



Reconstructive surgery in 1,014 consecutive patients with complex sphincter ani rupture: principles and practice

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ABSTRACT

Objective: To describe the anatomic fecal continence mechanism, the mechanism of action, the complex trauma itself and the reconstructive principles and to present the evidence-based results in a large scale study of a comprehensive approach to the repair of complex sphincter ani rupture.

Materials and Methods: A total of 1,014 women with sphincter ani rupture were operated by a personal operation technique exactly in the opposite order of the trauma, first the internal sphincter, then the external sphincter in end-to-end fashion and lastly the perineal body with meticulous attention to detail.

Results: At first attempt the sphincter ani rupture had healed in 924 patients (91%) and at final attempt 988 patients (98%) had healed with incontinence in 10 and a failure was noted in 26 patients out of whom 10 were inoperable.

Conclusion: This operation technique is highly effective since the normal functional anatomy is reconstructed and restored along with the physiology. It can be recommended to the low-, middle- and high-income world as evidence-based standard.

Keywords: Sphincter ani rupture; complex trauma; reconstructive surgery; prospective large scale study; evidence-based results

INTRODUCTION

Up until today, the fresh, intermediate or old obstetric sphincter ani rupture constitutes a challenge to the obstetrician and the surgeon in the low-, middle- and high-income world since it is a complex trauma with extensive involvement of the anatomic fecal continence mechanism as a Kees IIb rectovaginal fistula.¹⁻⁴

The results after surgery are not optimal because the functional anatomy is complicated, the mechanism is poorly understood, the trauma itself is complex and the surgical skills are not always up to standard combined with traction upon the repair from different directions/structures; as demonstrated in this study since 70% of the patients had been operated already from 1 to

12 times, and also by the fact that even in the author's hands the failure rate per operation is 9%.

Through continuous theoretical, clinical and surgical research and evidence-based results since 1984, the author developed a systematic reconstructive surgery approach with meticulous attention to detail keeping the additional surgical trauma to a minimum.⁵

The anatomic stool continence mechanism

The anatomic stool continence mechanism consists of the distal anorectum as smooth muscle internal sphincter, the external sphincter ani striated muscle as supported posteriorly

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by the puborectalis muscle and anteriorly by the perineal body as centrum tendineum into which the bulbocavernosus muscles radiate as posterior median (in)direct union and the transversus perinei muscles radiate as median (in)direct union as demonstrated in Figure 1.

The mechanism of action

The anterior obstetric sphincter ani rupture is a cut-through trauma whereby the head of the infant cuts through the stiff perineum in the following order: posterior distal vagina wall, the perineum with perineal body, the external sphincter ani, the prerectal fascia and the ano-rectum (as internal sphincter); since the perineal body is disrupted the posterior median union of the bulbocavernosus muscles and the median union of the transversus perinei muscles are disrupted as well; however without tissue loss.

The cut through is by precipitous delivery of the infant's head either as associated with a wide pelvis and wide pubic arch and then isolated with a live infant or after the obstruction within the birth canal has been overcome in a normal or narrow pelvis

and then combined with a pressure necrotic vesicovaginal fistula (VVF) with a stillborn infant.

Seldomly it is due to pressure necrosis in between the fetal head and the maternal sacrum and coccyx bones and then combined with extensive pelvis soft tissue loss which makes most of these fistulas inoperable.

The posterior obstetric sphincter ani trauma is caused by pressure necrosis in between the fetal head and the maternal coccyx bone.

The penetrating trauma like median episiotomy, impalement or rough sex could also be considered as a cut-through trauma.

Rarely it is caused by infection like lymphogranuloma venereum, perianal abscess formation or necrotizing gangrene.

The complex trauma of anterior sphincter ani rupture

The trauma consists of a tear in the distal posterior vagina wall with bilateral retraction, a rupture of the perineum with disruption of the perineal body with bilateral retraction since the posterior median union of the bulbocavernosus muscles and the median union of the transversus muscles are disrupted as well with retraction of these muscles, a rupture of the external sphincter ani muscle with bilateral circular retraction and a rupture of the prerectal fascia and ano-rectum (internal sphincter) with bilateral circular retraction.

The sum of all these tractions in different directions results into the typical inverted V configuration of the anterior sphincter rupture whereby the anterior anus endings are pulled into the vagina in the direction of the sacrum bone.

Lateral or posterior sphincter ani ruptures have their own configurations as based on traction in their specific location.

MATERIALS AND METHODS

Since 1983 up till today a total of 1,237 women with a sphincter ani rupture were treated out of whom 97 healed spontaneously including 13 with a posterior rupture, 91 were completely stool/flatus continent but came for leaking urine and 45 did not return for repair after VVF repair.

The remaining 1,014 sphincter ruptures were operated personally by the author with the following relevant characteristics and data.

The location of the rupture was anterior in 1,007 or >99%, lateral in three and posterior in four. The cause was obstetric in 978 or 96.5%, penetrating trauma in 22, iatrogenic in 16 and infection in three. The rupture was combined with a VVF in 548 or 54%. A previous operation, ranging from 1 to 12 times, was noted

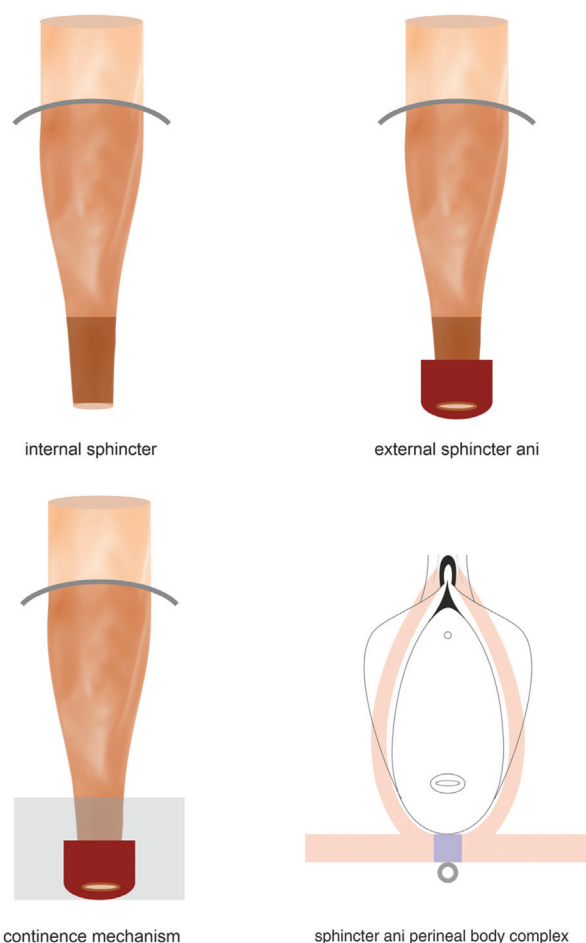


Figure 1. Stool continence mechanism

in 702 or 70% resulting into mutilation in 221 or 22% whilst 16 were considered inoperable. A colostomy was still present in 11 patients. The fistula size, i.e. longitudinal tear of the anorectum, was small (<2 cm) in 469 or 45.5%, medium (2–3 cm) in 410 or 39.8%, large (4–5 cm) in 90 or 8.7% and extensive (>6 cm) in 61 or 5.9%. Out of these patients, 10 developed the rupture within the age group 0–9 years, 639 within the age group 10–19 years, 255 within the age group 20–29 years, 98 within the age group 30–39 years and 12 within the age group 40–49 years. The duration of the fistula on operation day was less than 3 months in 329, from 3 months to 1 year in 300 and from 1 to over 20 years in 385 patients. The vagina was shortened (<9 cm) in 108 with stenosis in 90 and stricture in 22 patients.

The index parity in the 978 obstetric fistula patients varied from 1 to 14 with the majority of 570 or 60% at para 1. The great majority of 657 patients or 67% delivered in a hospital and 63 by caesarean section probably after failed vacuum or forceps trial. Out of the 984 infants born, since 6x twin delivery, 671 were males and 313 were females with a male to female sex ratio of 7:3; whilst 470 were born alive. A foot drop was noted in 765 patients or 78%. A repeat obstetric sphincter ani was found in 27 patients: 23 presented with a second, three with a third and one with a fourth obstetric rupture.

Preparation

As soon as the wounds are clean the patient is considered to be suitable for operation unless her general condition does not permit it. Since it is not possible to give enemas for whatever reason the preoperative instructions are no food the night before and the morning of the operation, bowel movement the morning of operation and drinking until the operation.

Personal reconstructive operation technique (see <https://youtu.be/QzVUPvfUtWA>)

All operations are performed under spinal anesthesia and in the lithotomy position with the surgeon and assistant standing. Just before the operation is started and under spinal anesthesia, a final assessment is made of the complex trauma with special attention to eventual pressure necrotic lesions.

The operation is executed in the opposite order of the trauma and can be divided into the following different steps:

1. Incision and dissection

Stretching the anorectum trauma into a straight horizontal line by bilateral fixation of the skin next to both external sphincter ani ends onto the inner sides of the legs. Then deep straight horizontal dissecting incision from one sphincter end to the

other in between the posterior vagina wall and distal anorectum edge freeing the posterior vagina wall from the prerectal fascia with freshening of the sphincter ends; but only minimally to such an extent that closure becomes possible without tension; extensive dissection is avoided because it is not necessary and will lead only to bleeding; if needed sharp/blunt freeing of adhesions between the rectum and surrounding tissue and/or sphincter ends and surrounding tissue to achieve a tension-free repair; this may be found if the patient has been operated before. Then the stretching sutures are being removed otherwise they would hinder the closure of the rectum, anus and sphincter by pulling exactly the opposite way.

2. Reconstruction of the anorectum (internal sphincter) with repositioning of the anterior anus

Longitudinal closure of the distal anterior anorectum and anterior anus by a layer of interrupted inverting polyglycolic acid sutures thru the prerectal fascia and muscularis (= internal sphincter) starting 1 cm proximally from the anorectum defect and up to the very distal end of the anterior anus; special care has to be given to the most distal suture at the anocutaneous junction which should start inside the mucosa thru muscularis of one side and then thru muscularis/mucosa on the other side and back; if this suture has been tied inside the anus the internal sphincter has been adapted over its full length with repositioning of the anterior anus and the inner ring of the external sphincter should be adapted (as check if the anterior anorectum defect really has been totally repaired); this layer is for strength of the internal sphincter repair

The first layer is inverted by a second layer of continuous polyglycolic acid for an air-tight closure, and then the smooth-muscle internal sphincter has been repaired over its full length.

This part of the reconstruction is the most important since it is the internal sphincter which is predominantly responsible for a continuous closure of the anus due to the tonus of its smooth-muscle circular arrangement.

If there is anything that would endanger the repair, e.g. major tissue loss due to pressure necrosis, the operation is ended as a first stage and the reconstruction of the external sphincter postponed as a second stage as done in 36 patients.

3. Reconstruction of the external sphincter ani

The striated-muscle external sphincter ends are identified and without any further dissection the already freshened sphincter ends are united in an end-to-end manner by three separate polyglycolic sutures (superficial, deep and subcutaneous part). Then patency of the anus is checked.

4. Reconstruction of the perineal body (with re-union of transversus perinei and bulbocavernosus muscles)

To restore the anatomy and shape of the vulva/perineum and to support the sphincter mechanism, the perineal body is repaired by 3-0 polyglycolic acid sutures taking deep bites starting para-anally; at the same time there will be indirect re-union of the transversus perinei and of the bulbocavernosus muscles. After tying these sutures there should be a normal-shape vulva with the perineum adapted; if it does not look normal then the repair is not alright, and this should be corrected.

5. Median transverse adaptation of the posterior vagina wall

Only transverse adaptation of the posterior vagina wall in the midline is needed, together with the last perineal body suture, according to the principles of septic surgery. The vagina and the perineum are always contaminated and thus ensuring free drainage of bacteria, wound fluid and small blood clots.



Figure 2. Sphincter ani rupture

6. Check upon hemostasis

After careful check upon hemostasis, the patient is transferred to the postoperative ward (Figure 2-5).

Remarks

The art is to reconstruct the stool continence mechanism step by step, slowly but very visible after each step, the normal functional anatomy is being restored and the (anterior) anus comes to lie secured in its anatomic distal position, outside the vagina and slightly protruding; everything should look normal.

If the sphincter ani rupture is combined with a vesicovaginal fistula (VVF), the VVF should be repaired first and then the sphincter rupture, either in the same session as done in 427 patients in this study, or if too complicated, the sphincter repair should be performed after the VVF has been repaired and healed.

The operation time of sphincter ani reconstruction is 20 plus/minus 5 minutes and of the combined VVF/RVF reconstruction 40 minutes plus/minus 10 minutes.

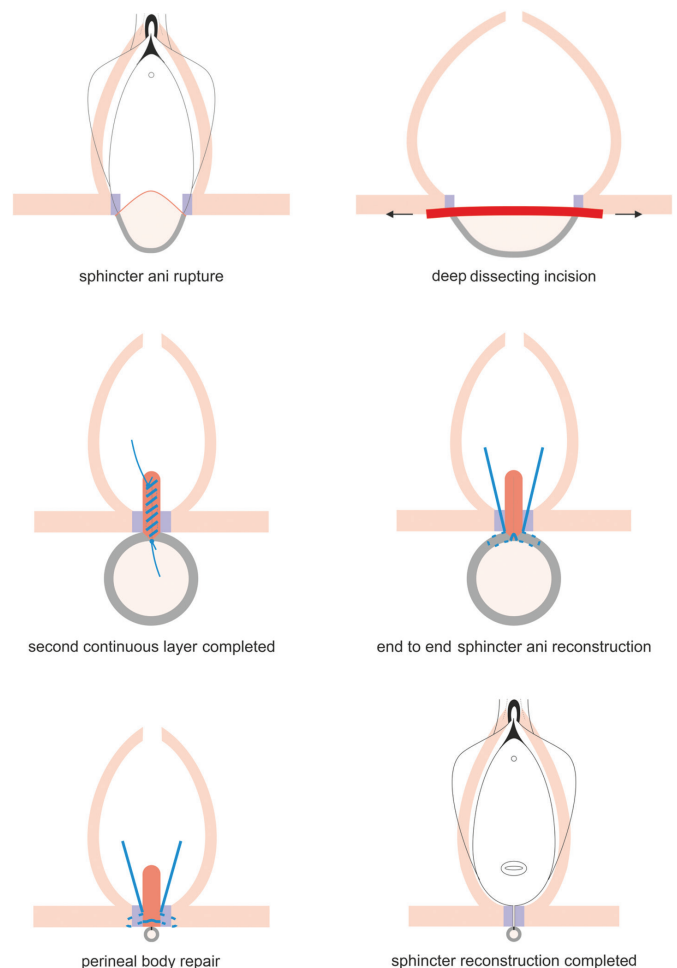


Figure 3. Reconstruction principles

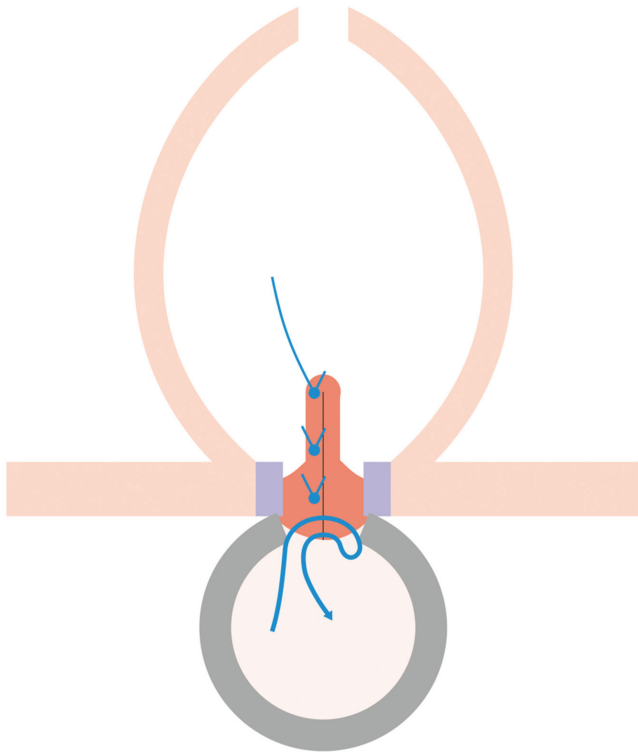


Figure 4. Crucial suture anocutaneous junction

If the repair was not successful, either in closure or in continence, a repeat operation was performed according to the same principles as the first repair.

Postoperative instructions and follow-up

Full mobilization should be started the morning after operation day, no solid food for 10 days and a stool softener for 10 days. After each bowel movement the perineum/anus has to be cleaned carefully by water and then completely dried. Sitzbaths are contraindicated, since they will soften the repaired tissue and infection will be more frequent; normally the less one does about an operation wound the better it heals.

10 to 14 days postoperatively the patient will be asked about defecation and stool/flatus (in)continence with complete inspection/examination of the operation site.

If it has healed, she will be discharged, instructed to refrain from sex for at least 3–4 months and told to come back one month later, when the same examination will be repeated up to 5–6 months postoperatively.

If it has not healed, she will also be discharged and instructed to come back after 3 months for another repair which is done according to the same principles as if it were the first.

If it has healed with slight incontinence, she is re-assured this will improve over 2–3 months since the tissues need time to heal completely due to strengthening and re-arrangement under physiologic stress.

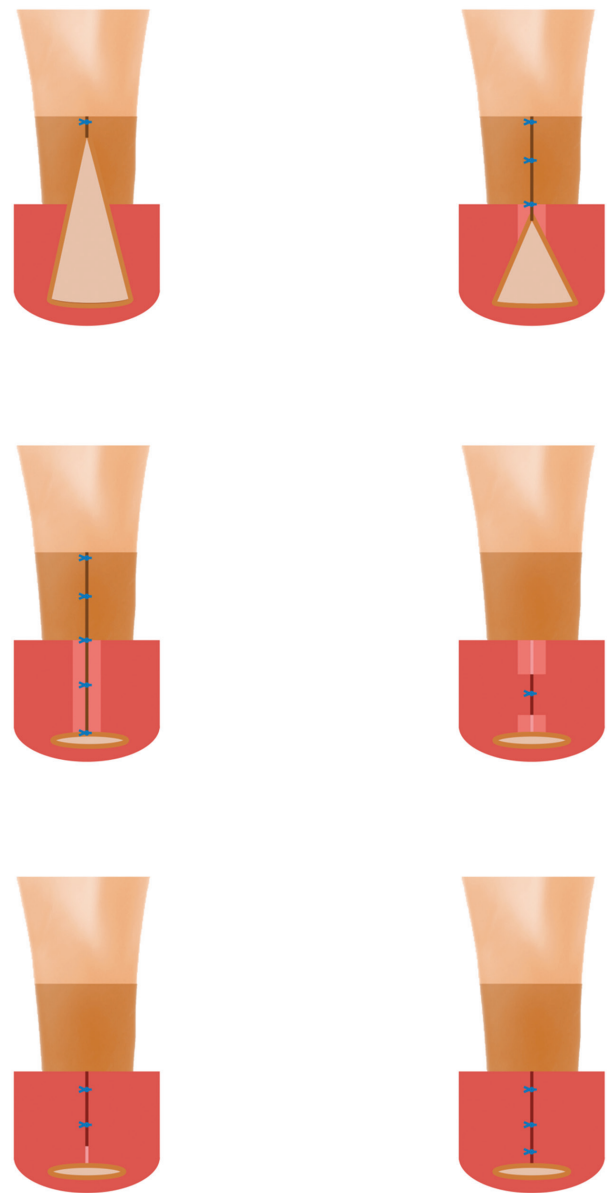


Figure 5. Internal and external sphincter reconstruction

If the patient complains of gross flatus/stool incontinence a meticulous examination is done to exclude a minute blow-out fistula or a loose external sphincter ani, and action taken accordingly.

Normally, the highly qualified and well trained operating theatre staff is responsible for the follow-up; only if there are problems the surgeon will see and examine the patient.

All things are meticulously documented by computerized operation reports including all relevant data, by prediction of outcome in healing and continence on a 5% scale from 5% to 95%, by schematic drawings, by digital pre-, intra- and/or postoperative photos and by written down postoperative check-ups until six months postoperatively; that is the real strength of the programme since it provides evidence-based results.

RESULTS

After first attempt by the author 924 patients (91%) were healed with stool/flatus continence in 895 (97% of the healed patients) whilst 90 had a complete breakdown including 10 of the 16 inoperable patients. During the first six months after repair 12 patients returned with a new sphincter ani rupture probably due to early sexual intercourse.

After another 157 repeat operations by the author finally 988 patients (98%) had healed completely with full stool/flatus continence in 977 (99% of the healed repairs) and 26 had failed out of whom 10 were inoperable.

Unfortunately, one patient died suddenly and unexpectedly at day 1st and another patient died from hepatorenal failure after taking native drugs at day 9th postoperatively.

During long-term follow-up 113 patients returned whilst pregnant with full stool/flatus continence and 31 patients returned with a repeat sphincter ani rupture after a subsequent delivery.

DISCUSSION

Though the perineum is torn as well, the sphincter ani rupture cannot be considered to be a fourth degree perineum tear since a perineum tear is only a tear, whilst the sphincter ani rupture is a highly complex trauma of all the different stool continence structures. In a compound bone-fracture there is a skin tear as well, but nobody considers it as a fourth degree skin tear. However, there is a fluid transition from a perineum tear into a complex sphincter ani rupture, the mechanism is the same and the symptoms may be the same.

The presented technique is a minimum-invasive straightforward approach with the objective to reconstruct only the affected individual structures, under the philosophy that in surgery only the necessary has to be done, nothing more but also nothing less; however, this has to be done very well with meticulous attention to detail. In repairing the distal anorectum, the first phase of the reconstruction it is the muscularis (= internal sphincter) together with the prerectal fascia that is being taken up by the sutures and not the mucosa as being described in other studies; otherwise, the internal sphincter being the most important part of the anal continence mechanism would not be reconstructed. Since the anorectum is composed of very delicate tissue, instrumentation and tissue handling is of utmost importance whilst care should be taken that minimum tension is applied in tying the sutures, bringing the tissues together. If at the end of this stage, the anterior anus is not in anatomic position, and/or the inner ring of the external sphincter ani is not adapted. it means there a

defect remains in the distal part of the internal sphincter which may lead to incomplete anal continence.

In 1993 the author used the overlapping sphincter technique once but gave it up immediately since it is non-physiologic with additional surgical trauma.

Though these parts cannot be identified macroscopically, an attempt is made to unite the superficial, deep and subcutaneous parts of the sphincter ani muscle, by different placement of the sutures.

The reconstruction failure rate of 9% may be explained by traction upon the repair from different directions and structures, circular by the internal sphincter, circular by the external sphincter, transverse by the transversus perinei muscles, and anteriorly by the bulbocavernosus muscles whilst previous repairs made their contribution as well.

However, the final reconstruction success rate of 98% with incontinence in only 10 (1%) of the healed patients is excellent.

There still remain few patients, in whom the reconstruction of the anorectum and external sphincter and perineal body is not possible, due to subtotal loss of these and other intravaginal structures. This remind us that there are limits to reconstructive surgery nevermind how skilful and resourceful the surgeon may be.

The reason that some patients with a sphincter ani rupture, even with a large anorectum trauma, claim to be fully stool/flatus continent, may be due to strong action of the puborectalis muscle at the anorectal angle level.

The author never used a colostomy, never united the levator ani muscles and never used the gracilis muscle, in his obstetric trauma surgery since first there is no need for these, and second - the theoretic and practical aspects are not sound. The third reason is that these procedures are mutilating and not contributing to the quality of life.

CONCLUSION

This operation technique is highly effective since the normal functional anatomy is reconstructed/restored and with it the physiology; it can be recommended to the low-, middle- and high-income world as evidence-based standard.

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Ethics

Ethics Committee Approval: This article does not require ethics committee approval since the previous patient records were used as data.

Informed Consent: Not necessary for this type studies.

Peer-review: Internally and externally peer-reviewed.

DISCLOSURES

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