obstetric trauma surgery
art and science

kees la stool fistulas

step-by-step reconstructive surgery

kees waaldijk

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obstetric trauma surgery
art and science

setting standards by evidence-based practice

kees la stool fistulas

step-by-step reconstructive surgery

based on

findings and outcome

570 surgical and 900 nonsurgical procedures
in 1,400 patients with kees la stool fistula

out of
5,100 procedures in 4,650 rectovaginal fistula patients

out of
29,000 obstetric fistula/trauma reconstructive procedures
in 25,000 patients

with
full documentation

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 low-, in the middle- as well as in the high-income world

the name of the series has been changed from obstetric fistula into 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 the pelvis, pelvis floor and pelvis organs, 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 **29,000** reconstructive and conservative procedures in **25,000** 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, 30 hours of video recordings and a comprehensive database as personal experience over a 35-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

the literature dealing with rectovaginal fistulas is scarce and the description of specific operation techniques even scarcer more or less a terra incognita

even as a trained and experienced colorectal surgeon the author found and still finds it difficult to handle the rectovaginal/stool fistula in all its forms; with falling and standing up

over the years he developed a series of kees operation technique principles which he would like to describe in detail

since the different types have their own general and specific characteristics with their own general and specific reconstructive surgery principles they will be addressed one by one

since the rectum is a high-pressure organ and the vagina a zero- or low-pressure organ stool and/or flatus may pass from the rectum into the vagina and then to the outside

therefore, once the rectum heals the posterior vagina wall will always heal; so one has to concentrate upon meticulous closure of the rectum

though there is an enormous variety the **kees Ia** fistulas have one thing in common that they do not involve the anatomic stool continence/closing mechanism without a rectum stricture and without a circumferential defect

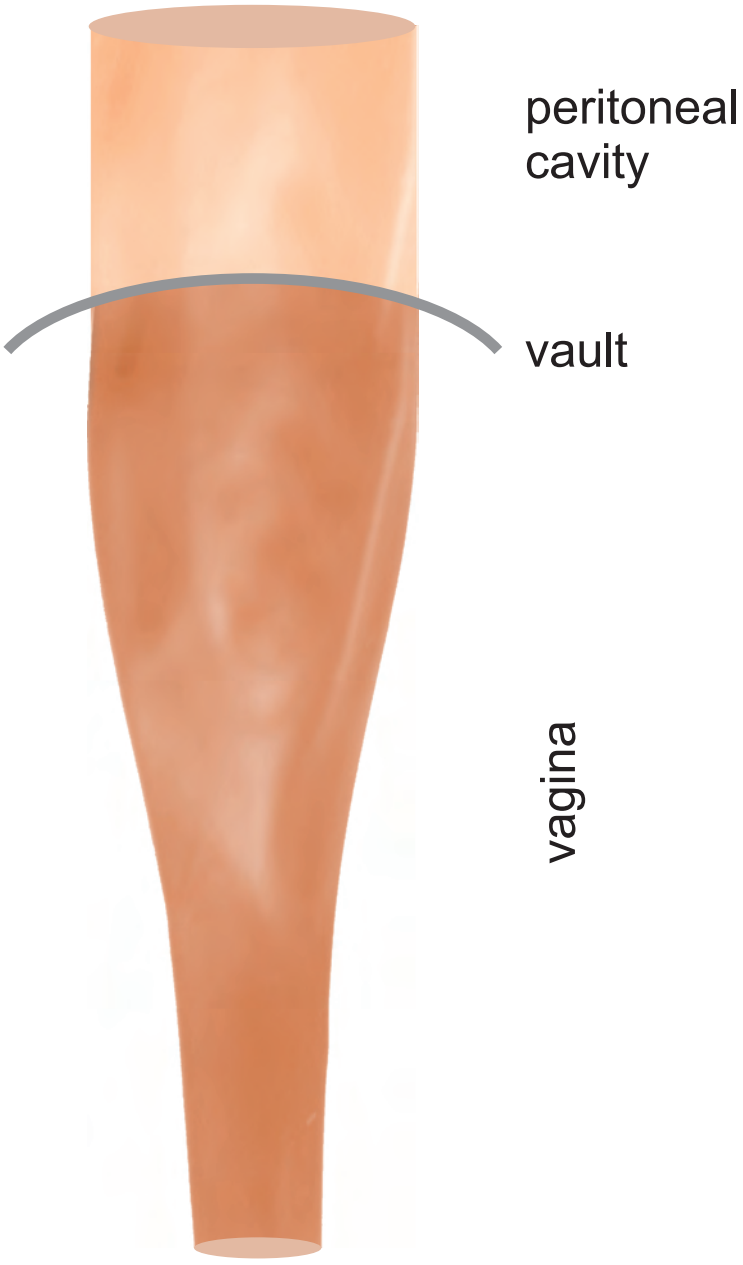
the author made an effort to explore this terra incognita; a start for further development

out of the series obstetric trauma surgery; art and science this textbook presents and outlines an evidence-based approach to the **kees Ia** stool fistulas which has been used by the author in a prospective way; as has been backed up by extensive documentation

however, this should be used as a guideline for reconstructive surgery principles since each fistula constitutes its own unique entity needing a customized approach; it cannot beat common sense

kees waaldijk md phd

august 2020



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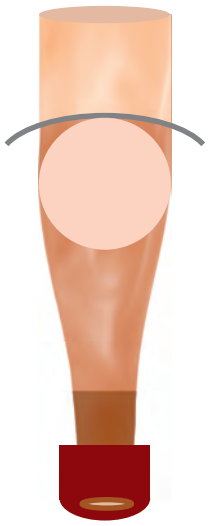
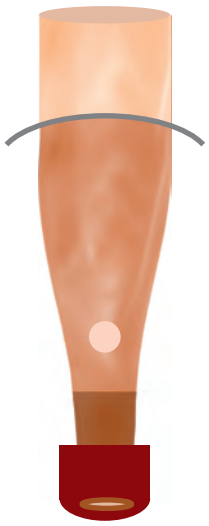
kees la stool fistulas





introduction

kees Ia stool fistulas

within the kees classification the fistula which **I** does not involve the anatomic stool con tinence mechanism **a** without a rectum stricture and without a circumferential defect is a **kees Ia** fistula so after healing the continence rate will be (almost) 100%

they are for (almost) 100% combined with a vesicovaginal fistula; unless the cause is penetration trauma, infection or a surgical complication which is rare

so far, a grand total of 1,417 patients with a kees Ia stool fistula were treated

the mechanism is pressure necrosis of the soft tissues between the fetal head and the maternal sacrum bone

there is a high tendency to spontaneous healing as demonstrated by the fact that 837 women healed without any surgical intervention during the first 3-6 months post partum; many of them already during the first 2 months

the reconstructive surgery principles are described in a step-to-step manner; and were applied as guideline in 570 operations in 501 patients

since these are proximal fistulas mostly deep inside the vagina with poor visibility, poor access and poor instrument handling, the operation procedure is complicated though the final result may be excellent

as demonstrated in these 501 patients with a healing rate of 96% and a continence rate of 99% of the healed fistulas

small very proximal fistulas may cause few or no symptoms at all since 79 patients did not want an operation stating once in while only flatus and/or diarrheic stool thru vagina and some even denied its existence but definitely fistula as seen during vvf-repair

the anatomic stool continence mechanism in the female consists of the

distal 4-5 cm of the anorectum

with

internal sphincter + external sphincter ani

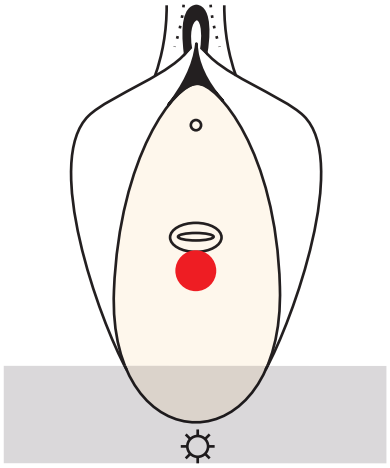
supported by

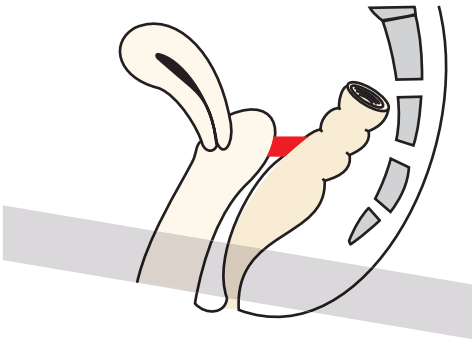
the perineal body

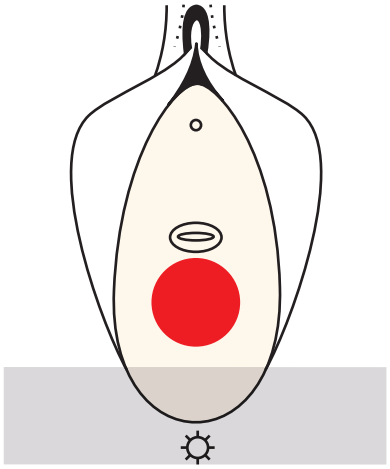
fixed anus as reference point for measurements

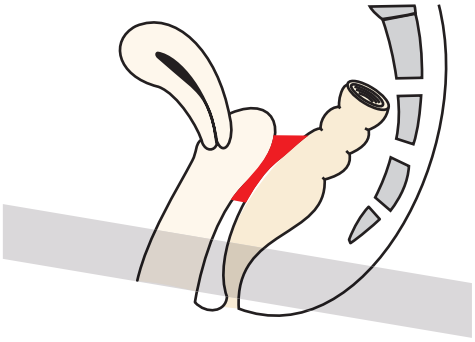
kees waaldijk md phd august 2020

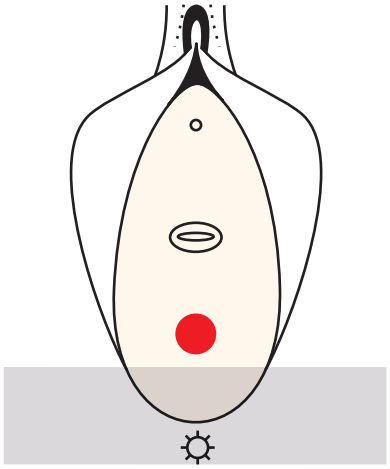
kees la stool fistulas

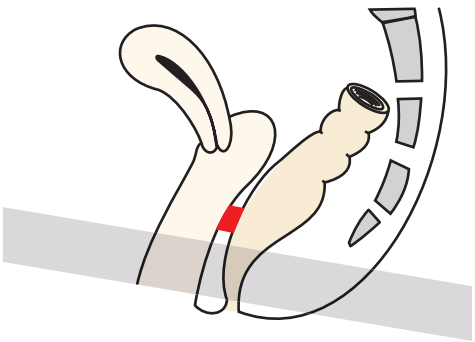












essentials

essentials stool fistula classification

kees Ia
kees Ib
kees Ic

kees IIa
kees IIb

kees III

postpartum stool/flatus incontinence

essentials stool fistula surgery

essentials kees Ia

I without involvement stool continence mechanism
a without rectum stricture and
without circumferential defect

essentials kees classification of stool fistulas

based on tissue loss, continence mechanism and operation technique with consequences for prognosis

any classification is a compromise considering the enormous variety of trauma

classification

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

kees I fistulas not involving the continence/closing mechanism

kees II fistulas involving the continence/closing mechanism

kees III miscellaneous

and of course **postpartum stool/flatus incontinence** without a fistula

table I
classification of fistulas according to anatomic/physiologic location

kees I	not involving continence mechanism	proximal fistulas
	a without rectum stricture	
	b with rectum stricture	
	c with circumferential defect	
kees II	involving continence mechanism	distal fistulas
	a without sphincter ani involvement	
	b with sphincter ani involvement	
kees III	miscellaneous, e.g. colostomy, ileouterine fistulas etc	

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

the transition from kees I into kees II fistulas is at 4-5 cm from the anus whilst for the kees I fistulas a rectum stricture or circumferential defect has to be looked for

the proximal kees I fistulas are due to pressure necrosis with anatomic tissue loss; few due to surgery

most of the distal fistulas kees II are due to a cut-thru mechanism without anatomic tissue loss; including penetration trauma and surgical complications

a grading of involvement of the stool continence mechanism of the different types is presented in table II

table II
involvement of continence mechanism according to type

type	involvement of continence mechanism
kees Ia	**none**
kees Ib	**none**
kees Ic	**none**
kees IIa	**from minimum up to moderate**
kees IIb	**extensive**
kees III	**none**

results

postrepair incontinence is not a major problem, though it may occur in kees **IIb** fistulas, whilst kees **Ic** fistulas have the worst results as to closure and may need a combined abdominovaginal approach; further, **no** clear relation to type

comment

so far it is the only classification with a

solid scientific background

clear operation technique principles for each type

prediction of outcome in terms of closure and continence

not only the fistula has to be classified, but all the lesions/defects have to be objectively described/documented in writing to be completely transparent

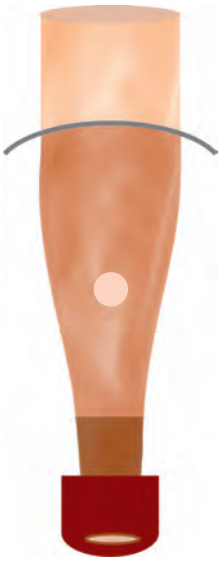
however, since the variety is so immense and there are no sharp demarcations but fluid transitions between the different types, this classification should be used as a compre hensive guideline since

each fistula constitutes a separate unique entity and needs its own specific customized approach, and that is exactly what makes obstetric fistula surgery so intriguing and challenging since there are no identical obstetric fistulas

fistula size, vagina strictures, scarring, stenosis and/or previous repair(s)
are no part of any classification; it only may make the operation more complicated

kees classification stool fistulas

kees Ia



kees Ia

kees Ia

kees Ib

kees Ic

kees IIa

kees IIb

essentials rectovaginal/stool fistula surgery

operation principles for each type

type	**rectum closure direction**	**special measures**	**post vagina wall only half-open adaptation**
kees Ia	transverse	(+ colpotomy)	transverse
kees Ib	transverse	+ stricture disruption	transverse
kees Ic	circumferential end-to-end	colpotomy (+ stricture disruption) **highly complicated**	transverse
kees IIa	common sense transverse or longitudinal	(+ perineal body)	transverse or longitudinal
kees IIb	longitudinal	+ sphincter ani + perineal body	1x transverse adaptation
kees III	special class of its own that needs their own specific approach		

comments

these are only guidelines and the approach has to be **customized** since each fistula constitutes its own unique entity

there is a clear relation between the reconstructive surgery principles and fistula type in order to reconstruct the functional anatomy

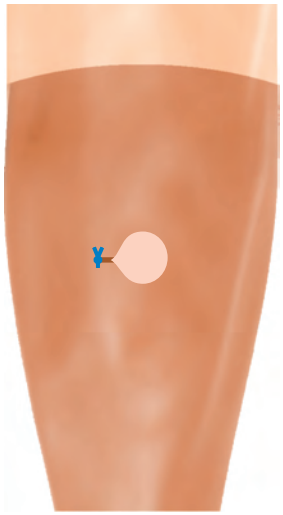
there is no relation between fistula type and outcome; only that **kees Ic** fistulas are the most complicated with the worst outcome whilst postrepair incontinence may only occur in **kees IIb** fistulas

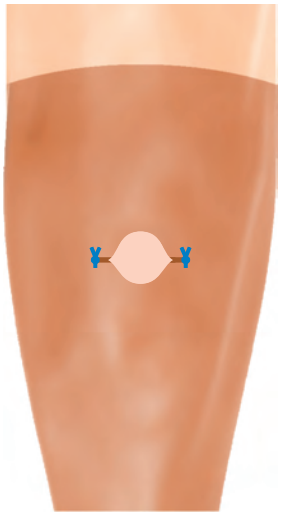
kees IIb fistulas need thorough theoretic/practical knowledge of the stool continence mechanism, otherwise the results will be poor

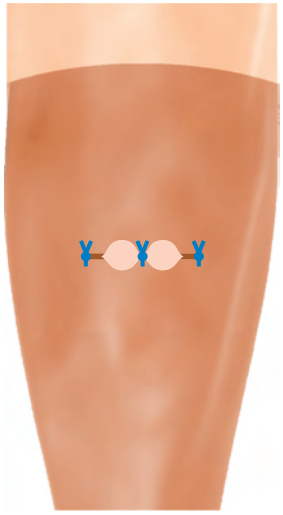
the author has **never** performed a **colostomy** for his obstetric trauma surgery; which would automatically mean at least 3 operations

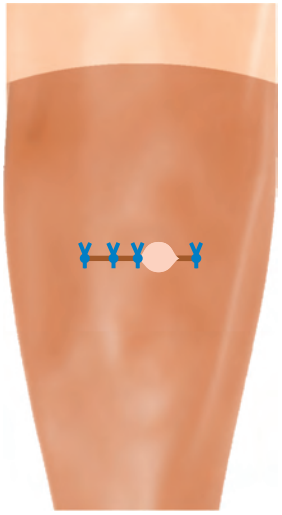
kees la

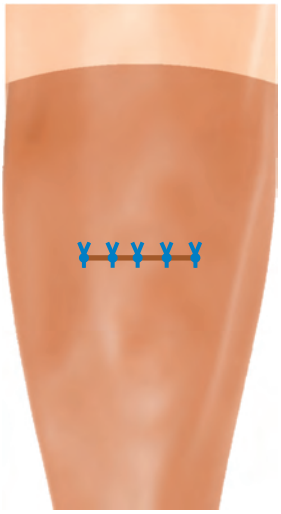
transverse rectum closure











essentials kees Ia stool fistulas

characteristics

the **kees Ia** fistulas comprise a group of fistulas which do **not** involve the anatomic stool continence mechanism; **without** a rectum stricture and **without** a circumferential defect

most of them are at or fixed onto the posterior cervix lip though they may be located any where between 4-5 cm from the anus as reference point and the cervix or vault

the small median ones at the cervix have a tendency to spontaneous healing if there is no infection and no outflow obstruction

the lateral ones may be fixed to the lateral pelvis wall which has to be released before closure

the small very proximal ones may be (almost) asymptomatic since only flatus/diarrheic stools per vaginam which is not a problem for the patients or they are even denying it on explicit asking; and as such a surprise finding intraoperatively (flatus)

there is an enormous variety also within the kees Ia class and each fistula constitutes its own specific entity which needs its own customized approach

nb the kees Ia fistulas are almost 100% combined with a vesicovaginal fistula = vvf

mechanism of action

pressure necrosis of the soft tissues in between the fetal skull and the maternal sacrum bone; so real anatomic tissue loss from minimal to extensive

reconstruction

the more proximal/deep the fistula the more complicated the repair since access is poor and instrument handling deep inside the vagina is difficult

though other surgeons may prefer another route, for all fistulas the vagina is the route of choice since this is the most logic and least traumatic approach

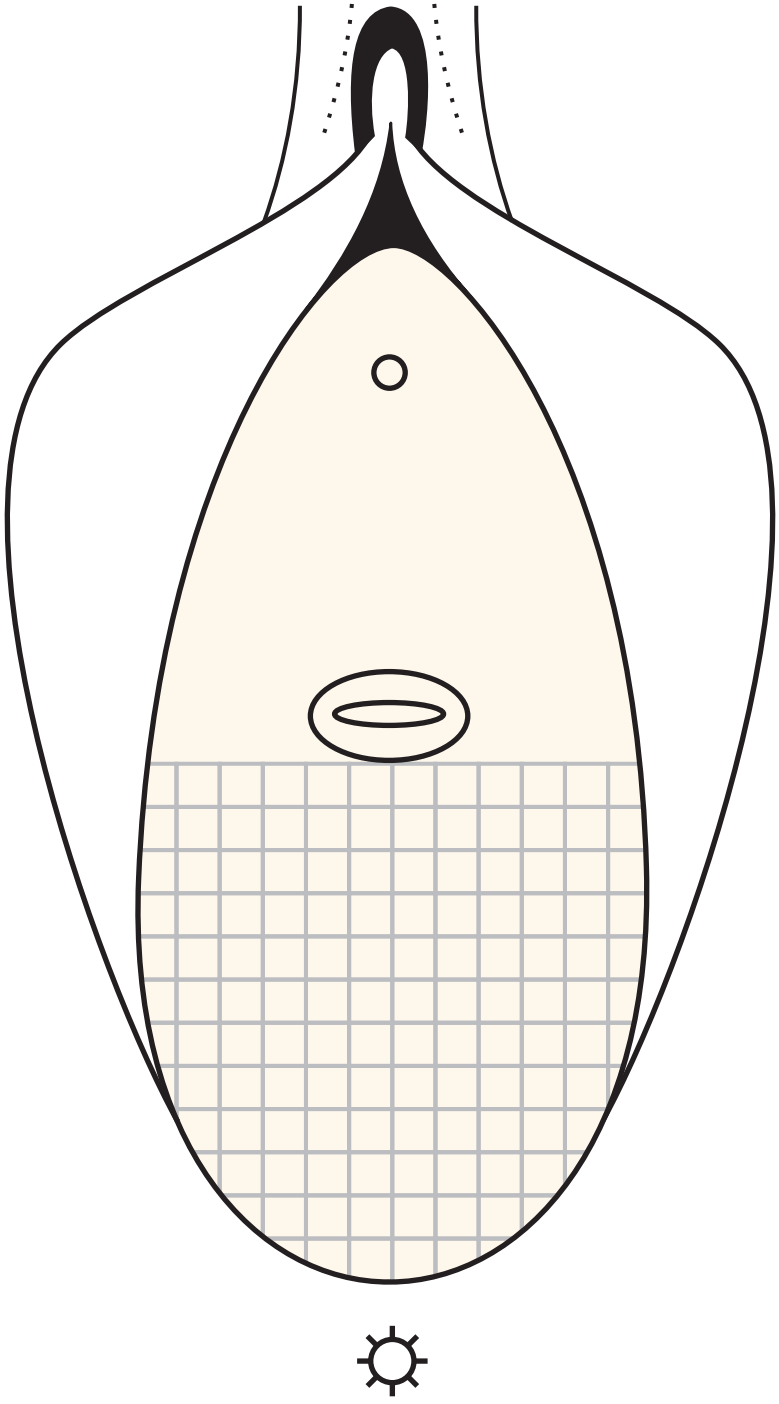
physiologic incision thru fistula, sharp dissection and then transverse rectum closure by a double layer (if possible) of inverting interrupted/continuous polyglycolic acid

normally, a colostomy and/or colpotomy is not required; whilst a colostomy does not guarantee rectum decompression and would automatically mean three operations

prognosis

good as to healing and excellent as to continence in kees Ia fistulas

documentation
anus as reference point



12 cm raster

kees Ia stool fistulas

I fistulas not involving continence mechanism

a without rectum stricture and
without circumferential defect

characteristics

- mechanism of action
- characteristics
- baseline data

reconstructive surgery

- step-by step reconstruction

discussion

kees Ia stool fistulas

I fistulas not involving continence mechanism

a without rectum stricture and without circumferential defect

introduction

the kees classification is based upon the quantitative and qualitative amount of tissue loss and on the involvement of the anatomic stool continence mechanism in the female with consequences for the operation technique and prognosis

the fistula which **I** does not involve the anatomic stool continence mechanism **a** without a rectum stricture and without a circumferential defect is a **kees Ia** fistula

also within this kees Ia class the variety is enormous

mechanism of action

pressure necrosis of the soft tissues in between the fetal skull and the maternal sacrum bone; so real anatomic tissue loss from minimal to extensive

characteristics almost 100% combined with vesicovaginal fistula

in **kees Ia** fistulas there is always anatomic tissue loss of the rectum, prerectal fascia and posterior vagina wall with possible tissue loss of the posterior cervix

there may be major tissue loss with also trauma to the sacrospinous ligament, (ischio) coccygeus muscles and piriformis muscles

the majority are located at the vault near or at the posterior cervix; with a fluid transition of the proximal kees Ia into kees Ib and into kees Ic stool fistulas

the rest is located anywhere between the vault/cervix and the internal rectum sphincter (stool closing mechanism) with a fluid transition of distal kees Ia into kees IIa fistulas

normally the fistulas are in the midline though they can be situated very laterally as well

if the fistulas are near or fixed to the posterior cervix and if the cervix retracted into the abdomen or fixed towards one of the ischium spines, visualization and instrumentation will be complicated

since the stool continence mechanism is not involved successful repair will ensure full stool/flatus continence

small kees Ia fistulas may heal spontaneously if no infection/no outflow obstruction as noticed during follow up in patients coming early for postpartum urine leakage and also passing flatus and/or stools per vaginam at first visit; and healed with full stool/flatus continence when seen later; so far, over 800 patients with spontaneous healing

the very proximal kees Ia fistulas may be a surprise finding at examination at operation beginning or during operation for a vesicovaginal fistula (flatus; compression of distal rectum by speculum) since several patients say they have no complaints (maybe only when diarrhea) and some do deny its existence even upon explicit asking

nb the kees Ia fistulas are almost 100% combined with a vesicovaginal fistula = vvf; isolated fistulas are rare

reconstruction see special chapter

since the majority are deep inside the vagina the repair poses a challenge to the fistula surgeon since access, visualization and instrumentation are complicated

normally the rectum is closed transversely in line with the natural tissue forces and common sense

infrequently the rectum is closed longitudinally in line with common sense

seldomly an oblique fistula is closed obliquely

purse string suturing was not really effectve

in principle the rectum is closed by a double inverting layer; the first interrupted for strength and the second continuously for flatus proof closure

the sutures are thru the prerectal fascia/muscularis resulting as well in rectum mucosa adaptation upon tying the sutures

primary suturing is performed in some 20% with good results

chance of healing is good; with excellent full continence of the closed/healed fistulas

discussion

the deeper (parts of) the fistula inside the vagina the poorer the access and the more complicated the instrumentation, especially if combined with a retracted/moving cervix and fixation of the fistula onto the sacrum; the same for fistulas not in the midline

try to bring the fistula towards the outside and if not in the midline towards the midline

though the (proximal) fistulas may be complicated to repair the prognosis as to closure and continence is excellent; actually, for all kees Ia fistulas

there is a fluid transition from proximal kees Ia into kees Ib and into kees Ic fistulas

and a fluid transition from distal kees Ia into kees IIa fistulas

personal experience of the author with 1,417 consecutive patients

right from the beginning the high tendency to spontaneous healing was noted whilst several had no symptoms despite a fistula so that only 501 patients needed surgery

spontaneous healing in	837	**60%**
570 operations in	501	**35%**
few/no symptoms in patients not bothered	79	**6%**

the baseline data for the 501 patients as operated will be presented in next chapter

baseline data kees Ia stool fistulas

501 patients as operated so far

as a failed system of obstetric care

obstetric versus other cause

obstetrics is by far the main cause of the rectovaginal fistula in **97.4%** of the patients as operated for kees Ia stool fistula; as indication of a failed system of obstetric care another cause, iatrogenic, postmeasles necrotizing infection, yankan gishiri and rape accounted for only 2.6%

combination with vesicovaginal fistula = vvf

almost 100% are combined with a vesicovaginal fistula whilst isolated fistulas are rare accounting for only < 0.5%; **nb** 3 patients had a ureterosigmoidostomy as well

combination with sphincter ani rupture kees IIb

combined with sphincter ani rupture in 7 or 1.4%
as expression of the extent of obstetric trauma in prolonged obstructed labor

fistula size

the **majority 60%** are rather small as situated at the vault at or near the cervix
however, the size alone is not representative since there are extensive small fistulas and “small” extensive fistulas in terms of real obstetric trauma

age at fistula

the great **majority of 67%** were younger than 20 yr when they developed the fistula
however, the age is not a contributing factor as a blunt lie by hypocritic people behind a desk look at the teenage deliveries in the united states and the united kingdom

you become pregnant later you get your fistula later

since these vocal fistula-illiterate people continue their blunt lies the author will continue his professional opinion

not that it matters but accepting vocal political rhetoric is not in his system; the only thing acceptable is creating a network of functioning obstetric care

index parity

the index parity ranged from para 0 thru para 14 with **majority 60%** at para 1 indicating that the **first** delivery is a test case for the pelvis

place of delivery

the great **majority of 75%** or three quarters delivered in a hospital
indicating a failed system of obstetric care

mode of delivery

the great **majority of 75%** delivered vaginally spontaneously or by assisted labor whilst the rest 25% delivered by cesarean section
indicating cesarean section too late to prevent (vvf+rvf) fistulas as another indication of a failed system of obstetric care

operated before

already **33%** or one third were operated before from 1 to 4 times whilst 24 patients (**5%**) had a **colostomy** as well
indicating low success rate despite claims by the verbal **simple** surgeons

sex infant at index delivery

the **3:1 male to female** sex rate in rectovaginal fistulas and the **2:1** rate in vesicovagi nal fistulas cannot be explained by the heavier male birthweight; so another mechanism must be in play eluding the author who was the first to find and point this out; already in his phd study in 1989

health status infant

a stillbirth rate of **97%** indicating the extreme trauma to the infant
once the infant has died, its head, the biggest circumference, shrinks and then the mother may be able to push the dead infant out but only if she herself has not died as well in the process

duration of fistula on operation day

roughly 50% with a fistula duration from 1 yr to over 30 yr
indicating non-availability of expertise

vagina

shortening in roughly **35%**, stenosis in **34%** and strictures in **10%**
indicating what the obstetric trauma means for the pelvis organs with consequences for reconstruction of the functional female pelvis anatomy

foot drop peroneal nerve trauma

was found in **83%** of which 316 bilateral plus 47 right foot and 42 left foot
so no difference between right and left foot
the obstetric trauma is more than only the obstetric fistula

table kees Ia stool fistula data

obstetric versus other cause

obstetric	488		97.4%
nonobstetric	13		2.6%
iatrogenic		5	1.2%
postmeasles necrotizing infection		5	1.0%
yankan gishiri		1	0.2%
rape		1	0.2%

combination with vesicovaginal fistula = vvf

combined with vvf	495	98.8%
isolated	6	1.2%

combination with sphincter ani rupture kees IIb

combined with sphincter ani rupture	7	1.4%

fistula size

small	≤ 2 cm	296	59.1%
medium	2-3 cm	141	28.1%
large	4-5 cm	48	9.6%
extensive	≥ 6 cm	26	5.2%

age at fistula

≥ 9 yr	6	1.2%
10-15 yr	211	42.1%
16-19 yr	118	23.6%
20-29 yr	98	19.6%
30-39 yr	57	11.4%
40-49 yr	9	1.8%

index parity

the index parity ranged from para 0 thru para 14 with **majority 60%** at para 1

para 1	291	58.1%

indicating that the **first** delivery is a test case for the pelvis

place of delivery

home	100	20.5%
hospital	369	75.6%
not asked	19	

mode of delivery

spontaneous/assisted vaginal	363	74.4%
cs-delivery	125	25.6%

operated before

at least once up to 4x	164	32.7%
colostomy	24	4.8%
+ ureterosigmoidostomy	3	

sex infant at index delivery

male	368	75.4%
female	120	24.6%

health status infant

sb	474	97.1%
live	13	2.7%
live/died 1st day	1	0.2%

duration of fistula on operation day

< 3 mth	98	19.6%
3 mth to < 1 yr	153	30.5%
1 yr to over 30 yr	240	47.9%

vagina

shortening < 9 cm	175	34.9%
vagina stenosis	170	33.9%
vagina stricture	49	9.8%

foot drop peroneal nerve trauma

total	405	83.0%
bilateral	316	64.8%
right foot only	47	9.6%
left foot only	42	8.6%

reconstructive surgery principles
kees Ia stool fistulas

surgical principles
- rectovaginal fistulas

kees Ia stool fistulas
- step-by-step reconstruction
- transverse closure
- longitudinal closure — infrequently
- oblique — upon indication
- purse string — hardly

discussion

surgical principles for rectovaginal fistulas

in line with principles of septic surgery
since the vagina is never sterile

introduction

the main objectives of any (obstetric) fistula repair are:

aa to close the fistula

bb to make the patient continent and

cc to preserve or to provide her with something for sexual intercourse

if these three objectives have been achieved the patient will be rehabilitated completely into her own society; this will take place spontaneously without further measures

patient consent

any patients is asked by the surgeon himself if she wants and agrees to be operated or not; a written consent is obtained as well

timing of operation

timing of operation: as soon as the wounds are clean the patients is considered to be suitable for operation unless her general condition does not permit it
if overt infection sitzbaths with water and a detergent like omo (cheap and available and highly effective) 3 times daily for 20 minutes until wound is clean
since the principles of septic surgery are being applied tissue inflammation itself is no contraindication

preoperative bowel preparation

though it is nice to have an empty rectum somehow it seems not possible to organize mechanical bowel cleansing: too early, too late or not at all or by patient to patient; or whatever, it is not functioning
in severe rectum stricture the proximal loop cannot be cleansed by enema and the author has experienced serious complications by forceful enemas thru distal colostomy in case of stool impaction into the distal colostomy loop up to severe rectum stricture not noticed during the enema and then sent to operating theater with stool still impacted and contaminated enema fluid transudation thru the traumatized sigmoid wall into the peritoneal cavity
therefore, the patient is instructed to stop eating the night before and to pass stools the morning of operation day

routine pre-, intra- and post-operative antibiotics as prevention of what??

in septic surgery **routine** antibiotics are considered **malpractice**
the author is not against the powerful working of antibiotics but only on **real indication** and only then it makes sense
nb if routine antibiotics would really work (as predicted) one would no longer see post operative wound infection and sepsis
instead this practice contributes to the ever increasing pandemic of antibiotic multi-resistance in a circulus vitiosus due to the financial lobbying of the drug makers, the fear of litigation and not to forget the vocal demand by the patients

manpower
fistula surgery is a one-man job, and all the operations are performed by the surgeon and one assistant who is doing the instrumentation; one retractor inside the vagina is already a crowd

anesthesia
spinal anesthesia with a long-acting drug is the anesthesia of choice

route of operation
the vagina is the route of choice
some surgeons prefer the combined abdominovaginal approach for kees Ic fistulas

position
the exaggerated lithotomy position with the buttocks over table end and legs flexed and abducted in leg holders is the position of choice
though some surgeons prefer the head up/buttocks down position for kees II fistulas

instruments
normal (long) vaginal surgery instruments are needed together with the following special instruments: **a)** auvard weighted speculum for keeping the vagina open, **b)** long allis clamps for picking up the vagina or rectum edges, **c)** a pair of sharply curved thorek scissors for dissecting the posterior vagina wall from the prerectal fascia/rectum
besides, a complete well-functioning hydraulic operation table is of utmost importance and a must

suturing materials
normal resorbable polyglycolic acid size 00 and 0 and nonabsorbable nylon sutures size 1 and 2 are needed with a strong small curved needle

concentrate upon rectum closure
since the rectum is a high-pressure organ and the vagina a zero- or low- pressure organ once the rectum has healed, the posterior vagina wall will always heal
therefore, concentrate upon the meticulous rectum closure and only adapt the posterior vagina wall or leave it half open in line with septic surgery

two-layer rectum closure in principle
the rectum is closed in two layers, the first interrupted and the second continuous, by inverting sutures for strength since the rectum cannot be decompressed and for flatus-proof closure otherwise there may be contamination when flatus should pass thru the small openings in between the interrupted sutures in case of rectum distension by gas

intraoperative stool contamination
cleanse it with abundant clean water since **the solution to pollution is dilution** and leave the pvw completely open or half open after rectum closure in order to prevent abscess formation and breakdown

intraoperative antibiotics **on indication**
if there is stool contamination with large wound area or after sharp dissection of rectum stricture the author gives tinidazole orally and one shot broad-spectrum antibiotic im in order to prevent endotoxin shock/septicemia since the bacterial contamination is sucked up by the open veins into the general vascular circulation

transverse posterior colpotomy with opening of abdomen

for the proximal kees Ia/Ib fistulas a transverse posterior colpotomy is not necessary but may facilitate the tension-free rectum closure; however, with risk of intraperitoneal contamination

in kees Ic fistulas a transverse posterior colpotomy is **obligatory** in order to perform (adapted) circumferential dissection plus (adapted) circumferential end-to-end rectosig moidorectostomy

if a colpotomy has been performed the abdomen has to be closed proximally from the repair to prevent intraperitoneal contamination if the repair should break down

in severe funnel-shape shortening (ba hanya) a colpotomy is performed to facilitate the repair and to reconstruct a neovagina in the same session

grafting

there is no need for grafting; reconstruction of the functional pelvis anatomy will be sufficient, ie meticulous rectum closure that is the decisive factor

combination rectovaginal fistula with vesicovaginal fistula

in one session

only if it is not too complicated and both can be done within a reasonable time frame; it is better to do them in two sessions than to compromise both in one session

in the proximal kees Ia and Ib fistulas the stool fistula should be closed first in order to prevent intraoperative stool contamination

kees Ic fistulas are so complicated that it is not advisable to combine them with the repair of a vesicovaginal fistula

in the distal kees IIa and IIb fistulas the vesicovaginal fistula should be repaired first otherwise access to the operation field may be compromised which is excellent in the kees IIb fistulas

in two sessions

in principle the vvf is repaired in the first session since that is the wish of the patient in most cases

and if successful the rvf can be done in the second session

however, when the patient wishes it the other way the rvf is done first

nb a rvf does not interfere with the healing of a vvf-repair in the author's experience

primary suturing of small kees Ia fistulas

in small proximal kees Ia fistulas near or at cervix/vault a freshening is made of the fistula edge and then only pvw closure (onto posterior cevix) is performed in an everting donati manner resulting in inverting good adaptation of the rectum; with good results however, make sure there is no rectum stricture

in small proximal kees Ib fistulas the same can be done; but then posterior disruption of the rectum stricture has to be performed; the results are moderate to good

delicate rectum tissue

the rectum tissue is rather delicate and has to be handled with care

prerectal fascia + muscularis

in closure of the fistula it is the prerectal fascia/muscularis which is picked up by the needle/suture whilst the mucosa will be adapted on tying the sutures

theoretically and in principle the needle should not go thru the rectum lumen but that is not always avoided and actually without negative effect upon healing

check on rectum closure
by vaginal visual inspection and intrarectal digital examination

half-open posterior vagina wall adaptation
in line with the principles of septic surgery since the vagina is never sterile in order to avoid abscess formation and breakdown
once the high-pressure rectum has healed, the posterior wall of the low-pressure vagina will always heal

large defects in the posterior vagina wall
can be left open for natural secondary epithelization whereby the superficial layer of the prerectal fascia will epithelize into vagina epithelium or
can be filled up by different kinds of skin flaps

decompression to avoid tension on sutures/repair
though after vvf-repair complete decompressions of the bladder can be ensured by an indwelling catheter
it is not possible to achieve this of the rectum, even with colostomy, so from time to time there will be (high) tension on the sutures/repair by gas/flatus and stools; and stool softeners are indicated to promote smooth fecal propulsion and smooth defecation
this explains the fact that the postoperative breakdown rate in rectovaginal/stool fistulas is higher than in vesicovaginal/urine fistulas

colostomy = iatrogenic colocutaneous kees III fistula
the rationale for colostomy in **abdominal colon surgery** is proximal decompression in order to prevent tension on the sutures with the possibility of breakdown with contamina tion of the peritoneal cavity as a life-threatening complication
however, complete continuous decompression is not guaranteed since stool may still enter the distal colostomy loop with high pressure inside the distal loop and eventual defecation thru the anus; in combination with stool thru the functioning colostomy
in **rectovaginal fistula** surgery where the repair and sutures are outside the abdomen the repair may break down but no stool contamination of the peritoneal cavity; so not a life-threatening complication
a colostomy means automatically 3 operations: colostomy, after functioning of colosto my the rvf-repair and after objective fistula healing colostomy closure
the author has never performed a colostomy in his obstetric trauma surgery, still with good results
however, stool softeners are indicated to minimize straining on defecation

traction on repair by fixed/moving cervix
since the fixation of the prerectal fascia onto the posterior cervix is via the vault, there is hardly any traction on the repair/sutures by the cervix
so this is not a factor in the healing process of a rectovaginal/stool fistula; unlike in vesi covaginal/urine fistulas

principles of surgical technique(s)

the vaginal approach is the route of choice with or without unilateral, median or bilateral episiotomies, spinal anesthesia is the anesthesia of choice and the (exaggerated) lithotomy position is the position of choice for kees I thru kees IIb fistulas
however, kees III fistulas may need a different approach

reconstructive surgery kees la stool fistulas

step by step

introduction

the main objectives of any (obstetric) fistula repair are:

aa to close the fistula

bb to make the patient continent and

cc to preserve or to provide her with something for sexual intercourse

if these three objectives have been achieved the patient will be rehabilitated completely into her own society; this will take place spontaneously without further measures

step-by-step reconstruction

see general principles

i anesthesia, position

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

if visibility is still poor the inclination of the operation table has to be increased; so more head down/buttocks up

ii systematic examination under anesthesia

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 the anus and the cervix or vagina vault, as to the condition of the vagina such as stricture, stenosis or even atresia, if there is a vesicovaginal fistula as well, if the fistula is accessible, if there is a stricture, circumferential defect etc

003

check pubic arch in °; if this is $\leq$ 80° access to operation field and instrumentation may be complicated

the narrower the pubic arch the more complicated the repair becomes

004

check vagina length in cm; if this is less than 9 cm there has been substantial vagina tissue loss

005

check position/mobility of cervix; if retracted with paradoxic movement on cough visibili ty will be poor with difficult instrumentation

iii kees classification

006
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

iv access to operation field

007
the labia minora are sutured onto the inside of the upper legs to keep the vagina open laterally

008
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
if done within the skin grease/lines and final skin closure by intracutaneous suturing the scar will be invisible

009
then an auvard self-retaining weighted speculum is placed inside the vagina with under neath a gauze covering the anus to keep the vagina open posteriorly; no more specula

v incision and dissection

010
put one or two long allis clamps onto posterior vagina wall (or onto cervix) proximally from the fistula and have assistant pulling it upwards and towards the outside and if not in the middle towards the midline
this will make the repair less complicated

011
a physiologic transverse incision is made within the ruga folds of the posterior vagina wall thru the fistula; then a circumferential incision is made at the fistula edge

012
the posterior vagina wall is dissected sharply from the prerectal fascia/anterior rectum wall using scalpel and sharply curved thorek scissors in order to execute a **tension-free** repair; aim for just sufficient dissection in one go to minimize wound surface and postoperative scarring; avoid the salami technique with cutting everywhere resulting in excessive scarring

nb if intentionally or accidently a colpotomy has been performed during incision/dissec tion the abdomen has to be closed at operation ending proximally from the repair to prevent contamination of the peritoneal cavity if the repair should break down

vi double-layer rectum closure

013
the principles of reconstructive surgery and common sense dictate the direction of closure: longitudinal, transverse or oblique

most of the time a transverse closure is the most logical in kees I fistulas as it presents itself this way and is in line with the natural tissue forces whilst longitudinal closure seems to be against these forces

014
the defect within the prerectal fascia/muscularis is closed with in the process closure of the rectum with a double layer of interrupted/continuous inverting polyglycolic acid 00 or 0 in order to obtain a flatus-proof closure

transverse closure **from north to south** **anterior to posterior**

closure is from bilaterally towards the midline

first inverting interrupted layer

015a
start with the 2 lateral sutures

015b
then the middle suture

015c
if necessary complete by sutures in between the lateral and the middle suture

second inverting continuous layer if possible

015d
complete the rectum closure by a second continuous layer inverting the first layer

longitudinal closure **from west to east** **side to side**

closure is from proximal towards distal

first inverting interrupted layer

015aa
start with the most proximal (deepest) suture and work from proximal to distal

second inverting continuous layer if possible

015ab
complete the rectum closure by a second continuous layer inverting the first layer

oblique closure

closure is from bilateral fistula edges towards the midline

first inverting interrupted layer

015aaa
start with the 2 lateral sutures

015aab
then the middle suture

015aac
if necessary complete by sutures in between the lateral and the middle suture

second inverting continuous layer if possible

015aad
complete the rectum closure by a second continuous layer inverting the first layer

016
good bites are taken thru the prerectal fascia/muscularis to get broad adaptation of the raw prerectal fascia/muscularis with adaptation of rectum mucosa

017
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

018
care is taken not to go through the rectum mucosa as theoretically this might lead to flatus contamination thru the small needle holes but in practice this does not happen

019
cave do not cut the sutures too short since then the knot(s) will slip and loosen up

nb at each step the surgeon should ask himself what am i doing exactly, which type of tissues are adapted, is it in line with the natural tissue forces and functional anatomy, and how will it look after 1 hour, 1 day, 1 week, 1 month and how ultimately after it has healed completely after 1 or 2 years

vii check result

020
intravaginal visual inspection and intrarectal digital examination

viii posterior vagina wall adaptation, episiotomy etc

021
the posterior vagina wall is only adapted by 2-4 everting absorbable or nonabsorbable sutures in donati fashion in principle in line with rectum closure

(021a) if severe stool contamination
give tinidazole orally and one shot of broad-spectrum antibiotic im to prevent endotoxin shock/septicemia if there is a large open wound area
and
only approximate the posterior vagina wall

021b if abdomen opened
if for whatever reason a colpotomy has been made close the abdomen proximally from the repair to prevent intraperitoneal contamination if the repair should break down

022
if episiotomies have been performed these are adapted with final skin closure by intra cutaneous suturing

023 optional
the vagina is packed tightly with gauze (soaked in antiseptic or not) to help hemostasis though normally complete hemostasis is secured

024
if the patient is in good condition she is transferred to the postoperative ward

ix tissue quality

during the operation procedure the tissue has to be classified as **good**, **medium** or **poor**; this has to be entered into the operation report

x documentation

since documentation is an important part of any type of surgery, analysis of technique, transparent audit and scientific process

write an operation report immediately after the operation, including all the relevant data and also eventual major complications; with prediction of healing and continence on a 5% scale from 5% to 95%; so everything is documented

the better the documentation the more valuable an evidence-based evaluation becomes of the technique(s) and the program

comments

dissection

the proximal pvw is dissected in one go using scalpel or curved thorek scissors whilst the distal pvw is dissected in one go by curved thorek scissors; no salami technique with small cuts everywhere as in a sausage factory

transverse closure

instruments in the horizontal axis

longitudinal closure

instruments in the longitudinal axis

one of the suture endings of the first interrupted layer is left long so the second continu ous layer can be interlocked to these suture endings

fistula location

the deeper the fistula inside the vagina the more complicated the reconstructive surgery becomes
the more lateral the fistula away from the midline the more complicated the operation becomes
the more the fistula retracted towards the sacrum the more complicated the repair

position/mobility of cervix with eventual paradoxic moving

the more fibrosis and the more the cervix is retracted with paradoxic moving on cough the more complicated the repair

obesity

the more obesity the more complicated the access and the more complicated the repair

presurgical data at first attempt by the author in 501 patients

already 164 patients or **33%** had been operated from 1 to 4 times
24 had a colostomy as well and
nb 3 patients had a ureterosigmoidostomy with a still existing kees Ia stool fistula
3 patients inoperable from the start

some surgical data of initial 501 repairs by the author

transverse closure	445	**88.8%**
longitudinal closure	29	5.8%
oblique closure	12	2.4%
purse string closure	12	2.4%
inoperable	3	0.6%
primary suturing	104	**20,8%**
abdomen opened	37	7,3%

discussion

fistula surgery belongs to the most complicated reconstructive surgery the author ever encountered during his extensive surgical career

simple repair of simple fistulas only exists in the simple mind of simple surgeons

as simply demonstrated by the fact that already 164 or **33%** out of the 501 patients had been operated by these simple surgeons from 1 to 4 times before the author started his own complicated surgery

these principles are evidence-based guidelines which have to be customized to each and any fistula as its own specific unique entity

residual fistulas are operated according to the same principles as if it were the first inter vention

since the rectum is a high-pressure organ compared to the low-pressure vagina once the rectum has healed the vagina will always heal

contrary to what many surgeons belief, grafting does not contribute to closure and/or postrepair continence and is contraindicated since it will contribute to more dissection and surgical scarring and do not think one knows it better than nature

the most important is to reconstruct the functional pelvis anatomy in a straightforward way with in the process closure of the fistula

so one has to concentrate on the basics which is already highly complicated considering a minimum failure rate of 10-15% even in experienced hands

the more simple the solutions/operations look the more complicated they are and only experts are able to make complicated things look simple

sutures cannot heal and it is not the number that counts; they can only adapt tissues for a sufficiently long time so that nature can heal by natural healing processes

one has to look for and then follow the natural tissue forces; by doing something against these forces the healing process may be compromised and result in severe mutilation

the deeper (parts of) the fistula inside the vagina the poorer the access and the more complicated the instrumentation, especially if combined with a retracted/moving cervix and fixation of the fistula onto the sacrum

the more scar tissue/fibrosis the more complicated the dissection and the more compli cated the repair

the more the fistula is away from the midline the more complicated the access and the instrumentation and the repair

try to bring the fistula towards the outside and if not in the midline towards the midline

(severe) obesity poses a problem during any surgery and postoperative period; so also in obstetric trauma/fistula surgery

so make sure everything is prepared well to ensure optimal conditions before even the incision is started since intraoperatively it may no longer be possible to correct anything as one is so concentrating on the surgery

good visibility and access to the operation field can be obtained by episiotomy and by adjusting the inclination of the operating table to the individual needs of the surgeon

the author likes the head down/buttocks up position; whilst other surgeons may prefer head up/buttocks down position or horizontal position

though the (proximal) fistulas may be complicated to repair the prognosis as to closure and continence is excellent; actually, for all kees la fistulas

as also demonstrated by the evidence-based and documented spontaneous healing in another 837 patients or **60%** out of a total of 1,417 consecutive patients with a kees la stool fistula

pt 504 **transverse rectum closure** rvf 676
pt 3930 katsina vvf 5461
pt 118 gusau vvf 129

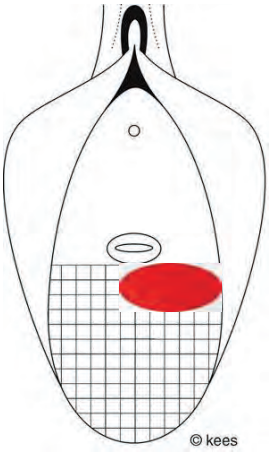
jhb (zamfara) female 19 yr 22/06-02

surgeon: kees waaldijk
assistant: gambo lawal

diagnosis: PI, stress incontinence grade III with minute < 0.1 cm 0 lungu fistula L, ± 5x2 cm rectovaginal fistula **Ia** midline/fixed at L, leaking urine/passing stools pv for 3 yr which started immediately following CS bco obstructed labor for 4 days, SB male, married 6 yr ago pre(menarche 4 mth later), not at her husband, no menstruation, drop foot R (grade 5) and L (grade 4), no yankan gishiri; normal AP diameter/narrow pubic arch 75°, "cervix" fixed, operated 1x (GUSAU_Ja) and 26/10-01 radio
EUO/F 2 cm, F/"C" 3 cm, I/F 8 cm, F/"C" 0 cm

operation: rvf-repair, uvvf-repair and fascio_colposuspension L
duration: 45 min
anesthesia: spinal L4/L5 with 4 ml bupivacaine 0.5%

bilateral episiotomy, incision at fistula edge, a sharp dissection without opening abdomen, tension-free transverse rectum/cervix_rectum closure by double inverting layer of interrupted/continuous serafit **no** rectum stricture
longitudinal incision thru fistula, sharp dissection, sharp mobilization of bladder from L pelvis wall, L paravesical space totally scarred, a tension-free longitudinal closure by single layer of inverting serafit, triple fixation of FOLEY Ch 18, fixation of L "fascia"_avw at 3-4 cm from EUO to L pubic bone/"pc musculature"/arcus tendineus by 1x seralon, skin closure and pack; free urine flow, EUO/BW 9 cm, good elevation, EUO/B 2 cm
normal bladder capacity (longitudinal diameter 9-2 = 7 cm)
acceptable position of UV-junction **against** middle/caudad third of symphysis
22.07.02 no stools/flatus pv, not leaking at all cath removed bladder drill
20/12-02 no stools_flatus pv; not leaking at all **both** healed, no stress



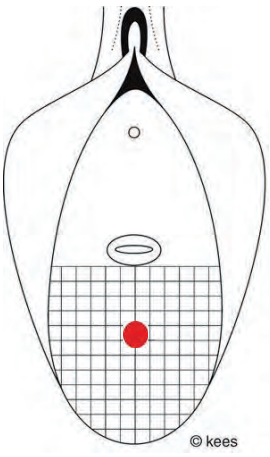
5x2 cm

RR
preanesthesia: 140/90 mm Hg
5": 130/80
10": 120/70
postoperation: 100/70

pt 362 **longitudinal rectum closure** rvf 464
pt 3005 katsina vvf 4134

lad (kano) female 17 yr 21/05-98
surgeon: kees waaldijk
assistant: hamisu abdullahi
diagnosis: PI, **very extensive** ± 3 cm 0 urethrovesicovaginal fistula with a circumferential defect/bladder base prolapse, ± 1 cm 0 rectovaginal fistula **Ia**, leaking urine/passing stools per vaginam for 6 mth which started immediately following obstructed labor for 5 days, in hospital SB male, married 6 yr ago pre(menarche 2 yr later), not living with husband, no menstruation, drop foot R (grade 2-3) and L (grade 3); very narrow pubic arch, severe vagina stenosis with major pc muscle loss
I/F 6 cm, F/"C" 4 cm, EUO/F 1 cm, F/"C" 0 cm 147.0 cm
operation: rvf-"repair", bilateral ureters, circumferential uvvf-"repair" as
duration: 50 min **minimum surgery**
anesthesia: spinal L3/L4 with 4 ml bupivacaine 0.5%
bilateral episiotomy, incision at RVF edge, sharp dissection of pvw, sharp/ blunt bilateral mobilization of rectum, excision of scar tissue ++, tension free longitudinal rectum closure by double layer of inverting serafit the solution to pollution is dilution! bilateral ureter catheterization, incision at fistula edge, sharp circumferential **minimum** dissection of bladder, advancement/caudad fixation of anterior bladder onto symphysis/ "urethra", tension-free circumferential UVVF-"repair" by end-to-end vesiourethrostomy by a single layer of inverting serafit/chromic catgut, FOLEY Ch 18, suturing avw onto posterio bladder wall with 5x supramid, skin closure, vagina pack; free urine flow, EUO/BW 9 cm, good elevation, EUO/B 1.5 cm avw could not be closed! normal bladder capacity (longitudinal diameter 9-1.5 = 7.5 cm) **stool pollution** poor position of UV-junction **against** caudad third of the symphysis
only the minimum has been done, everything left open deliberately

14.08.98 stools ok, urine incontinence
24/08-98 no stools_flatus pv; urine incontinence insp/ **both** healed, stress +
16/11-98 leaking insp/ uvvf **early sex**
13.02.99 operation: L ureter + uvvf-"repair" vvf 4375
10.07.99 operation: urethra/avw vvf 4531
16/06-01 no stools_flatus pv; not leaking at all **both** healed, no stress



1 cm

RR
preanesthesia: 160/100 mm Hg
5": 140/90
10": 120/80
postoperation: 100/60

Pt 79 **oblique rectum closure** katsina rvf 95
pt 8044 database ba hanya 9977 vvf 9977

mmmg (katsina) female 31 yr 18/05-89

surgeon: kees waaldijk

assistant: dr yushau armiyau

diagnosis: PI (0 alive), ± 4 cm 0 proximal rectovaginal fistula fixed to cervix, **extensi ve** urethrovesicovaginal fistula, leaking urine/passing stools pv for 9 yr which started immediately following obstructed labor for 5 days, at home SB male, married 20 yr ago pre(menarche 2 yr later), not living with husband, normal menstruation, drop foot L, vagina stenosis kees **Ia** I/F 6 cm, F/C 0 cm

operation: rvf-repair + vaginoplasty

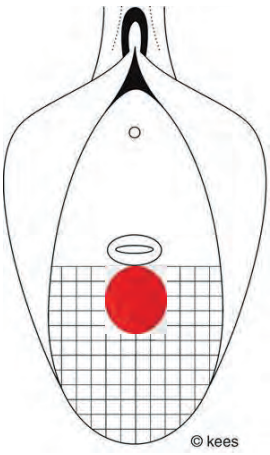
duration: 90 min

anesthesia: spinal L3/L4 with 4 ml bupivacaine 5%

bilateral episiotomy, then stools per fistulam, therefore rvf-repair, incision at fistula edge, sharp dissection, sharp dissection of rectum from cervix whereby abdomen opened, tension-free oblique rectum closure by double layer of inverting interrupted chromic catgut, intrarectal check, widening/lengthening vaginoplasty by skin rotation flap from L buttock, sphincter ani dilatation, skin closure, pack

01.06 + 05.06.89 no stools/flatus pv healed
16/09-90 no stools_flatus pv, normal defecation insp/ healed

18/10-90 operation: uvvf-"repair" vvf 1666
14/11-90 not leaking, incontinence ++, normal miction stools ok
insp/ **both** healed, good elevation, stress incontinence ++



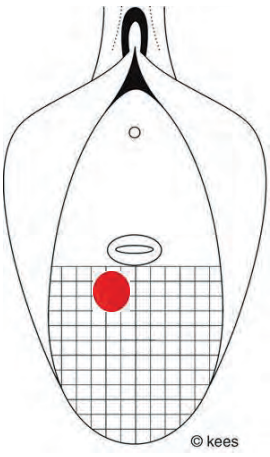
4 cm

	RR
preanesthesia:	120/70 mm Hg
5':	120/70
10':	120/70
postoperation:	100/50

pt 794 **primary suturing** katsina rvf 1014
pt 6294 highly uncooperative examination/anesthesia/repair vvf 8004
major total circumferential trauma
zak (katsina) female 22 yr 03.02.11

surgeon: kees waaldijk
assistant: kabir lawal
diagnosis: PV (1 alive), **extensive** ± 2 cm 0 urethrovesicovaginal with urerhra block/ circumferential defect type **IIAb**, ± 1 cm 0 proximal rectovaginal fistula at R type **Ia**, leaking urine/passing stools pv for 5 yr that started immediately following obstructed 3rd labor for 2 days, at home sb male, married 10 yr ago pre(menarche 1 yr later), not living with husband, normal menstru ation, drop foot R (grade 3) and L (grade 3-4) with bilateral gm_at contrac ture up to 95/5° dorsiflexion, no yankan gishiri, eclampsia yes; ?ap diame ter?/borderline pubic arch 80°, ar pos, bilateral atf/atl + pc_ilc_iscm loss + ssl_pm trauma, moderate vagina stenosis/shortening proximal lpl stricture euo/f 1.5 cm, f/c 1 cm, ab/au 1 cm, i/v 6 cm, a/f 6 cm, f/c 0 cm 140.0 cm
operation: **ps-like** uvvf-repair + **ps-like** rvf-repair
duration: 40 min healing **both** 70% continence 50%
anesthesia: spinal L4/L5 with 3 ml bupivacaine 0.5%
episiotomy L with severing of stenosis/lpl stricture, since at deep pull pat starts moving only incision at fistula edge, without dissection **ps-like** avw "closure" by 4x everting seralon, then **stool contamination** thru rvf until operation end, triple fixation of foley ch 18 with transverse avw adaptation; free urine flow, euo/bw 10 cm, good anterior elevation, euo/b 1.5 cm **vomiting food** **not drinking at all**
normal bladder capacity (longitudinal diameter 10-1.5 = 8.5 cm)
poor position of uv-junction **fixed against** caudad third of symphysis
normal-width 1.5 cm poor-quality urethra_euo in anatomic position
RE/ **no** rectum stricture incision at rvf edge, without dissection **ps-like** transverse cervix/pvw "closure" by 2x everting seralon, check on hemostasis, skin closure
not following any instruction: moving right from the beginning not because of operation pain but by feeling pain in shoulders; no defecation in the morning

10.03.11 stools ok, urine incontinence cath removed blad drill
22.03.11 stools ok, urine incontinence insp/ **both** healed, no stress
20.04 idem
18.06.11 stools ok, urine incontinence **both** healed, no stress

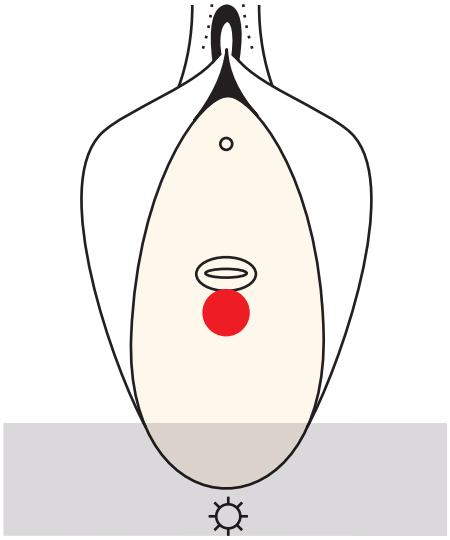


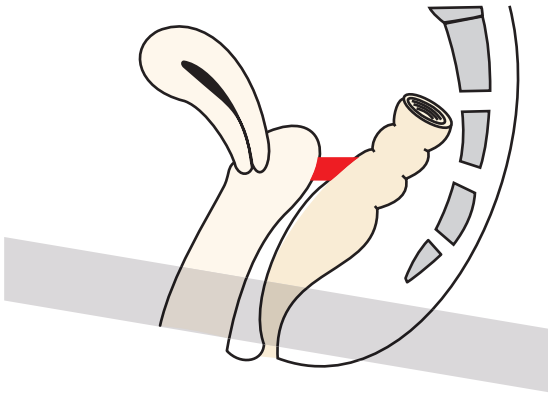
1 cm

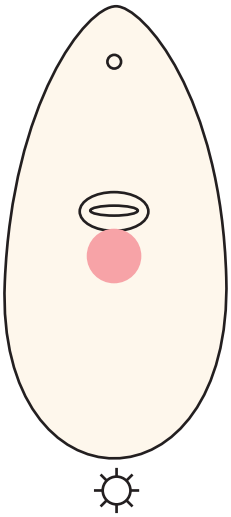
RR
preanesthesia: 130/80 mm Hg
5': 120/70
10': 120/70
postoperation: 120/70

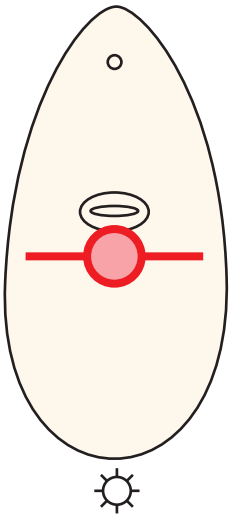
kees la

transverse rectum closure

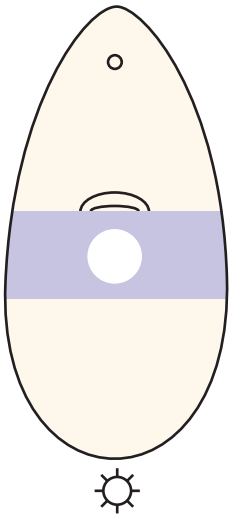








incision

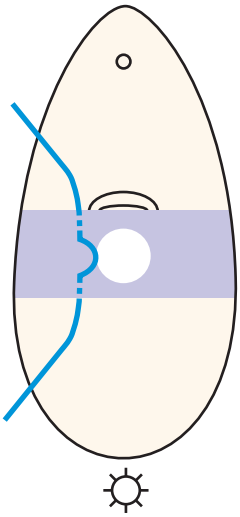


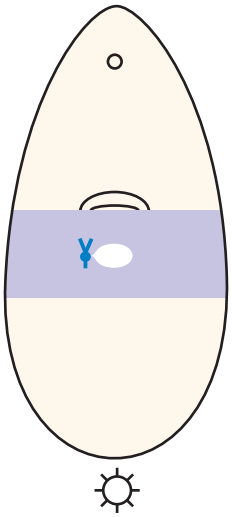
after dissection

kees la

transverse rectum closure

001





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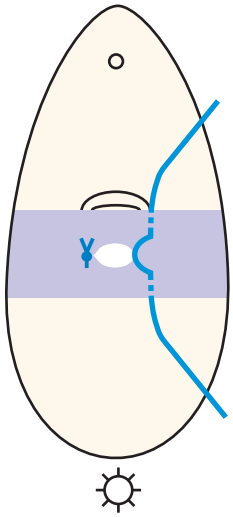

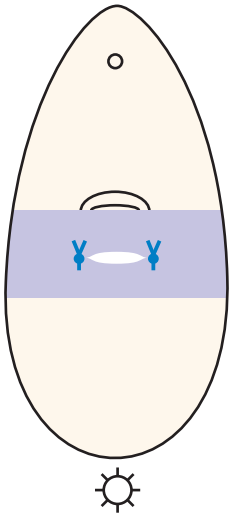

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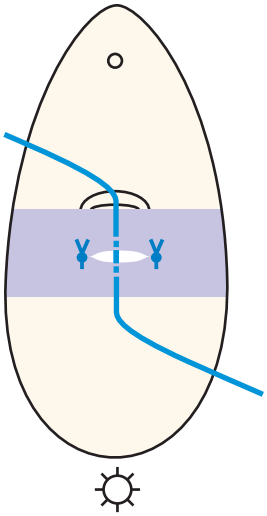
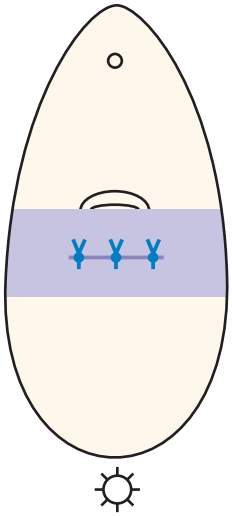
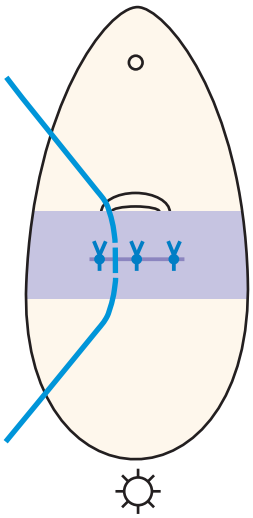


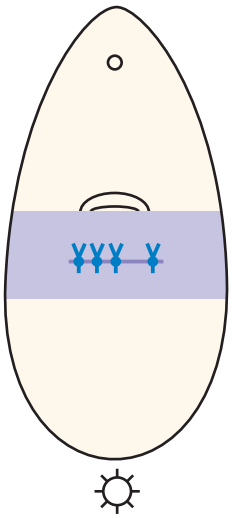


kees la

transverse rectum closure

004





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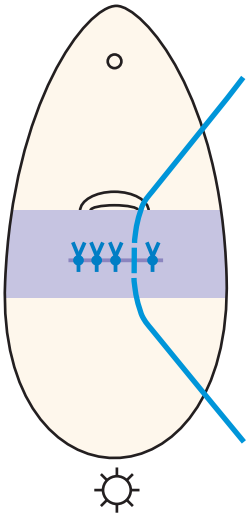

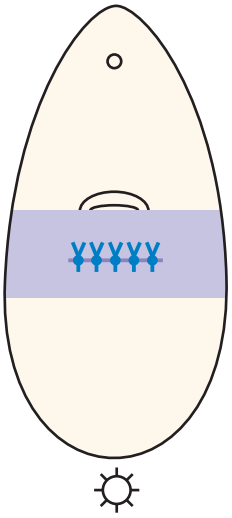

rectum closed

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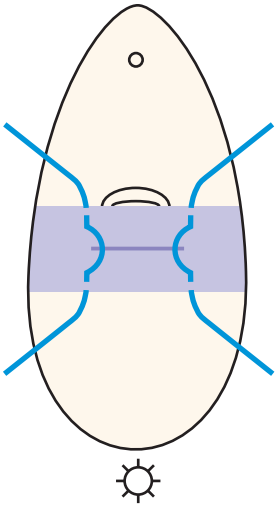
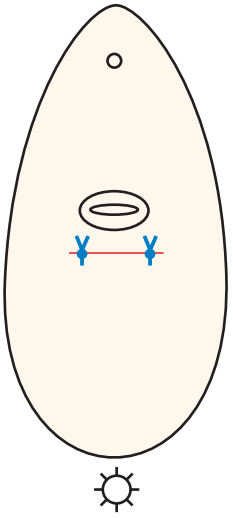
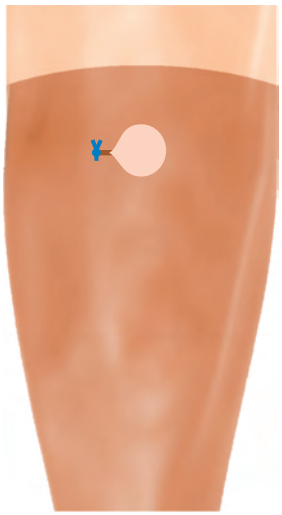


pvw adaptation



kees la

transverse rectum closure



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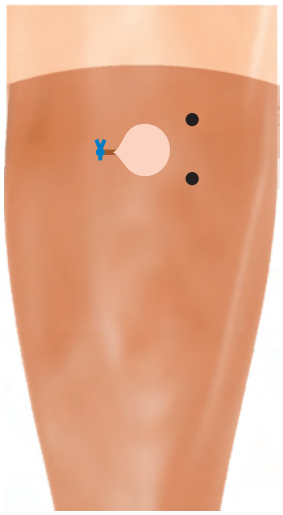

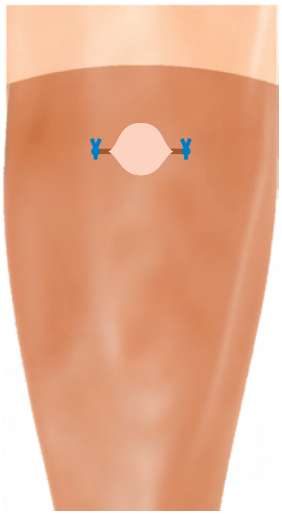

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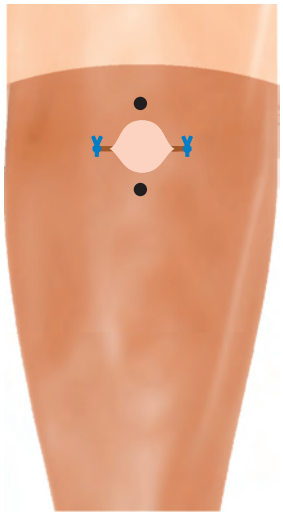
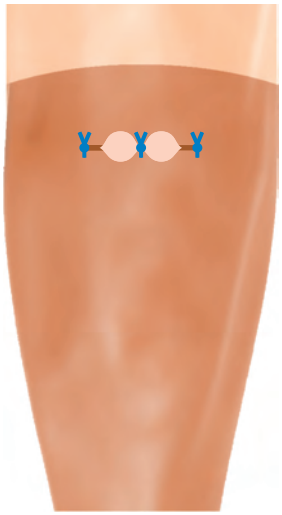
kees la

transverse rectum closure

003





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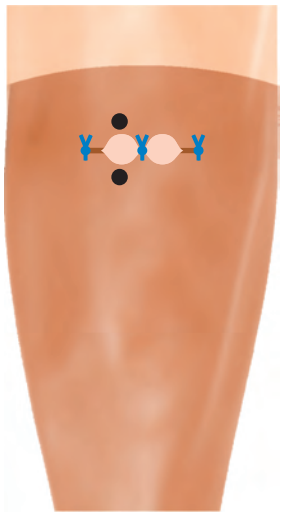

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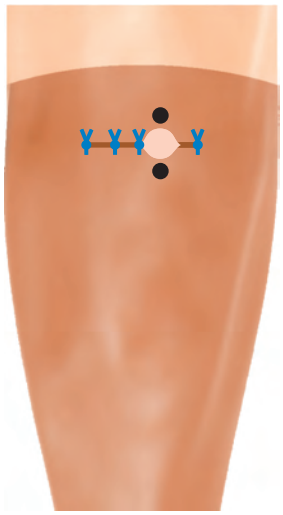
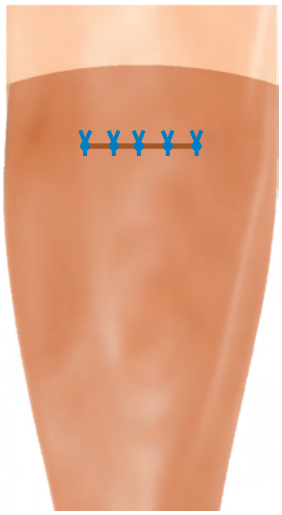
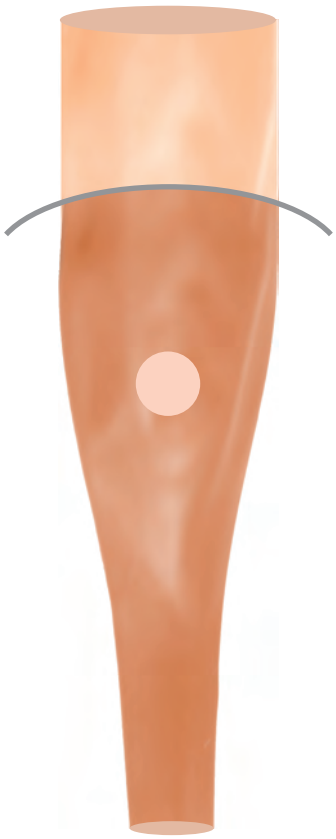


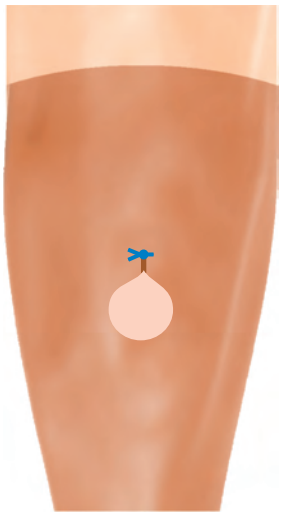


kees la

longitudinal rectum closure

infrequently





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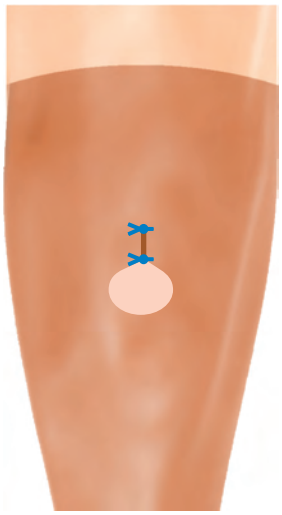
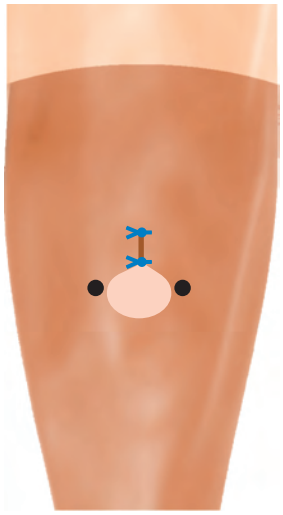


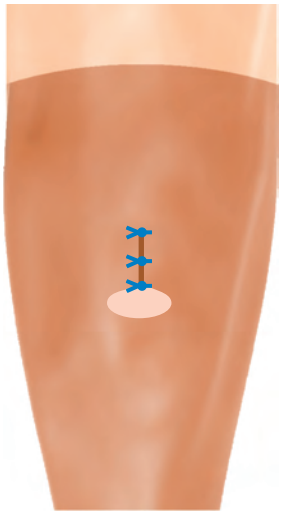
002

kees Ia

longitudinal rectum closure
infrequently

003





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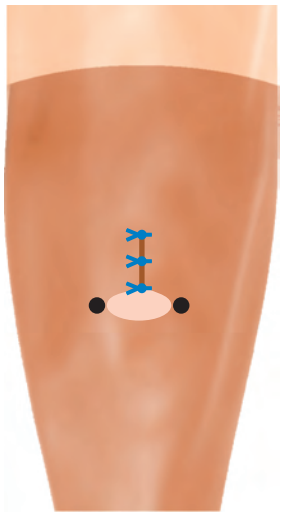

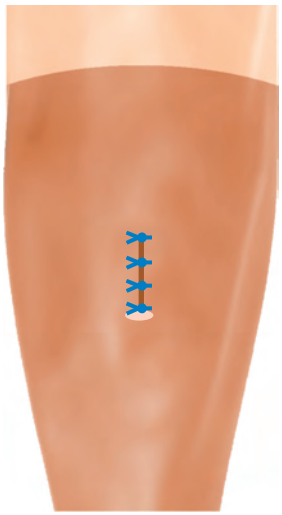

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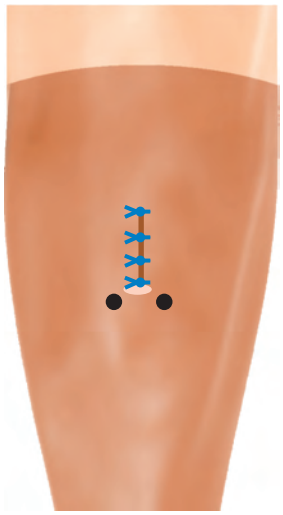
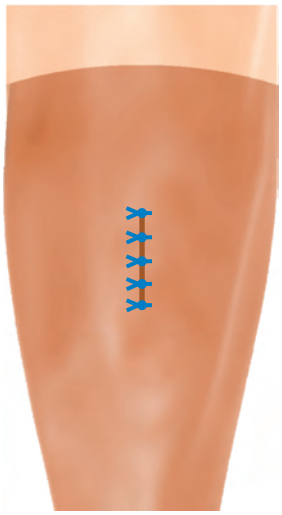
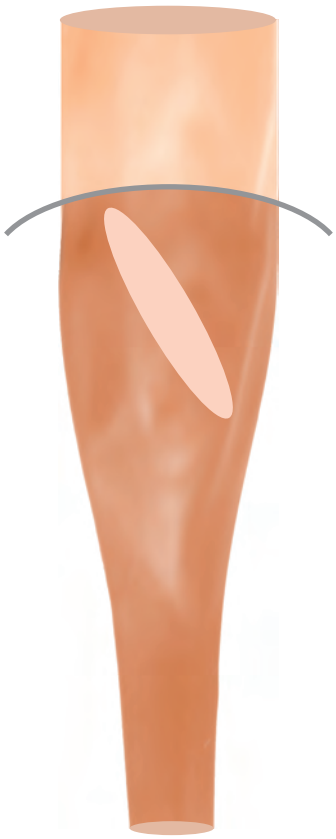
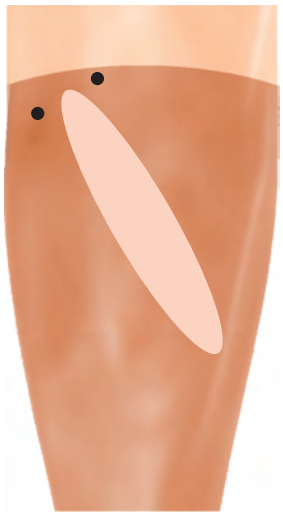


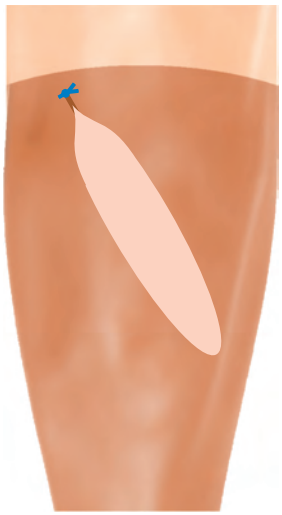


kees la

oblique rectum closure







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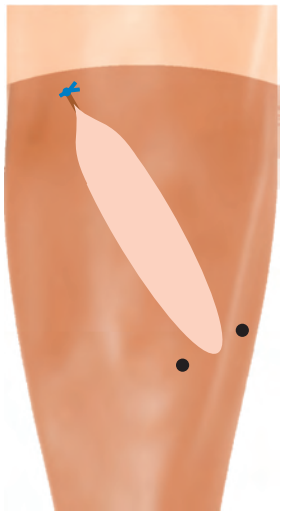
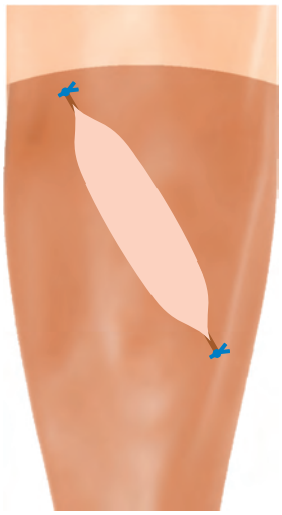


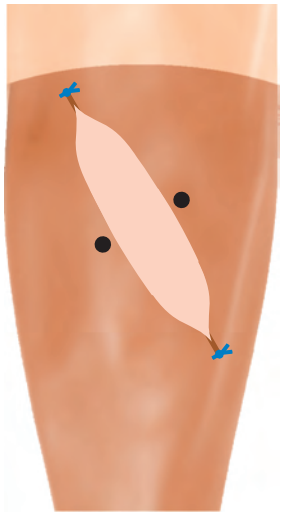


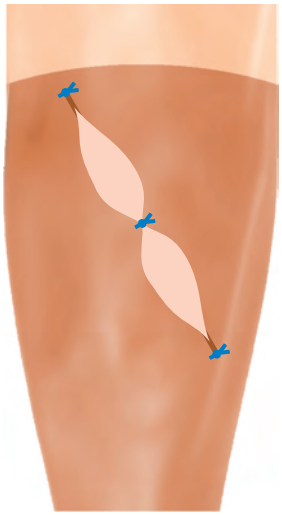
002

kees la

oblique rectum closure

003





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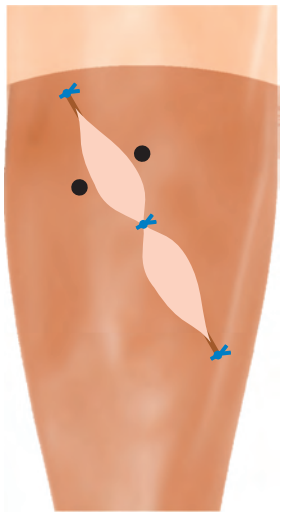

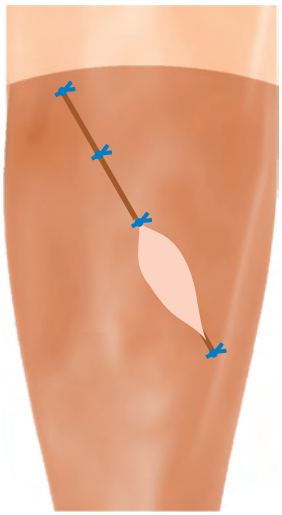

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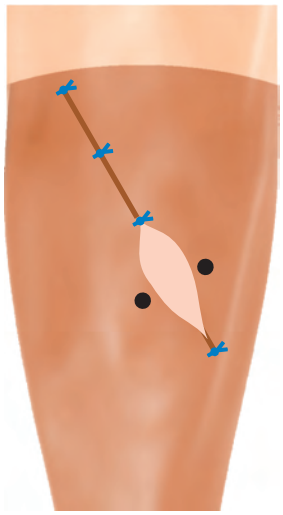
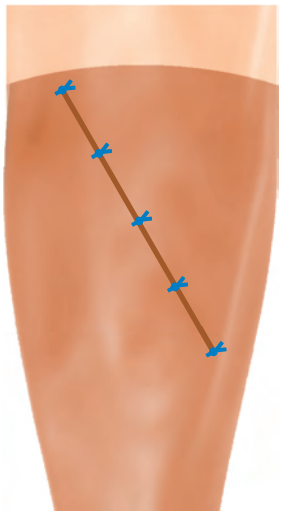
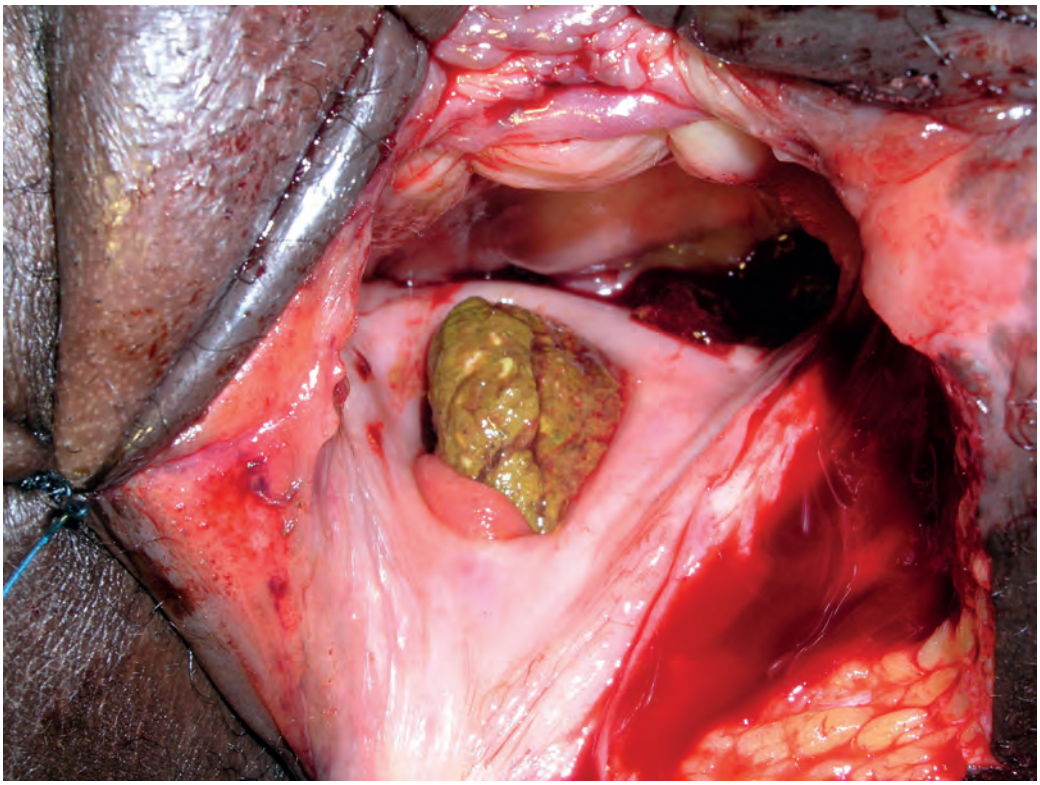
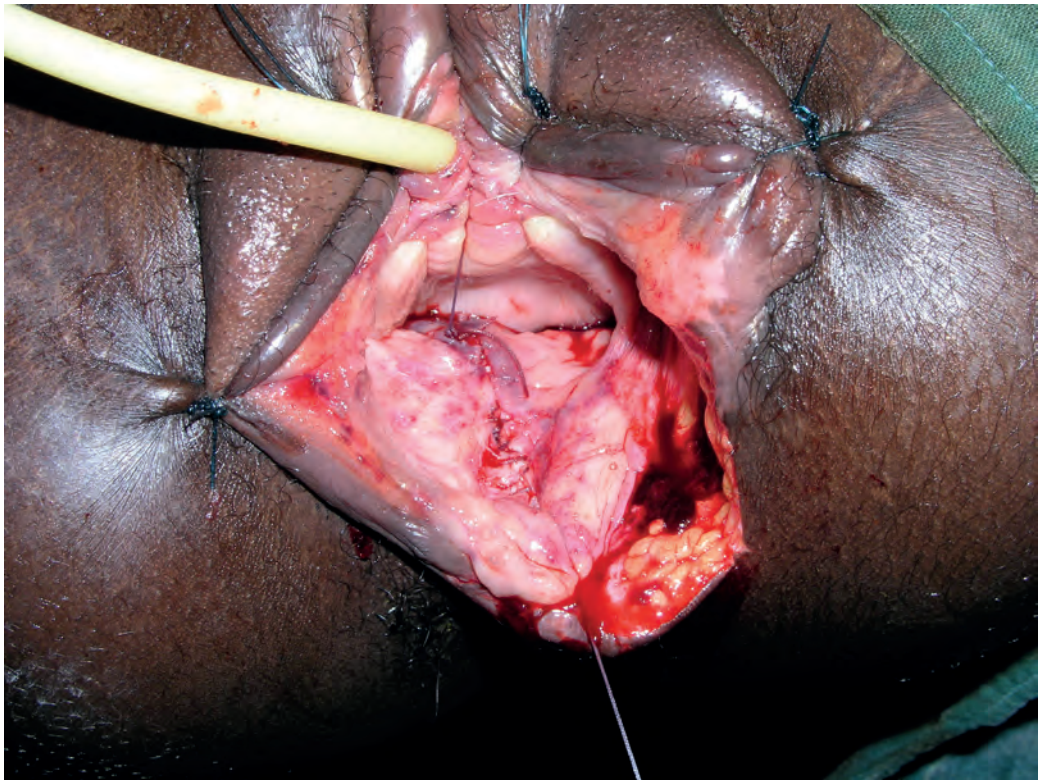








outcome kees la stool fistulas
in
1,417 patients

surgical outcome
570 operations in 501 patients **35%** of 1,417

spontaneous healing
in 837 patients **60%** of 1,417

minimal/no complaints
in 79 patients **6%** of 1,417

overall results
in 1,417 patients
objective
subjective

surgery results in kees Ia fistulas

570 repairs in 501 patients

reconstructive surgery in 501 patients

since there was a strong tendency to spontaneous healing only 501 patients or **35%** or roughly one third needed a total of 570 repairs

presurgical/surgical data and outcome of surgery are presented in table I, II and III

table I

presurgical data at first attempt by the author in 501 patients

already 164 patients or **33%** had been operated from 1 to 4 times
24 had a colostomy as well and
nb 3 patients had a ureterosigmoidostomy with a still existing kees Ia stool fistula
3 patients inoperable from the start

table II

some surgical data of initial 501 repairs by the author

transverse closure	445	**88.8%**
longitudinal closure	29	5.8%
oblique closure	12	2.4%
purse string closure	12	2.4%
inoperable	3	0.6%
primary suturing	104	**20,8%**
abdomen opened	37	7,3%

table III

results kees Ia reconstructive surgery 501 patients

healed first attempt	448		89.4%
inoperable	3		
healed finally	482		**96% healed** with **99% continence**
inoperable	3		
not healed	10		
mortality at 17 days		1	0,2%
unknown	6		
incontinence	4		**0.8%**
ureterosigmoidostomy spoiling		2	

discussion surgery

fistula surgery belongs to the most complicated reconstructive surgery the author ever encountered during his extensive surgical career

simple repair of simple fistulas only exists in the simple mind of simple surgeons who will stay simple for the rest of their simple life

as simply demonstrated by the fact that already 164 or **33%** out of the 501 patients had been operated from 1 to 4 times by these simple surgeons before the author started his own complicated surgery

these principles are evidence-based guidelines which have to be customized to each and any fistula as its own specific unique entity

since the rectum is a high-pressure organ compared to the low-pressure vagina once the rectum has healed the vagina will always heal

the most important is to reconstruct the functional pelvis anatomy in a straightforward way with in the process closure of the fistula

so one has to concentrate on the basics which is already highly complicated considering a minimum failure rate of 10-15% even in experienced hands

as demonstrated by the fact that the closure rate at first attempt by the author was 89% in this series whilst 3 fistulas were inoperable

the great majority of **almost 90%** were closed transversely in line with the natural tissue forces since that was the logical thing to do

if the repair broke down the residual fistula was operated according to the same surgical principles as the first repair

six patients left the hospital after 10-14 days postoperatively before being evaluated and did not return whilst the 9 patients with a residual fistula also did not return for another repair; at least not to the author

the only postoperative mortality at 17 days was due to severe gastroenteritis/dehydra tion despite rehydration measurements

though the (proximal) fistulas may be complicated to repair the prognosis as to closure and continence in expert hands is excellent; actually, for all kees la fistulas

with a **final healing rate of 96% with a continence rate of 99%** in this series

as also demonstrated by the evidence-based and documented spontaneous healing in another 837 patients or **60%** out of a total of 1,417 consecutive patients with a kees la stool fistula

spontaneous healing kees la stool fistulas

as documented in 837

introduction

there is a strong tendency to spontaneous healing in the kees la stool fistulas which has been documented by the author over a long period of time since 1985 when he first noticed this during immediate catheter treatment

the fistula was found on vaginal examination on catheter insertion or early closure and healed on follow-up examinations; or a healed pvw “fistula” was found at/near the cervix during vvf-repair with the patient admitting that initially she had been passing stools/fla tus thru the vagina up to 2-3 months post partum and even longer

the patient complained of initial passing (stool and) flatus per vaginam immediately after childbirth whereby later first passing of (diarrheic) stools stopped and then passing of flatus and then no longer flatus or stool thru the vagina

whilst she is specifically asked if it is thru the vagina or thru the anus

findings

so far, spontaneous healing was noted in 837 patients or **roughly 60%** out of a total of 1,417 patients with a kees la stool fistula

discussion spontaneous healing

the natural healing potential of the human body is enormous, and our task as a surgeon is to observe and only to interfere if something goes wrong or if it does not heal

spontaneous healing was found and documented in small proximal fistulas up to 2 cm

an explanation for spontaneous healing is given as following

since normally the rectum is empty whereby the fistula edge(s) may be in contact promo ting healing, there is intermittent filling up with distension of the rectum by stools and gas for a short time which would hinder the natural healing

the (weight of the) cervix may play a role since it may bring the fistula edges into contact and/or closing off/sealing off the fistula promoting the natural healing processes

whilst formed stools will not pass thru a small opening; only flatus and diarrheic stools; unless (severe) outflow obstruction

in lying, sitting and standing it seems stools is sliding over/against the posterior rectum wall leaving the anterior rectum wall free and at rest promoting healing

and it may be that some of the **necrotic** fistulas as seen on examination were not full thickness

katsina cath 1119

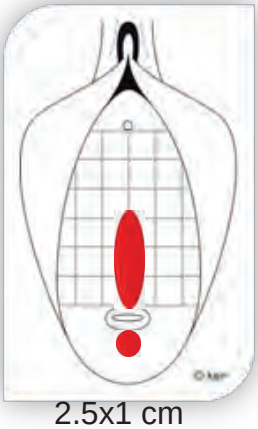
spontaneous healing small rvf kees **Ia** + vvf

zradm (katsina) female 23 yr 03.03.08

diagnosis: P (alive), 2.5x1 ± cm longitudinal urethrovesicovaginal fistula type **IIAa**, small proximal rectovaginal fistula, **leaking urine/passing tusa pv for 16 days** which started immediately following CS bco obstructed last labor for 1 day, SB female, married 10 yr ago post(menarche 3 mth earlier), still living with husband, no menstruation, drop foot R (grade 4) and L (grade 3), no yankan gishiri; normal AP diameter/pubic arch 85°, AR pos
EUO/F 2 cm, F/"C" 0 cm 159.0 cm

03.03.08 FOLEY Ch 18; free urine flow, EUO/BW 10 cm, good anterior elevation, EUO/B 1.5 cm
normal bladder capacity (longitudinal diameter 10-1.5 = 8.5 cm
poor position of UV-junction **against** caudad third of symphysis
normal-width 1.5 cm good-quality urethra_euo in anatomic position
will it heal since **deep necrosis**

06.03.08 still leaking insp/ **healing** during examination tusa from proximal vagina
leave catheter and wait
14.04.08 not leaking at all cath removed bladder drill
16.06.08 not leaking at all, no incontinence, normal miction tusa ok
Insp/ **both** healed, good elevation, no stress incontinence
11.08.08 idem
06.10.08 not leaking at all, no incontinence, normal miction healed, no stress



2.5x1 cm

kano cath 90

kees **Ia** rvf **spontaneous closure** rvf

hsz (kano) female 18 yr 20.07.92

diagnosis: PII (1 alive), ± 2.5x1 cm urethrovesicovaginal fistula R bladder neck **IIAa**, also proximal rectovaginal fistula, **leaking urine and passing stools per vaginam for 60 days** which started 7 days following obstructed labor for 7 days, in hospital SB male, married 5 yr ago pre(menarche 5 mth later), still living with husband, drop foot L (grade 3), no menstruation, severe vagina stenosis; when seen **17.06.92 necrotic vagina**
EUO/F 3 cm, F/C 3 cm 157.0 cm

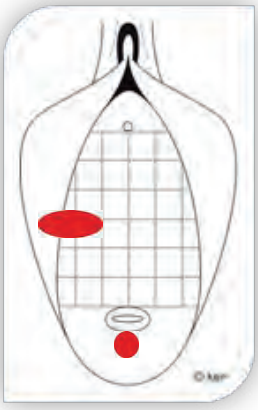
06.10.92: ± 8 mm 0 residual urethrovesicovaginal fistula R bladder neck **IIAa**, drop foot L (grade 3), normal menstruation, vagina stenosis/shortening **spontaneous closure of proximal rvf** (no longer stools per vaginam)
EUO/F 4 cm, F/C 1.5 cm 157.0 cm

06.10.92 operation: UVVF-repair vvf 457

episiotomy L, incision at fistula edge with small bilateral transverse extensions, sharp dissection of avw from scarred bladder/urethra, completely tension-free transverse closure with a single layer of interrupted inverting chromic catgut 00, transverse avw closure with everting chromic catgut and vicryl, fixation of FOLEY Ch 18, only skin closure of episiotomy, vagina pack; free urine flow, good bladder capacity (EUO/BW 12 cm), good elevation, EUO/B 4 cm
normal bladder capacity (longitudinal diameter 12-4 = 8 cm)

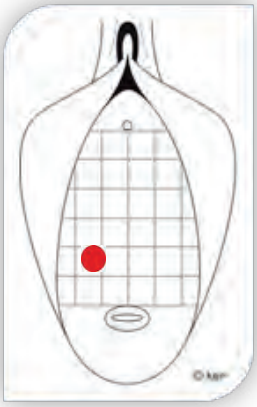
20.10.92 not leaking at all cath removed bladder drill
17.01.93 not leaking at all, no incontinence, normal miction
insp/ healed, good elevation, no stress incontinence
19.04.93 not leaking at all, no incontinence, normal miction healed, no stress

20.07.92



2.5x1 cm

06.10.92



0.8 cm

pt 1359 katsina vvf 1645
kees **Ia** rvf **spontaneous healing** rvf

rdsg (katsina) female 16 yr 04/10-90

surgeon: kees waaldijk

assistant: hauwa garba

diagnosis: PI, ± 2 cm 0 urethrovesicovaginal fistula midline fixed to symphysis with urethra block type **IIAb**, leaking urine for 4 mth that started 2 day following obstructed labor of 3 days, in hospital SB male married 4 yr ago pre(menarche 1 yr later), not with husband, no menstruation, drop foot R (grade 2) and L (grade 3), **spontanous healing of proximal RVF** (as noted 2 mth ago); passing stools pv stopped 2 wk ago, cervix in vault, no posterior fornix, vagina stenosis
EUO/F 4 cm, F/C 6 cm

operation: UVVF-repair

duration: 30 min

anesthesia: spinal L3/L4 with 4 ml bupivacaine 0.5%

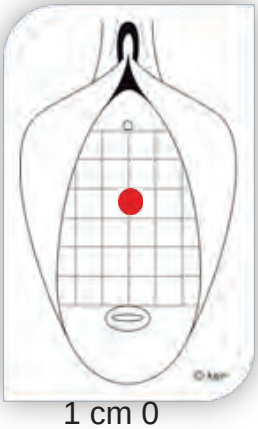
bilateral episiotomy, an incision at fistula edge with bilateral transverse extensions, sharp dissection of avw, FOLEY Ch 18, tension-free transverse closure by single layer of inverting chromic catgut 00, transverse avw closure by everting 3x supramid/chromic catgut 0/4, skin closure, vagina pack; free urine flow good bladder capacity
urethra/UV-junction/bladder neck **fixed against** symphysis; EUO/B 4 cm

20.10.90 not leaking at all cath removed bladder drill
28/10-90 not leaking at all, no incontinence, normal miction so
insp/ healed, good elevation, no stress incontinence

new obstetric problem

09/07-99 dysuria and intermittent urine retention bladder drill

24/07-99 no complaints, not leaking, no incontinence, normal miction
insp/ healed, good elevation, no stress incontinence


1 cm 0

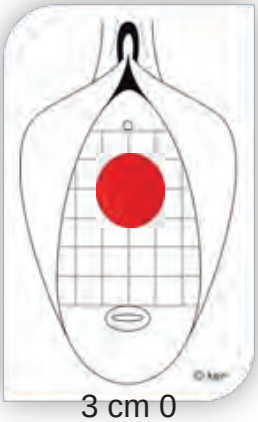
RR
preanesthesia: 130/80 mm Hg
5": 120/70
10": 110/60
postoperation: 110/60

pt 225 zaria vvf 247
kees **Ia** rvf **spontaneous healing** rvf aaaad

syk (zaria city) female 18 yr 14/07-06

surgeon: kees waaldijk
assistant: kabir lawal
diagnosis: PI, ± 3 cm 0 urethrovesicovaginal fistula with circumferential defect **IIBb**, ± 0.2 cm 0 proximal rectovaginal fistula fixed to midline cervix within 2 cm 0 pvw trauma, **leaking urine/passing tusa only pv for 35 days** which started immediately following destructive surgery bco obstructed labor for 2 days, SB male, married 1.5 yr ago post(menarche 3 yr earlier), not living with husband, no menstruation, drop foot R (grade 4) and L (grade 4-5), no yankan gishiri; normal AP diameter/narrow pubic arch 70°, AR pos, **extensive** pc_ic_ic muscle loss, **bare bones up to ischiac spine, empty pelvis**, distal vagina stenosis with pvw_lateral stricture, **major** ATF loss EUO/F 1 cm, F/C 4 cm, AB/AU 2 cm **wide open EUO drawn inside**
operation: circumferential UVVF-repair poor-quality □urethra□ tissue
duration: 45 min healing 80% continence 50%
anesthesia: spinal L3/L4 with 4 ml bupivacaine 0.5%

episiotomy L with severing of stenosis_stricture, incision at fistula edge, sharp circum ferential dissection, advancement/caudad fixation of anterior bladder onto symphysis/ urethra, tension-free circumferential UVVF-repair by end-to-end vesicourethrostomy by single layer of inverting serafit, separate paraurethra fixation of ep_pc fascia, triple fixation of FOLEY Ch 18, transverse avw adaptation by 2x everting seralon, skin closure, pack; free urine flow, EUO/BW 14 cm, good anterior elevation, EUO/B 1 cm (**extensive circum loss**) **no** rectum stricture so **rvf will heal spontaneously**
normal bladder capacity (longitudinal diameter 14-1 = 13 cm)
poor position of UV-junction **fixed against** caudad third symphysis
normal-width 1 cm urethra_EUO slightly drawn inside
11.08.06 not leaking at all cath removed bladder drill
14.09.06 not leaking at all, no incontinence, normal miction stools ok
insp/ **both/all** healed, good elevation, no stress incontinence
15.06.07 **amenorrhea for 4 mth** not leaking at all **instructions**
PII (1 alive) live male by cs 26.12.07 not leaking at all
PIII (2 alive) live female by cs 27.02.09 not leaking at all


3 cm 0

	RR
preanesthesia:	140/90 mm Hg
5':	130/80
10':	130/80
postoperation:	120/70

minimal/no complaint of kees la stool fistulas

as documented in 79 patients

introduction

during some urine fistula repairs a small proximal kees la stool fistula was detected as a surprise by passing flatus whilst patient, only upon explicit asking, stated she had no or only minimal complaints like once in a while flatus which did not disturb her at all

and even some patients denied it completely telling they never experienced anything; also on explicit asking and telling the patient there was a fistula

findings

a small proximal kees la stool fistula was detected at the beginning of or during the vvf repair as a surprise finding since during the anamnesis the patient had denied passing stool/flatus thru the vagina

in 79 patients who had a vesicovaginal fistula as well longer than 1 year

on explicit asking some patients admitted that once in a while they were passing flatus (and diarrheic stools) thru the vagina which did not bother them at all since it was only once in a while and considered this normal whilst some denied it completely

discussion

formed solid stools cannot pass a small opening in the anterior rectum wall unless there is severe outflow obstruction

but that is different for liquid stools in case of diarrhea and gas unless the small fistula is closed off and sealed off by the (weight of the) cervix

it seems that in standing/sitting/lying solid formed stools (?+ flatus?) is sliding over the posterior rectum wall leaving the anterior rectum wall free

the passing of flatus thru a small fistula during operation is promoted by the weight of the auvard speculum compressing the distal posterior vagina wall/anterior rectum wall and so causing some kind of obstruction and narrowing so the gas escapes proximally in an otherwise symptomless fistula

figures and overall results for total 1,417 fistulas

in

1,417 patients with kees la stool fistula

some relevant overall figures are presented for the total number of kees la fistulas

combination with vesicovaginal fistula — almost 100%

the combination is **almost 100%** since out of the total 1,417 stool fistulas 1,411 or **over 99.5%** were combined with a vesicovaginal fistula

final objective results — by the surgeon

fistula closed	1,319		**93.1%**
fistula not closed	89		**6.3%**
no symptoms		79	
mortality		1	**0.07%**
inoperable	3		**0.2%**
unknown	6		**0.4%**

final subjective results — by the patient

cured with continence	1,390	**98,1%**
healed with incontinence	4	**0,3%**

discussion

there is a strong tendency for small rectovaginal fistulas of **60%** in this series and for postpartum stool/flatus incontinence to heal spontaneously

therefore, the incidence of rectovaginal/stool fistulas is higher than generally assumed as presented in this series since the spontaneously healed fistulas will not be detected unless specifically looked for at the beginning of any vaginal procedure

also some patients or **6%** deny its existence and say no complaints (whatsoever)

so only **35%** needed an operation

the results are excellent, especially from the viewpoint of the patients, since **98%** of the 1,417 patients reported full cure with full continence

basic science

see textbook functional female pelvis anatomy

what is needed

anatomic stool continence mechanism

pelvis anatomy essentials

management principles

- rectovaginal/stool fistulas

what is needed before a start is made

one has to master the complicated functional anatomy of the pelvis, the pelvis organs and the pelvis floor

one has to understand the functional anatomy as interaction between the different structures in order

to understand the physiology of the urine and stool continence mechanisms in the female

one must be able to identify the individual structures of the functional anatomy in the living female

which is different from the post-mortem dead anatomy

one has to study and understand the mechanism of action of the obstetric trauma, what it does to the functional anatomy of the individual structures and master the enormous variety of lesions

one must be able to identify and assess the individual obstetric trauma defects in the living female

one must study, understand and master the mechanisms of action of urine and stool incontinence and of prolapse in the female

then one must devise a plan of action how to reconstruct the functional anatomy as customized to the individual findings and needs

one must master not only the principles of general, gynecologic, urologic, colorectal and reconstructive surgery but since the vagina is never sterile also the principles of septic surgery

one must understand and respect the natural tissue forces inside the human body

one must master the physiologic healing processes in order to promote the enormous natural healing potential of the human body realizing it starts the moment an incision is made

preferably one undergoes a practical training with a step-by-step approach where the basic skills are demonstrated in order to learn these skills

though the skills can be demonstrated and be practiced step by step under strict super vision there is no automatic transfer of these skills and the ultimate responsibility and accountability for any surgery rests upon the performing surgeon

the decisive factor in surgery is the surgeon

female stool continence mechanism

functional anatomy

introduction

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

the anatomic stool continence mechanism is situated within the distal 4-5 cm of the anorectum, the external sphincter ani muscle and support

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

the distal anorectum and external sphincter ani 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 stool continence mechanism

anorectum-rectum junction
diameter
anorectal angle, normally 80°-100°

anorectum
length 4-5 cm
shape and diameter
lumen
anus mucosa
anal cushions = columnae anales
submucous vascular plexus
circular smooth muscle fibers = internal sphincter ani
longitudinal smooth muscle fibers

sphincter ani muscle
circular striated muscle fibers around distal anorectum/anus
consisting of mostly slow-twitch for tonus but also fast-twitch for emergency closure
divided into three parts:
- subcutaneous
- superficial
- deep

anatomic/physiologic support

rectovaginal or prerectal fascia (of denonvillier)
supports the anterior anorectum

perineum outlet diaphragm
the anorectum with external sphincter ani complex are firmly anchored into the pierced thru punched out opening within the perineum outlet diaphragm

perineal body (= centrum tendineum perinei) with transversus perinei and bulbo spongiosus muscles
stabilizes the anus and sphincter ani anteriorly and laterally; in a way that is comparable to the role of the pubocervical fascia in stabilizing the posterior urethra

anococcygeal ligament
stabilizes the anus posteriorly

levator ani muscles + levator plate
anterobilaterally from pubis bone and arcus tendineus levator ani as a sling around the lateral and posterior anorectum walls and external sphincter ani, and inserting into levator plate, anococcygeal ligament and coccyx

especially the puborectalis muscles, median part of pubococcygeus muscles, play a role pulling the anorectum anteriorly; these muscles are responsible for the anorectal angle; its fibers fuse with the deep portion of the external sphincter ani muscle

posterior vagina wall
attached to perineal body and rectovaginal or pre(ano)rectal fascia and rectum serosa

perianal skin with subcutaneous tissue and constrictor ani muscle
stabilizes also the anus/sphincter ani muscle

intact innervation of these components

autonomic sympathetic and parasympathetic (vagus) nervous system for the circular smooth muscle as internal sphincter and longitudinal smooth muscle; the sympathetic fibers for stimulation and continence against the parasympathetic fibers for relaxation and defecation; from hypogastric and pelvic plexus
pudendal nerve innervating the external sphincter ani; from s2, s3, s4
levator ani nerve innervating levator ani muscles; from s3, s4
and of course the autonomic enteric nervous system

discussion

the stool continence mechanism must take care of
gas
for final sealing off the mucosa with mucosa cushions and the submucous vascular plexus are responsible

liquid stool
for final sealing off also the mucosa with mucosa cushions and the submucous vascular plexus are responsible
solid stool
this is the easiest since normally there is no stool inside the rectum

anorectal angle is determined by the puborectalis muscle and is normally 80°-100°; if it contracts the angle will become sharper; however, this seems to be of minor importance

anorectum mucosa with mucosa cushions and submucous vascular plexus are responsible for air- and water-tight closure; washer effect

water-tight closure is a problem since liquid stool inside the rectum is accompanied by a strong urge component with bowel contractions

linea dentata between squamous epithelium (proctodaeum origin) with sensibility for pain and touch since innervated by pudendal nerve and cubical epithelium (hindgut origin) without sensibility since innervated by autonomic nervous system

thickened circular smooth muscle = internal sphincter ani is the strongest factor and responsible for closure due to non-fatigue tonus; it is separated from the external sphincter by the longitudinal smooth muscle layer sheath

longitudinal smooth muscle is playing a role in defecation since it will shorten the anorectum if contracting; it separates the internal sphincter ani muscle from the external sphincter ani muscle

rectovaginal or prerectal fascia (denonvillier) bilaterally from an arcus tendineus attached to levator ani muscle fascia; this is attached to/supporting the anterior anorectum; if defective a rectocele will develop

external sphincter ani circular around the distal anorectum and consists of striated muscle fibers; the slow-twitch muscle fibers are contributing to its tonus whilst the fast-twitch fibers will contribute to short-duration closure of the anus; especially in the female it is thicker posteriorly than anteriorly

it consists of 3 parts: subcutaneous, superficial and deep; fibers of the puborectalis muscle fuse with the deep part bilaterally and posteriorly

it is separated from the internal sphincter by the longitudinal smooth muscle sheath of the anorectum

the external sphincter extends 0.5-1 cm distally from the internal sphincter (intersphinc teric groove) and protrudes slightly from the surrounding skin

perineum outlet diaphragm
the anorectum with the external sphincter ani complex are firmly anchored into the pierced thru punched out opening within this diaphragm stabilizing/securing these structures in their anatomic position

active contraction of its striated muscle component and reflex contraction of its smooth muscle component will reinforce the stool continence mechanism

perineal body
wedge-like connective tissue structure into which the bulbospongiosus and transversus perinei muscles radiate; attached to anterior external sphincter ani

this structure stabilizes and secures the anterior sphincter ani/anorectum in its anatomic position and as such supports the stool continence mechanism

transversus perinei muscles
bilaterally from ischium tuberosity and uniting indirectly medially via the perineal body and prevent lateral shifting of perineal body/anus

bulbospongiosus muscles
bilaterally from paraclitoridally and uniting posteriorly medially via the perineal body and prevent posterior shifting of perineal body/anus

levator ani muscles + levator plate
a flat striated muscle sheath originating anterobilaterally from pubis bone and arcus tendineus of levator ani muscles (atflam) and like a sling around lateral vagina walls and laterally from and underneath sphincter ani/anorectum/rectum and fusing with each other and inserting posteriorly from sphincter ani/anorectum/rectum into levator ani plate, anococcygeal ligament and coccyx bone

though it is one muscle it can be divided into different parts based on their origin: pubococcygeus and obturatoccygeus muscles

the medial part of the pubococcygeus is called the puborectalis muscle; this portion fuses with the bilateral and posterior deep external sphincter ani muscle fibers; it is responsible for the anorectal angle and prevents posterior shifting of the anus

due to its sling-like shape contraction of the levator ani muscles compresses the lateral and posterior anorectum and sharpens the anorectal angle and as such contributes to the stool continence mechanism

for some investigators the **(ischio)coccygeus muscle** is (synonymous with) the sacrospinous ligament

posterior vagina wall
covers and is attached to the perineal body and anorectum/prerectal fascia/rectum (serosa) and as such is fixed indirectly to the lateral pelvis walls

anococcygeal ligament
from coccyx bone to posterior sphincter ani/anus/anorectum and stabilizes/secures the external sphincter ani and anus in its posterior anatomic position and prevents anterior shifting of external sphincter ani/anus

shafik mechanism
surgically speaking this is difficult to check; as well this could only function if the levator ani muscles are posteriorly uniting around posterior anorectum (true), the anococcygeal ligament around anterior anorectum and/or external sphincter ani and/or perineal body (not true) and bulbospongiosus muscles unite posteriorly from anorectum (not true)

besides this, as long as an anatomically correct reconstruction is performed these structures will be restored as well whatever the arrangement

skin with subcutaneous tissue and corrugator ani muscle
the perianal skin and subcutaneous tissue in combination with corrugator ani muscle around the anus stabilizes the anus as well

intact innervation of these components
autonomic sympathetic, parasympathetic (vagus) nervous system for the anorectum circular smooth muscle fibers as internal sphincter and longitudinal smooth muscle fibers and for (non)sensibility of anorectum cubic mucosa up to dentate line; from hypo gastric and pelvic plexus; also complex coordination by enteric nervous system

pudendal nerve innervating the external sphincter ani and for sensibility for touch/pain of perianal skin and squamous anorectum mucosa up to dentate line; from s2, s3, s4

levator ani nerve innervating levator ani muscles; from s3, s4

synergistic interaction between stool and urine continence mechanisms
though the two mechanisms may function independently from each other there is a lot of analogy and synergy; for instance first flatus and then micturition (le vent avant la pluie) and first micturition before defecation, combination of cystocele and rectocele, combination of sphincter ani rupture and genuine intrinsic urine incontinence etc

analogy between stool and urine continence mechanism
analogy of functional anatomy: mucosa, submucous vascular plexus, internal smooth-muscle sphincter, external striated-muscle sphincter and support

analogy of posterior support of urethra by endopelvic diaphragm and anterior support of sphincter ani/anorectum by perineal body with transversus perinei and bulbospongiosus muscles and by prerectal fascia

analogy of innervation (pudendal nerve + autonomic nervous system)

and analogy of blood supply (internal iliac artery); and for (ano)rectum also inferior mesenteric artery

direct against indirect action of levator ani muscles
tonus and contraction of levator ani muscles have a **direct** action upon the stool continence mechanism since lateral/posterior anorectum walls are being squeezed and fibers of puborectalis support deep part of sphincter ani muscle ani whilst the anorectal angle becomes sharper

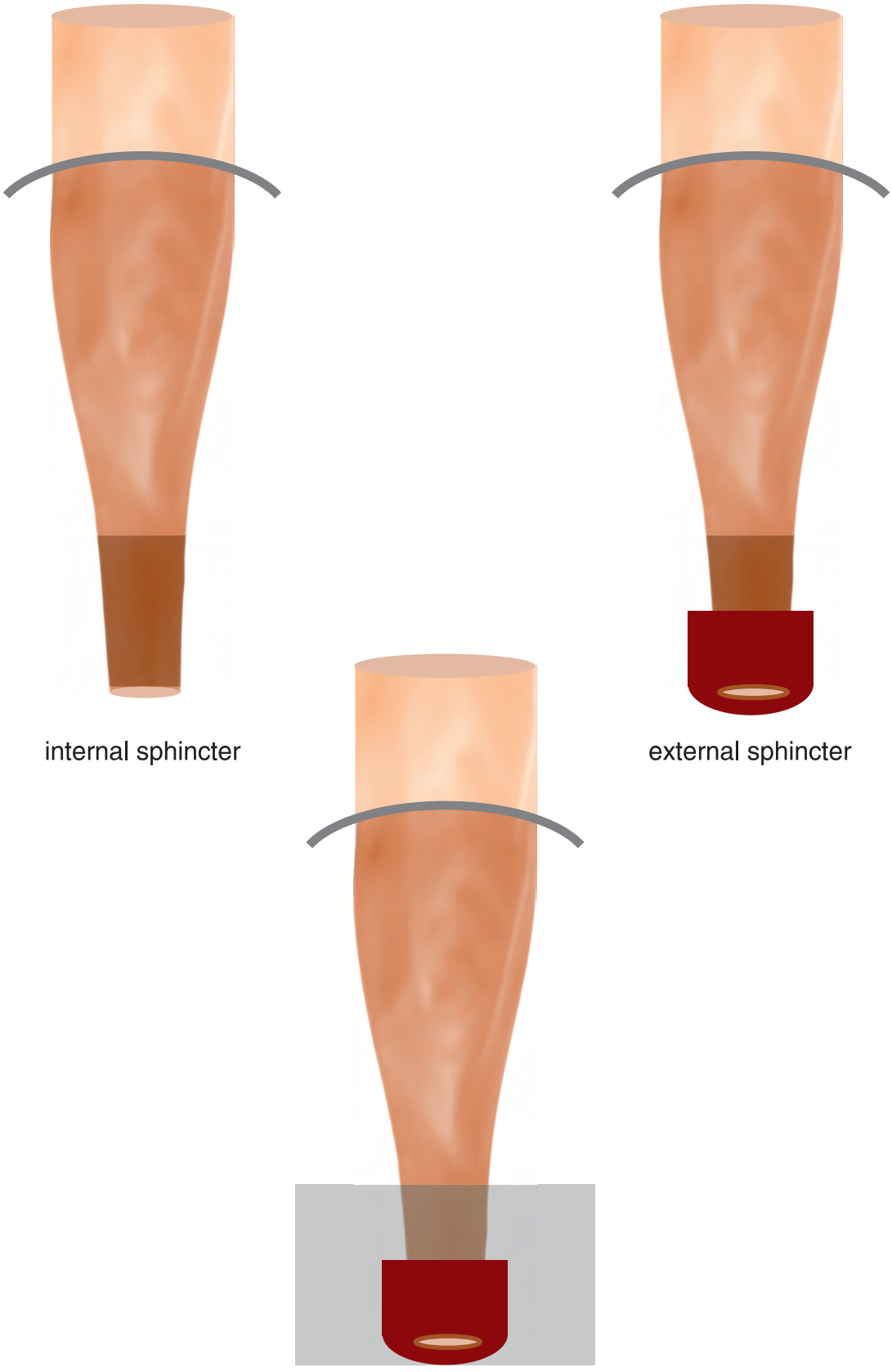
tonus and contraction of levator ani muscles have no direct action upon the female urine continence mechanism since there is no direct contact whatsoever between the two; but there is **indirect** action since the endopelvic diaphragm as attached to anterior vagina wall is moving anteriorly and cephalad by compression of lateral/posterior vagina walls which improves the support

sphincter ani/perineal body complex
schematic drawings of the sphincter ani/perineal body complex with transversus perinei and bulbospongiosus muscles are presented on following page.

last edition august 2020

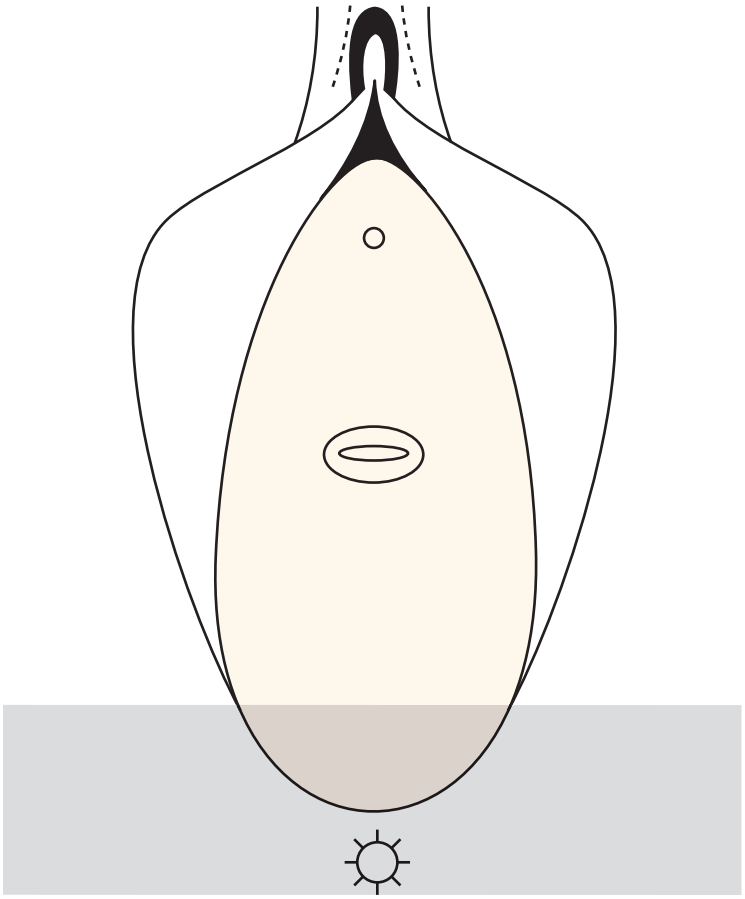
stool continence mechanism

4-5 cm distal anorectum

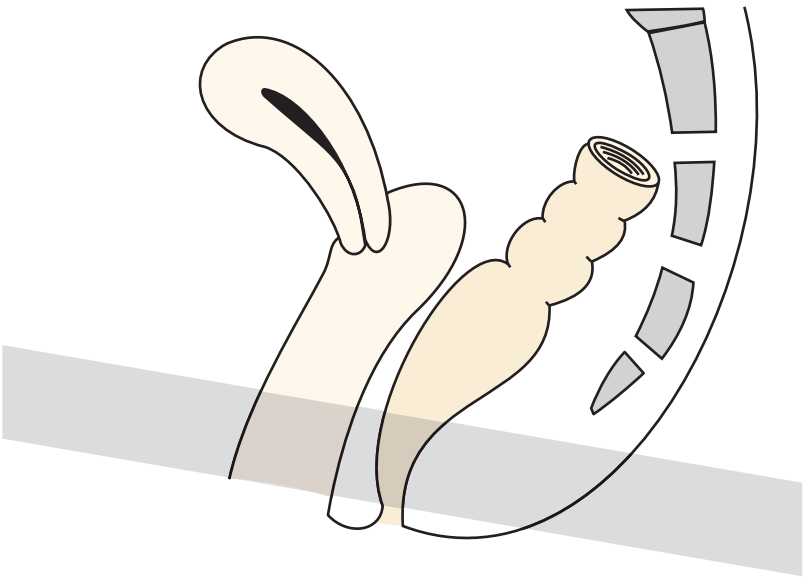


stool continence mechanism

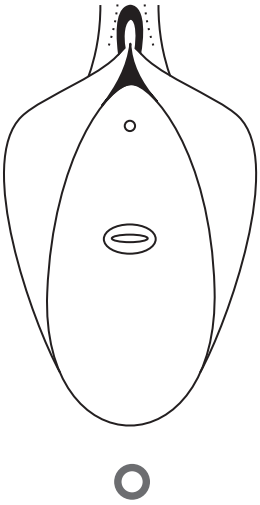
4-5 cm distal anorectum



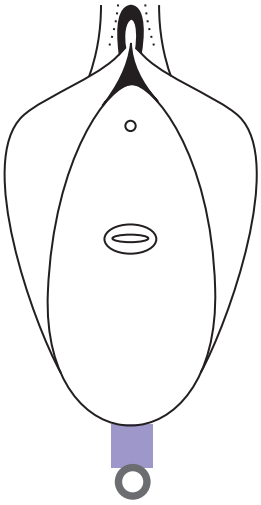
frontal



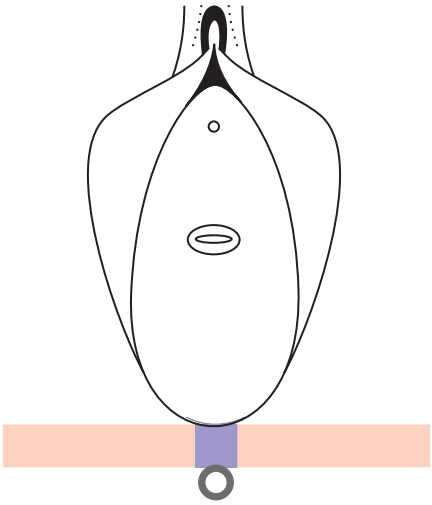
sagittal



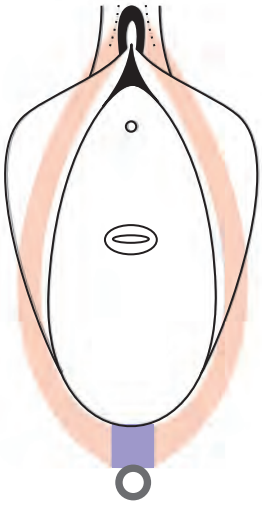
sphincter ani



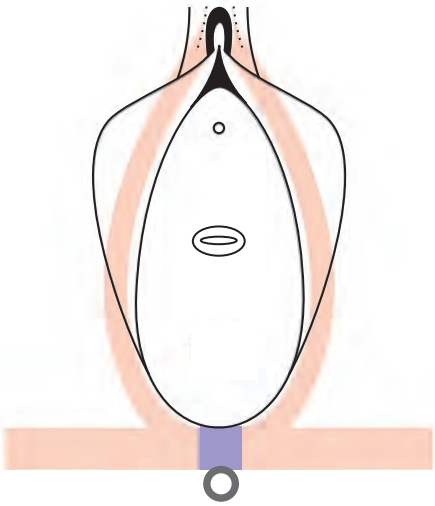
perineal body



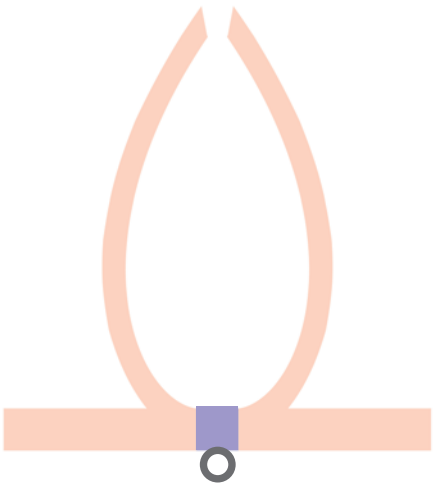
transversus perinei muscles



bulbospongiosus muscles



sphincter ani perineal body complex



sphincter ani perineal body complex

functional pelvis anatomy

essentials

true pelvis cavity
a confined space for the distal outlet organs of the urinary tract anteriorly, the genital tract in the middle and the digestive tract posteriorly with hydrostatic and compression pressure; normally in a continent way and divided into
anterior pre_subperitoneal compartment
for the distal end parts of the urinary tract: pelvic ureters, bladder and urethra
median subperitoneal compartment
for the (also distal end parts of) genital tract: uterus, adnexa, cervix and vagina
posterior retro_subperitoneal compartment
for the distal end parts of the digestive tract: rectum, anorectum and sphincter ani

enclosed by
parietal pelvis fascia covering pelvis wall/floor muscles
and
parietal peritoneum as boundary of intraperitoneal cavity
as connected to each other by
tela urogenitalis with corpus intrapelvinum and endopelvic diaphragm

corpus intrapelvinum as dynamic 3-dimensional matrix
connective tissue organ of pelvis consists of a cohesive mixture of collagen for strength, elastin for passive elasticity and plasticity and mostly smooth muscle fibers for dynamic active non-fatigue tonus in a loose, dense or condensed form as
a dynamic matrix into which the organs and their supply are embedded and suspended/connected to the pelvis wall and each other by highly specialized structures
protecting the organs and their supply against trauma and stabilizing/securing them in their variable anatomic position
as coordinated by intrinsic myogenic impulses and the autonomic nervous system
considered to be a fluidum since no sharp demarcations between the archaic matrix and its specialized structures

endopelvic diaphragm
highly specialized structure of corpus intrapelvinum from symphysis anteriorly to sacrum posteriorly as connected to its bilateral arcus tendineus fasciae with **cervix as centrum tendineum intrapelvinum** since all musculofascia structures are connected to it
as first line of counteracting intraabdominal hydrostatic pressure and
supporting the urogenital continence mechanisms in their anatomic position and
preventing herniation of the urinary tract, genital tract, intraperitoneal contents and distal digestive tract into the zero-pressure vagina

pelvis floor as one functional unit as part of abdominopelvic wall
levator ani muscles connected firmly to the perineum outlet diaphragm via perineal body and external sphincter ani muscle supporting and reinforcing each other
levator ani muscles as “pelvis diaphragm” highly overrated with direct action on stool continence mechanism and only indirect action on urine continence mechanism
perineum outlet diaphragm into which the end outlet organs with their striated sphincter mechanisms are anchored and supporting directly and the urine and stool continence mechanisms

female urine continence mechanism over in total 4-5 cm
bladder neck, uv-junction and whole urethra
supported by the endopelvic diaphragm and the perineum outlet diaphragm
there is an internal smooth muscle sphincter and an external striated rhabdosphincter
with washer effect by the mucosa and submucous vascular plexus
continence potential over its whole length

female genital continence mechanism over in total 3-4 cm
with cervix as internal smooth muscle sphincter as anchored into endopelvic diaphragm

female stool continence mechanism over in total 4-5 cm
anorectum and external sphincter ani
anchored within perineum outlet diaphragm
there is an internal smooth muscle sphincter and an external striated sphincter ani muscle with washer effect by mucosa and submucous vascular plexus

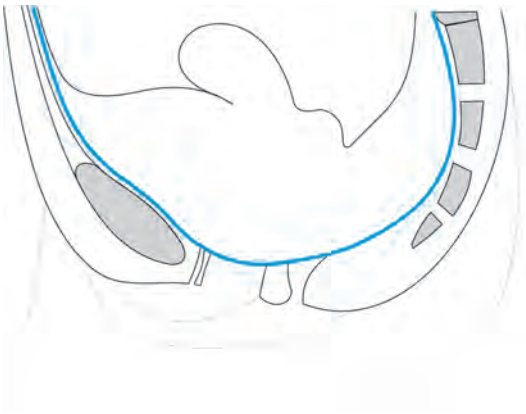
urine stress incontinence mechanism genuine and post fistula repair
the anterior urethra wall is always fixed to the symphysis and cannot rotate backwards away from the symphysis whilst the posterior urethra wall is mobile as supported by the endopelvic diaphragm
once this support becomes weak the posterior urethra wall rotates backwards causing funneling = vesicalization of the proximal and mid or whole urethra with a decrease in outflow resistance so that the intrinsic closing forces can no longer counteract the intra vesical expulsion forces
or by defects within the anchoring into perineum outlet diaphragm; isolated or combined

pelvis floor muscle exercises
may have a positive effect upon the urine and stool continence mechanism since
the perineum outlet diaphragm contributes to the urine and stool continence mechanism by further stabilizing the outlet parts
the levator ani muscles contribute directly to the stool continence mechanism to which they are anatomically connected but only indirectly to the urine continence mechanism with no anatomic connection whatsoever
with simultaneous reflex contraction of the external striated muscle sphincters
with increase in tonus of smooth muscle fibers of the endopelvic diaphragm by reflex action via intrinsic myogenic impulses as modulated by the autonomic nervous system

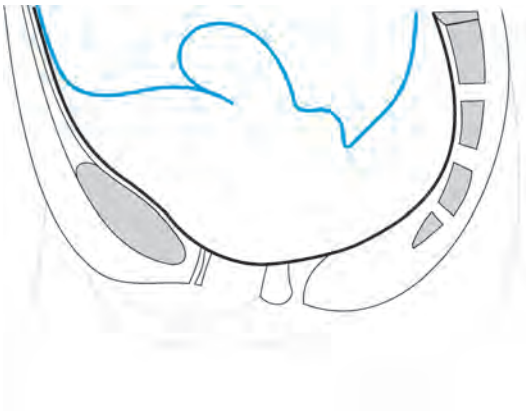
obstetric trauma
due to hydrostatic pressure, dilatation of birth canal, (in)direct cutting thru, shearing and compression; and in prolonged obstructed labor due to pressure necrosis
resulting in an enormous variety of defects from minimal to extensive

pelvis organ prolapse
herniation of adjacent high(er)-pressure organs into the zero-pressure vagina and then further prolapse thru the vagina dragging vagina wall with them as intussusception
due to defects within the separating and supporting endopelvic diaphragm structures of the corpus intrapelvinum between these organs and the vagina
levator ani muscles and perineum outlet diaphragm do not play a role in this process since there is no anatomic contact between those organs and these structures

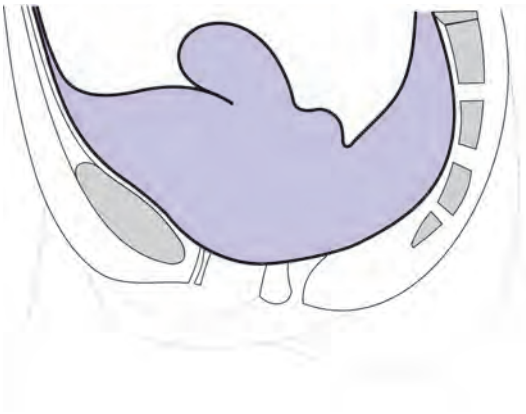
reconstructive surgery
the science is to identify the specific defects whilst the art is to reconstruct the functional anatomy using the available dynamic autologous structures



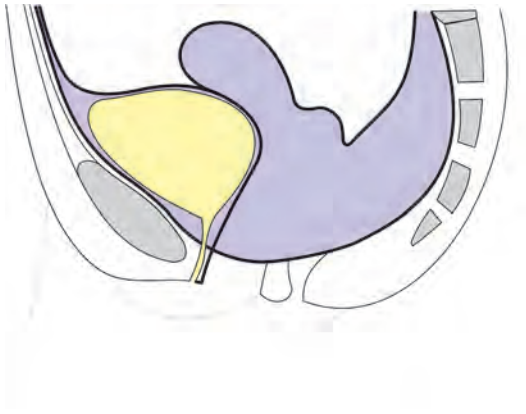
fascia pelvis parietalis



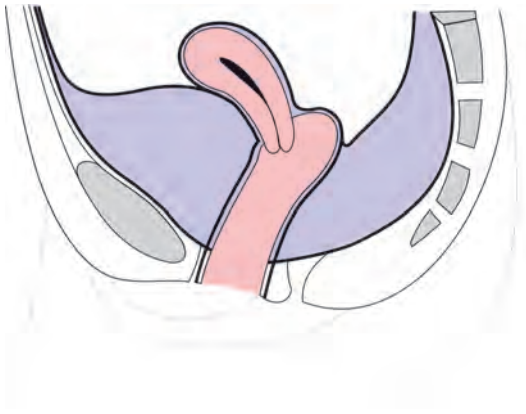
peritoneum parietale



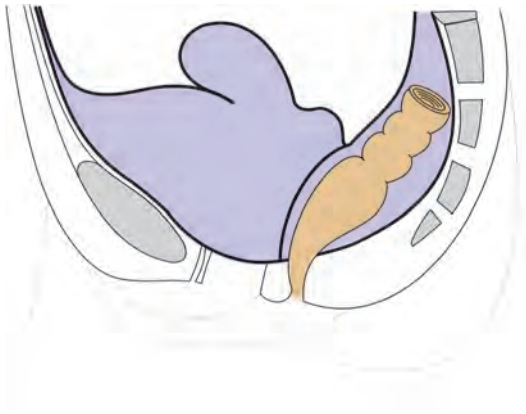
tela urogenitalis



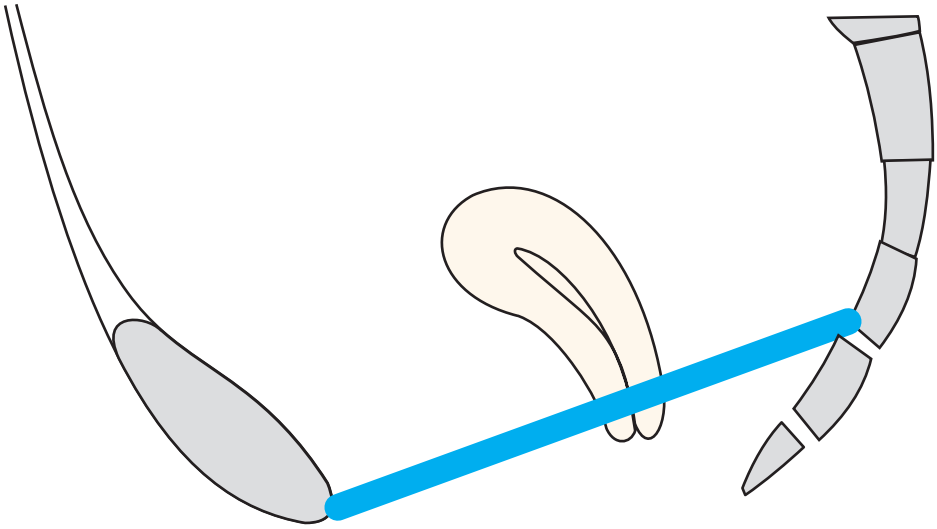
urinary tract compartment



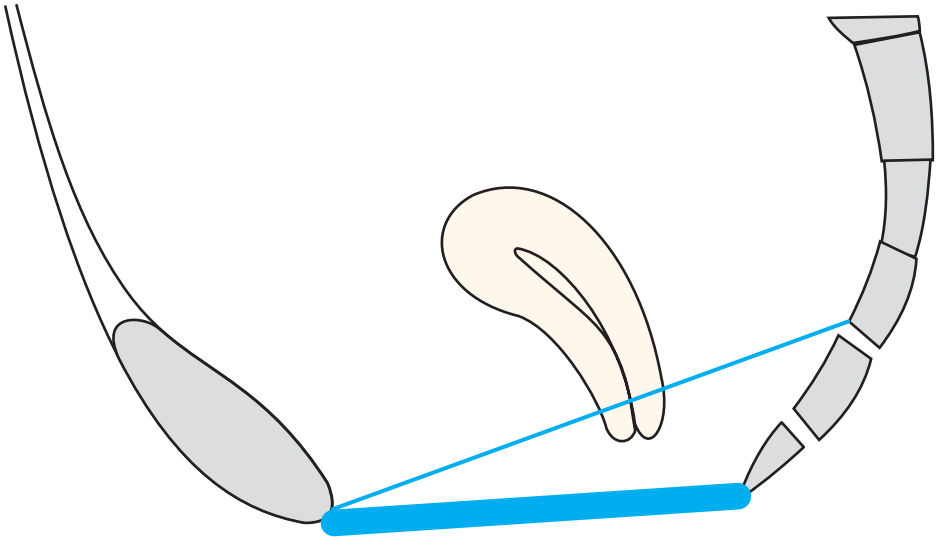
genital tract compartment



digestive tract compartment



endopelvic diaphragm
smooth muscle
intrinsic myogenic impulses
modulated by autonomic nervous system



perineum outlet diaphragm = pelvis floor
striated muscle
somatic innervation

pre-, intra- and postoperative management of rectovaginal/stool fistulas

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**

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**
- 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 passing of stools is manifest
- 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 kees I through kees IIBb fistulas; exceptionally and for type kees III fistulas other routes may be necessary
the abdominal route is not advanced surgery but a **lack** of surgical skills

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

colostomy for decompression
complete decompression not guaranteed
the author has never used it for his obstetric trauma surgery

prerectal fascia of endopelvic diaphragm
any defect has to be repaired meticulously

the martius fibrofatty pad graft or any other kind of grafting
does **not** contribute either to closure or to continence

indwelling bladder catheter for 2-3 days
foley catheter ch 18

postoperative fluid intake
high oral fluid intake

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

stool softeners
for 10-14 days

postoperative stool incontinence only in kees IIb fistulas

if necessary rhaphy of internal sphincter with rhaphy of external sphincter with reconstruction or reinforcement of perineal body

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

tissue quality

at operation end the tissue quality is documented as **good, medium** or **poor** only for predicting prospective results; not for operation techniques

residual fistulas

the same technique as if it were the first attempt

principles of surgical technique(s)

the vaginal approach is the route of choice with or without unilateral, median or bilateral episiotomies, spinal anesthesia is the anesthesia of choice and the (exaggerated) lithotomy position is the position of choice for kees Ia thru kees IIb fistulas; however, kees III fistulas may need a different approach

the fistula is classified by careful inspection and systematic examination of the complex obstetric trauma under spinal anesthesia just before the surgery is started and a final decision taken how to handle that specific fistula

an incision is made at the fistula edge, if needed with bilateral transverse extension, a sharp dissection of the rectum/prerectal fascia performed and the rectum closed without tension by two layers of inverting polyglycolic acid sutures taking good bites of the pre rectal fascia/muscularis

the principles of reconstructive surgery and common sense dictate the direction of closure: longitudinal, transverse or oblique;

the posterior vagina wall is only adapted or half closed, and in severe contamination only approximated, to allow free spontaneous evacuation of small blood clots, tissue debris and bacteria according to the principles of septic surgery

step-by-step reconstruction

in line with the functional pelvis anatomy
and in line with the principles of septic surgery

this is divided into different parts

i anesthesia, position

ii examination under anesthesia
fistula characteristics + all other obstetric trauma defects

iii classification

iv access to operation field

v physiologic incision + dissection

vi fistula closure

vii check result

viii adaptation of posterior vagina wall = pvw

ix tissue quality

x documentation

i anesthesia, position

spinal anesthesia is recommended since it is effective, safe and cheap

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
if visibility is still poor the inclination of the operation table has to be increased; so more head down/buttocks up

nb the knee-elbow position does not provide better visibility or access, is troublesome, time-consuming and may require general anesthesia; so not recommended

some surgeons prefer a head up/buttocks down position for kees II fistulas

ii systematic examination under anesthesia

the better (all) the obstetric trauma defects are identified the better these can be corrected during the reconstructive surgery process and the better the chance of success

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 the anus and the cervix or vagina vault, as to the condition of the vagina such as stricture, stenosis or even atresia, if there is a vesicovaginal fistula as well, if the fistula is accessible, if there is a stricture, circumferential defect etc

003
check pubic arch in °; if this is ≤ 80° access to operation field and instrumentation may be complicated
the narrower the pubic arch the more complicated the repair becomes

004
check vagina length in cm; if this is less than 9 cm there has been substantial vagina tissue loss

005
check position/mobility of cervix; if retracted with paradoxic movement on cough visibili ty will be poor with difficult instrumentation

iii kees classification

the more the author uses this classification the more valuable it becomes in devising the operation principles and in prediction of the results

006
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

iv access to operation field

good access to and good visibility of the operation field are a conditio sine qua non for any surgical operation
poor access and poor visibility will lead to unnecessary complications and poor results
make me shine is only by superior results, certainly not by speed/boasting

007
the labia minora are sutured onto the inside of the upper legs to keep the vagina open laterally

008
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
if done within the skin grease/lines and final skin closure by intracutaneous suturing the scar will be invisible

009
then an auvard self-retaining weighted speculum is placed inside the vagina with under neath a gauze covering the anus to keep the vagina open posteriorly; no more specula

v incision and 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

010
put one or two long allis clamps onto posterior vagina wall proximally from fistula and have assistant pulling it towards the outside and if not in the middle towards the midline; this will make the repair less complicated

011
a physiologic transverse curved incision is made within the ruga folds of the posterior vagina wall thru the fistula; then a circumferential incision is made at the fistula edge

012
the posterior vagina wall is dissected sharply from the prerectal fascia/anterior rectum wall using scalpel and sharply curved thorek scissors in order to execute a **tension-free** repair; aim for just sufficient dissection in one go to minimize wound surface and postoperative scarring; avoid the salami technique with cutting everywhere resulting in excessive scarring

vi double-layer rectum closure

the aim is to reconstruct the functional pelvis anatomy with in the process closure of the fistula
the real master shows himself in his restrictions; so only do the necessary and do not think one knows it better than nature

013
the principles of reconstructive surgery and common sense dictate the direction of closure: longitudinal, transverse or oblique
most of the time a transverse closure is the most logical in kees I fistulas as it presents itself this way and is in line with the natural tissue forces whilst longitudinal closure seems to be against these forces except in kees II fistulas

014
the defect within the prerectal fascia/muscularis is closed with in the process closure of the rectum with a **double layer** of interrupted/continuous inverting polyglycolic acid 00 or 0 in order to obtain a flatus-proof closure

transverse closure **from north to south** **anterior to posterior**
015a
closure is from bilaterally towards the midline, otherwise it may be very difficult to close the lateral angles and corner-corner fistulas may develop

longitudinal closure **from west to east** **side to side**
015aa
start with the most proximal (deepest) suture and work from proximal to distal

016
good bites are taken thru the prerectal fascia/muscularis in order to get broad adapta tion of the raw prerectal fascia/muscularis with adaptation of rectum mucosa

017
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
.
018
care is taken not to go through the rectum mucosa as theoretically this might lead to flatus contamination thru the small needle holes but in practice this does not happen

019
cave do not cut the sutures too short since then the knot(s) will slip and loosen up

nb at each step the surgeon should ask himself what am i doing exactly, which type of tissues are adapted, is it in line with the natural tissue forces and functional anatomy, and how will it look after 1 hour, 1 day, 1 week, 1 month and how ultimately after it has healed completely after 1 or 2 years
since anything not in line with the natural tissue forces and functional anatomy will work against the patient for life

vii check result

check of the end result is part of any surgical operation so that eventual missing/wrong parts can be corrected

020
Intravaginal visual inspection and intrarectal digital examination

viii posterior vagina wall adaptation, episiotomy etc

since the vagina is never sterile the posterior vagina wall is only adapted by a couple of everting sutures to allow free evacuation of blood clots, tissue debris and bacteria in line with septic surgery principles

021
the posterior vagina wall is only adapted by 2-4 everting absorbable or nonabsorbable sutures in donati fashion; if severe stool contamination only approximation

022
if episiotomies have been performed these are adapted with final skin closure by intra cutaneous suturing

023 optional
the vagina is packed tightly with gauze (soaked in antiseptic or not) to help hemostasis though normally complete hemostasis is secured

024
if the patient is in good condition she is transferred to the postoperative ward

ix tissue quality

during the operation procedure the tissue has to be classified as **good**, **medium** or **poor**; this has to be entered into the operation report

x documentation

since documentation is an important part of any type of surgery, analysis of technique, transparent audit and scientific process

write an operation report immediately after the operation, including all the relevant data and also eventual major complications; with prediction of healing and continence on a 5% scale from 5% to 95%; so everything is documented

the better the documentation the more valuable an evidence-based evaluation becomes of the technique(s) and the program

comments

dissection

the proximal pvw is dissected in one go using scalpel or curved thorek scissors whilst the distal pvw is dissected in one go by curved thorek scissors; no salami technique with small cuts everywhere as in a sausage factory

transverse closure

instruments in the horizontal axis

longitudinal closure

instruments in the longitudinal axis

one of the suture endings of the first interrupted layer is left long so the second continu ous layer can be interlocked to these suture endings

fistula location

the deeper the fistula inside the vagina the more complicated the reconstructive surgery becomes
the more lateral the fistula away from the midline the more complicated the operation becomes
the more the fistula retracted towards the sacrum the more complicated the repair

position/mobility of cervix with eventual paradoxic moving

the more fibrosis and the more the cervix is retracted with paradoxic moving on cough the more complicated the repair

obesity

the more obesity the more complicated the access and the more complicated the repair

discussion

fistula surgery belongs to the most complicated reconstructive surgery the author ever encountered during his extensive surgical career

simple repair of simple fistulas are both fake information within the political blah blah blah rhetoric of the political organizations including who with a real negative impact on the functioning of professional obstetric trauma surgeons since they have to attend to the **mutilation** as caused by the simple surgeons

these principles are evidence-based guidelines which have to be customized to each and any fistula as its own specific unique entity

since the rectum is a high-pressure organ compared to the low-pressure vagina once the rectum has healed the vagina will always heal

contrary to what many surgeons belief, grafting does not contribute to closure and/or postrepair continence and is contraindicated since it will contribute to more dissection and surgical scarring

the most important is to reconstruct the functional pelvis anatomy in a straightforward way with in the process closure of the fistula

so one has to concentrate on the basics which is already highly complicated considering a minimum failure rate of 10-15% even in experienced hands

the more simple the solutions/operations look the more complicated they are and only experts are able to make complicated things look simple

the deeper (parts of) the fistula inside the vagina the poorer the access and the more complicated the instrumentation, especially if combined with a retracted/moving cervix and fixation of the fistula onto the sacrum

the more scar tissue/fibrosis the more complicated the dissection and the more compli cated the repair

the more the fistula is away from the midline the more complicated the access and the instrumentation and the repair

(severe) obesity poses a problem during any surgery and postoperative period; so also in obstetric trauma/fistula surgery

so make sure everything is prepared well to ensure optimal conditions before even the incision is started since intraoperatively it may no longer be possible to correct anything as one is so concentrating on the surgery

good visibility and access to the operation field can be obtained by episiotomy and by adjusting the inclination of the operating table to the individual needs of the surgeon

the author likes the head down/buttocks up position; whilst other surgeons may prefer head up/buttocks down position or horizontal position

since the surgeon is responsible and accountable for his actions (s)he can only blame her/himself if anything goes wrong

so if a repair should break down a try is made to analyze what went wrong so that this can be avoided in the repair of the residual fistula

whilst a residual fistula is being operated according to the same principles as if it were the first operation

remember, a surgeon cannot heal; he can only bring tissues together to the best of his/her knowledge, skills and conscience

and then leave it to nature for healing

obstetric fistula surgery will bring any surgeon back with both feet solidly planted on the earth since the whole world can see (and the blind even smell) the misfortunes

the surgeon can boast about his performance until the sweeper reminds him/her about the visible urine, stools and offensive smell

obstetric trauma surgery belongs to the
most complicated surgery
the author encountered in his professional surgical career

calling things simple does not make things simple
encouraging/licensing people to mutilate girls/women

vocal rhetoric has neither prevented nor closed a single fistula

postscriptum

the obstetric fistula as an urban problem against the myth

besides the myth of early marriage there are many other myths as based on intentional fake information and assumption rather than on science and reality

it has always been claimed that the obstetric fistula poses only a problem in rural areas due to the distance from the laboring woman to the nearest health facility

however, when the author started in murtala muhammad specialist hospital in kano he noticed that the majority of the patients came from kano municipality with a population of 4-5 million people

and published this in evaluation reports XXII of 2005, XXIII of 2006 and XXIV of 2007

however, without acknowledging since the myth stayed that it was a rural problem and nobody was ready to accept the bitter truth of

a failed system of obstetric care

on analyzing the data the author found that roughly 4,500 women out of the 25,000 with an obstetric trauma/fistula were coming from within the municipalities of major cities with at least 1,000,000 up to over 5,000,000 inhabitants, even from lagos with far over 20,000,000 inhabitants; all with many public and private hospitals including university teaching hospitals

culture has nothing to do with home deliveries only the efficiency of the obstetric care

for this look at the mobile telephone; it is not in the culture but everybody has at least one, even beggars on the street, since it is functioning very well

why go to a hospital and pay for the same suffering as at home with the same outcome and being abused as well in the process

so why is nobody interested
in setting up
a network of functioning obstetric units

instead of persisting in
vocal blah blah blah political rhetoric of
early marriage

abbreviations

vvf	=	vesicovagnal fistula
rvf	=	rectovaginal fistula
uvvf	=	urethrovesicovaginal fistula
vcvf	=	vesicocervicovaginal fistula
vuvf	=	vesicouterovaginal fistula
cx	=	cervix
avw	=	anterior vagina wall
pvw	=	posterior vagina wall
pcmuf	=	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
oim	=	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
ab/au	=	distance between anterior bladder and anterior urethra in circumferential fistulas
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

reference point urine fistulas: **external urethra opening = euo**

reference point stool fistulas: **anus opening = a**

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 3.0-3.5 cm

however, during surgery it is more in the range of 2.5-3 cm; exceptionally 5 cm

longitudinal bladder diameter (euo/bw minus euo/b) 7-12 cm

anorectum 4-5 cm

symphysis 5-6 cm broad
axis inclination 30-45° as to horizontal in the upright position

pubic arch 85-90°

atf 7.5-8 cm
inclination 25-30° as to horizontal from pubis bone to ischium spine

atlam 7-7.5 cm
inclination 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 45-50° inclination as to horizontal in upright position

angle anterior perineum/posterior perineum 55-65°/115-125°

pelvis outlet surface 75-80 sq cm

gap between levator ani ledges 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

perineum outlet

spb = symphysis to perineal body	3.5-4.5 cm
pb height	2-2.5 cm
anus (+ sphincter) diameter	1.5-2 cm
pac = anus to coccyx bone	4-5-6 cm

ischium spine to upper brim ilium bone 6-7 cm
area of parametrium

ischium tuberosity to upper brim ilium bone 9 cm

rectum 12-15 cm from upper edge S3 to anus

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

reference point urine fistulas **external urethra opening = euo**

reference point stool fistulas **anus opening = a**

references

ashton-miller j a and delancey j o l
functional anatomy of the female pelvic anatomy ann ny acad sci 2007; 1101: 266-296

barber d b
contemporary views of female pelvic anatomy cleveland clin j med 2005 vol 72 suppl 4 S3-S11

delancey j o l
why do women have stress incontinence neurourol urodyn 2010; 29:s13-s17

delancey jol and ashron-miller j a
pathophysiology of adult urine incontinence gastroenterology 2004; 126: 623-632

hafferl a
lehrbuch der topographischen anatomie springer verlag 1957

halban j and talbert j
anatomie und aetiologe der genitalprolapse beim weibe wilhelm braumüller, 1907

hoyte l and damaser m
biomechanics of the female pelvic floor elsevier 2016

lahodny j
vaginale inkontinenz- und deszensuschirurgie ferdinand enke verlag stuttgart 1991

marani e and koch wfrm
the pelvis: structure, gender and society springer verlag 2014

martius h
die gynäkologischen operationen und ihre topographisch-anatomischen grundlagen georg thieme verlag 1960

petros p
the female pelvic floor springer 2010

waaldijk k
29,000 obstetric trauma procedures as covered by 30 annual evaluation reports

and as influenced by many others since the author started his medicine study in 1959 but especially by prof j m greep, prof t k a b eskes and dr med h stenkhoff

obstetric trauma surgery; art and science

kees waaldijk	the (surgical) management of bladder fistula in 775 women in northern nigeria **phd thesis**	university of utrecht	1989
kees waaldijk	step-by-step surgery of vesicovaginal fistulas	campion	1994
kees waaldijk	26,500 obstetric trauma procedures as documented in 30 annuals reports	printmarkt.eu	1983-2013
kees waaldijk	25 years of obstetric fistula surgery	printmarkt.eu	2008
kees waaldijk	obstetric fistula surgery; basics	printmarkt.eu	2008
kees waaldijk	30 years of obstetric trauma surgery	printmarkt.eu	2013
kees waaldijk	sphincter ani rupture	printmarkt.eu	2015
kees waaldijk	functional pelvis anatomy	printmatkt.eu	2016
kees waaldijk	ba hanya/prolapse workshop zaria	printmarkt.eu	2017
kees waaldijk	ba hanya	printmarkt.eu	2017
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