obstetric trauma surgery
art and science

cesarean section obstetric fistulas
circumstances driven

step-by-step reconstruction

kees waaldijk
sponsored and financed by

FISTULA FOUNDATION

pages: 116
color pages: 28

drawings by the author
technical assistance by mark

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katsina
nigeria
obstetric trauma surgery
art and science

setting standards by evidence-based practice

cesarean section fistulas

circumstances driven; not iatrogenic

step-by-step reconstruction

based on

findings and outcome
5,500 reconstructive cs-fistula procedures
5,000 patients
25,000 obstetric trauma procedures

the one and only risk factor of the obstetric fistula

poor obstetric care due to a failed system

all the rest is political blah blah blah rhetoric
deliberate lies and fake information

kees waaldijk
obstetric trauma surgery
art and science

series of textbooks each with a specific topic

setting evidence-based standards

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

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

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

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

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

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

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

the whole series is based on the Kee's archives of obstetric trauma with so far 25,000 reconstructive and conservative procedures in over 21,500 patients with a rare "complete" documentation of each procedure and results as to healing and continence by electronic reports with 150 parameters, over 100,000 pre/intra/postoperative digital photographs and a comprehensive database as personal experience over a 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

there is a huge worldwide cesarean section = cs epidemic which cannot be stopped and is only increasing rapidly

in the low-income countries where the conditions are far from optimal this is reflected by an increase in the circumstances-driven cs-related obstetric fistula

between 1983 and now there was a 3-fold increase in cs and a 3.5-fold increase in cs-related fistulas amongst the obstetric fistula patients as operated by the author

however, the cs-related obstetric fistula is certainly not an iatrogenic fistula but is due to the same horrendous circumstances of a failed system of obstetric care as the other obstetric fistulas

also within the cs-related fistulas the variety is enormous and each fistula has to be considered as its own specific entity with a customized approach

the cs-related fistulas may be isolated or combined with any other obstetric urine/stool fistula

then there are pressure necrotic fistulas with the same cs characteristics in patients who never had a cs or who had a cs in a previous delivery

or there may be a pressure necrotic obstetric fistula in patients who had a cs during the index delivery though too late

in order to achieve optimal results one has to understand the mechanism of action since the emergency cs poses an additional surgical trauma upon an existing obstetric trauma resulting in specific surgical tissue reactions added to possible pressure necrotic reactions

and the cs itself has an impact upon the functional pelvis anatomy by interfering with the position and the mobility of the cervix/uterus

having solved the theoretic problems and the practical consequences the author would like to share his experience and expertise as one textbook out of the series obstetric trauma surgery; art and science to present hard facts and evidence-based guidelines

nb it is high time the whole society takes its responsibility to establish a functioning obstetric care network system instead of persisting in blah blah blah rhetoric and pointing the finger to hard working young doctors

the author

may 2019
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Introduction

Any cesarean section = CS will cause some changes in the normal functional pelvis anatomy by interfering with the position and mobility of the cervix/uterus even if there is no fistula formation; due to scarring and adhesions to the surrounding organs/tissues.

This will be an additional factor in the surgical management and outcome of CS-related obstetric fistulas as well as in necrotic pressure obstetric fistulas in patients in whom a CS has been performed for the index delivery or in another delivery.

The characteristics of CS-related obstetric fistulas are that the cervix and/or uterus and/or ureters are involved in one way or the other related to a CS for the index delivery.

However, the same types of fistula are encountered in women who did not have a CS for the index delivery but had a CS previously.

Then the same types of fistula (even exclusively intrauterine or ureter fistulas) may be found in women who never had a CS.

Most of these fistulas present a superimposed surgical trauma upon an already existing obstetric edematous or pressure necrotic trauma.

And the CS-related obstetric fistula may be combined with all the other types of pressure necrotic and/or instrumental (vacuum/forceps) urine and stool fistulas.

Typical for all these fistulas is that the (anterior) cervix and/or (anterior) uterus are involved except for the ureter fistulas and the vesicocutaneous fistulas.

The major surgical problem is the poor accessibility combined with compromised mobility and position of the cervix and complicated instrument handling deep inside the vagina.

In order to achieve optimal results one has to understand the mechanism of action as the emergency CS constitutes an additional surgical trauma upon an existing obstetric trauma resulting in specific surgical tissue reactions superimposed on pressure necrotic reactions.

Then there are pressure necrotic obstetric fistulas without a CS-related fistula in patients who had a CS previously, for the index delivery or afterwards where the surgical trauma from the CS may interfere with the operation technique and the outcome.

The author

May 2019
circumstances driven cs-related obstetric fistulas

essentials

circumstances driven cs-related obstetric fistulas is on the rise due to the increasing worldwide cesarean section epidemic

circumstances driven cs-related fistula constitutes a surgical trauma superimposed upon an already existing obstetric trauma and has nothing to do with iatrogenic trauma since it is due to the same poor obstetric care due to a failed system as all the obstetric fistulas

even if there is no cs-related obstetric fistula but a pressure necrotic obstetric fistula the cs itself may interfere with the repair and its outcome

a cesarean section will always have an impact upon the functional pelvis anatomy which may vary from minimal if performed timely by an expert under optimal conditions to severe if performed in a late stage when there is already obstructed labor trauma, under poor conditions and/or by an inexperienced surgeon

besides the chance of fistula formation the resulting scar tissue and adhesions to the surroundings and anterior abdominal wall may influence the mobility and the position of the cervix/uterus

since the cervix is the centrum tendineum intrapelvinum and central point of the endo pelvic diaphragm this may interfere with the pelvis physiology

if (in)direct adhesions onto the anterior abdominal wall the cervix/uterus will retract (far up) intraabdominally and move paradoxically cephalad/anteriorly on cough instead of downwards

so there may be tension/traction on the repair during the operation and in the immediate postoperative period interfering negatively with the healing

as a positive effect these adhesions may protect the woman from developing prolapse later in life

since most circumstances driven cs-related fistulas are deep inside the accessibility is poor and the instrumentation complicated

there is also an increasing worldwide obesity epidemic and the combination makes the approach even more difficult

the logical route of approach seems to be the vagina as in all obstetric fistulas

though most cs-related fistulas are vesicovaginal fistulas other possibilities are ureter fistulas and vesicocutaneous fistulas which may need another route

fixed very deep cs-related fistulas in combination with severe obesity may be inoperable by any route
cs related obstetric fistulas

- circumstances driven
- mechanism of action
  - impact upon functional pelvis anatomy
- possibilities
  - enormous variety
cs-related obstetric fistulas

circumstances driven; certainly not iatrogenic

the organizations need a scapegoat to divert the attention from their own failure and non-action blaming hard-working doctors

and all the dead fish are following the flow of the river

introduction

the cs-related obstetric fistula is on the rise; however, to speak of iatrogenic fistulas is an insult to hard-working young doctors and completely besides the truth since these fistulas are due to the same poor obstetric care of a failed system as all the other obstetric fistulas

when something goes wrong the first we do is blaming others instead of looking at ourselves and doing something to solve the problem

one can only speak of iatrogenic surgical complications in elective procedures under optimal working conditions; and then only after a careful audit of all the factors involved since not only patients but also doctors have human rights

in the low(er) income countries a cesarean section is an emergency and the solution to prolonged obstructed labor with already variable amount of tissue “pressure necrosis”

personal figures

the author operated upon

2,434 cs-related obstetric fistulas, out of whom 807 cs-sth_tah-related obstetric fistulas and including 132 ureter fistulas, with a clear relation to cs, cs-sth or cs-tah

50 “cs-related” obstetric fistulas in patients with a previous cs but no cs for the index delivery

566 obstetric fistulas, also pure vesicocervical or vesicouterine, in patients who never in their life had a cs but who definitely would have been classified cs-related if they had had a cs for the index delivery or previously

2,012 pressure necrotic fistulas not related to a cs in patients who had a cs for the index delivery but too late
the real facts

horrendous circumstanes

patients

women only go the hospital for delivery once problems have arisen simply because they are neglected during labor at home and in the hospital; so why pay for all the abuse one suffers

so there are already major complications when they arrive in the hospital

emergency

most CS procedures are emergency procedures like prolonged obstructed labor (already obstetric pressure necrosis, ruptured uterus/bladder, arm prolapse, bleeding); so under tension since things must move fast and the anatomy distorted, not like in elective surgical procedures where one has time to identify and think

hospitals

no proper organization, poor or no equipment, poor malfunctioning operation table, poor malfunctioning instruments starting with blunt scalpels etc, no reliable water supply, no reliable electricity supply, no surgical or other consumables

doctors

the youngest and least experienced since the others refuse to be wakened up at night and then organize and work

since these doctors have little experience they operate under the directions from their operating theater nurse(s) and accept every single rotten instrument that is handed to them

they cannot complain since they will be immediately disciplined and told to shut up; the same as their young resident colleagues all over the world

so these young doctors without proper surgical training have to do things which actually need expert treatment since last resort in prolonged obstructed labor

the whole world including the verbal surgeons and vocal organizations

is nowhere to be found but specifically the verbal surgeons and vocal organizations are fast asleep so during daytime they can open their mouth (nb 8,000-10,000 km away from where the action is) to preach deliberate lies, to advocate fake news and to make political statements nobody needs

however, who is making the start of constructing the

150,000 functioning obstetric units

as needed in africa only

the whole world is sleeping and refusing to do something except for these young hard-working doctors praise to them

shame to the others

real-life scenario

a woman who has been in labor for a couple of days, neglected first at home and then further neglected in the hospital, develops obstructed labor

when she moans the midwife tells her to shut up since she is talking to her friend and she herself had 5 deliveries without making a sound
then sometime along the line it is found that she cannot deliver on her own and needs an emergency procedure and a decision is taken to call the doctor

but first the hospital driver has to be called to bring the doctor to the hospital

the hospital car has not sufficient petrol so someone has to bring some petrol in a tin; the battery is weak and the engine will not start so some people have to be arranged to push to start the car

at last the doctor arrives and takes the decision for an “emergency” cesarean section after the other options like forceps or vacuum have failed (each with their own additional trauma)

however, that is not so easy as said and this has to be organized since no preparation whatsoever

her relatives have to buy the surgical and other medical consumables in the pharmacy outside the hospital since they are not available, out of stock

in the meantime other or the same relatives have to donate blood which is then cross matched

once this has been fulfilled things can be set into motion, but now there is no electricity from the mains

so somebody has to buy some diesel or petrol for the standby generator (if a functioning one is available) to sterilize the instruments (or otherwise on gas stove)

unfortunately, there is no running water so some water from a bucket is used

at last the operation can start and the patient who is now in poor condition due to the enormous energy used due to prolonged labor is placed on the operation table which is not functioning anymore due to lack of maintenance

after he has given the spinal anesthesia the anesthetist goes home since his work has been done

no problem that the operation light has only one functioning bulb and the old generator is sputtering with fluctuations; the usual for an african surgeon

the instruments are either too small or too big and have only one thing in common: they are old, outdated, rusty and malfunctioning since of inferior quality; so what is not good for the high-income world is still good for africa

the surgeon starts the incision but the scalpel is blunt (of inferior quality) so he has to press hard to “cut” thru the skin and that is only the beginning

upon opening the abdomen he finds an already distorted anatomy since the woman is long time in labor; signs of threatening or overt ruptured uterus/bladder or anything else like overfilled bladder (forgotten or impossible to catheterize)

upon dissecting the bladder from the cervix with his blunt scalpel or far too short blunt scissors, there is a bleeder
everybody starts shouting and a too short clamp is placed but either placed wrongly or functioning wrongly so still bleeding; and

the too short clamp is removed and replaced by a too long clamp but this one is also malfunctioning

so everybody is getting nervous; at last after several attempts the bleeder is under control and the uterus opened and the infant taken out

somebody checks whether the infant is dead or alive and starts resuscitation

then there is bleeding from the uterine artery (branches) which has to be clamped with the same malfunctioning too short or too long clamps and then tied

after placing the first clamp the old generator gives up and the rest of the operation has to be continued by using a weak flashlight (batteries always of poor quality)

the rest of the operation is being performed by suturing using a malfunctioning needle holder where the needle is wobbling inside since its grip has gone

whilst also the forceps used to pick up the needle is too short and malfunctioning

at last the operation is finished, a catheter inserted and if she is still alive, which is not always the case, the woman is transferred to the ward

where she is met by a half or fully asleep night nurse who directs further care to the attendant(s) since she wants her dress to stay shiny white

nb it is not unusual when there is a time lapse of 1, 2 or even 3 days between decision for emergency cs and the actual start of operation

circumstances driven: poor obstetric care due to a failed system

so the cs-related obstetric fistulas are due to the same horrible conditions as the other obstetric fistulas

world-wide cs epidemic plus world-wide obesity epidemic

all over the world there seems to be an epidemic of cs termination of pregnancy with an increase in circumstances-driven obstetric cs-related fistulas

since obesity is on the rise, also in africa, this is a risk factor asking for trouble in any kind of surgery; and one cannot wait for slimming down

conclusions

the cs-related obstetric fistulas have nothing whatsoever to do with iatrogenic trauma but are obstetric fistulas due to a failed system
this only shows the poor notion of the obstetric fistula as a whole in people living in the highest income world who try to implement their double standards and their morality in a different low(er) income world due to their false superiority complex

the obstetric fistula in the highest income world disappeared by establishing a network of functioning obstetric units

once the same has been achieved in the lower income world the obstetric fistula will disappear as well

however, as long as these horrendous conditions still exist it does not make sense to call some of these fistulas iatrogenic even though related to a cs or any other obstetric procedure

and one cannot compare emergency surgery with elective surgery

**one can only speak of iatrogenic surgical trauma**

**in**

**elective procedures**

**with**

**normal anatomy**

**under**

**optimal working conditions**

and doctors have to stand up for their own human rights

luckily things are changing slowly due to ever improving socioeconomic conditions of societies in transition from low to middle income where people are taking things in their own hands; the lesson learned from the past when the present high-income societies were low income then

unfortunately and in contrast, the author still has to see the first obstetric fistula being prevented by the blah blah blah political rhetoric of the very vocal bystanders without any action to implement their words by deeds not a single obstetric unit to boast off

kees waaldijk

may 2019
cs-related obstetric fistulas

mechanism of action

the cs-related obstetric fistula is on the rise due to the exploding cs epidemic world wide due to the same circumstances of a failed system of obstetric care as all the other obstetric fistulas and as such has nothing to do with iatrogenic trauma

most cs-related obstetric fistulas are a combination of surgical trauma superimposed upon an already existing obstetric edematous and/or pressure necrotic trauma

the mechanism of action of the effects of a cs on the functional pelvis anatomy is being explained by interfering with the position and mobility of the cervix/uterus

a cesarean section will always have an impact upon the functional pelvis anatomy which may vary from minimal if performed timely by an expert under optimal conditions to severe if performed in a late stage when there is already obstructed labor trauma, under poor conditions and/or by an inexperienced surgeon

whilst postoperative wound infection, common in the low- and middle-income countries, may complicate the situation further

elective cs with proper antenatal care
since everything can be planned problems are anticipated (already during the antenatal care) though during surgery anomalies may become evident but one has sufficient time to weigh all options

emergency cs bco neglected antenatal care and neglected childbirth
since things must march quickly there is additional stress upon all the personnel but especially upon the surgeon at all (also odd) times and there is no time to contemplate since decisions and handling have to be quick; so more complications and more serious ones are to be expected which one cannot blame upon the surgeon in his efforts either to help the infant or the mother or both

besides the chance of fistula formation the resulting scar tissue and adhesions to the surroundings and anterior abdominal wall may influence the mobility and the position of the cervix/uterus

since the cervix is the centrum tendineum intrapelvinum and central point of the endo pelvic diaphragm this may interfere with the pelvis physiology

during the healing process (in)direct adhesions are formed between the uterus/cervix or remnants/vault and the anterior abdominal wall resulting in (severe) retraction/fixation of cx or vault with paradoxical anterior movement into the abdominal cavity upon cough so there will be continuous and/or intermittent traction/tension on the repair site in varying degrees

if (in)direct adhesions onto the anterior abdominal wall the cervix/uterus will retract (far up) intraabdominally and move paradoxically cephalad/anteriorly on cough instead of downwards
or the cervix may be fixed towards the lateral pelvis wall, deep inside towards the right or left ischium spine

the same happens after a subtotal or total abdominal or vaginal hysterectomy for non-obstetric conditions

this will pose additional characteristics for cs-related obstetric fistulas and also for pressure necrotic obstetric if a cs has been performed previously, for the index delivery or afterwards

the accessibility may be compromised since fistula deep inside with poor mobility; and complicated instrumentation

in order to improve the access to the operation field a liberal use of uni-, median or bilateral episiotomy is recommended

especially the combination of a retracted cs-related fistula and severe obesity is a major challenge to any fistula surgeon

since the repair may be under tension intraoperatively and postoperatively interfering negatively with the healing and continence; during operation efforts have to be made to neutralize this traction

it may influence the development of post cs incontinence since strong traction by cervix onto posterior urethra wall via the pubocervical musculofascia (anterior part of endopelvic diahragm)

if postrepair incontinence develops, special attention has to be paid to neutralize the strong traction by the retracted/moving cervix by bilateral (re)fixation of the endopelvic diaphragm onto the paraurethral pubis bone in order to reduce the posterior urethra wall and euro into its anatomic position with normalization of the anatomic continence mechanism with increase in outflow resistance

early sex during the immediate postoperative period may lead to recurrence since the tip of the penis is thrusting against the cervix which may disrupt the repair so special instructions are given

however, compliance is poor since and the patient and her husband/partner think she is fully cured since no leaking

the positive effect of a cs may be that the scarring/adhesions protect the woman from developing cervix/uterus prolapse later in life though the scarring/adhesions may soften up due to subsequent pregnancies

if a ureter fistula develops the mechanism of action may be
aa direct sharp trauma by scalpel or scissors; with ureter draining into the vagina by a clear-cut opening
bb blunt trauma by clamp or suture; with ureter draining into the vagina by scarred tract
cc denuding interfering with the blood supply; with ureter draining into the vagina by scarred tract

only ureter fistulas with a clear cut opening into the vagina, vault or cervix may be suitable for vaginal re-implantation
the cs-related vesiocutaneous fistula = cs-vcf is probably far more frequent than thought and should be taken into consideration if the cs wound has not healed within 2-3 weeks in the classic longitudinal midline incision but also in the lower transverse pfannenstiehl incision.

dis this could be the result of ruptured bladder though that is posteriorly due to ruptured uterus, surgical trauma to the anterior bladder or a suture thru the anterior bladder on closing the abdomen.

the author does not think wound infection is playing a role since the organ wall is a very strong barrier against abscess formation.

the better one understands the mechanism of action in combination with the obstetric trauma the better one will be able to perform the reconstructive surgery of the fistula and of the functional pelvis anatomy as required condition for the physiology.

as a positive effect these adhesions may protect the woman from developing prolapse later in life.

Conclusion

this is the first time attention is drawn to the impact of a cesarean section on the functional pelvis anatomy and physiology and to the fact that following a cs the cervix/uterus may be retracted high up into the abdomen due to scarring and (in)direct adhesions to the anterior abdominal wall with paradoxic movement cephalad and anteriorly on cough instead of coming downwards; which may prevent the development of prolapse.

or the cervix may be fixed to the lateral pelvis wall, either right or left ischium spine.

with consequences for the operation technique for the initial repair and for the eventual postrepair incontinence.
cs-related obstetric fistulas
variety of possibilities

cs-related fistulas
as with all obstetric fistulas there is an enormous variety in cs-related obstetric fistulas also which makes obstetric trauma surgery so challenging

intracervical cs-fistulas involving anterior cervix type kees I

intrauterine cs-fistulas involving anterior uterus type kees I

intracervical_uterine cs-fistulas involving anterior uterus and anterior cervix type kees I,
cs-fistulas involving anterior cervix and anterior vagina wall type kees I, kees IIAa, kees IIAb, kees IIBa and kees IIIBb
cs-fistulas involving anterior cervix, anterior uterus wall and anterior vagina wall type kees I, kees IIAa, kees IIAb, kees IIBa and kees IIIBb
cs-fistulas after (sub)total cs-hysterectomy; the vault fistulas
cs-fistulas combined with other pressure necrotic obstetric fistulas
cs-related vesicocutaneous fistulas type kees III which may be combined with any of the above
ureter fistulas type kees III which may be combined with any of the above
pressure necrotic fistulas where a cs has been performed without a cs-related fistula
all those fistulas may be combined with stool fistulas in all its forms

position of cervix

cervix fixed or retracted intraabdominally with or without (in)direct adhesions to anterior abdominal wall which may result in paradoxic movement upon cough

fixed towards R or L ischium spine

which means difficult access to operation field and/or traction upon the repair site after closure

and there are situations whereby also the resulting fistula is fixed onto anterior abdominal wall or lateral pelvis wall which makes a repair very complicated

combined with an increasing worldwide tendency to obesity
conservative and surgical management

immediate management
by catheter and high oral fluid intake

surgical management
route of repair
cs-fistulas
vault fistulas
primary suturing
ureter fistulas
vesicocutaneous fistulas
results
postrepair incontinence
rvf + cs
immediate management
by
catheter and/or early closure

introduction

the immediate management of the obstetric fistula in all its forms is an important tool in healing and as such in preventing the woman from becoming an “outcast”

and should start the moment the leaking of urine is manifest

catheter treatment

as soon as urine leaking, in whatever form and whatever the extent of the necrotic/surgical trauma, is evident it is mandatory to insert an indwelling bladder catheter to support the spontaneous healing process
the earlier this is done the better the chance of spontaneous healing

high oral fluid intake

a high oral fluid intake of at least 4,000-6,000 ml/24 hr is necessary to flush out any debris and prevent ascending infection

early closure if not healed by catheter

as soon as the wound is clean a repair can and should be performed since the results are superior
according to the guidelines/principles as will be explained

general condition

a high-protein diet and oral hematinics are recommended as standard

antibiotics

only in case of generalized sepsis like puerperal sepsis
otherwise it will only contribute to the worldwide problem of drug resistance and lead to expensive waste urine

peroneus nerve trauma

immediate and if needed forced mobilization to prevent ankle/leg contractures and to promote general health
compassion not pity is needed

eclampsia

one should be aware of eclampsia which is very prevalent in the low- and middle-income countries pre- intra- and postpartum and also pre-, intra- and postoperatively even months after delivery
immediate management

by

catheter and/or early closure

the immediate management of the obstetric fistula in all its forms is an important
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vaginal versus other route(s) of repair

vaginal versus abdominal approach

performing a fistula repair thru the abdomen or thru the bladder is like performing a
tonsillectomy thru the neck

some people claim that an abdominal repair is advanced level surgery; though actually it

comes from a lack of anatomic knowledge, lack of vaginal surgical skills and lack of

common sense

so where is the advanced level

a repair thru the abdomen requires going thru the skin, subcutis, muscle fascia, muscle,
muscle fascia, peritoneum, in between the bladder and cervix if present and then one is

exactly where one is without any dissection in one go per vaginam

what an additional surgical trauma

and then the actual repair starts

whilst after fistula repair the abdomen still has to be closed

and general anesthesia

a repair thru the bladder requires going thru the skin, subcutis, muscle fascia, muscle,
muscle fascia and anterior bladder wall and then one is exactly where one is without any

dissection in one go per vaginam

what an additional surgical trauma

and then the actual repair starts

whilst after fistula repair the anterior bladder and abdomen still have to be closed

and general anesthesia

vaginal versus laparoscopic approach

the same arguments can be used; and why would one push an instrument thru the

abdomen to come inside the vagina

besides this, though laparoscopic surgery in the high-income countries is an established

safe procedure, the instruments are expensive, its maintenance complicated, requires

highly trained surgeons and other personnel, requires reliable electricity, requires

general anesthesia and is time consuming so actually not suitable for middle- and low-
income countries

conclusion

whatever other surgeons do is up them but the author, even as an experienced old-
fashioned general surgeon, abdominal surgeon, colorectal surgeon and traumatologist, is

using and advocating the vaginal approach exclusively

except for some ureter fistulas and vesicocutaneous fistulas

only once in his life he used the abdominal approach for a cs-vesicouterine fistula which

was the second fistula repair in his obstetric trauma career when he was not so familiar

with vaginal surgery; so once out of over 25,000 obstetric trauma procedures
discussion

the aim of fistula surgery is to close the fistula, make the patient continent and preserve something for sexual intercourse

if these three things are achieved the woman will be able to lead a normal life medically, mentally and socially

how to proceed is up to the surgeon and if one is successful with his/her approach (s)he should continue since in medicine the one who cures is right

still there are some limitations to all approaches

though the vagina route is the least traumatic and can be used for all types of fistula, it may need (large) episiotomy but especially skills and when very deep in obese patients may be not advisable/possible though after slimming down it may become operable; so the deeper the fistula inside the vagina the more complicated the repair especially if the mobility is restricted

the limitations of the abdominal and laparoscopic approach are that this is only feasible for fistulas confined to the proximal vagina third/half

another physiologic route but only for small mid- or proximal third vagina fistulas would be via the external urethra opening using special instruments via a cystoscope but then the urethra has to be dilated to rather large proportions whilst filling the bladder by fluids is compromised

the argument that the abdominal, transvesical or laparoscopic approach in fistula and in (postrepair) incontinence surgery is less complicated and results in better closure and continence rate has never been proven by evidence-based data and according to the author does not make sense as based on his own real evidence-based data

besides this, the problem is not the route of operation but the poor understanding of the functional pelvis anatomy, the mechanism of action and the complex obstetric trauma resulting in tricks which may work; and quantity instead of quality

though we all started with supervised tricks at a certain point one must ask oneself what exactly am i doing and how can i improve

though other surgeons may prefer and advocate the abdominal, transvesical or laparoscopic route for some types of fistula and should continue to do so since anyone is responsible and accountable for his/her own actions

the author prefers exclusively the vagina as route of choice with excellent results not based on assumptions and small numbers but based on hard evidence-based data in very large numbers with extensive documentation from the very first to the very last in a fully randomized manner without a single one missing
most common type cs-related fistulas
step-by-step

introduction
the most common type is a small- or medium-size kees I fistula or a medium-size kees IIAa fistula with involvement of the cervix

preloading with high oral fluid intake

step-by-step reconstruction
under spinal anesthesia in the exaggerated lithotomy position

001 examination under anesthesia
with assessment of all the obstetric and other lesions

002 classification
as based on the obstetric trauma characteristics

003 determine (im)mobility of cervix and paradoxic movement on cough
the more mobile the tissues the less complicated the repair

004 devise plan of operation
and stay focused

start

005 uni-, median or bilateral episiotomy
even small ones may give far better access to the operation field
within skin lines/grease for good cosmetic healing

006 check with metal sound
for bladder stones
and to get impression of bladder capacity

007 if indicated make an effort to identify and then catheterize ureter(s)
leave the metal inside for safe dissection
though normally the ureters are not in the midline and are not in danger in this type of fistula

008 incision around fistula edge
with bilateral physiologic extension at cervix level

009 sharp dissection of avw
from the endopelvic diaphragm
010 sharp dissection of bladder
from the cervix

011 decide transverse or longitudinal closure
upon common sense and what is technically possible, since transverse closure deep
inside the vagina is complicated

012 if transverse closure
start bilaterally and work towards the midline

013 if longitudinal closure
start with the most proximal since this is a decisive factor; if not done properly the repair
will breakdown
and then work from proximally towards distally
or the other way starting distally

014 if necessary refix endopelvic diaphragm
onto the anterior cervix as the central point of the endopelvic diaphragm

015 check for closure and continence
by asking the patient to cough with a filled bladder
combined with suprapubic pressure push

016 no need to check with a dye

017 far more important is to check that not a piece of bladder mucosa
is sticking out between the sutures since that will interfere negatively with the healing

018 and if found push it back so that it cannot interfere negatively
with healing and if necessary secure this by an inverting suture

019 insert calibrated metal sound thru euo into the bladder
until it touches the bladder dome wall, remove it and
determine the distance euo/bladder wall = euo/bw in cm

020 insert foley catheter and inflate balloon
check for free urine flow

nb free good urine flow means
a catheter inside bladder
b at least one ureter functioning
c patient not in shock

021 deflate balloon and take out catheter

022 determine urethra length in cm
distance euo/balloon = euo/b in cm
023  determine longitudinal bladder diameter
    = euo/bw minus euo/b in cm
    as indication of bladder capacity

024  remove ureter catheters
    since they have done their job

025  insert indwelling bladder catheter
    balloon or fix it

026  transverse or longitudinal avw/cervix closure
    by evertting sutures and
    check for good hemostasis

027  check again for free good urine flow
    thru indwelling bladder catheter

028  closure of episiotomy

029  vagina pack
    up to preference of surgeon
    loose or with compression to stop eventual oozing

030  if everything ok
    the patient can be transferred to the postoperative ward

write an operation report immediately after the operation, including all the relevant data
so everything is documented also major intraoperative complications; the better the
documentation the more valuable an evaluation becomes of the technique(s) and the program

cave
at dissection of the bladder from the cervix (branches of) the uterine artery may be
traumatized

if that happens do not panic (the uterine artery is not the aorta) and do not place clamps
haphazardly which may traumatize the ureter

but apply compression by gauze for some time since minor bleeders will stop and if not
then locate the exact place and apply cross suture, leave it long so you can use it again
if necessary, when the bleeder is under control proceed with the repair

however, if there is a strong bleeder where the hemostasis is very complicated, control
the bleeder by compression sutures thru the avw and cervix and if controlled terminate
the operation and postpone the real repair for 1 or 2 months; safety is the first priority

see also chapter on primary suturing
step-by-step reconstruction

first suture; inverting

second suture

third suture
step-by-step reconstruction

fourth suture

fifth suture

epd/bladder closed

avw adaptation; evertine

operation end
intracervical and/or intrauterine fistulas

type kees I

introduction

these fistulas are not visible inside the vagina and may vary from small to medium to large and a dye test may be needed to confirm their presence

nb though it is claimed that these patients only complain about menuria (= hematuria during menstruation) this could not be confirmed by the author since all the patients he operated were leaking urine thru the vagina with only one complaining about leaking + menuria whilst one claimed to be leaking but totally dry when menstruating

preloading with high oral fluid intake

step-by-step reconstruction

under spinal anesthesia in the exaggerated lithotomy position

001 examination under anesthesia
with assessment of all the obstetric and other lesions

002 classification
as based on the obstetric trauma characteristics

003 determine (im)mobility of cervix and paradoxic movement on cough
the more mobile the tissues the less complicated the repair

004 devise plan of operation
and stay focused

start

005 uni-, median or bilateral episiotomy
even small ones may give far better access to the operation field
within skin lines/grease for good cosmetic healing

006 check with metal sound
for bladder stones
and to get impression of bladder capacity

007 if indicated make an effort to identify and then catheterize ureter(s)
however in this type of fistulas the ureters are not in danger
considering the topographic course of the ureters
but exceptions confirm the rule
the most elegant way to proceed is analogous to vaginal hysterectomy

008 semicircular incision at anterior cervix

009 dissection of bladder from cervix up to the fistula

((another way of access to fistula; effective but not so elegant and only for intracervical fistulas, not for intrauterine fistulas

008a transverse incision thru cervix
  up to the fistula
  cave trauma to uni- or bilateral uterine artery))

010 further dissection of bladder from cervix
  up to and slightly beyond proximal fistula edge

011 dissection must be sufficient
  to provide good visualization of the operation field
  and to allow instrument/needle manipulation between the bladder
  and what is left of the anterior cervix and/or anterior uterus

012 longitudinal bladder closure since
  transverse closure not possible technically
  start with the most proximal and most complicated suture
  if this is not properly done the repair will breakdown
  then work from proximally towards distally
  by a single layer of inverting polyglycolic acid sutures

014 check for leaking and continence

015 determine urethra length and longitudinal bladder diameter in cm

016 insert indwelling bladder catheter
  check for functioning and
  balloon or fix it

017 if possible longitudinal closure of cervix and/or uterus
  by single layer of polyglycolic acid sutures
  though most of the time this is being left alone

018 semicircular hemostatic avw/cervix adaptation
  by evertting polyglycolic acid sutures
  os is open
((018a  transverse hemostatic cervix closure for transverse incision leaving os open))

019  check on hemostasis
     aim for complete hemostasis

020  vagina pack

021  if everything ok
     transfer patient to postoperative ward

see also chapter on primary suturing

remarks

in a selected group of patients, eg a multipara with live children near the menopause, where the full repair is very complicated or dangerous or impossible there is one option to keep in mind

surgical closure of the cervix which will result in menuria (will stop after menopause) by circular excision of cx tissue especially mucosa around the os and then transverse closure which sounds easier than is done

this has to be discussed with the patient and only proceed with consent; few patients refuse this option and that has to be respected

if no consent it is up to the surgeon to continue with a very complicated procedure with a retracted/moving cervix_uterus deep inside the vagina especially in obese patients taking into account major complications (ureters, severe inaccessible deep bleeding) or to discontinue

remember it is always the last surgeon to be blamed for the whole misfortune; the first one walks free and does not care
transverse hemostatic cervix closure for transverse incision leaving os open.

Check on hemostasis aiming for complete hemostasis.

Vagina pack if everything ok.

Transfer patient to postoperative ward.

See also chapter on primary suturing.

Remarks:
In a selected group of patients, e.g., a multipara with living children near the menopause, where the full repair is very complicated or dangerous or impossible, there is one option to keep in mind: surgical closure of the cervix which will result in menuria (will stop after menopause) by circular excision of cervical tissue especially mucosa around the os and then transverse closure which sounds easier than it is done. This has to be discussed with the patient and only proceed with consent; few patients refuse this option and that has to be respected.

If no consent, it is up to the surgeon to continue with a very complicated procedure with a retracted/moving cervix-uterus deep inside the vagina especially in obese patients, taking into account major complications (ureters, severe inaccessible deep bleeding) or to discontinue.

Remember it is always the last surgeon to be blamed for the whole misfortune; the first one walks free and does not care.
step-by-step reconstruction

first suture; inverting

second suture

third suture
step-by-step reconstruction

last suture

bladder closed

avw/cervix adaptation; everting

operation end

cervix adaptation; everting

operation end

© kees
combination separate necrotic and cs-fistula

step-by-step

introduction

the combination of a type kees I cs-fisula with separate pressure necrotic type kees IIAa, IIAb, IIBa and IIBb fistulas is frequently found

and then the classification of both should shift to the necrotic type kees IIAa, IIAb, IIBa or IIBb for the whole complex

plan of action

only a small type kees IIAa fistula in combination with a type kees I cs-fistula should be performed in one stage

in the other combinations the pressure necrotic type kees IIAa, IIAb, IIBa or IIBb should be repaired first with their own specific relevant operation technique as first stage

though the bladder will be decompressed by the still existing cs-fistula an indwelling bladder catheter is inserted and left in situ for additional drainage but especially to keep open the urethra; otherwise a urethra block may develop

and then once healed

the cs-fistula should be repaired as second stage according to the principles outlined in the previous chapter

sometimes it may be tempting to do both in one session but it is better to concentrate on one thing at a time in a safe systematic manner than compromise the operation and the outcome

step-by-step reconstruction

under spinal anesthesia in the exaggerated lithotomy position

the different types are operated according to the relevant principles as described in the textbooks comprehensive training manual and kees classification of the obstetric fistula under the series obstetric trauma surgery; art and science by the author

see also chapter on primary suturing
combined necrotic with cs-fistula fused as one
step-by-step

introduction

a pressure necrotic fistula may fuse with a cs-fistula to form one fistula type kees IIAa, kees IIAb, kees IIBa or kees IIBb

normally these fistulas are large or even extensive especially when the cs-fistula involves the uterus as well

when the proximal part of the fistula is fixed high up to the anterior abdominal wall the repair becomes very complicated

when there is extensive tissue loss and/or everything fixed/fibrotic the fistula may be inoperable vaginally, abdominally and laparoscopically

step-by-step reconstruction
under spinal anesthesia in the exaggerated lithotomy position

the different types are operated according to the relevant principles as described in the textbooks comprehensive training manual and kees classification of the obstetric fistula under the series obstetric trauma surgery; art and science by the author

however, a must in these fistulas is catheterization of both ureters before even an incision is made

see also chapter on primary suturing
cs-sth and (cs-)tah and tvh vault fistulas

introduction

the vault fistulas after cs subtotal = cs-sth or cs total abdominal hysterectomy = cs-tah
are normally small type kees I fistulas at or near the vagina vault

the same type may be found after total abdominal = tah or vaginal hysterectomy = tvh
for other conditions like fibroids, prolapse etc

characteristics

small fistulas deep inside within scar tissue whereby the vault is fixed, medially, laterally
or far in the corner

though large ones are possible as well

main problem

since they are deep inside accessibility is compromised, instrumentation is complicated
and mobility is poor

the more so if combined with severe obesity

preloading with high oral fluid intake

step-by-step reconstruction

under spinal anesthesia in the exaggerated lithotomy position

001 examination under anesthesia
with assessment of all the obstetric and other lesions

002 identify the fistula
which may be difficult in small ones and then the dye will help

003 determine (im)mobility of vault/what is left of cervix
the more mobile the tissues the less complicated the repair

004 devise plan of operation
and stay focused

start
005 uni-, median or bilateral episiotomy
even small ones may give far better access to the operation field
within skin lines/grease for good cosmetic healing

006 check with metal sound
for bladder stones
and to get impression of bladder capacity

007 if indicated make an effort to identify and then catheterize ureter(s)
leave the metal wire inside for safe dissection
though normally the ureters are not in danger in this type of fistula

008 pick up avw distally from fistula by strong allis clamp(s)
and instruct assisting theater nurse to pull towards the outside
so that the operation field will be moved towards the outside
and the repair may become less complicated

008 incision around fistula edge
with bilateral physiologic extension thru vault/cervix remnants

009 sharp dissection of avw
from the endopelvic diaphragm/bladder
whereby

010 abdomen may be opened
intentionally or unintentionally
which may facilitate bladder closure

011 transverse, oblique or longitudinal closure
upon common sense and what is technically possible
by single layer of inverting polyglycolic sutures

012 check for closure and continence
by asking the patient to cough with a filled bladder
combined with suprapubic pressure push

013 no need to check with a dye

014 far more important is to check that not a piece of bladder mucosa
is sticking out between the sutures since that will interfere negatively with the healing

015 and if found push it back so that it cannot interfere negatively
with healing and if necessary secure this by an inverting suture

016 insert calibrated metal sound thru euo into the bladder
until it touches the bladder dome wall, remove it and
determine the distance euo/bladder wall = euo/bw in cm
017 insert foley catheter and inflate balloon
check for free urine flow

nb free good urine flow means
  a catheter inside bladder
  b at least one ureter functioning
  c patient not in shock

018 deflate balloon and take out catheter

019 determine urethra length in cm
distance euo/balloon = euo/b in cm

020 determine longitudinal bladder diameter
  = euo/bw minus euo/b in cm
  as indication of bladder capacity

021 remove ureter catheters
since they have done their job

022 insert indwelling bladder catheter
balloon or fix it

023 transverse vault closure (which will close the abdomen as well)
by everting sutures and
check for good hemostasis

024 check again for free good urine flow
  thru indwelling bladder catheter

025 closure of episiotomy

026 vagina pack
  up to preference of surgeon
  loose or with compression to stop eventual oozing

027 if everything ok
the patient can be transferred to the postoperative ward

write an operation report immediately after the operation, including all the relevant data
so everything is documented also major intraoperative complications; the better the
documentation the more valuable an evaluation becomes of the technique(s) and the
program

remarks
in sth-fistulas, the bladder may be closed onto the inner side of the posterior cervix rem
nants after dissection
41. Insert Foley catheter and inflate balloon.

42. Check for free urine flow.

NB: Free good urine flow means a catheter inside the bladder.

43. At least one ureter functioning.

44. Patient not in shock.

45. Deflate balloon and take out catheter.

46. Determine urethra length in cm.

47. Distance euo/balloon = euo/b in cm.

48. Determine longitudinal bladder diameter = euo/bw minus euo/b in cm. As indication of bladder capacity.

49. Remove ureter catheters since they have done their job.

50. Insert indwelling bladder catheter balloon or fix it.

51. Transverse vault closure (which will close the abdomen as well) by everting sutures and check for good hemostasis.

52. Check again for free good urine flow thru indwelling bladder catheter.

53. Closure of episiotomy.

54. Vagina pack up to preference of surgeon, loose or with compression to stop eventual oozing.

55. If everything is ok the patient can be transferred to the postoperative ward.

56. Write an operation report immediately after the operation, including all the relevant data so everything is documented also major intraoperative complications; the better the documentation the more valuable an evaluation becomes of the technique(s) and the program.

Remarks:

In sth-fistulas, the bladder may be closed onto the inner side of the posterior cervix remnants after dissection.
step-by-step reconstruction

bilateral sutures; inverting

middle suture

epd/bladder closed

vault adaptation; everting

operation end
primary suturing of obstetric fistulas
minimum safe surgery

introduction

the aim of reconstructive surgery is to adapt the right type of tissue so that nature can take over the physiologic healing process since the surgeon cannot heal

how the tissues are adapted is not important only that the right type of tissue is adapted; and there are many roads leading to rome

in the obstetric fistula the adaptation of the bladder or rectum is the most important since these are high-pressure organs compared to the zero-pressure vagina so that urine or stools first leak into the vagina and then thru the vagina to the outside

once these high-pressure organs heal the low-pressure vagina (wall) will always heal; so one has to concentrate on closure of the bladder and/or rectum

in 1988 the author started with one awv adaptation suture in combination with indwelling bladder catheter to treat a 18-day old type kees IIa fistula, then more now everting adaptation sutures, then a freshening of the edge with everting adaptation sutures, then freshening with minimal dissection with everting adaptation all in a prospective study resulting in the early closure management of the obstetric fistula and from 1992 this became evidence-proof standard

theoretic and practical background of primary suturing

the principle of incision, minimal dissection and only everting closure of the anterior vagina wall can still be used since automatically by everting closure of the awv the dissected pubocervical musculofascial (endopelvic diaphragm) with adherent posterior bladder wall will be inverted and adapted so nature can take over

it can even be perfected by picking up the epd minimally (so no danger of traumatizing ureters)

in the author’s experience this will result in a closure rate of at least 60% and is used regularly by him

especially in tricky situations when the ureters cannot be identified/catheterized or when real dissection is dangerous or as last resort when all other options fail or under high tension

total decompression of the bladder by an indwelling catheter for a sufficiently long period is a must
preloading with high oral fluid intake

**step-by-step reconstruction**
under spinal anesthesia in the exaggerated lithotomy position

001 examination under anesthesia
since only under anesthesia a real assessment can be made

002 assess the possibilities
weigh all the options against each other carefully

003 continue with primary suturing
if all other options are out of scope

004 episiotomy
uni-, median or bilateral

005 catheterize ureter(s)
if possible

006 incision at the fistula edge by scalpel
all around the fistula

007 minimum sharp dissection
if possible

008 otherwise needle dissection
whereby the needle goes in between
the anterior vagina wall and the endopelvic diaphragm
at the same time dissecting the tissues
especially in early closure

009 broad avw adaptation with tension
by everting sutures
so that as well the pubocervical musculofascial (endopelvic diaphragm)
with adherent posterior bladder wall will be inverted and “watertight” adapted

010 check for leaking and continence

011 determine urethra length and longitudinal bladder diameter in cm

012 insert indwelling bladder catheter
check for functioning and
balloon or fix it

013 check on hemostasis
aim for complete hemostasis
014 closure of episiotomy

015 vagina pack
   if still some oozing
   or tight to stop some deep bleeding which cannot be controlled otherwise

016 if everything ok
   transfer patient to postoperative ward

nb indwelling bladder catheter with high oral fluid intake for at least 3-4 weeks

extended primary suturing
the same principles can be used in all types of obstetric fistula surgery when it is clear
during a repair that the endopelvic diaphragm with adherent posterior urethra/bladder
cannot be closed meticulously or cannot be adapted sufficiently

008 inverting “approximation” of pubocervical musculofascia
   with adherent posterior bladder/urethra
   by 1 or 2 or more inverting polyglycolic acid sutures

then proceed with primary suturing as outlined above

009 broad avw adaptation with tension ............. thru 017

discussion
the theoretic and surgical principles are sound medical practice using common sense for
a condition which otherwise would be inoperable
carrying minimum risk and minimum surgical trauma though still highly complicated as
last resort
the evidence-based result in some hundreds of patients of minimum 60% is acceptable
against 0%
 thru these principles and backed up by the result the author was able to further develop
 the immediate management of the obstetric fistula by catheter and/or early closure
 especially in high type kees Ia stool fistulas this minimum technique is very effective
 and safe

conclusion
primary suturing is an important tool within the complete arsenal of the obstetric trauma
surgeon with a closure success rate of some 60%

however
there always remain fistulas where the amount of tissue loss or the scarring/fibrosis is
such that adaptation and as such surgical repair is not possible which will remind any
surgeon of his limitations in the management of the obstetric trauma
ureter fistulas

type kees III

introduction
the ureter fistula constitutes an abnormal connection between the ureter and the cervix, vault or vagina ending into these organs either directly or indirectly via scarred tract

most of them are due to surgical trauma during cs, cs-sth, cs-tah, tah, tvh, prolapse surgery or during an obstetric fistula repair

it may involve one ureter or both

however, some patients presented with an obstetric ureter fistula who never had cs or another operation or instrumental delivery; so by obstetric ?pressure necrotic? trauma

and there are congenital ectopic ureters

the obstetric trauma surgeon is familiar with the ureters since he encounters them on a daily base during his fistula surgery either still ending into the bladder, into or near the fistula edge or into the vagina outside the fistula edge whilst from time to time isolated ureter fistula without another obstetric fistula

all the different types of ureter fistulas need some kind of surgery

the ones encountered during obstetric fistula surgery catheterization and eventual reposi titioning as part of the repair

most of the isolated ureter fistulas need an abdominal reimplantation though some are very suitable for vaginal reimplantation as will be outlined

and then there is ureter trauma during the course of an obstetric fistula repair which need immediate attention if detected intraoperatively and otherwise later

surgical mechanism of action
there are 3 different surgical mechanisms of action
real sharp surgical trauma by scalpel or scissors
trauma by clamp or suture
trauma by denuding
with or without scar formation

and there are 2 types of ureter fistulas
those with clear cut ending into vagina or cervix
and those with scarred fistulous tract
which may be indicative of how to repair them

whilst both may be accompanied by an obstetric vesicovaginal fistula
kidney function

though normally the kidney on the side of the ureter fistula is functioning this may be compromised by obstructed outflow due to scarring though the kidney on the other side will compensate for this

diagnosis

suspicion if after a cs the patient is leaking continuously day and night and pass urine herself

especially with small intracervical fistulas and ureter fistulas with objective intrinsic stress incontinence

really preloading with fluids before operation then at examination under anesthesia before operation is started perform dye test to exclude or confirm ureter fistula since no dye inside vagina but clear urine, identify the ureter opening which is many times not possible especially in intracervical fistulas and fistulas with scarred fistulous tract then decide what to do

if in doubt about small intracervical cs-fistula or ureter fistula leave indwelling bladder catheter in and if still leaking with catheter in situ this is a strong indication of a ureter fistula

ureter fistula combined with stress incontinence

there is a frequent combination of a ureter fistula with stress incontinence either due to traction onto posterior urethra wall or since the ureter fistula works as a kind of pace maker

normally the stress incontinence disappears after successful ureter re-implantation but sometimes an incontinence operation is necessary

this is the first time notice is being drawn to this aspect

this was noted first by the author in 2003 in sokoto vvf-repair 404 + 505 + 675 when he operated upon a patient in sokoto bco post repair then post cs incontinence and again 3rd obstetric post cs intrinsic stress incontinence where on ending the continence operation the patient was still leaking from a R ureter fistula which was vaginally re-implanted with complete cure postoperatively

treatment

treatment is by surgical re-implantation of the ureter proximally from the trauma into the bladder

normally this is done by the abdominal route or by laparoscopic surgery for all types of ureter fistula

fistulas with scarred fistulous tract by abdominal re-implantation

only fistulas with clear-cut ending into vagina are suitable for vaginal re-implantation if identified and if catheterizable
though unilateral ureter fistulas are the norm bilateral ureter fistulas do occur

ureter openings inside the fistula edge or near to the edge are incorporated in the fistula repair and do not need explicit re-implantation

and then of course distally traumatized ureters or ureter trauma during the obstetric fistula repair

operation technique abdominal ureter re-implantation
see the textbooks on urology with straightforward guidelines/principles

operation technique laparoscopic ureter re-implantation
see textbooks on laparoscopic surgery

operation technique vaginal ureter re-implantation
only suitable for ureters with a clear-cut opening into the vagina which are easily catheterized for 20 cm

preloading with high oral fluid intake

**step-by-step reconstruction**
under spinal anesthesia in the exaggerated lithotomy position

001 examination under anesthesia
with assessment of all the obstetric and other lesions

002 identify the ureter opening or leakage location
which may be difficult
if leaking via fistulous tract decide for abdominal repair and terminate
if clear-cut ending and easy catheterization for 15-20 cm
continue with vaginal re-implantation

003 devise plan of operation
and stay focused

**start**

005 uni-, median or bilateral episiotomy
even small ones may give far better access to the operation field
within skin lines/grease for good cosmetic healing

006 check with metal sound
for bladder stones
and to get impression of bladder capacity
though unilateral ureter fistulas are the norm bilateral ureter fistulas do occur
ureter openings inside the fistula edge or near to the edge are incorporated in the fistula repair and do not need explicit re-implantation
and then of course distally traumatized ureters or ureter trauma during the obstetric fistula repair operation technique abdominal ureter re-implantation see the textbooks on urology with straightforward guidelines/principles operation technique laparoscopic ureter re-implantation see textbooks on laparoscopic surgery operation technique vaginal ureter re-implantation only suitable for ureters with a clear-cut opening into the vagina which are easily catheterized for 20 cm preloading with high oral fluid intake step by step re-construction under spinal anesthesia in the exaggerated lithotomy position
001 examination under anesthesia with assessment of all the obstetric and other lesions
002 identify the ureter opening or leakage location which may be difficult if leaking via fistulous tract decide for abdominal repair and terminate if clear-cut ending and easy catheterization for 15-20 cm continue with vaginal re-implantation
003 devise plan of operation and stay focused start
005 unilateral, median or bilateral episiotomy even small ones may give far better access to the operation field within skin lines/grease for good cosmetic healing
006 check with metal sound for bladder stones and to get impression of bladder capacity
007 catheterize ureter for 15-20 cm using ch 5 or ch 6 ureter catheter
008 check if catheter is really inside ureter small amount of normal saline may be injected into the ureter catheter and then see if it returns, if not the ureter catheter is not inside the ureter and has to be re-inserted
009 leave metal stilet inside ureter catheter to protect ureter during operation
010 make small avw incision around fistula opening
011 minimum sharp avw/cervix dissection making sure ureter is not further traumatized
012 blunt/sharp opening bladder medially from ureter opening by clamp (and if needed by scalpel) just medially from ureter opening only small bladder opening is needed nb it is not so easy to make a small vesicovaginal fistula
013 route ureter catheter thru bladder opening, bladder and euo using the clamp which was used for opening the bladder picking up distal end ureter catheter/metal stilet
014 check if ureter catheter is still inside ureter if not re-insert ureter catheter inside ureter if so continue with the vaginal re-implantation
015 fix ureter catheter (with metal stilet in situ) just distally from euo by nonabsorbable suture leave it long so that indwelling bladder catheter can be fixed with it as well
016 check again is ureter catheter is still inside ureter check for urine flow and re-insert metal stilet
017 inverting closure of bladder over inverted ureter opening by single layer of polyglycolic acid sutures so that ureter opening now is inside the bladder in whatever direction according to common sense
018 check for closure and continence by asking the patient to cough with a filled bladder combined with suprapubic pressure push
019 insert calibrated metal sound thru euo into the bladder until it touches the bladder dome wall, remove it and determine the distance euo/bladder wall = euo/bw in cm

020 insert foley catheter and inflate balloon check for free urine flow
nb free good urine flow means
   a catheter inside bladder
   b at least one ureter functioning
   c patient not in shock

021 deflate balloon and take out catheter

022 determine urethra length in cm
distance euo/balloon = euo/b in cm

023 determine longitudinal bladder diameter
   = euo/bw minus euo/b in cm
   as indication of bladder capacity

024 insert indwelling bladder catheter
   and fix it with nylon suture of ureter catheter

025 closure of avw or avw/cervix
   by single layer of everting sutures in whatever direction according to common sense

026 check again for free good urine flow
   thru indwelling bladder catheter
   and thru ureter catheter
   and do not insert metal stilet again

027 closure of episiotomy

028 vagina pack
   up to preference of surgeon
   loose or with compression to stop eventual oozing

029 if everything ok
   the patient can be transferred to the postoperative ward

write an operation report immediately after the operation, including all the relevant data so everything is documented also major intraoperative complications; the better the documentation the more valuable an evaluation becomes of the technique(s) and the program

and instruct the patient that nobody should remove any of the catheters for 3-4 weeks; only to be removed in the theater and not in the ward
exceptional repair

in very obese patients all **safe** options become highly complicated or impossible

in one excessively obese patient with ureter fistula at fixed vault very deep inside with a scarred fistula tract which could not be catheterized and also no candidate for abdominal re-implantation

a circular incision was made of the proximal vagina at 10-12 cm from the introitus, then wide vesicovaginal fistula up to the vault/fistula was made with excision of avw and some bladder tissue and then a kind of small proximal pouch was constructed by closure using the anterior vagina wall onto rectum/posterior vagina wall so that the fistula was draining into the bladder via this pouch

the outcome was successful

this technique was based on what is done in patients with high cs-tah or cs-sth fistula whereby the cervix remnants are retracted high up with paradoxic movement as already described in a previous chapter

ectopic ureters

with sausage like cystic dilatation in between the bladder and anterior vagina wall whereby the wanzami already cut thru this structure are difficult or impossible to catheterize

though in two patients we did a successful en-block repositioning into the bladder special care being taken that the proximal ureter was not traumatized

creativity/art of the surgeon

is asked

distally traumatized ureter

due to previous surgery catheterization thru ureter os and then thru the distal part and proximal part, adaptation of ureter by using peri-ureteral tissue

intraoperative ureter trauma

prevention ureter catheterization and leave metal inside catheter; this will prevent full cut thru in partial trauma, just adapt the peri-ureteral tissue and leave ureter catheter for 3-4 weeks if noted during dissection catheterize proximal part and include it in the whole process or if noted at operation end since still clear urine in vaginae perform vaginal re-implantation as described above; if not possible plan for second stage re-implantation either vaginal or abdominal
discussion

though all his operation techniques have been devised and developed by the author personally over the years

the idea and principles for vaginal re-implantation the author learned from reading an article in something like the annals of urology in 1985; unfortunately, the book was lost and the author forgotten but still the author would like to refer to both

out of 262 ureter fistulas the author was able to re-implant 132 (roughly half) vaginally with a success rate of 94%, since only 8, ones with a scarred tract, failed

this led to the conclusion that only ureter fistulas with a clear-cut ending are candidates for vaginal re-implantation if the ureter can be catheterized easily for 15-20 cm

the other half were re-implanted successfully by urologists

for the ureter fistulas with a scarred tract where the fistula opening is identified an en-block vaginal re-implantation may be an option if abdominal re-implantation is out of question for whatever reason

the frequent combination of ureter fistula with stress incontinence which normally completely disappeared after successful re-implantation as found by the author has not yet been mentioned in the literature, except for in his own teaching books out of the series obstetric trauma surgery; art and science

it was also a surprise that there were obstetric ureter fistulas in three patients who never had a cs or instrumental delivery or another operation
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**cs-vesicocutaneous fistulas = cs-vcf**

*type kees III*

**introduction**

the cs-related vesicocutaneous fistula = cs-vcf is probably far more frequent than thought and should be taken into consideration if the cs wound has not healed within 2-3 weeks in the classic longitudinal midline incision but also in the lower transverse pfannenstiel incision

this could be the result of ruptured bladder though that is posteriorly due to ruptured uterus, surgical trauma to the anterior bladder or a suture thru the anterior bladder on closing the abdomen

the author does not think wound infection is playing a role since the organ wall is a very strong barrier against abscess formation

the author encountered this as an additional fistula in 30 patients though a systematic examination has not been performed and several others must have healed by catheter treatment after intravaginal fistula repair

**management**

spontaneous healing is the rule as promoted by indwelling bladder catheter until the wound has healed completely

still there are few patients who do not healed by this management and then a surgical closure of the wound in layers, bladder, fascia, skin is necessary

in one patient the author performed two times just adaptation + catheter but only after closure in layers it was successful

**urachus fistula**

one must keep in mind urachus fistulas which the author encountered only once and first thought and treated it like cs-vcf since she came complaining it started after cs, then later on when it did not heal by catheter + adaptation she admitted she had an abdominal operation as child bco urine leaking; the urachus was excised and then the bladder closed successfully

**discussion**

though hardly mentioned in the literature the cs-vcf is a cs-related obstetric fistula which may need surgical correction if not healed spontaneously with or without a catheter and should be kept in mind within the complex obstetric fistula trauma
cs vesicocutaneous fistulas = cs-vcf

Introduction
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Management
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Urachus fistula
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Discussion
Though hardly mentioned in the literature the cs-vcf is a cs-related obstetric fistula which may need surgical correction if not healed spontaneously with or without a catheter and should be kept in mind within the complex obstetric fistula trauma.
negative effect of cs upon
other necrotic pressure fistula repair

introduction

even though the cesarean section may not be related to obstetric fistula formation the cs itself is a negative factor in other obstetric fistula repairs

mechanism of negative action

any cesarean section constitutes an additional surgical trauma however professionally it is performed

fixed/retracted cervix may interfere negatively with tissue mobility and as such make the repair more complicated and the repair less tension-free and the instrumentation more difficult; even more so if the cervix is fixed deep onto lateral pelvis wall towards one of the ischium spines with lateralization of the fistula

paradoxic movement upon cough will exert strong tension on the suture line of repair with more chance of breakdown; so already during repair elements must be built in to neutralize or counteract this strong traction by quartercircular reinforcement of the endopelvic diaphragm proximally or bilaterally from the repair onto the pubis bones and arcus tendinous fasciae if possible

even if the repair heals off the fixed/retracted cervix/uterus may exert strong traction upon the posterior urethra wall via the endopelvic diaphragm (pubocervical musculo fascia as anterior part) with negative effect upon the continence mechanism which may lead to postrepair incontinence

once this develops besides kees urethralization the fixation of the endopelvic diaphragm onto the paraurethra pubis bones must be reinforced

also the bladder and awv in between the proximal fistula edge and the cervix may be very thin by ?what mechanism?

the cs scar in the uterus may be a locus minoris resistentiae during subsequent deliveries which may lead to an obstetric fistula even if no cs is performed for the index delivery

cervix as centrum tendineum intrapelvinum within the endopelvic diaphragm plays a major role within the functional pelvis anatomy

mechanism of positive action

however, there is also a positive action since these adhesions/fixations may prevent or delay uterus/cervix prolapse
Measles Vaccine: The Best Kind of Vaccine

Introduction

Although the measles vaccine is highly effective in preventing measles, it can be less effective in individuals who have received the vaccine at an older age or who have received a partial series of vaccines. This is because the immune system may not have had the opportunity to produce enough antibodies to protect against the virus. As a result, the vaccine may be less effective in protecting against the disease. This is especially true for individuals who have received the vaccine after the age of 12 months.

Mechanism of Negative Action

Any additional surgical trauma constitutes an additional stress on the body, and the body's response to this stress is to produce an inflammatory response. The body's immune system is designed to protect the body from infection, but it can also cause inflammation and damage to the body's tissues. In the case of the cesarean section, the body's immune system is responding to the surgical trauma of the incision and the repair of the incision. The body's immune system is also responding to the presence of the cesarean section scar in the uterus, which can be a source of inflammation and infection. This can interfere negatively with tissue mobility and make the repair more complicated and the repair less tension-free and the instrumentation more difficult; even more so if the cervix is fixed deep onto lateral pelvis wall towards one of the ischium spines with lateralization of the fistula paradoxic movement upon cough will exert strong tension on the suture line of repair with more chance of breakdown; so already during repair elements must be built in to neutralize or counteract this strong traction by quartercircular reinforcement of the endopelvic diaphragm proximally or bilaterally from the repair onto the pubis bones and arcus tendinace fasciae if possible even if the repair heals off the fixed/retracted cervix/uterus may exert strong traction upon the posterior urethra wall via the endopelvic diaphragm (pubocevrical musculo fascia as anterior part) with negative effect upon the continence mechanism which may lead to postrepair incontinence once this develops besides kees urethralization the fixation of the endopelvic diaphragm onto the paraurethra pubis bones must be reinforced also the bladder and avw in between the proximal fistula edge and the cervix may be very thin by what mechanism? the cs scar in the uterus may be a locus minoris resistentiae during subsequent deliveries which may lead to an obstetric fistula even if no cs is performed for the index delivery cervix as centrum tendineum intrapelvinum within the endopelvic diaphragm plays a major role within the function al pelvis anatomy

Mechanism of Positive Action

However, there is also a positive action since these adhesions/fixations may prevent or delay uterus/cervix prolapse...

Cs-Related Fistulas Operation Results

Figures in 4,997 Patients

<table>
<thead>
<tr>
<th>Category</th>
<th>Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>i catheter treatment</td>
<td>180 patients</td>
</tr>
<tr>
<td>129 patients = 72% healed by catheter only with final healing after operation in 175 = 97% with unknown outcome in 2 = 1%; out of the 175 healed 6 = 3.4% had a second fistula but did not return for further treatment by the author; with zero mortality</td>
<td></td>
</tr>
<tr>
<td>ii cs-related obstetric fistulas</td>
<td>2,107 patients</td>
</tr>
<tr>
<td>previous operation in 599 = 28.5%; mutilation in 419 = 20%</td>
<td></td>
</tr>
<tr>
<td>1,916 patients = 91% healed at first attempt with a final healing in 2,012 = 95.5% out of whom 50 = 2.5% were totally incontinent and 34 = 1.6% still had a 2nd fistula whilst 28 = 1.3% were right from the beginning inoperable; with mortality in 6 = 0.3%</td>
<td></td>
</tr>
<tr>
<td>iii ureter fistulas</td>
<td>132 patients</td>
</tr>
<tr>
<td>out of 132 vaginal ureter re-implantations 12 failed at first attempt, 4 were operated again vaginally with good result final healing in 124 patients = 94% with total incontinence in 3 = 2.4% and minor form of stress incontinence in 7 = 5.6%; with zero mortality the 8 failed all had a fistulous tract and were not right candidates since one cannot re-implant a fistula tract into the bladder (not realized by the author at time of operation)</td>
<td></td>
</tr>
<tr>
<td>iv necrotic fistula plus cs</td>
<td>2,012 patients</td>
</tr>
<tr>
<td>previous operation in 612 = 30.4%; mutilation in 320 = 16%</td>
<td></td>
</tr>
<tr>
<td>1,870 patients = 93% healed at first attempt with a final closure in 1,944 = 96.6% out of whom 77 = 4% were totally incontinent; whilst 32 = 1.6% were inoperable right from the beginning; with mortality in 5 = 0.2%</td>
<td></td>
</tr>
<tr>
<td>v “cs” fistula never cs</td>
<td>566 patients</td>
</tr>
<tr>
<td>previous operation in 69 = 12.1%; mutilation in 54 = 9.5%</td>
<td></td>
</tr>
<tr>
<td>500 patients = 88% healed at first attempt with final closure in 542 = 96% with total incontinence in 23 = 4.2%; whilst 8 = 1.4% were inoperable right from the beginning; with mortality in 5 = 0.9%</td>
<td></td>
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</tbody>
</table>

See table on next page
### Fistula Characteristics with Results

<table>
<thead>
<tr>
<th></th>
<th>i Catheter</th>
<th>ii Cs-related</th>
<th>iii Ureter</th>
<th>iv Necrotic</th>
<th>v Cs Never Cs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>180</td>
<td>2,107</td>
<td>132</td>
<td>2,012</td>
<td>566</td>
</tr>
</tbody>
</table>

### Preoperative Factors
- **Prev Op:**
  - 599
  - 8.5%
  - 612
  - 30.4%
  - 69
  - 12.1%

- **Mutilated:**
  - 419
  - 20%
  - 320
  - 16%
  - 54
  - 9.5%

- **Inoperable:**
  - 28
  - 1.3%
  - 32
  - 1.6%
  - 8
  - 1.4%

### Healed
- **1st:**
  - 129
  - 72%
  - 1,916
  - 91%
  - 1,870
  - 91%
  - 500
  - 88%

- **Final:**
  - 175
  - 97%
  - 2,012
  - 95.5%
  - 1,944
  - 94%
  - 542
  - 96%

### Incontinence
- **Total:**
  - 0
  - 2.5%
  - 50
  - 2.4%
  - 3
  - 4%
  - 7
  - 4.2%
  - 23

- **Stress:**
  - 3
  - 1.7%
  - 100
  - 5%
  - 7
  - 5.6%
  - 140
  - 7.2%
  - 17
  - 3.1%

### Mortality
- 0
- 6 = 0.3%
- 5 = 0.2%
- 5 = 0.9%

Total mortality rate 16 out of 4.997: 0.3%
postrepair urine incontinence 
essentials 
in cs-related obstetric fistulas

introduction
the incidence of post type **kees I** incontinence is low since the anatomic continence mechanism is not involved

when post repair incontinence develops after the successful repair of the cs-related obstetric fistula there is one extra factor which may play a role, viz

traction by retracted/moving cervix upon posterior urethra wall via the endopelvic diaphragm resulting in opening up of uv-junction and proximal urethra with decrease in outflow resistance

responsible factors
functional and/or anatomic tissue loss defects within the endopelvic diaphragm and its fixation onto the anterobilateral pelvis wall; with in post cs-related incontinence strong traction by retracted/moving cervix

prevention (at first or subsequent repair)
paying meticulous attention to detail in reconstructing the functional pelvis anatomy by anatomic reconstruction of uv-junction, if necessary by end-to-end vesicourethrostomy,

and repairing any defect in the pubocervical musculofascia/endopelvic diaphragm and its anterobilateral fixation onto pubis bones/arcus tendineus fasciae = atf

avoiding all things which will lead to more scarring such as extensive dissection and all things which are not in line with the functional pelvis anatomy like wrong type of incision and wrong direction of closure against the natural tissue forces

visual confirmation
urine loss thru the external urethra opening = euo must be confirmed objectively by the surgeon with(out) coughing; if no urine loss thru euo there may still be a fistula

conservative management
some form of urine incontinence is frequent upon catheter removal and will disappear spontaneously within 2-3 months
this process can be speeded up by bladder drill ie by continue to drink at least 4 liter per 24 hours and frequent micturition every 30-45 min; this will strengthen the physiologic process of bladder filling and micturition and train the continence mechanism

if there is no relief within 3-4 months a surgical intervention should be planned, however by a surgeon with the necessary theoretical knowledge and practical skills

surgical management

since a minute fistula will act as pacemaker with objective urine loss thru euo with(out) coughing this has to be excluded by a dye test (up to 150 ml) under spinal anesthesia before the surgery is started; by closure of the minute fistula normally the incontinence will disappear

if no fistula detected, identify the defect(s) responsible for the incontinence like urethra too short and/or too open and/or median or transverse defects in the pubocervical mus culofascia as part of the endopelvic diaphragm or its fixation onto pubis bones/atf

postrepair urine incontinence surgery
step-by-step kees urethralization plus refixation

introduction

the rationale of reconstructive surgery is to reconstruct the functional pelvis anatomy ensuring normal physiology

this seems already to be quite complicated in genuine incontinence without tissue loss considering the enormous number of techniques and principles

so even more in postrepair urine incontinence with variable amounts of tissue loss and variable amounts of additional surgical trauma like scar tissue

having solved the problems involved the author would like to present the principles in a step-by-step manner

history taking

when is the woman leaking: during daytime, at night, always and during which activity: whilst coughing, standing up, standing, walking, lying down, sleeping, sex

examination without anesthesia

the incontinence must be verified objectively with a filled bladder; in doubt suprapubic pressure push can be executed when she coughs
failed period of bladder drill + pelvis floor muscle exercises
a **minimum of 3-4 months** should be allowed before (repeat) surgical intervention since many women with postrepair incontinence are cured spontaneously by these methods and any surgical intervention is additional trauma

**special surgical challenges**
one is confronted with a short urethra with open deformed euo posteriorly drawn inside the vagina, scar and/or mutilation tissue and vagina strictures, fibrosis or shortening or even gynatresia in a patient as already operated by oneself or even worse by somebody else and everybody expects miracles

previous repair(s) varies from at least once up to over 10 times with repeat accumulated additional surgical trauma and scar tissue

one can hardly expect cooperation/compliance by the patient since at the first drop of urine after the incontinence surgery she will stop drinking

and how to ensure a normal functioning urine continence mechanism in this mess

**step-by-step reconstruction**
in line with the functional pelvis anatomy

this is divided into different parts

i   anesthesia, position, examination etc
ii  dye test
iii physiologic incision + dissection
iv  identifying responsible defects epd/connection to pelvis wall
v   repair of longitudinal epd defect + if indicated re-anchoring cervix
vi  repair of any further defect within endopelvic diaphragm
vii refixation of any loose epd connection to pelvis wall
viii check of result + fixation of indwelling catheter
ix  adaptation of avw
x   urethra tissue quality
xi  documentation
i  anesthesia, position, examination etc

000 spinal anesthesia with long-acting agent

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

002 a careful inspection and systematic examination (under anesthesia!) of the whole obstetric trauma is made like repair scar, distance euo to cervix or vault (euo/c) in cm, typing of incontinence if possible, position/state of euo etc

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

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

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

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

ii  dye test
to exclude minute fistulas (ectopic pacemaker)

a dye test is mandatory to exclude a minute fistula which may not be visible during the routine examination

this minute (or larger) fistula is responsible for the occurrence of urine intrinsic stress incontinence since it seems to function like an ectopic pacemaker

once the fistula has been repaired successfully, normally the incontinence will disappear as well

007 perform dye test with 50-100 ml asking patient to cough after instillation whilst keeping euo closed with catheter in situ and exert suprapubic pressure push

aa if positive by dye leakage and fistula identified, proceed further by closing this fistula according to the principles valid; nb this was found in over 600 patients
bb if no dye but clear urine in vaginae this means a ureter fistula

cr if negative, no dye and no clear urine in vaginae, remove catheter and check for objective dye/urine thru euo which means real postrepair intrinsic-stress incontinence and proceed as following

at the same time check urethra length in cm and longitudinal bladder diameter in cm by euo/bw minus euo/b as starting reference point

iii physiologic incision + dissection

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

008 a quarter- or semicircular physiologic incision is made at 2 cm proximally from euo thru or parallel to repair scar (if repair has been made by transverse incision) as within or parallel to ruga folds and also the same incision if repair has been made by longitudinal incision

009 the anterior vagina wall is dissected sharply from the endopelvic diaphragm using the scalpel and/or sharply curved thorek scissors in order to have a proper direct view of the endopelvic diaphragm and its connection to the pelvis wall

IV systematic examination under spinal anesthesia + identifying the responsible defect(s)/factor(s)

the better (all) the responsible factors are identified the better these can be corrected during the reconstructive surgery process and the better the chance of success; do not look for fascia tissue but look for defects within the shiny smooth muscle endopelvic diaphragm check for (loose) connection of endopelvic diaphragm to pelvis wall/cervix

010 a meticulous examination is performed under spinal anesthesia as to euo deformed or not, wide or normal, in anatomic position or posteriorly drawn inside, urethra length, longitudinal bladder diameter, operation scars, tissue quality good, medium, poor

011 identify the responsible factor(s) the possibilities are longitudinal, transverse, quartercircular, semicircular defects within the endopelvic diaphragm and/or
direct or indirect loose connection of endopelvic diaphragm onto pubis bones/bilateral arcus tendineus fasciae with uni- or bilateral open paravesical space and

012 check for cervix anchoring within the endopelvic diaphragm

v **kees urethralization by repair longitudinal defect; plus if indicated re-anchoring of cervix; this is essential in all types of genuine and postrepair incontinence**

the aim is to reconstruct the endopelvic diaphragm with cervix re-anchoring to ensure its dynamic function

013 repair the **ragged median** longitudinal defect by polyglycolic acid sutures with re-anchoring cervix with proximal suture

so the posterior urethra wall, posterior uv-junction and posterior bladder are prevented from herniating into the vagina

vi repair the **transverse, quarter- or semicircular defects within the endopelvic diaphragm** by refixation of endopelvic diaphragm to paraurethra pubis bones periost and paraurethra atf over these defects

the aim is to reconstruct the endopelvic diaphragm and its connection to the pelvis wall to ensure its dynamic function

014 refix the lateral endopelvic diaphragm onto bilateral paraurethra atf by 1-2x polyglycolic acid sutures each side

check for continence and measure urethra length in cm

015 **important to neutralize the traction towards the cervix/sacrum** make small deep transverse paraurethra incisions up to pubis bone periost otherwise fixation may slip during the immediate postoperative period or later and

then refix paramedian endopelvic diaphragm onto paraurethra pubis bone periost by 2x polyglycolic acid suture each side

this is **important** since it will prevent retraction/shift of the endopelvic diaphragm + adherent posterior urethra wall towards the sacrum
016
if done correctly there will be normalization of euo with reduction of posterior euo into anatomic position since traction onto endopelvic diaphragm towards cervix/sacrum has been neutralized; and increase in urethra length

Vii refix any quarter- and semicircular loose connection

only if an intact endopelvic diaphragm is circumferentially connected to the pelvis wall can an increase in its tonus produce cephalad/anterior elevation

Viii tissue handling, sutures etc

tissue handling is an important part + suture technique has to be perfected at each operation

017
good bites are taken to get broad adaptation of the raw endopelvic smooth muscle onto pubis bone periost and arcus tendineus fasciae

018
care is taken to apply sufficient tension in order to counteract the traction towards the cervix/sacrum in order to neutralize this traction

019
care is taken only to pick up the smooth muscle endopelvic diaphragm and on picking up the atf also the “underlying” pubis bone periost

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

Ix check for continence after each step

by checking for continence after each step the surgeon will notice at which stage continence becomes evident; to improve his own insight

021 with urine or normal saline inside the bladder ask patient to cough (+ suprapubic pressure push onto anterior abdominal wall) and look if there is urine leakage thru euo

X final check + fixation of catheter

final check with measurements with documentation for transparent audit and indwelling bladder catheter for 2 weeks for total bladder decompression promoting the healing of the endopelvic diaphragm
check for continence and measure urethra length/longitudinal bladder diameter in cm by measuring the distance euo to bladder wall (euo/bw) by calibrated metal sound, then insert foley catheter and determine urethra length by measuring distance euo to balloon (euo/b)
euo/bw minus euo/b = longitudinal bladder diameter (in cm)

nb normally the final urethra length at operation ending is a minimum of 1.5-2 cm and at least 1 cm longer then the initial urethra length at operation beginning resulting in normal-width good/medium/poor-quality urethra_euo in anatomic position

insert nelaton ch 16, fix it and check for urine drainage thru catheter if urine is draining this means 3 things:
  a the catheter is inside bladder
  b at least one ureter is draining into the bladder and
  c the patient is not in shock
if no draining of urine, check for the cause and correct it

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

anterior vagina wall adaptation, episiotomy etc

since the vagina is never sterile the anterior 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

the anterior vagina wall is only adapted quartercircularly by 2-4 everting absorbable or nonabsorbable sutures

if episiotomies have been performed these are adapted

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

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

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

during the operation procedure the urethra tissue has to be classified as good, medium or poor in order to predict the outcome and to evaluate the results; this has to be entered into the operation report as documentation.

Xi documentation

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

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

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

then the outcome of the surgery has to be documented as well against all the parameters to assess if one is on the right track or not and then continue and refine the technique or take the necessary action.

special attention post cs incontinence  015-020

neutralize strong traction by retracted/moving cervix onto posterior urethra wall by (re) fixation of pubocervical musculofascia (anterior part of endopelvic diaphragm) under traction onto paraurethra pubis bone by 1-2x polyglycolic acid sutures each side which will reduce the posterior urethra wall/external urethra opening into its anatomic position with increase in outflow resistance.
step-by-step epd reconstruction

ragged median epd defect

plus defective fixation onto paraurethra att/pubis bone
step-by-step epd reconstruction

defective fixation onto paraurethra atf/pubis bone

refixation 1-2 x onto R paraurethra atf

refixation 1-2 x onto L paraurethra atf

refixation 1-2 x onto paraurethra pubis bone

refixation completed

epd + fixation reconstructed

© kees
postrepair fibrosis/ traction

fixation epd onto paraurethra pubis bone under tension

fixation epd onto paraurethra pubis bone under tension
rectovaginal fistulas
combined with
cs for the index delivery

this essay would not be complete without mentioning some of the findings about the combination of a rectovaginal fistula and a cs for the index delivery

the author encountered 286 rectovaginal fistulas where a cs had been performed for the index delivery

though most of the rectovaginal fistula were proximal type kees I fistulas where the cs may have been performed too late there were even 61 sphincter ani ruptures, even in primipara, for which an explanation cannot be given

however, he remembers one patient where a cesarean section had been performed though the head was already fully out according to the patient

she was in labor at home for 2 days, then spent 1 day in a health center before the head was born fully and then because of this since the child could not be delivered she was referred to a hospital where a cesarean was performed with a stillborn male infant and resulting into a pressure necrotic urine fistula

this only highlights the

horrendous conditions of poor obstetric care within a failed system

the slogan eradication of the obstetric fistula within a generation and now even within a decade seems to be very hollow

even if the political blah blah blah rhetoric will be replaced by action

no wonder since the real expertise and strategy is missing
prevention of cs-related fistulas

we should stop pointing our finger to and blaming young hard working doctors and start concentrating upon the only effective strategy

the one and only cause of the obstetric fistula, including the cs-related, is a system of failed obstetric care

this can only be solved by

establishing a network of some 150,000 functioning obstetric units throughout africa already only

all the rest is political blah blah blah rhetoric and deliberate lies

since a timely intervention cs is the keystone in preventing the obstetric fistula each unit must have

the hardware

a functioning operation theater with

a functioning electricity supply

a functioning water supply

a functioning operating table

high-quality instruments

high-quality consumables

a functioning blood bank


cost: us dollars 50,000 to 100,000 per unit

the staff

well trained doctors in sufficient number

well trained nurses in sufficient number

well trained other staff in sufficient number

only then can one expect quality service
cs-related obstetric fistulas

summary and discussion

the cs-related obstetric fistula is on the rise due to the exploding cs epidemic world wide due to the same circumstances of a failed system of obstetric care as all the other obstetric fistulas and as such has nothing to do with iatrogenic trauma

the mechanism of action of the effects of a cs on the functional pelvis anatomy is being explained

this is the first time attention is drawn to the fact that following a cs the cervix/uterus may be retracted high up into the abdomen due to scarring and (in)direct adhesions to the anterior abdominal wall with paradoxic movement cephalad and anteriorly on cough instead of coming downwards

or the cervix may be fixed towards the lateral pelvis wall, deep inside towards the right or left ischium spine

this will pose additional characteristics for cs-related obstetric fistulas and also for pressure necrotic obstetric ones if a cs has been performed previously; or for the index delivery or afterwards

the accessibility may be compromised since fistula deep inside with poor mobility; and complicated instrumentation

in order to improve the access to the operation field a liberal use of uni-, median or bilateral episiotomy is recommended

especially the combination of a retracted cs-related fistula and severe obesity is a major challenge to any fistula surgeon

since the repair may be under tension intraoperatively and postoperatively interfering negatively with the healing and continence; during operation efforts have to be made to neutralize this traction

it may influence the development of post cs incontinence since strong traction by cervix onto posterior urethra wall via the pubocervical musculofascia (anterior part of endopelvic diahragm)

if postrepair incontinence develops, special attention has to be paid to neutralize the strong traction by the retracted/moving cervix by bilateral (re)fixation of the endopelvic diaphragm onto the paraurethral pubis bone in order to reduce the posterior urethra wall and euo into its anatomic position with normalization of the anatomic continence mechanism with increase in outflow resistance

early sex during the immediate postoperative period may lead to recurrence since the tip of the penis is thrusting against the cervix which may disrupt the repair so special instructions are given
this was noted as a trend among the patients still married and living with their husbands as against the patients not living with their husband

though both are discharged total dry several patients from the first group came back stating they started to leak again some 1-2 mth after discharge

though they do not come out spontaneously some of them admit upon questioning that the leakage returned after sexual intercourse which may be due to the fact that the tip of the penis thrusts against the cervix and so may cause partial disruption of the repair

most patients will be dry and stay dry after a second repair and instructions to refrain from sex for some 4-6 mth

however, compliance is poor since and the patient and her husband/partner think she is fully cured since no leaking

the positive effect of a cs may be that the scarring/adhesions protect the woman from developing cervix/uterus prolapse later in life though the scarring/adhesions may soften up due to subsequent pregnancies

the better one understands the mechanism of action in combination with the obstetric trauma the better one will be able to perform the reconstructive surgery of the fistula and of the functional pelvis anatomy as required condition for the physiology

whatever other surgeons do and whatever their explanations the author is maintaining that the vagina is the (only) route of choice in obstetric fistula surgery, also in the cs-related obstetric fistulas except for the vesicocutaneous fistulas and major part of the ureter fistulas especially the ones with a scarred tract; though part of the ureter fistulas can be re-implanted vaginally if there is a clear cut opening into the vagina, cervix, vault and the ureter easily catheterized for 15-20 cm

every surgeon is responsible and accountable for his/her own actions

also in the cs-related obstetric fistula the immediate management by catheter and/or early closure is recommended with excellent results

in the intracervical and intrauterine fistulas a dye test may be needed for the diagnosis and the identification of the fistula

cs-related vesicocutaneous fistulas heal normally by catheter treatment but some may need closure in layers

conclusions

any cs has a definite impact upon the functional pelvis anatomy in the female by interfering with the position and mobility of the cervix as centrum tendineum intrapelvinum due to scar formation and adhesions to the surrounding tissues in the healing process with consequences for the operation technique in the repair of the cs-related obstetric fistulas and for the eventual postrepair incontinence
cs-related fistulas
basic science

functional pelvis anatomy
   essentials

corpus intrapelvinum
   connective tissue body of pelvis

endopelvic diaphragm
   with cervix as centrum tendineum intrapelvinum

vvf classification
   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
- **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
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
pelvis anatomy
corpus intrapelvinum
multifunctional connective tissue body of pelvis
as archaic matrix

introduction

the whole complex of intrapelvic connective tissue is called the corpus intrapelvinum or connective tissue body of pelvis; as 3-dimensional matrix for the pelvis organs with their arterial blood supply, venous drainage, lymphatic drainage and innervation

it is also called endopelvic fascia or fascia endopelvina (conjugans), however, its main component consists of smooth muscle tissue/fibers; so the term fascia is misleading

though its basic anatomic structure and functions are easy to understand it is difficult to comprehend and visualize its exact anatomic extent with highly specialized functions according to the different physiologic needs

especially since there are no clear demarcations which make it difficult to demonstrate this body/organ with different structures by dissection and/or indirect imaging

however, it is only by studying its full anatomic extent and understanding its functions that progress will be made in reconstructive pelvis surgery

since weakness and defects in this important corpus intrapelvinum are responsible for the development of genuine intrinsic incontinence, urogenital prolapse, enterocele and rectocele

the amount of literature is enormous with confusing and contradicting terminology and various complicated theories

however, the anatomy and functional anatomy do not change and the author would like to give an outline as based on existing anatomic textbooks, especially

lehrbuch der topographischen anatomie as written by anton hafferl as second edition from 1957

by analyzing the topographic position in relation to the urinary and genital tract the paramount role of the levator ani muscles in these theories seems to be overvalued and highly questionable

the author thinks another concept is needed with regard to the functional anatomic urine (in)continence mechanism and pelvis organ anatomic position and prolapse

therefore he would like to introduce the concept of the endopelvic diaphragm as part of the corpus intrapelvinum as first line for counteracting the intraabdominal hydrostatic and compression pressure, as support of the urine continence mechanism and for securing the pelvis organs in their variable anatomic position; see next chapter
basics of serous membranes

the body cavities are enclosed by bones and muscles covering the bones and muscles bridging the gaps in between the bones

the fascia interna is the total fascia inner lining of the cavity

the serosa (peritoneum, pleura) is connected to this fascia by

the tela subserosa

depending upon the width in between the fascia and the serosa the tela subserosa may develop from minimal with its basic loose archaic texture to extensive with a cohesive mixture of collagen, elastin and smooth muscle tissue as connective tissue body/organ in a loose, dense or condensed form

the intracavity organs are embedded into the tela subserosa together with their blood supply, venous drainage, lymphatic drainage and innervation; whilst the tela subserosa also connects/suspends the organs to the cavity wall and each other

abdominopelvic cavity

the total fascia inner lining of the abdominopelvic cavity is called fascia abdominis interna; the serosa is called parietal peritoneum; the connective-tissue layer connecting the fascia abdominis interna to the parietal peritoneum is called the tela subserosa

the width between the internal fascia and peritoneum is small at the upper anterior abdominal wall from the umbilicus upwards and at the thoracoabdominal diaphragm and the fascia interna may “fuse” with the parietal peritoneum

however, the distance between the parietal peritoneum and posterior abdominal wall, anterior lower abdominal wall and pelvis wall becomes wider and wider resulting into extensive development of the tela subserosa as tela urogenitalis

pelvis cavity

the total fascia inner lining of the pelvis cavity is part of the fascia abdominis interna; and here it is called

the fascia pelvis parietalis

the serosa is called peritoneum parietale

the tela urogenitalis is that part of the tela subserosa which is filling up the large gap between the fascia pelvis parietalis and peritoneum parietale

the intrapelvic organs are embedded into the tela urogenitalis together with their arterial blood supply, venous drainage, lymphatic drainage and innervation; whilst the tela urogenitalis also connects/suspends the organs to the pelvis wall and each other
from the tela subserosa urogenitalis 3 structures develop

**fascia visceralis**

encapsulating the organs and ensheathing the blood/lymphatic vessels and nerves

**corpus intrapelvinum**

cohesive mixture of collagen, elastin and smooth muscle tissue/fibers in a loose, dense or condensed form; its main component is **dynamic** smooth muscle tissue/fibers

loose connective tissue

filling up the spaces not occupied by the corpus intrapelvinum

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**fascia visceralis**

as part of the tela urogenitalis which encapsulates the organs and then is named after the organ like fascia visceralis vesicae = visceral bladder fascia; and which as well ensheaths the blood and lymphatic vessels and the nerves

the space in between the fascia visceralis and the organ wall is filled up by loose connective tissue allowing the organs like the bladder to expand and deflate rapidly by filling and emptying within a short time span

when the organ does not expand and deflate rapidly like the uterus which grows slowly during pregnancy the fascia visceralis “fuses” with the organ wall and grows slowly together with the uterus; after emptying by childbirth it involutes slowly together with the uterus during the puerperium

**corpus intrapelvinum** = connective tissue organ of pelvis

as part of the tela urogenitalis; it constitutes a multifunctional connective tissue organ/ body and consists of a cohesive mixture of collagen, elastin and smooth muscle tissue fibers in loose, dense or condensed form according to whatever is needed

collagen for strength, elastin for passive elasticity and plasticity and smooth muscle fibers for active dynamic tonus and relaxation as coordinated by intrinsic myogenic impulses and extrinsic impulses by the autonomic nervous system

the smooth muscle component is the main component; even if some parts of it are called fascia or ligament it is still prevalent

its extensive 3-dimensional mesh-like structure ensures a seamless combination of static and dynamic functions

as a whole together with components of the organ walls as embedded into it, the corpus intrapelvinum is the major force in resisting hydrostatic and compression intraabdominal pressure due to its non-fatigue tonus which can be increased by reflex action and as such contributes to compression pressure

the pelvis floor with its large hernia-prone openings is secondary in taking care of the rest pressure

it also protects the organs with their supply from physiologic trauma during walking, sexual intercourse and childbirth
the specialized parts of it are called fasciae, septa, ligaments, plicae which all together form the corpus intrapelvinum each with a specialized function for the organs with their supply and then combined for the whole biomechanicophysiology of the pelvis cavity

it has to be considered as one multifunctional organ where the basic archaic texture has developed into individual specialized structures according to the physiologic needs

the space between one organ and another or between an organ and the adjacent cavity wall is called a spatium filled up by connective tissue in a condensed form as septum/fascia or in a loose form or in a loose form with a thin fluid film

it embeds the organs and their arterial blood supply, venous drainage, lymphatic drainage and innervation; and stabilizes and secures the organs in their variable anatomic position depending upon the degree of filling of the organ itself or filling of the adjacent organ(s); in whatever body position

it suspends/connects the intrapelvic organs to the pelvis wall with so called pillars for arterial blood supply, venous drainage, lymphatic drainage and innervation

it is responsible for the blood flow inside the valve-less intrapelvic veins towards the vena cava inferior

it allows the organs to expand rapidly by filling and deflate rapidly by emptying

it allows the organs to move smoothly and independently from or simultaneously with each other

depending upon the physiologic needs it condenses to dense fascia plates or septa in between the organs and ligaments from the organs to the (bi)lateral pelvis wall and also loose structures like plicae; since the ligaments are smooth muscle tissue they are called muscles as well

though it is one continuous 3-dimensional mesh-like body/organ it is subdivided into overlapping para-structures

paracystium
that part of corpus intrapelvinum into which the bladder is embedded with condensation as bladder pillar at posterior bladder base cephalad to the ischium spine containing the blood and lymphatic vessels and nerves, and the pelvic ureter; connecting/suspending the bladder to the pelvis wall

parametrium
that part of corpus intrapelvinum which embeds the uterus/cervix, tubes and ovaries with condensation as uterovaginal pillar at uterus isthmus in the frontal plane thru and cephalad to the ischium spine containing the blood and lymphatic vessels and nerves and the pelvic ureter; connecting/suspending these organs to the pelvis wall

paracolpium
that part of corpus intrapelvinum which embeds the vagina with condensation as utero vaginal pillar in the frontal plane thru and in the region of the ischium spine containing the blood and lymphatic vessels and nerves; connecting/suspending the vagina to the pelvis wall
paraproctium
that part of corpus intrapelvinum which embeds the rectum with condensation as rectum pillar caudad to the ischium spine containing the blood and lymphatic vessels and nerves; connecting/suspending the rectum to the pelvis wall

and into the condensed parts in between the organs like septum; these are not separate parts but fit into the corpus intrapelvinum as part of the fascia between the organs like pubocervical musculofascia

septum vesicocervicale
in between posterior bladder and anterior cervix as vesicocervical fascia

septum vesicovaginale
in between posterior bladder and anterior vagina wall as pubocervical musculofascia

septum rectovaginale
in between anterior rectum and posterior vagina wall and is fixed to centrum tendineum perinei (perineal body) as rectovaginal fascia

the space between the septa and the visceral fascia of the organs is filled up by loose connective tissue allowing friction free movement of the organ wall against the septum; ideally this is the layer or space of interest for surgeons in bloodless dissection

spatium prevesicale
between bladder and symphysis in continuity bilaterally with

spatium paravesicale
between bladder and (bi)lateral pelvis wall
all filled up by loose connective tissue and thin adhesive fluid film allowing the bladder wall to slide against the pelvis wall and anterior abdominal wall without coming loose

spatium vesicocervicale
between bladder and cervix

spatium vesicovaginale
between bladder and vagina

spatium rectovaginale
between vagina and rectum and up to perineal body

spatium pararectale
(bi)laterally between rectum and pelvis wall in connection with

spatium retrorectale
between rectum and sacrum continues cephalad into the spatium retroperitoneale

it reacts to hormones and reconfigures and strengthens under physiologic stress
and is subdivided into other specialized condensed structures for further stabilizing the organs and connecting them to the pelvis wall like

**arcus tendineus fasciae = atf**
as line of fusion bilaterally from posterior pubis bone body 0.5-1 cm from midline pubis symphysis to ischium spine; as anterolateral attachment of the endopelvic diaphragm to the pelvis wall
it is connected to the obturator fascia and to the arcus tendineus of levator ani muscle via a narrow triangular fascia sheath
inclination of 25-30° as to horizontal from anterior to posterior in upright position

**pubocervical musculofascia = vesicovaginal musculofascia**
in between the posterior bladder wall and anterior vagina wall as part of the endopelvic diaphragm; see special chapter endopelvic diaphragm

**arcus tendineus of rectovaginal fascia = atrf**
as line of fusion from the lateral side of perineal body over levator ani fascia to ischium spine and fuses with the posterior part of the arcus tendineus fasciae

**rectovaginal musculofascia = prerectal fascia**
in between the posterior vagina wall and anterior rectum wall and fixed anteriorly to the perineal body, (bi)laterally to arcus tendineus of the rectovaginal fascia and posteriorly to the cervix and the sacrouterine ligaments

**vesicoumbilical fascia**
in between bilateral vesicoumbilical ligaments from bladder to umbilicus

**medial vesicoumbilical ligament**
obliterated urachus
from median bladder to umbilicus
restricting the upward movement of the bladder

**(bi)lateral vesicoumbilical ligaments**
obliterated umbilical arteries
from bilateral internal iliac artery to umbilicus
restricting the upward and sideward movement of the bladder

**pubovesical ligaments = pubovesical muscles**
condensation of pubocervical musculofascia
stabilizing the posterior bladder neck

**posterior pubourethral ligaments = pubourethral muscles**
condensation of pubocervical musculofascia as anterior attachment to pubis bones
stabilizing the posterior proximal/mid urethra wall

**broad ligament = parametrium**
from lateral uterus to pelvis wall
comprising

**round ligament (muscle)**
smooth muscle structure from anterolateral uterus horn thru inguinal canal and radiating into labium majus and mons pubis
stabilizing uterus in anteflexion/version
infundibulopelvic ligaments = suspensory ligament of ovary
from ovary to pelvis wall
suspends ovary

ligamentum ovarii proprium = proper ovary ligament
from ovary to lateral uterus
connects ovary to uterus

cardinal ligaments
from ilium/ischium bones to (bi)lateral cervix in a frontal plane cephalad to the ischium spines
suspending/connecting the cervix and endopelvic diaphragm bilaterally to the pelvis wall

sacrorectal ligaments = rectouterinus muscles
from cervix to rectum and sacrum
attached to (ischio)coccygeus fascia and piriformis fascia via fascia sheath

endopelvic diaphragm
one highly specialized structure within the corpus intrapelvinum as a whole constitutes a dynamic functional endopelvic diaphragm; see next chapter

loose connective tissue
as part of the tela urogenitalis in a loose archaic form filling up the spaces not occupied by the corpus intrapelvinum; these spaces are of interest to the surgeon for a bloodless dissection

this allows friction-free movement/sliding of the organ wall against the structures of the corpus intrapelvinum without becoming loose from each other

and together with a thin adhesive fluid film it allows the bladder wall to slide against the anterior abdominal wall and anterior and lateral pelvis wall without becoming loose

and ensuring that the anterior urethra wall is always adherent to the posterior symphysis and as such does not rotate; not even if the posterior urethra wall rotates backwards away from the posterior symphysis due to defective connective tissue support and then resulting into progressive funneling or vesicalization of the urethra starting proximally

innervation
the corpus intrapelvinum is controlled and coordinated by intrinsic myogenic impulses via baro- and stretch receptors as modulated by extrinsic impulses from the autonomic (sympathetic, parasympathetic ?and also enteric?) nervous system via a complex reflex mechanism and from hormones and from other neurotransmitters

since its main component is smooth muscle tissue/fibers the corpus intrapelvinum forms a highly dynamic body/organ due to its non-fatigue tonus and has the ability to react by hypertrophy and hyperplasia for increased strength; and also by involution
discussion

how to describe an important 3-dimensional mesh-like collagen, elastin and smooth muscle connective tissue organ without clear demarcations in its full anatomic extent and full dynamic multi-functionality as

a combination of a synchronized multi-unit smooth muscle archaic matrix with single-unit smooth muscle specialized structures with tonic action for non-fatigue tonus and immediate superimposed reactive phasic action upon stretch

with a stop anteriorly at the umbilicus and continuous with the tela subserosa of the retroperitoneal space posteriorly cephalad since both belong to the tela subserosa of the whole abdominopelvic cavity

as based on findings during his obstetric trauma surgery and evidence based results it became clear that another concept was needed; as one major function of the corpus intrapelvinum

the problem is that since there are no clear demarcations between this body and the organs except for the visceral organ fascia and between the different structures of the corpus intrapelvinum like a fluidum it is difficult to demonstrate it as a whole and/or demonstrate its different structures by surgical dissection and/or indirect imaging

however, once one starts looking for this dynamic corpus and its different structures as a surgeon one will find it and its structures and then starts realizing its paramount importance for the functional pelvis anatomy

though the different structures have their own specific function their actual strength is that their function will be reinforced by the simultaneous function of the whole corpus intrapelvinum as one dynamic biomechanicophysiologic unit

embedding the organs and their arterial blood supply, venous drainage, lymphatic drainage and innervation and being

responsible for the independent physiologic functioning of the organs, for stabilizing/securing the organs in their variable anatomic position, for suspending/connecting the organs to the pelvis wall and to each other, for protecting the organs and their supply against physiologic trauma during walking, sexual intercourse and childbirth and for supporting the continence mechanisms of the urinary, genital and digestive tract

genuine intrinsic urine incontinence, urogenital prolapse like cystocele and uterus/cervix prolapse, intraperitoneal content prolapse like enterocoele and digestive prolapse like rectocele are all due to localized defects in the endopelvic diaphragm of the corpus intrapelvinum; in isolated form or combined

though the author believes strongly in this concept, time and evidence-based results and challenges by other reconstructive surgeons will tell if he is right or wrong

first edition 
November 2015

last edition 
October 2018
Discussion on how to describe an important dimensional mesh-like collagen, elastin and smooth muscle connective tissue organ without clear demarcations in its full anatomic extent and full dynamic multi-functionality as a combination of a synchronized multi-unit smooth muscle archaic matrix with single-unit smooth muscle specialized structures with tonic action for non-fatigue tonus and immediate superimposed reactive phasic action upon stretch with a stop anteriorly at the umbilicus and continuous with the tela subserosa of the retroperitoneal space posteriorly cephalad since both belong to the tela subserosa of the whole abdominopelvic cavity as based on findings during his obstetric trauma surgery and evidence based results it became clear that another concept was needed; as one major function of the corpus intrapelvinum the problem is that since there are no clear demarcations between this body and the organs except for the visceral organ fascia and between the different structures of the corpus intrapelvinum like a fluidum it is difficult to demonstrate it as a whole and/or demonstrate its different structures by surgical dissection and/or indirect imaging however, once one starts looking for this dynamic corpus and its different structures as a surgeon one will find it and its structures and then starts realizing its paramount importance for the functional pelvis anatomy though the different structures have their own specific function their actual strength is that their function will be reinforced by the simultaneous function of the whole corpus intrapelvinum as one dynamic biomechanicophysiologic unit embedding the organs and their arterial blood supply, venous drainage, lymphatic drainage and innervation and being responsible for the independent physiologic functioning of the organs, for stabilizing/securing the organs in their variable anatomic position, for suspending/connecting the organs to the pelvis wall and to each other, for protecting the organs and their supply against physiologic trauma during walking, sexual intercourse and childbirth and for supporting the continence mechanisms of the urinary, genital and digestive tract genuine intrinsic urine incontinence, urogenital prolapse like cystocele and uterus/cervix prolapse, intraperitoneal continence prolapse like enterocele and digestive prolapse like rectocele are all due to localized defects in the endopelvic diaphragm of the corpus intrapelvinum; in isolated form or combined though the author believes strongly in this concept, time and evidence-based results and challenges by other reconstructive surgeons will tell if he is right or wrong.

First edition November 2015
Last edition October 2018
**endopelvic diaphragm**

**in the female**

**with cervix as its central point**

**introduction**

the intrapelvic organ and organ support situation in the female differs radically from the situation in the male by the interposition of the large female genital tract in between the distal urinary tract anteriorly and the distal digestive tract posteriorly.

all embedded into the corpus intrapelvinum of the tela urogenitalis, together with their vascular and nervous supply.

though the situation of the superior layer of pelvis floor is more or less the same since the levator ani muscles are not affected; except for a wider pelvis.

the perineum outlet diaphragm is severely weakened by the large vagina opening; so instead of two now a third and large opening has been pierced thru punched out.

so the pelvis floor in the female is prone to dysfunctioning.

there is increased hydrostatic intraabdominal pressure due to the weight of the female genital organs; especially during pregnancy.

also the support of the anatomic female urine continence mechanism changed since in the male it is well supported by the prostate.

as compensation in order to support the female bladder and urethra and the uterus and cervix and to withstand the intraabdominal pressure the corpus intrapelvinum formed a functional dynamic structure as the author would like to call the

**endopelvic diaphragm**

from the pubis bone bodies anteriorly to the sacrum posteriorly and circumferentially connected to the pelvis wall like the skin of a drum or trampoline with the cervix as its center; and fusing anteriorly with the perineum outlet diaphragm under an angle of 35-40°.

in between the distal urinary tract, the proximal genital tract, the intraperitoneal contents and the distal digestive tract and the vagina.

with a small opening anteriorly for the urethra and a larger one posteriorly for the rectum.

since the cervix is firmly anchored into the central pierced thru punched out opening it becomes the centrum tendineum intrapelvinum as well; since all the musculofascia structures are firmly anchored onto it.
it consists of a mixture of connective tissue for strength, elastin for passive elasticity and plasticity and smooth muscle fibers for active dynamic non-fatigue tonus and relaxation via baro- and stretch receptors as modulated by the autonomic nervous system

it is the first line of counteracting the hydrostatic intraabdominal pressure and contributes to compression pressure by increase or decrease of its tonus; especially since its main component is smooth muscle fibers

whilst the rest pressure is dealt with by the pelvis floor structures, especially by the perineum outlet diaphragm

it supports the posterior urethra, posterior uv-junction and posterior bladder neck in their anatomic position and as such contributes to the anatomic urine continence mechanism

it prevents the posterior urethra, posterior bladder, cervix, intraperitoneal contents and anterior rectum from herniating into the vagina

it is divided into specialized parts as the pubovesical/posterior pubourethral ligaments, pubocervical musculofascia, arcus tendineus fasciae, cardinal and broad ligaments, rectovaginal fascia and sacrouterine ligaments with the cervix as centrum tendineum intrapelvinum since all its musculofascia/ligament structures are firmly connected to it

**pubovesical/posterior pubourethral ligaments (= muscles)**

anchoring the most anterior part of the pubocervical musculofascia as part of the endopelvic diaphragm onto the pubis bone bodies and

securing the posterior proximal urethra, uv-junction and bladder neck in their anatomic position and so supporting the female urine continence mechanism

once they become defective intrinsic stress incontinence may develop

**pubocervical musculofascia**

like a triangle from the pubis bone bodies and bilateral aff to the cervix as the anterior part of the endopelvic diaphragm as part of the corpus intrapelvinum

this thick musculofascia is well developed and seems to consist of longitudinal smooth muscle/collagen fibers (from anterior towards posterior) and underneath the mid/distal urethra also transverse smooth muscle/collagen fibers (in between the median inferior surfaces of the pubis bones) interwoven by collagen and elastin

the longitudinal arrangement seems likely since longitudinal median defects are found intraoperatively at genuine incontinence, cystocele and cervix prolapse surgery

the anterior transverse arrangement seems likely since the median longitudinal defects stop at 1.5-2 cm to the external urethra opening where the endopelvic diaphragm fuses with the perineum outlet diaphragm

the intact pubocervical musculofascia secures and stabilizes the (posterior) bladder base/neck, uv-junction and urethra in their anatomic position and as such supports the female urine continence mechanism; it also stabilizes the cervix anteriorly and bilaterally

the intact pubocervical musculofascia prevents the pre/subperitoneal contents bladder base/uv-junction/urethra and the cervix from herniating into the vagina
the axis of the pubocervical musculofascia as to the horizontal/ground is 25-30° from symphysis to ischium spine in the upright position

the posterior wall of the urethra, uv-junction and the bladder trigonum are not expanding during the asymmetric filling of the bladder; therefore these structures are firmly fixed to the pubocervical musculofascia/endopelvic diaphragm whilst

the anterior vagina wall is rapidly expanding and deflating with shearing during sexual intercourse and even more during childbirth and as such is loosely connected/fixed to the pubocervical musculofascia/endopelvic diaphragm

arcus tendineus fasciae = atf
as bilateral fixation/insertion of the endopelvic diaphragm/pubocervical musculofascia whilst

the arcus tendineus fasciae is further connected to the lateral pelvis wall (arcus tendineus of levator ani muscle and oburator internus muscle fascia) via a narrow triangular fascia sheath

cervix
the cervix is considered to be the centrum tendineum intrapelvinum since all musculo fascia structures of the endopelvic diaphragm are firmly anchored onto it and the cervix itself is firmly anchored into the central pierced thru punched out opening within the endopelvic diaphragm

cardinal ligaments and broad ligaments
since their smooth muscle fibers radiate into the cervix they support the endopelvic diaphragm restricting its downward movement

sacrouterine ligaments = rectouterinus muscles
as posterior fixation of the endopelvic diaphragm onto the sacrum since they fix/connect the cervix posteriorly onto the rectum and sacrum restricting its anterior movement

with lateral fixation to the pelvis wall (coccygeus muscles, sacrospinous ligaments and priformis muscles) via fascia sheaths

they contract during childbirth keeping the cervix in its position by preventing upward movement

(part of the) rectovaginal fascia
In between the vagina and rectum and anchored onto the posterior cervix in between the sacrouterine ligaments as part of the endopelvic diaphragm

weakest point in endopelvic diaphragm/pubocervical musculofascia
considering the anterior cone-like triangular shape with the narrowest at the pubis bones and the broadest in between the ischium spines the weakest point is in the median at the anterior cervix

and the broader the pelvis (with broad span) the more prone for median defects and as such for stress incontinence, urethrocele, cystocele and cervix prolapse
innervation

by **intrinsic** myogenic impulses
from baroreceptors for **tonic** action for a long-standing non-fatigue tonus to counteract the intraabdominal hydrostatic pressure and from stretch receptors for an immediate **phasic** action upon stretch on sudden intraabdominal pressure rise as superimposed upon the already existing tonic action
as modulated

by **extrinsic** impulses
from the autonomic nervous system via complex mechanism of reflex action and from hormones and from other neurotransmitters

it is very well possible that there are also impulses from the enteric nervous system

**mechanism of physiologic action**

the endopelvic diaphragm is a **single-unit** smooth muscle structure with **tonic** action for a non-fatigue tonus to counteract the hydrostatic pressure and immediate reactive **phasic** action by contraction upon stretch as superimposed upon the tonic action to counteract sudden intraabdominal pressure rise, like cough, standing up etc

this in combination with the synchronized **multi-unit** archaic matrix of the corpus intra pelvinum with its other **single-unit** smooth muscle specialized structures

and as such stabilizing/securing the pelvis organs in their variable anatomic position and supporting the continence mechanisms

especially preventing the posterior bladder neck, posterior uv-junction and posterior urethra wall from backward rotation with funneling of the urethra

this explains the fact that even under spinal anesthesia and with a filled bladder a sudden fist push onto the suprapubic lower abdominal wall combined with coughing does not result in urine loss thru the euo (as stress incontinence) when the endopelvic diaphragm is intact

this test is a standard procedure to check continence during all our reconstructive pelvis surgery

**reaction to biomechanic stress and hormones**

during pregnancy there is continuously increasing intraabdominal hydrostatic pressure combined with hormonal flooding

since smooth muscle cells are also capable to multiply if the need arises the endopelvic diaphragm will then react by hypertrophy and hyperplasia according to the increasing intraabdominal hydrostatic pressure and hormones
during the puerperium the endopelvic diaphragm will involute as well according to the
decreasing intraabdominal hydrostatic pressure until an equilibrium has been achieved

nb the decrease of estrogens in the second half of the cycle may explain the fact that
the symptoms of stress incontinence may worsen during the second half of the cycle

mechanism of pathophysiologic action

the downward intraabdominal pressure upon the endopelvic diaphragm may lead to
defects within this diaphragm

the downward pressure increases during the course of pregnancy with highest pressure
at the median where the cervix is anchored into the endopelvic diaphragm

the broadest part of the endopelvic diaphragm is in between the ischium spines where it
stabilizes and secures the cervix and

this is exactly where splitting/division of the longitudinal smooth muscle/collagen fibers
at the median starts and then continues from proximally to distally whilst

the endopelvic diaphragm fibers retract bilaterally since medially disrupted

normally the most distal 1-2 cm stay intact since the short span is able to withstand the
pressure and the smooth muscle/collagen fibers are also transverse (and longitudinal)

it is good to remember that during childbirth itself the pressure changes from downward
caudad to upward cephalad and that semicircular compression and shearing occur at
where the endopelvic diaphragm is attached to pubis bone and atf

in prolonged obstructed labor pressure necrosis may develop and lead to anatomic
tissue loss defects at any location within the endopelvic diaphragm

then there may be direct trauma (penetration, surgery) and trauma due to infection

defects within the endopelvic diaphragm

there are two types of defects viz defects without anatomic tissue loss like those due to
intraabdominal pressure or shearing and defects with anatomic tissue loss varying from
minimal to (sub)total loss like those due to pressure necrosis in prolonged obstructed
labor or due to infection or due to surgery

aa defects without anatomic tissue loss

since it is the first line of withstanding intraabdominal hydrostatic pressure especially
during pregnancy and also withstanding shearing forces during sexual intercourse and
physiologic vaginal childbirth

it is clear that defects may develop weakening the endopelvic diaphragm in varying
degrees from minor to extensive
it is good to realize that during pregnancy the direction of long-term pressure is from cephalad to caudad whilst during childbirth the short-term pressure is from caudad to cephalad upon this diaphragm

since it has multiple functions, like supporting the urine continence mechanism and securing the organs in their anatomic position, defects within the diaphragm will have different effects depending upon their location

the possibilities are as following: anterior, median, lateral, central and posterior; isolated or in any combination

**anterior defects**
with weakening of the urine continence support since the posterior urethra wall will “rotate backward” away from the symphysis causing vesicalization of the (proximal) urethra since fixed/adhesive anterior urethra wall
by this mechanism genuine or postrepair intrinsic stress incontinence develops

**median longitudinal defects**
depending upon its location the posterior urethra, bladder base may herniate thru this defect into the zero-pressure vagina and eventually prolapse to the outside only if there is also concomitant weakening of the support or dorsal-directed pull on the posterior urethra wall towards the sacrum the urine continence mechanism may be involved

**central defect**
the cervix/uterus will herniate thru this defect into the vagina and then may prolapse unopposed to the outside thru the hernia-prone opening in the pelvis floor dragging the anterior vagina wall with it like intussusception only infrequently if there is concomitant weakening of the support or dorsal-directed pull on the posterior urethra wall towards the sacrum the urine continence mechanism may be involved
normally there is full urine continence in total uterus/cervix prolapse c3 or c4 even with a urethra length of only 0.5-1 cm however, with increased longitudinal bladder diameter, shortened urethra and narrow external urethra opening

**apical defect**
this will result in herniation of the intraperitoneal contents into the zero-pressure vagina

**posterior defects**
this will result in herniation of the rectum into the zero-pressure vagina especially when combined with perineal body defects

**lateral defects at atf**
this will result in loss of tonus of the endopelvic diaphragm and increase in the caudad/cephalad movements but not in herniation/prolapse of an organ thru this defect

**lateral defects of the fascia sheath in between the atf and atlam**
this will result in medial displacement of the atf with loss of tonus and hypermobility of the endopelvic diaphragm but not in herniation/prolapse of an organ thru this defect

**other location**
due to penetrating trauma or forceps delivery or vacuum delivery
bb defects with anatomic tissue loss

it is good to realize that in any obstetric urine fistula there is anatomic tissue loss of the endopelvic diaphragm/pubocervical musculofascia as well

therefore in obstetric trauma surgery one should make an effort to identify the musculo fascia defects and repair them together with the fistula

the extent and location of pressure necrosis lesions in prolonged obstructed labor may be from minimal to extensive and from one location to the other in an endless variation which makes the obstetric trauma so intriguing

circular punched out defects
the same size as the fistula or (slightly) bigger than the fistula

transverse curved defects
bigger than the fistula whereby the fistula is somewhere within this defect

quartercircular defects
with partial or total anatomic loss of atf and atlam and possible partial loss of levator ani muscles, obturator muscles and obturator membrane with fistula formation and possible opening of the paravesical space

semicircular defects
with partial or total anatomic tissue loss of atf and atlam; and with partial tissue loss of the levator ani muscles, obturator internus muscles and obturator membrane; eventually with bare bones with fistula formation and opening of the paravesical space

(sub)total pubocervical musculofascia loss
regularly (sub)total fascia loss with extensive fistula formation and anterior vagina wall loss and total loss of atf and atlam and (partial/extensive) loss of levator ani muscles, obturator internus muscles and obturator membranes is found with bare bones in a so-called empty pelvis

(sub)total endopelvic diaphragm loss
from time to time (sub)total loss of the whole diaphragm may be found with extensive soft tissue loss resulting in extensive urine/stool fistulas as cloaca; for these unfortunate women nothing can be done

however, anatomic tissue loss may also be found
due to surgery whereby tissue is excised

or due to necrotizing infections like postmeasles noma vaginae

cc combination of functional with anatomic defects

this combination of aa and bb is always possible and has to be checked for during the reconstructive procedure
reconstructive surgery

it is important first to identify the real (extent of the) defect(s) and then reconstruct the functional anatomy meticulously using autologous structures so that normal physiology will be ensured whilst

special attention has to be given to check that all (musculo)fascia structures are firmly (re)connected to the cervix as the centrum tendineum intrapelvinum

discussion

the endopelvic diaphragm as part of the corpus intrapelvinum is an important dynamic structure

it constitutes a real diaphragm with the cervix as its center with a small anterior median opening for the urethra and a larger posterior median opening for the rectum

separating the distal urinary tract, proximal genital tract, intraperitoneal contents and distal digestive tract (rectum) from the zero-pressure vagina

counteracting as first line the intraabdominal hydrostatic pressure due to the non-fatigue dynamic tonus of its smooth muscle component by its tonic action via baroreceptors as modulated by the autonomic nervous system; whilst the rest pressure is then dealt with by the pelvis floor structures

with immediate reactive phasic action contraction upon stretch as superimposed upon the already existing tonic action in case of sudden intraabdominal pressure rise

contributing to securing and stabilizing the pelvis organs in their variable anatomic position and as such

supporting the anatomic urine and genital continence mechanisms

defects in this diaphragm are rather common and may be due to (increased) hydrostatic pressure, shearing by vaginal childbirth, pressure necrosis during prolonged obstructed labor, penetrating trauma and necrotizing infection; as also influenced by hormonal and ageing processes

depending upon (the large variety of) the anatomic location and extent of these defects the following is possible

intrinsic stress incontinence, ?cervix incompetence?, urethrocele, vesicocele, uterus/cervix prolapse, enterocele and rectocele; either isolated or in combination

there is a clear correlation between genuine intrinsic urine incontinence, cystocele and cervix prolapse with a wide pubic arch of ≥ 90° as indication of a wide pelvis

simply since the wider the pelvis the broader the span by the diaphragm and the more chance the longitudinal fibers will split/divide in the midline; with its weakest point just anteriorly from the cervix where the span is the widest
though lateral defects due to hydrostatic pressure and/or shearing at atf level and lateral defects in the narrow triangular fascia sheath between atf and atlam are possible this will not lead to herniation of the posterior bladder wall thru these defects into the vagina

at least the author has not encountered this as the cause of cystocele; the only time the author encountered a lateral defect with cystocele formation was in a patient who developed a fourth obstetric fistula after successful repair of three previous obstetric fistulas including an extensive type IIBb

in quartercircular and semicircular defects (always combined with lateral defects) with anatomic tissue loss of the endopelvic diaphragm and with fistula formation ensuring an empty bladder, another mechanism comes into play according to the natural tissue forces; besides the fact that the urethra and bladder will retract in opposite directions

which is the opposite of what one would expect

due to the balloon-like structure of the bladder with anterior bladder wall adherent/sticking to the posterior symphysis this will result in anterior and cephalad pull onto the posterior bladder (neck) wall whereby the loose endopelvic diaphragm is pulled as well and will re-attach onto the pubis bones and bilateral pelvis wall at a more anterior and cephalad level due to the natural tissue forces

actually, the saucer-like shape of the empty bladder in the normal anatomic situation is caused by the fact that the fixation of the posterior bladder wall onto the endopelvic diaphragm prevents the natural tissue forces from adapting the posterior bladder wall onto the anterior bladder wall

in identifying the endopelvic diaphragm
look for
shiny smooth muscle tissue
though lateral defects due to hydrostatic pressure and/or shearing at the level and lateral defects in the narrow triangular fascia sheath between atf and atlam are possible this will not lead to herniation of the posterior bladder wall thru these defects into the vagina at least the author has not encountered this as the cause of cystocele; the only time the author encountered a lateral defect with cystocele formation was in a patient who developed a fourth obstetric fistula after successful repair of three previous obstetric fistulas including an extensive type IIBb in quarter circular and semicircular defects (always combined with lateral defects) with anatomic tissue loss of the endopelvic diaphragm and with fistula formation ensuring an empty bladder, another mechanism comes into play according to the natural tissue forces; besides the fact that the urethra and bladder will retract in opposite directions which is the opposite of what one would expect due to the balloon-like structure of the bladder with anterior bladder wall adherent/sticking to the posterior symphysis this will result in anterior and cephalad pull onto the posterior bladder (neck) whereby the loose endopelvic diaphragm is pulled as well and will re-attach onto the pubis bones and bilateral pelvis wall at a more anterior and cephalad level due to the natural tissue forces actually, the saucer-like shape of the empty bladder in the normal anatomic situation is caused by the fact that the fixation of the posterior bladder wall onto the endopelvic diaphragm prevents the natural tissue forces from adapting the posterior bladder wall onto the anterior bladder wall in identifying the endopelvic diaphragm look for shiny smooth muscle tissue

endopelvic diaphragm
smooth muscle
intrinsic myogenic impulses
modulated by autonomic innervation

perineum outlet diaphragm = pelvis floor
striated muscle
somatic innervation
essentials kees vvf classification
as based on tissue loss, continence mechanism, operation technique and outcome

introduction

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

kees classification

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

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

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

- **type kees III**  
  miscellaneous

and of course  

- **postpartum urine incontinence**

**table I**
classification of fistulas according to anatomic/physiologic location

<table>
<thead>
<tr>
<th>kees I</th>
<th>fistulas not involving the continence/closing mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>kees II</td>
<td>fistulas involving the continence/closing mechanism</td>
</tr>
<tr>
<td></td>
<td>A without (sub)total urethra involvement</td>
</tr>
<tr>
<td></td>
<td>a without circumferential defect</td>
</tr>
<tr>
<td></td>
<td>b with circumferential defect</td>
</tr>
<tr>
<td></td>
<td>B with (sub)total urethra involvement</td>
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<td></td>
<td>a without circumferential defect</td>
</tr>
<tr>
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<td>b with circumferential defect</td>
</tr>
</tbody>
</table>

| kees III | miscellaneous, e.g. ureter fistulas and other exceptional fistulas |

fluid transition from type I into type II fistulas is at 4-5 cm whilst transition from type IIA into type IIB fistulas is at 0.5-1 cm from the external urethra opening.
a grading of involvement of the urine continence mechanism of the different types is presented in table II

**table II**

involvement of continence mechanism according to type

<table>
<thead>
<tr>
<th>type</th>
<th>involvement of continence mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>kees I</td>
<td>none</td>
</tr>
<tr>
<td>kees II Aa</td>
<td>minor to moderate</td>
</tr>
<tr>
<td>kees II Ab</td>
<td>moderate to major</td>
</tr>
<tr>
<td>kees II Ba</td>
<td>major</td>
</tr>
<tr>
<td>kees II Bb</td>
<td>extensive</td>
</tr>
<tr>
<td>kees III</td>
<td>none</td>
</tr>
</tbody>
</table>

**operation principles**

the operation principles for each type are presented in table III

**table III**

operation principles for each type

<table>
<thead>
<tr>
<th>type</th>
<th>bladder/urethra direction of closure</th>
<th>endopelvic diaphragm</th>
<th>ant vagina wall closure</th>
</tr>
</thead>
<tbody>
<tr>
<td>kees I</td>
<td>any according to common sense</td>
<td>no special measures</td>
<td>adaptation</td>
</tr>
<tr>
<td>kees II Aa</td>
<td>transverse</td>
<td>transverse repair (+ fixation)</td>
<td>transverse adaptation</td>
</tr>
<tr>
<td>kees II Ab</td>
<td>circumferential end-to-end</td>
<td>refixation</td>
<td>transverse adaptation</td>
</tr>
<tr>
<td>kees II Ba</td>
<td>longitudinal (+ transverse)</td>
<td>fixation</td>
<td>flap</td>
</tr>
<tr>
<td>kees II Bb</td>
<td>longitudinal + circumferential nonurethra tissue</td>
<td>refixation</td>
<td>flap</td>
</tr>
</tbody>
</table>

| kees III | special class of its own that needs their own specific approach |
results

in 1,716 consecutively operated patients, a final check-up after first and/or final attempt was performed 5-6 months postoperatively

then the final results were analyzed whereby the incontinence rate was calculated as part of the healed fistulas and not as part of the total number of patients, see table IV.

table IV

results as to fistula type in 1,716 patients (1992-2001)

<table>
<thead>
<tr>
<th>type</th>
<th>number</th>
<th>healed first attempt</th>
<th>final healing</th>
<th>incontinent</th>
</tr>
</thead>
<tbody>
<tr>
<td>kees I</td>
<td>243</td>
<td>238 (97.9%)</td>
<td>242 (99.6%)</td>
<td>1 (0.4%)</td>
</tr>
<tr>
<td>kees IIa</td>
<td>888</td>
<td>868 (97.4%)</td>
<td>888 (100%)</td>
<td>11 (1.2%)</td>
</tr>
<tr>
<td>kees IIb</td>
<td>366</td>
<td>333 (91.0%)</td>
<td>353 (96.4%)</td>
<td>30 (8.5%)</td>
</tr>
<tr>
<td>kees IIa</td>
<td>87</td>
<td>80 (96.4%)</td>
<td>86 (98.9%)</td>
<td>14 (16.3%)</td>
</tr>
<tr>
<td>kees IIb</td>
<td>132</td>
<td>114 (86.4%)</td>
<td>121 (91.7%)</td>
<td>59 (48.8%)</td>
</tr>
</tbody>
</table>

discussion

this classification is based on the qualitative and qualtitative amount of tissue loss of the urine continence mechanism in the female

so far it is the only classification with a

solid scientific background

clear operation technique principles for each type and prediction of outcome in terms of closure and continence

the other classifications are either based on subjective opinion of the surgeon like simple, complex, easy, difficult etc etc or are a modification of what has been presented by the author in this book

of course within each type tens, hundreds or thousands of subsubtypes can be made but that would make the sense of classification unworkable

at least for the author the more he uses this classification the more it becomes of value

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

not only the fistula has to be classified, but all the lesions/defects have to be objectively described/documentated in writing to be completely transparent
In 1,716 consecutively operated patients, a final check-up after first and/or final attempt was performed 5–6 months postoperatively when the final results were analyzed whereby the incontinence rate was calculated as part of the healed fistulas and not as part of the total number of patients, see Table IV.

### Table IV

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<th>Final healing</th>
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### Discussion

This classification is based on the qualitative and quantitative amount of tissue loss of the urinary continence mechanism in the female. So far, it is the only classification with a solid scientific background and clear operation technique principles for each type and prediction of outcome in terms of closure and continence. The other classifications are either based on subjective opinion of the surgeon like simple, complex, easy, difficult, etc. etc. or are a modification of what has been presented by the author in this book. Of course, within each type, tens, hundreds or thousands of subsubtypes can be made but that would make the sense of classification unworkable. The more the author uses this classification, the more it becomes valuable. These are only guidelines and the approach has to be customized since each fistula constitutes its own unique entity.

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.
type kees I fistulas

vesicovaginal fistula

vesicocervicovaginal fistula

vesicouterine fistula

vagina vault fistula
type kees IIAb fistulas

urethrovessicovaginal fistula

urethrovessicovaginal fistula

urethrovessicovaginal fistula

urethrovessicovaginal fistula

urethrovessicovaginal fistula

urethrovessicovaginal fistula

© kees
type kees IIbA fistulas

urethrovaginal fistula

urethrovaginal fistula

urethrovaginal fistula

urethrovaginal fistula

urethrovaginal fistula

urethrovaginal fistula

© kees
type kees IIb fistulas

urethrovescovaginal fistula

urethrovescovaginal fistula

urethrovescovaginal fistula

urethrovescovaginal fistula

urethrovescovaginal fistula

urethrovescocervicovaginal fistula

urethrovescovaginal fistula

© kees
fistula size

small fistula

medium fistula

large fistula

extensive fistula
endopelvic diaphragm defects

type I

type II Aa

type II Ab

type II Ba

type II Bb

genuine incontinence
postscriptum

the author is engaged in a major effort to transfer his hard-fought knowledge, experience and expertise to the present and next generation of obstetric trauma surgeons which is not only about fistulas but also about incontinence and prolapse in which the (physiologic) obstetric trauma plays a major role

after 35 full years of professional obstetric trauma surgery with continuous clinical and surgical and theoretic research

the author is forced to re-evaluate his thinking, his research and his surgical management by analyzing his evidence-based documentation in a critical manner

to his surprise he found the following

though his writing is based upon his expertise on the other hand the writing down contributes to his own even more critical and more systematic approach and found he himself violates his own statements from time to time which led to a better theoretic insight and more physiologic approach

however, what he failed to find was a simple fistula with a simple approach

having spent 6 years of postgraduate training in surgery/traumatology and 2 years in obstetrics/gynecology and 1 yr in leprosy/tuberculosis and reconstructive surgery
to find simple solutions and then apply them is highly complicated even though it may look simple in experienced hands

many speak about simple things and then apply complicated techniques

how can we as surgeons create the right type of conditions so that nature can execute its physiologic healing processes optimally

this requires deep insight into the basics of functional anatomy, physiology, mechanism of action, resulting lesions and reconstructive surgery as backed up by evidence-based results

if one does something basically right it may heal to full satisfaction of anybody involved though there is no guarantee

if one does something basically wrong it cannot heal to full satisfaction however much one tries though there are exceptions

and the knowledge of today may not be the knowledge of tomorrow

though the author is trying to provide the theoretical insight as based on extensive study and anatomic findings in the living and to give the practical evidence-based solutions these are only guidelines and it is up to the reader to devise his/her own plan of action since strict protocols without insight will only lead to tricks
### abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>vvf</td>
<td>vesicovaginal fistula</td>
</tr>
<tr>
<td>rvf</td>
<td>rectovaginal fistula</td>
</tr>
<tr>
<td>uvvf</td>
<td>urethrovaginal fistula</td>
</tr>
<tr>
<td>vcvf</td>
<td>vesicocervicovaginal fistula</td>
</tr>
<tr>
<td>vuvf</td>
<td>vesicouterovaginal fistula</td>
</tr>
<tr>
<td>cx</td>
<td>cervix</td>
</tr>
<tr>
<td>avw</td>
<td>anterior vagina wall</td>
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<tr>
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<tr>
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<td>arcus tendineus of levator ani muscle</td>
</tr>
<tr>
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<tr>
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<td>total abdominal hysterectomy</td>
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<tr>
<td>tvh</td>
<td>total vaginal hysterectomy</td>
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</table>
euo = external urethra opening
uo = internal urethra opening
uv(-junction) = urethrovesical (junction)

euo/f = distance between euo and fistula
f/c = distance between fistula and cervix
f/v = distance between fistula and vagina vault;
euo/b = distance between euo and catheter balloon
euo/bw = distance between euo and bladder wall (fundus)
a/f = distance between anus and (rectovaginal) fistula
i/v = distance between introitus and vagina vault; vagina length

pa = pubic arch
ap = anterior to posterior pelvis diameter
ar = anal reflex

gm = gastrocnemius muscle
sm = soleus muscle
at = achilles tendon

min = minute
hr = hour
wk = week
mth = month
yr = year

R = right
L = left

bladder capacity by longitudinal diameter (euo/bw minus euo/b)
small \leq 4 \text{ cm}
moderate 5-6 \text{ cm}
normal 7-12 \text{ cm}
transitional 13-14 \text{ cm}
increased \geq 15 \text{ cm}
normal pelvis measurements

vagina length  10-12 cm
euo/c  6-7-8 cm
anatomic urine continence mechanism  4-5 cm
anatomic stool continence mechanism  4-5 cm
urethra length  3.5-4 cm
    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 cm
  anus (+ sphincter) diameter  1.5-2 cm
  pac  = anus to coccyx bone  5-6 cm
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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