DIAGNOSIS AND TREATMENT OF DISORDERS OF THE POSTERIOR PELVIC COMPARTMENT Daniëlla M.J. Oom **DIAGNOSIS AND TREATMENT OF DISORDERS OF THE POSTERIOR PELVIC COMPARTMENT** Daniëlla M.J. Oom DIAGNOSIS AND TREATMENT OF DISORDERS OF THE POSTERIOR PELVIC COMPARTMENT Daniëlla M.J. Oom DIAGNOSIS AND TREATMENT OF DISORDERS OF THE POSTERIOR PELVIC COMPARTMENT Daniëlla M.J. Oom DIAGNOSIS AND TREATMENT OF DISORDERS OF THE POSTERIOR PELVIC COMPARTMENT Daniëlla M.J. Oom DIAGNOSIS AND TREATMENT OF DISORDERS OF THE POSTERIOR PELVIC COMPARTMENT **Daniëlla M.J. Oom** DIAGNOSIS AND TREATMENT OF DISORDERS OF THE POSTERIOR PELVIC COMPARTMENT Daniëlla M.J. Oom

Diagnosis and Treatment of Disorders of the Posterior Pelvic Compartment

Diagnose en Behandeling van Aandoeningen van het Achterste Compartiment van het Kleine Bekken

Proefschrift

ter verkrijging van de graad van doctor aan de
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ERASMUS UNIVERSITEIT ROTTERDAM

"In the middle of difficulty lies opportunity"
A. Einstein (1879 - 1955)
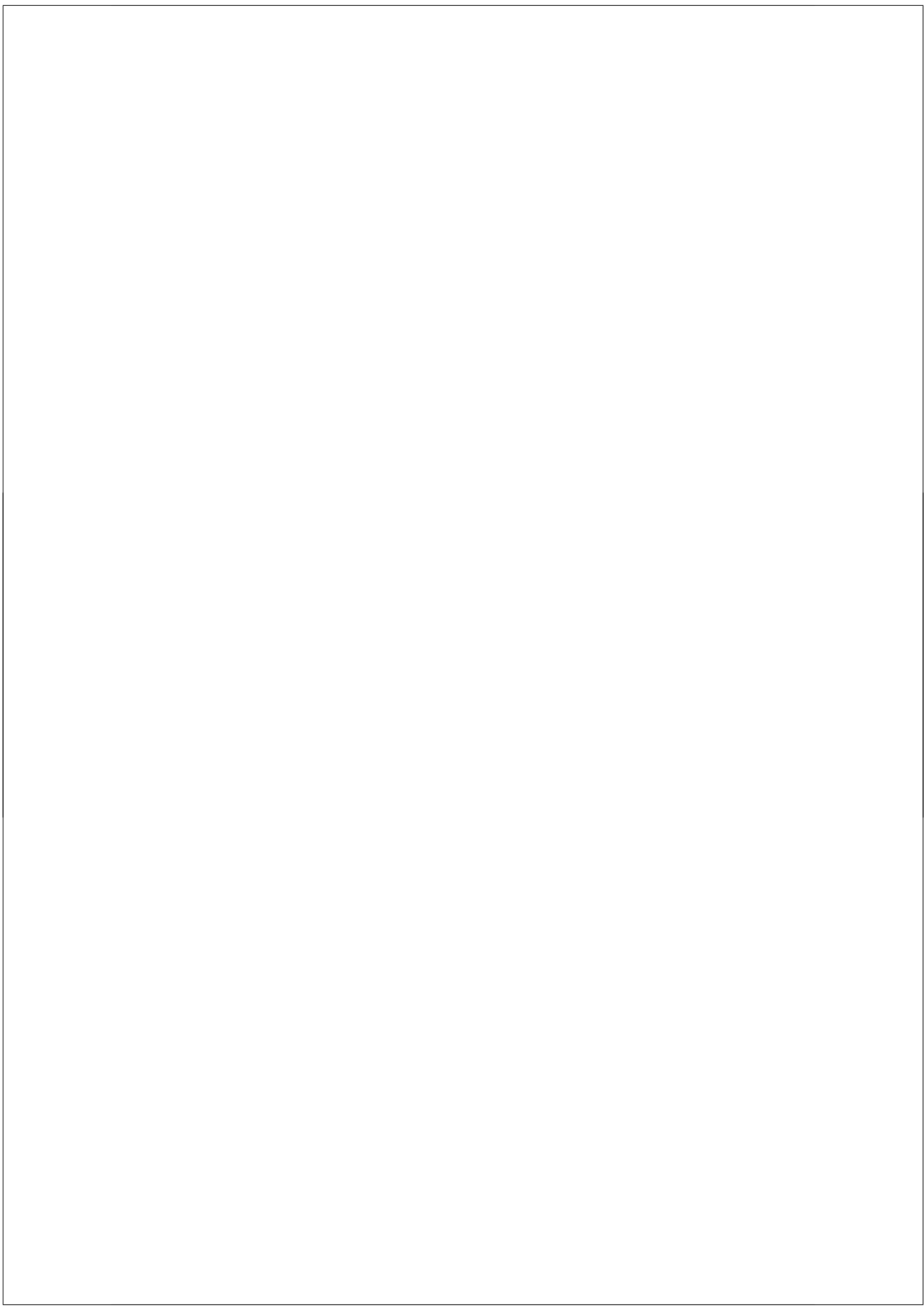
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Introduction

Chapter 1

Introduction and outline of the thesis

Daniëlla M.J. Oom

The pelvic floor is an important structure, mandatory to maintain urinary and faecal continence and to prevent descent of pelvic viscera. Simultaneously it should also permit micturition, defaecation and sexual intercourse. The female pelvic floor can additionally be challenged by pregnancy and delivery, with sometimes devastating consequences [1, 2]. Disorders associated with the pelvic floor are common, especially in older multiparous women, and have a significant impact on quality of life [3, 4]. According to the related pelvic viscera, these disorders can be separated into three groups, which are the anterior, middle, and posterior pelvic compartment disorders. This thesis will focus on the diagnosis and treatment of disorders of the posterior pelvic compartment.

Anatomy of the Posterior Pelvic Compartment

The posterior pelvic compartment encloses the area located posterior to the vagina and the uterus. It runs from the perineal body, along with the rectovaginal septum, towards the posterior fornix of the vagina and includes the anal sphincters, the rectum, and the pouch of Douglas [5] (Figure 1). The pelvic floor is attached to the internal surface of the pelvis and forms the hammock that supports the pelvic viscera. The muscular layer of the pelvic floor is subdivided into three parts according to their attachments and the pelvic viscera to which they are related, namely the ileococcygeal, pubococcygeal, and puborectal muscle [6, 7] (Figure 2). The puborectal muscle represents the most central and distal part of the pelvic floor. This muscle originates at the pubic bone and forms a U-shaped sling around the rectum. The pubo- and ileococcygeal muscles run more lateral and cranial to the puborectal muscle. The anal sphincter complex consists of two cylindrical layers. The internal anal sphincter forms the inner cylinder and is a thickened continuation of the circular smooth muscle of the bowel. The outer cylinder, the external anal sphincter, is made up of striated muscle. The deep bundles of this external anal sphincter are intimately fused with the most distal part of the puborectal muscle [8].

Physiology of the Posterior Pelvic Compartment

Faecal Continence

Faecal continence is the ability to prevent unintended loss of rectal contents. Maintaining faecal continence depends on a highly integrated series of complex events. Several aspects such as stool volume and consistency, rectal and anal sensory perception, rectal reservoir function, mechanical factors, and anal sphincter function play a role in maintaining continence. The ability to prevent unintended loss might depend on whether the rectal contents are solid, liquid, or gas. This discrimination of stool consistency mainly depends on sensory receptors in

the anal epithelium [9]. Rectal reservoir function is influenced by adaptive compliance, capacity and distensibility of the rectum. The angulation between the rectum and anal canal, which is induced by the continuous tonic activity of the puborectal muscle, as well as the high-pressure zone in the anal canal, contribute to an effective barrier against loss of rectal contents. Both anal sphincters are responsible for the anal high-pressure zone at rest, however, the continuous state of tonic contraction of the internal anal sphincter supplies the largest contribution to this anal resting pressure. The haemorrhoidal anal cushions also contribute to the prevention of leakage of liquid rectal contents [10].
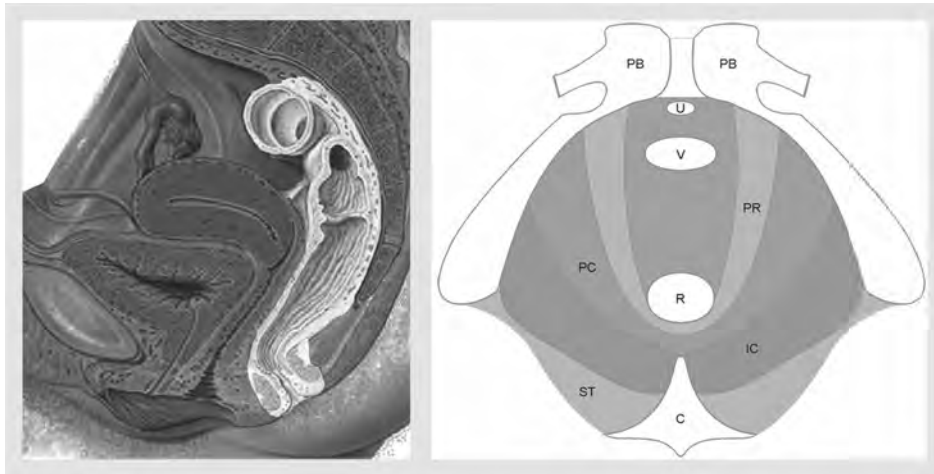
Figure 1. Pelvic anatomy, the posterior pelvic compartment is highlighted

Figure 2. Female pelvic floor

PR: puborectal muscle, PC: pubococcygeal muscle,

IC: ileococcygeal muscle, U: urethra, V: vagina, R: rectum,

PB: pubic bone, C: coccyx, ST: sacrotuberal ligament

Normal Defaecation

Whenever stool reaches the rectum, the intrarectal pressure increases, resulting in rectal wall distension which is the stimulus for initiating defaecation. The internal anal sphincter relaxes, which induces contraction of the external anal sphincter. During this phase, anal sensory receptors will discriminate the consistency of the rectal content. Whenever voluntary defaecation is allowed, a squatting position is assumed, resulting in straightening of the angulation between the rectum and anal canal. A voluntary Valsalva manoeuvre is performed to overcome the external anal sphincter resistance. The pelvic floor descends and the rectal wall tone increases, inducing enhanced intrarectal pressure and an expulsive force on the faecal mass. Relaxation of the external anal sphincter will permit passage of the faecal mass. After rectal evacuation, the pelvic floor and anal sphincters regain their resting activity, resulting in anal closure [10, 11].

Disorders of the Posterior Pelvic Compartment

Posterior pelvic compartment disorders generally refer to functional anorectal disorders, such as faecal incontinence and obstructed defaecation. These disorders are often non-specific and might be related to different functional and anatomical deficits. Disorders, specific for this thesis are pointed out, other disorders (e.g. anorectal malignancies) are beyond the scope of this thesis and therefore not further described.

Functional Posterior Pelvic Compartment Disorders
Faecal Incontinence

Functional posterior pelvic compartment disorders can be subdivided into faecal incontinence and obstructed defaecation. Faecal incontinence occurs when the complex mechanism that maintains continence is disturbed. This disorder is reported to affect 11 to 15 percent of the general Western population [12, 13]. Numerous different factors, which might exist simultaneously, can be identified in the aetiology of faecal incontinence. The effects of aging reflect the most prominent association [14]. Leaving these elderly patients out of consideration, the most common causes of faecal incontinence are pregnancy and delivery [15]. Anal sphincter defects are present in approximately one out of three multiparous women [16]. Other well-known contributing factors are previous anorectal surgery, pelvic trauma, pudendal nerve neuropathy, complete rectal prolapse, and diarrhoea [14, 17, 18].

Faecal incontinence ranges in severity from mild loss of gas to complete loss of control over solid stool. Several grading systems are available for the assessment of faecal incontinence severity. In 1975, Parks was the first to describe a classification system, which is still frequently used [19] (Table 1). The Parks classification is simple and solely based on the type of unintended loss, whereas other classifications address other components, such as the number of incontinence episodes, pad use, and lifestyle alterations [20-22]. Unfortunately, none of these classifications is universally accepted and it remains questionable whether some of these grading systems are reliable in reflecting incontinence severity [23].

Faecal incontinence can be treated by different conservative and surgical therapies, depending on the severity, impact, and underlying pathophysiologic mechanism. In general, patients will first be offered conservative treatment, such as medication and / or pelvic floor muscle training [24, 25]. When these therapies fail, patients are eligible for surgical treatment.

Table 1. Parks classification	
I	Full continence
II	Incontinence for gas or soiling
III	Incontinence for liquid stool
IV	Incontinence for solid stool

Obstructed Defaecation

Rectal evacuation reflects a functional event requiring coordination of a complex series of events. Different mechanisms can lead to a disturbance of these events and might eventually lead to obstructed defaecation [26]. Defaecation difficulties are reported to affect approximately 15 percent of the adult Western population [27]. Mechanical outlet obstruction and shifting of the direction of the expulsive force vector are thought to play a role in patients with posterior pelvic compartment prolapse. Other well-known mechanisms are a defective rectal filling sensation and functional outlet obstruction due to ineffective muscle relaxation.

Patients complaining of constipation present with a wide range of symptoms regarding defaecation difficulties, referring to hard stools, inability to defaecate, infrequent defaecations, and feelings of incomplete evacuation. However, these symptoms are relatively common and do not necessarily reflect obstructed defaecation. To date, obstructed defaecation is defined according to the Rome III criteria [28] (Table 2).

When conservative treatment, such as increasing dietary fibre and pelvic floor muscle training, is unsuccessful, appropriate additional therapy should rely on proper identification of the underlying pathophysiologic mechanism. It is important to distinguish those patients with delayed colonic transit from those with obstructed defaecation, because slow transit constipation requires a different therapeutic approach. As anatomic findings (i.e. enterocele and rectocele) are associated with obstructed defaecation, several different surgical techniques are described [29-31]. However, it remains uncertain whether these procedures are capable of restoring normal defaecation.

Table 2. Rome III criteria
Criteria fulfilled for the last three months, onset at least six months prior to diagnosis
I   Must include two or more of the following:
a. Straining during at least 25 percent of defaecations
b. Lumpy or hard stool in at least 25 percent of defaecations
c. Sensation of incomplete evacuation for at least 25 percent of defaecations
d. Sensation of anorectal blockage for at least 25 percent of defaecations
e. Manual manoeuvres to facilitate at least 25 percent of defaecations
f. Fewer than three defaecations per week
II   Loose stools are rarely present without the use of laxatives
III There are insufficient criteria for irritable bowel syndrome

Anatomic Posterior Pelvic Compartment Disorders

Posterior Pelvic Compartment Prolapse

Posterior pelvic compartment prolapse involves loss of support, which results in descent of one or more pelvic viscera in this compartment. Posterior pelvic compartment prolapses are divided in enterocele, rectocele, intussusception, and complete rectal prolapse. Enterocele is described as a herniation of small bowel or rectosigmoid into the vagina. A herniation of the anterior rectal wall into the lumen of the vagina is called rectocele and intussusception is defined as an infolding of the rectal wall into the distal part of the rectum or anal canal. A full-thickness protrusion of rectal wall through the anal canal is a complete rectal prolapse.

The prevalence of pelvic organ prolapse is estimated at 30 percent in women between 20 and 60 years [32], but is even higher in older women. It has been reported that these prolapses are mainly caused by injury related to pregnancy and vaginal delivery [5, 33]. The prevalence of pelvic organ prolapse is strongly associated with parity. The risk increases with each child, but the rate of increase declines once a woman has had two children [33]. Other known risk factors include age, obesity, hysterectomy, smoking, chronic bronchitis, chronic constipation, heredity, and collagen disorders [34-37].

Different symptoms are attributed to prolapse of the posterior pelvic compartment. However, these symptoms are often non-specific and might also be related to prolapse of the anterior and middle pelvic compartment. Patients often complain about pelvic discomfort, such as feelings of a vaginal lump, heaviness, and pelvic pressure, which might disappear when lying down [38]. Anorectal disturbances, which include obstructed defaecation, urgency, and faecal incontinence, are also frequently found [39]. Other symptoms, attributed to these prolapses, are sexual dysfunction and pain [29, 38]. Women with posterior pelvic compartment prolapse often have concomitant prolapses in the anterior and / or middle compartment [40, 41], which might result in concomitant symptoms and possibly in the need for a different therapeutic approach.

Surgical repair is the treatment of choice for women, in whom conservative treatment, such as pelvic floor muscle training and vaginal pessary, fails. The goal of surgical repair is to restore the original anatomic state and to resolve the associated symptoms. Many different types of repair have been described, all with their own advantages and disadvantages [29, 42]. Although most of these procedures provide successful anatomic correction, the associated symptoms are not so easy to resolve and persist in a substantial number of patients.

Rectovaginal Fistula

A rectovaginal fistula is an abnormal communication between the two epithelial-lined surfaces of the rectum (or anal canal) and the vagina. Rectovaginal fistulas are classified as low, intermediate, and high fistulas, depending on the site of the vaginal opening [43]. Most of the rectovaginal fistulas are low fistulas, which are in fact anovaginal fistulas. Obstetric injury is the most frequent cause of rectovaginal fistula formation [44, 45]. Approximately two percent of

vaginal deliveries in Western society result in a perineal tear involving the anal sphincters [46]. Subsequent rectovaginal fistula formation is reported in approximately three percent of the patients with such a perineal tear [2]. Perianal infections, prior anorectal surgery, carcinoma, and radiation might also lead to rectovaginal fistula formation [10]. The most common symptoms are passage of gas and stool through the vagina [47]. Furthermore, these fistulas might lead to vaginal discharge, chronic vaginitis, and urinary tract infection [10].

Despite some anecdotic reports, there is no evidence that rectovaginal fistulas heal spontaneously. Surgical repair is considered as the treatment of choice for patients with such a fistula. Despite a multitude of different surgical repair strategies [48-50], healing rates are often disappointing, especially in women in whom the fistula persisted after a prior repair procedure [51-53].

Investigations of the Posterior Pelvic Compartment

Different methods of investigation are available for the examination of patients with symptoms related to posterior pelvic compartment disorders, such as anorectal manometry, endoluminal imaging, evacuation proctography, transperineal ultrasound, and colonic transit time measurement. Other tests, such as rectal balloon expulsion test, pudendal nerve terminal motor latency measurement, and electromyography are beyond the scope of this thesis and therefore not further described.

Anorectal Manometry
Since its clinical introduction in the 1960s [54], anorectal manometry has become a standard method to quantify anorectal function [55]. Internal and external anal sphincter function is assessed by the evaluation of anal resting and squeeze pressure. Furthermore, manometry can be used to elicit the rectoanal inhibitory reflex and rectal compliance. Despite the well-established use of anorectal manometry, there is no standardised method to perform anorectal manometry. Different systems, including water-perfused catheters, closed balloon systems, and microtip transducers, have been used, all with their own advantages and disadvantages [56-58]. Recently, high-resolution manometry has been described [59], however this sophisticated technique has not been established as superior to more conventional techniques.

Endoluminal Imaging
Endoluminal imaging provides a tool for the assessment of anal sphincter and rectal wall integrity. Both ultrasound and magnetic resonance (MR) imaging can be performed endoluminally. These imaging techniques play an important role in the diagnostic work-up of patients with faecal incontinence and rectovaginal fistulas [60, 61]. The internal and external anal

sphincters are evaluated separately for the presence of defects (Figure 3). Both endoluminal ultrasound and MR imaging have been found accurate in detecting anal sphincter defects [62-64]. In addition, MR imaging has the advantage of simultaneously detecting external anal sphincter atrophy [65], which might influence the outcome of treatment [66]. However, ultrasound is less expensive and more widespread available.
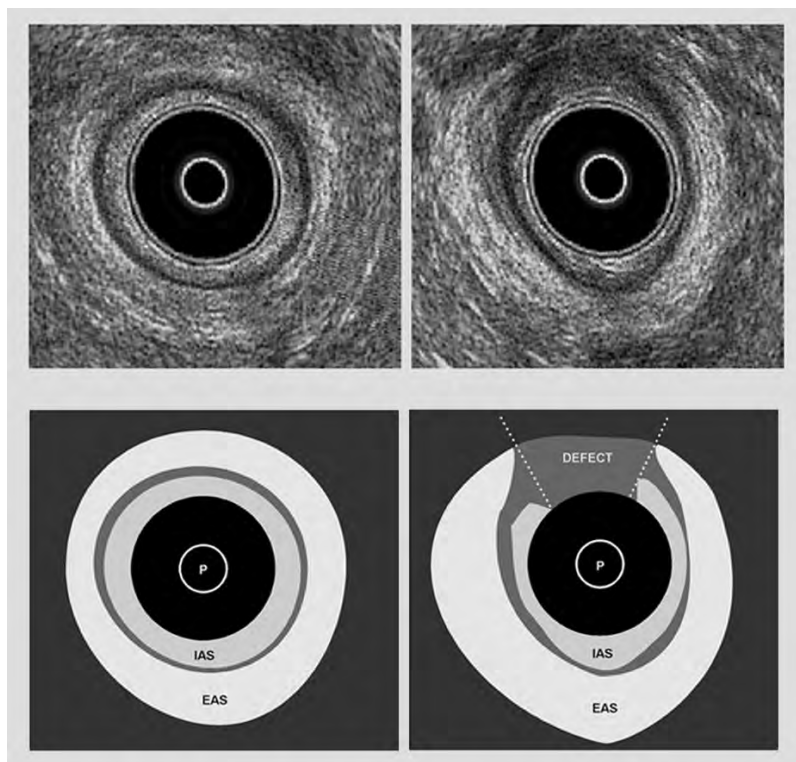
Figure 3. Endo-anal ultrasound

left: normal anal sphincters, right: combined internal and external anal sphincter defect

IAS: internal anal sphincter, EAS: external anal sphincter, P: probe

Evacuation Proctography

Evacuation proctography, also called defaecography, can be used for visualisation of abnormalities which might be related to defaecation difficulties [61, 67]. The rectosigmoid and preferably also the small bowel and vagina are opacified with liquid contrast. With the patients seated on a radiolucent toilet chair, lateral radiographs are taken at rest, during squeezing, and during straining, which mimics defaecation [68]. Evacuation proctography, which is performed in

semi-physiologic circumstances, enables objective detection of the presence and extensiveness of posterior pelvic compartment prolapse (Figure 4). Simultaneous opacifying of the bladder can be used for imaging of concomitant micturition disturbances [69]. Exposure to ionising radiation is an important drawback of evacuation proctography. MR defaecography has been introduced in the last decade for the detection of pelvic floor dysfunction [70]. However, to date, the role of this new technique is limited, since it is only available in a minority of specialised clinics.
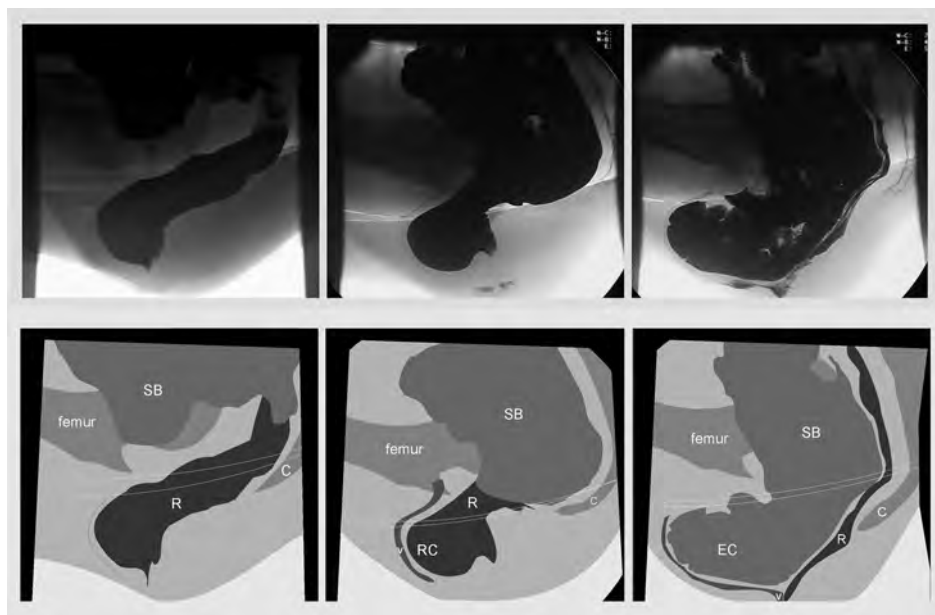
Figure 4. Evacuation proctography with opacification of rectosigmoid, small bowel and vagina

left: normal situation, middle: large rectocele, right: large enterocele

SB: small bowel, R: rectum, V: vagina, C: coccyx, RC: rectocele, EC: enterocele

Transperineal Ultrasound

Another imaging technique for posterior pelvic compartment disorders is dynamic transperineal ultrasound imaging, which has recently been introduced by Dietz *et al*. [71, 72]. This type of ultrasound imaging is performed with a transducer placed at the perineum and is non-invasive compared to endoluminal imaging. Another advantage of this imaging technique is the possibility of simultaneous detection of abnormalities in all three pelvic compartments. Evaluation of these three compartments simultaneously seems important, since it has been reported that symptoms originating from one compartment do not imply absent pathology

in another compartment [40, 41]. Furthermore, transperineal ultrasound can be used for the evaluation of pelvic floor function, as well as pelvic floor and anal sphincter integrity [73-75] (Figure 5). Since transperineal ultrasound requires additional training and equipment, its use is, at present, limited to specialised pelvic floor centers.
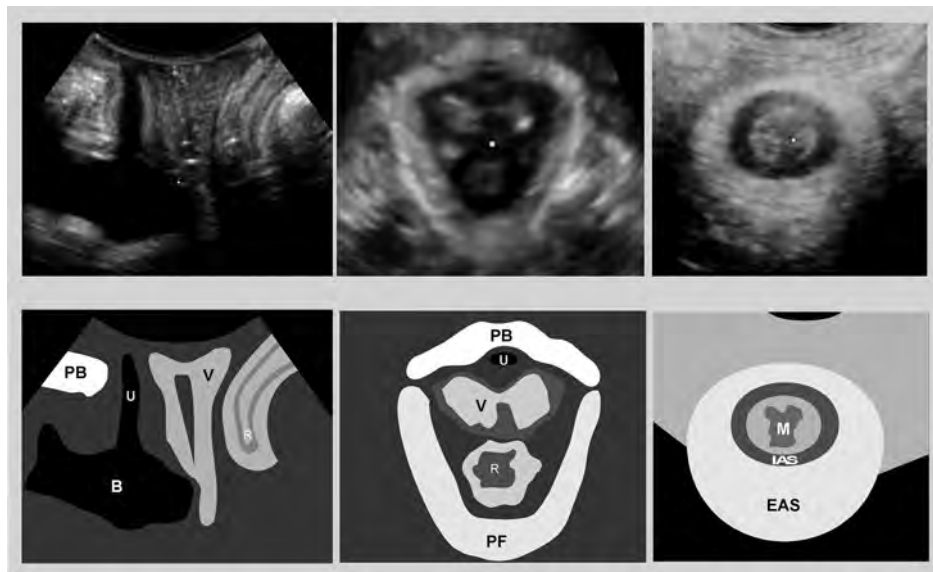
Figure 5. Transperineal ultrasound

left: normal three-compartment view, middle: normal pelvic floor, right: normal anal sphincters

PB: pubic bone, B: bladder, U: urethra, V: vagina, R: rectum, PF: pelvic floor, IAS: internal anal sphincter, EAS: external anal sphincter, M: mucosa

Colonic Transit Time Measurement

A useful investigation in the evaluation of patients complaining of constipation is colonic transit time measurement. This technique determines how much time is required for passage of stool through the large bowel. Patients should ingest a standardised number of radiopaque markers for a consecutive series of days. Simultaneously the use of laxatives and / or enemas should be refrained. Progression of the markers is followed by daily abdominal radiographs or by a single radiograph on the first day after the last ingestion of markers [76-78]. The large bowel, visualised by one or more abdominal X-ray's, is subdivided into three segments, which are the right and the left colon and the rectosigmoid. In those three segments, the markers, which are still present, are counted and segmental and total transit times are calculated [79]. This technique enables the distinction between delayed colonic transit and obstructed defaecation.

Aims and Outline of the Thesis

This thesis is aimed at evaluating diagnosis and treatment of disorders of the posterior pelvic compartment. It is mainly focussed on the outcome of different surgical modalities in the treatment of these posterior pelvic compartment disorders. Furthermore, the value of transperineal ultrasound in the assessment of posterior pelvic compartment prolapse is investigated.

Various procedures have been developed for the surgical treatment of symptomatic enterocele. It has been reported that an abdominal approach provides an effective tool for anatomic correction of this type of pelvic organ prolapse. Furthermore, short-term follow-up has shown that abdominal enterocele repair is beneficial, especially for those patients with pelvic discomfort. However, it is unknown whether this effect is sustained in the long-term. In **Chapter 2** the long-term outcome of abdominal obliteration of the pelvic inlet for symptomatic enterocele is described, especially regarding the effect of the repair on symptoms of pelvic discomfort and obstructed defaecation.

Rectocele repair is mostly performed by a transvaginal or a transanal approach. It is well known that these types of rectocele repair are associated with *de novo* dyspareunia. Transabdominal repair of rectocele seems to offer a limited risk of *de novo* dyspareunia as a side effect. The outcome of abdominal anterolateral rectopexy for symptomatic rectoceles is evaluated in **Chapter 3**.

Evacuation proctography is considered as the gold standard imaging technique for the assessment of patients with symptoms of posterior pelvic compartment prolapse. However, evacuation proctography is relatively invasive and requires exposure to ionising radiation. Transperineal ultrasound, which has recently been developed, enables dynamic and non-invasive investigation of all three pelvic compartments simultaneously, without ionising radiation and at low cost. In **Chapter 4**, the level of agreement between evacuation proctography and transperineal ultrasound in diagnosing posterior pelvic compartment prolapse is presented.

Anterior sphincteroplasty is the surgical treatment of choice for patients with faecal incontinence, associated with an external anal sphincter defect. Recently, it has been reported that patients with such a defect may also benefit from sacral neuromodulation. The question is whether anterior sphincteroplasty still deserves a place in the surgical treatment of faecal incontinence. In **Chapter 5** the long-term outcome of anterior sphincteroplasty in a large cohort of patients is described. A comparable outcome classification was used to facilitate comparison between anterior sphincteroplasty and sacral neuromodulation.

It has been shown that vaginal delivery may result not only in anal sphincter defects but also in pelvic floor injury. Until now it is unknown whether this type of injury plays a role in the aetiology of faecal incontinence and whether it affects the outcome of treatment. The prevalence of pelvic floor injury in faecal incontinent patients who were eligible for surgical

treatment in the past is reported in **Chapters 6** and **7**. In addition, the impact of this type of injury on the outcome of anterior sphincteroplasty (**Chapter 6**) and sacral neuromodulation (**Chapter 7**) is presented.

Several techniques are available for the surgical treatment of rectovaginal fistulas, however the results are often rather disappointing, especially in women in whom the fistula persisted after a prior procedure. It has been suggested that interposition of healthy, well-vascularised tissue may be the key to rectovaginal fistula healing. In **Chapter 8** the outcome of interposition of the healthy and well-vascularised puborectal sling in the treatment of rectovaginal fistulas is described. Puborectal sling interposition is not efficient in patients who have undergone previous attempts at repair. Based on this finding, we introduced an adapted rectal sleeve advancement for the treatment of patients with such a persistent rectovaginal fistula. The early experience with this new type of rectovaginal fistula repair is presented in **Chapter 9.**

The results as obtained from the studies described in this thesis, are summarised and discussed in **Chapter 10**. Moreover, suggestions for future research are made.

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Part I

Posterior Pelvic Compartment Prolapse
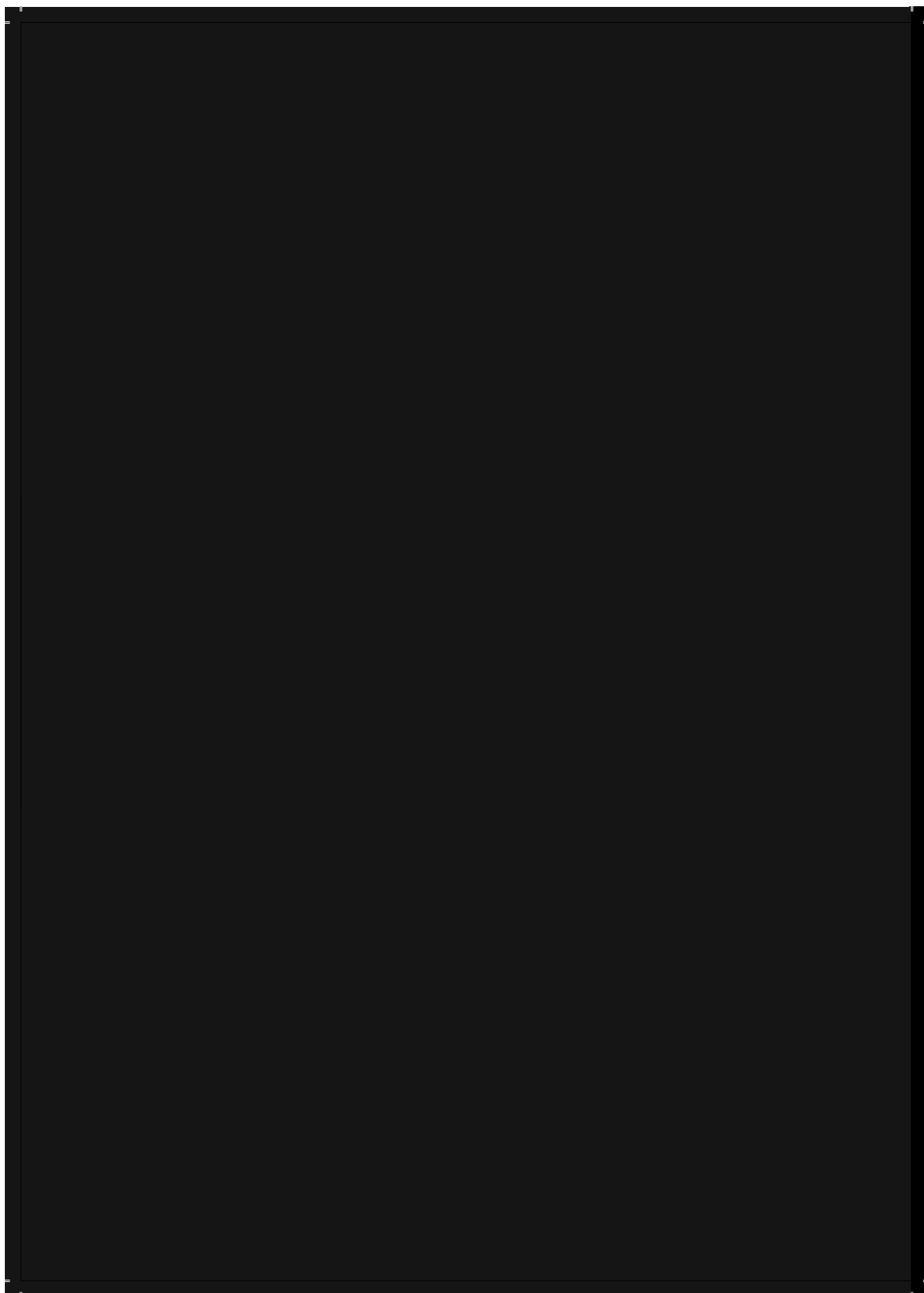
Chapter 2

Enterocele repair by abdominal obliteration of the pelvic inlet: long-term outcome on obstructed defaecation and symptoms of pelvic discomfort

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Valeria R.M. van Dijl
Martijn P. Gosselink
Jan J. van Wijk
W. Ruud Schouten

Abstract

Introduction

Enterocele is defined as a herniation of the peritoneal sac between the vagina and the rectum. This may contain either sigmoid colon or small bowel. It has been reported that enterocele is associated with obstructed defaecation and symptoms of pelvic discomfort. The aim of the present study was to evaluate the long-term effect of enterocele repair.

Patients and Methods

In the time period between 1994 and 2003, 54 women (median age: 54 years, range: 31 – 80) with a symptomatic enterocele underwent obliteration of the pelvic inlet with a U-shaped Mersilene® mesh. All patients underwent evacuation proctography, which was repeated six months after the repair. In addition, they were contacted by telephone in order to assess the long-term effect of enterocele repair. Forty-nine patients were willing to answer the questions over the telephone. Five patients were lost to follow-up (response rate: 91%).

Results

Six months after the procedure, evacuation proctography revealed a recurrent or persistent enterocele in five patients (9%), which was symptomatic in two, both of whom underwent a second repair. Among the 49 patients without an enterocele after six months, 10 women (23%) encountered recurrent symptoms of pelvic discomfort at a median follow-up of 85 months (range: 3 – 137). Despite adequate correction of the enterocele, obstructed defaecation persisted in 21 of 28 patients (75%), who presented with this problem before the procedure. *De novo* dyspareunia occurred in five percent of the women after the procedure.

Conclusion

Obliteration of the pelvic inlet with a U-shaped Mersilene® mesh provides an effective tool for anatomical correction of enteroceles. However, in the long-term one of four patients encounters recurrent symptoms of pelvic discomfort. It seems unlikely that enterocele contributes to obstructed defaecation, as evacuation difficulties persist in around three quarters of the patients.

Introduction

Enterocele is defined as a herniation of the peritoneal sac between the vagina and the rectum. This may contain either sigmoid colon or small bowel. Enterocele was first described by Garengeot [1] in 1736. It is well known that this condition is associated with symptoms of pelvic discomfort, including feelings of prolapse and pelvic pressure [2, 3]. It has also been suggested that enterocele, especially if it contains a sigmoid loop, is an underlying cause of obstructed defaecation [4, 5]. Enterocele is most frequently found in elderly, multiparous females. The exact prevalence of this abnormality is unknown. In a review in 1994, Holley [6] stated that enteroceles are uncommon. However, Cronjé et al. [7] reported that of all cases in their pelvic floor dysfunction database, 45 percent presented with an enterocele. Evacuation proctography revealed an enterocele in up to 18 percent of the women who underwent hysterectomy [8] and in 10 percent of healthy female volunteers [9, 10]. Almost two-third of the women with a symptomatic enterocele had undergone a hysterectomy in the past [4, 11, 12].

Various procedures have been developed for the surgical treatment of symptomatic enteroceles. In 1912, Moschcowitz [13] was the first to describe obliteration of the distal part of the peritoneal sac by an abdominal approach. Originally, he developed this technique for the treatment of complete rectal prolapse. Later on, gynaecologists adapted this procedure for the treatment of enterocele repair. In 1922, Ward [14] described a transvaginal approach. It has been reported that this transvaginal repair is effective in the majority of patients. However, in several studies, the duration of follow-up was short and the clinical outcome of this type of repair has only been assessed by physical examination and subjective criteria and not by evacuation proctography [4, 15-18]. A drawback of the transvaginal repair is the potential risk of dyspareunia [4, 15, 18]. More recently, different types of abdominal repair such as rectovaginopexy and obliteration of the pelvic inlet have been reported [2, 3, 19]. In two small studies, the efficacy of these abdominal procedures has been assessed by evacuation proctography after the procedure [2, 19]. Based on the outcome of these studies, it seems likely that an abdominal approach provides an effective tool for anatomical correction of enterocele.

Short-term follow-up has revealed that enterocele repair is beneficial, especially for those patients with symptoms of pelvic discomfort [2, 3]. The question is whether this effect is sustained in the long-term. In a recent study, Jean et al. [3] observed that none of their patients had symptoms of pelvic discomfort three months after abdominal enterocele repair. However, at median-term follow-up of 27 months, they encountered recurrent symptoms of pelvic discomfort in 27 percent of their patients. The aim of the present study was to assess the efficacy of abdominal enterocele repair utilising objective radiological criteria. The other goal was to evaluate the long-term effect of enterocele repair on symptoms of pelvic discomfort and obstructed defaecation.

Patients and Methods

Between 1994 and 2003, 54 female patients (median age: 54 years, range: 31 - 80) underwent obliteration of the pelvic inlet with a U-shaped Mersilene® (Ethicon, Johnson & Johnson, Somerville, USA) mesh to repair their symptomatic enterocele. Fifty-one patients (94%) presented with symptoms of pelvic discomfort, including feelings of prolapse and pelvic pressure. Thirty-one patients (57%) also complained of evacuation difficulties, which were classified as obstructed defaecation if the patient fulfilled two or more of the Rome II criteria [20] (Table 1). The history of 45 patients (83%) revealed one or more previous gynaecologic procedures. All these 45 patients had undergone a hysterectomy in the past.

Table 1. Rome II criteria [20]
I   Two or more of the following for at least 12 weeks in the preceding 12 months:
a. Straining during at least 25 percent of defaecations
b. Lumpy or hard stool in at least 25 percent of defaecations
c. Sensation of incomplete evacuation for at least 25 percent of defaecations
d. Sensation of anorectal blockage for at least 25 percent of defaecations
e. Manual manoeuvres to facilitate at least 25 percent of defaecations
f. Fewer than three defaecations per week
II   Loose stools are rarely present without the use of laxatives
III   There are insufficient criteria for irritable bowel syndrome

All patients underwent evacuation proctography with opacification of the small bowel and vagina in order to confirm the diagnosis and to classify the enterocele prior to surgery (Figure 1a). Six months after the procedure evacuation proctography was repeated in all patients (Figure 1b). For the classification of enteroceles a special grading system was used (Table 2). In 45 patients (83%) the peritoneal sac between the vagina and the rectum contained small bowel loops. A sigmoid loop was found in six patients (11%), whereas three patients (6%) presented with both small bowel loops and a sigmoid loop. A coexisting rectocele and intussusception were observed in 17 and 36 patients respectively (31% and 67%). In patients in whom the rectocele was considered symptomatic, the procedure was combined with an anterolateral rectopexy. In one patient a vaginal hysterectomy was performed simultaneously.

Hospital records and outpatient clinic charts were analysed, and follow-up information was obtained from both review of charts and personal telephone communication by one author (DMO), who had not participated in the surgical procedure. A standardised questionnaire was used to determine clinical outcome. This form included questions about pelvic discomfort, obstructed defaecation and dyspareunia. Five patients were lost to follow-up (response rate: 91%).
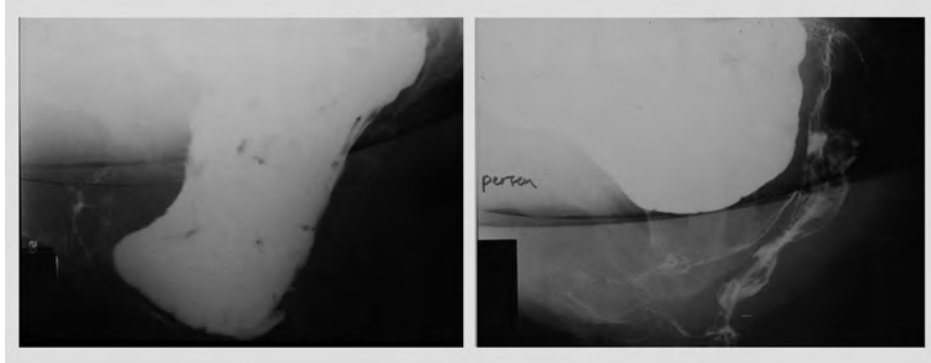
Figure 1a. Evacuation proctography beforen enterocele repair

Figure 1b. Evacuation proctography after beforen enterocele repair

Table 2. Preoperative grading of enterocele		n	%
Grade			
1	Enterocele descending to the upper one-third of the vagina	2	4
2	Enterocele descending to the middle one-third of the vagina	9	16
3	Enterocele descending to the lower one-third of the vagina	43	80

Surgical Technique

Before surgery all patients underwent conventional bowel preparation with Kleanprep™ (Helsinn Birex Pharmaceuticals, Dublin, Ireland). At the time of induction of anaesthesia, cefuroxime (1.500 mg) and metronidazole (500 mg) were administered intravenously. Laparatomy was performed by a midline incision through the lower abdominal wall. On both sides of the pelvic inlet, the peritoneum was incised above the level of the ureters. In 45 patients, who had undergone hysterectomy previously, the apex of the vagina was mobilised. In addition, the proximal part of the mesorectum was mobilised posteriorly. During this phase of the procedure, both limbs of the superior hypogastric plexus were identified. A U-shaped Mersilene® mesh was sutured to the apex of the vagina. In the patients without previous hysterectomy, the mesh was sutured to the posterior side of the vagina at the level of the posterior fornix. Both limbs of the U-shaped mesh were fixed to the incised peritoneum at both sides of the pelvic inlet proximal to the level of the ureters. The distal end of both limbs of the mesh were then wrapped around the rectum and sutured to the presacral fascia at the level of the promontory, taking care of both limbs of the superior hypogastric plexus. Tension was avoided to prevent narrowing of the rectum. The peritoneal defects were then closed. All procedures were performed by one surgeon (WRS).

Results

The median duration of hospital stay was eight days (range: 4 – 16). Five patients (9%) developed minor postoperative complications, including urinary tract infection (n = 3) and haematoma (n = 2). Six months after the procedure, evacuation proctography revealed a recurrent or persistent enterocele in five patients (9%). Recurrent or persistent enterocele was only observed in patients who had undergone repair of a large, grade 3, enterocele. Two of the five patients underwent a second repair, the remaining three patients were found to be asymptomatic. In 16 of the 17 patients who underwent an additional anterolateral rectopexy, no recurrent or persistent rectocele was found.

At a median follow-up of 85 months (range: 3 – 137), 10 patients (23%) had recurrent symptoms of pelvic discomfort despite adequate correction of the enterocele. Three of these patients had also undergone an additional anterolateral rectopexy.

Despite adequate correction, obstructed defaecation persisted in 21 of 28 patients (75%) who presented with this problem before the procedure. In five of these 21 patients persistent symptoms of obstructed defaecation finally resulted in the construction of a stoma. Seven of 23 patients (30%) without symptoms of obstructed defaecation prior to the operation encountered this problem postoperatively. There was no differences between the patients who underwent an enterocele repair alone and those who underwent an additional anterior rectopexy (Table 3). With respect to postoperative obstructed defaecation, no differences were found between patients with a small bowel enterocele and those with a sigmoid enterocele.

Table 3. Obstructed defaecation before and after adequate enterocele repair				
	Obstructed defaecation after repair			
Obstructed defaecation before repair	Yes (n)	No (n)	Ileo/colostomy (n)	Total (n)
In all patients				
Yes	16	7	5	28
No	6	10	0	16
Total	22	17	5	44
In patient without additional rectopexy				
Yes	7	6	4	17
No	6	6	0	12
Total	13	12	4	29
In patients with additional rectopexy				
Yes	9	1	1	11
No	0	4	0	4
Total	9	5	1	15

Thirty-three of the 49 patients (67%), who were available for follow-up, answered the questions about dyspareunia. Eleven of these 33 patients (33%) experienced painful intercourse before the operation. This symptom disappeared after the procedure in three patients (27%). One of the 22 patients (5%), who did not report pain during intercourse before the procedure, experienced *de novo* dyspareunia after the operation.

Discussion

Abdominal obliteration of the pouch of Douglas, according to Moschcowitz [13], was the treatment of choice for patients with an enterocele. Despite the popularity of this procedure, outcome data are scarce. In 1922, Ward [14] described a transvaginal approach. Five observational studies from the last two decades do suggest that this approach results in a good anatomical repair [4, 15-18]. However, in none of these studies was evacuation proctography performed postoperatively. Furthermore, except for one [4], in none of these studies was the effect on associated symptoms such as pelvic discomfort and obstructed defaecation investigated. In three of these series the duration of follow-up was short. Recently, it has been suggested that enteroceles can be corrected by an abdominal vaginal suspension technique. Cronjé *et al*. [7] described the results of four modifications of abdominal vaginal suspension procedures. At follow-up (mean duration: 7 months) physical examination revealed no persistent or recurrent enterocele. However, they did not perform evacuation proctography to confirm this finding. In our opinion, it seems unlikely that colpopexy alone is efficient, because this procedure results in obliteration of the central part of the pouch of Douglas whereas both lateral parts, especially that on the left side, remain open and deep.

In 1998, Silvis *et al*. [19] described a novel approach by a combined rectovaginopexy. They performed evacuation proctography before and three months after the procedure and found a persistent enterocele in one out of 10 patients. A similar technique has been used by Jean *et al*. [3] in 62 patients. According to these authors, the procedure was effective in 98 percent of the cases. In an earlier study from 1999, Gosselink *et al*. [2] reported that complete obliteration of the pelvic inlet with a U-shaped Mersilene® mesh was highly efficient for patients with an enterocele. Anteriorly, the mesh was sutured to the apex of the vagina and posteriorly to the presacral fascia at the level of the promontory, thereby resulting not only in obliteration of the pelvic inlet but also in a sacral colpopexy. Evacuation proctography, performed in all their patients after surgery, revealed that the repair was adequate in all patients. Although this technique was effective regarding symptoms of pelvic discomfort, obstructed defaecation persisted in almost all patients. It remains unknown whether this beneficial effect on symptoms of pelvic discomfort is sustained in the long-term. The present study was conducted to answer this question.

At a median follow-up of 85 months, we found that 23 percent of our patients had recurrent symptoms of pelvic discomfort despite adequate correction of the enterocele. A similar finding has been reported by Jean *et al*. [3]. They observed that none of their patients had symptoms of pelvic discomfort three months after treatment of the enterocele by abdominal colporectosacropexy. At a median follow-up of 27 months recurrent symptoms of pelvic discomfort were encountered in 27 percent of their patients, however they evaluated their patients after the procedure by bidigital examination and not by evacuation proctography.

All our patients underwent evacuation proctography, which was repeated six months after the repair. In our opinion, this imaging technique is mandatory to confirm the efficacy of the repair. Enterocele cannot always be detected by physical examination. Kelvin *et al*. [21] examined 74 female patients with symptoms of pelvic organ prolapse. Evacuation proctography revealed an enterocele in 17 patients (23%). Physical examination resulted in detection of only seven of these enteroceles. This finding illustrates that evacuation proctography is a more reliable tool to demonstrate the presence or absence of an enterocele.

In many textbooks, enterocele is considered to be an important cause of obstructed defaecation. Although many women with an enterocele present with symptoms of obstructed defaecation, it is questionable whether the two are linked. Chou *et al*. [22] examined 310 female patients. All had completed a preoperative questionnaires and had their prolapses graded according to the International Continence Society System. The signs and symptoms in 77 women with an enterocele, confirmed at surgery, were compared with those from 233 women without an enterocele. The women with an enterocele had more advanced apical and posterior vaginal prolapses than those without an enterocele, but there was no difference from them in bowel function. In a recent study, Klingele *et al*. [23] found no association between the severity of pelvic organ prolapse and symptoms of obstructed defaecation. Kahn *et al*. [24] reported that most associations between bowel symptoms and pelvic organ descent are weak. These findings are in accordance with those reported by Jelovsek *et al*. [25], who found no relationship between constipation and the stage of pelvic organ prolapse. In the present study, obstructed defaecation persisted in 75 percent of our patients who presented with this problem prior to the operation. Mellgren *et al*. [26] performed a slightly modified Ripstein rectopexy in 22 patients with an enterocele and concomitant (in)complete rectal prolapse. Obstructed defaecation persisted in 80 percent of their patients. Jean *et al*. [3] reported that 34 of 40 patients (85%) with an enterocele, who presented with obstructed defaecation prior to colporectosacropexy, encountered the same problem 27 months after the procedure. Recently, Mølsted-Pederson *et al*. [18] reported the outcome of transvaginal repair of enterocele with concomitant vaginal vault prolapse using autologous fascia lata graft. According to these authors, constipation persisted in 65 percent of the patients despite adequate repair. Based on these findings, it seems unlikely that enteroceles are a major cause of obstructed defaecation. In our opinion it is more likely that other abnormalities, such as abnormal rectal sensory perception, or altered

rectal wall contractility, contribute to the problem of obstructed defaecation in patients with an enterocele.

Our study shows that abdominal obliteration of the pelvic inlet with a U-shaped Mersilene® mesh provides an effective tool for anatomical correction of enteroceles without dyspareunia as side effect. However, in the long-term one of four patients encounters recurrent symptoms of pelvic discomfort. It has been demonstrated that most patients with an enterocele have other types of pelvic organ prolapse [12]. Althought the persistent or recurrent symptoms of pelvic discomfort might be due to these co-existing prolapses, they may also be attributed to progression of the underlying disorder causing physiologic changes that surpass the otherwise effective repair. The most appropiate surgical approach for enterocele is still controversial. There is also a lack of concensus about the indications for enterocele repair and the need for concomitant surgery. The limited evidence that exists at present suggests that an abdominal approach utilising synthetic graft material provides a more durable support than a transvaginal approach. Randomised controlled trials are warranted to clarify which procedure is optimal.

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Chapter 3

Rectocele repair by anterolateral rectopexy:

long-term functional outcome

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W. Ruud Schouten

Abstract

Introduction

Rectocele is frequently associated with feelings of pelvic discomfort and symptoms of obstructed defaecation. Repair by a transvaginal or transanal approach might result in *de novo* dyspareunia in up to approximately 40 percent of the patients. This study was designed to investigate whether anterolateral rectopexy provides an adequate rectocele repair without dyspareunia as a side effect.

Patients and Methods

A consecutive series of 33 women (median age: 55 years, range: 37 - 73) with a symptomatic rectocele (depth > 3 centimeters) underwent anterolateral rectopexy. Before the operation, all patients underwent evacuation proctography, which was repeated six months after the repair in all but three patients. A standardised questionnaire concerning pelvic discomfort, obstructed defaecation and dyspareunia was used to assess the long-term effect of rectocele repair. The response rate was 91 percent.

Results

Six months after the procedure evacuation proctography revealed a recurrent or persistent rectocele in six patients (20%). However, in four of these patients, the depth of the rectocele was less than three centimeters. The median duration of follow-up was 74 months (range: 2 – 96). Among the patients with an adequate repair, signs of obstructed defaecation persisted in 55 percent. None of the patients encountered *de novo* dyspareunia after the procedure.

Conclusion

Anterolateral rectopexy provides an effective tool for anatomical correction of rectocele and does not result in dyspareunia as a side effect. However, despite adequate repair, obstructed defaecation persists in the majority of patients.

Introduction

Rectocele is defined as a herniation of the anterior rectal wall into the lumen of the vagina. This type of pelvic organ prolapse is frequently associated with symptoms of pelvic discomfort and signs of obstructed defaecation [1].

Traditionally, rectoceles were repaired by gynaecologists. They performed a posterior colporrhaphy by a transvaginal approach. Their principal goal was to alleviate the associated feelings of pelvic discomfort. Until now it is not clear whether such a transvaginal approach enables the diminution of obstructed defaecation. Several reports do suggest that transvaginal rectocele repair is beneficial for patients with obstructed defaecation [2, 3]. Other studies, however, have revealed that this procedure does not reduce obstructed defaecation in the majority of patients [4-7]. Some authors even noted *de novo* signs of obstructed defaecation [4, 6, 7]. In addition, *de novo* dyspareunia is frequently reported after a transvaginal rectocele repair [3-6].

Colorectal surgeons prefer a transanal approach. Comparing the transvaginal and the transanal approach, it is still not clear which procedure is the most optimum one. Several authors have reported that transanal repair of rectocele alleviates the problem of obstructed defaecation [2, 8-10]. However, two recent studies have revealed that transanal repair does not reduce obstructed defaecation in the majority of patients [11, 12]. Until now, only one randomised trial has been conducted comparing transanal with transvaginal rectocele repair [13]. This study does not elucidate which technique is the most optimal one. Besides *de novo* dyspareunia, deterioration of anal sphincter function is another drawback of transanal repair [14, 15].

Rectocele can also be repaired by a transperineal approach, with or without the use of a mesh [16, 17]. Based on the results of several small series it seems unlikely that this approach improves the outcome.

More recently, transabdominal approaches for rectocele repair have been introduced, such as the sacrocolpo(perineo)pexy [18, 19], the rectovaginal(vesico)pexy as described by Silvis *et al*. [20] and the anterolateral rectopexy [21].

Based on the data, reported in the literature, it is very difficult to assess which of the procedures mentioned above is the most optimum one for the treatment of obstructed defaecation related to a rectocele. In most studies, obstructed defaecation is not defined with the help of the diagnostic Rome II criteria [22]. Furthermore, the efficacy of the different procedures is not assessed by postoperative evacuation proctography in the majority of the studies. Comparing the different procedures, the transabdominal approach seems to offer a potential benefit based on the limited risk of *de novo* dyspareunia. Aim of the present study was to examine whether abdominal anterolateral rectopexy provides an adequate rectocele repair without dyspareunia as a side effect.

Patients and Methods

Between 1998 and 2005, a consecutive series of 33 female patients (median age: 55 years, range: 37 – 73) with a large (> 3 centimeters) rectocele underwent anterolateral rectopexy. In all patients, the rectocele was associated with obstructed defaecation. We used four of the six ROME II criteria [22] to define obstructed defaecation: straining, sensation of incomplete evacuation, sensation of anorectal obstruction or blockage, and manual assistance to facilitate evacuation. Patients were included only when they fulfilled two or more of these criteria and these symptoms occurred regularly over at least 12 consecutive weeks in the preceding 12 months. Regarding obstructed defaecation, the procedure was considered unsuccessful if the patient still fulfilled two or more of these four criteria. Prior to the procedure, colonic transit time was assessed in all patients by daily ingestion of radiopaque markers and a single X-ray at day 7. All except three patients had normal colonic transit time. In 76 percent of the patients (n = 25), rectocele was also associated with pelvic discomfort, including feelings of prolapse and pelvic pressure. The history of 28 patients (85%) revealed one or more previous surgical procedures of the pelvis. Most of the patients (94%) were multiparous. All patients underwent evacuation proctography with opacification of the small bowel and vagina in order to confirm the diagnosis and to assess the depth of the rectocele prior to the operation. Six months after the procedure, evacuation proctography was repeated to evaluate the efficacy of the repair.

Hospital records and outpatient clinic charts were analysed, and follow-up information was obtained both from a standardised questionnaire and review of charts by one author (DMO), who had not participated in the surgical procedure. The standardised questionnaire included questions about obstructed defaecation as defined by four of the six ROME II criteria, pelvic discomfort, and dyspareunia. Twenty-seven patients (82%) completed whole postoperative follow-up (evacuation proctography and questionnaire). In 13 patients the procedure was combined with obliteration of the pelvic inlet with a U-shaped Mersilene® mesh to correct a co-existing enterocele [23]. In one patient, an abdominal hysterectomy was performed simultaneously.

Surgical Technique

At the time of induction of anaesthesia, cefuroxime (1.500 mg) and metronidazole (500 mg) were administered intravenously. With the patient in lithotomy position, a lower midline laparatomy was performed. The mesosigmoid was retracted ventrally and to the left. The right ureter was visualised. A peritoneal incision was made over the sacral promontory. The deepest part of the pouch of Douglas was retracted and incised. The rectovaginal septum was opened down to the pelvic floor and both anterolateral sides of the distal part of the rectum were exposed. Using nonabsorbable sutures, a strip of Marlex® (CR Bard, Cranston, USA), with a width of 3 cm, was sutured to both anterolateral sides of the distal rectum. Proximal to the incised pouch of

Douglas, further sutures were used to fix the mesh to the anterior border of the rectum. Under traction, the mesh was fixed upon the sacral promontory using nonabsorbable sutures. The incised peritoneal pouch of Douglas was closed over the distal part of the mesh with resorbable sutures. The proximal part of the mesh was not covered with peritoneum. All procedures were performed by the same surgeon (WRS).

Results

No intraoperative complications were observed and no blood transfusions were required. Median hospital stay was eight days (range: 6 – 17). There was no postoperative death. One patient developed an abscess in the pouch of Douglas. This serious complication was treated by ultrasound guided drainage without long-term sequaelae for the Marlex strip. Five other patients (15%) developed minor postoperative complications, including urinary tract infection (n = 4) and postoperative ileus combined with urinary tract infection (n = 1). No late complications, including mesh related problems, were encountered.

Three patients refused evacuation proctography six months after the procedure. The pre- and postoperative findings of evacuation proctography are shown in Table 1. Evacuation proctography revealed a recurrent or persistent rectocele in six patients (20%). In four of these patients, the depth of the rectocele was less than three centimeters. In all patients who underwent an additional obliteration of the pelvic inlet, no recurrent or persistent enterocele was found. Evacuation proctography revealed that in all patients with an intussusception this abnormality had disappeared after the procedure.

Table 1. Findings of evacuation proctography		Prior to surgery n (%)	After surgery* n (%)
Rectocele	> 3 cm	33 (100)	2 (7)
	< 3 cm	0 (0)	4 (13)
Enterocele		15 (45)	0 (0)
Intussusception		8 (24)	0 (0)

* 3 patients refused evacuation proctography after surgery.

The median duration of follow-up was 74 months (range: 2 – 96). In three patients in whom obstructed defaecation was associated with delayed colonic transit, the defaecatory problems persisted. In the patients in whom obstructed defaecation was associated with a normal colonic transit time, symptoms of obstructed defaecation persisted in 11 of 20 patients (55%) despite adequate rectocele repair (Table 2).

Table 2. Impact on obstructed defaecation in patients with an adequate repair			
	Evacuation after repair		
Evacuation before repair	Normal (n)	OD (n)	Total (n)*
OD	9	11	20
OD + STC	–	3	3

* Patients, who completed whole postoperative follow-up.
Patients with recurrent or persistent rectocele on postoperative evacuation proctography were excluded.
OD: obstructed defaecation, STC: slow transit constipation.

Twenty-five of the 33 patients (76%) also reported symptoms of pelvic discomfort, including feelings of pelvic prolapse and pelvic pressure. In 10 of these 25 patients, the rectocele was associated with a concomitant enterocele. In the patients without an enterocele the anterolateral rectopexy resolved the symptoms of pelvic discomfort in 77 percent of the patients. In the patients with a concomitant enterocele (n = 13), the anterolateral rectopexy was combined with obliteration of the pelvic inlet. After this combined procedure, symptoms of pelvic discomfort resolved in 80 percent.

Twenty-one of the 30 patients (70%), who were available for follow-up, answered the questions about dyspareunia. Four of these 21 patients (19%) experienced painful intercourse before the operation. This problem disappeared after the procedure in one patient. None of the patients who did not report pain during intercourse before the procedure experienced *de novo* dyspareunia after surgery.

Discussion

It is generally accepted that rectoceles contribute to the problem of obstructed defaecation. In the past, rectocele repair was almost exclusively performed by gynaecologists. Their approach consisted of a posterior colporrhaphy, characterised by midline plication of the levator muscles, with or without plication of the rectovaginal fascia, in order to strengthen the posterior vaginal wall [4, 24]. Later on, modified techniques were introduced, including posterior colporrhaphy using different types of synthetic meshes or collagen implants and site-specific repair techniques of the rectovaginal fascia defects [3, 25]. The main goal of these transvaginal repairs was to alleviate symptoms of pelvic discomfort. Until the 1990s, data regarding the impact of this type of repair on associated symptoms of obstructed defaecation were lacking. During the last decade, more attention has been paid to this aspect. However in none of the studies conducted so far, validated criteria have been used to define obstructed defaecation. Although some reports do suggest that transvaginal rectocele repair alleviates obstructed defaecation in almost all patients [2, 3], most studies indicate that this type of repair is beneficial

for less than half of the patients [4-7]. According to some authors, transvaginal rectocele repair can even induce obstructed defaecation [4, 6, 7]. A potential drawback of transvaginal repair is *de novo* dyspareunia [3-6]. This side-effect has been reported in up to 27 percent of the patients [6].

In contrast to gynaecologists, most colorectal surgeons performed a rectocele repair by a transanal approach. Their main goal was diminution of obstructed defaecation. Comparing the transvaginal and the transanal approach, it is not clear which procedure is the most optimum one for patients with obstructed defaecation. Although some authors [2, 8-10, 26] have reported that transanal rectocele repair or a combined transanal / transvaginal repair is effective in more than half of the patients, two recent studies have revealed that transanal repair has no effect on obstructed defaecation in the majority of patients [11, 12]. Until now, only one randomised controlled trial [13] has been conducted comparing transanal with transvaginal rectocele repair. This study did not elucidate which technique is the most optimum one. Like transvaginal repair, transanal repair can also result in *de novo* dyspareunia. This side effect is reported in up to 41 percent of the patients [26]. Another drawback of the transanal approach is deterioration of anal sphincter function [14, 15]. An adequate transanal repair can only be performed with the use of a Parks anal retractor or another comparable instrument. In a randomised controlled trial, comparing two different types of anal retractors, Zimmerman *et al.* [27] observed that the use of a Parks retractor during perianal fistula repair has a deteriorating effect on faecal continence, probably because of damage to the internal anal sphincter.

In recent years, transabdominal approaches for rectocele repair have been introduced. Some gynaecologists prefer an abdominal sacrocolpo(perineo)pexy in patients in whom the rectocele is associated with vaginal vault prolapse [18, 19]. In 1998, Silvis *et al.* [20] introduced the rectovagino(vesico)pexy to alleviate combined defaecation and micturition disorders. This approach was performed in 22 patients with a rectocele. Unfortunately, the authors did not report whether this type of repair diminuted obstructed defaecation in this selected group of patients. In 2004, D'Hoore and coworkers [28] reported the long-term outcome of laparascopic ventral rectopexy, not for rectocele but for complete rectal prolapse. Fourteen of 42 patients were categorised as having obstructed defaecation. In the majority of the patients, symptoms of obstructed defaecation resolved. According to these authors, the ventral position of the mesh attributes to the beneficial effect on obstructed defaecation. Despite these promising results it is questionable whether a similar outcome can be obtained after ventral rectopexy in patients with a symptomatic rectocele. Vermeulen *et al.* [21] were the first to report a modified anterolateral rectopexy for rectocele repair. Postoperative evacuation proctography revealed adequate correction of rectocele in all patients. Despite this adequate repair, only 13 percent of the patients encountered complete relieve of obstructed defaecation after a median follow-up of 18 months. However, in their study, obstructed defaecation was not defined with the help of the diagnostic Rome II criteria. Utilising these criteria, we observed a success rate of 45 percent.

In contrast with earlier reports, these findings and the data recently presented by others indicate that surgical correction of the bulging anterior rectal wall alone is not beneficial for more than half of the women with obstructed defaecation. The question is whether rectocele is the cause or a result of obstructed defaecation.

During the last decade, more attention has been paid to other causes of obstructed defaecation, especially those related to rectal wall properties. Gosselink and Schouten [29] reported that in women with obstructed defaecation the threshold for rectal sensory perception is significantly increased, indicating rectal hyposensitivity. They also found that the tonic response of the rectum to an evoked urge to defaecate is absent or significantly blunted [30]. Rectal hyposensitivity in patients with obstructed defaecation has also been described by others. Gladman *et al.* [31], for example, observed rectal hyposensitivity in one of three patients with obstructed defaecation. Comparing patients with and without rectocele, the incidence of rectal hyposensitivity was found to be equal. There is limited evidence that rectal hyposensitivity is caused by impairment of afferent pathways due to pelvic nerve injury [32]. Recently, it has been shown that the proximal colonic motor response to mechanical and chemical stimulation of the rectum is impaired in women with obstructed defaecation [33]. Based on these findings, it seems unlikely that obstructed defaecation is caused by one single abnormality, such as a rectocele.

It has been reported that biofeedback therapy, especially sensory retraining, improves rectal sensitivity as assessed during physiologic evaluation [34, 35]. Improvement of rectal hyposensitivity was associated with clinical improvement. There is little evidence that patients with more severely impaired rectal sensitivity are less likely to improve their sensory function [36]. In recent years, it has been suggested that biofeedback therapy also improves obstructed defaecation in patients with a rectocele [37, 38]. However, the number of studied patient are small and the duration of follow-up is limited to the short-term. Furthermore, in the majority of studied patients, rectocele was associated with concomitant anismus. Based on the data, obtained from these studies, it is not clear whether biofeedback therapy is effective by resolving rectal hyposensitivity or by dissolving the problem of anismus. Chang *et al.* [39] reported that electrical stimulation therapy, using an anal plug with pulse generator, resulted in clinical improvement and enhancement of rectal sensitivity on physiologic testing. It has been suggested that improvement in rectal sensitivity may be one of the mechanisms by which symptoms of obstructed defaecation improve following sacral nerve modulation [40, 41], although direct evidence of this is currently lacking [42].

Two recently introduced surgical procedures are also based on the assumption that impaired rectal sensitivity contributes to obstructed defaecation. First, the vertical reduction rectoplasty has been introduced, based on the premise that reducing rectal capacity and compliance would restore the perception of rectal fullness in patients with idiopathic megarectum [42, 43]. The other procedure is the stapled trans-anal rectal resection (STARR). The main goal of this operation is to remove the distal part of the insensitive and dysfunctional rectum. Preliminary results are

promising [44], although some authors have reported significant complications such as faecal urgency, incontinence, anastomotic stenosis, and new onset rectovaginal fistula [45, 46]. Recently, the results from the European STARR registry have been reported [47]. These results, obtained from 1.058 patients, indicate that this procedure is safe and beneficial for many patients with obstructed defaecation. Although rectocele repair by anterolateral rectopexy results in adequate rectocele repair, symptoms of obstructed defaecation persist in more than half of the patients. The assumed relation between rectal hyposensitivity and obstructed defaecation might explain why anatomical correction of a rectocele alone, as obtained in the present study, fails to restore symptoms of obstructed defaecation in many women.

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Chapter 4

Assessment of posterior compartment prolapse;
a comparison of evacuation proctography and transperineal
ultrasound

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Abstract

Introduction

Evacuation proctography is considered to be the gold standard investigation for the diagnosis of posterior compartment prolapse. Transperineal ultrasound imaging of the pelvic floor is a non-invasive investigation for detection of pelvic floor abnormalities. This study compared evacuation proctography with transperineal ultrasound in diagnosing posterior compartment prolapse.

Patients and Methods

In a prospective observational study, all patients with symptoms related to posterior compartment prolapse were invited to participate in a standardised interview, clinical examination, transperineal ultrasound, and evacuation proctography. Both exams were analysed separately by two experienced investigators, blinded against the clinical data and against the results of the other imaging technique. After the examinations, all patients were asked to fill out a standardised questionnaire concerning subjective experience.

Results

Between 2005 and 2007, 75 patients were included with a median age of 59 years (range: 22 – 83). The Cohen's kappa coefficient for enterocele was 0.65 (good) and for rectoceles it was 0.55 (moderate). The level of agreement for intussusception was fair ($κ = 0.21$).

Conclusion

This study showed moderate to good agreement between transperineal and evacuation proctography for detecting enterocele and rectocele.

Introduction

Patients with pelvic organ prolapse symptoms will be referred to a (uro)gynaecologist or colorectal surgeon for investigation and treatment. For the classification of pelvic organ prolapse a subdivision into three pelvic compartments is utilised (anterior, middle, and posterior). Voiding dysfunction and urinary incontinence are commonly related to prolapse of the anterior compartment [1]. Symptoms such as feelings of a lump, heaviness, and pelvic pressure are attributed to all pelvic compartments. Symptoms of obstructed defaecation and faecal incontinence have been correlated with the posterior compartment [2-4]. It is important to be able to differentiate between different anatomic abnormalities, especially when considering surgery.

Evacuation proctography, with opacification of the small bowel and vagina, has been claimed to be the gold standard investigation for objective diagnosis of posterior compartment prolapse. Evacuation proctography is uncomfortable for the patient and requires exposure to ionising radiation. Furthermore, when used without opacification of the bladder it lacks the ability to visualise the anterior and middle compartments.

Recently, more advanced imaging techniques such as dynamic magnetic resonance (MR) imaging and transperineal ultrasound, have become available [5, 6]. These are able to show all three pelvic compartments. Furthermore, they are less invasive and ionising radiation is not required. However, dynamic MR imaging, especially open-architecture MR imaging, is very expensive and not generally available. Transperineal ultrasound enables dynamic investigation of all three pelvic compartments at low cost. Dietz *et al*. [6, 7] reported that transperineal ultrasound can differentiate between different forms of posterior anatomic abnormalities, such as rectocele and enterocele.

At present four studies have been published to assess the level of agreement between evacuation proctography and transperineal ultrasound, but the patient groups have been small in most of these studies and in some there is a selection bias, with patients having a history of longstanding obstructed defaecation [8-11].

This study was designed to assess the level of agreement between evacuation proctography and transperineal ultrasound in diagnosing posterior compartment prolapse in patients with related symptoms.

Patients and Methods

All women with symptoms related to posterior compartment prolapse referred to our tertiary pelvic floor unit were included in this prospective observational study. They were interviewed using a standardised questionnaire, concerning medical history, urinary function, pelvic discomfort, and bowel function. A clinical examination was performed according to the International Continence Society guidelines, using the POP-Q system [12]. The patients underwent standardised evacuation proctography and dynamic transperineal ultrasound, with a maximum interval of six months. After both examinations, all patients were asked to complete a standardised questionnaire concerning subjective experience. Written informed consent was obtained from all participants. This study was approved by the hospital's human research ethics committee.

Evacuation Proctography

Evacuation proctography was performed using a standardised technique with opacification of the rectosigmoid, small bowel, and vagina, using liquid barium contrast. Imaging was acquired at rest, during pelvic floor contraction, and during straining and a video recording was obtained during evacuation of contrast. Quantitative measurements were made for comparison with transperineal ultrasound. Enterocele was described as a herniation of small bowel or rectosigmoid into the vagina (Figure 1a). Rectocele was defined as a herniation of the anterior rectal wall into the lumen of the vagina and intussusception was defined as an infolding of the rectal wall into the rectum or anus. When an external component was present, it was called complete rectal prolapse. Enterocele, rectocele, and intussusception were classified into grades, see Table 1 [13, 14]. Rectocele depth was measured perpendicular to a line projected along the expected contour of the anterior rectal wall (Figure 2a). All video files were analysed by one colorectal surgeon (WRS), blinded against all clinical data and the results of transperineal ultrasound.

Transperineal Ultrasound

Transperineal ultrasound was performed using a GE Kretz Voluson 730 expert system (GE Healthcare, clinical systems, Hoevelaken, the Netherlands), using an abdominal 4 – 8 MHz transducer. Patients were examined after voiding and in supine position. 2D cine loop volumes (3D) were obtained at rest, during pelvic floor contraction, and during maximal Valsalva manoeuvre, as previously described by Dietz *et al.* [6, 7]. Off line evaluation of the cine loop volumes was performed by one gynaecologist (ABS), blinded against all clinical data and the results of evacuation proctography, using 4D view software (GE Healthcare). Enterocele was diagnosed if a herniation of abdominal contents developed anterior to the anorectal junction and extended into the vagina (Figure 1b). Rectocele was defined as a defect in the rectovaginal

septum. This defect was seen as a sharp discontinuity in the ventral contour of the anorectal muscularis, which resulted in a herniation of ≥ 10 mm in depth [7]. Measurement of rectocele depth was performed similar to the technique as described by evacuation proctography (Figure 2b). Intussusception and complete rectal prolapse were identified similar to evacuation proctography. Enterocele, rectocele, and intussusception were graded in concordance with Table 1. In addition, abnormalities of the anterior and middle prolapse were described [6].
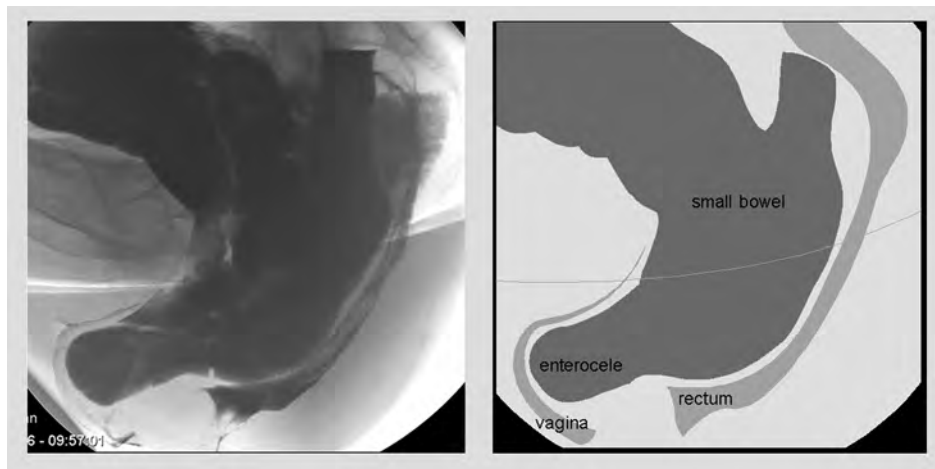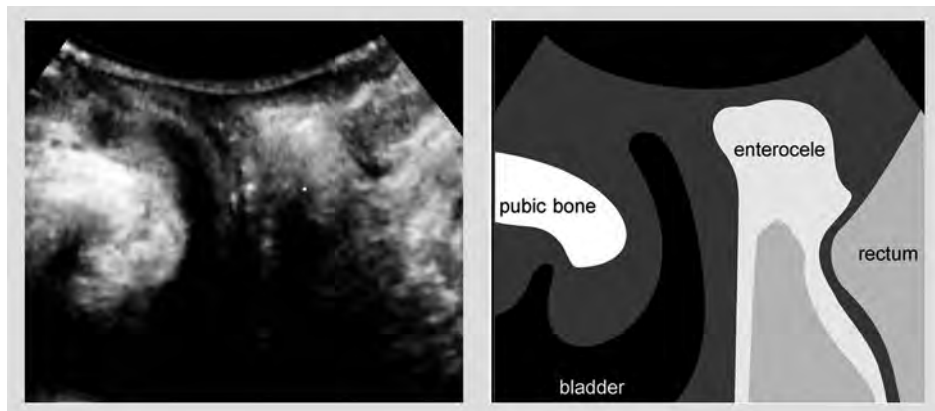

Figure 1a.

Figure 1b.
Figure 1. Enterocele, as demonstrated by evacuation proctography (Figure 1a)
and transperineal ultrasound (Figure 1b)

Table 1. Grading system for enterocele, rectocele, and intussusception.	
Prolapse	Description
Enterocele	
Grade 1	Most distal part descending to the upper ⅓ of the vagina
Grade 2	Most distal part descending to the middle ⅓ of the vagina
Grade 3	Most distal part descending to the lower ⅓ of the vagina
Rectocele	
Grade 1	Depth < 2 centimeters
Grade 2	Depth 2 – 4 centimeters
Grade 3	Depth > 4 centimeters
Intussusception	
Grade 1	Most distal part remains completely intrarectal
Grade 2	Most distal part descending into anal canal

After both examinations, all patients received a written standardised questionnaire designed to assess patient expectations, inconvenience, and discomfort. Patients were asked to rate any discomfort on a visual analogue scale (VAS, 0: no discomfort, 10: severe discomfort).

Statistical Analysis

Statistical analysis was performed using the SPSS software package (14.0 version, SPSS Inc., Chicago, IL, USA). The Cohen's kappa coefficient was obtained to compare evacuation proctography and transperineal ultrasound in the detection of enterocele, rectocele, and intussusception (Table 2). Spearman's correlation coefficient was used to calculate the level of correlation between mean rectocele depths. To compare questionnaires, the chi-squared test was used. Wilcoxon's signed ranks test was used for comparing VAS scores. Results were considered statistically significant when $p \leq 0.05$ (two-sided). Evacuation proctography was considered to be the gold standard investigation to calculate the sensitivities and specificities for detection of different prolapses with transperineal ultrasound.

Table 2. Cohen's kappa coefficient			Table 3. Symptoms as reported by the patients	
	Value			n (%)
Poor agreement	0.00 – 0.20		Stress urinary incontinence	38 (51)
Fair agreement	0.21 – 0.40		Urge urinary incontinence	25 (33)
Moderate agreement	0.41 – 0.60		Pelvic discomfort	50 (67)
Good agreement	0.61 – 0.80		Obstructed defaecation	36 (48)
Excellent agreement	0.81 – 1.00		Faecal incontinence	26 (35)
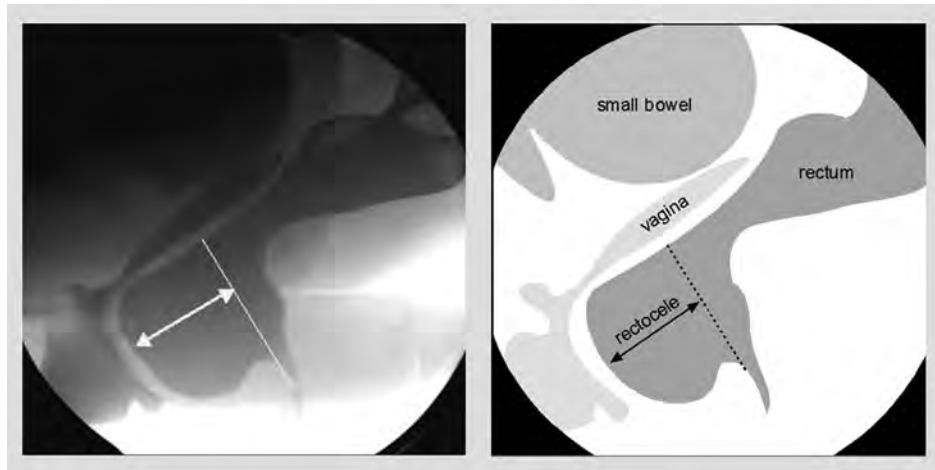
Figure 2a.
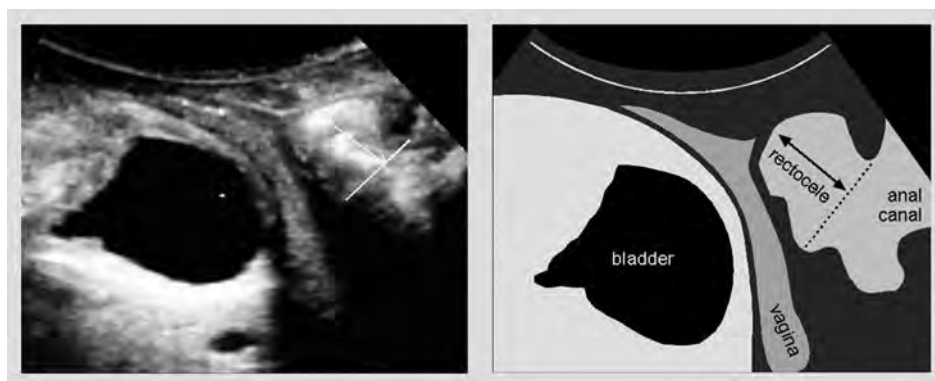
Figure 2b.

Figure 2. Rectocele, as demonstrated by evacuation proctography (Figure 2a) and transperineal ultrasound (Figure 2b) arrow indicates rectocele depth

Results

Between September 2005 and July 2007, 75 women were referred with symptoms related to posterior compartment prolapse. These included pelvic discomfort, obstructed defaecation and faecal incontinence or a combination (Table 3). The median age was 59 years (range: 22 – 83). A previous hysterectomy had been carried out in 31 women (41%) and a previous pelvic organ prolapse repair in 37 (49%). Median parity was 2 (range: 0 – 10 vaginal deliveries, four nulliparous women).

Clinical examination showed absence of prolapse in 16 patients (21%), stage 1 prolapse in 27 patients (36%), stage 2 in 21 patients (28%) and stage 3 in 11 patients (15%). Evacuation proctography revealed in seven of the 16 patients (44%) without prolapse during clinical examination some form of posterior compartment prolapse. Transperineal ultrasound revealed some form of prolapse in six of these patients (38%). The clinical diagnosis of posterior compartment prolapse (stage 1 – 3) was confirmed by evacuation proctography and transperineal ultrasound in 83 and 81 percent respectively.

Evacuation proctography revealed an enterocele in 25 patients (33%), rectocele in 36 (48%), and intussusception in 27 (36%). In 25 patients a second, concomitant form of posterior compartment prolapse was found. Transperineal ultrasound showed an enterocele in 18 patients (24%), rectocele in 37 (49%), and intussusception in eight (11%). A second, concomitant form of posterior compartment prolapse was found in 24 patients (32%). In 23 patients (31%) transperineal ultrasound revealed some type of (concomitant) prolapse of the anterior or middle compartment, which could not be detected by evacuation proctography. Neither examinations revealed any complete rectal prolapses.

Comparing both methods (Table 4), a Cohen's kappa coefficient of 0.65 was found for diagnosing all enteroceles (grade 1 – 3). Of the nine grade 1 enteroceles detected by evacuation proctography, seven (78%) were not detected by ultrasound. However, only two of 16 grade 2 and 3 enteroceles detected with evacuation proctography were not detected with transperineal ultrasound, resulting in a Cohen's kappa coefficient of 0.77 for detection of grade 2 and 3 enteroceles. Furthermore, transperineal ultrasound revealed an enterocele in two other patients, which was not diagnosed by evacuation proctography. Overall, we found a sensitivity of 64 percent and a specificity of 96 percent for the detection of all enteroceles with ultrasound.

A Cohen's kappa coefficient of 0.55 was found for detection of rectocele. The mean rectocele depth was 2.82 centimetres at evacuation proctography and 2.32 centimetres with ultrasound ($r = 0.47$, $p < 0.05$). Eight rectoceles detected by evacuation proctography were not detected by ultrasound, however, nine rectoceles detected by ultrasound were not found by evacuation proctography. Of all grade 2 and 3 rectoceles, 87 percent was confirmed with transperineal ultrasound in contrast to only 25 percent of all grade 1 rectoceles. The sensitivity and specificity of diagnosing rectocele with ultrasound in general was 78 and 77 percent respectively.

For the detection of intussusception a Cohen's kappa coefficient of 0.21 was found, with no differences for grade 1 and grade 2 intussusceptions. Overall, the detection rate of intussusceptions with ultrasound was low, 21 of the 27 (78%) intussusceptions detected with evacuation proctography were not confirmed by ultrasound. The sensitivity and specificity of diagnosing intussusception with transperineal ultrasound were 22 and 96 percent respectively.

Table 4. Prolapses as shown with both imaging techniques			
	Evacuation proctography (n)		Cohen's kappa coefficient
Transperineal ultrasound	Yes	No	κ
Enterocele			
Yes	16	2	
No	10	48	0.65
Rectocele			
Yes	28	9	
No	8	30	0.55
Intussusception			
Yes	6	2	
No	21	46	0.21

Questionnaire

Sixty-four (85%) patients responded to the questionnaire. Evacuation proctography caused significantly more discomfort for the patients (p < 0.001). VAS scores concerning discomfort for evacuation proctography were rated at median 4 / 10 (range: 0 – 10), whereas VAS scores for transperineal ultrasound were rated at median 1 / 10 (range: 0 – 9). Evacuation proctography was a less tolerated exam compared with transperineal ultrasound in 87 percent of the patients, while in eight percent the transperineal ultrasound was less tolerated (p < 0.001). Significantly, more patients preferred to have a repeat ultrasound than an evacuation proctogram (p < 0.003).

Discussion

The present study showed good agreement between transperineal ultrasound and evacuation proctography for diagnosing enterocele, moderate agreement for diagnosing rectocele, and fair agreement for detecting intussusception.

The absence of a real gold standard against which to compare these results is a major problem when assessing the differences between transperineal ultrasound and evacuation proctography. Different levels of agreement have been reported for evacuation proctography. Poor inter-observer reliability has been reported [15]. On the other hand, other authors found good inter-observer agreements for this imaging technique [16, 17]. Regarding transperineal ultrasound, Dietz and Steensma recently showed good repeatability for detection of rectoceles [7]. Further data about inter-observer reliability of this ultrasound technique are, however, lacking. Further research should reveal whether the differences as found in the present study imply under- or over-diagnosis by one of the imaging techniques.

The agreement for diagnosing enterocele is comparable with the results recently reported by others (Table 5). Regarding detection of rectocele and intussusception, varying Cohen's kappa coefficients (both lower and higher as compared to the present study) have been reported. These differences may be explained by the use of rectal contrast during transperineal ultrasound. Beer-Gabel *et al*. [8, 10] performed transperineal ultrasound after injection of contrast medium into the rectum and reported higher levels of agreement for the detection of both rectocele and intussusception. Another possible explanation may be due to selection bias. In three studies, only patients with longstanding complaints of obstructed defaecation were included [8, 10, 11], whereas in another study only patients without prior history of pelvic organ prolapse were studied [9]. The present study is the first to include all patients with symptoms of posterior compartment prolapse.

Table 5. Overview of literature					
Author	Year	n	Enterocele (κ)	Rectocele (κ)	Intussusception (κ)
Beer-Gabel *et al*. [8]	2004	33	0.7	0.88	0.88
Grasso *et al*. [9]	2007	43	–	0.41	0.91
Beer-Gabel *et al*. [10]	2008	62	0.78	0.78	–
Perniola *et al*. [11]	2008	37	–	0.26	0.09
The present study	2009	75	0.65	0.55	0.21

κ = Cohen's Kappa coefficient

Based on the present study, it seems that enteroceles and rectoceles were in a more advanced stage when detected by transperineal ultrasound than when detected by evacuation proctography. These findings are in concordance with the results as recently reported by others [9] and might be explained by the supine position adopted during the ultrasound examination in contrast with the sitting position during evacuation proctography. It is conceivable that a non-physiologic supine position will lead to under-diagnosis of prolapse. Evacuation proctography may seem more physiologic but the patient may feel embarrassed to defaecate in public, resulting in reduced cooperation [18]. Furthermore, evacuation proctography seems unlikely to reflect complete physiological defaecation because of the lack of urge to defaecate and the use of non-physiologic liquid contrast. It is suggested that evacuation proctography can furthermore result in over-diagnosis of posterior compartment prolapse. For example, rectocele, smaller than 2 cm, is often diagnosed with evacuation proctography in asymptomatic women [19]. The question arises therefore whether under-diagnosis of grade 1 rectoceles and grade 1 enteroceles with ultrasound has clinical consequences. In our opinion, these lesions are often asymptomatic and, therefore, do not require treatment.

The majority of intussusceptions found during evacuation proctography were not adequately detected with ultrasound. Doubt has risen about the clinical significance and

required treatment for this anatomic abnormality. Rectal intussusception has been reported in up to 50 percent of healthy volunteers [19]. Furthermore, a recent study showed that evacuation parameters fall within the normal range in most patients and that obstructed defaecation do not imply proctographic evidence of occlusion [20].

Retrospective evaluation of the enteroceles, which were missed with ultrasound (n = 2), revealed that one patient did not perform an adequate Valsalva manoeuvre during the examination and that the other patients had a concomitant severe uterine prolapse. Both patients in whom an enterocele was missed with evacuation proctography showed an intussusception during evacuation proctography, which was probably seen as an enterocele during transperineal ultrasound. An adequately performed Valsalva manoeuvre is essential for the right interpretation. Inadequate performed Valsalva manoeuvre might be an important cause of under-diagnoses.

A major advantage of transperineal ultrasound in comparison with evacuation proctography is the prevention of the use of ionising radiation. Goei and Kemerink reported that evacuation proctography results in a mean effective radiation dose of 4.9 mSv [21]. To compare, a single chest X-ray results in an organ dose of 0.01 mSv and an abdominal CT scan results in a dose of 10 mSv. Although a radiation dose of 4.9 mSv is considerable but not extremely high, prevention of exposure to ionising radiation is preferable, especially in female patients of reproductive age.

Transperineal ultrasound revealed (concomitant) pathology in the anterior and middle compartment in 31 percent of the patients. Unfortunately, these compartments were not visualised by evacuation proctography, as used in the present study. Evacuation proctography can be supplemented by opacification of the bladder to include imaging of the anterior compartment. However, this procedure is even more invasive, poorly tolerated, and requires an additional radiation dose.

Another advantage of transperineal ultrasound is the patient-friendly character, as shown in the present study. The majority of patients indicated transperineal ultrasound as the last unpleasant examination. No endovaginal or endoanal contrast is used and no evacuation of contrast is required for imaging of posterior compartment prolapse.

In recent years, other techniques, such as MR imaging and MR defaecography, have been used for the detection of anatomic abnormalities in patients with pelvic organ prolapse. MR imaging provides a good and direct demonstration of all three pelvic compartments, and in addition, does not involve the use of ionising radiation [22]. Furthermore, MR imaging is capable of visualising the soft tissues and the pelvic floor similar to ultrasound, whereas evacuation proctography (without opacification of the bladder) supplies no information about the anterior and middle compartment at all. A drawback of dynamic MR imaging is the lateral or supine position during the examination, which is demonstrated not as accurately as evacuation proctography [23]. MR defaecography can be performed with the patient in the sitting position, however, this requires an open technique, which is very expensive and not generally available [24].

Furthermore, to date, standardised reference points and normal values are lacking [25]. Compared with MR imaging, transperineal ultrasound offers a less expensive investigation, ensures a more optimal Valsalva manoeuvre and is, therefore, easier to control.

Conclusions

The present study showed good agreement for the detection of clinically relevant enterocele and rectocele. A fair agreement was found for detection of intussusception, however, the clinical relevance of this incomplete rectal prolapse is unknown. In addition, transperineal ultrasound is significantly better tolerated by patients. Therefore, transperineal ultrasound is an alternative to evacuation proctography in clinically relevant posterior compartment prolapse and may be used as the first diagnostic tool for symptomatic patients.

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Chapter 4

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Part II

Faecal Incontinence
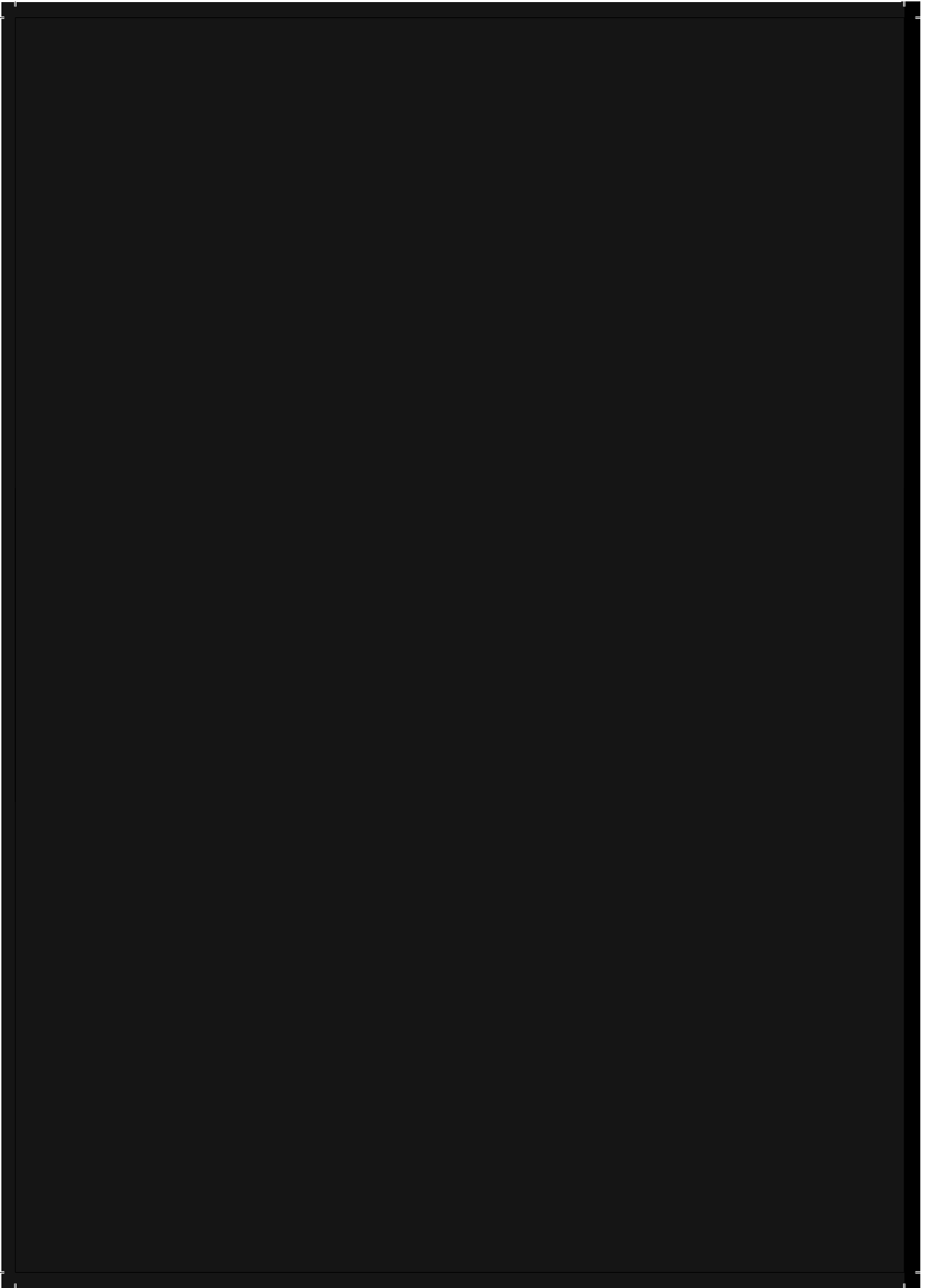
Chapter 5

Anterior sphincteroplasty for faecal incontinence;
a single center experience in the era of sacral neuromodulation

Daniëlla M.J. Oom
Martijn P. Gosselink
W. Ruud Schouten

Abstract

Introduction
Anterior sphincteroplasty is the surgical treatment of choice for patients with faecal incontinence, associated with an external anal sphincter defect. Recently, it has been reported that patients with such a defect may also benefit from sacral neuromodulation. The question is whether anterior sphincteroplasty still deserves a place in the surgical treatment of faecal incontinence. The aim of the present study was to investigate the outcome of anterior sphincteroplasty in a large cohort of patients.

Patients and Methods
A consecutive series of 172 patients underwent anterior overlapping sphincteroplasty. A standardised questionnaire concerning current continence status, overall satisfaction, and quality of life was used to assess the outcome.

Results
Follow-up data were obtained from 75 percent of the 160 patients who were still alive. After a median follow-up of 111 months (range: 12 – 207), the outcome was still good to excellent in 44 patients (37%). In 28 patients (23%) the result was classified as moderate, since these patients still encountered regular incontinence for stool. However, they were satisfied with their outcome, as they experienced a reduction of incontinence episodes of 50 percent or more. The outcome was poor in 40 percent of the patients. Predictors of poor outcome were older age at surgery (≥ 50 years), deep wound infection, and isolated external anal sphincter defects. Patients with long-term follow-up (≥ 5 years) had the same outcome as patients with medium-term follow-up (< 5 years).

Conclusion
Anterior sphincteroplasty results in an acceptable to excellent long-term outcome in 60 percent of the patients, especially in those under the age of 50 years at surgery.

Introduction

Faecal incontinence is the inability to prevent unintended loss of rectal contents. Social and psychological consequences of incontinence are devastating for both patients and their families [1]. Pregnancy and vaginal delivery are the most common causes of faecal incontinence. A recent meta-analysis revealed that the incidence of anal sphincter defects after childbirth in primiparous women is 27 percent and that in women without sphincter damage after their first delivery, the risk of sphincter defects after subsequent deliveries is 8.5 percent [2]. Instrumental delivery, large birth weight, and prolonged second stage of labour have been shown to increase the risk of faecal incontinence after vaginal delivery [3, 4]. After primary repair of obstetric tears involving the anal sphincter, persistent defects have been demonstrated in up to 85 percent of the cases [4]. Traumatic injuries to the pelvis and anorectal procedures may also lead to sphincter damage and faecal incontinence [5, 6].

To date, anterior sphincteroplasty is considered as the treatment of choice for incontinent patients with an external anal sphincter defect, in whom supportive management fails. This procedure was first described by Parks and McPartlin in 1971 [7]. Initially, the short-term success rates of anterior sphincteroplasty were encouraging, with up to 76 percent of the patients who became continent for liquid and solid stool [8]. Although, the long-term results are not as good as thought in those early days [9-12], anterior sphincteroplasty still results in a significant reduction of incontinence episodes, which sustains in the long-term in the majority of the patients [11, 13]. However, the number of studies, conducted to assess the long-term outcome after anterior sphincteroplasty, is limited. Furthermore, in all but one study relatively small series of patients have been analysed [11].

In 1995, Matzel and co-workers were the first to introduce sacral neuromodulation for the treatment of faecal incontinence [14]. Based on short- and medium-term follow-up, this technique has evolved to an attractive alternative for patients with faecal incontinence. Although sacral neuromodulation was indicated for patients without structural defects of the anal sphincters, it has recently been reported that sacral neuromodulation can also be used in patients with an external anal sphincter defect without prior sphincter reconstruction. Melenhorst and co-workers [15] showed that sacral neuromodulation is as effective in patients with an external anal sphincter defect without prior repair, as in those patients who underwent previous sphincter reconstruction. Therefore, the question arises whether patients with faecal incontinence associated with an anterior external anal sphincter defect should be treated primarily by anterior sphincteroplasty or directly by sacral neuromodulation.

The results of anterior sphincteroplasty are hardly to compare with the results of sacral neuromodulation, since in most studies regarding anterior sphincteroplasty other outcome classifications are used than in the studies regarding sacral neuromodulation. A reduction of incontinence episodes of 50 percent or more is widely accepted as a successful outcome

of sacral neuromodulation. This criterion was also used in the present study to classify the outcome of anterior sphincteroplasty, in order to facilitate comparison between anterior sphincteroplasty and sacral neuromodulation.

Patients and Methods

Between 1990 and 2007, a consecutive series of 172 patients with faecal incontinence underwent overlapping anterior sphincteroplasty. All patients presented with three or more incontinence episodes per week. The procedure was only performed in patients who experienced their involuntary loss of stool as disabling. Almost all patients were female (97%). Most patients (90%) underwent preoperative endoanal ultrasound and / or endoanal magnetic resonance (MR) imaging in order to assess the presence and the extensiveness of anal sphincter defects. An isolated external anal sphincter defect was found in 24 percent of the patients, whereas defects in both sphincters were observed in 76 percent of the patients. The median extent of the external anal sphincter defects was 120 degrees of the anal circumference (range: 60 – 180). A concomitant rectovaginal fistula was detected in 11 patients (6%). This rectovaginal fistula was treated during anterior sphincteroplasty by additional labial fat flap transposition (n = 8), transanal advancement flap repair (n = 1) or puborectal sling interposition (n = 2). Seventeen patients (10%) were operated before the introduction of endoanal ultrasound and endoanal MR imaging in our clinic. Obstetric trauma, prior anal surgery, and pelvic trauma were the principal cause of the anterior anal sphincter defect in 84, 11, and 3 percent of the patients respectively. In two percent of the patients the cause of sphincter damage could not be identified.

For this study, hospital records and outpatient clinic charts were analysed, and follow-up information was obtained from both a questionnaire and review of charts by one author (DMO), who had not participated in the surgical procedure. Continence improvement, degree of faecal incontinence, overall satisfaction, and quality of life were determined by a written standardised questionnaire. Patients were asked to rate their experienced reduction of incontinence episodes on a visual analogue scale (0 – 100 percent reduction). Rockwood faecal incontinence severity index (RFISI) score [16] was used to assess continence status during this assessment. Rockwood faecal incontinence quality of life scale (FIQLS) [17] was used to determine disease-specific quality of life and EQ-5D questionnaire [18] was used to evaluate generic quality of life.

The outcome was classified as excellent, good, moderate, or poor. This classification is based on objective continence status, as well as on subjective assessment of satisfaction. The outcome was classified as excellent if the patient reported full continence. If the patient encountered incontinence for flatus or sporadic (< 1 per month) loss of liquid stool only, the outcome was graded as good. The result was classified as moderate if the patient still suffered

from regular incontinence for liquid and / or solid stool but reported to be satisfied, since they experienced a reduction of incontinence episodes of 50 percent or more. In patients who underwent an additional surgical procedure for persistent faecal incontinence and in patients who encountered regular incontinence for liquid and / or solid stool, with less than 50 percent reduction of incontinence episodes, and who were not satisfied with their current situation, the outcome was defined as poor. This study was approved by the hospital's human research ethics committee.

Surgical Technique

All patients underwent complete mechanical bowel preparation (polyethylene glycol; Klean-prep, Helsinn Birex Pharmaceuticals, Dublin, Ireland). After induction of general endotracheal anaesthesia, metronidazole (500 mg) and cefuroxime (1.500 mg) were administered intravenously. All patients were operated in the lithotomy position. The repair was performed through a curvilinear incision, paralleling the outer edge of the superficial part of the external anal sphincter. The posterior vaginal wall was separated from the anterior rectal wall. The intersphincteric plane was entered bilaterally to separate the external and the internal anal sphincter. The entire scar tissue in the anterior midline was divided completely. The anterior rectal wall was plicated and the internal anal sphincter was imbricated. Next, both limbs of the puborectal sling were approximated in the midline with interrupted sutures. Finally, an overlapping repair of the external anal sphincter was performed. Monocryl 2-0 sutures (Ethicon, Johnson & Johnson, Somerville, USA) were used during the whole operation. The procedure was performed without covering ileostomy. All procedures were performed by or supervised by the same colorectal surgeon (WRS).

Statistical Analysis

Statistical analysis was performed with the SPSS software package (15.0 version, SPSS Inc., Chicago, IL, USA). Patient characteristics: age during surgery, time since anterior sphincteroplasty, preoperative sphincter defects, cause of anal sphincter defects, and postoperative complications, were compared between responders and non-responders and between patients with and without a poor outcome. When appropriate, patient groups were compared with the chi-square test or Fisher's exact test. Continuous variables were compared with the Mann–Whitney test. A multivariate logistic regression analysis of the significant clinical variables in univariate analysis was done with logistic regression models. Differences were considered statistically significant at a two-tailed p-value of ≤ 0.05.

Results

Thirty-nine patients (23%) encountered a postoperative complication. Wound infection occurred in the majority of these patients (n = 35), resulting in an abscess in 21 patients with subsequent fistula formation in 15 of them. All these 21 patients required further surgery to treat their complication. Two patients developed postoperative ileus, one patient encountered deep venous thrombosis and one other patient suffered from lung embolism. These four patients fully recovered.

During the follow-up period, 12 patients died from unrelated causes. One hundred and twenty of the remaining 160 patients (75%) returned a completed questionnaire. The median time interval between the procedure and the current analysis was 111 months (range: 12 – 207). The median age at follow-up was 58 years (range: 30 – 85). The responders were comparable with the non-responders regarding age, duration of follow-up, extensiveness of anal sphincter defects, cause of anal sphincter defects, and postoperative complications (Table 1).

Table 1. Comparison of responders and non-responders			
	Responders (n=120)	Non-responders (n=40)	p-value
Age at follow-up, median (range)	58 (30 – 85)	54 (31 – 87)	0.25
Time interval since surgery in months, median (range)	111 (12 – 207)	127 (12 – 207)	0.42
Preoperative sphincter defect (%)			
No imaging available	6	7	
Isolated EAS defect	23	20	0.70
IAS and EAS defect	71	73	
Cause of anal sphincter defect (%)			
Obstetric trauma	85	85	
Prior anal surgery	2	8	0.19
Major pelvic trauma	2	2	
Idiopathic	11	5	
Postoperative complication (%)			
Yes	24	20	0.59

EAS: external anal sphincter, IAS: internal anal sphincter

The outcome was excellent in seven patients (6%). A good outcome was observed in 37 patients (31%). In 28 patients (23%), the long-term outcome was classified as moderate. A poor outcome was observed in 48 patients (40%). Twenty-two patients with a poor outcome underwent an additional surgical procedure for persistent faecal incontinence. In 13

patients a permanent colostomy was constructed, six patients underwent additional sacral neuromodulation, one patient underwent repeat sphincteroplasty, and in two patients dynamic graciloplasty was performed.

Median RFISI score did not differ between patients with a moderate outcome (RFISI = 42, range: 27 – 56) and patients with a poor outcome who did not underwent an additional surgical procedure (RFISI = 47, range: 27 - 61) (Figure 1a). However, the median number of incontinence episodes per month was significantly lower in patients with a moderate outcome (8 episodes, range: 1 – 30), compared with patients with a poor outcome (45 episodes, range: 3 – 120) (Figure 1b).
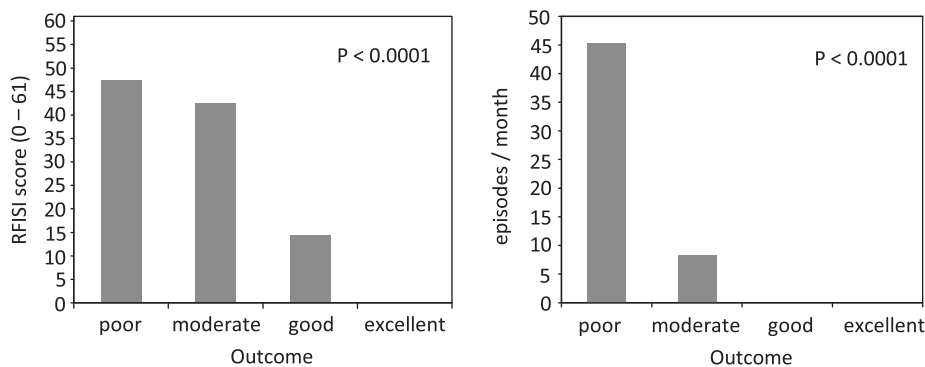

Figure 1. Faecal continence

Figure 1a. Median RFISI score

Figure 1b. Median number of incontinence episodes

Patients who underwent further surgery are not presented in both figures.

Patients with a poor outcome, who did not underwent further surgery, had lower disease specific quality of life scores (FIQLS) than patients with a moderate, good, or excellent outcome. Generic quality of life, which was evaluated by the EQ5D questionnaire, did not differ between patients with a poor outcome and those with a moderate, good, and excellent outcome (Table 2).

Predictors of outcome are presented in Tables 3 and 4. The causes of anterior anal sphincter defects and duration of follow-up did not differ between patients with and those patients without a poor outcome. Comparing patients followed less than five years (n = 29) and those followed five years or more (n = 91), the outcome was found to be poor in 38 and 41 percent respectively (p = 0.79). Patients with a poor outcome were significantly older at surgery. Patients under the age of 50 years at surgery had a poor outcome in 29 percent, whether patients with an age of 50 years or older at surgery had a poor outcome in 53 percent (Figure 2). Patients who encountered a deep wound infection were likely to have a less favorable outcome.

Comparing patients with and without a deep wound infection; the outcome was found to be poor in 79 and 36 percent respectively. Patients with an isolated external anal sphincter defect also encountered a worse outcome.

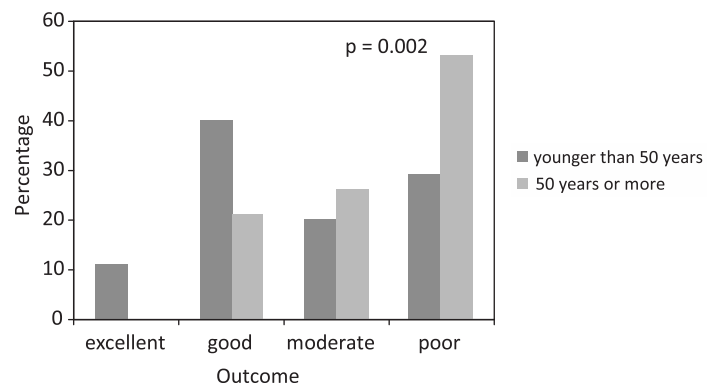| Table 2. Quality of life after anterior sphincteroplasty (median values)			
	Outcome		
	Moderate, good, or excellent	Poor, no additional surgery	p-value
EQ 5D	0.80	0.76	0.18
EQ 5D VAS	75	70	0.11
FIQLS			
Lifestyle	3.8	3.2	0.001
Coping behavior	3.0	2.0	< 0.001
Depression	3.7	3.4	0.010
Embarrassment	3.2	2.3	< 0.001

Figure 2. Long-term outcome of anterior sphincteroplasty with respect to age

Table 3. Factors predictive of long-term outcome, univariate analysis			
	Outcome		
	Moderate, good, or excellent (n = 72)	Poor (n = 48)	p-value
Age at surgery, median (range)	42 (21 – 80)	54 (28 – 72)	0.003
Time interval since surgery in months, median (range)	107 (14 – 207)	113 (12 – 202)	0.97
Preoperative sphincter defects (%)			
Isolated EAS defect	15	39	0.003
IAS and EAS defect	85	61	
Cause of anal sphincter defects (%)			
Obstetric trauma	83	88	
Prior anal surgery	3	0	0.43
Major pelvic trauma	3	0	
Idiopathic	11	12	
Deep wound infection (%)			
Yes	4	23	0.002

EAS: external anal sphincter, IAS: internal anal sphincter

Table 4. Factors predictive of long-term outcome, multivariate logistic regression analysis			
	OR	95% CI	p-value
Age at surgery	0.96	0.93-0.99	0.008
Isolated EAS defect	2.94	1.11-7.76	0.03
Deep wound infection	7.93	1.86-33.79	0.005

OR: odds ratio, CI: confidence interval, EAS: external anal sphincter

Discussion

To date, anterior sphincteroplasty is considered as the surgical treatment of choice for faecal incontinent patients with an external anal sphincter defect, in whom supportive management, such as dietary measures and biofeedback therapy, fails. Complete continence for liquid and solid stool has been reported in up to 76 percent of the patients after short-term follow-up [19, 20]. However, according to some authors these promising results do not sustain in the long-term [9-12]. The number of studies, conducted to assess the long-term outcome after anterior sphincteroplasty, is limited. Furthermore, in all but one study relatively small series of patients have been analysed.

Bravo Guttierez et al.[11] assessed the outcome of anterior sphincteroplasty in 191 patients. After a median follow-up of 10 years, bowel control was considered to be better than before the procedure by 62 percent of the patients, although some of them still experienced involuntary loss of solid stool. Despite the use of a different outcome classification, the present study is comparable with the study conducted by Bravo Guttierez et al. with respect to the number of studied patients, the duration of follow-up, and the long-term results. Our study revealed that the long-term outcome was good to excellent in 37 percent of the patients. Twenty-three percent of the patients were satisfied with their current status, despite persistent incontinence, since they experienced a reduction of incontinence episodes of 50 percent or more. Based on these findings, the overall long-term outcome was considered acceptable to excellent in 60 percent of the patients.

Comparing patients followed less than five years and those followed five years or more, the outcome was found to be similar, indicating that a significant deterioration of continence with time is unlikely. However, the results obtained from the present study are based on one single assessment, performed more than five years after the procedure in the majority of patients. In contrast with this finding, worsening of continence in the long-term has been reported by several authors [9-12]. Based on a three- and ten-year assessment, Bravo Guttierez et al.[11] concluded that continence deteriorates with time. In the other studies regarding this subject, the long-term outcome was assessed in a relatively small number of patients [9]. Furthermore, in one of these studies the short-term assessment was only based on a review of outpatient clinic charts [12]. It is questionable whether the information obtained from such a review is reliable. In another study, no short-term assessment was performed [10]. In our opinion, the evidence for worsening of continence with time is not convincing.

Comparing patients under the age of 50 years with those of 50 years or more, an acceptable long-term outcome was observed in 71 and 47 percent respectively. A similar finding has been reported by others [11, 21]. Since the external anal sphincter defects in older women are most likely caused by vaginal delivery many years before, it might be possible that other factors play a role in the pathophysiological mechanism of faecal incontinence in these female patients. Therefore, the question arises whether repair of the damaged external anal sphincter is justified as the surgical treatment of choice in these older incontinent patients.

All patients underwent complete mechanical bowel preparation and antibiotics were administered intravenously. Despite these measures we encountered a high rate of wound infection. In the present study, wound infection was related to a worse outcome. Although a similar finding has been reported by Londono-Schimmer et al.[22], other authors were not able to demonstrate such a relation [23].

It has been reported that the outcome of anterior sphincteroplasty in patients with an isolated external anal sphincter defect and in those with a combined defect is comparable [24]. In contrast with this observation, the present study revealed a worse outcome in patients with an isolated external anal sphincter defect. However, an explanation for this finding is lacking.

The present study is limited by its retrospective nature, whereas no specific follow-up protocol was used. Patients were asked to rate the reduction of incontinence episodes in retrospection. Therefore the results as obtained from the present study should be handled with care. Another limitation of this study is the relatively low participation rate. However, considering the median duration of follow-up of more than nine years, the participation rate of 75 percent is acceptable. A reduction of incontinence episodes of 50 percent or more is widely accepted as a successful outcome of sacral neuromodulation. This criterion was also used in the present study to classify the outcome of anterior sphincteroplasty, in order to facilitate comparison between anterior sphincteroplasty and sacral neuromodulation. The observation that patients with a moderate outcome encountered significantly less incontinence episodes than patients with a poor outcome indicates that our classification can be justified.

Originally, sacral neuromodulation was advocated for the treatment of incontinent patients without an external anal sphincter defect. Complete continence for liquid and solid stool can be obtained after sacral neuromodulation in up to 75 percent [25]. However, according to other reports the percentage of patients with complete continence varies between 21 to 57 percent [26-29]. A reduction of the number of incontinence episodes of 50 percent or more has been reported in 68 to 96 percent of the patients [28-31]. However, these data are based on studies with a short- or medium-term follow-up, since studies regarding the long-term outcome of sacral neuromodulation are scarce. Recently, two reports did suggest that incontinent patients with an external anal sphincter defect could be effectively treated with sacral neuromodulation [15, 32]. In addition, it has also been suggested that sacral neuromodulation can be used primarily in patients with an external anal sphincter defect [15]. Therefore, the question arises whether incontinent patients with an external anal sphincter defect should be treated primarily by anterior sphincteroplasty or directly by sacral neuromodulation. However, the results of anterior sphincteroplasty are hardly to compare with the results of sacral neuromodulation, since in most studies regarding anterior sphincteroplasty other outcome classifications are used than in the studies regarding sacral neuromodulation. Despite its limitations, the present study facilitates a better comparison between the outcome of anterior sphincteroplasty and sacral neuromodulation, since a comparable outcome classification was used. However, to assess the definite role of anterior sphincteroplasty in this era of sacral neuromodulation, randomised controlled trials are warranted, comparing both procedures in patients with an external anal sphincter defect. These studies are also necessary to compare the cost-effectiveness of both procedures.

Conclusions

This study shows that anterior sphincteroplasty can stand the challenge of time. Acceptable to excellent results are maintained in 60 percent of the patients, especially in those who are under the age of 50 years at surgery.

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Chapter 6

**Anterior sphincteroplasty for faecal incontinence;
is the outcome compromised in patients with associated pelvic
floor injury?**

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W. Ruud Schouten

Abstract

Introduction

It has been shown that vaginal delivery may result not only in sphincter defects but also in pelvic floor injury. However, the influence of this type of injury on the aetiology of faecal incontinence and its treatment is unknown. Aim of the present study was to assess the prevalence of pelvic floor injury in patients who underwent anterior sphincteroplasty for the treatment of faecal incontinence and to determine the impact of this type of injury on the outcome of this procedure.

Patients and Methods

Women, who underwent anterior sphincteroplasty in the past, were invited to participate in the present study. With transperineal ultrasound, which has been developed recently, pelvic floor integrity was examined in 70 of the 117 patients (60%). Follow-up was obtained from a standardised questionnaire.

Results

The median time period between anterior sphincteroplasty and the current assessment was 106 months (range: 15 – 211). Pelvic floor injury was diagnosed in 43 patients (61%). Despite the prior sphincteroplasty, an external anal sphincter defect was found in 20 patients (29%). Outcome did not differ, neither between patients with and those without pelvic floor injury, nor between patients with and those without an adequate repair. However, patients with an adequate repair and an intact pelvic floor did have a better outcome than patients with one or both abnormalities.

Conclusion

The majority of patients who were eligible for anterior sphincteroplasty have concomitant pelvic floor injury. Based on the present study, it seems unlikely that this type of injury itself has an impact on the outcome of anterior sphincteroplasty.

Introduction

Both the anal sphincters and the pelvic floor are thought to play an important role in maintaining faecal continence. The pelvic floor is attached to the internal surface of the pelvis. The muscular layer of the pelvic floor is subdivided into three parts according to their attachments and the pelvic viscera to which they are related, namely the ileococcygeal, pubococcygeal, and puborectal muscle [1, 2]. The puborectal muscle originates at the pubic bone and forms a U-shaped sling around the rectum. The most distal part of this puborectal muscle becomes intimately fused with the deep bundles of the external anal sphincter.

In the 1990s, injury of the pelvic floor has been identified by magnetic resonance (MR) imaging [3]. Initially, the origin of this observed abnormality was not clear. Recently, DeLancey *et al*. [4] demonstrated a relation between vaginal delivery and pelvic floor injury. Comparing primiparous and nulliparous women with MR imaging, they found this type of injury in 20 and zero percent respectively. Dietz and Lanzorone [5] reported similar findings using transperineal ultrasound. Pelvic floor injury was found in up to 36 percent of primiparous women, whether no abnormalities could be identified in women after caesarean section. These findings indicate that pelvic floor injury is most likely caused by vaginal delivery and not by pregnancy itself.

It has been reported that pelvic floor injury is related to pelvic organ prolapse [6], especially in the anterior and middle compartment [7, 8]. Until now no relation between pelvic floor injury and bladder dysfunction could be identified [7, 9]. Recently, it has been reported that besides anal sphincter defects, pelvic floor injury can be found in up to 72 percent of the patients with faecal incontinence [10, 11]. However, it is unknown whether this type of injury contributes to the underlying pathophysiologic mechanism of faecal incontinence.

To date, anterior sphincteroplasty is the treatment of choice for incontinent patients with an external anal sphincter defect, located at the anterior side of the anal canal, in whom supportive management fails. It has been shown that the long-term outcome is poor in approximately 40 percent of the patients, especially in older women [12-14]. However, it is not clear whether the outcome of this procedure is affected by pelvic floor injury.

For many years, MR imaging was the only technique available for pelvic floor imaging. In 2003, Dietz *et al*. [15] introduced transperineal ultrasound, as a relatively simple and non-invasive method for the detection of pelvic floor injury. Aim of the present study was to visualise the pelvic floor with this new imaging technique, in order to examine the prevalence of pelvic floor injury in women, who underwent anterior sphincteroplasty for faecal incontinence in the past and to determine the impact of pelvic floor injury on the outcome of this procedure.

Patients and Methods

The present study was part of a larger one, aimed at evaluating the outcome of anterior sphincteroplasty for the treatment of faecal incontinence in a large cohort of patients. All female patients who participated in this follow-up study were asked to participate in the present study, which was approved by the hospital's human research ethics committee. After obtainment of written informed consent, the patients were seen at the outpatient clinic for a standardised interview, concerning parity and medical history, and transperineal ultrasound examination. Patients with an external anal sphincter defect were eligible for anterior sphincteroplasty if they presented with three or more incontinence episodes per week. The procedure was only performed in women who experienced their involuntary loss of stool as disabling. Endoanal ultrasound and / or endoanal MR imaging was performed prior to the procedure to assess the extensiveness of anal sphincter defects. The surgical technique of anterior overlapping sphincteroplasty has been described previously [16].

Clinical Outcome

The outcome of anterior sphincteroplasty was assessed by a written standardised questionnaire concerning continence improvement, degree of faecal incontinence and overall satisfaction. Long-term outcome was classified as excellent, good, moderate, or poor. This classification is based on objective continence status, as well as on subjective assessment of satisfaction. The outcome was classified as excellent if the patient reported full continence. If the patient encountered incontinence for flatus or sporadic (< 1 per month) loss of liquid stool only, the outcome was graded as good. The result was classified as moderate if the patients still suffered from regular incontinence for liquid and / or solid stool but reported to be satisfied, since they experienced a reduction of incontinence episodes of 50 percent or more. In patients who underwent an additional surgical procedure for persistent faecal incontinence and in patients who encountered regular incontinence for liquid and / or solid stool, without 50 percent or more reduction of incontinence episodes, and who were not satisfied with their current situation, the outcome was defined as poor.

Transperineal Ultrasound

Transperineal ultrasound was performed using a GE Kretz Voluson 730 expert system (GE Healthcare, clinical systems, Hoevelaken, the Netherlands), with a 4 – 8 MHz transducer for examination of the pelvic floor and a 5 - 9 MHz transducer for examination of the anal sphincters. Patients were examined after voiding and in supine position. Ultrasound volumes were obtained at rest and during levator contraction as previously described [17]. Off-line evaluation of the volumes was performed by two investigators (DMO and ABS), using specialised software (4D view, GE Healthcare), and blinded against parity, current continence status, and medical

history with the exception of prior anterior sphincteroplasty. In case of discrepancy between both investigators, volumes were reviewed and discussed until consensus was reached.

For the assessment of pelvic floor integrity, the method was used as described by Dietz *et al*. [9]. 3D volumes obtained at maximum pelvic floor contraction, or volumes obtained at rest in patients who were unable to elicit a contraction, were evaluated with tomographic ultrasound imaging. A set of eight slices with an interval of 2.5 mm was analysed. Pelvic floor injury was diagnosed when a unilateral or bilateral discontinuity was seen between the puborectal part of the pelvic floor and the pubic bone, according to the criteria as described by Dietz *et al*. [8] (Figure 1). Pelvic floor contraction was classified as insufficient when a reduction of less than 25 percent was found in the area between both limbs during maximum contraction (hiatal area reduction) [18].
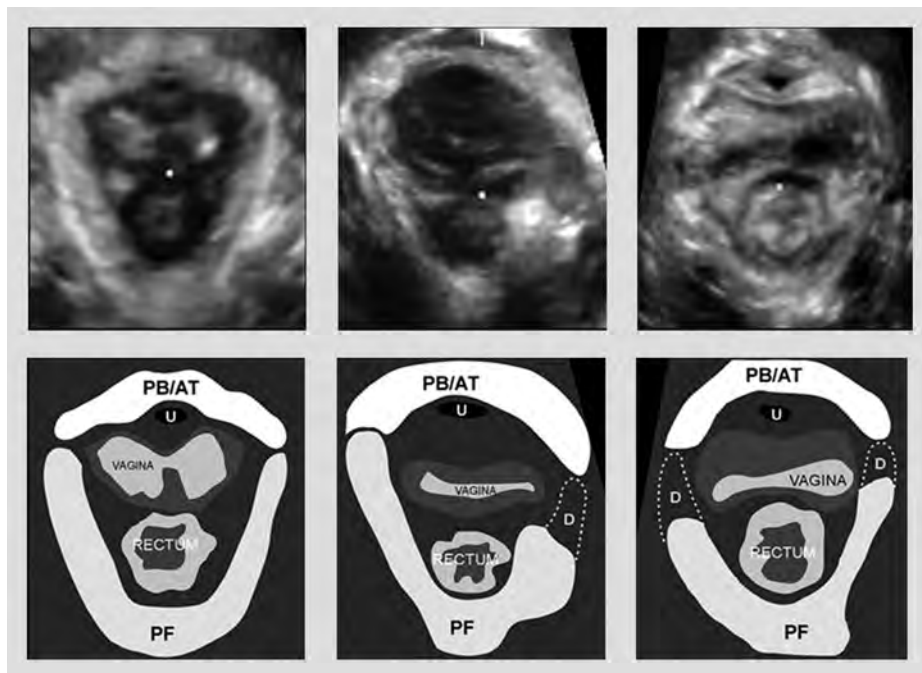

Figure 1. Transperineal ultrasound of the pelvic floor

left: normal, middle: unilateral injury, right: bilateral injury

PB/AT: pubic bone and arcus tendineus, U: urethra, PF: pelvic floor, D: defect

For the assessment of anal sphincter integrity, a volume contrast imaging technique was used with slice thickness of 2 mm. An inadequate repair was diagnosed when a discontinuity of the external anal sphincter at the anterior side was found (Figure 2).
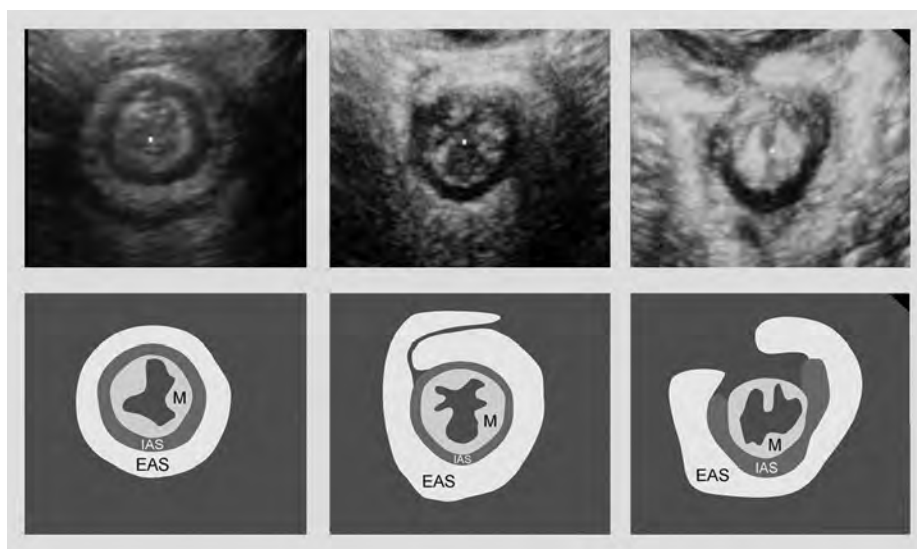
Figure 2. Transperineal ultrasound of the anal sphincters

left: normal, middle: intact overlapping repair, right: inadequate repair

M: mucosa, IAS: internal anal sphincter, EAS: external anal sphincter

Statistical Analysis

Statistical analysis was performed with the SPSS software package (15.0 version, SPSS Inc., Chicago, USA). When appropriate, patients groups were compared with the chi-square test or Fisher's exact test. Continuous variables were compared with the Mann-Whitney test. Cohen's kappa coefficient was obtained to assess inter-observer agreement for the detection of pelvic floor injury. Differences were considered statistically significant at a two-tailed p-value of ≤ 0.05.

Results

All 117 female patients who participated in our prior follow-up study were asked to participate in the present study. Seventy of these 117 patients (60%) agreed to undergo transperineal ultrasound examination. The median age of these participants was 59 years (range: 32 – 80). The median extent of the external anal sphincter defect prior to the anterior sphincteroplasty was 120° of the anal circumference (range: 45 – 240°). The median time-interval between anterior sphincteroplasty and the current assessment was 106 months (range: 15 – 211). Median vaginal parity was 2 (range: 0 – 6), three patients were nulliparous and two patients

had only caesarean section delivery. Thirteen patients had a history of forceps delivery and in five patients a vontuse was used during labour. None of the participants had a vaginal delivery since anterior sphincteroplasty. The participants were comparable with the non-participants regarding age, time period since surgery, and clinical outcome (Table 1).

Table 1. Comparison of participants and non-participants			
	Participants (n=70)	Non-participants (n=47)	p-value
Median age (range)	59 (32 – 80)	58 (31 – 86)	0.72
Median time period since surgery in months (range)	106 (15 – 211)	119 (17 – 205)	0.96
Clinical outcome (%)			
Excellent	6	4	
Good	27	36	0.54
Moderate	27	17	
Poor	40	43	

The long-term outcome was excellent in four patients (6%). A good outcome was observed in 19 patients (27%). The outcome was classified as moderate in 19 patients (27%). A poor outcome was observed in 28 patients (40%). Fourteen patients with a poor outcome underwent an additional surgical procedure for persistent faecal incontinence. In six patients a permanent colostomy was constructed, six patients underwent additional sacral neuromodulation, and in two patients dynamic graciloplasty was performed.

Pelvic floor injury was diagnosed in 43 patients (61%). This injury involved one or both sides of the pelvic floor in 15 and 28 patients respectively. Fifteen patients with pelvic floor injury (35%) had a history of instrumental delivery. No pelvic floor injury was detected in the five patients without a history of vaginal delivery. Pelvic floor contraction was insufficient in 35 patients with pelvic floor injury (81%) and in eight patients with an intact pelvic floor (30%) (p < 0.0001). An inadequate sphincter repair was diagnosed in 20 patients (29%), 12 of these patients had concomitant pelvic floor injury. The inter-observer agreement for the detection of pelvic floor injury was found to be good (Cohen's kappa coefficient: 0.76).

In patients with an intact pelvic floor and in those with pelvic floor injury, the outcome was poor in 33 and 44 percent respectively (p = 0.37). In patients with an adequate repair and in those with an inadequate repair, the outcome was poor in 34 and 55 percent respectively (p = 0.11). However, patients with an adequate repair and intact pelvic floor did have a better outcome than patients with one or both abnormalities (p = 0.048) (Figure 3).
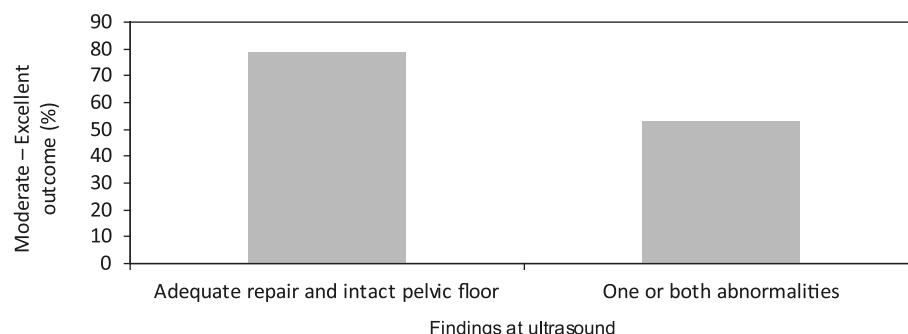
Figure 3. Long-term outcome of anterior sphincteroplasty in patients with an adequate repair and intact pelvic floor and in those with one or both abnormalities

Discussion

The present study showed that pelvic floor injury is present in the majority of faecal incontinent patients who were eligible for anterior sphincteroplasty. A clear relation between pelvic floor injury and a worse outcome of this procedure was not found. However, patients with an intact external anal sphincter and an intact pelvic floor did have a better outcome than patients with one or both abnormalities.

Recently, it has been reported that the observed pelvic floor injury most frequently involves the anterior side of the puborectal and probably also the pubococcygeal muscle near their insertion to the pubic bone [5, 19]. It has been suggested that this type of injury represents avulsion of the puborectal-pubococcygeal muscles from the pubic bone [5, 9]. Unfortunately, to date, anatomic studies supporting this premise are lacking. Therefore, it cannot be precluded that other forms of trauma, such as excessive stretching of the pelvic floor and nerve stretching or compression, resulting in denervation and muscle atrophy, could also play a role in the mechanism, which causes these abnormalities.

It has been reported that pelvic floor injury is related to pelvic organ prolapse [6], especially to prolapse in the anterior and middle compartment [7, 8]. Comparing patients with and without pelvic organ prolapse, DeLancey *et al*. [6] found pelvic floor injury in respectively 55 and 16 percent. Until now no relation between pelvic floor injury and bladder dysfunction could be identified [7, 9]. Recently, Terra *et al*. [10] performed endo-anal MR imaging in 105 female patients with faecal incontinence. They showed that anal sphincter defects and pelvic floor injury were present in 79 and 35 percent of the patients respectively. Pelvic floor abnormalities were found in 39 percent of the patients with anal sphincter defects and in 23 percent of the patients without anal sphincter defects. This latter finding indicates that pelvic floor injury can

occur without concomitant damage of the anal sphincters. However, until now it is unknown whether pelvic floor injury contributes to the underlying pathophysiologic mechanism of faecal incontinence.

The present study, using transperineal ultrasound in female patients, performed many years after anterior sphincteroplasty, revealed pelvic floor injury in 61 percent of the cases. This imaging technique has been shown to be a reliable tool for the detection of both pelvic floor injury and anal sphincter defects, with a good repeatability and inter-observer agreement [7, 11, 20]. The present study also revealed a good inter-observer agreement with a Cohen's kappa coefficient of 0.76.

Pelvic floor injury is most likely caused by vaginal delivery and not by pregnancy itself [4, 5]. Since none of our patients had a vaginal delivery after the anterior sphincteroplasty, it seems obvious that the observed pelvic floor injury was pre-existent at the moment of the operation. The question arises whether the high prevalence of pelvic floor injury in our patients reflects a major contributing role of this type of injury in the aetiology of faecal incontinence.

With the same imaging technique, Weinstein *et al*. [11] also observed a high prevalence of pelvic floor injury (72%) in faecal incontinent women. According to these authors, patients with faecal incontinence had a higher prevalence of pelvic floor injury and concomitant anal sphincter defects as compared with asymptomatic parous controls. It might be possible that women with anal sphincter defects due to vaginal delivery plus concomitant pelvic floor injury have a higher risk for developing faecal incontinence as compared to those women with only anal sphincter defects. Based on our findings, it seems unlikely that associated pelvic floor injury itself has a detrimental effect on the outcome of anterior sphincteroplasty. However, patients with an adequate repair and an intact pelvic floor did have a better outcome than patients with one or both abnormalities. This finding supports the premise that the anal sphincters, as well as the pelvic floor, play a significant role in maintaining faecal continence and that abnormalities in one or both structures might lead to the development of faecal incontinence. Further research is warranted to determine the exact role of pelvic floor injury in the aetiology of faecal incontinence and to assess a possible synergistic effect between pelvic floor injury and anal sphincter defects.

The present study is limited by the retrospective assessment of pelvic floor integrity. Transperineal ultrasound was not performed as a part of the preoperative workup but many years after anterior sphincteroplasty. It is unknown whether aging has an effect on pelvic floor and anal sphincter appearance during transperineal ultrasound and, therefore, might lead to suboptimal evaluation of the integrity of both structures. Another limitation of the present study is the relatively low participation rate (60%). However, considering the median duration of follow-up of more than nine years, the participation rate seems acceptable.

Transperineal ultrasound, as used in the present study, revealed external anal sphincter defects in 29 percent of our patients, indicating an inadequate repair. Breakdown of the

sphincter repair has been reported in up to 36 percent of the cases [21, 22]. This finding is based on short-term follow-up, demonstrating that breakdown of the sphincter repair occurs shortly after the procedure. It seems unlikely that the external anal sphincter defects, observed in the present study, developed many years after the procedure. Although it has been reported that breakdown of the sphincter repair has a detrimental effect on the short-term outcome, we were not able to demonstrate a relation between inadequate repair and long-term outcome.

Predictors of long-term outcome of anterior sphincteroplasty are unknown, except for age at surgery. It has been reported that patients with a poor outcome are significantly older at surgery [13]. The present study revealed that both pelvic floor injury and inadequate repair itself are no predictors of outcome. Therefore, it seems obvious that anterior sphincteroplasty still can be considered as the treatment of choice for relatively young incontinent patients with an external anal sphincter defect, even in those with associated pelvic floor injury.

Conclusions

Pelvic floor injury is present in the majority of patients who were eligible for surgical treatment of an external anal sphincter defect. This type of injury itself has no significant impact on the outcome of anterior sphincteroplasty. Patients with an adequate repair and intact pelvic floor have a better outcome than patients with one or both abnormalities.

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Chapter 7

Is sacral neuromodulation for faecal incontinence worthwhile in patients with associated pelvic floor injury?

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W. Ruud Schouten

Abstract

Introduction

It has been shown that vaginal delivery may result in pelvic floor injury. Until now it is unknown whether this type of injury plays a role in the aetiology of faecal incontinence and whether it affects the outcome of treatment. Aim of the present study was to assess the prevalence of pelvic floor injury in faecal incontinent patients who were eligible for sacral neuromodulation and to determine whether sacral neuromodulation is worthwhile or not in patients with pelvic floor injury.

Patients and Methods

All women with faecal incontinence, who were eligible for sacral neuromodulation in the past, were invited to participate in the present study. With transperineal ultrasound, which has been developed recently, pelvic floor integrity was examined in 46 of the 66 patients (70%). Follow-up was obtained from a standardised questionnaire.

Results

Pelvic floor injury was found in 29 of the 46 participants (63%). No differences regarding the efficacy of sacral neuromodulation were found between patients with and those without pelvic floor injury. Successful test stimulation was obtained in 86 percent of the patients with pelvic floor injury and in 71 percent of the patients without this type of injury. After implantation of a definitive pulse generator, a successful outcome was found in 84 percent of the patients with pelvic floor injury and in 75 percent of the patients with an intact pelvic floor.

Conclusion

Pelvic floor injury is present in the majority of incontinent patients who were eligible for sacral neuromodulation. This type of injury has no detrimental effect on the treatment outcome.

Introduction

Sacral neuromodulation was initially developed for the treatment of bladder dysfunction in the early 1980s [1]. In 1995, Matzel and co-workers were to first to introduce sacral neuromodulation for the treatment of faecal incontinence [2]. This innovative technique has evolved to an attractive method for the treatment of patients with involuntary loss of stool. The reported short and medium-term results are good to excellent [3-5]. Initially, it was thought that sacral neuromodulation was only effective in patients with an intact external anal sphincter [6]. However, recently it has been reported that sacral neuromodulation can also be used in patients with an external anal sphincter defect [7, 8].

Both the anal sphincters and the pelvic floor are thought to play an important role in maintaining faecal continence. The muscular part of the pelvic floor is subdivided into three parts according to their attachments and the pelvic viscera to which they are related, namely the ileococcygeal, pubococcygeal, and puborectal muscle [9, 10]. In the 1990s, injury of the pelvic floor has been identified by magnetic resonance (MR) imaging [11]. Initially, the origin of this pelvic floor injury was not clear. Recently, it has been shown that this type of injury is most likely caused by vaginal delivery, since no pelvic floor abnormalities can be found in nulliparous women, nor in women after caesarean section [12, 13].

The observed abnormalities most frequently involve the anterior side of the puborectal and probably also the pubococcygeal muscles near their insertion to the pubic bone [13, 14]. It has been suggested that pelvic floor injury represents avulsion of the puborectal and pubococcygeal muscles from the pubic bone [13]. Unfortunately, to date, anatomic studies supporting this premise are lacking. Therefore, it cannot be precluded that other forms of trauma, such as excessive stretching of the pelvic floor and nerve stretching or compression, resulting in denervation and muscle atrophy, could also play a role in the mechanism, which causes these abnormalities.

It has been reported that pelvic floor injury is related to pelvic organ prolapse [15], especially in the anterior and middle pelvic compartment [16, 17]. Until now, no relation between pelvic floor injury and bladder dysfunction could be identified [16, 18]. Recently, it has been reported that besides anal sphincter defects, pelvic floor injury can be found in up to 72 percent of the patients with faecal incontinence [19, 20]. However, it is unknown whether this type of injury contributes to the underlying pathophysiologic mechanism of faecal incontinence. Furthermore, the question arises whether the mechanism of action of sacral neuromodulation depends on pelvic floor integrity.

For many years, MR imaging was the only technique available for pelvic floor imaging. In 2003, Dietz *et al*. [21] introduced 3D transperineal ultrasound, as a relatively simple and non-invasive method for the detection of pelvic floor injury. Aim of the present study was: 1st, to determine the prevalence of pelvic floor injury in women with faecal incontinence, who

were eligible for sacral neuromodulation in the past and 2nd, to determine whether sacral neuromodulation is worthwhile in patients with pelvic floor injury, as detected by transperineal ultrasound.

Patients and Methods

All female patients, who underwent test stimulation during the last nine years in our institution, were invited to participate in the present study, which was approved by the hospital's human research ethics committee. Patients with disabling faecal incontinence were considered for test stimulation when they met the criteria as listed in Table 1. After written informed consent was obtained, transperineal ultrasound was performed to assess pelvic floor integrity. A standardised interview concerning parity and medical history was obtained at the time of the assessment of pelvic floor integrity. In patients who received a permanent pulse generator, follow-up was obtained with a standardised questionnaire concerning continence improvement, degree of faecal incontinence, and the current number of incontinence episodes.

Table 1. Criteria for test stimulation
Inclusion criteria
At least three incontinence episode per week (confirmed by bowel diary)
Under the age of 80 years
Failed conservative treatment
External anal sphincter: No defect
Or a small defect (< 90°)
Or failed previous sphincter repair
Exclusion criteria
Congenital anorectal malformation
Neurological disease
Chronic diarrhea
Inflammatory bowel disease
Psychiatric disease
Pregnancy

Test stimulation and permanent implantation of a pulse generator were performed as previously described [6]. All patients completed a bowel diary before, during, and after test stimulation. Hospital records and outpatient clinic charts were retrospectively analysed by one author (DMO), who had not participated in the surgical procedure. All patients underwent test

stimulation for at least two weeks, but in most cases for three weeks. If patients encountered a reduction of incontinence episodes of at least 75 percent during the test stimulation, the test period was considered as successful. Only patients with a successful test stimulation were selected for permanent implantation.

Transperineal Ultrasound

Transperineal ultrasound was performed with a GE Kretz Voluson 730 expert system (GE Healthcare, clinical systems, Hoevelaken, the Netherlands), with a 4 – 8 MHz transducer for examination of the pelvic floor and a 5 – 9 MHz transducer for examination of the anal sphincters. Patients were examined after voiding and in supine position. Ultrasound volumes were obtained at rest and during levator contraction as previously described [22]. Off-line evaluation of the volumes was performed by two investigators (DMO and ABS), using specialised software (4D view, GE Healthcare), and blinded against parity, current continence status, and medical history with the exception of prior test stimulation. In case of discrepancy between both investigators, volumes were reviewed and discussed until consensus was reached.

For the assessment of pelvic floor integrity, the method was used as described by Dietz *et al*. [18]. 3D volumes obtained at maximum pelvic floor contraction, or volumes obtained at rest in patients who were unable to elicit a contraction, were evaluated with tomographic ultrasound imaging. A set of eight slices with an interval of 2.5 mm was analysed. Pelvic floor injury was diagnosed when a unilateral or bilateral discontinuity was seen between the puborectal part of the pelvic floor and the pubic bone, according to the criteria as described by Dietz *et al*. [17] (Figure 1). Pelvic floor contraction was classified as insufficient when a reduction of less than 25 percent was found in the area between both limbs of the pelvic floor during maximum contraction (hiatal area reduction) [23].

Outcome Classification

Clinical outcome of permanent implantation was classified as excellent, good, moderate, or poor. The outcome was classified as excellent if the patient reported full continence. If the patient encountered incontinence for flatus or sporadic (< once per month) loss of liquid stool only, the outcome was graded as good. The result was classified as moderate if the patient still suffered from regular incontinence for liquid and / or solid stool but encountered a reduction of incontinence episodes of at least 50 percent. If the patient encountered no reduction of incontinence episodes or a reduction of less than 50 percent, the outcome was defined as poor.

Statistical Analysis

Statistical analysis was performed with the SPSS software package (15.0 version, SPSS Inc., Chicago, USA). When appropriate, patients groups were compared with the chi-square test or Fisher's exact test. Continuous variables were compared with the Mann-Whitney U test. Paired

data were analysed with the paired-samples t-test or Wilcoxon signed rank test. Cohen's kappa coefficient was obtained to assess inter-observer agreement for the detection of pelvic floor injury. Differences were considered statistically significant at a two-tailed p-value of ≤ 0.05.
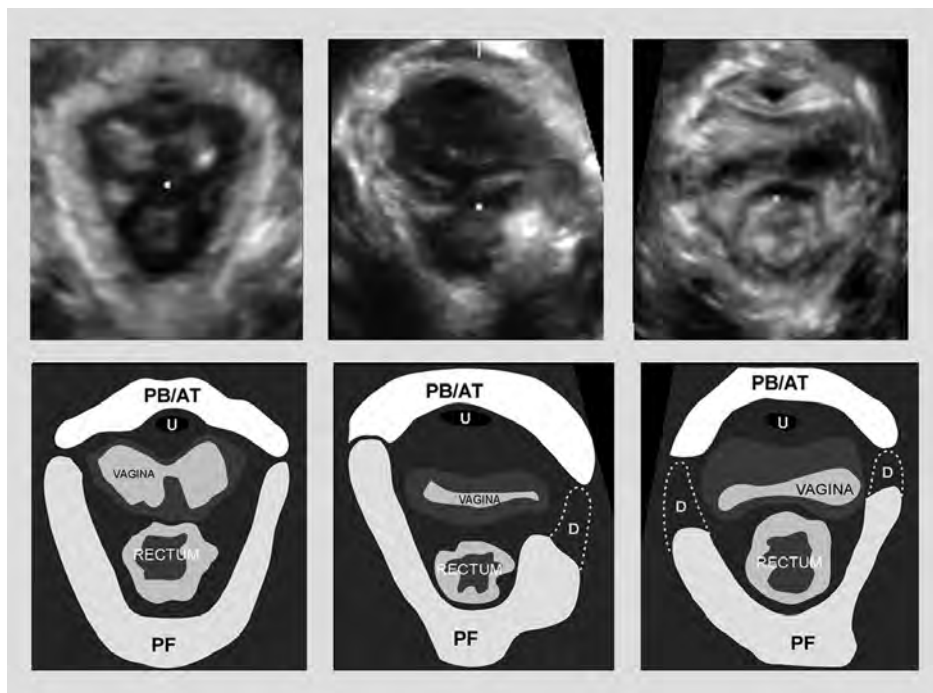

Figure 1. Transperineal ultrasound of the pelvic floor
left: normal, middle: unilateral injury, right: bilateral injury
PB/AT: pubic bone and arcus tendineus, U: urethra, PF: pelvic floor, D: defect

Results

Between 2000 and 2008, 66 female patients underwent test stimulation. Forty-six of these patients (70%) agreed to participate in the present study. The median age of these participants was 60 years (range: 29 – 80). The median number of incontinence episodes per week, prior to test stimulation, was 9 (range: 3 – 35). Median vaginal parity was 2 (range: 0 – 5), two patients were nulliparous. Two patients had a history of forceps delivery and in three patients a vontuse was used during labour. Vaginal delivery was complicated by an obstetric tear involving the anal sphincters in 17 patients (37%). Eight patients (17%) had undergone anal surgery in

the past. The history of one patient (2%) revealed an obstetric tear, as well as previous anal surgery. Twenty patients (44%) had an uncomplicated obstetric history or no vaginal delivery at all (n = 1) without previous anal surgery in the past. None of the patients had a vaginal delivery since test stimulation. The participants were comparable with the non-participants regarding age, number of incontinence episodes prior to test stimulationand percentage of patients with successful test stimulation (Table 2).

Table 2. Comparison of participants and non-participants			
	Participants (n = 46)	Non-participants (n = 20)	p-value
Median age (range)	60 (29 – 80)	61 (37 – 71)	0.70
Median IE prior to TS	9 (3 – 35)	10 (3 – 30)	0.40
Successful TS (%)	80	65	0.22

IE: incontinence episodes per week, TS: test stimulation

Pelvic floor injury was detected in 29 patients (63%). This injury involved one side of the pelvic floor in eight patients and in 21 patients a bilateral injury was observed. All five patients with a history of instrumental delivery were found to have pelvic floor injury. The pelvic floor was intact in the two patients without a history of vaginal delivery. Pelvic floor contraction was insufficient in 25 patients with pelvic floor injury (86%) and in five patients with an intact pelvic floor (29%) (p < 0.0001). No differences regarding age, number of incontinence episodes prior to test stimulation, and duration of follow-up were found between patients with and those without pelvic floor injury (Table 3). The inter-observer agreement for detection of pelvic floor injury was excellent (Cohen's kappa coefficient: 0.82).

Successful test stimulation was obtained in 80 percent of the participants. When comparing patients with and those without pelvic floor injury, the test stimulation was found to be successful in 86 and 71 percent respectively (p = 0.26). During test stimulation, the median reduction of incontinence episodes per week was comparable in both groups.

All patients with successful test stimulation underwent permanent implantation of a pulse generator (Figure 2). The median duration of follow-up in these patients was 32 months (range: 3 – 98). Overall, the clinical outcome was excellent in two patients (5%). A good outcome was observed in 18 patients (49%). In 10 patients (27%), the outcome was classified as moderate and a poor outcome was found in seven patients (19%). Clinical outcome in patients with pelvic floor injury was comparable to that in patients with an intact pelvic floor. The median number of incontinence episodes per week at follow-up was similar in both groups. Furthermore, the clinical outcome was poor in 16 percent of the patients with pelvic floor injury and in 25 percent of the patients with an intact pelvic floor.

Table 3. Comparison of treatment outcomes in patients with and those without pelvic floor injury			
	Pelvic floor injury (n = 29)	Intact pelvic floor (n = 17)	p-value
Median age (range)	61 (31 – 74)	59 (29 – 80)	0.37
Median IE prior to TS (range)	8 (3 – 33)	12 (3 – 35)	0.08
Median IE during TS (range)	0 (0 – 4)	4 (0 – 18)	0.22
Median reduction (%) of IE during TS (range)	100 (0 – 100)	92 (0 – 100)	0.36
Successful TS (%)	86	71	0.26
Median follow-up in months (range)*	32 (3 – 98)	27 (3 – 98)	0.98
Median IE at the end of follow-up (range)*	0 (0-15)	0 (0-15)	0.34
Clinical outcome of permanent implantation (%)*			
Excellent	8	0	
Good	44	58	0.50
Moderate	32	17	
Poor	16	25	

IE: incontinence episodes per week, TS: test stimulation
* follow-up was obtained in all patients after permanent implantation (n=37)
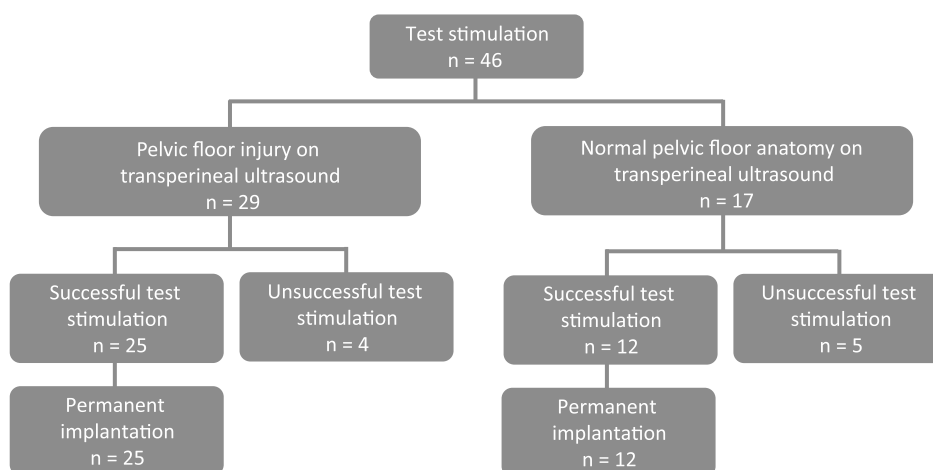
Figure 2. Flow chart of the participants

Discussion

Transperineal ultrasound, as used in the present study, revealed pelvic floor injury in 63 percent of faecal incontinent women who were eligible for sacral neuromodulation. The results of the test stimulation and the clinical outcome after implantation of a permanent pulse generator did not differ between patients with and those without pelvic floor injury.

Transperineal ultrasound has been introduced recently as a reliable tool for the evaluation of both pelvic floor function and integrity [22], with a good reproducibility and inter-observer agreement [16, 20, 24]. In the present study, the inter-observer agreement was also found to be excellent.

It has been suggested that pelvic floor injury, as observed in the present study, represents avulsion of the puborectal-pubococcygeal part of the pelvic floor [13]. However, anatomic studies supporting this premise are still lacking. It has been shown that pelvic floor injury is related to pelvic organ prolapse [15], especially in the anterior and middle pelvic compartment [16, 17]. The present study showed that 86 percent of the patients with pelvic floor injury were not able to elicit a normal pelvic floor contraction, whereas this phenomenon was found in only 29 percent of the patients with an intact pelvic floor. These findings do suggest that the observed pelvic floor abnormalities may result in insufficient pelvic floor contraction.

Pelvic floor injury is most likely caused by vaginal delivery and not by pregnancy itself [12, 13]. Since none of our patients had a vaginal delivery since test stimulation, it seems obvious that the observed pelvic floor injury was pre-existent at the moment of referral for sacral neuromodulation. The question arises whether the high prevalence of pelvic floor injury, found in the present study (63%), reflects a major contributing role of this type of injury in the underlying pathophysiologic mechanism of faecal incontinence.

With the same imaging technique, Weinstein *et al*. [20] also observed a high prevalence of pelvic floor injury (72%) in faecal incontinent women. According to these authors, patients with faecal incontinence had a higher prevalence of pelvic floor injury and concomitant anal sphincter defects as compared with asymptomatic parous controls. It might be possible that women with external anal sphincter defects due to vaginal delivery plus concomitant pelvic floor injury have a higher risk for developing faecal incontinence as compared to women who have only external anal sphincter defects. Further research is warranted to determine the exact role of pelvic floor injury in the aetiology of faecal incontinence.

The present study is limited by the retrospective assessment of pelvic floor integrity. Transperineal ultrasound was not performed as a part of the preoperative workup but only after test stimulation or after implantation of a permanent pulse generator. It is unknown whether chronic sacral neuromodulation and subsequent aging have an effect on pelvic floor appearance during transperineal ultrasound and, therefore, might lead to suboptimal evaluation of pelvic floor integrity. Another limitation of the present study is the relatively small number of studied patients.

Since the introduction of sacral neuromodulation for the treatment of faecal incontinence in 1995 [2], several authors showed encouraging short- and medium-term results. Complete continence for stool has been reported in up to 57 percent of the patients [5, 6, 25, 26]. A reduction of the number of incontinence episodes of 50 percent or more has been described in 68 to 96 percent of the patients [4, 5, 26, 27]. The overall clinical outcome, as observed in the present study, is comparable with these results as reported by others.

Until now, it is still not clear why and how sacral neuromodulation is effective. Convincing evidence that sacral neuromodulation affects anal resting pressure and anal squeeze pressure is lacking [28-30]. It has been suggested that an increased rectal sensitivity is one of the mechanisms of action [31]. In addition, recent work revealed that sacral neuromodulation possibly drives dynamic brain changes, which might influence continence [32, 33]. However, until now, it was unclear whether an intact pelvic floor is a prerequisite for effective sacral neuromodulation.

Despite its limitations, the present study does not suggest that associated pelvic floor injury has a detrimental effect on the efficacy of sacral neuromodulation. The response to test stimulation was comparable in patients with and those without pelvic floor injury. Furthermore, the reduction in the number of incontinence episodes and the clinical outcome after permanent implantation of a pulse generator did not differ between patients with and those without pelvic floor injury. Earlier reports have already indicated that the mechanism of action of sacral neuromodulation does not depend on an intact external anal sphincter [8]. The findings of the present study suggest that the same holds true for an intact pelvic floor.

Conclusions

Pelvic floor injury is present in the majority of faecal incontinent patients who were eligible for sacral neuromodulation. This type of injury does not affect the efficacy of sacral neuromodulation.

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Part III

Rectovaginal Fistula
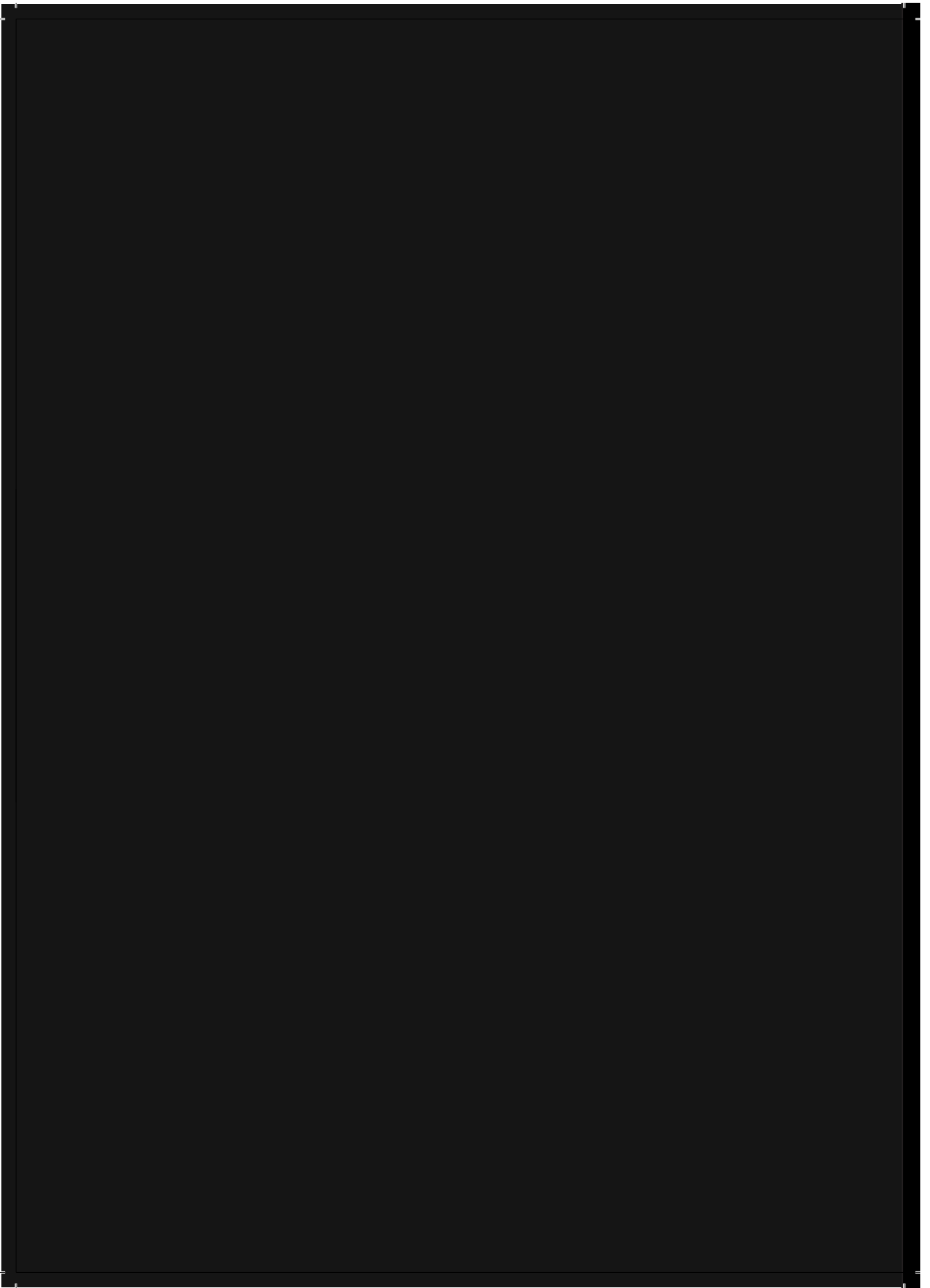
Chapter 8

Puborectal sling interposition for the treatment of rectovaginal fistulas

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Martijn P. Gosselink
Valeria R.M. van Dijl
David D.E. Zimmerman
W. Ruud Schouten

Abstract

Background

Several techniques are available for the surgical treatment of rectovaginal fistulas. However, the results are often rather disappointing. It has been suggested that interposition of healthy, well-vascularised tissue may be the key to rectovaginal fistula healing. The present study was aimed at evaluating the outcome of the puborectal sling interposition in the treatment of rectovaginal fistulas.

Patients and Methods

Between 2001 and 2004, 26 consecutive patients (median age: 41 years, range: 15 – 69) with a rectovaginal fistula underwent a puborectal sling interposition. The aetiology of the fistulas was: obstetric injury (n = 11), complications after prior surgery (n = 2), bartholinitis (n = 4) cryptoglandular fistulous disease (n = 2), inflammatory bowel disease (n = 2), and idiopathic (n = 5). The patients received a standardised questionnaire about faecal continence and dyspareunia.

Results

The median follow-up was 14 months (range: 3 – 50). The rectovaginal fistula healed in 16 of 26 patients. In patients who had undergone one or more previous repairs, the healing rate was only 31 percent versus 92 percent in patients without previous repairs (p < 0.01). The Rockwood faecal incontinence severity index score did not change. Seventeen percent of patients experienced painful intercourse before the operation. After the procedure this problem was encountered by 57 percent of the patients.

Conclusion

The puborectal sling interposition is only successful in patients without previous repairs and in those with an uneventful postoperative course. However, *de novo* dyspareunia is a major drawback of this procedure.

Chapter 8

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Introduction

A rectovaginal fistula is an abnormal tract between the rectum and the vagina. Such a fistula is frequently associated with physical and emotional burden. Rectovaginal fistulas are commonly classified as low, intermediate, and high, depending on the location of the vaginal opening. In most cases the patient presents with a low rectovaginal fistula, which is in fact an anovaginal fistula. Obstetric injury is by far the most frequently reported cause of these low rectovaginal fistulas [1-4]. In the Western society, vaginal deliveries result in a third or fourth degree perineal tear in two percent of the women [5]. Disruption of the external anal sphincter, despite a proper repair, with a concomitant wound infection are major contributing factors.

Several techniques are available for the repair of rectovaginal fistulas. In the early 1980s, transanal advancement flap repair was advocated as the treatment of choice for patients with a low rectovaginal fistula. Initially, the reported results were very promising, with healing rates varying between 78 and 95 percent [4, 6-8]. More recently, a significantly lower healing rate has been reported, especially in women who had previous repairs [9-11]. In our own institution we also encountered low healing rates after transanal advancement flap repair. In an attempt to improve our results, we added labial fat flap transposition to the advancement flap repair. Unfortunately, this combined procedure did not improve the outcome [12].

It has been suggested that interposition of healthy, well-vascularised tissue may be the key to rectovaginal fistula healing. Reviewing the literature from the past, we noticed that gynaecologists frequently applied interposition of healthy, well-vascularised sphincter muscle. In the early 1990s, the beneficial effect of a puborectal sling interposition has been reported [13-15]. The high success rate, varying between 92 and 100 percent, inspired us to conduct the present study, aimed at evaluating the outcome of the puborectal sling interposition in the treatment of rectovaginal fistulas.

Patients and Methods

Between 2001 and 2004, 26 consecutive patients with a low rectovaginal fistula (median age: 41 years, range: 15 – 69) underwent a puborectal sling interposition. In 11 patients the fistula developed after vaginal delivery, complicated by a perineal tear. In two patients the fistula was due to complications after sphincter and rectocele repair respectively. In four patients the fistula was a late result of a prior bartholinitis. Other causes were cryptoglandular fistulous disease (n = 2) and inflammatory bowel disease (n = 2). The underlying cause of the fistula could not be identified in five patients. Thirteen patients had undergone one or more previous attempts at repair before referral to our hospital. A transperineal approach was applied in 10 patients. In 16 patients an approach trough the posterior vaginal fourchette was used. Prior to

the procedure, all patients underwent magnetic resonance imaging with an endoanal coil. In seven patients a concomitant sphincter defect was detected. In these patients the puborectal sling interposition was combined with a sphincter repair.

Postoperatively all patients were immobilised for five days. During the same period of time they were restricted to clear liquids. Metronidazole and cefuroxime were administered intravenously three times daily for five days. A standardised questionnaire was used to determine the Rockwood faecal incontinence severity index (RFISI) score. Prior to the procedure, completed forms were returned by 23 patients. These 23 patients received the same questionnaire after the operation. Completed forms were returned by all but one patients. The questionnaire about dyspareunia, which was send to all patients after the operation, was returned by 17 of them.

Surgical Technique

All patients underwent complete mechanical bowel preparation (polyethylene glycol, Klean-prep, Helsinn Birex Pharmaceuticals, Dublin, Ireland). After induction of general endotracheal anaesthesia, metronidazole (500 mg) together with cefuroxime (1.500 mg) was administered intravenously. All patients were operated in the lithotomy position. Initially, the repair was performed through a perineal incision, placed in an arc anteriorly at a distance of 1 to 1.5 cm to the anal verge. Later on, the repair was performed through a curved incision in the posterior fourchette of the vagina, in the line of the mucocutaneous junction (Figure 1). After the incision, the rectovaginal septum was dissected by cephaled mobilisation. The posterior vaginal wall was separated from the anterior wall of the anal canal and the rectum. During this part of the procedure, the fistulous tract was transected. The opening in the anterior wall of the anal canal was enlarged by removing all fibrotic tissue located at the edge of the opening. The enlarged opening in the anterior wall of the anal canal was closed with interrupted sutures, using 2-0 monocryl® (Ethicon, Johnson & Johnson, Somerville, USA) (Figure 2a). Then, the anterior wall of the rectum and the anal canal was plicated with a running 2-0 monocryl® suture, in order to create a second layer of healthy, well-vascularised tissue, imbricating the first line of sutures (Figure 2b). Next, both limbs of the puborectal sling were approximated in the midline with interrupted sutures, using 2-0 monocryl® (Figure 2c). This provides an additional layer of well-vascularised tissue between the anterior wall of the rectum and anal canal and the posterior vaginal wall. In patients with a concomitant anterior defect of the external anal sphincter an overlapping repair was performed simultaneously. Then, the opening in the posterior vaginal wall was closed with interrupted 3-0 vicryl® (Ethicon, Johnson & Johnson, Somerville, USA) sutures. Finally, the subcutaneous layer and the skin were closed with interrupted 3-0 vicryl® sutures. In all but one patient, the procedure was performed without covering ileostomy.
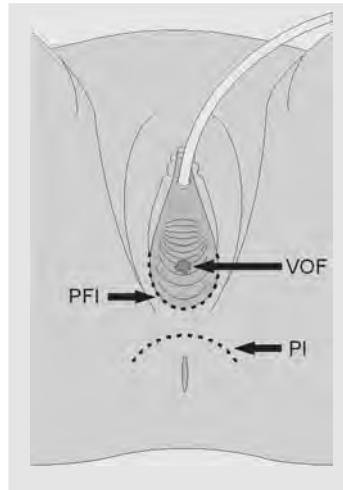
Figure 1. Exposure of the rectovaginal fistula

PFI: posterior fourchette incision, PI: perineal incision,
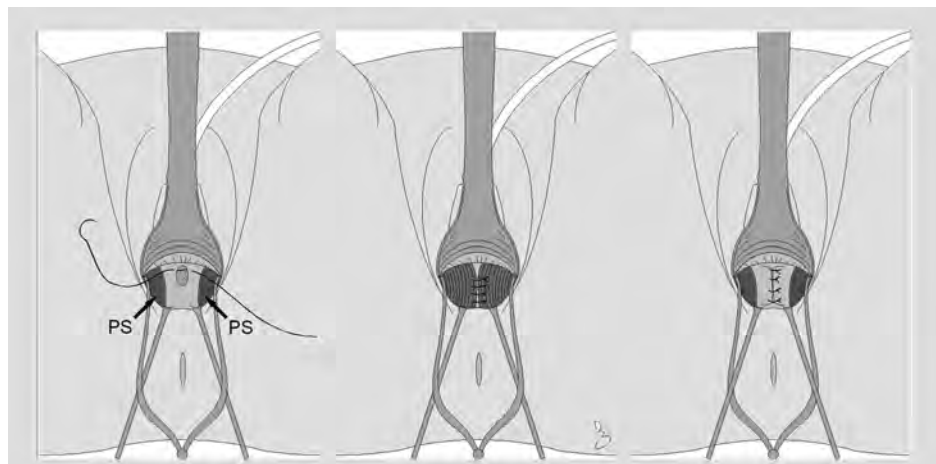
VOF: vaginal opening of the fistulous tract

Figure 2a.   Figure 2b.   Figure 2c.

Figure 2. Closure of the rectovaginal fistula

Figure 2a. First layer: closure of the enlarged opening in the anterior wall of the anal canal

Figure 2b. Second layer: plication of the anterior wall of the anal canal

Figure 2c. Third layer: plication of both arms of the puborectal sling

PS: puborectal sling

Statistical Analysis

Before and after surgery differences of RFISI score were evaluated using the Wilcoxon Signed Ranks test. Dyspareunia before and after surgery was compared with McNemar's test. When appropriate, patient groups were compared using the chi-square test or Fisher`s exact probability test. The limit of statistical significance was set at $p \leq 0.05$ (two-sided).

Results

At a median-follow up of 14 months (range: 3 – 50), the overall-healing rate was 62 percent. Among the 13 patients without a previous repair the healing rate was 92 percent. A significantly lower healing rate of 31 percent was found in the 13 patients with one or more previous repairs ($p < 0.01$). Eleven patients (42%) encountered a postoperative wound infection, independent of the surgical approach and a history of previous repairs. Comparing the healing rates in patients with and those without postoperative wound infection, a significant difference was found (36 versus 80%, $p < 0.05$). The healing rate was found to be zero percent in the six patients with one ore more previous repairs, who developed a postoperative wound infection. The healing rate was 80 percents in the five patients without previous repairs, who developed a postoperative wound infection. In the eight patients without a previous repair, who encountered an uneventful postoperative course, the procedure was successful in 100 percent of the cases. The surgical approach, the underlying cause of the fistula, the patient's age, as well as smoking habits, did not influence the outcome (Table 1).

Faecal Continence

The median RFISI score after the puborectal sling interposition did not differ from the preoperative score (8 versus 8). Prior to the operation, 10 patients were full continent (RFISI score: 0). After the procedure, eight of these patients remained full continent, whereas two patients noticed a deterioration of continence (RFISI score: 32 respectively 33). Thirteen patients reported impairment of continence before the operation (median RFISI score: 23). After the procedure, six of these patients experienced an improvement, whereas five patients reported no further impairment of continence. The impact of the procedure on faecal continence could not be assessed in the patient with an ileostomy and in the patient who did not return the questionnaire.

Dyspareunia

Three of the 17 patients, who returned the questionnaire, experienced painful intercourse before the operation. Eight of the 14 patients, who did not report pain during intercourse before the procedure, experienced painful intercourse after the operation (57%).

Table 1. Factors predictive of outcome				
		Success (n)	Failure (n)	Healing rate (%)
Age				
	< 35 years	6	4	60
	> 35 years	10	6	63
Previous repairs*				
	Yes	4	9	31
	No	12	1	92
Wound infection#				
	Yes	4	7	36
	No	12	3	80
Etiology				
	Obstetric	7	4	64
	Complications after prior surgery	1	1	50
	Barholinitis	3	1	75
	Cryptoglandular fistulous disease	1	1	50
	IBD	2	0	100
	Idiopathic	2	3	40
Approach				
	Perineal	7	3	70
	Fourchette	9	7	56
Smoking				
	Yes	5	2	71
	No	11	8	58

* p < 0.01
# p < 0.05
IBD: inflammatory bowel disease

Discussion

Despite some anecdotic reports, there is no evidence that rectovaginal fistulas heal spontaneously. Until now it is not clear whether a non-surgical approach, such as the use of fibrin glue and treatment by electrocauterisation, is successful or not [16-19]. Therefore, it seems likely that closure of a rectovaginal fistula can only be obtained by surgical repair.

Traditionally, rectovaginal fistulas were repaired by gynaecologists utilising a transvaginal approach [20, 21]. According to Greenwald and Hoexter, a low rectovaginal fistula has the

characteristics of a shunt between a high-pressure zone (anal canal) and a low-pressure zone (vagina) [22]. They stated that closure of the anal opening, at the high-pressure side, is essential for a successful repair. Therefore, both authors advocated a transanal approach. They performed an elliptical incision extending through the whole rectovaginal septum in order to excise the entire fistulous tract. Then, they closed the defect in two or three layers. Finally, the rectal mucosa was advanced and sutured distal to the repair. The transanal advancement flap repair is based on the same principles. Noble [23] was the first who used this technique for the repair of rectovaginal fistulas in 1902. In the 1980s this technique regained popularity [4, 6, 8]. Initially, the reported healing rates varied between 78 and 95 percent [6, 8]. Based on these promising results this procedure was also introduced in our institution. Unfortunately, our experience with this technique was rather disappointing. We found a healing rate of just 44 percent [12]. Such a low healing rate has also been reported by others, especially in women who had previous repairs [9-11]. Based on these data, it seems obvious that closure of the anal opening, by a transanal advancement flap repair, is not the only key to a successful repair. Impairment of continence, observed in a substantial number of patients, is another drawback of this procedure [7, 24]. In an attempt to improve the results, we added labial fat flap transposition to the advancement flap repair. Unfortunately, this combined procedure did not improve the outcome [12].

It has been suggested that poor blood supply and the presence of scar tissue in the rectovaginal septum preclude healing [4, 9]. Based on this assumption, it might be possible that the outcome of repair can be improved by interposition of healthy, well-vascularised tissue in the rectovaginal septum. In the early 1990s, three reports do suggest that interposition of the puborectal muscle might be beneficial for the treatment of rectovaginal fistulas [13-15]. The reported healing rates varied between 92 and 100 percent, even in patients with Crohn's disease. In the present study, similar results were only observed in patients without previous repairs and without a postoperative wound infection. The closure rate declined to zero percent in patients with one or more previous repairs, who developed a postoperative wound infection. Tsang *et al.* [11] analysed the outcome of 35 sphincter repairs with or without levatorplasty in the treatment of rectovaginal fistula. In contrast with our finding, they noted a success rate of 80 percent for those without previous repairs versus 75 percent for those with one or more previous repairs. Until now, the adverse effect of previous repairs has only been reported in patients who underwent a transanal advancement flap repair. Lowry *et al.* [4] observed a healing rate of 88 percent in patients without a previous flap repair. The closure rate dropped to 55 percent in patients who had undergone two prior attempts at repair. Tsang *et al.* [11] reported that the success rates for flap repair declined from 45 percent for patients without a previous repair to 25 percent for those with one or more previous repairs. It has been suggested that the adverse effect of previous repairs is due to a poor blood supply and the presence of scar tissue. The results of our present study illustrate that this detrimental effect is not eliminated by the interposition of healthy, well-vascularised muscle. In our patients without previous repairs the puborectal sling interposition was very successful.

Initially, we used a transperineal approach for the puborectal sling interposition. Later on, we used an incision at the posterior vaginal fourchette. The most important reason for this change in policy was the relatively high incidence of wound complications after the perineal approach. Maybelle Tan and co-workers [25] conducted a randomised controlled trial comparing the conventional perineal incision with the posterior vaginal fourchette incision. Postoperative wound complications were fewer when a posterior vaginal fourchette incision was used compared with a perineal incision. In contrast with this finding, we were not able to demonstrate a significant difference between both approaches with respect to the number of wound complications.

In the present study, the puborectal sling interposition, either by a perineal approach or by a posterior fourchette approach, did not adversely affect faecal continence. Comparing the Rockwood faecal incontinence severity index score before and after surgery, no differences were found. It has been shown that after transanal advancement flap repair, impairment of faecal continence does occur in a substantial number of patients [7, 24].

Although the puborectal sling interposition does not result in impairment of continence, this procedure has two disadvantages. First, the outcome is not successful in patients with previous repairs and in those who developed a postoperative wound infection. The high incidence of *de novo* dyspareunia is another drawback. In the present study, 57 percent of patients complained about dyspareunia after the procedure.

The results of the present study indicate that the outcome of rectovaginal fistula repair can be improved by the puborectal sling interposition. However, this beneficial effect was only observed in patients without previous repairs and in those with an uneventful postoperative course. Based on the poor outcome in patients who had undergone one or more previous repairs and the high incidence of *de novo* dyspareunia after the procedure, the puborectal sling interposition cannot be considered as the treatment of choice for women with a low rectovaginal fistula. In our opinion, therefore, further studies are warranted in order to examine other techniques.

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Chapter 9

Rectal sleeve advancement for the treatment of persistent rectovaginal fistulas; a feasibility study

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Daniëlla M.J. Oom

Abstract

Introduction
Different surgical procedures are available for rectovaginal fistula repair. Most of these procedures fail in a substantial number of women, especially in those with a persistent fistula after prior attempts at repair. In addition, these procedures have a potential risk of dyspareunia. The question was whether rectal sleeve advancement could be a valuable option for women with such a persistent rectovaginal fistula. Aim of the present study was to examine the feasibility of this new procedure.

Patients and Methods
Eight consecutive women (median age: 41 years, range: 28 - 53) with a persistent, low rectovaginal fistula underwent rectal sleeve advancement, six patients by a posterior "Kraske" approach and two patients by an abdominal approach. The aetiologies were obstetric trauma (n = 4), prior anal surgery (n = 2), and cryptoglandular fistulous disease (n = 2).

Results
Five patients had an uneventful postoperative course. Three patients encountered recurrent symptoms shortly after the procedure. In these three patients an additional transanal approach was performed to close the anal opening of the fistulous tract. This additional approach was successful in one patient. The median duration of follow-up was 12 months (range: 3 – 17). The overall healing rate was 75 percent. None of the patients encountered *de novo* dyspareunia. One patient encountered involuntary loss of stool during the night postoperatively.

Conclusion
Based on these early results, rectal sleeve advancement, by a posterior "Kraske" approach, or by an abdominal approach, seems to be a valuable alternative for the treatment of persistent rectovaginal fistulas.

Introduction

A rectovaginal fistula is an abnormal tract between the rectum and the vagina. Rectovaginal fistulas are commonly classified as low, intermediate, and high, depending on the location of the vaginal opening [1]. In most cases the patient presents with a low rectovaginal fistula, which is in fact an anovaginal fistula. Obstetric injury is by far the most frequently reported cause of these low rectovaginal fistulas [2, 3]. In the Western society, vaginal deliveries result in a third or fourth degree perineal tear in two percent of the women [4]. Rectovaginal fistula formation is reported in approximately three percent of the patients with such a perineal tear [5]. Perianal infections, including inflammatory bowel disease, prior anorectal surgery, carcinoma, and radiation may also lead to rectovaginal fistula formation.

Different surgical techniques are available for rectovaginal fistula repair. In the early 1980s, transanal advancement flap repair was advocated as the treatment of choice for women with a low rectovaginal fistula. Initially, the reported healing rates varied between 78 and 95 percent [6-9]. Recently, lower healing rates have been reported, especially in women in whom the fistula persisted after prior surgery [10-13]. Based on the assumption that insufficient blood supply and the presence of scar tissue preclude healing, it has been suggested that interposition of healthy, well-vascularised tissue might improve the outcome of rectovaginal fistula repair. However, a previous study revealed that addition of labial fat flap transposition to transanal advancement flap repair does not improve the outcome [13]. In addition, in another study, it was shown that puborectal sling interposition was only successful in patients without prior attempts at repair [14]. Data regarding the efficacy of gracilis muscle interposition in women with persistent, low rectovaginal fistulas are scarce. Furthermore, it is well known that *de novo* dyspareunia is a potential drawback of tissue interposition in the rectovaginal septum, but this serious side effect is seldom mentioned.

Rectal sleeve advancement by a transanal approach has been described previously for the treatment of patients with a rectovaginal fistula, almost exclusively in women with Crohn's disease [15-19]. Data regarding the efficacy of rectal sleeve advancement in women with a persistent, low rectovaginal fistula is lacking. The present study was aimed at evaluating the feasibility of rectal sleeve advancement, either by a posterior "Kraske" approach, or by an abdominal approach, for the treatment of patients with such a fistula.

Patients and Methods

Between 2006 and 2009, eight consecutive patients with a persistent, low rectovaginal fistula underwent rectal sleeve advancement (Table 1). A posterior "Kraske" approach was intended in six patients and an abdominal approach was preferred in two patients, based on the

complexity of previous surgery. Informed consent to perform the procedure was obtained from all patients. The median age of the women at the time of surgery was 41 years (range: 28 – 56). The aetiologies were vaginal delivery complicated by a fourth degree perineal tear (n = 4), complications after prior anal surgery (n = 2), and cryptoglandular fistulous disease (n = 2). Patients with a rectovaginal fistula caused by Crohn's disease were excluded.

Table 1. Patient's characteristics			
Patient	Age	Aetiology of RVF	Prior attempts at repair
1	43	obstetric trauma	TAFR + PRI
2	41	previous anal surgery	TAFR + PRI
3	40	cryptoglandular fistulous disease	PRI + AS + TAFR
4	53	cryptoglandular fistulous disease	TAFR
5	41	previous anal surgery	TEM
6	44	obstetric trauma	TAFR (2x)
7	29	obstetric trauma	TAFR
8	28	obstetric trauma	AS + TAFR

RVF: rectovaginal fistula, TAFR: transanal advancement flap repair, PRI: puborectal sling interposition, AS: anterior sphincteroplasty, TEM: transanal endoscopic microsurgery

After the procedure, all patients were seen and subsequent examined at the outpatient clinic to determine whether the rectovaginal fistula was healed. Pre- and postoperatively, a standardised questionnaire was used to assess the impact of the procedure on faecal continence and dyspareunia in all patients. Five patients underwent anal manometry before, as well as six months after the procedure.

Preparation to Surgery
Complete mechanical bowel preparation (polyethylene glycol; Klean-prep, Helsinn Birex Pharmaceuticals, Dublin, Ireland) was given the day prior to surgery. After induction of general endotracheal anaesthesia, metronidazole and cefuroxime were administered intravenously.

Surgical Technique
Posterior "Kraske" Approach
With the patient in prone jack-knife position, a semi-curved incision was made, starting just lateral to the left side of the sacrococcygeal joint and ending just outside the external anal sphincter (Figure 1). The distal part of the coccyx was removed. The incision was deepened to expose the pelvic floor, which was longitudinally incised in the midline to expose the distal part of the rectum. The rectum was circumferentially mobilised, both upwards as far as possible and downwards to the deepest part of the pelvic floor (Figure 2). At this level the distal part of the rectum was transacted.

Figure 1. With the patient in prone jackknife position, a semi-curved incision is made according to the marked line

Figure 2. The distal part of the rectum is circumferentially mobilised

In order to gain access to the anal canal a Lonestar retractor (Lone Star Retractor System, Lone Star Medical Products, Houston, Texas) was used. Using electrocautery, a circumferential mucosectomy was performed, starting at the dentate line and carried up to the level of transection (Figure 3). The anal opening of the fistula was enlarged and the entire fistulous tract was excised. Thereafter, the defect in the rectovaginal septum was closed in two layers, leaving the vaginal mucosa open for drainage (Figure 4). After advancement through the anal canal (Figure 5), the mobilised and transected distal part of the rectum was anastomosed to the dentate line with interrupted absorbable sutures (Figure 6). After closing of the pelvic floor with running absorbable sutures, a suction drain was placed and the skin was closed.

Figure 3. A circumferential mucosectomy is performed from the level of the dentate line

Figure 4. After mucosectomy, the enlarged anal opening of the rectovaginal fistula is closed in two layers

Figure 5. The mobilised and transected rectum is advanced through the anal canal

Figure 6. The rectoanal anastomosis is made with interrupted absorbable sutures

Abdominal Approach

With the patient in lithotomy position, a lower midline laparotomy was performed. The sigmoid colon was mobilised by incising the lateral peritoneal reflection. At the level of the sacral promontory the presacral space was entered and developed. Under direct vision, posterior dissection was extended and continued towards the level of the pelvic floor. The arterial supply of the rectum was preserved. Anteriorly, the peritoneum was incised at the deepest part of the pouch of Douglas and the rectovaginal septum was opened down to the pelvic floor. Both anterolateral sides of the distal part of the rectum were mobilised. The rectum remained attached laterally because both lateral ligaments were not divided. Just above the deepest

part of the pelvic floor, the rectum was transected. Thereafter, the transanal phase of the procedure was started as described above in the posterior "Kraske" approach. The mobilised and transacted rectum was advanced through the anal canal and anastomosed to the dentate line with interrupted absorbable sutures.

Postoperative Care

All patients were immobilised and restricted to a clear liquid diet for five days. Metronidazole and cefuroxime were administered intravenously three times daily during the same period.

Results

Two patients had undergone a diverting ileostomy prior to referral to our hospital. These patients reported complete continence before construction of their ileostomy. In the other six patients rectal sleeve advancement was performed without diverting ileostomy. None of these patients reported unintended loss of stool prior to the procedure. None of the sexually active patients experienced painful intercourse before the operation.

In six patients the posterior "Kraske" approach was intended and successfully completed in five of them (Table 2). In one patient it was not possible to gain enough length for sufficient advancement and rectoanal anastomosis. In this patient the operation was converted to an abdominal procedure, which enabled sufficient mobilisation of the distal part of the rectum and subsequent rectoanal anastomosis. The postoperative course in this patient was uneventful. In two patients a primary abdominal approach was preferred because of the complexity of previous surgery.

Table 2. Results after rectal sleeve advancement							
Patient	Approach	Complications	Additional procedure	Duration of FU (months)	Persistent RVF	Faecal incontinence	Dyspareunia
1	Kraske	no	no	12	no	no	no
2	Kraske	converted to abdominal	no	12	no	no	no
3	Kraske	no	yes	12	yes	no	no
4	Kraske	wound infection	yes	12	no	no	no
5	abdominal	no	no	12	no	no	NSA
6	abdominal	no	no	17	no	yes	no
7	Kraske	no	yes	12	yes	no	no
8	Kraske	no	no	3	no	no	NSA

FU: follow-up, RVF: rectovaginal fistula, NSA: not sexually active

Examination at the outpatient clinic, revealed no signs of a persistent fistula in five patients. Three patients encountered recurrent loss of gas and stool through their vagina shortly after the procedure. In these three patients an additional transanal approach was performed to close the anal opening of the fistulous tract, which was successful in one patient. One of these patients also encountered a postoperative wound infection. In the two patients with a diverting ileostomy, the ileostomy was closed after seven and twelve months respectively.

Follow-up information was obtained from a standardised questionnaire in all patients after a median follow-up of 12 months (range: 3 – 17). Impairment of continence was noticed in one patient. She reported loss of solid stool, which occurred only during the night. In five patients anal manometry was performed before and after rectal sleeve advancement. No deterioration of anal sphincter pressures was observed. None of the sexually active women encountered *de novo* dyspareunia after the procedure.

Discussion

Rectovaginal fistulas, persisting after prior attempts at repair, are difficult to treat. Transanal advancement flap repair, for example, fails in many women with such a persistent fistula. Lowry and co-workers [6] observed a healing rate of 88 percent after flap repair in patients without previous repairs, whereas the healing rate dropped to 55 percent in patients who had undergone two or more prior attempts at repair. Tsang *et al*. [12] reported that the closure rate after flap repair declined from 45 percent in patients without a previous repair to 25 percent in patients with a history of one or more previous repairs. Halverson *et al*. [18] reported an overall healing rate of only 30 percent in patients who underwent transanal advancement flap repair for persistent rectovaginal fistula. Based on these data it seems obvious that persistent rectovaginal fistulas are difficult to treat by a transanal advancement repair.

It is thought that the adverse effects of previous repairs may be attributed to insufficient blood supply and the presence of scar tissue. Based on this assumption, it has been stated that the outcome of rectovaginal fistula repair can be improved by interposition of healthy, well-vascularised tissue in the rectovaginal septum. However, in a previous study, it has been shown that the healing rate after puborectal sling interposition was 92 percent in patients without previous surgery and dropped to 31 percent in patients with one or more previous attempts at repair [14]. Since the treatment of persistent rectovaginal fistulas is associated with a poor outcome, we introduced an adapted rectal sleeve advancement for the treatment of these fistulas. In our opinion, this procedure has two potential benefits. First, the anal opening of the fistula is covered by a full-thickness layer of the rectum. Secondly, interposition of tissue in the rectovaginal septum is avoided, thereby minimising the risk of *de novo* dyspareunia.

Rectal sleeve advancement has been previously described by others [15-19]. So far, this procedure has only been performed by a transanal approach, almost exclusively in a limited number of patients with a rectovaginal fistula caused by Crohn's disease. In most of these studies, regarding transanal rectal sleeve advancement, the impact on faecal incontinence and dyspareunia was not assessed. To our knowledge, the present study is the first one to describe rectal sleeve advancement, either by a posterior "Kraske" approach, or by an abdominal approach, for the treatment of persistent, low rectovaginal fistulas in patients without Crohn's disease.

Although performed in only eight female patients, the observed healing rate after rectal sleeve advancement of 75 percent is favourable as compared to the reported healing rates after other techniques for the treatment of persistent rectovaginal fistulas. It is obvious that further research is warranted to assess the exact healing rate after rectal sleeve advancement in a larger number of patients.

Faecal continence was adversely affected by the procedure in one patient. This patient experienced involuntary loss of solid stool during the night. Prior to the rectal sleeve advancement, she had undergone several transanal procedures in order to repair her rectovaginal fistula. Due to the limited number of selected patients, included in the present feasibility study, it is not possible to determine whether the previous repairs or the rectal sleeve advancement itself contributes to deterioration of continence.

Repair of rectovaginal fistulas by interposition of tissue in the rectovaginal septum has a potential risk of *de novo* dyspareunia [14]. However, most authors do not mention this serious side effect. Since most patients with a rectovaginal fistula are relatively young and sexual active, the onset of dyspareunia, which has a significant impact on quality of life, should be prevented if possible. Rectal sleeve advancement, either by a posterior "Kraske" approach, or by an abdominal approach, minimises the risk of *de novo* dyspareunia, as shown in the present study.

Conclusions

Rectal sleeve advancement, performed by a posterior "Kraske" approach, or by an abdominal approach, results in fistula healing in 75 percent of the patients with a persistent rectovaginal fistula, without dyspareunia as side effect. Based on these early results, it seems likely that this adapted rectal sleeve advancement is a valuable alternative for the treatment of persistent rectovaginal fistulas.

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Summary
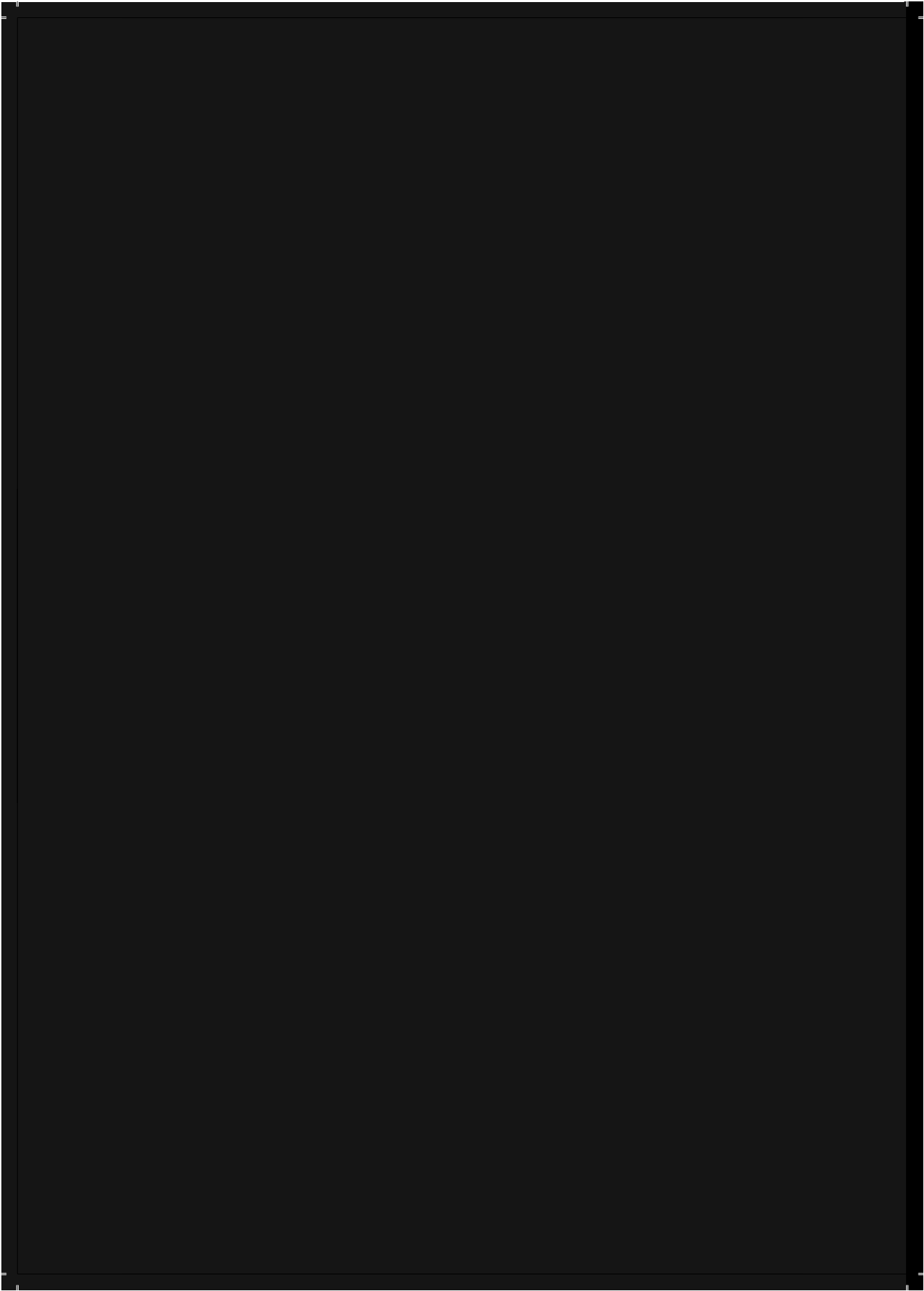
Chapter 10

Summary and discussion

Samenvatting voor niet-ingewijden

Posterior pelvic compartment disorders are relatively common, especially in older multiparous women, and have a significant impact on quality of life. This thesis is aimed at evaluating diagnosis and treatment of disorders of the posterior pelvic compartment. A general introduction to this subject, as well as the aims and outline of this thesis, are presented in **Chapter 1**.

Part I. Posterior Pelvic Compartment Prolapse

Short-term follow-up has shown that transabdominal enterocele repair, utilising synthetic graft material, is beneficial, especially for patients with symptoms of pelvic discomfort. However, it is questionable whether this beneficial effect does sustain in the long-term. The long-term effect of transabdominal enterocele repair by obliteration of the pelvic inlet was evaluated and the results of this study were described in **Chapter 2**. Despite an adequate enterocele repair, assessed by evacuation proctography six months after the procedure, recurrent symptoms of pelvic discomfort were observed in approximately one of four patients after a median follow-up of 85 months. Although co-existing prolapses in the other pelvic compartments might explain the recurrence of symptoms, they may also be attributed to progression of the underlying disorder causing physiologic changes that surpass the otherwise effective repair. It seems unlikely that enteroceles are a major cause of obstructed defaecation, since defaecation difficulties persisted in the majority of patients who presented with this problem prior to the procedure. It is more likely that other abnormalities, such as impaired rectal sensory perception and altered rectal wall contractility, also contribute to the problem of obstructed defaecation in patients with an enterocele. To date, there is no consensus regarding the indications for enterocele repair and the need for concomitant surgery for associated abnormalities. It seems likely that surgical repair should mainly depend on patient's symptoms. Enterocele repair can be offered to patients with pelvic discomfort. However, this procedure is not recommended if obstructed defaecation is the most prominent complaint. Enterocele should be considered as a part of pelvic organ prolapse and concomitant prolapses should, therefore, be diagnosed and treated if necessary in all patients.

A major drawback of transvaginal and transanal rectocele repair is the potential risk of dyspareunia after the procedure. It has been suggested that rectoceles can also be treated by a transabdominal approach without this serious side effect. In **Chapter 3** the results of transabdominal anterolateral rectopexy for the treatment of patients with rectocele and associated obstructed defaecation are described. Anterolateral rectopexy resulted in an adequate anatomic correction in 80 percent of the patients, without dyspareunia as a side effect. Despite this adequate repair, obstructed defaecation persisted in the majority of patients. Since obstructed defaecation also persists after other types of rectocele repair, the question arises whether rectocele is the cause or rather the result of obstructed defaecation.

In the last decade more attention has been paid to the underlying pathophysiologic mechanism of obstructed defaecation. It has been questioned whether obstructed defaecation is the result of one single abnormality, such as rectocele. It seems more likely that obstructed defaecation is caused by multiple factors, which might explain why anatomical correction of a rectocele alone, as obtained by anterolateral rectopexy, fails to restore symptoms of obstructed defaecation in a substantial number of patients. Further research is warranted to reveal the exact pathophysiologic mechanism of obstructed defaecation and to identify adequate treatment strategies for patients with defaecation difficulties.

Evacuation proctography provides a useful tool for the assessment of posterior pelvic compartment prolapse. However, this imaging technique is relatively invasive and requires substantial exposure to ionising radiation. Furthermore, evacuation proctography, without opacification of the bladder, lacks the ability to visualise the anterior and middle pelvic compartment. Imaging of all three pelvic compartments seems to be important, since it has been shown that patients with one type of prolapse often have concomitant prolapses, requiring treatment as well. Transperineal ultrasound, which has recently been developed, offers the possibility to visualise abnormalities in all three pelvic compartments simultaneously, without exposure to ionising radiation and at low cost. In **Chapter 4** the results are presented of a study, conducted to assess the level of agreement between evacuation proctography and transperineal ultrasound in diagnosing posterior pelvic compartment prolapse. Good agreement was found for the detection of enteroceles. Regarding the detection of rectoceles, a moderate agreement was found. For the detection of intussusception the level of correlation was fair. However, it has been reported that intussusception is present in up to 50 percent of healthy volunteers, therefore, the clinical significance of this incomplete rectal prolapse is unknown. In addition, transperineal ultrasound was significantly better tolerated by the patients. Based on these findings, transperineal ultrasound is considered to be an alternative to evacuation proctography in diagnosing posterior pelvic compartment prolapse. Therefore, it may be used as the first diagnostic tool for symptomatic patients.

Part II. Faecal Incontinence

To date, anterior sphincteroplasty is considered as the treatment of choice for faecal incontinent patients with an external anal sphincter defect, in whom supportive management fails. It has recently been reported that patients with an external anal sphincter defect may also benefit from sacral neuromodulation. Therefore, it is questionable whether patients with such an external anal sphincter defect should be treated primarily by anterior sphincteroplasty or directly by sacral neuromodulation. Unfortunately, the results of both procedures are hardly to compare, since in most studies regarding anterior sphincteroplasty other outcome

classifications are used than in studies regarding sacral neuromodulation. In **Chapter 5** the results of anterior sphincteroplasty are described, based on an outcome classification similar to that used in studies regarding sacral neuromodulation. Using this outcome classification, anterior sphincteroplasty was found to result in a successful outcome in 60 percent of the patients, which is sustained in the long-term. However, a less favourable outcome was found in patients aged 50 years or more at the time of the procedure. A similar finding has been reported by others. It seems obvious that additional factors play a role in the aetiology of faecal incontinence in these older women, since their external anal sphincter defect was most likely caused by vaginal delivery many years before. The question arises whether external anal sphincter repair can be justified as the surgical treatment of choice in these older faecal incontinent patients. The results obtained from this study facilitate a better comparison between the outcomes of anterior sphincteroplasty and sacral neuromodulation. However, to assess the definite role of both procedures in the management of faecal incontinence, associated with external anal sphincter defects, randomised controlled trials are warranted.

Vaginal delivery may result not only in anal sphincter defects but also in pelvic floor injury. However, until now, the influence of this type of injury on the aetiology of faecal incontinence and its treatment is unknown. The prevalence of pelvic floor injury in patients with faecal incontinence, who were eligible for anterior sphincteroplasty or sacral neuromodulation in the past, is described in **Chapter 6** and **7** respectively. In addition, the impact of this type of injury on the outcome of both procedures is verified. Transperineal ultrasound revealed that pelvic floor injury is present in the majority of patients who were eligible for surgical treatment of their incontinence. However, based on the results of both studies, it seems unlikely that this type of injury itself has a detrimental effect, or on the outcome of anterior sphincteroplasty, either on the efficacy of sacral neuromodulation. It is questionable whether the high prevalence of pelvic floor injury in the studied patients reflects a major contributing role of this type of injury in the aetiology of faecal incontinence. Recently, is has been reported that patients with faecal incontinence have a higher prevalence of pelvic floor injury and concomitant anal sphincter defects as compared to asymptomatic parous controls. It might be possible that women with an anal sphincter defect due to vaginal delivery plus concomitant pelvic floor injury have a higher risk for developing faecal incontinence as compared to women who have only an external anal sphincter defect. Further research should reveal the exact role of pelvic floor injury in the aetiology of faecal incontinence.

Part III. Rectovaginal Fistula

Various techniques are available for the surgical treatment of rectovaginal fistulas. However, the results after these procedures are often disappointing, especially in women in whom the fistula persisted after prior surgery. It has been suggested that interposition of healthy, well-vascularised tissue, such as puborectal muscle, may be the key to rectovaginal fistula healing. In **Chapter 8** the results after puborectal sling interposition in the surgical treatment of rectovaginal fistulas are presented. Puborectal sling interposition leads to rectovaginal fistula healing in the majority of patients without previous repairs. However, in most patients who had undergone one or more previous attempts at repair, the fistula persisted. In addition, a high prevalence of *de novo* dyspareunia was observed after this procedure. Based on the less favourable outcome and the high risk of *de novo* dyspareunia, puborectal sling interposition cannot be considered as the treatment of choice for women with rectovaginal fistulas, especially not for those with a persistent fistula after prior attempts at repair.

Therefore, rectal sleeve advancement was adapted for the treatment of patients with a persistent rectovaginal fistula. In **Chapter 9** the feasibility of this new type of rectovaginal fistula repair is described. Although performed in a limited number of patients, rectal sleeve advancement resulted in fistula healing in 75 percent of the patients with a persistent rectovaginal fistula, without serious postoperative complications and without dyspareunia as a side effect. Based on these early results, it seems likely that this adapted rectal sleeve advancement is a valuable alternative for the treatment of women with persistent rectovaginal fistulas. However, further research, conducted in a larger number of patients, is warranted to assess the exact role of this procedure.

Conclusions

Transabdominal obliteration of the pelvic inlet is only beneficial for patients with an enterocele and associated symptoms of pelvic discomfort **(Chapter 2)**.

Rectocele repair by transabdominal anterolateral rectopexy is not beneficial for patients with obstructed defaecation **(Chapter 3)**.

Transperineal ultrasound can be used as the first diagnostic tool for the assessment of patients with symptoms suggesting posterior pelvic compartment prolapse **(Chapter 4)**.

Improvement of faecal continence after anterior sphincteroplasty sustains in the long-term **(Chapter 5)**.

Pelvic floor injury is present in the majority of faecal incontinent patients who were eligible for surgical treatment in the past **(Chapters 6 & 7)**.

The efficacy of the surgical treatment of women with faecal incontinence is not influenced by pelvic floor injury **(Chapters 6 & 7)**.

Dyspareunia is a serious side effect of puborectal sling interposition **(Chapter 8)**.

Rectal sleeve advancement seems a valuable alternative for the treatment of women with persistent rectovaginal fistulas **(Chapter 9)**.

Aandoeningen van het achterste compartiment van het kleine bekken komen relatief vaak voor, voornamelijk bij vrouwen op een hogere leeftijd en na één of meerdere vaginale bevallingen. Deze aandoeningen belemmeren de patiënt vaak in het dagelijks functioneren. Dit proefschrift richt zich op de diagnose en de behandeling van deze aandoeningen van het achterste compartiment van het kleine bekken. **Hoofdstuk 1** vormt de algemene inleiding van dit proefschrift. Tevens worden in dit hoofdstuk de doelen en de opbouw van het proefschrift beschreven.

Deel I. Verzakking van het Achterste Compartiment van het Kleine Bekken

Het herstel van een enterocèle door middel van een transabdominale ingreep, waarbij gebruik gemaakt wordt van een synthetisch matje, is op de korte termijn zinvol gebleken bij patiënten met klachten van een verzakkingsgevoel. Het is echter de vraag of dit effect ook op de lange termijn blijft bestaan. In **Hoofdstuk 2** wordt het lange-termijn resultaat beschreven van een operatie waarbij de bekkeningang, via een transabdominale ingreep, wordt afgesloten. Ondanks dat bleek dat de enterocèle was verdwenen na de ingreep, keerde het verzakkingsgevoel bij één op de vier vrouwen uiteindelijk terug. Dit zou mogelijk kunnen passen bij de aanwezigheid van andere verzakkingen, bijvoorbeeld van de blaas of van de baarmoeder, maar het zou ook goed kunnen dat dit gewijd moet worden aan langzame uitbreiding van de onderliggende oorzaak, waardoor in eerste instantie de enterocèle is ontstaan. Daarnaast bleef een bemoeilijkte stoelgang na de operatie bestaan bij de meeste patiënten waarbij dit probleem voor de operatie gezien werd. Het lijkt dus niet waarschijnlijk dat de enterocèle alleen de oorzaak is voor het ontstaan van een bemoeilijkte stoelgang. Het is waarschijnlijker dat andere afwijkingen, bijvoorbeeld een veranderde werking van de wand van de endeldarm, ook bijdragen aan de bemoeilijkte stoelgang die sommige vrouwen met een enterocèle ervaren. De beslissing of een patiënt met een enterocèle geopereerd zal worden, dient gebaseerd te worden op het klachtenpatroon van de vrouw. Indien het belangrijkste probleem het verzakkingsgevoel is, kan een afsluiting van de bekkeningang overwogen worden. Echter, deze ingreep dient niet aanbevolen te worden als een bemoeilijkte stoelgang op de voorgrond staat. Daarnaast dient ook actief gezocht te worden naar de aanwezigheid van eventuele andere verzakkingen, die indien zij aanwezig zijn ook behandeld dienen te worden.

Een potentieel risico van het herstel van een rectocèle, door middel van een transvaginale of transanale ingreep, is het ontstaan van pijn tijdens het vrijen na de operatie. Een transabdominale ingreep lijkt dit risico niet te hebben. In **Hoofdstuk 3** worden de resultaten beschreven van een behandeling van rectocèles door middel van de transabdominale voorste rectopexie. Na deze ingreep bleek de rectocèle adequaat gecorrigeerd te zijn bij 80 procent van de patiënten, zonder dat er pijn tijdens het vrijen ontstond. Echter, ondanks het verdwijnen van de

rectocèle na de operatie, bleef bij de meeste vrouwen een bemoeilijkte stoelgang bestaan. Dit teleurstellende resultaat wordt ook gevonden na andere typen ingrepen voor de behandeling van een rectocèle. Het is daarom de vraag of de rectocèle de oorzaak of juist het gevolg is van een bemoeilijkte stoelgang. Op basis van recent onderzoek lijkt het waarschijnlijker dat een bemoeilijkte stoelgang ontstaat door meerdere factoren, wat mogelijk kan verklaren waarom het herstel van de rectocèle alleen niet leidt tot een vermindering van de klachten van de patiënt. Vervolgonderzoek is nodig om aan te tonen wat het exacte onderliggende mechanisme van een bemoeilijkte stoelgang is. Op basis van deze informatie kunnen dan mogelijk andere behandelingsopties worden ontwikkeld.

Het defaecogram is een goede manier om patiënten te onderzoeken die zich presenteren met klachten welke mogelijk kunnen passen bij verzakking in het achterste compartiment van het kleine bekken. Belangrijke nadelen van deze beeldvormende techniek zijn echter de blootstelling aan röntgenstraling en de benodigde vulling van de endeldarm, de dunne darm en de vagina met contrastmiddel. Daarnaast is het niet mogelijk om met deze techniek informatie te verkrijgen over de toestand van het voorste en het middelste compartiment. Omdat patiënten met één verzakking vaak tegelijkertijd andere verzakkingen hebben, die tevens behandeld dienen te worden, is het duidelijk dat het verkrijgen van informatie over alle compartimenten van het kleine bekken onmisbaar is. Transperineale echografie is een nieuwe techniek, die de mogelijkheid biedt om alle compartimenten tegelijkertijd in beeld te brengen. Daarnaast gebruikt deze techniek geen röntgenstraling en is dit onderzoek relatief goedkoop uit te voeren. In **Hoofdstuk 4** wordt beschreven wat de mate van overeenkomst is tussen het defaecogram en de nieuwe transperineale echografie als het gaat om het aantonen van verzakking in het achterste compartiment van het kleine bekken. Tijdens de studie hebben alle patiënten met klachten welke mogelijk zouden kunnen passen bij deze verzakkingen beide onderzoeken ondergaan. Een goede mate van overeenkomst werd gevonden voor het aantonen van een enterocèle. Voor het aantonen van een rectocèle werd een gemiddelde overeenkomst gevonden en een matige overeenkomst werd gevonden voor het aantonen van een intussusceptie. Het is echter niet duidelijk of een intussusceptie klinische betekenis heeft. Tevens gaven de patiënten aan dat zij de transperineale echografie een stuk minder belastend vonden dan het defaecogram. Gebaseerd op deze bevindingen is transperineale echografie een goed alternatief voor het defaecogram bij patiënten met klachten welke mogelijk kunnen passen bij verzakking in het achterste compartiment van het kleine bekken.

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Deel II. Faecale Incontinentie

Voor patiënten met faecale incontinentie op basis van een defect in de buitenste anale sfincter, die geen baat hebben gehad bij ondersteunende maatregelen, is een voorste sfincterplastiek op dit moment de behandeling van keuze. Recent is duidelijk geworden dat deze patiënten ook geholpen kunnen worden door middel van sacrale neuromodulatie. Het is daarom de vraag of deze incontinente patiënten met een defect in de buitenste anale sfincter primair behandeld dienen te worden door middel van een voorste sfincterplastiek of door middel van sacrale neuromodulatie. Omdat in de meeste studies naar de voorste sfincterplastiek gebruik gemaakt wordt van andere uitkomstmaten dan in de studies naar sacrale neuromodulatie zijn de resultaten van beide behandelmethoden tot op heden lastig te vergelijken. In **Hoofdstuk 5** worden de resultaten beschreven van een studie naar de uitkomst van de voorste sfincterplastiek. Hierbij is gebruik gemaakt van een uitkomstmaat die vergelijkbaar is met de uitkomstmaat die vaak gebruikt wordt in studies naar sacrale neuromodulatie. Het is hierdoor beter mogelijk om de resultaten van beide behandelmethoden met elkaar te vergelijken. De voorste sfincterplastiek bleek over het algemeen te resulteren in een substantiële verbetering van de faecale continentie bij 60 procent van de patiënten. Daarnaast bleef dit gunstige effect ook op de lange termijn bestaan. Patiënten met een leeftijd van 50 jaar of ouder tijdens de ingreep bleken helaas een stuk minder baat te hebben bij de ingreep. Het is bekend dat een beschadiging van de sfincters voornamelijk ontstaat tijdens een vaginale bevalling. Deze beschadiging is bij deze vrouwen dus al jaren aanwezig. Het lijkt daarom logisch dat er meerdere factoren een rol spelen bij het ontstaan van faecale incontinentie bij deze vrouwen. Het is dan ook de vraag of het uitvoeren van een voorste sfincterplastiek bij deze vrouwen van 50 jaar of ouder gerechtvaardigd kan worden.

Een vaginale bevalling kan niet alleen tot beschadiging van de anale sfincters leiden, maar ook tot beschadiging van de bekkenbodem. Het is echter tot op heden onbekend of bekkenbodemschade een rol speelt in de ontstaanswijze van faecale incontinentie en van invloed is op het resultaat van een eventuele behandeling van dit probleem. In **Hoofdstuk 6** en **7** wordt beschreven in welk deel van de vrouwen, die in het verleden chirurgisch zijn behandeld voor faecale incontinentie, een beschadiging van de bekkenbodem gevonden wordt. Tevens wordt beschreven of deze beschadiging een invloed heeft op het resultaat van zowel een voorste sfincterplastiek (**Hoofdstuk 6**) als sacrale neuromodulatie (**Hoofdstuk 7**). Op basis van de uitgevoerde transperineale echografie bleek dat de meeste patiënten, na een chirurgische behandeling van faecale incontinentie, bekkenbodemschade hadden. De aanwezigheid van deze schade had echter geen invloed op het wel of niet slagen van de uitgevoerde chirurgische behandeling. Mogelijk kan het hoge percentage vrouwen met een beschadigde bekkenbodem in deze groep patiënten worden verklaard doordat de aanwezigheid van bekkenbodemschade een rol speelt in de ontstaanswijze van faecale incontinentie. Het blijkt dat de combinatie van

een beschadigde bekkenbodem met beschadigde sfincters vaker voorkomt bij vrouwen met faecale incontinentie dan bij vrouwen zonder klachten. Het is dus mogelijk dat vrouwen met schade aan de anale sfincters en tegelijkertijd schade aan de bekkenbodem een hoger risico lopen om faecaal incontinent te worden dan vrouwen met alleen schade aan de anale sfincters. Vervolgonderzoek zal moeten uitwijzen wat de exacte rol van bekkenbodemschade is in de ontstaanswijze van faecale incontinentie.

Deel III. Rectovaginale Fistels

Verschillende technieken zijn beschreven voor de chirurgische behandeling van een rectovaginale fistel. Echter, het is gebleken dat deze operatieve procedures vaak tot een teleurstellend resultaat leiden, voornamelijk bij vrouwen met een rectovaginale fistel, die al een eerdere en dus mislukte operatie voor de behandeling van deze fistel hebben ondergaan. Het is gesuggereerd dat er een beter resultaat behaald kan worden als er gezond en goed doorbloed weefsel aangebracht wordt tussen de endeldarm en de vagina. In **Hoofdstuk 8** worden de resultaten van een dergelijk ingreep, de puborectale sling interpositie, beschreven. Na deze operatie genas de fistel in de meerderheid van de patiënten die nog niet eerder geopereerd waren aan deze fistel. Echter, de fistel persisteerde in de meeste patiënten die wel al een eerdere operatie hadden ondergaan. Daarnaast ontstond in een aanzienlijk deel van de patiënten pijn tijdens het vrijen na de operatie. Op basis van deze ongunstige resultaten blijkt de puborectale sling interpositie niet de behandeling van keuze voor vrouwen met een rectovaginale fistel, zeker niet voor diegene die al een eerdere operatie voor de behandeling van deze fistel hebben ondergaan.

Hierop voortbordurend werd een andere operatie, de rectale verschuivingsplastiek, aangepast voor de behandeling van patiënten met een nog bestaande rectovaginale fistel na een eerdere operatie. In **Hoofdstuk 9** wordt de haalbaarheid van deze nieuwe operatie voor de behandeling van vrouwen met deze persisterende rectovaginale fistels beschreven. De fistel genas in driekwart van de vrouwen, zonder serieuze complicaties en zonder dat er pijn tijdens het vrijen ontstond na de operatie. Echter, tijdens dit onderzoek is de procedure uitgevoerd bij slechts een klein aantal patiënten. Daarom kan op basis van deze voorlopige resultaten alleen geconcludeerd worden dat de rectale verschuivingsplastiek een waardevol alternatief lijkt te zijn voor de behandeling van vrouwen met een persisterende rectovaginale fistel. Vervolgonderzoek zal moeten uitwijzen wat de uiteindelijke waarde van deze ingreep is.

Conclusies

Transabdominale afsluiting van de bekkeningang is alleen zinvol bij patiënten met een enterocèle en daarbij passende klachten van een verzakkingsgevoel (**Hoofdstuk 2**).

Herstel van een rectocèle door middel van een transabdominale voorste rectopexie is niet zinvol bij patiënten met een bemoeilijkte stoelgang (**Hoofdstuk 3**).

Transperineale echografie kan worden gebruikt als het primair beeldvormend onderzoek bij patiënten met klachten die zouden kunnen passen bij verzakking in het achterste compartiment van het kleine bekken (**Hoofdstuk 4**).

Na een voorste sfincterplastiek blijft de verbetering van faecale continentie op de lange termijn bestaan (**Hoofdstuk 5**).
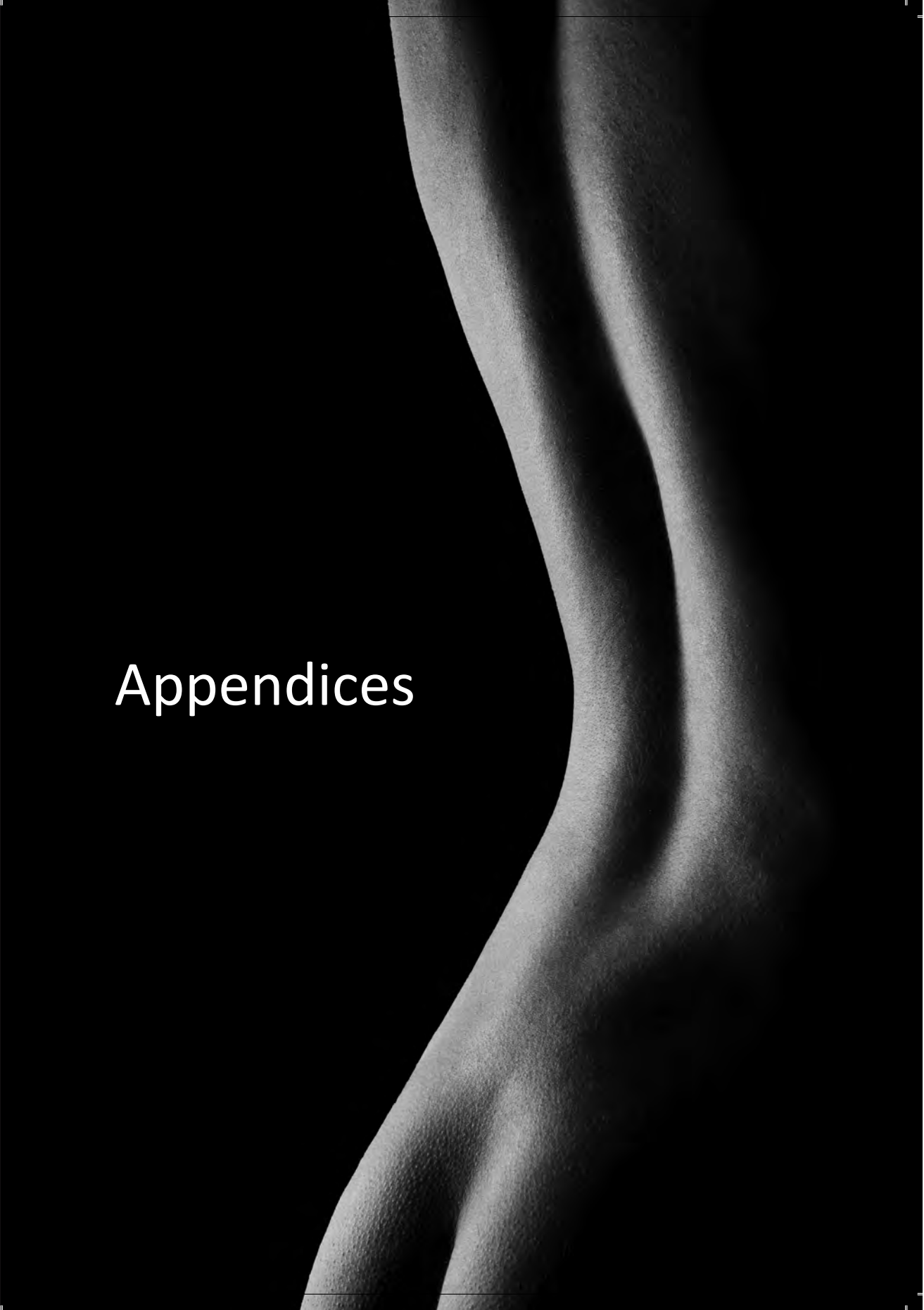
Bekkenbodemschade is aanwezig bij het merendeel van de patiënten die in het verleden chirurgisch zijn behandeld voor faecale incontinentie (**Hoofdstuk 6 & 7**).

De effectiviteit van een chirurgische behandeling van faecale incontinentie wordt niet beïnvloed door de aanwezigheid van bekkenbodemschade (**Hoofdstuk 6 & 7**).
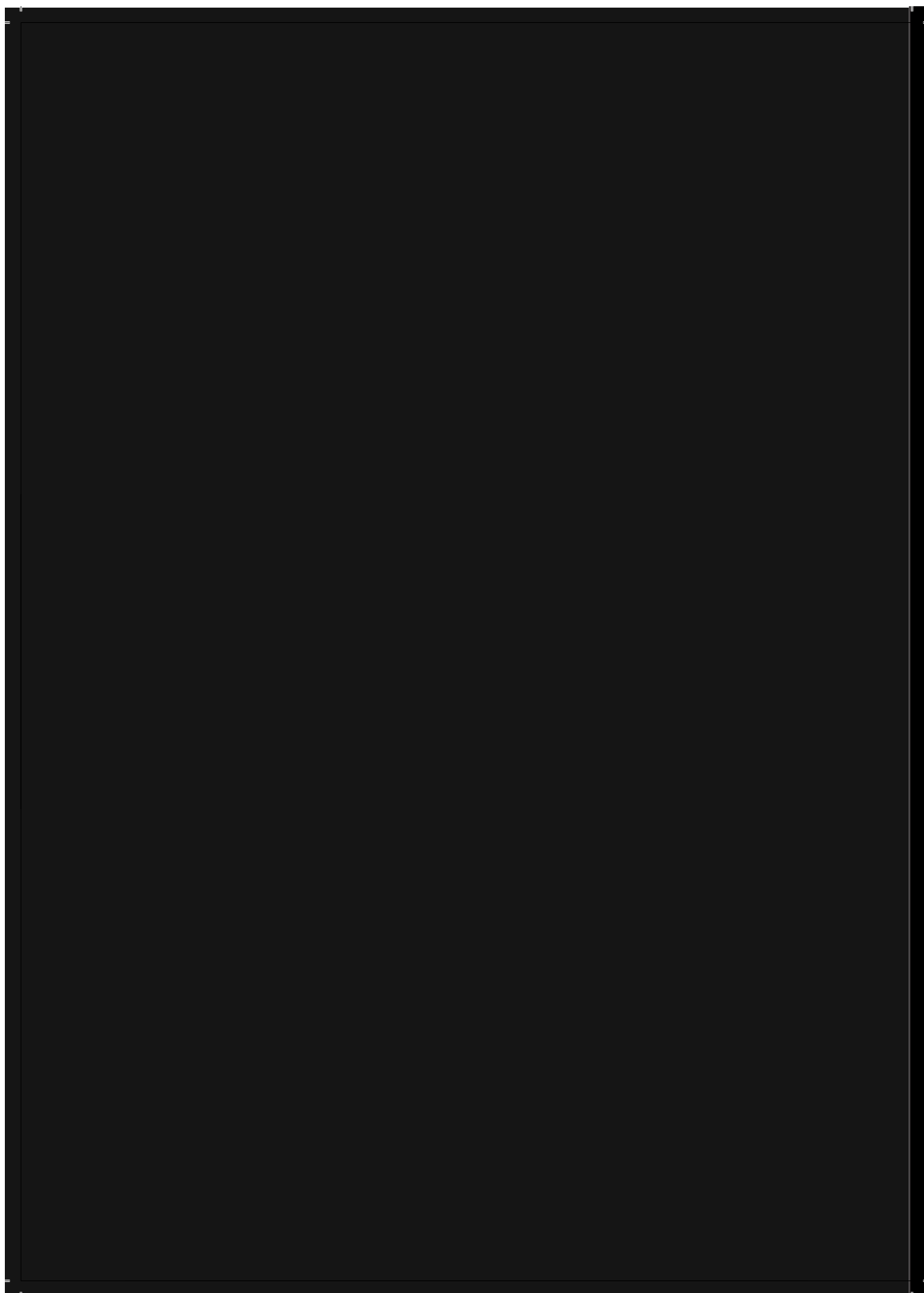
Pijn bij het vrijen is een belangrijke bijwerking van een puborectale sling interpositie (**Hoofdstuk 8**).

Een rectale verschuivingsplastiek lijkt een waardevol alternatief te zijn voor de behandeling van vrouwen met een persisterende rectovaginale fistel (**Hoofdstuk 9**).
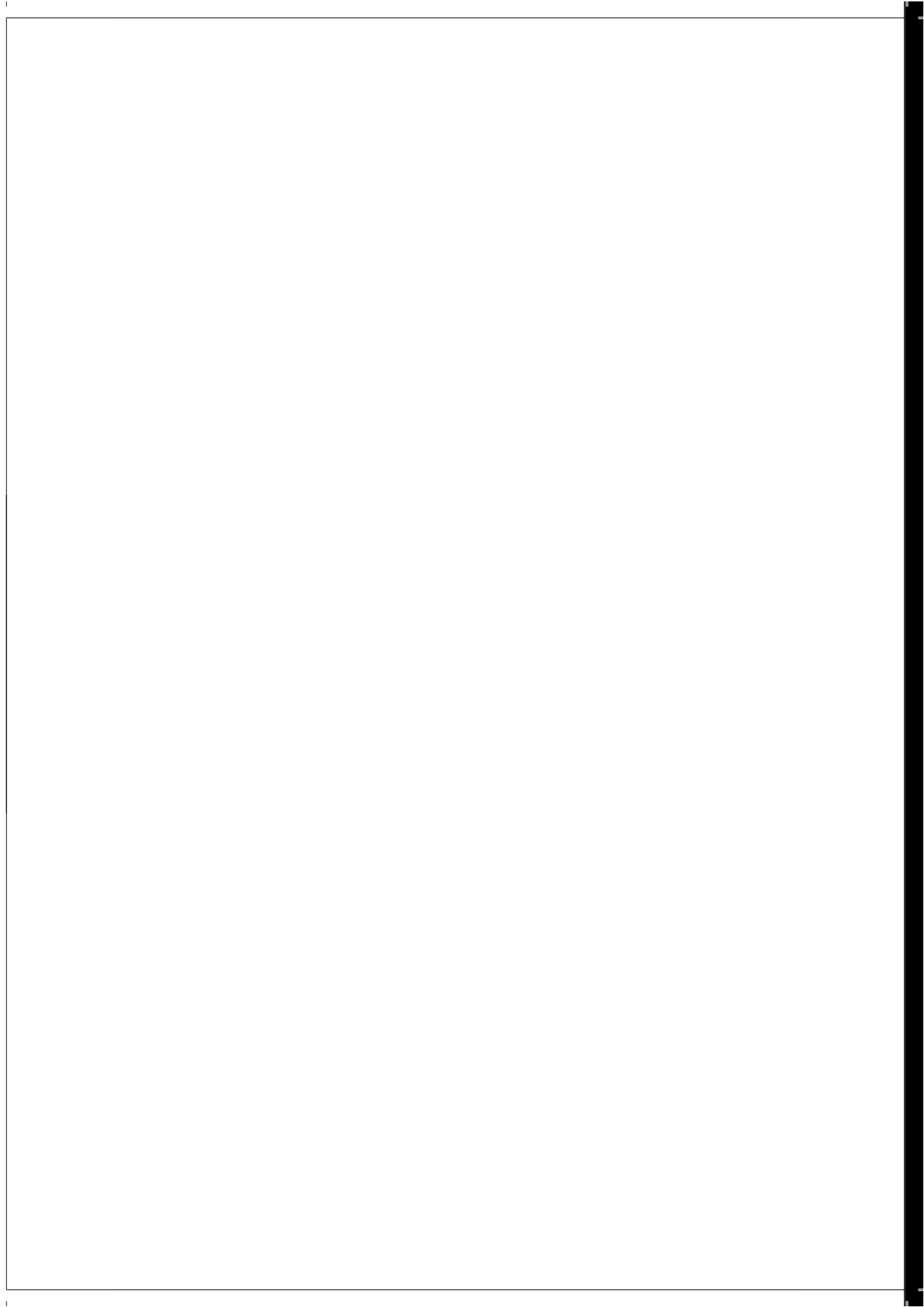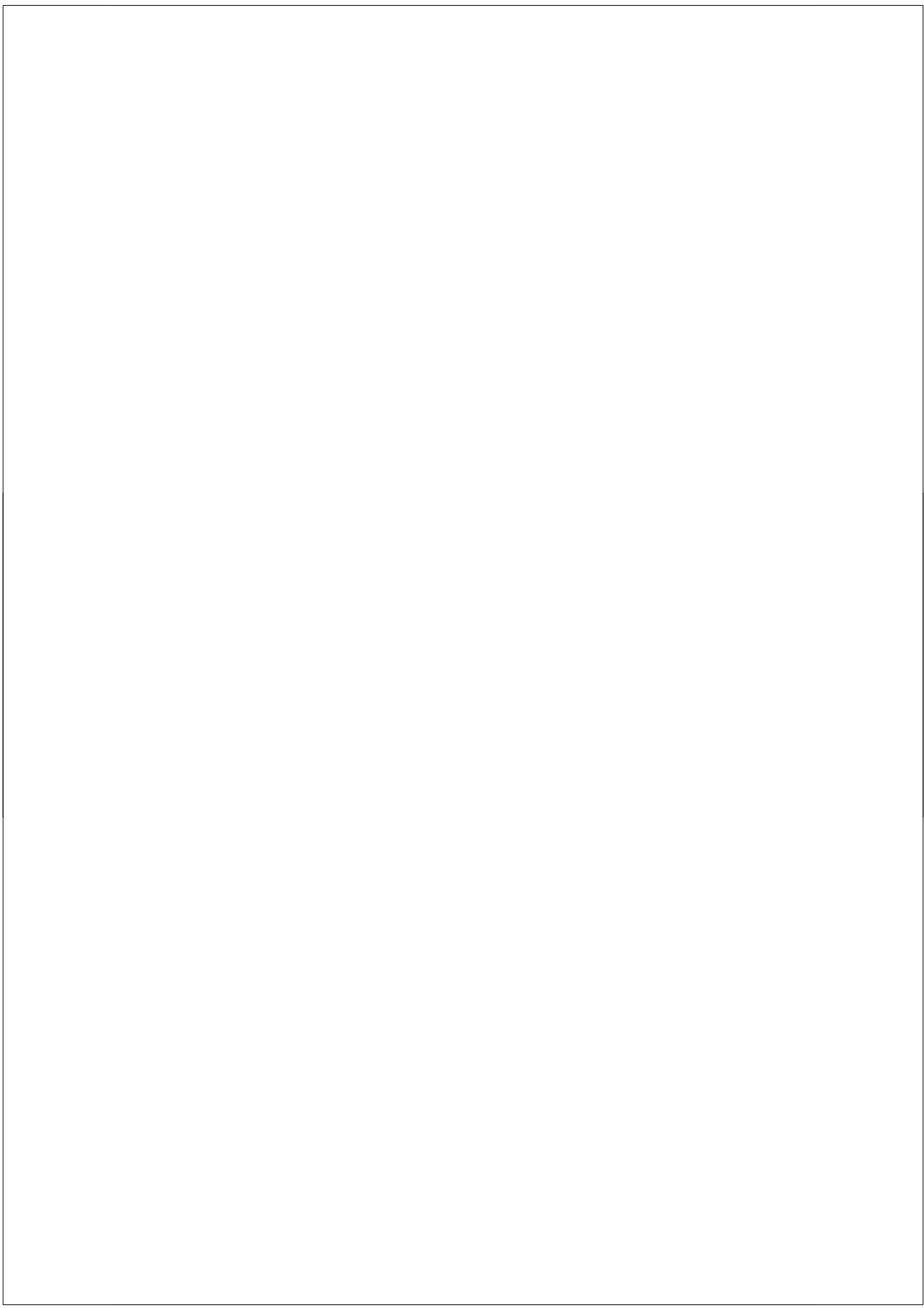
Appendices

Publications

Publications

Oom DMJ, Gosselink MP, van Dijl VRM, Zimmerman DDE, Schouten WR. Puborectal sling interposition for the treatment of rectovaginal fistulas. Tech Coloproctol 2006;10(2):125-30.

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Dankwoord
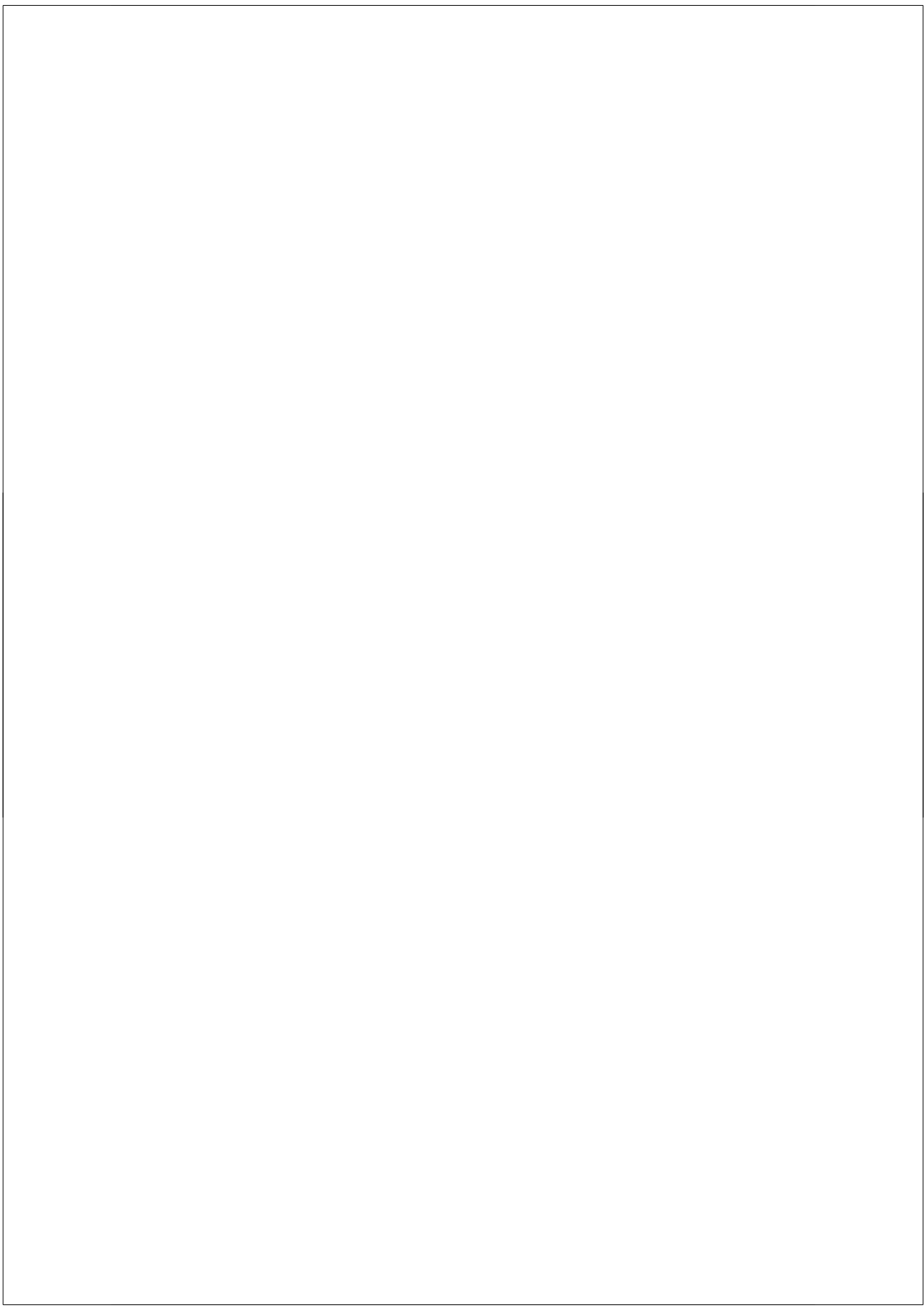
Dankwoord

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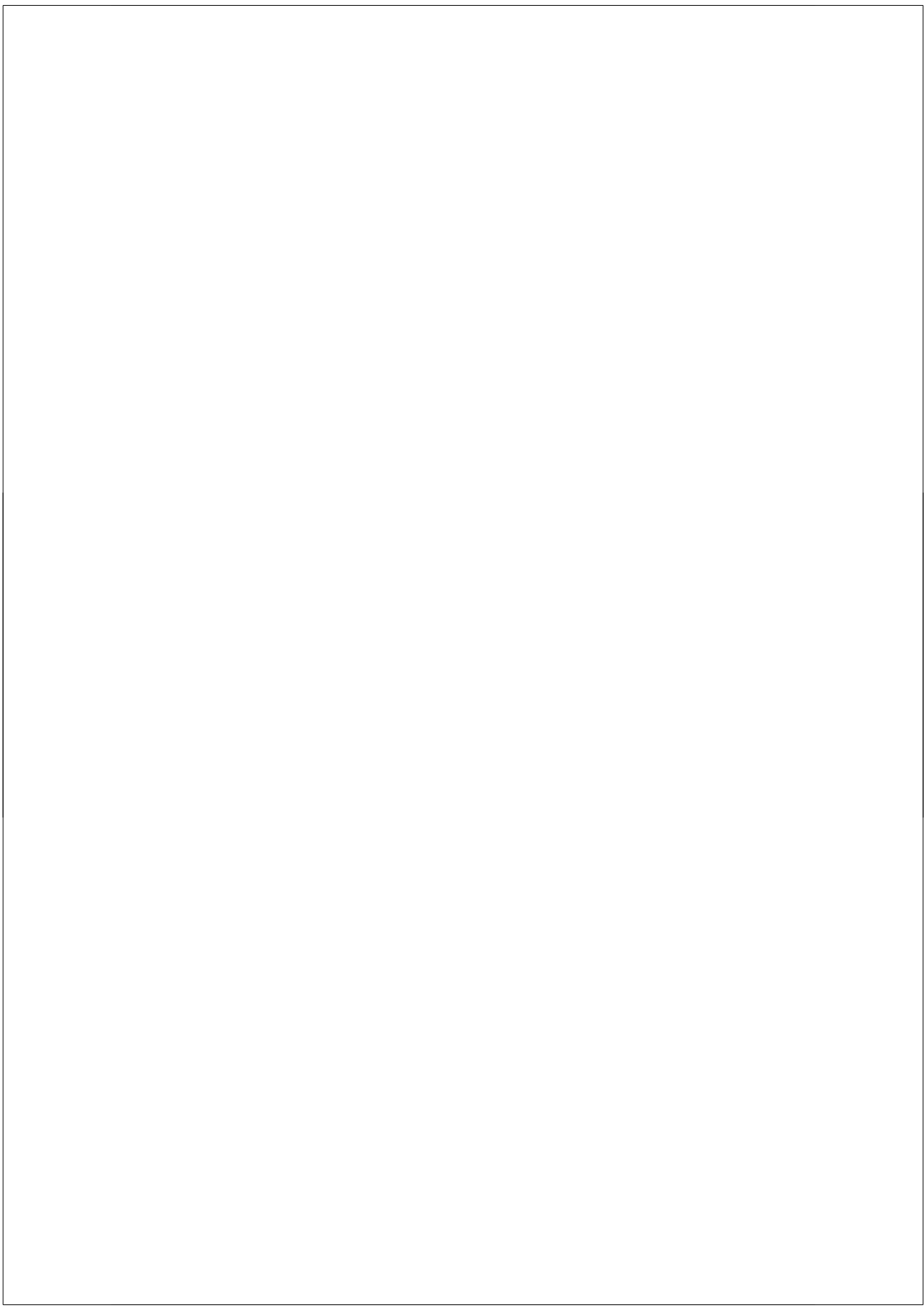
Patrick, lieve broer, ondanks dat onze beroepskeuzes ervoor zorgen dat wij elkaar niet zo vaak kunnen zien, ben jij er steeds voor me als het erop aankomt.

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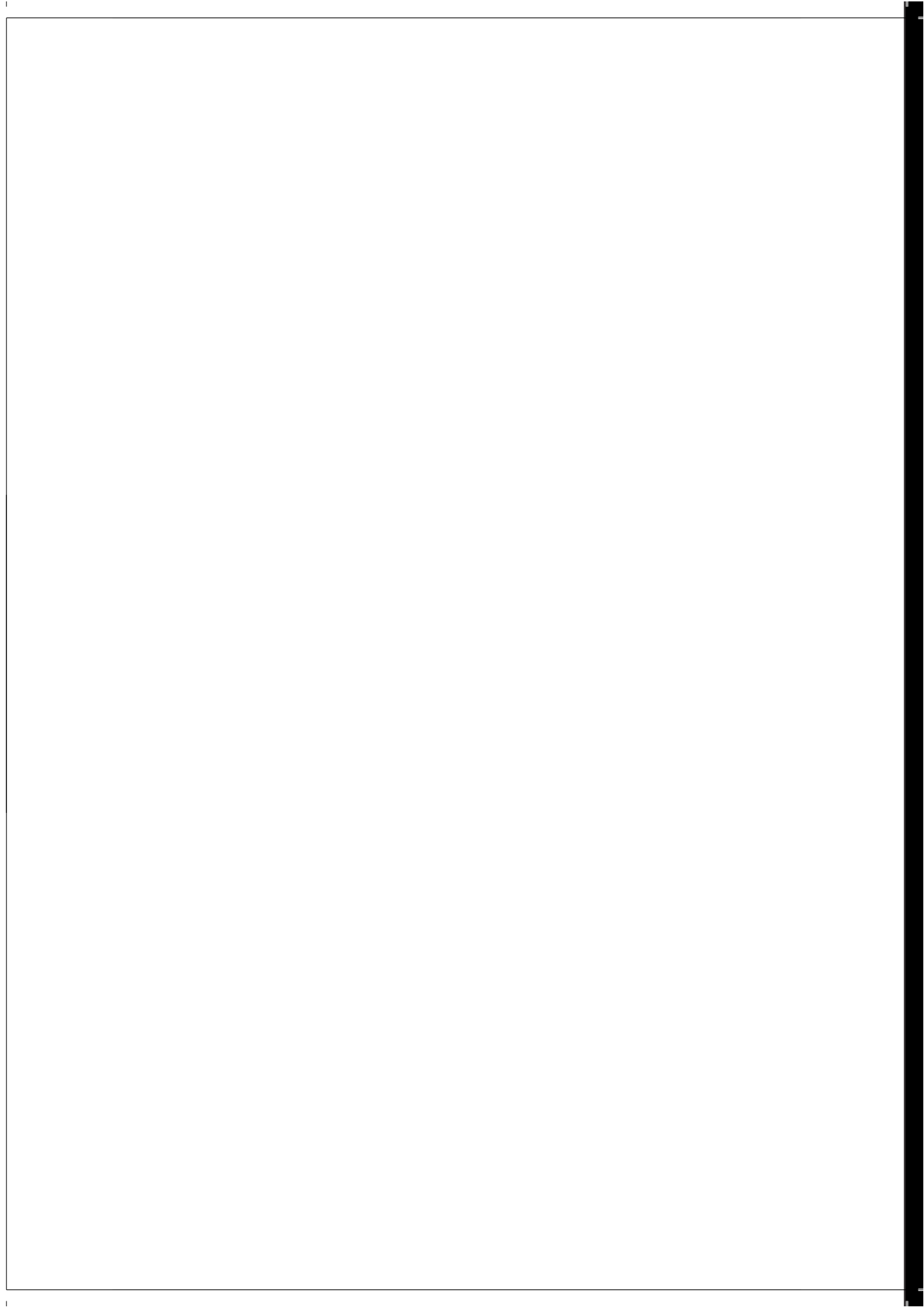
Curriculum Vitae

Curriculum Vitae

Daniëlla Maria Jacqueline Oom werd geboren op 27 september 1983 te Rotterdam. Na het eindexamen VWO, aan het Develstein College te Zwijndrecht, studeerde zij geneeskunde aan de Erasmus Universiteit Rotterdam. Tijdens haar doctoraalfase verrichtte zij multidisciplinair onderzoek in het Erasmus MC te Rotterdam, zowel op de afdeling Algemene Heelkunde als op de afdeling Obstetrie en Gynaecologie, onder leiding van dr. W.R. Schouten. Tijdens deze onderzoeksperiode legde zij de basis voor dit proefschrift. In mei 2008 werd het artsexamen Cum Laude behaald. Hierna volgde een aanstelling als arts-onderzoeker op de afdeling Algemene Heelkunde (prof. dr. J.J.B. van Lanschot). Sinds juni 2009 is zij werkzaam als ANIOS Obstetrie en Gynaecologie in het Maasstad Ziekenhuis te Rotterdam (dr. A.M. van Heusden).