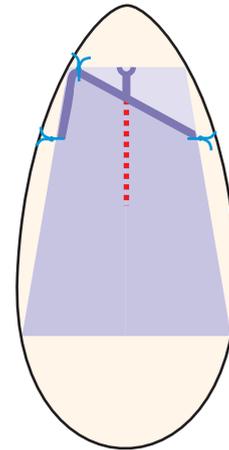
027

epd refixed onto paraurethra

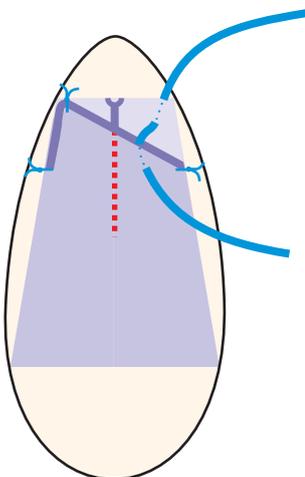


028

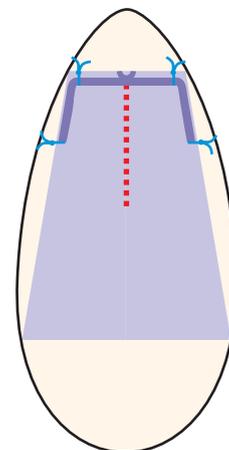
epd refixation onto para-uro pubis bone



028



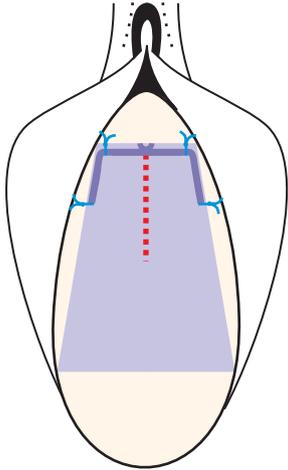
028



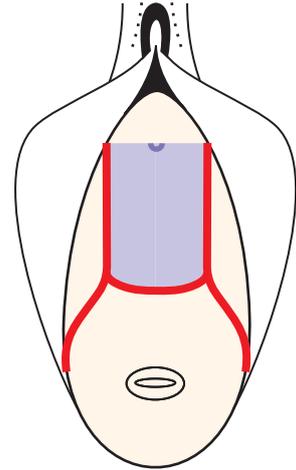
029

epd refixation completed

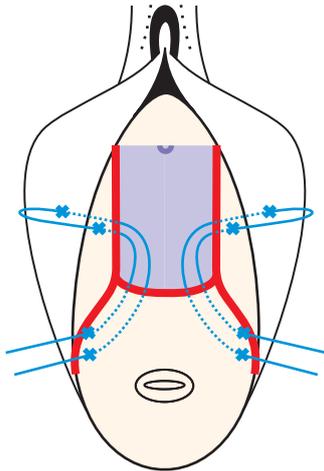
# continent urethra reconstruction



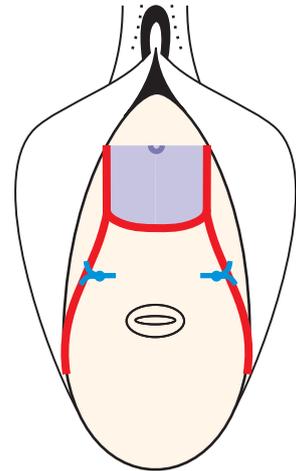
029 epd now covering urethra



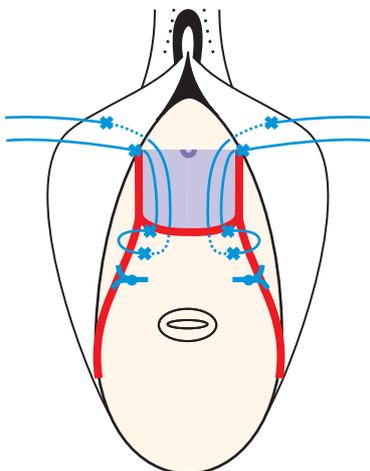
avw flap



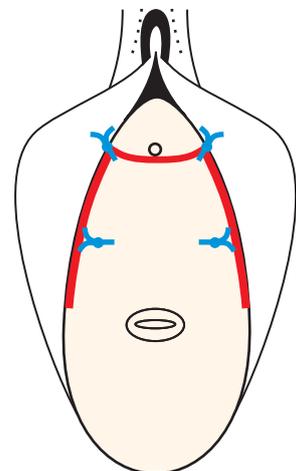
032 avw advancement/fixation



032 proximal avw fixation

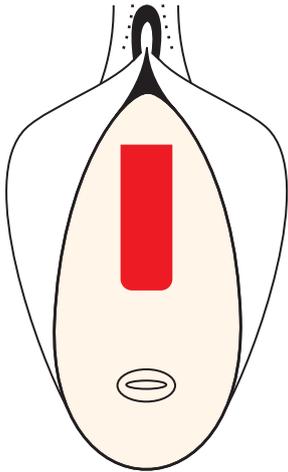


033 distal avw fixation

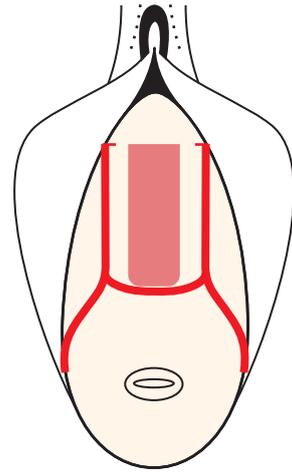


avw reconstructed

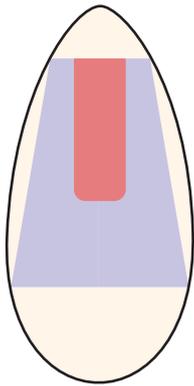
# continent urethra reconstruction



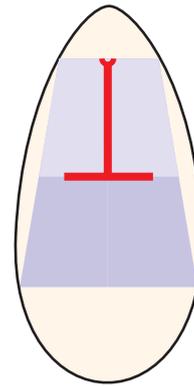
urethra fistula IIBa



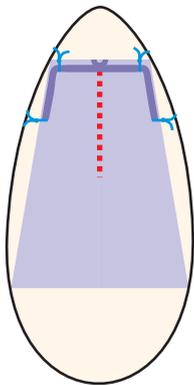
wide H incision



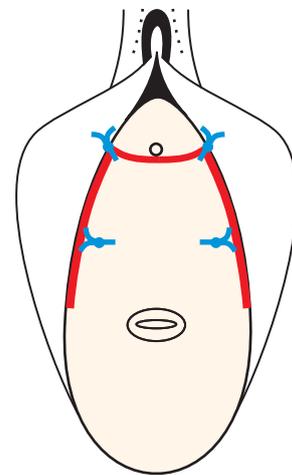
avw dissected/reflected



inverted T urethra



epd refixation  
covering urethra



avw reconstructed

# IIBa urethra fistula



000 type IIBa



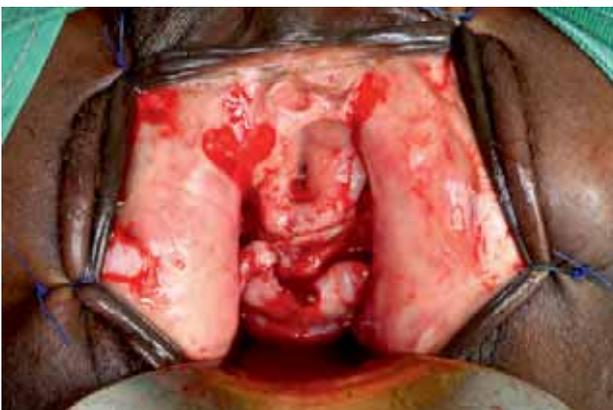
000 type IIBa



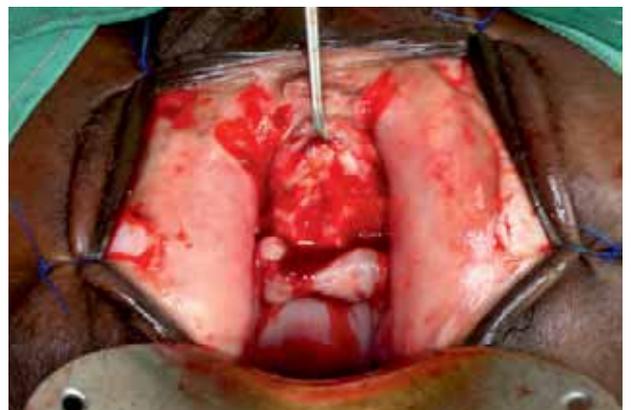
008 wide H incision



009 avw dissection

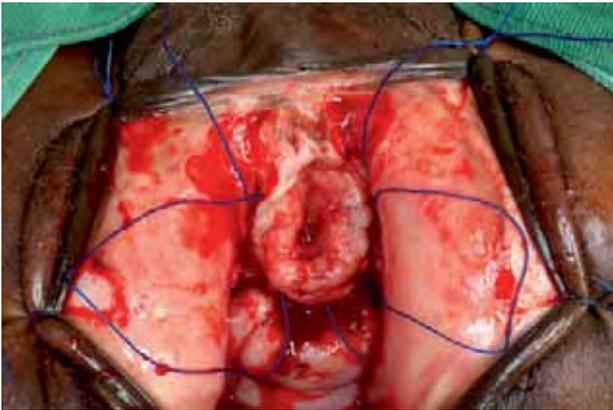


010 paraurethra dissection



011 posterior uv-junction

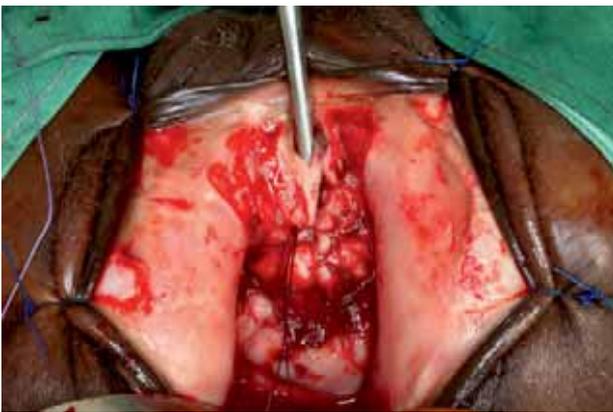
## IIBa urethra fistula



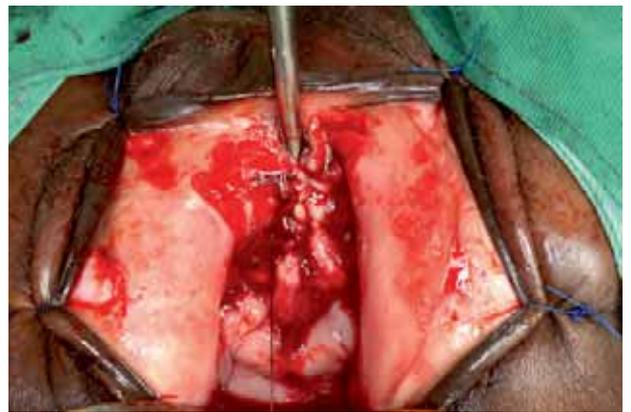
011 3-point uv-junction reconstruction



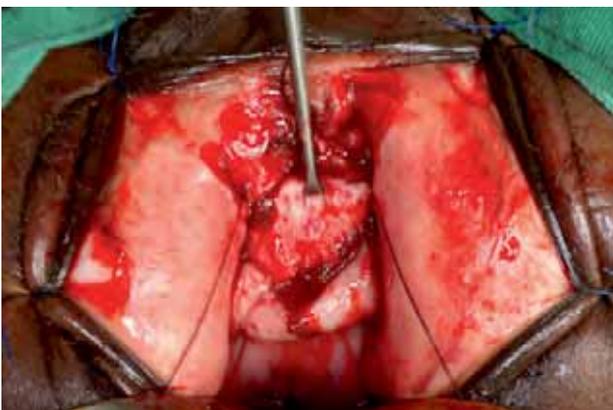
011 uv-junction reconstructed



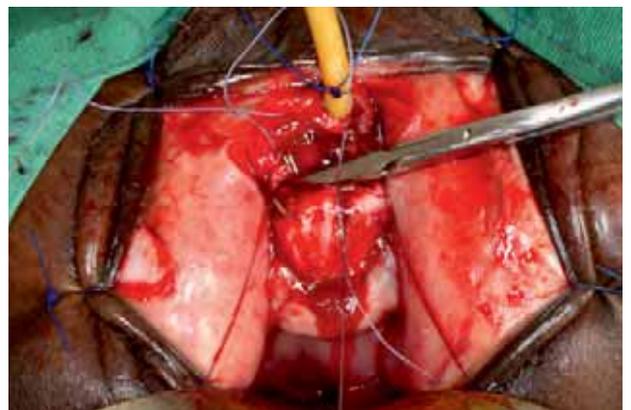
011 check by hegar h6 -h8



012-016 urethra reconstruction

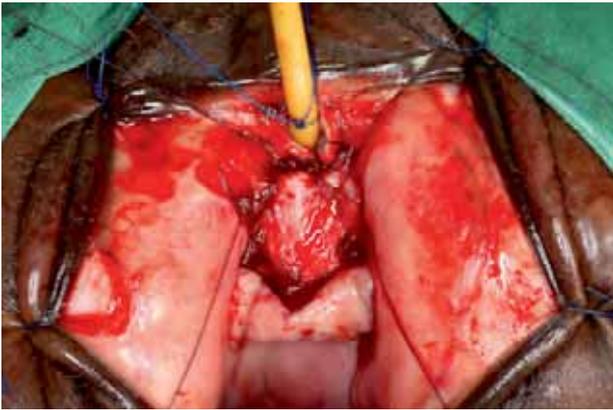


027 epd refixed onto paraurethra atf

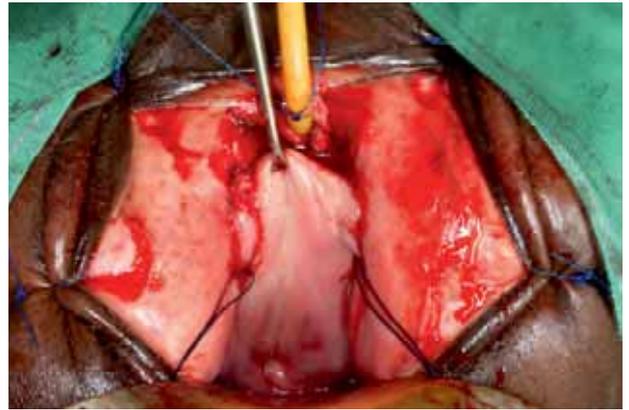


028 epd refixation onto para-euo pubis bone

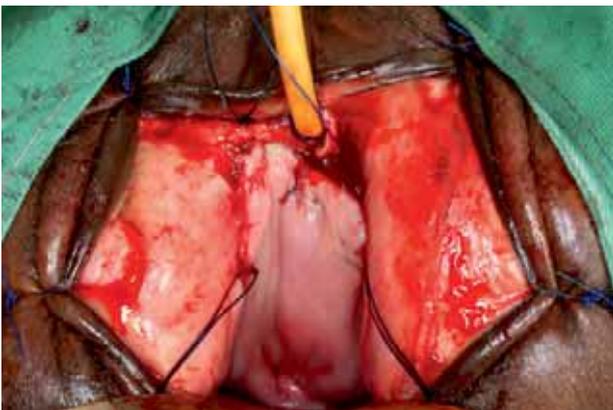
# IIBa urethra fistula



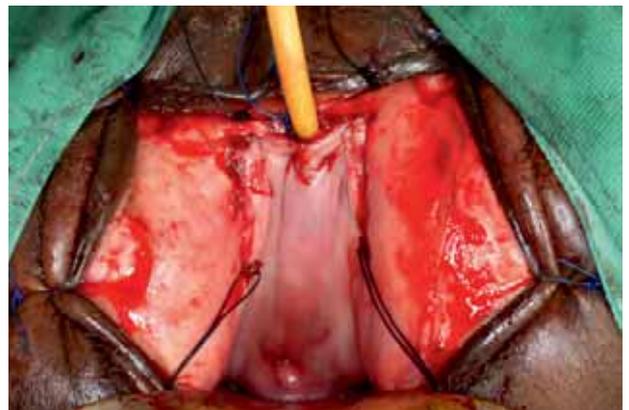
029 epd refixed covering urethra



032 avw reconstruction proximal flap fixation



033 avw reconstruction distal flap fixation



avw advancement flap in place



urethra fistula IIBa



end of reconstruction

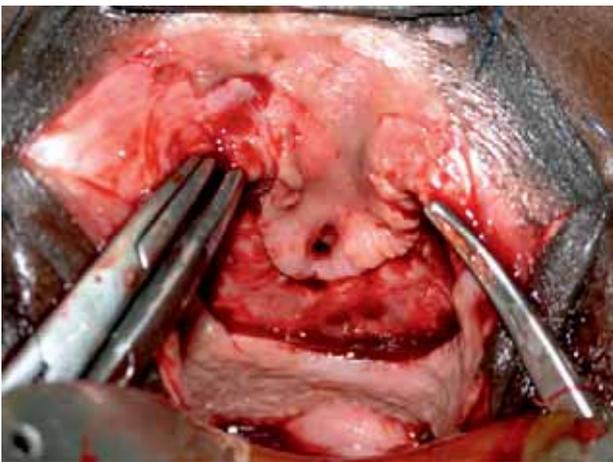
# IIBa urethra fistula



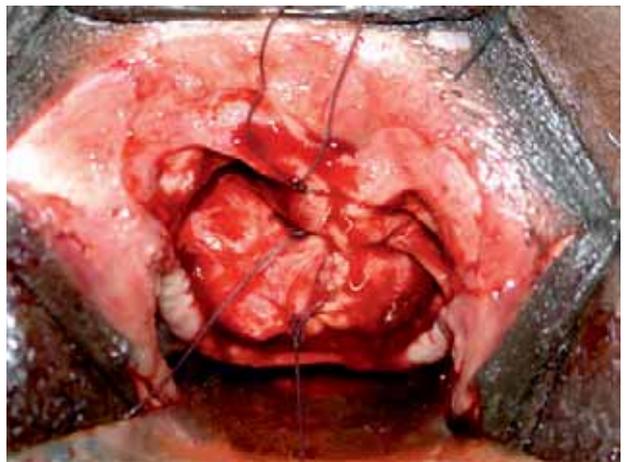
000



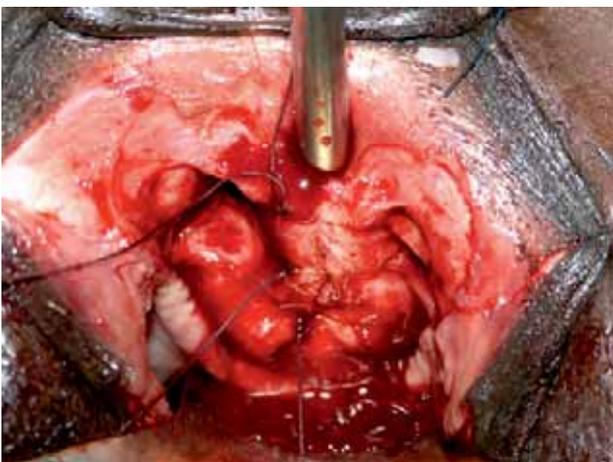
008



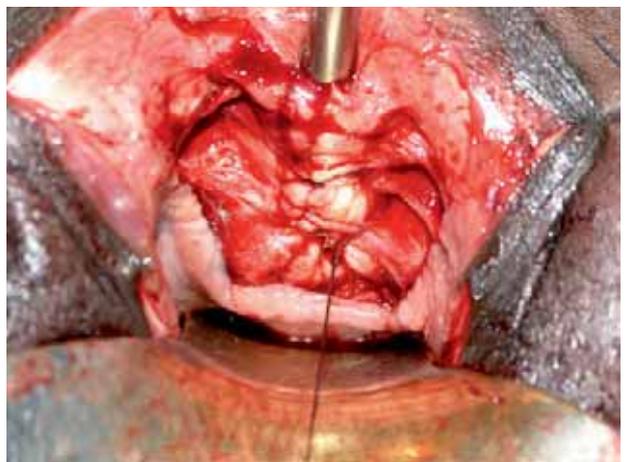
010 urethral arteries  
hemostasis



011-029

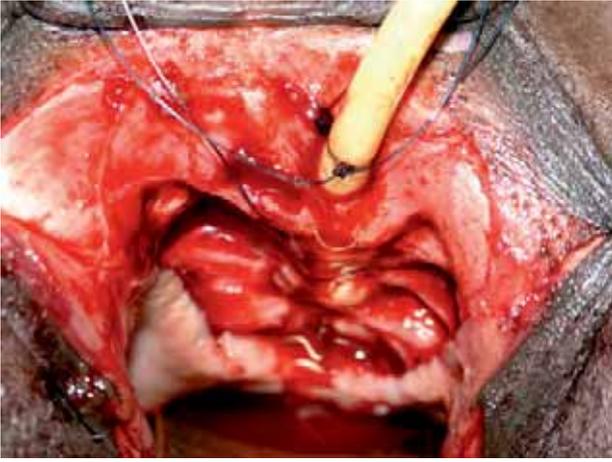


011-029

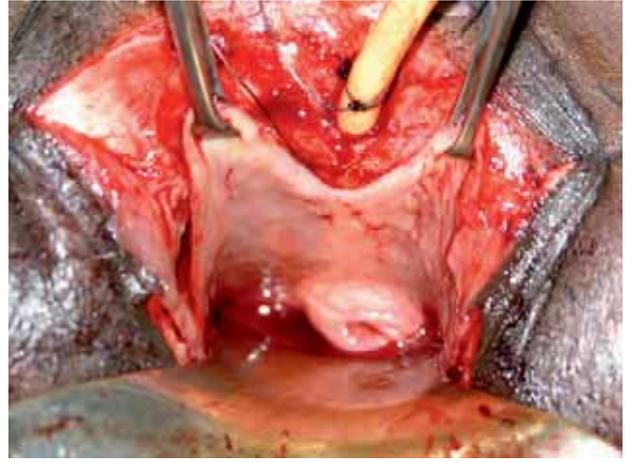


011-029

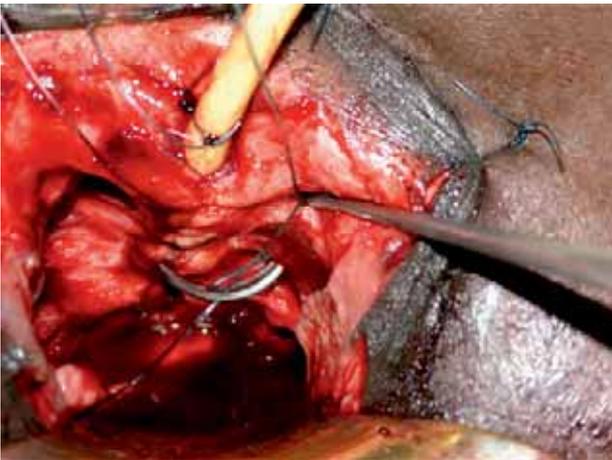
## IIBa urethra fistula



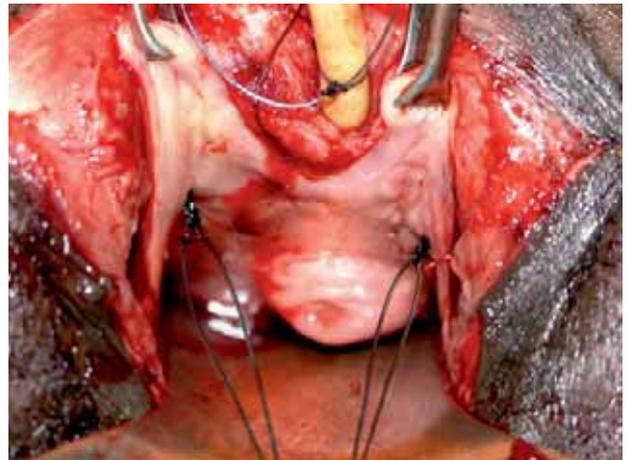
011-029



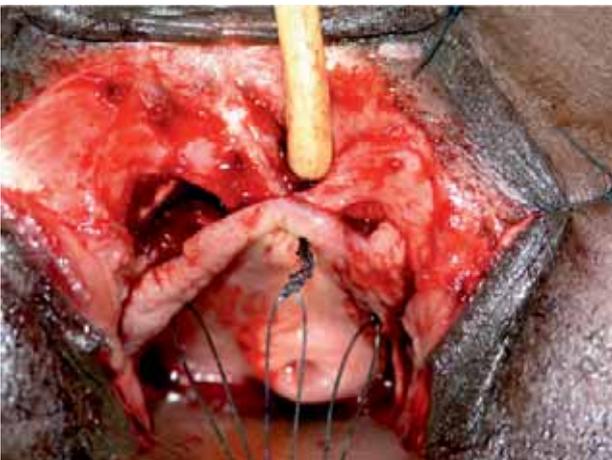
avw advancement flap



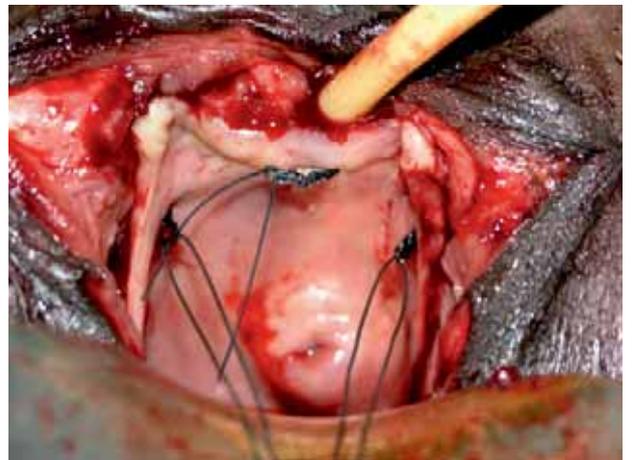
032 proximal avw fixation



032 proximal avw fixation



033 distal avw fixation

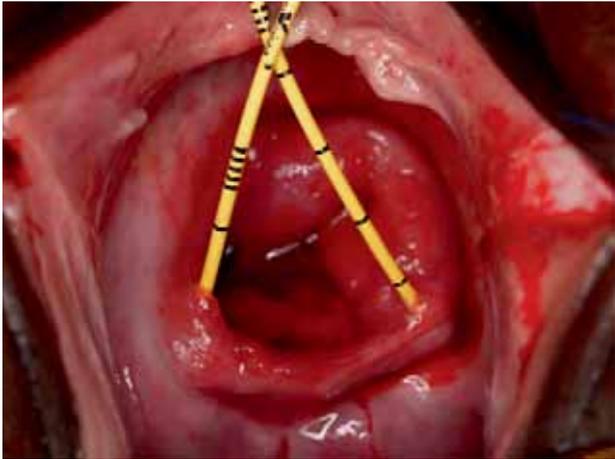


end of reconstruction

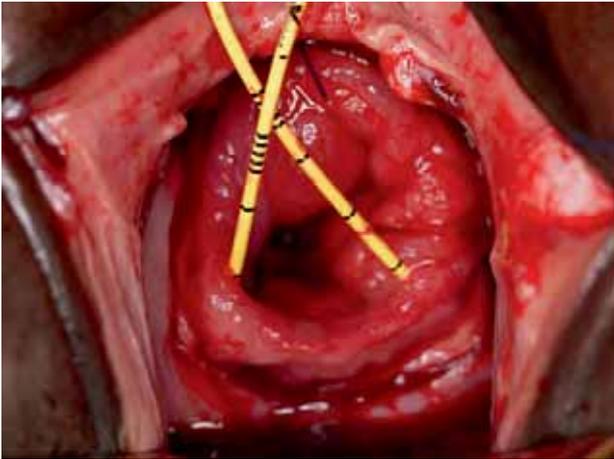
# IIBb urethra fistula



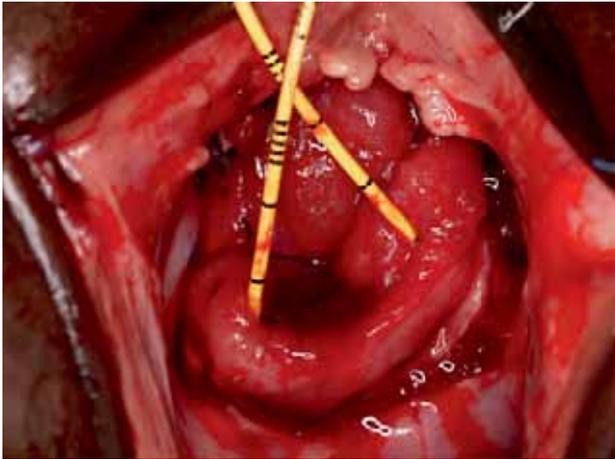
urethra fistula IIBb



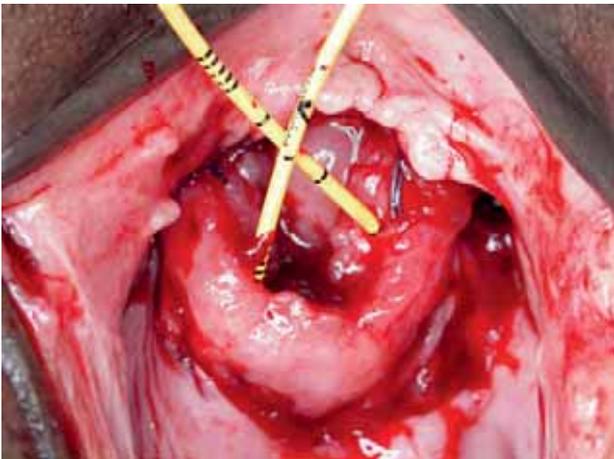
bilateral urethra catheterization



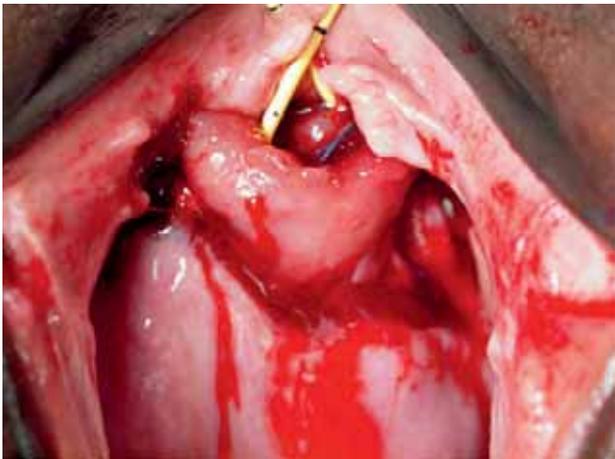
circumferential dissection



advancement + anterior fixation

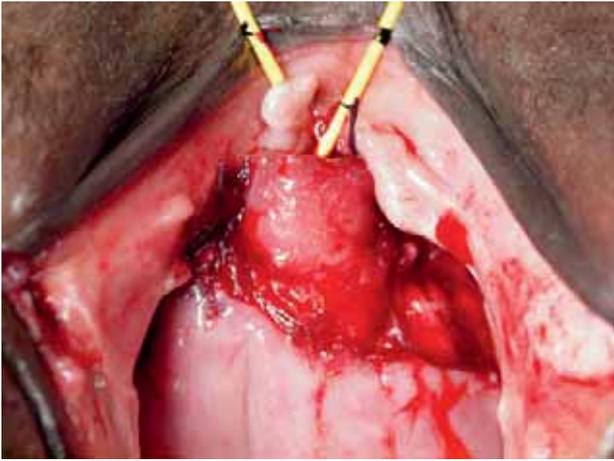


anterobilateral fixation

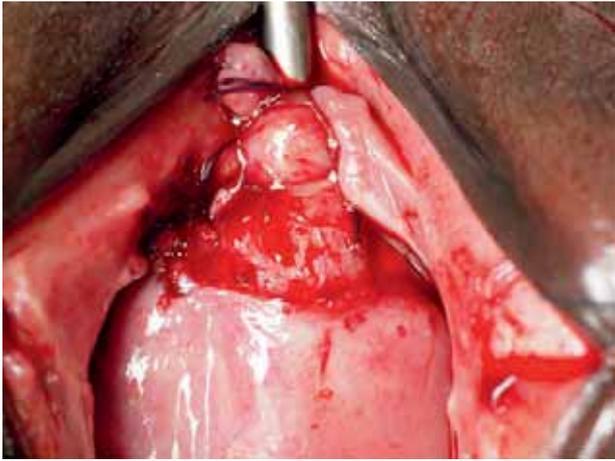


circumferential fixation

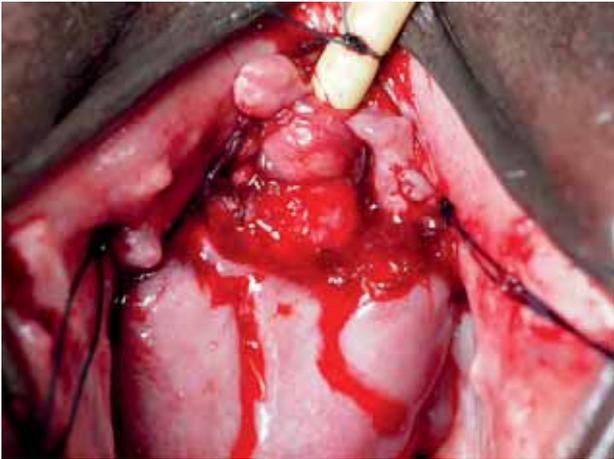
# IIBb urethra fistula



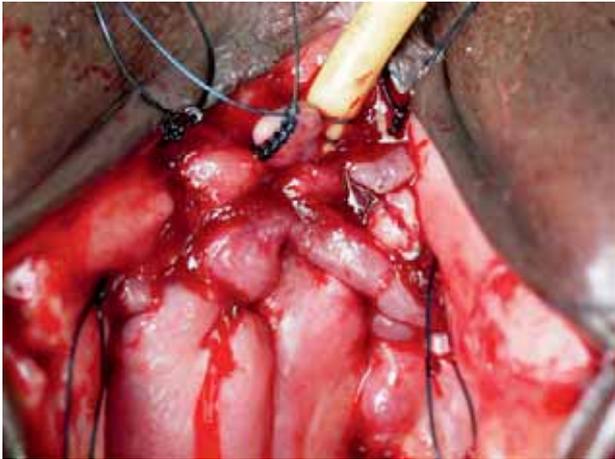
circumferential fixation



check by hegar h6-h8



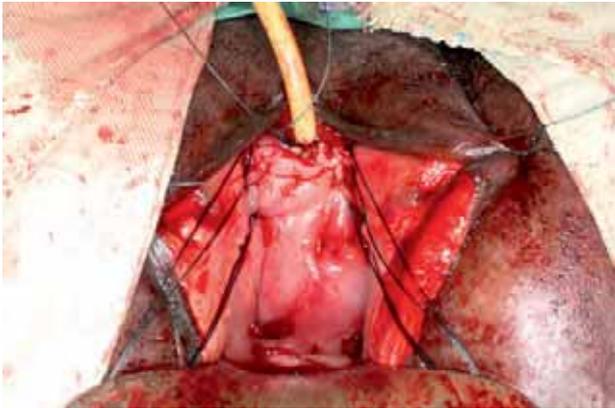
catheter fixed



avw fixation  
end of first stage



result first stage

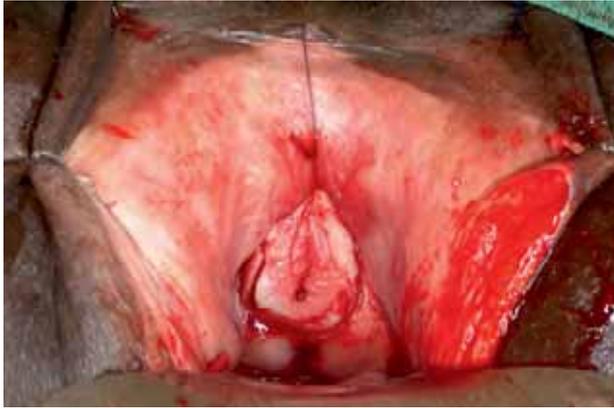


end second stage

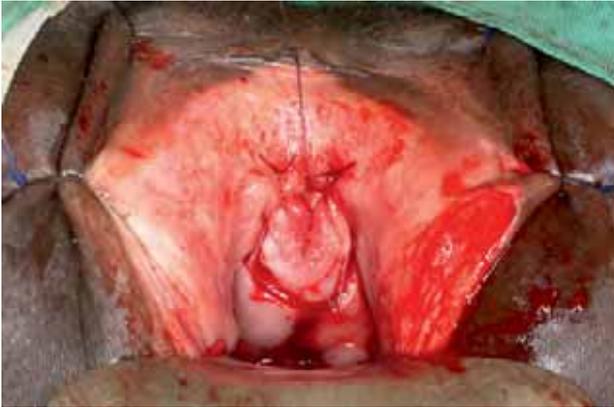
# IIBb urethra fistula



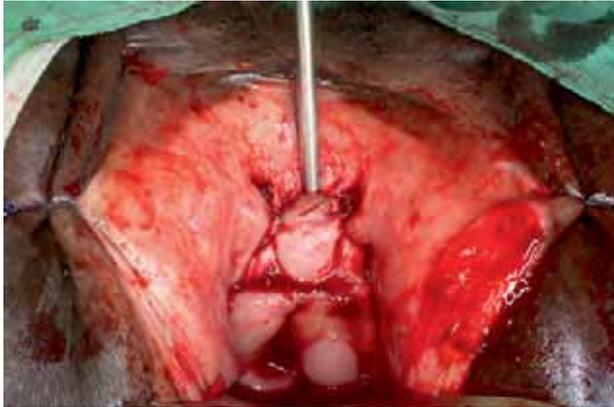
urethra fistula IIBb



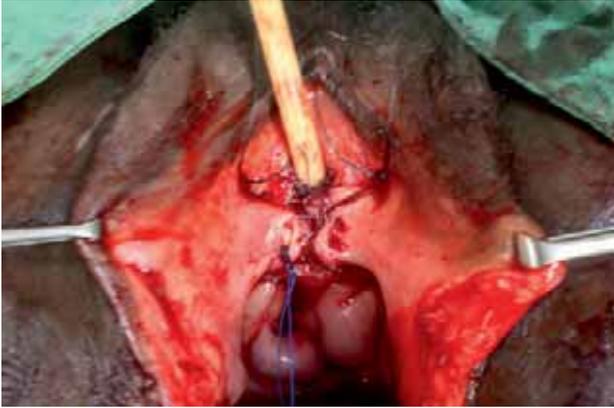
advancement + anterior fixation



anterobilateral fixation



check by hegar h6-h8

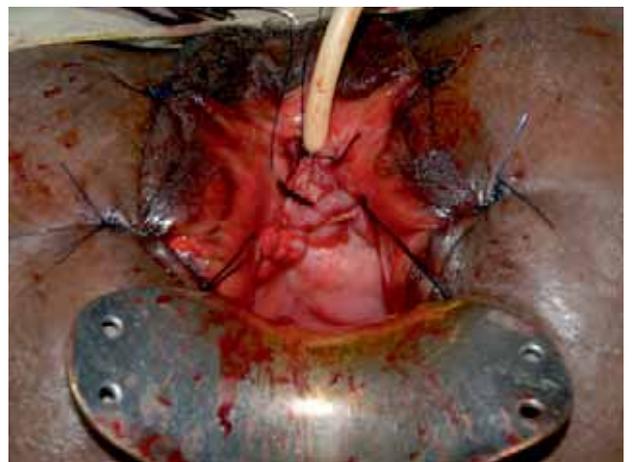
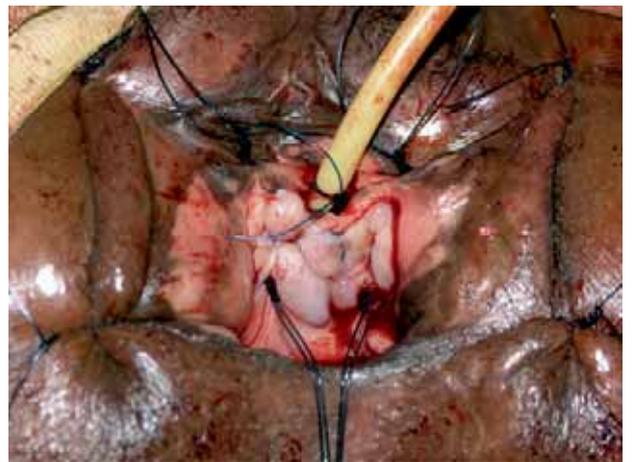
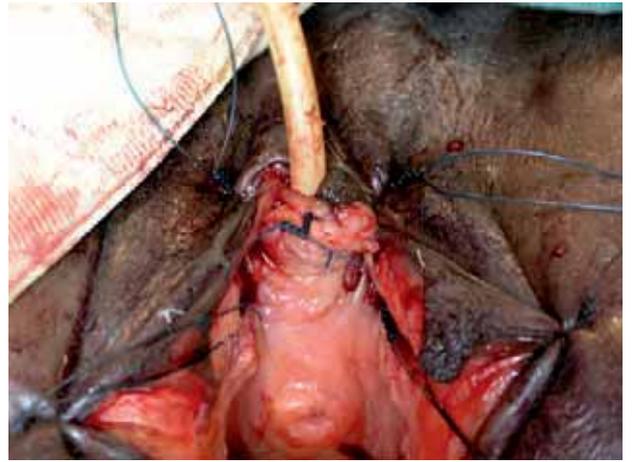


end first stage reconstruction



end result first stage

# post IIBa incontinence



## discussion

the women with a urethra fistula, type **kees IIBa** and **kees IIBb**, constitute some **15%**, viz 3,000, out of all the urogenital fistula patients, viz 18,500, as operated by the author personally over a 35-yr period, 1983 to 2018, besides the some 3,000 patients with a digestogenital fistula; with so far more than 25,000 procedures

this is the **first** time, the principles of a **continent urethra reconstruction** are presented as developed by the author himself during an **innovative and creative** process as **based on over 3,000 personal urethra reconstructions**

with a closure rate of at least 95% and final full continence rate of 90-95% of the healed type **kees IIBa** urethra reconstructions

whilst the results of **kees IIBb** urethra reconstructions are far worse due to the large amount of qualitative and quantitative tissue loss; and quite a number present right from the beginning as “inoperable” or really inoperable

it is not often that an operation technique is described in such detail but from his own experience the author knows how difficult it is to learn something especially when the teacher/instructor is not around and one stands alone totally isolated

the mechanism of action and trauma of type **kees IIBa** urethra fistulas are described in order to explain the fistula characteristics of this type, especially the retraction of tissue into different directions with anterior and anterobilateral loss of fixation of the endopelvic diaphragm to the pelvis wall

the chronology has been presented to show the process which is as important as the final solution itself as it will give the insight; nothing comes falling from heaven

though it is complicated already to reconstruct the urethra as a tube, especially over a catheter, with poor success at healing; then

after successful healing the major problem is the occurrence of severe postrepair urine incontinence

in line with his increasing insight into the functional pelvis anatomy the author built into his operation technique something to ensure continence, from first the **martius** fibrofatty pad to finally the meticulous reconstruction of the endopelvic diaphragm

the **final** operation principles are wide H incision, dissection as far in order to adapt the tissues tension-free, reconstruction of uv-junction with repositioning/reduction of posterior bladder neck wall, inverted T like longitudinal urethra reconstruction, endopelvic diaphragm reconstruction and avw reconstruction by flap

if it breaks down the same principles are used; if postrepair incontinence develops the real cause is identified and then corrected

though the principles have been outlined step by step, each fistula constitutes its own unique entity and the operation technique has to be customized to that specific fistula

# **basic science**

see textbook **functional female pelvis anatomy**

urine continence mechanism

management of vvf

management of rvf

# female urine continence mechanism

## introduction

the functional anatomy of the female urine continence mechanism consists of a rather complicated multi-interaction of static (bone, connective tissue) and dynamic structures (muscles; mucosa, submucous vascular plexus) and nervous innervation

the anatomic female urine mechanism comprises the bladder neck with both detrusor loops, the uv-junction and the whole urethra from internal to external opening over a total length of 4-5 cm with continence potential over its whole length as influenced by physiologic stress

there is an internal smooth muscle sphincter and an external striated muscle rhabdo sphincter with washer effect by the mucosa and submucous vascular plexus

the distal urethra and external opening are anchored into the pierced thru punched out opening in the perineum outlet diaphragm

here only a short comprehensive outline is given as a start/incentive to more extensive self-study

## functional anatomy

### anatomic urine continence mechanism

#### **bladder**

a balloon like organ for continent filling and storing of urine

the ureters, trigone and posterior urethra smooth muscles have the same origin and these structures are not as distensible as the rest of the bladder

uv-junction and stiff trigone as fixed point from which the bladder fills asymmetrically and towards which it contracts during micturition

adherent and sticking anteriorly to symphysis and (bi)laterally to pelvis wall by loose connective tissue and thin fluid film which allows friction-free upward/downward shifting/sliding of anterior and (bi)lateral bladder walls during filling and micturition

firmly adherent posteriorly to the pubocervical musculofascia as anterior part of the endopelvic diaphragm

this configuration is responsible for the saucer-like shape when the bladder is empty; otherwise the posterior and anterior bladder walls would be adapted due to the natural tissue forces

anteriorly it rests upon the symphysis and posteriorly upon the pubocervical musculo fascia as part of the endopelvic diaphragm; in the upright position

#### **bladder neck**

two detrusor loops

trigonal ring

## **urethra**

length 3.5-4 cm

with proximal internal and distal external opening

shape and diameter

lumen

urethra mucosa

submucous vascular plexus

longitudinal smooth muscle fibers

circular/oblique smooth muscle fibers

as internal smooth muscle sphincter

horseshoe-shaped striated muscle fibers; slow-twitch and fast-twitch

as external striated "rhabdosphincter"; since posteriorly it is open and

the endings are inserting into the pubocervical musculofascia; so sphincter-like elastin and connective tissue of urethra wall

## **anatomic/physiologic support**

### **pubis symphysis**

anterior bladder wall, anterior urethrovesical junction, anterior urethra are adherent/sticking to the posterior and caudad symphysis and rest upon it in the upright position

### **pubourethral ligaments: static and dynamic**

anterior and intermediate

as condensations of perineum outlet diaphragm and stabilizing the distal/mid urethra and external opening in anatomic position; since firmly anchored into this diaphragm

posterior

as condensations of the pubocervical musculofascia as anterior part of the endopelvic diaphragm and stabilizing the proximal/mid urethra in anatomic position

### **pubocervical musculofascia as anterior part of dynamic endopelvic diaphragm**

in between posterior bladder/urethra wall and anterior vagina wall and from pubis bone and arcus tendineus fasciae and

from pubis bone bodies anteriorly to cervix posteriorly and as

anterior part of the endopelvic diaphragm in combination with cervix, broad/cardinal ligaments and parametrium and sacrouterine ligaments

for stabilizing and securing the (posterior) urethra/bladder neck and cervix in their anatomic position

### **perineum outlet diaphragm**

inferior layer of pelvis floor

the distal urethra with external urethra opening are anchored into the perineum outlet diaphragm

as such these structures are stabilized and secured in their anatomic position and they become part of this diaphragm whilst

contraction with increase in its tonus will support the external rhabdosphincter

### **no direct role of levator ani muscles**

superior layer of pelvis floor

but only indirect role since no anatomic contact whatsoever between midline continence mechanism and lateral muscles

and anatomic continence mechanism cephalad to levator ani muscles

however, combined with the perineum outlet diaphragm together they form the

### **pelvis floor as one functional unit as abdominopelvic wall**

since these two structures are firmly connected to each other via perineal body, external sphincter ani complex and levator plate/anococcygeal ligament and so supporting and reinforcing each other

### **no support by anterior vagina wall**

very distensible and as such lacking the stiffness required; also loosely attached to and hanging on the endopelvic diaphragm “dragging” it down instead of pushing it up in the upright position; whilst the vagina is a zero-pressure organ since no filling content

## intact innervation of these components

autonomic sympathetic and parasympathetic nervous system for longitudinal and circular/oblique smooth muscles; the sympathetic fibers for stimulation and continence against the parasympathetic fibers for relaxation and micturition; from hypogastric and pelvic plexus and from s2, s3, s4

the pudendal nerve innervating the external striated “sphincter” and the perineum outlet diaphragm; from s2, s3, s4

## function of anatomic structures

**the two detrusor loops** keep the bladder neck contracted during the filling phase and prevent it from opening up

**trigonal ring** keeps the urethrovesical junction contracted and prevents the internal urethra opening/proximal urethra from opening up during the filling phase

**urethra length** is normally 3.5-4 cm; the critical length for continence seems to be 1-1.5 cm; if it is shorter continence may be compromised

**urethra shape** is tube like and probably circular over its whole length since the internal opening and the external opening are circular in shape

**urethra diameter** plays a role since the more narrow the stronger the natural centripetal forces closing the urethra; physical law of Poiseuille

**urethra mucosa with submucous vascular plexus** is responsible for a water-tight closure; washer effect

**longitudinal smooth muscle layer** plays a role in micturition since by contraction of its fibers the urethra becomes shorter and wider; under autonomic nervous system control

**circular/oblique smooth muscle layer as internal sphincter** is responsible for keeping the urethra closed due to the non-fatigue tonus of its fibers; also under autonomic nervous system control

**horseshoe-shaped striated muscle layer as external “rhabdosphincter”** gives additional strength due to the tonus of its slow-twitch fibers and if needed by short-time contraction of its fast-twitch fibers; under pudendal nerve control voluntarily but also by reflex action upon intraabdominal pressure rise like coughing or standing up

**anterior, intermediate and posterior pubourethral ligaments** secure the urethra in its anatomic position anteriorly against the posterior/caudad symphysis

**pubocervical musculofascia as part of endopelvic diaphragm** supports and secures the cervix, posterior bladder, posterior uv-junction and posterior urethra in their variable anatomic position since these structures are fixed to it and as such it supports the urine continence mechanism; if there is a defect in the diaphragm these structures herniate thru this defect whilst also genuine incontinence may develop

**anterior bladder wall, urethrovesical junction, urethra** are more or less adherent/ sticking to the posterior/caudad symphysis and rest upon it in the upright position and are pressed against it; as such these structures can shift/slide friction-free against the symphysis but **cannot rotate backwards** away from the symphysis

**posterior bladder wall, urethrovesical junction, urethra** are adherent to the endopelvic diaphragm; as such these structure are mobile depending upon movements of the dynamic diaphragm; if the support becomes defective they **can rotate backwards** away from the symphysis causing funnelling of the proximal or total urethra

**anterior vagina wall** is loosely adherent to the endopelvic diaphragm; with circular ruga folds of the vagina due to natural tissue forces; it lacks the stiffness characteristics required for support of the anatomic urine continence mechanism

**levator ani muscles** on contraction will “squeeze” the posterior and bilateral vagina walls resulting **indirectly** into cephalad and anterior movement of anterior vagina wall with adherent endopelvic diaphragm for better support of the posterior bladder neck, urethrovesical junction and urethra; and as such contribute to a better configuration of the anatomic continence mechanism

**other pelvis floor structures of the perineum outlet diaphragm** play a **direct** role in stabilizing the distal/mid female urethra in its anatomic position since these organs with the external “rhabdo”sphincter are anchored into the perineum outlet diaphragm

**intact innervation of these components** is needed for smooth coordination of all the physiologic processes

## physiology of continence and micturition

the literature is so abundant and confusing and contradicting that it is not possible to study it all and produce an evidence-based true statement; see chapter: **remarks on urine continence mechanism**

### **basic continence principles**

movement of contents within an organ is only possible from higher pressure levels towards lower pressure levels

so as long as the urethra closing pressure is higher than the intravesical excretory pressure there is continence

as soon as the intravesical pressure becomes higher than the urethra closing pressure urine will flow thru the urethra towards the outside; either as voluntary physiologic action like during micturition or involuntarily and then it is called incontinence

### **urethra closure**

it is not clear whether urethra closure is **circular** (external and internal opening circular on direct inspection) **or** that it is by **coaptation**;

however, if it is by coaptation then coaptation of the **posterior** urethra wall **against** the **anterior** urethra wall since **immobile anterior** bladder neck/uv-junction/urethra are more or less fixed/adhesive to and pressed against symphysis whilst **mobile posterior** bladder neck/uv-junction/urethra are adherent to elastic endopelvic diaphragm

### **biophysiomechanics**

the two detrusor loops and trigonal ring keep the urethrovesical junction closed during the filling phase of the bladder

the urethra is kept closed/adapted by centripetal forces and by the tonus of the internal sphincter and slow-twitch fibers of the external “sphincter”; whilst the urethra mucosa and submucous vascular plexus are responsible for a water-tight urine seal

during the compliant filling phase of the bladder these mechanisms maintain closure of urethrovesical junction and (proximal) urethra; when the bladder fills up more these forces increase via impulses from baroreceptors

(voluntary) increase of these forces is possible directly by contraction of the external urethra “rhabdosphincter” and (in)directly by contraction of the pelvis floor muscles; with increase in the tonus of the smooth muscles of the endopelvic diaphragm by reflex action of the sympathetic nervous system

at sudden intraabdominal pressure rise there is a reflex increase in tonus of the smooth muscle fibers of the endopelvic diaphragm and contraction of the external urethra “rhabdosphincter” which takes place a few milliseconds before there is an increase in intravesical pressure since first the thoracic diaphragm and the anterior abdominal musculature contract (with or without contraction of the pelvis floor) on cough and this causes intraabdominal pressure rise a few milliseconds later; this action may be enforced directly and indirectly by simultaneous reflex contraction of the pelvis floor muscles

if these **intrinsic** mechanisms are deficient, for whatever reason, stress incontinence develops in varying degrees

at the beginning of voluntary micturition the two detrusor loops relax whilst the longitudinal detrusor muscle contracts with additional relaxation of the detrusor loops, the fast-twitch and slow-twitch muscle fibers of the external urethra “rhabdosphincter” relax, the pelvis floor muscles relax, the tonus of the endopelvic diaphragm relaxes, the longitudinal smooth musculature of the urethra contracts whilst the circular smooth muscle fibers as internal sphincter relax resulting in urethra shortening with an increase in its diameter

so, the forces which close the urethra decrease whilst intravesical pressure increases and the urethra opens up from proximally, from the urethrovesical junction, towards distally, towards the external urethra opening, and stays open during micturition

at the end of spontaneous micturition the opposite takes place and the urethra stretches with a decrease in its diameter

so, the forces which close the urethra increase whilst intravesical pressure decreases and the urethra closes

## **pressure transmission on sudden intraabdominal pressure rise**

there is pressure transmission on sudden (or slow) increase in intraabdominal pressure due to cough, standing up, straining etc

its net effect upon the cephalad/anterior and the caudad/posterior movement of the endopelvic diaphragm will determine if this has a positive, neutral or negative effect on keeping the urethra closed

on cough by contraction of thoracic diaphragm and abdominal musculature without simultaneous contraction by pelvis floor the pressure transmission will be coming from cephalad and anteriorly

and will reach the bladder first before pushing down on the endopelvic diaphragm despite reflex increase in its tonus; and only if defective this will result in backwards rotation of the posterior urethra wall away from the symphysis and will have a negative effect

on cough by contraction of thoracic diaphragm and abdominal musculature and with simultaneous contraction by pelvis floor the pressure transmission will be from cephalad, from anteriorly and from caudad simultaneously

since the distance from the pelvis floor to the endopelvic diaphragm is shorter than the distance from the thoracic diaphragm the caudad pressure will first reach the endopelvic diaphragm and move this anterior/cephalad before meeting the anterior and cephalad pressure; this will result in rotation of the posterior urethra wall forwards toward the symphysis and will have a positive effect

if the pelvis floor contracts earlier than the thoracic diaphragm and anterior abdominal musculature the positive effect will be strengthened

however, the ultimate effect, involuntary urine loss or continence, is with the intrinsic forces of the continence mechanism

## **anatomic changes at urethrovesical junction and urethra**

### **vesicalization**

funneling of the internal urethra opening and proximal urethra may occur and this is called vesicalization by heinrich martius since this part of the urethra becomes part of the bladder (vesica); it may be partial or total

### **re-urethralization**

by tightening the support the vesicalized urethra becomes again proximal urethra so this is called by the author re-urethralization

### **urethralization**

in post-fistula repair intrinsic incontinence with real circumferential loss of the proximal urethra the remaining bladder neck can be narrowed by special operation technique and function as the proximal urethra; this is called urethralization by the author

## **stress incontinence mechanism**

the anterior urethra wall is adherent to the posterior symphysis by loose connective tissue and a thin fluid film which allows the anterior urethra wall to shift against the symphysis friction free, though little; however it cannot rotate backwards away from the symphysis

the posterior urethra wall is firmly adherent to the pubocervical musculofascia with pubourethral ligaments as part of the endopelvic diaphragm

if defects develop within this diaphragm the posterior urethra wall will rotate backwards away from the symphysis causing partial (or total) funneling of the proximal (or total) urethra since the anterior urethra wall stays sticking against the symphysis; this process is called vesicalization since functionally the funneled part of the urethra becomes part of the bladder (vesica)

besides backward rotation there is also backward shifting of the posterior urethra wall against the anterior urethra wall into the direction of the sacrum; since the anterior external opening is fixed and immobile

these two mechanisms of pathophysiologic action result into a wider (proximal) urethra lumen and a more oval elliptical arrangement of the smooth muscle fibers and

interfere with the intrinsic forces keeping the urethra closed since more force is needed to close the urethra; less resistance according to **poiseuille law**

once the intrinsic forces can no longer keep the urethra closed sufficiently this will lead to genuine or post fistula repair intrinsic stress incontinence in various degrees

in total intrinsic stress incontinence there is continuous leaking of urine on lying/sitting/standing/walking due to total loss of the intrinsic forces

intraoperatively under spinal anesthesia in these patients in the exaggerated lithotomy position the level of urine within the urethra is noticed in concord with respiration, rising on expiration and lowering on inspiration

a third mechanism may be a defect in the anchoring of the distal urethra (with external urethra opening) into the perineum outlet diaphragm; with or without avulsion

this mechanism is probably responsible for the development of postpartum genuine intrinsic stress urine incontinence with a **hourglass or sandglass** deformity of the urethra which is rather common; though combined with a median longitudinal defect within the endopelvic diaphragm

## urge incontinence mechanism

in urge incontinence there are involuntary contractions of the detrusor muscle without reflex increase in the intrinsic closing forces setting involuntary micturition in motion whilst voluntary increase in the extrinsic forces is too weak and too short to stop the involuntary micturition

the involuntary contractions are triggered by low-threshold pacemaker, irritation of the pacemaker (like in cystitis) or by an ?ectopic pacemaker?

## discussion

the author outlines the various structures and factors which influence the functional anatomic urine continence mechanism in the female

it is up to the reader to make his/her own conclusions

first edition           january 1999

last edition            april 2018

## pre-, intra- and postoperative management of vvf

the fistula is closed during the surgical process of  
reconstructing  
the functional pelvis anatomy

**the better the organization** of the preoperative preparation, of the operation theater and of the postoperative care **the better the outcome of fistula surgery** in terms of closure and continence and **the better the chance of medical, physical, mental and social rehabilitation**

however, it cannot be stressed enough that the weakest point of fistula surgery in the developing world is the poor nursing care

first visit of patient

extensive history

clinical check-up; with vaginal examination

special attention to other lesions due to obstructed labor: ulcers, foot drop etc

preoperative preparation

oral hematinics and high-protein diet; **no antibiotics**

**high oral fluid intake of at least 6-8 liters per day already preoperatively!**

full mobilization; if needed with stick

laboratory, blood bank and X-rays

Hb/Ht and serum creatinine

a blood bank is complicated

X-rays are not indicated

examination

normal vaginal examination at first visit and day before operation

eua (examination under anesthesia) is utterly nonsense if it is not followed up **immediately** by surgery **in the same session**

timing of fistula management

the management has to start the moment the leaking of urine is manifest

if no healing by catheter then for early closure as soon as wounds are clean

equipment

a well functioning hydraulic operating table with 45-50° inclination is a must

special surgical instruments

self-retaining weighted auvard speculum, long vaginal instruments, sharply curved thorek scissors, sharp deschamps aneurysm needle

suturing materials

polyglycolic acid and nylon; expensive atraumatic suturing materials are not required

anesthesia

spinal anesthesia with a long-acting agent, e.g. hyperbaric bupivacaine 0.5%

manpower

only the surgeon and one instrumentating operation theater nurse  
one retractor inside the vagina is already a crowd

operation route

the vagina in type I through type IIBb fistulas; exceptionally and for type III fistulas other routes may be necessary

position on the operation table

exaggerated lithotomy position with the legs flexed and slightly abducted in the leg holders

accessibility

by median, uni- or bilateral episiotomies

examination under anesthesia

this is done by any surgeon for whatever surgery **at the beginning of any operation**; the fistula is classified and a final decision taken how to tackle this specific fistula

**kees** classification of fistulas according to functional location (**phd thesis 1989**)

- I not involving the closing mechanism
- II involving the closing mechanism
  - A without (sub)total urethra involvement
    - a without circumferential defect
    - b with circumferential defect
  - B with (sub)total urethra involvement
    - a without circumferential defect
    - b with circumferential defect
- III miscellaneous, e.g. ureter and other exceptional fistulas

this classification is based on the quantitative and qualitative amount of tissue loss of the urine continence/closing mechanism

type I **intact continence/closing mechanism**

type IIAa **minor involvement of continence/closing mechanism**

type IIAb **moderate to major involvement of continence/closing mechanism**

type IIBa **major involvement of continence/closing mechanism**

type IIBb **extensive involvement of continence/closing mechanism**

type III **intact continence/closing mechanism**

and then there is **postpartum urine incontinence** without a fistula

the operation in order to close the fistula and to restore continence becomes progressively more complicated from type I thru type IIBb whilst the prognosis as to closure and continence worsens progressively; the same applies from small thru extensive type III fistulas are a class of its own

surgical objectives

**aa** close the fistula

**bb** make the patient continent

**cc** preserve sufficient vagina depth/length for sexual intercourse

operation: meticulous water-tight closure of bladder/urethra whilst only adaptation or half-open closure of anterior vagina wall

type I: only closure

type IIAa: closure and something has to be done about continence

type IIAb: circumferential repair by end-to-end vesicourethrostomy

type IIBa: (repair) + urethra reconstruction with functional urethra tissue

type IIBb: (circumferential repair) + urethra reconstruction with other tissue (scar tissue, paraurethra tissue or bladder); often in two stages

type III: ureter reimplantation or something else

pubocervical musculofascia/endopelvic diaphragm

any defect has to be repaired meticulously and if necessary it has to be (re) fixed to the paraurethra arcus tendineus fasciae and para-uro pubis bones

the martius fibrofatty pad graft or any other kind of grafting

does **not** contribute either to closure or to continence; **more** surgical trauma

indwelling bladder catheter for minimum period of 2 weeks

foley catheter ch 18 or nelaton ch 16

**postoperative fluid intake**

at least **6-8 liters per day** in order to get good urine flow with **urine output** of minimally **4,000-6,000 ml per 24 hr**

vagina pack

no routine vagina pack; good check on hemostasis

antibiotics

only on strict indications, e.g. pneumonia

the **indiscriminate use** of antibiotics only leads to **multi-resistance**

mobilization

full mobilization the morning following surgery

**main postoperative problem when the fistula is closed**

intrinsic stress and/or urge incontinence

so already at first attempt make sure the right technique is performed

postoperative intrinsic stress incontinence

urethralization and musculofascia repair/refixation

postoperative urge incontinence

only strict bladder drill

urethrovesical junction (or uv)-stricture with overflow

daily gentle dilatation for 2 weeks; eventually combined with urethrotomy

social rehabilitation

only by successful repair; then it takes place spontaneously

future subsequent pregnancies/deliveries

regular antenatal care with delivery in hospital by **elective** cesarean section since labor assistance/monitoring is very poor in most instances

**residual** fistulas

the same technique as if it were the first attempt

dye test with gentian violet

whenever in doubt (fistula?, incontinence?, which type of incontinence?) instill 20-200 ml gentian violet into the bladder under the motto **the dye no lie** however, it is troublesome and unreliable in the immediate postoperative period

**do not waste time, energy and money on things which make no sense** such as eua, first treating the urine dermatitis, intravenous pyelography, urine examination, waiting 3 months after delivery before surgery etc.

**concentrate on the most important thing:**

**close the fistula**

## pre-, intra- and postoperative management of rvf

**the better the organization** of the preoperative preparation, of the operation theater and of the postoperative care **the better the outcome of fistula surgery and the better the chance of social rehabilitation**

however, it cannot be stressed enough that the weakest point of fistula surgery in the developing world is the poor nursing care

preoperative preparation

oral hematinics and high-protein diet; **no antibiotics**

laboratory

Hb/Ht

X-rays are

not recommended

examination

normal vaginal examination at first visit and the day before surgery

eua (examination under anesthesia) is utterly nonsense if it is not followed up **immediately** by surgery **in the same session**

anesthesia

spinal anesthesia with a long-acting agent, e.g. hyperbaric bupivacaine 5%

manpower

only the surgeon and one instrumentating operation theater nurse

one retractor inside the vagina is already a crowd

special instruments

self-retaining weighted auvard speculum, long vaginal instruments, sharply curved thorek scissors, sharp deschamps aneurysm needle

suturing materials

polyglycolic acid and nylon; expensive atraumatic suturing materials are not required

operation route

the vagina in type I through type IIb fistulas; exceptionally as in type Ic and III fistulas other routes may be necessary

position on the operation table

exaggerated lithotomy position with the legs flexed and slightly abducted in the leg-holders

accessibility

by median, uni- or bilateral episiotomies

examination under anesthesia

this is done by any surgeon for whatever surgery **at the beginning of any operation**; the fistula is classified and a final decision taken how to tackle this specific fistula

kees classification of fistulas according to anatomic/physiologic location

- I proximal fistulas
  - a without rectum stricture
  - b with rectum stricture
  - c with circumferential defect very seldom
- II distal fistulas
  - a without sphincter ani involvement
  - b with sphincter ani involvement
- III miscellaneous, e.g. ileouterine fistulas after instrumental abortion

and then there is **postpartum stool/flatus incontinence** without a fistula

further classification as to size

- small** < 2 cm
- medium** 2-3 cm
- large** 4-5 cm
- extensive** ≥ 6 cm

operation air-tight closure of rectum whilst half-open adaptation or even no closure at all of posterior vagina wall (principles of septic surgery)

- type Ia: transverse closure of rectum
- type Ib: with disruption of rectum stricture
- type Ic: (abdomino)vaginal approach with end-to-end anastomosis/colostomy
  
- type IIa: transverse or longitudinal closure of rectum; common sense
- type IIb: with sphincter ani/perineal body reconstruction
  
- type III: depending upon the situation

vagina pack

no routine vagina pack; good check on hemostasis

perioperative antibiotics

**no routine**; only in complicated repairs eg disruption of rectum stricture  
tinidazole 2 g per os and one shot of broad-spectrum antibiotics i.m. at beginning of anesthesia/operation

colostomy

this is **not curative** but a help; only if it can be guaranteed that 2 weeks after colostomy the rvf is repaired and that 4 weeks after successful repair the colostomy is closed

no solid food postoperatively for 10 days

in order to have soft and less bulky stools

laxatives like liquid paraffin postoperatively for 10 days  
no straining on defecation

**no** antibiotics pre- and postoperatively  
only on strict indication, e.g. pneumonia

**no** sitzbaths postoperatively  
specifically when the sphincter ani has been repaired

prognosis as to closure  
there is no relation to type of fistula and success at closure

social rehabilitation  
by successful repair; it will take place spontaneously

future subsequent pregnancies/deliveries  
regular antenatal care with delivery in hospital

**sphincter ani rupture** with longitudinal ano-rectum trauma and perineum tear  
minimal dissection, longitudinal distal ano-rectum closure with meticulous air-tight  
adaptation of internal sphincter by double layer of inverting polyglycolic acid, end-  
to-end external sphincter ani repair and perineal body repair leaving posterior  
vagina wall and perineum open; see textbook **obstetric trauma surgery; art  
and science: sphincter ani rupture**

**nb** the rectum is very delicate and needs to be handled with care; as well there is  
always contamination so the principles of septic surgery have to be applied strictly and  
many times the posterior vagina wall is just left completely open; whilst the repair itself  
should be air-tight

**do not waste time, energy and money on things which make no sense** such as  
eua, waiting 3 months after delivery before surgery etc.

**concentrate on the most important thing: close the fistula**

## postscriptum

the author has been contemplating for a long time how to transfer his experience with and expertise in the **complex obstetric trauma** in detail

whilst claiming this as **science** and claiming his **intellectual property rights**

this is not possible by writing articles due to the straight-jacket format and the “you peer me i peer you” policy of the international journals which limits the number of words and the way of free expression combined with loss of copyright

and resulting in uniform impersonal documents with interchangeable study subjects, numbers, incomprehensible statistics; at least for the obstetric fistula

and it is also not possible by attending so-called **protocol** meetings since immediately afterwards the organizations (which do not have the relevant expertise) are claiming full ownership like **ngo** guidelines for the obstetric fistula (surgery), **ngo** training manual, **ngo** catheter protocol, **ngo** duration of catheter etc etc

though this is the **intellectual property** of the obstetric trauma surgeons by their hard work who participated in these meetings

**nb** whereby the scientific part is twisted to fit the political vocal **rhetoric** of the obstetric trauma illiterate ngo's pretending “scientific” endorsement

so far, the author has produced several contributions in book form and he will continue to do so: all with **official isbn/ean number**

first, the author thought these books would contribute to more scientific research, open discussions, challenges by others, full transparency etc

however, that did not happen and the author hardly got any scientific reaction; exactly the same as when he proposed advanced level training workshops

**now** he author knows he is writing these books for himself since he is intrigued and obsessed by the complex obstetric trauma the more so since his clinical and surgical research into the functional pelvis anatomy has come far but not far enough and he is still in a continuous learning process and he would like to document the progress

though the **yankan gishiri** does not belong to the complex obstetric trauma it poses a challenge to the obstetric fistula surgeon since it may result in a fistula and mostly in a type **kees IIBa** urethra fistula with tissue loss (by excision); so it is included

the author considers all his work **public domain** but he insists upon **recognition**

## abbreviations

vvf	=	vesicovaginal fistula
rvf	=	rectovaginal fistula
uvvf	=	urethrovesicovaginal fistula
vcvf	=	vesicocervicovaginal fistula
vuvf	=	vesicouterovaginal fistula
cx	=	cervix
avw	=	anterior vagina wall
pvw	=	posterior vagina wall
pcmf	=	pubocervical musculofascia
atf	=	arcus tendineus fasciae
atlam	=	arcus tendineus of levator ani muscle
lam	=	levator ani muscle
pcm	=	pubcoccygeus muscle
ocm	=	obturatococcygeus muscle
iscm	=	(ischio)coccygeus muscle
iom	=	obturator internus muscle
pm	=	piriformis muscle
sul	=	sacrouterine ligament
bl	=	broad ligament
cl	=	cardinal ligament
epd	=	endopelvic diaphragm
ch	=	charrière
g	=	gauge
h	=	hegar
p	=	parity
sb	=	stillborn
cs	=	cesarean section
sth	=	subtotal hysterectomy
tah	=	total abdominal hysterectomy
tvh	=	total vaginal hysterectomy

euo	=	external urethra opening
iuo	=	internal urethra opening
uv(-junction)	=	urethrovesical (junction)
euo/f	=	distance between euo and fistula
f/c	=	distance between fistula and cervix
f/v	=	distance between fistula and vagina vault;
euo/b	=	distance between euo and catheter balloon
euo/bw	=	distance between euo and bladder wall (fundus)
a/f	=	distance between anus and (rectovaginal) fistula
i/v	=	distance between introitus and vagina vault; vagina length
pa	=	pubic arch
ap	=	anterior to posterior pelvis diameter
ar	=	anal reflex
gm	=	gastrocnemius muscle
sm	=	soleus muscle
at	=	achilles tendon
min	=	minute
hr	=	hour
wk	=	week
mth	=	month
yr	=	year
R	=	right
L	=	left

bladder capacity by longitudinal diameter (euo/bw minus euo/b)

small	$\leq 4$ cm
moderate	5-6 cm
normal	7-12 cm
transitional	13-14 cm
increased	$\geq 15$ cm

## normal pelvis measurements

vagina length	10-12 cm
euo/c	6-7-8 cm
anatomic urine continence mechanism	4-5 cm
anatomic stool continence mechanism	4-5 cm
urethra length	3.5-4 cm
longitudinal bladder diameter (euo/bw minus euo/b)	7-12 cm
anorectum	4-5 cm
symphysis axis inclination	5-6 cm broad 30-45° as to horizontal in the upright position
pubic arch	85-90°
atf inclination	7.5-8 cm 25-30° as to horizontal from pubis bone to ischium spine
atlam inclination	7-7.5 cm 25-30° as to horizontal from pubis bone to ischium spine
angle between symphysis and atf/atlam	110-125°
inter ischium spine distance	10 cm
inter ischium tuberosity distance	10-11 cm
pelvis inlet plane	inclination 55-60° to horizontal from superior symphysis edge to promontory in the upright position
pelvis outlet	10-15° to horizontal from inferior symphysis to tip of coccyx in the upright position
anterior triangle pelvis outlet from inferior symphysis to ischium tuberosity in one plane with -10 to-15° inclination to horizontal in upright position	
posterior triangle pelvis outlet from ischium tuberosity to tip of coccyx in one plane with 65-70° inclination as to horizontal in upright position	
pelvis outlet surface	75-80 sq cm
gap between puborectalis edges	25-30 sq cm
diameter recta from inferior symphysis up to tip of coccyx	9-9.5 cm; up to 10.5-11cm during delivery

to be ordered from  
as  
printed by:



[info@printmarkt.eu](mailto:info@printmarkt.eu)  
[www.printmarkt.eu](http://www.printmarkt.eu)

